GLOBAL CARBON COUNCIL

Driving Climate Actions

Methodology for electrification of communities using DMRV Protocol

GCCNMT017

V1.0 - 2026

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CONTENTS

1. Background to baseline and monitoring methodologies of GCC

1. The Global Carbon Council (GCC) Program is the first international carbon market & sustainable development program in the Global South, which is endorsed and approved/endorsed by International Civil Aviation Organisation's (ICAO) for CORSIA scheme and by International Carbon Offset and Reduction Alliance (ICROA). The GCC Program is a voluntary carbon program and an initiative of the Gulf Organisation for Research and Development (GORD). The GCC Program receives GHG emission reduction and removal projects from the entire world. The unique feature of the GCC Program is that it provides opportunity to reduce or remove greenhouse gases and help to catalyse climate action on the ground, while ensuring that project construction and operations do not cause any harm to the environment and society, contribute to the United Nations Sustainable Development Goals as per host-country priorities and compliance to CORSIA, Article 6.2 and ICVCM requirements. The GCC Program is comprised of the entire governance structure, system, and the documentation framework to achieve these objectives[1]. GCC Program will offer a single window opportunity for carbon market players to contribute to climate change mitigation and sustainability, while ensuring integrity, independence, objectivity and transparency. The details about GCC Program are described in 'GCC Program Framework' document.

2. Methodology Key Elements

2. The following table describes the key elements of the methodology:

Table 1. Methodology Key Elements

Typical project(s)	Communities are supplied with electricity from individual renewable and/or hybrid energy systems (e.g., solar PV-diesel, wind-diesel) or grid/mini-grid or rehabilitation/refurbishment of individual renewable energy system or renewable energy system serving a mini-grid. The project activity supplies electricity to consumers who, prior to project implementation, were not connected to a national/regional grid
Type of GHG emissions mitigation action	Displacement of fossil fuel use: Low-carbon-intensive electricity supplied by grid/mini-grid/individual energy system displaces high-carbon-intensive electricity or lighting services

3. Scope, applicability, and entry into force

3.1. Scope

3. The project activities involve displacement of fossil fuel use in fossil fuel-based - systems, such as stand-alone diesel generators and diesel-based mini-grids.

3.2. Applicability

4. This methodology is applicable in situations where consumers that were not connected to a national/regional grid, prior to project implementation, are supplied with electricity generated from the project activity. It is also applicable in situations where a fraction of consumers that were supplied with electricity from a fossil-based individual energy system or fossil fuel based mini-grid prior to the implementation of the project, are supplied with electricity from the project activity (e.g. moving from carbon intensive mini-grid to a less carbon-intensive grid or mini-grid).

5. Electricity consumers may include households, commercial facilities such as shops, public services/buildings and small, medium and micro enterprises (SMMEs). Applications may

[1] GCC documents are available here: http://www.globalcarboncouncil.com/resource-centre/

include lighting, household electrical appliances (e.g., refrigerators, TV, radio), public lighting and water pumps. At least 75 per cent (by number) of the consumers connected by the project activity shall be households. This methodology is not applicable to the use of electricity supplied by the project activity for cooking purposes.

6. This methodology is applicable to the electrification of a community of consumers, which is achieved through one or more of the following technologies/measures:

   (a) New construction of individual energy systems (renewable or hybrid) such as roof-top solar photovoltaic systems or hybrid energy systems;

   (b) Rehabilitation (or refurbishment) of individual energy systems, mini-grid or hybrid energy system may be undertaken, if it can be demonstrated that the existing system(s) i) are not part of another carbon market project activity; ii) are non-operational and iii) require a substantial investment for them to be rehabilitated to or above the original electricity generation capacity. To demonstrate compliance with this condition, the project participants shall provide documentation that:

      The existing system has not generated electricity, or that alternative fuels (e.g. diesel) have been used, for at least six months prior to Project Submission Form submittal; and

      Substantial investments are required to rehabilitate the existing systems (e.g. investments greater than half of the cost to install a new power generation system with the same electricity generation capacity);

   (c) Installation or extension of a mini-grid that distributes electricity generated from renewable energy systems or hybrid energy systems;

   (d) Hybridization of existing fossil fuel-powered mini-grids using renewable energy systems;

   (e) Extension of a grid (national or regional) to supply new consumers as well as consumers currently connected to mini-grid.

7. Project equipment shall comply with applicable international standards or comparable national, regional or local standards/guidelines, and, when relevant, the PDD shall indicate the standard(s) applied for main project equipment.

8. For projects involving the installation of hydro power plants with reservoirs, the requirements prescribed under “AMS-I.D.: Grid-connected renewable electricity generation” shall be followed.

3.3. Entry into force

9. The date of entry into force is the date of the publication of the methodology at the GCC website.

3.4. Applicability of sectoral scopes

10. The sectoral scopes eligible under the GCC have been defined in the ‘Standard for Development of Methodologies’.

11. Only a third-party Validation and Verification Bodies (VVBs) approved under the GCC for sectoral scope 1: “Energy (renewable/non-renewable sources)” and sectoral scope 2: “Energy distribution” can conduct validation or verification of a GCC project activity that applies this methodology.

4. Normative References

12. This methodology is based on the latest approved version of the CDM methodology AMS-III.BL “Integrated methodology for electrification of communities”.

13. This methodology refers to the Rules, Modalities and Procedures for the mechanism established by Article 6.4 of the Paris Agreement. This methodology also refers to the latest approved versions of the following Article 6.4 standards:

    (a) A6.4-STAN-METH-004: Standard "Setting the Baseline in Mechanism Methodologies;

    (b) A6.4-STAN-METH-006: Standard "Addressing Suppressed Demand in Mechanism Methodologies";

    (c) A6.4-STAN-METH-003: Standard "Demonstrating Additionality in Mechanism Methodologies";

    (d) A6.4-STAN-METH-005: Standard "Addressing Leakage in Mechanism Methodologies";

    (e) A6.4-AMT-001: Methodological Tool: Common Practice Analysis;

    (f) A6.4-AMT-002: Methodological tool: Investment analysis.

14. This methodology also refers to the latest approved versions of the following tools and methodologies, tools and standards of the Clean Development Mechanism (CDM) under the Kyoto Protocol:

    (a) "AM0045: Grid connection of isolated electricity systems" (hereinafter referred to as AM0045);

    (b) "AM0104: Interconnection of electricity grids in countries with economic merit order dispatch" (hereinafter referred to as AM0104);

    (c) "AMS-I.D.: Grid connected renewable electricity generation" (hereinafter referred to as AMS-I.D.);

    (d) "TOOL03: Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (hereinafter referred to as TOOL03);

    (e) "TOOL07: Tool to calculate the emission factor for an electricity system" (hereinafter referred to as TOOL07);

    (f) "TOOL19: Demonstration of additionality of microscale project activities";

    (g) "TOOL33: Default values for common parameters" (hereinafter referred to as TOOL33);

    (h) "Standard on sampling and surveys for CDM project activities and programmes of activities".

15. This methodology also refers to the GCC "Standard on Avoidance of Double Claiming of Mitigation Outcomes in Host Country NDCs".

5. Definitions

16. For the purpose of this methodology, the following definitions shall apply:

    (a) **Off-grid systems:**

    Individual renewable energy (RE) system - an electricity generation system that supplies electricity to a single consumer (e.g. a home or school) and that is not connected with other facilities or generation systems (i.e. stand-alone systems);

    Mini-grid system - An integrated energy system consisting of interconnected loads and one or more energy resources with a total capacity not exceeding 15 MW (i.e. the sum of installed capacities of all electricity-generating units connected to the mini-grid is equal to

or less than 15 MW). The system is not connected to a national or a regional grid;

Hybrid energy system - combines at least two different kinds of electricity generation technologies including at least one renewable energy technologies with a total installed capacity not exceeding 15 MW. It includes hybrid "mini-grid" and hybrid "individual energy system" such as wind-diesel, PV-Diesel, wind-PV-Diesel energy system, where diesel generation is restricted to the use only as back-up generation for variable renewable energy systems. Hybrid energy system may also include battery energy storage system integrated with variable renewable energy systems (e.g., solar photovoltaic or wind power plant) with or without back-up diesel generation.

(b) **Rehabilitation (or refurbishment**) - Investment to restore existing individual, renewable electricity generation systems or renewable energy systems that are not generating electricity in their current condition which excludes investments in non-operational fossil fuel units. The investment may involve repairs, renovations or replacement of broken, missing or worn out equipment, but specifically excludes actions only involving on-going or deferred maintenance. The primary objective of rehabilitation or refurbishment is to restore the performance of the system. Rehabilitation may also lead to increased efficiency performance of individual renewable electricity generation systems or renewable energy systems serving a mini-grid ultimately increasing electricity generation;

(c) **Grid (National/regional Grid)** - Grid is an electricity network, including transmission and distribution lines and power plants. The spatial extent of the grid includes the power plants that are physically connected through transmission and distribution lines to the project activity (e.g. extension of a grid for the purpose of electrification of communities) and that can be dispatched without significant transmission constraints.

(d) **Consumer(s)** - are end-user(s)/facility(ies) that may include households; public buildings; and/or small, medium and micro enterprises (SMMEs);

(e) **Consumer sub-group** - within a given consumer type, a group of consumers with a similar connection size (e.g. size of renewable energy system, load limit on connection, or other connection limitation) and likely to have a similar consumption level. Sub-group is used as strata for stratified random sampling.

(f) **New connection or new consumer** - consumers that, prior to the project activity, had no connection to an operational source of electricity.

(g) **Existing supply** - In all cases, existing supply source refers to an operational system. If a consumer is physically connected to an energy source (e.g. individual RE system or mini-grid system) that has not been operational in six months, it is not considered an operational connection. For example, if a household is connected to a mini-grid, but it has not been operational in six months, it is not considered an "existing mini-grid consumer". Instead, they are considered to be consumers with no electricity supply.

(h) **Special underdeveloped zone (SUZ)**[2] – SUZ is a region in the host country (zone, municipality, or any other designated official administrative unit) identified by the government in official notifications for development assistance, including for planning, management, and investment, satisfying any one of the following conditions using the most recently available data:

[2]CDM TOOL19: Demonstration of additionality of microscale project activities".

(a) The proportion of population with income Purchasing Power Parity (PPP) less than USD 2 per day in the region is greater than 50 per cent;

- The GNI per capita in the country is less than USD 3000[3] and the population of the region is among the poorest 20 per cent in the poverty ranking of the host country as per the applicable national policies and procedures[4];

(b) The proportion of population in the region with income less than the national poverty line used by the host country for reporting on the Sustainable Development Goals (SDGs)[5] is greater than 50 per cent;

(i) **Communities –** Refers to a body or a group with a common interest located in a particular area served by the technology/measure (e.g. group of households, commercial facilities such as shops, public services/buildings).

(j) **Data processing and analytics system** - is a customised software system under the Digital Monitoring, Reporting and Verification (DMRV) framework responsible for processing and analysis of monitored data using programmed algorithms (that comply with this methodology) and providing a repeatable result including estimation of GHG emission reductions and generation of periodic "Project Monitoring Report". The system architecture for the "data processing and analytics system" has an inbuilt quality assurance/ quality control protocol for the detection of outliers or missing data.

6. Project Boundary

17. For project activities involving national or regional grids, the spatial extent of the project boundary includes all power plants within the host country physically connected through transmission and distribution lines to the national or regional grid[6] which is being extended through the project activity.

18. For project activities involving mini-grids, the spatial extent of the project boundary includes all power plants connected through transmission and/or distribution lines to the mini-grid that is being built or extended through the project activity.

19. For all project types, the spatial extent of the project boundary also includes the physical sites of the end-use consumers served by the project activity.

20. For projects involving multiple technologies (e.g. grid extension and standalone system), the project boundary shall cover relevant locations per the paragraphs 17 to 18 above.

21. The GHGs included in or excluded from the project boundary are listed in Table 2.

[3] PPP or the World Bank atlas method or another comparable method.
[4] Information on per capita income or other economic indicators used for the ranking purposes shall be provided in USD.
[5] https://www.un.org/sustainabledevelopment/sustainable-development-goals/
[6] Refer to TOOL07 for the definition of electricity system.

Table 2. Emission sources included in or excluded from the project boundary

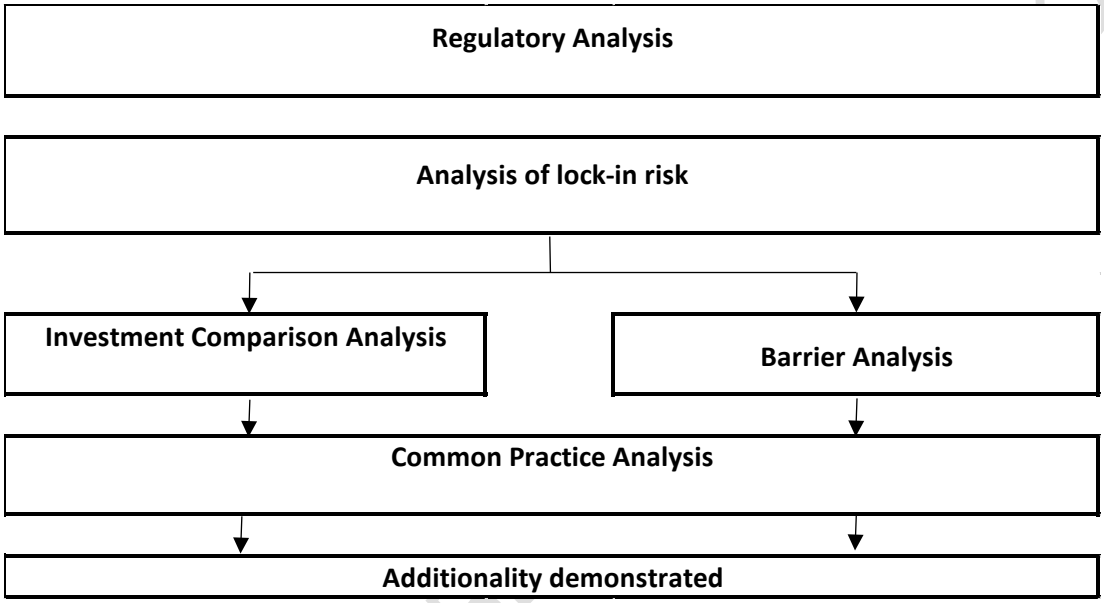
	Source	GHG	Included	Justification/explanation	Determination of Emissions/Removals
Baseline	CO_2 emissions from electricity generation in fossil fuel energy systems that are displaced due to the project activity	CO2	Yes	Main emission source	
		CH4	No	Minor emission source	
		N2O	No	Minor emission source	
Project Activity	For dry or flash steam geothermal power plants, emissions of CH4 and CO2 from non-condensable gases contained in geothermal steam	CO2	Yes	Main emission source	
		CH4	Yes	Main emission source	
		N2O	No	Minor emission source	
	For binary geothermal power plants, fugitive emissions of CH4 and CO2 from non-condensable gases contained in geothermal steam	CO2	Yes	Main emission source	
		CH4	Yes	Main emission source	
		N2O	No	Minor emission source	
	For binary geothermal power plants, fugitive emissions of hydrocarbons such as n-butane and isopentane (working fluid) are contained in the heat exchangers	Low GWP hydrocarbon /refrigerant	Yes	Main emission source	
	CO_2 emissions from the combustion of fossil fuels for electricity generation in hybrid systems and geothermal power plants	CO_2	Yes	Main emission source	
		CH_4	No	Minor emission source	
		N_2O	No	Minor emission source	
	For hydro power plants, emissions of CH_4 from the reservoir	CO_2	No	Minor emission source	
		CH_4	Yes	Main emission source	
		N_2O	No	Minor emission source	

7. Demonstration of Additionality

22. The proponents of the project activity shall apply the approach to additionality demonstration in line with the latest approved version of the Article 6.4 Mechanism "Standard: Demonstration of additionality in mechanism methodologies", as presented in the flowchart in Figure 1 below.

23. A project activity applying a technology or fuel listed under a positive list adopted by the Article 6.4 Supervisory Body of the Paris Agreement Crediting Mechanism or the GCC Programme is deemed to be automatically additional.

Figure 1. The approach to the demonstration of additionality



1.1. Regulatory Analysis

24. When conducting the regulatory analysis, project owners shall demonstrate that the proposed project activity represents mitigation that exceeds any mitigation that is required by law or regulation unless the law or regulation refers to or formally integrates carbon markets as an instrument for implementation.

25. All national and sub-national policies that are applicable to the project activity and its alternatives shall be considered. This includes legal requirements[7], subsidies, taxes, tariffs, fees, and other incentives. This shall also include any specific national or sub-national targets for the sector or the type of project activity, but not general goals that are not specific to the sector or the type of project activity.

26. The regulatory analysis shall confirm that legal requirements (except for those that refer to or formally integrate carbon markets as an instrument for implementation) do not:

(a) Directly require the implementation of the proposed project activity;
(b) Indirectly require the implementation of the proposed project activity, by requiring a certain technological, performance, or management action, or by preventing potential alternative scenarios to the implementation of the project activity;

[7]Legal requirements include laws, statutes, regulations, court orders, decrees, executive orders, permitting conditions, consent agreements (for example, agreements between parties, such as between a private sector entity and a government, to take an action in exchange for avoiding court action), or any other legally binding mandates.

(c) Establish a support scheme that:

i. Is designed to achieve a quantitative target or outcome for the technologies or practices to be implemented under the proposed project activity;
ii. Is applicable to the proposed project activity; and
iii. Would likely result in the same amount of emission reductions, if the proposed project activity were not implemented.

27. The regulatory analysis shall be based on credible and current evidence and be justified.

28. The regulatory analysis shall be updated at each renewal of the crediting period in order to confirm that the conclusion of the regulatory analysis is still valid.

7.1. Avoidance of locking-in the level of emissions

29. Since applicable project activities include the electrification of off-grid communities supplied from renewable and/or hybrid energy systems (e.g., wind-diesel) or an extension of the existing electricity grid, the analysis of lock-in risk shall not be conducted as applicable project activities are deemed to not have a lock-in risk and will not lead to locking in levels of GHG emissions or carbon-intensive technologies incompatible with paragraph 33 of the Rules, Modalities and Procedures of the Article 6.4 Mechanism.

7.2. Investment analysis

30. The investment analysis shall be used as the preferred approach for additionality demonstration. The proponents of the project activity shall demonstrate the additionality of the proposed project activity using guidance on investment analysis stipulated in the latest approved version of the A6.4-AMT-002 Methodological tool: Investment analysis.

7.3. Barrier analysis

31. The proponents of the project activity may apply barrier analysis to demonstrate additionality for project activities that are implemented at individual households (e.g., deployment of solar home systems) or undertaken by small public or private entities that do not have access to commercial or public third-party finance. Guidance for conducting the barrier analysis stipulated in the latest adopted version of the A6.4-STAN-METH-003 Standard: Demonstration of additionality in mechanism methodologies shall be followed by the proponents of the project activity.

7.4. Common practice analysis

32. Common practice analysis shall be conducted to complement the investment comparison analysis or barrier analysis in order to demonstrate that the relevant technology or system planned to be implemented in the proposed project activity is not common practice in the applicable geographical area. Common practice analysis shall be conducted in line with guidance stipulated in the latest approved “Methodological tool: Common practice analysis” of Article 6.4 Mechanism.

33. If the project technology shows a market penetration, meaning the percent of consumers in off-grid communities in the target population with a functional technology that is equivalent to the project technology, greater than 25% for project activities implemented in LDCs, SIDSs and Special Under-developed Zones, and 20% for project activities implemented in other countries, then it is considered common practice and is not additional. The quantification of market penetration should not include technology installed as a result of any voluntary or compliance carbon crediting activity.

8. Baseline Scenario

34. The baseline scenario is determined in line with the guidance stipulated in paragraph 36 of the Rules, Modalities and Procedures for the mechanism established by Article 6.4 of the Paris Agreement, Article 6.4 Mechanism Standard "Setting the Baseline in Mechanism Methodologies and Article 6.4 Mechanism Standard "Addressing Suppressed Demand in Mechanism Methodologies".

8.1. Selection of the baseline approach from paragraph 36 of the Rules, Modalities and Procedures for the mechanism established by Article 6, paragraph 4, of the Paris Agreement

35. The baseline scenario for project activities applying this methodology shall be established in accordance with paragraph 36 (iii) of the Rules, Modalities and Procedures for the Article 6.4 mechanism, which refers to an approach based on existing actual or historical emissions.

8.2. Application of the selected approach, prior to implementation of a downward adjustment

8.3. Procedure for the identification of the baseline scenario

36. The baseline scenario is the continuation of the current practice, in accordance with which, in the absence of the project activity, the end users would have used fossil fuel-based lighting, stand-alone diesel electricity generators for appliances other than lighting (e.g., charging a mobile phone), or would have been supplied by carbon intensive mini-grid.

9. Baseline emissions

9.1. Calculation of baseline emissions prior to downward adjustment

37. The baseline emissions prior to downward adjustment are calculated using the three steps as prescribed below.

9.1.1. Step 1. Classification of consumers

38. The baseline scenario is determined by the *type* of consumer. Appendix I (Table 1, Table 2, and Table 3) provides classification of consumer Types I and II, and is summarised below:

(a) Type I – consumers who were not connected to a national/regional grid or a mini-grid prior to the project implementation and who were previously supplied by a stand-alone fossil fuel power system (such as diesel generators or fossil fuel-based lighting not connected to a mini-grid or regional/national electricity grid) or consumers who had no electricity supply prior to the project. This consumer category also includes water pumping and public lighting consumers, who were previously supplied by a stand-alone fossil fuel power system or had no previous supply of electricity. This type of consumer could be served by individual energy systems, mini-grids, or grid extension measures.

(b) Type II - consumers who were connected to a fossil-fuel mini-grid system prior to the project activity. This type of consumer could only be served by mini-grid and grid extension measures.

39. The baseline scenario for each type of consumer is defined as follows:

Table 3. Type of consumers and baseline scenario

Type of consumer	Baseline Scenario
Type I	Stand-alone fossil fuel generators
Type II	Generation from existing mini-grid[8]

40. Project participants shall provide an ex-ante estimate of the number of consumers that will fall into each group or type, based on business plans or other similar project documents. The estimates of consumers belonging to each group or type shall be transparently documented. During project implementation, the exact number of consumers by type and project technology/measure shall be recorded as part of the monitoring plan during the first monitoring period. The designation of consumer type shall be done only once, at the start date of the project or at the first verification of the project. Table 3 below shows an example for reporting the consumer numbers. During the project crediting period, consumers may move from one technology/measure to another, for example, from an individual system to a mini-grid over time, but not from Type I to Type II (i.e., one column to the next but not from one row to another with reference to the table below).

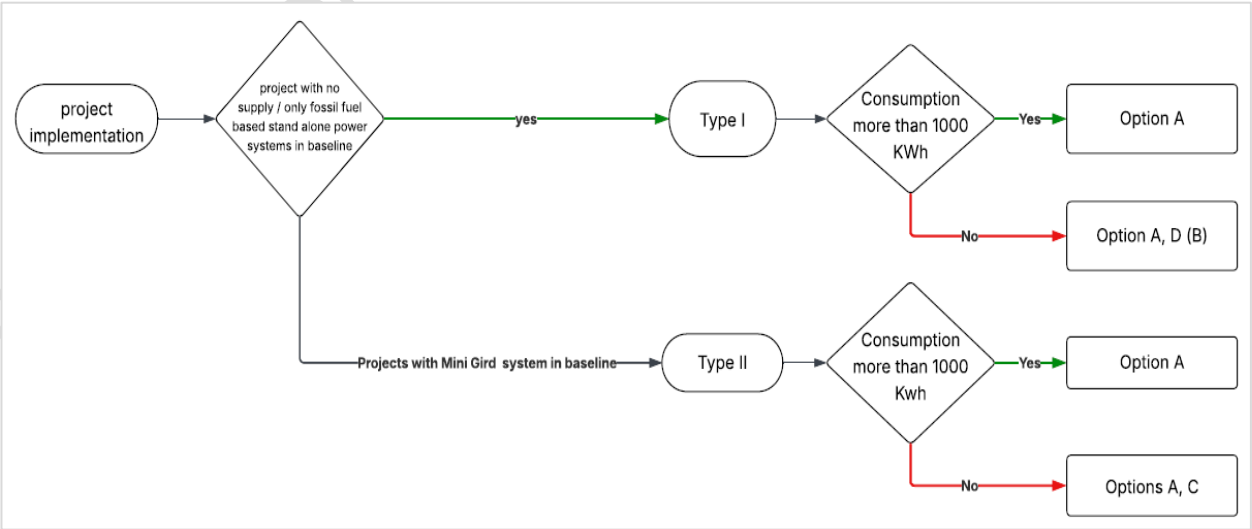
Table 4. Reporting of consumer numbers by type and project technology/measure

	Project Technology/Measure		
Type	Individual System	Mini-Grid	Grid Extension
I			
II	N/A		

9.1.2. Step 2. Determine the consumption of each consumer type and sub-group

Consumption levels for each type of consumer are determined ex post using one of the following options (A, C, or D, and option B is used for cross-checking) described below, depending on the technology/measure being implemented at that consumer site. The flow charts in Figure 2 specify the applicability of each of the four options.

Figure 2. Flow chart showing options for determining consumption for Type I and II



(a) **Option A**. **Metering**. Metering includes the following options (see Section 15.1 for additional details):

[8] Type II consumers are only served by mini-grids or grid extension measures, while Type I consumers could be served by individual energy systems, mini-grids or grid extension.

Standard electrical meter

Pre-payment meter

Pay-as-you-go (Pay-Go) model under:

- Perpetual lease financing model, or
- Lease-to-own financing models

All consumer types may use metering. However, for any consumer with annual consumption greater than 1000 kWh, Option A is mandatory;

Where pre-payment meters are used, electricity consumption shall be determined from the billing records. The total electricity consumed by each consumer is the summation of the prepaid electricity purchased during the monitoring period, which excludes the last purchase during the monitoring period and includes the last purchase of the previous monitoring period.

Where the Pay-as-you-go (Pay-Go) financing model is used, consumers pay for the time periods of use of electricity-generating installation. The total electricity consumed by each consumer is estimated based on payment records, taking into account the time interval during which the energy system remains operational following an instalment payment, daily energy budget and a fraction of the daily budget actually consumed by the consumer (called capacity utilization factor). There are two approaches to estimate electricity consumption under the PayGo financing model depending on whether the perpetual lease or lease-to-own financing model is used (see Sections 15.1.3.1 and 15.1.3.2 for detailed guidance).

For energy systems supplying electricity to a consumer exceeding the electricity consumption levels corresponding to suppressed demand conditions (see section 9.2.1 on guidance for estimating electricity consumption associated with suppressed demand conditions), a stratified random sample survey (Option B. below) in an electronic form shall be conducted in order to cross-check the capacity utilization factor of such an energy system.

For energy systems supplying electricity to a consumer equal to or below the electricity consumption levels corresponding to suppressed demand conditions (see section 9.2.1 on guidance for estimating electricity consumption associated with suppressed demand conditions), the capacity utilization factor of such an energy system is assumed to be equal to 100 per cent and no survey is required to be conducted in this case (this means the full daily energy budget is assumed to be consumed by the consumer).

(b) Option B. Sample survey (stratified random sampling)

A stratified random sample survey shall be conducted only for cross-checking purposes under **Option A. Metering** (PayGo) and/or **Option D. Deemed consumption** and is required to be conducted only for energy systems that supply electricity to a consumer at levels that exceed the electricity consumption levels corresponding to suppressed demand conditions for the type of consumer in question (residential or non-residential consumer, see section 9.2.1 on guidance for estimating electricity consumption associated with suppressed demand conditions of residential and non-residential consumers). A stratified random sample survey shall be conducted in an electronic form in order to cross-check the capacity utilization factor (a fraction of the allocated daily budget that is actually consumed by a consumer) for the energy system.

For energy systems supplying electricity to a consumer at levels equal to or below the electricity consumption levels corresponding to suppressed demand conditions for the type of consumer in question (residential or non-residential consumer, see section

9.2.1 on guidance for estimating electricity consumption associated with suppressed demand conditions of residential and non-residential consumers, the capacity utilization factor of such an energy system is assumed to be equal to 100 per cent, and no survey is required to be conducted in this case. This means that the full daily energy budget is assumed to be fully consumed by the consumer of electricity supplied by the energy system at a level equal to or below the electricity consumption levels corresponding to suppressed demand conditions.

The sample survey should follow the "Standard on sampling and surveys for CDM project activities and PoAs";

(c) Option C. Distribution metering and consumer numbers – Only Type II consumers served by a mini-grid or grid connection may choose to estimate consumption levels from the total metered consumption of a community/consumer group, less the sum of consumption by consumers with meters, divided by the number of operational connections, taking into account distribution losses (see paragraph 53);

Example: In a mini-grid with 100 households, where 10 households have meters and consume 1200 kWh/year per household, total mini-grid net output of 18000 kWh/year, and default distribution losses of 10%, the average consumption of the households without meters would be ((18000 x (1 – 0.1)) – (10 x 1200))/(100-10) = 47 kWh/yr;

(d) **Option D. Deemed consumption** – as a special case, Type I consumers that are served by a project individual renewable energy system may determine consumption based on the installed system capacity and an availability factor (see paragraph 113).

42. If Option C is used to determine the annual average electricity consumption of Type I consumers (which are not metered) in a project area, it is calculated from:

- Total electricity supply to the project area monitored at the nearest sub-station or by monitoring electricity outputs of plants feeding a mini-grid; and
- The total electricity consumption from other consumer groups (metered).

43. The annual average electricity consumption of Type-I consumers is then calculated using the equation below:

$$EC_{T1,x,y} = \frac{\left(ES_{tot} \times \left(1 - TDL_p\right)\right) - \sum EC_{T2,w,y}}{N_y} \quad \text{Equation (1)}$$

Where

$EC_{T1,x,y}$	=	Annual electricity consumption of Type I consumer *x* in year *y* (MWh)
$ES_{tot,y}$	=	Total electricity supply to all consumers (MWh)
TDL_p	=	Transmission and distribution losses within the project area (%), with 10 per cent as a default value
$EC_{T2,w,y}$	=	Annual electricity consumption of Type II consumer *w* in year *y* (MWh)
N_y	=	Number of Type I consumers in year *y*

44. In the above example, if some Type I consumers use Option A and some use Option C, then the amount of electricity consumption of Type I consumers determined using option A is

subtracted in the equation above (i.e. the numerator would include subtracting the sum of Type I consumption using Option A).

45. As indicated in paragraph 39, project participants shall provide an ex ante estimate of the consumption levels (i.e. less than or greater than 1000 kWh per year) of each consumer type, based on business plans or other similar project documents. However, during project implementation, consumption shall be determined according to the monitoring procedure presented in section 10 below.

9.1.3. Step 3. Determine baseline emissions of each consumer type

46. The parameters are determined differently for different project technologies and consumer groups, as outlined below. Total baseline emissions are the sum of all the individual consumer groups.

$$BE_y = BE_{T1,y} + BE_{T2,y} \quad \text{Equation (2)}$$

Where:

BE_y	=	Baseline emissions in year *y* (tCO_2)
$BE_{T1,y}$	=	Baseline emission from Type I consumers in year *y* (tCO_2)
$BE_{T2,y}$	=	Baseline emission from Type II consumers in year *y* (tCO_2)

47. For Type I consumers, baseline emissions are calculated as follows:

$$BE_{T1,y} = \sum_{x=1}^{N} \left(EC_{T1,x,y} \times EF_{CO2,T1}\right) \quad \text{Equation (3)}$$

Where:

$BE_{T1,y}$	=	Baseline emission from Type I consumers in year *y* (tCO_2)
$EC_{T1,x,y}$	=	Annual electricity consumption of Type I consumer *x* in year *y* (MWh)
$EF_{CO2,T1}$	=	Baseline emissions factor for Type I consumers. A default emission factor value of 0.8 as specified in Table 1 of TOOL33 based on the diesel generator (tCO_2/MWh)
N_y	=	Number of Type I consumers in year *y*
x	=	Type I consumer (x = 1, 2, 3, …*N*)

48. For residential Type I consumers that consume less than 500 kWh per year the following options to estimate baseline emissions are available in addition to Equation (3):

(a) If Type I consumers were connected to small renewable energy supply sources (such as solar home systems) with power capacity equal to or below 50 W in the baseline and are supplied with the electricity from a mini-grid or national/regional grid extension in the project activity, their baseline emissions are estimated for the share of annual electricity consumption of Type I consumer *x* in year *y* (MWh) associated with the increase in electricity service (the difference between electricity generated by the baseline small renewable energy supply source estimated using Option D. Deemed consumption (Option D2) and electricity supplied by the project activity) multiplied by the default emission factor value of 0.8 as specified in Table 1 of TOOL33 based on the diesel generator (tCO_2/MWh). This option is not applicable to projects where Type I consumers were connected to small renewable energy supply sources (such as solar home systems) with power capacity equal to

or below 50 W in the baseline and are supplied with electricity from another renewable energy source in the project.

i. If the option specified in paragraph 48 (a) has been used for issuance of ACCs for periods shorter than one full calendar year, the emission reductions for the issuance of ACCs shall be estimated based the default emission factor value of 0.8 (tCO_2/MWh) only starting from the level electricity supplied by the project system beyond the level of electricity generated by the baseline small renewable energy supply source (estimated using Option D2. Deemed consumption) for all monitoring periods summing up to the full calendar year.

(b) If Type I consumers were not connected to any operational source of energy prior to the project activity, their baseline emissions are estimated as follows:

(i) For the portion of up to and including 0.055 MWh of electricity, a default emission factor value of 2.72 as specified in Table 1 of TOOL33 based on kerosene (tCO_2/MWh);

(ii) For the portion greater than 0.055 MWh of electricity, a default emission factor value of 0.8 as specified in Table 1 of TOOL33 based on the diesel generator (tCO_2/MWh);

- If the option specified in paragraph 48 (b) has been used for issuance of ACCs for periods shorter than one full calendar year, the emission reductions for the issuance of ACCs shall be estimated based the default emission factor value of 0.8 (tCO_2/MWh) for all monitoring periods summing up to the full calendar year and the total consumption of each Type I consumer using this option shall be estimated to confirm it is up to 500 kWh per year in that year. If the total annual consumption of the Type I consumer is confirmed to be up to 500 kWh per year in that year, the emission reductions for the issuance of ACCs can be re-estimated for that year for the portion of up to and including 0.055 MWh of electricity using the default emission factor value of 2.72 (tCO_2/MWh) and for the portion greater than 0.055 MWh of electricity, a default emission factor value of 0.8 (tCO_2/MWh). The reconciliated difference of ACCs between the re-estimated and already issued ACCs can be issued after the full calendar year, for which the reconciliation of ACCs is conducted, elapsed.

49. For Type II consumers, baseline emissions are calculated as follows:

$$BE_{T2,y} = \sum_{w=1}^{P} \left(EC_{T2,w,y} \times EF_{CO2,T2} \right)$$ Equation (4)

Where:

$BE_{T2,y}$ = Baseline emission from Type II consumers in year *y* (tCO_2)

$EC_{T2,w,y}$ = Annual electricity consumption of Type II consumer *w* in year *y* (MWh)

$EF_{CO2,T2}$ = Baseline emissions factor for Type II consumers (tCO2/MWh) For a mini-grid system where all generators use exclusively fuel oil and/or diesel fuel, a default emission factor of 0.8 given in Table 1 of TOOL33 shall be used. For all other mini-grids it shall be calculated as the weighted average emissions for the current generation mix following the procedure provided in AMS-I.D.

P_y = Number of Type II consumers in year *y*

w = Type II consumer (w = 1, 2, 3, …*P*)

9.2. Calculation of the downward adjusted baseline emissions

50. The downward adjusted baseline emissions are estimated as follows:

$$BE_{adj,y} = BE_{T1,adj,y} + BE_{T2,w,adj,y}$$

Equation (5)

Where:

$BE_{adj,y}$ = Downward adjusted baseline emissions in year *y* (tCO_2)

$BE_{T1,adj,y}$ = Downward adjusted baseline emissions from Type I consumers in year *y* (tCO_2)

$BE_{T2,w,adj,y}$ = Downward adjusted baseline emission from Type II consumer *w* in year *y* (tCO_2)

51. Calculation of the downward adjusted baseline emissions shall be conducted taking into account the suppressed demand conditions of the project activity beneficiaries. The downward adjustment to the baseline emissions of 1 per cent shall be applied only to the share of baseline emissions that exceed the baseline emissions level associated with suppressed demand conditions.

52. The application of downward adjustment to the share of baseline emissions exceeding the emissions associated with suppressed demand shall be applied up to the level of emissions associated with suppressed demand. If, in the course of application of downward adjustment to the baseline emissions, the emission level associated with the suppressed demand threshold is reached, no further downward adjustment shall be applied to the level of baseline emissions. This means that the application of downward adjustment to the baseline emissions shall not result in downward adjusted baseline emissions below the emissions associated with the suppressed demand threshold.

53. In order to estimate the downward adjusted baseline emissions, the following steps shall be taken:

Step 1. Recognize suppressed demand conditions and estimate the emissions level associated with suppressed demand conditions;

Step 2. Estimate the share of baseline emissions that exceeds the level of emissions associated with suppressed demand conditions.

Step 3. Apply downward adjustment to the share of baseline emissions that exceed the level of emissions associated with suppressed demand conditions up to the emissions level associated with suppressed demand conditions.

Step 4. Calculate downward adjusted baseline emissions as a sum of baseline emissions associated with suppressed demand conditions and the share of downward adjusted baseline emissions in year y of the crediting period. The downward adjusted baseline emissions shall serve as the crediting baseline;

54. Detailed guidance on implementing these steps is presented below.

9.2.1. Step 1. Recognize suppressed demand conditions and estimate the emissions level associated with suppressed demand conditions

55. In order to recognize suppressed demand in the baseline emissions, the project owners shall demonstrate that the intended project activity beneficiaries are in suppressed demand

conditions with respect to the identified basic human needs at the start of each crediting period, and demonstrate that these conditions persist every year of the crediting period. For this purpose, guidance stipulated in the latest approved version of the Article 6.4 Mechanism Standard "Addressing Suppressed Demand in Mechanism Methodologies" shall be used in conjunction with the Article 6.4 Mechanism Standard "Setting the Baseline in Mechanism Methodologies".

56. The thresholds for the level of service for meeting basic human needs are defined in the Article 6.4 Mechanism Standard "Addressing Suppressed Demand in Mechanism Methodologies" as follows[9]:

(a) For suppressed demand in residential energy consumption, total electricity consumption up to 250 kWh per person per year;

(b) For suppressed demand in non-residential energy consumption, total direct and indirect electricity consumption up to 750 kWh per person per year.

For Healthcare Facilities[10]:

Healthcare facility	Description	Energy consumption per hospital
Basic Health Post - basic access to healthcare	No beds other than for emergencies/ maternity care. Typically located in a remote setting with limited services and a small staff	7.5 kWh/day
Primary Hospital - intermediate access to healthcare	Coverage for 30–60 beds. Low/moderate energy requirements.	15 kWh/day
Secondary Hospital - advanced access to healthcare	Coverage for 60–120 beds. Moderate energy requirements. May accommodate sophisticated diagnostic medical equipment	20 kWh/day
Tertiary Hospital – full access to healthcare	Coverage for >120 beds. High-energy requirements. May contain sophisticated diagnostic devices requiring additional power and perform surgical procedures.	25 kWh/day

57. Project activities targeted at communities that are not connected to a national/regional electricity grid and demonstrate that the levels of electricity consumption of Type I and/or Type II consumers that are below or equal to the levels corresponding to the electricity consumption thresholds stipulated in paragraph 57 above are considered to be in suppressed demand.

9.2.2. Step 2. Estimate the share of baseline emissions that exceeds the level of emissions associated with suppressed demand conditions

58. For each Type I and II consumer estimate the share of baseline emissions that exceeds the level of emissions associated with suppressed demand conditions. For this purpose, the following steps shall be undertaken:

(a) For each individual consumer, for which electricity consumption levels were determined ex-post under Step 2 in section 9.1.2 above, collect data on the number of persons per

[9] Additional thresholds for the level of service for meeting basic human needs may be included for other types of electricity consumption by submitting a request for revision of this methodology.

[10] Achieving universal electrification of rural healthcare facilities in sub-Saharan Africa with decentralized renewable energy technologies. 2021 Oct 20; 5(10) : 2687–2714. DOI: 10.1016/j.joule.2021.09.010

individual consumer. If Step 2 in section 9.1.2 electricity consumption was estimated for a consumer sub-group, collect data for the number of consumers belonging to the sub-group and the number of persons per individual consumer belonging to this sub-group;

(b) For residential consumers, baseline emissions associated with suppressed demand conditions are calculated as follows:

$$BE_{ResSD,y} = EC_{ResSD} \times M_y \times EF_{CO2} \quad \text{Equation (6)}$$

Where:

$BE_{ResSD,y}$	=	Baseline emissions associated with suppressed demand conditions of a residential consumer in year *y* (tCO_2)
EC_{ResSD}	=	Annual electricity consumption per person of a residential consumer - a default value of 250 kWh per person per year in year *y* (MWh)
EF_{CO2}	=	Baseline emissions factor - a default emission factor value of 0.8 as specified in Table 1 of TOOL33 based on the diesel generator (tCO_2/MWh)
M_y	=	Number of persons residing in a residential consumer in year *y*

(c) For non-residential consumers, baseline emissions are calculated as follows:

$$BE_{Non-resSD,y} = EC_{Non-resSD} \times Q_y \times EF_{CO2} \quad \text{Equation (7)}$$

Where:

$BE_{Non-resSD,y}$	=	Baseline emissions associated with suppressed demand conditions of a non-residential consumer in year *y* (tCO_2)
$EC_{Non-resSD}$	=	Annual electricity consumption per person of a non-residential consumer - a default value of 750 kWh per person per year in year *y* (MWh)
EF_{CO2}	=	Baseline emissions factor - a default emission factor value of 0.8 as specified in Table 1 of TOOL33 based on the diesel generator (tCO_2/MWh)
Q_y	=	Number of persons residing in a residential consumer in year *y*

(d) Estimate the difference between the annual electricity consumption in year *y* of an individual consumer or consumer sub-group and the annual electricity consumption corresponding to the suppressed demand conditions using default values stipulated in paragraph 56 above. If electricity consumption was determined under Step 2 in section 9.1.2 above for the consumer sub-group, electricity consumption corresponding to the suppressed demand conditions shall be calculated for the entire sub-group based on the type of consumers (residential or non-residential) belonging to this sub-group, the number of persons of each individual consumer and the number of individual consumers belonging to this sub-group;

(e) Estimate baseline emissions associated with the annual electricity consumption corresponding to the suppressed demand conditions using the same approach as the approach utilized to estimate baseline emissions for each particular consumer or consumer sub-group under Step 3 in the section 9.1.3 in order to ensure that the entire level of baseline emissions and the share of baseline emissions corresponding to the

suppressed demand conditions are estimated using the same approach and utilize the same default values, where applicable.

(f) For each consumer or sub-group of consumers, estimate the share of baseline emissions that exceeds the level of emissions associated with suppressed demand conditions in year *y* as the difference between the baseline emissions in year *y* of the consumer or sub-group of consumers estimated under Step 3 in the section 9.1.3 and baseline emissions associated with the annual electricity consumption corresponding to the suppressed demand conditions of this consumer or sub-group of consumers, estimated under paragraph 56 (c) above;

(g) Share of baseline emissions of a residential Type I consumer that exceeds the level of emissions associated with suppressed demand conditions in year *y* is calculated as follows:

$$\Delta BE_{T1,Res,y} = BE_{T1,y} - BE_{ResSD,y} \quad \text{Equation (8)}$$

Where:

$\Delta BE_{T1,Res,y}$	=	Share of baseline emissions of a residential Type I consumer that exceeds the level of emissions associated with suppressed demand conditions in year *y* (tCO_2)
$BE_{ResSD,y}$	=	Baseline emissions associated with suppressed demand conditions of a residential consumer in year *y* (tCO_2)
$BE_{T1,y}$	=	Baseline emission from Type I consumers in year *y* (tCO_2)

(h) Share of baseline emissions of a non-residential Type I consumer that exceeds the level of emissions associated with suppressed demand conditions in year *y* is calculated as follows:

$$\Delta BE_{T1,Non-res,y} = BE_{T1,y} - BE_{Non-resSD,y} \quad \text{Equation (9)}$$

Where:

$\Delta BE_{T1,Non-res,y}$	=	Share of baseline emissions of a non-residential Type I consumer that exceeds the level of emissions associated with suppressed demand conditions in year *y* (tCO_2)
$BE_{Non-resSD,y}$	=	Baseline emissions associated with suppressed demand conditions of a non-residential consumer in year *y* (tCO_2)
$BE_{T1,y}$	=	Baseline emission from Type I consumers in year *y* (tCO_2)

(i) Share of baseline emissions of a residential Type II consumer that exceeds the level of emissions associated with suppressed demand conditions in year *y* is calculated as follows:

$$\Delta BE_{T2,Res,y} = BE_{T2,y} - BE_{ResSD,y} \quad \text{Equation (10)}$$

Where:

$\Delta BE_{T1,Res,y}$	=	Share of baseline emissions of a residential Type II consumer that exceeds the level of emissions associated with suppressed demand conditions in year *y* (tCO_2)

$BE_{ResSD,y}$ = Baseline emissions associated with suppressed demand conditions of a residential consumer in year *y* (tCO_2)

$BE_{T2,y}$ = Baseline emission from Type II consumers in year *y* (tCO_2)

(j) Share of baseline emissions of a non-residential Type II consumer that exceeds the level of emissions associated with suppressed demand conditions in year *y* is calculated as follows:

$$\Delta BE_{T2,Non-res,y} = BE_{T2,y} - BE_{Non-resSD,y} \quad \text{Equation (11)}$$

Where:

$\Delta BE_{T2,Non-res,y}$ = Share of baseline emissions of a non-residential Type II consumer that exceeds the level of emissions associated with suppressed demand conditions in year *y* (tCO_2)

$BE_{Non-resSD,y}$ = Baseline emissions associated with suppressed demand conditions of a non-residential consumer in year *y* (tCO_2)

$BE_{T2,y}$ = Baseline emission from Type II consumers in year *y* (tCO_2)

9.2.3. Step 3. Apply downward adjustment to the share of baseline emissions that exceed the level of emissions associated with suppressed demand conditions up to the emissions level associated with suppressed demand conditions

59. Downward adjustment of 1 per cent per year shall be applied only to the share of baseline emissions that exceed the level of emissions associated with suppressed demand conditions, estimated under Step 2 above. The application of downward adjustment to the share of baseline emissions that exceed the level of emissions associated with suppressed demand shall stop at the level when the total baseline emissions reach the level of baseline emission associated with suppressed demand conditions estimated under Step 2 above. This means that downward adjusted baseline emissions shall not be below the level of baseline emission associated with suppressed demand conditions at any point in time during the crediting period for any type of consumer or sub-group of consumers.

60. The downward adjusted baseline emissions in year y are calculated for each consumer or sub-group of consumers as the sum of baseline emissions associated with suppressed demand conditions of this consumer or sub-group of consumers and the downward adjusted share of baseline emissions that exceed the level of emissions associated with suppressed demand conditions of this consumer or sub-group of consumers in year y.

61. For each residential Type I consumer *x*, downward adjusted baseline emissions in year y are calculated as follows:

62. If $\Delta BE_{T1,Res,y} > 0$, then:

$$BE_{T1,x,adj,y} = BE_{ResSD,y} + \Delta BE_{T1,x,Res,y} \times 0.99 \quad \text{Equation (12)}$$

Where:

$BE_{T1,x,adj,y}$ = Downward adjusted baseline emissions from Type I consumer *x* in year *y* (tCO_2)

$\Delta BE_{T1,x,Res,y}$ = Share of baseline emissions of a residential Type I consumer *x* that exceeds the level of emissions associated with suppressed demand conditions in year *y* (tCO_2)

$BE_{ResSD,y}$ = Baseline emissions associated with suppressed demand conditions of a residential consumer in year *y* (tCO_2)

63. If $\Delta BE_{T1,Res,y} \leq 0$, then:

$$BE_{T1,x,adj,y} = BE_{T1,x,y}$$

Equation (13)

Where:

$BE_{T1,x,adj,y}$ = Downward adjusted baseline emission from Type I consumer *x* in year *y* (tCO_2)

$BE_{T1,x,y}$ = Baseline emission from Type I consumer *x* in year *y* (tCO_2)

64. For each non-residential Type I consumer x, downward adjusted baseline emissions in year y are calculated as follows:

65. If $\Delta BE_{T1,Non-res,y} > 0$, then:

$$BE_{T1,x,adj,y} = BE_{ResSD,y} + \Delta BE_{T1,x,Non-res,y} \times 0.99$$

Equation (14)

Where:

$\Delta BE_{T1,x,Non-res,y}$ = Share of baseline emissions of a non-residential Type I consumer *x* that exceeds the level of emissions associated with suppressed demand conditions in year *y* (tCO_2)

$BE_{Non-resSD,y}$ = Baseline emissions associated with suppressed demand conditions of a non-residential consumer in year *y* (tCO_2)

$BE_{T1,x,y}$ = Baseline emission from Type I consumer *x* in year *y* (tCO_2)

66. If $\Delta BE_{T1,Non-res,y} \leq 0$, then:

$$BE_{T1,x,adj,y} = BE_{T1,x,y}$$

Equation (15)

Where:

$BE_{T1,x,adj,y}$ = Downward adjusted baseline emission from Type I consumer *x* in year *y* (tCO_2)

$BE_{T1,x,y}$ = Baseline emission from Type I consumer *x* in year *y* (tCO_2)

67. Downward adjusted baseline emission from Type I consumers in year y are calculated as follows:

$$BE_{T1,adj,y} = \sum_{x=1}^{N} BE_{T1,x,adj,y}$$

Equation (16)

Where:

$BE_{T1,adj,y}$	=	Downward adjusted baseline emissions from Type I consumers in year *y* (tCO_2)
$BE_{T1,x,adj,y}$	=	Downward adjusted baseline emission from Type I consumer *x* in year *y* (tCO_2)
N_y	=	Number of Type I consumers in year *y*
x	=	Type I consumer (x = 1, 2, 3, …*N*)

68. For each residential Type II consumer w, downward adjusted baseline emissions in year y are calculated as follows:

69. If $\Delta BE_{T2,Res,y} > 0$, then:

$$BE_{T2,w,adj,y} = BE_{ResSD,y} + \Delta BE_{T2,w,Res,y} \times 0.99 \quad \text{Equation (17)}$$

Where:

$BE_{T2,w,adj,y}$	=	Downward adjusted baseline emissions from Type II consumer *w* in year *y* (tCO_2)
$\Delta BE_{T2,w,Res,y}$	=	Share of baseline emissions of a residential Type II consumer w that exceeds the level of emissions associated with suppressed demand conditions in year *y* (tCO_2)
$BE_{ResSD,y}$	=	Baseline emissions associated with suppressed demand conditions of a residential consumer in year *y* (tCO_2)

70. If $\Delta BE_{T2,Res,y} \leq 0$, then:

$$BE_{T2,w,adj,y} = BE_{T2,w,y} \quad \text{Equation (18)}$$

Where:

$BE_{T2,w,adj,y}$	=	Downward adjusted baseline emission from Type II consumer *w* in year *y* (tCO_2)
$BE_{T2,w,y}$	=	Baseline emission from Type II consumer *w* in year *y* (tCO_2)

71. For each non-residential Type II consumer w, downward adjusted baseline emissions in year y are calculated as follows:

72. If $\Delta BE_{T2,Non-res,y} > 0$, then:

$$BE_{T2,w,adj,y} = BE_{ResSD,y} + \Delta BE_{T2,w,Non-res,y} \times 0.99 \quad \text{Equation (19)}$$

Where:

$\Delta BE_{T2,w,Non-res,y}$	=	Share of baseline emissions of a non-residential Type II consumer *w* that exceeds the level of emissions associated with suppressed demand conditions in year *y* (tCO_2)
$BE_{Non-resSD,y}$	=	Baseline emissions associated with suppressed demand conditions of a non-residential consumer in year *y* (tCO_2)

$BE_{T2,w,y}$ = Baseline emission from Type II consumer *w* in year *y* (tCO_2)

73. If $\Delta BE_{T2,Non-res,y} \leq 0$, then:

$$BE_{T2,w,adj,y} = BE_{T2,w,y}$$

Equation (20)

Where:

$BE_{T2,w,adj,y}$ = Downward adjusted baseline emission from Type II consumer *w* in year *y* (tCO_2)

$BE_{T2,w,y}$ = Baseline emission from Type II consumer w in year *y* (tCO_2)

74. Downward adjusted baseline emission from Type II consumers in year y are calculated as follows:

$$BE_{T2,adj,y} = \sum_{w=1}^{P} BE_{T2,w,adj,y}$$

Equation (21)

Where:

$BE_{T2,adj,y}$ = Downward adjusted baseline emissions from Type II consumers in year *y* (tCO_2)

$BE_{T2,w,adj,y}$ = Downward adjusted baseline emission from Type II consumer *x* in year *y* (tCO_2)

P_y = Number of Type II consumers in year *y*

w = Type II consumer (w = 1, 2, 3, …*P*)

75. The downward adjusted baseline emissions in year y shall serve as the crediting baseline emissions.

10. Project Emissions

76. The table below shows a summary of the approaches for project emissions:

Table 5. Approaches to determine project emissions based on technology type

Project technology	Project emissions approach
New or rehabilitation of individual renewable or hybrid energy systems	If only renewables, no project emissions. If a hybrid system, emissions from diesel generator fuel use
Renewable or hybrid mini-grids	Emission factors based on default emission factors for fossil fuel plants or weighted average following AMS-I.D.
Grid-extension	Emissions factor based on: The weighted average of the top 10 per cent high-emission-intensive plants in the grid or default emission factor based on the highest carbon-intensive fuel in the grid for projects implemented in LDCs/SIDs. Project emissions are zero if: Grid extension is directly associated with the renewable energy plant. Fuel mix in the grid is equal to or greater than 95 per cent renewable in each of the most recent three years prior to the project implementation, and projects are located in LDCs/SIDs

77. Total project emissions are the sum of all the individual technologies.

$$PE_y = PE_{IS,y} + PE_{G,y} \quad \text{Equation (22)}$$

Where:

PE_y = Project emissions in year *y* (tCO_2)

$PE_{IS,y}$ = Project emission from new or rehabilitated individual renewable or hybrid energy systems in year *y* (tCO_2)

$PE_{G,y}$ = Project emissions from renewable and hybrid mini-grids (new and rehabilitated) and grid extension in year *y* (tCO_2)

10.1.1. Project emissions for new or rehabilitation of individual renewable or hybrid energy systems

78. For systems with only renewable energy generation, project emissions are considered zero (i.e. $PE_{IS,y} = 0$) except in the cases of geothermal plants or hydro power plants with reservoirs, where the most recent version of AMS-I.D is applied to calculate project emissions.

79. For hybrid individual systems, project emissions are calculated from the generation contribution of the diesel part of the system.

$$PE_{IS,y} = EG_{diesel,y} \times EF_{CO2,diesel} \quad \text{Equation (23)}$$

Where:

$PE_{IS,y}$ = Project emissions from new or rehabilitated individual renewable or hybrid energy systems in year *y* (tCO_2)

$EG_{diesel,y}$ = Generation at individual systems from diesel in year *y* (MWh).

$EF_{CO2,diesel}$ = Emissions factor for diesel generation, based on Table 1 of TOOL33 (tCO_2/MWh). Two options are available:
Option 1. Use a conservative default emission factor of 1.0 for diesel generator systems (tCO2/MWh)
Option 2. Collect data on load factor and size (capacity) of project fuel oil and/or diesel fuel generator systems and select an emission factor from Table 1 of TOOL33 (tCO2/MWh)

80. Total project emissions for this technology would then be the sum of the emissions from all of the individual systems.

10.1.2. Project emissions from renewable or hybrid mini-grids (new and rehabilitated) or grid extension

81. Project emissions are emissions associated with the generation of electricity supplied to the project activity end use facilities.

$$PE_{G,y} = \frac{\left(ES_{tot,y} \times EF_{grid,CO2,y}\right)}{\left(1 - TDL_{grid}\right)}$$ Equation (24)

Where:

$PE_{G,y}$ = Project emissions from renewable and hybrid mini-grids (new or rehabilitated) and grid extension in year *y* (tCO_2)

$ES_{tot,y}$ = Total electricity supply to all consumers (MWh)

$EF_{grid,CO2}$ = Emission factor for the project electricity system in year *y* (tCO_2/MWh).

If the project activity involves connection to an existing mini-grid, rehabilitated mini-grid or construction of new mini-grid, the emissions factor is determined as either:

(a) for a mini-grid system where all generators use exclusively fuel oil and/or diesel fuel using the emissions factors in Table 1 of TOOL33. Two options are available:

Option 1. Use a conservative default emission factor of 1.0 for diesel generator systems (tCO2/MWh)
Option 2. Collect data on load factor and size (capacity) of project fuel oil and/or diesel fuel generator systems and select an emission factor from Table 1 of TOOL33, (tCO2/MWh), or

(b) for all other mini-grids per the weighted average emissions for the current generation mix following the procedure provided in AMS-I.D.

If the project activity involves connection to an existing national or regional grid, the emissions factor is determined using one of the options prescribed under paragraph 85 below

TDL_{grid} = Transmission and distribution losses in the project electricity system, where the project activity is grid extension, with a 10% default value. This does not apply to a mini-grid, because local distribution losses are already captured as TL_p in equation 24 below (i.e. TL_{grid} = 0 for mini-grid)

82. $ES_{tot,y}$ is either determined by the measurement at an electricity meter at the point of supply to community, or as the sum of electricity consumption of all consumers. Note that, if Option C is used for calculating consumption by any consumer groups, then $ES_{tot,y}$ shall be measured directly.

83. If the sum of consumption from all consumers is used, $ES_{tot,y}$ is calculated using the following equation:

$$ES_{tot,y} = \frac{\sum_{x=1}^{N_y} EC_{T1,x,y} + \sum_{w=1}^{P_y} EC_{T2,w,y}}{(1 - TDL_p)}$$ Equation (25)

Where

$ES_{tot,y}$	=	Total electricity supply to all consumers (MWh)
$EC_{T1,x,y}$	=	Annual electricity consumption of Type I *consumer x* in year *y* (MWh)
$EC_{T2,w,y}$	=	Annual electricity consumption of Type II *consumer w* in year *y* (MWh)
N_y	=	Number of Type I consumers in year *y*
P_y	=	Number of Type II consumers in year *y*
TDL_p	=	Local distribution losses within the project area (per cent), with 10 per cent as a default value

84. If multiple mini-grids are involved, total project emissions shall be calculated as the sum of the emissions from all of the mini-grids.

10.1.2.1. Determination of grid emission factor for calculating project emissions

85. The following options are available for determining grid emission factor for the purpose of determining project emissions due to electrification through grid extension:

(a) **Option 1:** Emission factor is determined by ranking all the power units in the national or regional grid in a decreasing order of GHG intensity. The emissions factor is the weighted average emission factor of the top 10 per cent most GHG intensive plants in the grid. If the grid, associated with the project, is the net importer of electricity from other countries the emission factor shall be the higher among the following two: (i) the weighted average emissions factor of the top 10% most GHG intensive plants in the grid of the host country; and (ii) the weighted average emissions factor of the top 10% most GHG intensive plants in the exporting grid. The emissions factors of the plants shall be calculated based on the default plant efficiency provided in the TOOL07;

(b) **Option 2:** If the project activity involves electrification of a community due to the construction of a new grid-connected renewable power plant, the emission factor of zero can be applied if the following conditions are met:

i. The main feeder supplying electricity to a community is a dedicated line “energized/ charged” from the newly constructed renewable power plant;

ii. The feeder is not “energized/ charged” by a grid or other fossil fuel sources when the plant is not in operation. If this is not the case, project emissions shall be calculated for the proportion of electricity that is supplied by a grid or other sources, for the period of time when the plant is not in operation, using the other options mentioned in this section.

(c) **Option 3:** If the projects are implemented in least developed countries (LDCs) or small island developing States (SIDS), the following alternatives are available:

i. The emission factor of zero can be applied if the share of renewable energy mix is equal to or greater than 95% based on of the average of the most recent three years prior to the project implementation .

ii. The emissions factor is determined by the most GHG-intensive fuel used in the national or regional grid and the default technology efficiency (lower range) as provided in the TOOL07. The default emission factors prescribed in Table 6 below should be used.

Example for using the default emission factor:

a. If a grid has a fuel mix of natural gas, oil, and hydro, take the default emission factor of oil;

b. if a grid has a fuel mix of several oil and several coal-fired power plants, take the default emission factor of coal.

Table 6. Default emission factors for determining project emissions

Fuel	Fuel EF from IPCC (kg/TJ)	Efficiency (%)	Default grid EF (tCO_2/MWh)
Coal	101 000	36.5	1.0
Natural gas	58 300	30	0.7
Oil	74 800	30	0.9

11. Avoidance of double-counting

86. To implement the requirements of section 8 of the Appendix to the Article 6.4 Mechanism Standard "Setting the Baseline in Mechanism Methodologies" and the GCC "Standard on Avoidance of Double Claiming of Mitigation Outcomes in Host Country NDCs" related to avoidance of double counting, all project activity participants shall demonstrate that the project activity will not result in double counting by:

(a) Providing evidence, in each monitoring report, that the outcomes from the project activity (e.g. electricity supplied by the project activity) for which they intend to request issuance of ACCs are not also claimed in other environmental markets or accounting framework (e.g. guarantees of origin for renewable energy generation, green hydrogen schemes, low-carbon fuel standards), except for outcomes not related to reducing greenhouse gases emissions (e.g., air contaminant reductions or social impacts); and

(b) Demonstrating that the reported GHG emission reductions for which they intend to request issuance of ACCs do not overlap with mandatory domestic mitigation schemes (e.g., emissions trading systems), or that measures are in place to ensure that any relevant impacts of the activity (e.g. the GHG emission reductions achieved or the kilowatt-hours of renewable electricity produced) are not counted towards the achievement of targets or obligations under the mandatory domestic mitigation scheme (e.g. by cancelling allowances from the emissions trading system before issuing carbon credits) if the overlap exists,[11] by:

(i) Declaring and providing evidence in each monitoring report that the project activity and the activities displaced in the baseline scenario (e.g. electricity generation using fossil fuels) do not fall within the scope of any mandatory domestic mitigation scheme; or

(ii) Where the project activity or the activities displaced in the baseline scenario fall within the scope of a mandatory domestic mitigation scheme, project activity participants may:

[11] When full or partial impact of the project activity is covered under mandatory domestic mitigation scheme and counted towards the achievement of targets and obligations under mandatory domestic mitigation scheme, the relevant share of the impact shall be deducted by the project activity participants from the amount requested for issuance.

- Provide evidence in each monitoring report that the mitigation outcomes of the project activity are not counted in the mandatory mitigation scheme to reduce the obligations of the entities covered by the scheme. For example, in the case of an emissions trading system covering electricity generation, a confirmation from the operator of the emissions trading system may be sought that a number of allowances equal to the ACCs being requested for issuance for the electricity generation component were cancelled before the issuance of the ACCs; or

- Demonstrate that project participants are not requesting the issuance of ACCs for any emission reductions resulting from a component of the project activity that falls within the scope of the mandatory domestic scheme. For example, in the case of an emissions trading system covering electricity generation, the activity participant could elect not include baseline emissions from electricity generation in the calculation of the total emission reductions and thereby demonstrate that no double-counting has occurred.

87. Notwithstanding paragraph 86 above, where the policy for establishing the framework or environmental market or for establishing the mandatory domestic mitigation scheme refers to or formally integrates the mechanism as an instrument for implementation, participation in such a framework or environmental market or domestic mitigation scheme does not result in double counting.

12. 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

88. Project activity participants shall attach to the Project Submission Form and provide to the VVB responsible to perform the validation of the project activity a confirmation from the designated national authority[12] or designated focal point of the host Party, that the designated national authority/designated focal point of the host Party has undertaken an assessment of the project activity's consistency with Decision 3/CMA.3 paragraph 40 (c) and paragraph 27 (a), as part of the host Party's approval, to demonstrate that the project activity does not constrain, but aligns with the policies, options and implementation plans of the host Party with regard to the nationally determined contribution (NDC) of the host Party, its long-term low greenhouse gas emission development strategies (LT-LEDS) if it has submitted one, and the long-term temperature goal of the Paris Agreement and long-term goals of the Paris Agreement.

13. Leakage

89. Leakage on account of construction of new transmission/distribution lines (e.g. carbon stock loss due to deforestation) shall be calculated using the method indicated in baseline and monitoring methodology AM0045 or AM0104. If the estimated leakage is within 5 per cent of the estimated emission reductions of the project, then this leakage source may be neglected, the leakage shall be deducted from the emissions reductions.

90. If any energy-generating equipment is transferred from another activity, leakage is to be considered.

[12] By Decision 3/CMA.3, list of Designated National Authority for the mechanism established by Article 6, paragraph 4, of the Paris Agreement is available on the UNFCCC secretariat and is accepted by GCC Program: https://unfccc.int/process-and-meetings/the-paris-agreement/article-64-mechanism/national-authorities#country_AtoH

14. Emission Reductions

91. Emission reductions are estimated as follows:

$$ER_y = BE_{adj,y} - PE_y - LE_y \quad \text{Equation (26)}$$

Where:

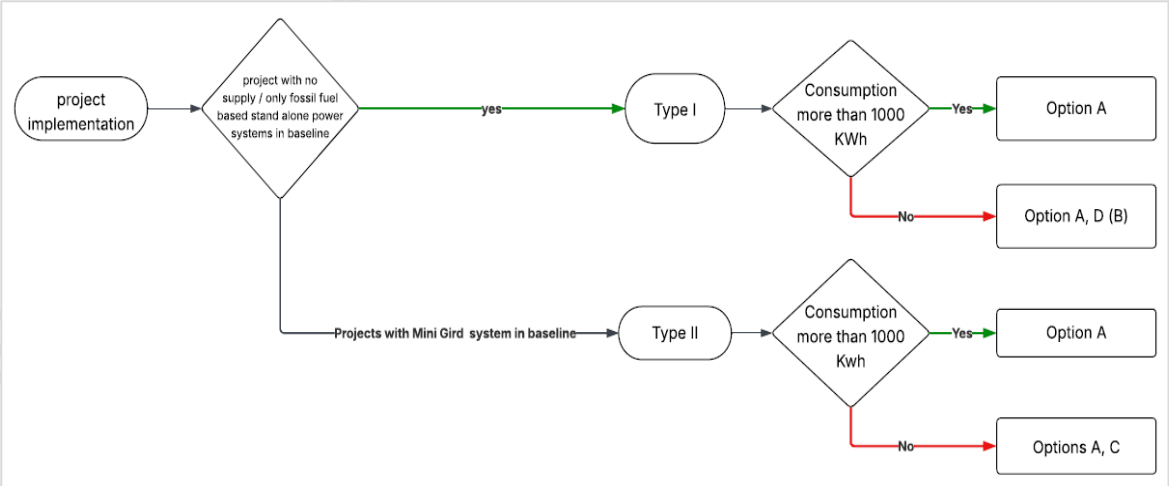
ER_y	=	Emission reductions in year y (tCO2)
$BE_{adj,y}$	=	Downward adjusted baseline emissions in year *y* (tCO_2)
PE_y	=	Project emissions in year y (tCO2)
LE_y	=	Leakage emissions in year y (tCO2)

15. Monitoring methodology

92. The monitoring of all the relevant parameters shall be as per the procedures detailed below. The applicable requirements (e.g. calibration) for the monitoring plan as specified in the "General guidelines for SSC CDM methodologies" are an integral part of the monitoring guidelines specified below and therefore shall be referred to by the project participant.

93. For project activities covering Type I and Type II consumer, it is possible for a phased implementation. That is, if during the crediting period, a consumer changes from electricity being supplied under the project by an individual energy system (in an earlier phase) to being supplied by a mini-grid or grid extension (in a later phase) the consumer will thereafter be considered a mini-grid or grid consumer for purposes of baseline and project emissions (i.e. they no longer will qualify to use Option D for monitoring). In such a case, the information regarding the potential phased implementation shall be provided in the applicable project documentation (e.g. PSF).

94. The key parameters monitored are the consumption of each type of consumer, as well as the total electricity supplied by the project activity, where applicable.



95. Figure 1 above illustrate the applicability requirements for each monitoring option:

(a) **Option A**. Metering;

i. Standard electrical meter;

ii. Pre-payment meter;

iii. Pay-as-you-go (Pay-Go) model under:

a. Perpetual lease financing model, or

b. Lease-to-own financing models

(b) **Option B.** Sample survey;

i. A stratified random sample survey shall be conducted only for cross-checking purposes under **Option A. Metering** (PayGo) and/or **Option D. Deemed consumption** and is required to be conducted only for energy systems that supply electricity to a consumer at levels that exceed the electricity consumption levels corresponding to suppressed demand conditions for the type of consumer in question (residential or non-residential consumer, see section 9.2.1 on guidance for estimating electricity consumption associated with suppressed demand conditions of residential and non-residential consumers).

(c) **Option C.** Distribution metering and consumer numbers;

i. Only Type II consumers served by a mini-grid or grid connection may choose to estimate consumption levels from the total metered consumption of a community/consumer group, less the sum of consumption by consumers with meters, divided by the number of operational connections, taking into account distribution losses (see paragraph 42);

(d) **Option D.** Deemed consumption.

i. As a special case, Type I consumers that are served by an individual renewable energy system may determine consumption based on the installed system capacity and an availability factor (see paragraph 113).

96. Project participants shall document how many consumers of each type will apply which option for monitoring. The template presented below (Table 7) may be used.

Table 7. Number of consumers by type and monitoring option

	Monitoring Option			
Type	**A**	**B**	**C**	**D**
I				
II				N/A*

* Option D only apply to individual renewable energy systems, which would not be used to replace a fossil fuel mini-grid

97. The applicable requirements specified in the "Standard on sampling and surveys for CDM project activities and PoAs" are also an integral part of the monitoring guidelines and therefore shall be referred to by the project participant in the case of PoAs.

15.1. Option A. Metering

98. All consumer types may use metering. However, any consumers with annual consumption greater than 1000 kWh are required to use metering.

15.1.1. Electricity meters

99. Electricity consumption can be metered using calibrated electricity meters that had been calibrated as per national standards or requirements set by the meter supplier or requirements set by the grid operators. The accuracy class of the meters should be in accordance with the stipulation of the meter supplier and/or as per the requirements set by the grid operators or national requirements. If these standards are not available, and the meter supplier does not

specify, calibrate the meters every 3 years and use the meters with at least 0.5 accuracy class (e.g. a meter with 0.2 accuracy class is more accurate and thus it is accepted).

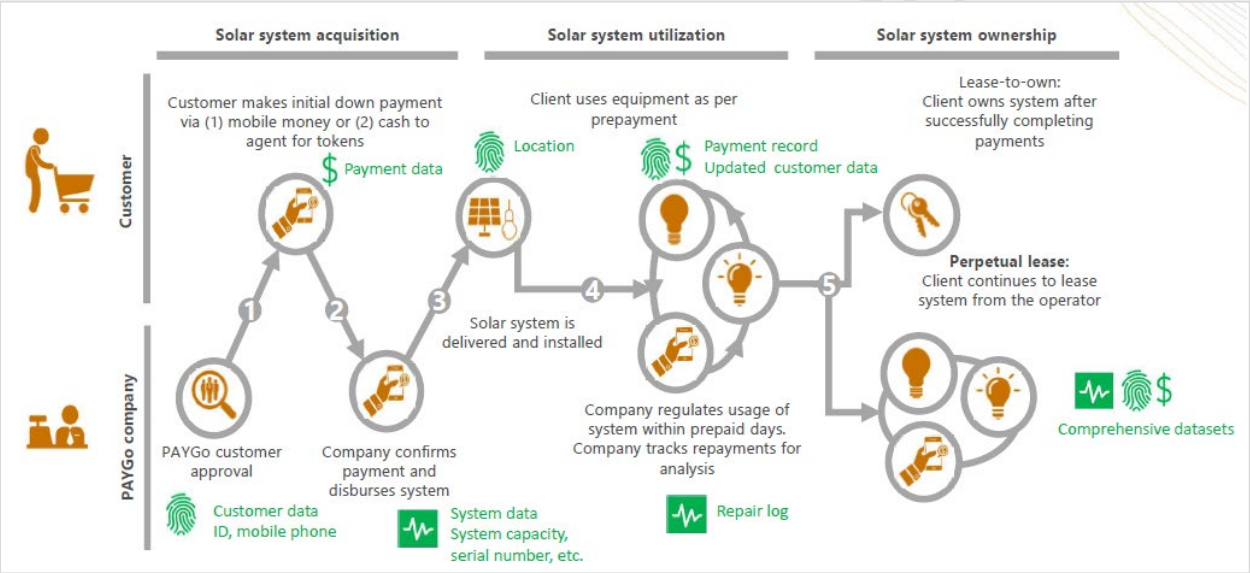
15.1.2. Pre-payment meters

100. Where pre-payment meters are used, electricity consumption will be determined from the billing records. The total electricity consumed for each consumer is the summation of the pre-paid electricity purchased during the monitoring period, excluding the last purchase during the monitoring period but including the last purchase of the previous monitoring period. Pre-payment purchases shall be substantiated by billing records from the supplier or similar documentation.

15.1.3. Pay-as-you-go (Pay-Go)

101. The Pay-as-you-go (Pay-Go) financing model for renewable energy installations, such as solar home systems, may operate under the (1) perpetual lease or (2) lease-to-own financing models illustrated in Figure 4 below. Electricity consumption under these financing models is estimated as presented in sections 10.1.3.1 and 10.1.3.2 below.

Figure 3. Pay-Go financing model



15.1.3.1. Perpetual lease

102. Under the perpetual lease model, for systems without metered data of electricity consumption, where consumers pay for the time periods of use of electricity-generating installation, such as a solar home system, is estimated based on payment records using the following equations:

Equation (27)

$$EC_{T1,TI,x,on,Installation_{ID},y} = \sum_{TI_{x,on,Installation\_ID}} TI_{x,on,Installation\_ID} \times DB_{Installation\_ID} \times AAF_{y,Installation\_ID}$$

Where:

$EC_{T1,TI,x,on,Installation}$ = Annual electricity consumption of Type I consumer *x* powered by the system with Installation_ID during all time intervals $TI_{x,on,Installation\_ID}$ in year *y* (MWh)

$TI_{x,on,Installation\_ID}$	Time interval, during which the system with Installation_ID remains operational following an instalment payment (days)
$DB_{Installation\_ID}$	Daily energy budget allocated to Installation_ID (MWh)
AAF_y	Average availability factor is a fraction of the daily budget actually consumed by consumer of Installation_ID (fraction)

103. Time interval (number of days), during which the electricity-generating installation with Installation_ID remains operational after the instalment payment is made, is estimated from the payment amount and price per instalment using the following equation below. This ensures that the days of operation ($TI_{x,on,Installation\_ID}$) are proportional to the payment made by directly linking financial transactions to estimated energy use.

$$TI_{x,on,Installation\_ID} = \frac{PA_{x,Installation\_ID} \times IPP_{x,Installation\_ID}}{PIP_{x,Installation\_ID}} \quad \text{Equation (28)}$$

Where:

$TI_{x,on,Installation\_ID}$	Time interval, during which the system with Installation_ID remains operational following an instalment payment (days)
$PA_{x,Installation\_ID}$	Payment amount for the system with Installation_ID (local currency)
$PIP_{x,Installation\_ID}$	Price per instalment (local currency)
$IPP_{x,Installation\_ID}$	Instalment payment period (days)

104. Baseline emissions from consumer *x* powered by the system with Installation_ID are estimated using the equation below:

$$BE_{T1,TIy,on} = \sum_{x=1}^{N} \left(EC_{T1,TI,x,on,Installation_{ID},y} \times EF_{CO2,x} \right) \quad \text{Equation (29)}$$

Where:

$BE_{T1,TIy,on}$	=	Baseline emission from Type I consumer *x* powered by the energy system with Installation_ID during all time intervals $TI_{x,on,Installation\_ID}$ in year *y* (tCO_2)
$EC_{T1,TI,x,on,Installation_{ID},y}$	=	Annual electricity consumption of Type I consumer x powered by the system with Installation_ID during all time intervals $TI_{x,on,Installation\_ID}$ in year *y* (MWh)
$EF_{CO2,x}$	=	A conservative default emission factor value of 0.8 as specified in Table 1 of TOOL33 based on the diesel generator (tCO_2/MWh)

105. If there are more than one type of the renewable electricity system with different system characteristics, then calculations for different systems shall be performed separately. The following parameters may be considered in order to define system characteristics:

(a) The system is an off-grid or water pumping system;

(b) The system is with or without battery;

(c) The system includes or excludes inverters;

(d) Type of solar panel (e.g. monocrystalline silicon, polycrystalline silicon and thin films);

(e) Type of solar tracking device (e.g. fixed, one-axis, two-axis, azimuth);

(f) Type of control method, orientation and slope (i.e., maximum power point tracker vs. clamped degrees above horizontal for the slope, azimuth of solar panel in degrees from due South);

15.1.3.2. Lease-to-own

106. Electricity consumption under the lease-to-own model is estimated for the total period not longer than the lifetime of the system as follows:

(a) For the periods when the customer does not own the system and makes installement payments to consume electricity generated by the installation, electricity is estimated in accordance with equations 11, 12 and 13 using the same approach as for the perpetual lease model described in Section 15.1.3.1 above.

(b) For the periods starting from the time when the customer successfully completed the installment payments and the ownership of the system is transferred to the customer, electricity consumption is estimated as the minimum of the following:

(i) The estimate of the average electricity consumption in the most recent three years of the operation of the system prior to the transfer of the ownership of the system to the customer. If the ownership of the system has been transferred to the customer earlier than the three years of lease of the system elapsed, the average electricity consumption of the lease period of the system shall be estimated. The average electricity consumption estimates are conducted in accordance with with the procedures and equations 11, 12 and 13 for the the perpetual lease model described in Section 15.1.3.1 above;

(ii) Estimate of the deemed electricity generation in accordance with Option D2 of the **Option 2. Deemed consumption** described in Section 15.4 below.

15.2. Option B. Sample survey

107. A sample survey may be undertaken for all consumer types with consumption less than 1000kWh to determine their average consumption. Where there are sub-groups within this consumer type that are likely to have different consumption levels (e.g. due to specified service levels, load limits, or other connection controls or sizes), the sampling should be stratified for each sub-group. The sample survey should follow the “Standard on sampling and surveys for CDM project activities and PoAs”. The share of connections that are operational are determined using the same approach as outlined in paragraph 115 for individual renewable energy systems.

108. A stratified random sample survey shall be conducted only for cross-checking purposes under **Option A. Metering** (PayGo) and/or **Option D. Deemed consumption** and is required to be conducted only for energy systems that supply electricity to a consumer at levels that exceed the electricity consumption levels corresponding to suppressed demand conditions for the type of consumer in question (residential or non-residential consumer, see section 9.2.1 on guidance for estimating electricity consumption associated with suppressed demand conditions of residential and non-residential consumers). A stratified random sample survey shall be conducted in an electronic form in order to cross-check the capacity utilization factor (a fraction of the allocated daily budget that is actually consumed by a consumer) for the energy system.

109. For energy systems supplying electricity to a consumer at levels equal to or below the electricity consumption levels corresponding to suppressed demand conditions for the type of consumer in question (residential or non-residential consumer, see section 9.2.1 on guidance

for estimating electricity consumption associated with suppressed demand conditions of residential and non-residential consumers), the capacity utilization factor of such an energy system is assumed to be equal to 100 per cent and no survey is required to be conducted in this case. This means that the full daily energy budget is assumed to be fully consumed by the consumer of electricity supplied by the energy system at the level equal to or below the electricity consumption levels corresponding to suppressed demand conditions.

110. All data collected via the sampling survey shall be collected in an electronic form and recorded in the the central digital data storage facility where data are directly uploaded and processed by the "data processing and analytics system". The "data processing and analytics system" includes algorithms for data conversion and analysis in compliance with the methodology, enabling a repeatable process for generation and sharing of monitoring reports. The "data processing and analytics system" should also have an inbuilt quality assurance/ quality control mechanism for detection of outliers/ missing data/ sensors malfunction

15.3. Option C. Distribution metering and consumer numbers

111. Type I consumers that are served by a mini-grid or grid connection (may choose to estimate consumption levels from the total metered consumption of a community/consumer group, less the sum of consumption by other consumer types, divided by the number of operational connections, taking into consideration distribution losses. The calculation for this is shown in paragraph 42 and the relevant monitoring parameters are included below.[13] The share of connections that are operational are determined using the same approach as outlined in paragraph 115 for individual renewable energy systems.

15.4. Option D. Deemed consumption

112. This option may only be used by Type I consumers who, under the project activity, are served by individual energy systems that use only renewable energy. The consumption is calculated as the installed capacity of the project renewable energy generation systems multiplied by an annual average value for availability/capacity factor.[14]

15.4.1. Solar photovoltaic individual electricity systems

113. For solar photovoltaic electricity systems, the annual average value for availability can be obtained through following options[15]:

(a) **Option D1**: Assume a conservative default value of twelve per cent (12 per cent) for the annual average value for availability;[16]

(b) **Option D2:** Calculate the annual average value for availability based on local site conditions and system characteristics. "RETScreen® International Photovoltaic Project Model" included in the "RETScreen Clean Energy Project Analysis Software"[17] may be used as below:

(i) Complete the "Energy Model and Solar Resource & System Load" worksheet;

(ii) For the cells where "user inputs" are required and where online databases are provided (e.g. weather database), the latter may be used as sources for the input to the cells;

[13] For example, in a mini-grid with 100 households, where 10 households have meters and consume 200 kWh/year, total mini-grid output of 8000 kWh/year, and default distribution losses of 10%, the average consumption of the households without meters would be ((8000 x (1 – 0.1)) – (10 x 200))/(100-10) = 57 kWh/yr.

[14] This assumes that all of the renewable energy that is produced will be consumed by the facility.

[15] Availability factors for other renewable energy systems may be proposed following the procedures for request for revision of GCC methodologies.

[16] For example, a 15 Wp Solar Home System would deliver 15.77 kWh annually (0.015 x 8760 x 0.12).

[17] Publicly available at http://www.retscreen.net/ang/home.php. Other similar software may be proposed for inclusion following the procedures for a revision of a GCC methodology.

(iii) If the annual solar radiation[18] (MWh/m^2/year) in the sites of the project activity or the component project activity vary significantly (i.e. greater than +/-10 per cent variation) then:

a. Perform the calculation for the site receiving the least amount of annual solar radiation; or

b. Perform the calculation for a representative selection of sites and take the weighted average value;

(iv) If there is more than one type of project electricity generation system i.e. the system characteristics of the project systems differ, then perform the calculations separately for each type of system and take the weighted average value. The following parameters may be considered for defining the system characteristics:

a. The system is an off-grid or water pumping system;

b. System is with or without battery backup;

c. System includes or excludes inverters;

d. Type of solar panel when more than one type of solar panel is used (e.g. monocrystalline silicon, polycrystalline silicon and thin films);

e. Type of tracking device when more than one type of solar tracking devices are used (i.e. fixed, one-axis, two-axis, azimuth);

f. Type of control method, orientation and slope (i.e. maximum power point tracker vs clamped degrees above horizontal for the slope, azimuth of solar panel in degrees from due South);

g. Assume a value of 10% loss for the miscellaneous losses;

(c) **Option D3**: Source the annual average value for availability from the project feasibility report (e.g. provided by the manufacturer/supplier of the system) when it includes the calculations for estimating the output from the system (i.e. weather data used, system characteristics and losses assumed are described).

15.4.2. Wind Energy Systems

2. For individual wind energy systems, the annual average value for capacity factor can be obtained through the following options:

(a) **Option D1**: Assume a conservative default value of x per cent for the capacity factor;

(b) **Option D2:** Calculate the annual average value for capacity factor based on local site conditions and system characteristics “RETScreen® Wind Energy Model” included in the “RETScreen Clean Energy Project Analysis Software”[19] may be used

(c) **Option D3**: Source the annual average value for capacity factor from the project feasibility report (e.g. provided by the manufacturer/supplier of the system) when it includes the calculations for estimating the output from the system (i.e. wind speed data used, system characteristics and losses assumed are described).

15.4.3. Number of operating renewable electricity generation systems

114. The number of operating renewable electricity generation systems is determined on a sample basis either annually choosing 90/10 confidence/precision or biennially choosing 95/10

[18] If the solar radiation values are available for each month it may be annualized by taking the average for 12 months.

[19] Publicly available at http://www.retscreen.net/ang/home.php. Other similar software may be proposed for inclusion following the procedures for a revision of a GCC methodology.

confidence/precision for the sample size estimation following the requirements under "Standard on sampling and surveys for CDM project activities and PoAs". This monitored value determines N/P (number of consumers) in equations (1), (3), (4), and (5). Renewable electricity generation systems can be counted as operating only if they can be shown to be able to produce electricity by means of one of the following:

(a) The manufacturer's warranty; or

(b) Regular maintenance arrangement (e.g. with suppliers/distributors/ implementers); or

(c) Showing that the systems are procured following the standards/guidelines (local/national/international) to ensure that the systems are of adequate quality and provide the required performance; or

(d) By direct monitoring of systems, if necessary on sample basis.

115. In the absence of this demonstration, the system capacity shall be de-rated following manufacturers guidelines or as per relevant international standards/guidelines.

15.5. Monitoring of suppressed demand conditions

116. For each individual consumer or consumer sub-group, for which electricity consumption levels were determined *ex-post* under Step 2 in section 9.1.2 above, the following data shall be collected at the beginning of each crediting period and used for estimating downward adjusted baseline emissions in the corresponding crediting period in line with requirements stipulated in section 9.2:

(a) If electricity consumption is estimated per individual consumer: number of persons per individual consumer;

(b) If electricity consumption is estimated per sub-group of consumers: the number of consumers belonging to the sub-group and the number of persons per individual consumer belonging to this sub-group;

(c) The difference between the annual electricity consumption in year *y* of an individual consumer or consumer sub-group and the annual electricity consumption corresponding to the suppressed demand conditions; if the difference is greater than zero, guidance for estimating downward adjusted baseline emissions stipulated in section 9.2 shall be applied.

15.6. Data parameters that are monitored

Data / Parameter table 1.

Data / Parameter:	$EC_{T1,x,y}$, $EC_{T2,z,y}$
Data unit:	MWh
Description:	Electricity consumption at each Type I or II consumer
Source of data:	-
Measurement procedures (if any):	Option A - electricity meters, pre-payment meters or PayGO. For electricity meters, the difference between the meter reading at the end of the monitoring period and the start of the period. Option B - sample survey, as per paragraph 108. A stratified random sample survey shall be conducted only for cross-checking purposes under Option A. Metering (PayGo) and/or Option D. Deemed consumption and is required to be conducted only for energy systems that supply electricity to a consumer at levels that exceed the electricity consumption levels corresponding to suppressed demand conditions for the type of consumer in question (residential or non-residential consumer, see section 9.2.1 on guidance for estimating electricity consumption associated with suppressed demand conditions of residential and non-residential consumers). A stratified random sample survey shall be conducted in an electronic form in order to cross-check the capacity utilization factor (a fraction of the allocated daily budget that is actually consumed by a consumer) for the energy system. Option D - recording of capacity at installation, based on manufacturer's specifications. Deemed consumption will be estimated as described in paragraphs 113, 115, and 116. Annual/biennial checks that individual systems are still working, done with a statistically significant sample of consumers. Use 90/10 and 95/10 precision for annual and biennial checks, respectively
Monitoring frequency:	Option A - continuous, with annual reporting. Option B - sample survey to be conducted in first year after installation and repeated at least every 24 months. Option D - once at installation (proportion of operational systems would still need to be monitored as per data /parameter table 2 below)
QA/QC procedures:	-
Any comment:	Only used for monitoring option A, option B and option D. Options C is not included because it is calculated from other parameters

Data / Parameter table 2.

Data / Parameter:	**Proportion of operational systems and connections**
Data unit:	No units
Description:	Check for continued operation or access to the grid or mini-grid
Source of data:	-
Measurement procedures (if any):	Annual/biennial checks that individual systems and connections to the grid or mini-grid are still working, by taking a statistically significant sample of consumers. Use 90/10 and 95/10 precision for annual and biennial checks, respectively. When a consumer has a meter, these readings may be used in place of on-site checks
Monitoring frequency:	Annual/biennial

QA/QC procedures:	-
Any comment:	Only used for individual energy systems applying monitoring Option D and mini-grid and grid connections applying Options B or C

Data / Parameter table 3.

Data / Parameter:	$EG_{diesel,y}$
Data unit:	MWh
Description:	Generation at individual systems from diesel
Source of data:	-
Measurement procedures (if any):	For units larger than 750 kW, electricity meters are required. For units below 750 kW, generation may be estimated from the design specific fuel consumption and the quantity of diesel consumed
Monitoring frequency:	Continuous, with monthly recording and annual reporting or using fuel purchase/invoices
QA/QC procedures:	Calibration according to manufacturer's specifications if system capacities are larger than 750 kW or following local regulatory requirements
Any comment:	Refer to the TOOL03 Used for project emissions from hybrid energy systems

Data / Parameter table 4.

Data / Parameter:	$ES_{tot,y}$
Data unit:	MWh
Description:	Total electricity supply to all consumers
Source of data:	-
Measurement procedures (if any):	Measured using an electricity meter at the main point of supply (e.g. sub-station serving a community)
Monitoring frequency:	Continuous, with monthly recording and annual reporting
QA/QC procedures:	Calibration according to manufacturer's specifications or following local regulatory requirements
Any comment:	Only used when Option C for monitoring mini-grid and grid consumers is applied

Appendix I. Detailed classification of consumers

Table 1. Alternative technology and baseline combinations for stand-alone, facility scale power systems

Existing supply	Project supply technology	Baseline	Consumer Type	Project emissions
None	New RE system	Diesel generator	I	Diesel generation in hybrid system; No RE emissions unless hydro or geothermal under conditions in AMS-I.D.
	New hybrid system	Diesel generator	I	
Non-operational RE	Rehabilitate RE system	Diesel generator	I	
Fossil system	Replace with RE system	Diesel generator	I	
	Supplement/expand with RE system (hybridise)	Diesel generator	I	

Note: RE= renewable energy; Non-operational RE includes both individual systems and plants serving a mini-grid

Table 2. Alternative technology and baseline combinations for mini-grid projects

Hybrid Mini-grid?	Existing Supply	Project supply technology	Connections/ consumers	Baseline	Consumer type	Project emissions
Yes	None	New hybrid mini-grid	All new	Diesel generator	I	Diesel generation in hybrid MG; no RE emissions unless hydro or geothermal under conditions in AMS-I.D.
	Non-operational hybrid mini-grid	Rehabilitate RE plant of the mini-grid	Existing	Diesel generator	I	
			New	Diesel generator	I	
	Operational fossil mini-grid	New RE plant displace some fossil in the mini-grid	Existing	Fossil mini-grid	II	
			New	Diesel generator	I	
	Individual fossil or hybrid energy systems	New hybrid mini-grid	Existing	Diesel generator	I	
No	None	New RE mini-grid	All new	Diesel generator	I	
	Non-operational RE mini-grid	Rehabilitate RE plant of the mini-grid	Existing	Diesel generator	I	
			New	Diesel generator	I	
	Operational fossil mini-grid	New RE plant displace all fossil in the mini-grid	Existing	Fossil mini-grid	II	
			New	Diesel generator	I	

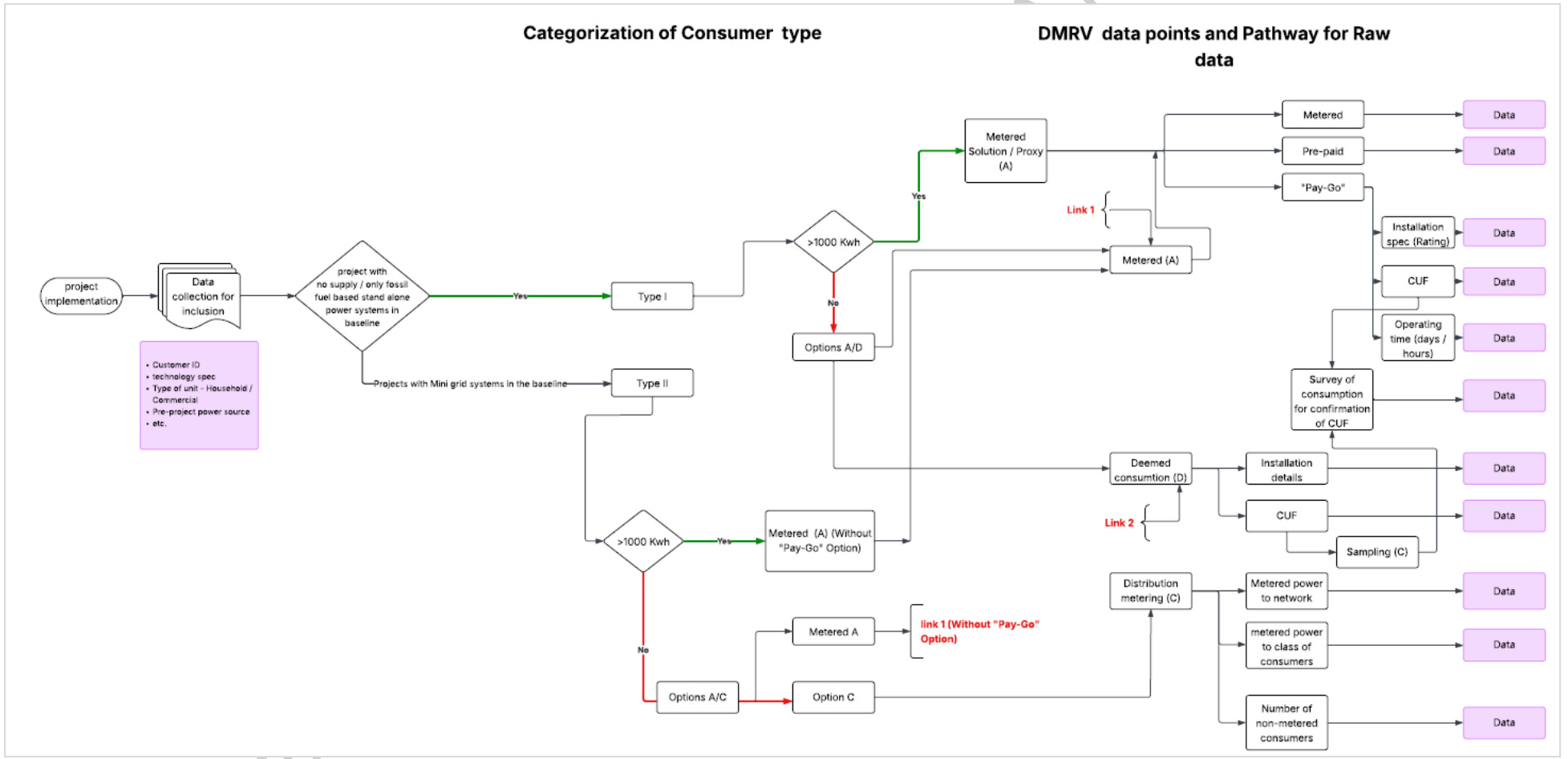
Hybrid Mini-grid?	Existing Supply	Project supply technology	Connections/ consumers	Baseline	Consumer type	Project emissions
	Individual fossil or hybrid energy systems	New RE mini-grid	Existing	Diesel generator	I	

Note: RE = renewable energy, MG= Mini Grid

Table 3. Alternative technology and baseline combinations for grid extension projects

Existing supply	Project supply technology	Connections/ consumers	Baseline	Consumer type	Project emissions
None	Grid	All new	Diesel generator	I	National/ regional grid EF
Operational fossil MG	Grid	Existing	Fossil MG EF	II	
		New	Diesel generator	I	
Operational hybrid MG	Grid	Existing	Hybrid MG EF	II	
		New	Diesel generator	I	
Individual fossil or hybrid energy systems	Grid	Existing	Diesel generator	I	

Appendix II. Digital MRV data points and pathways for data collection



Appendix III. Survey and Sampling Requirements

15.7. General guidance

117. A stratified random sample survey shall be conducted only for cross-checking purposes under **Option A. Metering** (PayGo) and/or **Option D. Deemed consumption** and is required to be conducted only for energy systems that supply electricity to a consumer at levels that exceed the electricity consumption levels corresponding to suppressed demand conditions for the type of consumer in question (residential or non-residential consumer, see section 9.2.1 on guidance for estimating electricity consumption associated with suppressed demand conditions of residential and non-residential consumers). A stratified random sample survey shall be conducted in an electronic form in order to cross-check the capacity utilization factor (a fraction of the allocated daily budget that is actually consumed by a consumer) for the energy system.

118. For energy systems supplying electricity to a consumer at levels equal to or below the electricity consumption levels corresponding to suppressed demand conditions for the type of consumer in question (residential or non-residential consumer, see section 9.2.1 on guidance for estimating electricity consumption associated with suppressed demand conditions of residential and non-residential consumers), the capacity utilization factor of such an energy system is assumed to be equal to 100 per cent and no survey is required to be conducted in this case. This means that the full daily energy budget is assumed to be fully consumed by the consumer of electricity supplied by the energy system at the level equal to or below the electricity consumption levels corresponding to suppressed demand conditions.

119. All data collected via the sampling survey shall be collected in an electronic form and recorded in the central digital data storage facility where data are directly uploaded and processed by the “data processing and analytics system”. The “data processing and analytics system” includes algorithms for data conversion and analysis in compliance with the methodology, enabling a repeatable process for generation and sharing of monitoring reports. The “data processing and analytics system” should also have an inbuilt quality assurance/ quality control mechanism for detection of outliers/ missing data/ sensors malfunction. The information shall be obtained through the face-to-face survey. Each surveyor shall carry out the number of established surveys.

120. Photos of surveyed equipment (such as missing or worn out equipment of renewable electricity generation system that will be rehabilitated via the project activity) may be collected and, to provide supporting evidence for collected data, uploaded in the central digital data storage facility where data are directly uploaded and processed by the “data processing and analytics system”.

121. The survey shall be conducted by a company with a minimum of three years of experience in comparable surveys in the respective country or region to ensure a professional survey implementation.

122. The sampling plan with a description of the sampling approach, important assumptions, and justification for the chosen approach, shall be included in the Project Submission Form and the Project Monitoring Report.

123. The following levels of confidence and precision shall be applied as the criteria for reliability of sampling efforts:

    (a) For parameter values collected via sampling on an annual basis, the 90/10 confidence/precision levels shall be achieved;

    (b) For parameter values collected via sampling on a biennial basis, the 95/10 confidence/precision levels shall be achieved.

2. These reliability specifications shall be applied to determine the sampling requirements for each individual parameter value determined through a sampling effort. The reliability of a

sample-based estimate depends on both the numerical size of the sample and the variability associated with the parameter of interest. The larger the sample size, the greater the reliability, whereas the relationship with the variability is the opposite, that is, the more variable the parameter, the less reliable the estimate. If a parameter has a large amount of variability, increasing the sample size will help to increase the reliability. An assessment of the variability will also deliver information on the need for stratification (see section 15.9 Sample design). If there is more than one parameter value to be estimated in a project via the sampling, then a sample size calculation should be done for each of them. Then either the largest number for the sample size is chosen for the sampling effort with one common survey, or the sampling effort and survey is repeated for each of the parameters. A random sub-sample within the common survey is allowed as long as: (i) the reliability specification (e.g. 90/10 confidence/precision for parameter values collected via sampling on an annual basis and 95/10 for parameter values collected via sampling on an biennial basis) is achieved for each individual parameter; and (ii) the random sub-sample is consistent with the design of the survey and the corresponding sample size calculation.

15.8. Sample size

3. When developing a sampling plan, the project participants shall calculate the sample size required to achieve a required level of reliability. The sample size should be determined manually or using appropriate statistical software, taking into account the target level of confidence and the precision (e.g. 90/10 or 95/10). The CDM Sample Size Calculator[20] may be used for the calculation of the sample size.

15.9. Sample design

4. The two-stage probabilistic design shall be applied to the sample design:

   (a) **First stage:** Stratified – Simple Random Sampling (SRS);

      (i) **Main strata:** Type of consumers (e.g., Type I or II) with expected annual electricity consumption at levels that exceed the electricity consumption levels corresponding to suppressed demand conditions for the type of consumer in question (residential or non-residential consumer, see section 9.2.1 on guidance for estimating electricity consumption associated with suppressed demand conditions of residential and non-residential consumers) and utilizing **Option A. Metering** (PayGo) and/or **Option D. Deemed consumption**;

      (ii) **Sub-strata:** Within a given consumer type, a sub-group of consumers (e.g, end-user(s)/facility(ies) that may include households, public buildings, and/or small, medium, and micro enterprises (SMMEs)) with a similar connection size (e.g., size of renewable energy system, load limit on connection or other connection limitation) and likely to have a similar consumption level. Sub-group is used as a sub-strata for stratified random sampling;

   (b) **Second stage:** Systematic sampling of consumers in the selected sub-strata.

5. Coverage:

   (a) The end-use consumers served by the project activity and relevant power plants included the project boundary (see section 6 Project Boundary);

6. Selection of consumers for sampling:

   (a) The selection of consumers within main strata (consumer Type) and consumer sub-group belonging to the consumer Type shall be conducted in accordance with a Simple Random Sampling design.

[20] CDM Sample Size Calculator available at: https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fcdm.unfccc.int%2Fsunsetcms%2Fstorage%2Fcontents%2Fstored-file-20150813144045237%2FMeth_guid48Calculator.xlsx&wdOrigin=BROWSELINK

Appendix IV. General guidance for data collection

15.10. Unique identification details for each renewable energy installation

124. For each renewable energy installation, the following data and parameters need to be collected in order to have a record of every unique installation, and enable the linking of electricity production and emission reductions to each particular installation:

(a) A unique identifier for the specific renewable energy system deployed;

(b) A unique identifier for the specific individual or household making use of the deployed system. The User ID can make use of one or multiple deployed systems (e.g. one user of multiple SHS or pico devices), or multiple User IDs can make use of the same Installation ID (e.g. many users of the same mini grid)

(c) Date, DD/MM/YYYY, at which the renewable energy system is installed by the distributor or project developer

(d) Precise GPS coordinates of the location where a specific renewable energy system is deployed by the distributor or project developer

(e) The category of connection refers to the type of user (e.g., residential (household) and non-residential (e.g., business, public institution).

(f) Type of productive use of energy - classifying how energy supports activities that generate economic value, such as agricultural processing, domestic energy use in households, or public services (e.g., hospitals, schools). It helps evaluate the impact of energy use on sustainable development co-benefits.

Data / Parameter Table 5.

Data / Parameter:	Installation_ID
Data unit:	SKU NUM
Description:	The Installation ID is a unique identifier for the specific renewable energy solution deployed. It can be a stand-alone system with a single device, or a complex system with multiple devices, e.g. a mini-grid.
Source of data:	Project activity site
Measurement procedures (if any):	Static reading (one-off)
Quality Procedure, if any:	
Any comment:	Having a record of every unique installation, and being able to link energy production and emission reduction to each particular installation ID, via a single or multiple Meter IDs, or Payment IDs. Used to populate the database of deployed installations in the central digital data storage facility where data are directly uploaded and processed by the “data processing and analytics system”. All ongoing measurements done by associated meter IDs or through proxies , e.g. payments, are referenced to the particular installation ID to which they are attributed.

Data / Parameter Table 6.

Data / Parameter:	User_ID
Data unit:	

Description:	The User ID is a unique identifier for the specific individual or household making use of the deployed system. The User ID can make use of one or multiple deployed systems (e.g. one user of multiple SHS or pico devices), or multiple User IDs can make use of the same Installation ID (e.g. many users of the same mini grid).
Source of data:	Project activity site
Measurement procedures (if any):	Static reading (one-off)
Quality Procedure, if any:	
Any comment:	Having a record of every unique user, and being able to link installation IDs, energy production and emission reduction to each particular User ID. The measurement is linked to the associated Installation ID in the central digital data storage facility where data are directly uploaded and processed by the "data processing and analytics system".

Data / Parameter Table 7.

Data / Parameter:	Date_of_connection
Data unit:	Date, DD/MM/YYYY
Description:	Date at which the renewable energy system is installed by the distributor or project developer
Source of data:	Project activity site
Measurement procedures (if any):	Static reading (one-off)
Quality Procedure, if any:	
Any comment:	Serves as a design safeguard ensuring that ACCs (carbon credits) cannot be issued prior to the date of connection. Serves as a cut-off date for crediting activities once the end of the issuing period is reached.

Data / Parameter Table 8.

Data / Parameter:	Location_GPS_coordinates
Data unit:	Number (Latitude, Longitude coordinates)
Description:	Precise GPS coordinates of the location where a specific installation ID is deployed by the distributor or project developer
Source of data:	Project activity site
Measurement procedures (if any):	Static reading (one-off)
Quality Procedure, if any:	
Any comment:	Recorded as coordinates or as geohashes of various precision depending on privacy requirements. Used to add geographical anchoring to the installation IDs registered in the central digital data storage facility where data are directly uploaded and processed by the "data processing and analytics system". All ongoing measured activities (energy production/ emission reduction/ payments) are referenced to the particular location to which it is associated. Ensuring compliance with the geographical boundary of the carbon crediting activity

Data / Parameter Table 9.

Data / Parameter:	Category_of_connection
Data unit:	Category (e.g., residential (household) or non-residential (business, public institution)
Description:	The category of connection refers to the type of user (e.g., residential (household) or non-residential (business, public institution)
Source of data:	Project activity site
Measurement procedures (if any):	Static reading (one-off)
Quality Procedure, if any:	
Any comment:	Collecting the category of connection serves two purposes: firstly, to ensure that the thresholds specified by the methodology are not exceeded, and secondly, to provide data that can be used for estimating suppressed demand conditions and estimating co-benefit metrics.

Data / Parameter Table 10.

Data / Parameter:	Type_of_PUE
Data unit:	Category
Description:	The "type of productive use of energy" category classifies how energy supports activities that generate economic value, such as agricultural processing, domestic energy use in households, or public services (e.g., hospitals, schools). It helps evaluate the impact of energy use on sustainable development co-benefits.
Source of data:	Project activity site
Measurement procedures (if any):	Static reading (one-off)
Quality Procedure, if any:	
Any comment:	The type of "type of productive use of energy" (PUE) is collected for methodological purposes to help evaluate the impact of energy used on sustainable development co-benefits.

15.11. Additional information for solar home systems

(a) Location

(b) Contact details (name, organization, name of the village/suburbs, phone number) of the end-user in case the technology requires maintenance, is moved to another address or transferred to another owner;

(c) Date of installation

(d) Type of user (residential (household) or non-residential (SMME/public institution/public lighting)

(e) Capacity of the system and technical details:

(i) Distinguish average capacity such as 70, 90, 170 and 375 Wpeak. The SHS package type (such as SHS with 12V batteries, charge regulator, and DC

compact fluorescent lamps (CFLs). For the largest systems (i.e. 375W), an inverter and AC bulbs)

(ii) Battery storage;

(iii) Details of connected load (household appliances with wattage and hour of use to calculate Capacity Utilization Factor)

(f) Warranty information of the system

15.12. Additional information for new and existing connections to hybrid mini grids and grid extension

(g) GPS Coordinates

(h) Contact details (name, organization, phone number) of the end-user in case the technology requires maintenance, is moved to another address or transferred to another owner

(i) Date of connection

(j) Type of user (residential (household) or non-residential (SME/public institution/public lighting)

(k) Load limit on the connection, where applicable

(l) Capacity and load factor of back-up diesel generator, where applicable;

15.13. Additional information for solar lanterns

(a) Date of sale;

(b) Type of lamp;

(c) Type of charging mechanism;

15.14. Data and parameters for monitoring suppressed demand

125. For each individual consumer or consumer sub-group, for which electricity consumption levels were determined *ex-post* under Step 2 in section 9.1.2 above, the following data shall be collected via survey and electronically recorded in the central digital data storage facility (where data are directly uploaded and processed by the "data processing and analytics system") at the beginning of each crediting period and used for estimating downward adjusted baseline emissions in the corresponding crediting period in line with requirements stipulated in section 9.2:

(a) If electricity consumption is estimated per individual consumer: number of persons per individual consumer;

(b) If electricity consumption is estimated per sub-group of consumers: the number of consumers belonging to the sub-group and the number of persons per individual consumer belonging to this sub-group;

126. The difference between the annual electricity consumption in year *y* of an individual consumer or consumer sub-group and the annual electricity consumption corresponding to the suppressed demand conditions; if the difference is greater than zero, guidance for estimating downward adjusted baseline emissions stipulated in section 9.2 shall be applied.

(a) Residential consumer (household):

(b) Number of persons per household;

(c) Non-residential consumer:

(i) Public buildings:

a. Schools;

i. Number of persons per school;

b. Hospitals;

i. Number of persons served by hospital;

c. Other (specify);

i. Number of persons per public building type *n*;

(ii) Small, medium, and micro enterprises (SMMEs)

a. SMME type 1;

i. Number of persons per SMME type 1;

b. SMME type 2;

i. Number of persons per SMME type 2;

c. SMME type n;

i. Number of persons per SMME type *n*;

(iii) Water pumping

a. Number of persons served by the water pumping system;

(iv) Public lighting

a. Number of persons served by the public lighting system;

Data / Parameter Table 11.

Data / Parameter:	**Number of persons per consumer**
Data unit:	Persons/consumer
Description:	1. If electricity consumption is estimated per individual consumer: number of persons per individual consumer; 2. If electricity consumption is estimated per sub-group of consumers: the number of consumers belonging to the sub-group and the number of persons per individual consumer belonging to this sub-group; Number of persons per consumer shall be collected for each consumer served by the project activity. Consumers shall be distinguished into consumer Type I and Type II consumers, and further disaggregated into residential and non-residential consumers. Non-residential consumers shall be further disaggregated into different consumer types (public building types, SMMEs, water pumping, public lighting), as stipulated in paragraph 142.
Source of data	Project activity site
Measurement procedures (if any):	
Monitoring frequency:	Once, at the inclusion of a consumer into the project activity, updated at the renewal of the crediting period.
Quality Procedures, if any.	
Any comment:	

15.15. Proxy parameters if metering data is not available

Data / Parameter Table 12

Data / Parameter:	**Battery_capacity**
Data unit:	Wh / day
Description:	Battery capacity is the maximum energy available in the battery of a solar system once fully charged through PV. Used to calculate the daily energy consumption by the users of a system assuming a certain utilization rate, e.g number or fraction of a full charging cycle The Battery capacity in Wh/day is recorded in the central digital data storage facility where data are directly uploaded and processed by the "data processing and analytics system", where it is used for determining the emission reductions resulting from proxy-derived usage intervals, e.g. payments, which unlock usage (PAYGO)
Source of data	The CRM system The Verasol database
Measurement procedures (if any):	
Monitoring frequency:	
Quality Procedures, if any.	
Any comment:	

Data / Parameter Table 13

Data / Parameter:	**Payment_ID**
Data unit:	
Description:	The Payment ID is the unique identifier of a single payment made for the purchase of a solar system through a payment/CRM/last mile monitoring system. The Payment ID is associated with a specific Payment amount, a specific User ID, and a specific Installation ID. The payment ID is used to keep a unique record of every single payment made by a specific User for the unlocking of a specific Installation ID for a specific time period. The Payment ID records, each with an associated payment amount, are the IDs to which the specific emission reduction units will be associated in the central digital data storage facility where data are directly uploaded and processed by the "data processing and analytics system" (similarly to emission reduction units being associated to energy consumption intervals in projects where energy metering is possible).
Source of data	The CRM system
Measurement procedures (if any):	
Monitoring frequency:	
Quality Procedures, if any.	
Any comment:	

Data / Parameter Table 14

Data / Parameter:	**Payment_amount**
Data unit:	Number (currency)
Description:	The Payment amount is the specific amount of money paid by a User ID to unlock the purchased renewable energy system for a given period of time. It is the monetary value of a Payment ID. The purpose of the Payment amount is to act as a measurable proxy for the energy consumption during the time period that the payment affords. The Payment amount is used to calculate the renewable energy consumed, and the achieved emission reduction for the time period that is unlocked by the Payment amount
Source of data	The CRM system
Measurement procedures (if any):	
Monitoring frequency:	
Quality Procedures, if any.	
Any comment:	

Data / Parameter Table 15

Data / Parameter:	**Payment_group_table**
Data unit:	Multiple units: W, Wh, PRICE NUM
Description:	The payment group table is a reference table that summarizes relevant product and pricing parameters for the RE systems sold by a given distributor/ project developer. The table can list the following elements: names of particular RE products sold, PV panel size for each product, Battery capacity/ daily energy allowance for each product, included appliances if applicable, and payment tranche price for each product (e.g. price/month). The payment group table is used to determine the energy consumption of the RE system per specific Payment ID/Payment amount. The payment group table is a static and updatable file that is used to reference specific payments up against. The payment group table can either be: 1) extracted from the CRM system of the distributor/ project developer, and recorded in the central digital data storage facility where data are directly uploaded and processed by the “data processing and analytics system”, or 2) automatically compiled within the central digital data storage facility where data are directly uploaded and processed by the “data processing and analytics system” on the basis of specific data points that are collected by the distributor/project developer and ingested into 3rd party aggregator systems.
Source of data	The CRM system
Measurement procedures (if any):	
Monitoring frequency:	
Quality Procedures, if any.	
Any comment:	

Data / Parameter Table 16

Data / Parameter:	**Days_on**
Data unit:	Number of days
Description:	"Days on" indicates the number of days the solar unit is in use for a given payment amount. Days on is used in combination with other parameters to determine the energy consumption of the RE system per specific Payment ID/Payment amount. By having the daily energy budget in Wh and the days on it is possible to compute the daily emission reductions.
Source of data	The CRM system
Measurement procedures (if any):	
Monitoring frequency:	
Quality Procedures, if any.	
Any comment:	

Data / Parameter Table 17.

Data / Parameter:	**Product_name**
Data unit:	
Description:	Product name is a unique identifier of the product bundle that has been purchased, including device type and size. The purpose of the "Product name" as a unique identifier is to clearly distinguish each product bundle. The product name information is used to identify the specific product and ensure the application of the right carbon computation is applied.
Source of data	The CRM system
Measurement procedures (if any):	
Monitoring frequency:	
Quality Procedures, if any.	
Any comment:	

Data / Parameter Table 18.

Data / Parameter:	**Product_description**
Data unit:	
Description:	The product description is the description of what the product bundle contains. The product description is a text string that elaborates the content of a given Product name, including hardware specifications, payment plan type, and possible discounts associated to the product bundle. The product description information is used to identify the specific product and ensure the application of the right emission computation is applied.
Source of data	The CRM system
Measurement procedures (if any):	

Monitoring frequency:	
Quality Procedures, if any.	
Any comment:	

Data / Parameter Table 19

Data / Parameter:	**Daily_alloted_Wh_budget**
Data unit:	Wh
Description:	The daily allotted Wh (watt-hour) budget refers to the maximum amount of energy that can be generated by the user of the solar installation per 24 hour period. The daily allotted Wh budget is used to estimate the daily amount of emission reductions. The daily allotted Wh budget is the datapoint used when calculating emission reductions.
Source of data	The CRM system
Measurement procedures (if any):	
Monitoring frequency:	
Quality Procedures, if any.	
Any comment:	

Data / Parameter Table 20.

Data / Parameter:	**Billing_model**
Data unit:	
Description:	The Billing model can either be a perpetual lease or a lease-to-own model. The billing model is used to inform the possible carbon credit issuance period. When it is a lease-to-own model, the issuance of credits stops once the installation is paid off. When the billing model is based on a perpetual lease, the issuance period is determined by the applied methodology.
Source of data	The CRM system
Measurement procedures (if any):	
Monitoring frequency:	
Quality Procedures, if any.	
Any comment:	

Data / Parameter Table 21

Data / Parameter:	**Installment_period**
Data unit:	Time interval in days
Description:	The installment payment period is the standardized time interval that a given payment plan is indicated in, e.g. 30 days. The installment_period is a proxy parameter that helps determine the time interval that a particular payment_amount unlocks for a particular installation_ID The parameter is applied in the dynamic payments-to-energy computations required to determine the energy consumption related to a specific payment_ID by the user of a given Installation_ID. This energy consumption data is in turn combined with methodology-specific emission calculations to arrive at estimated emission reductions.
Source of data	The CRM system
Measurement procedures (if any):	
Monitoring frequency:	
Quality Procedures, if any.	
Any comment:	

Data / Parameter Table 22.

Data / Parameter:	**Price_per_installment_period**
Data unit:	Number (currency)
Description:	The price per installment period is the standardized price that a given installment_payment_period is valued at in the payment plan for a given Installation_ID The price_per_installment_period is a proxy parameter that helps determine the time interval that a particular payment_amount unlocks for a particular installation_ID The parameter is applied in the dynamic payments-to-energy computations required to determine the energy consumption related to a specific payment_ID by the user of a given Installation_ID. This energy consumption data is in turn combined with methodology-specific emission calculations to estimate emission reductions.
Source of data	The CRM system
Measurement procedures (if any):	
Monitoring frequency:	
Quality Procedures, if any.	
Any comment:	

DOCUMENT HISTORY		
Version	**Date**	**Comment**
V 1.0	20/01/2026	Methodology published for the Global Stakeholder Consultation