Unlocking the potential for enterprise level electric cooking in Nepal

FINAL REPORT

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Executive Summary

This study funded by MECS is as far as the authors are aware the first of its kind to seek to understand the viability and potential to integrate electric cooking (eCooking) within the enterprise level (defined as commercial or institutional organisations) in Nepal. Current understanding of the opportunities and challenges of enterprise-level electric cooking in Nepal is limited, with research in the eCooking sector primarily focusing on the household level. This study aimed to better understand the opportunities and challenges for eCooking transitions in enterprises, focusing on three broad enterprise category types: hotels, restaurants, and institutions.

Data were collected from 17 hotels, 21 institutions, and 23 restaurants using a structured questionnaire. Before the data collection, the team conducted a rapid assessment of 15 enterprises to better understand and design samples and methodologies. In addition to the survey, the following research approaches were used: ethnographic surveys with six enterprises representing different enterprise types, two Focus Group Discussions (FGD) with the Restaurant and Bar Association Nepal (REBAN) and the chef community, and key informant interviews with the Chef Association of Nepal, REBAN, the Hotel Association (HAN), the Nepal Electricity Authority (NEA).

The results showed that currently a part transition to eCooking, balancing the benefits of cooking with electricity and LPG, seems feasible for most enterprises. Almost all (95%) the surveyed enterprises used LPG as their primary fuel for cooking while for the remaining three (5%), electricity was the primary fuel. Additionally, 93% of the enterprises used electric appliances in some form, mainly in the pre-cooking preparation of different food items and dishes rather than exclusively for cooking purposes. Mixers/juicers (56 of the 61 enterprises), electric kettles (43), rice cookers (22), coffee machines (20), and microwave ovens (18) and toasters (11) were the most commonly owned eCooking appliances in use. Large-size LPG stoves (45), steel fabricated LPG stoves (29), simple residential LPG stoves (19), and LPG Gas ovens (16) were the most common LPG appliances owned, while 16% of enterprises reported using charcoal, 3% coal, and 2% fuel wood for cooking.

Respondents generally perceived electric cooking as a promising option with several benefits highlighted by the majority of respondents including: cost efficiency (80% of respondents), reducing dependency on LGP (80%), being environmentally friendly (74%), maintaining cleanliness in the kitchen (67%), time saving (61%), and allowing multi-tasking (33%). Most (67%) disagreed with the idea that cooking with electricity is unsafe. According to respondents,

eCooking appliances were suitable for various cooking methods, including boiling (92%), reheating (70%), baking (57%), simmering (48%), and frying (48%). A majority (67%) expressed a willingness to invest in electric appliances, while the remaining respondents did not exclude the possibility of doing so. Analysis of the supply chain found large commercial/institutional scale eCooking appliances were available from Nepali suppliers but that enterprises were often unaware of this availability in the domestic market.

Analysis was also carried out with three enterprise types (a bakery, a fine dining restaurant and a cloud kitchen) to assess the financial benefits of transitioning from LPG to eCooking. The results showed that the 'After-Intervention' scenario (which saw enterprises shift some of their cooking from LPG to electricity) had a financial edge over the BAU scenario (where only LPG was used) by a slight margin for all three enterprises. For the bakery, the payback period decreased from 3.03 years (BAU) to 2.55 years (After Intervention) and the IRR also increased from 38.32% (BAU) to 44.67% (After Intervention). Likewise, the effect of replacing LPG based equipment with electric equipment in the fine dining restaurant resulted in a slight reduction in the payback period from 7.36 years to 6.46 and an increase in the IRR from 14.91% to 17.24%. In the case of the cloud kitchen, the After Intervention scenario saw a marginal decrease in the payback period from 0.57 years (BAU) to 0.53 years while the IRR increased slightly from 192.53% (BAU) to 208.14%.

The research also identified challenges facing enterprises seeking to transition to eCooking. The main challenges to adoption were found to be:

- Reliability of electricity: This encompasses issues like power cuts, voltage fluctuations, and concerns about the consistency of electricity supply from NEA.
- Limited supplier awareness: Many enterprises lack knowledge about reliable suppliers of commercial scale eCooking appliances (mostly imported), the availability of such appliances, and the quality of after-sales services such as repair & maintenance.
- Understanding modern electric cooking technologies: There is often a lack of awareness and understanding, especially within the chef community, regarding the proper usage of modern electric cooking technologies.
- Economic return: Enterprises may lack confidence in the economic benefits of making significant investments in electric appliances.
- Taste considerations: Taste plays a critical role in food preparation and there were concerns among chefs that stoves using open flames provide a better taste compared to electric cooking.

Based on the data analysis and interactions with key stakeholders, the following key recommendations for future studies and program interventions to support the opportunities for electric cooking in enterprises were identified:

1. There has been gradual progress in the use of electric appliances in commercial kitchens. Regular awareness raising programs through business membership organizations and government initiatives are necessary to further promote and sensitise enterprises to the benefits of eCooking.
2. Measuring the electricity consumption data of various eCooking appliances in different types of commercial and institutional settings can help develop more precise and detailed cost-benefit analyses of eCooking transitions for enterprises, which in turn can help further the business case for investments in eCooking.
3. Further research is required into the impact that different Government policies, economic tools, and regulatory measures may have on increasing the existing benefits and viability of electric cooking for enterprises.

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Disclaimer

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Abbreviations

CAN	Chefs Association Nepal
CBS	Central Bureau of Statistics
CSR	Corporate Social Responsibility
EPC	Electric Pressure Cookers
FGD	Focus Group Discussion
FY	Fiscal Year
GoN	Government of Nepal
GWh	Gigawatt hour
HAN	Hotel Association Nepal
KII	Key Informant Interview
KVA	kilo-volt ampere
kWh	Kilowatt Hour
LPG	Liquefied Petroleum Gas
MECS	Modern Energy Cook Services
MoEWRI	Ministry of Energy, Water Resources, and Irrigation
MoF	Ministry of Finance
NATHAM	Nepal Academy of Tourism and Hotel Management
NSIC	Nepal Standard Industrial Classification (NSIC)
NEA	Nepal Electricity Authority
REBAN	Restaurant and Bar Association Nepal
PAC	Practical Action Consulting
SOP	Standard Operating Procedures
TOD	Time of Day
VAT	Value Added Tax
WFP	World Food Program
WECS	Water and Energy Commission Secretariat

1. Introduction

1.1 Background

Nepal is gradually transitioning from electricity deficit country to electricity exporting country. Electricity generation situation in the country, which is clean. is improving as new hydropower project are being added into the national grid. Nepal already has a seasonal surplus in terms of electricity generation. Only during the dry season, Nepal is required to import from India. During surplus, Nepal is exporting electricity to India. 493.60 GWh electricity was exported to India in FY 2021/22 which is significantly higher compared to the year before, which was 33.30 GWh (NEA, 2021). According to the NEA annual report, FY 2021/22 was very productive as most of the NEA hydro power projects generated more energy compared to the preceding years. Moreover, over the last 5-years except for year 2020/21 which was heavily impacted by COVID-19, the generation of electricity is progressive. With plethora of hydro projects waiting in line for commissioning in coming years, the electricity generation is encouraging for Nepal.

NEA is also massively focusing on upgrading transmission, distribution systems, and other infrastructure in its corporate development plan to enhance the reliability of supply. NEA is also expediting transmission and distribution system by addition of sub-station, upgrading the transformers, and improving the service delivery mechanism. Upgradation in transmission and distribution is something that cannot happen overnight but intentions from NEA indicate that the transmission and distribution system upgradation is seen as a major priority for NEA. Recently, NEA announced to set up 8 high-capacity sub-station to improve transmission and distribution system within Kathmandu valley[1].

On the electricity demand side, policy makers are concerned about identifying sectors other than industrial sector that will ensure the consumption of additional electricity that is being generated. eCooking and Electric Vehicle (EV) are considered as the sectors that has potential to increase the consumption of electricity. eCooking has gained immense interest from relevant government entities, non-government organizations, development agencies, civil

1https://myrepublica.nagariknetwork.com/news/nea-to-construct-eight-high-capacity-substations-in-kathmandu-valley-to-meet-electricity-demand-till-2050/

society, energy professionals and practitioners. Bunch of favourable national policies[2] (Vaidya, 2020) for e-cooking, mass awareness and capacity building campaigns organized by civil societies, continuous research works supported by various organization along with encouraging electricity generation rate can be attributed to the promotion of eCooking in Nepal. eCooking in the residential sector is at the stage where it no longer needs subsidy to increase the uptake of e-cooking devices, especially in the urban and peri-urban areas. In addition, private sectors are moving aggressively and are well supported by development agencies to promote eCooking through market-based mechanism (Vaidya, 2021). eCooking in the residential sector has taken great strides towards market-based adoption. The recent database from the Custom Department also indicates that people are gradually moving towards adopting e-cooking appliances. The comparison of import data till mid-May 2023 (FY 2022/23) compared to the import data till mid-May 2022 (FY 2021/22) shows an increment of 11%, 46% and 167% in the quantity imports of microwave ovens, induction stoves and infrared stoves respectively. A total of 34,747 microwave ovens, 106,902 induction stoves and 69,161 infrared stoves have already been imported in the 10 months period of FY 2022/23.

The scope of eCooking is beyond the residential sector. Compared to the residential sector, introducing eCooking in commercial sectors have not received much attention at the required level either by the development agencies or the government. eCooking in the commercial sector also has potential to offer new avenues to reduce the consumption of traditional fuels (LPG, fuelwood, charcoal, etc) for cooking and make transition towards eCooking. The cooking behaviour in the commercial sector is completely different to that of residential sector. The basic feature of the commercial cooking is higher frequency of cooking spread across the day and night hours, high volume and wide variety of food preparation, instant preparation of the food, and large size of the vessels and utensils used for cooking. These cooking features cannot be fully complemented by technologies and cooking appliances used for residential sectors. Moreover, compared to residential sector cooking is highly energy intensive. Commercial kitchen is one of the most energy intensive space within enterprises and institution (Mudie et al., 2014).

2 Second Nationally Determined Contribution (NDC): 25% of households using electricity as primary source of cooking, Energy White Paper (2018) developed by Ministry of Energy Water Resource and Irrigation (MOEWRI) to replace solid biomass with electrical energy, 15th plan approach paper (2019) developed by National Planning Commission to promote electric cooking at household level and strategy adopted by the GoN to improve the reliability of electricity distribution network are some of the major policies form the GoN to support e-cooking.

Of late, Nepal has become heavily dependent on imports of petroleum products to meet its energy needs. The price of petroleum products is highly volatile and usually increasing in the country. Over the years, the country has experienced a hike in the price of LPG on multiple occasions. Increasing petroleum price is likely to create an enabling environment that would encourage penetration of eCooking (stove stacking) in the cooking energy mix even in commercial sector. Nevertheless, significant effort is required to understand financial, economic, and socio-cultural viability of eCooking of the commercial sector.

In the domestic sector, the cooking hours among the residential sector are almost common, putting unwanted stress on the transmission and distribution system even in the city areas thus requiring strong argument for need of upgradation to support rapid dissemination of e-cooking. The commercial cooking in the enterprise and institutional sector can provide the option of continuous consumption of electricity at a time of a day where the consumption from residential sector is at the lowest. On a technical ground, the stability of the grid can improve if the load curve variability can be reduced (difference between peak and off-peak hours). Cooking using electricity in both household and commercial sector is in the best interest of Nepal to increase consumption of the electricity within the country.

1.2 Objective

The main objective of the study is as follows:

- Identification of the opportunities and challenges for enterprise level transitions to eCooking.
- Understanding factors and criteria required to assist potential transition to eCooking in different commercial sectors (restaurants, hotel and accommodation, institutions).
- Develop inventory of commercial eCooking appliances available in the country.
- Review current practice in the commercial sector.

1.3 Rationale of the study

In Nepal, many organizations; government and non-government have been advocating and promoting electric cooking at the residential level through various plans, programs, and projects. Different market mechanisms are being tried and tested to promote electric cooking at he the residential level. Although the progress in electric cooking for the residential level is encouraging, the scope of electric cooking in the commercial sector (enterprise and institution) has not been explored. In terms of cooking volume and varieties, consumption of LPG cylinders, commercial sector seems to have high potential to adopt electric cooking. While

adopting eCooking is likely to have its fair share of challenges, there are notable benefits that can be envisaged through adoption of eCooking within the commercial sector. The rationale for the study therefore has been briefly described below illustrating the potential benefits for the national energy mix and energy macro-economics. Other than that, this study will also facilitate in identifying the research methodology that are likely to be convenient and practical to design a comprehensive research method to assess feasibility of eCooking for the commercial sector.

1.3.1 Excess electricity generation surplus

Nepal already has a seasonal surplus in terms of electricity generation. Only during the dry season, Nepal is required to import from India. Otherwise, Nepal since the beginning of FY 2022 has been generating significant amount of revenue from the sales of the electricity. 493.60 GWh electricity was exported to India in FY 2021/22 which is significantly higher compared to the year before which was 33.30 GWh (NEA, 2021). The COVID-19 has had an impact on the sales of electricity otherwise, two years prior to this FY, the sales amount of the electricity was 101 GWh. Nepal is gradually transitioning from electricity deficit country to electricity exporting country. With plethora of hydro projects waiting in line for commissioning in the coming years, the electricity generation scenario is encouraging for Nepal to fulfil the national demand. Besides, NEA (2022) is massively focusing on upgrading transmission, distribution systems, and other infrastructure in its corporate development plan to enhance the reliability of supply. The current circumstance clearly calls for energy services that can increase the demand for electricity consumption within the country and e-Cooking in hospitality enterprise and institution can contribute to escalating the daily demand for electricity.

1.3.2 Contribute to reduce trade deficit

Compared to 2021, imports of LPG in 2022 catapulted to US$ 460 million from US$250 million – an increase of 88%. This puts a huge amount of stress on the national economy. Every effort to reduce the import of LPG will add relief to the economy of the developing country like Nepal. There is encouraging sign regarding availability of electricity therefore introducing e-Cooking and making efforts to escalate the uptake of e-Cooking in residential and commercial sectors will contribute to reducing the trade deficit triggered by the import of petroleum products.

LPG, the energy of choice by most of the enterprises in hospitality sectors and institutions is the major import commodity in Nepal. Nepal imported more than half a million metric ton of

LPG during the FY 2021/22. LPG stood third in the overall imports in Nepal during the period. (Source: Foreign Trade Statistics FY 2021/22, Customs Department)3 This has a large bearing in the balance of trade and payments to the national economy. In addition, the price hike of the petroleum products after COVID 19 and recent unrest in Europe has posed a serious challenge to developing country like Nepal to curtail the inflation rates. The current level of electricity production and distribution in Nepal has already proved surplus supply especially during the off hours and the use of such electricity in cooking will help government to manage the deficits in the economy if it can provide access to reliable and high-quality electricity.

1.3.3 Load management

In the domestic sector, the cooking hours among the households are almost common, therefore the load peaks around the morning and especially in evening hours as shown in Figure 1 and Figure 2. Unlike in the residential sector, the cooking in the commercial sector (hospitality business), cooking activities are spread across the day. To serve the guests, the kitchen in the hospitality sector remains functional throughout day at least 15 hours in a day. The commercial cooking in such enterprises and institutions can provide the option of continuous consumption of electricity at a time of a day where the consumption from residential sector is at the lowest. The stability of the grid can improve if the load curve variability across the day in different hours can be reduced.

3 FTS FY 2078/79 - || Department of Customs ||

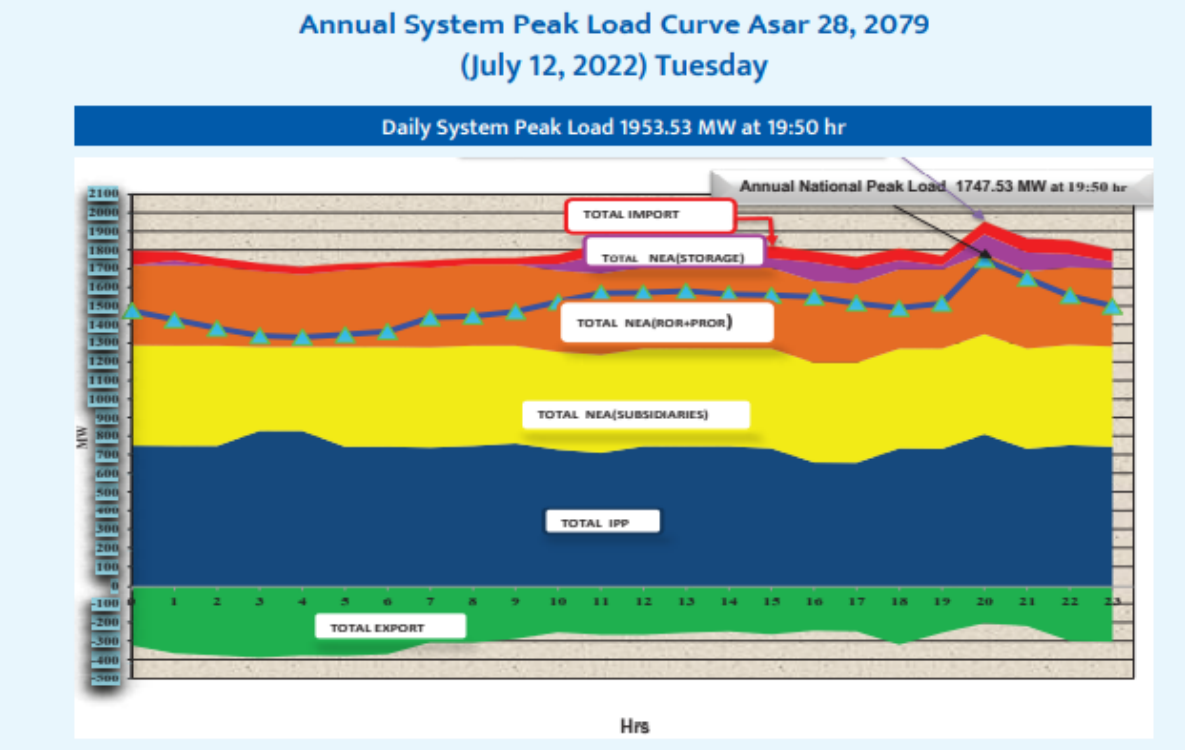


Figure 1: Peak Load curve of a typical day in Nepal

Source: (NEA, 2021)

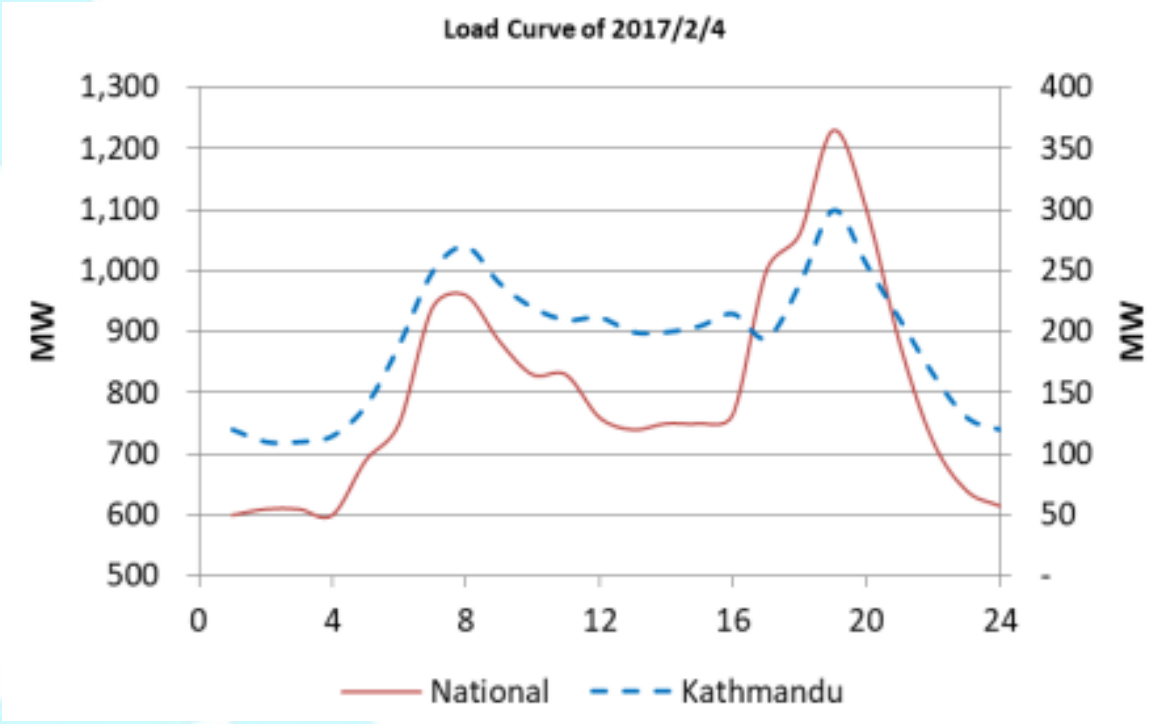


Figure 2: Daily load curve of Kathmandu valley

(Rajbhandari, et al., 2020)

1.3.4 Identifying research methodology

The study is perhaps one of the first that has investigated eCooking for commercial sector. The findings from the research are likely to pave the way for future research that would complement analysis coming out from this research. Since cooking necessities are completely different to that of residential sector, efforts are to be made to see if the research methodology adopted to understand the potential, challenges, and opportunities of eCooking in residential sector can be replicated and implemented widely to understand eCooking for commercial sector in Nepal. This research will help to provide a general picture of cooking necessities in commercial sector which can be relevant for further in-depth research to promote eCooking in commercial sector.

2. Literature Review

2.1 Enterprise Categorization

The Government of Nepal has conducted National Economic Census. The national Economic Census has defined enterprises as "establishments[4]". According to the ToR of this assignment, the enterprise has been categorized into restaurants, hotels and accommodation and institution. As defined by Nepal Standard Industrial Classification (NSIC), all three enterprise categories for this study (restaurants, hotels and accommodation and institutions) comes under the sub-group of commercial sectors "Accommodation and Food Service Activities". It should be noted that canteens, cafe, mess etc., that are providing service inside premises of school, hospitals, or offices, also needs to get registered and are listed under this sub-group. There are 21 such sub-groups based on which the establishments have been divided (CBS, 2019). According to NSIC, under commercial sector there are education sector (school, college, universities), health and social service (hospitals, clinic, health post, I/NGOs), food and lodging (hotel, lodge, restaurants), trade and retail (wholesale and repair center), financial service (banks, insurance) and professional/administration and real states (WECS, 2022a).

As of April 2018, there are 923,356 establishments in which 3,2,28,457 people are engaged in these establishments. As expected, Kathmandu being the capital city, large number establishments under "Accommodation and Food Service Activities" are located within Kathmandu valley. There are more than 5,000 establishments under "Accommodation and Food Service Activities". "Accommodation and Food Service Activities" category comprises of almost 14% of total registered industries or enterprises and this category is responsible to provide employment to almost 12% population within the industrial sector (CBS, 2019).

2.2 Energy consumption scenario in enterprise sector

The enterprise sector is associated with one of the major economic activities. In some literatures the key component in terms of enterprise type that the study has investigated has been mentioned as commercial sector. The data that has been referred for energy consumption has mentioned commercial sector that comprises of restaurants, hotels and accommodations

[4] An establishment is defined as an economic unit that engages, under a single ownership or control - that is, under a single legal entity - in one, or predominantly one, kind of economic activity at a single physical location – for example, a mine, a shop, a factory or workshop. It is an establishment that is situated in a single location and in which only a single (non-ancillary) productive activity is operated or in which the principal productive activity accounts for most of the value added (CBS, 2019).

and registered canteens of the institutions which according to the study are categorized as enterprise. The canteens/mess of schools, hostel and hospitals are categorized under food and accommodation sector as legally these canteens should possess separate registration under VAT or PAN. The choice of fuel for cooking at commercial sector is mostly LPG. However, biomass, coal and electricity are also part of the energy mix for cooking at commercial sector.

The energy sector synopsis report (2022) indicates that the energy consumption by commercial sector have increased to 7% in 2021 from a low share of 1.3% in 2009. This makes it obvious that energy demand in the commercial sector is rising at a high rate. On the other hand, if looked at energy demand by type in commercial sector alone, 53% of energy comes from wood, 25% from LPG, 7% from coal and charcoal in 2021 respectively. These fuels are primarily used for thermal energy, cooking and water boiling. With more than 80% of energy coming from solid biomass and fossil fuels, it is evident that there is an opportunity for cleaner fuel uses.

The "Energy Consumption and Supply Situation in Federal System for Koshi and Madhesh Province" and that for Bagmati Province by WECS (2019), (WECS, 2022) have provided the energy consumption details from primary survey. Although these reports may not be exact representation of the country, but it does provide representative evidence regarding the energy consumption patterns in the commercial sector[5] of the country for cooking. Table 1 below shows the energy consumption status and choice of fuels for cooking in the commercial sector.

Table 1: Energy consumption status and choice of fuel for cooking in the commercial sector

Province	Energy Consumption in Cooking (TJ)	Fuel Source		
		Firewood	LPG	Electricity
Koshi	1,504	58.77% (884)	40.82% (614)	0.41% (6.2)
Madhesh Pradesh	324	2%[6] (6.48)	93% (301.32)	5% (16.2)
Bagmati Pradesh[7]	3,858	2% (77.16)	57% (2199)	36% (1388.88)

Source: (WECS, 2019) and (WECS, 2022b)

5 Commercial sector comprises of trade and retails (shops, manufacturing units, etc), accommodation and food (hotels and restaurants), financial service (banks, cooperatives, etc), social service (schools and hospitals) and other services (police station, IT, etc).

6 In case of Madhesh Province, the use of fuelwood for cooking is seen to be low for two main reasons – most of the hotels, restaurants, canteens etc. (those are registered as food and accommodation sector) prefer LPG as primary cooking method in one hand, while in the other, the shops that are not registered at all, or are registered as retail shops consume fuels in cooking activities as well.

7 5% accounts for other fuel types like coal (4.72%), briquette (0.25%) and solar thermal (0.16%)

According to WECS (2019), the commercial sector of the country is grouped into trade and retail, accommodation and food, financial service, social service, and other services in the energy sector analysis reports. Among these, accommodation and food service sub-sectors are mainly responsible for higher consumption of energy in cooking. This sub-sector comprises restaurants, hotels, and similar service sectors. The fuel consumption for cooking in accommodation and food service sub-sector is shown in Table 2. The most consumed fuel involved in this sub-sector for cooking is LPG which is imported in Nepal. It is evident that for cooking, electricity is simply not preferred fuel for cooking for the sub-sector but promotion of eCooking in the commercial sector does provide that window of opportunity whereby LPG imports can be substantially reduced.

Table 2: Fuel consumption for cooking in accommodation and food service sub-sector

Province	Fuel Source for Commercial Sector (Accommodation and Food Sub-Sector) in TJ				
	Total	Wood	Coal	LPG	Electricity
Koshi	910	445	-	320	145
Madhesh Pradesh	212.28	0.07	0.48	128.12	83.61

Source: (WECS, 2019)

Comparing Table 1 and Table 2, it can be inferred that in Koshi and Madhesh province, the accommodation and food sub-sector is the largest consumer of LPG in the commercial sector. In Koshi province almost 52% LPG is consumed by the accommodation and food sub-sector and likewise almost 42% in Madhesh province. The current energy consumption scenario and relatively low electricity use within the commercial sector and precisely in hospitality sector suggests there may be scope for promoting greater adoption of eCooking. For the commercial sector, shifting to electricity for cooking has potential to contribute to reduce consumption of imported LPG.

2.3 Challenges to Promote eCooking in Enterprise Sector

A study of this kind on enterprise level cooking hasn't been done in case of Nepal. Therefore, this section reviews the wider eCooking literature to gain insights on potential bottlenecks to promoting eCooking at enterprise level Electricity transmission and distribution system are frequently cited as an issue whenever there is discussion involving eCooking. In countries like Indonesia and Cambodia, where research have been performed to see the viability for eCooking in the enterprise level, the electricity utility service has been identified as major barrier that inhibits institutions and enterprises to switch to eCooking (MECS, 2022). The existing capacity for electricity distribution and transmission are not robust enough to meet the government's "Energy White Paper 2018" target of electric cooking in entire household of

the country by 2028 (CCA, 2022, Leary et al., 2022; Practical Action, 2021; Winrock International, 2021). Several studies regarding eCooking in Nepal has indicated unsatisfactory electricity transmission and distribution sector at the residential sector. Understandably, with same electricity transmission and distribution system, the enterprise sector is bound to face similar challenges.

When eCooking in the residential sector was in the embryo stage, many stakeholders were not aware of what is available in the market. The studies based on market supply chain has indicated lack of awareness about availability of different technology to be one of the major challenges to promote eCooking in Nepal (Practical Action, 2021; Vaidya, 2018). Stimulating demand for eCooking appliances among potential users is key to escalate the adoption of eCooking applainces (Bisaga & Campbell, 2022). In that respect, making potential end user aware about prospects of eCooking in the enterprise sector is essential.

eCooking for enterprises and institutions are in early stage in the Nepalese context. In August 2022, the Government of Nepal made announcement to ban LPG within the Singhaburbar (main administrative complex of the federal government) by replacing them with electric cooking[8]. Unfortunately, the announcement did not materialize due to many possible reasons that can only be confirmed upon discussion with the stakeholders[9]. The concept of institutional scale cooking for school was already initiated by World Food Program (WFP) in 2015 and while large scale EPCs have been proposed as part of a forthcoming pilot, the school feeding program currently mainly centres on interventions involving institutional scale firewood based improved cookstoves (Turner & Bossuyt, 2017). However, there have been efforts in other countries mainly in African region, where eCooking has been trialled in the institution such as schools. A school canteen in Lesotho was used eCooking to displace biomass stove with large scale EPC. EPC was integrated with solar water heater with an aim to reduce the energy needs for the canteen. WFP supported school cooking program with an aim to assess economic and business viability of replacing biomass-based cooking with large EPC (WFP, 2022). The best practices among other countries can be a reference point to start contemplating about possibility of integrating eCooking within enterprise sector and relevant institutions.

[8] https://english.onlinekhabar.com/cooking-gas-banned-singhadarbar.html

[9] https://english.onlinekhabar.com/singhadarbar-still-cooking-gas.html

2.4 Cost Competitiveness of Enterprise Level eCooking

Studies conducted in Tanzania, East Africa suggest that eCooking appliances like Electric Pressure Cooker (EPC) in microenterprise to cook heavy food that consumes time to be cooked like beans and cereals was efficient in terms of cost required to cook such food. In case of Tanzania, cooking in EPC was deemed to be expensive compared to cheaper charcoal (ESMAP, 2020). In this case electricity was coming biomass-solar hybrid minigrid which is usually much expensive than electricity coming from large scale hydropower plant.

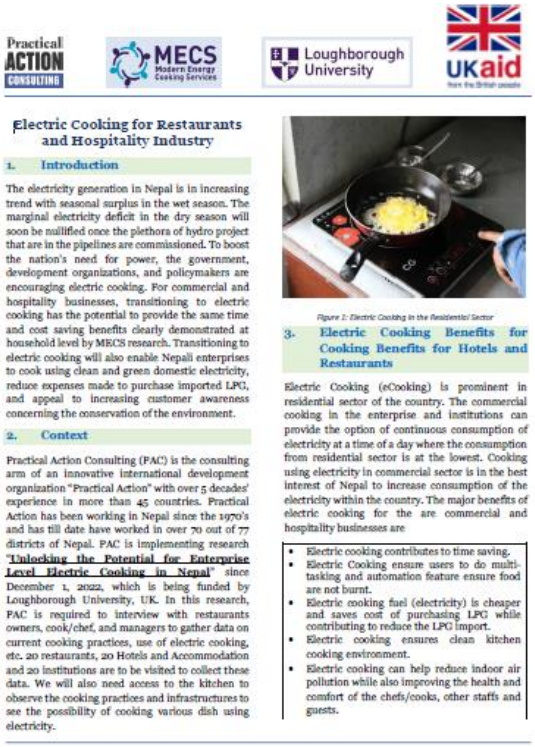
There has been test performed to assess the viability of large-scale EPC (40 litres) in replacing biomass for schools and catering service (Aloyce & Ngaya, 2021). The test results have suggested that large EPC is able to meet most of the cooking necessities of the school and catering services. According to Aloyce & Ngaya (2021), cooing with larger EPC was able to reap benefits in terms of energy efficiency, time saving and health. Same study has shown that mere 1-3.67 kWh electricity has been consumed to prepare local food at the institutional scale for schools and catering service. The amount of electricity being consumed is likely to be cost competitive in the Nepalese context as electricity in Nepal is cheaper compared to most African countries.

3. Methodology

3.1 Preparation phase

3.1.1 Development of research brief

A research brief was prepared and was circulated among potential research participants (enterprises, chairman of chef's association, Restaurant & Bar Association Nepal (REBAN), Hotel Association Nepal (HAN), interviewee for KII and focal person from chef community who supported in organizing FGD with chef community). The research brief was circulated through email for those participants whose email was available, and the brief was also shared during in person meetings. The research brief had information regarding the introduction and objective of research. This document was important to give a snapshot summary of the research to potential research participants. The final draft of the research brief is submitted to MECS along with this report.



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Electric Cooking for Restaurants and Hospitality Industry

1. Introduction

The electricity generation in Nepal is in increasing trend with seasonal surplus in the wet season. The marginal electricity deficit in the dry season will soon be nullified once the plethora of hydro project that are in the pipelines are commissioned. To boost the nation's need for power, the government, development organizations, and policymakers are encouraging electric cooking. For commercial and hospitality businesses, transitioning to electric cooking has the potential to provide the same time and cost saving benefits clearly demonstrated at household level by MECS research. Transitioning to electric cooking will also enable Nepali enterprises to cook using clean and green domestic electricity, reduce expenses made to purchase imported LPG, and appeal to increasing customer awareness concerning the conservation of the environment.

2. Context

Practical Action Consulting (PAC) is the consulting arm of an innovative international development organization "Practical Action" with over 5 decades' experience in more than 45 countries. Practical Action has been working in Nepal since the 1970's and has till date have worked in over 70 out of 77 districts of Nepal. PAC is implementing research "Unlocking the Potential for Enterprise Level Electric Cooking in Nepal" since December 1, 2022, which is being funded by Loughborough University, UK. In this research, PAC is required to interview with restaurants owners, cook/chef, and managers to gather data on current cooking practices, use of electric cooking, etc. 20 restaurants, 20 Hotels and Accommodation and 20 institutions are to be visited to collect these data. We will also need access to the kitchen to observe the cooking practices and infrastructures to see the possibility of cooking various dish using electricity.

Figure 1: Electric Cooking in the Residential Sector

3. Electric Cooking Benefits for Cooking Benefits for Hotels and Restaurants

Electric Cooking (eCooking) is prominent in residential sector of the country. The commercial cooking in the enterprise and institutions can provide the option of continuous consumption of electricity at a time of a day where the consumption from residential sector is at the lowest. Cooking using electricity in commercial sector is in the best interest of Nepal to increase consumption of the electricity within the country. The major benefits of electric cooking for the are commercial and hospitality businesses are

- Electric cooking contributes to time saving.
- Electric Cooking ensure users to do multi-tasking and automation feature ensure food are not burnt.
- Electric cooking fuel (electricity) is cheaper and saves cost of purchasing LPG while contributing to reduce the LPG import.
- Electric cooking ensures clean kitchen cooking environment.
- Electric cooking can help reduce indoor air pollution while also improving the health and comfort of the chefs/cooks, other staffs and guests.

3.1.2 Questionnaire development for rapid assessment

A structured survey questionnaire was developed to conduct a rapid assessment among three categories: Restaurants, Hotel and Accommodation and Institution (school, hostel, and hospital). The developed questionnaire aligned with the research proposal and administered in face-to-face interviews with the selected enterprises' representatives.

3.1.3 Rapid assessment survey

The rapid assessment was done using KoboToolbox. Five enterprises from each category (altogether 15 enterprises) were selected based on local knowledge within of the research team where rapid assessment was performed. It covered essential aspects of the enterprise operations, such as business details, types of food served, cooking appliances including eCooking appliances, size of utensil used, fuel type used in the kitchen, number of customers served etc. The result of the rapid assessment was also used to test the practicality of survey questions and to decide the total number of enterprises to be surveyed under different category

within 60 samples that was required by the assignment. The result and experience from the rapid assessment indicated that the number under each category needs to vary slightly as not all enterprise type was equally accessible for the survey. During this approach, real-time interactions allowed for a deeper understanding of the enterprises' current situations.

Rapid Assessment at Budhanilkantha School

Rapid Assessment at Hotel Shambhala

3.1.4 Development of detailed questionnaire

The findings from the rapid assessment and assignment ToR were reviewed to develop a more detailed questionnaire for the survey of 61 enterprises. Checklist for primary survey and interviews customized to the three sectors such that the required nine themes (1) Cooking practices and customer needs 2) Existing beliefs 3)Appliances 4) Supply Chain 5)Energy 6) Cost 7) Networks 8) Gender and Inclusion and 9) Wider Impact)and the sub-questions (for example, current practice and fuel usage in the kitchen and any eCooking devices currently being used by the enterprises and institutions, cost of fuel used, most sold food item, etc) were included in the survey facilitating analysis of data to address the research questions. Semi-structured questionnaire form and data entry tool was prepared in KoboToolbox. The questionnaire was reviewed by the MECS team, and the feedbacks were addressed before the data collection was started. The detailed questionnaire has been submitted to MECS along with this report.

3.1.5 Development of guideline for ethnographic survey

A generic guideline was developed by the research team to facilitate enumerators to conduct ethnographic survey. This guideline was also shared with MECS team for feedback and addressed in the final version. The guideline has been submitted to MECS along with this report.

3.1.6 Enumerator training

The data collecting team was provided with one day orientation on study design, the process of the study, interview techniques, questionnaire tool, and data entry formats. During the training, the enumerators were trained to collect data using detailed survey questionnaire and ethnographic survey. The kitchen, where this training was delivered, was used to practice ethnographic survey. Likewise, the detail survey questionnaire was also tested with the owner of the venue where enumerator training was organized. Following the trial of survey questionnaire and ethnographic survey, reflection about the learning and experience was shared among the research team to better prepare the actual field works.


Enumerator training for data collection and ethnographic survey

3.2 Data collection phase

3.2.1 Detailed enterprise survey

Using the detailed survey questionnaire, 61 enterprises were surveyed with data recorded on tablets. The research focused on the study of enterprises which was broadly categorized into restaurant, hotel and accommodation and institution. Under restaurants, fast food, fine dining, cloud kitchen, tea and snack shop were sampled while under hotels and accommodations, star hotels (luxury hotels) and hotels that offer food and lodging were sampled. Likewise, under institutions, canteens and mess of hospitals, schools and hostel were sampled. A total of 61 samples were collected through structured survey questionnaire. Among 61 samples, 23 were restaurants, 17 were hotels and accommodations, and 21 were institutions. A single set of survey questionnaire was prepared and used for survey.

3.2.2 Ethnographic survey

For each of the three categories, two enterprises were selected such that each one of them was different to another to conduct an ethnographic survey which includes 2-day observations of

enterprise kitchen (one weekday and one weekend). The enterprise that was selected also participated in detail enterprise survey. For the ethnographic survey, the enterprise that were selected were hospital canteen, cloud kitchen, bakery, restaurant, school canteen and hostel kitchen.

Enumerators spent two whole days (one during the weekday and another during the weekend) in the enterprise kitchen observing and recording the cooking drill (preparation for cooking food items, types of food being cooked, preparation required to cook food, cooking methods, cooking behaviour, utensil used for cooking, etc.). The owners from the 6 enterprises were provided with domestic eCooking appliances that they desired to own as a gesture of gratitude for supporting the research and to instil confidence among them to allow the research team to observe their kitchen and cooking protocol and practices.

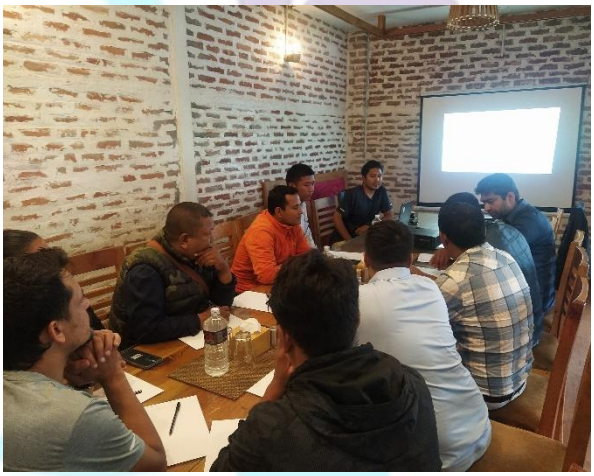
3.2.3 Assessing the eCooking appliances suppliers

A simple checklist was designed to facilitate enumerator to approach the suppliers. Several suppliers were approached for in person meeting. The list of suppliers that were inquired and interviewed are included in ANNEX I. ANNEX II consist of additional list of suppliers that were provided by FGD participants and some key informant interview participants. These were contacted but no significant information was retrieved from them. The suppliers were approached to get information about types of eCooking appliances and their price, types of customers purchasing the devices (residential or commercial), upcoming technologies, taxation, import and repair and maintenance facilities, identification and listing of the available technologies to complement eCooking and collection of specification through brochures and flyers (based on their availability). Suppliers, those who were easily approachable were met on several occasion to know about their opinion about prospect, challenges, and opportunities of eCooking in enterprise sector. Such meetings also assisted in understanding the marketplace for enterprise level eCooking appliances.

eCooking Appliances at Supplier Outlet- Electric Oven- Single and Triple Deck and (Left) Induction Stove (Right)

3.2.4 Focus Group Discussion

The research team participated in two Focus Group Discussions (FGDs). The first FGD was with Restaurant and Bar Association Nepal (REBAN) and second was with Chef community. The list of participants and keynote of the FGD is submitted to MECS along with this report. The consultative meetings were conducted in a collaborative and open manner, encouraging stakeholders to share their thoughts, suggestions, and expectations from the research. These consultation meetings allowed us to understand the specific challenges and opportunities faced by this sector and obtain their perspectives on how our research could be most beneficial. FGD with REBAN gave the perspective of enterprise owner while the FGD with chef community gave the perspective of cooks working in the enterprise. Feedback from these preliminary meetings was integrated into the recommended research design to enhance its relevance and potential impact.



FGD with Chef Community

FGD with REBAN

3.2.5 Key Informant Interview

The research team had identified some key stakeholders with whom Key Informant Interview (KII) was conducted. The key stakeholders included representatives from Chef Associations Nepal, REBAN, and Hotel Associations Nepal (HAN). In addition, two culinary school representatives were also interviewed along with the Nepal Electricity Authority (NEA) representative responsible to provide service to the enterprise level customers in accessing electricity meters.

KII with Shyam Lama, Chairman, Chefs Association Nepal

This step aimed to ensure that our research aligned with the industry's needs and concerns. By involving key stakeholders from the onset, the research fostered a cooperative and inclusive approach to the research, ensuring that it addressed the real-world needs of the enterprise sector, as well as the institutions within it. This engagement with industry and institutional leaders also served to establish a strong foundation of cooperation and support throughout the research process. The list of participants is shown in ANNEX IV and keynote of the KII is submitted to MECS along with this report.

3.2.6 Story development

A total of 9 case stories was developed form different types of enterprises that illustrated the back story about the establishment of the enterprise and journey of either enterprise owner or cook working in the enterprise in relation to their experience and suggestion for eCooking prospects in enterprise sector.

3.3 Report preparation and submission phase

3.3.1 Data cleaning

Regular meeting was conducted with the enumerators to get regular update and discuss any issues., After the completion of the survey, individual enumerators were invited for a meeting with the research team to clear out confusions in understanding the collected data and to get clarification on data outliers. These meetings were useful to instil uniformity in the information and data that were collected form the enterprise.

3.3.2 Data analysis

MS excel was used to analyse the data collected using rapid assessment questionnaire and detailed enterprise survey questionnaire. After completion of the ethnographic survey, the enumerators were invited for meeting to get reflection about their experience conducting ethnographic survey. Based on the interaction and the ethnographic survey guideline, a report was prepared for all six enterprise which is submitted to MECS along with this report. The meeting was also useful to understand cooking methodology adopted by different enterprises. The findings from the ethnographic survey were used to validate some information and data gathered through detailed enterprise survey, FGDs and KIIs. The information gathered form the eCooking appliance supplier were reviewed such that a list of eCooking appliances available in Nepalese market was developed which is shown in Table 5.

3.3.3 Literature review

Relevant literature such as publications, journals, reports, and articles were reviewed to generate relevancy of the research. The literature was also reviewed to check the result and findings from other similar research works.

3.3.4 Report preparation and submission

The final report was developed following the data analysis. The report was submitted to MECS for feedback and suggestions which were addressed and incorporated in a revised version submitted to MECS.

4. Findings and Discussions

The results and findings of this research has been derived from several data collection methods which has been described in the methodology section of this report. During the data collection process, respondents from various enterprises belonged to different designations. In some cases, multiple respondents participated from a single enterprise depending on the relevancy of question to the particular designation.

Table 3: Respondents of enterprise survey

Enterprise types	Owner	Manager	Cook	Waiter	Other
Restaurant	9	5	8	0	1
Hotel	9	2	6	1	0
Institution	7	2	7	6	2

The result and findings of this research has been organized in terms of the nine themes mentioned in the methodology section of this report which was identified by the ToR of the research.

4.1 Cooking practices and customer needs

4.1.1 Compatibility of eCooking appliances with enterprise level cooking

The compatibility of eCooking with large-scale culinary operations depends on several factors, primarily the cuisine type being prepared, and the specific cooking techniques utilized within the enterprise. The evaluation of eCooking's suitability in relation to cuisine types was conducted through KIIs, FGDs, and an enterprise survey. As indicated in the Table 4 below, different surveyed enterprises have expressed their preferences for various eCooking appliances they believe would be suitable for the dishes prepared in their enterprises. Among the desired eCooking appliances, the most sought-after was the induction stove, which garnered interest from 32 different enterprises (10 from restaurants, 9 from hotels, and 13 from institutions), followed by the rice cooker, electric kettle, and so on.

Table 4: Type of eCooking appliance desired by various enterprises to cook various food items

eCooking appliances	Restaurant	Hotel	Institution	Compatible dishes
Rice Cooker	-	5	11	Rice
Electric Steamer	4	1	1	Momo
Electric Kettle	2	4	6	Hot water for making tea, drinking water
Roti Maker	-	2	-	Roti

Electric Oven	7	2	2	Chicken tandoori, bakery items, pizza
Induction Stove	10	9	13	Rice, Momo, curry, soup, tea, hotpot, omlet, lentil soup, chicken tikka, paneer tika, Thukpa, fried noodles, roti
Electric Deep Fryer	2	1	-	French fries, potato wedges, onion rings, chicken lollypop, tempura, fritter
Hot Plate	-	3	2	Timur chicken, grill chicken, dragon chicken, barbecue, fish and chips, veg curry, chicken curry, lentil soup, pickle, fried noodles
Electric Grill/barbecue	7	1	-	Tandoori items, roast
Electric Range	0	1	-	Lentil soup, butter chicken, chicken curry, mutton curry, sautéed vegetable
Electric Pressure Cooker	2	0	-	Rice, lentil soup
Coffee Machine	1	3	5	Coffee, tea
Electric Frypan	-	2	-	Curry
Microwave	1	-	-	Chocolate melting, warming food
Infrared Stove	-	-	1	Lentil soup, curry, water boiling, fried noodles
Electric Tandoor	-	1	-	Naan roti, tandoori roti, tandoori chicken
None	3	7	1	

According to feedback gathered during FGD with chef community, the mainstream cooking, especially for main courses, currently does not rely on eCooking appliances. Instead, electric appliances such as blenders, mixers, grinders, electric kettles, and meat grinders/mincers play a prominent role in food preparation and Mise en place (Mise: preparatory works done to cook dishes mentioned in the menu of an enterprise), the organized setup of ingredients and tools before cooking. However, some enterprises utilize electrical appliances such as combi ovens, coffee machines, toasters, salamanders, microwaves (mostly for defrosting and warming food), and grills for actual cooking purposes.

In the context of bakeries, electric appliances like ovens, bread slicer, dough mixers, and dough sheeters are commonly utilized. Additionally, pasta and noodles making machines are employed to make pasta and noodles, respectively.

Chinese cuisine often involves fast and intense cooking using techniques like stir-frying and wok cooking, which rely on high heat and spot fire. LPG gas stoves or open flames are commonly preferred for such cooking methods due to their ability to provide instant and intense heat.

On the other hand, during the discussions with chefs during FGD, it was mentioned that eCooking appliances are more compatible with Continental cuisine, Italian cuisine, Japanese cuisine, roasting, boiling, baking, and grilling, as these methods generally involve more controlled and even heat distribution. Electric ovens are particularly well-suited for baking, as they offer consistent temperature control, crucial for producing quality baked items. All the chefs that were interviewed unanimously voted for eCooking appliances to be best suited for bakery purpose.

In summary, the compatibility of eCooking with enterprise level cooking practices depends on factors like the type of cuisine and specific cooking methods utilized within each establishment. While certain electric appliances are widely adopted for cooking purposes, the primary cooking processes for mainstream dishes currently do not heavily rely on eCooking appliances.

4.1.2 Enterprise level cooking and service hours

It is important to note that within each category of restaurant, hotel and accommodation, and institution, there exist various subtypes, sizes, and cuisine specialties, all of which contribute to determining the peak serving time and the number of customers served. These factors create unique demands and operational patterns for each enterprise, influencing their cooking practices and utilization of eCooking appliances. From the survey, on average, restaurants serve approximately 159 customers per day, hotel and accommodation serve around 77 customers per day, and institutions cater to about 436 customers per day. These figures reflect the varying scale and customer capacity of each type of enterprise.

The serving time for customers varies significantly across different types of enterprises. Figure 3 below shows the busiest times for enterprises to serve customers. As depicted in the Figure 3, 74% of the restaurants surveyed indicated that their busiest service hours are between 3 pm and 6 pm, with a notable exception during the morning from 6 am to 9 am. In the case of hotels, the busiest service hours were in the morning from 6 am to 9 am and in the evening from 6 pm to 9 pm, with 82% and 100% of surveyed hotels reporting high activity during these periods, respectively. For institutions, the surveyed sample included canteens for school, development organizations/office and hostels. The busy hours are evenly distributed except for late evening hours which may be due to the fact that some of the institutions survey are operation till evening hours only and does not operate till late evening.

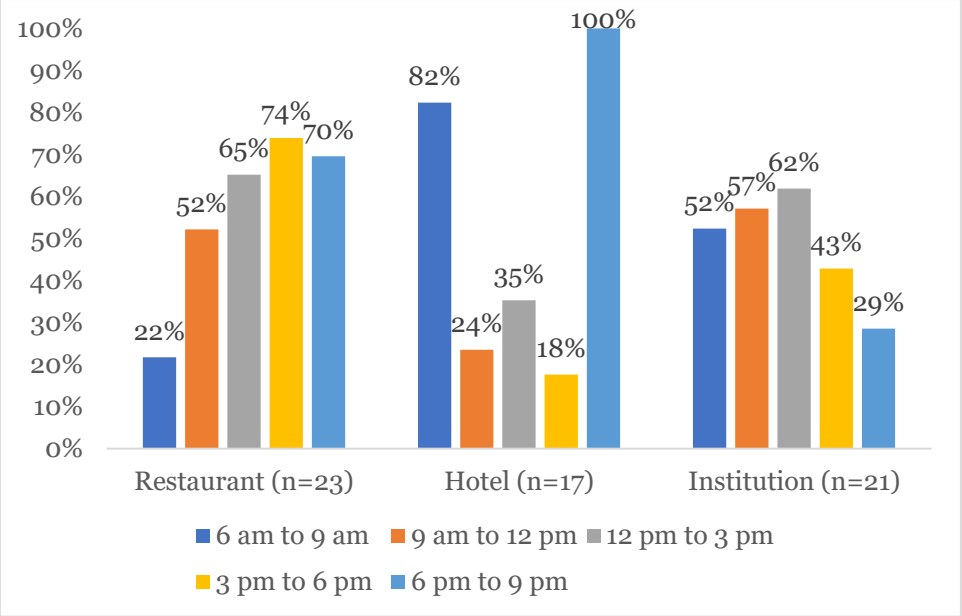


Figure 3: Busiest times for enterprises to serve customers

Interestingly, the findings from the ethnographic survey suggests that although the peak serving time do not coincide with residential cooking hours, most enterprise starts their preparation to cook different dishes during the morning hours especially in restaurants just before they open the restaurants for customers. In case of cloud kitchens, canteen (in hospital), the preparation for cooking is also done during late evening hours and during preparation certain electrical appliances like blenders, mixer, grinder, etc are heavily used by the enterprises. The food preparation time therefore is likely to coincide with residential cooking time. In addition, the cooked food items were reheated using microwave and other cooking devices while serving the customers in peak hours. In most of the case, the items mentioned in the menu are already prepared or half prepared during off-peak serving hours. For example, the gravy required for curries are already prepared in bulk in the off-peak serving hours. Same gravy is used for preparing different curries based on the customer order.

4.2 Existing practices and beliefs

4.2.1 Enterprise familiarity with eCooking appliances

Based on the survey findings, as well as insights gathered from Key Informant Interviews (KII) and Focus Group Discussions (FGD), it is evident that enterprise personnel possess a level of familiarity with eCooking technology, even though they primarily rely on LPG stoves for their cooking needs, enterprise staff members exhibited a notable level of familiarity with eCooking technology. This awareness and understanding of the advantages and potential of eCooking are noteworthy. It's interesting to observe that while LPG stoves continue to be the

predominant cooking equipment in many enterprises, electric appliances are commonly employed for food preparation tasks across various businesses.

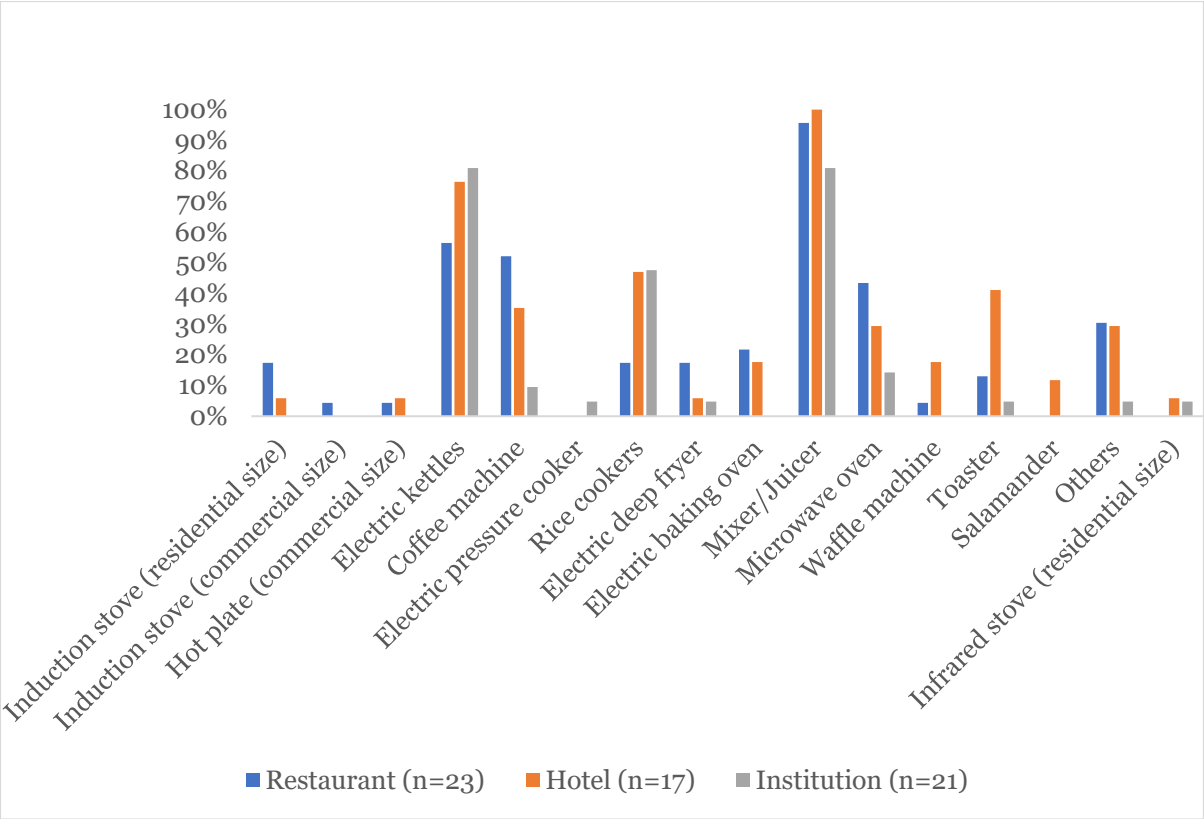


Figure 4 illustrates the variety of electric cooking devices utilized by different enterprises, with the mixer/juicer being the most prevalent choice (used by 96% of restaurants, 100% of hotels, and 81% of institutions), alongside other appliances such as electric kettles, rice cookers, microwave ovens, coffee machines, and more. The familiarity among the survey participants is more towards eCooking appliances that are used for food preparation rather than more cooking main course. These appliances, such as blenders, mixers, grinders, electric kettles, and meat grinders, are utilized for their efficiency and convenience in preparing ingredients and mise en place before actual cooking takes place which was mentioned by chefs during KII and FGD.

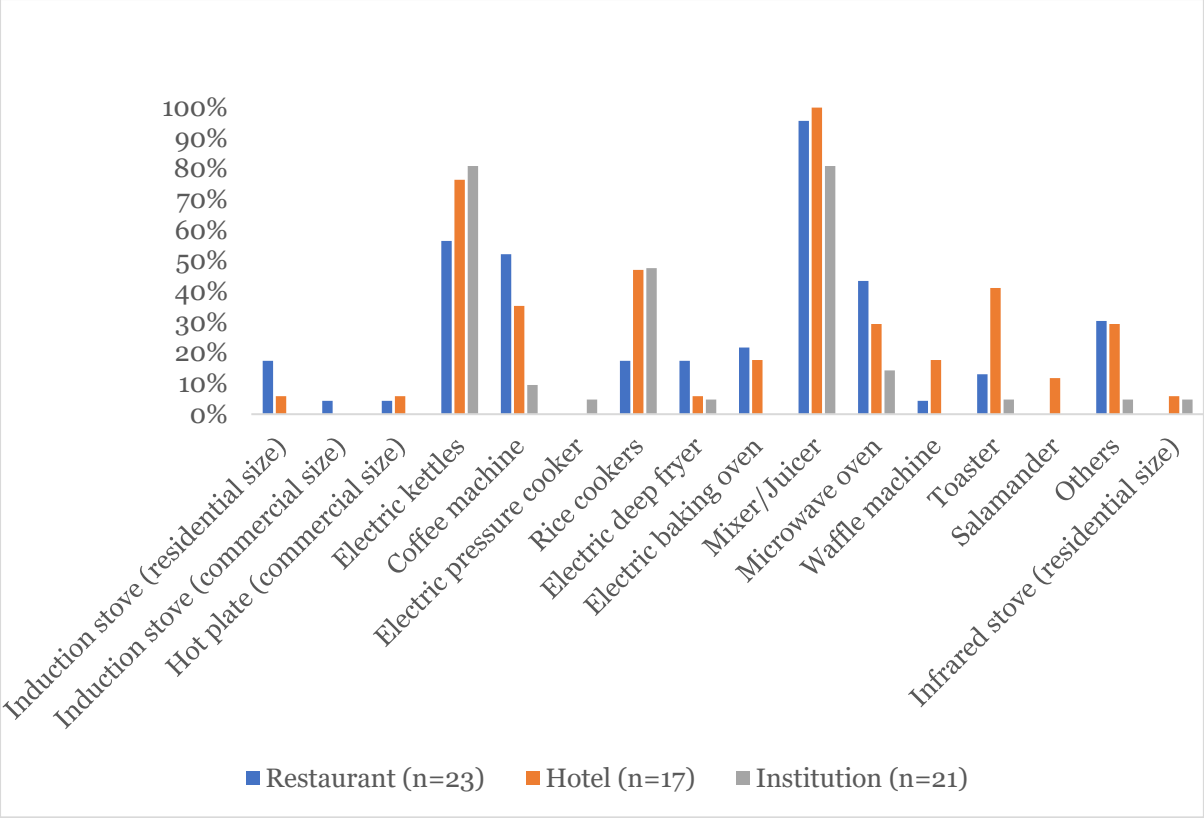


Figure 4: eCooking appliances used by different enterprises

Nonetheless, findings form the survey indicates that in luxury and star hotels and bakeries, there is a more pronounced dependency on electric appliances, both for food preparation and primary cooking. This preference for using difference eCooking appliances can be attributed to various factors, including greater financial resources, a quest for enhanced efficiency and precision, and the appeal of modern kitchen setups, as found in discussions with REBAN and chefs.

4.2.2 Awareness about benefits of eCooking for enterprise

According to the enterprise survey, it can be inferred that the enterprise staff members involved in cooking related responsibilities were aware of potential benefits of eCooking. As shown in Figure 5, more than half of the surveyed respondents perceived that cooking with electricity will contribute in reducing dependency on LPG, save time and cost of fuel while cooking, maintain hygiene in the kitchen, improves kitchen safety for cooks and helps to conserve the environment

Furthermore, discussion with the chairman from HAN, inferred eco-tourism for the country as potential benefit of transitioning to eCooking. Eco-tourism is gaining worldwide popularity due to travellers' increasing awareness of their environmental impact and their preference for

sustainable and responsible travel options. In addition, the chairman also mentioned that in Nepal, since electricity is generated from renewable sources, promoting eCooking as part of eco-tourism could be a significant selling point for enterprises like luxury hotels. Adopting green energy for cooking allows the tourism industry to demonstrate its commitment to sustainability and attract environmentally conscious tourists.

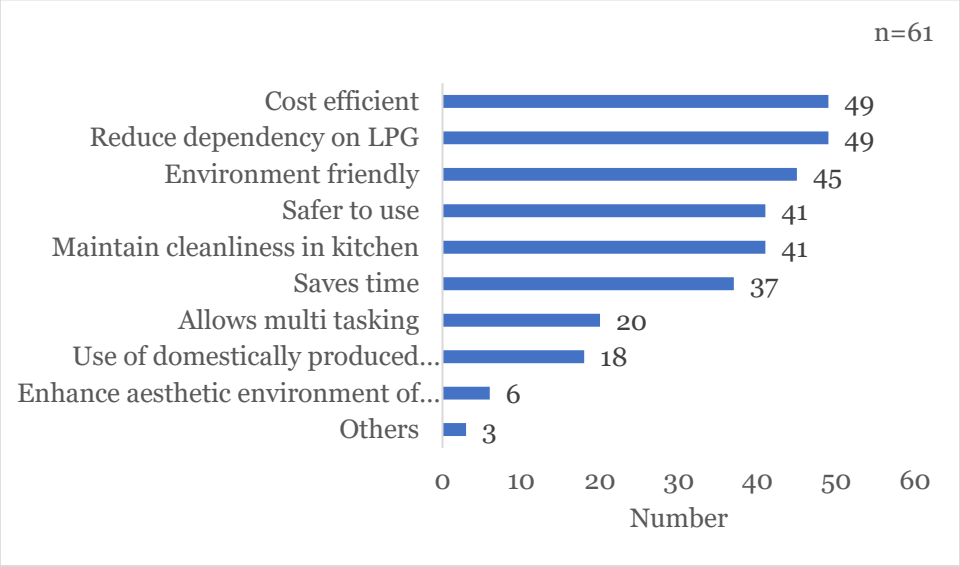


Figure 5: Awareness about benefits of eCooking for enterprise

In addition, the findings from the FGD conducted with the Chef community and KIIs with culinary school representatives suggested that people having cooking related work experience from foreign countries had more knowledge and experience working with eCooking appliances including cooking ranges (hot plate, etc) and therefore are well aware regarding benefits of eCooking.

4.2.3 Factors hindering the transition for enterprise level eCooking

The transition from traditional cooking appliances to electric cooking, especially at the enterprise level, can face certain barriers and resistance due to a variety of existing beliefs and perceptions. Based on the enterprise survey data, KIIs and FGDs, some of these beliefs were pointed out that may hold back the adoption of eCooking appliances (see 1-9 below).

1. **Traditional Culinary Practices:** Nepal has a rich culinary heritage with traditional cooking methods deeply ingrained in its diverse culture. Enterprise level stakeholders (owners) participating in the FGD, especially those running restaurants serving authentic Nepali cuisine, believe that traditional cooking techniques, such as open-fire

cooking and clay ovens (tandoors), are essential to preserve the authenticity and taste of Nepali dishes. This belief could lead to resistance in adopting eCooking appliances.

2. **Performance and Taste Concerns:** There is concerns among chefs and cooks that traditional cooking methods, such as using gas stoves or open flames, provide superior performance and better taste compared to electric cooking. Some chefs believed that the high heat and direct flame of gas cooking are essential for achieving certain flavours and textures in certain dishes. The taste of certain food items can indeed vary when prepared using eCooking appliances. The chefs communicated that food enthusiasts can differentiate between the taste cooked with respect to the fuel used for cooking. For instance, Nepalese barbecue enthusiasts prefer a smoky flavour, which may not be case while cooking barbecue with eCooking appliances. Similarly, the chef during FGD also mentioned that if in any case pizza cooked in electric oven is overcooked and burnt, the pizza gets a burnt taste and tends to have bitter flavour whereas while cooking a pizza in a wood-fired oven, if in any case, the pizza is overcooked and burnt, the pizza gets the desired smoky flavour which is palatable to most Nepalese people. Furthermore, cooking staple food like rice and lentil soup in a traditional way (Thakali), eCooking appliances is less likely to deliver the authentic taste that people are used to get while such food are prepared in LPG or firewood.
3. **Perceived Complexity and Learning Curve:** Transitioning to eCooking appliances, especially more advanced eCooking appliances, perceived as complex and requiring additional training. FGD conducted with chef community indicated that some cooks and enterprise owners may resist adopting new appliances due to concerns about the learning curve and the potential need to retrain kitchen staff respectively.
4. **Initial Investment Costs:** The FGD participants perceived the cost of eCooking appliances to be on the higher side. Upgrading to Cooking appliances can involve significant initial investment costs, especially if an enterprise needs to replace its existing gas-based cooking equipment with electric alternatives. The additional financial burden can arise in managing the displaced cooking appliances. This financial barrier may deter some enterprises from making the transition to eCooking.
5. **Infrastructure Limitations:** Some enterprises might lack the necessary electrical infrastructure to support a complete shift to eCooking. Upgrading electrical systems to accommodate higher power demands could be a logistical challenge. Most of the eCooking appliances available for using at the enterprise level might require a three-phase power supply as single-phase lines are insufficient for their operation. For hotels and the service industry to utilize eCooking appliances effectively in their enterprises, upgrading to a three-phase power line will be necessary. Even if some enterprise wants

to upgrade their supply system, there are challenges to acquire upgraded system. To upgrade the supply system, for enterprise that are in rented property require documents from the landlords which at times is challenges as some landlords are not willing to share their personal and property documents with enterprises. Other challenges include land acquisition to install higher capacity transformer. Often the local inhabitants do not allow NEA to install transformer within the vicinity of their locality mainly due to the fear of fire which is often witnessed by the locals. In addition to external infrastructure, most of the enterprise are in core of the city and in touristic area. Most enterprise are in old building which do not have robust internal house wiring which can inhibit operation of eCooking appliances without any disturbance.

6. **Reliability and Power Outages:** The concerns about the reliability of electric cooking during power outages or interruptions were imminent among the FGD participants. Traditional gas cooking can continue even in the absence of electricity, which may be seen as an advantage against unreliable power supply. In certain cases, while cooking specific dishes with eCooking appliances, even a slight disturbance or outage in electricity supply will have detrimental effect on quality and taste of the cooked dishes. Around 62% of the enterprise surveyed mentioned that there is reliability and power outages issues.
7. **Perceived Incompatibility with Certain Cuisines:** As mentioned earlier, certain cuisines and cooking techniques may be perceived as incompatible with eCooking. This belief could lead stakeholders to resist adopting electric appliances, especially if their menu heavily relies on cooking methods that are better suited to traditional methods.
8. **Lack of Awareness and Exposure:** Limited awareness on availability and exposure to the latest advancements in electric cooking technology could prevent stakeholders from exploring its potential benefits. Familiarity with traditional cooking methods may create a sense of comfort and reluctance to explore alternatives. Around 31% of the enterprise survey mentioned that they did not have proper knowledge about eCooking.
9. **Safety and Hazard Involved with eCooking:** Kitchen is regarded as an area which is likely to have water or any other liquid spillage. The findings from the FGDs suggested that there is general lack of sense of requirement of keeping the kitchen environment dry as much as possible. Based on the observation of the kitchen during ethnographic survey, it was observed that cooks and kitchen staff mostly had wet hands while involved in cooking duties. The chef community during the FGD expressed that cooks and staffs are likely to have a fear of operating electrical appliances while cooking

as they are fearful of getting electric shocks. Around 11% of the enterprise survey thought that there could safety and hazard involved with eCooking.

4.2.4 Perceptions of enterprises on eCooking appliances

The Figure 6 presents the perceptions of various enterprises regarding eCooking appliances in terms of convenience, cost, safety, and taste. According to the enterprise survey data, only a small percentage (5%) of enterprises find it difficult to cook on electricity, while a significant majority (74%) disagree with this notion. Furthermore, an even smaller proportion (3%) strongly disagrees with the idea that cooking on electricity is challenging.

Regarding the operating cost of eCooking, most enterprises (54%) express their disagreement with the belief that it is expensive. Furthermore, 10% strongly disagree with the notion of eCooking being costly. Almost one third of the respondents (31%) were found to have neutral feeling about cost of fuel suggesting hint of ambiguity with regards to cost for cooking using eCooking appliances.

Safety is another aspect where eCooking seems to shine in the eyes of the respondents. A significant 66% respondents disagree with the statement that eCooking is unsafe. Further 5% strongly disagree on eCooking being unsafe which indicates a high level of confidence among respondents regarding safety issue associated with eCooking. Respondents who felt eCooking to be unsafe and neutral on the issue were 15% respectively.

When it comes to the taste of food cooked on electricity, respondents were found to be somewhat divided. 57% disagrees that food cooked on electricity tastes better. Only 7% of the enterprises agree that food cooked on electricity tastes better than food prepared using other fuels like LPG or firewood. The level of ambiguity among respondents with regards to taste of the food cooked on electricity were also high at 34%.

Based on these findings, it is evident that eCooking is generally perceived positively by enterprises in terms of ease of cooking, cost-effectiveness, and safety. However, there is some concern regarding the taste of food cooked on electricity compared to other fuels like LPG or firewood. Despite this, the overall acceptability of eCooking seems to be high, considering the positive responses for convenience, cost, and safety.

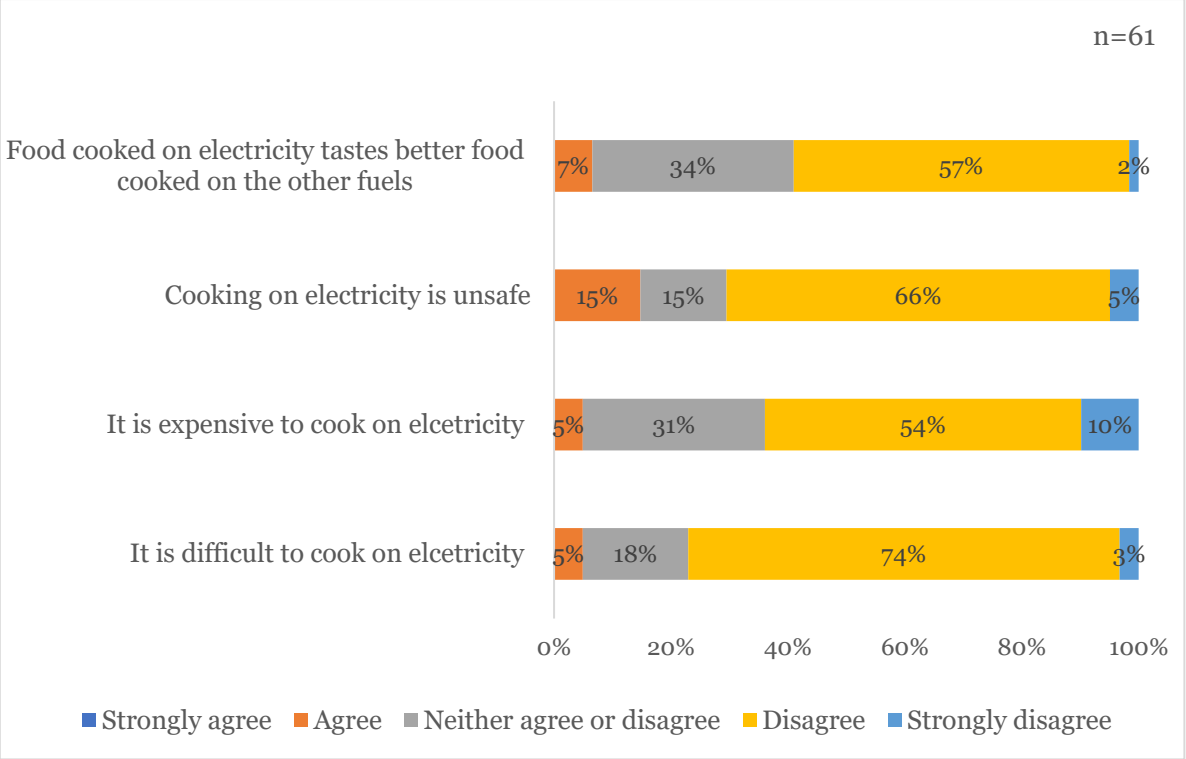


Figure 6: Perceptions of enterprises on eCooking Appliances

4.2.5 Perception on suitability of eCooking for various cooking process

The information provided in the Figure 7 below shows the general perception about suitability of eCooking appliances for different cooking processes carried out in the kitchens of various enterprises. The suitability percentages indicate the level of agreement among the respondents of enterprise survey regarding the compatibility of eCooking appliances with specific cooking methods.

As shown in Figure 7, more than 50% respondents believed eCooking to be highly suitable for cooking events that involves boiling (92%), reheating (70%) and baking (57%). The response on baking was interesting to know because all KIIs and FGDs suggested baking to be most suitable for eCooking appliances. This could be due to lack of knowledge regarding bakery-based enterprise among the respondents as most respondents were owners for the surveyed enterprises.

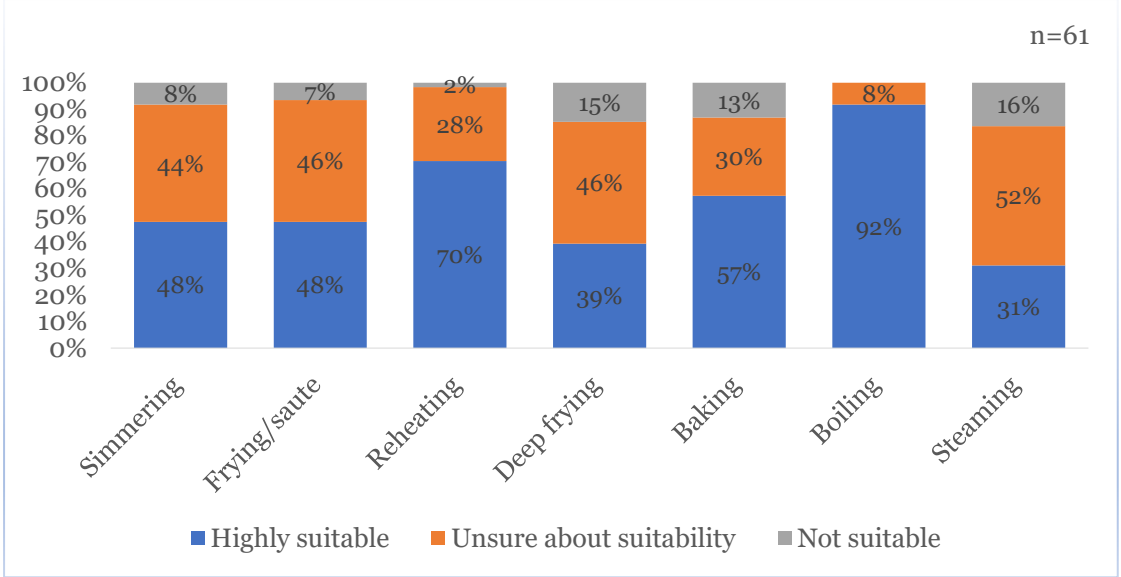


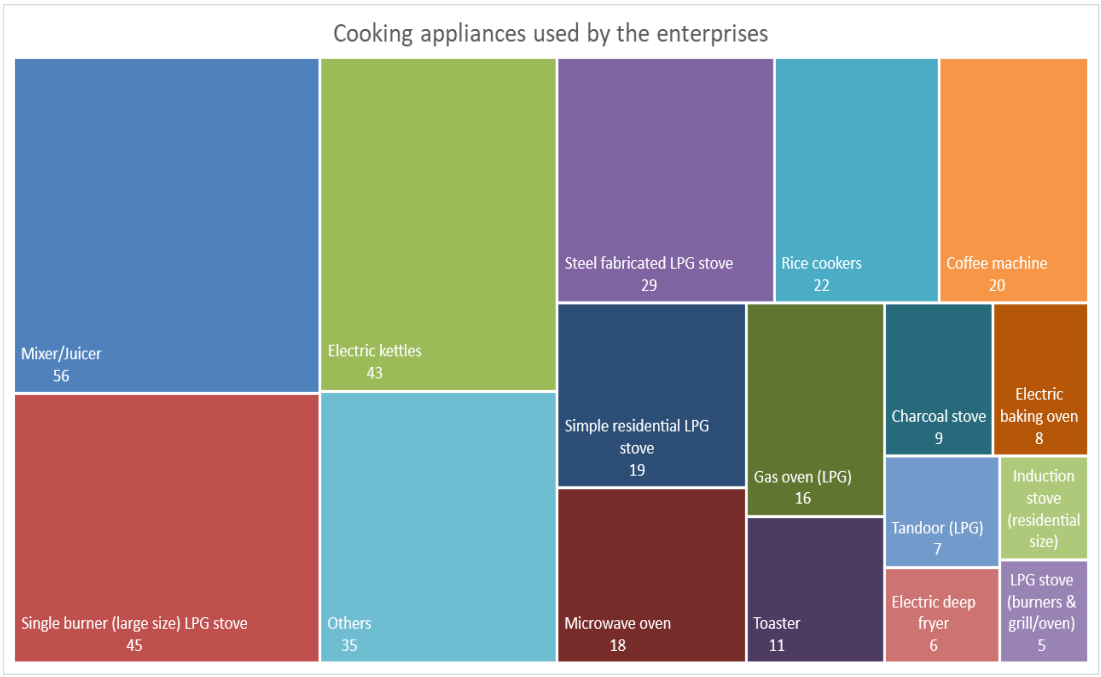
Figure 7: Perception on suitability of eCooking appliances for different cooking process

It's important to note that almost half of the surveyed respondents were unsure about the suitability of eCooking appliances for different cooking processes as depicted in Figure 7. Specifically, 44% of respondents were unsure about using eCooking appliances for simmering, 46% for frying/sautéing, 46% for deep frying, and 52% for steaming. Additionally, there were respondents that believed eCooking appliances were not suitable for any of the cooking processes they perform. However, the percentage of respondents were marginal.

4.3 Cooking Appliances and Utensil Used by the Enterprises

4.3.1 Appliances for Cooking

As depicted Figure 8a-b, the survey conducted among various enterprises revealed the prevalence of different types of cooking appliances used for food preparation. Among the surveyed enterprises, the most used cooking appliances fuelled by LPG were the single burner (large size) LPG stove, which was used by 48% of restaurants, 76% of hotels and 100% of institution, followed by the steel fabricated LPG stove which was used by 74% of restaurants, 47% of hotels and 19% of institution etc. Similarly, the most used electric appliances were mixer/ juicer used by 96% of restaurants, 100% of hotels and 81% of institution, followed by electric kettle which was used by 57% of restaurants, 76% of hotels and 81% of institution etc. Additionally, a variety of other cooking appliances were reported in various enterprise which is depicted in Figure 8a-b, like rice cookers, simple residential LPG stoves, microwave ovens, gas ovens, toasters, charcoal stoves, tandoors (LPG), electric deep fryers, electric baking ovens, induction stoves (residential size), LPG stoves with burners and grill/oven, waffle machines, tandoors (coal), salamanders, coffee machine and infrared stoves (residential size), electric water boiler.



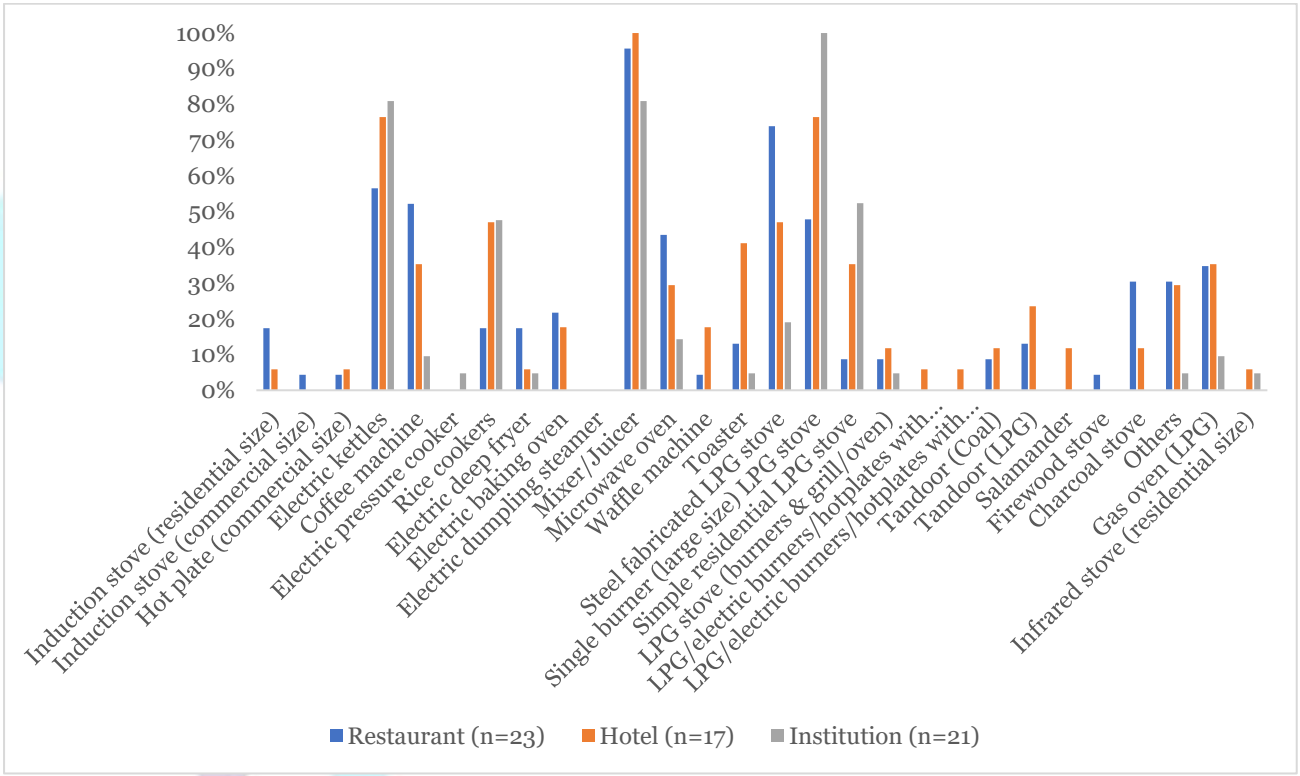


Figure 8a-b: Cooking appliances used by the enterprises overall (top) and disaggregated (bottom)

The data from the survey underscores the prevailing reliance on traditional LPG-fuelled cooking appliances in the surveyed enterprises for the main heating events. This suggests that the transition to eCooking appliances is still relatively nascent in the surveyed enterprises. The widespread use of LPG stoves indicates the need for further awareness and promotion of the

benefits of eCooking to encourage greater adoption of energy-efficient and sustainable cooking practices.

4.3.2 Utensils for cooking

As depicted in Figure 9, the survey conducted among various enterprises revealed the usage of various cooking utensils in food preparation. These utensils play a crucial role in preparing a wide range of food items. The different types of cooking utensils mostly used by the enterprises include:

1. **Pressure Cooker:** Pressure cookers are commonly used for fast and efficient cooking, especially for items like rice, lentils, and stews. In the surveyed enterprises, pressure cookers were available in sizes ranging from 1.5 to 24 litres.
2. **Stock Pot:** Stock pots are large, deep pots used for making stocks, soups, and large-batch dishes. In the various surveyed enterprises, stock pots were found in sizes ranging from 3 to 400 liters, with the largest size being used in hotels.
3. **Frying Pan:** Frying pans, also known as skillets, are shallow, flat-bottomed pans used for frying, sautéing, and searing food items. The diameter of these frying pans typically ranges from 10 to 60 cm.
4. **Griddle:** Griddles are flat cooking surfaces, often made of cast iron or steel, used for cooking items like pancakes, flatbreads, and grilled sandwiches. In the survey, the size of the griddles ranged from 15 to 60 cm in diameter.
5. **Saucepan:** Saucepans are small, deep pans with a long handle, primarily used for making sauces, gravies, and boiling small quantities of liquids. In the survey, saucepans were found in sizes ranging from 1 to 50 liters.
6. **Wok:** Woks are round-bottomed, deep cooking pans with sloping sides, commonly used in Asian cuisine for stir-frying, deep-frying, and steaming. In the surveyed enterprises, woks were available in sizes ranging from 5 to 90 cm in diameter.
7. **Dumpling Steamer:** Dumpling steamers are specialized steamers used to prepare dumplings and other steamed items. In the survey, dumpling steamers were found in various sizes, ranging from 2 to 200 litres.

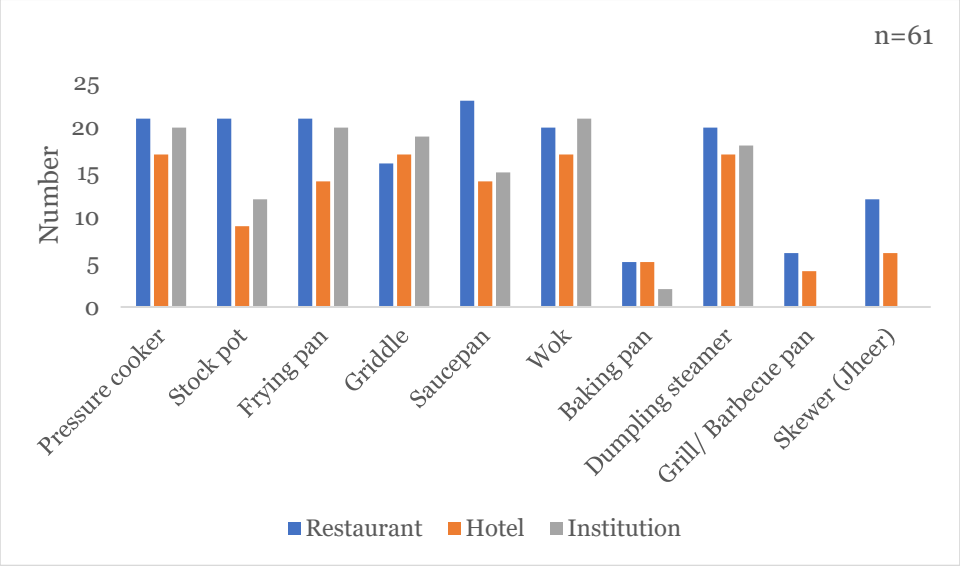


Figure 9: Utensils used in enterprise for cooking

Alongside these commonly used cooking utensils, some enterprises were also using specialized utensils for specific cooking purposes:

1. **Baking Pan:** Baking pans are used for baking cakes, cookies, and other baked goods in an oven.
2. **Barbecue Pan:** Barbecue pans are used for grilling or barbecuing food items, providing a smoky flavour without using an outdoor grill.
3. **Skewer:** Skewers are used to thread and cook kebabs, skewered vegetables, and meats.

The variety of cooking utensils used in the surveyed enterprises highlights the diverse range of dishes prepared in their kitchens. During the FGD with chef community and REBAN, when inquired about the suitability of their utensils for use with induction stoves, various enterprises indicated that their utensils were not compatible with such stoves. Each utensil serves a specific cooking function and is essential for creating various flavours and textures in the food items. As the enterprises explore different cooking techniques and cuisines, these cooking utensils play a vital role in meeting their culinary needs. There is not much difference in the type of utensil with respect to enterprise categories. However, the size of the utensils varies according to the size of the enterprise.

4.3.3 Desire to own enterprise level eCooking appliances

During enterprise survey, the respondents were asked if they want to have eCooking appliances for their enterprise. As depicted in the Figure 10, in restaurants, 83% respondents were interested in having or adding commercial eCooking appliances, while 17% respondents

did not want such appliances in their kitchen. Similarly, among hotels, 88% respondents expressed interest in having or adding commercial eCooking appliances, while 12% respondents did not wish to have such appliances in their kitchen. In institutions, 86% respondents showed interest in having or adding commercial eCooking appliances, while 14% respondents did not want to have such appliances in their kitchen.

The enterprises who were interested in having eCooking appliances that suits their most popular dish mentioned to have following eCooking appliances: induction stove (37), rice cooker (21), electric kettle (14), electric oven (12), coffee machine (9), electric grill/barbecue (8), hot plate (7), electric steamer (6), electric cooking range (3), electric pressure cooker (3), roti maker (3), electric frying pan (2), microwave (1) and not able to mention (14).

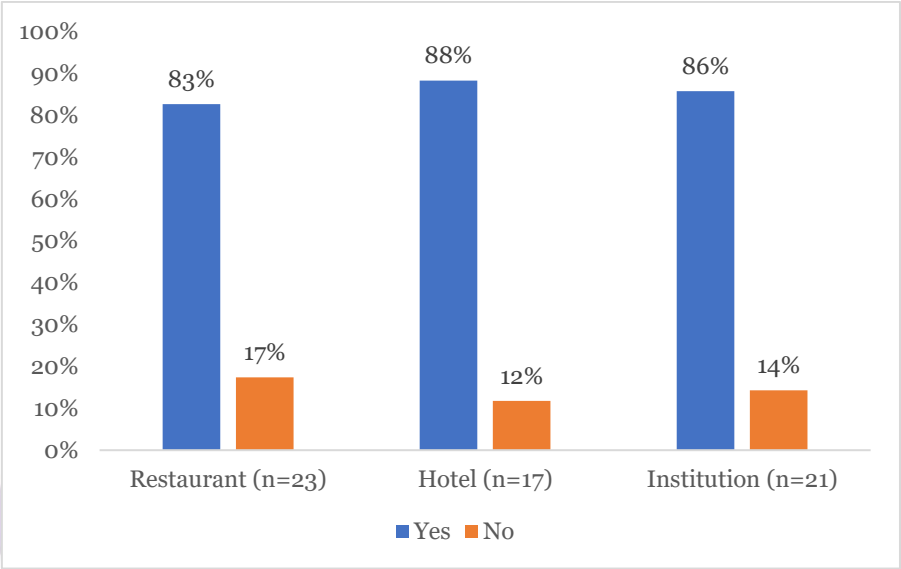


Figure 10: Interest to have or add enterprise level eCooking appliances

The responses illustrate the positive reception of enterprise level eCooking appliances among significant majority of respondents in each category. However, it also highlights that there are a few enterprises within each category that have reservations about adopting such appliances. Understanding the reasons behind their disinterest can help in addressing concerns and further promoting the benefits of commercial eCooking to encourage wider acceptance and adoption.

For some respondents (9) who lacked interest in adopting eCooking appliances were also queried about the conditions under which they might consider adopting such technologies. Figure 11. Among the restaurants, the respondents wanted to adopt eCooking if the cost of owning eCooking appliances were less along with the operating cost and they also wanted assurance about save in time while cooking using eCooking appliances. This was also the case

for institutions but other than these conditions, institutions also touched upon other conditions such as requiring subsidy while purchasing eCooking appliances, awareness about eCooking appliances and availability of provision of training to use them, accessibility for eCooking appliances and reliable after sales service from eCooking appliance suppliers. In case of restaurant, one of them mentioned compatibility issues with the type of food they cook, while another restaurant cited a lack of available space in their kitchen for additional cooking appliances.

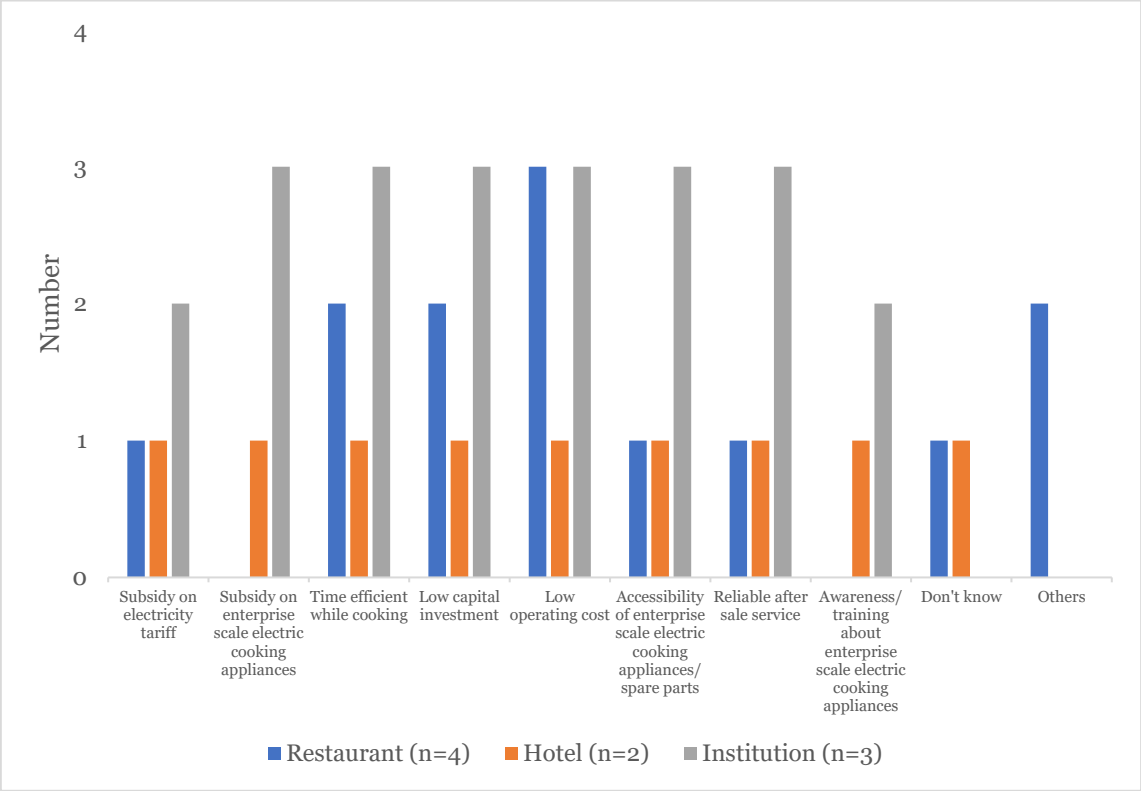


Figure 11: Conditions to encourage enterprises to adopt eCooking appliances

In addition to enterprise survey, the findings form the FGD conducted with the chef community, REBAN and KII conducted with chefs suggested some factors that would contribute to adoption of eCooking appliances at the enterprise level. Ensuring efficient and dependable cooking operations in busy enterprise kitchens, the specific requirements of appliances for enterprise level eCooking in Nepal hold utmost importance. The following considerations were highlighted during the FGDs and KIIs.

1. **Size and Capacity:** Devices used in commercial settings should have sufficient capacity to handle the volume of food to be prepared. The size of the devices should fit the existing cooking device burner size and be compatible with the kitchen space and production needs of the enterprise.

2. **Durability and Build Quality:** Commercial grade eCooking devices should be robust and built to withstand frequent and intensive use in a commercial kitchen environment.
3. **Energy Efficiency:** Energy-efficient devices are crucial for reducing operational costs and minimizing the environmental impact of the enterprise.
4. **Ease of Maintenance:** Devices should be easy to clean and maintain to ensure hygienic food preparation and prolong their lifespan.
5. **Safety Features:** Safety is paramount in a commercial kitchen, so devices should have appropriate safety features to prevent accidents and ensure the well-being of the kitchen staff.
6. **Adaptability to Local Cuisine and Cooking Techniques:** The devices should be capable of handling the diverse cooking requirements of Nepalese cuisine, including traditional dishes, and cooking techniques.
7. **Warranties and After-Sales Support:** Devices used for commercial/institutional use should come with appropriate warranties (preferably warranty period of more than two years as communicated during FGD with chef community) and access to reliable service and support to address any technical issues promptly.
8. **User-Friendly Interface:** Devices should have intuitive controls and interfaces to facilitate ease of use for kitchen staff.
9. **Cost-Effectiveness:** The cost of the devices should align with the enterprise's budget and provide value for money in terms of efficiency and performance.
10. **Cooking Speed:** For enterprise level kitchens, the cooking speed of eCooking devices can significantly impact overall food preparation time and customer service.
11. **Multiple Cooking Modes:** Devices that offer multiple cooking modes and functions can add versatility to the kitchen's culinary capabilities.
12. **Quality Control and Standard:** During both FGDs, major issue that was highlighted to encourage adoption was mechanism to control the quality of the commercial scale eCooking appliances and having standard to ensure that enterprise have access to quality product.

The discussion with REBAN emphasized on requirement of proper planning prior to the decision to purchase eCooking appliances. Prior to adopting eCooking appliances, enterprises should conduct a thorough assessment of their cooking needs and consult with suppliers or vendors who specialize in commercial scale eCooking appliances to identify the most suitable devices that meet their requirements. Additionally, training kitchen staff on the proper usage and maintenance of these devices is essential for their effective integration into the

enterprise's culinary operations. Testing and evaluating specific devices in a real kitchen environment can provide valuable insights into their performance and compatibility with the enterprise's cooking needs.

4.3.4 Willingness to pay for eCooking appliances

The data collected from various enterprises regarding their interest in having eCooking appliances reveals that while there is considerable interest across different types of enterprises, not all of them are equally willing to invest in purchasing such appliances. As shown in Figure 12, the willingness to invest in eCooking appliances were seen higher among restaurants followed by hotels and accommodations and institutions. The indecisiveness regarding whether to invest on eCooking appliances is more among institutions and least among restaurants.

The factors influencing their decision-making, such as cost, expected benefits, existing cooking setups, financial constraints etc were mentioned during the KII with associations and FGDs with REBAN and chef community. To encourage more definite investment decisions, suppliers/retailer that are planning to introduce eCooking appliances may need to engage in further discussions with the interested enterprises, provide detailed information about the advantages, and address any concerns or uncertainties that they might have. More importantly, the enterprises were vocal about wanting to be aware about cost and benefit of switching to eCooking.

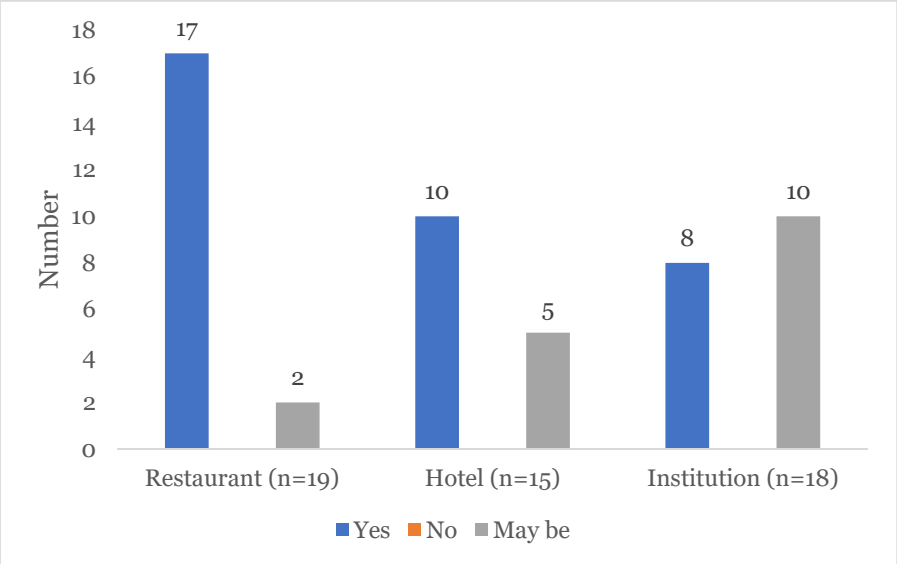


Figure 12: Willingness of enterprises to invest in eCooking appliances

The enterprise who was interested to adopt eCooking appliances in their kitchen were asked about the how much they are willing to pay to use eCooking appliances. As shown in Figure 13, most enterprises under restaurant category were inclined towards paying less than what they have been spending for fuel and cooking technology. In contrast, hotels and accommodations and institutions were seemed to be content with paying similar to what they have been paying for fuel and cooking technology.

From the data, it's evident that most of the enterprises in all three categories are looking for cost-effectiveness when adopting eCooking appliances. The willingness to adopt is higher when the cost is either lower or like what they have been spending on traditional fuel and cooking appliances. Very few enterprises are willing to adopt eCooking appliances even if the cost is higher, indicating that the technology must offer significant advantages or other benefits to justify the increased expenses. The enterprises are more likely to embrace this new technology if the initial investment is low and if it helps them reduce their operational costs.

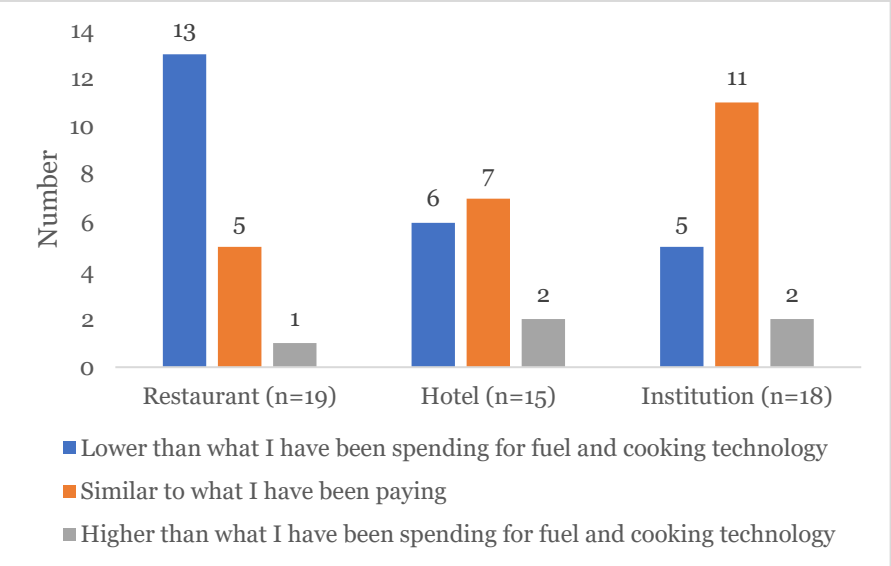


Figure 13: Level of willingness to pay to switch/add electric cooking appliances in your kitchen

4.4 Supply chain

As shown in Figure 14, overall, approx. 80% surveyed enterprises had knowledge about the availability of the enterprise level eCooking appliances. Among them all surveyed restaurants were found to be aware about availability of enterprise level eCooking appliances while 70.5% hotels and accommodation, 70.5% enterprises and 66.66% institutions had knowledge about availability of enterprise level eCooking appliances.

However, among those who were aware of the availability of commercial eCooking appliances, only a few knew about the enterprise level eCooking appliance suppliers who could provide larger eCooking appliances that would have facilitated volume-based cooking like preparing buffet. The remaining respondents mentioned other sources like eCooking appliance stores and online platforms like Daraz, which primarily sold household level appliances. Data obtained from KII with culinary schools, hotel, and chefs association and FGD with REBAN and chef community indicates that these key stakeholders aware about market and appliances suitable for enterprise level eCooking. Some of the chefs even suggested names of few suppliers while other were found to be reluctant to share the information. The name of the supplier found during the discussions are listed in ANNEX II. ANNEX I and ANNEX II contains a comprehensive list of suppliers who can offer commercial and/or enterprise level eCooking appliances.

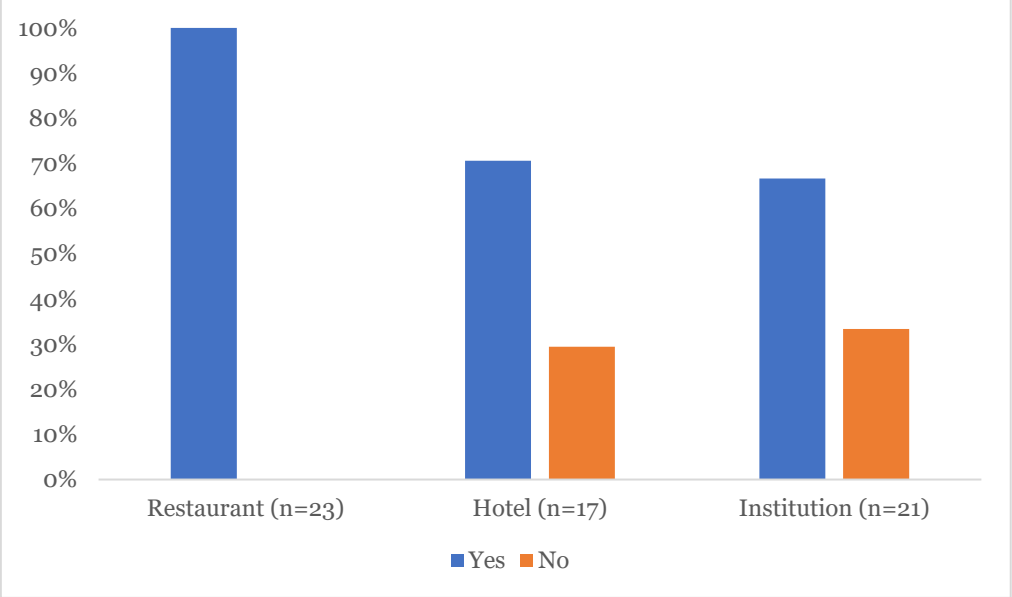


Figure 14: Knowledge about availability of enterprise level eCooking appliances

4.3.1 Enterprise Level eCooking Appliances Available in Nepalese Market

In Nepal, the choice of appropriate eCooking appliances for various enterprises can vary, depending on their specific cooking requirements, the types of cuisines they offer, and the scale of their operations. Based on the FGDs, KIIs, and interaction with enterprise level eCooking suppliers, the list of available eCooking appliances as per the information retrieved from the suppliers are included Table 5. As seen from the list of appliances, there are companies that are active in the market ad can import the enterprise level eCooking appliances. However, these companies do their marketing through the brochures and only imports the appliances following the order placement and advance (usually 50%) depot by the potential customers. The companies that were inquired to develop the list also had capabilities

to provide repair and maintenance service either through their own staff or through other companies that are usually outsourced. It should be noted that part from companies that agreed to share the details of the eCooking appliances, there were other companies that were also inquired but most of them were unwilling to provide the details requested by the research team.

Table 5: List of eCooking appliances in the market

S.N.	Enterprise Scale eCooking Appliances	Rated Wattage/ Power (W)	Phase	Capacity / Size	Enterprise Suitability
A. Induction based eCooking Appliances					
A.1.	#Single Burner Commercial Induction Stove with Wok *(NPR. 3,18,780 with 2 years warranty)*	12000	3	26 Litre	Induction woks are specifically designed for Asian cuisines and are perfect for enterprises specializing in stir-frying and other high heat cooking methods. All enterprise that specializes in Chinese food or Chinese cooking.
A.2.	#Induction Soup Cooker *(NPR. 2,57,400 with 1 year warranty)*	12000	3	49 Litre	Suitable for star hotels while preparing buffet with soup. Besides, due to smaller size, it can also be suitable for hospital canteens where soup is prepared for patients.
A.3.	#Induction Double Soup Cooker *(NPR. 5,80,635 with 1 year warranty)*	24000	3	98 Litre	Suitable for star hotels while preparing buffet with soup.
A.4.	*Induction Cooker *(NPR. 89,500 with 2 years warranty)*	3500	1	NA	Induction cooktops are ideal for fast and precise cooking, making them suitable for all types of enterprises like restaurants, cafes, and fast-food outlets, canteens, mess, etc. They offer quick heat-up times and efficient energy use. They can be used for various cooking styles, including stir-frying, and boiling, shimmering, reheating, and steaming.
A.5.	#Double Burner Induction Cooker *(NPR. 6,25,000 with 2 years warranty)*	12000	3	12.75 Litre	
A.6.	#Single Burner Induction Plate *(NPR. 1,27,512 with 2 years warranty)*	8000	3	26 Litre	
A.7.	#Induction Stove (Commercial Size) *(NPR. 48,000 with 1 year warranty and 22 units has been sold)*	3500	1	NA	
A.8.	**Commercial Induction *(NPR. 55,000 with 1 year warranty and no sales so far)*	3500	1 and 3	NA	
B. Electric Cooking Range					
B.1.	**Hot Plate *(NPR. 35,000 with 1 year warranty and 5 units has been sold)*	2500-4500	1	NA	Commercial hot plates can be used as an alternative to LPG cook stove. According to the information collected from FGD

S.N.	Enterprise Scale eCooking Appliances	Rated Wattage/ Power (W)	Phase	Capacity / Size	Enterprise Suitability
B.2.	***Commercial Hot Plate *(NPR. 50,000 with 1 year warranty and 10 units has been sold)*	3500	1	NA	conducted with Chefs community, the heat provided by the hot plate closely resembles to the heat provided by the LPG cooking range.
B.3.	**Popcorn Making Machine *(NPR. 26,000 with 1 year warranty and no sales so far)*	1200	1	NA	Used for making popcorn.
B.4.	*Stainless Steel Electrical Griddle	3500	1	NA	Enterprise that comprises of menu that require Sautee and shallow frying can opt for this appliance.
B.5.	**Electric Griller *(NPR. 1,20,000 with 1 year warranty and 5 units has been sold)*	6000	3	NA	These appliances have potential to replace coal and charcoal based barbecue cooking range. These appliances can be used to barbecue meat and vegetables.
B.6.	***Electric Griller *(NPR. 25000 with 1 year warranty and 7 units has been sold)*	3500	1	NA	
B.7.	**Tilting Pan *(NPR. 5,80,000 with 1 year warranty and 3 units has been sold)*	8000	1	NA	These appliances are used to prepare curries. While using this appliance, the chef or cook does not require to stir the curries manually.
B.8.	***Rotisseries *(NPR. 1,55,000 – 6,00,00 with 1 year warranty and 6 units has been sold)*	3200	1	NA	These appliances are used to barbecue whole chicken or Shwarma. This also has potential to replace LPG based rotisseries.
C. eCooking appliances for Steaming					
C.1.	#Rice Steamer	25000	3	80 kgs	Useful for canteen, mess of university hostel, hospital, army barracks, etc.
C.2.	**Rice Maker *(NPR. 70,000 with 1 year warranty and 5 units has been sold)*	9000	3		
	***Rice Steamer *(NPR. 1,20,000 – 4,50,000 with 1 year warranty and 100+ units have been sold)*	3500	3		
C.3.	##Electric Momo Maker (Steamer) *(NPR. 3,900 – 4,500 with 1 year warranty)*	800	1	22 pieces of Momo per tier (3 tiers)	Any enterprise that has Momo in their menu. However, it may not be suitable for enterprises that sells high quantity of Momo or sells only Momo. Electric steamers are well-suited for institutions and catering services that require steaming of food items like vegetables, noodles, Momo, and rice.

S.N.	Enterprise Scale eCooking Appliances	Rated Wattage/ Power (W)	Phase	Capacity / Size	Enterprise Suitability
C.4.	##Electric Pressure Cooker (EPC) *(NPR. 7,000 – 9,500 with 1 year warranty)*	910	1	5 Litre	EPC offer fast and efficient cooking, making them suitable for a variety of enterprises, including those with high-demand kitchens. This appliance can be useful in enterprise that believes in rice having better taste when cooked in pressure cooker compared to rice cooker.
D. Electric Oven for baking and roasting					
D1.	*Electrical Baking Oven - 1 Deck) *(NPR. 1,35,000)*	6600	1	2 Tray	Electric ovens, especially convection ovens, are versatile appliances suitable for baking and roasting. They are suitable for bakeries, pastry shops, and restaurants offering baked food items.
D.2.	*Electrical Baking Oven - 3 Deck *(NPR. 4,69,000)*	24000	3	9 Tray	
D.3.	##Combi Oven *(NPR. 12,00,000 – 25,00,00)*	18000-20000	3	Single Door	Combi ovens, which combine convection, steam, and sometimes microwave cooking, are versatile and suitable for large-scale operations like hotels and banquet facilities.
D.4.	*Pizza Oven *(NPR. 1,98,000)*	4200	1	NA	Suitable for enterprises that sells pizza in high volume or specializes in serving pizza of different types
D.5.	**Electric Oven *(NPR. 1,50,000 – 14,10,000 with 1 year warranty and 50 units has been sold)*	4200 - 9000	1 and 3	NA	Electric ovens are mostly used to make pizza, and for baking purpose. They are also used to roast meat items.
D.6.	***Electric Oven *(NPR. 60,000 - 8,00,000 with 1 year warranty and 100+ units have been sold)*	2500-8000	3	NA	
D.7.	**Microwave Oven *(NPR. 35,000 – 72,000 with 1 year warranty and 30 units has been sold)*	2200	1	NA	Mostly used to reheat the food and occasionally can also be used to bake food items based on the function available with respect to different brands.
D.8.	*Stainless Steel Single Door Proofer with Humidifier *(NPR. 14,70,000)*	2000	1	16 Tray	Suitable for bakeries
E. Electric Food Warmers					
E.1.	*Stainless Steel Electrical Food Warmer with Thermometer *(NPR. 1,20,000)*	1160	1	NA	Can be useful for canteens (school, hospital, and hostels) that needs to prepare in bulk but must keep the food warm for longer period of time.

S.N.	Enterprise Scale eCooking Appliances	Rated Wattage/ Power (W)	Phase	Capacity / Size	Enterprise Suitability
E.2.	*Stainless Steel Electrical Mini Bain Marie with 6 Food Tray *(NPR. 99,000)*	1400	1	6 Tray	
E.3.	**Baine Marie *(NPR. 50,000 -2,00,000 with 1 year warranty and 80 units have been sold)*	2000-4000	1	NA	
E.4	**Induction Commercial Warmer *(NPR. 48,000 with 1 year warranty and 20 units have been sold)*	1000	1	NA	
E.5.	*Stainless Steel Electrical Mini Infra-Red Food Warmer	510	1	NA	
F. Electric Deep Fryer					
F.1.	*Electrical Deep Fryer *(NPR. 18,000)*	2180	1	3 Liter	Size being small, this kind of appliance can be used in enterprise that specializes in fried items.
F.2.	**Electrical deep fryer *(NPR. 80,000-1,60,000 with 1 year warranty)*	3500	1	NA	Electric deep fryers are suitable for enterprises that regularly fry items like French fries, fried chicken, and other deep-fried dishes. This appliance is suitable for enterprise that specializes in fried items.
F.3.	*Stainless Steel Tabletop Electrical Deep Fryer *(NPR. 45,000)*	3000	1	9 Litre	
F.4.	**Electrical deep fryer *(NPR. 70,000-1,50,000with 1 year warranty and 18 units have been sold)*	5000-9800	3	NA	
G. Electric Water Boilers					
G.1.	*Water Boiler with PU Insulation- Digital Control	3000	1	30 Litre	Enterprise that uses warm water while cooking can have this appliance. As per ethnography survey, in some enterprises warm water is used to speed up the cooking process.
G.2.	*Stainless Steel Electrical Water Urn *(NPR. 49,500)*	2800	1	30 Litre	
G.3.	**Water Boiler *(NPR. 18,000 with 1 year warranty and 16 units have been sold)*	1800	1	NA	
H. Toaster, Salamander					
H.1.	*Stainless Steel Electrical Contact Toaster *(NPR. 79,500)*	2500	1	NA	Restaurants and other enterprises that provide continental breakfast on regular basis can opt for this appliance.

S.N.	Enterprise Scale eCooking Appliances	Rated Wattage/ Power (W)	Phase	Capacity / Size	Enterprise Suitability
H.2.	**Toaster *(NPR. 18,000 with 1 year warranty and 25 units have been sold)*	1800	1	NA	
H.3.	***Toaster *(NPR. 8,000 - 1,00,000 with 1 year warranty and 60 units have been sold)*	1500-2500	1	NA	
H.4.	*Stainless Steel Electrical Salamander *(NPR. 1,14,000)*	2700	1	NA	Salamanders can be used to prepare dishes that requires cheese crust or cheese melts. Enterprise that offers multiple dishes associated with bread and bakery is likely to find value in owning salamanders.
H.5.	**Salamander *(NPR. 26,000 - 34,000 with 1 year warranty and 40 units have been sold)*	2000-3200	1	NA	
H.6.	***Salamander *(NPR. 16,000 with 1 year warranty and 10 units have been sold)*	2500	1	NA	
H.7.	*Waffle Baker	1000	1	50-300^{0}C	Restaurants and other enterprises that provide continental breakfast on regular basis can opt for this appliance.
H.8.	**Waffle Maker *(NPR. 26,000 with 1 year warranty and 6 units have been sold)*	1800	1	NA	
H.9.	***Waffle Machine *(NPR. 14,000 with 1 year warranty and 30 units have been sold)*	2500	1	NA	
I. eCooking Appliances for Beverage					
I.1.	*Juice Dispenser Jet system *(NPR. 1,49,000)*	130	1	18.9 Litre	Restaurants and other enterprises that provide continental breakfast on regular basis can opt for this appliance.
I.2.	**Coffee Machine *(NPR. 2,80,000 - 6,25,000 with 1 year warranty and 25 units have been sold)*	2800-3500	1	NA	Coffee machines are used to prepare filter coffee.
I.3.	***Coffee Machine *(NPR. 3,25,000 with 1 year warranty and 20 units have been sold)*	1500	1	NA	
J. Electric Appliances for food Preparation (Mise en place)					
J.1.	*Commercial Blender without Cover *(NPR. 38,000)*	1800	1	2 Litre	This appliance is suitable for all those enterprises that prepares Momo pickles, gravy items and prepares their own spices instead of buying from the market.

S.N.	Enterprise Scale eCooking Appliances	Rated Wattage/ Power (W)	Phase	Capacity / Size	Enterprise Suitability
J.2.	*Commercial Blender with Cover *(NPR. 89,000)*	1500	1	2 Litre	
J.3.	*Bakery Mixer with Netting *(NPR. 88,500 – 16,05,000)*	300 325 600 1100 1500	1	5 Litre 7 Litre 10 Litre 20 Litre 28 Litre	Suitable for bakeries and enterprises that offers menu based on dough like pizza, Momo, Roti, etc.
J.4.	*Dough Sheeter *(NPR. 7,98,000)*	400	3	NA	Suitable for bakeries
J.5.	*Meat Mincer *(NPR. 1,95,000)*	1100	1	NA	Suitable for enterprises that offers menu based on minced meat for example Momo.
J.6.	***Electric Dumpling Machine *(NPR. 75,000 – 1,00,000 with 1 year warranty and 6 units have been sold)*	2000	1	NA	This machine enables making raw dumplings without any human intervention. The dough and minced meat re to prepared using either machine or needs to be prepared by humans.

Note:

#indicates appliance details gathered from Vision of Kitchen Links Co. Pvt. Ltd

indicates appliance details gathered from online portal and KII with culinary schools

* indicates appliance details gathered from the The Yale Group Pvt. Ltd

** indicates appliance details gathered from the GAI Import Export Pvt. Ltd

*** indicates appliance details gathered from the Kitchen Craft Pvt. Ltd

The prices mentioned in the Table 5 are the price that was provided during the survey between the period (Feb-July 2023)

4.3.2 Market System for enterprise level eCooking appliances

The availability of suppliers offering the eCooking appliances mentioned in the above section is limited. Most of these eCooking appliances need to be imported. While a few local manufacturers can produce some equipment locally, there are concerns about the quality and durability of such locally made devices, as discussed in the KII and FGD sessions. Figure 15 below demonstrates the simple market map for the enterprise level eCooking appliances. The market map is briefly explained in Table 6.

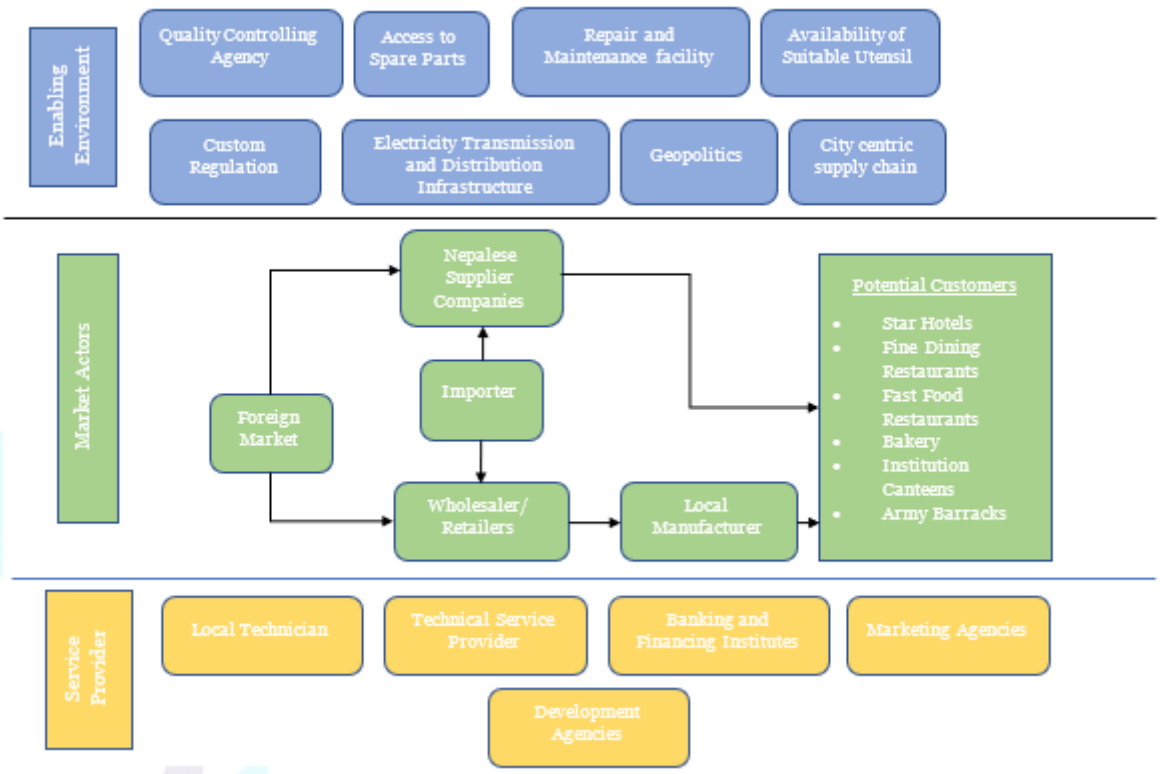


Figure 15: Market Map for enterprise level eCooking appliances

Table 6:Challenges and Opportunities within the Market system for enterprise level eCooking appliances

Enabling Environment	
Quality Controlling Agency	The quality of equipment currently available is not up to the mark, and there is no proper provision to assure their quality. Chinese equipment, in particular, is often perceived to be of subpar quality. On the other hand, other well-known and reputable brands offering high-quality eCooking appliances come with a hefty price tag. As a result, the initial investment required for acquiring quality eCooking appliances is notably high, posing a challenge for widespread adoption.
Access to Spare Parts	Based on discussion made during KII with representative of Academy of Culinary Arts enterprises and FGD with chefs, it was found that regardless of origin if import, in case where spare parts are required to maintain the eCooking appliances, the enterprises are required to wait for significant time in case there is damage to the components of eCooking appliances. The enterprises are not confident regrading availability of spare parts because the enterprise cannot afford to wait for days until arrival of spare parts as it would have severe impact on their business.
Repair and maintenance facility	Typically, suppliers of enterprise level eCooking appliances offer after-sales service and maintenance, including repairs, within the warranty period. Additionally, the enterprises that have purchased these appliances often maintain contact with independent technicians for repair and maintenance services. However, both the enterprises and culinary schools utilizing these commercial eCooking appliances expressed their dissatisfaction with the after-sales service and maintenance provided by the suppliers. The after-sales service for commercial eCooking appliances is not reliable, further impacting their practicality and maintenance. According to, the Director of Kitchen Operation, Academy of Culinary Arts, Mahalaxmisthan, Lalitpur, Nepal "***One of his electric ovens was repaired after 4 months of registering the complaint. The issue was with handle of the oven door. The handle of***

	the door had come out of its position. Spare part (handle and required nuts and bolts) did arrive upon complaining and eventually when it did arrived, the spare part did not fit exactly with the oven door and as a result the oven door could not be locked in place." The impression following the FGD with Chef community suggested that there is general dissatisfaction among the chef community regarding the quality of after sale service they get from the suppliers. They could only name hand full of suppliers that they could rely upon in case of need of urgent repair and maintenance with their eCooking appliances.
Availability of suitable utensil	While utensils suitable for domestic scale cooking are readily available in the market, larger utensils compatible with electric cooking are scarce, posing an additional obstacle for enterprises seeking to transition to eCooking appliances. Discussion with the chef community suggested eCooking compatible utensils are not easily available in the market.
Lack of information and knowledge regarding availability of commercial scale eCooking appliances	Except for big star hotels (luxury hotel), fine dining restaurants and bakeries, information, and knowledge about commercial and/or enterprise scale eCooking appliances are limited among enterprises.
Custom regulation	Since many of the eCooking appliances are imported from foreign markets, the supplier has shared their concern over ambiguity in custom regulation while importing appliances relevant to eCooking. According to the Chief Operating Officer, The Yale Group "***We are not sure how much custom duty is going to be charged on the imported eCooking appliances as we are paying different rate as custom duty for similar type of eCooking appliances. We are completely relying on custom agents to clear custom duty for our imports.***" Having a provision to refer the custom duty will enable suppliers to better prepare for their business and marketing. While developing the list of eCooking appliances in Table 5, the custom duty on induction-based appliances were 1% as in case of domestic scale induction stoves while the custom duty for other cooking range was communicated to be between 5-15%. The custom duty rate for the enterprise scale cooking range in the official government document is mentioned to be within the range of 7.25-15% depending on the origin of import (GoN, 2021). Lower custom duty rate is for appliances that are imported from SAARC countries while higher, 15% is for the appliances that are imported from countries other than SAARC countries.
Electricity transmission and distribution infrastructure	There is general concern among enterprises regarding the status of electricity distribution and transmission infrastructure within the country. The reliability of distribution and transmission infrastructure is likely to create enabling environment for increasing the demand of eCooking appliances as potential customers would then start to contemplate about possible benefits of switching to eCooking appliances. Discussion from the Chef community and REBAN suggested that at present, the chef community and even enterprise owners are not confident with the electricity supply system and do not want to risk their business by relying on eCooking appliances.
Geopolitics	According to the suppliers interacted during the research, the supply chain for enterprise level eCooking heavily relies on imports, with only a limited number of eCooking appliances being locally manufactured. Consequently, any disruptions in the import process, such as international trade challenges, geopolitical issues, or global logistics disruptions, can significantly impact the supply chain.
City centric supply chain	According to the suppliers interacted during the research, a majority of the commercial eCooking appliances suppliers are concentrated in major cities of Nepal, which currently hinders easy access for enterprises located in rural, remote, and mountainous regions. For sustainable use of the enterprise level eCooking appliances, it is essential to establish a robust supply chain that ensures timely delivery of appliances, spare

	parts, and maintenance services across the country. This may involve setting up distribution centers and service networks to efficiently meet the demands of various enterprises.
Market Actors	
Market Actor	Description
Foreign Market	Apparently, the commercial scale or enterprise level eCooking appliances are procured through foreign market. The foreign market includes market in China, India, Germany, Malaysia, Italy.
Importer	There are number of companies that are involved in import business. These importer takes the order from Nepalese companies that have a business of supplying commercial scale eCooking appliances. Their job is to basically facilitate the import of eCooking appliances from the market desired by the suppliers.
Nepalese Supplier Companies	There are number of suppliers whose business is related with setting up kitchen and supply appliances, both electrical and non-electrical appliances to the customer. These companies do marketing to the potential customers. Based on the order they receive from the potential customer, they can either contact importer or contact directly to the foreign market where most suppliers have taken agencies to sell particular brand of eCooking appliances. These suppliers also sub-contract technical companies that provide technical service which they use to provide repair and maintenance service to the customers. In some cases, the supplier company themselves provide the repair and maintenance facility for their customers. These supplier companies also operate second-hand market. They provide the exchange facility whereby they can take back old eCooking appliances or any other equipment from their clients in exchange other appliances. The old appliances are refurbished either through their own technician or sub-contract technical service provider.
Wholesaler/Retailers	These market actors are not necessarily suppliers of eCooking appliances, but they import eCooking appliance along with relevant spare parts that are procured by local manufacturer in Nepal.
Local Manufacturer	Local manufacturers have expertise in manufacturing steel fabricated LPG stove. These stoves they manufacture by procuring different parts like food grade steel, burner, copper pipe, etc which are required to manufacture such stove. Besides, some local manufacturer also manufacture custom made electric cooking appliances electric deep fryer, coffee roaster, etc. These appliances are also manufactured by procuring different components required to manufacture electric appliances. However, the quality of locally manufactured eCooking appliances is considered inferior compared to the imported appliances. According to the proprietor of the Dessert Delight (bakery café), locally manufactured eCooking appliances are prone to repeated repair and maintenance issue.
Potential Customers	Upon discussion with chefs and some suppliers of enterprise level eCooking appliances, it was found that major customers of commercial scale eCooking appliances are star hotels, fine dining restaurants, fast food restaurants, bakeries, canteens of school and hospitals, army, and police barracks, etc. These customers, through their kitchen department or chef communicates with suppliers to set up kitchen as per need and list out required eCooking appliances. In some cases, the customers simply share the specification of the eCooking appliances they need with suppliers. Often, the requirement is payment of 50% as advance to the suppliers to formally place an order with the suppliers. In conversations with enterprises mainly Dessert Delight, there exists a second-hand market in Nepal for purchasing enterprise level eCooking appliances. This market offers refurbished enterprise level eCooking appliances that have been reconditioned

	for resale. By providing access to second-hand appliances, this market offers a more affordable option for enterprises looking to adopt eCooking solutions.
Service Provider	
Technical Service Provider	There are some technical service provider companies that are sub-contracted by enterprise level eCooking supplying companies. They are responsible to address any repair and maintenance issues for the customers of supplier companies.
Local Technicians	In some cases, the users of eCooking appliances contact local technicians with knowledge and history of repairing eCooking appliances. Likewise, the technical service provider also contacts local technician if they need to provide repair and maintenance facility to their customer.
Banking and Financing Institutes	Almost all market actor needs to access financial service from the financing institutes. The importers and suppliers, they often take bank service to get Letter of Credit (LC) and bank guarantee facility to import the eCooking appliances. Many customers access loan from banks to establish enterprise like restaurants and bakeries. While conducting this research, discussion with chef community indicated that there was no instance where loan was accessed to procure just eCooking appliances by the customers. Instead upon discussion the financing institutes only provide loan to establish enterprise rather than to procure certain appliances that is required for the appliance.
Marketing Agencies	The suppliers and importers have social media handle where they had put images and video of different appliances including eCooking appliances. However, there is scope of using service from the professional marketing agencies. Although suppliers seemed to have idea about such facility, due to lack of desired level of demand for eCooking appliances, the suppliers and importer are reluctant to invest more on marketing. Apparently, the suppliers and importer have staff who are sent to the market with flyers and brochure used to promote and disseminate information about available eCooking appliances.
Development Agencies	Development agencies can play role to advocate policy makers regarding importance and benefits of commercial scale eCooking appliances. They can also play role to promote such appliances. Development agencies can contribute to aware concerned stakeholder and policy maker about the status quo of the enterprise level eCooking appliances market, its challenges, opportunities and demand.

4.5 Energy and Infrastructure

4.5.1 Energy sources

During the survey conducted with various enterprises, their kitchen fuel usage was investigated, and the results of which are depicted in Figure 16. The findings revealed that all restaurants, hotels and accommodations, and institutions were using LPG as one of the fuel sources for their kitchen. The fuel mix for cooking among institutions were confined to LPG and electricity. For hotels and accommodation, fuels like coals and charcoals were also used while the fuel mix among restaurants were found to be more diverse. Other than LPG and electricity, use of charcoal was significant compared to enterprises from other categories. Likewise, only enterprise under restaurant categories were found to using firewood for cooking mostly traditional and Nepali cuisine. The charcoal and coal are mostly consumed in preparing barbecues and tandoor-based food items.

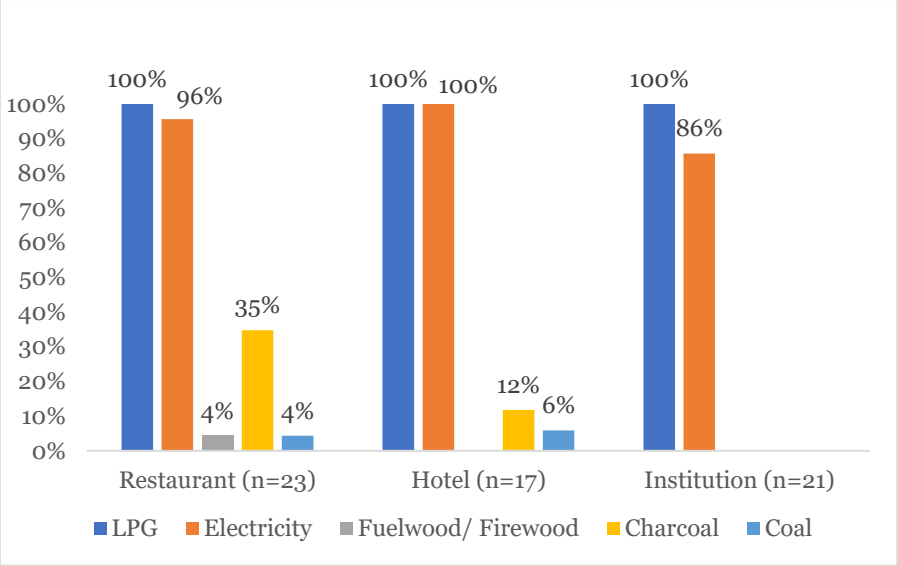


Figure 16: Cooking fuels used in the kitchen

Inquiring about the primary fuel used for cooking, all the surveyed enterprises reported using LPG as their primary fuel, even though they also utilized other fuel sources. As shown in Figure 17, for restaurants, 87% indicated that LPG was their primary fuel, while 13% relied on electricity as their primary fuel for cooking in their kitchen. It was observed that restaurants specializing in bakeries and tea were among those using electricity as their primary fuel. In case of intuitions and hotels and accommodations category, all the surveyed enterprises used only LPG as primary fuel.

When asked about the factors considered while selecting the primary fuel, respondents from different enterprises emphasized that the chosen fuel must meet certain criteria. These considerations by the respondents included easy availability (38), reasonable price (16), user-friendliness (8), cooking efficiency (7), reliability (4), traditional culinary practices (14), lack of better alternative fuel (15) and others (2).

LPG being the primary fuel source for cooking, the survey also tried to understand the consumption of the LPG in all three categories for enterprises. As shown in Figure 18, the average LPG consumption in hotels and accommodation was the highest (30 cylinders) followed by institutions (21 cylinders) and restaurants (19 cylinders). There is significant deviation in terms of minimum and maximum consumption of LPG in every category. This is likely due to the difference in scale of enterprise size within each category. For example: a small tea shop vs fine dining restaurant, star hotel vs lodge and office canteen vs school/hospital canteen.

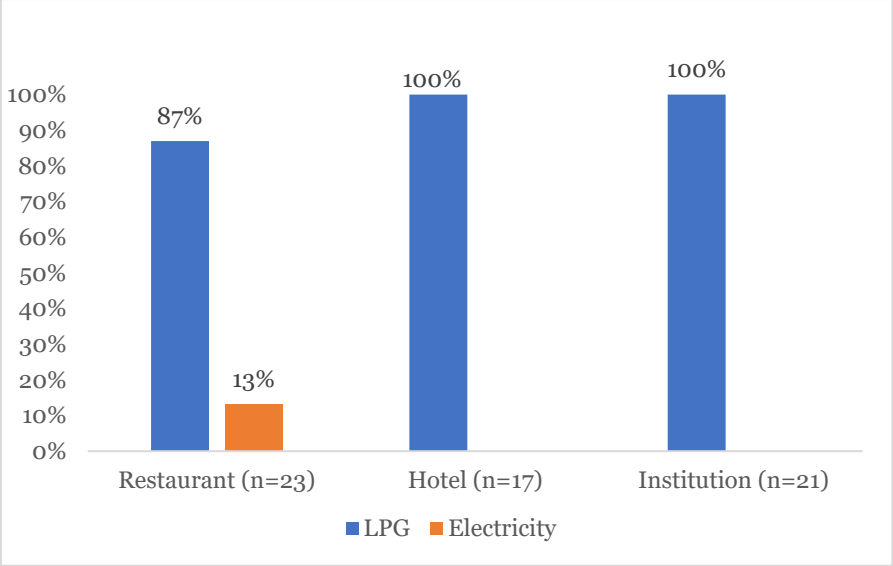


Figure 17: Primary fuel type used in the kitchen

Consumption was found to be high for enterprises, with on average 19 cylinders consumed per month (Figure 17). Hotels and accommodation category were found to be consuming the highest average number of LPG cylinder followed by institutions and restaurants.

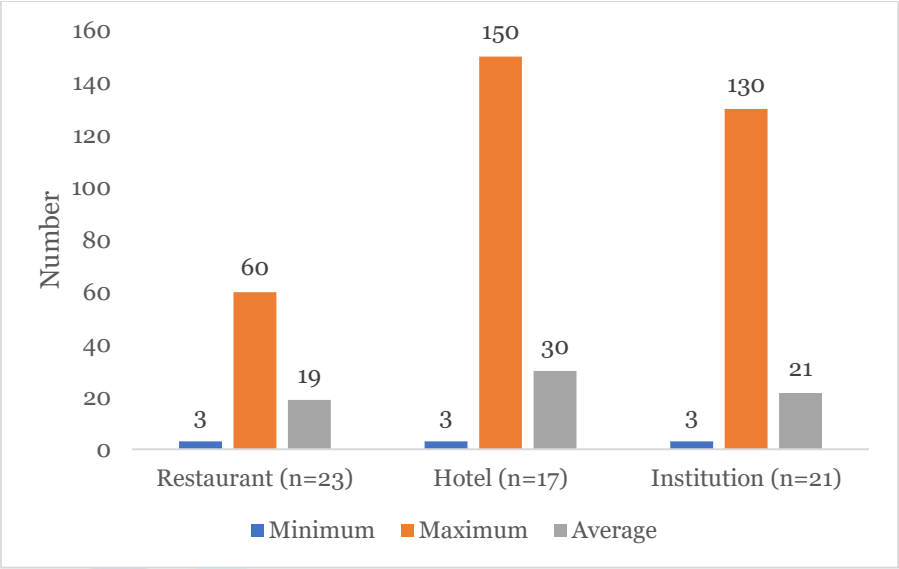


Figure 18: LPG gas cylinders consumed per month for cooking

4.5.2 Electricity supply and meter connections

Nepal has made efforts to enhance its electricity supply and energy access. Despite significant progress in recent years, electricity availability can still be inconsistent in certain regions, particularly in rural areas. Urban centres generally benefit from a more reliable power supply, although occasional outages and unscheduled load shedding might occur during peak demand periods or monsoon season as reported by most surveyed enterprises and KIIs and FGDs

participants. Such intermittent supply presented challenges for enterprises that rely on continuous and dependable electricity for eCooking which was mentioned by representative of various enterprise during FGD and KII.

Furthermore, Nepal experiences the need to import electricity only during the dry season, while during other times, it exports electricity to India. It is anticipated that Nepal will have a surplus of energy from the next fiscal year, leading the Nepal Electricity Authority (NEA) to prioritize electricity consumption within the country. The NEA is actively seeking sectors that can assure the consumption of this surplus electricity.

The cost of electricity is another important factor to consider. For enterprise level eCooking to be feasible and financially viable, the electricity tariff should be competitive and reasonable. High electricity costs can significantly affect the overall operating expenses for enterprises.

During FGD with REBAN, it was pointed out that the Time of Day (TOD) meter facility, offering variable electricity pricing based on usage time, is exclusively available to star hotels (luxury hotels). Enterprise like restaurants do not get the facility of TOD meter. This limitation could hinder the broader adoption of eCooking in restaurants, as they are deprived of the benefits of lower electricity rates during off-peak hours that the TOD meter provides. To promote the adoption of eCooking appliances in restaurants and other enterprises, policymakers should consider extending the availability of TOD meters to encompass a broader range of users beyond star hotels. By providing the TOD meter facility to restaurants, it could incentivize them to schedule their cooking activities during off-peak hours, effectively reducing electricity costs and encouraging energy efficiency. REBAN representatives believes that with lower electricity tariff, they can change the food preparation time in the hour of the day where the tariff is at the lowest.

Moreover, classifying restaurants as non-domestic users likely subjects them to different electricity tariffs compared to residential users, except for some restaurants that operate from residential houses. Non-domestic users typically face commercial rates, which is higher than residential rates, thereby encouraging enterprises to be more mindful of their electricity consumption.

4.5.3 Electricity meter connection type

When it comes to eCooking appliances, the electrical connection type becomes crucial because some eCooking appliances, especially those with high power requirements, may need a three-

phase connection to function optimally. While enterprises with single-phase connections can still use eCooking appliances, they might be limited to lower capacity or less powerful options.

Figure 19 below illustrates the electrical connections present in different types of enterprises: restaurants, hotels and accommodations, and institutions. Among the surveyed restaurants, 13 had a single-phase electrical connection, 9 had a three-phase electrical connection, and one respondent was unsure about their electrical connection type. Similarly, among the surveyed hotels and accommodations, 7 had a single-phase electrical connection, 7 had a three-phase electrical connection, and 3 respondents were uncertain about their electrical connection type. In the case of institutions, 9 had a single-phase electrical connection, 4 had a three-phase electrical connection, and 8 respondents were unsure about their electrical connection type. The number of institutions that were unable to identify the connection type is higher. This is likely since institutions often outsource entities that operates canteens and mess, making them less likely to be aware about connection type.

Enterprises with three-phase electrical connections have greater compatibility for using a wider range of eCooking appliances, including those with higher power demands, making it more suitable for larger-scale cooking operations like those in hotels and institutions. However, in smaller restaurants or enterprises with single-phase connections, low capacity eCooking appliances can still be used effectively.

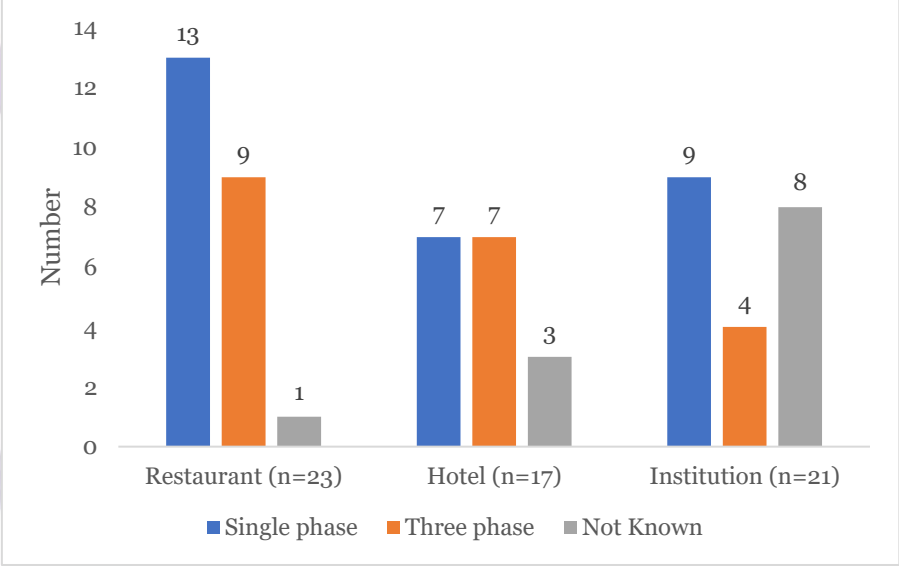


Figure 19: Electricity meter connection type in surveyed enterprises

In conclusion, the type of electrical connection influences the feasibility and capacity of eCooking appliances that enterprises can adopt. Enterprises with three-phase connections

generally have more options for eCooking appliances, while those with single-phase connections may need to consider appliances with lower power requirements.

4.5.4 Enterprise Ownership Type

The ownership status of the property where an enterprise operates can indeed influence the use of eCooking appliances. Figure 20 below illustrates the ownership status of the properties with respect to various enterprises. Among restaurant category, none of them were found to be running their business in their own property as most of them have been established in rented property (20) and few (2) in leased property. The enterprises that were established in their own property were very limited; two each under hotels and accommodation category and institutions category. Otherwise, like in restaurant category most of the enterprises under hotels and accommodation category and institutions category were found to running their business in either rented (11 and 15 enterprises respectively) or leased property (4 enterprises in each category). Different ownership scenarios have specific implications when it comes to adopting eCooking appliances:

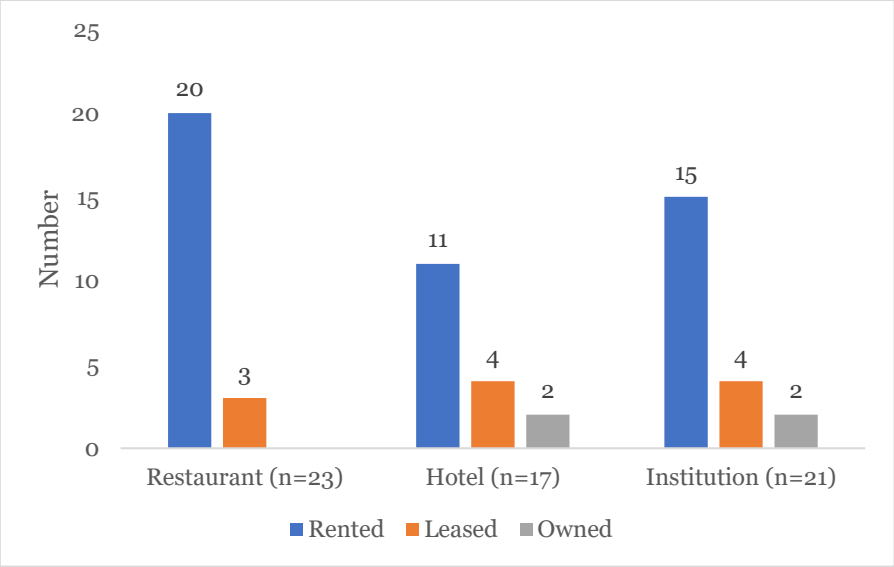


Figure 20: Ownership status of the surveyed enterprises

Most of the restaurants (20) were established in rented properties. A smaller number of restaurants (3) were operating in leased properties. Among the surveyed restaurants, none of them were established on their own property. For hotels and accommodations, among the surveyed hotels and accommodation, most of them (11) were established in rented properties. A few hotels (4) were operating in leased properties, and a couple of hotels (2) were established on their own properties. In case of institutions, the highest number (15) were operating in

rented properties. There were some institutions (4) operating in leased properties while mere (2) institutions were established on their own property.

- **Rented Property:** Enterprises operating in rented properties, especially if they are residential households, may face challenges related to basic house wiring. The existing wiring might be suitable for domestic use but may not be sufficient to handle the additional electrical load required for eCooking appliances. Moreover, inadequate earthing in older residential buildings could pose safety hazards. In such cases, the enterprise might need to invest in upgrading the wiring and electrical systems to accommodate eCooking appliances, which can be more challenging due to limited control over the property. Additionally, when enterprises seek to have separate energy meters, they may need the documents from the property owner, which could become a challenge if the owner is uncooperative or unresponsive. Having ownership or leasing rights can streamline this process as well.
- **Leased Property:** Like rented properties, enterprises in leased properties might encounter limitations in making significant modifications to the electrical infrastructure. However, depending on the leasing agreement, there might be more flexibility in making upgrades compared to rented properties.
- **Owned Property:** Enterprises that own the property have more freedom to modify and upgrade the wiring and electrical systems to meet the requirements of eCooking appliances. This can simplify the adoption process, as they have full control over property modifications and energy meter upgradation.

In summary, the ownership status of the property in which an enterprise operates can influence the ease and feasibility of adopting eCooking appliances. For those in rented or leased properties, there might be additional hurdles in upgrading the electrical infrastructure, whereas enterprises owning or leasing properties have more control and flexibility to make necessary changes. The enterprise that are established in their own property is comparatively low hanging fruit in terms of encouragement, ease, and feasibility of adopting eCooking appliances.

4.5.5 Kitchen infrastructure

Kitchen infrastructure plays a key role in determining the compatibility of adopting eCooking appliances in different enterprises. According to the FGD with REBAN, kitchens are usually designed as per the need, cuisine, and menu of the restaurants. The head chef or team of chef and suppliers of cooking equipment and appliances are responsible to design the kitchen for the enterprise. For a kitchen which has already been designed with respect to certain purpose,

it will be challenging to incorporate new cooking appliances including eCooking appliances due to limitation of the kitchen space. The stakeholders from the FGD also expressed their concern regarding management of existing cooking appliances. Should they be replaced with eCooking appliances, the existing cooking appliances either must be sold, scraped, or somehow adjusted within the limited kitchen space.

Figure 21 provides the approximate kitchen area of various enterprises. As anticipated, the average kitchen area was the largest among hotels and accommodation (421 sq.ft) followed by institutions (329 sq.ft) and restaurant (248 sq.ft) category. There is significant deviation in terms of minimum and maximum range for kitchen area. consumption of LPG in every category. This is likely due to the difference in scale of enterprise size within each category. As discussed during FGD with REBAN, since most restaurants are found in residential rented property, the area of kitchen for this category is the smallest.

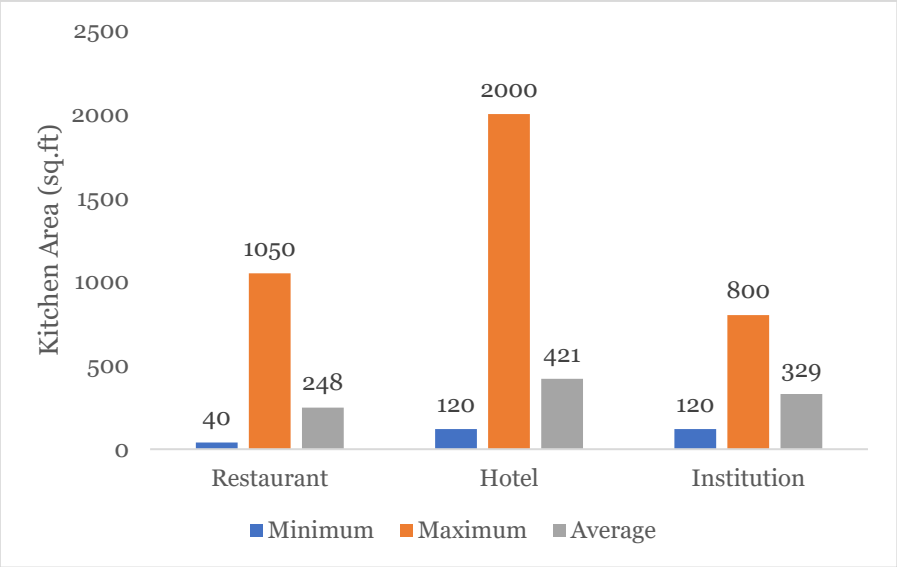


Figure 21: Kitchen Area (sq.ft.) of the surveyed enterprises

The available kitchen space influences the type and size of eCooking appliances that can be feasibly utilized by each enterprise. Larger kitchen areas in hotels and accommodations and some institutions may have more flexibility in adopting a variety of eCooking appliances, while smaller restaurant kitchens may need to consider compact and space-efficient eCooking solutions. Therefore, it's essential for enterprises to assess their kitchen area and layout carefully when considering the integration of eCooking appliances. Proper planning ensures that the selected eCooking appliances fit within the available space and meet the cooking demands of the enterprise. Additionally, enterprises with limited kitchen space might need to prioritize energy-efficient and multi-functional eCooking appliances to make the most of their available area while still benefiting from eco-friendly cooking solutions.

Like kitchen space, number of power socket is also likely factor to be considered when determining the compatibility or adopting eCooking appliances. Most of the eCooking appliances require a dedicated power socket as multiplugs seldom has the capacity to support higher capacity eCooking appliances. Having low capacity multiplug to operate higher capacity eCooking appliances will pose safety and hazard risk within the kitchen. Figure 22 below shows the status of power sockets in different enterprises. Among the surveyed enterprises, restaurants and hotels and accommodations category had similar numbers in terms of average (7), minimum (1 and 2 respectively) and maximum (24 and 25 respectively numbers of power sockets. For institutions, the number of power sockets available in the kitchen ranged from 1 (the lowest) to 10 (the highest), with an average of 5 power sockets.

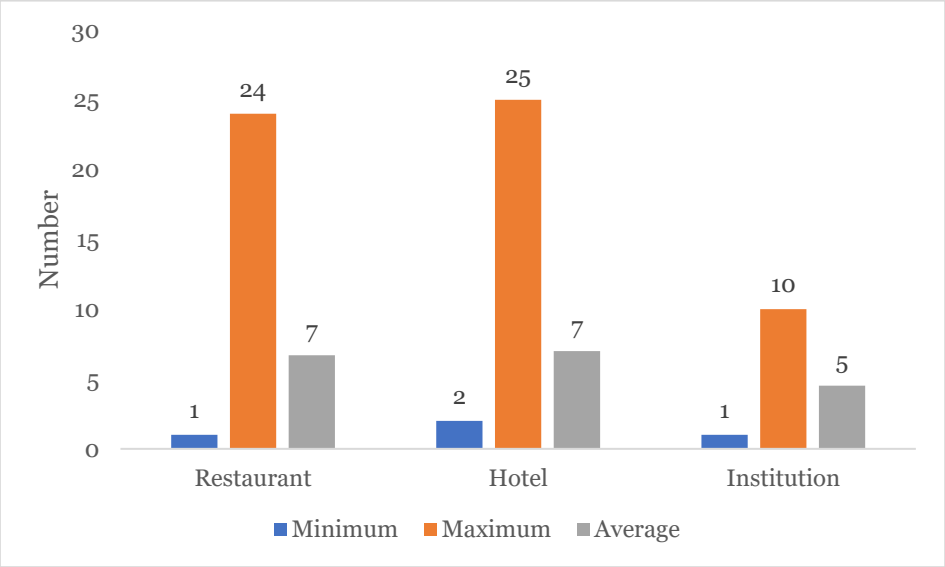


Figure 22: Number of power socket in kitchen in the surveyed enterprises

The availability of power sockets is critical for supporting the electrical requirements of eCooking appliances. Each eCooking appliance typically requires its own power supply, and having an adequate number of power sockets ensures that multiple appliances can be used simultaneously if needed.

The number of power sockets can influence the types and quantities of eCooking appliances that an enterprise can accommodate. Enterprises with a higher number of power sockets may have more flexibility in installing various eCooking appliances, including multiple stoves, ovens, induction cookers, or other electric cooking devices. On the other hand, enterprises with a limited number of power sockets may need to plan their kitchen layout carefully and prioritize energy-efficient eCooking appliances. For example, induction cookers are known for their energy efficiency compared to infrared cooktops and therefore can be a suitable choice for kitchens with a restricted number of power sockets.

Having an adequate number of power sockets also reduces the need for using extension cords or power strips, which can introduce safety risks if not used properly. Therefore, it is crucial for enterprises to assess the number of power sockets available in their kitchen when considering the adoption of eCooking appliances.

4.5.6 Kitchen dining infrastructure

The number of people an enterprise can accommodate at once is indeed a critical factor to consider when checking the compatibility or adopting eCooking appliances. The cooking demands in a kitchen serving a larger number of people would naturally be higher, and this would influence the type, size, and capacity of eCooking appliances required. Figure 23 below illustrates the approximate number of people that can be accommodated at once in different enterprises. The average capacity was similar across the three enterprises categories, ranging from restaurants (75 to 95 customers) with highest being in hotels and accommodations and lowest in restaurants. However, within each category, there was a huge range, which is likely to be an important factor in identifying eCooking solutions. This is likely due to the difference in scale of enterprise size within each category. Enterprises with larger accommodation capacities, may need more powerful and higher capacity eCooking appliances to meet the cooking needs of a larger customers. On the other hand, restaurants or institutions with smaller accommodation capacities might require more compact and efficient eCooking appliances that can cater to their specific requirements without excess capacity.

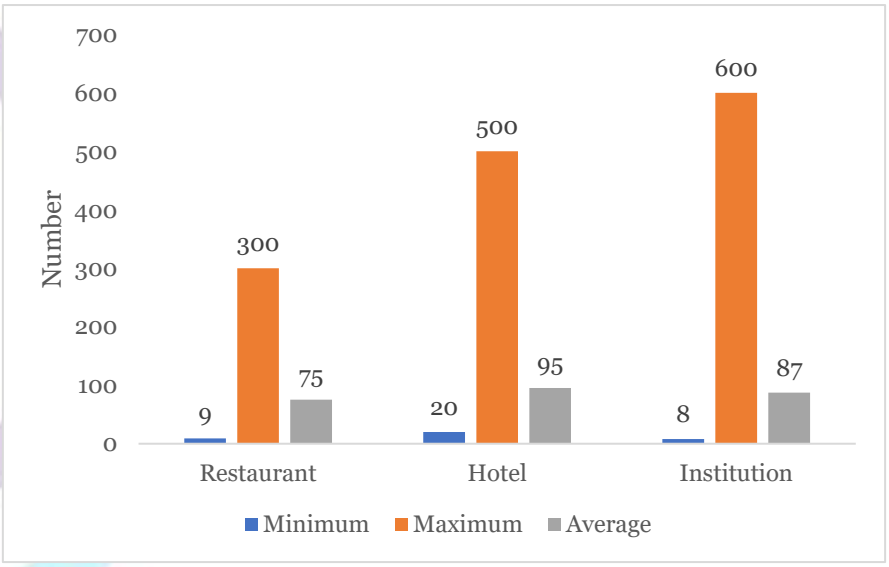


Figure 23: Capacity of enterprise to accommodate customer

4.5.7 Impacts of eCooking transitions on non-cooking energy needs of enterprises

Within the enterprise, the electricity was used for various end uses. Figure 24 below shows types of energy services that has been derived from electricity by the enterprises. Among the 23 restaurants surveyed, only 1 was utilizing electricity for space heating, while 21 enterprises used it for space cooling. Merely 15 restaurants relied on electricity for cooking main courses, whereas 22 used it for food preparation activities.

Similarly, in the case of surveyed 17 hotels and accommodations, 7 enterprises employed electricity for space heating, and 11 utilized it for space cooling. For cooking main courses, only 7 hotels relied on electricity, whereas all 17 used it for food preparation. Furthermore, 11 hotels employed electricity for providing warm water for showering and bathing. Likewise, among surveyed 21 institutions, 4 made use of electricity for space heating, and 8 used it for space cooling. For cooking main courses, electricity was utilized in only 6 institutions, while 15 institutions relied on it for food preparation tasks. Additionally, electricity was employed for other purposes in these enterprises, including dishwashing, refrigeration, and boiling water.

Figure 24: Use of electricity

As observed, a substantial portion of electricity usage in these enterprises is allocated to non-cooking purposes, including the various applications mentioned during interactions with chefs, hotel, and restaurant association representatives. By optimizing electricity usage, enterprises can enhance their operational efficiency and overall performance.

4.6 Cost

4.6.1 Economic sense for enterprises by switching to eCooking

A financial study was carried out with three different entities, namely a bakery, a restaurant, and a cloud kitchen. In the study, financial and operational data of the entities were taken through KIIs with the representatives of respective enterprise. The representative of the restaurant with whom KII was conducted were asked to choose suitable eCooking appliances to replace their existing LPG based cooking appliances. For the financial analysis, the payback period and Internal Rate of Return (IRR) has been calculated for two different scenarios; i) "BAU scenario" where enterprise is using whatever cooking appliances that they have at present and ii) "after intervention scenario" replacing existing LPG based appliances with the choice of eCooking appliances (the replacement suggested by the enterprise representative) with other things remaining the same.

For the financial analysis, the parameters considered were: initial investments (Investment in kitchen cooking equipment and utensils; investment in other kitchen infrastructures and additional investment required to purchase electric) made to start the enterprise; annual revenue; and operational cost (labour cost, material cost, annual electricity charges, annual fuel cost of LPG, annual maintenance cost, other overheads. These parameters were used to calculate net cash flow for 10 years followed by calculation of IRR and payback period.

To carry out the analysis, the annual electricity consumption in the after intervention scenario was first calculated (Table 7). For the energy consumption calculation, the rated power of the electrical cooking equipment along with their operational hours was considered. For each appliance, the energy consumption was calculated for both the heat up period and the standing cooking power period. The electric cooking appliances take a certain time to heat up to reach the desired temperature and in doing so use the full rated power of the appliance, but as soon as the desired temperature is reached the eCooking appliances operate in standing cooking power drawing far less power. The heat up period and standing cooking power in the table are authors' estimates. The annual cost of operating these replacement appliances was then calculated using an electricity tariff of 12 NPR/kWh.

Table 7: Annual electricity consumption and cost (after intervention scenario)

Description	Units	Dessert Delight	Bardali Restro and Meetings		Express Eats
Electrical Equipment		Oven	Pizza Oven	Fryer	Pizza Oven
Electricity tariff	NPR/kWh	12			
Electric Equipment Rating	kW	17	4.5	6	4.5
Operational hours	hour/day	6	5	4	8
Operational days	day/year	360	360	360	360
Heat up power	kW	17	4.5	6	4.5
Heat up period	hour/day	0.5	0.5	0.5	0.5
Standing cooking power (after up to temperature)	kW	1	0.5	4	2
Standing cooking power period	hour/day	5.5	4.5	3.5	7.5
Daily energy consumption	kWh/day	14	4.5	17	17.25
Annual energy consumption	kWh/year	5,040	1,620	6,120	6,210
Annual electricity cost	NPR/year	60,480	19,440	73,440	74,520

The annual electricity costs of the replacement eCooking appliances were then used as part of the financial analysis comparing the relative benefits of the BAU and After Intervention scenarios. In both scenarios, first year of the cash flow has been assumed to be the year of enterprise establishment therefore in the first year, the establishment is not generating any revenues nor any expenses apart from initial investment cost is incurred in the first year. In the "after intervention scenario", the electric equipment is assumed to have been purchased during the initial setup in place of the LPG equipment. With the introduction of eCooking appliances, the labour work (kitchen staff) has been assumed to be reduced by 10% and LPG gas consumed by the LPG cooking appliance is completely replaced by the electricity. The assumption of reduction in labour work was based on the feedback obtained during KIIs and FGDs. A full break down of the assumptions used and the calculations for all three enterprises can be seen in ANNEX III.

For each of the three case studies, the summary of the analysis in

Table 9 shows the After Intervention scenario to be slightly more financially beneficial than the BAU scenario. As seen in the table, the switch from LPG appliances to electric appliances results in savings in the initial investment costs and ongoing operational costs.

In case of bakery (Dessert Delight), the existing 3-deck LPG Oven was replaced by a similar 3-deck electric oven. The financial analysis in

Table 9 shows this change resulted in decreased overall operational costs for the bakery, resulting in the payback period decreasing from the current 3.03 years in the BAU scenario

where the 3-deck LPG Oven is used to 2.55 years when the LPG Oven is replaced by the electric 3-deck Oven. Correspondingly, the IRR increased from 38.32% (BAU) to 44.67% (After intervention).

Interestingly, the bakery is already operating appliances that are running on electricity (such as a combi oven) and the 3-deck oven is the only LPG oven which the bakery is using as of now. The study scenario replaced the only existing LPG oven with an electrical oven and the bakery representative mentioned that regardless of the fuel type used in the oven, the oven operation time remains the same which is 6 hours in a day. Therefore, had the bakery been using LPG for its other oven, the financial landscape in the after-intervention scenario may have improved further. Nevertheless, having one LPG based oven is beneficial for the bakery as they can use the oven as backup in case there are disturbances in electrical supply.

In case of the fine dining restaurant (Bardali Restro and Meetings), the financial analysis was based on replacing the currently used LPG Pizza oven and LPG Deep Fryer with an Electric Pizza Oven and Electric Deep Fryer respectively. Using the electric appliances instead of the LPG appliances marginally improved the payback period (7.36 years came down to 6.46 year) while there was slight increase in the IRR from 14.91% to 17.24%. In this case, transition to the electric cooking appliances seemed to have marginal benefit to the enterprise from the financial point of view.

In case of the cloud kitchen (Express Eats), since they are operating kitchen on remote basis, the capital investment is comparatively lower than other normal restaurants with dining area as they do not require dining space. Indeed, the lower capital expenditure and higher revenue has enabled the enterprise to recover all its initial investment in the first year itself. In this enterprise, the financial analysis was based on replacing the LPG Pizza oven with an Electric Pizza Oven. The replacement of the LPG Pizza Oven with the Electric Pizza Oven led to a decrease in the operational costs of the enterprise. As a result, the payback period decreased slightly from 0.57 years in BAU scenario to 0.53 in after intervention scenario and the IRR slightly increased from 192.53% to 208.14%. The details of IRR and payback period calculation for all three enterprises can be seen in ANNEX III.

Table 8: Summary of Financial Parameters with 10-year cash flow

Enterprise Type	Bakery		Fine Dining		Cloud Kitchen	
Description	BAU Scenario	After-Intervention Scenario	BAU Scenario	After-Intervention Scenario	BAU Scenario	After-Intervention Scenario
Initial Investment	5,000,000	4,932,000	40,000,000	39,977,000	4,500,000	4,482,000
Annual Revenue	12,600,000	12,600,000	48,000,000	48,000,000	36,000,000	36,000,000
Operational Cost	10,606,400	10,606,400	40,056,000	39,344,480	27,336,000	26,670,920
Discount Factor	10%					
PV of Cash Flows	12,249,809	13,883,772	48,812,441	53,184,423	53,236,529	57,323,158
NPV	7,249,809	8,951,772	8,812,441	13,207,423	48,736,529	52,841,158
Payback Period (yrs.)	3.03	2.55	7.36	6.46	0.57	0.53
IRR (%)	38.32%	44.67%	14.91%	17.24%	192.53%	208.14%

Table 9: Summary of Financial Analysis for different Enterprise Types: Bakery (A), Restaurant (B), Cloud Kitchen (C)

A. Bakery Industry - Dessert Delight		
Intervention	Replacement of 3 Deck LPG Oven with 3 Deck Electric Oven	
Savings in Initial Investment	68,000	NPR
Additional Annual Electricity Cost	60,480	NPR
Annual Saving in LPG Consumption	86,400	NPR
Payback Period before Intervention	3.03	Years
Payback Period after Intervention	2.55	Years
IRR before Intervention	38.32	%
IRR after Intervention	44.67	**%**

B. Restaurant Industry - Bardali Restro & Meetings		
Intervention	Replacement of LPG Pizza Oven and LPG Deep Fryer with Electric Pizza Oven and Electric Deep Fryer	
Savings in Initial Investment	23,000	NPR
Additional Annual Electricity Cost	92,880	NPR
Annual Saving in LPG Consumption	1,94,400	NPR
Payback Period before Intervention	7.36	Years
Payback Period after Intervention	6.46	Years
IRR before Intervention	14.91%	%
IRR after Intervention	17.24%	**%**

C. Cloud Kitchen Industry - Express Eats		
Intervention	Replacement of LPG Pizza Oven with Electric Pizza Oven	
Savings in Initial Investment	18,000	NPR
Additional Annual Electricity Cost	74,520	NPR
Annual Saving in LPG Consumption	1,29,600	NPR
Payback Period before Intervention	0.57	Years
Payback Period after Intervention	0.53	Years
IRR before Intervention	192.53%	%
IRR after Intervention	208.14%	%

Based on the cost analysis and interaction with chefs and owners through KII and FGDs it was found that switching to eCooking can indeed make economic sense for many enterprises. The extent of its economic viability depends on several key factors (listed below) which may further the financial case for electric cooking.

- **Electricity Tariffs:** Lower electricity tariff rate for business entity can encourage the switch to eCooking as lower tariff rate will assist to reduce the operating cost for the enterprises. In areas where electricity prices are relatively low compared to other cooking fuels (e.g., gas, propane), eCooking can be cost-effective and result in long-term savings.
- **Operational Efficiency:** Availability of quality eCooking appliances with better energy efficiency can further assist to reduce the operating cost for enterprises. Energy efficient appliances can contribute to reduced cooking times and lower energy consumption, which may result in cost savings and increased productivity for enterprises with high cooking demands.
- **Maintenance and Lifespan:** Quality eCooking appliances will typically require less maintenance than gas or other fuel-based systems. Additionally, they tend to have longer lifespans as the number of mechanical components are less in eCooking appliances, reducing the need for frequent replacements and lowering overall operating costs.
- **Availability of Electricity:** For eCooking to be economically viable, a stable and reliable electricity supply is essential. Frequent power outages or unreliable electricity infrastructure can be detrimental to the potential transition to eCooking as enterprises need assurance to make full use of the investments put to procure eCooking appliances. Poor electricity infrastructure will discourage enterprise to think about transitioning to eCooking.

- **Increasing Cost of LPG:** The cost of LPG in recent times is demonstrating growing trend. Increasing cost of LPG will favour potential switch to electricity for cooking. As Nepal Oil Corporation has adopted international rate for petroleum product the cost of LPG has been increasing as the subsidy in the LPG cylinder has been removed.
- **Regulatory Environment:** Provision of regulation to ensure availability of quality eCooking appliances, tax benefits, lowered tariffs for enterprises and innovative financial schemes for enterprise opting for eCooking appliances or even subsidies can expedite adoption of eCooking appliances as such regulation can contribute to making eCooking a financially viable option for the enterprises. Local regulations and incentives can significantly influence the economic feasibility of eCooking.

4.6.2 Potential for enterprises to scale up with eCooking appliances

Enterprises could potentially scale up and benefit from a transition to eCooking. Shifting from conventional LPG or fossil fuel-based cooking methods to eCooking can offer several advantages, both from an environmental and operational perspective. In an era marked by increasing environmental awareness and evolving consumer preferences, enterprises are presented with a unique opportunity for growth through the transition to eCooking methods. As sustainability becomes a driving force in business decisions and regulatory landscapes evolve, the adoption of electric cooking technologies has the potential to reshape the culinary landscape. This transition not only aligns with the global push towards cleaner energy sources but also offers enterprises a range of strategic advantages that can contribute to their expansion and success. This discussion delves into the various ways in which enterprises can benefit from eCooking methods to drive growth, capitalize on emerging market trends, and position themselves as leaders in innovation and sustainability. Transitioning to electric cooking methods can offer several benefits to enterprises, potentially contributing to growth in various ways. Here are some reasons why this transition could lead to growth which was discussed during the KIIs and FGDs:

1. **Cost savings:** eCooking methods can be more energy-efficient compared to traditional fossil fuel-based methods. While the upfront cost of transitioning to electric equipment might be higher, the long-term operational costs can be lower due to energy savings. This cost reduction can positively impact the bottom line of enterprises, allowing them to allocate resources to other growth initiatives.
2. **Environmental considerations:** Many consumers and stakeholders are becoming increasingly conscious of environmental impacts. Transitioning to eCooking can showcase an enterprise's commitment to sustainability and eco-friendly practices,

attracting environmentally conscious customers and enhancing the company's reputation. This can lead to increased customer loyalty and new market opportunities.

3. **Regulatory compliance and incentives:** In some regions, there might be regulations or incentives that encourage businesses to adopt cleaner energy sources like electricity for cooking. Compliance with these regulations not only avoids potential fines but can also position the enterprise as a responsible corporate citizen, improving its standing in the market.
4. **Marketing and branding:** The transition to electric cooking methods can be an excellent marketing and branding opportunity. Enterprises can promote their efforts to reduce carbon emissions and promote cleaner energy use, potentially attracting a wider customer base and differentiating themselves from competitors.
5. **Innovation and differentiation:** Adopting electric cooking methods can be seen as an innovative move in the industry. Enterprises that lead the way in embracing new technologies and methods often stand out and can gain a competitive advantage. This can drive growth by attracting customers who appreciate forward-thinking and modern approaches.
6. **Diversification of menu and offerings:** Electric cooking methods can open up new possibilities for menu diversification. Some electric cooking equipment offers unique features and capabilities that can enable the creation of innovative dishes, attracting food enthusiasts and expanding the enterprise's offerings.
7. **Adaptation to trends:** As societies become more focused on health and wellness, electric cooking methods can align with these trends. Health-conscious consumers may prefer food cooked using cleaner energy sources, providing an opportunity for growth in customer base.
8. **Long-term stability:** Transitioning to electric cooking methods can offer stability in the face of fluctuating fuel prices and supply chain disruptions. This stability can contribute to the enterprise's overall resilience and growth prospects.

However, it's important to note that the actual impact of transitioning to eCooking methods will depend on various factors, including the specific industry, market trends, customer preferences, and the overall business strategy. Careful planning, investment analysis, and consideration of the unique circumstances of each enterprise are essential to successfully leveraging this transition for growth.

4.7 Networks

In Nepal, like in many other cultures, social networks and patterns around food, appliance, and fuel purchasing can have a significant impact on transitions to enterprise level cooking. Some of these social networks and patterns may not be immediately visible but can play a crucial role in influencing cooking practices and choices which was pointed during the discussion in KII and FGD.

1. **Community traditions and norms**: In many Nepalese communities, traditional cooking methods and recipes have been passed down through generations. These cultural norms and customs can strongly influence the types of cooking appliances and fuels used. Introducing new eCooking appliances may require navigating these deeply rooted traditions and convincing communities of the benefits of transitioning to eCooking.
2. **Local influencers and leaders**: In many communities, there are influential individuals, such as community leaders, religious figures, or elders, whose opinions carry weight. Their support and endorsement of enterprise level eCooking initiatives can significantly impact their acceptance and adoption within the community.
3. **Association of relevant stakeholders:** Associations like REBAN, HAN and Chefs association are key stakeholders who can influence transition to eCooking. These association must be well informed regarding benefits of eCooking for the enterprises. Providing clear information and demonstrations of the advantages of enterprise level eCooking can encourage mass adoption of eCooking appliances.
4. **Incentives and subsidies**: Government policies, incentives, and subsidies can play a vital role in encouraging the adoption of new eCooking appliances. Favourable policies can accelerate the transition by reducing financial barriers. For example, in Nepal LPG is subsidized by the government whereas electricity tariff is not subsidized. Such circumstances can hinder the adoption of eCooking in enterprises.

4.8 Gender and social inclusion

Based on the FGD with Chef community and KII with a representative from a culinary school, it became apparent that the culinary industry is experiencing a rise in the number of female professionals, especially in the bakery sector. However, there are still some challenges and social stigmas that women face in this field. These challenges mainly revolve around the reluctance to work night shifts due to safety concerns during travel and the lack of pick-up and drop services provided by employers, which can deter them from continuing in their profession if night duties are involved.

Academic courses in hospitality management are producing a considerable number of female professionals, but they tend to get employed in service aspects of the industry such as housekeeping and bartending, rather than culinary arts. This may indicate a potential underrepresentation of women in the core culinary roles.

Traditional cooking methods that rely on LPG and firewood can be physically demanding, requiring labour and brute force for fuel transportation and handling. In contrast, eCooking (cooking with electric appliances) can be more suitable for women professionals and those with manageable physical disabilities [10]due to its potential for automation and ease of use. With proper training and awareness about these advantages, it could encourage more women professionals and individuals with disabilities to join and excel in the culinary industry.

eCooking appliances is feasible for bulk cooking in relatively shorter time period compared to bulk cooking using LPG stoves. This time-saving benefit can be advantageous for women professionals, allowing them to manage their work hours better and potentially go home on timely manner.

Additionally, eCooking provides a more comfortable and convenient environment for women professionals, especially during menstruation. The elimination of physical strain associated with carrying LPG cylinders and working in a warm kitchen can significantly reduce the discomfort and challenges that women might face during this time. The kitchen that uses multiple LPG burners are relatively warm compared to kitchen with a smaller number of LPG burners. During menstruation, women may experience various physical and emotional changes, and in such circumstances, the more relaxed and comfortable working conditions provided by eCooking can be a welcome relief. This can positively impact the overall well-being and productivity of female professionals in the culinary industry.

By promoting the adoption of eCooking and creating a supportive work environment, employers can demonstrate their commitment to gender inclusivity and ensure that women professionals feel valued and comfortable throughout their careers. Additionally, it can help break down barriers and stereotypes associated with traditional gender roles in the culinary field, fostering an atmosphere of equality and mutual respect among all professionals.

[10] Manageable physical disabilities indicates disabilities where an Individuals movement is not restricted due to absence of limbs.

In conclusion, the adoption of eCooking appliances can be beneficial for women professionals and individuals with physical disabilities, given proper training and standard operating procedures (SOPs). With its wide range of features, versatility, and automation, eCooking offers a simpler and more convenient cooking experience for this group of professionals and the industry can work towards creating a more inclusive and efficient culinary workforce.

4.9 Wider impact

The enterprise level transition to eCooking in Nepal can have several potential wider impacts across various dimensions mentioned below which are based on KIIs and FGDs.

1. **Food Safety:** The automation feature in eCooking appliances enable temperature and heat control without much attention required from the chef or cook. Electric cookstoves offer better temperature control than traditional methods, reducing the risk of undercooked or overcooked food, and preventing foodborne illnesses. Furthermore, transitioning from traditional cooking methods, such as burning biomass or charcoal, to electric cooking can lead to improved indoor air quality, reducing respiratory health issues.
2. **Food Waste:** eCooking appliances often come with precise temperature settings and cooking timers, leading to more efficient and controlled cooking. This can help in reducing food wastage by preventing overcooking or burning.
3. **Household Cooking Energy Transitions:** When people see eCooking appliances being used in professional settings, such as restaurants or commercial kitchens, and witness that these appliances produce good quality food efficiently, it builds trust and confidence in the technology. They can see firsthand that the appliances are reliable and capable of delivering satisfactory results. The most crucial factor that influences a person's decision to adopt eCooking appliances is the taste and quality of the food it produces. When individuals experience delicious and well-cooked meals from eCooking appliances in restaurants, they are more likely to believe that these appliances can replicate the same results at home. In a restaurant setting, where time is of the essence, eCooking appliances often demonstrate their efficiency and time-saving capabilities. This can appeal to people who have busy schedules and value convenience, making them more interested in adopting similar appliances at home for quicker and easier cooking.
4. **Local economic development:** The adoption of eCooking appliances can create new job opportunities within Nepal. As the demand for electric stoves and related infrastructure increases, there will be a need for local manufacturing, distribution,

sales, and servicing of these products. This can lead to the emergence of small and medium-sized enterprises (SMEs) involved in the eCooking value chain, generating employment and income for the local population. As Nepal embraces eCooking appliances, it may attract eco-conscious travelers interested in experiencing sustainable practices. This can boost tourism and hospitality industries, leading to additional economic benefits for local communities.

5. **Increase in consumption of electricity:** NEA is seeing eCooking as one of the sectors that can contribute to consuming surplus electricity that is expected to be generated in near future. eCooking for enterprise can play pivotal role in consuming electricity within the country. This can have impact in reducing LPG consumption within the enterprise sectors.

5. Case Stories

Story 1: Baking Delights

Key Facts	
Enterprise name:	Dessert Delight
Enterprise type:	Restaurant (Bakery)
Average occupancy:	Serve 50 customer in a day (at the café/outlet and serving the order
Most popular dishes:	Bread, Doughnut, Cakes, Crossiant, Cookies and Pastry
Main cooking fuel:	Electricity
Existing use of eCooking:	Electric Oven, Combi Oven, Proover, Doughnut Fryer, Dough Sheeter, Dough Mixer

Jagat Lama, a passionate baker and a graduate from Nepal Academy of Tourism and Hotel Management (NATHAM), embarked on a journey to turn his baking dreams into reality. In 2021, after the initial turbulence of the COVID-19 pandemic began to subside, he co-founded "Dessert Delight," a bakery that would soon become a local sensation. Despite his aspirations for a bakery, Jagat faced challenges in securing sufficient investment, leading him to opt for second-hand cooking equipment, combining innovation and tradition.

Jagat Lama showing his Doughnut Fryer (Left) and operation Combi Oven (Right)

Drawing on his expertise and commitment to the baking art, Jagat assumed the role of managing and operating the bakery, while his partner offered valuable insights into investment and marketing strategies. With a total investment of NPR 5 million, half of which was allocated for cooking appliances, Dessert Delight boasted an array of equipment acquired from the second-hand market, including an electric Combi Oven and three LPG-powered ovens. Besides, the bakery has dough mixer, dough sheeter, doughnut fryer and proofer. All

these appliances were purchased in the second-hand market, and they operate using electricity. Jagat says, "**in the early days, we had limited capital to work with therefore although we knew that electric baking appliances are available in the market and are efficient compared to its counterparts that operate on LPG due to high cost of electrical appliances, we decided to have only one Combi Oven followed by three other oven that operates on LPG.** Jagat's decision to include a Combi Oven among the LPG ovens was guided by its versatility and ability to perform multiple cooking techniques simultaneously."

LPG Ovens

Staffs working with Dough Sheeter

Jagat mentions that in bakery, all cooking related activities (both preparation and cooking) can be done with electrical appliances. However, he adds that "**the quality electrical appliances required for bakery are almost 2-3 times more expensive compared to appliances that can be run with LPG.**" Jagat further adds that "**electricity supply is not reliable and cooking in bakery is very sensitive to heat and temperature. Any disturbance in electrical supply can damage whole batch of bakery item. Even if I have capital to purchase all electrical appliances for my bakery, I will not do it mainly because I do not have confidence in the electricity supply system.**" Jagat shared a recent incident where he had to cancel his order of 20 loafs of bread due to unscheduled load shedding. Jagat says "I **took the order in the morning and promised to deliver by the evening of the same day. I would have easily ensured delivery of the order by the evening but on that day, there was loadshedding which lasted for the whole day. Finally, the electricity supply resumed at 9 PM**

but unfortunately at that time my staff did not agree to work late and then eventually I had to cancel my order. Cancelling order is detrimental to the image of business, that is why I do not want to take risk and be dependent only on electrical appliances."

Despite Jagat has information and experience about numerous advantages of eCooking appliances over traditional LPG based cooking appliances, scepticism over supply of quality and reliable supply of electricity deterred Jagat from going 100% electrical equipment for his bakery. The advantages that Jagat communicated about having eCooking appliances are features such as automation enabling him to worry less about over cooking or undercooking bakery items and ensure desired level of production with consistency with less manpower. For example, in absence of dough sheeter, he would need at least 2 people to do the task but with dough sheeter only one person is enough to do required job. Furthermore, cleaning eCooking appliances is much easier than using a traditional oven using LPG. With more eCooking appliances the kitchen environment is much cleaner and spacious as no space is occupied by placement and storage of LPG cylinders.

In terms of expenses, mainly operating cost, he finds using electric appliances for cooking is cheaper compared to using LPG oven. Apparently, his three LPG stove consumes about one cylinder each in a month (approx. NPR 6,000 per month for cylinders). Since most other appliances required in preparation of bakery items are electrical, he is paying about NPR 25,000 per month for electricity usage coming from three-phase connection. The bill amount includes NPR. 8,000 as demand charge which Jagat must pay regardless of consumption of electricity. In addition, Jagat also uses electricity for storage and for his outlet (chiller, deep freezer, etc). So, it is not quite clear if there is a saving on cost.

Today, Jagat's bakery has given employment to 8 people (5 males and 3 female staffs) and has the sales of approx. NPR 35,000 in a day. Besides the sale of bakery item Jagat has also started recruiting trainees and providing them with bakery training. With regards to his experience with giving training to trainees, Jagat shares his experience about convenience in using eCooking appliances for cooking bakery items. Jagat adds that "**teaching trainees is much easier with eCooking appliances as they only need instruction on required temperature range, duration of cooking and demonstration on using appliances. With LPG oven s/he needs to be explained about when to alter the intensity of heat and therefore chances of error are more with LPG oven.**"

In an industry where precision, reliability, and consistent quality are paramount, Jagat's pragmatic approach to integrating electric and LPG appliances has enabled him to navigate challenges, train future bakers, and establish a successful bakery that delights its customers every day.

Story 2: Bhuwan's Culinary Journey

Key Facts	
Enterprise name:	Kathmandu Gurukul
Enterprise type:	Institution (School)
Average occupancy:	Food served to approx. 350 students and 45 staffs (25 teaching and 20 non-teaching staffs) in their school.
Most popular dishes:	Rice, Beans, Momo and Lentil Soup
Main cooking fuel:	LPG
Existing use of eCooking:	Rice Cooker (two units of 20 liter), Mixer, Electric Kettle (5 liter)

Meet Bhuwan Bahadur Sinjali, a dedicated 32-year-old chef with a remarkable story of learning and growth in the culinary world. Despite limited formal education, Bhuwan's passion for cooking and his determination to provide for his family led him on a journey filled with diverse experiences as a cook and a migrant worker. Today, he is the head cook at Kathmandu Gurukul School, where he orchestrates the preparation of meals for students and staff. It has been just 7 months since Bhuwan got appointed at the school. Bhuwan's culinary journey began at an early age, skipping

Kathmandu Gurukul is a Secondary school that provides education up to grade 9. Kathmandu Gurukul was established in 2014. Ms. Khadka, along with other founder, they have taken school franchise from India. Including Kathmandu Gurukul, which is not part of the franchise, the management have 9 other schools (pre-school/kindergarten) with the Indian franchise, "Shemrock".

Anjana Khadka, Co-founder, Kathmandu Gurukul

formal education after eighth grade to work as a dishwasher in small hotels. He later ventured abroad to Malaysia as a migrant worker, spending 4.5 years earning a livelihood. Upon his return to Nepal, Bhuwan delved into the world of cooking, amassing nearly a decade of experience in various capacities.

Bhuwan had been working as a cook for various party palace and banquets as freelancer prior to working at school. In his current role as the head cook at Kathmandu Gurukul School, Bhuwan leads the culinary team, working alongside his assistant Nirajan Khadka. Their daily routine starts at 7 AM, except for Saturdays, and involves preparing three meals: breakfast, lunch, and a daytime snack. The menu is designed based on the school's weekly schedule and includes a variety of dishes, rice, lentil soup, bean soup and curry for lunch, milk, biscuit, bread, and puff for breakfast and chowmin, momo, beans, beaten rice, etc for daytime snack.

Bhuwan Bahadur Sinjali, School Canteen Head Cook Cooking Bean Soup in Stockpot

Nirajan Khadka, Assistant Cook, School Canteen Cooking Curry in the Wok

The school kitchen is equipped with basic electric appliances, including a 20-liter rice cooker (x2) and a 5-liter electric kettle. LPG remains the primary cooking fuel, powering a steel fabricated LPG stove with two burners and a single burner LPG stove. Bhuwan and his team

rely on a range of cooking utensils, from woks to stock pots and pressure cookers. The school consumes around one LPG cylinder per day to prepare meals.

Bhuwan does not have experience of learning any vocational skills relevant to cooking. Bhuwan's culinary skills were honed through practical experience rather than formal training. His expertise in preparing traditional Nepali dishes was acquired by observing and learning from his seniors. His journey from assisting other cooks to becoming an accomplished chef showcases the power of hands-on learning. Bhuwan says "**whatever cooking knowledge I have is through learning by doing as he had started working in the hotel business since very early age. After returning from Malaysia, I worked under different head cooks for party palace and banquets and in the initial days I only assisted head cooks to prepare the food. Later just by observing and learning from my seniors, I started cooking by myself and today I have expertise in cooking typical Nepali dishes**".

20-liter Rice Cooker being used to cook rice

LPG arrangements for cooking

Despite his culinary prowess, Bhuwan's exposure to electric cooking appliances remains limited. Apart from using rice cookers and electric kettles, he hasn't extensively explored eCooking options. Bhuwan's reservations about eCooking stem from concerns about heat control and electrical hazards. He acknowledges the evolving technology but emphasizes the need for comprehensive training to safely utilize eCooking appliances. Bhuwan recollects **"throughout my cooking career, I haven't used any eCooking appliances for cooking except for rice cookers and electric kettle although I have seen rudimentary clay heater, gas oven and induction stove being used by others for cooking". Occasionally, during holidays I go to resorts to cook and there I have**

seen a gas oven being used to prepare pizza. Other than that, I am not aware of any other eCooking appliances being used for cooking."

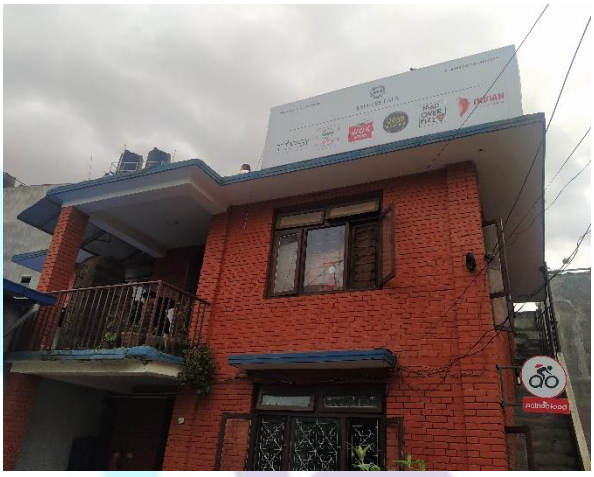
Bhuwan envisions a future where cooking with eCooking appliances could become mainstream. However, he highlights the importance of bridging the knowledge gap and addressing safety concerns through training. Bhuwan's perspective underscores the potential for technological advancement in the culinary world, while also emphasizing the need for skill development. Bhuwan shares "**I am not sure if Nepali food can be cooked in eCooking appliances mainly because I have doubts on being able to control the heat to obtained desired level of heat required for certain food item. Besides, in kitchen, my hands are mostly wet as I do multiple things at a time, there might be risk of getting electric shocks if I use electric cooking appliances while cooking.**" Bhuwan's perception on eCooking clearly indicates that not all cooks working in enterprises and institutions have knowledge about cooking with eCooking appliances. Nevertheless, Bhuwan does believe that technology has evolved a lot and in future cooking can be done using eCooking appliances.

Bhuwan Bahadur Sinjali's journey from being a dishwasher to a skilled head cook exemplifies the transformative power of passion and experience. His dedication to his craft, his pragmatic approach to traditional cooking techniques, and his cautious optimism about embracing electric cooking appliances contribute to a rich narrative that resonates with both culinary enthusiasts and those curious about the evolving landscape of cooking technology.

Story 3: A Culinary Evolution: Express Eats' Shift to eCooking Appliances

Key Facts	
Enterprise name:	Express Eats
Enterprise type:	Restaurants (Cloud Kitchen)
Average occupancy:	Serve approx. 100 customers in a day.
Most popular dishes:	Pizza, Nann Roti, Briyani, Butter Chicken, Momo
Main cooking fuel:	LPG
Existing use of eCooking:	Electric kettles mixer, juicer microwave oven

Sudeep Singh, a visionary entrepreneur, co-founded Express Eats, a cloud kitchen that emerged amidst the pandemic to cater to the evolving needs of food delivery services. Express Eats quickly established itself as a virtual restaurant, partnering with delivery platforms (Pathao and Foodmandu) and introducing its own app. With a portfolio of five specialized cloud kitchens ((Mad Over Pizza, Indian Tadka, World of Burgers, Khaja Express and Wok Story), Express Eats serves a diverse array of dishes.



Express Eats Facility

Express Eats Cloud Kitchen

Express Eats operates as a cloud kitchen, devoid of a dining area but well-equipped to whip up delicious dishes. Express Eats kitchen do not possess any electrical cooking appliances. Sudeep initially opted for traditional LPG ovens, including a tandoor for authentic flavours. However, the absence of a 3-phase connection at their facility limited their use of electric cooking appliances.

In case of Express Eats, although they were aware about availability and usefulness of eCooking appliances for their kitchen, they did not install one at their current facility. Motivated by research and feedback from his head chef, Sudeep embarked on a path toward embracing electric cooking appliances for a new Express Eats outlet. Recognizing the quality

and cost-efficiency benefits, Sudeep planned to incorporate electric fryers, ovens, and dough mixers. Along with cooking appliances, they are also planning to add electric appliances that will facilitate them to prepare certain food such as meat mincer. The decision was driven by the desire to enhance food quality, minimize oil wastage, and reduce operating costs. Sudeep says "**upon doing some research and getting feedback from my head chef and culinary fraternity, I believe that the quality of pizza cooked in electric oven is better and taste is consistent compared to pizza cooked in LPG oven. Similarly, the chefs have informed that with electric deep fryer, the amount of oil wastage can be minimized compared to deep frying done using LPG burner and wok. At present, my kitchen is consuming 2 LPG cylinders in a day so with introduction of eCooking appliances this consumption can be reduced and probably operating cost will come down while cooking with electricity.**"

Bhumi Raj Sharma preparing Naan Roti in LPG Tandoor

The head chef of Express Eats was also interviewed to get his opinion regarding electric cooking. Bhumi Raj Sharma, 32 years old trained chef who has 15 years of experience working as a Chef. Bhumi has 8 years' experience working in India and 4 years' experience in Dubai. Bhumi has been with Express Eats since its inception. After returning to Nepal, Bhumi was working as cook for Global college managing the college canteen. Bhumi mentioned that both in Dubai and India, LPG was used as primary fuel for cooking. While working in Dubai, Bhumi had seen and worked with electric deep fryer, gravy machine, and electric oven. When he was working in Dubai, he mentioned using induction stove for cooking Thai dishes. Bhumi says, "**induction stoves are suitable for cooking dishes that require slow cooking**". Apparently, in case of Nepal he sees some challenges in cooking with electricity. Reliability in electricity supply system seemed to be a major issue to motivate chefs to use eCooking appliances. Bhumi shared his experience regarding using electrical back up to operate his LPG

oven for Express Eats. Bhumi says, "**the LPG oven that we have here requires ignition to start the flame. The ignition is supposed to be provided through electricity but since the electricity supply is unreliable, we have installed inverter which is used to ignite the flame in the LPG oven.**" Other than reliability issue, Bhumi also see challenge in large cooking quantity of food using eCooking appliances and cooking Chinese food.

Express Eats is now expanding and very soon they are about to establish another outlet. As of now, the new outlet is under construction and is expected to be inaugurated within few months' time. Bhumi recollects "**I am happy that my suggestion has been well received by the founder of Express Eats. The new outlet will now have eCooking appliances. I had suggested them about eCooking appliances which I had worked with in the past. I think using electric deep fryer and electric oven will be helpful in improving quality of food and contribute to cost saving in LPG.**"

On a positive side, Bhumi is optimistic about transition to eCooking. While working in Dubai he has seen example of transition from traditional way of cooking to eCooking. Bhumi shared is learning about transition, "**in 2007, while working in Dubai, buffet was prepared and was put over a block of paraffin to keep the food warm and in 2011, the paraffin was replaced by induction stove to keep the food warm.**" Bhumi believes that sooner or later, eCooking will gradually gain recognition but as of now there are challenges associated with reliable supply of electricity which need to be addressed by relevant stakeholders. Bhumi also suggests concerned stakeholders and organizations to organize eCooking appliances demonstration events so that enterprise owners are made aware about availability of suitable eCooking appliances while for cooks and chefs a training program is essential for cooks and chef to be familiar with use of eCooking appliances.

The journey of Express Eats exemplifies the changing landscape of culinary technology. The emergence of cloud kitchens as a response to the pandemic, combined with the drive to elevate food quality and operational efficiency, led Sudeep to explore the potential of eCooking appliances.

Story 4: eCooking Prospects in Fine Dining Restaurant

Key Facts	
Enterprise name:	Bardali Restro and Meetings
Enterprise type:	Restaurants (Fine Dining)
Average occupancy:	Serve 150 customer in a day (average for a week)
Most popular dishes:	Mutton Pakku (Curry), Barbecue, Twa Meat (Cooked in Griddle), Nepali Thali Set (rice, meat, lentil, pickle, curry, etc), Newar Khaja Set (comprise of 4-5 different traditional local dishes)
Main cooking fuel:	LPG
Existing use of eCooking:	Electric oven, waffle machines, coffee makers, and mixers

Meet Mandip Sapkota, 36-year-old seasoned chef with over 18 years of experience in the culinary world. Mandip's culinary journey started as a dishwasher, evolving over time through hands-on experience and limited formal training. Despite not having a comprehensive culinary education, he honed his skills by observing his seniors and working his way up the ranks. Mandip had a family business where his father operated a small hotel service tea and day-time snacks. After grade 10, Mandip started helping his family with the business and he recollects cooking for the first time for his own hotel. Today, he possesses the expertise to cook a variety of cuisines, grounded in a rich tapestry of practical learning. Mandip has been working as head chef at Bardali Restro and Meetings since last 2.5 years. Mandip, joined six months after the inception of Bardali Restro and Meetings.

Bardali Restro and Meetings

Mandip Sapkota, Head Chef, Bardali Restro and Meetings

Mandip started his journey as a dishwasher in a small hotel in Kathmandu. While working as a dishwasher, he had the opportunity to support cooking in the hotel. Mandip had aspiration

to become a cook as he had a keen interest in cooking since childhood. While he was working as dishwasher. He joined an institute and took generic cooking training for 2 months. After training, he gave trial in many hotels and applied to be chef for their kitchen. Fortunately, he was hired by one of the restaurants in Patan Durbar Square area. While continuing to work as a chef, he got the opportunity to join further training in Dwarika hotel (5-star level hotel). There he was trained for 3 months, and his training was mainly focused on kitchen handling, dealing with guests, developing food costing, cost control mechanism, and food hygiene. Working as a chef in different stages of his life he gained 18 years of working experience (within country, India, and Saudi Arabia) where he has experience working as helper, Chef de Parties (responsible to oversee certain section of the kitchen), sous-chef and head chef. Mandip says, "**Whatever skill I have as of now is more due to the learning from my work experience. I did not receive any specific training that many culinary enthusiasts receive from culinary school or reputed institute, but I was able to learn to observation and guidance of my seniors at my workplace.**"

Mandip is no stranger to eCooking appliances. He's worked with a range of them, including electric ovens, salamander, combi oven, waffle machine, hot plate, sandwich griller, electric griller, boiler, bain marie, sous vide and toaster. However, at Bardali, their culinary landscape revolves around a cooking range fuelled by LPG. While they employ a few eCooking appliances like electric oven, waffle machines, coffee makers, and mixers for prep work, most of their cooking is done on a conventional LPG cooking range. Most of the cooking in Bardali is done via a cooking range that is based on LPG. In total Bardali has 8 burners (high flame burners), LPG tandoor, and barbecue stove for which Mandip uses coal. On an average 45 LPG cylinder is consumed in a month.

Mandip preparing curry for Nepali Khana Set

Supporting staff working in the kitchen

Mandip recognizes the advantages of both LPG and eCooking, based on the type of cuisine, speed of service, and cooking processes. Mandip says, "**LPG stoves are suitable for fast cooking whereas eCooking is suitable for slow cooking dishes like sauce, soup, stalk, broth, etc. Sous vide is the best eCooking appliance for slow cooking dishes as it can cook at the temperature range of 50-60°C**". He further adds, "**LPG based cooking is 2-3 time faster in giving required heat compared to hot plate.**" He also recalls that about not seeing a kitchen that is using electricity for the entire cooking. Mandip recalls, "**Every kitchen that I have worked in, LPG is the primary fuel for cooking and LPG is a must as a backup fuel for cooking to ensure timely service is delivered**." Mandip informed that "**in most cuisine, the serving time for main course is between 15-20 minutes while for starter and appetizer it is 10-12 minutes. In case of some dishes, eCooking cannot ensure delivery within aforementioned time interval.**"

Mandip also discusses the practical challenges of maintaining eCooking appliances. While LPG stoves are comparatively easier to repair and maintain, eCooking appliances require specialized service. He recalls a frustrating experience with a malfunctioning microwave oven, where repeated visits from service providers were needed to diagnose and fix the issue. Mandip says, "**Myself and my team usually do routine check up on all LPG based cooking range. LPG stove only needs regular cleaning and check for the blockades. Until and unless, we need to replace any parts of LPG stoves, we do not have to rely on service providers whereas they need service provider to address any repair and maintenance issue with their electric oven.**"

Continuing with the challenges, Mandip indicated unreliable supply of electricity to be major hindrance to encourage cooks and owners to contemplate replacing some of the cooking appliances with eCooking appliances. Additionally, he also mentions that the restaurant owner and management are also not aware about possibility of cooking in eCooking appliances and availability of variety of eCooking appliances. At the end Mandip was asked hypothetical question "***If your management allowed you to bring in some eCooking appliances in the current kitchen setup what would you bring and why?***". Mandip's response was "**there is a possibility to introduce electric deep fryer as we do get many order that require deep frying and I would also replace 4 of my burners with 4 hotplates as I am aware of my menu and decide suitability of cooking certain dish with hotplates without effecting the service time. Replacing LPG stove will also contribute to reducing my LPG consumption and I think this will also reduce cost of fuel used for cooking for this restaurant. I can replace charcoal barbecue with**

electric griller, but I doubt about guests adapting to the taste of the barbecue meat as Nepalese are fond of smoky flavour in the barbecue."

As a seasoned chef, he's navigated the complexities of cooking in various settings, from small hotels to corporate kitchens. His insights into the practical challenges of adopting eCooking appliances provide a holistic perspective on the culinary industry's evolving landscape. Whether it's optimizing service times, preserving the smoky flavours cherished by Nepalese diners, or ensuring seamless maintenance, Mandip's story reflects the dynamic balance between embracing new technologies and preserving the authenticity of culinary experiences.

Story 5: Balancing Tradition and Innovation: A Fast-Food Legacy

Key Facts	
Enterprise name:	Quality Kitchen
Enterprise type:	Restaurants (Fast Food)
Average occupancy:	Serve 100 customer in a day.
Most popular dishes:	Momo, Naan Roti, Barbecue, Chowmin, Chicken Chilly
Main cooking fuel:	LPG
Existing use of eCooking:	Mixer, Juicer, Coffee Machine and Electric Kettle

Quality Kitchen, a renowned fast-food restaurant in Maitidevi, Kathmandu, has been delighting patrons with its Nepali and Chinese delicacies for the past 25 years. Led by a father-son duo, the establishment has resisted the lure of modernizing its kitchen setup and eCooking appliances due to its distinctive menu and operational dynamics. Quality kitchen occasionally provide the buffet service while organizing birthday or other family celebration. Quality kitchen has the infrastructure that can accommodate approx. 170-180 people at a time.

Bibek Dhakal, now 34, left Nepal at 18 to pursue education and gain experience abroad. Working in an Australian hospital canteen, he mastered the art of crafting sandwiches and wraps. Later, he became a store manager in a department store. However, Bibek's heart was drawn back to his family's restaurant, where he now plays a pivotal role in its management and operations. Bibek came back to Nepal in 2017 with a degree in Construction Management.

Quality Kitchen Restaurant


Bibek Dhakal, Owner, Quality Kitchen

Quality kitchen is a simple fast-food restaurant that do not possess any electric cooking appliances except for Coffee machine. Coffee machine was procured after Bibek had returned from Australia. Quality Kitchen's menu has stood the test of time, catering to simple yet beloved flavours. Bibek acknowledges his knowledge of eCooking appliances, having used

them during his time abroad, but he believes they are not suited to his restaurant's current setup. The menu's focus on wok-based cooking and shallow frying aligns well with traditional LPG burners, which provide quick and high flames essential for fast-food staples. Bibek says, "**we have a very limited and common menu that does not require new cooking methods or fancy cooking appliances.**" Bibek adds, "**Lots of my menu requires shallow frying. Most of the cooking is wok-based cooking which is suitable for LPG burners that provide quick and high flame. Orders for modern food items like pizza is few and far in between therefore having ovens to prepare pizza will not be economically viable. I do have lot of deep-fried items in my menu, and I could have had electric deep fryer but having electrical deep fryer will be sensible only if I am able to switch on the fryer for whole day. Unfortunately, I do not have demand for fried items that can sustain use of electric deep fryer. Electric deep fryers cannot be switched on and off at regular intervals as it takes time to heat up the oil once it is switched off which delays our serving time and secondly the oil used for deep frying quickly becomes black if the fryer is switched on and off on regular interval. Electric deep fryers are most appropriate for restaurant that specializes only in fried items like KFC and Valley Express.**" Quality Kitchen had an innovative way of preparing pizza which doesn't require an electric or gas oven. The pizza base is topped with pizza sauce and toppings and is subjected to steaming in a steamer. Once steamed, cheese is spread over the pizza and then put in salamander to melt the cheese and to bring crispiness in the pizza. Like pizza, they have other innovative and unique ways of preparing dishes with whatever resource they have in their kitchen. With such innovative practices, Quality Kitchen has been able to main its brand with traditional cooking practices.

Steel Fabricated LPG stove with 2-burners

Kitchen Staff preparing Momo

There seemed to be many challenges to bring any changes to the kitchen. First and foremost, Bibek doesn't want to inject any further investment into the restaurant simply because he is

happy with whatever revenue the restaurant is generating from the limited menu he has. While Bibek recognizes the potential of eCooking appliances to diversify the menu, he's cautious about the challenges they pose. Staff turnover and potential resistance from customers due to changes in taste and preparation methods concern him. Bibek's staff, mainly from rural backgrounds, lack formal training, making their adoption of new appliances and techniques a potential challenge. Additionally, the restaurant's limited space and electrical system capacity deter him from investing further. Bibek says, "**I know that with addition of eCooking appliance, there is a potential to diversify my menu, but I do not want to face potential risk associated with staff's inability to operate the appliances, complaints from the customers regarding change of taste, change in kitchen infrastructure which already has limited space and potential failure of the electrical system of the restaurants due to additional load.**" Bibek further adds, "**I do not have trained staff. Most of the staff are village inhabitants who migrated from their villages to Kathmandu in search of work. These staff are mostly illiterate and therefore there is a chance of them not being able to use new and modern appliances or damage such appliances.**"

Nevertheless, despite the hesitations, Bibek envisions a different future for his upcoming banquet establishment. He plans to embrace eCooking appliances, particularly a combi oven, to cater to larger groups of people. This forward-looking mindset highlights his willingness to adapt when circumstances are conducive to change. Bibek has plans to start a banquet for which he has been looking for space and location. Bibek says, "**I am planning to start a party palace as soon as I get leased space and I think eCooking appliance like combi oven will be beneficial and have economic sense as I will have to serve food for large number of people.**"

Quality Kitchen's story is one of preserving a culinary tradition while acknowledging the possibilities of innovation. Bibek's reverence for the restaurant's legacy and his practical considerations underlines the complexities of incorporating eCooking appliances into established operations. As he prepares to launch his banquet venture, Bibek's optimism and adaptability shine a light on the restaurant's enduring spirit, committed to delivering both nostalgia and new experiences to its loyal customers.

Story 6: LPG Stoves Reign at Kamakhya Boy's Hostel

Key Facts	
Enterprise name:	Kamakhya Boy's Hostel
Enterprise type:	Institution (Boy's Hostel)
Average occupancy:	Serve approx. 40-45 boys in a day.
Most popular dishes:	Rice, Curry, Pickle, and Lentil Soup
Main cooking fuel:	LPG
Existing use of eCooking:	Rice Cooker and Electric Kettle

Rama Siwakoti, a proactive businesswoman, manages Kamakhya Boy's Hostel in the bustling area of Buddhanagar, Kathmandu. Through her pragmatic approach, Rama navigates the challenges of running a hostel, providing meals for dozens of students, and maintaining a disciplined environment. Prior to 2022, Rama lived as a traditional housewife occasionally supporting her husband's business of electronics trade. Hostel business became her focus due to her desire to contribute to the family income. Her son who is a student studying for a bachelor's in business administration, helps her to manage the hostel by doing grocery shopping.

Kamakhya Boy's Hostel accommodates 40 people, all of whom are students in a 4.5 storied rented building. The hostel provides 4 meals (breakfast, lunch, daytime snack, and dinner) a day to the students. The meal consists of typical Nepali staple food for lunch and dinner while for breakfast hostel provides black tea with biscuit and for daytime snack hostel provide milk tea along with wide variety of food that is served based on the daily routine of the hostel. Rama has employed two ladies who are responsible for preparing meals and one man responsible to maintain sanitation in the hostel. Altogether, the hostel is required to prepare meals for at least 43 people on a daily basis.

The hostel is using a residential scale LPG stove and one single burner stove for cooking. Other than that, 8-liter rice cooker and a 5-liter electric kettle is the electrical cooking appliances used in the hostel. Rama was questioned about her knowledge with eCooking appliances. Interestingly she was aware of Electric Pressure Cooker (EPC). Probably her husband's business helped her to be aware about availability and use of EPC. Rama answered "**I could have added EPC to my hostel for cooking rice, but unfortunately larger size EPC**

is not available in the market. Otherwise, rice prepared in EPC tastes much better than rice prepared in the EPC." Like EPC, Rama also had her justification for not using microwave. Rama said, "**In my hostel, there are 40 people and not all of them eat at same time. The hostel has a rule that any student who comes for lunch after 12 PM will have to serve himself which means the kitchen staff will not be present to warm the food for them. In such a situation, I think having a microwave will be risky as it will be operated by many hands and when appliances are used for many people, the chances of being damaged is also high. Besides, I will also need multiple microwave compatible utensils and teach everyone to use microwave for reheating food. This would have been an unwanted hassle for me. All these will also add up to my expenses and hostel business these days are very competitive which doesn't give me with option to increase the fee. As soon as I increase the fee, I will lose my students to other nearby hostels. With LPG gas no one needs to be taught to use them and everyone can use LPG to reheat food without any problem,**"

Rama Siwakoti with her 8-liters rice cooker

Hostel cooking staff preparing curry

Rama was also inquired about the possibility of replacing LPG with electricity for cooking for her hostel. Rama responds "**Apparently, hostel uses 3 LPG cylinders per month which roughly costs around NPR. 6,000. If there are eCooking appliances that can complement cooking volume required in the hostel, the appliances should contribute to saving time for cooking. Timely preparation of lunch is very important as I must ensure that students do not get late for their classes. Also, the cost of electricity should not be more than what I have been paying for the LPG cylinders and finally eCooking appliances must be compatible to the utensils and vessel that I have as I would not like to make further investment on utensils.**"

The hostel building is a regular residential bunding and is having single phase line with 30 Ampere connection. The hostel also seemed to discourage the use of any additional electrical equipment to the students. However, the students are using electric kettle for themselves. Almost every student owns an electric kettle. Likewise, some students use fans during summer season. The hostel doesn't allow students to use iron. The restriction imposed by the hostel is understandable as Rama mentioned occasional tripping problem. Rama saw the rented apartment also being additional challenge to integrated additional electrical appliances. Rama says, "**if the existing electrical system does not support additional electrical equipment, I might have additional hassle to ask for permission to change the electrical system with the landlord which I doubt will be granted.**"

While eCooking appliances offer potential efficiency gains, Rama's concern lies in balancing innovation with practicality. Her understanding of her clientele, cost constraints, and the hostel's unique dynamics leads her to continue relying on LPG stoves for now. As Kamakhya Boy's Hostel continues to serve its students, Rama's thoughtful approach ensures the delivery of meals that nurture both bodies and minds.

Story 7: Paving the Way for eCooking in Luxury Hospitality: The Malla Hotel Perspective

Enterprise name:	The Malla Hotel
Enterprise type:	Hotel and Accommodation (Luxury/Star Hotel)
Average occupancy:	Serve 60 customer in a day.
Most popular dishes:	Curry, Barbecue, Bakery item, Sauteed Vegetables and Pancake
Main cooking fuel:	LPG
Existing use of eCooking:	Residential Scale Induction Stove, Electric Kettles Coffee Machine, Turkey Fryers, Mixer, Juicer, Microwave Oven, Waffle Machine, Toaster, LPG/electric burners/hotplates with gas grill/oven, salamander

Khageshwor Adhikari is the Director of Human Resource for the Malla Hotel and has been employed by the Malla hotel since January 2023. Khageshwor Adhikari, a seasoned Human Resources professional, currently serves as the Director of Human Resources for the prestigious Malla Hotel, a luxurious 5-star establishment in the heart of Thamel, Kathmandu. With an illustrious career in the hospitality industry spanning over 15 years, Khageshwor's insights into eCooking appliances shed light on the challenges and potential of integrating them into the hotel's culinary operations.

The Malla Hotel, renowned for its premium services since its inception in 1975, stands as a testament to luxury and quality. As a hub for national and international tourists, the hotel's kitchen caters to a diverse range of palates, necessitating an array of cooking methods and equipment. Khageshwor's rich background in Human Resources has equipped him with a comprehensive understanding of the hospitality industry's dynamics. Having worked with various reputable hotels, he recognizes the need for adaptability, quality, and efficiency in culinary operations. While talking to Khageshwor, he gave an impression of having ample knowledge about eCooking appliances, cooking protocol for the hotel, need for policy reforms and human resource ability to work with cooking tasks.

The hotel's existing kitchen infrastructure, built over nearly five decades, presents challenges to incorporating new equipment. Khageshwor explains that "**the variety of cuisines and dishes served demand a mix of cooking methods, making an entirely eCooking-based setup impractical. Moreover, unreliable electricity quality and potential capacity constraints hinder a complete transition to eCooking.**"

Bearing in mind the self-sufficiency of electricity within the country in the next couple of years, Khageshwor completely agrees regarding the need for transition to eCooking within the hospitality industry. Khageshowr envisions eCooking's potential within the hospitality industry, especially for new establishments. Policy reforms and incentives, such as tax rebates and reduced electricity tariffs, could encourage hotels to incorporate eCooking appliances as primary sources of cooking. He believes in a hybrid approach that combines both LPG and electricity to ensure reliability. Khageshwor says, "**It will be much easier to encourage new star hotels that are under process of registration. There are certain criteria that need to be fulfilled for a hotel to get a 5-star rating and requirements of using eCooking appliances of certain types can be introduced as one of the criteria through policy reforms. Furthermore, having tax rebate facility and reduction in electricity tariff for hotel would encourage hotel businesses to opt for making electricity as primary source of cooking. In fact, using a hybrid cooking technology that can work with both LPG and electricity would be more desirable for hotel kitchens.**"

Khageshowr acknowledges that not all hoteliers are aware of the benefits and availability of large-scale eCooking appliances. Khageshwor says, "**collaborating with organizations like the Hotel Association of Nepal and culinary training schools could raise awareness and facilitate the transition. Specialized training modules for eCooking would equip kitchen professionals with the skills needed for efficient operation**." In addition to that, Khageshwor further added "**It will be a burden if the hotel themselves must give training to their new recruits. Having access to trained kitchen professionals who are proficient is using eCooking appliances will be an asset to the hotel.**"

Transitioning to eCooking requires addressing human habits and behaviours ingrained in traditional cooking methods. Khageshwor suggests that "**adapting to eCooking would require refreshment training for the existing staffs to enable them to use eCooking appliances in an efficient manner.**" Advocacy, policy support, and consistent

power supply form the trifecta that can catalyze eCooking adoption within the hospitality industry.

Khageshowr's insights highlight the careful balance between tradition and innovation that the luxury hospitality sector must navigate. As the industry evolves, eCooking's potential remains promising, but it requires a collaborative effort to create awareness, policy support, and a skilled workforce ready to embrace the benefits of modern cooking technology.

Story 8: Quick serving not compatible to eCooking

Key Facts	
Enterprise name:	Rudrani Catering Pvt Ltd
Enterprise type:	Institution (Neuro Hospital Canteen)
Average occupancy:	Serve 300 customer in a day.
Most popular dishes:	Soup, Jaulo (Rice Porridge), Momo, Chaumin, Tea & Coffee and Nepali Thali Set (rice, meat, lentil, pickle, curry, etc)
Main cooking fuel:	LPG
Existing use of eCooking:	Electric Oven, Mixer and Juicer

Meet Prem Bahadur Shrestha, 62 a self-made chef and the owner of the Neuro Hospital Canteen located in Bansbari, Kathmandu. In 2007, Prem established the canteen and named "Rudrani Catering Pvt Ltd". The canteen serves around 200 people on a daily basis among whom most are patients, visitors of the patients, doctor and hospital staff. Prem has employed 16 staffs and among them only one is female who is responsible for cleaning and vegetable cutting responsibilities. With over 16 years of experience in operating the canteen, Prem's journey from a village boy to a seasoned chef reflects his dedication and passion for cooking.

Neuro Hospital Canteen

Prem Bahadur Shrestha, Owner, Neuro Hospital Canteen

Prem is a self-made man who comes from a mediocre family. Prem's story began with leaving his village at a young age in pursuit of better opportunities. His culinary journey kicked off as a watchman in the French Embassy staff quarters. Learning on the job, he transitioned from being a watchman to a gardener and finally to a skilled cook, and his talents eventually earned him cooking roles in various embassies. There is a very interesting story behind Prem becoming a seasoned chef. While working for the embassy, there was an instance where the staff responsible for cooking for the embassy had to take a leave for a long duration. During that time, Prem was supporting his boss in cooking meals. Prem responded that his boss had

taught him to prepare different French dishes. With every passing day Prem independently started to cook for the embassy staff. Looking at his work rate and efficiency, Prem was then appointed as cook for the staff quarter. Prem recalls "**bread was the first things I prepared independently.**" He was 17 years of age when he started cooking independently. Prem worked for 4 years in the French embassy staff premise. After that he was recommended for a similar job in other embassy staff accommodations. He has experience working in Danish Embassy, Canadian Embassy, and Italian Embassy. Prem says, "**while working for embassies, I developed the skill to prepare continental food. In my early days working as a cook, most of the dishes I cooked were continental.**" Prem never looked back following his work experience in the embassies and decided to work as chef in the future. Prem since his first job as cook for French embassy staff quarter have collected 29 years of experience working as cook.

Prem's experience with embassies equipped him with the skills to prepare continental dishes, emphasizing his adaptability and willingness to learn new cuisines. A pivotal experience in Thailand to work for Kamalaya Wellness Sanctuary and Holistic Spa allowed him to master Thai cuisine, further expanding his culinary repertoire. Prem shared that "**almost every alternate year since 2012 depending on the volume of tourist in the Ko Samui Island, I am invited to the hotel to look after the kitchen work to manage the work volume in the resort during the peak tourist season. I usually manage cooking staff and is responsible to prepare Thai food for the resort. I stay for around a month usually between December to January.**"

Despite having so much experience working as a cook and operating a hospital canteen, Prem doesn't seem to have much experience with electric cooking. Electric oven is only eCooking appliances that he is most familiar with as he uses that for cooking meat, bread, and cookies. Apart from that he uses electric kettle for warm water for customers and for preparing dishes. His cooking is grounded in traditional methods, and while he understands the concept of eCooking, he has yet to fully integrate it into his culinary practices. Prem shares, "**I have experience working with electric oven which I have used the most. I have seen and worked with hybrid ovens that work on both LPG and electricity. The baking was done via electricity while cooking is done via LPG where the cooking range was placed above the oven. Apart from that I haven't used any electric appliances for cooking main course dishes. At my home I have used microwave and electric hotplate which I had bought after the economic embargo imposed by India in 2015.**" The electric hotplate is seldom used by Prem even at his home once the economic embargo was removed. Prem felt that electric hotplate was drawing lot of electricity and as

result his electricity bill was going up. Prem says, "**electric hotplate with two potholders I bought from Thailand was seldom used once LPG supply became normal after economic embargo. Whenever, I used electric hotplate, my electric bill increased for my house.**"

Prem's canteen requires quick meal preparation due to the high demand from patients and staff. He avoids using microwaves for reheating, as he believes that food reheated in microwaves tends to cool down faster. His priority is serving food promptly and ensuring that the meals remain at an optimal temperature. Prem mentioned, "**the food reheated in the microwave quickly cools down. I realized this while reheating food at my home. I have a feeling that people would complain about serving cold food which they might feel is being served stale food from the previous day. Most of the cooking is done in the early morning and as the order comes, we must serve the order by reheating it. I do not prefer reheating using microwave for my customers.**" Prem, however, prefers to cook chicken roast using his electric oven. However, Prem must cook roast in LPG gas when there are events. Prem is adamant that cooking roast in an oven or LPG stove is not much different in terms of time required. Prem iterates, "**sometimes I use both LPG stove and electric oven to cook the chicken roast. I do not see much difference between cooked chick roast coming out of oven and LPG gas stove. Almost equal amount is time is required for cooking. The only advantage of cooking in electric oven is that I do not have to give constant attention while cooking which is a must to avoid any burnt marks on the chicken roast when it cooked in LPG stove using fry pans.**"

Canteen Staffs preparing different dishes

Cooking range in the canteen

Prem is open to exploring eCooking appliances for his canteen, provided they contribute to faster operations and reduce his workforce. His familiarity with electric ovens and access to a 3-phase connection along with diesel generator for electricity backup gives him the necessary infrastructure to embrace eCooking. However, he lacks information about suppliers and products in the market. Prem says, "**I have been good are observing and learning skills throughout my career, so if I get to see what are available in the market and how they work, I am happy to adopt such appliances provided they contribute to speeding my work and reduce my workforce.**" Prem believes that demonstrations and trade fairs showcasing enterprise level eCooking appliances could bridge the knowledge gap for business owners like him. As the culinary industry evolves, Prem's open-mindedness and willingness to learn highlight the potential for eCooking's integration, even in traditional settings.

Prem Bahadur Shrestha's culinary journey exemplifies his determination to learn and adapt. While he holds onto traditional cooking methods, his openness to exploring new avenues, like eCooking, reflects the industry's continuous evolution.

Story 9: eCooking for Tea Enthusiasts

Enterprise name:	Chiya Adda
Enterprise type:	Restaurant (Cloud Kitchen/Cafeteria)
Average occupancy:	Serve 150 customer in a day.
Most popular dishes:	Tea, Coffee, French Fry, Smoothie, Pizza, Sandwich, and Burgers
Main cooking fuel:	Electricity in the outlet but LPG in the central kitchen
Existing use of eCooking:	Coffee Machine, Electric Deep Fryers, Pronto oven (portable Electric Oven), mixer and grinder, Microwave Oven and Induction Stoves.

Meet Sanjog Koirala, the visionary behind Chiya Adda, a popular chain of tea spots that offers an inviting haven for tea enthusiasts. With a blend of entrepreneurial spirit and a passion for tea, Sanjog has successfully created a unique space where people can enjoy quality tea in a delightful ambiance. Established in December 2018, Chiya Adda translates to "Tea Spot" and aims to cater to tea lovers seeking a hygienic and inviting environment. At the time the Sanjog saw booming coffee culture within the major cities. At the same he saw a gap for tea enthusiasts who didn't have the option to explore quality junction to enjoy a nice cup of tea. Chiya Adda was established to fulfil this gap. With five outlets across Nepal, Chiya Adda offers an extensive menu of tea options alongside appetizers and main courses, all prepared with care and quality.

Chiya Adda Outlet in Tripureshowr, Kathmandu

Chiya Adda Ambience

Chiya Adda is operated through a central kitchen with a limited menu. While Chiya Adda's central kitchen relies on steel fabricated LPG cooking ranges (2 burner LPG cooking range made put of stainless steel, a residential scale LPG stove and Deep Fryer) for its daily operations, the outlet located at Tripureshwor, Kathmandu are equipped with a variety of electrical cooking appliances. These include a versatile combination of appliances such as a coffee machine (able to run on LPG and electricity), 8 litre capacity electric deep fryers, pronto oven (portable electric oven specifically used for pizza but also used for grilling purpose), mixer and grinder to make shakes and smoothies, microwave, and induction stoves (x2 with 2100 W capacity each). The outlet also has a steamer which is exclusively used for Momo and monthly 2-3 LPG cylinders are used for cooking Momo. For all other purpose electricity is being used as the main fuel within Chiya Adda outlet.

The major cooking is done at the central cooking and dishes in their menu are transferred to their outlets. The fired items are half done and sent to the outlets where they are prepared in electric fryer upon customer order. Chiya Adda outlet outsource bakery items from a bakery. Only drinks and Momo on their menu are prepared at their outlets. Understandably, a lot of reheating is done at the outlet.

Chiya Adda Central Kitchen with LPG Cooking range and Deep Fryer

Staffs working at Chiya Adda Central Kitchen

Sanjog's choice of hybrid cooking appliances in his outlets stems from practicality and cost-effectiveness. For small and medium-scale enterprises like Chiya Adda, the balance between cost and efficiency is crucial. While fully electrical equipment might be costly, hybrid appliances provide reliable solutions that fulfill the cooking needs efficiently. Sanjog says "**fully electrical equipment is costly compared to hybrid cooking appliances while the cooking needs can be fulfilled by the hybrid cooking system that is more**

reliable, there is minimum scope to go for fully electrical equipment." The Chiya Adda outlet is in a shopping mall which has got 24-hour electricity supply system with a diesel backup. The central kitchen does not have any backup in the kitchen for electrical usage therefore central kitchen have only LPG based cooking ranges. For small and medium scale enterprises, to adopt eCooking appliances, there needs to be guarantee in terms of quality and reliable supply of electricity to those enterprises. eCooking for enterprises has many challenges that need to be overcome. Summarizing some of those challenges Sanjog articulates "**at the electricity supply end, the relevant stakeholder responsible for supplying electricity should have a mechanism to notify their customers regarding possible loadshedding that can occur for whatever reason. This allows the enterprise to better prepare and ensure their service delivery is not hampered. At the demand end, the quality of electrical appliances that are available in the Nepalese market are below par. In case of any repair and maintenance related issue, there is lack of spare part and quality service delivery team.**"

In the case of central kitchen for Chiya Adda, although a trained senior chef is leading the kitchen management team, most of the support staff are not educated to a level where they have confidence to use sophisticated eCooking appliances. Despite embracing eCooking, Sanjog highlights some challenges. Sanjog recognizes the challenges of introducing new cooking methods to traditional staff members. Change can be met with resistance, especially when employees are accustomed to traditional cooking practices. However, once staff members are trained and comfortable with eCooking appliances, the chances of human errors are reduced, and efficiency increases. Sanjog shared an incident from his residence "**I have personnel who has been hired to support in household chores, whenever she is told to reheat the food, she never uses microwave to reheat the food rather uses LPG stove for reheating. I have also taught her to use microwave, but she is still very reluctant to use it due to fear of mishandling microwave.**" Nevertheless, Sanjog sees opportunities to promote eCooking within the eatery business. According to Sanjog, eCooking adoption can be encouraged through changes electricity tariff rate. He believes that "**if the electricity tariff rate is low for higher consumption, enterprises are more likely to choose electricity as fuel source for cooking compared to LPG. Moreover, enterprises that opt for eCooking and express their eCooking credential during company registration, such companies can be provided with tax benefits. Such policy reform can encourage quick adoption of eCooking in the enterprise sector.**"

Following discussion with Sanjog, the manager of the Chiya Adda outlet was also interacted. Since the outlet was using the majority of eCooking appliances, the manager of the outlet, Purnima Shrestha, 28 who has been part of Chiya Adda since past 3 years had only positive things to share regarding usage of eCooking appliances. Purnima says, "**eCooking is very suitable for reheating dishes that we have in our menu. Moreover, since we are just three ladies responsible for operating the outlet, not having to lift heavy cylinders is an advantage of using eCooking appliance over LPG based cooking appliances. Once you are trained to use eCooking appliances, chances of making human errors while cooking is much less as due to availability of cooking mode and automation feature that these appliances possess. We are only using LPG for steaming Momo so if there is availability of eCooking appliances that can replace the steamer, we are more than happy to introduce such eCooking appliances in our outlet.**" Purnima's thought of replacing steamer with electric steamer was seconded by Sanjog as well. At Chiya Adda outlet, Purnima also recalls some of the complaints made by their customer regarding taste of tea being different and less preferred compared to tea prepared in LPG stove. Purnima shared "**customers sometimes complain about not liking the taste of tea. If the tea gets ample time to be boiled even in induction stove, there is not much difference in the taste of tea. Sometimes due to continuous order of tea, the tea do not get enough time to be boiled which results in difference in taste of the tea.**"

In a nutshell, Chiya Adda is an exemplary enterprise representing SME category that is using eCooking to serve their customers. The nature and type of service that Chiya Adda is delivering suits the maximum use of eCooking appliances within their business. Sanjog Koirala's Chiya Adda stands as a testament to how a passion for tea and innovative thinking can create a successful business venture. With a blend of tradition and technology, Chiya Adda continues to cater to tea enthusiasts, offering them a cozy space to savor the joys of a well-brewed cup of tea.

6. Opportunity and Challenges with eCooking in enterprise

When considering the enterprise-level transition to eCooking in Nepal specifically in comparison to LPG use, there are distinct opportunities and challenges that arise. LPG is already a widely used clean cooking fuel in Nepal, and transitioning to eCooking presents both advantages and hurdles in relation to LPG use. The opportunities and challenges associated with adopting eCooking appliances are briefly discussed below.

6.1 Opportunities

1. **Balance in electricity supply and demand:** As indicated by the relevant literature, Nepal is soon going to be self-sufficient in terms of electricity supply. The energy sector policy makers are concerned about ensuring the consumption of electricity that is generated in the country. Failure to ensure the balance between supply and demand of the electricity supply is likely to be detrimental to NEA as they have already agreed to pay certain amount to the Independent Power Producers (IPPs). In such circumstances, energy sector policy maker is promoting eCooking and electric vehicle to ensure that there is additional demand for electricity. This situation can present an opportunity to promote eCooking in the enterprise sector as well.
2. **Long-term cost savings:** Over time, eCooking can potentially provide cost advantages compared to LPG. While LPG prices can fluctuate due to international markets, eCooking's operational costs is likely to remain more stable, offering potential long-term savings for enterprises.
3. **Independence from fuel supply chains:** eCooking reduces dependency on LPG supply chains, which can be vulnerable to disruptions or price fluctuations. By relying on electricity for cooking, enterprises can gain independence from LPG delivery logistics.
4. **Mitigating supply shortages:** In periods of high demand or shortages, LPG supplies might be constrained, affecting enterprises. Transitioning to eCooking can mitigate the risks associated with unpredictable LPG availability.
5. **Environmental sustainability:** While LPG is cleaner than traditional solid fuels, eCooking offers even more significant environmental benefits as it produces zero direct emissions during use. In case of Nepal, almost entire generation of electricity is from hydropower which is cleaner source of energy. Nepal is generating green electricity. Therefore, the transition to eCooking can further reduce carbon emissions and indoor air pollution, contributing to environmental sustainability. Promoting eCooking as

part of eco-tourism in Nepal has the potential to attract environmentally conscious travellers and showcase the country's commitment to sustainability.

6. **Corporate Social Responsibility (CSR):** Adopting eCooking aligns with the growing emphasis on CSR, allowing enterprises to showcase their commitment to environmental sustainability and social welfare.

6.2 Challenges

1. **Initial investment costs:** The upfront costs associated with transitioning to eCooking, including purchasing eCooking appliances, kitchen infrastructure modifications, and electrical upgrades, can be significant for enterprises, especially for small and medium-sized enterprises with limited financial resources. Many enterprises in Nepal already have established LPG-based cooking systems in place for their kitchen. Adapting and retrofitting kitchens to accommodate eCooking appliances may require considerable effort and investment.
2. **Electricity access and reliability:** While Nepal has made progress in improving electricity access, challenges in ensuring quality and reliable supply persist. The supply situation is even more challenging in rural areas. Ensuring reliable and consistent electricity supply is crucial for the successful adoption of eCooking at the enterprise level. Without imparting sense of reliability and quality in terms of electricity supply among the culinary fraternity, the enterprises are less likely to make transition towards eCooking.
3. **Behaviour changes and acceptance:** The familiarity and convenience of LPG might lead to resistance among staff and customers to switch to eCooking or enjoy food and meals prepared in eCooking appliances respectively. Convincing them to embrace this new technology requires education and awareness efforts.
4. **Training and adaptation:** Transitioning from LPG to eCooking might necessitate kitchen staff training to operate the new appliances efficiently and safely. Ensuring a smooth adaptation process is crucial to maintain enterprise operations.
5. **Government policies and regulations:** Existing policies and regulations may heavily favour LPG usage due to its widespread adoption. For example, the Government of Nepal has continuously provided subsidy in LPG cylinder. As long as there is the provision for subsidy on LPG, there will be reluctance among users to switch to electricity for cooking. Moreover, with subsidy LPG cost is more likely to be competitive against cost of electricity for cooking. Encouraging a shift to eCooking might require advocating for supportive policies and incentives from the government.

6. **Market competition:** LPG suppliers and providers might actively compete to maintain their market share. The emergence of eCooking may face resistance or challenges from vested interests in the LPG industry.
7. **Consumer preferences:** Consumer preferences for the taste of food prepared on LPG stoves may pose a challenge in promoting eCooking, as food taste and quality are essential factors for enterprises in the food industry.
8. **Premature supply chain for eCooking appliances:** Apparently, major chunk of the consumers or customers do not have enough information about the eCooking appliances available in the market and their utility scale. The suppliers are usually collecting order from their potential customers and then placing order into foreign market after taking advance from the potential customers. From the customer point of view, there is an element of risk involved when they place order with certain vendor because they remain unsure when their order is going to be delivered or if their order will be delivered. During FGDs and KIIs, concern was raised by stakeholders regarding the risk involved in placing order with certain vendors or suppliers. Secondly, there are very few suppliers that possess eCooking appliances in their outlet to demonstrate to their potential customer. Very few suppliers are likely to have brochure and flyers of the eCooking appliances. In such situation, potential customers are not sure about what they are going to get with eCooking appliances that they order based on the limited information they have.

In summary, while transitioning to eCooking from LPG usage offers numerous environmental and potential cost advantages, challenges related to initial investment, infrastructure, electricity access, and behavioural change need to be addressed at the enterprise level. Collaboration between government, enterprises, and other stakeholders is crucial to facilitate a smooth and successful transition towards cleaner cooking appliances in Nepal.

6.3 eCooking transition potential in enterprise

Based on the findings from the research, inference can be made in relation to eCooking transition potential among different category of the enterprise. The eCooking transition potential among different enterprises are mentioned below.

a) **Restaurants**

Most of the restaurants are in rented and residential buildings. Restaurants are also located in closer proximity to human settlements and in crowded marketplaces. These areas are bound to have issues of connection capacity, earthing and internal house wiring. In addition, the

kitchen space among most restaurants is also limited which allows minimum flexibility in case of replacing or addition of addition cooking equipment or eCooking appliances. Furthermore, the restaurants are not eligible to access TOD meter which means they do not get facility of differential tariff rate which is lower in off-peak hours.

Restaurants that are operating with central kitchen has high potential to use eCooking appliances mainly because the cooking volume is higher in these types of restaurants. eCooking appliances apparently have less chance of being adopted in fast food chain as eCooking is less likely to be compatible with quick serving nature of the restaurants. Every restaurant that uses LPG oven can be advocated to use electric oven as the purpose of LPG oven is most likely to be addressed by electric oven.

Cloud kitchens, also known as ghost kitchens or virtual restaurants, are commercial facilities which are designed for food preparation exclusively for delivery or takeout. They have become increasingly popular in urban centres in Nepal, especially in cities with a growing food delivery market like Kathmandu and Lalitpur. Cloud kitchens are typically more receptive to adopting eCooking appliances compared to traditional restaurants. Since they operate in centralized locations with better access to electricity, they can take advantage of eCooking appliances for their food preparation needs.

Overall, due to the issues associated with infrastructure, accessing TOD meters, kitchen space, volume of food being prepared, nature of restaurants to serve fast food in a la carte basis, possibility of transition to eCooking is minimal. The most effective eCooking appliances that restaurants can adopt in the first place are induction cooktops, electric oven, electric water boilers, electric griddles, and hot plates. Significant effort in terms of raising awareness regarding eCooking appliances, behavioural change and infrastructure upgradation is required to trigger transition in restaurants.

b) **Hotels and accommodations**

Hotels and accommodation are driven by their interest to operate sustainably in terms of resource usage and environment conservation. Some hotels, especially eco-conscious enterprises in major tourist destinations are likely to have interest in adopting eCooking appliances as part of their sustainability efforts. Star hotels with a focus on luxury and eco-friendliness are more likely to explore electric cooking options as a way to appeal to environmentally conscious travellers and demonstrate their commitment to responsible tourism.

Among three categories of enterprise, hotel and accommodation seemed to have high potential to transition to eCooking. Most of the hotels and accommodations are in owned or leased property which allows them a lot of flexibility in terms of expanding their kitchen space or upgrade the electricity transmission and distribution system. In most cases, these enterprises have their own transformer which ensure they get relatively better and reliable electricity supply. Additionally, big star hotel, they have competent team that can design their kitchen and import required cooking appliances including eCooking appliances. Star hotel also recruits highly trained and competent staff of the kitchen. Most of their cooking team is likely to have experience working in foreign countries which means their workforce is most likely to quickly adapt to electric cooking technology. In comparison to other two categories, hotels and accommodations, especially star hotels possess minimum restriction in terms of investment capacities.

Based on the FGD, KII and opportunity to observe few kitchens, among three categories of the enterprise, hotel and accommodation with high-end hotels and star hotels are already using some eCooking appliances in their kitchen. Representative of such hotels had also communicated that prior to having long 18 hours of loadshedding in the country, high-end hotels and star hotels were already using eCooking appliances like hot plates, large steamer, etc. Still in such hotel, eCooking was preferred mostly for volume-based cooking for example preparing buffet for large number of guests. Hotels with extensive kitchen operations and higher cooking demands is likely to be predominantly dependent on eCooking appliances. However, for a la carte, even hotels preferred LPG cooking.

Star hotels are the low hanging fruits and are most likely to be quick adopter of eCooking appliances provided their demand for electricity is fulfilled along with assurance over quality, and reliable supply of electricity. Detailed research and/or study that can instil value for the money they invest in eCooking appliances will catapult the efforts to advocate eCooking within hotels and accommodations. Being a business entity, they must be made aware of cost benefits in switching to eCooking. Combination of realization of cost benefit and establishing their USP as being environmentally responsible is likely to provide much needed impetus to adopt eCooking in these enterprises' kitchen facility.

c) **Institutions**

The institution category is one of the most diverse among the enterprise categories. Institutional kitchens in Nepal may have different considerations and priorities compared to hotels and accommodations and restaurants. Canteens of some institutions are serving more

than 100 to 1000 people (like big schools, army barracks, large development agencies, hospitals, government office, corporate office, etc) while some canteens despite being categorized under institution serves limited number of people, under 50 (like hostels, smaller branch of banks, and financial institutions, etc). Institutions, such as schools, hospitals, corporate office, and government organizations, might have more incentives to explore electric cooking options, especially if they receive support from government initiatives aimed at promoting renewable energy and reducing carbon emissions. The implementation could vary depending on factors like the scale of the institution, practicality, budget, and infrastructure.

Larger institutions which are serving between 100-1000 people are more likely to be convinced in using eCooking in their kitchen but for smaller institution, since the cooking behaviour is similar to residential cooking, simpler and readily available eCooking appliances like EPC, induction cooktops, etc can be promoted. In larger institution, people are likely to be served with staple food in such circumstances large rice cooker or rice steamer might have scope. Electric oven, microwave, electric dumpling steamer, juice maker, dough mixer and even combi oven is likely to have scope of use in these enterprise categories. With right policy and incentives larger institutions can be motivated to adopt eCooking appliances.

7. Conclusion and Recommendation

7.1 Conclusion

This study has assessed the opportunities and challenges for enterprise level eCooking across nine key themes. Taking each theme in turn, Table 10 provides a summary of the primary opportunities and challenges in implementing eCooking at the enterprise level. It is essential to leverage these opportunities while also tackling the associated challenges to advance the adoption of eCooking in various enterprises.

In terms of cooking practices, eCooking appliances are well suited for boiling, slow cooking, baking, reheating, and methods that require even heat distribution and slow cooking, while dishes that need instant and intense heat tend to favour non-eCooking methods. Cooking timings also vary by enterprise type, with institutions showing scope to provide demand for surplus daytime electricity generation. Ethnographic research underscores how cooking practices differ across types of enterprises and allowed research to understand cooking protocol for several dishes cooked or prepared by the enterprise. The adoption of eCooking appliances offers the potential for multitasking, automation, and reduced workforce, driving menu innovation, energy efficiency, safety enhancements, and sustainability initiatives.

The transition to eCooking may face resistance due to traditional beliefs, performance and taste concerns, complexity, initial costs, infrastructure limitations, and reliability during power outages. Additionally, certain cuisines' compatibility, appliance availability, lack of awareness, industry norms, and safety considerations pose barriers to widespread adoption. Overall, the data suggests that eCooking appliances, are widely considered highly suitable for boiling and reheating. However, for baking, simmering, and frying, opinions are more divided. Further education and experience with eCooking appliances may help address uncertainties and increase their acceptance in a broader range of cooking processes where there may be opportunities, such as using commercial scale induction cookstoves for frying processes.

Despite the prevalence of LPG stoves, familiarity with eCooking technology grows among staff responsible for cooking. Higher-end enterprises exhibit more comprehensive integration of eCooking appliances, indicating greater recognition of their benefits. Key informant interviews and focus group discussions highlight knowledge gaps among personnel with foreign cooking backgrounds, who are generally more familiar with eCooking appliances. Survey echoes awareness, benefits understanding, including cost-efficiency, reduced LPG reliance, safety, cleanliness, and time-saving, supporting eco-tourism and sustainability efforts. A diverse

landscape of cooking appliances and utensils used for food preparation emerges from a survey of various enterprises. Specific eCooking appliances suitable for different enterprises are identified, such as induction cooktops, steamers, and electric tandoors etc, considering factors such as cooking requirements, cuisines, and scale of operations. Despite this, the adoption of eCooking appliances remains limited. Increased awareness and promotion of energy-efficient and sustainable cooking practices are essential to encourage greater eCooking adoption.

Awareness and availability of commercial eCooking appliances vary, with limited knowledge about suppliers catering to larger-scale cooking. Quality control, after-sales service, and suitable utensil availability are challenges, along with custom regulations, electricity infrastructure, and supply chain limitations.

A robust supply chain for eCooking appliances is essential to meet diverse demands. Challenges related to electricity availability, cost-effectiveness, and regulatory environment influence the economic viability of eCooking adoption. The intricate web of social networks and purchasing patterns linked to food, appliances, and fuel significantly influence the shift towards enterprise level eCooking. Recognizing these hidden dynamics is crucial for a seamless transition. Upon conducting financial and economic analysis on representative enterprise, compared to business-as usual scenario electric cooking demonstrated slight advantage over LPG based cooking. The willingness to invest in eCooking appliances is influenced by cost-effectiveness, operational benefits, and financial constraints. Communication of advantages and addressing concerns play a crucial role in encouraging informed investment decisions.

Enterprise level eCooking also has Gender, Inclusivity, and Leave No One Behind implications, with the potential to address some of the challenges faced by women and individuals with disabilities. For instance, automation can promote inclusivity, break gender stereotypes, and improves working conditions. The transition can also potentially bring broader impacts like diverse diets, nutrition education, food safety, waste reduction, better indoor air, economic growth, job creation, and tourism boost.

Table 10: Summary of opportunities and challenges for enterprise level eCooking with respect to various theme

Theme	Main Opportunities	Main Challenges
Cooking practices	· eCooking suitable for most cooking process like food items that requires baking, roasting/ grilling, boiling, pressure cooking, frying etc. · Preparatory work (e.g. blending, grinding, peeling etc.) are compatible with electric appliances and widely used. · Busiest serving times indicate eCooking can support electricity consumption during daytime. · In luxury star hotels, executive chefs possess international culinary expertise and has knowledge about various eCooking appliances.	· Food items that require direct/ spot fire are not suitable to cook in electric appliance. · Chefs who are not professionally trained or traditionally groomed are less likely to switch to eCooking and have very less knowledge about eCooking. · Some chefs didn't have any idea about eCooking appliances suitable for their respective food menu.
Existing beliefs	· Positive perceptions of eCooking widely held such as switching to eCooking can reduce dependency on LPG, increase safety in kitchen, reduce cost of fuel and maintain cleanliness in kitchen. · Chefs can play a pivotal role in adopting eCooking appliances, as they are influencing kitchen layouts, menus, and equipment choices.	· Concerns that food will not taste the same and result in loss of business. · Behaviour changes and acceptance related with traditional cooking practices. · For restaurant and institution serving fast food, eCooking appliances are less suitable as there is belief that eCooking appliances cannot provide instant and intense heat required for cooking fast food.
Appliances	· Range of appliances available on the market which could be used for commonly used cooking processes. · As low hanging fruit, LPG oven can be replaced with electric oven in various enterprise. · Enterprise having deep fried items in their menu can adopt electric deep fryer. · For institution serving staple food (rice, lentil soup) eCooking appliances like large size rice steamer, EPC has potential to replace conventional pressure cooker. · Momo (dumplings) one of the most popular foods items found in all three enterprise, traditional cooking process (mostly cooked in LPG stove) can be switched to eCooking appliances which may need innovation to develop suitable eCooking appliances. · Appliances required for bakery can be 100% eCooking appliances	· Prevailing reliance on traditional LPG-fuelled cooking appliances · Current utensils available in the enterprises are not compatible with induction eCooking appliances. · Most enterprise level eCooking appliance available in the market requires 3 phase connection. · Kitchen space may need to be redesigned to incorporate some appliances incurring additional costs. · Trained kitchen staff are required to operate modern eCooking appliances.

Supply Chain	· There are wide variety of enterprise level eCooking appliances imported from various countries available in the Nepalese market which can used as alternative to LPG/ traditional cookstoves. · Availability of local manufactures of selected eCooking appliances · Demand for enterprise level eCooking can be stimulated through awareness campaign and demonstration events.	· There is limited knowledge about the enterprise level eCooking appliances availability. · Perceived low credibility in quality of eCooking appliances and utensils. · Premature supply chain for eCooking appliances; lack of display outlets · Lack of credible repair and maintenance service · Lack of quality assurance mechanism for enterprise level eCooking appliances.
Energy and Infrastructure	· Potential to use cleaner energy source i.e. hydro electricity · Balance in electricity supply and demand · Consumption of electricity in off peak hours · For star hotels, upgrading the meter connection and transmission and distribution is relatively convenient.	· Unreliable electricity supply undermines confidence to transition to eCooking. · LPG as a primary fuel source with robust supply chain. · In rented residential building it is difficult to operate eCooking appliances due to low connection capacity and low-capacity house wiring · Lack of space to install new transformer. General publics are reluctant to allow installation of transformers around their property due to safety concern
Cost	· Increasing trend in cost of LPG can stimulate switch to eCooking. · Innovative financing schemes can encourage enterprise to adopt enterprise level eCooking appliances.	· Higher initial investment cost to purchase enterprise level eCooking appliances and utensils required for induction eCooking appliances. · Additional cost may be incurred to upgrade meter connection.
Networks	· REBAN, HAN and Chefs Association Nepal are eager to collaborate with development agencies to support in advocacy, awareness campaign and demonstration to promote eCooking. · NEA is highly supportive to upgrade the transmission and distribution system. · NEA is positive about promoting eCooking for enterprise cooking for enterprises and institutions.	· Not recognized as industries (in the same way hotels are) to get benefit from use of TOD meter. · Presence of Nepal LPG Industries Association and their business
Gender and Inclusion	· Automation features in eCooking appliances can encourage involvement of differently able individuals and can be gender friendly. This also beneficial for differently able individuals as it minimizes movement in the kitchen. · eCooking can avoid requirement of brute force and strength required to manoeuvre LPG cylinder around the kitchen	· Lack of standard operation procedures to operate eCooking appliances is most likely to limit involvement of women and differently able individuals
Wider Impact	· Reduction in trade deficit imposed by LPG import. · Increase in consumption of the electricity.	· Well trained human resource from culinary school (including in eCooking appliances) tend to migrate to foreign country for better opportunity

	· Existing culinary training institutes can integrate eCooking appliances into their training modules. · Automation and temperature controlling mechanism enables quality assurance of cooked food.	

7.2 Recommendations

Transitioning to electric cooking in different enterprise sectors in Nepal would require a coordinated effort from various stakeholders, including the government, private sector, NGOs, and local communities. Here are some recommendations to facilitate the transition.

7.2.1 Collaboration and partnership for capacity building and awareness

- Partner with relevant association like Chefs Association Nepal, REBAN, and HAN to promote and advocate for eCooking appliances and usage in enterprises.
- Establish linkage between enterprise level eCooking appliance suppliers and relevant associations to organize demonstration and utility of eCooking appliances available in the Nepalese market. Such demonstrations can be held with renowned chefs using eCooking appliances to inspire and influence other enterprises to follow suit. Such demonstration events can contribute to imparting knowledge about eCooking among owners of enterprises.
- Partner with culinary schools and training centers to develop Standard Operating Procedures (SOPs) to prepare different recipes using eCooking appliances.
- Conduct workshops, seminars, and information campaigns targeted at enterprise owners and chefs to demonstrate the benefits of electric cooking.
- Partner with appliance manufacturers and industry experts to provide hands-on training and technical support to enterprise. The training needs to cover troubleshooting common issues to minimize downtime and ensure optimal appliance performance. In addition, the training sessions should also cover agenda like proper use, cleaning, and maintenance of electric cooking appliances.
- Collaborate with electric appliance manufacturers and suppliers to increase the availability of a wide range of energy-efficient electric cooking equipment in the local market.
- Development agencies can organize meeting with potential donors that have interest in clean cooking sector and electricity infrastructure development sector and aware them regarding status quo of enterprise in terms of energy usage for cooking, opportunities,

and challenges to promote eCooking in enterprises and their potential to transition to eCooking.

- Involve local community leaders, influencers, culinary school, and media to amplify the message and reach a broader audience. Various communication channels, including television, radio, social media, and local community events can be utilized to reach a wide audience.
- Collaborate with international organizations and other countries that have experience in promoting electric cooking to learn from their best practices.
- Facilitate public-private partnerships between the government, private sector, NGOs, hotel and restaurant association, chef association and local communities to leverage resources and expertise for a more effective transition.

7.2.2 Policy and regulation

- The government should create a clear policy framework that encourages the adoption of electric cooking in different enterprise sectors. This may include setting targets for the percentage of enterprise using eCooking appliances by a specific timeline.
- Establish regulations, quality control mechanism and standards for eCooking appliances to ensure safety, quality, and energy efficiency.
- Introduce tax incentives, import duty exemptions, and subsidies on electric cooking equipment to reduce the initial investment cost for enterprise.
- Establish innovation hubs or centers to support local entrepreneurs working to develop eCooking appliances.
- Host competitions and awards to recognize and incentivize innovative approaches in the field of electric cooking.
- Policy and regulation can be such which shall encourage new enterprise to go for eCooking. New enterprises can easily adapt to changing regulation while for older enterprises there are financial and socio-economical implication in switching from traditional cooking methods to eCooking. For older enterprises, there are hurdles of replacing existing equipment, upgrading house wiring and connection.

7.2.3 Infrastructure development and technology

- Invest in expanding the electricity grid, sub-stations and improving reliability in both urban and rural areas to ensure a stable, quality, and reliable power supply for enterprise that wants to make transition to electric cooking.

- Implement energy storage solutions, for example grid-tied solar PV with battery backup to manage fluctuations in electricity supply, particularly for enterprises located in areas with intermittent power availability.
- There are some local manufacturers in the country who have the capacity to develop and manufacture certain eCooking appliances like electric deep fryer, water boiler, coffee roaster, etc. Local chefs and culinary experts can be used as experts to seek advice while designing and developing eCooking appliances to ensure that the design align with traditional Nepalese cooking practices.

7.2.4 Socio-economic

- Offer low-interest loans, grants, viability gap funds or revolving funds specifically dedicated to supporting the transition to electric cooking.
- Establish partnerships with financial institutions to create customized financing packages for enterprises looking to switch to eCooking appliances.
- Develop a thorough cost benefit analysis that would highlight the cost savings, reduced health risks from indoor air pollution, and positive environmental impact associated with electric cooking methods.
- Develop leasing or rental options for eCooking appliances to make it more affordable for small and medium scale enterprises.
- Set up a robust monitoring and evaluation system to track the progress of the transition to electric cooking in different sectors.
- Regularly assess the impact of policies and initiatives and make necessary adjustments based on the findings.
- Establish innovation funds or grants to support research projects that focus on improving the efficiency and affordability of electric cooking solutions.
- Identify pilot enterprise projects that can showcase successful electric cooking adoption in different sectors.
- Encourage research institutions and private companies to invest in research and development of eCooking appliances suited to the specific needs of Nepal's diverse cuisines and cooking practices.

7.2.5 Methodologies for working with enterprises

Drawing from our collective experiences, data insights, and knowledge gained during the research process, we have provided responses to the following inquiries, considering various methodologies and tools employed.

Survey Questionnaires

- Unlike in residential and household surveys, conducting surveys with enterprise was challenging due to time limitation. Enterprises are driven by profit making aspirations therefore conducting the survey during rush hours and peak time was difficult.
- The length of survey questionnaire in this research was deemed long by enumerators and research participants which was taking around 1 hour. Being mindful about the busy schedule in the enterprise, it is desirable to have shorter survey questionnaire for respondents ideally around 30 min.
- The question included in the survey was generic and in some cases the respondent lacked confidence in answering certain question. For example, the cooking related question would have been answered with much confidence by the cooks/chefs while questions about investment, willingness to pay, kitchen and electricity transmission distribution infrastructure were more relevant with owners and managers of the enterprise. Having two sets of question for owner/manager and cook/chef can be beneficial from research point of view and time efficient with regards to length of the questionnaire. However, enumerators will require more time and resource to conduct two different surveys with owner/managers and cook/chef.
- Accessing star hotel representative was most difficult to conduct the survey. The star hotels are too sensitive and concerned about disturbance and sanitation in their kitchen. Besides, the level of bureaucracy is also comparatively more in star hotels.

Ethnographic Survey

- For most of the enterprises, kitchen was deemed to be private therefore the owners of the enterprises were reluctant to allow the research team into their kitchen. This could be largely due to hesitation among owners to encounter Department of Food Technology and Quality Control (DFTQC) that is responsible to regulate standards within restaurants and hotels to ensure quality service and food is being offered to the customers. At the time of the research, DFTQC was very active in conducting operation for quality assurance within restaurants and hotels. Having identity card, request letter highlighting the purpose of the research and provision to select domestic eCooking appliances helped to instil confidence among owners to allow research team to observe their kitchen and cooking protocol and practices.
- This research methodology was very effective in terms of understanding cooking protocols followed by different enterprises. The cooking behaviour was found to complete different to that of residential cooking in terms of quantity of food being

prepared, amount of reheating required, preparation of dishes in advance, etc. The enumerators could also observe how the chef/cook were handling the utensils for cooking certain dish. They could also see the size of utensils used in enterprise cooking. Overall, having ethnographic survey for different type of enterprise was fruitful to understand enterprise level cooking in different types of enterprise. The observation from ethnographic survey was useful to validate the responses from enterprise survey, FGDs and KIIs.

- The challenge associated with enterprise cooking were taking permission from enterprise to access their kitchen for the day. The research team members used their network to conduct ethnographic survey otherwise it was realized that kitchen being a very sensitive space for enterprise, they are hesitant to allow strangers to enter their kitchen.
- Idea of giving eCooking appliances of their choice as gesture of gratitude was very helpful to build rapport with the enterprise and undertake ethnographic survey.
- For a larger kitchen and busy kitchen, having two enumerators or research team members to conduct ethnographic survey would have been comfortable and effective to observe many different things that was happening in the kitchen. However, in some cases, the kitchen lacked any space to accommodate research team member in their kitchen.

Focus Group Discussions

- In course of implementing the research, the research found many associations (HAN, REBAN, Chef association, Fast-Food Association, Hotel Business Association, etc) that possess relevancy to the objective of the research. However, some of such associations are driven by political agenda and some seemed to be formed after certain group of people broke away from existing associations due to some difference.
- In future, the association that needs to be informed, advocated, and partnered in relation to development projects relevant to eCooking are HAN, REBAN and Chef Association. Among them such as Hotel Association Nepal (HAN) is one the biggest association that possess capacity to influence at the policy making level.
- HAN was not able to provide time to organize a FGD as the Chairman of the association first wanted himself to have better understanding of what the research was doing. Following the KII with HAN chairman, there was an indication that HAN is open to collaborate in near future with development projects relevant to eCooking and seemed to have strength in policy advocacy. HAN apparently was involved with some

development projects that dealt with minimum use of plastic. For this research, the Chairman felt that KII would be enough and suggested to have consultative meetings in near future provided there is scope of collaboration with development organization.

- The associations mentioned above can be approached to organize eCooking appliance trade fair which can be helpful to demonstrate the eCooking appliance market to potential customers (owner or investor of the enterprise) in the enterprise sector. Chef association seems to be most suitable partner to collaborate in future if there is possibility to organize a training program or develop SOP to use eCooking appliances to cook specific dishes.
- The suppliers of eCooking appliances were reluctant to come together for joint meeting or FGD. The suppliers seemed to be reluctant to share the information of eCooking appliances that they import with their competitors.
- Collaboration with association like chef association will be helpful to get detailed list of eCooking appliances suppliers name with contact detail. Having representative of association (HAN, REBAN, Chef association) in the research team can be helpful to develop list of suppliers and build rapport with enterprise.

Financial and Economic Analysis

- REBAN had suggested that they can provide list of restaurants that can actively support the research activities provided the research is able to conduct a detailed financial and economic analysis of the enterprise such that the enterprise owner is able to get information on cost and benefit of switching to eCooking.
- Having financial and economic expert in the future research team will be beneficial to conduct financial and economic analysis. Such analysis will generate numbers that can attract interest from the enterprise owners and possible investors.
- REBAN also suggested to conduct energy audit as a pilot project for some restaurant so that they get an understanding of their electrical system to be able to handle additional electric load in their kitchen.

Enterprise Category

- The research did not sample party palace and banquets. Banquets can be considered or categorized under institution category and based on the feedback from relevant stakeholders involved in cooking and kitchen management, banquets have potential to be adopt eCooking appliances as they are more into volume-based cooking. Large quantity of food is cooked in banquets which is suitable for eCooking.

- Enterprise category can be reviewed based on category developed by NISC to ensure enterprise category aligns with national categorization of enterprises.
- This study encompasses a range of enterprise sizes (small, medium, large) within the restaurant, hotel, accommodation, and institutional sectors. This deliberate inclusion leads to significant data variations during the data collection phase, thereby resulting in substantial diversity in the analysis. Consequently, when conducting a similar study in the future, it's advisable to select a sample of enterprises that share similar characteristics such as nature of business, size, and investment. This approach will ensure that the collected information can yield well-defined insights for implementation within those specific enterprises.

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9. ANNEX

ANNEX I: List of suppliers of enterprise level eCooking Appliances

S.N.	Name	Address
1.	The Yale Group	Thadodhunga, Lalitpur
2.	Vision of Kitchen Links Co. Pvt. Ltd, Anamnagar, Ktm	Anamnagar, Kathmandu
3.	Kitchen Craft	Sankhamul, Kathmandu
4.	GIA Import Export Pvt. Ltd	Thulobharyang, Kathmandu
5.	ROBAM Nepal	Baluwatar, Kathmandu
6.	Sigma Refrigeration	Kalanki, Kathmandu
7.	Bishal Kitchen	Sanobharyang, Kathmandu
8.	Kami Maya Kitchen	Bhaisepati, Lalitpur, Nepal

ANNEX II: List of suppliers of enterprise level eCooking Appliances suggested by stakeholders.

S.N.	Name	Address
1.	Kitchen Trading Concern	Kalimati, Kathmandu
2.	Multi Trading Nepal	Sanobharyang, Kathmandu
3.	Universal Kitchen Equipment	Banasthali, Kathmandu
4.	Kantipur Kitchen Equipment	Sitapaila, Kathmandu
5.	Kathmandu Kitchen Equipment	Sanobharyang, Kathmandu
6.	B2B Hospitality Pvt. Ltd	Lazimpat, Kathmandu
7.	Namaste Kitchen Concern	Indrachowk, Kathmandu
8.	Himchuli Kitchen	Ravibhawan, Kathmandu
9.	Novo Era Pvt. Ltd	Itahari, Sunsari

ANNEX III: Financial Analysis Calculations

A. Dessert Delight Bakery

Calculation of Payback Period for replacement of LPG Equipment with Electric Equipment												
BAU Scenario												
Particulars	**Assumption/ Explanation**	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**
Initial Investment Cost												
Investment in Kitchen equipment	This includes the capital expenditure made for set up of the kitchen, kitchen equipment, appliances, and the utensils. Information retrieved through KII.	2,500,000										
Investment in Other Infrastructures	This includes the capital expenditure made for dining area like furniture and fixtures and decorations. Information retrieved through KII.	2,500,000										
Initial Investment Sub-Total		5,000,000										
Annual Revenue	Average daily sales of Rs. 35,000 earned for 360 days in a year. The enterprise is assumed to be in operation for whole year.		12,600,000	12,600,000	12,600,000	12,600,000	12,600,000	12,600,000	12,600,000	12,600,000	12,600,000	12,600,000
Operational Cost												
Labour Cost	(8 workers @ Rs. 20,000 per month). Information retrieved through KII.		1,920,000	1,920,000	1,920,000	1,920,000	1,920,000	1,920,000	1,920,000	1,920,000	1,920,000	1,920,000
Material Cost	(60% of the Sales). Information retrieved through KII.		7,560,000	7,560,000	7,560,000	7,560,000	7,560,000	7,560,000	7,560,000	7,560,000	7,560,000	7,560,000
Annual Electricity Charges	Average Rs. 30,000 per month. Information retrieved through KII.		360,000	360,000	360,000	360,000	360,000	360,000	360,000	360,000	360,000	360,000
Annual fuel cost of LP Gas	Monthly 4 LPG cylinders costing Rs. 1800 each consumed for a year		86,400	86,400	86,400	86,400	86,400	86,400	86,400	86,400	86,400	86,400
Annual Maintenance cost	The maintenance cost is assumed for maintenance of all the cooking equipment present in the kitchen (Lumpsum). Information retrieved through KII.		50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Other Overheads	(5% of the Sales) Information retrieved through KII.		630,000	630,000	630,000	630,000	630,000	630,000	630,000	630,000	630,000	630,000
Operational Cost Sub-Total			10,606,400	10,606,400	10,606,400	10,606,400	10,606,400	10,606,400	10,606,400	10,606,400	10,606,400	10,606,400
Net Cashflow		-5,000,000	1,993,600	1,993,600	1,993,600	1,993,600	1,993,600	1,993,600	1,993,600	1,993,600	1,993,600	1,993,600
Discount Factor @ 10%	Nepal Long Term Interest Rate was reported to be 9% p.a. (source: ceicdata.com) in August 2023. A premium of 1% is added to reach at the discount rate of 10%	1	0.91	0.83	0.75	0.68	0.62	0.56	0.51	0.47	0.42	0.39
Discounted Cashflow		-5,000,000	1,812,364	1,647,603	1,497,821	1,361,656	1,237,869	1,125,335	1,023,032	930,029	845,481	768,619
Cum. DCF		- 5,000,000	-3,187,636	-1,540,033	-42,212	1,319,444	2,557,313	3,682,648	4,705,680	5,635,709	6,481,190	7,249,809
PV of Cash Flows		12,249,809										
NPV		7,249,809										

Payback Period (yrs.)		3.03										
IRR (%)		38.32%										

After intervention Scenario												
Particulars	**Assumption/ Explanation**	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**
Initial Investment Cost												
Investment in Kitchen equipment	This includes the capital expenditure made for set up of the kitchen, kitchen equipment, appliances, and the utensils.	2,500,000										
Investment in Other Infrastructures	This includes the capital expenditure made for dining area like furniture and fixtures and decorations	2,500,000										
Add. Investment in Electric Equipment	Individual cost of 3 Deck Electric Oven	230,500										
Saving on Investment of Gas Equipment	Individual cost of 3 Deck LP Gas Oven	-298,500										
		4,932,000	-	-	-	-	-	-	-	-	-	-
Annual Revenue	Average daily sales of Rs. 35,000 earned for 360 days in a year		12,600,000	12,600,000	12,600,000	12,600,000	12,600,000	12,600,000	12,600,000	12,600,000	12,600,000	12,600,000
Operational Cost												
Labour Cost	(7 workers @ Rs. 20,000 per month)		1,680,000	1,680,000	1,680,000	1,680,000	1,680,000	1,680,000	1,680,000	1,680,000	1,680,000	1,680,000
Material Cost	(60% of the Sales)		7,560,000	7,560,000	7,560,000	7,560,000	7,560,000	7,560,000	7,560,000	7,560,000	7,560,000	7,560,000
Annual Electricity Charges	Average Rs. 30,000 per month		360,000	360,000	360,000	360,000	360,000	360,000	360,000	360,000	360,000	360,000
Annual fuel cost of LP Gas	Monthly 4 LPG cylinders costing Rs. 1800 each consumed for a year		86,400	86,400	86,400	86,400	86,400	86,400	86,400	86,400	86,400	86,400
Additional Electricity Charges	Electricity charges at Rs. 12 per unit for 17 kW Electric oven operated for 6 hrs daily for 360 days in a year		60,480	60,480	60,480	60,480	60,480	60,480	60,480	60,480	60,480	60,480
Saving in LP Gas Cost	Monthly 4 LPG cylinders costing Rs. 1800 consumed for the LPG oven run for a year		-86,400	-86,400	-86,400	-86,400	-86,400	-86,400	-86,400	-86,400	-86,400	-86,400
Annual Maintenance cost	Lumpsum		50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Other Overheads	(5% of the Sales)		630,000	630,000	630,000	630,000	630,000	630,000	630,000	630,000	630,000	630,000
			10,340,480	10,340,480	10,340,480	10,340,480	10,340,480	10,340,480	10,340,480	10,340,480	10,340,480	10,340,480
Net Cashflow		-4,932,000	2,259,520	2,259,520	2,259,520	2,259,520	2,259,520	2,259,520	2,259,520	2,259,520	2,259,520	2,259,520
Discount Factor @ 10%	Nepal Long Term Interest Rate was reported to be 9% p.a. (source: ceicdata.com) in August 2023. A premium of 1% is added to reach at the discount rate of 10%	1	0.91	0.83	0.75	0.68	0.62	0.56	0.51	0.47	0.42	0.39
Discounted Cashflow		-4,932,000	2,054,109	1,867,372	1,697,611	1,543,283	1,402,984	1,275,440	1,159,491	1,054,083	958,257	871,143
Cum. DCF		-4,932,000	-2,877,891	-1,010,519	687,092	2,230,374	3,633,359	4,908,799	6,068,290	7,122,372	8,080,629	8,951,772
PV of Cash Flows		13,883,772										
NPV (Rs.)		**8,951,772**										
Payback Period (yrs.)		**2.35**										
IRR (%)		**44.67%**										

B. Bardali Restro and Meetings

Calculation of Payback Period for replacement of LPG Equipment with Electric Equipment												
BAU Scenario												
Particulars	**Assumption /Explanation**	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**
Initial Investment Cost												
Investment in Kitchen equipment	This includes the capital expenditure made for set up of the kitchen, kitchen equipment, appliances, and the utensils.	6,000,000										
Investment in Other Infrastructures	This includes the capital expenditure made for dining area like furniture and fixtures and decorations	34,000,000										
Initial Investment Sub-Total		40,000,000										
Annual Revenue	Average monthly sales of Rs. 400,000 earned for 12 months in a year		48,000,000	48,000,000	48,000,000	48,000,000	48,000,000	48,000,000	48,000,000	48,000,000	48,000,000	48,000,000
Operational Cost												
Labour Cost	(24 workers @ Rs. 25,000 per month)		7,200,000	7,200,000	7,200,000	7,200,000	7,200,000	7,200,000	7,200,000	7,200,000	7,200,000	7,200,000
Material Cost	(50% of the Sales)		24,000,000	24,000,000	24,000,000	24,000,000	24,000,000	24,000,000	24,000,000	24,000,000	24,000,000	24,000,000
Annual Electricity Charges	Average Rs. 40,000 per month		4,80,000	4,80,000	4,80,000	4,80,000	4,80,000	4,80,000	4,80,000	4,80,000	4,80,000	4,80,000
Annual fuel cost of LPG	Monthly 45 LPG cylinders costing Rs. 1800 each consumed for a year		972,000	972,000	972,000	972,000	972,000	972,000	972,000	972,000	972,000	972,000
Annual cost of charcoal	Monthly 100 Kg charcoal consumed costing Rs. 120 per kg		144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000
Annual Maintenance cost	Lumpsum		60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
Other Overheads	(15% of the Sales)		7,200,000	7,200,000	7,200,000	7,200,000	7,200,000	7,200,000	7,200,000	7,200,000	7,200,000	7,200,000
Operational Cost Sub-total			40,056,000	40,056,000	40,056,000	40,056,000	40,056,000	40,056,000	40,056,000	40,056,000	40,056,000	40,056,000
Net Cashflow		- 40,000,000	7,944,000	7,944,000	7,944,000	7,944,000	7,944,000	7,944,000	7,944,000	7,944,000	7,944,000	7,944,000
Discount Factor @ 10%	Nepal Long Term Interest Rate was reported to be 9% p.a. (source: ceicdata.com) in August 2023. A premium of 1% is added to reach at the discount rate of 10%	1	0.91	0.83	0.75	0.68	0.62	0.56	0.51	0.47	0.42	0.39
Discounted CashFlow		-40,000,000	7,221,818	6,565,289	5,968,445	5,425,859	4,932,599	4,484,181	4,076,528	3,705,935	3,369,031	3,062,756
Cum. DCF		-40,000,000	-32,778,182	-26,212,893	-20,244,448	-14,818,589	-9,885,990	-5,401,809	-1,325,281	2,380,654	5,749,685	8,812,441
PV of Cash Flows		48,812,441										
NPV		**8,812,441**										
Payback Period (yrs.)		**7.36**										
IRR (%)		**14.91%**										

After intervention Scenario												
Particulars		**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**
Initial Investment												
Investment in Kitchen equipment	This includes the capital expenditure made for set up of the kitchen, kitchen equipment, appliances, and the utensils.	6,000,000										
Investment in Other Infrastructures	This includes the capital expenditure made for dining area like furniture and fixtures and decorations	34,000,000										
Add. Investment in Electric Equipment												
Electric Pizza Oven (Single Deck)	Individual cost of Electric Pizza Oven	60,500										
Electric Fryer	Individual cost of Electric Fryer	46,500										
Saving on Investment of Gas Equipment												
LPG Pizza Oven	Individual cost of Gas Pizza Oven	-78,500										
LPG Fryer	Individual cost of Gas Fryer	-51,500										
Initial Investment Sub-Total		39,977,000	-	-	-	-	-	-	-	-	-	-
Annual Revenue	Average monthly sales of Rs. 400,000 earned for 12 months in a year		48,000,000	48,000,000	48,000,000	48,000,000	48,000,000	48,000,000	48,000,000	48,000,000	48,000,000	48,000,000
Operational Cost												
Labour Cost (24 workers @ Rs. 25,000 per month)	(22 workers @ Rs. 25,000 per month)		6,600,000	6,600,000	6,600,000	6,600,000	6,600,000	6,600,000	6,600,000	6,600,000	6,600,000	6,600,000
Material Cost (50% of the Sales)	(50% of the Sales)		24,000,000	24,000,000	24,000,000	24,000,000	24,000,000	24,000,000	24,000,000	24,000,000	24,000,000	24,000,000
Annual Electricity Charges	Average Rs. 40,000 per month		480,000	480,000	480,000	480,000	480,000	480,000	480,000	480,000	480,000	480,000
Annual fuel cost of LP Gas	Monthly 45 LPG cylinders costing Rs. 1800 each consumed for a year		972,000	972,000	972,000	972,000	972,000	972,000	972,000	972,000	972,000	972,000
Annual cost of charcoal	Monthly 100 Kg charcoal consumed costing Rs. 120 per kg		144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000
Additional Electricity Charges												
Electric Pizza Oven (Single Deck)	Electricity charges at Rs. 12 per unit for 4.5 Kw Electric oven operated for 5 hrs daily for 360 days in a year		19,440	19,440	19,440	19,440	19,440	19,440	19,440	19,440	19,440	19,440
Electric Fryer	Electricity charges at Rs. 12 per unit for 6 kW Electric ovens operated for 4 hrs daily for 360 days in a year		73,440	73,440	73,440	73,440	73,440	73,440	73,440	73,440	73,440	73,440
Saving in LP Gas Cost												
LPG Pizza Oven	Monthly 4 LPG cylinders costing Rs. 1800 consumed for the LP Gas oven run for a year		-86,400	-86,400	-86,400	-86,400	-86,400	-86,400	-86,400	-86,400	-86,400	-86,400
LPG Fryer	Monthly 5 LPG cylinders costing Rs. 1800 consumed for the LP Gas oven run for a year		-108,000	-108,000	-108,000	-108,000	-108,000	-108,000	-108,000	-108,000	-108,000	-108,000
Annual Maintenance cost	Lumpsum		50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Other Overheads (15% of the Sales)	(15% of the Sales)		7,200,000	7,200,000	7,200,000	7,200,000	7,200,000	7,200,000	7,200,000	7,200,000	7,200,000	7,200,000
Operational Cost Sub-Total			39,344,480	39,344,480	39,344,480	39,344,480	39,344,480	39,344,480	39,344,480	39,344,480	39,344,480	39,344,480
Net Cashflow		-39,977,000	8,655,520	8,655,520	8,655,520	8,655,520	8,655,520	8,655,520	8,655,520	8,655,520	8,655,520	8,655,520
Discount Factor @ 10%	Nepal Long Term Interest Rate was reported to be 9% p.a. (source: ceicdata.com) in August 2023. A premium of 1% is added to reach at the discount rate of 10%	1.00	0.91	0.83	0.75	0.68	0.62	0.56	0.51	0.47	0.42	0.39

Discounted Cashflow		-39,977,000	7,868,655	7,153,322	6,503,020	5,911,837	5,374,397	4,885,815	4,441,650	4,037,864	3,670,785	3,337,078
Cum. DCF		-39,977,000	-32,108,345	-24,955,023	-18,452,003	-12,540,166	-7,165,769	-2,279,954	2,161,696	6,199,560	9,870,346	13,207,423
PV of Cash Flows		53,184,423										
NPV		**13,207,423**										
Payback Period (yrs.)		**6.46**										
IRR (%)		**17.24%**										

C. Express Eats

Calculation of Payback Period for replacement of LPG Equipment with Electric Equipment												
BAU Scenario												
Particulars	**Assumption/ Explanation**	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**
Initial Investment Cost												
Investment in Kitchen equipment	This includes the capital expenditure made for set up of the kitchen, kitchen equipment, appliances, and the utensils.	2,500,000										
Investment in Other Infrastructures	This includes the capital expenditure made for dining area like furniture and fixtures and decorations	2,000,000										
Initial Investment Cost Sub-Total		4,500,000										
Annual Revenue	Average monthly sales of Rs. 300,000 earned for 12 months in a year		36,000,000	36,000,000	36,000,000	36,000,000	36,000,000	36,000,000	36,000,000	36,000,000	36,000,000	36,000,000
Operational Cost												
Labour Cost	(20 workers @ Rs. 25,000 per month)		6,000,000	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000
Material Cost	(50% of the Sales)		18,000,000	18,000,000	18,000,000	18,000,000	18,000,000	18,000,000	18,000,000	18,000,000	18,000,000	18,000,000
Annual Electricity Charges	Average Rs. 15,000 per month		180,000	180,000	180,000	180,000	180,000	180,000	180,000	180,000	180,000	180,000
Annual fuel cost of LP Gas	Monthly 60 LPG cylinders costing Rs. 1800 each consumed for a year		1,296,000	1,296,000	1,296,000	1,296,000	1,296,000	1,296,000	1,296,000	1,296,000	1,296,000	1,296,000
Annual Maintenance cost	Lumpsum		60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
Other Overheads (5% of the Sales)	(15% of the Sales)		1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000
Operational Cost Sub-Total			27,336,000	27,336,000	27,336,000	27,336,000	27,336,000	27,336,000	27,336,000	27,336,000	27,336,000	27,336,000
Net Cash Flow		- 4,500,000	8,664,000	8,664,000	8,664,000	8,664,000	8,664,000	8,664,000	8,664,000	8,664,000	8,664,000	8,664,000

Discount Factor @ 10%	Nepal Long Term Interest Rate was reported to be 9% p.a. (source: ceicdata.com) in August 2023. A premium of 1% is added to reach at the discount rate of 10%	1.00	0.91	0.83	0.75	0.68	0.62	0.56	0.51	0.47	0.42	0.39
Discounted Cash Flow		- 4,500,000	7,876,364	7,160,331	6,509,391	5,917,629	5,379,662	4,890,602	4,446,002	4,041,820	3,674,382	3,340,347
Cum. DCF		- 4,500,000	3,376,364	10,536,694	17,046,086	22,963,714	28,343,377	33,233,979	37,679,981	41,721,801	45,396,182	48,736,529
PV of Cash Flows		53,236,529										
NPV		48,736,529										
Payback Period (yrs.)		0.57										
IRR (%)		192.53%										

After Intervention Scenario												
Particulars	**Assumption/ Explanation**		**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**
Initial Investment Cost												
Investment in Kitchen equipment	This includes the capital expenditure made for set up of the kitchen, kitchen equipment, appliances, and the utensils.	2,500,000										
Investment in Other Infrastructures	This includes the capital expenditure made for dining area like furniture and fixtures and decorations	2,000,000										
Add. Investment in Electric Equipment												
Electric Pizza Oven (Single Deck)	Individual cost of Electric Pizza Oven	60,500										
Saving on Investment of Gas Equipment												
LPG Pizza Oven	Individual cost of Gas Pizza Oven	-78,500										
Initial Investment Cost Sub-Total		4,482,000	-	-	-	-	-	-	-	-	-	-
Annual Revenue	Average monthly sales of Rs. 300,000 earned for 12 months in a year		36,000,000	36,000,000	36,000,000	36,000,000	36,000,000	36,000,000	36,000,000	36,000,000	36,000,000	36,000,000
Operational Cost												
Labour Cost	(18 workers @ Rs. 25,000 per month)		5,400,000	5,400,000	5,400,000	5,400,000	5,400,000	5,400,000	5,400,000	5,400,000	5,400,000	5,400,000
Material Cost	(50% of the Sales)		18,000,000	18,000,000	18,000,000	18,000,000	18,000,000	18,000,000	18,000,000	18,000,000	18,000,000	18,000,000
Annual Electricity Charges	Average Rs. 15,000 per month		180,000	180,000	180,000	180,000	180,000	180,000	180,000	180,000	180,000	180,000
Annual fuel cost of LP Gas	Monthly 60 LPG cylinders costing Rs. 1800 each consumed for a year		1,296,000	1,296,000	1,296,000	1,296,000	1,296,000	1,296,000	1,296,000	1,296,000	1,296,000	1,296,000
Additional Electricity Charges												
Electric Pizza Oven (Single Deck)	Electricity charges at Rs. 12 per unit for 4.5 Kw Electric oven operated for 8 hrs daily for 360 days in a year		74,520	74,520	74,520	74,520	74,520	74,520	74,520	74,520	74,520	74,520
Saving in LPG Cost												
LPG Pizza Oven	Monthly 6 LPG cylinders costing Rs. 1800 consumed for the LP Gas oven run for a year		-129,600	-129,600	-129,600	-129,600	-129,600	-129,600	-129,600	-129,600	-129,600	-129,600
Annual Maintenance cost	Lumpsum		50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Other Overheads (5% of the Sales)	(15% of the Sales)		1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000
Operation Cost Sub-Total			26,670,920	26,670,920	26,670,920	26,670,920	26,670,920	26,670,920	26,670,920	26,670,920	26,670,920	26,670,920
Net Cash Flow		-4,482,000	9,329,080	9,329,080	9,329,080	9,329,080	9,329,080	9,329,080	9,329,080	9,329,080	9,329,080	9,329,080
Discount Factor @ 10%	Nepal Long Term Interest Rate was reported to be 9% p.a. (source: ceicdata.com) in August 2023. A premium of 1% is added to reach at the discount rate of 10%	1.00	0.91	0.83	0.75	0.68	0.62	0.56	0.51	0.47	0.42	0.39
Discounted Cash Flow		-4,482,000	8,480,982	7,709,983	7,009,076	6,371,887	5,792,625	5,266,022	4,787,293	4,352,085	3,956,441	3,596,764
Cum. DCF		-4,482,000	3,998,982	11,708,965	18,718,041	25,089,928	30,882,553	36,148,575	40,935,869	45,287,953	49,244,394	52,841,158
PV of Cash Flows		57,323,158										
NPV		52,841,158										
Payback Period (yrs.)		0.53										
IRR (%)		208.14%										

ANNEX IV: List of individuals for Key Informant Interview

S. No.	Name	Designation	Organization
1.	Shyam Lama	Chairman	Chefs Association Nepal (CAN)
2.	Binod Sapkota	Engineer	Distribution and Consumer Services (DCS) – Nepal Electricity Authority (NEA)
3.	Tek Mahat	CEO	Hotel Association Nepal (HAN)
4.	Prakash Shrestha	Senior Instructor	International Hotel Training School
5.	Bishnu Maharjan	Director of Kitchen Operation	Academy of Culinary Arts