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MECS
Modern Energy Cooking Services

CLEAN COOKING: RESULTS-BASED FINANCING AS A POTENTIAL SCALE-UP TOOL FOR THE SECTOR

Photo 1: Kenya EPC solar-hub trial. Jon Leary/MECS

REPORT 4 OF THE FINANCING CLEAN COOKING SERIES

MECS AND ENERGY 4 IMPACT
OCTOBER 2021

Loughborough University

UKaid
from the British people

ESMAP
Energy Sector Management Assistance Program

Disclaimer: This research is funded by UK aid. However, the views expressed do not necessarily reflect the official policies of the UK government.

THE BIG PICTURE

- Innovative financing models are needed to scale up modern energy cooking solutions through accelerated investment and market development.
- Results-Based Financing (RBF) for clean and modern energy solutions has become an important funding tool for the sector over the last decade.
- The focus of RBF in the clean cooking sector is advancing from predominately supporting improved biomass cookstoves (ICS) to greater incorporation of modern energy cooking solutions, including electric-cooking (e-cooking).
- Energy financing usually includes clean cooking RBFs, but it is often detached from electricity access programming, leaving untapped potential for maximising impact through a joint roll-out (Batchelor et al., 2019).
- One of the key success factors for modern energy cooking RBF programmes is to design the programme for local market conditions and to have the flexibility to change the design as needed. It is also important to select markets that are sufficiently mature for the targeted technologies, for example in terms of private sector presence, consumer awareness and fuel supply.
- A key challenge for RBF financing is monitoring and verification, including tracking use of the stoves. Supporting the expansion of PAYGO solutions in the clean cooking sector, for example, through an innovation funding component, could potentially provide usage data relevant for reporting on impact metrics and for impact payments (MECS and Energy 4 Impact, 2021).
- Carbon financing offers significant potential to scale up investment in modern energy cooking solutions and so RBF programmes should consider providing technical assistance to companies to help access carbon credit revenues.

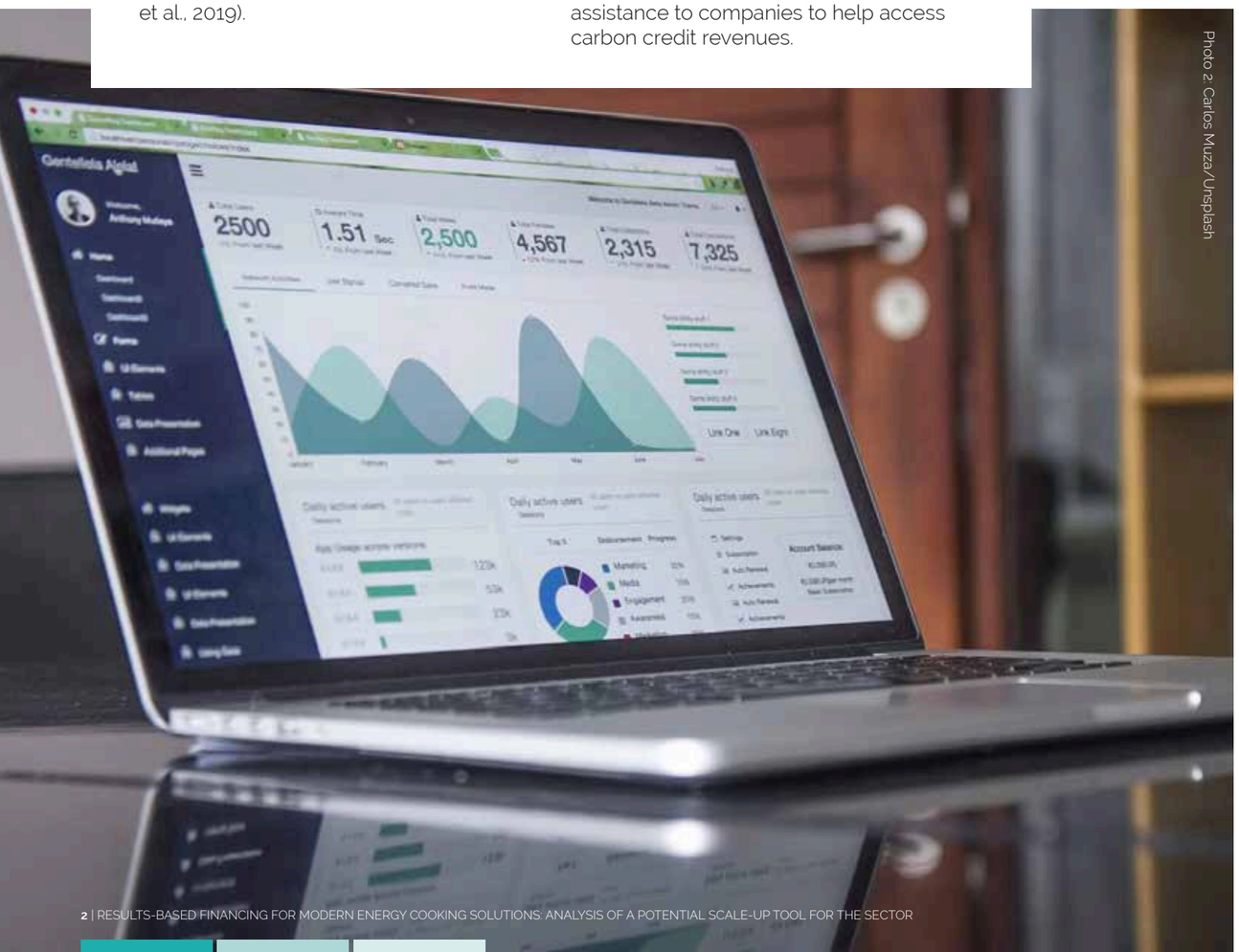

Photo 2: Carlos Muza/Unsplash

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THE FINANCING CLEAN COOKING SERIES

Energy 4 Impact and Loughborough University, the lead implementing partner on the UK aid-funded Modern Energy Cooking Services (MECS) programme, signed an agreement in 2020 to collaborate on research into financing for the clean cooking sector.

The **Financing Clean Cooking Series** aims to facilitate the transition to clean cooking through financing and investment. The series is targeted at a diverse range of public and private stakeholders in clean cooking, including NGOs, donors, investors, and suppliers.

Clean Cooking: Results-Based Financing as a Potential Scale-up Tool for the Sector is the fourth report in the series and discusses key success factors for Results-Based Financing programmes as a scale-up tool for modern energy cooking solutions based on the evaluation of previous programmes.

Previous publications in the series include:
- Clean Cooking: Scaling Up with Crowdfunding
- Clean Cooking: Financing Appliances for End Users
- Clean Cooking: Structuring Concessions for Displaced People

The final report of the series will focus on the financing landscape for clean cooking and is set to be published in the fourth quarter of 2021.

EXECUTIVE SUMMARY

This report explores the potential of Results-Based Financing (RBF) as a tool to scale up the clean cooking sector, particularly modern energy cooking solutions, and makes recommendations on potential donor interventions.

The report was commissioned by Loughborough University, the lead implementing partner on the FCDO-funded Modern Energy Cooking Services Programme ("MECS"). It is based on primary and secondary research conducted by Energy 4 Impact between August and November 2020 and MECS between March and July 2021, including 17 interviews with RBF implementers and clean cooking beneficiaries.

The report focuses on performance-based RBF programmes rather than other RBF mechanisms such as carbon credits, development impact bonds, and conditional cash transfers. However, it briefly discusses how climate finance can create opportunities for clean cooking RBF programmes.

Performance-based RBF mechanisms disburse grants to private companies or service organisations based on the delivery and verification of pre-agreed results (such as the number of stoves sold). They aim to encourage organisations to carry out activities outside their usual business, for example expanding into underserved areas. Consequently, RBF can catalyse enhanced uptake of new or improved technologies in challenging or early-stage markets.

One of the key principles of RBF versus grant funding is that the financial risk of non-performance rests with the service or product supplier rather than the donor. The donor and supplier agree on a price for the service, including a risk premium. If the results are not realised, the supplier does not get paid. The donor protects against underperformance through strong programme design, robust due diligence during supplier selection, and dynamic monitoring during implementation.

A clean cooking RBF programme has six design elements that determine the outreach of the programme and its potential impact on the clean cooking sector:

1. Targets: All current cooking-based RBF programmes have output targets based on the number of stoves sold. None are outcome- or impact-focused.

2. Eligibility: The programme defines which technologies, geographies, and types of suppliers are eligible to participate. While most clean cooking RBF programmes continue to be technology-neutral, there is a trend towards supporting higher tier, more efficient technologies and in some cases excluding the lowest tier biomass improved cookstoves (ICS).

3. Bidding mechanism: RBF programmes have traditionally adopted a fixed incentive per stove of up to 50 per cent of the price of the stove. However, many programmes now require companies to bid through reverse auctions to reduce the subsidies per unit of output. While reverse auctions may result in financial savings for the donor, they can force the price too low for successful delivery by the winning supplier. Larger suppliers may gain an unfair advantage through their greater ability to maximise economies of scale. If done correctly, the bid price can be used as an indicator for the level of market development and a future benchmark for pricing under normal market conditions.

4. Incentive structure: Most RBF programmes use a tiered structure, with greater incentives for more highly valued outcomes. These include higher tier technologies (as classified by the World Bank Multi-Tier Framework[1]) sales in underserved regions, to lower income groups or for cooking as a productive use. Some programmes also offer catalytic grants to cover the upfront cost of market setup and development activities before the RBF cycle begins.

5. Programme management: Donors need to decide whether the RBF should be managed by a public body, a social enterprise, or a mix of the two. While public-body engagement ensures a level of political buy-in it also bears the risk of delays and increased complexity of an RBF approach over a normal grant programme.

6. Monitoring, reporting and verification (MRV): The MRV process can be costly and resource-intensive. The majority of MRV processes for clean cooking RBFs are still based on manual verification (phone calls to consumers or SMS user surveys). However, there is increasing interest in developing and using remote monitoring systems and mobile money payments to reduce MRV and other costs. Some RBF programmes analyse customer data alongside the MRV process. Others including the World Bank also use proxies to translate outputs into outcomes and impacts. Due to fuel stacking these proxies may not always be reliable, so it will be important to continue developing smart MRV innovations.

Over the last decade, RBF has become increasingly popular as a tool for donors to scale up clean cooking alongside other tools such as upfront grants and carbon financing. The challenges facing the clean cooking sector – such as the nascency of the market, lack of proven business models, lack of affordability, limited consumer awareness, lack of finance, and lack of data – directly impact RBF programmes[2]. Indeed, designing RBF for clean cooking is more complicated than for other energy access sectors, such as solar home systems, for several reasons: the upfront cost of most stoves is relatively low compared to their fuel and life cycle costs; the market lacks homogeneity due to a large number of clean cooking fuel technologies each with their own set of business models; there are challenges around developing remote monitoring systems for tracking fuel usage and payments; and many of the smaller, earlier-stage players that characterise nascent clean cooking markets are likely to need bridge funding for the RBF.

Photo 3: LPG cookstove. Jon Leary/MECS

1 See: https://www.worldbank.org/en/topic/energy/brief/fact-sheet-multi-tier-framework-for-cooking
2 See: Energy 4 Impact and MECS (2021). Clean Cooking: Financing Appliances for End Users. Report 2 of the Financing Clean Cooking Series. https://mecs.org.uk/wp-content/uploads/2021/07/Clean-Cooking-Financing-Appliances-for-End-Users.pdf

From our research, we have identified five pre-conditions for a successful clean cooking RBF:

1	Select a clean cooking market that is relatively well developed: it must have a reasonable number of established or potential market players, a reasonable level of consumer technological awareness, and a functioning supply chain for the technologies with after-sales service. The clean cooking technologies supported through the RBF approach should ideally be competitive against substitute fuels and the policy environment for clean cooking should be relatively attractive with appropriate fiscal incentives (e.g. VAT exemptions, proportionate import tariffs). End-user financing for the appliances should be available if required and there should be data available on the market, companies, and consumers.
2	Ensure a simple, flexible design and implementation.
3	Allow a wide range of eligible clean cooking technologies.
4	Allow a wide range of RBF recipients (suppliers) to suit local market conditions.
5	Provide upfront grants to suppliers for market setup and development costs including Technical Assistance (TA) for applicants and local public institutions, for example in setting up testing protocols for technology safety and performance.

Some RBF programmes are purely clean cooking related, while others are part of broader energy access schemes. The first large-scale standalone clean cooking RBF programmes took place between 2012 and 2019 and focused on ICS.[3] Recent programmes have focused more on modern energy cooking solutions, with some specifically excluding Tier 1 ICS. Higher tier appliances (Tier 3 and above) have been subject to higher RBF incentives per stove offered by such programmes.[4] There are few examples of RBF programmes that take an integrated approach to energy, including solar home systems, mini-grids, and clean cooking, but this is changing with the emergence of programmes like KOSAP and BRILHO (see case studies 3 and 5).

Many of the historic clean cooking RBF programmes have focused on Kenya, which is generally considered the most established market for clean cooking in sub-Saharan Africa. However, there is a growing interest in other countries. The World Bank's Clean Cooking Fund (CCF) has launched an RBF in Rwanda and is actively looking at Ghana, Niger, and Uganda. The Nordic Environment Finance Corporation (NEFCO) is developing clean cooking programmes under the BGFA[5] scheme with a focus on Zambia, Tanzania, Mozambique, DRC, and Zimbabwe. They are supported by Open Capital Advisors and MECS in designing the RBF programme. USAID is rolling out clean cooking RBFs in Malawi and Zambia through their 'Alternatives to Charcoal' (A2C) programme.

This report contains five RBF case studies: the Global LEAP RBF pilot for electric pressure cookers (EPCs) in Kenya; EnDev 2.0 in Kenya; KOSAP in Kenya; the CCF in Rwanda; and BRILHO in Mozambique. The first two programmes have been completed, the last three are either in the middle or just starting implementation. Two are pure clean cooking programmes and three are clean cooking components in broader energy access programmes.

3 See Table 2 on p.25 of this report for an overview.
4 See Figure 3 on p.27 of this report for an overview
5 'Beyond the Grid Fun for Africa': https://beyondthegrid.africa

The Global LEAP EPC RBF pilot was the first to focus on a single modern energy cooking technology, Electric Pressure Cookers (EPCs). It faced significant challenges because of the underdeveloped supply chain for EPCs in Kenya, (exacerbated by the COVID-19 pandemic) and a programme implementation period of just six months. Many companies ended up amassing higher than normal levels of inventory due to the short implementation period and customer affordability issues. Despite these challenges, the pilot helped develop the market for EPCs, demonstrated strong consumer interest in the product, and provided valuable data on how EPCs can improve quality of life.

The EnDev 2.0 clean cooking RBF in Kenya was notable because it was one of the first RBF programmes to offer higher incentives for sales of higher-tier performance stoves and to customers in hard-to-reach markets. The programme facilitated sales of over 110,000 Tier 2 and above cooking solutions, with 6 per cent of those going to marginalised counties.

The KOSAP Clean Cooking RBF is a US$5m facility implemented through the Government of Kenya which aims to incentivise clean cooking in underserved counties. The programme contains three major components: an upfront grant to support supply chain development and other market entry activities, an RBF grant to incentivise sales of cookstoves, and a sustainability component. The first phase of the programme was mainly focused on ICS but implementation delays have led to the adoption of some outdated technologies. It is too early to draw specific conclusions, but some lessons are already apparent.

The World Bank launched its first CCF programme in 2020 in Rwanda, which included ICS and modern energy cooking solutions. Managed by the local development bank (Banque Rwandaise de Développement – BRD), the CCF is the largest clean cooking RBF of its kind and includes a $17m for a RBF program and $3m for TA. The programme aims to drive impact by including features such as higher incentives for lower income groups and incentives linked to stove usage, which is related to sustainable adoption and behavioural change.[6] Applications are being accepted on a rolling basis and over 20 companies had completed the first application stage at the time of writing this report.

The CCF has many innovative features, including higher incentives for lower-income groups, incentives linked to stove usage, and the use of financial and other proxies to measure impact. To enhance market uptake, the programme offers TA for local testing and design of stoves, innovation grants, financial support for consumer awareness campaigns, and future linkages with the World Bank's Ci-Dev carbon credit programme.[7]

The BRILHO RBF in Mozambique contains useful insights into the use of catalytic grants and multi-tier incentives for different clean cooking technologies. Applicants are not required to be Mozambican legal entities and this has helped to attract larger international companies into an otherwise challenging nascent market. The programme has been delayed by disruptions to global supply chains caused by the COVID-19 pandemic and the restructuring of the programme funder FCDO. However, the programme implementer is confident that they can still meet their target of providing clean cooking appliances to 750,000 Mozambicans by 2024. They are planning a second call for applications in the last quarter of 2021. This call is expected to place greater emphasis on higher-tier cooking technologies and include extra incentives for consumer financing and gender impacts.

Finally, the report contains recommendations on how future RBF programmes can best support the uptake of modern energy cooking services.

6 The programme applies SEforALL's Clean Cooking Data Platform (CCDP) which is using sensors on stoves to track usage.
7 In the CCF Rwanda, however, the carbon credits are expected to go back into a revolving fund to support further RBF disbursements rather than directly to the companies i.e the companies are required to hand over future carbon credit revenues in exchange for the RBF grants.

Based on the research from this report and other RBF research by MECS[8], we are issuing a call to action in the following areas:

Key recommendations for a successful RBF are that its design is ideally based on in-depth clean cooking market assessment, the inclusion of TA and other support mechanisms that address challenges such as the establishment of supply chains for modern cooking fuels, the development of usage-tracking technologies, and greater collaboration between electricity access and modern energy cooking programmes among others.

8 Stritzke, S., Sakyi-Nyarko, C., Bisaga, I., Bricknell, M., Leary, J., and Brown, E. (2021). Results Based Financing (RBF) for Modern Energy Cooking Solutions: an effective driver for innovation and scale? *Energies, Special Is.*
9 See: E4I/MECS: "Clean Cooking: Review of the Funding Landscape, the TA Needs of Companies, the Data Needs of Funders and Recommendations on Potential Interventions", 09/2021, www.mecs.org.uk

GLOSSARY

Carbon Credits – A form of results-based financing based on certified CO2 emission reductions. The carbon credits can be traded through emission trading schemes and voluntary carbon markets. The credits can be earned by clean cooking projects by reducing the amount of CO2 being released compared to a baseline figure, for example through the introduction of energy-saving stoves. The credits can then be sold to companies or countries to offset their own carbon emissions.

Improved Cookstoves (ICS) – ICS stands for a range of improved biomass stoves developed to replace highly inefficient traditional charcoal or wood-burning stoves. ICS that meet the standards of Tier 1 to Tier 3 under the Multi-Tier Framework have been the primary focus of early clean cooking RBFs.

Independent Verification Agent (IVA) – An organisation that is contracted by the RBF funding or implementation agency to check the project documents submitted by the RBF beneficiary and to further verify the results through additional spot checks.

Mobile Money – The process of making financial transactions using a mobile phone which hosts applications that receive, store, and spend money.[10]

Modern energy cooking solutions – Households that meet the standards of Tier 4 or higher across all six attributes under the Multi-Tier Framework can be considered to have gained access to modern energy cooking services. In a humanitarian setting, the most relevant modern cooking technologies are likely to be LPG (liquefied petroleum gas), ethanol, biomass pellets with a forced draft gasifier stove and electric cooking.[11]

Multi-Tier Framework – The tiered framework developed by ESMAP measures household access to cooking solutions across six attributes with six thresholds of access, ranging from Tier 0 (no access) to Tier 5 (full access). The six attributes are exposure to pollutants, efficiency, convenience, safety, affordability and fuel availability. 'Modern energy cooking services' refer to households meeting Tier 4 standards and higher – see separate definition. 'Improved cooking services' refers to households meeting at least Tier 2 standards across all six attributes, but with at least one attribute not reaching Tier 4.

Pay-As-You-Go (PAYGO) – PAYGO technology removes the upfront price barrier of the cooking appliance and fuel, by allowing end-users to pay a small or zero deposit followed by affordable instalments over time.[12]

Results-Based Financing (RBF) – Financing is usually in the form of grants provided to companies or institutions after agreed-upon results have been achieved and verified. For clean cooking, a company could receive funds for every stove verified as delivered and in use by an end-user. The company has flexibility on how they spend money to achieve the result and the financier disburses funding only when the results have been verified.

Reverse Auction – An auction in which sellers place bids on the price or subsidy they require for selling a certain volume of clean cooking appliances in a particular area. The winning bidder(s) are the ones that bid the lowest prices.

Solar Home System (SHS) – SHS are stand-alone photovoltaic systems which provide basic power supply (e.g. for lighting and operation of smaller appliances) to remote/rural households that are not connected to the electrical grid.

10 For more on definitions of mobile money, see www.gsma.com/mobilefordevelopment/wp-content/uploads/2012/06/mobilemoneydefinitionsnomarks56.pdf
11 MECS and ESMAP, The State of Access to Modern Energy Cooking Services (2020). https://documents.worldbank.org/en/publication/documents-reports/documentdetail/937141600195758792/the-state-of-access-to-modern-energy-cooking-services
12 For more details on the various approaches for PAYGO see: https://energypedia.info/wiki/Pay-as-you-go_Approaches_(PAYGO)

INTRODUCTION

Results-Based-Financing (RBF) is increasingly becoming the instrument of choice for public financing interventions in the clean cooking sector.

RBF provides public funds to private companies for the delivery of pre-agreed outputs and independent verification of those outputs. This report evaluates experiences from RBF programmes in the clean cooking sector and discusses the suitability of this financing instrument as a tool for scaling up modern energy cooking services through accelerated investment and market development.

BACKGROUND

Research by the World Bank's Energy Sector Management Assistance Programme (ESMAP) suggests that in order to achieve universal access to modern energy cooking solutions, by 2030, about $150bn investment annually is needed.[13] Over $100bn of the amount will need to come directly from household contributions for stoves and fuels (Chinkhumba et al., 2020). Consequently, there is the need to explore innovative financing tools for the clean cooking sector to increase the affordability of clean cooking solutions for a wider share of the population in developing countries. Energy 4 Impact and Loughborough University, the lead implementing partner of the Modern Energy Cooking Services Programme ("MECS") developed this report in recognition of the importance of RBF as a potential key instrument to scale-up access to clean cooking and undertook the research to inform the market and support its key stakeholders.

The purpose of this report is to highlight the lessons learnt from past and current clean cooking RBF programmes, to discuss the question of whether RBF can be a suitable tool for scaling up modern energy cooking technologies primarily electricity, LPG, ethanol, biogas, and biomass gasifiers, and to derive key RBF design elements that are suitable to support the uptake of these modern energy technologies.[14]

The report is based on primary and secondary research conducted by Energy 4 Impact and MECS between August and July 2021 as well as desk research and data evaluation. The partners carried out interviews with 17 stakeholders, including the World Bank, RBF programme implementers, and clean cooking company RBF beneficiaries (see Annex 1).

SCOPE

The report focuses on performance-based RBF programmes for clean cooking. The term "performance" is used when it is relatively easy to quantify whether results have been achieved. Under this type of RBF, the recipient is the programme service provider i.e. the clean cooking company. Payment is made against the performance of the service provider against pre-determined outputs.

The report does not focus on all types of RBF mechanisms such as output-based aid programmes for results, output-based disbursements, cash on delivery aid, and conditional cash transfers.[15] The report does provide a short overview of carbon credits and development impact bonds given the importance of these instruments as sources of funding to the sector. As both are grant funds provided by donors based on verified Sustainable Development Goal (SDG) impacts, these instruments can be considered a form of atypical RBF. The report findings also suggest the need for further development of methodologies for translating the outputs of clean cooking RBF programmes into outcomes and impacts such as improved health, gender equality, and reductions in harmful emissions. However, these are not discussed in detail.

13 ESMAP (2020). The State of Access to Modern Energy Cooking Services (English). Washington, D.C.: World Bank Group.: https://documents.worldbank.org/en/publication/documents-reports/documentdetail/937141600195758792/the-state-of-access-to-modern-energy-cooking-services

14 The definition of MECS from the original DFID business case refers to "genuinely clean cooking" (referencing both health and environment) and alternatives to biomass suggesting a focus on MTF level 5. In the State of the Sector report (2020) the World Bank slightly broaden the definition to include all tier 4 and 5 solutions: "A household is considered to have access to modern energy cooking services (MECS) when their cooking practices meet the MTF Tier 4 or above." (https://www.worldbank.org/en/topic/energy/publication/the-state-of-access-to-modern-energy-cooking-services)

15 Conditional cash transfers tend to target the very poorest households, which are not the target market for most modern cooking companies. Energy 4 Impact is currently running a pilot for UNICEF and funded by SIDA to test conditional cash transfers for stand-alone solar home systems (SHS) in two of the poorest counties in Kenya (the Energy Cash Plus Programme). For more information on these different RBF mechanisms, please refer to the following link by the Global Partnership for Results-Based Approaches: https://www.gprba.org/results-based-financing

STRUCTURE

The report is divided into ten sections. The first two sections look at the general principles around RBF and the main features of clean cooking RBF programmes. The next two sections look at the challenges of clean cooking RBFs, including differences with the solar home system pay-as-you-go (SHS PAYGO) sector and the lessons learnt. In the following two sections, we summarise the clean cooking RBF landscape and present case studies of relevant RBF programmes either completed, in process or planned. We then discuss the potential of impact funding such as carbon credits and development impact bonds to scale up the adoption of clean cooking. Finally, in a call to action, we suggest how RBF can further contribute to the scaling of modern energy cooking solutions.

TO ACHIEVE UNIVERSAL ACCESS TO MODERN ENERGY COOKING SOLUTIONS, BY 2030, APPROXIMATELY $150BN ANNUAL INVESTMENT IS NEEDED. CONSEQUENTLY, THERE IS NEED TO EXPLORE INNOVATIVE FINANCING TOOLS FOR THE CLEAN COOKING SECTOR WHICH CAN INCREASE THE AFFORDABILITY OF CLEAN COOKING SOLUTIONS.

Photo 4 : Josh Appel/Unsplash

PRINCIPLES OF RBF

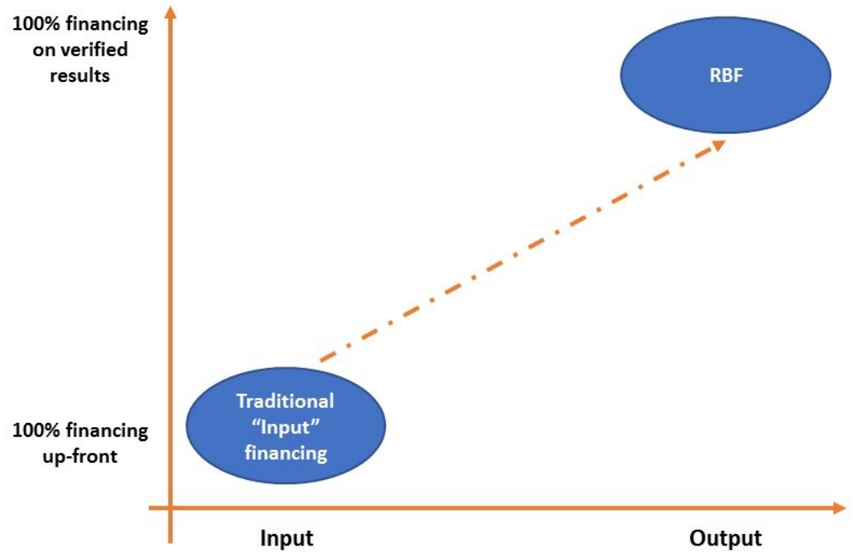
Results-Based Financing is an umbrella term for a range of financing mechanisms linked to the delivery of pre-agreed and independently verified results. This contrasts with the traditional input-based finance in which the financing is provided upfront before any results have been achieved (Stritzke et al., 2021). This is illustrated in Figure 1.

RBF programmes are designed to incentivise clean cooking providers to carry out activities outside their "business as usual" model, including:

- Expanding distribution networks to areas that otherwise would not be reached.
- Distributing socially beneficial products and technologies that otherwise would not be distributed.
- Serving vulnerable groups (pro-poor, underserved or refugee markets) that otherwise would be ignored.
- Improving the efficiency of the procurement process for socially beneficial products.

RBF incentives are not intended to distort the market by subsidising the price of products being sold.[17] Instead, they are supposed to cover the losses from the "first-mover disadvantage". They subsidise the costs of operations, market entry, or delivering a product by "for-profit" social enterprises and by doing so they encourage these companies to increase the supply of merit goods – i.e. clean cookstoves – that would otherwise not happen.

Figure 1: Transition from input-based to output-based financing[16]



16 Source: Energy 4 Impact

17 There is an emerging and important debate on how to use RBF more effectively to support delivery to groups that would not be reachable via the market alone which has been a feature of RBF in the delivery of health services. This debate currently supports the case for clean cooking RBF programmes to include some form of demand-side subsidization. See Energy4All, "Better use of subsidies to achieve impact", 2020 (https://pubs.iied.org/sites/default/files/pdfs/2020-12/16677IIED.pdf) and DFID, 2020. "Demand-side subsidies in off-grid solar" (https://www.ace-taf.org/wp-content/uploads/2020/09/Demand-Side-Subsidies-in-Off-Grid-Solar-A-Tool-for-Achieving-Universal-Energy-Access-and-Sustainable-Markets.pdf)

Photo 5: Biogas cookstove example. Brett Jordan/Unsplash

One of the key principles of RBF is that the risk of non-performance rests with the organisation delivering the project i.e. the cooking company selling the stoves. In traditional input financing, the financial risk of project failure is largely borne by the donor. If the donor's funds have already been committed and the project fails to deliver the expected results, most of the funds will not be recoverable. In contrast, the financial risks borne by a donor in an RBF are reduced. If the project fails to deliver the expected results, then the donor does not have to disburse funds to the supplier organisation. The supplier organisation is free to decide how they deliver the service required and can potentially raise private funding against the promise of a future RBF payout.

While the RBF approach has obvious advantages, it can create challenges for the RBF programme managers and donors. First, because the supplier organisation is taking more financial risk, they can require higher incentives per unit of output. Assuming the budget for the RBF is fixed, the RBF will potentially be able to support fewer interventions compared to grant funded projects. Second, while an RBF reduces the financial risk for the donors, they can face the reputational risk of non-performance and other implementation risks e.g. force majeure events, potential fraud.

FEATURES OF CLEAN COOKING RBF PROGRAMMES

RBF programmes typically follow a standard process as shown in Figure 2.

When designing an RBF programme, there are a number of features that need to be considered:

- Targets – Outputs or Outcomes
- Eligibility – By technology, geography, and/or RBF beneficiary[19]
- Bidding mechanism – Fixed incentive or reverse auction
- Incentives and payment triggers – Fixed incentive or multi-tiered incentives
- Implementation manager – Public, private or NGO
- Monitoring and verification of results – Increasing interest in automated "MRV" and analysing customer data.

These categories are described in more detail in Table 1.

Figure 2: Key process steps in an RBF programme[18]

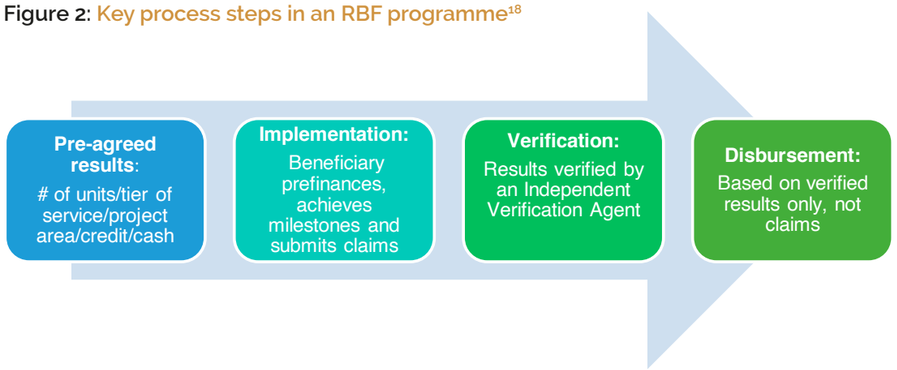


Photo 6: Dimitry Demidko/Unsplash

18 Source: Energy 4 Impact research.
19 Usually, it is a combination of factors that is decisive with this regard and can also include factors like registration location of a company (locally in the country of programme or overseas) and a certain minimum of available funds on the balance sheet (at the company applying).

THE COST OF MANUAL MRV IN AN RBF PROCESS IS RELATIVELY HIGH. CLEAN COOKING RBFS ARE INCREASINGLY INCENTIVISING THE USE OF REMOTE MRV AND PAYGO TECHNOLOGIES TO GENERATE COST SAVINGS FOR IMPLEMENTERS AND PARTICIPATING COMPANIES.

Table 1: Main features of a clean cooking RBF programme

FEATURES OF RBF	OPTIONS
Targets	**Outputs** – Most RBF programmes now have output-based targets, primarily based on number of sales (or inventories) of stoves. Some also have secondary targets such as the number of retail outlets or the number of agents hired. It is much easier to target outputs than outcomes and outputs are often considered as close proxies for desired outcomes. However, fuel or stove stacking means that these proxies are often not reliable. For stoves to deliver much of their desired social or environmental impact, customers must significantly reduce use of their old stoves. This requires behavioural change that is influenced by practical considerations such as time and cost, as well as culture and tastes. Therefore, it is important to track fuel or electricity usage, which has tended not to happen in most RBF programmes. **Outcomes** – None of the clean cooking RBFs in this report have outcome targets (e.g. health improvements, gender equality, or emission reductions), although some are using methodologies to derive outcomes from outputs. This means companies are paid RBF incentives solely on outputs. The same is true of nearly all SHS and mini-grid RBF programmes[20], although we did identify one SHS RBF that has a small element of outcome-based funding.[21] While payments based on outcomes are theoretically more desirable than payments for outputs, outcome-based RBFs have several challenges versus output-based ones: • They are more expensive to administer and verify. • It is difficult to define and measure appropriate outcomes. • Companies must wait longer before they are paid the RBF, creating potential cash flow challenges. It must however be noted that for other sectors where RBF has been in use for longer and where the focus is more on outcomes, although the implementation costs have been higher, payments have been made in a timely manner.[22]
Eligibility and due diligence	**Clean cooking technology** – Most of the current RBF programmes target clean cooking technologies of Tier 2 and above, though one is targeted at a single technology (the Global LEAP EPC RBF). **Geography** – Most RBF programmes target particular countries or regions of countries. Even those that have a broader geographical focus tend to be implemented on a country basis e.g. the World Bank's Clean Cooking Fund has a global focus, but its first programme is in Rwanda. **Beneficiary** – One of the key questions is what types of companies are allowed to participate in the RBF (e.g. manufacturers/ suppliers, distributors, asset financiers etc). Other criteria might include the track record of the company, their marketing strategy and ability to achieve scale, and having a legal entity in the country concerned. **Due diligence** – The level of due diligence will vary according to the programme. Some will require companies to pre-qualify in order to access the RBF. Others, particularly for under-developed clean cooking markets, will have to actively seek out RBF participants.

20 Their output targets are based on the number of SHS units sold or the number of mini-grid electricity connections made.
21 20% of the incentives for the EnDev 2.0 SHS RBF in Tanzania are based on the level of customer satisfaction with the product. This is measured through the Net Promoter Score (NPS) and is based on surveys conducted 3-4 months after the SHS is installed. NPS is an index ranging from -100 to 100 that measures the willingness of customers to recommend a company's products or services to others. It is used as a proxy for gauging customer satisfaction with a company's product or service and the customer's loyalty to the brand.
22 See: https://ieg.worldbankgroup.org/evaluations/program-for-results

Bidding mechanism	**Fixed incentive** – The traditional RBF model fixes the incentives in advance (e.g. subsidy of up to 50 per cent of the sales price of the stove) without going through an auction process. This approach has the advantage of simplicity, although it does not provide any visibility on the level of subsidies required by the private sector. **Reverse auction** – In a reverse auction, the roles of buyer and seller are reversed. In an ordinary auction, buyers compete to obtain goods or services by offering increasingly higher prices. In a reverse auction, the sellers compete to obtain business from the buyer, and prices typically decrease as the sellers underbid each other. In the case of clean cooking, they compete based on the subsidy to sell a certain volume of stoves in a particular area. Reverse auctions are becoming an increasingly popular tool for running RBF bidding processes, although they may not necessarily be the best approach. The main benefits are price discovery, flexibility around contractual commitments, and potentially reduced subsidies. However, there are many potential drawbacks: • Price is not necessarily the best means of selecting winners in a nascent sector such as clean cooking in which there are few proven business models. Other factors are potentially more important e.g. user experience and awareness of the product, competitiveness against substitute fuels. • There is a risk that some companies will bid aggressively to win the competition but then not be able to deliver on the promised sales volumes. • Reverse auctions tend to favour larger companies because they can bid more aggressively on a per unit basis and make up for it through higher sales volumes. They can more easily cover the fixed costs of moving into a new market because of their higher sales. Consequently, the major share of the RBF funds is distributed among a small number of larger, more established, and often foreign-owned companies under this mechanism. This can bear the risks of concentrating the performance risk in those companies and creating market disadvantages for smaller, local companies. For example, in the KOSAP SHS RBF, one large SHS company's assertive bidding strategy allowed them to secure about 30 per cent of the total $3m RBF. In many of the Kenyan counties supported by KOSAP, two companies received 50 per cent plus share of the incentives available. One solution could be to organise separate reverse auctions for different sizes and types of companies, so a more diverse range of companies can compete and are properly represented in the RBF. Interestingly, the KOSAP project used a reverse auction for their solar RBF component, but fixed incentives for their clean cooking RBF component. The BRILHO programme in Mozambique is a good example of a clean cooking RBF that used a reverse auction.
Incentives and payment triggers	**Incentives for sales of stoves** – In the traditional RBF model, there is a fixed incentive per type of stove, typically no more than 50 per cent of the retail price of the stove. The incentives can be broken down into component parts e.g. purchase of inventory, the final sale of stoves. **Multi-tiered incentives** – In more recent RBF programmes, the incentives have been broken down into tiers according to the performance rating of the clean cooking technology (higher for e-cooking and other modern cooking solution technologies) or by geography (higher for underserved regions) or consumer income categories (higher for lower-income groups) or use of stove (higher for productive use). The RBF is typically structured with a base incentive (linked to the stove) with bonus or tiered incentives on top based on the technical performance of the stove or underserved regions. The BRILHO case study below is a good example of this. The multi-tiered approach to incentives is already very common for SHS and mini-grid RBF programmes and there have been some recent examples of such RBF programmes including additional payments for consumers who also access clean cooking devices (this was a component under the most recent round of the Beyond the Grid Zambia programme).[23] **Catalytic grants** – Some programmes offer catalytic grants to cover the CAPEX and OPEX of market setup and development activities. Such grants are paid upfront but are still linked to certain milestones such as recruitment of key personnel. These grants are provided in addition to the RBF incentives that get paid out later. Catalytic grants are particularly important for modern cooking fuel companies that may need to invest upfront in infrastructure for distribution/retail and fuel production. Such companies are unlikely to be interested in an RBF unless the infrastructure already exists, or they get financial support. Catalytic grants will likely be needed for other market setup activities e.g. market research assessments, running consumer awareness campaigns, setting up sales, distribution and marketing channels, product development, and training and skills development. **Technical assistance (TA)** – There may also be a need for TA and capacity building for companies (e.g. for the RBF application process or improving the design of locally produced stoves) or for public institutions (e.g. around local testing facilities and protocols). **Commercial pricing** – Most RBF programmes assume that the stoves will be sold at market or near market pricing although that is a question under debate. The RBF is supposed to cover the costs of market entry in a nascent market, but not subsidise prices. The cost-effectiveness of RBFs however is not yet fully proven (Chinkhumba et al., 2020; Zeng et al., 2018).

Implementation Manager	**Government or public body** – One of the main advantages of working through public implementing agencies is political buy-in. On the other hand, there may be a greater risk of delays and possible mismanagement of funds especially in countries with weak corruption control and prevention mechanisms. **NGOs**, either acting alone or together with government.
Monitoring, verification and data analysis	**Monitoring** – Monitoring is important for tracking progress against contracted milestones, both at a programme level and at the individual project level. This typically involves quarterly and annual operational and financial reports and discussions with the RBF supplier organisations. Topics covered include delivery status against milestones (e.g. number of units sold or in inventory, number of new retail stores, number of staff hired, number of agents recruited), portfolio quality, recent technology developments, financing and partnerships. It can also involve more qualitative assessments of impact. **Verification** – In all RBFs, there is a requirement to independently verify the pre-agreed results claimed by the RBF supplier organisations. The verification process is triggered when the RBF supplier organisation files an incentive claim. The objective is to validate the sales claim (or in other circumstances the impacts claimed) of the RBF supplier organisation and determine how much of the claim should be paid out. The verification process can be run in different ways: • 100 per cent run by a third party – an Independent Verification Agent (IVA) is contracted to check the project documents submitted by the RBF supplier organisation and to further verify the results through additional checks. 100 per cent run by the RBF manager – the RBF manager approves the request for payment after checking the project documents and does not necessarily verify the results through additional checks. • Hybrid process – In this case, the IVAs are engaged for one or two verification processes, during which the RBF manager develops in-house capacity and processes to handle verification. IVAs may also just be asked to carry out additional checks. Verification is one of the key challenges in implementing a successful RBF programme for clean cooking. In the PAYGO SHS sector, a majority of the units sold through RBF programmes are connected through GSM technology which allows for remote monitoring and control and makes it easy to identify the location of the unit. In addition, most payments for SHS are done with mobile money, so there is a digital payment trail for customers. Similarly, it is also easy to verify the number of mini-grid connections established and even the electricity consumed. However, for clean cooking, most of the Tier 2 and Tier 3 biomass stoves are sold on a cash and carry model and only a few LPG stoves have in-built PAYGO technology. As a result, more human resources are needed for monitoring, reporting and verification (MRV), and the risk of corruption and misreporting by the portfolio company is higher. The MRV costs in the clean cooking can be as high as 15 per cent of the RBF allocation compared to 10 per cent or less for the PAYGO SHS sector. The use of remote monitoring and PAYGO technology in modern energy cooking services could therefore potentially play a major role in lowering the cost of MRV and increasing the interests of RBF funders and managers in clean cooking. See the EnDev 2.0 case study for an overview of their verification process. **Data analysis** – Most RBF programmes do not carry out detailed data analysis. However, in some RBFs, the verification agent is tasked with carrying out data analysis e.g. CLASP used 60 Decibels for both verification and analysis of customer satisfaction for the Global LEAP RBF programmes, including the one on EPCs in Kenya. **Outputs versus outcome** – The World Bank Clean Cooking Fund plans to monitor and measure outputs and then use standard calculation methodologies to project outcomes and impacts. The carbon credit markets are already using methodologies to translate monitored and verified outputs into outcomes – AMS-II.G, which looks at the number of stoves sold and AMS-I.E, which looks at the achieved fuel switch.[24] For the AMS-I.E methodology, credits are paid out based on the reduced use of the dirty fuel and increased use of the cleaner fuel, based on surveys, interviews, and field visits with a sample of customers.

23 Incentives are linked to ESMAP's Multi-Tier Framework which considers power availability, reliability and quality. There are five performance tiers based on different criteria including peak power, allowable daily energy consumption, duration of supply, evening supply, and reliability. SHS may offer between Tier 1 and 3 performance – the incentives offered for the RBF under the World Bank-funded National Electrification Project or NEP varied from US$16/unit for Tier 1 to US$50/unit for Tier 3.

24 For more information, see https://cdm.unfccc.int/methodologies/index.html

CHALLENGES AND OPPORTUNITIES

This section considers the challenges of developing effective clean cooking RBFs in order to facilitate RBF programme design optimization in the future.

CLEAN COOKING SECTOR CHALLENGES

Most of the challenges related to clean cooking RBF programmes relate to wider issues of the sector rather than the use of RBF itself. Examples include:

- Under-developed markets in many countries, reflected by the relatively small number of sizeable players in each segment of the market.
- Lack of proven business models working at scale combined with a perceived lack of profitability, and lack of investible pipeline.
- Ability and willingness of customers to pay. Lack of consumer awareness on available products.
- Poor access to finance for companies and consumers.
- Lack of country-level data on the market (e.g. consumption patterns, competing fuel prices), technologies (e.g. unit economics), companies (e.g. business models, distribution strategies, payment plans), and customers (cooking behaviours in different cultural settings).
- Lack of standardised impact metrics.
- Lack of financial management and reporting capacity among clean cooking companies, many of whom are quite small and early stage.
- Lack of clear government commitment and targets for clean cooking.

Technical progress in both the gas and electricity sectors may be addressing some of the challenges regarding consumer awareness and perception. Clean cooking companies focused on LPG tend to be much larger entities and are able to draw on greater economies of scale and access to finance. Similarly, electric cooking appliance manufacturers (and in some cases, distributors) are also much larger organizations, with significant capacity, if they can be convinced there is a worthwhile market to serve in target countries. These factors mean that some of the larger modern energy cooking companies do not always face as many of the challenges identified above or at least they have greater resources with which to confront them.

With regard to the policy landscape, the awareness of modern energy cooking and the necessity of clear targets is slowly rising among national policymakers, as can be observed in Kenya or Zambia for example. However, the lack of overall acknowledgement of clean cooking as a central part of the energy sector and the development of coherent access strategies is still a key challenge in most countries.

CLEAN COOKING RBF CHALLENGES

There are some challenges that appear to be specific for clean cooking RBF programmes (as opposed to other energy sector RBF programming) which make them more difficult and expensive to implement. A review of the relevant literature reveals the following commonly recurring characterisations of the difficulties of designing RBF programmes for this sector.

- Lack of homogeneity in clean cooking – there are multiple technologies (improved biomass, biogas, LPG, ethanol, electric) and business models and they often overlap with each other e.g. stacking of electric and LPG stoves.
- There are no standardised approaches to clean cooking RBF designs. Changes will need to be made along the way to allow for new technologies and business models e.g. new stove tests, contract amendments.
- There is a need to run smaller RBF pilots to test the market for consumer acceptability and feasibility of appliances. The fixed costs of setting up and running these programmes are likely to be similar to larger ones, making them less attractive to donors.
- There is potentially a need for higher RBF incentives or blended structures (e.g. lining up different types of support, e.g. market development/consumer awareness, ex-ante grants, ex-post incentives – similar in theory to the KOSAP design but not yet in practice) due to the under-developed nature of the market and the over-dependence on a few small market players and the presence of ample free or very low-cost dirty fuels in many markets.
- There is less scope for remote online monitoring and verification in clean cooking than other energy access sectors which can significantly reduce costs (except for e-cooking or PAYGO[26] – see Table 1).
- All clean cooking RBF programmes except for the clean cooking RBF component of the Rwanda Energy Access and Quality Improvement Programme (EAQIP) focus on outputs rather than outcomes and metrics. The methodologies used to measure outcomes and impacts from outputs are still unreliable – see Table 1.

Many clean cooking companies are cash-constrained and will need bridge funding before they can deliver on RBF milestones and get paid the RBF incentives. They typically need funds for setting up their operations, including inventory and the human and system infrastructure for supply, sales and marketing, and reporting. They may also need to offer financing to their customers. Many financial institutions (both local and international) are reluctant to lend due to the immaturity of the market and the small size of the companies involved.[27]

Photo 7. Rice cooker, EPC and gas cooker in a Kenyan kitchen. Jon Leary/MECS

26 Automated usage tracking/sensors could potentially play this role (e.g., the CCDP planned in Rwanda through SEForALL and Nexleaf).

27 However, it must be noted that market entrants in the case of MECS tend to be much larger entities than start-ups in the ICS sector. So, whilst companies may have been set up for longer in lower-tier markets, they do tend to be small and relatively immature. On the other hand, LPG suppliers and electric appliance manufacturers and retailers tend to be much larger entities with greater access to company finance for example.

RBF AND LIFETIME COST

RBF incentives, as a supply-side subsidy, aim to facilitate the sale of stoves, but the retail price of the stove is only a fraction of the cost of fuel over the life of the stove, which has important impacts on longer-term consumer affordability. Take the case of an EPC which retails at $70 and has an expected life of five years. Let us assume an average household consumes about 30 kWh a month on electricity for cooking and pays a grid tariff of $0.20/kWh. This implies a total running cost of $360 over five years which is over five times higher than the price of the appliance. If the RBF funds 50 per cent of the cost of the stove, then the RBF is not even covering 10 per cent of the lifetime cost of the stove. For improved biomass cookstoves, the proportion covered by the RBF incentive is likely to be even smaller.

Overall, it appears easier to design an RBF for a standardized product like PAYGO SHS than clean cooking. While there is essentially one business model for PAYGO SHS, there are multiple business models for clean cooking i.e. tool only (improved biomass cookstoves versus electric) and tool and fuel (LPG versus ethanol versus biogas etc).[28]

Output-based RBF programmes, which dominate in the energy sector, work best when usage and payments can be tracked using automated and remote monitoring and verification technologies. This technology however is still at a nascent stage due to the relatively high cost of the tracking device in comparison to the cooking appliance. While remote monitoring of electricity at the household level is common, the smart technology required to monitor the usage of individual electric appliances is expensive and therefore rarely used.

THE RBF IS MOST SUITABLE IN A MARKET THAT IS NOT TOO NASCENT. SOME TECHNOLOGY AND MODERN ENERGY COOKING SOLUTIONS FACE SPECIFIC CHALLENGES AND ARE HEAVILY INFLUENCED BY THE LOCAL CONTEXT, WHICH NEED TO BE ADDRESSED DURING PROGRAMME IMPLEMENTATION.

28 See Energy 4 Impact/MECS: See Energy 4 Impact and MECS (2021). Clean Cooking: Financing Appliances for End Users. Report 2 of the Financing Clean Cooking Series. https://mecs.org.uk/wp-content/uploads/2021/07/Clean-Cooking-Financing-Appliances-for-End-Users.pdf

LESSONS LEARNT

The evaluation of existing clean cooking RBF programmes generates key lessons for future programmes and improves our understanding of how best to enhance the uptake of clean and modern energy cooking solutions.

Selecting a market that has a certain potential for the further uptake of modern energy cooking solutions and that is not too nascent is a key factor for the success of a clean cooking RBF. This means that:

- The stoves and their fuels must be affordable for their target market (with consumer finance where needed). Consumers must be able and willing to pay for the stoves and fuel costs.[29]
- The clean cooking technologies supported must be competitive against substitute fuels.
- Consumers must be aware of the clean cooking technologies on offer.
- Technologies must be consumer-friendly and easy to use.
- There must be a functioning supply chain for the stoves/canisters and after-sales service.
- The infrastructure for modern fuel solutions should already exist (e.g. fuel distribution network and retail outlets, fuel production capacity).
- There must be an attractive policy environment for clean cooking and appropriate fiscal incentives are in place (e.g. VAT exemptions, proportionate import tariffs).
- Consumer financing for the appliances should be available if required.
- RBF development and implementation should be based on the availability and evaluation of sufficient data regarding the (clean) cooking and wider energy market, companies and consumers.

CONSUMER AWARENESS AND ACCEPTANCE ARE KEY SUCCESS FACTORS FOR A CLEAN COOKING RBF.

Photo 8: MECS EPC cooking trial Kenya. Jon Leary/MECS

29 However, RBF is also designed to enable companies to reach consumers that currently cannot afford their products by helping them to reap economies of scale or providing incentives to enhance profitability in pursuit of given outcomes. There is space for targeted subsidy for example with this regard which calls for blended RBF approaches in certain markets. Consequently, affordability remains a key factor as according to the SEforALL 'Taking the Pulse report' (published 10/2021) there are still very high affordability gaps for Tier 4 stoves/fuels, with fuel cost comprising >70% of the costs which indicates the necessity of fuel subsidies in addition to the supply side RBFs.

30 https://www.businessdailyafrica.com/bd/opinion-analysis/ideas-debate/clean-cooking-big-deal-give-it-suitable-tax-cover-3415180

31 https://www.gogla.org/news/a-big-win-for-kenya-government-reinstates-vat-exemption-on-renewable-energy-products

No developing country is likely to tick all these boxes and it becomes clear that RBF will not accelerate the clean cooking market alone, but is one tool in the clean cooking toolbox. That is why, in addition to using RBF, it is vital to provide catalytic grants and other forms of support to develop the local clean cooking markets. In Kenya for example, a country which is generally regarded as one of the more attractive clean cooking markets in sub-Saharan Africa, one cooking company told us, they would much prefer donors to offer concessional loans conditional on re-introducing fiscal incentives for clean cooking than to do another RBF. In terms of market development, it is also helpful to remove fiscal barriers for clean cooking devices. In Kenya the government removed the exemption on VAT and import duties for clean cooking stoves and fuels, including manufactured improved cookstoves, in 2019/20 which had a negative impact on the consumer pricing for these products,[30] then announced its reintroduction in July 2021 after serious concerns were raised by CCS stakeholders.[31]

- Having selected the right market and identified appropriate interventions for the sector, it is important to structure the RBF programme properly and take a long-term perspective on transforming the market. We recommend that programmes are of sufficient length so that there is time to adjust and correct mistakes. There is no one-size-fits-all approach to RBF, but the lessons below apply in most cases.
- Carry out (or assess existing) preliminary market research in the country.
- Ensure the gap between the selection of eligible technologies and implementation of the RBF is not too long (ideally less than 6 months) to avoid technologies going out-of-date.
- Keep the RBF design and implementation simple, including the verification process and ensure timely onboarding of the IVA.
- Consult with sector stakeholders on the design and implementation of the RBF.
- Give RBF suppliers flexibility in deciding how the RBF incentives are used.
- Tailor incentives to country-specific circumstances and market barriers.
- Offer catalytic grants to companies alongside the RBF incentives for market entry and development activities. Areas where support may be required include consumer awareness campaigns, the establishment of sales and marketing channels, and recruitment and training of agents.
- Use tiered incentives for technologies with different performance levels to encourage growth in under-served markets. Consider bonus incentives for technologies sold to low-income groups or used for productive purposes and how these relate to approaches towards social subsidisation and the appetite for demand-side interventions.
- Use the RBF to pilot uptake of new modern cooking technologies.
- Use the RBF to introduce technical standards and improve the supply and quality of affordable technologies.
- Make use of remote monitoring PAYGO technology and mobile money payments where possible to reduce the costs of monitoring and verification.
- Analyse the data from the RBF projects to improve understanding of the cooking preferences of consumers and their energy consumption patterns.
- Provide TA and raise awareness among local public institutions e.g. setting up testing centres.
- Provide TA to applicants of the RBF to improve access for smaller companies.
- Lobby for attractive clean cooking policy and regulations e.g. VAT and import duty exemptions.

30 https://www.businessdailyafrica.com/bd/opinion-analysis/ideas-debate/clean-cooking-big-deal-give-it-suitable-tax-cover-3415180
31 https://www.gogla.org/news/a-big-win-for-kenya-government-reinstates-vat-exemption-on-renewable-energy-products

RBF WON'T ACCELERATE THE CLEAN COOKING MARKET ALONE, BUT IS ONE TOOL IN THE CLEAN COOKING TOOLBOX.

Photo 9. Off-grid e-cooking trial. John Leary/MECS

CLEAN COOKING RBF LANDSCAPE

Most of the historic clean cooking RBF programmes have focused on improved biomass cookstoves (performance Tier 2 and above), although interest in modern cooking technologies is increasing.

Table 2 provides an overview of some of the most recent clean cooking RBF programmes that have been completed, are in implementation, or are planned.[32]

Photo 10: Modern energy cooking trial Zambia, Nancy Serenje/CEEEZ, Zambia

ALTHOUGH CLEAN COOKING RBFS ARE OFTEN PART OF ENERGY ACCESS PROGRAMMES, THEY ARE STILL USUALLY DETACHED FROM THE ACCESS TO ELECTRICITY COMPONENTS OF THESE PROGRAMMES WHICH REDUCES THE SCOPE FOR EARLY INTEGRATION OF E-COOKING IN THE OFF-GRID SECTOR.

32 While the authors acknowledge that there are RBF programmes that focus on ASEAN countries (Stritzke et al., 2021; Zhang and Adams, 2015; Zhang et al., 2018), for this report the case studies presented are primarily on RBF programmes implemented in sub-Saharan Africa.
33 Source: E4I and MECS research
34 For more details see https://3stf061ctnyu2kc55n1j4iyh-wpengine.netdna-ssl.com/wp-content/uploads/BGFA-PO-Guidelines.pdf
35 https://endev.info/content/Main_Page

Table 2: Clean Cooking RBF Programmes sector[33]

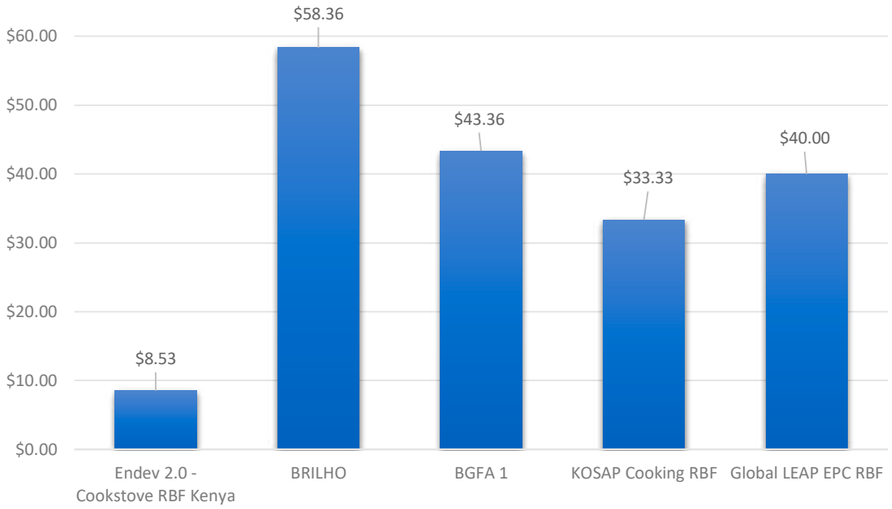
RBF PROGRAM	COOKING TECHNOLOGY OR EFFICIENCY TIER LEVEL	COUNTRY	IMPLEMENTER	FUNDER	DATES	AMOUNT
Historical						
Kenya Clean Cookstove Market Acceleration Project – EnDev 2.0 Clean cooking RBF**	ICS	Kenya	SNV; MESPT	FCDO, Sida, NORAD, BMZ, SDC, MFA NL	2009 -2019	US$944.975
EnDev 1.0 and 2.0 Cookstove Country RBF	ICS	Ethiopia, Kenya, Nepal, Peru, Malawi, Mozambique, Vietnam (Mekong)	GIZ, SNV	FCDO, Sida, NORAD, BMZ, SDC, MFA NL	2004 -2019	€1.6m
Implementation ongoing*						
BRILHO**	All	Mozambique	SNV	FCDO	2020 -2024	$8.8m
KOSAP**	ICS (Phase 1) All (Phase 2)	Kenya	Ministry of Energy/SNV	World Bank	2018 -2023	$5m
CCF Rwanda**	All	Rwanda	BRD	World Bank	2021	$17m
BGFA 1***	MECS excl. charcoal	Zambia, Liberia, Burkina Faso	NEFCO/REEEP	Sida	2021 -2025	€30.35m
Global LEAP EPC RBF**	EPCs	Kenya	EnDev/CLASP	FCDO, Power Africa	2020	$200,000
REACT Kenya	Wood stoves (tier2+), charcoal stoves (tier 3+), modern cooking	Kenya	AECF	Sida	2020-2023	$4m
Malawi Clean Cooking Fund	Sustainable charcoal/pellets/ethanol/LPG/ICS	Malawi	Tetra Tech	FCDO, USAID	2020 - 2022	$1.1m
Alternatives to Charcoal (A2C)	LPG/Biogas/EPC	Zambia	Tetra Tech ARD	USAID	2021-2026	$3.0m
Planned/In design						
MCHF****	Clean fuels	Malawi	Tetra Tech	USAID,	2020 -2024	$8.8m
MCHF****		Zambia				
Clean Cooking Fund (CCF)**	All	SSA, but implemented at country level	National governments or public bodies	World Bank	2019-2024	$500m
UEF*****	All	TBD	SE for All	Shell Foundation Rockefeller	2022	TBD

*Call for proposal sent to companies or companies awarded funds or funds disbursed
** See case study in Section 11
*** Beyond the Grid Fund for Africa 1 will cover standalone services (including SHS and clean cooking solutions) and mini-/micro-grids. The standalone component including clean cooking solutions has a budget of €21.3 m, with the remaining amount of €12.05 m going to mini-/micro-grids. The programme is managed by Renewable Energy and Energy Efficiency Partnership. They currently manage Beyond the Grid Fund for Zambia which covers just solar lighting (4 off-grid energy access companies).[34]
**** Modern Cooking for Healthy Forest
***** Universal Energy Facility. First UEF RBF launched in late 2020 focused on mini-grids in Sierra Leone and Madagascar (US$3m). RBF for SHS planned in 2021 and for clean cooking in 2022.

A number of interesting themes emerge from Table 2:

- Most of the existing and planned RBF programmes cover all clean cooking technologies, including modern cooking solutions (performance Tier 4 and above). One RBF (the Global LEAP E-cooking RBF) is entirely focused on EPCs but with a comparatively small volume.
- The increased interest in modern energy cooking solutions is reflected in the higher RBF incentive amounts per stove offered by current programmes – see Figure 3.
- Some RBF programmes are purely clean cooking related, while others are part of broader energy access schemes.
- Many of the existing and historic RBF programmes were funded by EnDev[35] and the World Bank, and they will continue to play an important role in future programmes.
- The regional scope of RBF programming in the clean cooking sector is widening. Kenya has been one of the countries with a lot of attention from RBF programmes and there is a growing interest in supporting other African countries, including Burkina Faso, Liberia, Malawi, Mozambique, Rwanda, and Zambia. The World Bank is also actively looking at clean cooking RBFs in Ghana, Niger, and Uganda.

Figure 3: Average RBF incentive amount per cookstove sold[36]



Note:
Numbers for EnDev 2.0 are based on actuals and mainly relate to improved charcoal stoves, hence the lower RBF incentive per stove
Numbers for programmes in implementation i.e. BRILHO, BGFA 1, KOSAP and Global LEAP EPC are based on total RBF incentives for clean cooking/ target number of stoves deployed

36 Source: Energy 4 Impact; The data for KOSAP is for phase 1 only.

THE FOCUS OF RBF IS SLOWLY SHIFTING FROM ICS TOWARDS MODERN ENERGY COOKING, INCLUDING E-COOKING SOLUTIONS.

Photo 11: Kenya EPC trial. Jon Leary/MECS

CLEAN COOKING RBFS IN SUB-SAHARAN AFRICA – SELECTED CASE STUDIES

For the evaluation of RBF programming in the clean cooking sector, five case studies from RBF programmes have been selected for evaluation. The aim is to cover programmes that provide a certain diversity in terms of supported cooking technologies.

These case studies are:

- **Global LEAP EPC RBF** – the first and only pure e-cooking RBF which was implemented in Kenya over 6 months and completed in November 2020 as part of the Global LEAP Appliance RBF for off-grid appliances
- **Endev Kenya 2.0** – a fully implemented clean cooking RBF with tiered incentives based on the efficiency of the stoves and sales in less developed areas
- **KOSAP Clean Cooking RBF** – an RBF targeted at the underserved counties in Kenya that is currently in the middle of implementation
- **Clean Cooking Fund Rwanda** – the largest clean cooking RBF in Africa which has just gone into implementation
- **BRILHO** – one of the largest single-country RBF on clean cooking currently in implementation

GLOBAL LEAP RBF PILOT FOR EPCS IN KENYA

Introduction

The third round of the Global LEAP RBF Programme took place between 2019 and 2020, and comprised two RBF components: a clean cooking component to pilot EPCs and an off-grid appliance component. Both components were run under the same programme but were implemented independently from each other.

The $226,000 RBF pilot for EPCs was organised in parallel to an EPC Global LEAP competition. The RBF was rolled out only in Kenya whilst the EPC Global LEAP competition was open internationally. The intention was that the winners from the EPC Global LEAP competition would become eligible for the EPC RBF, however, the timescales did not align. The $2.3m off-grid appliance RBF focused on solar water pumps and off-grid refrigerators which were winners or finalists in the 2019 Global LEAP Awards and targeted Kenya and six other countries.[37]

The EPC RBF pilot was the first RBF aimed at kick-starting a particular modern cooking technology in a developing country. Kenya was selected because it was considered more mature than other e-cooking markets. The pilot was conducted over a very short period – the competition was designed and run from January to April 2020 and implemented from May to October 2020, with final reporting to the donor in November 2020.

The Global LEAP RBF programme is managed by CLASP and funded by Power Africa, UK Aid, EnDev, Powering Agriculture, and USAID. The Global LEAP Appliance RBF[33] aims to increase uptake of off-grid appliances by lowering procurement costs and facilitating new markets for the suppliers of the appliances.

Target

The goal of the clean cooking RBF was to sell 5,000 EPCs by end of October 2020.

Eligibility

Eligible beneficiaries of the off-grid appliance programme included suppliers and last-mile distributors of off-grid solar appliances. The suppliers and appliances they supplied were either winners or finalists in the Global LEAP awards or had passed appropriate tests outside the Global LEAP Awards.

The EPC RBF was open to clean cooking companies operating or intending to operate across the EPC value chain in Kenya, including manufacturers, distributors, asset financiers, and retailers.

The EPC Global LEAP competition ran in parallel. MECS and CLASP carried out laboratory tests to identify the best in class EPCs available globally on the market. The winners and finalists are listed in a Buyer's Guide[38] and the intention is that these EPCs will be eligible for future RBF schemes. The winning EPC models were chosen based on safety, quality, and performance tests (Stritzke et al., 2021).

Bidding mechanism

Applicants for the EPC and off-grid RBF components were required to submit bids through a reverse auction, stating the amount of incentive funds requested (for clean cooking based on a percentage of the retail price of EPCs), the volume of products to be procured, and the national markets in which the products would be sold. The bids for the clean cooking RBF also included information on how the RBF could help the companies to scale up their EPC businesses beyond business as usual. The incentive payment was a percentage of the product per-unit Free on Board ("FOB") origin price. The payment

Photo 12: Global LEAP/MECS workshop Kenya. Jon Leary/MECS

37 See: Global LEAP: https://storage.googleapis.com/leap-assets/Global-LEAP-RBF-Terms-Conditions.pdf

38 Global Leap Awards Global LEAP Awards: Electric Pressure Cookers Available online: https://globalleapawards.org/electric-pressure-cookers; Modern Energy Cooking Solutions (MECS) Kenya eCookbook Beans and Cereals Edition; 2020.

was slightly higher for last-mile distributors than suppliers. RBF payments to suppliers were disbursed after the products had been sold to end customers and the sales had been verified. Payments to distributors were disbursed in three parts, with each part being independently verified:

- After the product had been procured i.e. down payment had been made and the transaction had been finalized;
- After the products had been received by the distributor; and
- After the products had been sold to end customers.

Incentives and Payment Triggers
RBF grants for the EPC component were offered for up to 45 per cent of the in-house "retail" price of the EPC (from manufacturers) or up to 50 per cent of the wholesale "retail" price (from distributors). The grants finally awarded were 35-50 per cent of the retail price. The incentive levels in the off-grid appliance component were 25-30 per cent of the original price of the unit. Disbursement of the RBF in both sectors was based on different milestones: time of purchase (20%), product shipment (20%) and product sale (60%).

Verification
60 Decibels was contracted to independently verify the results and, unlike most other RBFs, to also analyse data on the end customers.

The verification process was relatively simple. 60 Decibels carried out a random sample of phone calls to check if the purchases of EPCs were made, recording the name and address of the buyer.

The data analysis was divided into two parts:

- Baseline interviews to better understand the end customer profile e.g. income level, gender, existing cooking technologies, and behaviours
- Interviews after 3-4 months with the same customers e.g. impact of EPC on the customer, customer satisfaction, cost savings, taste preferences, stacking, cooking by other household members.

The COVID-19 pandemic disrupted the EPC supply chains which negatively impacted the distribution of the appliances. The pandemic also adversely affected the MRV process and 60 Decibels struggled to perform the targeted number of baseline interviews with end customers. On a positive note, EPC distributors reported an enhanced interest from customers in EPCs during the pandemic which was potentially driven by challenges in obtaining charcoal and increased home-cooking requirements.

Participating companies came from across the value chain (Table 3).By the end of October 2020, the Global LEAP RBF had supported procurement of 4,806 EPCs. By the end of June 2021, 3,112[39] of these products had been sold to consumers. The stoves sold through the RBF ranged in price from $68 to $138, with the RBF funding 25-50 per cent of the cost.

Table 3: EPC RBF Awardees[40]

AWARDEE	TYPE OF COMPANY
Bidhaa Sasa	Asset financier, LPG cooking specialist
Burn Manufacturing	Stove manufacturer/ distributor
Hotpoint	Retailer
SCODE	Distributor
Powerhive	Mini-grid
RVE Sol	Mini-grid

39 This figure is 3421 according to the 60 Decibels report: Uses and Impact of Electric Pressure Cookers. Insights from Kenya. Available online: https://storage.googleapis.com/e4a-website-assets/Uses-and-Impacts-of-EPCs_2021.pdf
40 Source: CLASP www.clasp.ngo

Photo 13: Electric Pressure Cooker Jon Leary/MECS

THE EPC RBF PROGRAMME IN KENYA EXPERIENCED SIGNIFICANT CHALLENGES INCLUDING SUPPLY-CHAIN DISRUPTIONS DUE TO THE COVID-19 PANDEMIC AND THE SHORT TIMELINE OF THE PROGRAMME. HOWEVER, STAKEHOLDERS EMPHASIZED THAT THE RBF FACILITATED EPC ADOPTION IN KENYA'S GROWING MARKET BY ALLOWING PARTICIPATING COMPANIES TO ORDER AND DISTRIBUTE EPCS IN BULK.

Key lessons

1. Mini-grid (MG) developers and cookstove manufacturers were able to explore adding e-cooking to the array of energy services they offer to their customers, which would have been unlikely without this incentivisation scheme.

2. The RBF facilitated EPC adoption in Kenya's growing market by allowing participating companies to order and distribute EPCs in bulk. However, smaller businesses experienced difficulty obtaining upfront bridging funding because of the collateral demanded by lenders, high local interest rates, and fees.

3. The cost of the EPC makes one-time purchases difficult for many potential customers. EPCs are being accessed by relatively wealthy customers with 74 per cent living above the international relative poverty line ($3.20 per person per day). Anecdotally, it has been reported that women were more willing to purchase EPCs through one-off payments, whereas men more often opted to purchase them with credit. Specific data to validate the observation is not yet available but it provides an interesting touchpoint for further research on gender-based purchasing behaviour. The introduction of PAYGO solutions could boost EPC purchasing and use by spreading the cost for customers.

4. Usage tracking systems remain a challenge for RBF supplier organisations to implement themselves and there is great need for further evaluating and developing optimised usage tracking methods for example via remote monitoring which is still costly in relation to the value of the appliance. One participating company estimated that an electronic usage tracking system would cost them around $450 per month, while a manual phone tracking and verification would cost them around $110.

5. The market research done by MECS[41] revealed that there is limited availability of DC-powered quality EPC models in the market which indicates the need for further EPC product evaluation/ development especially for e-cooking in the off-grid sector. All the EPCs sold through the RBF were AC-powered which has an impact on cost and applicability, especially in the off-grid sector. When sold with standalone SHS, the total cost of the product was significantly increased.

6. When there is no transaction history and limited market information there can be limited demand uptake for nascent technologies and it is difficult for RBF supplier organisations to forecast demand and project sales.[42] This is also a problem for RBF donors because they want their RBF funds to be utilised effectively.

7. TA is needed to make the RBF inclusive – TA is needed for potential applicants, particularly smaller companies that have fewer staff and less experience in RBF grant applications. It is also important to keep the application and implementation process as simple as possible.[43]

The two Global LEAP RBFs were the first to focus on data analysis as well as verification of results. One of the key findings from the EPC RBF was a high level of customer satisfaction with the EPCs, which reportedly positively impacted their quality of life.[44] Having this additional data available is useful in the design of future RBF programmes.

There were two major challenges with the EPC RBF:

First, the EPC market in Kenya was challenging to work in because it is an emerging market. This was implicitly recognised in the small-scale trial nature of the programme but the challenges were:

- CLASP had limited information on EPCs available in the market meaning some participants did not know which models to sell.
- It was difficult to source EPCs in bulk due to the lack of units available in Kenya and COVID-19 exacerbated the supply chain challenge, particularly for supplies from China. The process was donor-led rather than market-driven, with CLASP (and MECS) needing to actively identify potential distributors and manufacturers to take part in the RBF. Two of the seven awardees had not been involved with EPCs before. In a longer programme this would be less of an issue as the learning curve would not need to be so steep.

Second, the timetable for the award and implementation was too short, due to funding timeframes. Companies awarded the RBF only had six months to sell EPCs in a context where COVID-19 was slowing down global supply chains. Consequently, the sales targets could not be realistically achieved and instead, parts of the RBF grant were used for inventory building rather than sales.

Despite the challenges, the total product procurement supported by the Global LEAP EPC RBF represents a 200 per cent increase in the number of EPCs previously been sold by participating companies. It triggered established cooking companies to move into the modern energy cooking solutions market and demonstrated that there is a high level of interest from some customer groups.

However, although the RBF targeted a rather nascent market, it significantly enhanced the uptake of EPCs, demonstrated high interest of certain consumer groups in these higher tier cooking devices and triggered established cooking companies to move into modern energy cooking solutions (EPCs).

CONSUMERS REPORTED A HIGHLY POSITIVE IMPACT ON QUALITY OF LIFE WHEN USING EPCS IN KENYA.

Photo 14: EPC trial on a mini-grid in Kenya and LPG stove. Jon Leary/MECS

41 See: https://mecs.org.uk/wp-content/uploads/2020/11/Cooking-with-Electricity-A-Cost-Perspective.pdf
42 The final data on EPCs sold was not available at the time of publication.
43 Jikoni Magic, a Kenyan social media brand with 2 MECS challenge fund projects for example decided not to participate in the RBF as they weren't familiar with this type of funding mechanism and thought the paperwork was likely to be too heavy for the volume of sales they were expecting.
44 The data and detailed findings are presented in: Efficiency For Access Coalition and 60_decibels: Uses and impacts of electric pressure cookers. Insights from Kenya. Report. 08/2021: https://storage.googleapis.com/e4a-website-assets/Uses-and-Impacts-of-EPCs_2021.pdf

ENDEV KENYA 2.0

Introduction

Energising Development (EnDev) is a multi-donor programme implemented by GIZ, backed by the governments of the Netherlands, Germany, Norway, UK, Switzerland, and Sweden.[45] EnDev promotes sustainable access to modern energy services for households, social institutions, and small to medium-sized enterprises in 24 developing countries in Africa, Asia, and Latin America. EnDev Kenya was launched in 2006 and has been implemented in two phases:

- EnDev 1.0 2005 to 2009
- EnDev 2.0 2009 to 2019

As part of EnDev 2.0, SNV and GIZ implemented a €3.9 m RBF (Phase 2) for SHS and lanterns and a €1.6 m RBF for cookstoves.

Eligibility

EnDev 2.0 provided funding to clean cookstoves that were in Performance Tier 2 and above and passed the required tests. All stoves were tested at the Kenya Institute of Research and Development (KIRDI) and were required to achieve fuel savings of at least 40 per cent.

EnDev 2.0 had broad eligibility criteria for RBF supplier organisations. These included local financial institutions, cookstove manufacturers, retailers, community-based organisations, and NGOs. Private distributors of cookstoves selling on either credit or cash were also eligible.

Bidding mechanism

The RBF programme applied a flat incentive rate throughout the country based on the performance tier of the stove.

Incentive and payment triggers

The RBF incentives were based on the performance tier ratings of the stoves (Table 4). There was also scope for the incentives to be periodically modified to encourage increased uptake in underserved counties. Payments were disbursed based on independent verification of pre-agreed results, primarily sales of cookstoves.

Verification

Parker Randall Eastern Africa (PREA) was contracted by GIZ to carry out independent verification of both the solar light and cookstove RBF components. The verification process included phone calls and field visits, plus a review of project documents.

The verification process is summarised below:

Kick-off meeting to establish a working relationship between the RBF supplier organisation, PREA team, RBF finance team, and technical operations team.

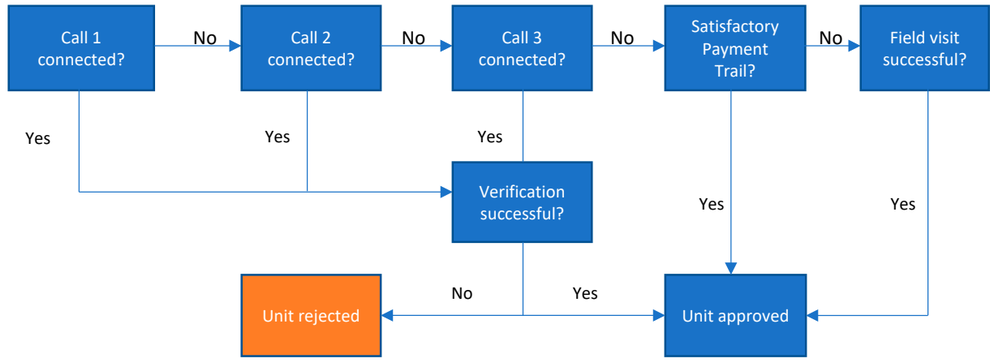
- **System Review** – A review of the PAYG, Customer Relationship Management (CRM), payment platform, and other systems involved in recording the sales and managing the customers.

Table 4: EnDev 2.0 incentives for cookstoves in Kenya[46]

COOKSTOVE	INCENTIVE RATE (€)
< Tier 2 in CO_2 Emissions	8
Tier 2	10
Tier 3	13

45 https://endev.info/content/Main_Page
46 Source: SNV/EnDev (https://snv.org/update/rbf-projects-kenya-see-16-million-people-gain-access-cleaner-energy)

Figure 4: Verification process for EnDev solar RBF in Kenya[47]



- **Document review** – Physical verification of key documents such as claim forms, sales reports and RBF contract terms. Data cleaning to remove duplicate sales records, ineligible transactions, and repossessed units.
- **Phone verification** – Calling sampled customers to verify the validity of the sales data (Figure 4). The process was guided by a prescribed telephone interview guide/questionnaire. The sample assumed a 5 per cent error margin and was calculated using tools such as RAO soft sample calculator.

The phone verification was conducted by call centre agents from the RBF supplier organisation in the presence of the PREA staff.

- **Field verification** – If the customer did not pick up the call on the registered mobile number three consecutive times and if there was no satisfactory payment trail for the customer, then a field visit could be organised, although these were rare.
- **PREA report submission** – Based on the results of the phone and field verification, PREA submitted a verification report that included recommendations on the RBF incentive that should be disbursed based on the number of successful sales confirmed.

Results

The key outputs of the RBF programmes are shown in Table 5.

Table 5: Results of EnDev 2.0[48]

	COOKSTOVE	INCENTIVE RATE (€)
Total number of units sold	272,495	110,807
Percentage of units sold by distributors/manufacturers	95%	77%
Percentage of units sold by financial institutions	5%	23%
Units sold in marginalized counties	25%	6%
Product type	SHS (51%), Lanterns (49%)	ICS (73%), LPG (21%) and ethanol (3%)

47 Source: Energy 4 Impact research
48 Source: EnDev (https://endev.info)

Photo 15: LPG cookstove. Jon Leary/MECS

Key Lessons[49]

1. It is important to select the right verification agent – The agent selected for the RBF programme had issues with staff capacity and continuous changes in staff. This led to delays in the verification process and disbursal of funds to companies.

2. Manufacturers and distributors are key participants in an RBF – The RBF programme was initially set up to channel funds through financial institutions (e.g. microfinance institutions or SACCOs) with the idea that they would provide loans to manufacturers and distributors to support product sales. However, this did not work because the vertically integrated SHS and cookstove makers already had in-house financing capacities and were not interested in partnering with the financial institutions.

3. Incentives need to be dynamic and tiered – During the first phase of the programme, the RBF participants only sold the lowest tier systems in "easy to reach" markets because there was no differentiation of incentives between products and customer markets. Later on, the RBF implementation agency introduced tiered incentives based on energy service levels and also revised the incentives periodically to encourage participants to sell in underserved counties. Sales of larger SHS and LPG stoves picked up after this change and the companies also started setting up distribution infrastructure in underserved counties.

4. Set strict quality standards for product eligibility – During the first phase of the programme, most of the stoves submitted by the companies performed poorly in terms of emission reductions. The companies were asked to redesign the stoves and improve the quality standards. As a result, more than two years were lost without any incentives being disbursed. On a positive note, the quality standards from the programme have since been adopted by other programmes such as the KOSAP RBF for cookstoves.

Following Endev 2.0, EnDev have now formed an eCooking community of practice drawing together their clean cooking and electrification portfolios, with eight countries planning eCooking piloting or scaling interventions over the next year.

49 The full report on outcomes and learning lessons is available here: https://endev.info/wp-content/uploads/2021/01/pico-PV_systems_and_high_tier_cookstoves_in_Kenya_through_RBF_report.pdf

STRICT QUALITY STANDARDS FOR THE COOKING DEVICE AND DYNAMIC INCENTIVES BASED ON MARKET UPTAKE ARE KEY RBF SUCCESS FACTORS.

KOSAP CLEAN COOKING RBF

Introduction

The KOSAP Clean Cooking Solutions Challenge Facility (CCS)[26] is an RBF targeted at clean cooking in the underserved counties of Kenya. The $6m CCS RBF[50] is part of the $150m Kenya Off-Grid Solar Access Project (KOSAP). Launched in July 2017, KOSAP is managed by the Kenya Ministry of Energy (MoE) and funded by the World Bank. It is due to be completed by June 2023. KOSAP is targeted at clean electricity and cooking in 14 underserved counties in Kenya, though the clean cooking part is only targeting eight counties.

Apart from the CCS RBF, KOSAP includes an off-grid power RBF facility ($12m) and a solar power debt facility ($30m). SNV is managing the RBF facilities, while SunFunder is managing the debt facility.

The CCS is being implemented in two rounds:

- Round 1 ($2m) was launched in 2019 and has been implemented since June 2020. It was targeted just at ICS. It received 26 applicants and 11 were selected for the implementation phase.
- Round 2 ($3m) is likely to be formally launched towards the end of 2021 and includes modern cooking fuels and technologies.

Target

The CCS aims to facilitate the sale of 150,000 clean stoves over four years across eight counties. Round 1 aims to facilitate the sale of 60,000 stoves, divided evenly between improved firewood and charcoal stoves. Round 2 aims to facilitate the sale of 90,000 stoves and is potentially open to all clean cooking fuels and technologies provided they are feasible in the target counties.

Eligibility

In 2017 the MoE called for clean cooking companies to submit their products for lab testing for them to be eligible for Round 1 of the CCS. The 11 applications accepted were all improved wood and charcoal stoves. There were no applications from modern energy cooking stoves. The stoves ranged in price from $25 to $100. One of the challenges with the CCS was that the stove models were selected two years before the launch of the RBF, so many were already out-of-date by the time the RBF was launched. Annex 2 shows the stoves selected.

Currently, the MoE in Kenya is in the process of selecting stoves for Round 2. They could include modern energy cooking stoves (LPG, ethanol, biogas, electricity) provided that the counties have the distribution infrastructure to support the fuels for such technologies, which may be a challenge given the remoteness of the target counties.

Round 1 of the CCS focused on five of the 14 counties covered by KOSAP, West Pokot, Turkana, Isiola, Samburu, and Marsabit. Round 2 is targeting an additional three counties, Kwale, Kilifi, and Taita-Taveta.

The RBF is open to manufacturers, wholesalers, retailers, and last-mile distributors of the approved stoves.

Bidding mechanism

Unlike the KOSAP Solar Solutions Provider (SSP) RBF, the CCS RBF did not adopt a reverse bidding mechanism but fixed the RBF incentive at 37 per cent of the product selling price.

50 https://snv.org/project/kenya-grid-solar-access-project-kosap

Incentive and Payment triggers
The RBF incentive is structured to offer payments that cover the incremental costs of market entry and sales in remote, vulnerable counties. It has three components:

- Market entry component – 30 per cent of the RBF incentives are disbursed "ex-ante" to cover market awareness campaigns, sales and marketing activities, purchase of inventory, and training and operating expenses. Funding is provided in advance, linked to pre-agreed milestones. This is particularly important due to the remote nature of the underserved counties.
- Results-based component – 60 per cent of the RBF incentives are disbursed "ex-post" based on pre-agreed and independent verification of sales targets.
- Sustainability component – 10 per cent of the RBF incentives are disbursed based on independent verification that the stoves are functioning and applicable warranties are being honoured at least one year after initial deployment of the products.

Verification
For the ex-post RBF, verification of sales will be done by an IVA contracted by the Ministry of Energy. The verification process will involve a combination of desk work, phone calls, and field visits. As of August 2021 no IVA has been contracted. This leads to a situation where participating companies that have already started procurement and distribution of stoves are waiting for RBF payments without a secure timeline. This could pose a serious threat to their cash flow.

Key Lessons
Although the final results of the first round have not yet been published, some lessons can already be derived from the KOSAP CCS.

1. Focusing on underserved counties has to be specifically planned into the RBF design, it will not just happen by accident[51] – Clean cooking companies tend to prefer urban and peri-urban cooking markets and have limited interest in underserved counties due to their remoteness, low population density, lower purchasing power, weaker infrastructure, and (in some cases) security issues. The KOSAP CCS was designed to address these issues by providing financial incentives to companies to move into these counties. However, it is too early to say whether they will be successful.

2. Do not make the technology choices too narrow – Round 1 only supported improved wood and charcoal stoves. Many of the stoves did not meet the required quality standards and the applicants had to go back and make changes before submitting them again, which led to delays of over a year. Unfortunately, no manufacturers of modern cooking technologies applied for Round 1, either because their technologies were not ready or because they were not interested. It remains to be seen whether the changes in Round 2 which incorporate a wider technological approach will lead to the adoption of these technologies.

3. Keep the timelines between selection of technology and implementation short – Some technologies selected in 2017 were out-of-date by the time the RBF was launched in 2019.

4. Market awareness-raising needs to happen early in the process – There were significant delays in onboarding a consultant for market awareness creation and behavioural change, which caused issues for companies operating in the field.[52]

5. There is no 'perfect' implementing agency so be aware of possible challenges early on and plan to mitigate them where possible. KOSAP is a World Bank-funded project, therefore, funding is channelled through the government. The investment of the Kenyan government of World Bank funds into the clean cooking sector is a significant commitment to driving clean cooking forwards and should be recognised as such. The engagement of the MoE helped with political buy-in, but may have contributed to some delays in the project (e.g. in the procurement of the IVA and the testing timelines). It was also important from a public relations perspective to emphasize the social impact of the project, rather than allowing the focus to be on the transfer of public money to private companies.

6. A suitable IVA needs to be appointed early in the programme – the absence of an appointed IVA under KOSAP has demonstrated how bottlenecks can easily be formed, with knock-on consequences for the supplier organisations relying on disbursements. IVAs need to be capable of managing the tasks assigned to them, with competent staff and the ability to continuously monitor programme performance.

Whilst it is too early to draw any conclusions about the overall performance of the KOSAP RBF, it is notable that the Ministry of Energy in Kenya has put itself forward as a leader in the sector. The KOSAP programme is working in difficult contexts and that brings additional challenges to the implementation. Far from going for 'low hanging fruit' the KOSAP programme is actively working in hard-to-reach locations. The clean cooking and electrification sectors should be following the programme with interest as it moves forwards to see what comes out as a result.

CLEAN COOKING FUND RWANDA

Introduction
The Clean Cooking Fund (CCF) was established by the World Bank's ESMAP in 2019 to accelerate progress toward universal access to clean cooking by 2030[53]. The CCF has three main objectives:

- To leverage finance of the World Bank and other multilateral development banks and attract private sector investments;
- To catalyse technology and business innovations by providing incentives to players across clean cooking value chains; and
- To link incentive payments with verified results.

The CCF has two implementation pillars:

Pillar 1: Country/Regional Investment Programme – provides grants to co-finance investment projects of the World Bank Group and other multilateral development banks to scale up public and private sector investments in the clean cooking sector, including funding for the verification of outputs and impacts of clean cooking interventions; TA and capacity building; and project development and preparation support.

Pillar 2: Knowledge, Innovation, and Policy Coordination – works with development partners to mobilize high-level political commitments for the clean cooking sector at both global and country levels; generate and disseminate knowledge; promote ongoing technology and business innovations; and improve policy coordination.

The CCF has a funding target of $500m over five years and aims to catalyse another $2bn in public and private investments, helping 200m people gain access to clean cooking.

As of October 2020, the CCF had received funding pledges from the governments of Norway, the Netherlands, and Denmark, amounting to more than $100m in CCF co-financing and at least the same amount from the World Bank. It will initially focus on Rwanda, Uganda, Ghana, Burundi, Niger, Zambia, Myanmar, and Nepal. Each country is likely to receive $20m for clean cooking, comprising of a $17m RBF from the CCF and $3m TA.

EAQIP Rwanda
The first CCF programme – the Rwanda Energy Access and Quality Improvement Project (EAQIP) – was approved in September 2020. The RBF grant volume is $17m and flanked by a $3m budget for technical assistance. The project aims to provide new or improved access to clean cooking solutions to 500,000 households by 2026. At the time of writing this report, there have been 28 applications from companies offering 48 different clean cooking technologies. Applications are accepted on a rolling basis from both local and international companies with

51 Contrary to other RBF programmes, KOSAP is ONLY for the remote underserved counties.
52 The delays were caused both by Government/MoE and World Bank processes with capacity being a key issue in the delay as well as processing contracts and providing World Bank approval.
53 See ESMAP Multi-Donor Trust Fund Grant Agreement -http://documents1.worldbank.org/curated/en/842871601312335713/pdf/Official-Documents-ESMAP-Grant-Agreement-for-Grant-No-TF0B3589.pdf

registered operations in Rwanda. Given the timeline of the programme, more applications are expected.

The clean cooking component is embedded in the $150m EAQIP which aims to improve electricity access by providing funding for the country's ongoing programme of expanding grid connections and improving the efficiency of electricity services, as well as by supporting an RBF for off-grid solar connections to reach low-income and remote households, and providing grants to reduce the costs of off-grid SHS.

The clean cooking strategy in Rwanda is managed by the Ministry of Infrastructure (MININFRA) and Rwanda Energy Group's subsidiary – the Energy Development Corporation Limited (REG-EDCL). The strategy is closely linked to their biomass energy strategy (A Sustainable Path to Clean Cooking 2019-2030 *Government of Rwanda, 2018*) including biomass pellet production, Tier 2-4 stoves, and supply of biogas energy which is VAT exempt.

The overall objective of the program is to 'provide new or improved access to clean cooking solutions to 500,000 households by 2026'.[21] The call for proposals was closed in February 2021. The CC-RBF has two components:

Component 1: RBF and Concessionary Loan

Eligibility criteria for cooking technologies

The eligibility criteria for the CCF Rwanda are presented in Table 6. The CC-RBF is using both ISO VPTs[54] and the MTF[55] as the key reference documents for determining eligible cooking technologies and will incorporate Rwanda's country context to reflect its cooking culture and practice. About 53 per cent of households use three-stone stoves (equivalent to Tier 0) and about 15 per cent use self-built or traditional biomass stoves (equivalent to Tier 1). The CC-RBF will support technologies that are at least Tier 2 during the initial phase while providing local producers TA to improve their products' performance level. Once sufficient cooking technologies and products are affordable and available at Tier 3 and higher, the minimum requirement will be lifted to Tier 3.

Table 6: Eligibility criteria for clean cooking technology[56]

STOVE TYPE	GENERAL TESTING AND EVALUATION REQUIREMENTS	OTHER CONSIDERATIONS
Stoves and accessories using biomass fuels that require no additional processing	Meeting thermal efficiency and PM 2.5 and CO emissions. Tier 2 requirements, according to ISO VPTs*.	Evaluate for safety and durability; expected lifetime to be at least 3 years and the manufacturer's warranty at least 1 year.
Stoves and accessories using biomass fuels that may require additional processing (for example, charcoal, wood, briquettes/pellets) and/or ventilation (for example, chimney)	Meeting thermal efficiency and PM 2.5 and CO emissions Tier 3 requirements, according to ISO VPTs; vented stoves will be assessed for fugitive emissions and efficiency	
Stoves and accessories using modern fuels/energy, which may include LPG, biogas, ethanol, electricity (including electric rice cooker and electric pressure cooker), solar energy, pellets, or other biomass fuels	Meeting thermal efficiency and PM 2.5 and CO emissions. Tier 4 or 5 requirements, according to ISO VPTs.	

Note:
* Tier 2 cooking technologies are considered transitional technology and may only be eligible for project support and promotion for the first two years.

54 International Organization for Standardization Voluntary Performance Target
55 Multi-Tier Framework
56 Source: Adapted from the Rwanda Energy Access and Quality Improvement Project Operation Manual (2021). Available at: https://www.brd.rw/brd/wp-content/uploads/2016/04/Clean_Cooking_Operations_Manual.pdf

Table 7: Subsidy/incentive levels per tier and Ubudehe[58]

TIER RATING	STOVE COST (IN US$)[59]	UBUDEHE CATEGORY	MAXIMUM COST COVERAGE (%)	MAXIMUM RBF AMOUNT (IN US$)
Tier 5	49.84 - 99.69	1	90	44.86
		2	70	34.89
		3	45	29.91
Tier 4	39.88 - 69.78	1	90	39.88
		2	70	29.91
		3	45	24.92
Tier 3	19.94 - 39.88	1	90	29.91
		2	70	19.94
Tier 2	9.97 - 19.94	1	90	14.94
		2	70	9.97

Electric cooking is included and the subsidy for electric cooking stoves and appliances is available to all Ubudehe categories. It is anticipated that initially, electric cooking will be more desirable for customers connected to the grid network or mini-grids.

The performance of eligible cooking technologies must be demonstrated through laboratory testing and/or field-based data. The Rwanda Standards Board (RSB) has set up a stove-testing laboratory, with funding from the World Bank, responsible for testing, evaluating, and certifying stoves ready for application to the RBF. The RSB will be provided with additional TA to build its cookstove testing and evaluation capacity and improve national cookstove standards. Safety and durability are evaluated as part of the eligibility criteria.

RBF incentives and payment triggers

The total amount of eligible RBF incentives are linked to the performance Tier and customer-income categories (Ubudehe categories 1, 2 and 3) as Table 7 illustrates. A similar process has been used for solar home system subsidies. The payment triggers will be linked to the verified results in terms of inventory, sales, adoption (verification of stove usage after 3 months through on-site visits/sampling), and impacts (predominantly climate impacts, but also gender and health). According to the World Bank's published documents, the subsidy levels per Ubudehe[57] and tier range between $10 and $100.

Under this RBF programme, it is expected that participating RBF supplier organisations fully pass on the subsidies to customers. As it is progressive, higher tiered solutions will attract higher incentives, with additional incentives being awarded depending on the Ubudehe level of the customer household: the lower the income category, the higher the incentive. The incentive/subsidy level for each Ubudehe category will be the lower of these two options: (a) a set maximum in absolute terms (in RWF), or (b) a set maximum in relative terms (in percentage).

Focus on affordable and sustainable adoption

Companies are required to specify their product and marketing strategies in the application and the impact of the RBF incentives on product offerings and pricing. TA and training will be provided to local producers to improve local product design and quality production.

57 Ubudehe is a social stratification programme which assigns households to different Ubudehe (or groups) depending on income. Ubudehe 1 are the lowest income households whereas Ubudehe 5 are the highest income households.
58 Source: Adapted from the Rwanda Energy Access and Quality Improvement Project Operation Manual (2021): https://www.cleancookingalliance.org/binary-data/RESOURCE/file/000/000/618-1.pdf
59 Prevailing exchange rate as at 6th July 2021: 1 RWF = US$0.001

Innovation grants will be available (through a competitive process) to encourage innovative technological, business, and financing approaches with a focus on meeting poor households' cooking needs and encouraging female entrepreneurs in the cooking sector. Awareness raising and behaviour-change campaigns will be conducted to stimulate demand and support sustainable adoption.

Adopting an adaptive and collaborative approach
The programme will continue to coordinate and collaborate with key stakeholders (for example, the EU, GIZ/EnDev, SNV, Enabel, Tony Blair Institute, Clean Cooking Alliance, Global LPG Partnership, AfDB, and MECS), as well as relevant Global Practices of the World Bank to align efforts in ongoing and potential programmes in the cooking sector.

Management of the facility
The RBF is managed by BRD, which is also managing the other energy access financial support programme (the Renewable Energy Fund or REF). The World Bank covers the management and operating costs of BRD. REG-EDCL are responsible for technology approval with the RSB who are responsible for certification of cooking products, standards setting, and development of a testing laboratory. A number of companies that have applied are currently undergoing the certification process.

Component 2: TA, Institutional Capacity Building and Implementation Support

Awareness raising and behavioural change campaigns
The programme will work with health practitioners, women's groups, and educators on the issue of household air pollution and clean cooking options. Gender-targeted messages will be developed, and influential champions (for example, clean cooking ambassadors) will be identified. Mass media and social media, as well as other innovative marketing approaches, will be used to raise awareness of and demand for improved and modern cooking solutions. These activities will be designed and implemented in close coordination with development partners to ensure complementarity with other related cooking programmes.

Market facilitation and policy/regulation review and improvement
The programme will hire a market facilitator to reach out to promising and interested cooking companies on opportunities and provide targeted business-development training for cooking companies participating in the RBF operation. It will also provide TA in reviewing related policies and regulations and identifying areas for improvement to support market development.

Stove testing and product development
TA and capacity building will be provided to a) increase stove-testing laboratories' testing and evaluation capacity; b) improve the design and quality of local producers' stoves, with a special focus on incorporating women's needs as users; c) establish links with international suppliers, partners, and financiers to assist technology development or transfer; and d) improve the RSB's testing protocol and relevant national standards to incorporate local cooking culture and practices.

Innovations
The programme will offer an innovation grant through a competitive process to support innovative cooking technologies, modern materials, technology transfer, and business and financing approaches, giving preferential support to female entrepreneurs.

Monitoring and verification for the RBF operations
The programme will cover the costs related to monitoring and verification of results at the output, outcome, and impact levels, as well as support for the development of a database to track and verify the operations. Figure 5 shows how the planned monitoring and verification metrics for the CCRBF will work. At the output level, the programme will measure the number of clean stoves sold, how much they are used, and the amount of investment mobilised. Based on these outputs, it will then use a framework of existing methodologies to calculate outcomes and impacts in three areas:

- Health benefits (reduced exposure to particulate matter and averted disability-adjusted life years or ADALYs);
- Gender equality (reduced time women and girls spend on collecting firewood and cooking and reduced drudgery and time poverty for women and girls); and
- Climate (reduced black carbon and other short-lived climate pollutants and carbon equivalent emissions).

Figure 5: Planned monitoring and verification metrics for the CCF[60]

These methodologies include the Multi-Tier Framework (MTF), the Clean Development Mechanism (CDM), the Gold Standard and Verified Carbon Standard (VCS) methodologies, ADALYs, Gold Standard Gender Equality Guidelines (2017), and Time Savings Methodology. Whilst a unique approach, measuring outputs and projecting outcomes could potentially lead to misleading figures for outcome achievements due to stove or fuel stacking.

Ci-Dev
Companies supported through the CCF are eligible for support from the World Bank's Carbon Initiative for Development (Ci-Dev), a World Bank trust fund that aims to mobilise private capital for clean energy access including clean cooking in low-income countries. It provides performance-based payments to clean energy enterprises after the verification of results (e.g. sale of stoves and purchase of clean cooking fuel) is achieved in the form of carbon credits called Certified Emission Reductions (CERs). Ci-Dev finances between $3-15m per company through Emission Reduction Purchase Agreements or ERPAs[61]. These agreements provide for the delivery of CERs at pre-agreed prices (€4-€10 per CER) over five to seven years.

60 Source: ESMAP – Yabei Zhang
61 An Emissions Reduction Purchase Agreement is the agreement used between the buyer and seller of carbon credits

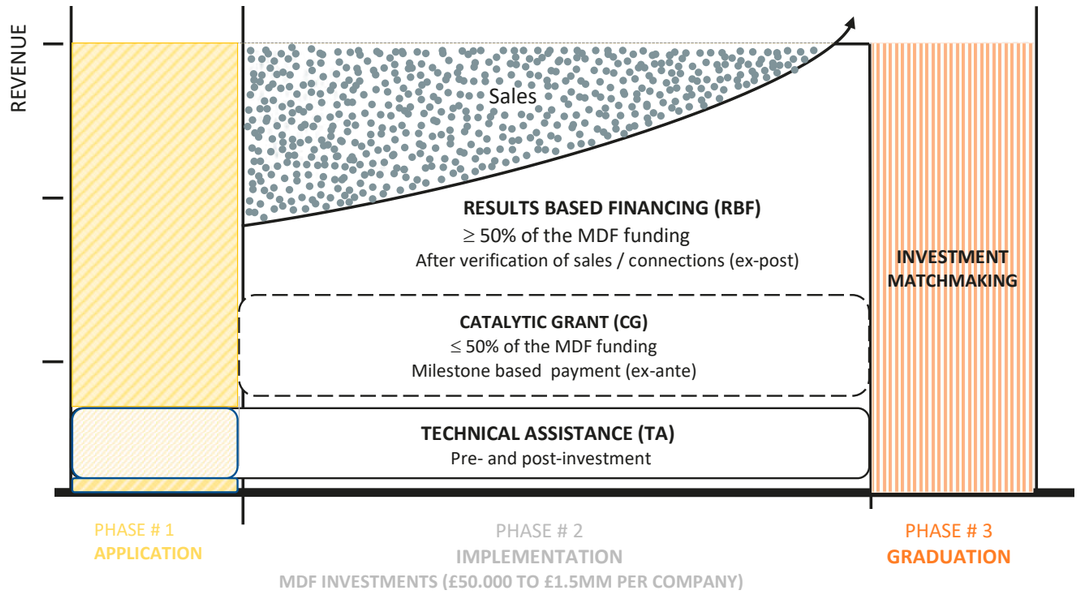
Key Lessons
The Rwanda CC-RBF is just starting so it is too early to identify lessons. However, there are two entries in the programme documentation that might hinder progress through the CC-RBF.

1. According to the Operational Manual (BRD, 2021: 1) "the households in Ubudehe 1 and Ubudehe 2 are not eligible to purchase LPG cookstoves. Extensive due diligence will be conducted to ensure the impact and sustainability of LPG cookstove subsidy to Ubudehe 1 and Ubudehe 2 households." This means that companies looking to engage customers in Ubudehes 1 and 2, particularly those in urban and peri-urban areas with existing LPG supply chains, cannot benefit from the LPG subsidy.[62] It is likely that an assessment of the Ubudehe 1 and 2 households' willingness and capacity to pay will be conducted before determining whether and how the LPG subsidy will be extended to these households.
2. The RBF's carbon credit component aims to extend the programme and its reach as the Ci-Dev carbon funding from the rollout will be processed as additional financing for EAQIP (i.e. the generated carbon credits will be reinvested into the programme). This has been disappointing for some companies as the carbon credit benefits are effectively taken away whilst the responsibilities for related monitoring and reporting remain.

BRILHO MARKET DEVELOPMENT FUND MOZAMBIQUE

Introduction
BRILHO[63] is a five-year GBP22.8 m energy access programme in Mozambique funded by FCDO. The programme, which runs 2019-2024, provides catalytic grants, RBF grants, and TA to private energy access and clean cooking companies. It also supports the development of the off-grid energy ecosystem, including info sharing, quality standards, and advocacy on policy and regulations. The RBF itself is innovative, due to its use of a reverse auction bidding system and multi-tier incentive structure, including bonuses. Launched in mid-2020 there are ten awardees, seven SHS firms and three clean cooking enterprises. The programme is in the process of closing contracts with some additional companies.

Figure 6: The BRILHO Market Development Fund[64]



62 The reasoning for not including Ubudehe 1 and 2 according to BRD Rwanda is the perceived willingness and capacity to pay for LPG among those households as it is assumed that those households will not be able to pay for these technologies even at the subsidised level.
63 https://brilhomoz.com/about-us
64 Source: https://brilhomoz.com/about-us

ALTHOUGH BRILHO INCORPORATED A WIDE RANGE OF CLEAN AND MODERN ENERGY COOKING APPLIANCES, KEY CHALLENGES ARE THE NASCENT MARKET AND END-USER AFFORDABILITY.

The programme's catalytic grants component is available to support market development and set up costs. These milestone-based grants can be used for CAPEX, OPEX, research and development, product and technology development, sales and marketing, and skills development. The maximum available catalytic grant per company is £750,000 and is conditional on 100% per cent match funding of the amount, either cash or in kind.

The RBF is tied to the successful sale of a pre-agreed number of units and is disbursed after independent verification of the sale. The maximum available RBF per company is £750,000. The BRILHO Market Development Fund is shown in Figure 6.

Targets
BRILHO aims to improve access to quality energy options for families and local businesses via:

- Improved Cooking Solutions, including improved biomass cookstoves, biogas, ethanol, LPG and electric stoves, benefitting 750,000 people
- Off-Grid Electrification Solutions, including SHS and green mini-grid, benefitting 750,000 people
- Productive Use of off-grid energy solutions benefitting 15,000 commercial businesses

Eligibility
The eligibility criteria for the BRILHO MDF are very wide.

All types of private clean cooking companies are eligible, including manufacturers, importers, distributors, retailers, installers, and operators of quality assured energy technologies. They do not have to have an operational history

Table 8: Eligible stove technologies by performance tiers[65]

MULTI-TIER FRAMEWORK CLASSIFICATION	TIER 1	TIER 2	TIER 3	TIER 4	TIER 5
Stove type	Simple ICS	Intermediate cookstoves	Advanced cookstoves	Non-biomass stoves	
Fuel type	Wood/charcoal	Wood/charcoal/pellets/ briquettes/sustainable charcoal		Biogas/LPG/ ethanol	Electric

65 Source: https://brilhomoz.com

or legal presence in Mozambique, thus encouraging the entrance of global companies into the market.

All stove technologies are eligible provided they have been quality assured. These are divided into tiers shown in Table 8.

Bidding mechanism
Companies submit a base incentive in GBP per stove and a target volume of sales.

Incentive and payment trigger
BRILHO MDF has an innovative multi-tier incentive structure for clean cooking companies. All companies get a base incentive per stove, with the opportunity for bonus incentives based on the energy service level (0-100% bonus), the extent to which the area is served (0-200% bonus) and whether the stove is for productive use (50% bonus).

Table 9 shows the bonus for different energy service levels. In this case, a company selling a Tier 3 biomass gasifier cookstove gets a bonus of £5 (50% bonus) on its base incentive of £10, while a company selling an electric cookstove gets a bonus of £10 (100% bonus) on its base incentive of £10.

Table 10 shows the bonus for underserved areas. The objective is to encourage companies to operate in less developed, more remote locations. Underserved areas are defined based on socio-economic factors such as population and poverty levels, plus the level of infrastructure such as roads and remoteness.

The RBF incentives are disbursed following independent verification of pre-agreed milestones. Milestones can include both quantitative factors (such as number of stoves sold and number of co-investments achieved) and qualitative factors (such as completion of market assessment reports and recruitment of key staff). BRILHO MDF allows 40 per cent of a milestone payment to be disbursed upfront.

Table 9: Bonus incentive based on energy service level[66]

ENERGY SERVICE LEVEL		
PERFORMANCE TIER	COOKSTOVE TYPE	BONUS (%)
Tier 1	Simple ICS	0
Tier 2	Intermediate ICS	25
Tier 3	Advanced ICS	50
Tier 4	Biogas, LPG, Ethanol	100
Tier 5	Electric	100

Table 10: Bonus incentive based on underserved areas[67]

UNDERSERVED AREA BONUS		
AREA CATEGORY	AREAS	BONUS RATE (%)
Underserved Area 1	Maputo Cidade and Provincial	0
Underserved Area 2	Gaza, Nampula	50
Underserved Area 3	Manica, Inhambane, Tete, Sofala, Cabo Delgado	100
Underserved Area 4	Zambezia, Niassa	150
Underserved Area 5	PPA: Priority Postos Administrativos	200

66 Source: BRILHO
67 Source: BRILHO

Photo 16: Induction stove. Sandie Clarke/Unsplash

Key Lessons
Although the programme is still in its early stages of implementation, the following preliminary lessons were shared by the implementer and participating companies:

1. The Mozambican clean cooking market is still relatively nascent compared to the likes of Kenya and Tanzania and will require further market development activities, including consumer awareness campaigns.

2. Some customers have struggled to afford the upfront cost of appliances and there is limited appliance-based financing available. For example, MFIs view the market as relatively underdeveloped, consequently they are reluctant to partner with the clean energy companies to provide consumer financing. In light of this issue, BRILHO is planning a second call for applications in the last quarter of 2021 which will include a component to incentivise consumer financing.

3. The application process for the RBF is relatively long and complex. The application process (from submission of Expression of Interest to contract signing) for both RBF and catalytic grants can take anywhere between 16 and 20 weeks, although the application for RBF-only support is shorter.

4. Another lesson relates to the support for SHS and MGs, which includes TA and catalytic grants to reduce the cost of digitalising monitoring and tracking systems. Thus, there is an opportunity to use RBFs to reduce the costs of digitalising monitoring and tracking systems for modern cooking solutions as well (Stritzke et al., 2021).

LOOKING BEYOND RBF TO CARBON CREDITS AND IMPACT FUNDING

RBF discussions tend to centre on public sector interventions by international agencies such as the World Bank and EnDev, through which incentive payments are paid to companies that meet pre-determined targets. However, other types of impact funding, such as carbon credits and grant payments linked to verified SDG impacts, may be considered under the umbrella of RBF because they also entail grant payments conditional on delivering pre-agreed targets.

Carbon credits have long been an important form of finance for cooking initiatives, particularly ICS projects carried out by non-governmental and humanitarian organisations (Clemens et al., 2018; Rosenthal et al., 2018; Aung et al., 2016). However, they have remained a niche market in comparison to other carbon credit investments (Aung et al., 2016). Carbon credits usually take the form of Emission Reduction Purchase Agreements (ERPAs) based on prices paid per tonne of CO_2. To date, these have come from two main sources:

- The Clean Development Mechanism (CDM), which is administered by the United Nations Framework Convention on Climate Change (UNFCCC). This was the primary source of funding for compliance purposes under the 1997 Kyoto Protocol but is now being reconsidered in light of the 2015 Paris Agreement.
- The 'voluntary market', which has functioned in parallel as an alternate source of carbon credits for clean cooking initiatives, allowing primarily private companies to offset their emissions voluntarily.

Carbon crediting has grown in popularity in recent years and by 2020, over 60 carbon pricing initiatives and more than 14,500 registered crediting projects were organised and implemented internationally across all industries. Although the carbon pricing market has grown significantly, the use of carbon credit finance in the clean cooking sector has in the past been fraught with difficulties. Price volatility, complex procedures, and high certification expenses, have often made it difficult for projects in the sector to take advantage of these opportunities.

In 2019, carbon market prices ranged from $2 to $12 per tonne of CO_2, with an average of $3.5 per tonne of CO_2 paid in the clean cookstove market (Donofrio et al., 2020). These prices were attractive for larger projects with more sophisticated sponsors but did not work well for many smaller projects given the overhead costs and complexities in managing a carbon credit programme. Some analysts have also questioned how well these incentives were truly working to lower emissions and how rigorous the certification procedures were (Cavanagh and Benjaminsen, 2014; Green, 2021). Recently, prices have improved significantly, leading to strong interest from participants in accessing credits. Even though the total volume of voluntary carbon markets for household devices, such as cleaner cookstoves and modern cooking fuels, accounted for only about 1.3 per cent of total market revenue in 2019, the volume of carbon credit financing in this sector more than doubled between 2017 and 2019 (Donofrio et al., 2020), from an estimated $15.1m to $36.7m. The potential for further growth is now very clear.

The majority of clean cooking enterprises polled for an Energy 4 Impact study in 2020 said they faced challenges in qualifying for or implementing carbon credits for their businesses. Key challenges included the volatile and occasionally depressed price of the credits, the length of time for receiving carbon credit payments, and onerous reporting/monitoring requirements.

It is now believed that the smart data features of modern energy cooking appliances may allow for a simplification in calculating emission reductions. Gold Standard, the leading certification agency for the voluntary market, has recently introduced a new approach for carbon credit certification for electrical and metered cooking appliances. Previously, the approach for determining emission reductions was to quantify emissions

Photo 17: Visual Stories-Micheile/Unsplash

resulting from the amount of fuel consumed in a sample of households, then compute emission savings by comparing this to emissions calculated after the project. The baseline and project kitchen surveys had to be extensive and precise, so they were normally conducted in 100 or more families and repeated at least every two years. The procedure was time-consuming, costly, and prone to data-gathering errors. With real usage tracked, the new approach will calculate emission savings for each unit of energy consumed in cooking, making calculations simpler and more accurate. Climate-related financing is linked to GHG emission reductions and comes from sources that are dedicated to achieving these goals. Clean cooking programmes generally have a number of other strong positive SDG outcomes, including improved health, gender equality, environmental benefits (by lowering black carbon emissions and biomass depletion), and improved livelihoods. These may present the potential for clean cooking projects to receive additional funding from donors with specific goals in mind, such as health improvement.

New RBF instruments to achieve donor SDG goals are being developed. Although these instruments are less advanced than the climate funds, their potential to support the sector is significant. One results-based vehicle for channelling funds to achieve SDG impacts is the Development Impact Bond (DIB). The DIB aims to arrange debt finance for a clean cooking project to advance and realise strong SDG impacts or outcomes. These outcomes are certified and sold to outcome buyers (donors), allowing the debt to be repaid and effectively converting the loan into a grant for the clean cooking company. As previously said, this type of RBF is in its infancy, but it has the potential to scale if it can be demonstrated to be cost-effective and reliable in satisfying donor goals. Cardano Development has been testing an initial DIB in the modern energy cooking sector and it has made substantial progress in addressing various issues.

SOME IMPACT FUNDING, SUCH AS CARBON CREDITS, CAN BE CONSIDERED UNDER THE RBF UMBRELLA BECAUSE THEY ENTAIL GRANT PAYMENTS CONDITIONAL ON DELIVERING PRE-AGREED TARGETS.

CALL TO ACTION

Based on the findings and lessons presented in this report, MECS and Energy 4 Impact call to action in the following five key areas:

1. Understand the market and adapt the RBF design to fit – don't make the market fit the RBF design.
The clean cooking market varies from county to country and even within a country. RBF programming needs to address these differences and include measures to overcome specific market barriers. This should be achieved by performing in-depth market assessments to identify key opportunities and barriers for modern energy cooking services before designing the RBF.

2. Examine and (re)design financing approaches to support RBF supplier organisations (especially smaller ones) in being able to participate in RBF calls.
RBF supplier organisations need to make significant upfront investments when participating in an RBF. These investments mean many companies will be cash-constrained until they achieve the agreed milestones, and the RBF funds are disbursed to them. While some RBF programmes offer catalytic grants, the "ex-ante" or upfront payments available tend to be limited (see Table 11). The availability of affordable financing, e.g. through bridging loans, needs to be considered more fully. For an RBF supplier organisation to access a loan against future RBF disbursements, the lender needs to be comfortable that the milestones can be met. Many local financial institutions in developing countries have a low-risk appetite and international lenders may be unwilling to lend to companies that pursue apparently risky activities outside their normal business. In some circumstances, lenders may be more willing to lend if part of the loan repayment is guaranteed. They may also offer lower interest rates or reduced collateral requirements.

3. Provide TA to smaller companies to apply for RBF schemes
While some larger companies have the resources and experience to apply for RBF funds or other grants, most small, early-stage companies do not. They often will not have realistic expectations of the RBF and the risks involved. While the RBF application processes may appear quite straightforward, they often involve important nuances which affect how the application is scored and which may not be well understood by potential applicants. Examples include the concept of additionality, leverage and co-funding, budget design, design of activities, defining and spacing milestones, preparation of support documents, and the bidding strategy. Most RBF programmes have webinars to explain the application process and some offer pre-investment TA (e.g. BRILHO), but it is still a complex process so additional, ongoing TA is often needed.[69]

4. Convene industry stakeholders to develop a digitalized and outcome-based clean cooking RBF
Many modern cooking fuel companies have developed or are in the process of developing PAYG technology solutions to remotely track usage of fuels and manage digital payments. At the most basic level, companies can track how much and when fuel is used. At a more advanced level, some companies can work out what type of food a household cooks by measuring heat intensity patterns, flame spread, and duration. PAYGO solutions have already been developed by companies for a wide range of appliances including EPCs, induction stoves, LPG cooking kits, biomass gasifiers, biodigesters, and solar-biomass hybrid energy systems. This means there is scope for an RBF based on "digitally-verified" outcomes, with commensurate savings in the costs of monitoring and verification as Figure 7 illustrates.[70]

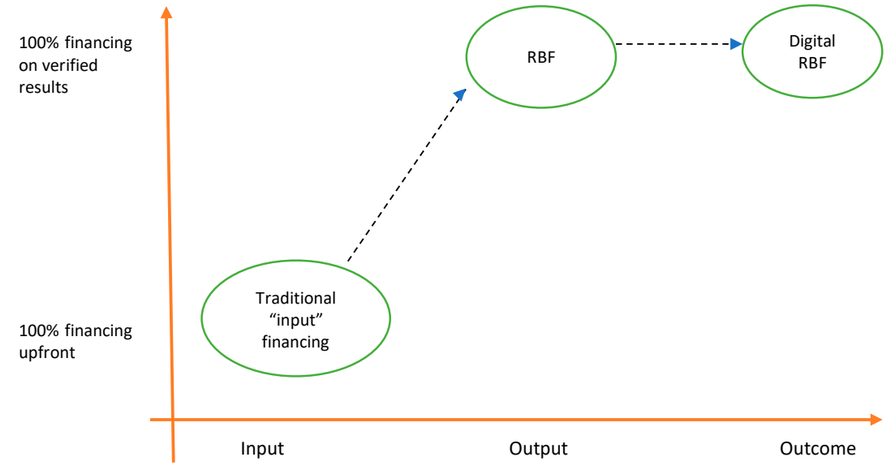
5. Further develop partnerships between RBF programme developers, implementers, stakeholders, and researchers to share lessons and best practice for future RBF development
The overall aims are a) the joint development of country-specific incentives based on a comprehensive market assessment, either through catalytic grants or the RBF incentives themselves; and b) expanding the inclusion of modern energy cooking solutions (technologies and suppliers) into future RBF programmes in both the clean cooking and electrification sectors.

Table 11: Ex-ante versus ex-post payments of incentives for clean cookstove RBF programmes[68]

CLEAN COOKING RBF PROGRAMMES	
PROGRAMMES IN IMPLEMENTATION	
BRILHO	Ex-ante limited to 40% of each total milestone payment
KOSAP	Ex-ante equal to 30% of claimed incentives
BGFA 1	Only ex-post
Global LEAP e-cooking RBF	Only ex-post
PROGRAMMES IN PLANNING AND DESIGN	
Modern Cooking for Healthy Forest (MCHF)	Ex-ante planned
Clean Cooking Fund (CCF)	Ex-ante planned
CCF Rwanda	Ex-ante planned
Universal Energy Facility	TBD

68 Source: Energy 4 Impact research

Figure 7: Outcome-based digital RBF[71]



69 This includes support in terms of raising capital, partnership building, the development of business models, impact measurement or market entry analysis among others. MECS could offer this service as an adjunct to the broader TA recommended by MECS and Energy 4 Impact See E4I/MECS: Clean Cooking: Review of the Funding Landscape. 10/2021: https://mecs.org.uk/publications/
70 See also: A2EI Climate Impact Payments Platform (CLIPP): https://a2ei.org/resources/uploads/2021/04/A2EI-Climate-Impact-Payments-Platform-CLIPP.pdf
71 Source: Energy 4 Impact research

ANNEX 1 AND 2

ANNEX 1: STAKEHOLDERS INTERVIEWED AND ACKNOWLEDGEMENTS

- Bidhaa Sasa, Kenya
- BRD, Rwanda
- BURN Manufacturing, Kenya
- CLASP, Kenya
- Earthspark, Haiti
- ESMAP Clean Cooking Division, World Bank Group
- ESMAP Financial Innovation Division, World Bank Group
- Ignite Power
- Koko Networks
- Odyssey Energy Solutions
- Powerhive, Kenya
- RVE.Sol, Portugal/Kenya
- Scode, Kenya
- Sistema Bio, India/East Africa
- SNV Kenya
- SNV Tanzania
- SNV Mozambique
- Vitalite, Zambia

ANNEX 2: STOVES SELECTED FOR ROUND 1 OF KOSAP CCS

The stoves below are all improved wood and charcoal stoves not modern energy cookstoves:

- African Clean Energy cookstove
- Biolite home stove
- Ecozoom Zoom Dura
- Burn Kuni Okoa
- Envirofit Super Saver Wood
- Prime stove
- EcoSmart stove Charcoal
- Jiko Kisasa Multipurpose
- Ecozoom Jiko fresh
- Burn Jikokoa
- Envirofit Super Saver Charcoal

ENERGY 4 IMPACT AND MECS WOULD LIKE TO THANK ALL STAKEHOLDERS INTERVIEWED FOR THIS REPORT AND THE PEER REVIEW OF THE REPORT DONE BY SEforALL.

REFERENCES

[1] Batchelor, S., Brown, E., Scott, N., and Leary, J. 2019. Two birds, one stone-reframing cooking energy policies in Africa and Asia. Energies, 12(9), 1–18. https://www.mdpi.com/1996-1073/12/9/1591/htm.

[2] MECS and Energy 4 Impact. 2021. Clean Cooking: Financing Appliances for End Users. Available online: https://mecs. org.uk/wp-content/uploads/2021/07/ Clean-Cooking-Financing-Appliances-forEnd-Users.pdf (accessed on 20 July 2021).

[3] Chinkhumba, J., De Allegri, M., Brenner, S., Muula, A. and Robberstad, B., 2020. The cost-effectiveness of using results-based financing to reduce maternal and perinatal mortality in Malawi. *BMJ global health*, *5*(5), p.e002260.

[4] Zeng, W., Shepard, D.S., Nguyen, H., Chansa, C., Das, A.K., Qamruddin, J. and Friedman, J., 2018. Cost–effectiveness of results-based financing, Zambia: a cluster randomized trial. *Bulletin of the World Health Organization*, *96*(11), p.760.

[5] Stritzke, S., Sakyi-Nyarko, C., Bisaga, I., Bricknell, M., Leary, J., and Brown, E. 2021. "Results-Based Financing (RBF) for Modern Energy Cooking Solutions: An Effective Driver for Innovation and Scale?" *Energies* 14, no. 15: 4559. https://doi.org/10.3390/en14154559.

[6] Zhang, Y., and Adams, N. 2015. Results-Based Financing to Promote Clean Stoves. Available online: https://openknowledge.worldbank.org/handle/10986/22114 (accessed on 4 August 2021).

[7] Zhang, Y., Durix, L., Tuntivate, V., and Adams, N. 2018. *Incentivizing a sustainable clean cooking market: lessons from a results-based financing pilot in Indonesia* (No. 128162, pp. 1-68). The World Bank.

[8] Government of Rwanda. 2019. *Biomass Energy Strategy: A Sustainable Path to Clean Cooking 2019-2030*. Ministry of Infrastructure, Rwanda.

[9] Clemens, H., Bailis, R., Nyambane, A. and Ndung'u, V., 2018. Africa Biogas Partnership Program: A review of clean cooking implementation through market development in East Africa. *Energy for Sustainable Development*, *46*, pp.23-31.

[10] Rosenthal, J., Quinn, A., Grieshop, A.P., Pillarisetti, A. and Glass, R.I., 2018. Clean cooking and the SDGs: Integrated analytical approaches to guide energy interventions for health and environment goals. *Energy for Sustainable Development*, *42*, pp.152-159.

[11] Aung, T.W., Jain, G., Sethuraman, K., Baumgartner, J., Reynolds, C., Grieshop, A.P., Marshall, J.D. and Brauer, M., 2016. Health and climate-relevant pollutant concentrations from a carbon-finance approved cookstove intervention in rural India. *Environmental science and technology*, *50*(13), pp.7228-7238.

[12] Donofrio, S., Maguire, P., Zwick, S., Merry, W., Wildish, J. and Myers, K., 2020. State of the Voluntary Carbon Markets 2020. *Second Installment of the 2020 State of the Voluntary Carbon Markets: The only Constant is Change – Featuring Core Carbon and Additional Attributes Offset Prices, Volumes and Insights.*

[13] Cavanagh, C. and Benjaminsen, T.A., 2014. Virtual nature, violent accumulation: The 'spectacular failure of carbon offsetting at a Ugandan National Park. *Geoforum*, *56*, pp.55-65.

[14] Green, J.F., 2021. Beyond Carbon Pricing: Tax Reform is Climate Policy. *Global Policy.*

AUTHORS:

Carlos Sakyi-Nyarko (MECS)
Susann Stritzke (MECS)
Malcolm Bricknell (MECS)
Iwona Bisaga (MECS)
Jon Leary (MECS)
Ed Brown (MECS)
Peter Weston (Energy 4 Impact)
Arun Gopalan (Energy 4 Impact)

ABOUT ENERGY 4 IMPACT

Energy 4 Impact is a UK-registered non-profit organisation seeking to reduce poverty in Africa by accelerating access to clean energy, helping businesses and communities make better use of that expanded access, and working with the private sector to support the sustainability of these efforts. Energy 4 Impact values access to energy not as an end in itself but for the difference it makes to people's lives every day, in terms of agricultural development, economic growth, humanitarian recovery and climate resilience. Supported by a small headquarters in London, Energy 4 Impact currently operates from regional offices in Kenya, Senegal, Benin, Tanzania, and Rwanda. Over the last 14 years, Energy 4 Impact has provided access to 18 million people in Africa. For more information on our work, please refer to www.energy4impact.org

ABOUT MECS

Modern Energy Cooking Services (MECS) is a five-year programme funded by UK aid which aims to spark a revolution through rapidly accelerating the transition from biomass to clean cooking on a global scale. By integrating modern energy cooking services into energy planning, MECS hopes to leverage investment in renewable energy (particularly in electricity access, both grid and offgrid) to address the clean cooking challenge. Modern energy cooking is tier 5 clean cooking, and therefore MECS also supports new innovations in other relevant cooking fuels such as biogas, LPG and ethanol. The intended outcome is a market-ready range of innovations (technology and business models) which lead to improved choices of affordable, reliable and sustainable modern energy cooking services for consumers. We 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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