

14. Energy / Rural Electrification

1. Typical Project Outline

- Introduction of renewable energy (hydro, solar) to off-grid areas where households, public and commercial facilities are getting lights from kerosene and diesel generators

2. Applicability

- (1) Targeting off-grid areas
- (2) Provide renewable energy by off-grid stand-alone technologies or mini grids.

3. Methodology of Emission Reduction Calculation

The emission reduction from the project activity is determined as the differences between the GHG emission of baseline scenario (users (households, public facilities) consume fossil fuel such as kerosene for lighting and electricity from fossil fuels sources) and project scenario (users consume electricity from renewable sources).

Details of sources of each data in the following formulae are provided in “4. Data and Parameters for the Estimation”.

$$ER_y = BE_y - PE_y$$

ER_y : Emission reduction through the project in year y (t-CO₂e/y)

BE_y : GHG emission from the baseline scenario in year y (t-CO₂e/y)

PE_y : GHG emission from the project scenario in year y (t-CO₂e/y)

(1) Calculation of Baseline Emission

In the absence of the project, users consume electricity from stand-alone diesel generators or mini grids or consume kerosene for lighting. A methodology that simplifies the methodology of the small-scale CDM methodology AMS-I.L is used for the baseline GHG emission calculation. That is, energy baseline (for example: 55 kWh/year for households that consume kerosene or electricity from diesel generators by using 2 bulbs, 250 kWh/year for households that consume electricity from diesel generators by using CFLs and other electric appliances such as radios, fans) is multiplied by corresponding CO₂ emission factors¹.

$$BE_y = BE_{55,y} + BE_{250,y} + BE_{250,plus,y}$$

$BE_{55,y}$: Aggregate baseline emissions for users that consumed equal to or less than 55 kWh of renewable electricity from project renewable electricity systems in year y (tCO₂)

$BE_{250,y}$: Aggregate baseline emissions for users that consumed more than 55 kWh but equal to or less than 250 kWh of renewable electricity from project renewable electricity systems in year y (tCO₂)

$BE_{250,plus,y}$: Aggregate baseline emissions for users that consumed greater than 250 kWh of renewable electricity from project renewable electricity systems in year y (tCO₂)

$$BE_{55,y} = \sum_i 55 \times EF_{CO_2,55}$$

$BE_{55,y}$: Aggregate baseline emissions for users that consumed equal to or less than 55 kWh of renewable electricity from project renewable electricity systems in year y (tCO₂)

$EF_{CO_2,55}$: Emission factor of users that consumed equal to or less than 55 kWh of renewable electricity from project

¹ The target year shall be a representative year under average operation or an annual average of multiple years.

14. Energy / Rural Electrification

renewable electricity systems in year y (6.8 t-CO₂e /MWh)

i : Number of users that consumed electricity equal to or less than 55 kWh/year

$$BE_{250,y} = \sum_j (250 - 0.055) \times EF_{CO_2,250} + C$$

BE_{250,y} : Aggregate baseline emissions for users that consumed more than 55 kWh but equal to or less than 250 kWh of renewable electricity from project renewable electricity systems in year y (tCO₂)

EF_{CO₂,250} : Emission factor of users that consumed more than 55 kWh but equal to or less than 250 kWh of renewable electricity from project renewable electricity systems in year y (1.3 t-CO₂/MWh)

C : Constant value (0.374 t-CO₂/MWh)

j : Number of users that consumed electricity more than 55 kWh but equal to or less than 250 kWh

$$BE_{250,plus,y} = \sum_k ((EG_{k,y} - 0.250) \times EF_{CO_2,250,plus}) + D$$

BE_{250,plus,y} : Aggregate baseline emissions for users that consumed greater than 250 kWh of renewable electricity from project renewable electricity systems in year y (tCO₂)

EG_{k,y} : Electricity delivered by project renewable electricity generation system to users k in year y, where the electricity delivered to the facility is greater than 250 kWh (kWh/year)

EF_{CO₂,250,plus} : Emission factor of users k that consumed electricity greater than 250 kWh (1 t-CO₂e /MWh)

D : Constant value (0.6275 t-CO₂/MWh)

k : Number of users k that consumed electricity greater than 250 kWh.

(2) Calculation of Project Emission

Project emissions are considered to be zero (i.e. PE_y =0)

4. Data and Parameters for the Estimation

Data	Description	Data Sources	
		For baseline emission calculation	For project emission calculation
i	Number of users that consumed electricity equal to or less than 55 kWh/year	A monitored value (Number of households that would have used kerosene for lighting or consume electricity by using bulbs (CFLs or LEDs) in the absence of the project activity)	N/A
j	Number of users that consumed electricity more than 55 kWh but equal to or less than 250 kWh	A monitored value (Number of households that would have used other electronic appliances (radios, TVs and fans) besides to lighting in the absence of the project activity)	N/A
k	Number of users k that consumed electricity greater than 250 kWh	A monitored value (Users other than households such as schools, hospitals and other facilities)	N/A

14. Energy / Rural Electrification

$EG_{k,y}$	Electricity delivered by project renewable electricity generation system to users k in year y, where the electricity delivered to the facility is greater than 250 kWh (kWh/year)	A planned value (Electricity provided to users other than households)	N/A
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5. Others

(1) Project Boundary

The physical boundary for measuring GHG emissions includes renewable energy power plants and their users.

(2) Leakage

There are probably indirect emissions that potentially lead to leakage due to activities such as product manufacturing or transport of materials. However, the kind of emission is temporary and negligible compare to the project scale. Therefore, it can be ignored.

(3) Comparison with existing CDM methodologies

As mentioned before, CDM methodology AMS-I.L. (Electrification of rural communities using renewable energy, Version 01) is referenced for development of the methodology.

The logic of emission reduction calculation in the methodology is almost the same as that of the AMS-II.A. However, this methodology simplified the methodology by using the concept of suppressed demand that 55 kWh/year is used with no exception as an electricity consumption of a household who consumed kerosene for lighting or electricity from diesel generators by using two bulbs and 250 kWh/year for a household who consume electricity from diesel generators by using CFLs and other electric appliances like radios and fans.

Moreover, there is no limitation for the emission reduction in the methodology like the small-scale CDM methodologies did.

(4) Revision history

Version	Year/Month	Revisions
2.0	March 2014	<ul style="list-style-type: none"> Amended the baseline emission calculation to use default values and the number of users (households or public facilities)
3.0	September 2019	<ul style="list-style-type: none"> No revision
4.0	March 2023	<ul style="list-style-type: none"> Deleted the column "Ex-post" in "4. Data and Parameters Estimated and Need Monitoring": current version of Climate-FIT aims to quantify GHG emission reductions in the "planning phase".
5.0	March 2024	<ul style="list-style-type: none"> No revision.