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|  | PROPOSED New baseline and Monitoring methodology oR methodological tool FORM FOR EMISSION REDUCTIONS ACTIVITIES (Version 02.0) | |
| 1. Information to be completed by the secretariat and Methodologies Expert Panel | | |
| Type of standard | | Choose an item. |
| Unique reference number and title of the proposed new methodology or new methodological tool | | >> |
| Date when this form was received at UNFCCC secretariat: | | Click or tap to enter a date. |
| Date of posting in the UNFCCC A6.4 web site for global stakeholder consultation | | Click or tap to enter a date. |

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| 1. Information to be completed by the submitter 2. (read before filling the form) |
| 1. This form is required at the “submission of proposed new methodology or methodological tool” stage and is submitted together with ‘New baseline and monitoring methodology and methodological tool proposal form (A6.4-FORM-METH-001). |

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| **Instructions for using this form**  In using this form, please follow the guidance established in the following documents:   * Fill out all relevant sections of the form in clear print or typing; * Provide your input after the >> indicator in the space provided; * Leave blank sections which are found to be not applicable.   **Formatting Instructions:**   * Do not modify any part of this form, including headings, logo, format or font; * The form provides the formatted headings which should be used throughout the document; * Please use word equation editor to write equations; * Please format figures, tables and footnotes to update automatically; * Please note the footnotes have a separate format (Times New Roman - size 10).[[1]](#footnote-2) * Please clearly distinguish between proper methodology text, tables and equations and explanatory notes, using the following colour coding:   + Methodology text shall be written in **black** fonts.   + Guidance from the UNFCCC is provided in **blue** fonts and can be deleted.   + Explanatory notes shall be written in **grey** fonts. Please note that explanatory notes are solely for the sake of methodology submission and consideration. Do not include guidance to activity participant in explanatory notes. Please note upon methodology approval, explanatory notes will be deleted. |

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| * 1. Summary and applicability of the baseline and monitoring methodology or methodological tool |

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| * + 1. Title, submission date and version |

Title: Comprehensive Lowered Emission Assessment and Reporting (CLEAR) Methodology for Cooking Energy Transitions

Submission date: August 28, 2025

Version: CLEAR v2

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| * + 1. If this methodology or methodological tool is based on a previous submission or an approved Article 6.4 mechanism methodology or methodological tool, please state the reference numbers here. Explain briefly the main differences and their rationale. |

>> N/A

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| * + 1. Summary description of the methodology or methodological tool, including major baseline and monitoring methodological steps. |

>> The CLEAR methodology defines emission reductions as total project emissions subtracted from total baseline emissions, adjusted for leakage. Both baseline and project emissions must account for fuel consumption, renewability, and upstream emissions.

**Energy consumption**

Energy consumption is calculated differently for Continuously Tracked Energy Consumption (CTEC) and non-CTEC projects. CTEC projects continuously measure fuel or energy consumption on all project technologies and in all project households (no sampling allowed) using built-in or external data loggers (also known as metering), or through fuel sales records. Non-CTEC projects are those that measure project cookstoves energy consumption at only a subset of sites.

Usage cannot be used as a substitute for direct fuel consumption measurements, which are required for calculating all project emissions and emission reductions.

Non-CTEC projects

The CLEAR methodology provides two options to determine baseline fuel consumption for non-CTEC projects. The first option is using a conservative global default that represents the minimum level of energy service required for household cooking, and the second option is conducting a baseline Kitchen Performance Test (KPT), subject to caps and flags if outside of the expected consumption range.

To determine project fuel consumption, non-CTEC project proponents must conduct a project KPT. To adjust for the Hawthorne effect, projects can either (i) cap their emission reductions (ERs) at 75% of what the project KPT-based estimate would be, or (ii) directly measure any effects using stove use monitors (SUMs), by comparing cookstove use during the KPT to the month before or after, and making the appropriate downward adjustment. For methodological consistency, this adjustment is applied directly in the project emissions calculation.

CTEC projects

The CLEAR methodology provides two options for determining energy consumption for CTEC projects. Under the first option, tracked project cookstove energy consumption data is used to back-calculate baseline energy consumption using annual usage surveys and specific fuel consumption ratios of the baseline and project cookstoves, determined via Controlled Cooking Tests (CCTs) performed on each cookstove model. Under the second option, a baseline KPT is used to estimate the emission reductions produced per TJ of the continuously tracked project technology energy consumption and then scaled by the total tracked project energy consumption to determine the total emission reductions. In both cases, fuel consumption is continuously measured directly through the use of built-in or external data loggers, or through fuel sales records, to determine the total energy use for all project cookstoves in all project households. Fuel sales records can only be used in CTEC projects and must be tracked at the household level. As a control on potential fuel diversion, household fuel consumption tracked through fuel sale records must be cross-checked against average project energy consumption values.

**User households and Project Technology Days (PTDs)**

CLEAR defines user households as project households with a functioning cookstove that is in use on average once or more per week during a given monitoring period, confirmed through both self-reporting (annual usage surveys) and visual inspection, or through SUMs. Households that do not meet these criteria must be excluded from the project.

CLEAR also incorporates the use of PTDs, which indicate the number of days for which project technologies are available (at the project household, within the project boundary, and functioning) and in regular use (once or more per week on average) during a given monitoring period. This parameter is used for non-CTEC projects only. The number of PTDs is capped based on whether the project provides certain customer support actions described in the methodology. For a non-CTEC project to be eligible to claim up to 90% of maximum PTDs, the project proponent must take the customer support actions described in the methodology and provide details of how each condition has or will be met on the [Project Information Cover Sheet](#A1) during the design phase of the project. Project proponents who do not undertake all three of these customer support actions may claim up to 75% of maximum PTDs. These caps are waived when PTDs are estimated with SUMs.

**Fraction of non-renewable biomass (fNRB)**

The CLEAR methodology requires the use of fNRB values derived from the MoFuSS model and disallows the use of CDM TOOL30. Project proponents have three options to determine fNRB under the CLEAR methodology, all using the MoFuSS model:

* National or sub-national default values from CDM TOOL33 (version 3.0);
* Customized project area (not aligned with national or subnational boundaries) using the online MoFuSS Default Scenarios (MoFuSS-DS) interface; or
* Where applicable, project proponents may run the MoFuSS model using their own rigorously validated inputs. For demand-side parameters like per capita fuel consumption, input data from population-representative surveys meeting the 95/10 rule or national datasets are acceptable. For supply-side data like land cover, biomass stock, or biomass growth maps, validated maps from reputed international sources or national remote sensing agencies are acceptable.

If UNFCCC determines that a marginal approach to calculating fNRB is allowable, MoFuSS may be used to calculate marginal fNRB for a given project under the CLEAR methodology.

**Wood to charcoal conversion**

Based on the latest scientific evidence, the CLEAR methodology uses a 6:1 conversion factor, which is incorporated into upstream emission factor values and fNRB. Nonetheless, the methodology also includes emission factors based on a 4:1 conversion factor, to enable ICVCM Core Carbon Principles (CCP) eligibility.

**Upstream emissions**

Upstream emissions from the production, processing, transportation, and distribution of cooking fuels are included in the calculation of CO2e. Upstream emissions apply to both baseline and project scenarios.

**Leakage**

The CLEAR methodology requires that projects apply a default adjustment factor of 2% to the emission reductions to approximate leakage emissions or evaluate the relevant potential sources of leakage and provide an evidence-based description and estimated quantification of each potential source and its relevance for the project.

**Additionality**

Project activities using the CLEAR methodology shall demonstrate that the project activity would have not occurred in the absence of the support of revenues from the carbon credit sales, and that the emission reductions achieved by the project would not occur as a result of any legal instrument. To demonstrate this, project proponents shall provide financial viability information and also conduct a regulatory analysis, barrier analysis, and a common practice analysis.

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| * 1. Proposed new baseline and monitoring methodology or methodological tool |

1. Introduction
2. The following table presents a summary of the key elements of a methodology:

Table 1. Methodology key elements

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| Type of GHG mitigation measure(s) | Fuel/feedstock switch  Technology switch  GHG destruction  GHG formation avoidance  Engineered carbon dioxide removal  Nature based carbon dioxide removal |
| Types of mitigation outcomes achieved under this methodology | Emission reductions  Removals |
| Are the mitigation outcomes under this methodology at risk of reversal? | Yes  No |
| Typical projects eligible under the methodology | Cooking (cookstove) projects |

1. Scope and entry into force
   1. Scope
2. The CLEAR methodology is specifically designed for crediting emission reductions from cooking projects. It is applicable for nearly all cooking energy transitions for which the technologies meet the performance applicability conditions noted below. The sectoral scope of the methodology is Energy Demand.
   1. Entry into force

*[For the UNFCCC secretariat to complete - Leave blank]*

* 1. Applicability of sectoral scopes

1. Designated operational entities validating and verifying Article 6.4 activities that use this methodology shall apply sectoral scope(s):

*[For the UNFCCC secretariat to complete – leave blank]*

1. Definitions
2. In addition to the definitions contained in the ‘Article 6.4 mechanism Glossary of Terms’, the following definitions apply for the purpose of this methodology:
3. As of August 2025, the Article 6.4 Mechanism Glossary of Terms is still under development by the Supervisory Body. Listed below are all the definitions of key terms used in the CLEAR methodology.
   1. **Additionality –** When the project activity would not have occurred in the absence of the incentives from the carbon credits and when the emission reductions achieved by the project would not occur as a result of any legal instrument. To demonstrate additionality, project proponents must provide financial viability information and also conduct a regulatory analysis, barrier analysis, and a common practice analysis.
   2. **Artisanal cookstoves –** Cookstoves produced by small-scale manufacturing processes that can result in large variations in dimensions; generally made by hand by skilled workers, rather than mass-produced in factories. This methodology requires that for artisanal cookstoves, at least three randomly selected samples of each cookstove model must be used when testing for ISO thermal efficiency, and where relevant for the CCT. ​​
   3. **Baseline scenario** – Existing baseline technologies and fuel consumption patterns in a planned cooking energy carbon project area, prior to the implementation of the project. This baseline scenario (or scenarios) includes fuel types, fuel mix proportions, and household size, identified through baseline surveys prior to project implementation. Under the CLEAR methodology, the baseline scenario must be compared to the baseline technologies and fuel consumption patterns of actual households recruited into the project. Adjustments must be made in the case of any material discrepancy.
   4. **Best practice –** Evidence-based approaches recommended throughout this methodology. These are not requirements.
   5. **Business-as-usual (BAU) scenario** – Plausible reference trajectory or scenario for greenhouse gas (GHG) emissions or removals that would occur in the absence of the implementation of the proposed Article 6.4 activity. In the CLEAR methodology, the BAU scenario is in most cases equivalent to the baseline scenario, with adjustments made to the baseline scenario for any changes over time, if necessary (see [Section 10.4. *Identification of the conservative BAU scenario*](#S104) for additional details).
   6. **Carbon-crediting program –** Standard-setting program that registers climate change mitigation activities and issues carbon credits.​​
   7. **Charcoal –** Fuel produced by partially burning wood in a low-oxygen environment. The black substance that results is made up mostly of carbon and has higher energy density than the wood.​​
   8. **Continuously tracked energy consumption (CTEC) project –** Project that continuously measures fuel or energy consumption directly on all project technologies and in all project households through built-in or external data loggers (also known as metering), or through fuel sales records. Fuel sales records can only be used in CTEC projects, must be tracked at the household level, and must be cross-checked. Commonly metered fuels/technologies include electric cookstoves, LPG, ethanol, and biogas.​​
   9. **Controlled Cooking Test (CCT) –** Test that measures cookstove performance in comparison to traditional cooking methods when a cook prepares a pre-determined local meal, which may include multiple dishes. It is designed to assess cookstove performance in a controlled setting using local fuels, pots, and practices.
   10. **Cooking energy transition(s) –** Shift from one or more cooking fuel/ technology combination to another. In the context of this methodology, it specifically refers to the shift from polluting cooking fuels and technologies to cleaner and/or more efficient alternatives that results in GHG emission reductions.​​
   11. ​**Cooking event(s) –** Occurrence in which useful energy is delivered from a cookstove to fulfil a discrete task or set of tasks, such as cooking a meal (which may include multiple dishes), preparing tea, or heating water for bathing.​
   12. **Crediting period –** Period defined by the carbon-crediting program during which the project GHG emission reductions are eligible for the issuance of carbon credits. A crediting period may include multiple monitoring periods. This methodology allows a maximum crediting period duration of 5 years, with opportunity for crediting period renewal.
   13. ​​​​**Displacement –** Dis-use of baseline cooking technologies and fuels due to use of the project cookstove.​​
   14. ​​​**Emission factor –** Quantity of a pollutant released to the atmosphere relative to an activity associated with the release of that pollutant. Emission factors are usually expressed as the quantity of pollutant divided by a unit weight, volume, distance, or duration of the activity emitting the pollutant. In the context of cookstove carbon projects, emission factors measure the average mass of carbon dioxide equivalent (CO2e) released to the atmosphere per energy unit of cooking fuel (e.g., tonnes per TJ).​​
   15. ​​**Fraction of Non-Renewable Biomass (fNRB) –** Geographically specific parameter that estimates the percentage of wood that is harvested beyond the landscape’s rate of regeneration meaning that the wood is not a carbon-neutral fuel.
   16. **Hawthorne Effect –** Impact from the act of observation on human behaviour affecting a given result or outcome.
   17. **Household –** Individual residential unit and all the individuals living together and sharing cooking facilities and energy resources within that dwelling as their usual place of residence.
   18. **Kitchen Performance Test (KPT)** – Field–based procedure to quantify fuel consumption under typical household and cookstove usage conditions. It involves daily measurements of the amount of fuel used across several days in the user household’s kitchen, and it is usually accompanied by descriptive surveys.
   19. **Leakage** – In the context of carbon-crediting programs, a change in anthropogenic GHG emissions that occur outside the project boundary, and which are attributable to the project activity.
   20. **Monitoring period** – Time period for which a given batch of emission reductions is verified and certified for issuance; a subset of the crediting period. While project proponents can determine the length of the monitoring period, CLEAR recommends a two-year maximum for the monitoring period, since KPTs must be conducted at least every two years.
   21. **Net Calorific Value (NCV) of fuel** – Amount of heat released during the complete combustion of a unit quantity of fuel excluding the heat needed to vaporize the water formed during combustion. In this methodology, it is expressed in units of energy per mass (TJ/tonne).
   22. **Non-continuously tracked energy consumption (non-CTEC) project** – Project that measures project cookstoves energy consumption on only a subset of sites, and/or do not measure energy consumption continuously.
   23. **Non-permanence** – When the emission reductions achieved by a project do not persist and emissions are released back into the atmosphere.
   24. **Non-renewable fuels** – Include the non-renewable fraction of fuelwood and charcoal, as well as fossil fuels such as LPG, coal, and kerosene.
   25. **Off-grid renewable energy** – Renewable energy that is generated independently of the national or regional electrical grid, for example, by community- or household-level solar, micro-hydro, or wind installations.
   26. **Pellets** – Upgraded biomass fuel made from densified dry materials such as residues from wood harvesting or processing, residues from harvesting or processing of agricultural crops or purpose grown plants. Pellet properties can be described according to the ISO 17225 set of standards.
   27. **Project technology days (PTDs)** – Number of days for which project technologies are available (at the project household, within the project boundary, and functioning) and in regular use (once or more per week on average) during a given monitoring period (see also “User household” definition). This parameter is used for non-CTEC projects.
   28. **Rebound effect** – Increased usage of a product or service resulting from an improvement in its efficiency, potentially negating some or all of the expected emission reductions. In cookstove carbon projects, this effect could occur if households are able to increase how much they cook with the same amount of fuel after the introduction of a project cookstove. Rebound is also often linked to suppressed demand, where the project cookstove meets previously unmet cooking needs (see Suppressed Demand).
   29. **Renewable biomass** – By-product, residue, or waste stream from agriculture, forestry, and related industries that would not be used as a fuel or feedstock in the absence of the project activity, or biomass that originates from plantations that operate sustainably where all project and leakage emissions associated with the biomass cultivation are accounted for.
   30. **Renewable fuels** – Include the renewable fraction of fuelwood and charcoal, waste biomass like crop residues and dung, processed biomass like briquettes and pellets from fully renewable sources, bioethanol, biogas, and solar.
   31. **Stove stacking** – Use of multiple cooking technologies and/or fuels within a household.
   32. **Stove Use Monitor (SUM)** – Device that quantifies cookstove usage through direct measurements of physical or chemical parameters (e.g., temperature, heat flow, light, power, motion, gas concentration, etc.) of cookstoves, kitchen technologies, and cookware, among others. SUMs do not measure fuel or energy consumption, and therefore do not meet the requirements for CTEC projects.
   33. **Suppressed demand** – Situation where the level of access to a given good or service is insufficient – due to poverty or lack of access to infrastructure – to meet human development needs. In the context of cookstove carbon projects, accounting for suppressed demand means that the baseline scenario is adjusted to an amount of cooking fuel necessary to provide for human needs rather than a potentially lower, actual amount of fuel used for cooking. To account for suppressed demand[[2]](#footnote-3), this methodology uses a baseline fuel consumption default value equivalent to 0.5 tonnes/(person\*year) of air-dried wood; the minimum level of energy service required for cooking.
   34. **Third-party entity** – Entity that has no affiliation with the project proponent and no financial stake in the project. The independence of the entity may be demonstrated through a signed conflict of interest form in which all conflicts are disclosed (including relational, financial, competitive, and others).
   35. **TJ/(person\*year)** – Unit of per capita annual energy consumption.
   36. **Tonne** – Metric tonne (1,000 kilograms).
   37. **Transmission and distribution (T&D) losses** – Losses incurred supplying grid electricity from point of the generation to end users.
   38. **Upstream emissions** – In the context of this methodology, upstream emissions represent the GHG emissions associated with the production, processing, transportation, and distribution of cooking fuels. Upstream emissions apply to both baseline and project scenarios.
   39. **Useful energy delivered** – Energy transferred to the contents of a cooking vessel, including the sensible heat that raises the temperature of the contents of the cooking vessel and the latent heat of evaporation of water from the cooking vessel.
   40. **User household** – Project household with a functioning cookstove that is in use on average once or more per week during a given monitoring period, confirmed through both self-reporting and visual inspection, or through SUMs.
   41. **Usage** – Frequency or quantity of cooking with a given technology. In the context of this methodology, usage is addressed in the form of annual usage surveys, which determine primary fuel type and household size, confirm whether a household meets “User household” criteria, and determine the proportion of cooking done on baseline cookstoves for back-calculating baseline energy consumption for CTEC projects. Usage is also addressed in the context of Hawthorne effect calculations in the form of number of cooking events per day. Usage cannot be used as a substitute for direct fuel consumption measurements, which are required for calculating all project emissions and emission reductions.
   42. **Validation and Verification Body (VVB)** – Accredited, independent organization that is responsible for auditing emission reductions in GHG emissions mitigation projects to ensure conformity with relevant standards and regulations.
   43. ​​**Wood-to-charcoal conversion factor –** Expresses the amount of wood needed to produce a standard quantity of charcoal, typically expressed as a ratio of the mass of air-dry or oven-dry wood input per mass of charcoal output. This factor is relevant only for projects that use charcoal in the baseline and/or project scenarios. This methodology uses a 6:1 conversion factor, which is incorporated into upstream emission factor values (as noted in [Appendix 4: Upstream Emissions from Other Fuels](#A4)), and fNRB (as noted in the fNRB parameter table in [section 14](#S14)). Nonetheless, the methodology also includes emission factors based on a 4:1 conversion factor, to enable ICVCM Core Carbon Principles (CCP) eligibility. ​
   44. ​​**Woody biomass –** Any and all wood, whether or not it is harvested and used as a fuel, including live trees and shrubs, and wood harvested for any purpose.​​ ​

***Acronyms:​​***

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| 4C | Clean Cooking and Climate Consortium |
| BAT | Best Available Technology |
| CCT | Controlled Cooking Test |
| CLEAR | Comprehensive Lowered Emission Assessment and Reporting Methodology for Cooking Energy Transitions |
| CTEC | Continuously Tracked Energy Consumption |
| CH4 | Methane |
| CO2 | Carbon dioxide |
| CO2e | Carbon dioxide equivalent |
| fNRB | Fraction of Non-Renewable Biomass |
| GHG | Greenhouse Gas |
| ISO | International Organization for Standardization |
| KPT | Kitchen Performance Test |
| kWh | Kilowatt-hour |
| LMIC | Low- and Middle-Income Country |
| LPG | Liquified Petroleum Gas |
| MJ | Megajoule |
| N2O | Nitrous Oxide |
| NCV | Net Calorific Value |
| PTDs | Project Technology Days |
| SUM | Stove Use Monitor |
| T&D | Transmission and Distribution |
| TJ | Terajoule |
| VVB | Validation and Verification Body |

1. Normative references
2. This proposed baseline and monitoring methodology is based on the following proposed new methodologies and/or approved or consolidated methodologies:
   1. There are no approved Article 6.4 cookstove methodologies or tools yet.
3. Where applicable, the CLEAR methodology requires use of the most recent versions of the following tools, standards, guidelines, and protocols:

* Article 6.4 Standard: Demonstration of additionality in mechanism methodologies: <https://unfccc.int/sites/default/files/resource/A6.4-STAN-METH-003.pdf>
* Article 6.4 Standard: Setting the baseline in mechanism methodologies: <https://unfccc.int/sites/default/files/resource/A6.4-STAN-METH-004.pdf>
* Article 6.4 Sustainable Development Tool: <https://unfccc.int/process-and-meetings/bodies/constituted-bodies/article-64-supervisory-body/rules-and-regulations#Tools>
* CCT Protocol, available at: <https://cleancooking.org/protocols/>
* CDM Methodological Tool: Default values for common parameters (TOOL33): <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-33-v3.pdf>
* IPCC Guidelines for GHG National Inventories: <https://www.ipcc.ch/report/2019-refinement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories/>
* ISO Standard 19867-1: <https://www.iso.org/standard/66519.html>
* Kitchen Performance Test Protocol, available at: <https://cleancooking.org/protocols/>
* Modelling Fuelwood Savings Scenarios (MoFuSS): <https://www.mofuss.unam.mx/>
* Mini-Grid Emissions Tool from SEforAll: <https://www.seforall.org/mini-grids-emissions-tool>

1. This methodology is based on the following sources of information:

The CLEAR methodology was developed in alignment with the [Principles for Responsible Carbon Finance in Clean Cooking.](https://cleancooking.org/news/cca-launches-principles-for-responsible-carbon-finance-in-clean-cooking/)

The CLEAR methodology also references the following sources which include general guidance for conducting high-quality baseline and project surveys in the low- and middle-income country (LMIC) context:

* Clean Cooking Alliance’s [Fuel Stacking Toolkit](https://cleancooking.org/reports-and-tools/reducing-fuel-stacking-a-survey-tool-for-the-clean-cooking-industry/)
* [Designing Household Survey Samples: Practical Guidelines](https://unstats.un.org/unsd/demographic/sources/surveys/handbook23june05.pdf)
* Gold Standard’s [MECD Survey Questionnaire](https://globalgoals.goldstandard.org/431-1-mecd-survey-questionnaire/)
* Gold Standard’s [TPDDTEC Survey Questionnaire](https://globalgoals.goldstandard.org/407-3-tpddtec-survey-questionnaire/)
* [Guidance on survey design](https://gspp.berkeley.edu/research-and-impact/centers/cepp/projects/berkeley-carbon-trading-project/cookstoves/recommendations) from the authors of Gill-Wiehl, A., Kammen, D.M. & Haya, B.K. Pervasive over-crediting from cookstove offset methodologies. Nat Sustain 7, 191–202 (2024). <https://doi.org/10.1038/s41893-023-01259-6>
* [Household Sample Surveys in Developing and Transition Countries](https://unstats.un.org/unsd/hhsurveys/pdf/household_surveys.pdf)
* Siwatu,Gbemisola Oseni; Palacios-Lopez,Amparo; Mugera,Harriet Kasidi; Durazo,Josefine. *Capturing What Matters: Essential Guidelines for Designing Household Surveys (English).* LSMS Guidebook Washington, D.C.: World Bank Group. <http://documents.worldbank.org/curated/en/381751639456530686>
* WHO World Health Survey Manual.

Additional sources used in CLEAR *Appendix 4: Upstream Emissions from Other Fuels* and *Appendix 5: Default Point of Use Emission Factors, Thermal Efficiencies, and NCVs:*

Akagi, S. K., R. J. Yokelson, C. Wiedinmyer, M. J. Alvarado, J. S. Reid, T. Karl, J. D. Crounse, and P. O. Wennberg. “Emission Factors for Open and Domestic Biomass Burning for Use in Atmospheric Models.” Atmospheric Chemistry and Physics 11, no. 9 (May 3, 2011): 4039–72. <https://doi.org/10.5194/acp-11-4039-2011>

Bertschi, Isaac T., Robert J. Yokelson, Darold E. Ward, Ted J. Christian, and Wei Min Hao. “Trace Gas Emissions from the Production and Use of Domestic Biofuels in Zambia Measured by Open-Path Fourier Transform Infrared Spectroscopy.” Journal of Geophysical Research-Atmosphere 108 (2003): 5–1, 5–13

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Fleming LT, Weltman R, Yadav A, et al. Emissions from village cookstoves in Haryana, India, and their potential impacts on air quality. Atmos Chem Phys. 2018;18:15169–15182.

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Gomez, Darío R., and John D. Watterson. 2006. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. edited by S. Eggleston, L. Buendia, K. Miwa, T. Ngara, and K. Tanabe. Kamiyamaguchi Hayama, Japan: Institute for Global Environmental Strategies.

Lacaux, J. P., J. M. Brustet, R. Delmas, J. C. Menaut, L. Abbadie, B. Bonsang, H. Cachier, J. Baudet, M. O. Andreae, and G. Helas. “Biomass Burning in the Tropical Savannas of Ivory Coast: An Overview of the Field Experiment Fire of Savannas (FOS/DECAFE 91).” Journal of Atmospheric Chemistry 22, no. 1–2 (October 1995): 195–216. <https://doi.org/10.1007/BF00708189>

Pennise, D., K. R. Smith, J. P. Kithinji, M. E. Rezende, T. J. Raad, J. Zhang, and C. Fan. “Emissions of Greenhouse Gases and Other Airborne Pollutants from Charcoal-Making in Kenya and Brazil.” Journal of Geophysical Research-Atmosphere 106 (2001): 24143–55

Smith, K. R., D. P. Pennise, P. Khummongkol, V. Chaiwong, K. Ritgeen, J. Zhang, W. Panyathanya, R. A. Rasmussen, and M. A. K. Khalil. “Greenhouse Gases from Small-Scale Combustion in Developing Countries: Charcoal Making Kilns in Thailand.” Research Triangle Park, NC: US EPA, 1999

Stockwell CE, Christian TJ, Goetz JD, et al. Nepal Ambient Monitoring and Source Testing Experiment (NAMaSTE): emissions of trace gases and light-absorbing carbon from wood and dung cooking fires, garbage and crop residue burning, brick kilns, and other sources. Atmospheric Chemistry and Physics. 2016;16:11043–11081.

The Earth’s Energy Budget, Climate Feedbacks and Climate Sensitivity, Table 7.15 in AR6 WG1 Chapter 7. <https://doi.org/10.1017/9781009157896.009>

Other references:

Bailis, R., Drigo, R., Ghilardi, A., and Masera, O. (2015). The carbon footprint of traditional woodfuels. Nature Climate Change, 5(3), 266-272.

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1. Applicability
2. The methodology is applicable under the following conditions:
   1. The CLEAR methodology can be applied to nearly all cooking energy transitions implemented at the household level that result in reductions of emissions of carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O), collectively referred to on a CO2e basis. Future iterations will also apply to institutional and commercial cookstove projects.
   2. This methodology is applicable for project activities that would not occur in the absence of revenues from carbon credit sales, which must be demonstrated by following the additionality requirements described in [Section 9](#S9). There is no restriction on the number of households involved or the total emission reductions achieved.
   3. To qualify to use this methodology, projects must meet the following criteria.
      1. Project cookstoves shall be identified with a permanent unique identifier affixed to the cookstove in order to avoid double counting of emission reductions by other mitigation actions. Each identifier shall be linked to a specific household, and the project proponent shall have an identifier management system in place to manage the replacement of any cookstoves within the crediting period.
      2. All projects must identify and replace or retrofit malfunctioning cookstoves with a technology of comparable or better quality and thermal efficiency, or not claim emission reductions for households when such failures occur. Projects must include a documented plan for this process at the project design phase.
      3. All biomass-burning project cookstove models must be tested for thermal efficiency using the International Organization for Standardization (ISO) Standard 19867-1:20184. For wood-burning project technologies that use a griddle surface (e.g., plancha cookstoves for making tortillas), the thermal efficiency requirement is 20% or higher. Project cookstoves burning charcoal must achieve 30% or higher. All other biomass-burning project cookstoves must achieve 25% or higher.
   4. Caveats and restrictions:
      1. Projects must follow any relevant carbon-crediting program requirements for avoiding long-term lock-in of fossil fuels for cooking.
      2. For artisanal cookstoves, at least three randomly selected samples of each cookstove model must be used when testing for ISO thermal efficiency, and when undertaking CCTs. The mean value from the three samples must be applied.
      3. For biogas projects, this methodology is only applicable to those using a CTEC approach. It calculates emission reductions only from cooking fuel consumption, not the use of generated slurry[[3]](#footnote-4).
      4. For CTEC projects, fuel sale records can be used to track consumption of pellets, liquified petroleum gas (LPG), and ethanol where LPG and ethanol fuel delivery systems are designed exclusively for use in a specific project technology. Projects shall implement safeguards to prevent fuel diversion for non-project activities (e.g., sealed canisters, tamper-evident meters, delivery log cross-verification, etc.), and cross-check household fuel consumption tracked through fuel sale records against average project energy consumption values. Any outliers, defined as a household where the per person energy consumption for the given monitoring period is greater than 1.5 times the interquartile range (IQR) above the third quartile must be justified, or the household excluded.
      5. This methodology is not applicable for households who use electricity as their primary baseline fuel[[4]](#footnote-5).
3. Avoidance of double-counting
4. The risk of double counting in clean cooking projects is low compared to other sectors, as project boundaries are defined by the specific set of households adopting the project technologies, and these can be uniquely identified and monitored. Nonetheless, overlaps can arise in three ways: through households being included in more than one carbon project; through reductions being simultaneously reported under national mitigation schemes or NDCs; or through participation in parallel results-based financing or environmental markets.
5. The CLEAR methodology requires: (i) a permanent unique identifier affixed to the cookstove and linked to a specific household, with an identifier management system in place to manage the replacement of any cookstoves within the crediting period; (ii) a regulatory analysis to assess potential overlaps with domestic schemes; and (iii) disclosure of other programmes to ensure emission reductions are not claimed more than once.
6. Demonstration of alignment with the policies, options and implementation plans with regard to the NDC and LT-LEDS of the host Party and the long-term temperature goal of the Paris Agreement and long-term goals of the Paris Agreement
7. Activity participants shall provide to the DOE responsible to perform the validation of the Article 6.4 project an assessment, undertaken by the DNA of the host Party, of the activity’s consistency with Decision 3/CMA.3 paragraph 40 (c) and paragraph 27 (a) as part of the host Party’s approval.
8. Activity Boundary
9. Under the CLEAR methodology, the project boundary corresponds to the physical, geographical sites where project technologies operate including the location from which baseline and project fuels are produced or collected. Where project devices use electricity, the project boundary includes the electricity generation system and, where applicable, also the T&D system.

Table 2. Emissions sources and sinks included in or excluded from the activity boundary

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Source | GHG | | | Justification / Explanation |
| BASELINE | Thermal energy generation (burning of fuel) | CO2 | Included  Not included | Controlled  Related to  Affected by | >>Major source of emissions |
| CH4 | Included  Not included | Controlled  Related to  Affected by | >>Can be significant for some fuels |
| N2O | Included  Not included | Controlled  Related to  Affected by | >>Can be significant for some fuels |
| ----- | Included  Not included | Controlled  Related to  Affected by | >>----- |
| BASELINE | Fuel production and transport | CO2 | Included  Not included | Controlled  Related to  Affected by | >>Major source of emissions for some fuels |
| CH4 | Included  Not included | Controlled  Related to  Affected by | >>Can be significant for some fuels |
| N2O | Included  Not included | Controlled  Related to  Affected by | >>Can be significant for some fuels |
| ----- | Included  Not included | Controlled  Related to  Affected by | >>----- |
| ACTIVITY | Thermal energy generation  (burning of fuel) | CO2 | Included  Not included | Controlled  Related to  Affected by | >>Major source of emissions |
| CH4 | Included  Not included | Controlled  Related to  Affected by | >>Can be significant for some fuels |
| N2O | Included  Not included | Controlled  Related to  Affected by | >>Can be significant for some fuels |
| ----- | Included  Not included | Controlled  Related to  Affected by | >>----- |
| ACTIVITY | Fuel production and transport | CO2 | Included  Not included | Controlled  Related to  Affected by | >>Major source of emissions for some fuels |
| CH4 | Included  Not included | Controlled  Related to  Affected by | >>Can be significant for some fuels |
| N2O | Included  Not included | Controlled  Related to  Affected by | >>Can be significant for some fuels |
| ----- | Included  Not included | Controlled  Related to  Affected by | >>----- |
| ACTIVITY | Electricity generation, T&D | CO2 | Included  Not included | Controlled  Related to  Affected by | >>Major source of emissions |
| CH4 | Included  Not included | Controlled  Related to  Affected by | >>Can be significant for some fuels |
| N2O | Included  Not included | Controlled  Related to  Affected by | >>Can be significant for some fuels |
| ----- | Included  Not included | Controlled  Related to  Affected by | >>----- |
| LEAKAGE | Biomass competition (fuelwood/charcoal displacement) | CO2 | Included  Not included | Controlled  Related to  Affected by | >>Major source of emissions |
| CH4 | Included  Not included | Controlled  Related to  Affected by | >>Can be significant for some fuels |
| N2O | Included  Not included | Controlled  Related to  Affected by | >>Can be significant for some fuels |
| ----- | Included  Not included | Controlled  Related to  Affected by |  |

1. Demonstration of additionality
   1. Regulatory analysis
2. The regulatory analysis shall demonstrate that the emission reductions achieved by the project are not occurring as a result of any legal instrument (including laws, statutes, regulations, court orders, decrees, consent agreements, executive orders, permitting conditions or any other legally binding mandates). Where an applicable legal instrument restricts or prohibits a cooking fuel or technology (e.g., informal charcoal), the project proponent shall provide credible evidence that households are not switching away from the restricted fuel or technology because of the legal restrictions and that the project activity is the only reason that fuel consumption is changing.
3. Project proponents shall conduct the regulatory analysis at the time of project validation and update it at each crediting period renewal, or more frequently if required by the host country or Article 6.4 requirements.
4. The analysis shall be based on credible and current evidence and clearly justified. Acceptable supporting evidence includes official regulatory texts and government websites, expert legal opinion (if appropriate), peer-reviewed or grey literature, household surveys, and documentation from interviews with relevant regulatory agencies or implementation bodies.
5. If a relevant legal mandate comes into effect during the crediting period, the project may only continue claiming credits up to the date that mandate becomes legally effective.
   1. Avoidance of locking-in the level of emissions
6. The CLEAR methodology is for cooking energy transitions; based on manufacturer reporting, improved cooking technologies can be assumed to have a technical or operational lifetime of no more than 10 years, and as such no lock-in risks are assumed.
   1. Investment analysis, Barrier analysis and Common practice analysis
      1. Investment analysis
7. The CLEAR methodology does not require an investment analysis (i.e., simple cost analysis, benchmark analysis, or investment comparison analysis) because such approaches are not feasible or appropriate for the majority of cookstove project activities the CLEAR methodology is designed to credit. Cookstove activities are typically implemented at the household level, one of the specific cases where, per paragraph 54 of the [Article 6.4 Standard: *Setting the baseline in mechanism methodologies*](https://unfccc.int/sites/default/files/resource/A6.4-STAN-METH-004.pdf) (Version 02.0), a barrier analysis may be applied as an alternative to investment analysis.
8. The Clean Cooking and Climate Consortium (4C) considers an investment analysis to be inappropriate to represent additionality in the context of the CLEAR methodology for the following reasons:
   1. Simple cost analysis, per the [Article 6.4 Standard: *Demonstration of additionality in mechanism methodologies*](https://unfccc.int/sites/default/files/resource/A6.4-STAN-METH-003.pdf), requires demonstrating that the implementation of the carbon project is associated with costs and does not generate any cost savings or revenues other than from carbon credits. This is not suitable for cookstove projects, as many generate modest revenues, such as partial cost recovery from cookstove or fuel sales. While these revenues are generally insufficient to make the project financially viable, they would disqualify the project under a simple cost analysis, even though the project still depends on carbon finance to exist or scale.
   2. Benchmark analysis involves comparing a project’s financial performance against a financial benchmark, such as the internal rate of return (IRR). However, cookstove projects often lack clear, centralized cash flows and are not implemented with the goal of achieving a financial return. Many are implemented by non-profit entities or social enterprises, which focus on public health and environmental outcomes rather than profit maximization.
   3. Investment comparison analysis requires comparing the project's financial attractiveness against alternative investment options. Similar to the benchmark analysis, this is not relevant in the clean cooking sector, where most projects are not structured as commercial investments and do not compete with alternative profit-generating options. Many projects are public-good interventions designed to address energy access, health, and climate challenges, not maximize financial return.
9. While a formal investment analysis is excluded for these reasons, CLEAR requires project proponents to include financial viability information, specifically:
   1. The increase in financial viability through carbon credit revenues (e.g., being able to reduce cookstove costs, being able to conduct awareness campaigns to convince the population to adopt the cookstove, secure financing, etc.); and
   2. The financial viability with and without carbon credit revenues, to show that the activity depends on carbon finance to happen.
10. A suitable financial indicator for the financial viability of an Article 6.4 activity shall be used, such as the net present value or internal rate of return.
11. As described in the section below, the CLEAR methodology also includes a barrier analysis, which is better suited to the clean cooking sector and more accurately reflects the constraints that prevent these projects from being implemented in the absence of carbon finance.
    * 1. Barrier analysis
12. Under the CLEAR methodology, project proponents shall conduct a barrier analysis. Barriers may include:
    1. Knowledge barriers, such as lack of awareness of the health risks associated with using traditional cookstoves and fuels for cooking;
    2. Financial barriers, specifically, the inability of households to afford transitioning to clean cooking solutions without the use of carbon revenue to reduce the upfront cost of cookstove acquisition and/or ongoing fuel costs;
    3. Infrastructural barriers, namely gaps in the supply of efficient technologies, access to operation and maintenance support and repairs, and fuel supply chains that may depend on carbon projects to arrange and facilitate access; and
    4. Institutional, such as the inability of project proponents to service last-mile customers without additional funding.
13. Barriers that are unique to a proposed Article 6.4 project may only be used if the proposed activity depends on inputs that are proprietary to the project proponent, such that it can only be implemented by the project proponent.
14. The barrier analysis shall include the following components:
    1. Identify and describe relevant barriers faced by the proposed project;
    2. Demonstrate that the barriers prevent cooking energy emissions from being reduced without carbon credit revenues;
    3. Demonstrate that there are no other programs or incentives, such as subsidies, that would incentivize this activity; and
    4. Demonstrate that the incentives from the carbon credits, such as free or reduced price cooking technologies and/or fuels, are the determinant element in overcoming the identified barriers;
15. In the case of cooking projects, the plausible alternative to the Article 6.4 activity that does not face barriers is assumed to be the continuation of the pre-activity scenario.
16. The barrier analysis shall be supported by credible evidence. Such evidence may include independent studies, publicly available surveys, relevant verifiable market data, household survey data, or data from national or international statistics but shall not include anecdotal evidence. The evidence shall be interpreted in a conservative manner (i.e., that it is unlikely that the effect of the barrier is overestimated).
17. For crediting period renewals, project proponents must demonstrate that the identified barriers still persist, and that carbon finance remains necessary to overcome them.
    * 1. Common practice analysis
18. Project proponents shall conduct a common practice analysis. Common practice shall be assessed using the **Market Penetration Method** (corresponding to Approach B in the [draft Article 6.4 Common Practice Tool](https://unfccc.int/sites/default/files/resource/A6.4-MEP007_A01.pdf)), using the following steps.
    1. **Define the applicable geographical area for the common practice analysis**. The applicable geographical area shall by default be the host country of the project activity, with results disaggregated by urban and rural households. For projects implemented in urban settings, only the national-level urban market penetration rate shall be used; for projects implemented in rural settings, only the national-level rural market penetration rate shall be used. Where credible, recent and representative data are available at a more detailed sub-national level, the analysis may be conducted using that sub-regional geographical area. **Project proponents may also disaggregate results by wealth quintiles or other nationally recognized income/wealth indices (such as those available in DHS surveys), where such data are available and credible, in order to better reflect affordability barriers to adoption for the target population.**
    2. **Calculate the indicator of common practice.** The indicator is count-based  and calculated as the number of households in the target population with a functional technology that is equivalent to the project technology within the applicable geographical area (as defined in Step 1), not including those provided through carbon finance. An equivalent technology is one that meets all of the following criteria:
       1. Accomplishes the same cooking tasks as the project technology;
       2. Has a thermal efficiency within ±10% of the project technology’s thermal efficiency; and
       3. Uses the same fuel(s).
    3. **Assess the market penetration rate** by dividing the count-based indicator by the total number of households in the target market. If the market penetration rate is below a threshold (F(max)) of 30%, the technology shall be considered not common practice and shall pass this step of the additionality assessment. If the market penetration rate is 30% or greater, the technology shall be considered common practice, and the project shall **provide additional justification to prove that it is additional***.* Such additional justification shall be provided on the Project Cover Information Sheet and shall reference acceptable data, as defined below.
19. The threshold of 30% reflects a reasonable bound for when a self-sustaining market for clean cooking technologies is likely to exist in LMICs. While a rule of thumb often identifies a 20% penetration rate as a tipping point for a self-sustaining market, the threshold is set higher for clean cooking due to weak distribution and knowledge networks connecting urban and rural areas and the relatively small middle-class consumer segment with disposable income in LMICs. Nonetheless, the option to provide further additionality justification is offered for specific circumstances where the universal 30% threshold is not applicable, as the need for clean cooking in almost all least developed nations and many developing countries is so pervasive.
20. **Data requirements**: All calculated variables shall:
    1. Exclude technologies installed as a result of voluntary carbon crediting activities;
    2. Be based on recent (no more than three years old) and credible data sources; and
    3. Include documentation of data sources, reference years, and all calculations.
       1. Acceptable data sources may include national household energy surveys, census data, or other representative market studies. Where no such sources are available, baseline surveys may be used as a last resort, provided that they follow statistically robust sampling and are documented transparently.
       2. Where the available dataset reports only fuel type and not cookstove technology, and the fuel type alone does not clearly indicate whether the cookstove meets the equivalence definition (e.g. fuels such as charcoal or wood, which may be used in a variety of cookstove types), the project proponent shall use credible supplementary data sources to determine the proportion of users of that fuel who own and regularly use a functional equivalent technology. Where no such supplementary data are available, the proportion may be obtained from the baseline survey**.** For fuels that correspond to a specific technology (e.g., LPG, electricity, ethanol), the reported fuel shall be assumed to correspond directly to one functional cookstove.
       3. Where functional status or thermal efficiency data are not directly available, project proponents shall apply conservative assumptions to classify equivalent technologies, with justification provided. Where only the primary cooking fuel or device is reported, this shall be interpreted as representing the main technology in regular use. Secondary cookstove ownership shall only be included where credible evidence demonstrates that the cookstove is functional and regularly used. Where data less than three years old are not available, the most recent credible dataset may be used, provided that a conservative adjustment is applied to reflect likely changes in penetration since the data were collected.
    4. Performance-based approach

N/A

1. Baseline scenario
   1. Selection of the baseline approaches from paragraph 36 of the rules, modalities and procedures

Best available technologies that represent an economically feasible and environmentally sound course of action, where appropriate.

An ambitious benchmark approach where the baseline is set at least at the average emission level of the best performing comparable activities providing similar outputs and services in a defined scope in similar social, economic, environmental and technological circumstances.

An approach based on existing actual or historical emissions, adjusted downwards to ensure alignment with paragraph 33 of the RMP.

1. The CLEAR methodology explicitly supports the use of existing actual baseline fuel consumption, derived from direct measurements of fuel consumption, including KPTs, and continuously tracked energy consumption approaches.
2. CLEAR requirements make it well-aligned with the approach of using existing actual and historical emissions adjusted conservatively to ensure environmental integrity, as required under paragraph 33 of the RMP. This approach is appropriate for the following reasons:
   1. **Data collection and downward adjustments:** The CLEAR methodology requires project proponents to estimate baseline fuel consumption using real-world data, ensuring alignment with environmental integrity principles under paragraph 33 of the RMP. For non-CTEC projects and CTEC projects using the KPT, baseline fuel consumption is measured directly using KPTs in a representative sample, with downward adjustments in the baseline required if project surveys reveal material shifts in household fuel use patterns. If the 95/10 rule is not met for the baseline, this also results in a downward adjustment. CTEC projects back-calculate baseline consumption based on tracked project fuel use, making conservative adjustments if the 95/10 precision rules is not met. Any missing tracking data of project energy consumption automatically reduces credited baseline displacement. Additionally, CTEC projects must reassess project cookstove efficiency through CCTs at least twice during the crediting period, using representative devices from the aging fleet, which captures performance degradation over time and further lowers estimated displaced baseline energy. These conservative approaches ensure that baseline scenarios reflect actual household energy use, avoiding inflation and enhancing the credibility of emission reduction estimates.
   2. **Alignment with paragraph 35: verifiability and integrity:** The methodology uses conservative caps and flags any outliers or high values for additional justification. It requires strong quality assurance procedures and requires 95/10 precision for all key sampling efforts. These elements ensure that baselines are verifiable and transparently derived, consistent with paragraph 35 requirements for robust, reproducible methodology development.
3. In addition, CLEAR allows the use of global default values for baseline energy consumption, which are technology-specific and represent the minimum level of energy service required for cooking. When global defaults are used, the applicable baseline approach under the UNFCCC standard is the Best Available Technology (BAT) approach.
4. The global default values for baseline fuelwood or charcoal consumption reflect a minimum household energy service level for cooking and serve as a conservative estimate. While not derived from Article 6.4 activity field measurements, the defaults are grounded in real world data and reflect conservative estimates of fuel use. The baseline technologies associated with the global defaults are widely available, economically feasible, and environmentally sound in the baseline context. Given that these technologies provide a similar output to the project activity (cooking services) and that the use of global default values result in the lowest emission per unit, the use of these default is consistent with the BAT baseline approach under the [Article 6.4 Standard: *Setting the baseline in mechanism methodologies*](https://unfccc.int/sites/default/files/resource/A6.4-STAN-METH-004.pdf).
   1. Application of the selected approach, prior to implementation of a downward adjustment
      1. Procedure for the identification of the baseline scenario
5. Under the CLEAR methodology, project proponents are required to use a pre-determined baseline scenario, defined as the continuation of the pre-activity scenario. The pre-activity scenario refers to the circumstances immediately prior to the implementation of the project and represents the existing conditions at the site where the activity will be implemented. Project proponents shall describe this scenario in detail.
6. The baseline scenario(s) shall be defined based on the existing baseline technologies and fuel consumption patterns that are being displaced by the project technology. The baseline scenario survey shall define fuel types, fuel mix proportions, and household size. It may also be used to support common practice analysis.
7. Multiple baseline scenarios may be generated as appropriate (e.g., for multiple geographic areas with differing demographics, or multiple kinds of user groups with different baseline fuel mixes), and each compared against the project scenario.
8. Conversely, if a project is promoting multiple project technologies/fuels, a single baseline scenario can be assessed against multiple project scenarios. Project technologies with similar design and performance characteristics (defined as having the same combustion technology and within 10% thermal efficiency per ISO 19867-1) may be included under a single project scenario. If not, they must be treated as independent project scenarios and are monitored and calculated separately.
9. For non-CTEC projects opting to measure the baseline using the KPT rather than using a default value, and for CTEC projects opting to use the KPT to measure baseline fuel consumption, the baseline scenario(s) shall be identified and defined through the application of a baseline survey to the target population. The baseline scenario survey can also be used to meet the customer support action of demonstrating that the project has selected technologies and fuels that meet the cooking needs of the target population.
10. For CTEC projects choosing to back-calculate the baseline, as well as non-CTEC projects opting to use a default value, the baseline scenario survey is recommended but not mandatory. These project types may use other data to establish baseline scenarios at the project design stage, as they will collect all the data necessary to substantiate emissions reductions from actual project households during the usage survey. Where possible, all scenarios will be cross-checked with recent, appropriate (geographically and demographically comparable) information from nationally- or regionally representative surveys or reputable literature.[[5]](#footnote-6)
11. All baseline scenarios shall be assessed for consistency with government policies and legal requirements, as detailed in [Section 9. *Demonstration of Additionality*](#S9). In addition, any baseline scenario that is not aligned with government policies but instead constrains their outcomes shall be excluded. Baseline scenarios surveys should assess the percent of households in the target population with a functional technology that is equivalent to the project technology as part of the common practice additionality check, as detailed in [section 9](#S9). If greater than 30%, the project must provide a justification for the additionality of the project on the [Project Information Cover Sheet](#A1).
12. The baseline scenario shall remain valid for the duration of the reasonably expected remaining lifetime of the baseline cookstoves. In practice, this provision does not, by itself, require any change in the baseline scenario during the crediting period: if a baseline cookstove reaches the end of its lifetime during the crediting period, the project proponent may assume that the household, in the absence of the project, would naturally replace it with a cookstove of the same type and performance. This assumption reflects that cookstove project crediting periods are relatively short, and without targeted support, households are unlikely to transition to improved or cleaner cookstoves during this period due to persistent affordability and access barriers, as identified in the additionality analysis.
13. **Additional requirements for non-CTEC and CTEC projects conducting baseline KPTs:**
    1. Proponents of non-CTEC or CTEC projects using the KPT to measure the baseline must also use the baseline scenario survey to collect data on the relative fuel use at different times of the year to address potential seasonal variation. The following question (or an appropriate variation) must be asked, “Relative to the amount of fuel you used this week, are there other times of the year when you use more fuel? If so, when? And/or less fuel? If so, when?” For additional information on addressing seasonal variation in fuel consumption, see “*Other monitoring requirements”* in [section 15.1](#S151).
    2. For projects with KPT baselines, project proponents must also identify any mismatch between values documented during the baseline scenario and those reported by actual project households during the first project usage survey for primary fuel type and household size. This assessment should be carried out using retrospective questions of project households during the first usage survey in any given household.
    3. Where a material discrepancy between the baseline scenario and baseline observed in project households occurs, project proponents must either not claim emission reductions for households that do not conform to the baseline scenario profile or follow requirements on adjusting the parameter value to produce the lower emissions reduction estimate.
    4. A material discrepancy is defined as more than a 10% absolute difference[[6]](#footnote-7) between the baseline scenario and the baseline observed in project households for the primary fuel type used[[7]](#footnote-8). For household size, a material discrepancy is defined as an estimate measured during a project usage scenario (Hs) that is greater than the baseline scenario estimate. When calculating the difference, the absolute difference should be relative to the project estimate. For example, if the proportion of use events with wood is 85% in the baseline and 80% in the project, the difference is estimated as (0.85-0.80)/0.80 = 6.2% (within the 10% threshold). Specific requirements for baseline and project scenario comparisons are provided in the table below.

|  |  |
| --- | --- |
| **Requirements for baseline and project scenario comparisons** | |
| **Potential material difference** | **Action required** |
| The number of people per household in the project is greater than in the baseline scenario. | The number of people per household (Hs) estimated from project usage surveys must be lowered to the baseline scenario. |
| The number of people per household in the project is less than in the baseline scenario. | No change |
| The primary fuel used for cooking events identified through the baseline scenario survey is more than 10% different from that determined retrospectively through the first project usage survey, and the difference results in baseline emissions that are lower than they would be if the proportion of primary fuel from the baseline and project scenarios matched. For example, if the baseline (from before the project technology was introduced) scenario indicates 85% wood use, and 15% charcoal use; and the first project usage survey indicates a baseline of 75% wood use and 25% charcoal use, then the emissions in the baseline scenario would be considered conservative, as charcoal has higher CO2e emissions than wood per unit of useful energy delivered. If more than two fuels are used, the same process must be applied for all. | No change |
| The primary fuel used for cooking events identified through the baseline scenario survey is more than 10% different from that determined retrospectively through the first project usage survey and the difference results in baseline emissions that are higher than they would be if the proportion of primary fuel in baseline and project scenarios matched. For example, if the baseline scenario indicates 75% primary wood use, and 25% charcoal use; and the first project usage survey indicates a baseline of 85% wood use and 15% charcoal use (from before the project technology was introduced), then the emissions in the baseline scenario would be considered non-conservative, as charcoal has higher CO2e emissions than wood per TJ of useful energy delivered. If more than two fuels are used, the same process must be applied for all. | The project must exclude the baseline energy consumption from non-primary fuels in the estimation of baseline emissions, or proportionately reduce the energy consumption of the primary fuel by the percent difference in primary fuel use between the baseline scenario and project-estimated baseline from the first project usage survey, whichever results in a lower baseline CO2e emissions estimate. |

Sample size requirements for baseline scenario parameters are provided in [Appendix 10](#A10).

* + 1. Calculation of baseline emissions prior to downward adjustment

1. This methodology determines both baseline and project emissions by calculating GHG emissions from electricity, renewable and non-renewable fuels.
2. Electricity can include both grid and off-grid sources. Emissions from grid electricity are country-specific and calculated based on marginal emission factors from the International Financial Institutions Technical Working Group on GHG Accounting, (provided in [Appendix 2: Grid Emission Factors](#A2)) or based on marginal emission factors provided by the relevant national authority. Emissions from off-grid sources are technology-specific (provided in [Appendix 3: Off-Grid Emission Factors for Select Technologies](#A3)). The off-grid component includes both individual household systems and mini-grids using either single or multiple sources of power.
3. Renewable fuels include the renewable fraction of fuelwood and charcoal, waste biomass like crop residues and dung, processed biomass like briquettes and pellets from fully renewable sources, bioethanol, biogas, and solar.
4. Non-renewable fuels refer to the non-renewable fraction of fuelwood and charcoal, as well as fossil fuels such as LPG, coal, and kerosene.
5. To account for renewable and non-renewable woody biomass, the methodology utilizes fNRB.
6. Emissions are calculated on an energy basis, for which the conversions from mass to energy are conducted using Equation (1):

|  |  |
| --- | --- |
|  | (1) |

Where:

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Description** | **Unit** |
|  | Energy consumption for the respective fuel and scenario *x* | TJ |
|  | Fuel consumption for the respective fuel and scenario *x* | tonnes |
|  | Net calorific value for fuel *x* (see [Appendix 5](#A5)) | TJ/tonnes |

1. The approaches for calculating baseline emissions under CLEAR depend on the type of project, with two options each for CTEC and non-CTEC projects.
2. For CTEC projects, baseline energy consumption can either be measured through a KPT or back-calculated from project cookstove energy consumption using specific energy consumption ratios of the baseline and project cookstoves, determined via CCTs performed on each cookstove model.
3. Non-CTEC projects may also choose from two different approaches to determine energy consumption in the baseline scenario: measuring fuel consumption using a baseline KPT or using a global default.
4. For both CTEC and non-CTEC projects, baseline fuel consumption and emission estimates derived from KPTs, CCT-based ratios, or global defaults are not subject to trend analysis. Each of these approaches reflects typical cookstove performance and usage as a snapshot in time, rather than a multi-year dataset capturing historical variability or long-term trends. The global defaults also represent the minimum level of energy service, which is not subject to trends. Accordingly, no trend analysis is applied to baseline fuel consumption values derived under any of these approaches.
5. **Baseline caps and flags:**
   1. Baseline energy consumption values (estimated with the KPT or back-calculated) for primary fuelwood users (75% of cooking events) are capped at 0.0047 TJ useful energy delivered/(person\*year) (2.0 tonnes/(person\*year)), or 0.031 TJ/(person\*year) of air-dried wood or a combination of wood and any other additional baseline fuels. Values above 0.0023 TJ useful energy delivered/(person\*year) (1.0 tonnes/(person\*year)) or 0.0156 TJ/(person\*year)) of air-dried wood and additional baseline fuels are flagged for additional justification.
   2. For baselines with charcoal as the primary fuel use, the cap is set at 0.00295 TJ useful energy delivered/(person\*year) (0.40 tonnes/(person\*year)), or 0.012 TJ/(person\*year) of charcoal and any additional baseline fuels. Values above 0.0015 TJ useful energy delivered/(person\*year) (0.20 tonnes/(person\*year)), or 0.0059 TJ/(person\*year) are flagged for further justification.
   3. For mixed baseline scenarios (no primary fuel is used for more than 75% of cooking events) or those with other primary baseline fuels, the flags and caps are the same as those for primary charcoal baselines.[[8]](#footnote-9)
   4. An overview of the baseline caps and flags is presented in the table below.
   5. When the flagged threshold is surpassed, projects must provide justification in the [Project Information Cover Sheet](#A1) for why a higher baseline is realistic in that project area.[[9]](#footnote-10) For example, such justifications could include the case of households using plancha cookstoves or areas where wood is relatively abundant.

|  |  |  |  |
| --- | --- | --- | --- |
| **User group** | **Cap** | **Flag** | **Unit** |
| **Primary fuelwood users** | 0.0047 | > 0.0023 | TJ useful energy delivered/(person\*year) |
| 0.031 | 0.0156 | TJ/(person\*year) |
| 2 | >1.0 | tonnes/(person\*year) |
| **Primary charcoal users** | 0.00295 | > 0.0015 | TJ useful energy delivered/(person\*year) |
| 0.012 | 0.0059 | TJ/(person\*year) |
| 0.4 | >0.2 | tonnes/(person\*year) |
| **Mixed/other primary baseline** | 0.00295 | > 0.0015 | TJ useful energy delivered/(person\*year) |
| 0.012 | 0.0059 | TJ/(person\*year) |
| 0.4 | >0.2 | tonnes/(person\*year) |

1. **Baseline emissions for** **CTEC projects using the back-calculation option**
   1. Baseline emissions for CTEC projects using the back-calculation option are calculated using Equation (2)[[10]](#footnote-11).

|  |  |
| --- | --- |
|  | (2) |

Where:

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Description** | **Unit** |
|  | Baseline emissions during year *y* | tCO2e |
|  | Displaced energy consumption of fuel *i* in baseline scenario in year *y*. Where fuels such as pellets and briquettes are made from a mix of renewable and non-renewable sources (e.g., renewable agricultural waste and non-renewable wood), each source should be considered its own fuel[[11]](#footnote-12). This parameter is determined following [Equation (3).](#e3) | TJ |
|  | Fraction of non-renewable woody biomass fuel *i* consumed. This parameter varies between zero and 100% for fuelwood, charcoal, and other solid biomass fuels that are not fully renewable. When renewable biomass fuels are used (defined above), this parameter is equal to zero. When fossil fuels are used, it is equal to 100%. | % |
|  | CO2 emission factor for baseline fuel *i* | tCO2e/TJ |
|  | Non-CO2 emission factor for baseline fuel *i* | tCO2e/TJ |
|  | Upstream emissions for baseline fuel *i* in year *y*, determined following the “*Upstream Emissions for the Baseline Scenario” requirements* presented in [section 10.2.2.](#S1022) | tCO2e |

This approach calculates baseline energy consumption for each technology that is displaced by determining the amount of equivalent energy required for the baseline technology(ies) to provide the same level of service as the project technology according to its continuously tracked energy consumption. This estimation is done using specific fuel consumption ratios, derived from CCTs performed on each of the baseline and project technology types. When multiple fuel-stove combinations are used in the baseline by the end user in the same premises, the proportional use shall be established from surveys or SUMs (See [Appendix 9](#A9) for SUMs guidance). For example, if baseline cookstove use is estimated as 50% of cooking events performed on a three-stone fire, 10% on a charcoal cookstove, and 40% on an LPG cookstove, then the baseline energy consumption that the project technologies displace shall be apportioned proportionately in accordance with Equation (3):

|  |  |
| --- | --- |
|  | (3) |

Where:

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Description** | **Unit** |
|  | Displaced energy consumption of fuel *i* in baseline scenario in year *y* | TJ |
|  | Total tracked energy consumption of project fuel *j* for CTEC projects in year *y* | TJ |
|  | Proportion of cooking events conducted using baseline fuel-stove combination *i* | % |
|  | Specific energy consumption of a baseline fuel-stove combination *i* to cook a given amount of food | MJ/kg food |
|  | Specific energy consumption of a project fuel-stove combination *j* to cook a given amount of food | MJ/kg food |

Baseline fuel consumption caps and flags described above apply.

1. **CTEC projects using tracked energy consumption and KPTs**
   1. Baseline emissions of CTEC projects using tracked energy consumption and KPTs are calculated using Equation (12).

|  |  |
| --- | --- |
|  | (12) |

Where:

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Description** | **Unit** |
|  | Baseline emissions during year *y* | tCO2e |
|  | Emissions quotient for the consumption of energy for cooking in baseline scenario | tCO2e/TJ  or tCO2e/kWh |
|  | Total tracked energy consumption of project fuel *j* for CTEC projects in year *y* (see [Equation (7)](#e7)) | TJ or kWh |
|  | Upstream emissions for baseline fuel *i* in year *y*, determined following the “*Upstream Emissions for the Baseline Scenario” requirements* presented in [section 10.2.2.](#S1022) | tCO2e |

This approach involves determining a baseline emission quotient per unit project fuel by using the energy consumption through its measurement by an ex-ante KPT of the baseline scenario and an ex-post KPT of the project scenario, using Equation (13).

|  |  |
| --- | --- |
|  | (13) |

Where:

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Description** | **Unit** |
|  | Emissions quotient for the consumption of energy for cooking in baseline scenario | tCO2e/TJ  or tCO2e/kWh |
|  | Energy consumption of each baseline fuel *i* for CTEC projects based on baseline KPT. Where fuels such as pellets and briquettes are made from a mix of renewable and non-renewable sources (e.g., renewable agricultural waste and non-renewable wood), each source should be considered its own fuel. (See example in [footnote 11](#footnote11)) | TJ/(person\*year) |
|  | Fraction of non-renewable woody biomass fuel *i* consumed. This parameter varies between zero and 100% for fuelwood, charcoal, and other solid biomass fuels that are not fully renewable. When renewable biomass fuels are used (defined above), this parameter is equal to zero. When fossil fuels are used, it is equal to 100%. | % |
|  | CO2 emission factor for baseline fuel *i* | tCO2e/TJ |
|  | Non-CO2 emission factor for baseline fuel *i* | tCO2e/TJ |
|  | Tracked energy consumption of project fuel *j* for project cookstove(s) only from project KPT | TJ/(person\*year) or kWh/(person\* year) |

* 1. For baseline energy sources other than electricity, use [Equation (1)](#e1) to convert fuel masses to fuel energy.
  2. If project cookstove energy use is in the form of electricity, then the equation will result in a quotient in terms of tCO2e/kWh.
  3. Baseline fuel consumption caps and flags described above apply.

1. **Baseline emissions for non-CTEC projects** 
   1. Baseline emissions for non-CTEC projects are calculated using Equation (17).

|  |  |
| --- | --- |
|  | (17) |

Where:

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Description** | **Unit** |
|  | Baseline emissions during year *y* | tCO2e |
|  | Consumption of fuel *i* in baseline scenario in year *y.* Where fuels such as pellets and briquettes are made from a mix of renewable and non-renewable sources (e.g., renewable agricultural waste and non-renewable wood), each source should be considered its own fuel. (See example in [footnote 11](#footnote11)) | TJ |
|  | Fraction of non-renewable woody biomass fuel *i* consumed. This parameter varies between zero and 100% for fuelwood, charcoal, and other solid biomass fuels that are not fully renewable. When renewable biomass fuels are used (defined above), this parameter is equal to zero. When fossil fuels are used, it is equal to 100%. | % |
|  | CO2 emission factor for baseline fuel *i* | tCO2e/TJ |
|  | Non-CO2 emission factor for baseline fuel *i* | tCO2e/TJ |
|  | Upstream emissions for baseline fuel *i* in year *y*, determined following the “*Upstream Emissions for the Baseline Scenario” requirements* presented in [section 10.2.2.](#S1022) | tCO2e |

* 1. Non-CTEC projects may choose from two different approaches to determine energy consumption in the baseline scenario: measuring fuel consumption using a baseline KPT or using a global default for fuelwood or charcoal consumption.

**Global default**:

The global default can only be applied for projects where the baseline is predominantly wood or charcoal (more than 75% of cooking events with wood or charcoal, respectively, as determined via surveys).

The global default for baseline fuelwood consumption is 0.0012 TJ useful energy delivered/(person\*year)[[12]](#footnote-13), which is assumed to be equivalent to 0.5 tonnes/(person\*year of air-dried wood, or 0.0078 TJ/(person\*year).

The global default for baseline charcoal consumption is 0.00074 TJ useful energy delivered/(person\*year)[[13]](#footnote-14), which is assumed to be equivalent to 0.1 tonnes/(person\*year, or 0.00295 TJ/(person\*year) for charcoal.

When fuels other than wood or charcoal are in the respective baselines, their energy use must be accounted for in the 0.0012 and 0.00074 TJ useful energy delivered/(person\*year), respectively.[[14]](#footnote-15) These values reflect the minimum level of energy service required for cooking.

As an alternative to using a static baseline representing the minimum level of energy service required for cooking, project proponents may use the suppressed demand approach outlined in “[Addressing Suppressed Demand in Mechanism Methodologies](https://unfccc.int/sites/default/files/resource/A6.4-SBM017-A05.pdf)”.

**Baseline KPT**:

Projects conducting an ex-ante KPT of the baseline scenario should follow Equations (18) and (19); the resulting baseline fuel consumption calculations are subject to the caps and flags described above apply.

|  |  |
| --- | --- |
|  | (18) |

|  |  |
| --- | --- |
|  | (19) |

For baseline energy sources other than electricity, use [Equation (1)](#e1) to convert fuel masses to fuel energy.

Where:

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Description** | **Unit** |
|  | Consumption of fuel *i* in baseline scenario in year *y* | TJ |
|  | Average household size (persons per household, regardless of age or gender) | Number |
|  | Energy consumption of baseline fuel *i* for non-CTEC projects taken from global default baseline energy consumption value, or results from baseline KPT. | TJ/(person\*year) |
|  | PTDs of the monitoring period during year *y* | Number |
|  | Percent of project households with cookstoves present, where project cookstove is used at least once per week, determined via survey and visual observation, or estimated with SUMs, in year *y.* | % |
|  | Number of total possible project-technology days during the year y in household *h* | Number |
|  | Days in a calendar year *y*. Use 366 for leap years, 365 for other years. | Number |

1. **Upstream emissions for the baseline scenario:** 
   1. Upstream emissions for fuels in year *y* in the baseline scenario () are calculated using Equation (27):

|  |  |
| --- | --- |
|  | (27) |

* 1. For CTEC projects using the back-calculation approach, shall be taken as equal to .
  2. For CTEC projects using the KPT approach, is calculated by scaling the amount of energy consumption for each fuel during the KPT per TJ of project fuel during the KPT by the total tracked project fuel consumption per year:

|  |  |
| --- | --- |
|  | (29) |
|  |  |

Where:

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Description** | **Unit** |
|  | Upstream emissions for baseline fuel *i* in year *y* | tCO2e |
|  | Energy consumption for a fuel *i* in the baseline scenario in year *y* | TJ |
|  | Upstream emission factor for fuel *i* | tCO2/TJ |
|  | Energy consumption of baseline fuel *i* for CTEC projects based on baseline KPT. Where fuels such as pellets and briquettes are made from a mix of renewable and non-renewable sources (e.g., renewable agricultural waste and non-renewable wood), each source should be considered its own fuel. (See example in [footnote 11](#footnote11)) | TJ/(person\*year) |

* 1. Calculation of the downward adjusted baseline

1. **Downward adjustment in the calendar year of the start date of the crediting period for CTEC projects back-calculating the baseline:** 
   1. For CTEC projects deriving baseline energy consumption from back-calculating the displaced baseline energy consumption based on relative specific energy consumptions between baseline and project technologies, an initial downward adjustment is applied to ensure that baseline emissions remain below a conservatively determined BAU level and that credited emission reductions are not overstated. The specific energy consumptions for each baseline fuel-stove combination (shall be determined using the lower bounds of the one-sided[[15]](#footnote-16) 95 percent confidence intervals when estimating .
   2. The unadjusted baseline emissions during the calendar year of the start date of the first crediting period (), are calculated using equations [(2)](#e2), [(3)](#e3) and [(27)](#e27), based on the mean values obtained for the specific energy consumption of each baseline fuel-stove combination .
   3. The downward adjusted baseline emissions during the calendar year of the start date of the first crediting period, are calculated using equations [(2)](#e2), [(3)](#e3) and [(27)](#e27), based on the lower bounds of the one-sided 95 percent confidence intervals of the specific energy consumption for each baseline fuel-stove combination .
2. **Downward adjustment in the calendar year of the start date of the crediting period for CTEC projects using the KPT**
   1. For CTEC projects deriving baseline energy consumption from KPTs, an initial downward adjustment is applied to ensure that baseline emissions remain below a conservatively determined BAU level and that credited emission reductions are not overstated. To account for sampling uncertainty, the baseline energy consumption shall be determined using the lower bounds of the one-sided 95 percent confidence intervals for each respective fuel (*i*) in the baseline.
   2. The unadjusted baseline emissions during the calendar year of the start date of the first crediting period, are calculated using equations [(12)](#e12), [(13)](#e13) and [(27)](#e27), based on the mean values of the baseline energy consumption for each value .
   3. The downward adjusted baseline emissions during the calendar year of the start date of the first crediting period, are calculated using equations [(12)](#e12), [(13)](#e13) and [(27)](#e27), based on the lower bounds of the one-sided 95 percent confidence intervals of the baseline energy consumption for each fuel .
3. **Downward adjustment in the calendar year of the start date of the crediting period for non-CTEC projects**
   1. For non-CTEC projects deriving baseline energy consumption from KPTs, an initial downward adjustment is applied to ensure that baseline emissions remain below a conservatively determined BAU level and that credited emission reductions are not overstated. The baseline energy consumption shall be determined using the lower bounds of the one-sided 95 percent confidence intervals for each respective fuel (*i*) in the baseline .
   2. In addition, for the parameter representing the percent of project households with cookstoves present, where the project cookstove is used at least once per week, a cap of 90% or 75% shall be applied, even if monitoring results indicate a higher usage rate. The applicable cap depends on whether the project undertakes customer support actions as described below.
   3. These measures collectively address baseline uncertainty and potential overestimation of project usage and constitute the initial downward adjustment required under Section 7 of the [Article 6.4 Standard: *Setting the baseline in mechanism methodologies*](https://unfccc.int/sites/default/files/resource/A6.4-STAN-METH-004.pdf).
   4. The unadjusted baseline emissions during the calendar year of the start date of the first crediting period, are therefore calculated using equations [(17)](#e17), [(18)](#e18), [(19)](#e19) and [(27)](#e27), based on the mean values of the baseline energy consumption for each fuel and without the application of a cap on .
   5. The downward adjusted baseline emissions during the calendar year of the start date of the first crediting period, are therefore calculated using equations [(17)](#e17), [(18)](#e18), [(19)](#e19) and [(27)](#e27), based on the lower bounds of the one-sided 95 percent confidence intervals of the baseline energy consumption and with the application of the appropriate cap on .
   6. For projects using the global default for baseline energy consumption, the baseline is considered to follow the BAT approach. Because the BAT default already represents a conservative, low-energy benchmark (the minimum level of energy service required for cooking), no additional downward adjustment for baseline uncertainty is required.

**Customer support actions:** To be eligible to claim up to 90% of maximum PTDs in the calculation of baseline and project emissions, project proponents estimating PTDs with surveys must take the following customer support actions and provide details of how each condition has or will be met on the [Project Information Cover Sheet](#A1) during the design phase of the project.

* Demonstrate that the project has selected technologies and fuels that meet the cooking needs of the target population, either by citing robust research or conducting an investigation of cooking practices and attitudes during the project design phase.
* Provide evidence of project participant support activities. These may include such things as providing materials (print, in-person, or video) on how to operate the cookstove to prepare common local foods, how to troubleshoot common operational issues, and how to make minor repairs (including how to access any necessary parts). All project participant communications and materials shall be provided in local language(s) commonly used in the project area.
* Project participants must be able to contact the project proponent to access support (e.g., maintenance and repair services) through a commonly used, toll-free communications channel.

Project proponents who do not undertake all three of these customer support actions may claim up to 75% of maximum PTDs when estimating baseline and project emissions. These caps are waived when PTDs are estimated with SUMs.

1. **Minimum downward adjustment for CTEC and non-CTEC projects:** For projects that do not use the global default for baseline energy consumption, the downward adjusted baseline emissions must be less than or equal to the minimum downward adjustment, as specified in the [Article 6.4 Standard: *Setting the baseline in mechanism methodologies*](https://unfccc.int/sites/default/files/resource/A6.4-STAN-METH-004.pdf). The minimum downward adjusted baseline emissions for the first calendar year of the crediting period shall be calculated using Equation (4):

|  |  |
| --- | --- |
|  | (4) |

Where:

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Description** | **Unit** |
|  | Minimum downward adjusted baseline emissions during year | tCO2e |
|  | Unadjusted baseline emissions during year | tCO2e |
|  | Project emissions during year | tCO2e |
|  | Calendar year of the start date of the first crediting period |  |

The final downward adjusted baseline emissions for the calendar year of the start date of the first crediting period is then calculated using Equation (5):

|  |  |
| --- | --- |
|  | (5) |

Where:

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Description** | **Unit** |
|  | Final downward adjusted baseline emissions during year | tCO2e |
|  | Minimum downward adjusted baseline emissions during year | tCO2e |
|  | Downward adjusted baseline emissions during year | tCO2e |
|  | Calendar year of the start date of the first crediting period |  |

For projects using the global default for baseline energy consumption, no additional downward adjustment for baseline uncertainty is required. For these projects, the baseline emissions in the calendar year of the first crediting period are equal to the final downward adjusted baseline emissions during this year (.

1. **Downward adjustment in subsequent years for CTEC and non-CTEC projects:** For each calendar year after the first crediting year, a downward adjustment to the baseline emissions shall be calculated by applying an annual reduction of 1% relative to the final adjusted baseline of year 1 using Equation (6):

|  |  |
| --- | --- |
|  | (6) |

Where:

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Description** | **Unit** |
|  | Final downward adjusted baseline emissions during year | tCO2e |
|  | Final downward adjusted baseline emissions during year | tCO2e |
|  | Calendar year after the first crediting year |  |
|  | Calendar year of the start date of the first crediting period |  |

The 1% annual rate is intended to ensure that baselines remain ambitious over time, while acknowledging the economic realities of clean cooking projects, which often face significant affordability barriers. This downward adjustment for subsequent years applies to all projects, including those using the global default for baseline energy consumption.

1. **General comments on the application of downward adjustment:** In order to assure compliance with section 4.7 of the [Standard: *Application of the requirements of Chapter V.B (Methodologies) for the development and assessment of Article 6.4 mechanism methodologies*,](https://unfccc.int/sites/default/files/resource/A6.4-STAN-METH-001.pdf) the CLEAR methodology requires downward adjustments applied both initially and on an annual basis over the duration of the crediting period for both CTEC and non-CTEC projects.

The initial downward adjustment of the baseline in the calendar year of the start date of the crediting period is based on the lower bounds of the one-sided 95% confidence intervals of baseline energy consumption assessed through KPTs for all projects that measure the baseline in this way. In the case of CTEC projects that back-calculate the baseline rather than using KPTs, the initial downward adjustment is based on the lower bounds of the one-sided 95% confidence intervals of the baseline specific energy consumptions.

To address the risk of over-crediting due to the over-estimation of use of the project technology, all non-CTEC projects not using SUMs to estimate PTDs must apply an initial 25% downward adjustment to the total number of PTDs that they can claim when calculating their baseline and project emissions. Project proponents have the option to reduce this downward adjustment to 10% by providing certain customer support actions described in the methodology and providing details of how each condition has or will be met on the [Project Information Cover Sheet](#A1) during the design phase of the project. The CLEAR methodology also applies an annual downward adjustment to the baseline emissions of 1% relative to the final adjusted baseline of year 1 for each calendar year after the first crediting year.

While the [Article 6.4 Standard: *Setting the baseline in mechanism methodologies*](https://unfccc.int/sites/default/files/resource/A6.4-STAN-METH-004.pdf) calls for a minimum initial downward adjustment of 10% of the expected emissions reductions for all sectors, CLEAR proposes in the case of cooking projects an initial minimum of 5%. This approach maintains the intended safeguard function of the 10% requirement because the CLEAR methodology ensures that the original baseline itself, before the application of any downward adjustment, is already based on rigorous accurate measurement and conservative assumptions. CLEAR’s proposed 5% instead of 10% reflects a prioritization of accuracy over undifferentiated conservatism, given the direct measurement requirements already in place as well as the multiple safeguards in the methodology that mitigate baseline-related risks.

Under CLEAR, baseline energy consumption values are established through direct field measurements using KPTs, conservative default energy consumption values that represent the minimum level of service, or metered data. Where measurements are used, rigorous sampling protocols require 95% confidence with **±10% precision**, with adjustments for design effects in cluster sampling.

When the ex-ante measurement of any parameter fails to meet the 95/10 precision guideline, project proponents have the option to undertake additional sampling until the 95/10 threshold is met. If they do not, they must apply the conservative bound of the confidence interval (see [Appendix 10](#A10) for guidance), always selecting the bound that yields lower baseline emissions estimates. These provisions ensure that the measured baseline is statistically robust, conservative in estimation, and protected against key sources of over-crediting risk from the outset.

In addition, where defaults are applied, they are set at intentionally conservative levels. For example, the default thermal efficiency for a three-stone fire is set at **15%**, which is higher (more efficient) than many values reported in the literature. By assuming a more efficient baseline cookstove, the methodology produces a lower estimated baseline fuel consumption and therefore lower baseline emissions.

On top of this conservative baseline determination, the CLEAR methodology adds **further layers of conservatism** to safeguard against over-crediting, including:

* In the first monitoring period, all projects (except those using the global default baseline) must assess their baseline measurements for three possible over-crediting risks: mismatches between baseline and project household sizes; mismatches between baseline and project fuel use patterns; and monitored fuel consumption values that do not meet the 95/10 rule.

Each of these conditions requires a downward adjustment, as described in [Section 10.2.1 (Identification of the baseline scenario).](#S1021)

* A downward adjustment to emission reduction to account for potential over-crediting due to the Hawthorne effect for non-CTEC project of 25% of what the KPT-based estimate would be, or the percentage obtained by measuring this effect directly with SUMs, comparing cookstove use during the KPT to the month before or after.

These combined safeguards provide a level of conservatism at least equivalent to that of a 10% minimum downward adjustment applied to a baseline that was not subject to the same rigorous statistical requirements. The 5% minimum for cooking projects under CLEAR therefore preserves environmental integrity while avoiding excessive over-conservatism that could compromise project financial viability in a sector with high monitoring costs and slim revenue margins.

* 1. Identification of the conservative BAU scenario

1. The CLEAR methodology considers the business-as-usual (BAU) scenario as the continuation of the prevailing cooking technologies and fuel consumption patterns in the absence of the project activity.
2. The BAU scenario is identified through a rigorous, conservative process using direct measurement and contextual validation:
   1. **Baseline survey and literature review**  
      Project proponents conduct a baseline scenario survey within the target population to determine the dominant baseline cooking technologies, fuel types, stacking patterns, and household size. Where feasible, this is cross-checked with appropriate national or regional datasets or published literature.
   2. **Assessment against legal and policy context**  
      The identified BAU scenario is reviewed for consistency with legal requirements and relevant government policies. Scenarios that violate or constrain applicable policies are excluded unless clear justification is provided that the applicable policy is not enforced, in which case the project may apply a BAU scenario that reflects actual observed conditions.
   3. **Adjusting for changes periodically**  
      CLEAR uses a robust, conservative approach to define baselines through direct measurement, including KPTs or back-calculation based on tracked fuel consumption and CCTs. During the first usage survey, project households are asked retrospective questions to assess alignment with the originally defined baseline scenario. If material discrepancies are found—defined as more than a 10% difference in fuel mix or household size—conservative adjustments are required, either by not claiming emissions reductions from non-conforming households or adjusting baseline estimates downward (see section below for specific quantitative guidance). Subsequent usage surveys identify changes over the course of the crediting period.
   4. **Alignment with crediting periods**  
      The BAU scenario must be reassessed at the start of each crediting period (no more than 5 years), ensuring that the baseline remains current and continues to reflect the most accurate and conservative estimate of what would have occurred in the absence of the project.
3. In the CLEAR methodology, the BAU scenario is in most cases equivalent to the baseline scenario, with adjustments made to the baseline scenario for any changes in the target population, if necessary. However, the methodology also allows for the use of global defaults for the baseline scenario. In this case, the BAU and baseline scenarios are different. The process for determining the BAU scenario follows the same steps as for establishing the baseline scenario.
   * 1. Calculation of the conservative BAU emissions
4. BAU emissions are calculated using the same methodological approach and parameters as the baseline emissions. The equations, assumptions, and justifications applied are identical and are detailed in [section 10.2.2](#S1022). The conservative BAU emissions are taken to be minimum downward adjusted baseline emissions calculated for the first crediting year (.
5. For projects with KPT baselines, project proponents must also identify any mismatch between values documented during the baseline scenario and those reported by actual project households, as described in [section 10.2.1.](#S1021)
6. For CTEC projects that back-calculate their baseline, the proportion of cooking on baseline technologies is assessed periodically (at least every other year) during the project. As such, the monitoring directly accounts for changes in the baseline associated with “business-as-usual” trends.
   1. Comparison of the downward adjusted baseline and the conservative business-as-usual baseline
7. In the CLEAR methodology, the BAU scenario is in most cases equivalent to the baseline scenario, because baseline emissions are typically derived from historical energy consumption data. These data reflect actual household usage patterns and the impacts of enforced policies. In such cases, the difference between baseline emissions and BAU emissions is zero and therefore does not require calculation by project proponents.
8. However, the methodology also allows for the use of global default energy consumption values for the baseline scenario. Where this approach is used, the BAU and baseline emissions diverge. In these cases, the baseline emissions are presumed to be lower than the BAU emissions, as the default values reflect the minimum level of energy service.
9. For all projects, the baseline for each calendar year shall be set as the lower of two values:
   1. the final downward adjusted baseline emissions for year y (; and
   2. the conservative BAU emissions.
10. The conservative BAU emissions are taken to be minimum downward adjusted baseline emissions calculated for the first crediting year (.
11. Activity scenario
    1. Calculation of activity emissions
12. The following text describes the calculations for project emissions in accordance with the three CLEAR approaches: CTEC projects back-calculating the displaced baseline, CTEC projects using the KPT, and non-CTEC projects using the KPT**.**
13. **CTEC projects using the back-calculation approach for displaced baseline energy consumption:** Project emissions for CTEC projects using the tracked energy consumption of project technology option are calculated using Equation (7).

|  |  |
| --- | --- |
|  | (7) |

Where:

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Description** | **Unit** |
|  | Project emissions during year *y* | tCO2e |
|  | Total tracked energy consumption of project fuel *j* for CTEC projects in year *y.* Where fuels such as pellets and briquettes are made from a mix of renewable and non-renewable sources (e.g., renewable agricultural waste and non-renewable wood), each source should be considered its own fuel. (See example in [footnote 11](#footnote11))  For any given project participant or technology, if more than half of the possible CTEC data for a monitoring period is missing, only available CTEC data may be included in emission reduction calculations. If missing CTEC data for a given project participant or technology consists of less than half of the possible data, then the project proponent may use the 25th percentile of the available tracked project energy consumption for that project participant or technology as a conservative replacement of the missing data. | TJ |
|  | Fraction of non-renewable woody biomass fuel *j* consumed. This parameter varies between zero and 100% for fuelwood, charcoal, and other solid biomass fuels that are not fully renewable. When renewable biomass fuels are used (defined above), this parameter is equal to zero. When fossil fuels are used, it is equal to 100%. | % |
|  | CO2 emission factor for project fuel *j* | tCO2e/TJ |
|  | Non-CO2 emission factor for project fuel *j* | tCO2e/TJ |
|  | Upstream emissions for project fuel *j in year y*, determined following the “*Upstream Emissions for the Project Scenario”* requirements presented in [section 11.1.](#S111) | tCO2e |
|  | Emissions from electric energy consumption in year *y* | tCO2e |

The continuously tracked energy consumption in the project scenario is determined by continuously tracking fuel or electricity for the project technology, or from fuel sales.

Other, non-project cookstoves that may be in use in the project scenario are ignored, and the baseline fuel consumption calculation only includes that which is displaced by the project cookstove.

For CTEC project cookstoves:

|  |  |
| --- | --- |
|  | (8) |

Where:

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Description** | **Unit** |
|  | Total tracked energy consumption of project fuel *j* for CTEC projects in year *y* | TJ |
|  | Tracked energy consumption of project fuel *j* in project household *h* in year *y* | TJ |
|  | Project households | Number |

For **project energy sources other than electricity**, use [Equation (1)](#e1) to convert fuel masses to fuel energy.

If the **project cookstove uses electricity**, coming from either the national grid or an off-grid system(s) using renewable or non-renewable energy sources, its project emissions and electricity consumption must be calculated using Equation (9) and Equation (10), and/or Equation (11).

|  |  |
| --- | --- |
| ] | (9) |

Where:

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Description** | **Unit** |
|  | Emissions from electric energy consumption in year *y* | tCO2e |
|  | Tracked grid electricity consumption for cooking | kWh |
|  | Country-specific marginal grid emission factor in year *y*. See [Appendix 2: *Grid Emission Factors*](#A2) | gCO2e/kWh |
|  | Tracked off-grid electricity consumption for cooking in year y | kWh |
|  | Fraction of off-grid electricity provided by source *k* in year *y* | % |
|  | Off-grid emission factor for source *k*. This is a technology-specific value provided in [Appendix 3: *Off-Grid Emission Factors for Select Technologies*](#A3) | gCO2e/kWh |
|  | Average technical T&D losses for providing electricity in year *y* | % |
|  | Unit conversion for grams CO2e to tonnes CO2e |  |

Electricity consumption shall be measured, using calibrated equipment[[16]](#footnote-17) such as a built-in or external power meter, from all project electric cookstoves using Equation (10) and/or Equation (11).

|  |  |  |
| --- | --- | --- |
|  | (10) |  |
|  | (11) |  |
|  |  |  |

Where:

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Description** | **Unit** |
|  | Tracked grid electricity consumption for cooking in year *y* | kWh |
|  | Tracked grid electricity consumed for cooking in household *h* in year *y* | kWh |
|  | Tracked off-grid electricity consumption for cooking in year *y* | kWh |
|  | Tracked off-grid electricity consumed for cooking in household *h* in year *y* | kWh |
|  | Project households | Number |

1. **CTEC projects using tracked energy consumption and KPTs**: Project emissions for CTEC projects using this option are calculated using Equation (14).

|  |  |
| --- | --- |
|  | (14) |

Where:

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Description** | **Unit** |
|  | Project emissions during year *y* | tCO2e |
|  | Emissions quotient for the consumption of energy for cooking in project scenario in year *y* | tCO2e/TJ  or  tCO2e/kWh |
|  | Total tracked energy consumption of project fuel *j* for CTEC projects in year *y* | TJ or kWh |
|  | Upstream emissions for project fuel *j* in year *y*, determined following the “*Upstream Emissions for the Project Scenario”* requirements presented in [section 11.1.](#S111) | tCO2e |
|  | Emissions from electric energy consumption in year *y* (See [Equation 9](#e9)) | tCO2e |

This approach for determining energy consumption in the project scenario requires quantifying the energy consumption of all technologies used in the project scenario (including any baseline technologies still in use) based on a project KPT, using metered energy consumption data for the project cookstove specific to the KPT period where available. Where metered energy consumption is not available specific to the KPT period, the traditional fuel-weighing KPT approach must be used. Fuel-weighing must always be used for fuel consumption based on sales data. To link total emission reductions with the amount of tracked project fuel consumption, the emission reductions as measured during the KPTs are normalized by project fuel consumption and scaled by the amount of tracked project fuel consumption, as shown in Equation (15).

|  |  |
| --- | --- |
|  | (15) |

Where:

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Description** | **Unit** |
|  | Emissions quotient for the consumption of energy for cooking in project scenario in year *y* | tCO2e/TJ  or  tCO2e/kWh |
|  | Energy consumption of each fuel *j* used in project households from project KPT for CTEC projects. Where fuels such as pellets and briquettes are made from a mix of renewable and non-renewable sources (e.g., renewable agricultural waste and non-renewable wood), each source should be considered its own fuel. (See example in [footnote 11](#footnote11)) | TJ/(person\*year) |
|  | Fraction of non-renewable woody biomass fuel *j* consumed. This parameter varies between zero and 100% for fuelwood, charcoal, and other solid biomass fuels that are not fully renewable. When renewable biomass fuels are used (defined above), this parameter is equal to zero. When fossil fuels are used, it is equal to 100%. | % |
|  | CO2 emission factor for project fuel *j* | tCO2e/TJ |
|  | Non-CO2 emission factor for project fuel *j* | tCO2e/TJ |
|  | Tracked energy consumption of project fuel *j* for project cookstove(s) only from project KPT | TJ/(person\*year) or kWh/(person\*year) |

For continuously tracked project energy sources other than electricity, apply [Equation (1)](#e1) to convert fuel masses to fuel energy. This equation excludes any consumption of electricity in the numerator.

If the project cookstove uses electricity, then the equation will result in a quotient in terms of tCO2e/kWh.

For determining emissions from energy consumption from electric technologies apply [Equation (9)](#e9), [Equation (10)](#e10), and [Equation (11)](#e11).

1. **Non-CTEC projects using the KPT**: For non-CTEC projects, project emissions before any Hawthorne effect adjustment are calculated using Equation (20).

|  |  |
| --- | --- |
|  | (20) |

Where:

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Description** | **Unit** |
|  | Project emissions during year *y*, before applying any Hawthorne effect adjustment | tCO2e |
|  | Consumption of fuel *j* in project scenario in year *y.* Where fuels such as pellets and briquettes are made from a mix of renewable and non-renewable sources (e.g., renewable agricultural waste and non-renewable wood), each source should be considered its own fuel (See example in [footnote 11](#footnote11)). | TJ |
|  | Fraction of non-renewable woody biomass fuel *j* consumed. This parameter varies between zero and 100% for fuelwood, charcoal, and other solid biomass fuels that are not fully renewable. When renewable biomass fuels are used (defined above), this parameter is equal to zero. When fossil fuels are used, it is equal to 100%. | % |
|  | CO2 emission factor for project fuel *j* | tCO2e/TJ |
|  | Non-CO2 emission factor for project fuel *j* | tCO2e/TJ |
|  | Upstream emissions for project fuel *j* in year *y*, determined following the “*Upstream Emissions for the Project Scenario”* requirements presented in [section 11.1.](#S111) | tCO2e |
|  | Emissions from electric energy consumption in year *y* (See [Equation (22)](#e22)) | tCO2e |

Non-CTEC projects may choose from two approaches to determine energy consumption in the project scenario, differentiated by application (or non-application) of SUMs. Both approaches involve determining non-CTEC project fuel consumption through a representative sample with direct measurements of fuel using KPT following Equation (21):

|  |  |
| --- | --- |
|  | (21) |

Where:

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Description** | **Unit** |
|  | Consumption of fuel *j* in project scenario in year *y* | TJ |
|  | Average household size (persons per household, regardless of age or gender) | Number |
|  | Energy consumption of project fuel *j* for non-CTEC projects as measured by the project KPT during year *y* | TJ/(person\*year) |
|  | PTDs of the monitoring period during year *y* (See [Equation (19)](#e19)); as in the baseline scenario, PTDs are capped at either 90% or 75% depending on customer support actions taken as described in [section 10.2.2](#S1022). These caps are waived when PTDs are estimated using SUMs.) | Number |
|  | Days in a calendar year y. Use 366 for leap years. | Number |

For **energy sources other than electricity**, use [Equation (1)](#e1) to convert fuel masses to fuel energy.

In the case of **non-CTEC electricity use in the project scenario**, project emissions must be calculated taking into account the average electricity consumption measured by the project KPT including the use of a plug-in power meter and its corresponding emission factor. Emissions from electric energy consumption from grid and/or off-grid sources are calculated using Equation (22).

|  |  |
| --- | --- |
|  | (22) |
|  |  |

Where:

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Description** | **Unit** |
|  | Emissions from electric energy consumption in year *y* | tCO2e |
|  | Grid electricity consumption for cooking for non-CTEC project in year *y* (See [Equation (23)](#e23)). | kWh |
|  | Country-specific marginal grid emission factor. See [Appendix 2: *Grid Emission Factors* in year *y*](#A2) | gCO2e/kWh |
|  | Off-grid electricity consumption for cooking in year y (See [Equation (24)](#e24)). | kWh |
|  | Fraction of off-grid electricity provided by source *k* in year *y* | % |
|  | Off-grid emission factor for source *k*. This is a technology-specific value provided in [Appendix 3: *Off-Grid Emission Factors for Select Technologies*](#A3) | gCO2e/kWh |
|  | Average technical T&D losses for providing electricity in year *y* | % |
|  | Unit conversion for grams CO2e to tonnes CO2e |  |

Electricity consumption shall be determined using plug-in power meters during the KPT and calculated using Equation (23) for grid electricity, and/or Equation (24) for off-grid electricity:

|  |  |
| --- | --- |
|  | (23) |
| (24) |

Where:

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Description** | **Unit** |
|  | Grid electricity consumption for cooking for non-CTEC project in year *y* | kWh |
|  | Grid electricity consumption for cooking for non-CTEC project in year *y* | kWh |
|  | Average household size (persons per household, regardless of age or gender) | Number |
|  | PTDs of the monitoring period during year *y* | Number |
|  | Grid electricity consumption in project KPT in year *y* | kWh/(person\*year) |
|  | Off-grid electricity consumption in project KPT in year *y* | kWh/(person\*year) |

1. **Upstream emissions for the project scenario:** Upstream emissions for fuels in year y in the project scenario () for all fuels except electricity are calculated as follows:

|  |  |
| --- | --- |
|  | (28) |

For CTEC projects using the back-calculation approach, shall be taken as equal to

For CTEC projects using the KPT approach, is calculated by scaling the amount of energy consumption for each fuel during the KPT per TJ of project fuel during the KPT by the total tracked project fuel consumption per year:

|  |  |
| --- | --- |
|  |  |
|  | (30) |

Where:

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Description** | **Unit** |
|  | Upstream emissions for project fuel *j* in year *y* | tCO2e |
|  | Energy consumption for project fuel *j* in the project scenario in year *y* | TJ |
|  | Upstream emission factor for fuel *j* | tCO2/TJ |
|  | Energy consumption of each fuel *j* used in project householdsfrom project KPT for CTEC projects. Where fuels such as pellets and briquettes are made from a mix of renewable and non-renewable sources (e.g., renewable agricultural waste and non-renewable wood), each source should be considered its own fuel (See example in [footnote 11](#footnote11)). | TJ/(person\*year) |
|  | Tracked energy consumption of project fuel *j* for project cookstove only based on project KPT | TJ/(person\*year) |
|  | Total tracked energy consumption of project fuel *j* for CTEC projects in year *y* | TJ |

Upstream emissions from electricity generation are included in the grid/off-grid emission factors which are presented in [Appendix ‎2](#A2) and [Appendix 3](#A3). The emission factor accounting for the technical T&D losses for providing electricity is not included in the grid emission factors. Technical T&D losses are accounted for separately.

1. **Adjustment for the potential impact of the Hawthorne effect for non-CTEC projects**: To account for the potential impacts of the Hawthorne Effect on project KPTs for non-CTEC projects, the methodology applies a Hawthorne Effect adjustment factor (). This factor adjusts the calculated emissions reductions. For methodological consistency, the adjustment is incorporated directly in the project emissions calculation.
2. **Final project emissions**:
   1. Final project emissions () are calculated using Equation (25).

|  |  |
| --- | --- |
|  | (25) |

Where:

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Description** | **Unit** |
|  | Final project emissions during year *y* | tCO2e |
|  | Project emissions during year *y*, before applying any Hawthorne effect adjustment | tCO2e |
|  | Final downward adjusted baseline emissions during year *y* | tCO2e |
|  | Hawthorne Effect adjustment factor, either:  75% when KPTs and usage surveys are used without SUMs,  or  Result of [Equation (26)](#e26) where KPTs and usage surveys are complemented by SUMs measurements | % |

* 1. When projects complement KPTs and surveys with SUMs measurements, the ratio of project technology usage (cooking events/day) measured during the KPT to that measured during the month prior to or following the KPT is used to adjust the emission reduction estimate, such that in [Equation (25),](#e25) equals the result of this ratio (see [Equation (26)](#e26)). This option requires that SUMs be applied to all project cookstoves in households where the KPT is performed. See “Other monitoring requirements” in [section 15.1](#S151) for SUMs monitoring requirements and [Appendix 9](#A9) for general SUMs guidance.
  2. When projects measure fuel consumption through KPTs and usage surveys only, maximum emission reductions are capped at 75% of the KPT-based estimate to account for the Hawthorne Effect, such that in [Equation (25](#e25)), equals 75%.

|  |  |
| --- | --- |
|  | (26) |

Where:

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Description** | **Unit** |
|  | Adjustment to calculated emission reductions for the Hawthorne Effect | % |
|  | Average project technology cooking events per day over 1 month from SUMs measurements | Number |
|  | Average project technology cooking events per day over the project KPT from SUMs measurements | Number |

1. Leakage
   1. Identification of leakage emission sources
2. The table below presents the potential sources of leakage for cooking energy projects. Project proponents shall either apply a default adjustment factor of 2% to the emission reductions to approximate leakage emissions or identify all leakage sources relevant to their project and take the necessary prescribed steps to address it.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Potential sources of leakage and associated action(s) required** | | | | | |
| **Source** | **Scenario description** | **Impact on ERs** | **Evidence base** | **Notes** | **Required action** |
| Baseline equipment transfer | When a household primarily reliant on fuelwood or charcoal at baseline receives a more efficient biomass cookstove, they may sell or gift their baseline cookstove to a household outside the project boundary. | None | Sector expertise | In the LMIC context, projects promoting more efficient biomass cookstoves are almost always replacing three stone fires or very rudimentary traditional cookstoves. As these types of cookstoves are ubiquitous, there is no incentive to move them to a household outside the project boundary. | No leakage adjustment needed |
| Baseline equipment transfer | When a household using an efficient biomass cookstove at baseline benefits from a fuel-switch program, they may sell or gift their existing biomass cookstove to a household outside the project boundary. | Likely positive | Sector expertise | A household with a higher quality improved biomass cookstove that they no longer needed might sell or gift it to a household outside the project boundary. Experience suggests the receiving household would only adopt such a cookstove if their baseline cookstove was a three stone fire or low performing biomass cookstove. This would create a positive impact on ERs. | No leakage adjustment needed |
| Baseline equipment transfer | When a household using biogas, ethanol, electricity, or LPG at baseline benefits from a program promoting a different one of these clean fuels, they may sell or gift their existing clean cooking system to a household outside the project boundary. | Likely positive | Sector expertise | In the LMIC context where biomass cooking remains such a significant source of climate pollution relative to other cooking fuels, it would be extremely unlikely for a project proponent to propose this activity. It is further very likely that this case would result in a positive ER impact, as the relocated cookstove would likely reduce emissions in its new location given the prevalence of biomass across the LMIC context. | No leakage adjustment needed |
| Competition for resources | When woodfuel use is reduced due to project activity, it may result in a decrease in wood harvesting outside the project boundary. The woody biomass left intact due to the project activity may be harvested by households outside the project boundary to increase their use of biomass for cooking beyond subsistence levels. It may also be harvested by fuel producers or other industrial actors. | Negative | Gill-Wiehl et al., in preparation, 2025 | The existing evidence (which only covers the rural context) suggests that leakage from an increase in household cooking outside the project boundary is less than 1%. Commonly in the LMIC context, the household cooking volume is limited by the availability of food and water as well as access to refrigeration in addition to the availability of fuel. In many cases, it is unnecessarily burdensome to require a project proponent to determine the magnitude of this leakage. It maybe measurable if the baseline fuel source is a well-defined area. However, in the urban context, chain of custody data is almost never available for charcoal, which is frequently produced illegally and commonly transported further than fuelwood. | Projects reducing biomass use or replacing biomass used in the baseline shall either measure leakage from affected biomass sources where feasible or may opt to apply a 2% discount to the emission reductions. |
| Competition for resources | A project produces pellets or briquettes for cooking fuel from agricultural waste, which reduces the natural fertilizer on agricultural land and results in an increase in synthetic fertilizer | Likely negative | Sector expertise | We have not found any evidence of this situation. For it to occur, the profit gained from selling agricultural waste as fuel feedstock would have to exceed the cost of synthetic fertilizer, which is highly unlikely in the LMIC context. | No leakage adjustment needed |
| Competition for resources | If a project facilitates the electrification of multiple large institutional kitchens in the same community, it could cause the affected utility to adopt load-shedding measures among residential customers cooking with electricity, causing them to substitute more polluting fuels, such as biomass, for cooking. | Likely negative | Sector expertise | For material leakage to occur, a significant portion of households would need to already be cooking with electricity. This is not common in the current LMIC context. | No leakage adjustment needed. |

* 1. Avoidance or minimization of leakage

1. The CLEAR methodology minimizes leakage by incentivizing higher preforming technologies with continuously tracked fuel consumption.
2. As described in 12.1, the identified risks of negative leakage in clean cooking projects are mostly negligible, unlikely to occur, or positive in their impact. Therefore, CLEAR does not prescribe additional measures beyond those already required.
3. Baseline equipment transfer: Where baseline cookstoves are three-stone fires or rudimentary devices, they are ubiquitous and have no transfer value, so no negative leakage is expected. Where higher-performing cookstoves are displaced, the impact is likely positive. Therefore, no further action to avoid or minimize leakage is required for this potential source of leakage.
4. Competition for resources – biomass: In LMIC contexts, household cooking demand is constrained by food, water, and refrigeration rather than fuel availability, and robust chain-of-custody data for fuels such as charcoal are almost never available. Because potential leakage is both negligible in scale and not practically measurable, no additional applicability conditions are required. As a conservative option, project proponents may instead apply the 2% deduction set out in paragraph 12.3.
5. Competition for resources – fuel made from agricultural waste or electricity: Available evidence shows that agricultural waste typically surplus to agronomic needs, and electrification at the household level is too limited to materially impact grid stability. Because there is no evidence of significant negative leakage from these sources, no further action is required.
   1. Addressing leakage emissions
6. Leakage emissions, 𝐿𝐸𝑦, shall be determined following one of two options below.
   1. **Option 1:** Apply a default adjustment factor of 2% to the emission reductions to approximate leakage emissions. In this case, the term “(1- 𝐿𝐸𝑦)” in [Equation 16](#e16) changes to “98%”.
      1. Option 1 is conservative and pragmatic. In one of the few analyses of leakage from clean cooking projects, Gill-Wiehl et al (in publication) concluded that leakage from multiple rural cookstove projects was extremely low, estimating it at 0.53%.
   2. **Option 2:** The project proponent must evaluate the relevant potential sources of leakage and provide an evidence-based description and estimated quantification of each potential source and its relevance for the project.
      1. For each source for which the leakage assessment expects an increase in fuel consumption by non-project households attributable to the project activity, then calculations must be undertaken to account for the leakage from this source. Leakage is either calculated as a quantitative emissions volume (tCO2e) or as a percentage of total emission reductions. The project documentation shall include a projection of leakage emissions based on available data and information. The monitoring plan must include monitoring parameters to be registered during the leakage investigation every two years to populate the leakage calculation.
7. The project proponent must conduct a leakage investigation every two years using relevant methods. For example, surveys to determine parameters for the leakage calculation may be combined with project monitoring surveys, as is applicable.
8. Methods for measuring all types of leakage from cooking energy transition projects are still in development and will vary significantly depending on the project context and the type of leakage risk. Gill-Wiehl et al (in preparation) offers some relevant methods. In general, monitoring plans should include field-based measurement methods, especially for the quantification of fuel, as data on fuel use estimated via surveys are often insufficiently accurate.
9. Emission reductions
10. **Emission reductions for CTEC and non-CTEC project**: Emission reductions for CTEC and non-CTEC projects are calculated using Equation (16).

|  |  |
| --- | --- |
|  | (16) |

Where:

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Description** | **Unit** |
|  | Emission reductions for the project during year *y* | tCO2e |
|  | Final downward adjusted baseline emissions during year *y* | tCO2e |
|  | Project emissions during year *y* | tCO2e |
|  | Percentage deduction to account for leakage emissions during year *y* | % |

All projects shall either apply a default adjustment factor of 2% to the emission reductions to approximate leakage emissions, or evaluate the relevant potential sources of leakage and provide an evidence-based description and estimated quantification of each potential source and its relevance for the project.

1. Data and parameters not monitored

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data/parameter** | *CD* | | | |
| Description | Days in a calendar year *y*. Use 366 for leap years | | | |
| Data unit | Number | | | |
| Equations referred | Eq. [18](#e18) and [21](#e21) | | | |
| Purpose of data | T Baseline emissions / removals | T Project emissions / removals | | ☐ Leakage emissions |
| Tick the applicable box(es). | | | |
| Value(s) applied | 365 (non-leap year) or 366 (leap year) | | | |
| Source of data | ☐ Measured | | ☐ Other sources | |
| N/A | | | |
| Choice of data or measurement methods and procedures | N/A | | | |
| Treatment of uncertainty | N/A | | | |
| Additional comments | ------- | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data/parameter** |  | | | |
| Description | CO2 emission factor for baseline fuel *i* | | | |
| Data unit | tCO2e/TJ | | | |
| Equations referred | Eq. [2](#e2), [13](#e13), and [17](#e17) | | | |
| Purpose of data | T Baseline emissions / removals | ☐ Project emissions / removals | | ☐ Leakage emissions |
|  | | | |
| Value(s) applied | See [*Appendix 5: Default Point of Use Emission Factors, Thermal Efficiencies, and NCVs.*](#A5) | | | |
| Source of data | ☐ Measured | | T Other sources | |
|  | | | |
| Choice of data or measurement methods and procedures | Default values from the latest version of the IPCC Guidelines for National GHG Inventories are provided for most fuels; other fuels shall use data from peer reviewed sources (see the notes and references listed in [Appendix 5](#A5)). If a fuel is not included in [Appendix 5](#A5), then use literature-based values or project level tests using ISO 19867. | | | |
| Treatment of uncertainty | Uncertainty is addressed through the use of conservative default values. | | | |
| Additional comments |  | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data/parameter** |  | | | |
| Description | Non-CO2 emission factor for baseline fuel *i* | | | |
| Data unit | tCO2e/TJ | | | |
| Equations referred | Eq. [2](#e2), [13](#e13), and [17](#e17) | | | |
| Purpose of data | T Baseline emissions / removals | ☐ Project emissions / removals | | ☐ Leakage emissions |
|  | | | |
| Value(s) applied | See [*Appendix 5: Default Point of Use Emission Factors, Thermal Efficiencies, and NCVs*.](#A5) | | | |
| Source of data | ☐ Measured | | T Other sources | |
|  | | | |
| Choice of data or measurement methods and procedures | Default values from the latest version of the IPCC Guidelines for National GHG Inventories are provided for most fuels; other fuels shall use data from peer reviewed sources (see the notes and references listed in [Appendix 5](#A5)). If a fuel is not included in [Appendix 5](#A5), then use literature-based values or project level tests using ISO 19867. | | | |
| Treatment of uncertainty | Uncertainty is addressed through the use of conservative default values. | | | |
| Additional comments |  | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data/parameter** |  | | | |
| Description | CO2 emission factor for project fuel *j* | | | |
| Data unit | tCO2e/TJ | | | |
| Equations referred | Eq. [7](#e7), [15](#e15), and [20](#e20) | | | |
| Purpose of data | ☐ Baseline emissions / removals | T Project emissions / removals | | ☐ Leakage emissions |
|  | | | |
| Value(s) applied | See [Appendix 5: *Default Point of Use Emission Factors, Thermal Efficiencies, and NCVs*](#A5) | | | |
| Source of data | ☐ Measured | | T Other sources | |
|  | | | |
| Choice of data or measurement methods and procedures | Default values from the latest version of the IPCC Guidelines for National GHG Inventories are provided for most fuels; other fuels shall use data from peer reviewed sources (see the notes and references listed in [Appendix 5](#A5)). If a fuel is not included in [Appendix 5](#A5), then use literature-based values or project level tests using ISO 19867. | | | |
| Treatment of uncertainty | Uncertainty is addressed through the use of conservative default values. | | | |
| Additional comments |  | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data/parameter** |  | | | |
| Description | Non-CO2 emission factor for project fuel *j* | | | |
| Data unit | tCO2e/TJ | | | |
| Equations referred | Eq. [7](#e7), [15](#e15), and [20](#e20) | | | |
| Purpose of data | ☐ Baseline emissions / removals | T Project emissions / removals | | ☐ Leakage emissions |
|  | | | |
| Value(s) applied | See [*Appendix 5: Default Point of Use Emission Factors, Thermal Efficiencies, and NCVs*.](#A5) | | | |
| Source of data | T Measured | | T Other sources | |
|  | | | |
| Choice of data or measurement methods and procedures | Default values from the latest version of the IPCC Guidelines for National GHG Inventories are provided for most fuels; other fuels shall use data from peer reviewed sources (see the notes and references listed in [Appendix 5](#A5)). If a fuel is not included in [Appendix 5](#A5), then use literature-based values or project level tests using ISO 19867. | | | |
| Treatment of uncertainty | Uncertainty is addressed through the use of conservative default values. | | | |
| Additional comments |  | | | |

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| --- | --- | --- | --- | --- |
| **Data/parameter** | and | | | |
| Description | Upstream emission factor for fuel *i* in baseline or fuel *j* in project scenario | | | |
| Data unit | tCO2e/TJ | | | |
| Equations referred | : [Eq. 27](#e27)  : [Eq. 28](#e28) | | | |
| Purpose of data | T Baseline emissions / removals | T Project emissions / removals | | ☐ Leakage emissions |
| None of the above. Purpose of data is calculation of upstream emissions in baseline and project scenarios. | | | |
| Value(s) applied |  | | | |
| Source of data | ☐ Measured | | T Other sources | |
|  | | | |
| Choice of data or measurement methods and procedures | See [Appendix 4](#A4) | | | |
| Treatment of uncertainty | Uncertainty is addressed through the use of conservative default values. | | | |
| Additional comments | Upstream emissions for fuelwood are considered as zero. | | | |

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| --- | --- | --- | --- | --- |
| **Data/parameter** |  | | | |
| Description | Country-specific marginal grid emission factor | | | |
| Data unit | gCO2e/kWh | | | |
| Equations referred | Eq. [9](#e9) and [22](#e22) | | | |
| Purpose of data | ☐ Baseline emissions / removals | T Project emissions / removals | | ☐ Leakage emissions |
|  | | | |
| Value(s) applied | See [Appendix 2](#A2) | | | |
| Source of data | ☐ Measured | | T Other sources | |
|  | | | |
| Choice of data or measurement methods and procedures | Marginal emission factors from the International Financial Institutions Technical Working Group on GHG Accounting, (provided in [Appendix 2: Grid Emission Factors](#A2)), or marginal emission factors provided by the relevant national authority. | | | |
| Treatment of uncertainty | Uncertainty is addressed through the use of conservative default values. | | | |
| Additional comments |  | | | |

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| --- | --- | --- | --- | --- |
| **Data/parameter** |  | | | |
| Description | Off-grid emission factor for source *k* | | | |
| Data unit | gCO2e/kWh | | | |
| Equations referred | Eq. [9](#e9) and [22](#e22) | | | |
| Purpose of data | T Baseline emissions / removals | T Project emissions / removals | | ☐ Leakage emissions |
|  | | | |
| Value(s) applied | See [Appendix 3](#A3) | | | |
| Source of data | ☐ Measured | | T Other sources | |
|  | | | |
| Choice of data or measurement methods and procedures | Mini-grid Emission Tool from SEforAll | | | |
| Treatment of uncertainty | Uncertainty is addressed through the use of standardized values from the SEforALL Mini-Grid Tool, which applies conservative assumptions. | | | |
| Additional comments |  | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data/parameter** |  | | | |
| Description | Fraction of non-renewable woody biomass fuel *i* during year *y* | | | |
| Data unit | Fraction | | | |
| Equations referred | Eq. [2](#e2), [7](#e7), [13](#e13), [15](#e15), [17](#e17), and [20](#e20) | | | |
| Purpose of data | T Baseline emissions / removals | T Project emissions / removals | | ☐ Leakage emissions |
|  | | | |
| Value(s) applied |  | | | |
| Source of data | ☐ Measured | | T Other sources | |
|  | | | |
| Choice of data or measurement methods and procedures | * National or sub-national default [a] values from CDM TOOL33 [b]; or * Customized project area (not aligned with national or subnational boundaries) using the online MoFuSS Default Scenarios (MoFuSS-DS) interface [c]; or * Where applicable, project proponents may run their own model with webMoFuSS [d] using their own rigorously validated inputs, as stipulated in the model. For demand-side parameters like per capita fuel consumption, input data from population-representative surveys meeting the 95/10 rule or national datasets are acceptable. For supply-side data like land cover, biomass stock, or biomass growth maps, validated maps from reputed international sources or national remote sensing agencies are acceptable. More guidance to be published on webMoFuSS.   [a] Sub-national values are appropriate for projects concentrated in specific regions. National values are appropriate for projects that are evenly spread throughout a country.  [b] Default fNRB values from CDM TOOL33 (version 3.0) are included in [Appendix 11.](#A11)  [c] <https://mofuss.unam.mx/mofuss-ds/>  [d] If UNFCCC determines that a marginal approach to calculating fNRB is allowable, MoFuSS may be used to calculate marginal fNRB for a given project under this methodology. | | | |
| Treatment of uncertainty | The MoFuSS model explicitly addresses uncertainty in select inputs like biomass growth rates by running Monte Carlo simulations (multiple model runs using randomly selected inputs from a statistical distribution of possible values). The results are expressed as standard errors in the web-based query for MoFuSS default scenarios (<https://mofuss.unam.mx/mofuss-ds/>) and can also be accessed from the permanent MoFuSS data repository (<https://zenodo.org/records/14389323>). | | | |
| Additional comments | Frequency of monitoring: Determined once ex-ante.  This parameter is only considered when woody biomass is used in either baseline or project scenario.  This parameter varies between zero and 1 for fuelwood, charcoal, and other solid biomass fuels that are not fully renewable. When renewable biomass fuels are used, this parameter is equal to zero. When fossil fuels are used, it is equal to 1.  Updated at crediting period renewal. | | | |

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| **Data/parameter** | *LEy* | | | |
| Description | Percentage deduction to account for leakage emissions during year *y* | | | |
| Data unit | Percentage | | | |
| Equations referred | [Eq. 16](#e16) | | | |
| Purpose of data | ☐ Baseline emissions / removals | ☐ Project emissions / removals | | T Leakage emissions |
|  | | | |
| Value(s) applied | 2% | | | |
| Source of data | T Measured | | T Other sources | |
|  | | | |
| Choice of data or measurement methods and procedures | Project proponents shall either:  -Apply a default adjustment factor of 2% to the emission reductions to approximate leakage emissions; or  -Evaluate the relevant potential sources of leakage and provide an evidence-based description and estimated quantification of each potential source and its relevance for the project.  If utilizing the latter, for each source for which the leakage assessment expects an increase in fuel consumption by non-project households attributable to the project activity, then calculations must be undertaken to account for the leakage from this source. Leakage is either calculated as a quantitative emissions volume (tCO2e) or as a percentage of total emission reductions. The project documentation shall include a projection of leakage emissions based on available data and information. The monitoring plan must include monitoring parameters to be registered during the leakage investigation every two years to populate the leakage calculation.  When using the latter, the project proponent must conduct a leakage investigation every two years using relevant methods. For example, surveys to determine parameters for the leakage calculation may be combined with project monitoring surveys, as is applicable. Monitoring plans should include field-based measurement methods, especially for the quantification of fuel, as data on fuel use estimated via surveys are often insufficiently accurate. | | | |
| Treatment of uncertainty | Uncertainty is addressed through the use of conservative default values. | | | |
| Additional comments |  | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data/parameter** |  | | | |
| Description | Net calorific value of fuel *x* (or *j*) | | | |
| Data unit | TJ/tonnes | | | |
| Equations referred | [Eq. 1](#e1) | | | |
| Purpose of data | T Baseline emissions / removals | T Project emissions / removals | | ☐ Leakage emissions |
|  | | | |
| Value(s) applied | See [Appendix 5.](#A5) | | | |
| Source of data | T Measured | | T Other sources | |
|  | | | |
| Choice of data or measurement methods and procedures | Default values from the latest version of the IPCC Guidelines for National GHG Inventories are provided for most fuels in [Appendix 5](#A5)). Use of these values for wood and charcoal are required. For other fuels, project level tests using ISO 19867 may be used. Significant variance between such outputs and the values above must be noted and justified in the [Project Information Cover Sheet](#A1). If a fuel is not included in [Appendix 5](#A5), then use literature-based values or project level tests using ISO 19867. | | | |
| Treatment of uncertainty | Uncertainty is addressed through the use of conservative default values. | | | |
| Additional comments | Not applicable for electricity as energy source in baseline or project scenario | | | |

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| --- | --- | --- | --- | --- |
| **Data/parameter** | 𝑛t𝐸𝐶base*,i,y* | | | |
| Description | Energy consumption of baseline fuel *i* for non-CTEC projects in year *y* | | | |
| Data unit | TJ/(person\*year) | | | |
| Equations referred | [Eq. 18](#e18) | | | |
| Purpose of data | T Baseline emissions / removals | ☐ Project emissions / removals | | ☐ Leakage emissions |
| Calculation of baseline emissions for non-CTEC projects | | | |
| Value(s) applied |  | | | |
| Source of data | ☐ Measured | | T Other sources | |
|  | | | |
| Choice of data or measurement methods and procedures | Global default value from [*Section 10.2.2.*](#S1022)or results from baseline KPT.  Frequency of monitoring: Beginning of the crediting period | | | |
| Treatment of uncertainty | When Global Default values are used, uncertainty is addressed through the use of conservative default values.  Projects that choose the KPT approach to determine fuel consumption in the baseline scenario must collect data from a representative sample of households and follow the most recent version of the KPT protocol available at this link: <https://cleancooking.org/protocols/>  The monitoring must meet the minimum confidence and precision of 95/10 for annual fuel energy consumption per person to use the mean values. The 95/10 rule is applied to the sum of energy consumption across fuels. If the target precision is not met, the project proponent shall take the conservative bound of the confidence interval as the parameter value, proportionately applied across all of the fuels used. The conservative bound is that which produces a lower CO2e emissions reduction estimate. | | | |
| Additional comments |  | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data/parameter** |  | | | |
| Description | Average technical T&D losses for providing electricity in year *y* | | | |
| Data unit | Percentage | | | |
| Equations referred | [Eq. 9](#e9) and [22](#e22) | | | |
| Purpose of data | ☐ Baseline emissions / removals | T Project emissions / removals | | ☐ Leakage emissions |
|  | | | |
| Value(s) applied | ------ | | | |
| Source of data | ☐ Measured | | T Other sources | |
|  | | | |
| Choice of data or measurement methods and procedures | T&D loss values should come from the following sources:   * If available, the percentage published by the national grid’s operator should be used. * If the value from the national grid’s operator is not available, then national T&D loss percentages from international, reputable sources such as the World Bank or the International Energy Agency should be used. * If none of the options above are available, a 20% conservative default for T&D losses should be applied.   Frequency of monitoring: Determined once ex-ante | | | |
| Treatment of uncertainty | Uncertainty is addressed by using the most reliable data available: published values from the national grid operator where possible. Such official data may carry reporting uncertainties but are considered the most accurate available. If unavailable, estimates from reputable international sources (e.g., World Bank, IEA) are applied. In the absence of both, a conservative default of 20% is used | | | |
| Additional comments |  | | | |

1. Data and parameters monitored

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| --- | --- | --- | --- | --- |
| **Data/parameter** |  | | | |
| Description | Number of maximum possible project-technology days during the year *y* in household *h* | | | |
| Data unit | Number | | | |
| Equations referred | [Eq. 19](#e19) | | | |
| Purpose of data | T Baseline emissions / removals | | T Project emissions / removals | ☐ Leakage emissions |
|  | | | |
| Measurement and updating frequency | Frequency of monitoring: Annually | | | |
| Measurement methods and procedures | For each project household this is determined using the date the project-technology was obtained by the household, and the dates of the monitoring period. | | | |
| Entity/person responsible for the measurement | Project proponent | | | |
| Measuring instrument(s) | *Type of instrument* | N/A | | |
| *Accuracy class* | Exact number of dates | | |
| *Calibration requirements* | N/A | | |
| *Location* | Project household | | |
| QA/QC procedures | - | | | |
| Treatment of uncertainty | N/A  This value is assumed to have negligible uncertainty as it is based on sales or distribution records, which establish the date on which each project device entered the household. It is therefore not an estimate, but a precise historical value. | | | |
| Additional comment | - | | | |

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| --- | --- | --- | --- | --- |
| **Data/parameter** |  | | | |
| Description | Energy consumption of baseline fuel *i* for CTEC projects based on baseline KPT | | | |
| Data unit | TJ/(person\*year) | | | |
| Equations referred | Eq. [13](#e13) and [29](#e29) | | | |
| Purpose of data | T Baseline emissions / removals | | ☐ Project emissions / removals | ☐ Leakage emissions |
| Calculation of baseline emissions for CTEC projects that use tracked energy consumption and KPTs | | | |
| Measurement and updating frequency | Frequency of monitoring: Ex-ante, once per crediting period | | | |
| Measurement methods and procedures | CTEC projects that use tracked energy consumption and KPTs to determine fuel consumption in the baseline scenario must collect data from a representative sample of households and following the most recent version of the KPT protocol available at this link: <https://cleancooking.org/protocols/> | | | |
| Entity/person responsible for the measurement | Project proponent | | | |
| Measuring instrument(s) | *Type of instrument* | KPT | | |
| *Accuracy class* | See Treatment of uncertainty | | |
| *Calibration requirements* | *See QA/QC procedures* | | |
| *Location* | Project households | | |
| QA/QC procedures | Weekly scale calibration (±1%), documented outlier handling, and inclusion only of households with ≥3 valid days of data collected within two weeks. | | | |
| Treatment of uncertainty | The study must meet the minimum confidence and precision of 95/10 for the target parameter of average annual energy consumption per person. The 95/10 rule is applied to the sum of energy consumption across fuels (see parameter ∑ in [Appendix 10](#A10), which subsumes this parameter). If the target precision is not met, the project proponent shall take the conservative bound of the confidence interval as the parameter value, proportionately applied across all the fuels used. The conservative bound is that which produces a lower CO2e emissions reduction estimate. | | | |
| Additional comment | - | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data/parameter** | and | | | |
| Description | Electricity consumption in project KPT in year *y* | | | |
| Data unit | kWh/(person\*year) | | | |
| Equations referred | Eq. [23](#e23) and [24](#e24) | | | |
| Purpose of data | ☐ Baseline emissions / removals | | T Project emissions / removals | ☐ Leakage emissions |
|  | | | |
| Measurement and updating frequency | Frequency of monitoring: Every two years during project | | | |
| Measurement methods and procedures | A representative sample with built-in or external data loggers, where they conform with industry standards and are calibrated according to manufacturer recommendations and/or relevant national requirements as applicable, shall be used during KPTs. | | | |
| Entity/person responsible for the measurement | Project proponent | | | |
| Measuring instrument(s) | *Type of instrument* | Built-in or external data loggers | | |
| *Accuracy class* | - | | |
| *Calibration requirements* | Calibrated according to manufacturer recommendations and/or relevant national requirements as applicable | | |
| *Location* | During KPTs in project households | | |
| QA/QC procedures | See Calibration requirements | | | |
| Treatment of uncertainty | The monitoring must meet the minimum confidence and precision of 95/10 for the target parameter of average annual energy consumption per person. The 95/10 rule is applied to the sum of energy consumption across fuels. If the target precision is not met, the project proponent shall take the conservative bounds of the confidence intervals as the parameter value, proportionately applied across all the fuels used. The conservative bounds are those that produce a lower CO2e emissions reduction estimate. | | | |
| Additional comment | - | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data/parameter** |  | | | |
| Description | Fuel consumption for the respective fuel and scenario *x* (also Fuel consumption for fuel *j or i* in household *h* in year *y*) | | | |
| Data unit | Tonnes | | | |
| Equations referred | [Eq. 1](#e1) | | | |
| Purpose of data | T Baseline emissions / removals | | T Project emissions / removals | ☐ Leakage emissions |
|  | | | |
| Measurement and updating frequency | Frequency of monitoring: at baseline and every two years for project KPTs | | | |
| Measurement methods and procedures | KPT | | | |
| Entity/person responsible for the measurement | Project proponent | | | |
| Measuring instrument(s) | *Type of instrument* | Weighing scale | | |
| *Accuracy class* | Scales must have the capacity to weigh the respective solid fuels encountered during KPT. They will have a minimum resolution of 10 g or 2% of the expected difference between daily weighings for the primary fuel type.    Scales must remain stable at a zero reading after taring. | | |
| *Calibration requirements* | Scales must be checked during every day of use to confirm that they are within 1% of a certified calibration weight. The calibration weight must be within +/- 50% of typical weights for the primary fuel type. For example, if bundles of wood are typically 10 kg, then the calibration weight must be between 5 and 15 kg. If a scale indicates it is out of compliance, measurements from that scale must be discarded until the previous, valid check. | | |
| *Location* | Baseline and project households | | |
| QA/QC procedures | See *Calibration requirements*. | | | |
| Treatment of uncertainty | Uncertainty for fuel consumption (FC) parameters is subsumed under energy consumption uncertainty (EC) after the fuel mass is converted to equivalent fuel energy. | | | |
| Additional comment | - | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data/parameter** |  | | | |
| Description | Fraction of off-grid electricity provided by source *k* in year *y* | | | |
| Data unit | % | | | |
| Equations referred | [Eq. 22](#e22) | | | |
| Purpose of data | ☐ Baseline emissions / removals | | T Project emissions / removals | ☐ Leakage emissions |
|  | | | |
| Measurement and updating frequency | Frequency of monitoring: Annual | | | |
| Measurement methods and procedures | Electric meters measuring off-grid sources. | | | |
| Entity/person responsible for the measurement | Project proponent | | | |
| Measuring instrument(s) | *Type of instrument* | Electric meters measuring off-grid sources. | | |
| *Accuracy class* | - | | |
| *Calibration requirements* | - | | |
| *Location* | Project households | | |
| QA/QC procedures | Measured generation shall be cross-checked with off-grid source installed capacity and load factor. | | | |
| Treatment of uncertainty | Controlled via calibrated meters and QA/QC procedures | | | |
| Additional comment | Purpose of data: Apportioning fraction of electricity use for off-grid emission factors. | | | |

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| --- | --- | --- | --- | --- |
| **Data/parameter** |  | | | |
| Description | Average household size | | | |
| Data unit | Persons per household, regardless of age or gender (number) | | | |
| Equations referred | Eq. [18](#e18), [21](#e21), [23](#e23) and [24](#e24) | | | |
| Purpose of data | T Baseline emissions / removals | | T Project emissions / removals | ☐ Leakage emissions |
|  | | | |
| Measurement and updating frequency | Frequency of monitoring: Annual | | | |
| Measurement methods and procedures | Baseline survey and annual usage surveys, adjusting to the lower value when a decrease in persons per household is observed. | | | |
| Entity/person responsible for the measurement | Project proponent | | | |
| Measuring instrument(s) | *Type of instrument* | Survey | | |
| *Accuracy class* | See Treatment of uncertainty | | |
| *Calibration requirements* | - | | |
| *Location* | Project households | | |
| QA/QC procedures | Surveys are conducted by trained enumerators, verified through visual inspection and geo-tagged photographic evidence, and where possible administered on electronic platforms with built-in quality checks. | | | |
| Treatment of uncertainty | The parameter estimate from the survey must meet the minimum confidence and precision of 95/10 to use the mean value. If the target precision is not met, the project proponent shall apply the conservative bounds of the confidence intervals as the parameter value. The conservative bounds are those that produce a lower CO2e emissions reduction estimate. | | | |
| Additional comment | - | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data/parameter** | 𝑛t𝐸𝐶base*,i,y* | | | |
| Description | Energy consumption of baseline fuel *i* for non-CTEC projects in year *y* | | | |
| Data unit | TJ/(person\*year) | | | |
| Equations referred | [Eq. 18](#e18) | | | |
| Purpose of data | T Baseline emissions / removals | | ☐ Project emissions / removals | ☐ Leakage emissions |
| Calculation of baseline emissions for non-CTEC projects | | | |
| Measurement and updating frequency | Frequency of monitoring: Beginning of the crediting period | | | |
| Measurement methods and procedures | Representative sample using a baseline KPT.  Projects that choose the KPT approach to determine fuel consumption in the baseline scenario must collect data from a representative sample of households and follow the most recent version of the KPT protocol available at this link: <https://cleancooking.org/protocols/> | | | |
| Entity/person responsible for the measurement | Project proponent | | | |
| Measuring instrument(s) | *Type of instrument* | KPT | | |
| *Accuracy class* | See Treatment of uncertainty | | |
| *Calibration requirements* | See QA/QC procedures | | |
| *Location* | Project households | | |
| QA/QC procedures | Weekly scale calibration (±1%), documented outlier handling, and inclusion only of households with ≥3 valid days of data collected within two weeks. | | | |
| Treatment of uncertainty | The monitoring must meet the minimum confidence and precision of 95/10 for the target parameter of average annual energy consumption per person. The 95/10 rule is applied to the sum of energy consumption across fuels. If the target precision is not met, the project proponent shall take the conservative bounds of the confidence intervals as the parameter value, proportionately applied across all the fuels used. The conservative bounds are those that produce a lower CO2e emissions reduction estimate. | | | |
| Additional comment | - | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data/parameter** |  | | | |
| Description | Energy consumption of project fuel *j* for non-CTEC projects as measured by the project KPT in year *y* | | | |
| Data unit | TJ/(person\*year) | | | |
| Equations referred | Eq. [20](#e20) and [21](#e21) | | | |
| Purpose of data | ☐ Baseline emissions / removals | | T Project emissions / removals | ☐ Leakage emissions |
|  | | | |
| Measurement and updating frequency | Frequency of monitoring: Every two years | | | |
| Measurement methods and procedures | Representative sample using a KPT | | | |
| Entity/person responsible for the measurement | Project proponent | | | |
| Measuring instrument(s) | *Type of instrument* | KPT | | |
| *Accuracy class* | See Treatment of uncertainty | | |
| *Calibration requirements* | See QA/QC procedures | | |
| *Location* | Project households | | |
| QA/QC procedures | Weekly scale calibration (±1%), documented outlier handling, and inclusion only of households with ≥3 valid days of data collected within two weeks. | | | |
| Treatment of uncertainty | The monitoring must meet the minimum confidence and precision of 95/10 for the target parameter of average annual energy consumption per person. The 95/10 rule is applied to the sum of energy consumption across fuels. If the target precision is not met, the project proponent shall take the conservative bounds of the confidence intervals as the parameter value, proportionately applied across all the fuels used. The conservative bounds are those that produce a lower CO2e emissions reduction estimate. | | | |
| Additional comment | - | | | |

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| --- | --- | --- | --- | --- |
| **Data/parameter** | *b,i* | | | |
| Description | Proportion of cooking events conducted using baseline fuel *i* | | | |
| Data unit | Percentage | | | |
| Equations referred | This parameter does not appear in emissions reduction quantification equations, see Additional Comment field. | | | |
| Measurement and updating frequency | Frequency of monitoring: Once per crediting period | | | |
| Purpose of data | T Baseline emissions / removals | | ☐ Project emissions / removals | ☐ Leakage emissions |
|  | | | |
| Measurement methods and procedures | Baseline scenario surveys.  The survey must ask to identify all the cooking devices present in the household. For all cooking devices present in the household, ask “How many times did you cook using [cooking device] yesterday?” to determine the number of usage events per day per device.  When multiple devices/fuels are used in the baseline by the end user in the same premises, the proportional use shall be established from surveys or stove use monitoring as described in [Appendix 9.](#A9) | | | |
| Entity/person responsible for the measurement | Project proponent | | | |
| Measuring instrument(s) | *Type of instrument* | Baseline scenario surveys or stove use monitoring | | |
| *Accuracy class* | See Treatment of uncertainty | | |
| *Calibration requirements* | - | | |
| *Location* | Project households | | |
| QA/QC procedures |  | | | |
| Treatment of uncertainty | The parameter estimate from the survey must meet the minimum confidence and precision of 95/10 for the percentage of baseline cooking conducted using baseline fuel *i*, with a minimum of 200 households. | | | |
| Additional comment | The purpose of the data is to estimate the proportion of cooking events conducted using baseline fuel *i,* used in conjunction with Parameter PC*p,j* to calculate a material difference between the baseline scenario and actual project households, for non-CTEC and CTEC with KPT projects. This parameter does not appear in emissions reduction quantification equations. | | | |

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| **Data/parameter** | *p,j* | | | |
| Description | Proportion of cooking events conducted using project fuel *j* | | | |
| Data unit | Percentage | | | |
| Equations referred | This parameter does not appear in emissions reduction quantification equations, see Additional Comment field. | | | |
| Measurement and updating frequency | Frequency of monitoring: Once per crediting period | | | |
| Purpose of data | ☐ Baseline emissions / removals | | T Project emissions / removals | ☐ Leakage emissions |
|  | | | |
| Measurement methods and procedures | Project usage surveys or stove use monitoring.  The survey must ask to identify all the cooking devices present in the household. For the project cookstove and each other cooking device present in the household, ask “How many times did you cook using [cooking device] yesterday?” to determine the number of usage events per day per device.  When multiple devices/fuels are used in the baseline by the end user in the same premises, the proportional use shall be established from surveys or stove use monitoring as described in [Appendix 9.](#A9) | | | |
| Entity/person responsible for the measurement | Project proponent | | | |
| Measuring instrument(s) | *Type of instrument* | Project usage surveys or stove use monitoring. | | |
| *Accuracy class* | See Treatment of uncertainty | | |
| *Calibration requirements* | - | | |
| *Location* | Project households | | |
| QA/QC procedures | Surveys are conducted by trained enumerators, verified through visual inspection and geo-tagged photographic evidence, and where possible administered on electronic platforms with built-in quality checks. | | | |
| Treatment of uncertainty | The parameter estimate from the survey must meet the minimum confidence and precision of 95/10 for the percentage of baseline cooking conducted using project fuel *j*. | | | |
| Additional comment | The purpose of the data is to estimate the proportion of cooking events conducted using project fuel *j*, used in conjunction with Parameter PC*b*,*i* to calculate a material difference between the baseline scenario and actual project households, for non-CTEC and CTEC with KPT projects. This parameter does not appear in emissions reduction quantification equations. | | | |

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| --- | --- | --- | --- | --- |
| **Data/parameter** |  | | | |
| Description | Average project technology cooking events per day over 1 month from SUMs measurements | | | |
| Data unit | Cooking events/day (Number) | | | |
| Equations referred | [Eq. 26](#e26) | | | |
| Purpose of data | ☐ Baseline emissions / removals | | T Project emissions / removals | ☐ Leakage emissions |
|  | | | |
| Measurement and updating frequency | Frequency of monitoring: Once for a one-month duration during the first monitoring period of the crediting period | | | |
| Measurement methods and procedures | Installation of SUMs on a representative sample of project technology cookstoves.  SUMs sampling protocols (installation, placement, downloading) and algorithms used to convert raw data into cooking events must not change between sampling during KPTs and sampling during ongoing project operation. | | | |
| Entity/person responsible for the measurement | Project proponent | | | |
| Measuring instrument(s) | *Type of instrument* | SUMs | | |
| *Accuracy class* | See Treatment of uncertainty | | |
| *Calibration requirements* | - | | |
| *Location* | Project households | | |
| QA/QC procedures | SUMs must be consistently installed and placed following protocol, algorithms validated and publicly disclosed with sample data, and photographs of device placement retained for verification. | | | |
| Treatment of uncertainty | The monitoring must meet the minimum confidence and precision of 95/10 for the target parameter of average cooking events per day per project technology cookstoves. If the target precision is not met, the project proponent shall take the conservative bounds of the confidence intervals as the parameter value. The conservative bounds are those that tend to underestimate project technology cooking events. | | | |
| Additional comment | User households in the SUMs sample shall not receive any support different or additional to those not in the sample. | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data/parameter** |  | | | |
| Description | Average project technology cooking events per day over the project KPT from SUMs measurements | | | |
| Data unit | Cooking events/day (Number) | | | |
| Equations referred | [Eq. 26](#e26) | | | |
| Purpose of data | ☐ Baseline emissions / removals | | T Project emissions / removals | ☐ Leakage emissions |
|  | | | |
| Measurement and updating frequency | Frequency of monitoring: Once during the project KPT | | | |
| Measurement methods and procedures | Installation of SUMs on the project technology cookstoves during the project KPT.  SUMs sampling protocols (installation, placement, downloading) and algorithms used to convert raw data into cooking events must not change between sampling during KPTs and sampling during ongoing project operation. | | | |
| Entity/person responsible for the measurement | Project proponent | | | |
| Measuring instrument(s) | *Type of instrument* | SUMs | | |
| *Accuracy class* | See Treatment of uncertainty | | |
| *Calibration requirements* | - | | |
| *Location* | Project households | | |
| QA/QC procedures | SUMs must be consistently installed and placed following protocol, algorithms validated and publicly disclosed with sample data, and photographs of device placement retained for verification. | | | |
| Treatment of uncertainty | The monitoring must meet the minimum confidence and precision of 95/10 for the target parameter of average cooking events per day per project technology cookstoves. If the target precision is not met, the project proponent shall take the conservative bounds of the confidence intervals as the parameter value. The conservative bounds are those that tend to underestimate project technology cooking events. | | | |
| Additional comment | - | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data/parameter** |  | | | |
| Description | Specific energy consumption of a baseline cookstove using fuel *i* to cook a given amount of food | | | |
| Data unit | MJ / kg food | | | |
| Equations referred | [Eq. 3](#e3) | | | |
| Purpose of data | T Baseline emissions / removals | | ☐ Project emissions / removals | ☐ Leakage emissions |
| Back-calculation of baseline fuel consumption for CTEC projects using the back-calculation approach for displaced baseline energy consumption | | | |
| Measurement and updating frequency | Frequency of monitoring: Before validation | | | |
| Measurement methods and procedures | Most recent version of the CCT protocol available at this link: <https://cleancooking.org/protocols/>  Description of measurement methods are provided in the CCT protocol.  QA/QC procedures: Requirements per the CCT protocol. Additionally:   * A minimum of 15 CCTs by 5 different cooks (3 repeats per cook) must be conducted per cookstove type. * The CCTs must be alternated between the baseline and project cookstoves to limit potential bias in increased cook efficiency over repeats. * For artisanal cookstoves, at least three randomly-selected samples of each cookstove model must be tested. | | | |
| Entity/person responsible for the measurement | Project proponent | | | |
| Measuring instrument(s) | *Type of instrument* | CCT | | |
| *Accuracy class* | See Treatment of uncertainty | | |
| *Calibration requirements* | - | | |
| *Location* | Project households | | |
| QA/QC procedures | See measurement methods and procedures | | | |
| Treatment of uncertainty | The mean value for this parameter can only be used when the text results meet the minimum confidence and precision of 95/10. If the target precision is not met, the project proponent shall apply the conservative bounds of the confidence intervals as the parameter value. The conservative bounds are those that produce a lower CO2e emissions reduction estimate. | | | |
| Additional comment | - | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data/parameter** |  | | | |
| Description | Specific energy consumption of a project cookstove using fuel *j* to cook a given amount of food | | | |
| Data unit | MJ / kg food | | | |
| Equations referred | [Eq. 3](#e3) | | | |
| Purpose of data | T Baseline emissions / removals | | ☐ Project emissions / removals | ☐ Leakage emissions |
| Back-calculation of baseline fuel consumption for CTEC projects using the back-calculation approach for displaced baseline energy consumption. | | | |
| Measurement and updating frequency | Frequency of monitoring: Before validation, and every 2 years thereafter | | | |
| Measurement methods and procedures | Most recent version of the CCT protocol available at this link: <https://cleancooking.org/protocols/>  Description of measurement methods are provided in the CCT protocol.  QA/QC procedures: Requirements per the CCT protocol. Additionally:   * A minimum of 15 CCTs by 5 different cooks (3 repeats per cook) must be conducted per cookstove type. * The CCTs must be alternated between the baseline and project cookstoves to limit potential bias in increased cook efficiency over repeats. * For artisanal cookstoves, at least three randomly-selected samples of each cookstove model must be tested. The mean value from the three samples must be applied. | | | |
| Entity/person responsible for the measurement | Project proponent | | | |
| Measuring instrument(s) | *Type of instrument* | CCT | | |
| *Accuracy class* | See Treatment of uncertainty | | |
| *Calibration requirements* | - | | |
| *Location* | Project households | | |
| QA/QC procedures | See measurement methods and procedures | | | |
| Treatment of uncertainty | The mean value for this parameter can only be used when the text results meet the minimum confidence and precision of 95/10. If the target precision is not met, the project proponent shall apply the conservative bounds of the confidence intervals as the parameter value. The conservative bounds are those that produce a lower CO2e emissions reduction estimate. | | | |
| Additional comment | - | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data/parameter** |  | | | |
| Description | Tracked grid electricity consumed for cooking in household *h* in year *y* | | | |
| Data unit | kWh | | | |
| Equations referred | [Eq. 10](#e10) | | | |
| Purpose of data | ☐ Baseline emissions / removals | | T Project emissions / removals | ☐ Leakage emissions |
|  | | | |
| Measurement and updating frequency | Continuous and aggregated annually | | | |
| Measurement methods and procedures | Metered electricity use for each household | | | |
| Entity/person responsible for the measurement | Project proponent | | | |
| Measuring instrument(s) | *Type of instrument* | Applies for households consuming energy from the grid.   Built-in or external data loggers may be used, where they conform with industry standards and are calibrated according to manufacturer recommendations and/or relevant national requirements as applicable. | | |
| *Accuracy class* | See QA/QC procedures | | |
| *Calibration requirements* | - | | |
| *Location* | Project households | | |
| QA/QC procedures | Measured project technology electricity use shall be cross checked with the wattage of the project technology and the estimated operating hours for a sample of project-technology units. | | | |
| Treatment of uncertainty | Controlled through meter accuracy and calibration | | | |
| Additional comment | - | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data/parameter** |  | | | |
| Description | Energy consumption of each fuel *j* used in project householdsfrom project KPT for CTEC projects. | | | |
| Data unit | TJ/(person\*year) | | | |
| Equations referred | Eq. [13](#e13) and [15](#e15) | | | |
| Purpose of data | T Baseline emissions / removals | | T Project emissions / removals | ☐ Leakage emissions |
|  | | | |
| Measurement and updating frequency | Frequency of monitoring: Once per crediting period | | | |
| Measurement methods and procedures | CTEC projects that use tracked energy consumption and KPTs must collect data on all cookstoves operating in parallel with the project cookstove, from a representative sample of households and following the most recent version of the KPT protocol available at this link: [https://cleancooking.org/ protocols/](https://cleancooking.org/%20protocols/) | | | |
| Entity/person responsible for the measurement | Project proponent | | | |
| Measuring instrument(s) | *Type of instrument* | KPTs | | |
| *Accuracy class* | See Treatment of uncertainty | | |
| *Calibration requirements* | - | | |
| *Location* | Project households | | |
| QA/QC procedures | Weekly scale calibration (±1%), documented outlier handling, and inclusion only of households with ≥3 valid days of data collected within two weeks. | | | |
| Treatment of uncertainty | The monitoring must meet the minimum confidence and precision of 95/10 for the target parameter of average annual energy consumption per person. The 95/10 rule is applied to the sum of energy consumption across fuels (see parameter ∑ in [Appendix 10](#A10), which subsumes this parameter). If the target precision is not met, the project proponent shall take the conservative bounds of the confidence intervals as the parameter value, proportionately applied across all the fuels used. The conservative bounds are those that produce a lower CO2e emissions reduction estimate. | | | |
| Additional comment | - | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data/parameter** |  | | | |
| Description | Tracked energy consumption of project fuel *j* for project cookstove only based on project KPT | | | |
| Data unit | TJ/(person\*year) or (in the case of electricity) kWh/(person\*year) | | | |
| Equations referred | Eq. [10](#e10) and [12](#e12) | | | |
| Purpose of data | T Baseline emissions / removals | | T Project emissions / removals | ☐ Leakage emissions |
|  | | | |
| Measurement and updating frequency | Frequency of monitoring: Once per crediting period | | | |
| Measurement methods and procedures | CTEC projects that use tracked energy consumption and KPTs must collect data on all cookstoves operating in parallel with the project cookstove, from a representative sample of households and following the most recent version of the KPT protocol available at this link: [https://cleancooking.org/ protocols/](https://cleancooking.org/%20protocols/)  is extracted from the same measurements as the ones used to obtain and comprises energy consumption of project fuel *j* for projec*t* cookstove only. It also may be expressed in kWh/(person\*year) if the project-technology consumes electricity. | | | |
| Entity/person responsible for the measurement | Project proponent | | | |
| Measuring instrument(s) | *Type of instrument* | KPTs | | |
| *Accuracy class* | See Treatment of uncertainty | | |
| *Calibration requirements* | - | | |
| *Location* | Project households | | |
| QA/QC procedures | Weekly scale calibration (±1%), documented outlier handling, and inclusion only of households with ≥3 valid days of data collected within two weeks. | | | |
| Treatment of uncertainty | The monitoring must meet the minimum confidence and precision of 95/10 for the target parameter of average annual energy consumption per person. The 95/10 rule is applied to the sum of energy consumption across fuels (see parameter ∑ in [Appendix 10](#A10), which subsumes this parameter). If the target precision is not met, the project proponent shall take the conservative bounds of the confidence intervals as the parameter value, proportionately applied across all the fuels used. The conservative bounds are those that produce a lower CO2e emissions reduction estimate. | | | |
| Additional comment | - | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data/parameter** |  | | | |
| Description | Tracked off-grid electricity consumed for cooking in household *h* in year *y* | | | |
| Data unit | kWh | | | |
| Equations referred | Eq. [11](#e11) | | | |
| Purpose of data | ☐ Baseline emissions / removals | | T Project emissions / removals | ☐ Leakage emissions |
|  | | | |
| Measurement and updating frequency | Frequency of monitoring: Continuous and aggregated annually | | | |
| Measurement methods and procedures | Metered electricity use for each household | | | |
| Entity/person responsible for the measurement | Project proponent | | | |
| Measuring instrument(s) | *Type of instrument* | Applies for households consuming energy from off-grid sources.   Built-in or external data loggers may be used, where they conform with industry standards and are calibrated according to manufacturer recommendations and/or relevant national requirements as applicable. | | |
| *Accuracy class* | See QA/QC procedures | | |
| *Calibration requirements* | - | | |
| *Location* | Project households | | |
| QA/QC procedures | Measured project technology electricity use shall be cross checked for consistency with the wattage of the project-technology and the estimated operating hours for a sample of project-technology units. | | | |
| Treatment of uncertainty | Controlled through meter accuracy and calibration | | | |
| Additional comment | - | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data/parameter** | *b,i* | | | |
| Description | Proportion of cooking events conducted using fuel-stove combination *i* for CTEC projects | | | |
| Data unit | Percentage | | | |
| Equations referred | [Eq. 3](#e3) | | | |
| Purpose of data | T Baseline emissions / removals | | ☐ Project emissions / removals | ☐ Leakage emissions |
|  | | | |
| Measurement and updating frequency | Frequency of monitoring: Once per crediting period | | | |
| Measurement methods and procedures | Baseline scenario surveys or stove use monitoring.  The survey must ask to identify all the cooking devices present in the household. For the project cookstove and each other cooking device present in the household, ask “How many times did you cook using [cooking device] yesterday?” to determine the number of usage events per day per device.  When multiple devices/fuels are used in the baseline by the end user in the same premises, the proportional use shall be established from surveys or stove use monitoring as described in [Appendix 9](#A9). | | | |
| Entity/person responsible for the measurement | Project proponent | | | |
| Measuring instrument(s) | *Type of instrument* | Baseline scenario surveys or stove use monitoring. | | |
| *Accuracy class* | See Treatment of uncertainty | | |
| *Calibration requirements* | - | | |
| *Location* | Project households | | |
| QA/QC procedures | Surveys are conducted by trained enumerators, verified through visual inspection and geo-tagged photographic evidence, and where possible administered on electronic platforms with built-in quality checks.  SUMs are installed and placed consistently, algorithms validated and publicly disclosed with sample data, and photographs of device placement retained for verification. | | | |
| Treatment of uncertainty | The parameter estimate from the survey must meet the minimum confidence and precision of 95/10 for the percentage of baseline cooking conducted on each cookstove-fuel combination present in the baseline. If the target precision is not met, the project proponent shall take the conservative bounds of the confidence intervals as the parameter value, proportionately applied across all the fuels used. The conservative bounds are those that produce a lower CO2e emissions reduction estimate. | | | |
| Additional comment | - | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data/parameter** |  | | | |
| Description | Percent of project households with cookstoves present, where project cookstove is used at least once per week, determined via survey and visual observation, or estimated with SUMs, in year *y.* | | | |
| Data unit | Percentage | | | |
| Equations referred | [Eq. 19](#e19) | | | |
| Purpose of data | T Baseline emissions / removals | | T Project emissions / removals | ☐ Leakage emissions |
|  | | | |
| Measurement and updating frequency | Frequency of monitoring: Annual | | | |
| Measurement methods and procedures | Household surveys of project households with cookstoves present for which participants are asked if they use the cookstove more than once per week on average. The cookstove must also be visually observed and indicate signs of consistent intended use:   * Cookstove is unpacked * Present in an easily accessible area * Not being used for a non-cooking purpose * Appears in working condition * Does not have signs of disuse such as being covered in dust or filled with spider webs * Has ashes from recent use   Capped at90% for projects that undertake customer support actions as described below and 75% for those that do not.  **Customer support actions:** To be eligible to claim up to 90% of maximum PTDs, project proponents not estimating PTDs with SUMs must take the following customer support actions and provide details of how each condition has or will be met on the [Project Information Cover Sheet](#A1) during the design phase of the project.   * Demonstrate that the project has selected technologies and fuels that meet the cooking needs of the target population, either by citing robust research or conducting an investigation of cooking practices and attitudes during the project design phase. * Provide evidence of project participant support activities. These may include such things as providing materials (print, in-person, or video) on how to operate the cookstove to prepare common local foods, how to troubleshoot common operational issues, and how to make minor repairs (including how to access any necessary parts). All project participant communications and materials shall be provided in local language(s) commonly used in the project area. * Project participants must be able to contact the project proponent to access support (e.g., maintenance and repair services) through a commonly used, toll-free communications channel.   Project proponents who do not undertake all three of these customer support actions may claim up to 75% of maximum PTDs. These caps are waived when PTDs are estimated using SUMs. | | | |
| Entity/person responsible for the measurement | Project proponent | | | |
| Measuring instrument(s) | *Type of instrument* | Household surveys | | |
| *Accuracy class* | See Treatment of uncertainty | | |
| *Calibration requirements* | - | | |
| *Location* | Project households | | |
| QA/QC procedures | Surveys are conducted by trained enumerators, verified through visual inspection and geo-tagged photographic evidence, and where possible administered on electronic platforms with built-in quality checks. | | | |
| Treatment of uncertainty | Sampling must be conducted to meet the 95/10 precision guideline on the target parameter of the percentage of project households with cookstoves present in which project cookstove is used at least once per week. If the target precision is not met, the project proponent shall take the conservative bounds of the confidence intervals as the parameter value, proportionately applied across all the fuels used. The conservative bounds are those that produce a lower CO2e emissions reduction estimate. | | | |
| Additional comment | - | | | |

* 1. Frequency of submission of monitoring reports

1. For activities involving removals and for emission reduction activities with risks of reversals:
   1. The maximum permissible interval between the start date of the first crediting period and the submission of the first monitoring report is 5 years; and
   2. The maximum permissible interval between the submission of two consecutive monitoring reports after the first monitoring report is 5 years.

While a monitoring period can be up to 5 years, CLEAR recommends a two-year maximum for the monitoring period, since KPTs must be conducted at least every two years. Monitoring reports must be based on completed KPTs.

1. The two tables below present the monitoring activity schedule for CTEC and non-CTEC projects, respectively.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Monitoring activity schedule for CTEC projects** | | | | |
| **Activity** | **Prior to validation** | **Prior to first verification** | **Annual** | **Every monitoring period** |
| **Emission reduction estimation** | X |  |  |  |
| **Baseline studies** |  | | | |
| Baseline scenario survey | X |  |  |  |
| Baseline energy consumption measurement for CTEC projects using KPT approach |  | X |  |  |
| Specific energy consumption of baseline cookstove and fuel combination (from CCTs) for CTEC projects back-calculating the baseline | X |  |  |  |
| **Project studies** |  | | | |
| Usage survey |  |  | X |  |
| Project energy consumption measurement (from KPTs or tracked energy consumption)  \*Continuous if tracked, and reported every monitoring period |  | X |  | X\* |
| Specific energy consumption of project cookstove and fuel combination (from CCTs) before validation and every two years thereafter for CTEC projects that use CCTs to back-calculate the baseline. | X |  |  | X |
| **Ongoing monitoring tasks** |  | | | |
| Maintenance of total sales and service records, and project databases | Continuous | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Monitoring activity schedule for non-CTEC projects** | | | | |
| **Activity** | **Prior to validation** | **Prior to first verification** | **Annual** | **Every monitoring period** |
| **Emission reduction estimation** | X |  |  |  |
| **Baseline studies** |  | | | |
| Baseline scenario survey | X |  |  |  |
| Baseline energy consumption measurement (from KPTs) (required for all projects not using global default value) |  | X |  |  |
| **Project studies** |  | | | |
| Usage surveys |  |  | X |  |
| Project energy consumption measurement (from KPTs). KPTs must be performed no less frequently than every two years even if the monitoring period is longer. |  | X |  | X |
| **Ongoing monitoring tasks** |  | | | |
| Maintenance of total sales and service records, and project databases | Continuous | | | |

1. **Other monitoring requirements:**
   1. KPTs must be undertaken every two years, within the last four months of the monitoring period for which credits are being validated and issued, rather than at the beginning of a monitoring period. For a five-year crediting period, project proponents are expected to conduct KPTs at the end of Year 2 and Year 4. They may either conduct an additional KPT in Year 5 or if the project is renewed, apply the results from KPTs conducted in Year 6.
   2. Evolving baselines:For projects with KPT baselines, project proponents must identify any mismatch between values documented during the baseline scenario and those reported by actual project households during the first project usage survey for primary fuel type and household size. This assessment shall be carried out using retrospective questions of project households during the first usage survey in any given household. Where a material discrepancy between the baseline scenario and the baseline observed in project households occurs, project proponents must either not claim emission reductions for households that do not conform to the baseline scenario profile or follow requirements on adjusting the baseline (toward lower baseline emissions).
   3. Seasonality: Projects are required to account for the impact of seasonal variation on fuel-use measurements in the baseline and project scenarios. Prior to project validation, projects must collect data during the baseline scenario survey on the relative fuel use at different times of the year. Project proponents are required to incorporate the resulting information into their monitoring plan design and to justify on the [Project Information Cover Sheet](#A1) how the approach they are taking will result in accurate baseline and project fuel use measurements. If space heating is common in the project area, the justification must include an explanation of how space heating has been addressed in the project design. If an accurate approach cannot be taken, then the project proponent must instead select and justify a conservative approach.
   4. CTEC monitoring data**:** For any given project participant or technology, if more than half of the possible CTEC data for a monitoring period is missing, only available CTEC data may be included in emission reduction calculations. If missing CTEC data for a given project participant or technology consists of less than half of the possible data, then the project proponent may use the 25th percentile of the available tracked project energy consumption for that project participant or technology as a conservative replacement of the missing data.
   5. Stove use monitoring**:**
      1. The algorithm for estimating technology use events must be able to reliably distinguish cookstove use events from other potential factors that could be interpreted as cookstove use events that are caused by external reasons (e.g., temperature fluctuations from typical diurnal patterns). The algorithms shall be clearly presented publicly with associated equations and/or logic rules.
      2. The same algorithm and SUM device type shall be used for the duration of the project.
      3. Sampling must meet the 95/10 precision guidelines, per the sampling guidance included in [Appendix 10](#A10).
      4. SUMs sampling protocols (installation, placement, downloading) and algorithms used to convert raw data into cooking events must not change between sampling during KPTs and sampling following KPTs. Project participants in the SUMs sample shall not receive any support different or additional to those not in the sample. See [Appendix 10](#A10).

* 1. For non-CTEC projects using the KPT and SUMs approach, the average of the cookstove use events per day during the full 1-month of stove use monitoring must be used to adjust for potential Hawthorn Effects. If SUMs data is incomplete or missing, it must be omitted from the analysis.

1. Methodologies principles
   1. Encouraging ambition over time
2. The CLEAR methodology includes several provisions designed to encourage ambition over time. The methodology includes incentives for project proponents to provide knowledge products and capacity building to project participants. It also supports projects to develop customer service and repair facilities, which embeds the cookstove more firmly into the local and regional infrastructure and encourages use of the project technologies and/or fuels.
3. CLEAR also has more stringent applicability requirements for improved biomass cookstoves than what has been the norm for cooking carbon methodologies previously. As the performance of these technologies improves over time, the criteria will continue to be tightened in order to maximize emission reductions.
4. Further, under the CLEAR methodology, all projects must identify and replace or retrofit malfunctioning cookstoves with a technology of comparable or better quality and thermal efficiency, or not claim emission reductions for households when such failures occur. Projects must include a documented plan for this process at the project design phase.
5. Finally, the crediting period for cookstove projects under CLEAR is only five years. At the beginning of each crediting period, the baseline must be completely reassessed, ensuring that projects must select technologies for the project activity that are more efficient than any emissions reductions occurring generally in the baseline at large.
   1. Contributing to the equitable sharing of mitigation benefits between participating Parties
6. Unlike other project types that require communities to limit or forgo certain activities (such as gathering fuelwood, hunting, or harvesting non-timber forest products), which can lead to direct economic losses, cooking energy transition projects provide end users an immediate benefit. Cookstove adoption can directly reduce household expenses by lowering fuel costs and improve indoor air quality and family well-being. Further, many cooking carbon project proponents use carbon revenue to subsidize the cost of the cookstove to consumers. This type of benefit sharing allows households who wouldn’t otherwise be able to afford them access to high performing cooking solutions. Of note, participation in cookstove projects is usually at the household level, with household members making the personal choice to opt in based on their own needs and willingness. Clean cooking interventions aim to provide additional resources (in the form of cleaner, more efficient cooking solutions) without requiring any trade-off in terms of rights or access to resources.
   1. Encouraging broad participation
7. CLEAR is a comprehensive carbon project methodology for estimating emission reductions from more efficient cookstoves and/or cooking fuel switch projects. It was developed by the clean cooking sector, for the clean cooking sector, through a process facilitated by 4C. Its development involved collaboration with more than 250 stakeholders, including the United Nations Framework Convention on Climate Change (UNFCCC) secretariat, voluntary carbon standards bodies, project proponents, researchers, carbon buyers, and others.
8. Throughout the methodology development process, 4C has used our deep collective sector experience as well as the extensive input from stakeholders to balance accuracy, conservativeness, and accessibility. The requirements for field measurements combined with applicability performance criteria that are higher than previous cooking carbon methodologies uphold stringency, while the applicability of CLEAR to both fuel-efficiency and fuel-switch projects as well as the flexibility to choose among multiple monitoring pathways encourages broad participation. Moreover, this new methodology covers all common cooking transition scenarios, and it has been developed as a public good available for use by any standards body or bilateral/multilateral agreement.
9. CLEAR has been developed specifically for the LMIC context where biomass cooking remains a major source of carbon emissions. Several input-gathering sessions were held in sub-Saharan Africa, and public comments were received from stakeholders in many LMICs.
10. CLEAR requires that all field data collection be conducted in consultation with all relevant authorities and community leaders. It also mandates that surveys be conducted in the local language(s).
11. CLEAR allows for the use of a conservative default value for baseline fuel consumption, reducing the monitoring burden. External data sources are also required to substantiate the project baseline scenario(s), and guidance is given on how to select appropriate data sources. As resources permit, 4C is also committed to providing web-based resources to assist practitioners in accessing relevant studies. Finally, where possible, the methodology provides project proponents with the option to collect additional monitoring data to improve accuracy or cap the parameter value to ensure conservativeness.
    1. Attributability of emission reductions or net removals to the Article 6.4 activity
12. CLEAR ensures that the quantified emission reductions result from the implementation of the Article 6.4 activity by defining project boundaries as the specific set of households adopting the project technologies, which are themselves uniquely identified and monitored. CLEAR uses a robust, conservative approach to define baselines through direct measurement wherever baselines greater than the minimum level of energy service required for household cooking are claimed. Project fuel consumption must be directly measured through KPTs or continuously tracked in all project households. Emission reductions are calculated based on the difference between the downward adjusted measured baselines and measured project scenarios of actual project households.
    1. Potential perverse incentives
13. The risk of perverse incentives is relatively low for cookstove projects. The most common potential perverse incentives are related to conditional cash-transfer projects, where households receive cash payments in return for using project technologies. If these incentives are not carefully tuned to the local cost of fuel, they may create an incentive for households to use their project cookstove more than is necessary. Projects that offer cookstoves that also provide charging for cell phone, electric lights, or other small electronic devices may also find that households are sometimes operating those cookstoves solely for the charging benefits.
14. Projects shall guard against the risk of perverse incentives by conducting an assessment of such risks at the project design stage. If any perverse incentive risks are identified, the project proponent shall report these together with robust strategies for their mitigation on the [Project Information Cover Sheet](#A1).
    1. Rebound effects
15. The CLEAR methodology addresses potential rebound effects by requiring all projects to either continually track appliance usage or conduct statistically representative KPTs to determine fuel consumption in the project scenarios. As such, the project scenario accounts for any rebound effects.
16. Project Information Cover Sheet

*To be completed at the project design stage (validation) and updated at time of each verification (highlighting changes from originals)*

Name of project proponent:

Organization name:

Phone:

Email:

Project title:

Project ID:

Project location:

Crediting period start date:

Crediting period end date:

Baseline fuel type(s):

Project fuel type(s):

Project cookstove(s) type(s), model(s):

Project cookstove(s) ISO thermal efficiency(ies):

ISO tier(s) for PM2.5 emissions (optional):

ISO tier(s) for CO emissions (optional):

Number of households:

Average household size (persons per household, regardless of age or gender):

Number of cookstoves of each type:

Expected CO2e emission reductions (per household):

Calculation sheet publicly available? (Y/N)

Fuel consumption continuously tracked for all project cookstoves in all households?  (Y/N)

If no (non-CTEC projects):

Baseline fuel consumption approach (default or KPT):

Baseline fuel consumption value:

Justification if value over flagged threshold:

Project monitoring approach (KPT or KPT+SUMs):

Third party used for KPTs? (Y/N):

Number of households sampled for KPT:

Number of households sampled for SUMs:

If yes (CTEC projects):

Project monitoring approach (tracked fuel consumption+back-calculated baseline displacement or baseline+project KPTs):

Type of fuel consumption data:

Third party used for KPTs? (Y/N)

Number of households sampled for KPT:

fNRB source (CDM TOOL33 defaults/WebMoFuSS-derived):

fNRB value:

Calculated downward adjustment for first calendar year:

Calculated downward adjustment annually thereafter:

NCV approach for other than wood and charcoal (default or self-determined):

If self-determined, method used:

If self-determined results vary significantly from [Appendix 5](#A5) values, justification for the difference:

EFs default or self-determined:

Details on customer support activities provided:

* Demonstration that the project has selected technologies and fuels that meet the cooking needs of the target population:
* Project participant operations and maintenance support activities:
* Support communication channels availability to project participants:

How seasonality is addressed in the project monitoring plan:

* Justification for how this approach will result in accurate baseline and project fuel use measurements:
* If space heating is common in the project area, how space heating has been addressed in the project design:

For CTEC projects using fuel sale records to track consumption of pellets, LPG or ethanol:

* Safeguards taken to prevent fuel diversion for non-project activities (e.g., sealed canisters, tamper-evident meters, delivery log cross-verification, etc.):
* Results of cross-check of household fuel consumption tracked through fuel sale records against average project energy consumption values, and justification or removal of any outliers:

Description of any missing and outlier/excluded data for KPTs, CCTs, SUMs, surveys:

Description of how sampling randomization was conducted and what proof is available to auditors:

SUMs validation checks performed (as described in [Appendix 9](#A9)), for projects using SUMs:

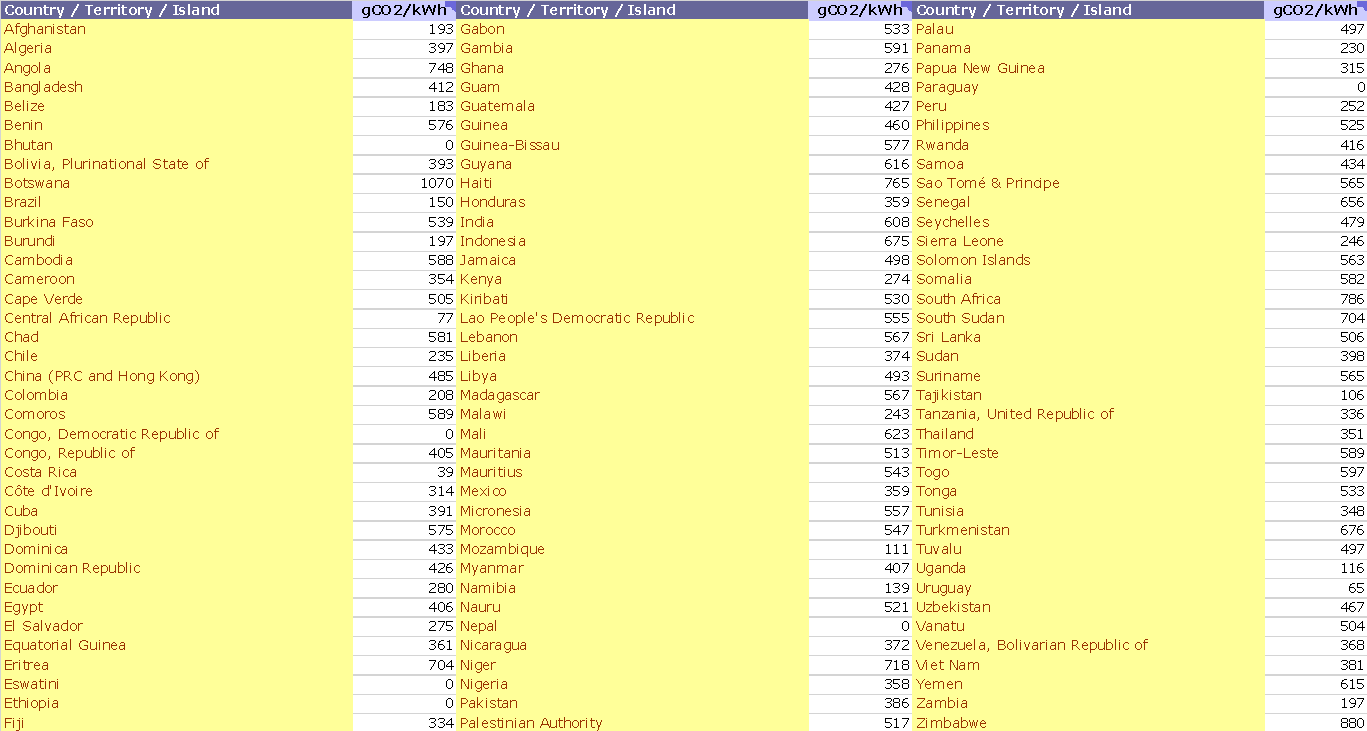
Compliance with the Principles for Responsible Carbon Finance in Clean Cooking (optional):

1. Grid Emission Factors

The CLEAR methodology uses marginal grid emission factors. These grid emission factors should be sourced from the estimates provided by the [International Financial Institution’s Technical Working Group](https://unfccc.int/sites/default/files/resource/AHG-002_IFI_Approach_to_grid_electricity_consumption_v01_clean.pdf) (IFI-TWG) on GHG Accounting, or from the marginal grid emission factors provided by the relevant national authority. Additionally, Article 6.4 Mechanism tools to derive electricity emission factors are currently under development.

The IFI-TWG uses the Combined Margin (CM) grid emission factor for electricity consumption. CM is a weighted average of each country’s operating margin (33%) and build margin (67%). Operating margin is the cohort of existing power plants that are most likely to be brought online to meet an additional unit of demand. Build margin is the cohort of power plants expected to come online based on a country-specific assessment of planned and expected new generation capacity.

**For IFI-TWG estimates, the most recent values should be used where available.** To obtain a grid emission factor for a specific country, download [the full database](https://unfccc.int/sites/default/files/resource/Harmonized_IFI_Default_Grid_Factors_2021_v3.2_0.xlsx) and use the data from Column E “Electricity Consumption”.For reference, grid emission factors from 2024 for several countries are provided below.

****

1. Off-Grid Emission Factors for Select Technologies

If the project activity includes electric cooking from off-grid or mini-grid sources, then the emissions associated with those sources must be accounted for. Off-grid or mini-grid power may be derived from petrol or diesel generators as well as renewable sources. If off-grid or mini-grid power is derived from petrol or diesel generators, then emission factors for Equations [9](#E9) and [22](#E22) should be taken from the table below; values from the SEforAll Mini-Grid Emissions Tool. If off-grid or mini-grid power is derived from renewable sources, then CLEAR assumes the upstream emissions are negligible and does not require they be included in assessing emission reductions. Additionally, Article 6.4 Mechanism tools to derive electricity emission factors are currently under development.

|  |  |  |
| --- | --- | --- |
| **Generation technology** | **gCO2e/kWh** | **Source** |
| Petrol generator | 1252 | <https://www.seforall.org/system/files/2021-08/SEforALL_Carbon-emissions-methodology-note.pdf> |
| Diesel generator | 1000 | <https://www.seforall.org/system/files/2021-08/SEforALL_Carbon-emissions-methodology-note.pdf> |

1. Upstream Emissions from Other Fuels in tonne/TJ

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Fuel** | **CO2** | **CH4** | **N2O** | **CO2e** |
| Kerosenea | 9.0 | 0.10 | 0.00016 | 11.9 |
| LPG from crude oil | 18.4 | 0.12 | 0.00029 | 22.1 |
| LPG from natural gas | 9.9 | 0.15 | 0.00019 | 14.5 |
| LPG derived from a mix of crude and natural gas inputsb | 13.6 | 0.11 | 0.00019 | 16.8 |
| Coal mining and cleaning | 1.5 | 0.23 | 0.00003 | 8.3 |
| Sugarcane-based ethanolc,d,e | -9.8 | 0.58 | 0.061 | 24.2 |
| Pellets | 4.6 | 0.0085 | 0.0014 | 5.2 |
| Charcoal (traditional kiln assuming 6:1 conversion) f, 1-6 | 130 | 3.0 | 0.005 | CO2 must be multiplied by fNRB before adding up to CO2e |
| Charcoal (traditional kiln assuming 4:1 conversion)f | 72 | 1.7 | 0.005 |

Project proponents must use the emissions factors for the fuels provided here. These values come from [Floess et al. 2023](https://iopscience.iop.org/article/10.1088/1748-9326/acb501). For pellet fuels, which can have widely varying feedstocks, project proponents may estimate their own upstream emissions factors or justify values through published literature.

Global Warming Potentials (GWPs) from the IPCC Sixth Assessment Report (AR6.4) should be multiplied by the emission factors to convert them to CO2e as follows:

* + CO2: 1
  + CH4 fossil fuels: 29.8
  + CH4 non fossil fuels: 27.2
  + N2O: 273

**Notes:**

a) Kerosene emissions are based on jet fuel from the GREET model

b) Combined LPG is a weighted average using the 2021 global input mix, which was 37% crude and 63% natural gas

c) CO2 is negative because it accounts for carbon fixed during plant growth

d) CH4 emissions are due to field burning, which is common for cane produced in many LMICs

e) Life Cycle Assessment impacts are allocated by mass assuming 20% of farm-gate output goes toward ethanol

f) Charcoal production emission factors are taken from six peer-reviewed studies of emissions from traditional kilns. The average conversion rate from those studies is 3.7 tonnes of oven-dry wood per tonne of charcoal. However, those studies were conducted under controlled conditions, which tend to yield higher conversion efficiencies than those typically observed in field conditions. In more industrialized contexts, a charcoal conversion factor 4:1 would be appropriate. However, CLEAR research supports a 6:1 charcoal conversion factor for LMIC contexts, as noted in the Explanation of Decisions document. For this methodology, we use a default conversion rate of 6:1 to better reflect conversion efficiencies observed in the field. This is incorporated into emissions factors here and fNRB calculations. Using a rate of 6:1 means that more wood, and therefore more carbon, is required to obtain the same amount of charcoal compared to the controlled studies. This results in higher carbon emissions. Accordingly, we proportionally adjust CO2 and CH4 emission factors to reflect this increased input, reflected in the table above. Nonetheless, this table also includes emissions factors based on a 4:1 conversion factor, to enable [ICVCM Core Carbon Principles (CCP)](https://icvcm.org/core-carbon-principles/) eligibility.

**Sources:**

1Bertschi, Isaac T., Robert J. Yokelson, Darold E. Ward, Ted J. Christian, and Wei Min Hao. “Trace Gas Emissions from the Production and Use of Domestic Biofuels in Zambia Measured by Open-Path Fourier Transform Infrared Spectroscopy.” Journal of Geophysical Research-Atmosphere 108 (2003): 5–1, 5–13

2Lacaux, J. P., J. M. Brustet, R. Delmas, J. C. Menaut, L. Abbadie, B. Bonsang, H. Cachier, J. Baudet, M. O. Andreae, and G. Helas. “Biomass Burning in the Tropical Savannas of Ivory Coast: An Overview of the Field Experiment Fire of Savannas (FOS/DECAFE 91).” Journal of Atmospheric Chemistry 22, no. 1–2 (October 1995): 195–216. <https://doi.org/10.1007/BF00708189>

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4Pennise, D., K. R. Smith, J. P. Kithinji, M. E. Rezende, T. J. Raad, J. Zhang, and C. Fan. “Emissions of Greenhouse Gases and Other Airborne Pollutants from Charcoal-Making in Kenya and Brazil.” Journal of Geophysical Research-Atmosphere 106 (2001): 24143–55

5Akagi, S. K., R. J. Yokelson, C. Wiedinmyer, M. J. Alvarado, J. S. Reid, T. Karl, J. D. Crounse, and P. O. Wennberg. “Emission Factors for Open and Domestic Biomass Burning for Use in Atmospheric Models.” Atmospheric Chemistry and Physics 11, no. 9 (May 3, 2011): 4039–72. <https://doi.org/10.5194/acp-11-4039-2011>

6Christian, T. J., R. J. Yokelson, B. Cárdenas, L. T. Molina, G. Engling, and S.-C. Hsu. “Trace Gas and Particle Emissions from Domestic and Industrial Biofuel Use and Garbage Burning in Central Mexico.” Atmospheric Chemistry and Physics 10, no. 2 (January 21, 2010): 565–84. [h](https://doi.org/10.5194/acp-10-565-2010h)ttps://doi.org/10.5194/acp-10-565-2010

1. Default Point of Use Emission Factors, Thermal Efficiencies, and NCVs

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Fuel** | **Net Calorific Value**  **(TJ/tonnes)** | **Thermal efficiency** | **CO2 Emission Factor**  **(tonnes/TJ)** | **CH4 Emission Factor (tonnes/TJ)** | **N2O Emission Factor (tonnes/TJ)** |
| **Biogas1** | 0.0504**1** | 50% | 54.6**1** | 0.005**1** | 0.0001**1** |
| **Charcoal (2-5)** | 0.0295 | 25% | 78.5 | 0.2 | 0.008 |
| **Kerosene1** | 0.0438 | 50% | 71.9 | 0.01 | 0.0006 |
| **LPG1** | 0.0473 | 50% | 63.1 | 0.005 | 0.0001 |
| **Wood1** | 0.0156 | 15% | 112 | 0.3 | 0.004 |
| **Dung1, 6-9** | 0.012 | 15% | 80.4 | .83 | 0.004 |
| **Other liquid biofuels 1** | 0.0274 | 50% | 79.6 | 0.01 | 0.0006 |
| **Anthracite1** | 0.0267 | Project-specific | 98.3 | 0.3 | 0.0015 |
| **Other (Bituminous Coal)1** | 0.0258 | Project-specific | 94.6 | 0.3 | 0.0015 |
| **Sub-Bituminous1** | 0.0189 | Project-specific | 96.1 | 0.3 | 0.0015 |

**Notes**:

* To avoid double counting, the fuel emission factors above do not include upstream emissions, which are accounted for separately.
* Project proponents must use the NCV values for wood and charcoal listed here. For other fuels, project level tests using ISO 19867 may be used. Significant variance between such outputs and the values above must be noted and justified in the [Project Information Cover Sheet](#A1).
* Default net calorific values and default emission factors for other fuel types (e.g., specific types of coal) can also be found in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories or may be justified from literature and/or testing reports.
* GWPs from the IPCC Sixth Assessment Report (AR6.4) should be multiplied by the emission factors to convert them to CO2e as follows:
  + CO2: 1
  + CH4 fossil fuels: 29.8
  + CH4 non fossil fuels: 27.2
  + N2O: 273.
* The tonnes CO2e per TJ for CO2, CH4, and N2O should be summed.

**Sources**

1 Gomez, Darío R., and John D. Watterson. 2006. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. edited by S. Eggleston, L. Buendia, K. Miwa, T. Ngara, and K. Tanabe. Kamiyamaguchi Hayama, Japan: Institute for Global Environmental Strategies.

2 Brocard, D., C. Lacaux, J. P. Lacaux, G. Kouadio, and V. Yoboue. “Emissions from the Combustion of Biofuels in Western Africa.” In Biomass Burning and Global Change, edited by J. S. Levine, 1:350–60. Cambridge, MA: MIT Press, 1996.

3 Bertschi, Isaac T., Robert J. Yokelson, Darold E. Ward, Ted J. Christian, and Wei Min Hao. “Trace Gas Emissions from the Production and Use of Domestic Biofuels in Zambia Measured by Open-Path Fourier Transform Infrared Spectroscopy.” Journal of Geophysical Research-Atmosphere 108 (2003): 5–1, 5–13.

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5 Smith, Kirk, R. Uma, V. V. N. Kishore, K. Lata, V. Joshi, Junfeng Zhang, R. A. Rasmussen, and M. A. K. Khalil. “Greenhouse Gases From Small-Scale Combustion Devices In Developing Countries Phase IIa: Household Stoves In India.” Research Triangle Park, NC: US Environmental Protection Agency, June 2000.

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7Fleming LT, Weltman R, Yadav A, et al. Emissions from village cookstoves in Haryana, India, and their potential impacts on air quality. Atmos Chem Phys. 2018;18:15169–15182.

8Stockwell CE, Christian TJ, Goetz JD, et al. Nepal Ambient Monitoring and Source Testing Experiment (NAMaSTE): emissions of trace gases and light-absorbing carbon from wood and dung cooking fires, garbage and crop residue burning, brick kilns, and other sources. Atmospheric Chemistry and Physics. 2016;16:11043–11081.

9Akagi SK, Yokelson RJ, Wiedinmyer C, et al. Emission factors for open and domestic biomass burning for use in atmospheric models. Atmospheric Chemistry and Physics. 2011;11:4039–4072.

10The Earth’s Energy Budget, Climate Feedbacks and Climate Sensitivity, Table 7.15 in AR6 WG1 Chapter 7. <https://doi.org/10.1017/9781009157896.009>

1. Requirements and Best Practices for Baseline and Project Surveys

**Overview**

Surveys are an integral part of the CLEAR methodology for developing the baseline scenario ex-ante, conducting a baseline KPT ex-ante, measuring usage annually, and completing a project KPT bi-annually.

This Appendix provides:

* General guidance on conducting high quality surveys;
* Resources with sample questionnaires related to clean cooking; and
* Particular instructions for each required survey.

Requirements and guidance for selecting samples of appropriate size and representativeness can be found in [Appendix 10.](#A10)

**General survey requirements and guidance**

All surveys undertaken for CLEAR must be conducted by trained enumerators. Best practice is for these enumerators to be independent of the project proponent’s organization. At a minimum, enumerators must not be engaged in a customer-facing role for the project proponent or its implementation partners, such as selling, marketing, distributing, or providing customer service for project technologies.

Before conducting surveys, the project proponent must ensure that relevant local authorities and community leaders have been consulted. All laws for the jurisdiction must be followed, and local customs should also be respected.

Wherever possible, all surveys should be conducted using an electronic platform with built-in quality checks.

All surveys should be conducted with the main household cook, who must give her informed consent prior to the start of the interview. Consent must be documented as part of the survey form. If cultural or domestic constraints require that the interview be conducted with someone else, the main cook should be present at the interview, and the enumerator should endeavor to vet the answers with her. If the main household cook is a dependent child, both the child and their guardian must provide consent and be present for the interview.

If the enumerators do not speak the local language fluently, an interpreter must be brought in to assist with administration of the questionnaire.

Surveys should be as concise as possible. Enumerators must provide a realistic estimate of the time needed to complete the survey, and efforts should be made to schedule interviews at times that minimize disruptions to the household.

Retrospective questions should ask the cook to report on their activities on a certain day, commonly “yesterday,” as this approach has been shown to be more accurate than asking interviewees to aggregate or approximate their activities over a longer period of time, such as “last week.”

The methodology uses the term “cooking event” to refer to any occurrence where useful energy is delivered from a cookstove to fulfill a discrete task or set of tasks, such as cooking a meal (which may include multiple dishes), preparing tea, or heating water for bathing.  Surveys undertaken for CLEAR should use similar language, and project proponents must ensure that respondents include all types of tasks conducted using their cookstoves in their responses.

General guidance on conducting high quality surveys in the LMIC context can be found in the following documents:

* [Household Sample Surveys in Developing and Transition Countries](https://unstats.un.org/unsd/hhsurveys/pdf/household_surveys.pdf)
* [Designing Household Survey Samples: Practical Guidelines](https://unstats.un.org/unsd/demographic/sources/surveys/handbook23june05.pdf)
* [WHO WORLD HEALTH SURVEY SURVEY MANUAL](https://apps.who.int/healthinfo/systems/surveydata/index.php/catalog/118/download/1323#:~:text=An%20official%20letter%20from%20the,of%20questions%20that%20will%20be)
* Siwatu,Gbemisola Oseni; Palacios-Lopez,Amparo; Mugera,Harriet Kasidi; Durazo,Josefine. *Capturing What Matters : Essential Guidelines for Designing Household Surveys (English).* LSMS Guidebook Washington, D.C. : World Bank Group. <http://documents.worldbank.org/curated/en/381751639456530686>

Specific survey guidance and tested questions relating to various aspects of household energy patterns and transitions, including cooking carbon projects, can be found in the following resources. Not all questions may be relevant for CLEAR application.

* [Guidance on survey design](https://gspp.berkeley.edu/research-and-impact/centers/cepp/projects/berkeley-carbon-trading-project/cookstoves/recommendations) from the authors of Gill-Wiehl, A., Kammen, D.M. & Haya, B.K. Pervasive over-crediting from cookstove offset methodologies. Nat Sustain 7, 191–202 (2024). <https://doi.org/10.1038/s41893-023-01259-6>
* Gold Standard’s [MECD Survey Questionnaire](https://globalgoals.goldstandard.org/431-1-mecd-survey-questionnaire/)
* Gold Standard’s [TPDDTEC Survey Questionnaire](https://globalgoals.goldstandard.org/407-3-tpddtec-survey-questionnaire/)
* Clean Cooking Alliance’s [Fuel Stacking Toolkit](https://cleancooking.org/reports-and-tools/reducing-fuel-stacking-a-survey-tool-for-the-clean-cooking-industry/)

**Baseline scenario survey**

Purpose:

* Establish household size;
* Identify cooking fuels and technologies used;
* Document the percentage of cooking events carried out on each fuel-technology combination;
* Capture seasonal or other variation in the percentage of cooking events carried out on each fuel-technology combination over the course of one year; and
* Understand the impact of space heating on fuel consumption (if any).

Project proponents are required to incorporate the resulting information on seasonal or other variations in fuel use into their monitoring plan design and to justify on the [Project Information Cover Sheet](#A1) how the approach they are taking will result in accurate baseline and project fuel use measurements. If space heating is common in the project area, the justification must include an explanation of how space heating has been addressed in the project design. If an accurate approach cannot be taken, then the project proponent must instead select and justify a conservative approach.

**Baseline and project KPT surveys**

Purpose:

* Track the number of people cooked for; and
* Document any unusual cooking events.

**Usage survey**

Purpose:

* Determine the presence of the project technology, and frequency with which the household uses the project technology in order to determine if the household may be counted as a user household. Note that SUMs monitoring may be used to measure the frequency of the use, but the survey must still be conducted to determine the presence of the project technology.
* Assess the types and characteristics of seasonal variations that may affect the project’s emission reductions.

Usage survey results shall be corroborated with a visual inspection using a standardized checklist to assess if the project technology is present in the kitchen and shows signs of recent use. Enumerators must also take photographs with a Geographic Information System (GIS) and time record of all the cookstoves present in the household, as well as of the cooking area(s). The photographs must include both close-ups of each technology and its fuel (if present) and wider compositions showing the position of the cookstoves within or near the household.

*Supplemental purpose of first usage survey administered for any given household*

* Establish household size;
* Identify cooking fuels and technologies used prior to acquisition of project technology (retrospective baseline);
* Document the percentage of cooking events carried out on each fuel-technology combination used prior to acquisition of project technology (retrospective baseline);

This supplemental usage survey activity is used to check how well the project household characteristics match the ex-ante baseline scenario. Retrospective questions are added to the first usage survey conducted in any given household. To the extent possible, these retrospective questions should be identical to the questions in the baseline scenario survey, just asked retrospectively. Project proponents must identify any mismatch between the primary fuel type and household size documented during the baseline scenario and those reported by actual project households during the project roll-out (see [Section 10.2.1](#S1021) for further details).

1. Requirements and Best Practices for Kitchen Performance Tests (KPTs)

**Overview**

The KPT is a field-based methodology used to estimate household fuel consumption under real-world conditions. Within the CLEAR methodology, the KPT serves as the primary tool for assessing fuel savings needed to calculate emissions reductions.

This document provides context for how the KPT protocol should be applied in the CLEAR methodology. It refers to the latest version of the KPT protocol available on the CCA website at <https://cleancooking.org/protocols>. Where guidance provided here conflicts with the directives of the KPT protocol, guidance here should be followed for projects using CLEAR, including the energy consumption estimates on a per capita fuel consumption basis rather than per standard adult basis.

**Sampling requirements**

Projects must meet the 95/10 precision guideline for the total energy consumption (TJ/(person\*year)) for the project and baseline KPTs or use the conservative 95% confidence bound that results in the lower emissions reduction estimate.

For baseline and project KPTs, households shall be selected from the group of households included in the baseline scenario survey and project usage surveys, respectively. Households are anticipated to be statistically similar to those of the larger surveys and must be within 10% of the household size and proportion of cooking done with the primary fuel for the respective baseline and project scenarios. If either of these conditions are not met, the project will conduct additional sampling until these conditions are met. This requirement is separate and additional to checking that the baseline scenario is representative of the project scenario (see [Section 10.2.1](#S1021)). For the project scenario, sampling shall be stratified across technology ages to ensure representative results.

Given that simple random sampling may result in impractical logistics for four days of consecutive household visits, a household may be excluded if all of the following conditions are met:

1. The household requires more than one hour of transportation from the next nearest household in the sample;
2. The households in the area where the samples are excluded can be demonstrated to be similar in household size, fuel use type, and energy demand; and
3. The total number of excluded households is not greater than 10% of households initially selected for the KPT sample.

**Measurements and sample integrity**

Scale Checks

* Scales must be checked with a certified calibration weight (5–20 kg) at least weekly during field campaigns and results of calibration checks clearly recorded to facilitate verification by VVBs.
* The scale must be accurate within 1% of the calibration mass.
* If a scale fails a check, any data collected since the last successful check must be excluded from the analysis.

Accounting for Wood Moisture

* Default energy conversions assume air-dried wood (~20% moisture, wet basis) with a Net Calorific Value (NCV) of 0.0156 TJ/tonne.
* This NCV should be applied to wood quantities before making any moisture adjustments.
* While NCV assumptions provide a standardized approach, it is best practice to measure actual moisture content, particularly to:
  + Identify potential outliers
  + Assess seasonal variations in fuel characteristics

**Fuel provision**

Because providing fuel to households can introduce substantial bias, fuel should not be provided to households for use during the KPT in most cases.

In situations where households normally collect their fuel (e.g., wood, crop residues, dung) daily and are not able to collect and store a full day’s fuel in advance, project proponents may provide fuel for the KPT under the following conditions:

* The number of households that are unable to collect and store a full day’s fuel in advance must comprise more than 40% of the KPT sample; otherwise, those households should simply be excluded from the sample.
* Where fuel is provided, the household must be identified as having been provided fuel, and a 20% discount must be applied to the fuel consumption measured for that household during the baseline KPT.
* The amount of fuel provided must not exceed 30 MJ/(person\*day) (approximately 2 kg/(person\*day)).
* If fuel is provided to a household for the baseline KPT, the same amount of fuel must also be provided to that household for the project KPT.

For households where the primary fuel is purchased in discrete quantities, and it is impractical to store three times the amount typically used in a day, projects must follow the KPT protocol guidance for fuel purchases and estimate weights accordingly.

Alternatively, rather than providing fuel, project proponents may use fuel-weighing sensors that measure fuel consumption in real-time. This option may be used for any KPT, regardless of household fuel constraints.

**Data quality and outlier handling**

Outliers Identification and Exclusion Criteria

Outliers shall be defined as data points that fall beyond 1.5 times the interquartile range (IQR) from its endpoints. Outliers may only be excluded if there is a clear, documented reason for their removal. Any excluded data must be retained along with an explanation. Acceptable reasons for exclusion are:

* Data entry errors;
* Documented unusual events (e.g., party, non-household members using the cookstove); or
* A per capita fuel consumption >175 MJ/(person\*day) for any single day (equivalent to ~10 kg of wood/(person\*day)).

Minimum Data Requirements

* Only households with at least three complete days of data may be included in the analysis.
* These three days do not need to be consecutive if:
  + Some data are missing due to measurement failures; and
  + Additional visits were conducted to compensate.
  + All data collection must occur within a two-week period.

**CTEC KPT considerations**

The CTEC KPT approach for determining energy consumption in the project scenario requires quantifying the energy consumption of all technologies used in the project scenario based on a project KPT. The project must use metered energy consumption data for the project technology/fuel specific to the KPT period where available.

Where metered energy consumption is not available specific to the KPT period, the traditional fuel-weighing KPT approach must be used. Fuel-weighing must always be used for fuel consumption based on sales tracking data.

1. Requirements and Best Practices for Controlled Cooking Tests (CCTs)

**Overview**

The CCT is a field test used to measure cookstove performance in a controlled setting using local fuels, pots, and cooking practices, with local cooks preparing a pre-determined local meal, which may include multiple dishes. This standard meal is defined as all the prepared foods that are commonly eaten together by a household at the time of day when that household consumes their largest amount of food.

Within the CLEAR methodology, the CCT is used to assess the specific energy consumption of both baseline and project cookstoves, the ratio of which is used to back-calculate displaced baseline energy consumption in CTEC projects.

This document provides context for how the CCT protocol should be applied in the context of the CLEAR methodology. It refers to the latest version of the CCT protocol available on the CCA website at <https://cleancooking.org/protocols>. Where guidance provided here conflicts with the directives of the CCT protocol, guidance here should be followed for projects using CLEAR.

**Sampling requirements**

To ensure robust and representative data collection for the CCT within the CLEAR methodology, the following sampling and testing requirements must be adhered to.

1. ***Selection and testing of baseline and project cookstoves***

* Baseline technologies must be tested in order to be included in baseline fuel consumption displacement. Untested baseline technologies shall not be included in calculating displaced fuel consumption. For example, if project surveys indicate that a baseline technology accounts for 10% of cooking events and the project does NOT conduct a CCT with that baseline technology, then the 10% displacement that would have been attributed to that baseline technology is disregarded and not included in the back calculation, nor is it redistributed to the other cookstove types, resulting in a lower baseline than could otherwise be claimed;
* The most common example of a given type of baseline cookstove should be selected (see section on cookstove types below). For example, if there are multiple simple open-fire cookstove types (e.g., three-stone fire or U-shaped mud cookstove), the most common, representative example should be chosen for each cookstove type. This selection should be made as part of the process with project area cooks to determine the standard meal, per the CCT protocol[[17]](#footnote-18);
* At least three samples of each baseline cookstove type must be tested to account for inter-stove type variability;
* Each cook must prepare at least three meals per baseline cookstove type (at least one on each baseline cookstove type sample) to capture variability in performance.
* All project technologies must be tested.
* When CCTs are conducted as part of ongoing project monitoring, including to account for any degradation over time, then at least three cookstoves per vintage randomly sampled from project households, should be tested (households should receive a new replacement cookstove).

1. ***Selection of cooks***

* At least three local cooks, who are unfamiliar with each other and reside in different locations within the project area, shall be recruited for testing;
* Cooks recruited for testing must not be affiliated with the project beyond their participation in the CCTs. Ideally, they would not be project participants, but if they are they must not receive any special treatment beyond what is required for the CCT. All cooks may be compensated for their time and travel for the CCT testing;
* The cooks should be familiar with and comfortable cooking on all of the baseline cookstove phenotypes;
* If any of the cooks do not yet have the project cookstove, they should be given one to use at their household for a minimum of two weeks before starting the CCT.  They should be given the same training and support (and no extra) that regular project participants receive; and
* Ideally, the same cooks should be used for the initial CCTs conducted during the validation phase and for subsequent project monitoring periods. If not possible, alternate cooks may be selected using the same criteria as above.

**Testing matrix and precision guidelines**

The figure below represents the minimum required testing configuration for a CCT given the set of cookstoves listed above. Each of the three cooks should conduct an equal number of tests across all cookstove types. The cookstove types included in the example below are:

* CTEC cookstove (e.g., electric, LPG, ethanol, or biogas cookstove);
* LPG cookstove (baseline);
* Charcoal cookstove (baseline); and
* Simple wood cookstove (baseline, e.g., three-stone fire or mud cookstove).

To minimize bias, cookstove models should be rotated systematically so that no cook follows the same sequence repeatedly.

As shown in the Figure below, each set of three tests is conducted simultaneously, with Cook 1, Cook 2, and Cook 3 testing different cookstoves at the same time. The cookstove type order changes for each test block to ensure that no cook consistently follows the same cookstove sequence.

A chart of different colors

Description automatically generated with medium confidence

Minimum testing configuration and example schedule for CCT.

**Measurements and sample integrity**

Scale Checks

* Scales must be checked with a certified calibration weight (5–20 kg) daily during the testing campaign;
* The scale must be accurate within 1% of the calibration mass; and
* If a scale fails a check, any data collected since the last successful check must be excluded from the analysis.

**Data quality and outlier handling**

Outliers Identification and Exclusion Criteria

Outliers shall be defined as data points that fall beyond 1.5 times the interquartile range (IQR) from its endpoints. Outliers may only be excluded if there is a clear, documented reason for their removal. Any excluded data must be retained along with an explanation. Acceptable reasons for exclusion are:

* Data entry errors;
* Documented unusual events (test was interrupted, weather impacts, etc.); and
* A cook reports a problem with the specific test.

Minimum Data Requirements

* There must be equal numbers of successfully completed CCTs for each cook-technology combination; and
* A minimum of three cooks and three repeated CCTs per cook-technology combination must be completed.

**Classifying baseline cookstove types**

Baseline cookstoves can be categorized into distinct types based on their physical structure. This classification helps standardize the selection of representative cookstove models for performance testing and emissions reduction calculations. The types described here are common in many regions, but they are not exhaustive. Different contexts, geographies, and cultural cooking practices will influence the specific baseline cookstoves used in a given project.

Project proponents must identify and justify the most appropriate types for their specific setting, ensuring that selected models accurately represent the prevailing baseline cooking technologies. These types should be used as the basis for testing fuel consumption, thermal efficiency, and emissions when establishing baseline parameters.

**Examples of common wood cookstove types**

1. Three-Stone Fire
   * A setup using three stones or bricks arranged in a triangular shape to support a cooking pot, with an open fire in the center.
   * Materials: Natural stones, bricks, or compacted earth.
2. Sunken Pit Cookstove
   * A shallow pit dug into the ground where wood is burned.
   * Materials: Bare earth or reinforced with clay.
3. U-Shaped Mud Cookstove
   * A simple mud or clay structure in a U-shape, designed to hold a pot over an open fire.
   * Materials: Locally sourced mud or clay, sometimes reinforced with straw.
4. Traditional Chulha/Chulho
   * Cookstove A raised, built-in clay or brick cookstove with one or more burner holes for pots.
   * Materials: Clay, bricks, or mud, sometimes with cow dung.
5. Plancha Cookstove (Traditional)
   * A raised clay or metal cookstove with a flat griddle (plancha) for cooking tortillas or flatbreads.
   * Materials: Clay, bricks, metal griddle.

**Examples of common charcoal cookstove types**

1. Metal Bucket Cookstove
   * A metal bucket or shallow metal bowl with ventilation holes at the bottom and a top grate for placing charcoal.
   * Materials: Sheet metal, iron, steel.
2. Ceramic-Lined Charcoal Cookstove
   * A metal bucket cookstove with a ceramic liner inside for heat retention and insulation.
   * Materials: Sheet metal exterior with a ceramic inner lining.
3. Clay Pot Cookstove
   * A clay vessel with an opening for airflow and a flat surface for a cooking pot.
   * Materials: Fired clay or terracotta.
4. Requirements and Best Practices for Stove Use Monitors (SUMs)

In the context of the CLEAR methodology, non-CTEC projects may choose from two approaches to determine energy consumption in the project scenario, differentiated by application (or non-application) of SUMs, which correspond to two different methods for accounting for the Hawthorne Effect.

When projects complement KPTs and surveys with SUMs measurements, the ratio of project technology usage (cooking events/day) measured during the KPT to project technology usage measured during the month prior to or following the KPT is used as a multiplier in the emission reduction estimate calculation (only when that value is less than 1).

When projects measure fuel consumption through KPTs, complemented by usage surveys only without SUMs, maximum emission reductions are capped at 75% of the KPT-based estimate to account for the Hawthorne Effect (the equivalent of a 75% ratio of project technology usage described above).

Project proponents opting to use the SUMs method must place SUMs on the project cookstoves for the duration of the KPT, as well as for the contiguous 30 days (before, after, or any combination of before and after) to serve as a reference point.

SUMs may be used to characterize the primary fuel-stove combination usage for identification of a potential mismatch between the baseline and project scenario profiles or to determine the proportion of cooking done on baseline cookstoves for back-calculating the baseline energy consumption (*b,i*).

SUMs may also be used to estimate Ψ, the percent of project households with the project cookstove present, where the project cookstove is used at least once per week. Projects must use the same measurement period (at a minimum) as that used for determining a potential Hawthorne effect, and the same sampling requirements for Ψ as those outlined in [Appendix 10](#A10). If sampling includes households where KPTs are being conducted, the frequency of use estimates must not include data from days when KPTs are occurring. For households where SUMs installation is not possible because the project cookstove is not present, these households must be included as non-users in the estimate Ψ.

This appendix provides requirements and best practice guidance for using SUMs within the CLEAR methodology.

**Requirements for the use of SUMs in the CLEAR methodology**

* The algorithm for estimating cookstove usage must be able to reliably distinguish cooking events from other potential factors that could be interpreted as cooking events but that are actually caused by external circumstances (e.g., temperature fluctuations from typical diurnal patterns).
* The algorithm shall be clearly presented publicly with associated equations and/or logic rules (see section below titled: *Public presentation of stove use algorithms).*
* The same algorithm and SUM device type shall be used for the duration of the project. If a different SUM device and/or algorithm is used, then the project must demonstrate that the stove use estimates between the two approaches are unbiased. This can be demonstrated by conducting a side-by-side comparison in a representative subsample of households, where both devices/algorithms are applied simultaneously, and the resulting cooking event estimates are compared. Statistical tests such as paired t-tests, regression analyses, or Bland–Altman plots may be used to assess whether systematic bias exists. The results of these tests, along with all supporting data and documentation, must be provided to the VVB.
* Sampling must meet the 95/10 precision guidelines, per the sampling guidance included in [Appendix 10.](#A10)
* SUMs sampling protocols (installation, placement, downloading) and the algorithm used to convert raw data into cooking events must not change between sampling during the KPTs and sampling prior to or following the KPTs.
* Project participants in the SUMs sample shall not receive any support different or additional to those not included in the sample.
* Project proponents shall ensure that photographs of the SUMs placement in each sampled household are taken and retained as part of the monitoring record.
* The average of the cooking events per day during the full 30 days of cookstove use monitoring must be used to adjust for potential Hawthorne Effects. If SUMs data is incomplete or missing, it must be omitted from the analysis.

**Additional requirements for the use of SUMs to characterize fuel-stove use proportions**

* If SUMs sampling is being used to characterize the primary fuel-stove combination usage for identification of a potential mismatch between the baseline and project scenario profiles (*b,i* ) and (*p,j*), or for determination of proportion of cooking done on baseline cookstoves for back-calculating the baseline energy consumption (*b,i*), the following guidelines must be followed:
  + The guidance in the above bullet points must be followed, including the sample size guidance in [Appendix 10](#A10)
  + SUMs must be placed on all cookstove-fuel combinations (in each household) that are to be included in the baseline.

**Best practice guidance for using SUMs**

Installation

Project proponents should follow manufacturer installation requirements (if provided) for the SUMs instrumentation being used. Unless specifically indicated otherwise, placement of the device should generally follow these key guidelines.

* The project cookstoves’ temperature profiles during cooking events should be analyzed before the field campaign to determine optimal placement.
* Temperature sensors and loggers should not be placed in a location where temperatures exceed their maximum operating/sensing temperature specifications.
* Sensor placements should provide a maximum temperature differential between ambient and cookstove temperature (without exceeding maximum operating temperature for the sensor).
* When possible, cookstoves and sensing units (e.g., thermocouple leads) should be kept out of direct sunlight to reduce sensors logging the radiant heat of the sun, which can be confounded with cooking.
* Sensor placement must be standardized as much as possible across the sample.
* Sensor placement should not get in the way of the pot, or obstruct or interrupt the cooking, or be located where liquids are likely to collect or boil over.
* Sensor placement should not interfere with participants’ normal activities. Placement should also minimize risk of the sensor being accessed, moved, and/or damaged by participants, other people, or common household features, such as water, insects, or animals.
* Project proponents should explain to household members that the SUMs are for measuring temperature and should not be tampered with. Household members should not press buttons, move parts, or disconnect or connect the sensors to computers or power.

Cookstove temperature analysis

Project proponents should follow manufacturer guidelines for data analysis[[18]](#footnote-19) where available. Unless specifically indicated otherwise, analysis should generally follow these key guidelines.

* Subtracting ambient temperature generally improves the ability to resolve a temperature response during cookstove events from normal diurnal and seasonal temperature variation.
* Perform validation or sense checks on the algorithms used to determine cookstove use. These can include:
  + Having a person with expertise manually inspect at least a subset of analyzed files to check that the algorithm is determining apparent cooking events as intended.
  + Cross-referencing observational data on cooking events with the analyzed data.
  + Using common sense checks with what is generally known about cooking behaviors in the region. For example, if only one cooking event per week is being estimated when it’s known that people are using several kg of fuel every day, the placement or algorithm are not working properly.

### Public presentation of stove use algorithms

To support transparency and reproducibility in stove use monitoring, all algorithms used to convert raw SUM data into cooking events must be publicly available, following the requirements below.

**1. Algorithm logic description.** Provide a clear explanation of how the algorithm detects cooking events, including:

* Physical parameter(s) monitored (e.g., temperature, power)
* Logic for identifying events (e.g., threshold crossings, sustained changes)
* Pre-processing steps (e.g., filtering, smoothing)
* Contextual adjustments (e.g., ambient corrections, diurnal patterns)

**2. Formal equation or code.** Present the algorithm as:

* Equations and logic rules, or
* Annotated code outlining the decision steps.

**3. Parameter definitions and units.** All thresholds and time-related values must:

* Be listed with units (e.g., °C, seconds).
* Be applied consistently across devices and time.

**4. SUM device specifications.** These include:

* Manufacturer, model, and firmware version
* Sampling rate and sensor types
* Any known limitations affecting performance

**5. Data sample publication.** Share at least three anonymized raw data files (2 weeks or more of data) for three different project cookstoves with their processed output to demonstrate algorithm performance. Data must:

* Be in a usable format (e.g., CSV, JSON)
* Include clear headers, units, and time zone information

**6. Hosting and access**. Publish the algorithm and sample dataset on a stable public platform (e.g., project website, registry, GitHub). Include the link in the [Project Information Cover Sheet](#A1).

A close up of a barrel

Description automatically generated

Example photos of SUMs placement.

1. Sampling Requirements and Best Practices for Surveys, Kitchen Performance Tests (KPTs), Controlled Cooking Tests (CCTs), and Stove Use Monitors (SUMs)

**Note**: Sampling requirements and guidance from this appendix may be revised in accordance with forthcoming Article 6.4 standard and guidance on sampling.

This appendix supports project proponents in planning sample sizes for data collection and ensuring that monitored parameters meet required precision standards. Specifically, it addresses the 95/10 precision guideline, which stipulates that sample sizes must be sufficient to achieve a 95% confidence interval with less than 10% margin of error. If a monitored parameter estimate does not meet the precision guideline, then additional sampling must be conducted, or the confidence bound that results in a lower emission reduction estimate must be applied.

For projects of 25,000 or more project households, the minimum required sample sizes for all monitored parameters, except those based on specific consumption from CCTs, shall scale by 0.05% in proportion to the total number of project households above 25,000.

Examples:

* A project with 25,000 households requires 100 KPTs and 200 surveys (minimums).
* A project with 250,000 households requires:
  + KPTs: 100 + (0.0005 × [250,000 − 25,000]) = 213
  + Surveys: 200 + (0.0005 × [250,000 − 25,000]) = 313

Projects must still demonstrate that the final sample achieves the 95/10 precision threshold. Projects using cluster sampling must account for design effects in both planning and analysis stages. If the achieved sample does not meet precision requirements, additional sampling or the application of a conservative confidence bound must be undertaken.

The appendix is structured into four components. First, it presents sampling method approaches. Next, a table outlining the monitored parameters that require sample size determination, including their descriptions, data sources, and applicable rules. This table provides direction on which sampling guidance section to follow for each parameter. The third section focuses on proportional parameters, such as the proportion of cooking conducted using a primary fuel, detailing methods for determining sample sizes. The last section provides guidance for continuous variables, such as baseline energy consumption, incorporating statistical approaches for variables with skewed normal distributions.

**Sampling methods**

Two sampling approaches are used in the CLEAR methodology: Simple Random Sampling and Cluster Random Sampling. The choice between these methods depends on the characteristics of the target population and logistical considerations. For both approaches, when sampling parameters for the project scenario, sampling shall be stratified proportionally across installed cookstove age groups (<1 year, 1–2 years, 2-3, 3-4, and 4> years) to ensure that performance and usage estimates reflect the distribution of cookstove ages in the project. Projects using cluster sampling must ensure that age stratification is preserved within and/or across clusters, as appropriate.

Regardless of the sampling approach used, the project proponent must document and provide verifiable materials to demonstrate how randomization was conducted and how it can be independently verified. Acceptable documentation may include a record of the random number generator or software used, screenshots of the randomization process, or signed attestations from third parties who witnessed the selection. These materials shall be maintained as part of the project record and made available to the validation and verification body upon request.

**Simple random sampling**

* Each household in the population has an equal probability of being selected.
* Suitable when the population is relatively homogeneous, such as within the same climate zone or socio-economic setting.
* Provides unbiased estimates.
* Can be costly and time-consuming, particularly if the population is spread over a large geographical area.

**Cluster random sampling**

* The population is divided into clusters, such as villages or communities, and a random selection of clusters is made. All or a subset of households within selected clusters are then sampled.
* Useful when the population is widely dispersed, reducing costs and logistical challenges.
* More efficient for large-scale studies but requires adjusting for the intraclass correlation coefficient (ICC), which measures the degree of similarity between households within the same cluster. A high ICC indicates that households within a cluster are more alike, meaning that the effective sample size is smaller than the actual number of observations, often requiring an increase in the number of clusters to achieve the desired precision.
* Assumes that each cluster represents the overall population, which may introduce bias if clusters are highly variable.
* The design and calculations for this approach are more complex. Projects applying cluster sampling must involve someone with sufficient statistical expertise to ensure appropriate design, analysis, and interpretation.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Description** | **Unit** | **Data source** | **Rule and guidance** | **Reference section for guidance** |
| *b,i* | For CTEC back-calculated baseline projects: Proportion of cooking events conducted using baseline fuel-stove combinations *i* | Percentage | Baseline scenario surveys or SUMs | 95/10 for the primary cookstove-fuel combination  Minimum 200 households + 0.05% of households additional to 25,000 | Proportional distribution |
| *b,i* | For non-CTEC and CTEC with KPT projects: Proportion of cooking events conducted using baseline fuel *i* | Percentage | Baseline scenario surveys or SUMs | 95/10 for the primary fuel type  Minimum 200 households + 0.05% of households additional to 25,000 | Proportional distribution |
| *p,j* | For non-CTEC and CTEC with KPT projects: Proportion of cooking events conducted using project fuel *j* | Percentage | Project usage surveys or SUMs | 95/10 for the primary fuel type  Minimum 200 households + 0.05% of households additional to 25,000 | Proportional distribution |
|  | Average household size | Persons per household (Number) | Baseline and project usage surveys | 95/10  Minimum 200 households + 0.05% of households additional to 25,000 | Continuous distribution |
|  | Total energy consumption of baseline fuels (*i*) non-CTEC projects (summed over all fuels used in households) | TJ/(person\*year) | KPT | 95/10  Minimum 100 households + 0.05% of households additional to 25,000 | Continuous distribution |
|  | Total energy consumption of project fuels (*j*) non-CTEC projects (summed over all fuels used in households) | TJ/(person\*year) | KPT | 95/10  Minimum 100 households + 0.05% of households additional to 25,000 | Continuous distribution |
|  | Specific energy consumption of a baseline fuel-stove combination *i* to cook a given amount of food | MJ/kg food | CCT | 95/10  Minimum 9 CCTs per cookstove type | Continuous distribution |
|  | Specific energy consumption of a project fuel-stove combination *j* to cook a given amount of food | MJ/kg food | CCT | 95/10  Minimum 9 CCTs per cookstove type | Continuous distribution |
|  | Total energy consumption of baseline fuels (*i*) for CTEC projects from KPT | TJ/(person\*year) | KPT | 95/10  Minimum 100 households + 0.05% of households additional to 25,000 | Continuous distribution |
|  | Total energy consumption of all fuels in project scenario (*j*) for CTEC projects from KPT | TJ/(person\*year) | KPT | 95/10  Minimum 100 households + 0.05% of households additional to 25,000 | Continuous distribution |
|  | Average project technology cooking events per day over 1 month from SUMs measurements | Cooking events/day | SUMs | 95/10  Minimum 100 households + 0.05% of households additional to 25,000 | Continuous distribution |
|  | Average project technology cooking events per day over the project KPT from SUMs measurements | Cooking events/day | SUMs | 95/10  Minimum 100 households + 0.05% of households additional to 25,000 | Continuous distribution |
|  | Percent of project households with cookstoves present and used at least once per week | Percentage | Project usage survey or SUMs | 95/10  Minimum 200 households + 0.05% of households additional to 25,000 | Proportional distribution |

**Sample size guidance: continuous variables**  
  
Estimation of required sample size

To estimate the required sample size for continuous variables, project proponents must first determine the coefficient of variation (CoV), which represents the variability of the data relative to the mean. The lookup table provided applies only to simple random sampling and assumes a normally or skew-normally distributed variable. If project proponents do not have prior data to estimate CoV, they should conduct a small pilot study to generate an approximation. Additionally, project proponents should plan for oversampling to account for potential data loss due to non-responses, measurement errors, or incomplete records, ensuring that the final sample size meets the precision requirement.

For cluster sampling, where participants are grouped into clusters such as villages or communities, the required sample size will be larger than in simple random sampling due to intra-cluster correlation. This means that the effective sample size is smaller than the actual number of observations. In such cases, design effects must be accounted for, and sample size determination should be conducted with the assistance of a statistician.

|  |  |
| --- | --- |
| ***Simple random sampling: CI: 95%*** | |
| ***CV(%)*** | ***Relative precision*** |
| ***10%*** |
| 5 | 25 |
| 10 | 25 |
| 15 | 25 |
| 20 | 25 |
| 25 | 40 |
| 30 | 55 |
| 35 | 75 |
| 40 | 100 |
| 45 | 125 |
| 50 | 155 |
| 55 | 185 |
| 60 | 220 |
| 65 | 255 |
| 70 | 295 |
| 75 | 340 |
| 80 | 385 |
| 85 | 435 |
| 90 | 490 |
| 95 | 545 |
| 100 | 605 |

#### Determination of meeting precision guidelines

Once data collection is complete, project proponents must verify whether the achieved sample size meets the 95/10 precision guideline. This requires calculating the actual CoV from the collected data and confirming that the confidence interval is within 10% of the mean estimate. Project proponents should utilize the [sample size calculator](https://samplesizecalculatorforsknormalandproportion.streamlit.app/) to determine whether their sample meets the required precision and the 95% confidence bounds that result in lower emission reductions estimates if the precision guideline is not met.

For **cluster sampling**, meeting the precision requirement is more complex due to the need to adjust for design effects. In such cases, a statistician should evaluate whether the collected data meets the required confidence and precision levels. If the required precision is not met, the conservative confidence bound must be applied, or additional sampling may be needed.

**Sample size guidance: proportional variables**

#### Estimation of required sample size

To estimate the sample size for proportional variables (e.g., the proportion of households using primary fuel), project proponents must first determine an expected proportion for the population. This can be based on prior research, survey data, or a pilot study. The lookup table provided is only applicable to simple random sampling and assumes a binomial distribution.

|  |  |
| --- | --- |
| **95% CI: Simple random sampling** | |
| **Prevalence (%)** | **Precision** |
| **10%** |
| 10 | 35 |
| 15 | 49 |
| 20 | 61 |
| 25 | 72 |
| 30 | 81 |
| 35 | 87 |
| 40 | 92 |
| 45 | 95 |
| 50 | 96 |
| 55 | 95 |
| 60 | 92 |
| 65 | 87 |
| 70 | 81 |
| 75 | 72 |
| 80 | 61 |
| 85 | 49 |
| 90 | 35 |

As with continuous variables, oversampling is necessary to account for expected data loss due to incomplete responses or participant dropouts. For cluster sampling, the required sample size will be larger due to intra-cluster correlation, meaning the actual number of surveyed participants must exceed the effective sample size. In such cases, a statistician should be consulted to correctly adjust for design effects.

#### Determination of meeting precision guidelines

Once the survey is completed, project proponents must verify that the achieved sample meets the 95/10 precision requirement by calculating the actual proportion and confirming that the confidence interval remains within 10% of the estimated proportion. Project proponents should utilize the [sample size calculator](https://samplesizecalculatorforsknormalandproportion.streamlit.app/) to determine whether their sample meets the required precision and the 95% confidence bounds that result in lower emission reductions estimates if the precision guideline is not met.

For cluster sampling, verification of precision must account for the design effect, which reduces the effective sample size. This requires statistical expertise, and a statistician should be involved in determining whether the collected sample meets the required confidence and precision levels. If precision is not met, additional sampling or conservative confidence bounds should be applied.

1. Default fNRB Values from CDM TOOL33

CDM TOOL33 (version 3.0) default values for fNRB at the regional (continental) and national levels are listed below.

**Regional (continental) fNRB values**

|  |  |
| --- | --- |
| **Region** | **fNRB (%)** |
| Asia | 18 |
| Latin America | 32 |
| Sub-Saharan Africa | 40 |

**National fNRB values**

|  |  |
| --- | --- |
| **Country** | **fNRB (%)** |
| Afghanistan | 10 |
| Angola | 27 |
| Armenia | 1 |
| Azerbaijan | 1 |
| Bangladesh | 39 |
| Benin | 34 |
| Bhutan | 30 |
| Plurinational State of Bolivia | 14 |
| Botswana | 35 |
| Brazil | 13 |
| Burkina Faso | 36 |
| Burundi | 35 |
| Cambodia | 20 |
| Cameroon | 38 |
| Central African Republic | 42 |
| Chad | 37 |
| China | 10 |
| Colombia | 7 |
| Costa Rica | 10 |
| Côte d'Ivoire | 19 |
| Democratic Republic of the Congo | 42 |
| Djibouti | 1 |
| Dominican Republic | 43 |
| Ecuador | 28 |
| Equatorial Guinea | 31 |
| Eritrea | 30 |
| Eswatini | 16 |
| Ethiopia | 33 |
| Gabon | 18 |
| Gambia | 55 |
| Georgia | 1 |
| Ghana | 35 |
| Guatemala | 41 |
| Guinea | 37 |
| Guinea-Bissau | 34 |
| Guyana | 0 |
| Haiti | 59 |
| Honduras | 33 |
| India | 7 |
| Indonesia | 9 |
| Islamic Republic of Iran | 5 |
| Iraq | 1 |
| Jamaica | 38 |
| Jordan | 1 |
| Kazakhstan | 7 |
| Kenya | 29 |
| Kyrgyzstan | 25 |
| Lao People’s Democratic Republic | 47 |
| Liberia | 40 |
| Madagascar | 36 |
| Malawi | 48 |
| Malaysia | 39 |
| Mali | 45 |
| Mauritania | 65 |
| Mexico | 30 |
| Mongolia | 12 |
| Mozambique | 38 |
| Myanmar | 36 |
| Namibia | 28 |
| Nepal | 45 |
| Nicaragua | 26 |
| Niger | 61 |
| Nigeria | 38 |
| Pakistan | 8 |
| Panama | 21 |
| Papua New Guinea | 8 |
| Peru | 4 |
| Philippines | 55 |
| Republic of the Congo | 16 |
| Rwanda | 33 |
| Senegal | 61 |
| Sierra Leone | 41 |
| Somalia | 64 |
| South Africa | 18 |
| South Sudan | 35 |
| Sri Lanka | 45 |
| Sudan | 50 |
| Syrian Arab Republic | 3 |
| Tajikistan | 19 |
| United Republic of Tanzania | 51 |
| Thailand | 20 |
| Timor-Leste | 39 |
| Togo | 46 |
| Türkiye | 13 |
| Turkmenistan | 0 |
| Uganda | 39 |
| Uzbekistan | 15 |
| Viet Nam | 36 |
| Zambia | 40 |
| Zimbabwe | 21 |

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Document information

| Version | Date | Description |
| --- | --- | --- |
|  | | |
| 1. 0.2.0 | 1. 19 August 2025 | 1. Revision to incorporate new sections and sub-sections in line with current standards; provide completion instructions, realign their sequence, and allow inclusion of explanatory notes. |
| 1. 01.0 | 1. 18 December 2024 | 1. Initial publication of form template. |
| 1. Decision Class: Regulatory Document Type: Form Business Function: Methodology  Keywords: A6.4 mechanism, developing methodologies and tools | | |

1. Format for footnotes. [↑](#footnote-ref-2)
2. Projects using the CLEAR methodology may use the minimum level of energy services required for cooking as a static baseline, or may use the suppressed demand approach outlined in “[Addressing Suppressed Demand in Mechanism Methodologies](https://unfccc.int/sites/default/files/resource/A6.4-SBM017-A05.pdf)”. [↑](#footnote-ref-3)
3. Methodologies that do allow credit for slurry include the most recent version of: Gold Standard Methodology for Animal Manure Management and Biogas Use for Thermal Energy Generation; AMS-I.I. - Biogas/biomass thermal applications for households/small users; and AMS-I.E. - Switch from non-renewable biomass for thermal applications by the user. [↑](#footnote-ref-4)
4. Use of electricity as a supplemental baseline fuel is permitted as it is not expected to be materially affected by project activities. [↑](#footnote-ref-5)
5. Examples of reputable literature include sources that are peer-reviewed and/or published by a national or multi-national agency. [↑](#footnote-ref-6)
6. CLEAR uses a greater than 10% variation as the definition of a material discrepancy throughout the methodology as this is appropriate given the distributed nature of the cooking technology intervention, the natural variation in human cooking behaviors, and the challenges of collecting real-word field data, especially in many low resource environments. [↑](#footnote-ref-7)
7. Parameters PC*bi* and PC*pj* are used to calculate this material difference and are used in Appendix 10 providing sampling requirements for these proportions of cooking events. [↑](#footnote-ref-8)
8. If baseline energy consumption is measured at 0.050 TJ/(person\*year) of wood and 0.00335 TJ/(person\*year) of charcoal, the useful energy delivered would be calculated using efficiency factors of 15% for wood and 25% for charcoal. This results in 0.0075 TJ/(person\*year) of useful energy from wood and 0.008375 TJ/(person\*year) from charcoal, for a total of 0.015875 TJ/(person\*year) of useful energy delivered. Since this results in a mixed baseline of 47.3% energy delivered from wood and 52.7% delivered from charcoal, the mixed baseline cap of 0.00295 TJ useful energy delivered/(person\*year) must be applied and the useful energy must be reduced proportionally to stay within the allowable limit. The adjustment factor needed is 0.00295 / 0.015875 = 0.186. Applying this factor, the useful wood energy becomes 0.001395 TJ/(person\*year), and the useful charcoal energy becomes 0.00156 TJ/(person\*year). Converting these adjusted useful energy values back into total fuel consumption, the wood component would be 0.0093 TJ/(person\*year), and the charcoal would be 0.00624 TJ/(person\*year). [↑](#footnote-ref-9)
9. 4C will provide publicly-available guidance to VVBs and rating agencies on evaluating these justifications. [↑](#footnote-ref-10)
10. In this methodology, the subscript *i* is used to represent either a fuel alone or a fuel–cookstove combination, depending on the parameter being referenced. For parameters that are fuel-specific (e.g., fNRB), *i* refers to the fuel only (e.g., fuelwood, charcoal, LPG). For parameters that are specific to the combination of fuel and cookstove technology (e.g., thermal efficiency, emissions factors), *i* refers to the unique fuel–cookstove combination (e.g., fuelwood with three-stone fire, fuelwood with a high efficiency wood cookstove). [↑](#footnote-ref-11)
11. For example: If a pellet fuel consists of 60% wood and 40% sugarcane bagasse (on a TJ basis), and the energy consumption for these pellets is 0.05 TJ/(person\*year), then there would be two constituent fuels to sum over; = 0.03 TJ/(person\*year), and = 0.02 TJ/(person-year), each with its own respective fNRB, EF, and UE. [↑](#footnote-ref-12)
12. 0.5 tonnes of air-dried fuel wood with 0.0156 TJ/tonnes NCV, and thermal efficiency of 15%. [↑](#footnote-ref-13)
13. 0.1 tonnes of charcoal with 0.0295 TJ/tonnes NCV, and thermal efficiency of 25%. [↑](#footnote-ref-14)
14. The energy for each fuel is estimated by applying the thermal efficiencies in Appendix 5 (e.g., 15% thermal efficiency for unimproved baseline wood cookstoves, 25% thermal efficiency for unimproved charcoal cookstoves, and 50% for gas and liquid fuelled cookstoves) to the useful energy delivered and relative amount of cooking on each fuel type. For example, if surveys indicate in the baseline that 80% of cooking events are done on wood cookstoves and 20% on LPG cookstoves, then the baseline energy consumption would be as follows: Wood consumption: (0.80\*0.0012 TJ useful energy delivered/(person\*year)) / 15% thermal efficiency = 0.0091 TJ useful energy delivered/(person\*year of wood energy; LPG 0.20\*0.0012 TJ useful energy delivered/(person\*year) / 50% = 0.00048 TJ useful energy delivered/(person\*year) of LPG energy. [↑](#footnote-ref-15)
15. One-sided 95% confidence intervals place all uncertainty in one direction to give a bound the true mean exceeds with 95% confidence, supporting conservative downward adjustments in baseline estimates. [↑](#footnote-ref-16)
16. Calibrated according to manufacturer recommendations and/or relevant national requirements as applicable. [↑](#footnote-ref-17)
17. For example, common baseline wood cookstove types (i.e., categories) include three stone fires and sunken wood pits. For projects where both exist, project proponents would need to test one example of each type to be able to count displacement for both types in their emissions reductions. Displacement can be considered for cookstove types tested. [↑](#footnote-ref-18)
18. Of note, data analysis can be challenging for cookstoves that are frequently moved indoors and outdoors for cooking, due to solar radiation affecting heating and cooling rates, so piloting placement of temperature monitors or probes is critical for such applications. [↑](#footnote-ref-19)