Comments on draft small-scale methodology SSC-NM105 and AMS-I.E. Version 11.0

submitted by atmosfair, 24.11.2020

We wish to provide our input to the draft methodology SSC-NM105 and AMS-I.E. Version 11.0. As we are currently in the process of developing and implementing several projects disseminating electric cooking appliances, we would like to specifically point out a flaw we have identified in the proposed calculation method of baseline emissions, which would pose a big challenge for our projects. We believe that the proposed calculation method underestimates the amount of replaced baseline fuel and incentivise project developers to deploy less efficient electric cooking devices. In addition to that, we would like to suggest that SSC-NM105 may also be applied to grids that are powered 100% by renewable energy sources.

1. Calculation of Baseline Emissions

In both AMS-I.E. and SSC-NM105 the option to determine baseline emissions directly via the annual consumption of biomass (via surveys or default values) has been removed. Instead, baseline emissions can only be determined via "thermal energy generated in the project" (Paragraph 31, Equation 3 in SSC-NM105).

The latter method has the elegance of relying purely on metered data without any survey data (e.g. questionnaires). In most cases, it will however severely underestimate baseline fuel consumption and thus emission reductions. On top of that, it incentivises the use of inefficient electric cooking appliances over efficient ones.

In addition to the higher thermal efficiency that is covered by Equation 3, efficient electric cooking leads to further energy savings compared to cooking with biomass thanks to more precise and faster heat control and heat retention (e.g. rice cookers, multi cookers, deep fryers, insulated frying pans, EPCs). These factors can result in significantly less thermal energy needed for cooking the same amount of food. Equation 3 does not consider this.

To illustrate this point, an example calculation has been performed, where baseline emissions for a project scenario have been calculated using options (a) and (d) from AMS-I.E:

For simplicity, only one household with one electric cooking device is considered and it is assumed that there is no continued use of pre-project devices. The electric cooking device is assumed to be an efficient multi-cooker with a thermal efficiency of 80% (WBT of such devices have been performed by atmosfair and show that this is a realistic assumption). The assumed energy consumption $EC_{AVG,y}$ is derived from the World Bank/MECS Report "Cooking with Electricity –A Cost Perspective" (Table 2.5 on page 21), which found that when cooking with highly efficient electric devices, a household of 4 consumes 1.02 kWh for cooking per day.

As the table below shows, calculating baseline emissions for this scenario, option (a) yields expected baseline emissions of 2.1 tCO_2e per year. Option (d) however only results in baseline emissions of 0.7 tCO_2e per year, i.e. less than half. The calculation via the thermal energy supplied, option (d), suggests that the baseline consumption of firewood for a household of 4 is

0.7 t, which is significantly less than the 2.0 t which can be assumed using option (a) by working with conservative default values provided by the methodology. It is unlikely a household of 4 would meet its energy needs for cooking with only 0.7 t of firewood when using a three-stone-fire.

	Parameter	Description	Source	Value	Unit
	f_{NRB}	Fraction of woody biomass used in the absence of the project activity in year y that can be established as non-renewable biomass	assumption	0.90	
	$NCV_{biomass}$	Net calorific value of the non-renewable woody biomass that is substituted	IPCC Default	0.0156	TJ/t
	$EF_{projected\ fossil\ fuel}$	Emission factor for the substitution of non-renewable woody biomass by similar consumers	AMS-I.E. Default for Sub-Saharan Africa	73.2	tCO2eq/TJ
(a)	N_{HH}	Number of households in the project activity	assumption	1	
	$BC_{BL,HH,y}$	Average annual consumption of woody biomass per household before the start of the project activity and at the renewal of each crediting period	derived from AMS-I.E. Default for a household of 4pp	2.0	t
	$BC_{PJ,HH,y}$	If it is found that pre-project devices were not completely displaced but continue to be used to some extent, average annual consumption of woody biomass per household in the pre-project devices during the project activity	assumption	0	t
	B_y	Quantity of woody biomass that is substituted or displaced		2.0	t
	BE_y	**Baseline emissions during the year y in tCO2e**		**2.1**	**tCO2e**
(d)	$HG_{p,y}$	Quantity of thermal energy generated by the new renewable energy technology in the project in year y		0.001	TJ
	$\eta_{old,i}$	Efficiency of pre - project device per type of device i	AMS-I.E. Default for three-stone fires	0.1	
	$EC_{AVG,y}$	Average consumption of electricity by electric cooking appliance(s) in year y per household / institution	assumption derived from MECS research	372.3	kWh
	$N_{0,i,j}$	Number of project devices of type i and batch j commissioned	assumption	1	
	$n_{i,j}$	Proportion of commissioned project devices of type i and batch j (N_0,i,j) that remain operating in year y	assumption	1	
	$\eta_{new,i,j}$	Efficiency of the project device type of device i and batch j	assumption based on WBTs performed by atmosfair	0.8	
	B_y	Quantity of woody biomass that is substituted or displaced		0.7	t
	BE_y	**Baseline emissions during the year y in tCO2e**		**0.7**	**tCO2e**

The reason for the discrepancy is that the electric multi-cooker has two important energy-saving mechanisms, which are not captured by the calculation:

1. Through thermal insulation of the pot in the device, the multi-cooker retains heat, thus minimising energy losses through heat dissipation and allowing for simmering food even

when the heat is turned off (similar to a fireless cooker or a heat retention box, that a pot is placed in to finish cooking a meal).
2. The multi-cooker allows for better heat control. Once water is brought to a boil in a multi-cooker, the heat is reduced or turned off completely, which is difficult or even impossible in biomass cooking setups.

Because of 2., the calculation via option (d) will underestimate emission reductions even for simple electric cooking appliances without heat retention, such as hot plates. However, it will underestimate emission reductions to a lesser extent for less efficient devices, thereby creating an incentive for project developers to deploy less efficient devices.

This issue is also nicely described in the World Bank/MECS report "Cooking with Electricity –A Cost Perspective" (p. 122 – 124):

"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 as 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. The EPC also offers significant advantages over the combination of induction and stovetop pressure pans in relation to the second factor, through the level of automatic control. The integrated appliance is completely controlled to avoid excessive pressurization, yielding further energy savings, increasing safety, and reducing the need for monitoring of the cooking process by the cook.

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."

Consequently, we would strongly suggest to reintroduce options (a) – (c) to calculate baseline emissions from AMS-I.E. in SSC-NM105 and to make them available for electric cooking appliances again in AMS-I.E.

2. Applicability of AMS-I.E. and SSC-NM105 for renewable/non-renewable grids

Regarding the applicability of AMS-I.E. and the draft methodology SSC-NM105 in cases of grid-connected electric cooking, the Meth Panel has decided that AMS-I.E. shall be applicable to grids which are powered 100% by renewable energy sources. In case there is at least one fossil fuel-powered generation unit, SSC-NM105 shall apply.

We do not understand the reason for this strict separation between methodologies, but see a number of challenges for project developers, since power generation units can change quickly in mini-grids. For instance, a renewable mini-grid could be expanded with a diesel backup system, resulting in a non-renewable power grid. Would this case then require a post-registration change due to the new applicable methodology? Furthermore, excluding renewable grids from this methodology would also complicate the combination of projects in renewable and non-renewable grids under one PoA.

It would be very helpful if methodology AMS-I.E. and SSC-NM105 could overlap such that both can be applied to the case of renewable power grids. In SSC-NM105 a renewable grid would then simply constitute the case where project emissions from electricity consumption are zero. Since there are other cases, where more than one methodology is applicable to a project, we do not understand why this strict separation of methodologies is necessary.