Where:

$MSL_{ec,y}$	Minimum Service Level in energy consumption in kWh (ec) for all consumer groups in a year (y).
$MSL_{ec,i,y} \times n_i$	Minimum Service Level in energy consumption in kWh (ec) for a consumer group (i) in a year (y) times the number of units in the consumer group

BASELINE EMISSIONS

The baseline emissions are defined as the sum of the MSL for all connected consumers multiplied by an appropriate emission factor. Diesel generators are defined as the default baseline measure to deliver the MSL for all eligible consumer groups.

For both mini-grid and facility scale system, a default emission factor for a diesel generator system of 1.3 kg CO_2e/kWh[12] can be used as the basis for calculating baseline emissions.

Alternative emission factors can be proposed by the project proponent and used for calculating baseline emissions. For instance the project proponent can justify higher emission factors for diesel generator systems as proposed in the latest version of CDM Small-Scale Methodology AMS 1.F, table 1.F.1. The project proponent must provide justification for the choice of emission factor and new emission factors must be approved by The Gold Standard Foundation during the validation process of a specific project activity.

Baseline emissions for an electricity generation system shall be calculated in the following way:

$$BE_y = MIN\left(E_{d,y} \div MSL_{ec,y}; 1\right) \times \left(\left(MSL_{ec,y} \times EF\right)\right)$$

Where:

BE_y	Baseline emissions in t CO_2 for an electricity generation system in a year (y)
$E_{d,y}$	Renewable electricity in kWh delivered (d) in a year (y). $E_{d,y}$ must be based on actual monitoring (see section 6)
$MSL_{ec,y}$	Minimum Service Level in energy consumption in kWh (ec) for all consumer groups in a year (y)
EF	Default emission factor of 0.0013 t CO_2e/kWh or another approved emission factor
$MIN\left(E_{d,y} \div MSL_{ec,y}; 1\right)$	If the delivered renewable electricity in kWh (E_d) in a year (y) is higher than or equal to the Minimum Service Level for the entire electricity generation system in kWh (MSL_{ec}) in a year (y) then the (MSL_{ec}) is the maximum electricity consumption in kWh which can be credited. If the delivered renewable electricity in kWh (E_d) in a year (y) is less than the Minimum Service Level for the entire electricity generation system in kWh (MSL_{ec}) in a year (y) then the actual renewable electricity delivered in kWh (E_d) constitutes the maximum amount of electricity in kWh which can be credited.

[12] CDM Small-scale Methodology AMS I.F, table I.F.1

4. Leakage

In the case when renewable energy generating equipment is transferred from another activity, leakage is to be considered.

Also, leakage is to be considered if a consumer group, other than those eligible for this methodology are connected to the mini-grid, and they consume electricity from the generation systems, which are part of the project activity. These consumers are defined as non-eligible consumers (NEC) and could include, for instance, a hotel or a petrol station. In a renewable energy system, the estimated or measured electricity in kWh delivered to NECs shall be considered as leakage. The project proponent must therefore provide reasonable assumptions and justifications for the energy consumption for each NEC.

The first step to measure leakage emissions from NECs is to determine the total energy consumption for all NECs within the project boundary.

This is estimated as:

$$NEC_{ec,y} = \sum_{i} NEC_{ec,y,i}$$

Where:

$NEC_{ec,y}$	Total energy consumption in kWh for all NECs in a renewable energy system in a year
i	NEC (e.g. NEC 1, NEC 2, NEC 3, etc.)
y	Year
$NEC_{ec,y,i}$	Electricity consumption in kWh for a NEC, i, in a year

Two scenarios for assessing leakage emissions can occur. The first scenario is where the electricity delivered is greater than or equal to the MSL. In this scenario one of the following two equations must be used to calculate leakage emissions:

For $E_{d,y} \geq MSL_{ec,y}$:

1. If $(NEC_{ec,y} + MSL_{ec,y}) \geq E_{d,y}$ then
$$LE_y = \left((NEC_{ec,y} + MSL_{ec,y}) - E_{d,y}\right) \times EF$$

2. If $(NEC_{ec,y} + MSL_{ec,y}) < E_{d,y}$ then
$$LE_y = 0$$

In the scenario where the electricity delivered is less than the MSL then leakage emissions must be calculated by using the following equation:

$E_{d,y} < MSL_{ec,y}$ then
$$LE_y = NEC_{ec,y} \times EF$$

$E_{d,y}$	Renewable electricity in kWh delivered (E_d) in a year (y)
$MSL_{ec,y}$	Minimum Service Level in energy consumption in kWh (ec) for all consumer groups in a year (y)
$NEC_{ec,y}$	Total energy consumption in kWh for all NECs in a renewable energy system in a year
EF	Default emission factor of 0.0013 t CO_2e/kWh or another approved emission factor
LE_y	Leakage emissions (t CO_2) in a year (y)

5. Project activity emissions

The project SF_6 emissions from transformers are considered insignificant.

Project emissions are considered to be zero tonnes CO_2 each year (PEy =0) for renewable biomass, wind and solar.

However for:

1. Hydropower projects, project emissions must be considered following the procedure described in the most recent version of CDM methodology *ACM0002*[13].
2. Biogas projects, project emissions must be considered following the procedure described in the most recent version of The Gold Standard methodology *Technologies and Practices to Displace Decentralized Thermal Energy Consumption*[14] (Annex 6).

Emission reductions are calculated as:

$$ER_y = BE_y - PE_y - LE_y$$

Where:

ER_y	Emission reductions (t CO_2) during one year (y)
BE_y	Baseline emissions (t CO_2) in a year (y)
PE_y	Project emissions (t CO_2) in a year (y)
LE_y	Leakage emissions (t CO_2) in a year (y)

The total amount of emission reductions per micro-scale project activity cannot exceed 10,000 t CO_2 /year.

6. Monitoring

The monitoring is based on measuring the net renewable energy generation and the number of connected consumers for each consumer group. The monitoring of net energy generation shall be carried out on a continuous basis.

[13] ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"
[14] http://www.cdmgoldstandard.org/project-certification/gs-methodologies

The actual consumption for each consumer, including the split between different types of services for one consumer, will not be monitored.

The renewable electricity delivered to connected consumer(s) in a year is:

$$E_{d,y} = E_{m,y} \times (1 - TDL)$$

Where:

$E_{d,y}$	Renewable electricity in kWh delivered (E_d) in a year (y)
$E_{m,y}$	Measured net amount of renewable electricity in kWh produced (E_m) in a year (y) at the renewable energy generation system.
TDL	Transmission and distribution loss[15] of 10 % may be anticipated, which means that TDL = 0.1 in this case. If another or more precise TDL value can be justified it can be used in the calculation instead.

The number of connected consumers for each consumer group will be monitored.

For distributed energy generation systems such as solar photovoltaic electricity systems, estimates for the electricity delivered to the consumers are based on the installed capacity times an availability factor. Assume a twelve per cent (12%) availability for solar photovoltaic electricity systems. The number of operating renewable electricity generation systems within the project shall be determined annually and can be determined on a sample basis. To determine the sample size choose 90/10 confidence/precision following the requirements under "Standard on sampling and surveys for CDM project activities and PoAs" [16].

Whenever actual emission reductions exceed the threshold of 10,000 t CO_2/year the claimable emission reductions are capped at 10,000 t CO_2/year.

Data and Parameters monitored over the crediting period

Data / Parameter	$E_{m,y}$
Data Unit	kWh/y
Description	Measured net amount of renewable electricity produced in kWh (E_m) in a year (y) by the renewable energy generation system.
Source of data	Electricity meter(s)
Monitoring frequency	Continuous monitoring and recording at least once per month during a monitoring period
QA/QC procedures	-
Additional comment	Information for a monitoring period shall be kept until the end of the crediting period

Data / Parameter	N_i
Data Unit	Number

[15] Transmission and distribution loss refers to the electricity lost whilst traveling from the production source to the end consumers.

[16] EB 69, Annex 4 or the most recent version

Description	Number of units in a type of consumer group connected to a specific renewable energy system
Source of data	Information gathered by appointed person(s)
Monitoring frequency	Information gathered once within a monitoring period
QA/QC procedures	-
Additional comment	Information for a monitoring period shall be kept until the end of the crediting period

Data / Parameter	$NEC_{ec,y}$
Data Unit	kWh/y
Description	Measured and/or justified electricity consumption in kWh for a non-eligible consumer connected to a specific renewable energy system
Source of data	Information gathered by appointed person(s)
Monitoring frequency	Information gathered once within a monitoring period
QA/QC procedures	-
Additional comment	Information for a monitoring period shall be kept until the end of the crediting period.

7. Bundle and PoA's

Project activities can be submitted within a bundle, however the upper threshold outlined in The Gold Standard's micro-scale scheme rules applies to the bundle as a whole. Project Participants shall refer to The Gold Standard micro-programme rules for the submission of micro-scale activities under a programme.

8. Appendix 1: Assumptions for default MSL values for eligible consumer groups

Household			
Definition, description and assumptions:	Type of Service	Number	Operation hours/day
A domestic unit consisting of the members of a family who live together. The assumption is that a household consists of 6 family members and often 5 rooms.	Indoor light	3	5
	Radio	1	2
	Cell Phone	2	24
	Refrigerator	1	24
	Fan	3	5

Health Center			
Definition, description and assumptions:	Type of Service	Number	Operation hours/day
A center with a possibility for minor surgery and operations. The center also dispenses medications and medical supplies. The size of a health center can vary, but at least 5 rooms are expected and at least 5 employees.	Indoor light	5	12
	Outdoor light	2	12
	Radio	1	2
	Cell Phone	4	24
	Fan	5	12
	Refrigerator	1	24

Dispensary			
Definition, description and assumptions:	Type of Service	Number	Operation hours/day
An office that dispenses medications and medical supplies. Often 2 rooms and at least 1 employee.	Indoor light	2	12
	Outdoor light	1	12
	Radio	1	2
	Cell Phone	1	24
	Fan	2	12
	Refrigerator	1	24

School			
Definition, description and assumptions:	Type of Service	Number	Operation hours/day
A school is an institution designed for the teaching of pupils under the direction of teachers. Often the children are between the ages of 5 – 16 years. Often several hundred pupils and often around 3 parallel classes. At least 10 employees and around 6 rooms anticipated.	Indoor light	12	5
	Outdoor light	2	12
	Radio	1	2
	Cell Phone	4	12
	Fan	6	12
	Refrigerator	1	24

Kindergarten

Definition, description and assumptions:	Type of Service	Number	Operation hours/day
A preschool educational institution for children. Children are often between the ages of 2-6 years. At least 2 employees and at least 2 rooms.	Indoor light	2	5
	Outdoor light	1	12
	Radio	1	2
	Cell Phone	2	12
	Fan	2	12
	Refrigerator	1	24

Public Administration			
Definition, description and assumptions:	Type of Service	Number	Operation hours/day
Public administration comprises police stations, HIV centers and other administrative buildings. At least 2 employees and at least 2 rooms.	Indoor light	2	5
	Outdoor light	1	12
	Radio	1	2
	Cell Phone	2	24
	Fan	2	12
	Refrigerator	1	24

Trading Place			
Definition, description and assumptions:	Type of Service	Number	Operation hours/day
A trading place is often in the central part of a village. A trading place would generally comprise of approx. 15 shops. Many types of shops may be expected, for instance meat vendors, clothing shops, barbershops, beverage retailers, kerosene and diesel sellers and maybe charging facilities. Often the trading place is nearby a bus stop and the main street.	Indoor light	30	5
	Outdoor light	7	12

9. Appendix 2: Type and quality of service

As an alternative to the default MSL values provided in the methodology, project proponents could propose new MSL values.

This includes proposals for:

- An alternative number of installations for lights or fans or any other service for a pre-defined consumer group, when a predefined consumer group increases in size compared to the standard case described in Appendix 1.
- Alternative service types to be added to the default list of services as given in Appendix 1.

In order to propose a new MSL, project proponents must use the normalised values presented below to measure the MSL (kWh).

Description	Unit	Value	Source
Indoor light	Lumen	1700	http://www.economicallysound.com/lighting_basics_for_your_basic_bulb_purchase.html
Indoor light	Watt	30	http://fleap.com/CFL.html
Outdoor light	Lumen	6000	http://hypertextbook.com/facts/2004/MarinaAvetisyan.shtml (average assumption)
Outdoor light	Watt	80	http://hypertextbook.com/facts/2004/MarinaAvetisyan.shtml (specific reference)
Radio	Watt	10	http://www.energysavers.gov/your_home/appliances/index.cfm/mytopic=10040
Refrigerator 300 l (food and drinks)	Wh/day	1534	http://www.google.dk/url?sa=t&rct=j&q=industry%20as%20a%20partner%20for%20sustainable%20development%20refrigerator&source=web&cd=1&ved=0CC4QFjAA&url=http%3A%2F%2Fwww.unep.fr%2Fscp%2Fcsd%2Fwssd%2Fdocs%2Fsectors%2Ffinal%2Frefrigeration.pdf&ei=qYnRUNGcN8XFtAaUn4CIBQ&usg=AFQjCNG7G_8-obwdEOBKj6tH9ukU5pFYgA&bvm=bv.1355534169,d.Yms
Refrigerator (Vaccine)	Wh/day	895	http://cdm.unfccc.int/methodologies/SSCmethodologies/approved (NM0073 and WHO (EO3/PV01.1)
Cell Phone	Wh/day	30	http://www.cs.wichita.edu/~vnambood/mypubs/JGEPavel2011.pdf
Fan, mainly cooling	Watt	65	http://www.energysavers.gov/your_home/appliances/index.cfm/mytopic=10040