eCook Tanzania Focus Group Discussions Summary Report

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Executive Summary

This report summarises the findings **from four Focus Group Discussions (FGDs) held in Tanzania**, with the aim of informing the development of a battery-supported electric cooking concept, eCook. It is part of a broader programme of work, designed to identify and investigate the opportunities and challenges that await in high impact markets such as Tanzania. Everyday cooks from rural, urban and peri-urban contexts were asked about their current cooking practices and how they aspire to cook in the future. The participatory sessions involved a live cooking demonstration of popular local foods with a prototype eCook device.

The evidence from these FGDs suggests that **LPG is currently the aspirational fuel** for most households in Tanzania, but cooking with electricity is an attractive proposition, especially since automated energy-efficient appliances such as the EPC can make cooking much easier. It confirms that **access, affordability (or perception of affordability) and reliability** are the **main barriers** holding back wider adoption of electric cooking, however safety is also a concern.

Unsurprisingly the focus groups confirmed that **it is mostly women do the cooking, however things are changing and eCook could catalyse this process**. Rarely do men cook even when there are home due to culture and norms. One group reported that in older times, it was actually a taboo for men to cook, it was seen as witchcraft. Some men might have liked to cook but social norms didn't allow. However, in this generation, some men do help their women in the households. It is likely that eCook will make cooking 'quicker' (easier), and that may be the trigger for a slight gender shift in responsibilities – by building on men's need to do things 'quickly'.

There is evidence of cooking practices changing, with **households previously relying solely on firewood now using significant amounts of charcoal and LPG**, especially in urban areas. Participants in per-urban Moshi are reportedly spending 1 USD/day on firewood, i.e. 30 USD/month if they buy every day! In urban Ubungo, those that use firewood spend less, approximately 0.45 USD/day, however this still works out at 13.5 USD/month! In contrast, where it is available, participants are spending roughly 9 USD/month on LPG.

The use of LPG for 'light' or soft foods, suggests that eCook's ability to cook 'heavy' foods (e.g. long boiling of beans) with a multicooker could be a strong selling point in its comparison with its main modern energy rival LPG. During the rainy season people tend to change what they cook due to unavailability of firewood and charcoal; only soft foods are cooked. Beans and makande are not cooked, instead ugali, vegetables, rice and other soft food are cooked repeatedly. The Moshi participants saw eCook, in particular the EPC, as particularly attractive, as it would allow them to cook makande to be cooked every day.

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Figure 1: Demonstrating how easy it is to cook 'heavy foods' such as beans in the EPC at Kifuru village.

There is a general perception that electricity is too expensive and too unreliable for cooking, with the few participants that had tried cooking with electricity dismissing it as a viable option for their household. It will be important that eCook is affordable and reliable in its early roll out, otherwise it may reinforce these notions. Willingness to pay to use a system like the one demonstrated during the session ranged from $2 USD/month (far too low) to $20 USD/month (which our modelling indicates is easily achievable as a discounted monthly payment on a battery-supported system).

Whilst the hotplate received quite negative feedback in the cooking demonstrations, the EPC, rice cooker and thermo-pot were much more attractive to participants. These comments do tend to confirm that **the existing hotplates on the market are not up to the job – and are doing the idea of electric cooking a disservice**.

The energy-efficient appliances were particularly attractive because they would make cooking easier and release time for other activities. The ability to automatically control heat on modern electric cooking appliances is likely to make cooking easier, which may well lead to more sharing of the cooking within the household. All groups felt they would be able to 'multitask' and focus on 'more important things'.

All of the dishes described by participants can be cooked in an EPC or rice cooker, as the main cooking process is boiling, sometimes with a bit of shallow frying. Pressure cooking would save more on some dishes than others. Recipes with long boiling sections, where all ingredients are added at beginning have the highest energy saving potential. Frying & depressurising to add ingredients one by one throughout cooking process is easy enough to do on an EPC but will increase energy demand significantly. The clay pot was considered useful, as it retained heat, so kept cooking after the fire went out. Some participants put charcoal on top of the lid when cooking pilau, as it heats the food from above and below. The insulation on a rice cooker and EPC perform similar functions, ensuring even cooking & energy-efficiency.

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1 Introduction

This report presents one part of the detailed in country research carried out to explore the market for eCook in Tanzania. In particular, this in country work aims to gain much greater insight into culturally distinct cooking practices and explore how compatible they are with battery-supported electric cooking. The report is rich with detail and is intended to provide decision makers, practitioners and researchers with new knowledge and evidence.

This report presents findings from four focus groups designed to inform the future development of eCook within Tanzania. It is one component of a broader study designed to assess the opportunities and challenges that lay ahead for eCook in high impact potential markets, such as Tanzania, funded through Innovate UK's Energy Catalyst Round 4 by DfID UK Aid and Gamos Ltd. (https://elstove.com/innovate-reports/). A much deeper analysis of the data collected during this project was supported by the Modern Energy Cooking Services (MECS) programme, which included the writing of this report.

The overall aims of the Innovate project, plus the series of interrelated projects that precede and follow on from it are summarised in in *Appendix A: Problem statement and background to Innovate eCook project*.

1.1 Background

1.1.1 Context of the potential landscape change by eCook

The use of biomass and solid fuels for cooking is the everyday experience of nearly 3 billion people. This pervasive use of solid fuels and traditional cookstoves results in high levels of household air pollution with serious health impacts; extensive daily drudgery required to collect fuels, light and tend fires; and environmental degradation. Where households seek to use 'clean' fuels, they are often hindered by lack of access to affordable and reliable electricity and/or LPG. The enduring problem of biomass cooking is discussed further in *Appendix A: Problem statement and background to Innovate eCook project*, which not only describes the scale of the problem, but also how changes in renewable energy technology and energy storage open up new possibilities for addressing it.

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1.1.2 Introducing 'eCook'

eCook is a potentially transformative battery-supported electric cooking concept designed to offer access to clean cooking and electricity to poorer households (HHs) currently cooking on charcoal or other polluting fuels (Batchelor 2013; Batchelor 2015a; Batchelor 2015b). Enabling affordable electric cooking sourced from renewable energy technologies, could also provide households with sustainable, reliable, modern energy for a variety of other purposes.

A series of initial feasibility studies were funded by UK Aid (DfID) under the PEAKS mechanism (available from https://elstove.com/dfid-uk-aid-reports/). Slade (2015) investigated the technical viability of the proposition, highlighting the need for further work defining the performance of various battery chemistries under high discharge and elevated temperature. Leach & Oduro (2015) constructed an economic model, breaking down PV-eCook into its component parts and tracking key price trends, concluding that by 2020, monthly repayments on PV-eCook were likely to be comparable with the cost of cooking on charcoal. Brown & Sumanik-Leary's (2015), review of behavioural change challenges highlighted two distinct opportunities, which open up very different markets for eCook:

- PV-eCook uses a PV array, charge controller and battery in a comparable configuration to the popular Solar Home System (SHS) and is best matched with rural, off-grid contexts.
- Grid-eCook uses a mains-fed AC charger and battery to create distributed HH storage for unreliable or unbalanced grids and is expected to best meet the needs of people living in urban slums or peri-urban areas at the fringes of the grid (or on a mini-grid) where blackouts are common.

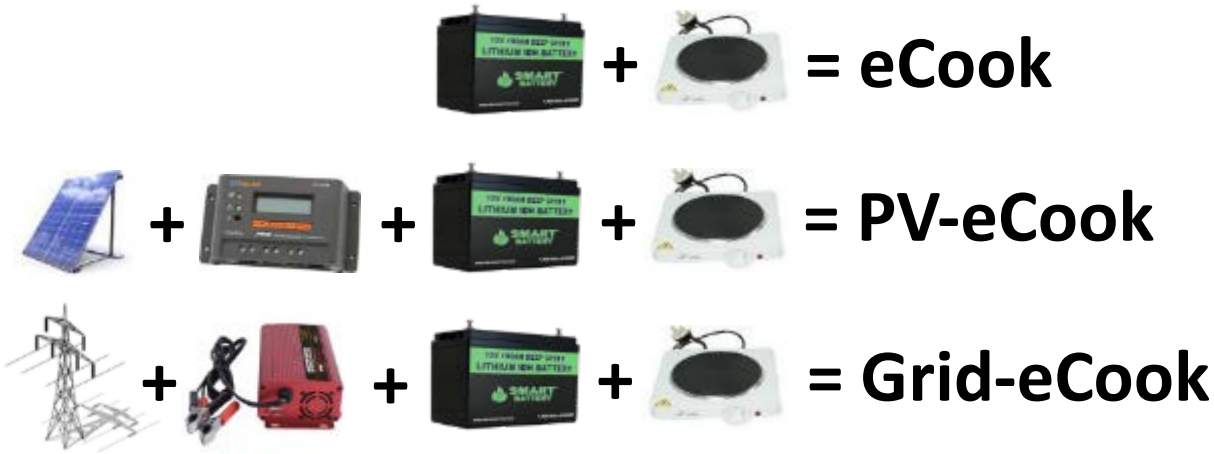

Figure 2: Pictorial definitions of 'eCook' terminology used in this report.

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1.1.3 eCook in Tanzania

Given the technical and socio-economic feasibility of the systems in the near future, Gamos, Loughborough University and the University of Surrey have sought to identify where to focus initial marketing for eCook. Each country has unique market dynamics that must be understood in order to determine which market segments to target are and how best to reach them. Leary et al. (2018) carried out a global market assessment, which revealed Tanzania as the second most viable context for PV-eCook, due to its strong SHS industry and the fact that it is one of the world's biggest charcoal markets, creating several global deforestation hotspots.

The accompanying reports from the other activities carried out in Tanzania can be found at: https://elstove.com/innovate-reports/ and www.MECS.org.uk.

1.2 Aim

The aim of this study is to gain a deeper understanding of how Tanzanians currently cook and how they aspire to cook.

In particular, the objectives of the study are:

- To assess the compatibility of current and aspirational cooking practices with battery-supported electric cooking (eCook).
- To identify design modifications and marketing strategies that can enable the generic eCook concept to evolve around the needs and aspirations of Tanzanian cooks.

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2 Methodology

Four focus groups were carried out to gain further insight into how Tanzanians currently cook and how they aspire to cook. A series of questions were designed to guide the discussion (see Appendix B: Focus group design brief), however open dialogue was encouraged when unforeseen issues were brought up by the participants. The participatory sessions involved a live cooking demonstration of popular local foods with a prototype eCook device. An range of energy-efficient electric cooking appliance were demonstrated during each session, inviting comments from the audience on how compatible the device was with the current and aspirational cooking practices.

Table 1 shows the four locations selected for the focus group discussions. These contexts were chosen to be able to compare and contrast the issues faced by people in rural and urban areas, of different income levels and who are using different cooking fuels.

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Table 1: Description of the 4 locations chosen for focus group discussions.

Location	Context	Participants	Context	Fuels
Kifuru 	Off-grid village	Low income. All female everyday cooks.	TaTEDO has carried out various sustainable energy activities here.	Predominantly firewood & charcoal, some LPG.
Kibindu 	Off-grid village	Low income. All female everyday cooks.	TaTEDO has recently developed a mini-grid for low power household applications.	Firewood & charcoal.
Moshi 	Peri-urban grid-connected village	Middle- & high-income. All female everyday cooks.	Local church group with links to TaTEDO.	Firewood, charcoal & LPG.
Ubungo 	Urban	Middle-& lower-income. All female everyday cooks.	Cooking diaries participants & neighbours	Firewood, charcoal, kerosene & LPG.

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3 Results

3.1 Gender roles

Unsurprisingly the Moshi focus group stated that it was mostly women do the cooking while the man is at work. Rarely do men cook even when there are home due to culture and norms. Only when the woman is sick or travelled does he cook; they all agree that with e-cookers men might be willing to cook. In Kibindu they also stated that women are the ones who cook all the time. Men do not cook because they think they will be controlled. Occasionally, female kids help their mothers to cook. However, in Ubungo there were two households where the men did some cooking. While Mwanaidi did most of the cooking, her husband at least prepared the tea, and in Neema Shai's household they share the cooking 50/50. For Imelda she joked that the husband 'gave recommendations'.

THE COMMENT ABOUT MEN LIKING 'QUICK FOODS' IS INSIGHTFUL. IT IS LIKELY THAT ECOOK WILL MAKE COOKING 'QUICKER' (EASIER), AND THAT MAY BE THE TRIGGER FOR A SLIGHT GENDER SHIFT IN RESPONSIBILITIES – BY BUILDING ON MEN'S NEED TO DO THINGS 'QUICKLY'.

They noted that in the old times they had a patriarchal system; so women do all the cooking and men just do 'queening'. It was actually a taboo for men to cook, it was seen as witchcraft. Other men would have liked to maybe cook but norms didn't allow. However, in this generation- some men help their women in the households. The group felt that most men have little skill regarding the cooking and so some women prefer to cook themselves. They noted that men prefer to prepare quick foods, they have quicker and shortcut ways to cook but they are poor when it comes to energy conservations and budgeting, and they don't clean after themselves and use more utensils.

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Figure 3: A cooking diaries participant explaining to other focus group participants in Ubungo how easy it is to cook one of Tanzania's major staples, ugali, in a rice cooker.

3.2 On taste and types of food

Not everybody cooks in more or less the same way? In Moshi participants reported:

- ✓ Different cooking styles
- ✓ Different tastes
- ✓ Health recommendations
- ✓ Fuel prices drive to change the cooking style and even type of food

"You can cook any food anywhere however, different tastes drive the need to use different fuels". Type of food and the time it takes to prepare determines whether to use either a normal pot, good for rice, bananas, pilau or clay pot, better for kiburu, makande. The way of cooking has moved more

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to boiling to preserve nutrients rather than frying; before they would fry onions until burning. Ubungo participants reported using a normal pot (chungu) and metal pan on charcoal and firewood stoves.

During the rainy season people tend to change what they cook due to unavailability of firewood and charcoal; only soft foods are cooked. Beans and makande are not cooked instead ugali, vegetables, rice and other soft food are cooked repeatedly. Strategy - In rainy season, they buy more firewood and store them in the house. In extra room, above the three stone so smoke and heat from below can keep drying them. They also use this place to dry bananas when there is surplus and crush them to make banana flour and ripen bananas.

Over the years cooking has changed. In Ubungo the ways of cooking have changed, nowadays people use ingredients such as ginger, garlic, green paper, carrot, etc; previously people cook without putting any ingredients (flavouring). "These changes are good as it brought good taste."

The focus groups were asked to discuss in some detail a few of the favourite dishes and to describe the cooking process. Table 1 at the end of this section summarises the 'recipes'.

THE BY PRODUCT OF SMOKE – KEEPING INSECTS AWAY OR AS IN THIS CASE, DRYING AND RIPENING BANANAS, IS POTENTIALLY A REAL LOSS IN TRADITIONAL PRACTICE – BUT HOPEFULLY THE BENEFITS OF ECOOK WOULD OUTWEIGH SUCH A LOSS & PEOPLE WILL FIND ALTERNATIVES. (PERHAPS SOLAR DRYING UNDER PLASTIC NEEDS TO BE PROMOTED WITH ECOOK?)

3.3 Fuels and costs

Charcoal and firewood were easily available in all contexts. In Moshi, firewood was bought at 3,000 or 2,000 TZS for one day on dry season but reduced wood during the rainy season some of them collect firewood. In Ubungo, firewood is bought at TZS 500 for cooking one meal, 1,000 for cooking per day. In Kibindu, charcoal is bought at TZS 1,500 for a 20 litre bucket during dry season and 2,000 during rainy season. In Moshi participants also noted that charcoal is expensive in the rainy season, almost double the price. People still use charcoal in the rainy season, but it is very expensive, 2,000 for 2kg, so only when they don't have firewood, or all firewood is wet. In Ubungo, firewood is 2,000 for 20kg, but only used for business occasionally.

PARTICIPANTS IN MOSHI ARE REPORTEDLY SPENDING 1 USD/DAY ON FIREWOOD, I.E. 30 USD/MONTH, IF THEY BUY EVERY DAY! IN UBUNGO, THE PRICE IS LOWER, AT 0.45 USD/DAY, HOWEVER THIS STILL WORKS OUT AT 13.5 USD/MONTH!

IN CONTRAST, WHERE IT IS AVAILABLE, PARTIPANTS ARE SPENDING JUST 9 USD/MONTH ON LPG.

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In Moshi, about 6 in the group have LPG, but it was only used to prepare light foods like tea for fear of running out of gas. The small cylinder costs 20,000 to refill and lasts 3 months. Big cylinder costs 48,000-50,000 TZS and lasts about 2-3 months - she only uses it to cook light foods too like the last stages of frying food and simmering. In Moshi, gas is available always; price increase only comes on increased price in raw product and profit greed. In Kibindu, the big cylinder costs 40k-55k and the small cylinder 19k-20k TZS.

In Ubungo, participants one participant reported using kerosene stove every day for tea and porridge. 1 litre costs 2,200 TZS and lasts about one week.

THE USE OF LPG FOR 'LIGHT' FOODS, SUGGESTS THAT ECOOKS ABILITY WITH A MULTICOOKER TO COOK 'HEAVY' FOODS (LONG TERM BOILING OF BEANS) COULD BE A SELLING POINT IN ITS COMPARISON WITH IT MAIN MODERN ENERGY RIVAL LPG.

3.4 Cooking with Electricity

In Kifuru, they only use charcoal and firewood; they have never used gas or electricity because of fear to cook with it and inexperience; after practice they will use. In Ubungo, some had tried it, but feared the high cost. They declared it not a reliable form of cooking. When they did use it, they used a rice cooker. There was no experience of kettles.

In Moshi, the Chairwoman has an electric stove, but has it locked in the store due to "the expensive nature of electricity". She's the only one who has ever used an electric stove. Half of the group do not have electricity connection, those who have it use it for lighting, TV, radio, fridge and ironing.

IT WILL BE IMPORTANT THAT ECOOK IS SUCCESSFUL & AFFORDABLE IN ITS EARLY ROLL OUT, OTHERWISE IT MAY REINFORCE THE NOTION THAT ELECTRICITY IS EXPENSIVE.

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Figure 4: Introducing the range of modern energy-efficient electric cooking appliances now available in Kibindu.

3.5 Future cooking practices - what and how would you prefer to cook in the future?

In Ubungo most people would like to use a combination of gas and electricity because of convenience and health issues. They would like to add chips and roast potatoes to their diet. In Moshi they focused on the idea they would like to 'have ease' in their cooking. Wet firewood in the rainy season is difficult.

In Moshi, participants would like to prevent smoke preferably using clean cooking appliances. Firewood is very smoky.

They would also like to save time. And they felt that such a change would not affect the type of food they cook because they have 'common food'.

Moshi would like to advance their cooking, cook with electricity and ensure makande to be cooked every day.

In terms of the positive impacts reliable affordable cooking with electricity would yield, all three groups noted that they would save time and maintain a clean house or environment. Two of the three groups said that the cooking would be easier and that one would be able to cook anytime and anywhere. Eat hot food anytime.

SAVE TIME

LESS SMOKE

'HAVE EASE'

CLEAN HOUSE

OTHER ACTIVITIES

THE GROUP RECOGNIZED THAT ECOOK HAD THESE & OTHER POTENTIALS. THIS CERTAINLY BODES WELL FOR ANY MARKETING CAMPAIGN – IT SUGGESTS PEOPLE WILL RESPOND WELL – IF ECOOK IS AFFORDABLE & RELIABLE.

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Figure 5: FGD facilitator demonstrating how simple it is to cook with an EPC – just turn the timer dial, put the lid on and leave it to do the work for you.

Indeed, two of the three groups went on to say that it would make their life overall easier, and release tome for other activities. All three felt they would be able to 'multitask, and focus on the 'important things', that it would allow for income generating activities e.g. women groups. Moshi noted that Save time and money to collect the firewood which takes at least 3 hrs if you are a quick walker and know the exact place to find firewood which lasts for almost 4days. All ladies in the group do farming, animal rearing and one of them does knitting. The chairlady is a pharmacist with her own pharmacy.

Moshi brought out the health and environment benefits. They noted that using electricity would likely result in Improved health; red eyes, running noses, chest pains and in conserving environment.

They would all use electricity if it was not expensive and it was reliable. However, it would have to be a device that does not depend on grid electricity which is not reliable.

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3.5.1 What prevents people from using this ideal fuel/device?

If electricity were available in everybody's homes and had no cost, everybody would use electricity. However, it does cost although the group noted that recently buying units has been accessed through mobile payment making it easier to buy more, which they contrasted with gas where one has to travel to the vendor. Kibindu also noted that if the cost of the system and the appliances are not expensive, they will use. They stated that they would prefer the cooking system that will allow them to pay per month for a certain time and thereafter own the system

Kibindu wondered whether the appliances were affordable and the life expectancy of the appliances (are they less robust, could they be spoiled easily).

There is of course a generalised lack of electrification. There are also some fears. In Kibindu, they felt that fear of death at first prevents from using electricity but if awareness and capacity is created, they will use.

5000=$2: THAT IS A BIT LOW

15000=$6: STILL LOWER THAN OUR EXPECTATIONS FOR 2020 FOR A FULL SHS SYSTEM

50000 = $20: COULD SELL THESE TWO PEOPLE A SYSTEM TODAY!

IT SUGGESTS THAT IN MOSHI, THERE COULD BE SOME CUSTOMERS FOR A SUITABLY RELIABLE SYSTEM.

Ubungo wondered whether electricity would be able to help preserve food by smoking? They noted that stoves are also used for space heating, and the smoke useful to keep insects away

3.5.2 Willingness to pay

For Moshi 30k-50k per month would be the maximum price people would be willing to pay to use an eCook device (per month)?

However, in the other groups everyone was willing to pay if it was monthly, it was just a question of how much

- ✓ 5 people - 5000
- ✓ 3 people - 10,000
- ✓ 2 people – 15,000

They preferred the model where a company like TANESCO would take care of maintenance and repairs

In the other group the range of monthly willingness to pay was slightly higher.

Willing to pay per month

- ✓ 1 person – 5,000
- ✓ 9 people - 10,000
- ✓ 2 people – 50,000
- ✓ 1 people – 25,000

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- ✓ 2 people – 30,000

3.6 Gender roles in the future

The group in Moshi thought that men might cook more if they used electricity. Most thought that women will do other things to improve their livelihood, most are businesswomen, women groups and chamas. They will not need to hire househelps who still need to be paid therefore saving more money. Moshi noted that women will use the saved time to do farm activities and other family issues.

On getting women involved with the new approach, the group was asked whether women who sell charcoal also sell 'airtime vouchers' for eCook devices? The group noted that they could suggesting that all businesses go with trend. They will find other business opportunities.

In Kibindu, they felt that men will easily cooperate on cooking. They thought that the change to electricity would mean that the cooking will be rotationally between men and women because with eCook no one will know that you are cooking.

THE COMMENT ABOUT MEN RELATES TO THEIR OPENING GENDER COMMENTS – THAT MEN LIKE 'QUICK FOODS' KIBINDU THOUGHT THAT IT WOULD CAUSE MORE SHARING OF THE COOKING WITHIN THE HOUSEHOLD – BY BUILDING ON MEN'S NEED TO DO THINGS 'QUICKLY'.

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3.7 Prototyping feedback

Figure 6: Focus group participants and facilitators with the eCook demonstration prototype at the Church hall in Moshi.

After some demonstration of electrical appliances, the group had the following observations.

Hot plate:

- ✓ Very slow
- ✓ Good food
- ✓ Only cooks when electricity is on
- ✓ Cooking in leisurely way
- ✓ No smoke
- ✓ Improved on electric shocking (as opposed to a hotplate?)
- ✓ (a need for) Safety measures- wear rubber shoes, be dry (to avoid shocks)

THESE COMMENTS DO TEND TO CONFIRM THAT THE EXISTING HOTPLATES ON THE MARKET ARE NOT UP TO THE JOB – AND ARE DOING THE IDEA OF ELECTRIC COOKING A DISSERVICE.

Rice cooker:

- ✓ thought to just cook rice
- ✓ Can cook ugali without hitches
- ✓ Can't fasten the cooking of beans and makande

RICE COOKERS MISNAMED! CAN COOK OTHER THINGS!!

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Figure 7: Discussing the range of foods that can be cooked in a rice cooker and how the batteries enable you to use it anywhere with FGD participants in Kifuru village.

Thermo-pot:

- ✓ Just boils water
- ✓ Keeps water hot for a period of time

The observations on the EPC demo were recorded as “all positive vibes”.

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Figure 8: Focus group participants in Moshi discussing the compatibility of the Electric Pressure Cooker (EPC) with the dishes they like to cook.

3.8 Questions from the groups

On being told that the system might offered on a pay monthly basis, the group were in tune with the ideas enough to ask sensible clarifying questions.

	Answer given
Can I own the system?	Yes, but then you will have to take care of the system after that; maintenance and repairs
How much is the whole system?	500 USD
What's the lifetime of the batteries?	About 6yrs
How many lights bulbs can you connect to the system?	Depends Any bulbs preferably energy saving
Will the company do the installations and wiring?	Yes

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The demonstration of appliances brought positive response (especially with pressure cooker) with few questions:

- Is it safe to cook with these appliances?
- What is the different between pressure cooker and rice cooker?
- How can we get the pressure cooker?

The Kibindu group also asked:

How much is the whole system?	Answer given: Tshs 1,000,000
How much is the pressure cooker?	It ranges from Tshs 120,000 to 170,000
What is the payment mode?	Loaned and pay monthly forever, Loaned pay monthly for certain period after that owns it.
Will the company do maintenance?	If it is owned by company
When will this business start in Kibindu?	Still in research but if you want to cook with electricity you can buy appliances

3.9 What are the desirable features of the ideal cooking appliance?

The Ubungo group suggested:

- ✓ Portability?
- ✓ Multitasking – can people leave food to cook and get on with something else?
- ✓ Access to pot (do you need to stir it the whole time)?
- ✓ Importance of safety- with good awareness and education on usage, safety becomes more efficient. Most just have a fear of some appliances
- ✓ Suitable mode of acquisition - self-build/cash/pay-as-you-go/utility
- ✓ Skills for operation/maintenance
- ✓ Access to fuel/device retailers

THE FINANCIAL QUESTIONS SUGGEST THERE WILL NEED TO BE A SHIFT IN THINKING – PEOPLE WANT TO OWN THE EQUIPMENT EVENTUALLY - WILL A UTILITY MODEL WORK?

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Figure 9: The full solar electric cooking system on display in Kifuru, illustrating how eCook enables modern cooking anywhere.

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4 Cooking practices and foods cooked

4.1 Kibindu

What do you cook?	How do you cook it?	Possible in EPC?
Ndizi, maharage	Light firewood, boil beans, prepare bananas while beans get ready Prepare tomatoes, onions carrots. put together with banana till ready add a little coconut milk and serve. Mostly cooked during the day.	Yes
makande	Sort your beans and wash then mix with washed maize then Soak, prepare dry firewood and light fire. This needs a lot of firewood and heat. Put into the fire and keep lighting the fire. Prepare carrots, onions, green pepper, garlic. When beans are almost ready; taste to determine. Add the ingredients with salt and oil and cover reduce the heat by removing some of the wood. Then wait to simmer. Taste to determine if they are ready.	Yes
Pilau	Prepare wood, prepare meat with onions tomatoes carrots and boil meat to make it soft if not already soft then fry all the meat with ingredients and add water. Sort the rice and wash it the mix with the meat in the fire then reduce heat and wait to simmer as it cooks	Yes
Ugali	Prepare green vegetables and cut into tiny pieces and fry with onions. Bring water to boil and make porridge then after boiling add more flour and keep turning till ready then move it to a plate ready for serving. Clay pot cooks differently as it retains heat and keeps cooking food even after fire is gone.	Yes
Kiburu (mtore wa maharage)	Prepare fire and clay pot put beans and water into the pot until ready for adding bananas (mshale, ng'ombe) then add and wait for it to cook well and add a little magadi and remove the foam. Put banana leaves to steam it and let it simmer as you do other activities. Wait till you smell the tasty flavour, add a little water to your liking then mash it traditionally. Cooked anytime	Yes

ALL OF THE DISHES DESCRIBED BY PARTICIPANTS CAN BE COOKED IN AN EPC, AS THE MAIN COOKING PROCESS IS BOILING, SOMETIMES WITH A BIT OF SHALLOW FRYING.

PRESSURE COOKING WOULD SAVE MORE ON SOME DISHES THAN OTHERS. RECIPES WITH LONG BOILING SECTIONS, WHERE ALL INGREDIENTS ARE ADDED AT BEGINNING HAVE THE HIGHEST ENERGY SAVING POTENTIAL. FRYING & DEPRESSURISING TO ADD INGREDIENTS ONE BY ONE THROUGHOUT COOKING PROCESS IS EASY ENOUGH TO DO ON AN EPC BUT WILL INCREASE ENERGY DEMAND SIGNIFICANTLY.

This research is funded by DfID/UK Aid and Gamos through the Innovate UK Energy Catalyst and the MECS programme.

4.2 Moshi

What do you cook?	How do you cook it?	Possible in EPC?
Ugali (sembe)	Light fire (firewood or charcoal), prepare metal pan and put water and put into the fire, leave the water to get warm, prepare porridge, after it boil put lid on for some time and then prepare ugali.	Yes
Ugali (Cassava)	Light fire, put metal pan of water into the fire, leave the water until it boils, put cassava flour and prepare your ugali.	Yes
Rice (vegetable oil)	Light charcoal stove, prepare rice, put a metal pan of water into the fire, leave the water to boil, put the boiled water aside, take another metal pan, put cooking oil, put ingredients (onions, carrot, green paper) and rice, fry for some time, put some amount of hot water, put a lid, after 10 minutes steer it and then put the lid on, put charcoal on top.	Yes
Rice (coconut)	1st Woman: Scrape the coconut, prepare the 1st coconut juice and put aside, prepare 2nd and 3rd coconut juice put together. light up charcoal, put the 2 and 3rd coconut juice into the metal pan and put into fire, steer it until it boiled, put rice and put lid on, after 5 to 10 minutes steer and put the 1st coconut juice (tui bubu), put lid on and put charcoal on top. 2nd Woman: Scrape the coconut, prepare the coconut juice and put aside, light up charcoal, put the all coconut juice into the metal pan and put into fire, steer it until it boiled, put rice and put lid on, after 5 minutes steer, put the lid on and put charcoal on top	Yes
Pilau	1st woman: Prepare all ingredients (garlic, ginger, onions), put metal pan into the fire with cooking oil, put ingredients when it becomes light brown, put rice and fry for some time, put enough water and steer, put lid on, put charcoal on top. 2nd woman: Boil water and put aside, fry the onions until it become light brown (kahawia), put garlic, ginger and pilau ingredient and steer, put water (estimate enough water) and then put rice, put lid on.	Yes
Pilau Nyama	Prepare garlic, onions and lemon, mix with meat and boil, ensure it has enough soup. Put the metal pan on fire, put cooking oil and ingredients (onions, garlic, ginger) and fry, put rice and fry for some time, put soup on the rice and steer, add some water if soup is not enough, steer and the lid on.	Yes
Maharage	Prepare beans, wash and put on the metal pan, put ginger, garlic and green paper, put on fire. Scrape the coconut, prepare 1st and 2nd coconut juice and put aside. After the beans is ready, put the second coconut juice and leave for until it boils without lid on, put the 1st coconut juice and leave until it boils.	Yes
Mchunga	1st Woman: Sort out the mchunga and wash, put the metal pan on the fire, put salt then mchunga and boil, steer until it is ready. Prepare coconut then fry your mchunga as other vegetable. 2nd Woman: Sort out mchunga rub with salt and wash, boil mchunga and then fry	Yes

THE CLAY POT WAS CONSIDERED USEFUL, AS IT RETAINED HEAT, SO KEPT COOKING AFTER THE FIRE WENT OUT. SOME PARTIPANTS PUT CHARCOAL ON TOP OF THE LID WHEN COOKING PILIAU, AS IT HEATS THE FOOD FROM ABOBE AND BELOW. THE INSULATION ON A RICE COOKER AND EPC PERFORM SIMILAR FUNCTIONS, ENSURING EVEN COOKING & ENERGY-EFFICIENCY.

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Kisamvu	Sort out, put into the kinu, add onions and paper, pound until it becomes somehow soft, put into the metal pan, wash the kinu and use that water to boil the kisamvu until it is ready, fry as other vegetables.	Yes
Mlenda (Bwando)	Sort out and wash, put on the metal pan, add nyanya chungu, put magadi, put into fire and boil until it is ready.	Yes
Ndizi Nyama (Malindi)	Boil water and put enough soup. Prepare banana, tomato, garlic and ginger, coconut. Wash banana and put on the metal pan, add all ingredients, put soup and boil. When it is about to be ready, put the meat and coconut.	Yes

THE ABILITY TO AUTOMATICALLY CONTROL HEAT ON MODERN ELECTRIC COOKING APPLIANCES IS LIKLEY TO MAKE COOKING EASIER.

4.3 Ubungo

What do you cook?	How do you cook it?	Possible in EPC?
Matoke, meat, beans	Boil meat and beans, fry ingredients then add bananas meat and beans to make stew. sometimes covered with banana leaves to steam	Yes
Ugali and fish-sato (from Lake Victoria)	Scale and wash then boil with onions tomatoes and some oil for a short time like 10mins, others add coconut milk-first grind is put aside, use the second grind in the stew first then add the first grind later to have a thick stew and if you use coconut milk you will have to let it boil it for like 15mins in it put it away. Boil water for ugali (sembe), just as it gets hot add some flour to avoid cuddles then stir and cover repeat until its ready. (Dona) the unground and cleared maize flour process is the same but it takes longer to cook	Yes
Rice meat	Cut into pieces and wash to cook first she uses gas. Grind Tangawizi and add to meat to simmer and cover, have tomatoes carrots, tangawizi, onions, hoho, garlic, black pepper then add to the simmered meat, add oil and water, and sprinkle some lemon juice and cover to boil for 15 - 20mins. Comes out thick and tasty stew and put side. Rice- wash and rinse thoroughly and drain the water, have boiled water, add salt, a little oil and the rice and sprinkle (in a charcoal stove. Reduce charcoal heat when it the water drains out you stir it then put charcoal on the cover for about 10mins with very small heat under. Green veggies- cut, wash and put onions, hoho and carrots and oil to simmer for 5mins.	Yes
Ugali (cassava) and dried shark (papa)	Shark- wash with hot water or boil it and prepare the ingredients, squeeze coconut milk, have oil in the pot add onions, tomatoes and other, add salt. Put the shark in and let it boil and add the first squeeze and boil for like 5 mins then add the other coconut milk then boil for 5 mins, its ready Dry your cassava, grind by hand or machine. Put water and add flour before it starts boiling on firewood heat for like 5-6 minutes. This is because firewood heat is very strong.	Yes
Makande	Maize is not dried. Light the fire, have water boil, add your maize in for like 15mins when the water is out adding beans either dried or fresh and add more water to boil till ready. You add oil and salt for taste and its ready.	Yes

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	Dried maize- 0.5 kgs, beans 0.5 kg mix wash and put in the pressure cooker and add water and set it to 90minutes, depressurize. Prepare onions, hoho, carrots and add in, grind coconut milk and add the second grind, salt and any other spices, boil then add first grind then wait for the coconut to get ready then serve.	
Pork 1kg	Charcoal stove-Wash and put in the pot, add tangawizi, salt lemons and simmer. Prepare potatoes (4), onions, chilli and garlic. add potatoes and let it boil, when the water is coming to end starts to brown add all the ingredients and let simmer till ready.	Yes

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5 Conclusion

The FGDs have confirmed that there is a strong market for eCook products and services in Tanzania. The convenience of being able to turn on an electric stove and control the heat output at the press of a button is highly valued by the majority of FGD participants. The evidence from these FGDs suggests that LPG is currently the aspirational fuel for most households in Tanzania, but cooking with electricity is an attractive proposition, especially since automated energy-efficient appliances such as the EPC can make cooking much easier. It confirms that access, affordability (or perception of affordability) and reliability are the main barriers holding back wider adoption of electric cooking, however safety is also a concern. By design, eCook addresses the latter two of these concerns and with the support of pay-as-you-go financing mechanisms, also addresses the first.

The findings from these FGDs will be combined with those from the other activities that have been carried under the eCook Tanzania Market Assessment. Together they will build a more complete picture of the opportunities and challenges that await this emerging concept. Further outputs will be available from https://elstove.com/innovate-reports/ and www.MECS.org.uk.

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6 Appendix

6.1 Appendix A: Problem statement and background to Innovate eCook project

6.1.1 Beyond business as usual

The use of biomass and solid fuels for cooking is the everyday experience of nearly 3 Billion people. This pervasive use of solid fuels—including wood, coal, straw, and dung—and traditional cookstoves results in high levels of household air pollution, extensive daily drudgery required to collect fuels, and serious health impacts. It is well known that open fires and primitive stoves are inefficient ways of converting energy into heat for cooking. The average amount of biomass cooking fuel used by a typical family can be as high as two tons per year. Indoor biomass cooking smoke also is associated with a number of diseases, including acute respiratory illnesses, cataracts, heart disease and even cancer. Women and children in particular are exposed to indoor cooking smoke in the form of small particulates up to 20 times higher than the maximum recommended levels of the World Health Organization. It is estimated that smoke from cooking fuels accounts for nearly 4 million premature deaths annually worldwide –more than the deaths from malaria and tuberculosis combined.

While there has been considerable investment in improving the use of energy for cooking, the emphasis so far has been on improving the energy conversion efficiency of biomass. Indeed in a recent overview of the state of the art in Improved Cookstoves (ICS), ESMAP & GACC (2015), World Bank (2014), note that the use of biomass for cooking is likely to continue to dominate through to 2030.

> "Consider, for a moment, the simple act of cooking. Imagine if we could change the way nearly five hundred million families cook their food each day. It could slow climate change, drive gender equality, and reduce poverty. The health benefits would be enormous." ESMAP & GACC (2015)

The main report goes on to say that "The "business-as-usual" scenario for the sector is encouraging but will fall far short of potential." (ibid,) It notes that without major new interventions, over 180 million households globally will gain access to, at least, minimally improved[1] cooking solutions by the end of the decade. However, they state that this business-as-usual scenario will still leave over one-half (57%) of the developing world's population without access to clean cooking in 2020, and 38% without even minimally improved cooking solutions. The report also states that 'cleaner' stoves are

[1] A minimally improved stove does not significantly change the health impacts of kitchen emissions. "For biomass cooking, pending further evidence from the field, significant health benefits are possible only with the highest quality fan gasifier stoves; more moderate health impacts may be realized with natural draft gasifiers and vented intermediate ICS" (ibid)

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barely affecting the health issues, and that only those with forced gasification make a significant improvement to health. Against this backdrop, there is a need for a different approach aimed at accelerating the uptake of truly 'clean' cooking.

Even though improved cooking solutions are expected to reach an increasing proportion of the poor, the absolute numbers of people without access to even 'cleaner' energy, let alone 'clean' energy, will increase due to population growth. The new Sustainable Development Goal 7 calls for the world to "ensure access to affordable, reliable, sustainable and modern energy for all". Modern energy (electricity or LPG) would indeed be 'clean' energy for cooking, with virtually no kitchen emissions (other than those from the pot). However, in the past, modern energy has tended to mean access to electricity (mainly light) and cooking was often left off the agenda for sustainable energy for all.

Even in relation to electricity access, key papers emphasise the need for a step change in investment finance, a change from 'business as usual'. IEG World Bank Group (2015) note that 22 countries in the Africa Region have less than 25 percent access, and of those, 7 have less than 10 percent access. Their tone is pessimistic in line with much of the recent literature on access to modern energy, albeit in contrast to the stated SDG7. They discuss how population growth is likely to outstrip new supplies and they argue that "unless there is a big break from recent trends the population without electricity access in Sub-Saharan Africa is projected to increase by 58 percent, from 591 million in 2010 to 935 million in 2030." They lament that about 40% of Sub-Saharan Africa's population is under 14 years old and conclude that if the current level of investment in access continues, yet another generation of children will be denied the benefits of modern service delivery facilitated by the provision of electricity (IEG World Bank Group 2015).

> "Achieving universal access within 15 years for the low-access countries (those with under 50 percent coverage) requires a quantum leap from their present pace of 1.6 million connections per year to 14.6 million per year until 2030." (ibid)

Once again, the language is a call for a something other than business as usual. The World Bank conceives of this as a step change in investment. It estimates that the investment needed to really address global electricity access targets would be about $37 billion per year, including erasing generation deficits and additional electrical infrastructure to meet demand from economic growth. "By comparison, in recent years, low-access countries received an average of $3.6 billion per year for their electricity sectors from public and private sources" (ibid). The document calls for the Bank Group's energy practice to adopt a new and transformative strategy to help country clients orchestrate a national, sustained, sector-level engagement for universal access.

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In the following paragraphs, we explore how increasing access to electricity could include the use of solar electric cooking systems, meeting the needs of both supplying electricity and clean cooking to a number of households in developing countries with sufficient income.

6.1.2 Building on previous research

Gamos first noted the trends in PV and battery prices in May 2013. We asked ourselves the question, is it now cost effective to cook with solar photovoltaics? The answer in 2013 was 'no', but the trends suggested that by 2020 the answer would be yes. We published a concept note and started to present the idea to industry and government. Considerable interest was shown but uncertainty about the cost model held back significant support. Gamos has since used its own funds to undertake many of the activities, as well as IP protection (a defensive patent application has been made for the battery/cooker combination) with the intention is to make all learning and technology developed in this project open access, and awareness raising amongst the electrification and clean cooking communities (e.g. creation of the infographic shown in Figure 10 to communicate the concept quickly to busy research and policy actors).

Gamos has made a number of strategic alliances, in particular with the University of Surrey (the Centre for Environmental Strategy) and Loughborough University Department of Geography and seat of the Low Carbon Energy for Development Network). In October 2015, DFID commissioned these actors to explore assumptions surrounding solar electric cooking[2] (Batchelor 2015b; Brown & Sumanik-Leary 2015; Leach & Oduro 2015; Slade 2015). The commission arose from discussions between consortium members, DFID, and a number of other entities with an interest in technological options for cleaner cooking e.g. Shell Foundation and the Global Alliance for Clean Cookstoves.

Drawing on evidence from the literature, the papers show that the concept is technically feasible and could increase household access to a clean and reliable modern source of energy. Using a bespoke economic model, the Leach and Oduro paper also confirm that by 2020 a solar based cooking system could be comparable in terms of monthly repayments to the most common alternative fuels, charcoal and LPG. Drawing on published and grey literatures, many variables were considered (e.g. cooking energy needs, technology performance, component costs). There is uncertainty in many of the parameter values, including in the assumptions about future cost reductions for PV and batteries, but the cost ranges for the solar system and for the alternatives overlap considerably. The model

[2] The project has been commissioned through the PEAKS framework agreement held by DAI Europe Ltd.

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includes both a conservative 5% discount rate representing government and donor involvement, and a 25% discount rate representing a private sector led initiative with a viable return. In both cases, the solar system shows cost effectiveness in 2020.

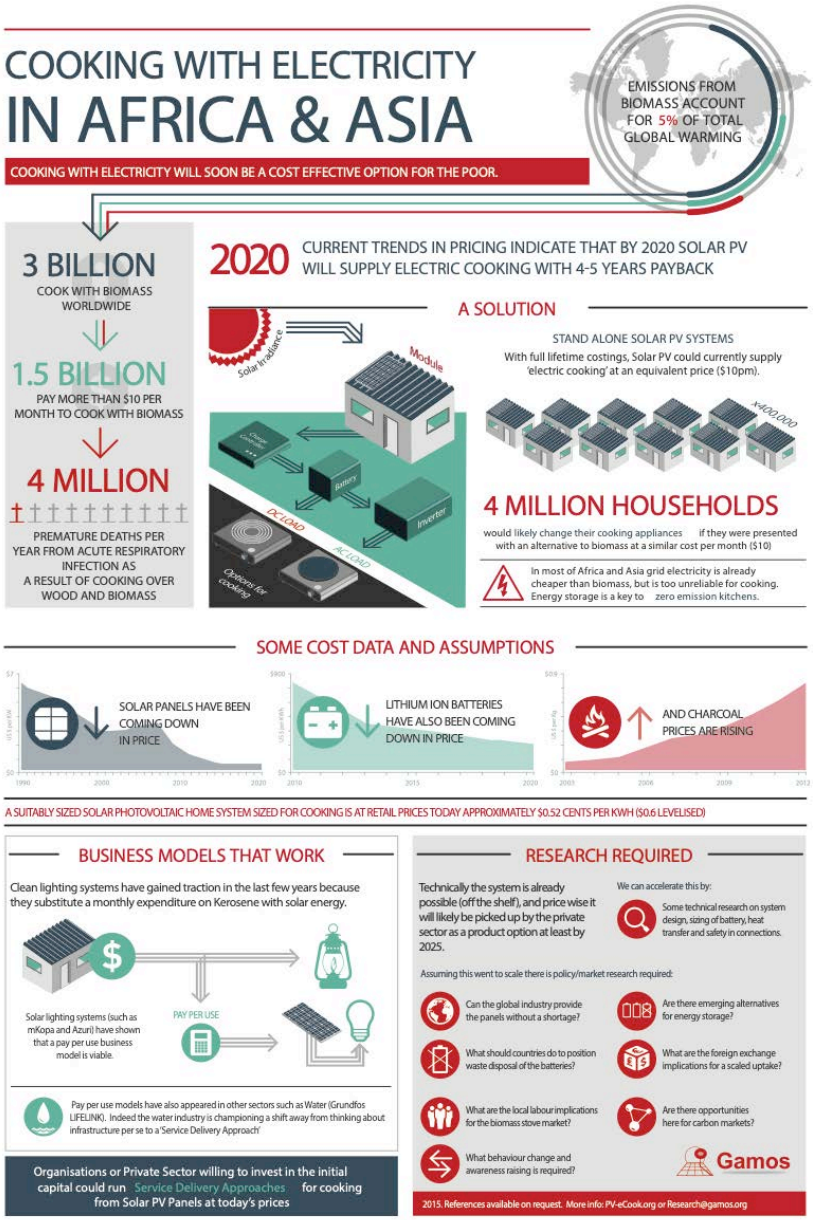

Figure 10 Infographic summarising the concept in order to lobby research and policy actors.

The Brown and Sumanik-Leary paper in the series examines the lessons learned from four transitions – the uptake of electric cooking in South Africa, the roll out of Improved Cookstoves (ICS), the use of LPG and the uptake of Solar Home Systems (SHS). They present many behavioural concerns, none of which preclude the proposition as such, but all of which suggest that any action to create a scaled use of solar electric cooking would need in depth market analysis; products that are modular and paired

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with locally appropriate appliances; the creation of new, or upgrading of existing, service networks; consumer awareness raising; and room for participatory development of the products and associated equipment.

A synthesis paper summarising the above concludes by emphasising that the proposition is not a single product – it is a new genre of action and is potentially transformative. Whether solar energy is utilised within household systems or as part of a mini, micro or nano grid, linking descending solar PV and battery costs with the role of cooking in African households (and the Global South more broadly) creates a significant potential contribution to SDG7. Cooking is a major expenditure of 500 million households. It is a major consumer of time and health. Where households pay for their fuelwood and charcoal (approximately 300 Million) this is a significant cash expense. Solar electric cooking holds the potential to turn this (fuelwood and charcoal) cash into investment in modern energy. This "consumer expenditure" is of an order of magnitude more than current investment in modern energy in Africa and to harness it might fulfil the calls for a step change in investment in electrical infrastructure.

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6.1.3 Summary of related projects

A series of inter-related projects have led to and will follow on from the research presented in this report:

- Gamos Ltd.'s early conceptual work on eCook (Batchelor 2013).
  - The key **CONCEPT NOTE** can be found here.
  - An early infographic and a 2018 infographic can be found here.
- Initial technical, economic and behavioural feasibility studies on eCook commissioned by DfID (UK Aid) through the CEIL-PEAKS Evidence on Demand service and implemented by Gamos Ltd., Loughborough University and University of Surrey.
  - The key **FINAL REPORTS** can be found here.
- Conceptual development, stakeholder engagement & prototyping in Kenya & Bangladesh during the "*Low cost energy-efficient products for the bottom of the pyramid*" project from the USES programme funded by DfID (UK Aid), EPSRC & DECC (now part of BEIS) & implemented by University of Sussex, Gamos Ltd., ACTS (Kenya), ITT & UIU (Bangladesh).
  - The key **PRELIMINARY RESULTS** (Q1 2019) can be found here.
- A series of global & local market assessments in Myanmar, Zambia and Tanzania under the "*eCook - a transformational household solar battery-electric cooker for poverty alleviation*" project funded by DfID (UK Aid) & Gamos Ltd. through Innovate UK's Energy Catalyst Round 4, implemented by Loughborough University, University of Surrey, Gamos Ltd., REAM (Myanmar), CEEEZ (Zambia) & TaTEDO (Tanzania).
  - The key **PRELIMINARY RESULTS** (Q1 2019) can be found here.
- At time of publication (Q1 2019), a new DfID (UK Aid) funded research programme '*Modern Energy Cooking Services*' (MECS) lead by Prof. Ed Brown at Loughborough University is just beginning and will take forward these ideas & collaborations.

This data and material have been funded by UK AID from the UK government; however, the views expressed do not necessarily reflect the UK government's official policies.

6.1.4 About the Modern Energy Cooking Services (MECS) Programme.

Sparking a cooking revolution: catalysing Africa's transition to clean electric/gas cooking.

www.mecs.org.uk | mecs@lboro.ac.uk

Modern Energy Cooking Services (MECS) is a five-year research and innovation programme funded by UK Aid (DFID). MECS hopes to leverage investment in renewable energies (both grid and off-grid) to address the clean cooking challenge by integrating modern energy cooking services into the planning for access to affordable, reliable and sustainable electricity.

Existing strategies are struggling to solve the problem of unsustainable, unhealthy but enduring cooking practices which place a particular burden on women. After decades of investments in improving biomass cooking, focused largely on increasing the efficiency of biomass use in domestic stoves, the technologies developed are said to have had limited impact on development outcomes. The Modern Energy Cooking Services (MECS) programme aims to break out of this "business-as-usual" cycle by investigating how to rapidly accelerate a transition from biomass to genuinely 'clean' cooking (i.e. with electricity or gas).

Worldwide, nearly three billion people rely on traditional solid fuels (such as wood or coal) and technologies for cooking and heating[3]. This has severe implications for health, gender relations, economic livelihoods, environmental quality and global and local climates. According to the World Health Organization (WHO), household air pollution from cooking with traditional solid fuels causes to 3.8 million premature deaths every year – more than HIV, malaria and tuberculosis combined[4]. Women and children are disproportionally affected by health impacts and bear much of the burden of collecting firewood or other traditional fuels.

Greenhouse gas emissions from non-renewable wood fuels alone total a gigaton of CO_2e per year (1.9-2.3% of global emissions)[5]. The short-lived climate pollutant black carbon, which results from incomplete combustion, is estimated to contribute the equivalent of 25 to 50 percent of carbon

[3] http://www.who.int/indoorair/health_impacts/he_database/en/

[4] https://www.who.int/en/news-room/fact-sheets/detail/household-air-pollution-and-health https://www.who.int/gho/hiv/epidemic_status/deaths_text/en/, https://www.who.int/en/news-room/fact-sheets/detail/malaria, https://www.who.int/en/news-room/fact-sheets/detail/tuberculosis

[5] Nature Climate Change 5, 266–272 (2015) doi:10.1038/nclimate2491

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dioxide warming globally – residential solid fuel burning accounts for up to 25 percent of global black carbon emissions[6]. Up to 34% of woodfuel harvested is unsustainable, contributing to climate change and local forest degradation. In addition, approximately 275 million people live in woodfuel depletion 'hotspots' – concentrated in South Asia and East Africa – where most demand is unsustainable[7].

Africa's cities are growing – another Nigeria will be added to the continent's total urban population by 2025[8] which is set to double in size over the next 25 years, reaching 1 billion people by 2040. Within urban and peri-urban locations, much of Sub Saharan Africa continues to use purchased traditional biomass and kerosene for their cooking. Liquid Petroleum Gas (LPG) has achieved some penetration within urban conurbations, however, the supply chain is often weak resulting in strategies of fuel stacking with traditional fuels. Even where electricity is used for lighting and other amenities, it is rarely used for cooking (with the exception of South Africa). The same is true for parts of Asia and Latin America. Global commitments to rapidly increasing access to reliable and quality modern energy need to much more explicitly include cooking services or else household and localized pollution will continue to significantly erode the well-being of communities.

Where traditional biomass fuels are used, either collected in rural areas or purchased in peri urban and urban conurbations, they are a significant economic burden on households either in the form of time or expenditure. The McKinsey Global Institute outlines that much of women's unpaid work hours are spent on fuel collection and cooking[9]. The report shows that if the global gender gap embodied in such activities were to be closed, as much as $28 trillion, or 26 percent, could be added to the global annual GDP in 2025. Access to modern energy services for cooking could redress some of this imbalance by releasing women's time into the labour market.

To address this global issue and increase access to clean cooking services on a large scale, investment needs are estimated to be at least US$4.4 billion annually[10]. Despite some improvements in recent

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[6] http://cleancookstoves.org/impact-areas/environment/

[7] Nature Climate Change 5, 266–272 (2015) doi:10.1038/nclimate2491

[8] https://openknowledge.worldbank.org/handle/10986/25896

[9] McKinsey Global Institute. *The Power of Parity: How Advancing Women's Equality can add $12 Trillion to Global Growth;* McKinsey Global Institute: New York, NY, USA, 2015.

[10] The SE4ALL Global Tracking Report shows that the investment needed for universal access to modern cooking (not including heating) by 2030 is about $4.4 billion annually. In 2012 investment was

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years, this cross-cutting sector continues to struggle to reach scale and remains the least likely SE4All target to be achieved by 2030[11], hindering the achievement of the UN's Sustainable Development Goal (SDG) 7 on access to affordable, reliable, sustainable and modern energy for all.

Against this backdrop, MECS draws on the UK's world-leading universities and innovators with the aim of sparking a revolution in this sector. A key driver is the cost trajectories that show that cooking with (clean, renewable) electricity has the potential to reach a price point of affordability with associated reliability and sustainability within a few years, which will open completely new possibilities and markets. Beyond the technologies, by engaging with the World Bank (ESMAP), MECS will also identify and generate evidence on other drivers for transition including understanding and optimisation of multi-fuel use (fuel stacking); cooking demand and behaviour change; and establishing the evidence base to support policy enabling environments that can underpin a pathway to scale and support well understood markets and enterprises.

The five-year programme combines creating a stronger evidence base for transitions to modern energy cooking services in DFID priority countries with socio-economic technological innovations that will drive the transition forward. It is managed as an integrated whole; however, the programme is contracted via two complementary workstream arrangements as follows:

- An Accountable Grant with Loughborough University (LU) as leader of the UK University Partnership.
- An amendment to the existing Administrative Arrangement underlying DFID's contribution to the ESMAP Trust Fund managed by the World Bank.

The intended outcome of MECS is a market-ready range of innovations (technology and business models) which lead to improved choice of affordable and reliable modern energy cooking services for consumers. Figure 11 shows how the key components of the programme fit together. We will seek to have the MECS principles adopted in the SDG 7.1 global tracking framework and hope that participating countries will incorporate modern energy cooking services in energy policies and planning.

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in cooking was just $0.1 billion. Progress toward Sustainable Energy: Global Tracking Report 2015, World Bank.

[11] The 2017 SE4All Global Tracking Framework Report laments that, "Relative to electricity, only a small handful of countries are showing encouraging progress on access to clean cooking, most notably Indonesia, as well as Peru and Vietnam."

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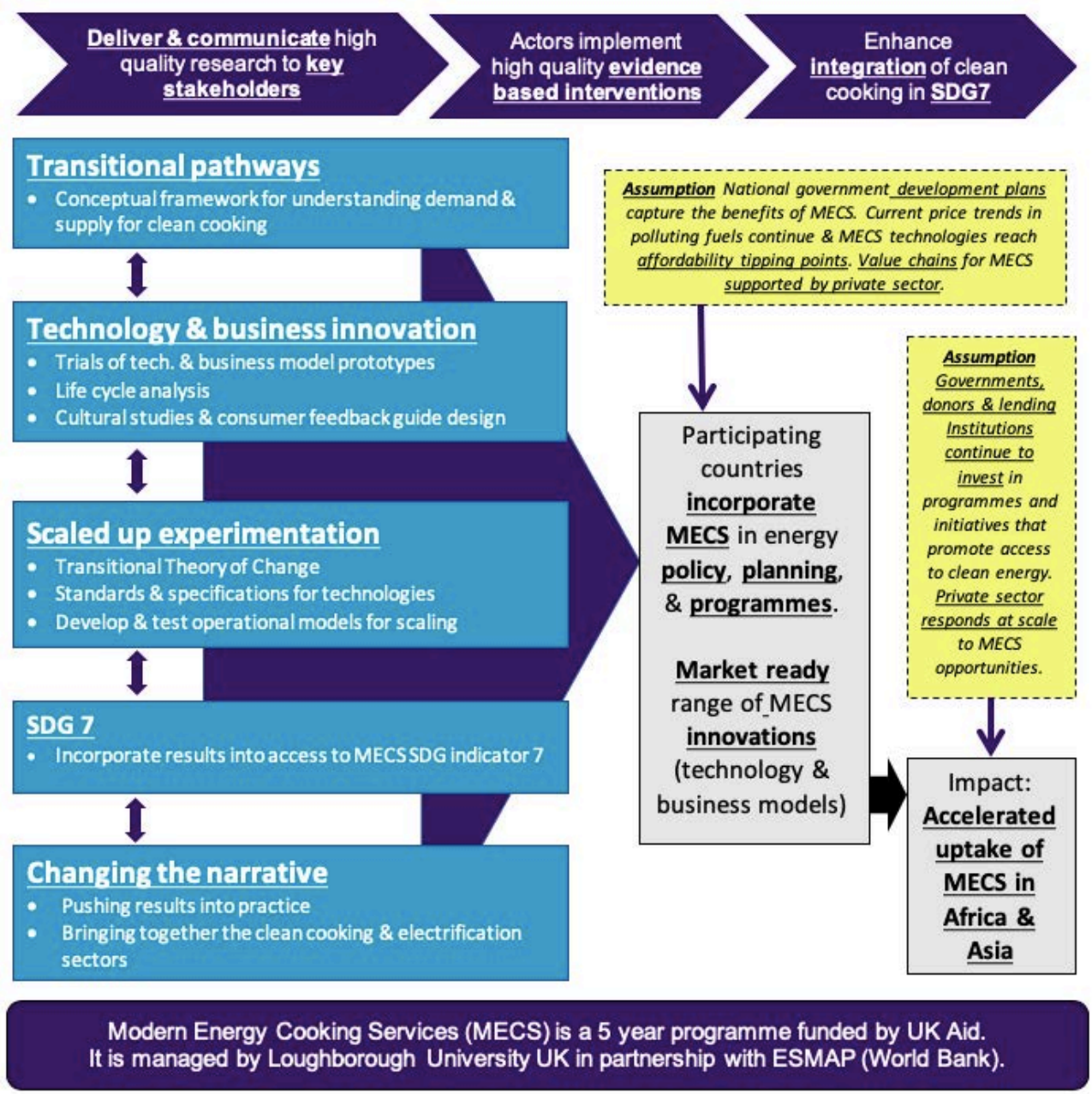

Figure 11: Overview of the MECS programme.

This research is funded by DfID/UK Aid and Gamos through the Innovate UK Energy Catalyst and the MECS programme.

6.2 Appendix B: Focus group design brief

Topics to explore:

1. Current cooking practices - **what do you currently cook and how?**
   - **1.1. What foods do you cook?**
     - **1.1.1. What processes are required for each (e.g. boiling, frying)?**
     - **1.1.2. What appliances do you use for each (both stoves and pots)?**
   - **1.2. Why do you prefer specific fuels/appliances?**
     - 1.2.1. Where/how do you store each fuel?
     - 1.2.2. Availability?
     - 1.2.3. Seasonal patterns?
     - 1.2.4. Cost?
     - **1.2.5. Has anybody tried cooking on electricity?**
       - 1.2.5.1. If so, what did they like and what did they not like?
       - 1.2.5.2. If you have electricity at home, when do you use it?
     - **1.2.6. Do you cook differently on different fuels/appliances? If so, why?**
     - 1.2.7. Does anybody use task specific appliances (e.g. kettle, rice cooker) or pots (e.g. pressure cooker/kettle without heating element)
   - **1.3. Does everybody tend to cook in more or less the same way? If not, why do people cook differently?**
   - **1.4. Is there any experience of people changing the way they cook?**
     - 1.4.1. How much resistance to change is there?
     - 1.4.2. What would make people change (e.g. fuel shortages, fuel prices, access to electricity….)?
2. Future cooking practices **- what and how would you prefer to cook in the future?**
   - 2.1. **Desirable foods and preparation methods** (e.g. what foods would you like to cook more often if they were easier to prepare)
   - 2.2. Desired fuel/appliance use
     - **2.2.1. What are the desirable features of the ideal cooking appliance?**
       - Portability?
       - Multitasking – can people leave food to cook and get on with something else?
       - Access to pot (do you need to stir it the whole time)?
       - Importance of safety
       - Suitable mode of acquisition - self-build/cash/pay-as-you-go/utility
       - Skills for operation/maintenance
       - Access to fuel/device retailers
     - **2.2.2. What prevents people from using this ideal fuel/device?**
       - 2.2.2.1. If electricity were available in everybody's homes and had no cost, would everybody use it for everything or are there other barriers too?

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