IMPROVED COOKSTOVES AND OTHER DISTRIBUTED THERMAL ENERGY GENERATION UNITS

Draft Methodology

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1 SOURCES

This methodology is based on the following methodologies:

- *CDM AMS-II.G. Energy efficiency measures in thermal applications of non-renewable biomass, v13.0*
- *VMR0006 Energy efficiency and fuel switch measures in thermal applications, v1.2*
- *CDM AMS-I.E. Switch from non-renewable biomass for thermal applications by the user, v13.0*

This methodology uses the latest versions of the following CDM methodologies, tools and guidelines:

- *CDM AMS-III.K. Avoidance of methane release from charcoal production*
- *CDM General guidelines for SSC CDM methodologies*
- *CDM Standard for sampling and surveys for CDM project activities and programmes of activities*
- *CDM TOOL03 Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion*
- *CDM TOOL12 Project and leakage emissions from transportation of freight*
- *CDM TOOL15 Upstream leakage emissions associated with fossil fuel use*
- *CDM TOOL16 Project and leakage emissions from biomass*
- *CDM TOOL30 Calculation of the fraction of non-renewable biomass*
- *CDM TOOL33 Default values for common parameters*

This methodology refers to the latest versions of the following protocols from the Clean Cooking Alliance (CCA):

- *CCA Durability Protocol*
- *CCA Controlled Cooking Test Protocol*
- *CCA Kitchen Performance Test Protocol*
- *CCA Water Boiling Test Protocol*

2 SUMMARY DESCRIPTION OF THE METHODOLOGY

Additionality and Crediting Method	
Additionality	Activity Method / Project Method
Crediting Baseline	Project Method

This methodology applies to project activities that introduce energy efficiency and fuel-switch measures in cookstoves and other forms of distributed thermal energy generation (including ovens, heaters and dryers). Projects must be implemented in households, community-based kitchens, institutions (e.g., schools, hospitals) or small and medium-sized enterprises[1] (SMEs).

3 DEFINITIONS

Batch
The population of a device of the same type commissioned during a certain period (e.g., week or month) in a certain calendar year[2]

Biomass residue[3]
Biomass by-products, residues and waste streams from agriculture, forestry and related industries

Improved thermal energy generation unit
A thermal energy generation unit (used for cooking, baking, heating or drying) that improves on traditional baseline technologies in terms of fuel savings through energy efficiency improvements and/or fuel switching to a less GHG-intensive fuel, thereby leading to GHG emission reductions

Modern electricity cooking devices
Project devices powered by electricity and connected to national/regional grid or mini grids that have met standards of Tier 4 of the ISO/TR 19867-3:2018 Voluntary Performance Targets (VPTs). Examples of these technologies include but are not limited to electric cooking

[1] This includes micro enterprises. Some regions and countries refer to micro, small and medium enterprises (MSMEs).

[2] Multiple batches may be installed within a single calendar year, and the date of commissioning of the last project device of the batch will be used as the commissioning date for the entire batch.

[3] Based on the CDM definition, available at: https://cdm.unfccc.int/Reference/Guidclarif/mclbiocarbon.pdf

appliances including induction cook stoves, hot plates, ceramic cooking-hob with heating coils, electric pressure cookers, slow cookers, crock pots, electric rice cookers, multi cookers.

Project device
An individual improved thermal energy generation unit used as part of the project activity

Self-generated renewable electricity
Electricity produced locally in off-grid systems using renewable energy sources, such as photovoltaic solar energy, that is used to power thermal energy generation units

Technical life
Total time for which the improved thermal energy generation unit is technically designed to operate from its first commissioning. The technical lifetime is expressed in years or hours of operation.

4 APPLICABILITY CONDITIONS

This methodology applies to project activities that introduce energy efficiency and fuel-switch measures in cookstoves and other distributed thermal energy generation units (including ovens, heaters and dryers).

This methodology is applicable where all of the following conditions are met:

1) The project activity corresponds to:

   a) Replacement of non-renewable biomass (e.g., firewood, charcoal) fired thermal energy generation units with any of the following:
      i) More efficient project devices that use the same fuel as in the baseline;
      ii) Efficient project devices fired by renewable biomass or bioethanol;
      iii) Efficient project devices fired by liquefied petroleum gas (LPG);
      iv) Solar thermal project devices; or
      v) Electric-powered project devices.

   b) Replacement of solid or liquid fossil-fuel (e.g, coal, kerosene) fired thermal energy generation units with any of the following:
      i) Efficient project devices fired by renewable biomass or bioethanol;
      ii) Efficient project devices fired by LPG;
      iii) Solar thermal project devices; or
      iv) Electric-powered project devices.

2) Project units are used in households, communities, institutions or SMEs, collectively referred to in this methodology as the “target population.”

Use of renewable biomass

3) Where renewable biomass is used, it is exclusively renewable[4] and qualifies as one of the following:

   a) A by-product, residue or waste stream from agriculture, forestry and related industries; or

   b) Originating from dedicated plantations that comply with all relevant applicability conditions in the latest version of the *CDM TOOL16*.

4) Where biomass residues are used, they would have been left to decay or burned without energy recovery before implementation of the project activity, and their use does not involve a decrease in carbon pools – in particular of dead wood, litter or soil organic carbon – on the land areas from which the biomass residues originate.

5) Where biomass residues from a production process are used, project implementation does not result in an increase in the processing capacity of raw input or any other substantial changes (e.g., product change) in this process.

6) More than one type of renewable biomass may be used. Each of the biomass types used must comply with the applicability conditions.

7) Renewable biomass may be processed into fuels, such as briquettes, wood chips or charcoal.

8) For project activities using renewable biomass in the form of charcoal, the methodology is restricted to renewable charcoal produced by efficient charcoal production processes (including but not limited to retort sedentary kilns,[5] improved sedentary kilns, Casamance kilns). Methane produced during the charcoaling process must be captured and destroyed or combusted for energy purposes.

9) The renewable biomass sources are documented in the project description and monitoring reports, including origin, quantities and conditions prior to use under the project activity. Where the biomass is sourced from a third party, proof of purchase must be provided (e.g., contractual agreements or purchase receipts).

[4] Refer to EB 23 Annex 18 for definition of renewable biomass

[5] These kilns emit a minimal amount of methane during the charcoaling process (i.e., an efficient process is employed that results in high charcoal yield) and the small amount of methane that is emitted is captured and used or destroyed.

Cookstove characteristics and usage

10) Project cookstoves using renewable biomass (fuel-switch) or non-renewable biomass (improved efficiency) are single-pot, multi-pot portable or in-situ cookstoves with a thermal efficiency of at least 25 percent.[6]

11) Project cookstoves using LPG or bioethanol are single-pot, multi-pot portable or in-situ cookstoves with a thermal efficiency of at least 30 percent.

12) Electric and solar thermal project cookstoves[7] have a durability score corresponding to ISO/TR 19867-3 Tier 3 or above, or a maximum risk factor score of 15 on the *CCA Cookstove Durability Protocol*.

13) Project devices using LPG comply with all of the following conditions:

    a) The baseline fuel is either non-renewable biomass or a more carbon-intensive fossil fuel (demonstrated by the baseline survey, see Section 6.2);

    b) Thermal energy devices of the same type using LPG in the project area have a penetration level below 20 percent in the project region.[8] This must be demonstrated by the baseline survey (Section 6.2) and cross-checked with official government documents and studies;

    c) The project does not issue any carbon credits for periods after 31 December 2035; and

    d) The project proponent has a plan in place to transition away from LPG in the project area immediately after the end of the project crediting period.

14) For electric project devices, the following electricity sources are eligible:

    a) Decentralized renewable energy systems. Decentralized energy systems using fossil fuels are not eligible, except for backup generators that supply less than 1 percent of the annual electricity of the decentralized renewable energy system[9]

    b) Self-generated renewable electricity, where at least 80 percent of the annual electricity generated is consumed by the project devices

    c) National or regional electricity grid

15) Project proponents implement a method for the distribution and identification of project devices that avoids double counting of emission reductions by other mitigation actions,

[6] Efficiency thresholds of 20 percent (Tier 2), 30 percent (Tier 3) and 40 percent (Tier 3) from ISO/TR 19867-3, available at: https://www.iso.org/standard/73935.html

[7] Defined as clean technologies, see https://www.who.int/tools/clean-household-energy-solutions-toolkit/module-7-defining-clean

[8] Thermal energy devices under GHG crediting programs may be excluded from penetration level analysis.

[9] Where the threshold is found to be exceeded in the verification audit, the emissions from the corresponding project devices must be discounted by the percentage of electricity provided by the backup generators during the monitoring period. This restriction aims to avoid the introduction of new, inefficient fossil fuel-fired electricity generation to fuel electric cookstoves.

such as unique identifications of product (e.g., program logo) and end-user locations (e.g., geographic coordinates, complete address information).

16) The project developer designs incentive mechanisms for the elimination of inefficient baseline devices and practices that are replaced by the project devices and describes these mechanisms in the project description.

Avoiding harm and double counting

17) The project complies with any national, sub-national or local regulations or guidance for the installation, commercialization, distribution and use of improved thermal energy generation units and/or fuel supply and use for the target population. National, regional and local regulatory frameworks must be documented for provision of the type of thermal energy services provided by the project.

    Where the host country does not have applicable regulations for the project technology, the project developer must demonstrate that its performance is in compliance with Tier 2 or above according to ISO/TR 19867-3, and that implementation of the project activity is not likely to cause any negative impacts.

18) For projects that reduce emissions from non-renewable biomass, including firewood and charcoal, the risk of double counting is assessed by evaluating whether there are REDD+ projects or jurisdictional programs that overlap with the expected fuel source area of the project.

    a) Projects located in rural areas where the baseline survey demonstrates that at least 90% of households collect wood as the fuel for cooking, must consider a radius of at least 5 km from the location of the thermal energy generation units when checking for overlapping REDD+ activities.

    b) Projects located in rural areas that do not fulfill the previous requirements as well as projects located in (peri-)urban areas and/or where thermal energy generation units are used by SMEs must consider whether there are overlapping REDD+ activities in the area within national boundaries that are accessible in 10 hours or less of travel in motorized vehicles, considering that non-renewable biomass and charcoal may be purchased from third parties located far from where the thermal energy generation units are located.

    Procedures and requirements for allocation of emission reductions to the REDD+ and cookstove projects will be included. See questions in the public consultation documents.

5 PROJECT BOUNDARY

The project boundary includes the thermal energy generation unit(s), the geographical site where they are located and the locations from which the baseline and project fuels are sourced.

Where project devices use electricity, the project boundary also includes the electricity generation, transmission and distribution system.

The GHG sources included in or excluded from the project boundary are shown in Table 1.

Methane and nitrous oxide may be a significant source of GHG emissions especially in the use of charcoal, biomass fuels and biomass residues. The project proponent must assess the significance of such fuel emissions and apply the de minimis criterion in the latest version of the *VCS Methodology Requirements* to determine which sources must be included.

Emissions from fuel production[10] and transportation may be ignored where they are higher in the baseline than the project scenario.

Table 1: GHG Sources Included in or Excluded From the Project Boundary

Source		Gas	Included?	Justification/Explanation
Baseline	Thermal energy generation	CO_2	Yes	Major source
		CH_4	Yes	May be significant for some fuels
		N_2O	Yes	May be significant for some fuels
	Production and transport of fuel (where applicable)	CO_2	Yes	Major source
		CH_4	Yes	May be significant for some fuels
		N_2O	Yes	May be significant for some fuels
Project	Thermal energy generation	CO_2	Yes	Major source
		CH_4	Yes	May be significant for some fuels
		N_2O	Yes	May be significant for some fuels
	Production and transport of fuel (where applicable)	CO_2	Yes	Major source
		CH_4	Yes	May be significant for some fuels
		N_2O	Yes	May be significant for some fuels
	Electricity generation and distribution	CO_2	Yes	Major source
		CH_4	No	Negligible
		N_2O	No	Negligible

[10] For example, energy use for renewable biomass processing, such as shredding and compacting in the case of briquetting, may be considered to be equivalent to the upstream emissions associated with the processing of a displaced fossil fuel and hence may be disregarded.

6 BASELINE SCENARIO

The baseline scenario including the GHG sources must be defined according to the technologies, practices, fuel types and fuel consumption patterns that will be replaced by the project technology in the defined target population.

6.1 Selection and Justification of the Baseline Scenario

Step 1: Identify alternative baseline scenarios

Define the alternative baseline scenarios according to the thermal energy generation unit type, the type of thermal energy service provided, the fuel type and source, and describe the GHG sources involved. The project activity occurring without being a VCS project must be included as one alternative.

The alternative baseline scenarios must include both existing and alternative thermal energy generation unit technologies that provide equivalent thermal energy services to the project.

Where the project activity replaces a mix of technologies, services and/or fuel types, the baseline alternative must be defined in a conservative way considering these variables. Where multiple fuels are used in the baseline, the proportion of baseline fuel usage may be established in terms of energy supplied by each of the identified fuels.

The baseline alternatives must be defined using the results of a baseline survey of the target population and/or based on relevant and current information from credible literature from the specific project region, official publications (e.g., surveys, studies) or official statistics from government entities or other credible agencies. Where a baseline alternative is defined using the results of a baseline survey, it must be cross-checked with information from at least one of the other sources listed.

Where a baseline survey of the target population is used to define a baseline alternative, the procedures and practices described in Section 6.2 must be applied.

Step 2: Consider existing and upcoming government policies and legal requirements

Eliminate the baseline alternatives that are inconsistent with existing and upcoming government policies and legal requirements. These may include minimum product efficiency standards and air quality requirements.

Step 3: Assess investment, technological and institutional barriers

Eliminate the baseline alternatives that face investment, technological or institutional barriers. The remaining baseline scenario must be one of the following:

1) **Non-renewable biomass:** The baseline scenario is the target population's continued use of inefficient thermal energy generation units fueled with non-renewable firewood or charcoal to meet similar thermal energy needs as those provided for by project devices. Project proponents may use a combination of different non-renewable biomass types in the baseline, for which they must establish the corresponding parameters (e.g., NCV, emission factor).
2) **Fossil fuels:** The baseline scenario is the target population's continued use of inefficient thermal energy generation units fueled by fossil fuels to meet similar thermal energy needs as those provided for by project devices.

Thermal energy units that have a fuel for the baseline scenario other than non-renewable biomass or fossil fuels (e.g., electricity, solar thermal, renewable biomass) must be excluded from the project activity.

6.2 Baseline Scenario Survey Requirements

The objective of the baseline survey is to collect critical information related to existing baseline technologies, services, fuel types and fuel sources in the target population. The survey must be designed, carried out and analyzed in line with the latest version of the CDM *Standard for sampling and surveys for CDM project activities and programmes of activities*.

The survey results and reference to relevant and current information from credible literature for the specific project region, official publications (e.g., surveys, studies) or official statistics from government entities or other credible agencies must define the following for each target population:

1) Baseline fuel type(s) and the percentage of their use by the target population;
2) Source(s) of each baseline fuel (i.e., if collected, purchased or procured through other means);
3) Baseline technologies and the percentage of their use by the target population;
4) Types of services provided by the baseline technologies (i.e., cooking, space heating, drying); and
5) Household size ($Hh_{i,j}$) (at the point at which the project implements activities in households).

A binding questionnaire is presented in Appendix 3 with the minimum requirements for the baseline survey. The proponent may choose a different format but must include these questions as a minimum.

Survey and data collection methods: The surveys may be conducted either as physical on-site visits (face-to-face) or through remote surveys via phone call or virtual meeting.

Sample size calculations: The surveys must be conducted for each target population. Where project devices are distributed within regions or target populations with heterogenous conditions (e.g., regional variations in fuel types or cooking practices), the target population must be divided into clusters or groups with homogeneous conditions.

The minimum sample size must be determined with respect to use of baseline fuel types and baseline technologies, and household size.

- Calculations should be completed manually or with appropriate statistical software
- The minimum confidence and precision must be 90/10 and a minimum sample size of 30 must be applied
- The target value must be identified (i.e., the expected value of the parameter)
- Where a survey covers two or more project activity instances, stratified or random sampling must be used

Survey reporting: The data collection method must be documented in the project description, as well as the protocol for producing the final dataset and results.

7 ADDITIONALITY

Additionality is demonstrated through an activity method (positive list) or project method (investment analysis).

Step 1: Regulatory surplus

The project proponent must demonstrate regulatory surplus in accordance with the rules and requirements regarding regulatory surplus set out in the latest version of the *VCS Standard* and *VCS Methodology Requirements*.

Step 2: Positive list

The project activity must meet all of the following conditions to qualify for the positive list:

1) The project activity introduces:
    a) Efficient biomass-fired thermal generation units that replace inefficient biomass-fired thermal generation units;
    b) Efficient, solely renewable biomass-fired thermal units that replace fossil fuel-fired thermal generation units; or
    c) Electric or solar thermal generation units that replace inefficient biomass-fired or fossil fuel-fired thermal generation units.

2) The project activity installs or distributes improved thermal energy generation units at zero cost to the end-user and has no revenue source[11] other than from the sale of verified carbon units (VCUs); and

3) The project activity is not implemented as part of government schemes and is not supported by multilateral funds.

Projects that pass the regulatory surplus test (Step 1) and are on the positive list (Step 2) are deemed additional and are not required to apply Step 3.

Step 3: Project method

If the project activity is not on the positive list, it must demonstrate additionality by applying an investment analysis as per the latest version of the *CDM Tool for the demonstration and assessment of additionality*.

Projects located in Least Developed Countries[12] (LDCs), Landlocked Developing Countries[13] (LLDCs) or Small Island Developing States[14] (SIDS) may alternatively apply the barrier analysis as per the latest version of the CDM *Tool for the demonstration and assessment of additionality* as a simplified procedure.

For both cases under Step 3, the project proponent must demonstrate that the project activity is not a common practice as per the latest version of the *CDM Tool for the demonstration and assessment of additionality*.

8 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

8.1 Baseline Emissions

Baseline emissions are calculated as follows:

$$BE_y = \sum_i \sum_j EC_{y,i,j} \times N_{i,j} \times n_{y,i,j} \times \left(EF_{b,i,CO2} \times f_{NRB,b,i,y} + EF_{b,i,nonCO2}\right) \quad (1)$$

[11] Including revenues from selling of firewood, charcoal, LPG, bioethanol or any commercial relationship with fuel providers

[12] Following the UN definition, see: https://www.un.org/development/desa/dpad/least-developed-country-category.html

[13] Following the UN definition, see: https://www.un.org/ohrlls/content/list-lldcs

[14] Following the UN definition, see: https://www.un.org/ohrlls/content/list-sids

Where:

BE_y	=	Baseline emissions during year *y* (t CO_2e)
$EC_{y,i,j}$	=	Average energy consumption of baseline device type *i* from batch *j* in year *y* (TJ)
$N_{i,j}$	=	Number of commissioned project devices of type *i* from batch *j*
$n_{y,i,j}$	=	Proportion of commissioned project devices of type *i* from batch *j* that remain operating in year *y* (fraction)
$EF_{b,i,CO2}$	=	CO_2 emission factor for fuel used by baseline device type *i* in the baseline scenario (t CO_2/TJ)
$f_{NRB,b,i,y}$	=	Fraction of woody biomass that is established to be non-renewable used by baseline device type *i* in year *y* in the baseline scenario (fraction); this variable is not considered for fossil fuels
$EF_{b,i,nonCO2}$	=	Non-CO_2 emission factor for fuel used by baseline device type *i* in the baseline scenario (t CO_2e/TJ)
i	=	Model of project device introduced to replace baseline device
j	=	Batch of project device

8.1.1 Average Energy Consumption of the Baseline Device ($EC_{y,i,j}$)

8.1.1.1 Project Devices Using Renewable or Non-Renewable Biomass, Fossil Fuels or Bioethanol

Where project devices use renewable or non-renewable biomass, fossil fuels or bioethanol, the average energy consumption of baseline device type *i* from batch *j* to generate thermal energy equivalent to that provided by the project device is calculated as follows:

$$EC_{y,i,j} = BC_{b,y,i,j} \times NCV_{b,i} \quad (2)$$

Where:

$BC_{b,y,i,j}$	=	Average quantity of fuel used per baseline device type *i* from batch *j* to generate thermal energy equivalent to that provided by the project device during year *y* (tonnes)
$NCV_{b,i}$	=	Net calorific value of baseline fuel for baseline device type *i* (TJ/tonne or TJ/m^3)

The quantity of fuel that would be used in the baseline scenario must be determined by one of the following methods.

Option 1: Measurement campaign (only for cookstoves)

A measurement campaign must be conducted following the procedures in the latest version of the *Kitchen Performance Test Protocol.* The sampling must comply with the latest version of the CDM *Standard for sampling and surveys for CDM project activities and programmes of*

activities. The campaign must achieve confidence and precision of at least 90/10 for the target parameter of average daily fuel consumption per adult equivalent. The result must be scaled appropriately using the average household size ($Hh_{i,j}$)[15] to obtain the value of $BC_{b,y,i,j}$. Where the project does not achieve the target precision in a monitoring period, the project proponent must apply an appropriate conservativeness deduction as per the latest *VCS Methodology Requirements*.[16]

The quantity of fuel determined by this calculation must be compared to the results from Option 2 as a cross-check. Where the baseline Kitchen Performance Test (KPT) indicates that baseline consumption is higher than that indicated by back-calculation from the project scenario, and the difference is not adequately justified to the VVB, Option 2 must be applied using the ratio of efficiencies as a conservative cap.

Option 2: Estimation of fuel consumption based on thermal efficiencies (for any distributed thermal energy generation unit, including cookstoves)

The average energy consumption of the baseline device is determined by the quantity of fuel consumed by the project device and the thermal efficiencies of the baseline and project devices as follows:

$$BC_{b,y,i,j} = BC_{p,y,i,j} \times \frac{\eta_{new,i,j,y}}{\eta_{old,i,j}} \quad (3)$$

Where:

$BC_{p,y,i,j}$	=	Average quantity of fuel used by project device type *i* from batch *j* during year *y* (tonnes or m^3)
$\eta_{new,i,j,y}$	=	Efficiency of project device type *i* from batch *j* in year *y* (fraction)
$\eta_{old,i,j}$	=	Efficiency of baseline device that is replaced by project device type *i* from batch *j* (fraction)

$BC_{p,y,i,j}$ must be determined as per Section 8.2.

8.1.1.2 Project Devices Using Electricity

Where the project device involves the use of electricity, the average energy consumption of the baseline device ($EC_{y,i,j}$) is determined using one of the following options:

[15] This parameter is determined using the procedure described in Section 6.2.

[16] See Section 2.4 "Uncertainty" of the *VCS Methodology Requirements v4.4*, or equivalent section of the most recent version.

Option 1: Measurement campaign (only for cookstoves)

The project proponent must apply the same procedures as in Option 1 in Section 8.1.1.1.

Option 2: Calculation based on electricity consumption and efficiencies (for any distributed thermal energy generation unit, including cookstoves)

$$EC_{y,i,j} = EC_{p,y,i,j} \times 0.0036 \times \frac{\eta_{new,i,j,y}}{\eta_{old,i,j}} \quad (4)$$

Where:

$EC_{p,y,i,j}$	=	Annual consumption of electricity by electric project device type *i* from batch *j* in year *y* (MWh)
0.0036	=	Factor to convert MWh to TJ
$\eta_{new,i,j,y}$	=	Efficiency of project device type *i* from batch *j* in year *y* (fraction)
$\eta_{old,i,j}$	=	Efficiency of baseline device that is replaced by project device type *i* from batch *j* (fraction)

$EC_{p,y,i,j}$ must be determined as per Section 8.2.

8.1.1.3 Special Considerations for Project Devices Using Electricity

For electric project devices with additional characteristics that affect energy consumption (e.g., pressure), thermal efficiency does not reflect the device's thermal performance. In such cases, the following equation must be applied to determine specific energy consumption. This requires the determination of specific energy consumption for both baseline and project scenarios using a Controlled Cooking Test (CCT).

$$EC_{y,i,j} = EC_{p,y,i,j} \times 0.0036 \times \frac{SC_{p,i}}{SC_{b,i}} \quad (5)$$

Where:

$SC_{p,i}$	=	Specific energy consumption of project device type *i* in the project scenario (TJ/test/person)
$SC_{b,i}$	=	Specific energy consumption of baseline device type *i* in the baseline scenario (TJ/test/person)

The CCT must be conducted using dishes and cooking practices typical of the project region. The CCT must be performed for the same cooking tasks with the baseline and project devices. Cooking tasks that cannot be performed with the project device must be excluded from the CCT.

Where the project device replaces more than one type of baseline device, the specific consumption ($SC_{b,i}$) must be determined as the weighted average of the specific energy consumption of the replaced baseline cooking devices, weighted by the proportion of cooking tasks performed by the target population with each type of baseline cooking device.

$EC_{p,y,i,j}$ must be determined as per Section 8.2.

8.2 Project Emissions

Project emissions are calculated as follows:

$$PE_y = PE_{energy,y} + PE_{others,y} \quad (6)$$

Where:

PE_y	=	Project emissions during year *y* (t CO_2e)
$PE_{energy,y}$	=	Project emissions from energy consumption of project devices in year *y* (t CO_2e)
$PE_{others,y}$	=	Project emissions from other sources in year *y* (t CO_2e)

To determine project emissions from energy consumption of project devices ($PE_{energy,y}$), one of the following options (Sections 8.2.1–8.2.3) must be used.

8.2.1 $PE_{energy,y}$ from Biomass, Fossil Fuels or Bioethanol

Project emissions from energy consumption of project devices using biomass, fossil fuels or bioethanol in year *y* are calculated as follows:

$$PE_{energy,y} = \sum_i \sum_j BC_{p,y,i,j} \times N_{y,i,j} \times NCV_{p,i} \times n_{y,i,j} \times \left(EF_{p,i,CO2} \times f_{NRB,p,i,y} + EF_{p,i,nonCO2}\right) \quad (7)$$

Where:

$PE_{energy,y}$	=	Project emissions from energy consumption of project devices during year *y* (t CO_2e)
$BC_{p,y,i,j}$	=	Average quantity of fuel used by project device type *i* from batch *j* during year *y* (tonnes or m^3)
$N_{i,j}$	=	Number of commissioned project devices of type *i* from batch *j*
$NCV_{p,i}$	=	Net calorific value of project fuel used in project device type *i* (TJ/tonne or TJ/m^3)
$n_{y,i,j}$	=	Proportion of commissioned project devices of type *i* from batch *j* that are still being used in year *y* (fraction)
$EF_{p,i,CO2}$	=	CO_2 emission factor for fuel used by project device type *i* in the project scenario (t CO_2/TJ)
$f_{NRB,p,i,y}$	=	Fraction of woody biomass established to be non-renewable used by project device type *i* in year *y* (fraction or %); this variable is not considered for fossil fuels
$EF_{p,i,nonCO2}$	=	Non-CO_2 emission factor for fuel used by project device type *i* (t CO_2e/TJ)

The CO_2 emission factors for renewable biomass and other renewable energy sources are zero. Non-CO_2 emissions of these fuels must be accounted for where they are not deemed de minimis (see Section 5).

$BC_{p,y,i,j}$ is determined depending on the fuel type following Sections 8.2.1.1 and 8.2.1.2.

8.2.1.1 $BC_{p,y,i,j}$ for Project Devices Using Renewable or Non-renewable Biomass

Option 1: Kitchen Performance Test (only for cookstoves)

A measurement campaign following the *Kitchen Performance Test Protocol* must be designed, carried out and analyzed in compliance with the latest version of the CDM *Standard for sampling and surveys for CDM project activities and programmes of activities*. The campaign must achieve a confidence and precision of at least 90/10 for the target parameter of average daily fuel consumption per adult equivalent. The result must be scaled appropriately using the average household size ($Hh_{i,j}$) to obtain the value of $BC_{p,y,i,j}$. Where the project does not achieve the target precision in a monitoring period, the project proponent must apply an appropriate conservativeness deduction as per the latest *VCS Methodology Requirements*.[16]

Option 2: Stove sensors (only for cookstoves)

For a sample of project devices, continuously measure stove operation with a stove sensor to determine the total duration of use per year. The sampling must comply with the latest version of the CDM *Standard for sampling and surveys for CDM project activities and programmes of activities*. The campaign must be designed to achieve a confidence interval and precision of at least 90/10 for the target parameter of total annual usage time. Where the project does not achieve the target precision in a monitoring period, the project proponent must apply an appropriate conservativeness deduction as per the latest *VCS Methodology Requirements*.

Multiply by the stove fuel use rate to obtain annual project fuel use. The fuel use rate must be taken from the performance evaluation following ISO/TR 19876-3 guidelines.

Option 3: Direct measurement

Use direct measurement with equipment calibrated in accordance with national/international requirements. A sample of project devices may be measured such that a confidence and precision of 90/10 is achieved for the target parameter of total annual fuel use. The sampling must comply with the latest version of the CDM *Standard for sampling and surveys for CDM project activities and programmes of activities*. Where the project does not achieve the target precision in a monitoring period, the project proponent must apply an appropriate conservativeness deduction as per the latest *VCS Methodology Requirements*.[16]

8.2.1.2 $BC_{p,y,i,j}$ for Project Devices Using Fossil Fuels or Bioethanol

Option 1: Direct measurement

Apply the same procedure as in Option 3 of Section 8.2.1.1.

Option 2: Fuel purchase monitoring (only LPG)

Keep continuous records of all LPG purchases.

Ensure LPG is used only for thermal energy generation by the project device, for example by using a fuel cylinder design that may only be attached to the project device.

8.2.2 $PE_{energy,y}$ from Electricity

Where the project activity involves the introduction of electric devices, project emissions are calculated as follows:

$$PE_{energy,y} = \sum_{i} \sum_{j} EC_{p,y,i,j} \times N_{y,i,j} \times n_{y,i,j} \times EF_{el,y} \times (1 + TDL_{i,y}) \quad (8)$$

Where:

$EC_{p,y,i,j}$	=	Annual consumption of electricity by electric project device type *i* in year *y* (MWh)
$N_{y,i,j}$	=	Number of project devices of type *i* from batch *j* commissioned during year *y*
$n_{y,i,j}$	=	Proportion of commissioned project devices of type *i* from batch *j* that are still being used in year *y* (fraction)
$EF_{el,y}$	=	Emission factor of the electricity system (t CO_2e/MWh); this is zero for 100 percent renewable sources
$TDL_{i,y}$	=	Average technical transmission and distribution losses for providing electricity to project device type *i* in year *y*

The electricity consumption $EC_{p,y,i,j}$ must be estimated by one of the following two options.

Option 1: Direct measurement

Use direct measurement by metering. A sample of project devices may be measured, following the sampling approach described in the latest version of the CDM *Standard for sampling and surveys for CDM project activities and programmes of activities* with a confidence level and precision of at least 90/10. Where the project does not achieve the target precision in a monitoring period, the project proponent must apply an appropriate conservativeness deduction as per the latest *VCS Methodology Requirements*.[16]

Option 2: Estimation based on operating time

Calculate the annual electricity consumption by multiplying the wattage of project device type *i* from batch *j* by its operational time.

$$EC_{p,y,i,j} = HC_{i,j} \times t_{y,i,j} \quad (9)$$

Where:

$HC_{i,j}$	=	Wattage of project device type *i* from batch *j*, as per manufacturer specification (MW)
$t_{y,i,j}$	=	Number of hours for which project device type *i* from batch *j* is used during year *y* (hours)

8.2.3 $PE_{others,y}$ from Transportation, Fuel Production, Fugitive Emissions and Backup Generators

$$PE_{others,y} = PE_{transp,y} + PE_{prod,y} + PE_{fugitive,y} + PE_{backup,y} \quad (10)$$

Where:

$PE_{others,y}$	=	Project emissions from other sources in year *y* (t CO_2e)
$PE_{transp,y}$	=	Project emissions due to fuel transportation in year *y* (t CO_2e)
$PE_{prod,y}$	=	Project emissions due to fuel production in year *y* (t CO_2e)
$PE_{fugitive,y}$	=	Fugitive emissions in year *y*
$PE_{backup,y}$	=	Project emissions from backup generators in year *y* (t CO_2e)

Project emissions from fuel transportation ($PE_{transp,y}$)

$PE_{transp,y}$ must be estimated if the average transportation distance is greater than 200 km or if it cannot be demonstrated to be less than 200 km through valid means (like mapping tools), in which case a conservative estimate of the transportation distance must be used. The latest version of the CDM *TOOL12 Project and leakage emissions from transportation of freight* must be applied.

If the average transportation distance is less then 200 km, it can be assumed that the baseline and project emissions from fuel transportation are similar and project emissions do not have to be accounted for.

Project emissions from fuel production ($PE_{prod,y}$)

$PE_{prod,y}$ must be determined for renewable biomass (e.g., firewood) or biomass-derived fuels (e.g., bioethanol) by applying CDM *TOOL16 Project and leakage emissions from biomass.*

$PE_{prod,y}$ must include emissions resulting from soil management, cultivation, thermal/mechanical processing and biomass burning associated with fuel production.

Fugitive emissions ($PE_{fugitive,y}$)

$PE_{fugitive,y}$ from renewable charcoal must be estimated by applying the latest version of *AMS-III.K. Avoidance of methane release from charcoal production*.[17]

Project emissions from backup generators ($PE_{backup,y}$)

For project devices using electricity from a mini-grid with backup generators, emissions from fuel consumption must be determined as follows:

$$PE_{backup,y} = \sum_{i} FC_{i,y} \times NCV_i \times EF_{fuel,i} \quad (11)$$

Where:

$FC_{i,y}$ = Fuel consumption of the backup generator *i* in year *y* (tonnes)
NCV_i = Net calorific value of fuel used by backup generator *i* (TJ/tonne)
$EF_{fuel,i}$ = Emission factor of the fuel used by backup generator *i* (tCO_2/TJ)

8.3 Leakage Emissions

Leakage emissions (LE_y) depend on the project scenario and must be accounted for as indicated in the following sections.

8.3.1 Leakage Emissions Associated with the Reduced or Avoided Use of Non-Renewable Biomass

Use of non-renewable biomass by users not participating in the project

For projects that reduce the consumption of non-renewable biomass through more efficient devices, use of renewable biomass, or fuel switching, leakage emissions from increased consumption of non-renewable biomass by users that do not participate in the project activity must be accounted for.

The project proponent must apply a discount factor of five percent to the total GHG emission reductions to address such leakage emissions.

[17] This refers to Equation 4 of *AMS-III.K. v5.0* or the equivalent equation of the most recent version.

8.3.2 Leakage Emissions Associated with the Use of Renewable Biomass

Dedicated plantations for renewable biomass supply

Where the project activity involves dedicated plantations for renewable biomass supply, leakage emissions associated with the plantations must be calculated using the latest version of *CDM TOOL16*.

Reuse of technologies replaced by project devices outside the project boundaries

Baseline devices with lower efficiency and/or more GHG-intensive fuels may be reused in other activities outside the project boundaries. These leakage emissions must be estimated with monitoring surveys and/or by applying conservative calculations.

Such leakage emissions do not need to be accounted for where any of the following apply:

1) It is not possible to transport and install the displaced technology in a different location (e.g., three-stone fire, in-situ cookstove);
2) The displaced technology is decommissioned; or
3) The displaced technology is equally or more efficient than most existing technologies in the target population.

Otherwise, the displaced technology may be reused in place of a lower-emitting technology than would have occurred in the absence of the project. This potential leakage source must be evaluated using relevant monitoring surveys and leakage emissions must be calculated.

Diversion of biomass residues from other uses to the project activity

Leakage emissions from the diversion of biomass residues from other applications must be estimated using the latest version of *CDM TOOL16*.

Reuse of technologies replaced by project devices in some activity outside the project boundaries

If the baseline technology is portable and is not a three-stone fire, then technologies replaced by improved thermal energy generation units may be reused in some activity outside the project boundaries.

If the displaced technology is a three-stone fire or an in-situ cookstove, then this potential source of leakage may be ignored.

If the displaced technology is decommissioned, then this potential source of leakage may be ignored.

If the displaced technology is equally or more efficient than the majority of existing technologies in the target population, then this potential source of leakage may be ignored.

Otherwise, the displaced technology may be reused in place of a lower-emitting technology than would have occurred in the absence of the project. This potential leakage source shall be evaluated using relevant monitoring surveys and leakage emissions calculated for the excess emissions.

8.3.3 Leakage Emissions Associated with Fossil Fuel Use

Increased emissions from fossil fuels by users not participating in the project

Leakage may occur due to increased emissions from fossil fuel combustion in the population who do not participate in the project, where this population was previously using lower-emitting sources and instead use the fossil fuels saved under the project activity. A net-to-gross adjustment factor of 0.95 to account for leakage must be applied.

Upstream leakage emissions associated with LPG

Projects using LPG must apply the *CDM TOOL15 Upstream leakage emissions associated with fossil fuel use* to determine upstream leakage emissions.

8.4 Net GHG Emission Reductions

Net GHG emission reductions and removals are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y \quad (12)$$

Where:

BE_y = Baseline emissions during year y (t CO_2e)
PE_y = Project emissions during year y (t CO_2e)
LE_y = Leakage in project scenario during year y (t CO_2e)
ER_y = Emission reductions during year y (t CO_2e)

9 MONITORING

9.1 Data and Parameters Available at Validation

Data/Parameter	$EF_{b,i,CO2}$ $EF_{p,i,CO2}$ $EF_{fuel,i}$
Data unit	tCO_2/TJ
Description	CO2 emission factor for fuel used by baseline device type *i* in the baseline scenario

	CO_2 emission factor for fuel used by project device type *i* in the project scenario Emission factor of the fuel used by backup generator i
Equations	(1), (7), (11)
Source of data	Default value from the latest version of the *IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied	**Wood:** 112 t CO_2/TJ **Charcoal:** • 112 t CO_2/TJ (combustion only). Apply when renewable charcoal is used in the project and emissions from production of charcoal are estimated as project emissions ($PE_{fugitive.y}$). • 165.22 t CO_2/TJ (combustion and charcoal production emissions). Apply when non-renewable biomass charcoal is used in the baseline, or in the baseline and project. **Other fuels:** IPCC defaults
Justification of choice of data or description of measurement methods and procedures applied	IPCC Guidelines are a recognized source
Purpose of data	Calculation of baseline and project emissions
Comments	

Data/Parameter	$EF_{b,i,nonCO2}$ $EF_{p,i,nonCO2}$
Data unit	t CO_2e/TJ
Description	Non-CO_2 emission factor for fuel used by baseline device type *i* in the baseline scenario Non-CO_2 emission factor for fuel used by project device type *i* in the project scenario
Equations	(1), (7)
Source of data	Default value from the latest version of the *IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied	**Wood:** 9.46 tCO_2e/TJ (AR5 GWP) **Charcoal:** 5.865 tCO_2e/TJ (AR5 GWP) **Other fuels:** Use one of the following options: 1) Default values from the latest version of the *IPCC Guidelines for National Greenhouse Gas Inventories* 2) Testing in accredited/recognized laboratories

Justification of choice of data or description of measurement methods and procedures applied	IPCC Guidelines are a recognized source
Purpose of data	Calculation of baseline emissions
Comments	

Data/Parameter	$f_{NRB,b,i,y}$
Data unit	Fraction
Description	Fraction of woody biomass that is established to be non-renewable used by baseline device type *i* in year *y*
Equations	(1)
Source of data	
Value applied	
Justification of choice of data or description of measurement methods and procedures applied	*This will be aligned with the CDM default values and procedures that are under development. A draft of fNRB default values for Sub-Saharan African countries was published on 13 October 2023 for public comments.*
Purpose of data	
Comments	

Data/Parameter	$NCV_{b,i}$ NCV_i
Data unit	TJ/tonne or TJ/m^3
Description	Net calorific value of baseline fuel used by baseline device type *i* Net calorific value of fuel used by backup generator *i*
Equations	(2) , (11)
Source of data	Measured or use default values from the latest version of the *IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied	The values must be determined ex ante by using one of the following options: 1) Use default values from the latest version of the *IPCC Guidelines for National Greenhouse Gas Inventories*; or

	2) Testing using standardized methods (e.g., ASTM D5865-12, ISO 1929)
Justification of choice of data or description of measurement methods and procedures applied	IPCC Guidelines are a recognized source
Purpose of data	Calculation of baseline emissions
Comments	The values for wood and charcoal of the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* are: • **Wood:** 0.0156 TJ/tonne • **Charcoal:** 0.0295 TJ/tonne

Data/Parameter	$\eta_{old,i,j}$
Data unit	Fraction
Description	Efficiency of baseline device that is replaced by project device of type *i* from batch *j*
Equations	(3), (4)
Source of data	The efficiency must be established using one of the following methods, and the corresponding documentation must be presented: 1) Water Boiling Test surveys in compliance with the latest version of the CDM *Standard for sampling and surveys for CDM project activities and programmes of activities*; 2) Manufacturer-certified value that is determined via the Water Boiling Test; 3) Certification by the host country's national standard body or certifying agency; or 4) Approved default values from the most recent version of CDM *TOOL33*.
Value applied	-
Justification of choice of data or description of measurement methods and procedures applied	These are recognized methods and sources
Purpose of data	Calculation of baseline emissions
Comments	

Data/Parameter	$Hh_{i,j}$
Data unit	Equivalent standard male adults
Description	Average household size of the target population using device type *i* from batch *j*
Equations	Input to $EC_{y,i,j}$ and $BC_{b,y,i,j}$
Source of data	Baseline survey
Value applied	
Justification of choice of data or description of measurement methods and procedures applied	Recognized survey methods based on the *CDM Standard for sampling and surveys for CDM project activities and programmes of activities*
Purpose of data	Estimation of average energy consumption when applying Option 1: Measurement campaign (only for cookstoves) Cross-checking energy and fuel consumption values
Comments	This parameter must be determined ex ante via the baseline survey as described in Section 6.2. Equivalent standard male adults according to Guidelines for Woodfuel Surveys for FAO by Keith Openshaw, cited in Joseph, S. (1990). *Guidelines for planning, monitoring and evaluating cookstove programmes*, UNFAO: Community Forestry Field Manual 1.

Data/Parameter	$HC_{i,j}$
Data unit	MW
Description	Wattage of project device type *i* from batch *j*
Equations	(9)
Source of data	Manufacturer specification
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of data	Calculation of electric energy consumption for project emissions
Comments	This parameter must be determined ex ante where annual consumption of electricity by electric project device is not directly measured.

Data/Parameter	$SC_{b,i}$ $SC_{p,i}$
Data unit	TJ/test/person
Description	Specific energy consumption of baseline device type *i* in the baseline scenario Specific energy consumption of project device type *i* in the project scenario
Equations	(5)
Source of data	Controlled Cooking Test following the latest version of the *Controlled Cooking Test (CCT) Protocol* (Clean Cooking Alliance) and in compliance with the CDM *Standard for sampling and surveys for CDM project activities and programmes of activities*. The campaign must achieve a confidence and precision of at least 90/10 for the target parameter of TJ/test/person. Where the project does not achieve the target precision in a monitoring period, the project proponent must apply an appropriate conservativeness deduction as per the latest *VCS Methodology Requirements*.[16]
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	This parameter must be estimated ex ante.
Purpose of data	Calculation of baseline and project emissions
Comments	The CCT must use the same cooking tasks when assessing baseline and project devices. Cooking tasks that are not compatible with project devices must be excluded from the CCT for baseline devices. When renewing the crediting period, the project developer must check whether the end users use the project device for preparation of the expected dishes. Where the project device is used differently than expected, the CCT design must be updated to reflect the observed cooking practices of end users using the project device.

Data/Parameter	$BC_{b,y,i,j}$
Data unit	tonnes
Description	Average quantity of fuel used per baseline device type *i* from batch *j* to generate thermal energy equivalent to that provided by the project device during year *y*

Equations	(2)
Source of data	This applies to Option 1 of Section 8.1.1.1 or Option 1 of Section 8.1.1.2. A measurement campaign following the CCA Kitchen Performance Test protocol must be designed, carried out and analyzed in compliance with the latest version of the CDM *Standard for sampling and surveys for CDM project activities and programmes of activities*. The campaign must achieve a confidence and precision of at least 90/10 for the target parameter of average daily fuel consumption per adult equivalent. Where the project does not achieve the target precision in a monitoring period, the project proponent must apply an appropriate conservativeness deduction as per the latest *VCS Methodology Requirements*.[16] The result must be scaled appropriately using the average household size to obtain the value of $BC_{b,y,i,j}$. The quantity of fuel determined by this alternative must be compared to the results from Option 2 (in Section 8.1.1.1 or 8.1.1.2) as a cross-check. Where the baseline KPT indicates that baseline consumption is higher than that indicated by back-calculation from the project scenario, and the difference is not adequately justified to the VVB, Option 2 must be applied using the ratio of efficiencies as a conservative cap.
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of data	Calculation of baseline emissions
Comments	Once determined, must remain fixed for the entire crediting period

9.2 Data and Parameters Monitored

Data/Parameter	$N_{y,i,j}$
Data unit	Number
Description	Number of commissioned project devices of type *i* from batch *j*
Equations	(1), (7), (8)
Source of data	Monitoring
Description of measurement methods	The following data must be recorded during project activity implementation:

and procedures to be applied	1) Number of new devices distributed under the project activity, identified by the type of device and date of commissioning; and 2) Identification information of the recipient of the device distributed under the project activity (e.g., name, address, phone number).
Frequency of monitoring/recording	Every time that new project devices are distributed
QA/QC procedures to be applied	
Purpose of data	Calculation of baseline and project emissions
Calculation method	
Comments	The number of project devices must be recorded in a database, sales record or similar to ensure transparency.

Data/Parameter	$n_{y,i,j}$
Data unit	Fraction
Description	Proportion of commissioned project devices of type *i* from batch *j* that are still being used in year *y*
Equations	(1), (7), (8)
Source of data	Monitoring
Description of measurement methods and procedures to be applied	**Option 1 (SUMs):** Measured directly using stove use monitors (SUMs) in a sample of users according to the latest version of the CDM *Standard for sampling and surveys for project activities and programmes of activities* and achieving 90/10 confidence precision for the proportion of devices in operation. **Option 2 (surveys):** Based on a usage rate determined by a survey according to the latest version of the CDM *Standard for sampling and surveys for project activities and programmes of activities* and achieving 90/10 confidence precision for the proportion of devices in operation. The lower end of the 90 percent confidence interval must be used to ensure conservatism. The usage survey must include: 1) Kitchen observation; and 2) Interview with the primary cook. The project proponent must provide training and supervision to ensure field teams have the capacity required to complete usage surveys successfully. For both options 1 and 2, where the project does not achieve the target precision in a monitoring period, the project proponent must apply an

	appropriate conservativeness deduction as per the latest *VCS Methodology Requirements*.[16]
Frequency of monitoring/recording	**Option 1: (SUMs):** Continuous **Option 2 (surveys):** Annually
QA/QC procedures to be applied	The date on which a sample project device stopped being used should be taken as follows: **Option 1: (SUMs):** The date on which the SUM ceased registering any activity of the project device **Option 2 (surveys):** Where the project device is not working or not being used at the time of conducting the survey, it should be conservatively assumed that the project device has not been active since the date on which the last survey was conducted.
Purpose of data	Calculation of baseline and project emissions
Calculation method	-
Comments	Option 1 is the preferred method.

Data/Parameter	$BC_{p,y,i,j}$
Data unit	tonnes/year
Description	Average quantity of fuel used by project device type *i* from batch *j* during year *y*
Equations	(3), (7)
Source of data	Monitoring
Description of measurement methods and procedures to be applied	**For renewable and non-renewable biomass:** *Option 1: Kitchen Performance Test (only for cookstoves)* A measurement campaign following the Kitchen Performance Test protocol must be designed, carried out and analyzed in compliance with the latest version of the CDM *Standard for sampling and surveys for CDM project activities and programmes of activities*. The campaign must achieve confidence and precision of at least 90/10 for the target parameter of average daily fuel consumption per adult equivalent. The result must be scaled appropriately using the average household size to obtain the value of $BC_{b,y,i,j}$. *Option 2: Stove sensors (only for cookstoves)* This option applies to cookstoves. For a sample of project devices, continuously measure stove operation with a stove sensor to determine the total duration of usage per year. The sampling must comply with the latest version of the CDM *Standard for sampling and surveys for CDM*

	project activities and programmes of activities. The campaign must achieve confidence and precision of at least 90/10 for the target parameter of total annual usage time. Multiply by the stove fuel use rate to obtain the annual project fuel use. The fuel use rate must be taken from the performance evaluation following ISO/TR 19876-3 guidelines. *Option 3: Direct measurement* Apply direct measurement using equipment calibrated in accordance with national/international requirements. A sample of project devices may be measured in such a way that confidence and precision of 90/10 is achieved for the target parameter of total annual fuel use. The sampling must comply with the latest version of the CDM *Standard for sampling and surveys for CDM project activities and programmes of activities*. **For fossil fuel and bioethanol:** *Option 1: Direct measurement* Apply direct measurement using equipment calibrated in accordance with national/international requirements. A sample of project devices may be measured in such a way that confidence and precision of 90/10 is achieved for the target parameter of total annual fuel use. The sampling must comply with the latest version of the CDM *Standard for sampling and surveys for CDM project activities and programmes of activities*. *Option 2: Fuel purchase monitoring (only LPG)* Keep continuous records of all LPG purchases. Ensure LPG is used only for thermal energy generation by the project device, for example by using a fuel cylinder design that may only be attached to the project device. For any of the options above, where the project does not achieve the target precision in a monitoring period, the project proponent must apply an appropriate conservativeness deduction as per the latest *VCS Methodology Requirements*.[16]
Frequency of monitoring/recording	Continuous and aggregated annually
QA/QC procedures to be applied	Compare result to the reference value of 0.0045 GJ per capita per day. Where the project energy use is higher than the reference value, the project proponent must justify the energy use using independent third-party studies on cooking technologies and fuel/energy use that are specific to the project region, such as government publications, peer-reviewed literature, third party assessments and/or official data or statistics.

	Where it is not possible to justify the energy use using these sources of information, the reference value must be used in Equation (3), while the real monitored value should be used in Equation (7).
Purpose of data	Calculation of baseline and project emissions
Calculation method	
Comments	

Data/Parameter	$EC_{p,y,i,j}$
Data unit	MWh
Description	Annual consumption of electricity by electric project device type *i* from batch *j* in year *y*
Equations	(4), (8)
Source of data	Monitoring
Description of measurement methods and procedures to be applied	Apply direct measurement by metering. This may be applied to a sample of project devices, following the sampling approach described in the latest version of the CDM *Standard for Sampling and surveys for CDM project activities and programmes of activities* with a confidence level and precision of at least 90/10. Where the project does not achieve the target precision in a monitoring period, the project proponent must apply an appropriate conservativeness deduction as per the latest *VCS Methodology Requirements*.[16]
Frequency of monitoring/recording	Continuous and aggregated annually
QA/QC procedures to be applied	Measurement must use credible and calibrated equipment. Attached or in-built data loggers may be used, where they conform with industry standards and are calibrated according to relevant national requirements. Compare measurements to the reference value of 1 kWh per capita per day. Where the project energy use is higher than the reference value, the project proponent must justify the energy use using independent third-party studies on cooking technologies and fuel/energy use that are specific to the project region, such as government publications, peer-reviewed literature, third party assessments and/or official data or statistics. Where it is not possible to justify the energy use using these sources of information, the reference value must be used in Equation (4), while the real monitored value should be used in Equation (8).

Purpose of data	Calculation of baseline and project emissions
Calculation method	-
Comments	Where backup generators in decentralized energy systems provide more than one percent of the annual electricity supply, the emissions from the corresponding project devices must be discounted by the percentage of electricity provided by the backup generators during the monitoring period.

Data/Parameter	$\eta_{new,i,j,y}$
Data unit	Fraction
Description	Efficiency of project device type *i* from batch *j* in year *y*
Equations	(3), (4)
Source of data	Monitoring
Description of measurement methods and procedures to be applied	The efficiency must be established using one of the following methods, and the corresponding documentation must be presented: 1) Water Boiling Test campaigns in compliance with the latest version of the CDM *Standard for sampling and surveys for CDM project activities and programmes of activities*; 2) Manufacturer-certified value that is determined via Water Boiling Test; or 3) Certification from the host country's national standard body or certifying agency. The loss in thermal efficiency of project device *i* from batch *j* due to aging must be accounted for during the monitoring period, as presented below. For devices using biomass or fossil fuel: a) Standard Water Boiling Test campaigns[18] b) A linear decrease approach, applying a default schedule of linearly decreasing efficiency up to the terminal efficiency (assumed to be 20 percent) through the life span of the project device.[19] For devices using electricity: a) For project devices connected to national,regional or mini grids and have met standards of Tier 4 of the ISO/TR 19867-3:2018

[18] The WBT must be carried out following national standards (where available) or international standards or guidelines.

[19] Consider non-binding best practice example 6 in AMS-II.G.

	Voluntary Performance Targets (VPTs), thermal efficiency is expected to remain consistent over the technical lifespan of the product. No annual efficiency loss is assumed across the product lifespan. b) For all other electric project devices, efficiency loss is calculated by measuring the total heat absorbed by a known mass for a given time and dividing it by the input of electrical energy measured by a power analyzer and comparing to the result of the previous year.
Frequency of monitoring/recording	Annually
QA/QC procedures to be applied	-
Purpose of data	Calculation of baseline and project emissions
Calculation method	-
Comments	-

Data/Parameter	$t_{y,i,j}$
Data unit	hours
Description	Number of hours during which project device type *i* from batch *j* is used during year *y*
Equations	(9)
Source of data	Monitoring
Description of measurement methods and procedures to be applied	The number of utilization hours of electric project devices must be estimated at least once every two years. The survey must be in accordance with the CDM *Standard for sampling and surveys for CDM project activities and programmes of activities*. This parameter must be determined using one of the following: 1) Measurement devices such as stove use monitors (SUMs) in a sample of households/users;[20] or 2) A questionnaire-based survey, where the pre-project device was decommissioned (not applicable for three stone fire). For cookstoves, the survey should take into account the types of food prepared.

[20] Refer to Section 9.2 of the *CDM Standard for sampling and surveys for CDM project activities and programmes of activities*.

Frequency of monitoring/recording	Annually
QA/QC procedures to be applied	Usage records or fuel purchase records from the target population should be used to cross-check the estimates. The project proponent should take due care to ensure that survey results are reliable, by avoiding any possibilities for bias in survey design and implementation. Compare estimates to the reference value of 1 kWh per capita per day. Where project energy use is higher than the reference value, the project proponent must justify the energy use using independent third-party studies on cooking technologies and fuel/energy use that are specific to the project region, such as government publications, peer-reviewed literature, third party assessments and/or official data or statistics. Where it is not possible to justify the estimated energy use using these sources of information, the capped value must be used in Equation (8) when calculating baseline emissions, while the real monitored value should be used in Equation (8) for calculating project emissions.
Purpose of data	Calculation of baseline and project emissions
Calculation method	-
Comments	-

Data/Parameter	$f_{NRB,p,i,y}$
Data unit	*This table will be completed for the final methodology version based on the outcomes of the ongoing development of default values for fnrb by the Clean Development Mechanism (CDM).*
Description	
Equations	
Source of data	
Description of measurement methods and procedures to be applied	
Frequency of monitoring/recording	
QA/QC procedures to be applied	
Purpose of data	

Calculation method	
Comments	

Data/Parameter	$EF_{el,y}$
Data unit	t CO_2e/MWh
Description	Emission factor of the electricity system in year *y*
Equations	(8)
Source of data	Calculated
Description of measurement methods and procedures to be applied	Must be determined using CDM *TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation* Where the electricity comes from a renewable source, the emission factor is considered to be zero.
Frequency of monitoring/recording	Annually
QA/QC procedures to be applied	Use credible data for the electricity system
Purpose of data	Calculation of project emissions
Calculation method	-
Comments	-

Data/Parameter	$TDL_{i,y}$
Data unit	Fraction
Description	Average technical transmission and distribution losses for providing electricity to device type *I* in year *y*
Equations	(8)
Source of data	Calculated
Description of measurement methods and procedures to be applied	Determined using CDM *TOOL05*

Frequency of monitoring/recording	Once per monitoring period
QA/QC procedures to be applied	Use credible data for the electricity system
Purpose of data	Calculation of project emissions
Calculation method	-
Comments	-

Data/Parameter	$FC_{i,y}$
Data unit	tonnes
Description	Fuel consumption of the backup generator *i* in year *y*
Equations	(11)
Source of data	Measured
Description of measurement methods and procedures to be applied	The amount of fuel used by the backup generator(s) is determined using one of the following: 1) Apply direct measurement by metering using credible, manufacturer-calibrated equipment; or 2) Keep continuous records of fuel purchases.
Frequency of monitoring/recording	Annually
QA/QC procedures to be applied	-
Purpose of data	Compliance with applicability conditions for project devices using grid electricity
Calculation method	-
Comments	-

9.3 Description of the Monitoring Plan

The project proponent must maintain a record of the date of commissioning of project devices of each type *I* and batch *j*. Relevant parameters must be monitored and recorded during the crediting period as indicated in Section 9.2. The project proponent must must apply the requirements specified in the *General guidelines for SSC CDM methodologies*.

Data recording

The project proponent must compile data on each device that is derived from the total sales record with project technologies differentiated by different project scenarios. These data must be differentiated into sections based on the results of the applicable monitoring studies for each project scenario, so that emission reductions may be calculated appropriately, section by section. Technologies that have aged beyond their useful lifetime, as established in the usage survey, are removed from the project and are no longer credited.

The information captured for each project device included in the project activity must include, at a minimum:

1) Date of sale;
2) Geographic area of sale;
3) Model/type of project technology sold/distributed;
4) Name and telephone number (where available), and address of recipient;
5) Unique alpha/numeric ID for each device that is sold/distributed;
6) Whether baseline devices are fully decommissioned (and may no longer be used) or are kept in place and may potentially be further used.

Sampling

Where measurement campaigns are conducted, the sampling approach described in the latest version of the CDM *Standard for sampling and surveys for CDM project activities and programmes of activities* must be followed.

When developing a sampling plan, project proponents must calculate the sample size required to achieve the required level of reliability. The sample size should be determined manually or using appropriate statistical software.

The calculation is dependent on all of the following as well as the target level of confidence and the precision of 90/10:

a) The type of parameter of interest (i.e., mean value or proportion);

b) The target value (i.e., the expected value of the parameter), which should be determined using the project developer's knowledge and experience;

c) Expected variance (or standard deviation) for that measure in the sample, based on results from similar studies including other similar mitigation projects or previous monitoring periods, pilot studies or from the project developer's own knowledge.

Where the sample size calculation returns a value of less than 30, a minimum sample size of 30 must be used where the parameter of interest is a proportion. Where the parameter of interest is a numeric mean value (i.e., not a proportion or percentage) and the resulting sample size is less than 30, the Student's t-distribution must be used.

Avoidance of double counting

Project proponents must demonstrate that the project prevents double counting of emission reductions by any actor[21] who may wish to claim emission reductions from project devices. Ownership of the emission reductions resulting from the project activity must be clearly communicated by contract or clear written assertions in the transaction paperwork to all involved parties. Users must be notified that they are not permitted to claim emission reductions from the project.

[21] For example project technology manufacturers, wholesale providers, target population, among others

10 REFERENCES

Clean Cooking Alliance (2004). *Controlled Cooking Test Protocol 2.0*. Available at: https://cleancooking.org/binary-data/DOCUMENT/file/000/000/80-1.pdf

Clean Cooking Alliance (2014). *Water Boiling Test Protocol 4.2.3*. Available at: https://cleancooking.org/binary-data/DOCUMENT/file/000/000/399-1.pdf

Clean Cooking Alliance (2018). *Kitchen Performance Test Protocol 4.0*. Available at: https://cleancooking.org/binary-data/DOCUMENT/file/000/000/604-1.pdf

APPENDIX 1: THERMAL EFFICIENCY PERFORMANCE THRESHOLDS

The following default values for thermal efficiency performance thresholds are taken from *ISO/TR 19867-3: Clean cookstoves and clean cooking solutions — Harmonized laboratory test protocols — Part 3: Voluntary performance targets for cookstoves based on laboratory testing*.[22]

Table 2: Default Values for Voluntary Performance Targets

	Tier	Thermal efficiency (%)	Durability score
Better performance 	5	≥50	<10
	4	≥40	<15
	3	≥30	<20
	2	≥20	<25
	1	≥10	<35
	0	<10	>35

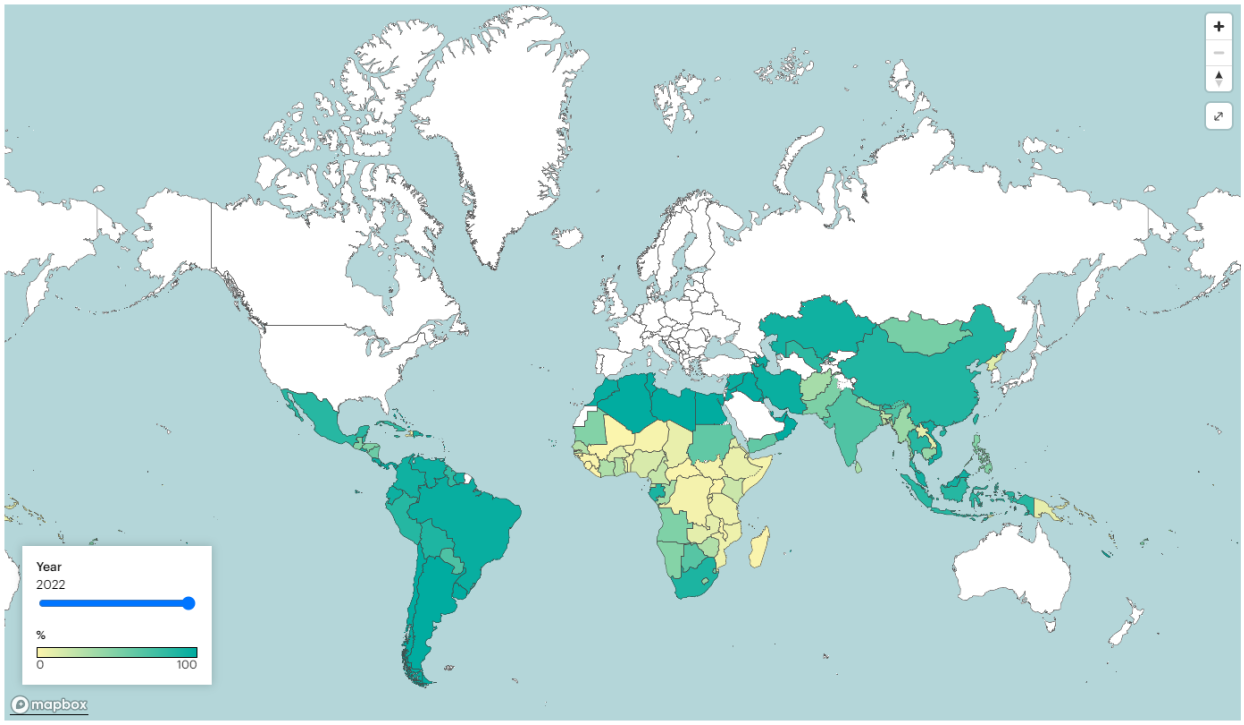
[22] Publicly available sections of ISO/TR 19867-3 are available at: https://www.iso.org/standard/73935.html A technical report providing a preview of some of the other content is available at: https://cdn.standards.iteh.ai/samples/73935/feb537d3c06f400dbe46e1b44ecbb67b/ISO-TR-19867-3-2018.pdf

APPENDIX 2: ACTIVITY PENETRATION

To establish a penetration rate of less than 20 percent for the project device technology, the UN SDG 7 progress report[23] has been used as a reference. Based on Appendix 1, the thermal energy generation units applicable under this methodology belong to Tier 2 and above, meaning either intermediate or advanced cooking solutions. Hence, for some countries, while penetration of improved cooking solutions may be higher than 20 percent, the penetration of intermediate and advanced improved cooking solutions may be very low. Project proponents may use other sources to establish penetration rates of less than 20 percent for respective technologies.

The International Energy Agency (IEA) uses the World Health Organisation (WHO) Household Energy Database for people without access to clean cooking for historic numbers and the World Energy Model and official energy balances to present the map shown in Figure 1.

Figure 1: Share of Population with Access to Clean Cooking[24]

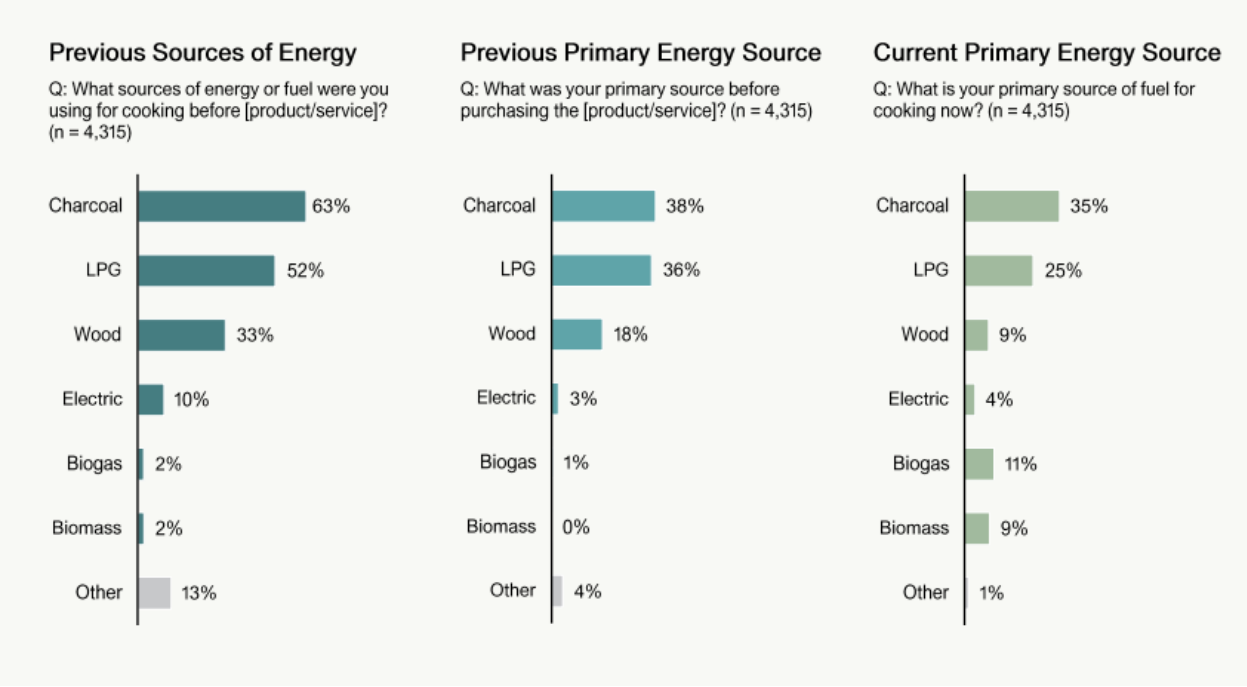


The Clean Cooking Alliance (CCA) in its Lean Data Insights Aggregate Report presents the sources of fuels used for cooking before and after purchasing products from CCA portfolio companies (Figure 2). Cleaner and safer energy sources such as biomass, biogas and electricity have a lower penetration rate compared to common fuels such as charcoal.

[23] Available at: https://sustainabledevelopment.un.org/content/documents/2019_Tracking_SDG7_Report.pdf

[24] Source: https://www.iea.org/reports/sdg7-data-and-projections/access-to-clean-cooking

Figure 2: Sources of Cooking Fuels Before and After Purchasing Products from CCA Portfolio Companies[25]



[25] Source: https://cleancooking.org/wp-content/uploads/2023/07/Clean-Cooking-Alliance_Lean-Data-Insights-Aggregate-Report.pdf

APPENDIX 3: BINDING SURVEY QUESTIONNAIRE

The following is a binding questionnaire with the minimum requirements for the baseline survey. The proponent may choose a different format but must include these questions, at minimum.

1. Survey Format A: Baseline Fuel Consumption Pattern

1.1. General information

Title of project activity	
Name of surveyor	
Date of survey	dd/mm/yyyy
Survey method	Face to face/ remote / telephone

1.2. Household profile[26]

Name (household representative)	
Household size (total number of people)	
- Females over 14 years	
- Males 15–59 years	
- Males over 59 years	
- Children 0–14 years	
Type or area (urban/rural)	
Address or coordinates	
Phone number	

1.3. Stove used prior to project implementation

(Mark "x" for all that apply)

A three-stone fire or a conventional system with no improved combustion air supply nor flue gas ventilation system (i.e., without a grate or chimney)	
Improved woodfuel cookstove	
Charcoal cookstove	
LPG cookstove	
Electric cookstove	
Other (describe)	

1.4. Household fuel consumption pattern prior to project implementation

How many meals did you prepare last week?	meals/week

[26] Selection of households should be based on a sampling plan.

Describe the ways in which you used your stove last week.	(open response)

1.4.1. Fuel used for cooking[27]

	Yes/No	Quantity of usage	Unit
Charcoal			kg/month or year
Wood			kg/month or year
LPG			kg or cylinders/month or year
Kerosene			litres/month or year
Coal			kg/month or year
Electricity			kWh/month or year
Other fuels (explain)			

1.4.2. Fuel sources

	Collected/ Purchased	Source or location of fuel
Charcoal		
Wood		
LPG		
Kerosene		
Coal		
Electricity		
Other fuels (explain)		

2. Survey Format B: Usage Rate Survey

2.1. General information

Title of project activity	
Name of surveyor	
Date of survey	dd/mm/yyyy
Survey method	Face to face
Period of usage (for usage rate)	dd/mm/yyyy to dd/mm/yyyy

[27] Where surveys are biennial, they may be designed to capture results for each year separately (e.g., the survey may ask for the utilization hours for year 1 and year 2 separately). The end-user may not be able to provide information on the quantity of cooking fuel in the units given here. In many places, the volume of firewood (e.g., the volume capacity and level of filling of the transporting/storage room) is measured, rather than its weight. Local measurement practices vary. The project proponent should include such local measurement units in the questionnaire. The measurement unit may also be given in terms of money spent on purchasing fuel. The project proponent must provide guidelines for how to convert the reported values to required units (mass or volume). For example, where a household uses a bag of charcoal every 10 days, the monthly average may be calculated if the weight (or volume and bulk density) of the full bag is determined.

2.2. Household profile[28]

Name (household representative)	
Household size (total number of people)	
- Female over 14 years	
- Male 15–59 years	
- Male over 59 years	
- Children 0–14 years	
Type or area (urban/rural)	
Address or coordinates	
Phone number	

2.3. Household fuel consumption pattern following project implementation

Cooking device	
Model name/number	
Unique ID	
Date of installation	dd/mm/yyyy
Do you use the project cookstove? (Physically check the stove)[29]	Yes/No
- If yes, have you used the stove regularly since you installed it?[30]	Yes/No
- If yes, is your stove in good condition?[31]	Yes/No
- If no, why did you stop using the stove?	
- How many meals did you prepare using the project cookstove last week or last month?	meals/week or month
Do you also use your traditional (baseline) cookstove?	Yes/No
- If yes, how many meals did you prepare using the traditional (baseline) cookstove last week or last month?[32]	meals/week or month
Do you use any other stove?[33]	Yes/No
If yes, list the types and number of other non-project stoves.	

[28] Selection of households should be based on a sampling plan.

[29] This is to determine whether the cookstove is currently in use. Physical checks to verify usage may include checking stove conditions (e.g., warm to touch, ashes in grate, soot on stove).

[30] This is to determine whether the cookstove has been continuously used.

[31] The project proponent may rephrase the question keeping in mind the objective (i.e., whether or not the project cookstove is in usable condition). Where the project cookstove is not in usable condition, the project proponent must exclude such stoves from the project database for the whole crediting year and subsequent years. The project proponent may include such stoves again on replacing them with new cookstoves of similar efficiency.

[32] This is to determine whether the baseline stove is being used, in order to accurately account for project emissions.

[33] This is to cross-check whether the project cookstove is used for all cooking requirements. It may also detect situations where a household is taking part in more than one project activity, thereby avoiding double counting.

How many times a week do you use the non-project stoves?	
How much do you spend on fuel for cooking per type of cooking device in a week/month?	

DOCUMENT HISTORY

Version	Date	Comment
v0.1	15 Dec 2023	Draft methodology for public consultation