TEMPLATE

DEVIATION REQUEST FORM

PUBLICATION DATE **14.1.2021**

Version **4.0**

A. To be completed by Gold Standard

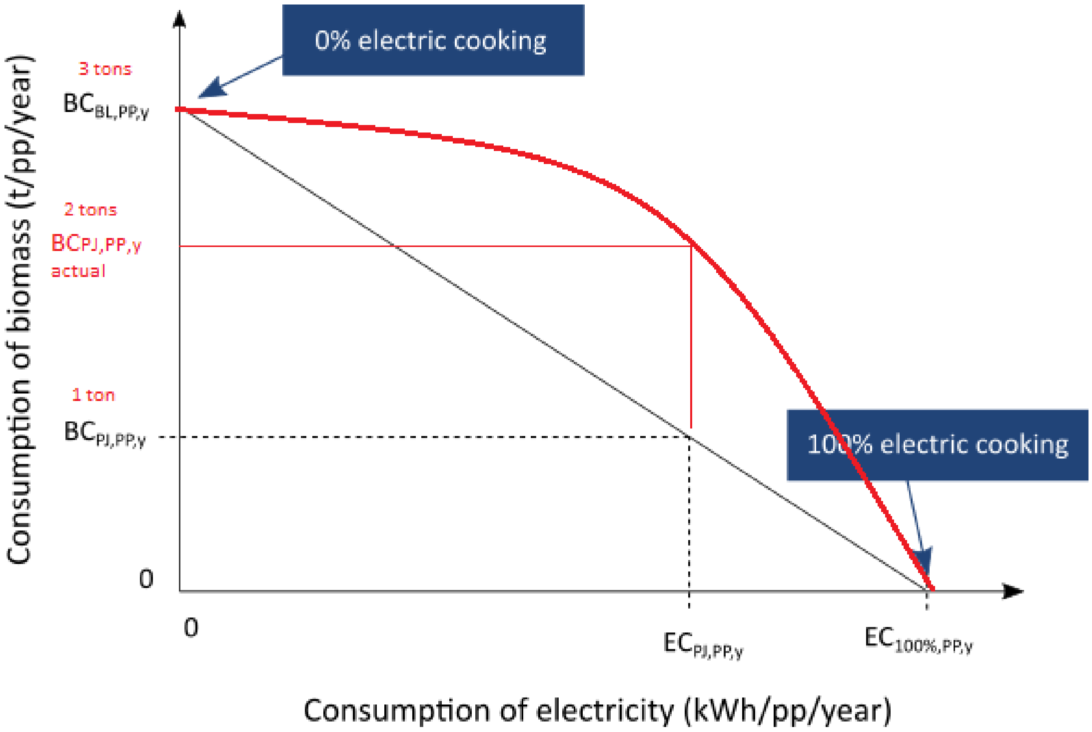
1| Decision

1.1 | Date – 26/09/2023

1.2 | Decision

The deviation is not approved considering that:

a. The PD's assumption on fuel displacement will be a linear trend without any statistical testing evidence and scientist peer review. The assumption of linear does not consider the uncertainties of actual fuel saving. For example, the household need to load 1kg of charcoal to their stove for 2 cooking tasks of BBQ (e.g., 0.5 kg consumption) and cooking rice (e.g., 0.5 kg consumption). Now that with the electricity rice cooker, they displace the rice cooking however, the household still need to use charcoal but not only 0.5 kg but they still need to load nearly 1kg to ensure the stove efficiency and their habit. So the marginal saving is low when saving a part of cooking task. In case the electric stove could displace all charcoal cooking task then the marginal saving would be high as illustrated in the below figure:



In the above figure, from PD's linear model, the Pby would be 2 tons (=3-1), but from the actual displacement line, Pb,y should only 1 tons (=3-2). The result could be in the reversed way depended on the actual displacement line.

b. Besides the above uncertainty, the Deviation request introduce a different approach to MECD that would require the peer review by experts and also stakeholders, so it is suggested that the PD to develop a concept note for methodology revision and follow up with the steps for approval of methodology revision.

1.3 | Is this decision applicable to other project activities under similar circumstances?

No

B. To be completed by the Project Developer/Coordinating and Managing Entity and/or VVB requesting deviation (Submit deviation request form in Microsoft Word format)

2| Background information

Deviation Reference Number	DEV_533	
Date of decision	26/09/2023	
Precedent (YES/NO)	No	
Precedent details	NA	
Date of submission	N/A	
Project/PoA/VPA	☒ Project	ID – GSXXXX
	☐ PoA	ID – GSXXXX
	☐ VPA	ID – GSXXXX
Project/PoA/VPA title	Electric Cooking for Households in Malawi	
Location of project/PoA/VPA	Host country(ies)	
Scale of the project/PoA/VPA	☒ Microscale ☐ Small scale ☐ Large scale	
Gold Standard Impact Registry link of the project/PoA/VPA	N/A	
Status of the project/PoA/VPA	☒ New ☐ Listed ☐ Certified design ☐ Certified project	
Title/subject of deviation	Calculation of Bb,y	
Specify applicable rule/requirements/methodology and version number	Methodology for metered & measured energy cooking devices, Version 1.0	
Specify the monitoring period for which the request is valid (if applicable)	Start date	End date
Submitted by	Contact person name: Annika Richter Email ID: richter@atmosfair.de	
	Organisation: atmosfair gGmbH	
	Project participant: Yes ☒ NO☐	
Validation and Verification body (VVB opinion shall be included, where required by the applicable rules/requirements or request is submitted by the VVB).	Yes ☐ NO☒ If yes; VVB name: Auditor name:	

3| Deviation detail

3.1 | Description of the deviation:

**Guidance* Use the space below to describe the deviation and substantiate the reason for requesting deviation from applicable rules/requirements. Please include all relevant information in support of the request. You are requested to follow the principles for requesting deviations, given in the [Deviation Approval Procedure/ Design Change Requirements.]*

3.1.1 | Deviation detail (to be completed by Project developer):

We would like to deviate from the methodology "Methodology for metered & measured energy cooking devices" by introducing a more accurate method to calculate baseline emissions $BE_{b,y}$. Specifically, a novel method for obtaining the parameter P_b shall be used. It includes monitoring electricity consumption of the electric cooking devices using electricity meters and performing a Kitchen Performance Test (KPT) adapted for electric devices to obtain the substitution factor of electricity and biomass fuel.

In order to determine this factor, an electricity consumption study will determine the average amount of electricity needed to fulfill cooking energy needs exclusively with electricity, equivalent to a Kitchen Performance Test for biomass consumption, but using electricity meters. From this consumption and the baseline biomass consumption it can be derived how many tonnes of biomass are displaced by a kWh of electricity.

By monitoring electricity consumption, the amount of displaced biomass can then be established, more transparently, reliably and accurately than through the method provided in "Methodology for metered & measured energy cooking devices".

Cooking with electricity differs significantly from cooking with biomass, as it allows for better heat control, heat retention as well as energy efficiency. Since energy efficiency is only one factor determining the overall energy consumption of an electric cooking device[1], considering energy efficiency alone to estimate the displacement of biomass fuel does not suffice. The empiric determination of a substitution factor for electricity

[1] see Worldbank Report "Cooking with Electricity: A Cost Perspective" on p. 122 – 124

and biomass fuel as suggested here therefore is the most accurate way of measuring the displacement of biomass fuels by electric cooking devices. In the following, the proposed baseline emission calculation method as per the draft PDD, is described:

Baseline emissions are calculated as follows:

$$BE_{b,y} = P_{b,y} \times f_{NRB} \times EF_b \times NCV_b \qquad \text{(Equation 1)}$$

Where:

$BE_{b,y}$	=	Emissions for baseline scenario b during the year y (tCO_2e)
$P_{b,y}$	=	Quantity of fuel consumed in baseline scenario b during year y (tons)
$f_{NRB,y}$	=	Fraction of biomass used during year y for the considered scenario that can be established as non-renewable biomass
NCV_b	=	Net calorific value of the fuel that is substituted or reduced
EF_b	=	CO_2 emission factor of the fuel that is substituted or reduced

$P_{b,y}$ is derived as follows:

$$P_{b,y} = N_{HH,y} \times N_{p,HH} \times (BC_{BL,PP,y} - BC_{PJ,PP,y}) \qquad \text{(Equation 2)}$$

Where:

$N_{HH,y}$	=	Number of households with functional cookstoves distributed under the project activity in year y (number)
$N_{p,HH}$	=	Average number of persons served per household (number)
$BC_{BL,PP,y}$	=	Average annual consumption of woody biomass per person before the start of the project activity or at the renewal of each crediting period whichever is later (tonnes/person/year)
$BC_{PJ,PP,y}$	=	Average annual consumption of woody biomass per person in the pre-project devices during the project activity (tonnes/person/year).

The cooking energy need of a household will either be met by consuming electricity, biomass, or both. It can therefore be deducted that the energy not provided by electricity is provided by biomass. This is illustrated in

Figure : In the ideal case where households switch to 100% electric cooking, no biomass is consumed in the project scenario. The opposite extreme, where households only consume biomass for cooking, is marked by the baseline consumption $BC_{BL,PP,y}$.

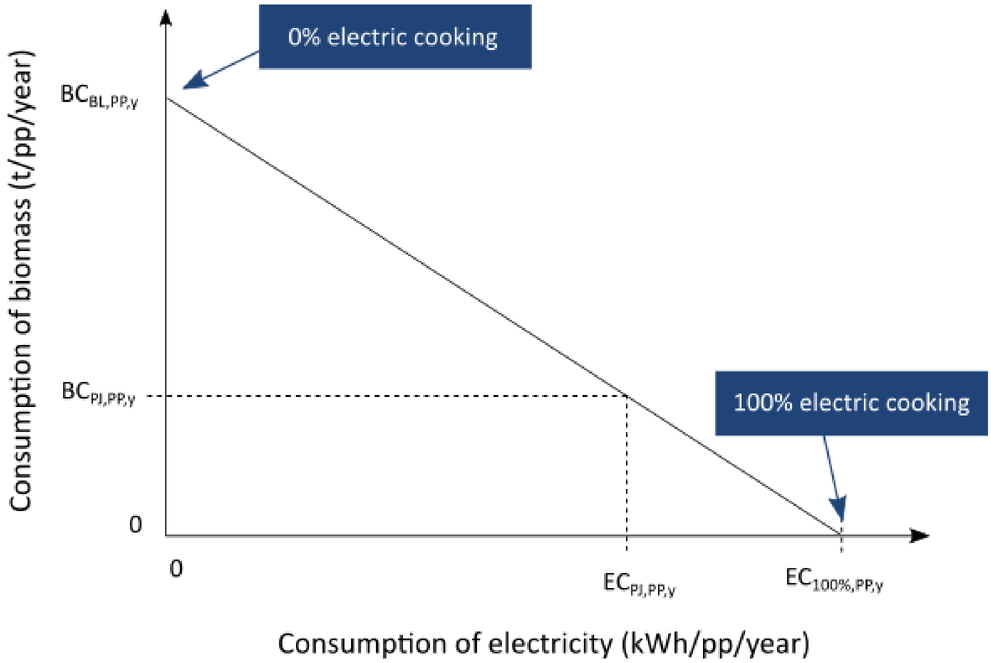


Figure 1: Relation between electricity and biomass consumption for cooking

As stove stacking is a common practice in Malawi, it is expected that households will still consume some amount of biomass in the project scenario, $BC_{PJ,PP,y}$, and therefore be located somewhere between the two extremes.

The slope of the curve illustrating the relationship between electricity and biomass consumption gives the substitution factor $S_{ec,b}$, which expresses the amount of biomass displaced by a certain amount of electricity.

$$S_{ec,b} = BC_{BL,PP,y} / EC_{100\%,PP,y} \qquad \text{(Equation 3)}$$

$BC_{PJ,PP,y}$ can then be obtained as follows:

$$BC_{PJ,PP,y} = (EC_{100\%,PP,y} - EC_{PJ,PP,y}) \times S_{ec,b} \qquad \text{(Equation 4)}$$

Where

$EC_{100\%,PP,y}$	=	Annual consumption of electricity per person when 100% of cooking energy needs are met with electricity (kWh/person/year)
$EC_{PJ,PP,y}$	=	Annual average consumption of electricity per person in the project scenario (kWh/person/year)
$S_{ec,b}$	=	Amount of biomass displaced by 1kWh of electricity (tons/kWh)

The energy need for cooking with 100% electricity, $EC_{100\%,PP,y}$, is dependent on the energy efficiency of the electric cooking equipment and its thermal heat detention capacity, as well as cooking habits of the users. It will be established by a survey, that is the equivalent to a Kitchen Performance Test for electric cooking, at the beginning of the first crediting period. In this survey, users are asked to cook exclusively with the project device for at least 3 consecutive days, during which their electricity consumption for cooking is recorded by metering devices. To incentivise users, at the beginning of the survey they are provided free electricity units exceeding the expected consumption for 100% electric cooking over the duration of the survey. Accompanying the electricity metering, users will be regularly interviewed during the survey to determine whether indeed all cooking energy needs were met with electricity. Literature values for $EC_{100\%,PP,y}$ from MECS research were used for the ex-ante estimation provided in the PDD.

3.1.2 | VVB opinion (to be completed by VVB, if applicable):

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3.2 | Assessment of the deviation:

**Guidance* Use the space below to describe how the deviation complies with the requirements, and, where applicable, the accuracy, completeness and conservativeness is ensured. Please include all relevant information in support of the request.*

3.2.1 | Deviation assessment (to be completed by Project developer):

The deviation represents a more accurate and robust method to quantify emission reductions from the displacement of non-renewable biomass by the electric cooking devices in the project activity.

The methodology "Methodology for metered & measured energy cooking devices" calculates baseline emissions based on thermal efficiency of the baseline and project devices. This has several flaws:

1. Water Boiling Tests are performed under lab conditions (same pot size and type, cooking procedure standardised) and do not represent real-life usage of the devices. E.g. thermal efficiency during usage by project households may vary due to pot size, amount of water heated, etc. The proposed methodology for determining $B_{b,y}$ reflects real-life usage in a much more accurate manner.
2. Thermal efficiency is only one parameter that determines the energy usage of an electric cooking devices next to factors like heat insulation and heat control, as clearly laid out in the World Bank report "Cooking with Electricity : A Cost Perspective", co-authored by MECS, on page 123:

"The amount of electricity required for cooking depends on the following factors:

1. the efficiency of heat transfer into the pot (for example, induction) or (better) directly into the food (as in a microwave)
2. control of the cooking process (through, for example, a timer on a microwave or a temperature sensor on a rice cooker)
3. the efficiency of heat transfer out of the pot (which is reduced by lids and insulation)
4. the temperature in the pot
5. energy-efficient cooking practices (such as soaking beans and chopping ingredients finely).

The focus of the clean cooking industry has been on the first factor, often using the efficiency of heat transfer from the fuel into the pot as the key performance indicator for improved cookstoves. Many people claim that induction stoves increase the "efficiency of cooking" by 10–20 percent over hot plates. This claim is based on the first factor only. Induction stoves can be used in tandem with other equipment that address the third and fourth factor (insulation and pressurization) through the use of insulated and/or pressurized stove-top pots. However, in rice cookers and electric pressure cookers (EPCs), insulation and pressurization (for EPCs) are integrated into the appliance itself. Rice cookers and EPCs may not use induction to heat the pot, but their strategic use of insulation means that there is minimal wastage in the heat transfer process; in many cases they mimic the efficiencies of the induction hob and exceed it by also retaining heat with insulation. […]
Much of the research on the performance of improved cooking appliances has used standardized water boiling tests, which are effective at measuring heat transfer and thus losses and efficiency in a laboratory setting. However, the amount of energy

actually saved depends on the meal being cooked. The greater control offered by electricity means that the savings and comparisons are particularly sensitive to what is cooked."

Since "Methodology for metered & measured energy cooking devices" only takes into account thermal efficiency of the cooking devices, energy savings resulting from improved heat control and heat insulation are not taken into account. These factors can result in significantly less thermal energy needed for cooking the same amount of food. This means that emissions reductions will be underestimated for most electric cooking devices, but more so for efficient electric cooking devices, which means the methodology incentivises the use of less efficient devices.
By determining a substitution factor for baseline and project fuel as proposed in this deviation request the displacement of baseline fuel by the project device and project fuel is accounted for in a more accurate manner.

The proposed methodology will deliver a conservative calculation of emission reductions, because in the electricity consumption study, users will be asked to cook exclusively with electricity for the duration of the study and be incentivised to do so through free electricity units. Because of this incentive structure, the study is likely to overestimate electricity consumption than underestimate it (e.g. when users cook more than they normally would, invite their neighbours to cook at their house etc.). As a result of this, the substitution factor will be smaller, i.e. it will be assumed that 1 kWh of electricity displaces less biomass than it does in reality. This will lead to an underestimation of emission reductions and therefore ensure conservativeness.

3.2.2 | VVB opinion (to be completed by VVB, if applicable):

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3.3 | Impact of the deviation:

**Guidance* Use the space below to describe the impact of the deviation on project design, safeguarding principles assessment, SDG assessment, emissions reductions, monitoring frequency, data quality, potential risk or any other relevant aspect of the project. Please substantiate the impact assessment with relevant and verifiable data/information.*

3.3.1 | Impact assessment (to be completed by Project developer):

The deviation will ensure higher accuracy i.e. data quality in determining emission reductions achieved by electric cooking devices in the planned Microscale project activity than the method laid out in "Methodology for metered & measured energy cooking devices", while providing a conservative estimate of emission reductions.

The deviation does not affect project design, safeguarding principles assessment, SDG assessment or monitoring frequency as it merely concerns the method of quantifying baseline emissions.

3.3.2 | VVB opinion (to be completed by VVB, if applicable):

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3.4 | Documents:

**Guidance* List of documents provided (note that once a decision has been made by Gold Standard, this deviation form along with supporting documents will be made public on the Gold Standard website. If any of the supporting documents are confidential, please indicate here to ensure they are omitted.)*

- Preliminary PDD
- Emission reduction calculation sheet
- Cooking with Electricity : A Cost Perspective, Worldbank, 2020
- Example calculation demonstrating shortcomings of CDM methodology AMS-I.E. for electric cooking devices