Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories

TYPE III - OTHER PROJECT ACTIVITIES

Project participants shall apply the general guidelines to SSC CDM methodologies and information on additionality (attachment A to Appendix B) provided at <http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html> *mutatis mutandis*.

III.AW Electrification of rural communities by grid extension

Technology/measure

1. This methodology comprises electrification of a rural community through extension of a national grid/regional grid (grid hereafter). The electricity distributed by the project activity displaces fossil fuel that would have been used in the absence of the project activity.

2. The applicability is limited to households and users[1] that do not have access to a grid.

3. Emission reductions can only be claimed if the share of electricity generation from renewable energy plants connected to the grid of the host country is greater than or equal to 99%[2] in total electricity generation in the grid of that host country in each year during the crediting period.

4. Cross border electricity export and import by the host country is quantifiable, and the data on import/export is available to the project developer.

5. The project does not involve construction of new electricity generation plants/units, but involves the extension of the existing power distribution network in the host country.

6. The project does not displace existing renewable based mini-grid electricity.[3] To ensure compliance with this condition, existing renewable based mini-grid system and their service area shall be identified and it is confirmed that the project does not provide electricity to the area serviced by the renewable based existing mini-grid system.

7. To avoid possible double counting of emission reduction claims from electricity generation companies, transmission companies, distribution companies, either all relevant parties are listed as participants to the project activity, or the project developer shall obtain a written consent from other relevant entities stating voluntary release of their right to develop CDM project activity and to claim emission reductions from the same electrification project activity. End users of the electricity

[1] It may include households, public buildings, small medium and micro enterprises (SMMEs), and electricity uses may include of interior or street lighting, refrigeration, agricultural water pumps.

[2] The purpose of keeping this threshold stringent is to simplify project emission calculations associated with incremental demand due to the project implementation in the grid and avoid complexity of calculating emissions from the operation of marginal power plants in the system required to cover the project activity demand. The concept of operating margin and build margin in the "Tool to calculate the emission factor for an electricity system" is to estimate baseline emissions and thus it would not be conservative to use the same concept in this methodology for project emissions. The project proponents are however encouraged to submit a request for revision of the methodology to include an alternative threshold or to exclude thresholds altogether with adequate provisions to determine project emissions.

[3] Displacement of standalone/facility scale renewable energy systems (e.g. solar PV system) is not excluded.

distributed as a result of project activity are not eligible to apply this methodology to claim emission reductions from consumption of electricity distributed by the project activity.

8. Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO_2 equivalent annually.

Boundary

9. The spatial extent of the project boundary encompasses the following:

(a). 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 electricity system[4] to which the CDM project is being connected to;

(b). The physical sites of the households, public services and other facilities that are supplied with electricity by the project activity (i.e. project region).

Baseline

10. The energy baseline is the fossil fuel consumption of the technology in use or that would have been used in the absence of the project activity to generate the equivalent quantity of energy.

11. The emission baseline based on the fuel consumed to generate equivalent quantity of electricity distributed by the project activity is calculated as follows.

$$BE_{CO2,y} = \sum_i ED_{i,y} * EF_{CO2} \quad \textbf{(1)}$$

Where:

$BE_{CO2,y}$	Emissions in the baseline in year y, tCO_{2e}/yr
EF_{CO2}	CO_2 emission factor, tCO_{2e}/MWh
$\sum_i$	The sum of the group of project regions
$ED_{i,y}$	Electricity distributed by the extended electricity distribution network to the project region i in year y, MWh/yr

12. A default value of 0.8 tCO_2e/MWh may be used for EF_{CO2} if it is confirmed that the project activity does not replace electricity distribution from stand-alone renewable electricity generation facilities existing in the project region. The proponent may, with adequate justification use a higher emissions factor from table I.F.1 under category AMS-I.F.

13. In case where the project replaces electricity from renewable sources, the default emission factor of 0.8 tCO_2e/MWh must be adjusted taking into account the renewable electricity replaced by the project activity.

[4] Refer to the most recent version of the "Tool to calculate the emission factor for an electricity system" for the definition of electricity system.

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14. The following procedure is used to adjust the emission factor.

$$EF_{CO2,y} = (1 - \beta) * 0.8 \quad \textbf{(2)}$$

$$\beta = EG_{renewable,y} / \sum_i ED_{i,y} \quad \textbf{(3)}$$

Where:

$EF_{CO2,y}$	CO_2 emission factor, tCO_2e/MWh
β	Discount fraction for electricity distributed by the project activity that replaces renewable electricity generated by the existing stand-alone renewable power generation units (e.g. solar PV system)
$EG_{renewable,y}$	Renewable electricity generated from existing stand-alone generation units in the project region expected to be replaced by the project activity, MWh/yr
$\sum_i$	The sum of the group of project regions
$ED_{i,y}$	Electricity distributed by the extended electricity distribution system to the project region *i* in year *y*, MWh/yr

15. To quantify renewable electricity generated from existing stand-alone generation units in the project region expected to be replaced by the project activity ($EG_{renewable,y}$), project developer will prepare a list of existing stand-alone renewable power generation units in the project region for which electricity generation capacity is available through host country's energy statistics or equivalent document (e.g. host country's electricity development plan). This list shall be prepared *ex ante*, validated by the DOE at the time of validation, and fixed throughout the project's lifetime.

16. For each identified existing stand-alone renewable power generation unit in the project region (listed as per paragraph 15), the fate of each relocated/removed unit shall be documented at the time of verification. Among the list of existing stand-alone renewable power generation units, all units removed due to implementation of the project activity shall be sub-listed and the destination of relocation is documented as per host country's electricity authority's records. For the units for which relocation document can not be provided, the baseline emission factor shall be discounted. Units removed due to the expiration of their lifetime shall be exempt from the discount if the expiration of equipment lifetime is confirmed through documented evidence. The renewable electricity generated from existing stand-alone generation units in the project region expected to be replaced by the project activity ($EG_{renewable,y}$) is determined as follows:

$$EG_{renewable,y} = \sum_i (EG_{renewable,replaced,i,ave}) \quad \textbf{(4)}$$

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Where:

$EG_{renewable,replaced,i,ave}$	Historical average electricity generation of the identified existing stand-alone renewable power generation unit *i*, MWh/yr. The minimum historical annual generation record from three years shall be applied, except for the system with less than three years of historical operation record. This value will be determined at the time of validation and fixed throughout the project life time

17. In case historical electricity generation of the identified existing stand-alone renewable power generation units are not available, annual power generation may be estimated using following equation and adopting a conservative load factor.

$$EG_{renewable,replaced,i,ave} = f * E_{renewable,replaced,i} * 8760 \quad (5)$$

Where:

f	Load factor of the identified existing stand-alone renewable power generation units replaced by the project activity. A conservative estimate shall be made for example through strategic surveys and research conducted by national or local organizations, initiatives by international organizations or non governmental organizations or the project proponent to collect reliable and comprehensive data
$E_{renewable,replaced,i}$	Installed capacity of the identified existing stand alone renewable power generation unit *i*, MW

Baseline emissions from consumers historically connected to a mini-grid (exclusively diesel based)

18. Where the grid electricity extension project displaces an existing mini-grid that is exclusively powered by diesel generators, the baseline for the amount of electricity historically supplied through the mini-grid will be different and base line emissions are calculated based on the historical emissions of the existing mini-grid as follows.

$$BE_{hist,y} = EG_{hist} * EF_{hist} \quad (6)$$

Where:

$BE_{hist,y}$	Baseline emissions from consumers historically connected to a mini-grid (tCO_2)
EG_{hist}	Historical electricity generation from existing mini-grid (MWh)
EF_{hist}	Historical emissions factor for the mini-grid (tCO_2/MWh)

19. The historical emissions factor for the mini-grid is calculated from total fuel consumption and generation from mini-grid connected plants for the most recent three years.

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III.AW. Rural electrification by extension of existing low carbon intensive electricity distribution network (cont)

$$EF_{hist} = \frac{\sum_{i}\left(FC_{hist,i} \times NCV_{i} \times EF_{CO2,i}\right)}{\sum GEN_{hist}} \quad \textbf{(7)}$$

Where:

EF_{hist}	Historical emissions factor for the mini-grid (tCO_2/MWh)
$FC_{hist,i}$	Historical consumption of fossil fuel type *i* in all mini-grid plants (tonnes)
NCV_{i}	Net Calorific Value of fossil fuel type *i* (GJ/tonne)
$EF_{CO2,i}$	Emission factor for fossil fuel type *i* (tCO_2/GJ)
GEN_{hist}	Historical electricity generation from all mini-grid plants (MWh)

20. For existing facilities with less than three years of operational data, all historical data shall be available (a minimum of one year data would be required). In the case of no historical data/information on baseline parameters such as efficiency, energy consumption and output (e.g. the available data is not reliable due to various factors such as the use of imprecise or non-calibrated measuring equipment), the baseline parameters can be determined using a performance test/measurement campaign to be carried out prior to the implementation of the project activity. The project proponent may follow the relevant provisions from the "Tool to determine baseline efficiency of thermal and electricity systems".

Leakage

21. 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 "Grid connection of isolated electricity systems". If the estimated leakage is within 5% of the estimated emission reductions of the project, then this leakage source may be neglected, otherwise the leakage shall be deducted from the emissions reductions.

Project activity emissions

22. For the period where the host country is a net importer, the project emissions shall be calculated for that period at least monthly basis using the following equation. Project emissions are zero during the period the host country is net exporter.

$$PE_{y} = \sum_{t}^{P} ED_{i,t} \times EF_{CO2,import,y} \quad \textbf{(8)}$$

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III.AW. Rural electrification by extension of existing low carbon intensive electricity distribution network (cont)

If $EG_{export,t} > EG_{import,t}$, then $EF_{CO2,import,y} = 0$

Where:

PE_y	Project emissions in year *y*, tCO_2e/yr
$\sum_t^P$	The sum of period during which the country is net importer, *t* can be hourly or daily or monthly
$EG_{import,t}$	Amount of electricity imported into the grid from other countries and monitored hourly or daily or monthly in a given year *y*, MWh
$EG_{export,t}$	Amount of electricity exported from the grid to other countries and monitored hourly or daily or monthly in a given year *y*, MWh
$ED_{i,t}$	Amount of electricity distributed by the extended electricity distribution system to project region i, monitored hourly or daily or monthly in a given year *y*, MWh
$EF_{CO2,import,y}$	CO_2 emission factor for the electricity the host country procured internationally, tCO_2e/MWh (Use 1.3 tCO2/MWh)

Emission reductions

23. Emission reductions (*ERy*) are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y \quad (9)$$

Monitoring

24. Monitoring shall consist of the following parameters listed in Table 1 below.

25. The applicable requirements specified in the "General Guidelines to SSC CDM methodologies" (e.g. calibration requirements, sampling requirements) are also an integral part of the monitoring guidelines specified below and therefore shall be referred to by the project participants.

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III.AW. Rural electrification by extension of existing low carbon intensive electricity distribution network (cont)

Table 1: Parameters for monitoring

No.	Parameter	Description	Unit	Monitoring /recording frequency	Measurement methods and procedures
1	ED_y	Amount of electricity distributed by the extended electricity distribution system to the project region *i* in year *y*	MWh/y	Continuous measurement by electricity meter(s), aggregated hourly or daily or monthly	Measured using calibrated electricity meter(s). Measured from the supply point that serves the project area, whether that is the nearest existing transmission/distribution sub-station, a feeder from that station, or a new branch in a distribution line that serves the project area. The distribution losses shall be deducted from the amount of electricity measured. A default value of 10% shall be used for average annual technical distributions losses. When multiple electricity meters are installed for monitoring of electricity distributed by the project activity (e.g. meters are installed for each household), sampling approach may be used to extrapolate the total amount of electricity distributed by the project activity. The average electricity measured per meter derived from sampling will be multiplied by the total number of meters installed under the project activity (N_{meter}). Standard for sampling and surveys for CDM project

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No.	Parameter	Description	Unit	Monitoring /recording frequency	Measurement methods and procedures
					activities and programme of activities" may be referred for sampling procedures. Validity of information source will be verified by DOE at the time of verification. Calibration record of electricity meter(s) may be checked for a sample of meters selected using simple random sampling method
2	N_{meter}	Number of electricity meters installed by the project activity	-	Recorded annually	Recorded by project developer
3	$EG_{import,t}$	The amount of electricity the host country imported from other countries in year *y*	MWh/y	Continuous measurement by electricity meter(s) aggregated hourly or daily or monthly	Data is sourced from host country electric authority/utility (e.g. from load dispatch centres)
4	$EG_{export,t}$	The amount of electricity the host country exported to other countries in year *y*	MWh/y	Continuous measurement by electricity meter(s) aggregated hourly or daily or monthly	Data is sourced from host country electric authority/utility (e.g. from load dispatch centres)

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III.AW. Rural electrification by extension of existing low carbon intensive electricity distribution network (cont)

No.	Parameter	Description	Unit	Monitoring /recording frequency	Measurement methods and procedures
5		Electricity generation in year *y* from all the power plants (renewable and others), that are within the host country, and are physically connected to the grid to which the CDM project is connected to (as per paragraph 3)	MWh/y	At least monthly, aggregated annually	Data is sourced from host country electric authority/utility (e.g. from load dispatch centres)

Project activity under a programme of activities

26. The methodology is applicable to a programme of activities, no additional leakage estimations are necessary other than that indicated under leakage section above.

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History of the document

Version	Date	Nature of revision
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