INSTITUTIONAL E-COOKING

Institute of Energy Studies and Research (IESR)

November 2023

This material has been funded by UK Aid from the UK government; however, the views expressed do not necessarily reflect the UK government's official policies.

eCooking Capacity Building & Market Development Programme (eCAP)

The eCooking Capacity Building & Market Development programme (eCAP) was implemented in 2023 as a partnership between Kenya Power and two UK-Aid-funded programmes, MECS and UK PACT. eCAP was managed collaboratively by Kenya Power and MECS via the STEER (Sustainable Transitions in Energy, Environment and Resilience) Centre at Loughborough University, UK and Gamos East Africa, Kenya. Kenya Power owns and operates most of the electricity transmission and distribution system in the country and sells electricity to over 9 million customers. Kenya Power's Pika na Power (Cook with Electricity) campaign aims to stimulate demand for electricity and increase the social and environmental impacts of electricity access.

Modern Energy Cooking Services (MECS) and United Kingdom Partnering for Accelerated Climate Transitions (UK PACT) are UKAid-funded programmes with the shared vision of supporting Kenya to transition from unsustainably harvested biomass to renewably-generated electricity.

eCAP aims to accelerate the uptake of eCooking in Kenya by building the capacity of key market actors and driving forward the development of a sustainable eCooking sector by:

- Developing institutional capacity within Kenya Power
- Designing and implementing a pipeline of scalable activities in parallel with the Kenya National eCooking Strategy (KNeCS)
- Identifying pathways for scaling up the Pika na Power campaign
- Bringing together Kenya's clean cooking and electricity access sectors to empower a network of eCooking Champions
- Generating evidence on the role of eCooking as a tool for stimulating demand and increasing the social impact of electricity access to inform decision-making by Kenya Power's Board of Directors

For more information on eCAP, visit www.MECS.org.uk.

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EXECUTIVE SUMMARY

Introduction

In Kenya, many people still rely on harmful traditional cooking fuels, leading to greenhouse gas emissions and health issues. However, a noticeable shift towards electric cooking is happening, driven by improved electricity access rates, rising fuel costs, and increased health awareness. Approximately 3% of households have acquired electric cooking appliances, signifying a gradual but significant change.

While electric cooking campaigns have primarily targeted households, there is considerable potential for its adoption in institutions that serve larger groups. The Institutional eCooking project, implemented by the Institute of Energy Studies and Research (IESR), introduces electric cooking on a larger scale at IESRs kitchen. The project deployed three 40-liter and one 25-liter Electric Pressure Cookers, two 16-liter rice cookers, and other cooking technologies such as LPG to prepare a variety of dishes at IESR's kitchen. This pilot site serves as a demonstration center for institutional eCooking, effectively showcasing its benefits to stakeholders in Kenya and beyond.

Objective

The primary objective of the project is to deploy institutional-level electric cookers and compare the cost of cooking with electricity and conventional cooking fuels such as Liquefied Petroleum Gas (LPG).

Methodology

The Institutional eCooking project applied the Controlled Cooking Tests (CCTs) approach to assess electric cooking in an institutional context. These tests involved the creation of standardized recipes for popular dishes typically prepared in the IESR kitchen, enabling a comprehensive comparison between institutional cooking using Electric Pressure Cookers (EPCs), rice cookers, and other conventional cooking technologies such as Liquid Petroleum Gas

(LPG). The primary objectives encompassed the evaluation of various factors, including energy consumption, costs, and efficiency comparisons.

Five dishes, including bean stew, green grams, beef stew, rice, and githeri, were selected for the CCT. These dishes are not only popular at the IESR canteen but are also common meals prepared in most Kenyan institutions.

Ingredients for each dish were carefully chosen and used in equal proportions for both LPG and electric cooking cycles. The established cooking recipes for different cooking technologies were consistently followed when preparing the selected dishes. Two cooking cycles for each dish were conducted using both electricity and LPG to ensure reliable and consistent results.

Findings

The results of the CCTs demonstrated that cooking with electric pressure cookers (EPCs) is not only more cost-effective but also time-saving compared to using LPG for common dishes prepared at the institution, such as rice, beef, beans, green grams, and githeri. Additionally, EPCs were found to be much more economical and a suitable technology for preparing dishes with longer preparation times, such as beans and githeri. Furthermore, it became evident that rice cookers are significantly more efficient than EPCs and LPG for preparing common dishes like rice.

Recommendations

Based on the findings, several recommendations can be made:

1. Institutions are strongly encouraged to transition to electric cooking as a means to reduce operational costs and minimize carbon emissions.
2. Implementation of discounted eCooking tariffs is highly recommended to incentivize more institutions to adopt electric cooking. The introduction of reduced off-peak time-of-use tariffs can help to distribute cooking energy loads. This approach not only supports cost savings for institutions but also contributes to a more balanced national energy demand profile, reducing the occurrence of excess or underutilized renewable-based energy sources in the country.
3. It is advisable to consider the use of energy meters equipped with well-defined time stamps for recording cooking events during Controlled Cooking Tests (CCTs). The integration of IoT (Internet of Things) meters into electric cooking appliances can streamline the collection of energy consumption data, making it more efficient and accurate.

4. There is a need to promote local production, assembly, and repair capabilities for large-capacity electric pressure cookers and rice cookers designed for institutional-level cooking within the country.

Conclusion

The Controlled Cooking Tests (CCTs) conducted as part of the project provide compelling evidence of the cost-effectiveness and efficiency of electric cookers. These results make a convincing case for institutions to transition to electric cooking. Such a transition not only leads to cost savings but also plays a significant role in reducing carbon emissions. The findings underscore the transformative potential of electric cooking in reshaping cooking practices within institutions in Kenya.

1.0 INTRODUCTION

1.1 Background information

The majority of the population in Kenya continues to rely on biomass and other polluting fuels for their cooking needs, thereby contributing significantly to Greenhouse Gas (GHG) emissions and the economic burden of related health challenges. However, due to high electrification rates and intensified promotion of electric cooking, coupled with the increasing costs and health issues associated with traditional fuels, this transition toward electric cooking has gained momentum. Currently, approximately 3% of households have adopted electric cooking appliances, demonstrating a gradual but positive shift in cooking technology.

While eCooking initiatives have predominantly focused on households, it's essential to recognize that institutions also have the high potential to generate substantial demand for electric cooking technologies. They serve significantly larger numbers of individuals than households and, therefore, require larger cookware and cooking devices. This presents a significant opportunity for the adoption of large-scale institutional-level electric cooking.

The Institutional eCooking project, implemented by the Institute of Energy Studies and Research (IESR), introduces institutional eCooking to IESR's kitchen by deploying four 40-liter automatic Electric Pressure Cookers (EPC), two 20-liter rice cookers, and various other large eCooking devices for preparing a variety of menus.

The pilot site is envisioned as a dedicated institutional eCooking demonstration center, intended to showcase the benefits of electric cooking to key stakeholders within the country and the broader region.

1.2 Objectives

The project's primary objective is to deploy institutional-level electric cookers and compare the cost of cooking with electricity and conventional cooking fuels like Liquefied Petroleum Gas (LPG).

2.0 DEPLOYMENT OF INSTITUTIONAL ECOOKERS AT IESR KITCHEN

2.1 Procurement of large-volume institutional electric cookers

In contrast to the easily accessible small-volume electric cookers designed for domestic use in the Kenyan market, there is a conspicuous absence of large-volume institutional electric cookers with capacities exceeding 60 liters, as required for the pilot institutional electric cooking project at the Institute of Energy Studies and Research (IESR). Consequently, IESR found it necessary to collaborate with international suppliers to procure institutional-level electric cookers. As a result, IESR acquired two 40-liter electric pressure cookers from suppliers in China, representing the largest available capacity for electric pressure cookers in the supplier's inventory (Agent details are presented in Appendix 1). Additionally, IESR obtained two 16-liter electric cookers from Tanzania and two additional 40-liter institutional-level electric pressure cooker units previously used in a similar initiative by the MECs in Kakuma.

This strategic approach to appliance acquisition from diverse international sources was aimed at bridging the gap in the availability of larger-capacity electric cookers within the local market. These larger cookers are essential for meeting the cooking demands of institutions in the country. The incorporation of various electric cookers into the project enables a comprehensive assessment of the cost and efficiency of electric cooking compared to conventional cooking fuels, such as Liquefied Petroleum Gas (LPG). The institutional eCooking appliances used in the pilot at IESR are presented in Figure 1.

Figure 1: From left - 25-liter EPC, three 40-liter EPCs, and two 16-liter rice cookers.

2.1 IESR Kitchen Wiring Upgrade

As the provision for institutional electric cooking was not initially considered in the kitchen building's wiring design, it became necessary to make certain modifications in order to meet the standard electrical wiring requirements for the deployment of eCooking appliances in this project. During the wiring upgrade, additional breakers were installed at the building's electrical distribution boards, and new connection cables were run from these breakers to each cooker through single-phase smart energy meters. This setup allows for real-time and accurate metering and recording of energy consumption.

Additionally, due to the substantial current drawn by the large electric cookers, 32A industrial-grade sockets and plugs were used to establish a robust connection between the cookers and the electric power supply system. This was crucial to ensure the safe and reliable operation of the appliances. Figure 2 shows the schematic illustrating the wiring upgrades and setup for the institutional electric cooking pilot at the IESR kitchen.

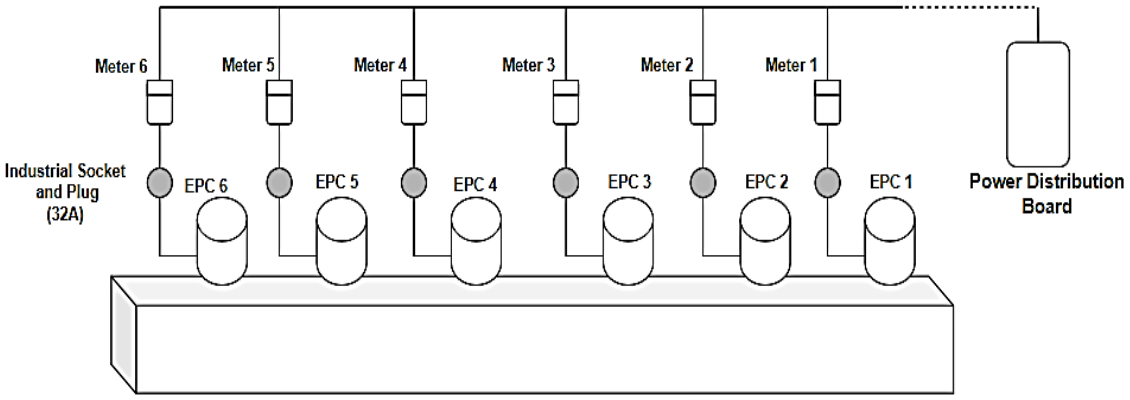


Figure 2: Circuit diagram for electric wiring upgrade at IESR

Figure 3: Upgraded electrical wiring and connections for electric cookers at IESR

2.3 Collaboration with Local Institutional E-cooking Stakeholders

During the testing phase, IESR collaborated with institutional electric cooking stakeholders in Kenya, including Feion Green Ventures, an innovative company specializing in eco-friendly cooking and energy-efficient solutions. Feion Green Ventures generously provided a heavy-duty 2-in-1 multipurpose electric cooker designed for large-scale use, which was tested alongside the imported institutional e-cooking appliances. In addition to evaluating the performance of a 58-liter (50 liters + 8 liters) locally manufactured cooker, IESR actively contributed to enhancing the prototype by providing user feedback to improve its functionality and user-friendliness. This collaboration aimed to enhance the effectiveness and convenience of the locally fabricated cookers.

Figure 5: 58-Liter 2-in-1 Multipurpose Electric Cooker (Jiko Kul) at IESR's Kitchen.

Figure 6: Mercy Kyalo (wearing a black top), Chief Executive Officer of Feion Green Ventures, explaining how to use the Jiko Kul to the IESR chefs.

Furthermore, IESR, through the Pika na Power Academy seed fund, is also funding an institutional eCooking project aimed at designing and installing a pilot institutional electric cooker for a primary school in Nairobi

2.4 Institutional eCooking stakeholders

The IESR organized a demonstration of the institutional eCooking pilot attended by stakeholders from neighboring institutions and participants from the Community of Practice (CoP) page. These demonstrations aimed to showcase the successful transition to electric cooking in IESR's kitchen and the resulting cost savings with the overall objective of influencing potential institutions to consider adopting electric cooking at their respective institutions.

3.0 COOKING TEST METHODOLOGY AND RESULTS

3.1 Controlled Cooking Test

IESR initiated a series of Controlled Cooking Tests (CCTs) tailored specifically for institutional electric cooking. This phase placed significant emphasis on the development of standardized recipes for the diverse menus regularly prepared in the kitchen. These recipes were methodically employed to prepare identical dishes under closely monitored and controlled conditions, using both electricity and LPG fuels. The primary objectives of these tests were to measure and compare various key factors, including energy consumption and cost.

3.2 Dish Selection for the CCT

Considering the popularity of the meals prepared at the IESR kitchen, a set of five meals was chosen for the exercise. These meals comprise bean stew, green grams stew, beef stew, rice, and githeri, as illustrated in Figures 7a, b, c, d, e. These dishes are not only favorites at the IESR canteen but also commonly prepared in other Kenyan institutions, including primary and high schools.

a) Beef stew

b) Green grams

c) Beans

d) Rice

e) Githeri

3.3 Ingredient Selection and Usage in the CCT

Throughout the CCT, ingredients for each dish were carefully selected and utilized in equal proportions for the two cooking cycles using LPG and EPC. Additionally, rice was prepared using a rice cooker. Table 1 shows the ingredients and their corresponding quantities used during the test for all cooking fuels.

Table 1: Proportions of ingredients used for each dish during the CCT.

Dish	Cooking Fuel/Technology	Number of cooking cycles for each fuel	Ingredients	Quantity
Beans	1. LPG 2. EPC	2	Beans	5 Kg
			Onions	1 Kg
			Tomatoes	1.5 Kg
			Coriander	100g
			Salt	120g
			Frying Oil	400 ml
			Cold water	6 L
Green Grams	1. LPG 2. EPC	2	Green Grams	4 Kg
			Onions	1 Kg
			Tomatoes	1.5 Kg
			Coriander	100g
			Salt	100g
			Frying Oil	300 ml
			Cold water	6 L
Beef stew	1. LPG 2. EPC	2	Beef	9.2 Kg
			Onions	1.2 Kg
			Tomatoes	1.8 Kg
			Coriander	100g
			Salt	120g
			Frying Oil	200 ml
			Fresh Garlic	100 g
			Fresh Ginger	60 g
			Cold water	1.5 L
Githeri	1. LPG 2. EPC	2	Maize	2 kg
			Beans	3 Kg
			Onions	1 Kg
			Tomatoes	1.8 Kg
			Coriander	100g
			Salt	120g
			Frying Oil	200 ml
			Cold water	6 L

Rice	1. LPG 2. EPC 3. Rice Cooker	2	Rice	4 Kg
			Salt	100 g
			Frying oil	200 ml
			Cold water	4 L

3.4 Cooking Procedures

The dishes selected for the CCT were prepared based on established cooking procedures for different cooking fuels. The recipes were clearly outlined prior to the CCTs to ensure consistency and to avoid disparities that might occur if prepared after the CCTs. Two cycles were conducted for each dish using specified cooking procedures with both electricity and LPG to ensure precision. Table 2 shows the recipes for the dishes prepared using an EPC and LPG, while Table 3 shows the recipes for preparing rice using the rice cooker.

Table 2: Recipes for various meals cooked in EPC and LPG during the CCT at IESR.

S/N	**Dish**	**Ingredients**	**Recipe EPC**	**Recipe LPG**
1	Beans stew	a) Beans b) Coriander c) Tomatoes d) Onions e) Salt f) Cold water g) Frying oil.	1. Wash the beans thoroughly the previous day (evening) and let them soak overnight. 2. Drain the water from the soaked beans and rinse again. 3. Cut the tomatoes and onions into cubes. 4. Switch on the EPC, press the clear and open-lid cooking buttons, and let the cooking pot heat for two minutes. 5. Pour the frying oil and let it heat for one minute. 6. Add onions and let them fry till they are golden brown. 7. Add tomatoes and let them cook to form a sauce and add salt to taste. 8. Add the cleaned-soaked beans and stir the mixture. Add the required amount of water, cover the cooking pot with its lid, and press the beans button. 9. Observe the pressurization of the EPC when the food starts cooking.	1. Wash the beans thoroughly the previous day and let them soak thoroughly. 2. Drain the water from the soaked beans and rinse again, 3. Cut the tomatoes and onions into cubes. 4. Let the cooking pot heat for two minutes, pour the frying oil, and let it heat for one minute. 5. Add onions and let them fry till they are golden brown. 6. Add tomatoes and let them cook to form a sauce and add salt to taste. 7. Add the soaked beans and stir the mixture. 8. Add 6L of water, cover the cooking pot with its lid. 9. Add 2L of water 10. Boil the bean stew 11. Reduce the heat to allow the bean stew to simmer. 12. Add 2L of water

			10. When the set time is over, raise the pressure valve to release the pressure till the lid can be opened. 11. Garnish the beans with freshly chopped coriander and serve.	13. Garnish the bean stew with freshly chopped coriander(dhania) and serve.
2	Green grams stew	a) Green grams b) Tomatoes c) Onions d) Coriander e) Salt f) Frying oil g) Cold water	1. Wash the Green Grams 2. Cut the tomatoes and onions into cubes. 3. Switch on the EPC, press the clear and open-lid cooking buttons, and let the cooking pot heat for two minutes. 4. Pour the frying oil and let it heat for one minute. 5. Add onions and let them fry till they are golden brown. 6. Add tomatoes and let them cook to form a sauce and add salt to taste. 7. Add the cleaned Green Grams and stir the mixture. 8. Add the required amount of water, cover the cooking pot with its lid, and press the Beans button. 9. Observe when the EPC pressurizes and the	1. Wash the green grams thoroughly. 2. Cut the tomatoes and onions into cubes. 3. Let the cooking pot heat for two minutes, pour the frying oil, and let it heat for one minute. 4. Add onions and let them fry till they are golden brown. 5. Add tomatoes and let them cook to form a sauce and add salt to taste. 6. Add the cleaned green grams and stir the mixture. 7. Add the required amount of water, cover the cooking pot with its lid 8. Observe when the water starts boiling and the food starts cooking. 9. Add 3L of water 10. Add 2L of water

			food starts cooking 10. When the set time is over, raise the pressure valve to release the pressure till the lid can be opened. 11. Garnish the Green Grams with freshly chopped coriander and serve.	11. Garnish the green grams with freshly chopped coriander and serve.
3	Beef stew	a) Beef b) Coriander c) Tomatoes d) Onions e) Garlic f) Ginger g) Salt h) Cold water i) Frying oil	1. Wash the meat thoroughly before cutting. 2. Cut the tomatoes and onions into cubes. 3. Grind the Ginger and Garlic into a paste 4. Switch on the EPC, press the clear and open-lid cooking buttons, and let the cooking pot heat for two minutes. 5. Pour the frying oil and let it heat for one minute. 6. Add onions and let them fry till they are golden brown. 7. Add the ginger-garlic paste. 8. Add tomatoes and let them cook to form a sauce and add salt to taste. 9. Add the meat, stir the mixture, and boil it for 10 minutes. 10. Add 1.5 liters of water, cover the cooking	1. Wash the meat thoroughly before cutting. 2. Cut the tomatoes and onions into cubes. 3. Grind the Ginger and Garlic into a paste 4. Let the cooking pot heat for two minutes. 5. Pour the frying oil and let it heat for one minute. 6. Add onions and let them fry till they are golden brown. 7. Add the ginger-garlic paste. 8. Add tomatoes and let them cook to form a sauce and add salt to taste. 9. Add the meat, stir the mixture, and boil it for 10 minutes. 10. Add the required amount of water, and cover the cooking pot with its lid. 11. Garnish the beef stew with freshly chopped

			pot with its lid, and press the meat button. 11. Observe when the EPC pressurizes and the food starts cooking 12. When the set time is over, raise the pressure valve to release the pressure till the lid opens. 13. Garnish the Green Grams with freshly chopped coriander and serve.	coriander and serve.
4	Rice	a) Rice b) Salt c) Frying oil d) Cold water	1. Select the rice and make sure it's clean and free of stones and foreign bodies. 2. Wash the rice with cold water at least 4 times to remove extra starch. 3. Drain the water and let the rice rest for 40 minutes. 4. Put the water into the cooking pot, add salt, cooking oil, and rice, and stir to make it level. 5. Cover the cooking pot. 6. When the rice is cooked, Use a wooden fork to separate the rice and serve as desired	1. Select the rice and ensure it's clean and free of stones and foreign bodies. 2. Wash the rice with cold water at least 4 times to remove extra starch. 3. Drain the water and let the rice rest for 40 minutes. 4. Put the water into the cooking pot and bring it to a boil. Add salt, cooking oil, and rice and stir to make it level. 5. Cover the cooking pot and let the rice cook. 6. Use a wooden fork to separate the rice and serve as desired.
5	Githeri.	a) Beans b) Maize	1. Wash the maize and beans 2. Cut the tomatoes and onions into cubes.	1. Wash the beans thoroughly the previous day (evening) and let them soak overnight.

		c) Coriander d) Onion e) Tomatoes f) Salt g) Cold water h) Frying oil	3. Switch on the EPC, press the clear and open-lid cooking buttons, and let the cooking pot heat for two minutes. 4. Pour the frying oil and let it heat for one minute. 5. Add onions and let them fry till they are golden brown. 6. Add tomatoes and let them cook to form a sauce and add salt to taste. 7. Add the cleaned beans and maize and stir the mixture. 8. Add 6 litres of water, cover the cooking pot with its lid, and press the beans button. 9. Observe the pressurization of the EPC when the food starts cooking. 10. When the set time is over, raise the pressure valve to release the pressure till the lid can be opened 11. Add 3 litres of water, cover the cooking pot with its lid, and press the beans button. 12. Observe the pressurization of the EPC when the food starts cooking	2. Drain the water from the soaked beans and rinse again. 3. Wash the maize 4. Cut the tomatoes and onions into cubes. 5. Let the cooking pot heat for two minutes. 6. Pour the frying oil and let it heat for one minute. 7. Add onions and let them fry till they are golden brown. 8. Add tomatoes and let them cook to form a sauce and add salt to taste. 9. Add the cleaned-soaked beans and maize and stir the mixture. 10. Add 9 litres of water and cover the cooking pot with its lid. 11. Add 21 litres of water as the food is cooking 12. Garnish the beans with freshly chopped coriander and serve.

			13. When the set time is over, raise the pressure valve to release the pressure till the lid can be opened. 14. Garnish the beans with freshly chopped coriander and serve.	

Table 3: Recipes used for preparing rice during the CCT.

S/N	**Dish**	**Ingredients**	**Recipe**
1	Rice	a) Rice b) Salt c) Frying Oil d) Cold Water	1. Select the rice and make sure it's clean and free of stones and foreign bodies 2. Wash the rice with cold water at least 4 times to remove extra starch 3. Drain the water and let the rice rest for 40 minutes 4. Put the water into the cooking pot and bring it to a boil. Add salt, cooking oil, and rice and stir to make it level 5. Cover the cooking pot and let the rice cook 6. When the rice is cooked, do not remove the lid immediately but wait for at least 7 minutes. This will allow the excess water to evaporate as the cooking process completes. 7. Use a wooden fork to separate the rice and serve as desired

4.0 CCT TEST RESULTS AND DISCUSSION

4.1 Feedback on the taste of food.

Although there was no specific post-eating client evaluation form to assess the taste of food prepared with the EPCs in comparison to those prepared using LPG, there was no client feedback from the over one hundred clients who were served daily from the kitchen about the difference in the taste of the food. Previously, the kitchen received feedback from clients on any major food-related issues. As such, this attested that the quality of food prepared using EPCs remained the same if not better than those prepared by LPG and was enjoyed by the clients. This was also because the same chefs, ingredients, and nearly identical recipes were used for preparing the meals in the CCT.

4.2 Comparison of cooking times for various cooking technologies

The total cooking times for the various meals prepared during the CCTs were measured and compared for the different cooking technologies. The best cooking times, primarily from the second cooking cycle, were recorded and used in the analysis. However, the variations in cooking times between cycles one and two were small. Cycle 1 was generally a learning cycle, and the experience gained led to better cooking outcomes in cycle 2. In some instances, both cycles 1 and 2 were conducted simultaneously. Figure 8 presents a comparative analysis of the cooking times for the various cooking technologies used in the CCT.

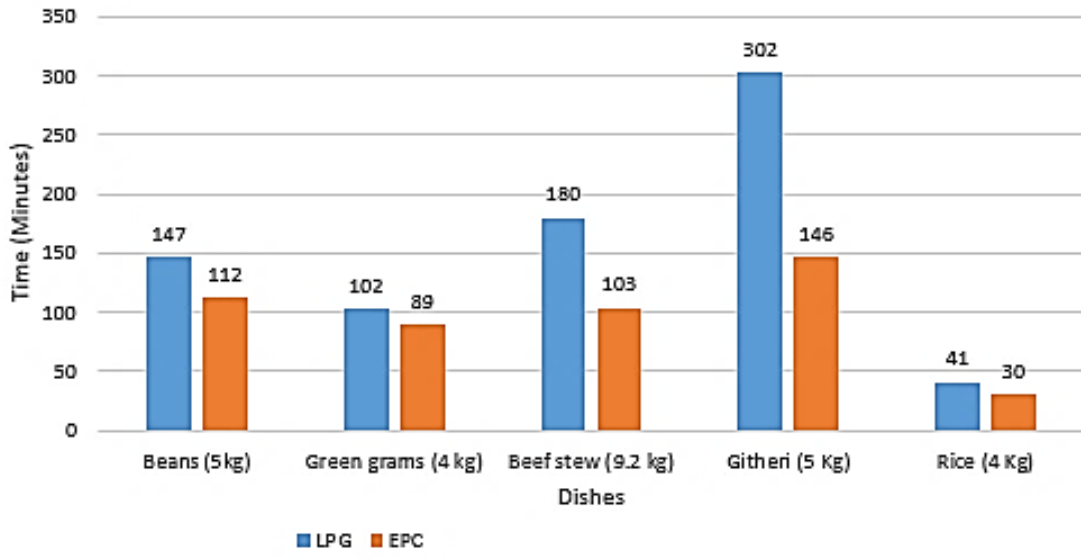


Figure 8: Comparison of cooking times for various cooking technologies.

The corresponding comparison for the computed time taken to prepare 1 kilogram of each dish using LPG and EPC is presented in *Appendix 2*.

4.3 Cooking cost comparison for different cooking technologies

The primary objective of the CCT test was to assess the cooking costs associated with various menus prepared using different cooking technologies. To achieve this goal, a combination of methods was employed. For instance, data on the energy consumed during the cooking cycles using electric appliances was gathered from the smart meter database, which recorded the energy consumed during the corresponding cooking times.

To calculate the total cost of cooking with electricity, a tariff rate of Ksh 30.58, designated for the IESR customer category (small commercial 2), was applied. On the other hand, the cost of cooking with LPG was determined by measuring the amount of gas consumed, essentially calculated as the difference between the initial weight of gas and the weight recorded at the end of cooking. The weight of gas was then multiplied by the average cost of gas per kilogram (Ksh 243) to determine the cost of cooking using LPG.

This comprehensive approach ensured the accurate determination of the cooking costs associated with each respective technology, thereby providing valuable insights into the economic implications of the different cooking methods employed in the CCT test, as shown in Figure 9.

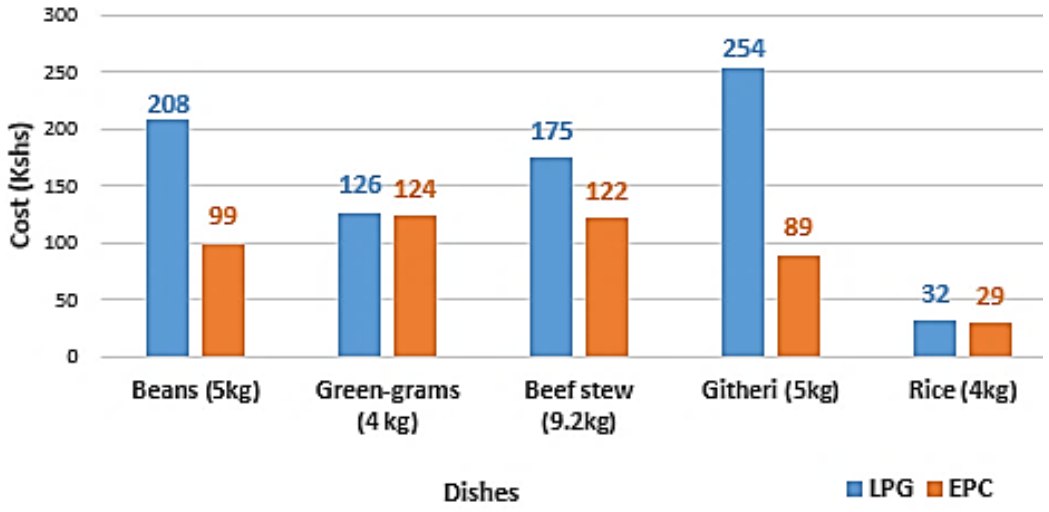


Figure 9: Cooking cost comparison for different cooking technologies.

The corresponding comparison for the computed costs of preparing 1 kilogram of each dish using LPG and EPC is presented in *Appendix 3*.

4.4 Efficiency comparisons for different cooking technologies

The efficiency of the cooking appliances was evaluated based on their performance in preparing a common menu within the shortest time and with the least energy consumption. In this test, the efficiency of the cooking appliances was determined by the time it took to prepare 4 kilograms of rice using the ingredients listed in Table 2. The efficiencies of the different cooking technologies, relative to LPG, are illustrated in Figure 10.

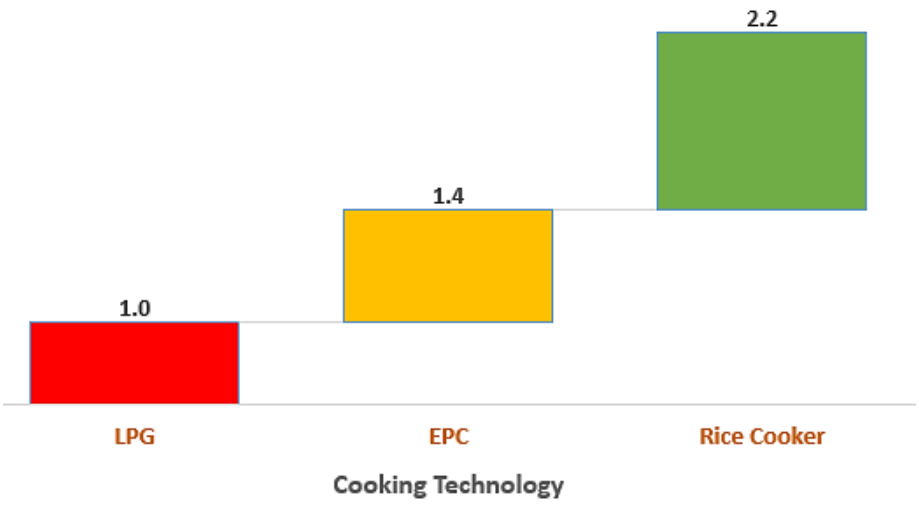


Figure 10: Efficiency Comparisons Among Various Cooking Technologies in Relation to LPG

5.0 CONCLUSION

The results of the CCT clearly demonstrate that cooking with EPC is not only more cost-effective than using LPG but also time-saving when preparing common menus. Furthermore, the cost-effectiveness of EPCs becomes even more evident when used to cook dishes that demand longer preparation times. For instance, using an EPC costs substantially less than half the expense of using LPG when preparing beans and githeri. Additionally, a comparison of electricity-based cooking methods reveals that rice cookers are significantly more efficient than EPCs when used to prepare common dishes like rice.

6.0 RECOMMENDATIONS

Based on the CCT results demonstrating the cost-effectiveness and efficiency of electric cookers, the following recommendations are made:

1. Institutions are encouraged to transition to electric cooking for their cooking needs in order to reduce costs and contribute to a reduction in carbon emissions.
2. Discounted eCooking tariffs should be implemented to encourage more institutions to adopt electric cooking. Reduced off-peak time of use tariffs can help redistribute the cooking energy loads. This will also contribute to a more balanced national energy demand profile and reduce instances of excess or unutilized renewable-based generation sources.
3. Energy meters used for CCTs should have ell defined time stamps for cooking events. As an improvement to address the challenge of accessing energy data, it is advisable to consider utilizing electric cooking appliances integrated with IoT meters to simplify the process and reduce the burden of acquiring additional meters for testing.
4. Due to the limited availability of large-capacity electric pressure cookers and rice cookers for institutional-level cooking in the country, it is recommended to enhance their production and also promote local assembly and repair of such appliances.

7.0 ACKNOWLEDGEMENTS

The successful realization of the Institutional eCooking pilot project at IESR was made possible through the support of the project committee members, including Dr. Jeremiah Kiplagat - KPLC, Dr. Patrick Karimi – KPLC, Samson Ondiek – KPLC, Irene Wanjohi – KPLc, Wairimo Njehia – KPLC, Annetriza Ekessa – KPLC, Jane Spencer – Loughborough University, Dr. Jon Leary– Gamos East Africa, Beryl Onjala – Gamos East Africa, Oscar Avukuse- KPLC, and a team of project support assistants and interns who contributed to the project in various capacities, including data recording and the preparation of various dishes.

Your valuable insights, guidance, and unwavering support played a pivotal role in ensuring the success of the implementation of the Institutional eCooking Project.

8.0 APPENDICES

Appendix 1 – Details of the institutional electric cooker supplier.

PEJON
FREIGHT MOVERS LTD
The movers that care

PEJON FREIGHT MOVERS LTD
Nellea Plaza, 2 nd Floor, Ngara Rd, Opp Total Petrol Station,
P.O. Box 4583-00506, Nairobi
Tel: +254 20 3592750
Cell 0728 333021/0773 011499
Email Info@pejonfreight.co.ke
Website: www.pejonfreight.co.ke

Research & Innovation Section,
Institute of Energy Studies & Research- (IESR),
Kenya Power- Ruaraka, NAIROBI.

25/06/2023
INVOICE NO. 4830

Att: Oscar

COMMODITY: ELECTRIC PRESSURE COOKER

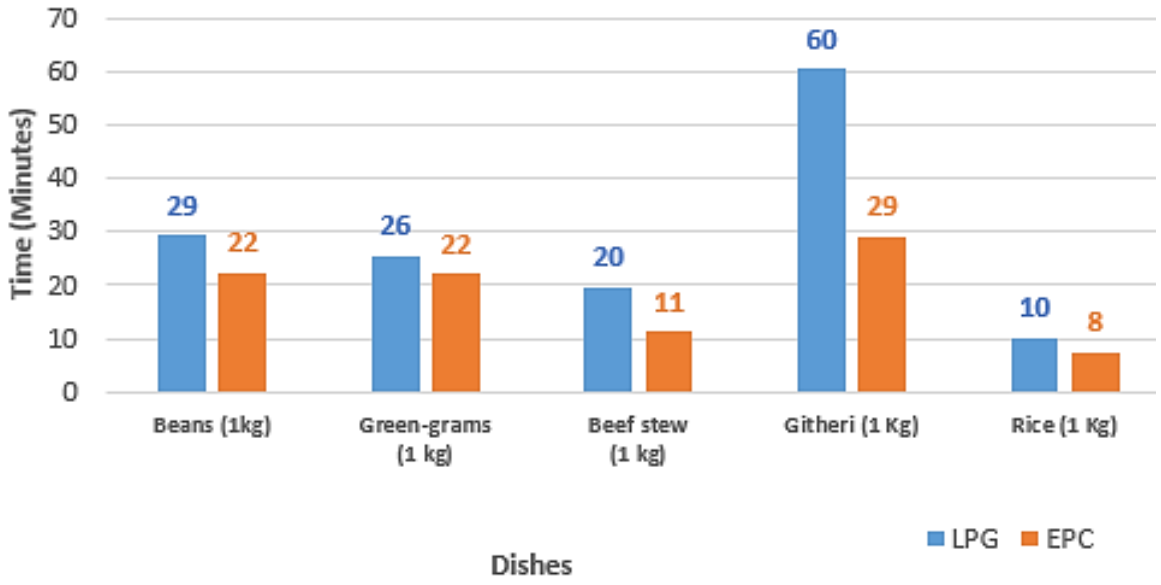
REF:	PEJ/AIRFRT/07/10/2023
Your Ref: Door to Door Shipment	KSHS
Taxes	57,760.00
Door to Door Freight Charges	118,750.00
KEBS Destination Inspection Fee	7,500.00
Purchase price	69,020.00
Agency fee	10,000.00
Terminal Handling Charges	12,500.00
Local Bank Transfer Charges	1,500.00
VAT on Agency Fee	1,920.00
Total amount	278,950.00

ACCOUNTS ARE DUE ON DEMAND

PIN No. P051178585Q VAT No. 0153801L

Home,Office & International Removals • Clearing & Forwarding • Warehousing • Transport

Appendix 2 – Time taken to prepare 1 kilogram of each shish using LPG and EPC



Appendix 3 – Cost of preparing 1 kilogram of each dish using LPG and EPC