Nepal eCooking Market Assessment

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EnDev/MECS eCooking Market Assessments

- Part of a series of publications produced jointly by Energising Development (EnDev) and the Modern Energy Cooking Services (MECS) Programme.
- Strategic insight on the current state of electricity access and clean cooking, identifying the key opportunities and challenges to the scale up of eCooking in 8 countries across sub-Saharan Africa and South Asia.

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Overview

- Summary of the opportunity for eCooking in Nepal
- Clean cooking & electricity access
- Deep dive into:
  - Enabling environment
  - Consumer demand
  - Supply chain
- Recommendations for strategic interventions

Summary

- The Government of Nepal (GoN) has adopted an **integrated electrification-clean cooking approach** with a 2020 NDC target of 25% of all households using electricity as a primary mode of cooking by 2030 and a dedicated eCooking tariff already deployed.
- The country has made massive strides in its electrification with current access close to **95%** with **71.7%** of households **grid-connected** and **23% off-grid**. The GoN 2018-2028 announced as the Decade of Energy and Hydropower to realize the dream of 'Prosperous Nepal, Happy Nepali' and included in this was the **aim to provide electricity access to every household by 2022**.
- Yet **52.4%** of households rely on **firewood** as their main fuel for cooking (35.4% urban; 65.8% rural). **Currently 0.4% of Nepali households use electricity as their primary cooking fuel.**
- The country's increasing investment in **renewable generation capacity** and expected **surplus capacity** means that **cooking with electricity is a viable option** (and will become increasingly so), particularly for those connected to the grid.
- In 2020/21, the GoN's Alternative Energy Promotion Centre (AEPC) aimed to promote e-cooking in 100,000 households and the Nepal Electricity Authority (NEA) launched a dedicated eCooking tariff.

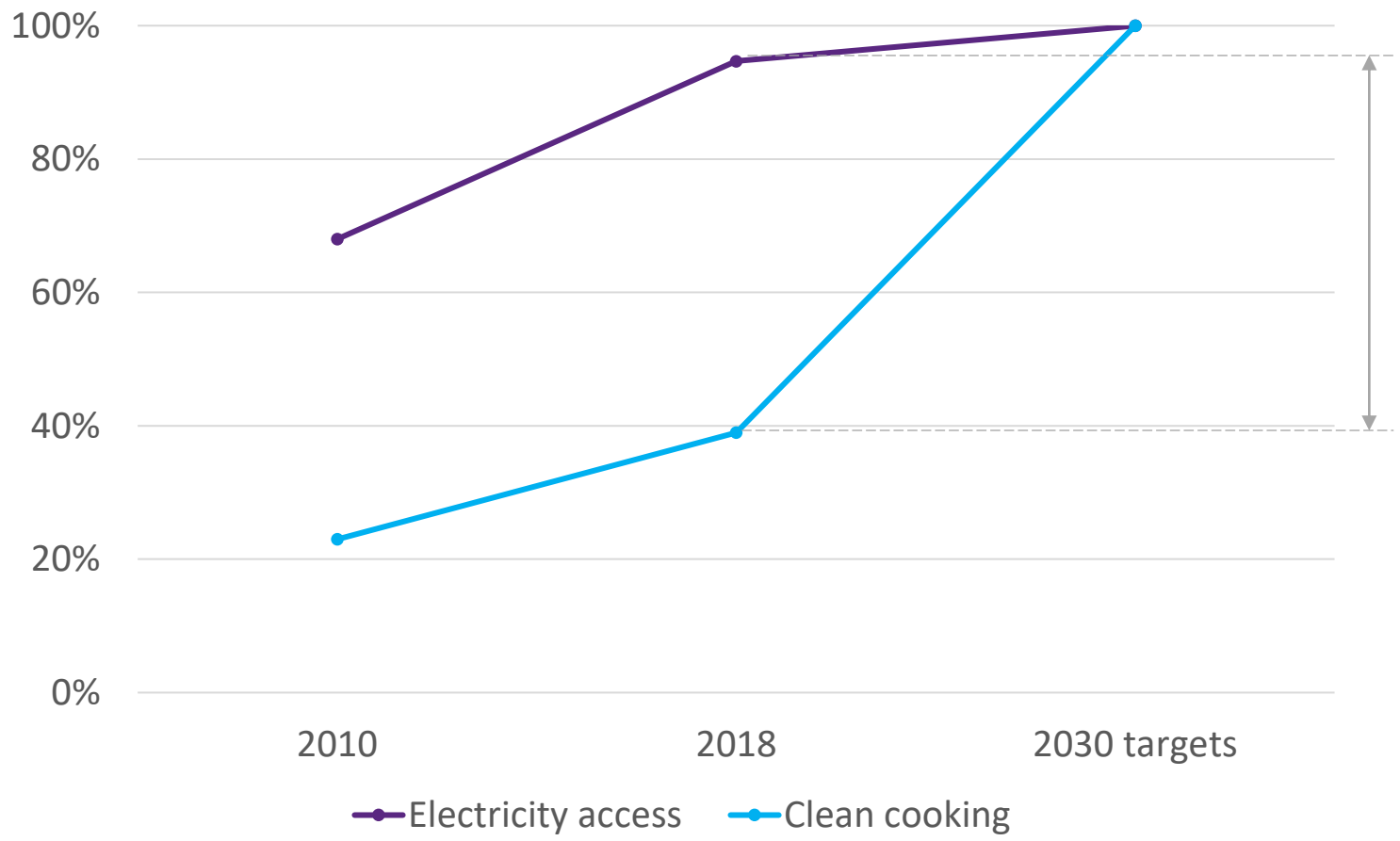
The clean cooking challenge

- Despite near universal access to electricity, quality and reliability of electricity supply remains a key issue.
- Unfortunately, less than 1% of Nepali households primarily cook with electricity.
- Households continue to rely heavily on freely available solid biomass (firewood, cow dung, plant residue) as a cooking fuel.
- Clean energy sources such as LPG and electricity are perceived (by households) to be expensive in comparison to freely available fuelwood or cheaper agricultural residue.
- Issues around the unavailability of after sales services (repair and maintenance) persist.

The opportunity for eCooking

- The Government of Nepal has a 2020 NDC target of 25% of all households using electricity as a primary mode of cooking by 2030. The main driver of this approach is the interest to switch LPG users to cooking with electricity (33% of hh).
- The GoN MoEWRI “Current Status and the Roadmap for the Future” White Paper made provision for electric cooking to be included in the long-term vision of AEPC activities and the 15th Plan Approach paper (2019/20-2023/24) and the Clean Cooking Solution for All (CCS4ALL).
- Recently (October 2021), the Electricity Regulatory Commission has reduced the electricity tariff for households consuming over 150 units with the hope of encouraging the use of electric ovens (and other electric cooking appliances) to increase power consumption and reduce wastage.
- Development of the 15th Plan Approach which is a five-year plan has dual aim:
  (1) smokeless kitchens with suitable electricity tariffs for e-cooking;
  (2) standards and efficiency of electric cookstoves to be established prior to household dissemination.

Clean cooking and electricity access in Nepal

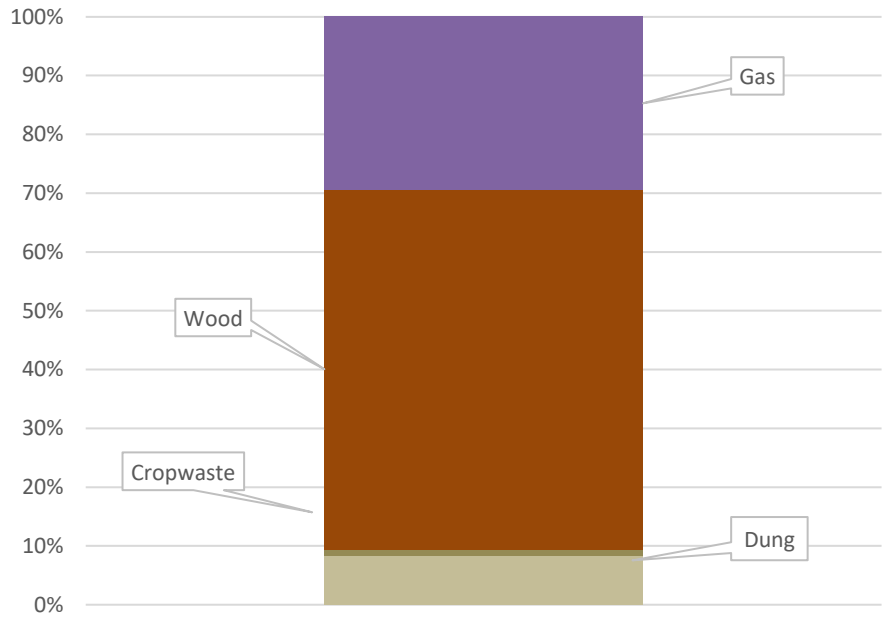


56% now connected to electricity, but still primarily cooking with polluting fuels

Nepal data snapshot from [MECS eCooking Global Market Assessment]

Cooking energy

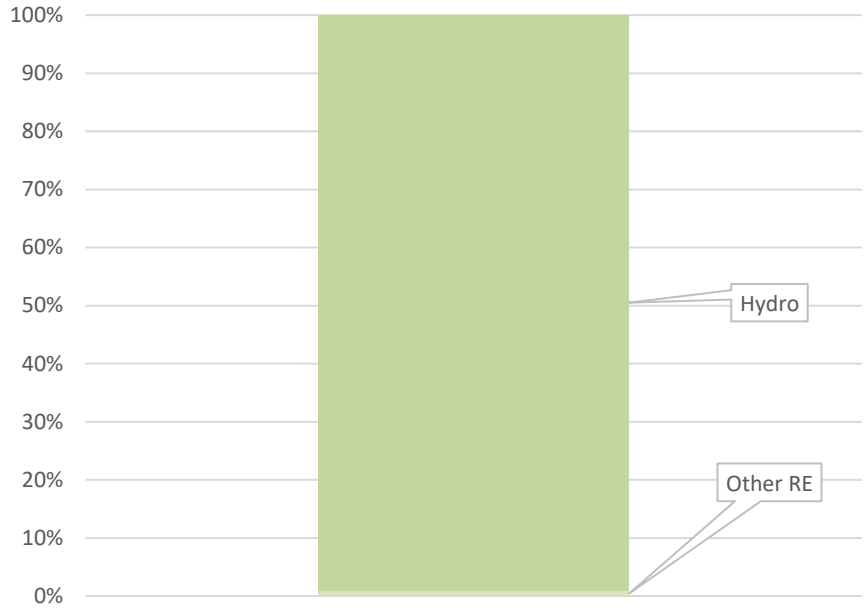
0.4% cook primarily with electricity



0% cook primarily with commercialized polluting fuels

Electricity generation (on-grid)

100% renewable

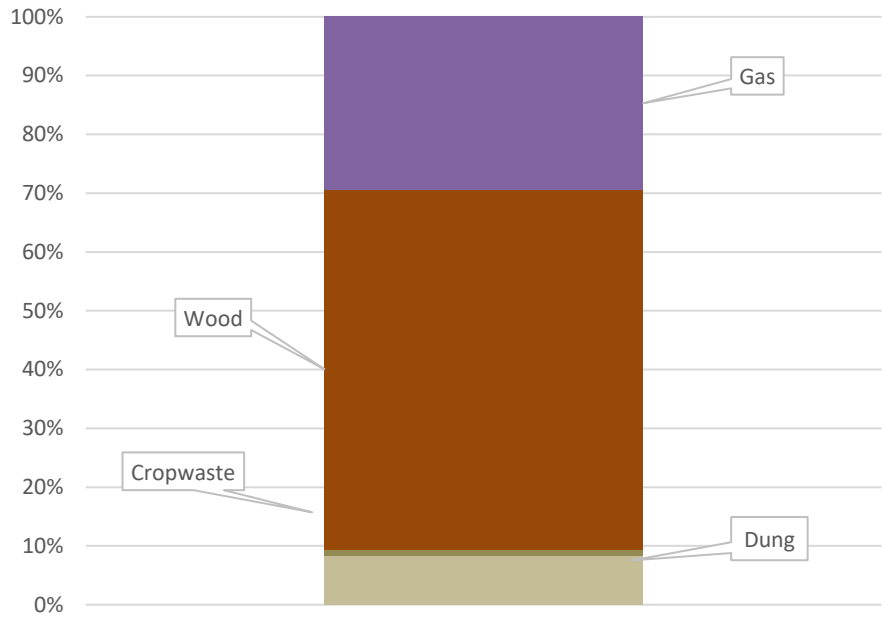


200-600MW per day surplus power generation

Variable Reliability: **47.4%** hh receive almost 24 hours supply; **5%** hh have **8-16 hrs** p/day, whilst **47.7%** receive **16-23 hrs** p/day.

Cooking energy

0% cook primarily with electricity



46% cook primarily with commercialized polluting fuels

Electricity generation (off-grid)

World leading mini-grid & off-grid sectors:

- 23% mini-grid customers
- 1.5m off-grid lighting/appliance customers

MECS eCooking GMA viability scores/rankings

- GMA = Global Market Assessment
- Scored all low- & middle-income countries using international indicators for:
  - economics (clean fuels, market size, financial sector strength)
  - human (policy, health, gender, development, business environment)
  - infrastructure (electricity access, reliability, RE share)
- MECS.org.uk/GMA

Nepal	Overall:	On-grid eCooking:	Mini-grid eCooking:	Off-grid eCooking:
	2nd/130	**0.54 – 54th/130**	**0.43 – 7th/130**	**0.48 – 16th/130**

Key opportunities

- GoN are committed to addressing policy for an integrated approach of electricity access and clean cooking sectors;
- Dedicated eCooking tariff already in place;
- Expected surplus generation capacity;
- Most mini-grid systems hydro powered - more appropriate than solar for electric cooking;
- Large body of past/ongoing research.

Key challenges

- New eCooking tariff disincentivises low-income households from adopting electric cooking;Grid supply and reliability issues (blackouts, low voltage);
- Lack of awareness of clean cooking options;
- Constrained financial resources among households using traditional stoves;
- Installed capacity of the grid.

Potential impacts of scaled uptake in most viable market segment

If 40% of Nepal's grid-connected firewood users (2.7m ppl, 650,000 HHs) switched to eCooking, the WHO's BAR-HAP tool suggests that:

- 11,881 DALYs/yr avoided
- 1.8m tonnes/yr CO2eq emissions reduced
- 1m tonnes/yr reduction in unsustainable wood harvest
- 286m hrs/yr of women's time saved (438hrs/HH/yr)
- 6 months payback for eCooking appliances (80$/HH upfront cost, 165$/HH/yr savings on fuel energy costs)
- 571 GWh demand for electricity stimulated

- Health benefits include more than 700 lives saved per year.
- Some 12% of current unsustainable wood harvesting would be avoided.
- Nepal's electricity almost completely renewable, so greenhouse gas emissions from the cooking sector would reduce by >10%.
- Impacts may seem modest, but this scenario is targeting less than 10% of the total population.

Enabling environment

Enabling environment

- **eCooking policy outlook:** GoN are committed to addressing policy for an integrated approach of electricity access and clean cooking sectors, with key policy makers starting to create an integrated policy framework that cuts across the two sectors.

- **Key policy stakeholders include** Nepal Electricity Authority (NEA), Alternative Energy Promotion Centre (AEPC), National Association of Community Electricity Users-Nepal (NAECUN), Kathmandu Alternative Power and Energy Group (KAPEG), ENERGIA, Clean Cooking Alliance, Practical Action, Practical Action Consulting, PEEDA, Winrock, IRADe.

RISE (Regulatory Indicators for Sustainable Energy) scores:

64%	74%	42%	27%
Electricity Access	Clean Cooking	Renewable Energy	Energy Efficiency

eCooking cuts across all 4 pillars

Targets:

Electricity access

100% electricity access by 2030 (grid/off-grid)

100% renewable grid electricity by 2030

Clean cooking

72% clean cooking access by 2030

25% modern energy cooking access by 2030

Key government/NGO programmes creating the enabling environment in which eCooking can scale

- The AEPC have driven the promotion of renewable energy technologies including clean cooking solutions. The GoN have also established the Terai Clean Cooking Programme which aims to replace traditional fuels with tier 3 or better cookstoves in 22 districts of the Terai region.
- Clean Cooking Programme funded by ESMAP/World Bank – a 5-year project to promote e-cooking across 0.7 million households.
- Five-year programme in conjunction with the Green Climate Fund which hopes to accelerate cooking solutions, including electric cooking.

Key barriers/drivers in the enabling environment

Drivers

- Favourable electrification-ecooking policy and future outlook;
- The electric cooking appliance market has rapidly grown since 2018 in Nepal;
- As of October 2021, reduced tariff (as mentioned earlier) was introduced to encourage cooking with electric ovens;
- Under the revised tariffs, hhs are currently able to upgrade their meters for free.

Barriers

- Lack of awareness;
- Affordability of both electricity and initial upfront investment for low-income hh;
- Variable and unstable electricity supply.

Consumer demand

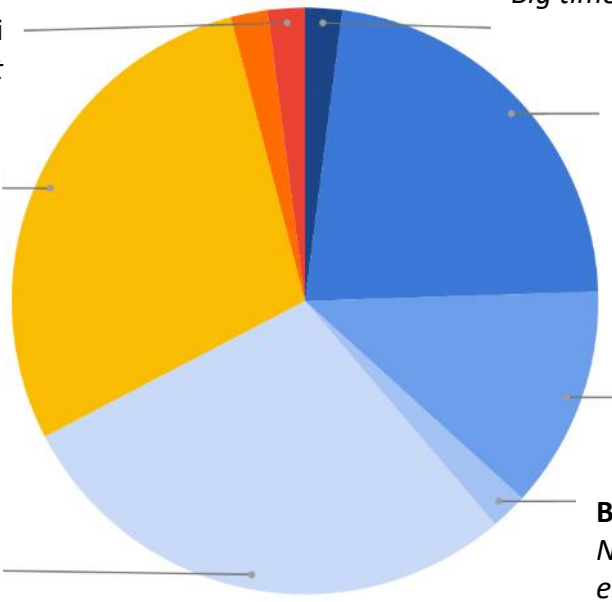
Consumer demand

- In an average week, a typical Nepali household might prepare:

Flatbreads (2x per week) – e.g. chappati
Needs flat pan & even heat – infra-red easiest

Heavy foods / long boiled dishes (1x per week) – e.g. beans
Big time & energy savings in EPC

Deep fried dishes (1x per week) – e.g. samosa, pakoda, sel roti
Needs high heat & deep pan – infra-red, or induction easiest



Lighter stews/curries (11x per week) – e.g. dal stew, meat stew
Moderate time & energy savings in EPC, but an electric frying pan, induction or infra-red stove may be preferred for easier to access to the pan.

Shallow fried dishes (14x per week) – e.g. achar, fried veg
Requires frequent stirring – induction or infra-red easier

Hot drinks (6x per week) – e.g. tea
Kettle most convenient

Boiled staples (14x per week) – e.g. rice, potatoes/maize
Insulated & automated devices (e.g. rice cooker, EPC) offer convenience & moderate energy savings

Boil & stir staples (1x per week) – e.g., dheedo
Non-stick pots make cleaning much easier. Moderate energy savings with insulated & automated devices (e.g., rice cooker, EPC)

Popular meal combinations in Nepal

- A typical meal will most often consist of *dal* (lentil soup), *bhat* (boiled rice) and *tarkari* (curried vegetables) or chicken (or meat) curry.
- *Dheedo* (or *Dhido*), a thick porridge prepared by boiling ground cornmeal or buckwheat or millet flour with salt and water, is a staple in rural diets and often eaten with butter, vegetable curries, pickles and yoghurt (as part of *Dhido Thali*).
- Meals are often accompanied by roti or *chappati* and *achar*.
- Most meals are prepared at home, and most dishes take on average 20-60 minutes to prepare each.

Key market segments

- *Firewood* – Around **73.5%** of Nepali households use firewood for cooking only or in combination with other fuels, as firewood makes up a considerable portion of the fuel stack.
- Firewood is often freely collected. Households in rural areas rely more heavily on firewood (78.5%) than urban households (54.8%).
- *Other* biomass fuels are **dung (5.4%), crop residue (4.9%), charcoal (0.2%), processed biomass (0.2%),** and **saw dust (0.5%).**
- *LPG* – Around **34.9%** of households in Nepal use LPG and, conversely, it is more popular in urban areas (56.5%) than rural households (29.1%).
- Electricity – substantially small with under **1%** of the population using electricity or solar cookers.

Source: MTF Nepal

Key demand side barriers/drivers

Drivers

- Improved health due to reduced HAP;
- Cleaner pots and kitchens due to reduced smoke/soot;
- Less time spent on fuel collection means increased time spent on other activities (whatever they may be);
- Shortened cooking time (instant heat for cooking) and increased convenience;
- Environmental benefits (deforestation/environmental degradation is reduced);
- Cost competitiveness versus LPG.

Key demand side barriers/drivers

Barriers

- Firewood remains freely available;
- High initial investment and monthly costs;
- Concerns around safety of the technology;
- (Initial) concerns around learnability of new appliances;
- Cold climate in mountainous regions - fire from cooking also acts as heat for room.

However, perceptions could be easily addressed through improved awareness and marketing campaigns – especially as the NEA are committed to an integrated electrification and e-cooking approach. Support is already at government level.

Supply chain

Supply chain

- **Key domestic eCooking appliance manufacturers:**
  - Despite CG being a locally-established brand, they manufacture in China
- **Key eCooking appliance distributors:**
  - n/a
- **Identified international eCooking appliance manufacturers:**
  - CG, Baltra, GEEPAS, Urban, Kenwood, Sonesta, Philips

Innovative eCooking pilot projects

- MECS Technology Research Innovation for International Development (TRIID) with PEEDA, KAPEG, University of Bristol and coordinated with RERL/AEPC: Assessing electric cooking potential in micro-hydropower microgrids in Nepal

- **5 Electric Cooking Outreach Projects** over two themes which aim to provide a critical evidence base to inform policy on the current opportunities to scale up electric cooking.
  - **4 Community scale pilot studies addressing** whether efficient electric pressure cookers (EPCs) fit the cultural cooking processes and electricity supply in different communities in Nepal.
  - **1 Market Assessment**

Key supply side barriers/drivers

Barriers

- Electric cookstoves do not seem to be locally manufactured;
- Poor after sales service (i.e. poor access to repair and maintenance);
- Issues around quality and stability of electricity supply.

Drivers

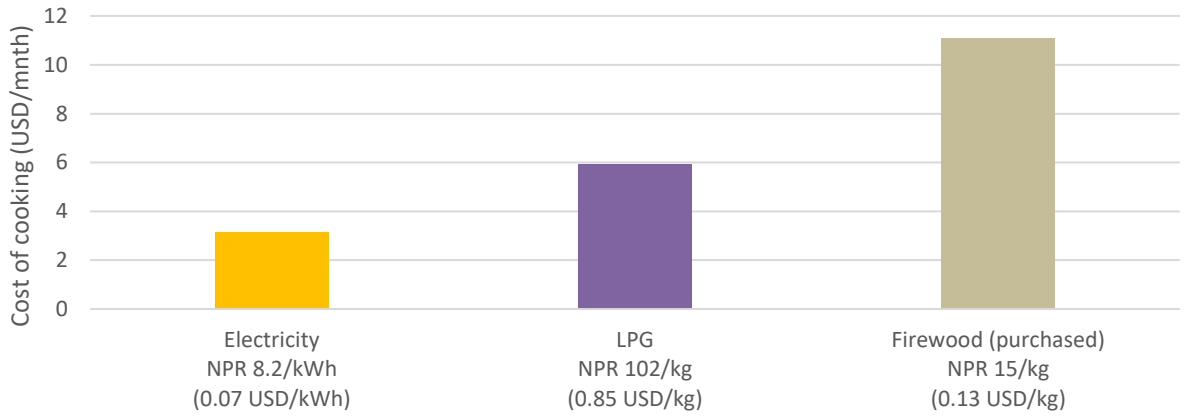
- Electric cooking appliances have increasingly been adopted by high-income urban Nepali households;
- NCS endorsed the Electric Cooktop Standards in 2019 to set safety and standard requirements for household electrical cooking appliances;
- Electric Cooktop Standards of 2019 aims to improve the appliance market with better quality and standardised electric cooking devices;
- During COVID-19, the GoN encouraged the adoption of e-cooking by waiving custom duties on induction cookstove imports and by “providing a 25% discount on electricity consumption of up to 150kWh per month”.

Popular appliances in Nepal today

- Induction stoves;
- Hot plates;
- Infrared stoves;
- Electric rice cookers;
- Microwave ovens;
- Roti maker;
- Electric kettle;
- Electric pressure cookers (nascent).

Relative cost of eCooking vs. popular cooking fuels

- Clean energy sources such as LPG and electricity are perceived to be expensive in comparison to freely available fuelwood or cheaper agricultural residue.
- Controlled Cooking Trials conducted by PEEDA have shown that electric cooking on all electric cooking stoves is cheaper than LPG – with EPCs being over half as cheap due to higher efficiency.
- Electricity Regulatory Commission has reduced the electricity tariff for households consuming over 150kWh so as to encourage the use of electric ovens (and other electric kitchen appliances) to increase power consumption and reduce wastage.



Grid electricity tariffs:

- **Avg estimate**: **8.38 NPR/kWh** (0.07 $/kWh)
- Mini-grid tariffs: don't have data as costs vary

Recommendations for strategic interventions

Recommendations

Market segments	Current status	Recommended interventions
On-grid	*Two thirds of households are grid connected and increasing surplus generation capacity is expected in the near future – with electric cooking seen by the GoN as a critical load for the coming surplus. Reliability of supply is a key issue and outages are frequent, particularly in the dry season when hydro power resources are low.*	*Advocate to National Clean Cooking Strategy and GoN of the importance of demand side management being prioritised within electrification strategies to address seasonal fluctuations in supply. Strengthen the role of CREEs. Increase installed electricity generation capacity to cope with increased demand for eCooking. Encourage GoN to consider ways in which transitioning all hh – not only those cooking with LPG – to eCooking*
Mini-grid	*Strong mini-grid infrastructure: 23% of households connected to off-grid sources crucial to expanding rural electricity access. Most are micro-hydro projects which are more appropriate than solar for electric cooking. Initial research indicates battery storage is key to upscaling eCooking on MHP systems.*	*Support PEEDA's piloting of eCooking on MHP systems to understand how supply and demand can be balanced effectively.* *Leverage the new Gold Standard streamlined methodology for eCooking projects with smart metering to access carbon finance to mitigate costs both upfront and ongoing.*
Off-grid (SHS)	*Current lack of comprehensive data. Further research required.*	*Explore viability of off-grid SHS to support electric cooking in Nepal.*

Recommendations

TToC dimensions	Current status	Recommended interventions
Supply chain	*The Electric Cooktop Standards of 2019 should improve the appliance market with better quality and standardised electric cooking devices. Lack of domestic manufacture and after sales services (e.g., repair and maintenance) for electric cooking.*	*Lobby government to provide public funding or develop an RBF to support eCooking in areas which are more commercially challenging for the private sector. Targeted local capacity building to develop a more geographically even spread of after sales services for electric cooking. Encourage development and regulating of safety standards and capacity of testing of appliance.*
Consumer demand	*Electric cooking appliance market has rapidly grown since 2018. Majority of cuisine can be cooked on electricity. Affordability (both upfront and monthly) is the main barriers to uptake, especially in rural areas. There are also some consumer perceptions that electric cooking appliances are unsafe.*	*Explore viability of different consumer finance models to break down the high upfront cost of energy-efficient eCooking appliances. Set up campaigns to increase awareness of electric cooking as a clean cooking option. Use campaigns to highlight socio-economic and health benefits and address consumer concern*
Enabling environment	*Current policy framework has an integrated approach to electrification and clean cooking with clear and ambitious eCooking targets.* *Under the revised tariffs, HHs are currently (as of October 2021) are able to upgrade their meters for free.*	*Support National Clean Cooking Strategy currently being developed by CCA by raising awareness of key findings from completed and ongoing eCooking projects from MECS and other development organisations. Electricity distribution infrastructure in rural areas needs upgrading. Coordination is needed across national and local government entities, as well as private stakeholders/entities. Lobby for increased research and consideration of climate change impacts through the continued use of biomass fuels (especially black carbon).*

Find out more

Visit MECS.org.uk for:

- The full Nepal eCooking Market Assessment
- The full set of 8 country studies
- Cross-country comparison
- Impact modelling methodology
- Guiding framework