TYPE I - RENEWABLE ENERGY PROJECTS

Note: Categories I.A, I.B and I.C involve renewable energy technologies that supply electricity, mechanical and thermal energy, respectively, to the user directly. Renewable energy technologies that supply electricity to a grid fall into category I.D.

Follow the link to find General guidance / Abbreviations

I.A. Electricity generation by the user

Technology/measure

1. This category comprises renewable energy generation units that supply individual households or users with a small amount of electricity. ~~Upgrading of existing equipment is not allowed.~~ The applicability is limited to households and users that do not have a grid connection. These units include technologies such as solar power, hydropower, wind power, and other technologies that produce electricity all of which is used on-site by the user, such as solar home systems, and wind battery chargers. The renewable generating units may be new or replace existing fossil fuel fired generation. The capacity of these renewable energy generators shall not exceed 15 MW.

2. Combined heat and power (co-generation) systems are eligible under categories I.C and I.D.

3. If the unit added has both renewable and non-renewable components (e.g.. a wind/diesel unit), the eligibility limit of 15MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires [non-] renewable biomass and fossil fuel, the capacity of the entire unit shall not exceed the limit of 15MW.

4. Project activities adding renewable energy capacity should consider the following cases:
   1) Adding new units;
   2) Replacing old units for more efficient units.

To qualify as a small scale CDM project activity, the aggregate installed capacity after adding the new units (case 1) or of the more efficient units (case 2) should be lower than 15 MW[1].

Boundary

5. The physical, geographical site of the renewable energy generating unit and the equipment that uses the electricity produced delineates the project boundary.

Baseline

6. The energy baseline is the fuel consumption of the technology in use or that would have been used in the absence of the project activity. The project participants may use one of the following energy baseline formulae:

   (a) Option 1:

[1] Example: 5 MW of new capacity is added to existing 9 MW to make the aggregate capacity of 14 MW which is within the allowed limits for capacity.

$$E_B = S_i(n_i \,.\, c_i)/(1 - l)$$

where:

E_B = annual energy baseline in kWh per year.
S_i = the sum over the group of "i" renewable energy technologies (e.g. residential, rural health centre, rural school, mills, water pump for irrigation, etc.) implemented as part of the project.
n_i = number of consumers supplied by installations of the renewable energy technology belonging to the group of "i" renewable energy technologies during the year.
c_i = estimate of average annual individual consumption (in kWh per year) observed in closest grid electricity systems among rural grid connected consumers belonging to the same group of "i" renewable energy technologies. If energy consumption is metered, c_i is the average energy consumed[2] by consumers belonging to the group of "i" renewable energy technologies.
l = average technical distribution losses that would have been observed in diesel powered mini-grids installed by public programmes or distribution companies in isolated areas, expressed as a fraction.[3]

OR

(b) Option 2:

$$E_B = S_i O_i /(1 - l)$$

where:

E_B = annual energy baseline in kWh per year
S_i = the sum over the group of "i" renewable energy technologies (e.g. solar home systems, solar pumps) implemented as part of the project.
Oi = the estimated annual output of the renewable energy technologies of the group of "i" renewable energy technologies installed (in kWh per year)
l = average technical distribution losses that would have been observed in diesel powered mini-grids installed by public programmes or distribution companies in isolated areas, expressed as a fraction.

OR

(c) Option 3: A trend adjusted projection of historic fuel consumption is acceptable in situations where an existing technology is replaced.

[2] Potential over sizing of the power capacity installed or energy generated by the CDM project activity shall not be reflected in the baseline and emissions reduction calculation. For this reason, the energy value taken into account shall be the energy consumed. It cannot be the electricity output, except if the project participant justifies that it represent a reasonable estimate of the energy that would have been generated by a diesel generator larger than 35 kW and operating with a load factor of at least 50% to provide similar electricity services.

[3] A reasonable default value for distribution losses on low voltage rural distribution grid could be 20%.

I.A. Electricity generation by the user (cont.)

7. If the project participants wish to use a different formula to determine $\boldsymbol{E_B}$, the proposal needs to be accepted in accordance with the modalities for new methodologies for small-scale project activities (see paragraph 2 of the general guidance (section A) above).

8. The emissions baseline is the energy baseline calculated in accordance with paragraph 4 above times the CO_2 emission coefficient for the fuel displaced. IPCC default values for emission coefficients may be used. A default value 0.9 kg CO_2 equiv./kWh, which is derived from diesel generation units, may be used. A small-scale project proponent may, with adequate justification use a higher emissions factor from Table I.D.1

9. In the case of project activities adding renewable energy capacity, if the availability of renewable resources is limited, the impact of a decrease in electricity production from the units installed before the project implementation must be considered.

For the specific case of hydropower plants, this effect could be considered calculating the production of electricity that must be used for emission reduction calculation with the following procedure:

1) To estimate every year during the crediting period, the energy that would have been produced in the same hydrological conditions by the units installed before the project;
2) The electricity production EGy (MWh/ year) that must be considered to calculate emission reductions is calculated with the following formula:

EGy = TEy – WTEy

where:

TEy = the actual electricity produced in year y in the plant (all units)
WTEy = the electricity that would have been produced by the units installed before the project under the hydrological conditions of year y

Leakage

10. If the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered.

Monitoring

11. Monitoring shall consist of:

(a) An annual check of all systems or a sample thereof to ensure that they are still operating (other evidence of continuing operation, such as on-going rental/lease payments could be a substitute).

OR

(b) Metering the electricity generated by all systems of a sample thereof.

12. In the case of co-fired and hybrid systems, the amount of fossil fuel input shall be monitored.

TYPE I - RENEWABLE ENERGY PROJECTS

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Follow the link to find General guidance / Abbreviations

I.B. Mechanical energy for the user

Technology/measure

1. This category comprises renewable energy generation units that supply individual households or users with a small amount of mechanical energy. ~~Upgrading of existing equipment is not allowed~~. These units include technologies such as hydropower, wind power, and other technologies that provide mechanical energy, all of which is used on-site by the household or user, such as wind-powered pumps, solar water pumps, water mills and wind mills.

2. Where generation capacity is specified, it shall be less than 15MW. If the generation capacity is not specified, the estimated diesel-based electricity generating capacity that would be required to provide the same service or mechanical energy shall be less than 15 MW. In the case of irrigation where diesel-fuelled pumps are used directly, the cumulative rating of diesel-fuelled pumps shall not exceed 15 MW. The size of a diesel-based generator or a diesel pump that would be required shall be justified.

3. If the unit added has both renewable and non-renewable components (e.g.. a wind/diesel unit), the eligibility limit of 15MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires [non-] renewable biomass and fossil fuel, the capacity of the entire unit shall not exceed the limit of 15MW.

4. Project activities adding renewable energy capacity should consider the following cases:
   1) Adding new units;
   2) Replacing old units for more efficient units.

To qualify as a small scale CDM project activity, the aggregate installed capacity after adding the new units (case 1) or installed capacity of the more efficient units (case 2) should be lower than 15 MW[4]

Boundary

5. The physical, geographical site of the renewable energy technology and the equipment that uses the mechanical energy produced delineates the project boundary.

Baseline

[4] Ex: 5 MW of new capacity is added to existing 9 MW to make the aggregate capacity of 14 MW which is within the allowed limits 15 MW capacity.

I.B. Mechanical energy for the user (Cont.)

6. The simplified baseline is the estimated emissions due to serving the same load with a diesel generator consumption saved times the emission coefficient for diesel. The diesel emissions displaced annually are calculated either as:

(a) The power requirements times hours of operation per year times the emission factor for diesel generator systems in Table I.D.

OR

(b) The diesel fuel consumption per hour times hours of operation per year times the default value for the emission coefficient for diesel fuel (3.2 kg CO_2 per kg of diesel fuel).

7. In the case of project activities adding renewable energy capacity, if the availability of renewable resources is limited, the impact of a decrease in energy production from the units installed before the project implementation must be considered.

For the specific case of hydropower plants this effect could be considered calculating the production of energy that must be used for emission reduction calculation with the following procedure:

1) To estimate every year during the crediting period, the energy that would have been produced in the same hydrological conditions by the units installed before the project;
2) The energy production EGy (MWh/ year) that must be considered to calculate emission reductions is calculated with the following formula:

$$EGy = TEy - WTEy$$

where:

TEy is the actual energy produced in the year y in the plant (all units)
WTEy is the energy that would have been produced by the units installed before the project under the hydrological conditions of the year y

Leakage

8. If the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered.

Monitoring

9. Monitoring shall consist of:

(a) Recording annually the number of systems operating (evidence of continuing operation, such as on-going rental/lease payments could be a substitute); and

(b) Estimating the annual hours of operation for the equipment that uses the mechanical energy produced, if necessary using sampling methods. Annual hours of operation can be estimated from total output (tonnes of grain milled) and output per hour if an accurate value of output per hour is available.

10. In the case of co-fired and hybrid systems, the amount of fossil fuel input shall be monitored.

TYPE I - RENEWABLE ENERGY PROJECTS

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Follow the link to find General guidance / Abbreviations

I.C. Thermal energy for the user

Technology/measure

1. This category comprises renewable energy technologies that supply individual households or users with thermal energy that displaces fossil fuels. ~~Upgrading of existing equipment is not allowed.~~ Examples include solar thermal water heaters and dryers, solar cookers, energy derived from renewable biomass for water heating, space heating, or drying, and other technologies that provide thermal energy that displaces fossil fuel. Biomass-based co-generating systems that produce heat and electricity for use on-site are included in this category.

2. Where generation capacity is specified by the manufacturer, it shall be less than 15MW.

3. For co-generation systems and/or co-fired systems to qualify under this category, the energy output shall not exceed 45 $MW_{thermal}$. E.g., for a biomass based co-generating system the capacity for all the boilers affected by the project activity combined shall not exceed 45 $MW_{thermal}$. In the case of the co-fired system the installed capacity (specified for fossil fuel use) for each boiler affected by the project activity combined shall not exceed 45 $MW_{thermal}$.

4. Project activities adding renewable energy capacity should consider the following cases:
   1) Adding new units;
   2) Replacing old units for more efficient units.

To qualify as a small scale CDM project activity, the aggregate installed capacity after adding the new units (case 1) or of the more efficient units (case 2) should be lower than 45 $MW_{thermal}$ [5]

Boundary

5. The physical, geographical site of the renewable energy generation delineates the project boundary.

Baseline

6. For renewable energy technologies that displace technologies using fossil fuels, the simplified baseline is the fuel consumption of the technologies that would have been used in the absence of the project activity times an emission coefficient for the fossil fuel displaced. IPCC default values for emission coefficients may be used.

[5] Ex: 15 $MW_{thermal\ of}$ new capacity is added to existing 27 $MW_{thermal}$ to make the aggregate capacity of 42 $MW_{thermal}$ which is within the allowed limits for capacity

I.C. Thermal energy for the user (cont)

7. For renewable energy technologies that displace electricity the simplified baseline is the electricity consumption times the relevant emission factor calculated as described in category I.D, paragraphs 6 and 7.

Leakage

8. If the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered.

Monitoring

9. Monitoring shall consist of:

(a) Metering the energy produced by a sample of the systems where the simplified baseline is based on the energy produced multiplied by an emission coefficient.

OR

(b) Metering the thermal and electrical energy generated for co-generation projects. In the case of co-fired plants, the amount of fossil fuel input shall be monitored;

OR

(c) If the emissions reduction per system is less than 5 tonnes of CO_2 a year:

(i) Recording annually the number of systems operating (evidence of continuing operation, such as on-going rental/lease payments could be a substitute); and

(ii) Estimating the annual hours of operation of an average system, if necessary using survey methods. Annual hours of operation can be estimated from total output (e.g. tonnes of grain dried) and output per hour if an accurate value of output per hour is available.

TYPE I - RENEWABLE ENERGY PROJECTS

Note: Categories I.A, I.B and I.C involve renewable energy technologies that supply electricity, mechanical and thermal energy, respectively, to the user directly. Renewable energy technologies that supply electricity to a grid fall into category I.D.

Follow the link to find General guidance / Abbreviations

I.D. 'Grid connected renewable electricity generation'

Technology/measure

1. This category comprises renewable energy generation units, such as photovoltaics, hydro, tidal/wave, wind, geothermal, and renewable biomass, that supply electricity to and/or displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit.

2. If the unit added has both renewable and non-renewable components (e.g., a wind/diesel unit), the eligibility limit of 15MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15MW.

3. Biomass combined heat and power (co-generation) systems that supply electricity to and/or displace electricity from a grid are included in this category. To qualify under this category, the sum of all forms of energy output shall not exceed 45 $MW_{thermal}$. E.g., for a biomass based co-generating system the rating for all the boilers combined shall not exceed 45 $MW_{thermal}$.

4. Project activities adding renewable energy capacity should consider the following cases:
   1) Adding new units;
   2) Replacing old units for more efficient units.

To qualify as a small scale CDM project activity, the aggregate installed capacity after adding the new units (case 1) or of the more efficient units (case 2) should be lower than 15 MW[6].

5. Project activities that seek to retrofit or modify an existing facility for renewable energy generation are included in this category. To qualify as small scale project, the total output of the modified or retrofitted unit shall not exceed the limit of 15 MW

Boundary

6. The project boundary encompasses the physical, geographical site of the renewable generation source.

Baseline

7. In the case of landfill gas, waste gas, wastewater treatment and agro-industries projects, recovered methane emissions are eligible under category III.D. If the recovered methane is used for

[6] Ex: 5 MW of new capacity is added to existing 9 MW to make the aggregate capacity of 14 MW which is within the allowed limits for capacity

electricity generation the baseline shall be calculated in accordance with paragraphs 6 or 7 below. If the recovered methane is used for heat generation it is eligible under category I.C.

8. For a system where all generators use exclusively fuel oil and/or diesel fuel, the baseline is the annual kWh generated by the renewable unit times an emission coefficient for a modern diesel generating unit of the relevant capacity operating at optimal load as given in Table I.D.1.

Table I.D.1
Emission factors for diesel generator systems (in kg CO_2equ/kWh*) for three different levels of load factor**

Cases:	Mini-grid with 24 hour service	i) Mini-grid with temporary service (4-6 hr/day) ii) Productive applications iii) Water pumps	Mini-grid with storage
Load factors [%]	25%	50%	100%
<15 kW	2.4	1.4	1.2
>=15 <35 kW	1.9	1.3	1.1
>=35 <135 kW	1.3	1.0	1.0
>=135<200 kW	0.9	0.8	0.8
> 200 kW***	0.8	0.8	0.8

*) A conversion factor of 3.2 kg CO_2 per kg of diesel has been used (following revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories)
**) Figures are derived from fuel curves in the online manual of RETScreen lnternational's PV 2000 model, downloadable from http://retscreen.net/
***) default values

9. For all other systems, the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO_2equ/kWh) calculated in a transparent and conservative manner as:

(a) The average of the "approximate operating margin" and the "build margin", where:

(i) The "approximate operating margin" is the weighted average emissions (in kg CO_2equ/kWh) of all generating sources[7] serving the system, excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation;

(ii) The "build margin" is the weighted average emissions (in kg CO2equ/kWh) of recent capacity additions to the system, based on the most recent information available on plants already built for sample group *m* at the time of PDD submission. The sample group *m* consists of either the five power plants that have been built most recently, or the power plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been

[7] Power plant capacity additions registered as CDM project activities should be excluded

built most recently. Project participants should use from these two options that sample group that comprises the larger annual generation. Power plant capacity additions registered as CDM project activities should be excluded from the sample group *m.*If 20% falls on part capacity of a plant, that plant is included in the calculation.

OR,

(b) The weighted average emissions (in kg CO_2equ/kWh) of the current generation mix.

(c) Approximate Operating Margin emission factor and the weighted average emission factor can be calculated using either of the two following data vintages for years(s) y:
>Option 1:
A 3-year average, based on the most recent statistics available at the time of PDD submission.
>Option 2:
The year in which project generation occurs, if emission factor is updated based on ex post monitoring.

Build margin emission factor can be calculated using either of the following data vintages for years(s) y:
>Option 1
Most recent information available on plants already built at the time of PDD submission.
>Option 2
For the first crediting period, emission factor is updated based on ex-post monitoring. For subsequent crediting periods, Emission factor should be calculated ex-ante, as described in option 1 above.

10. In the case of project activities adding renewable energy capacity, if the availability of renewable resources is limited, the impact of a decrease in electricity production from the units installed before the project implementation must be considered.

For the specific case of hydropower plants, this effect could be considered calculating the production of electricity that must be used for emission reduction calculation with the following procedure:

1) To estimate every year during the crediting period, the energy that would have been produced in the same hydrological conditions by the units installed before the project;
2) The electricity production EGy (MWh/ year) that must be considered to calculate emission reductions is calculated with the following formula:

$$EGy = TEy - WTEy$$

where:

TEy = the actual electricity produced in year y in the plant (all units)
WTEy = the electricity that would have been produced by the units installed before the project under the hydrological conditions of year y

11. For project activities that seek to retrofit or modify an existing facility for renewable energy generation the baseline scenario is the following:

I.D. Grid connected renewable electricity generation (cont)

In the absence of the CDM project activity, the existing facility would continue to provide electricity to the grid (EGbaseline, in MWh/year) at historical average levels (EGhistorical, in MWh/year), until the time at which the generation facility would be likely be replaced or retrofitted in the absence of the CDM project activity (DATEBaselineRetrofit). From that point of time onwards, the baseline scenario is assumed to correspond to the project activity, and baseline electricity production (EGbaseline) is assumed to equal project electricity production (EGy, in MWh/year), and no emission reductions are assumed to occur.

EGbaseline = EGhistorical until DATEBaselineRetrofit
EGbaseline = EGy on/after DATEBaselineRetrofit

Baseline emissions (BE_y in tCO_2) are then, the product of the baseline emissions factor (EF_y in tCO_2/MWh) calculated in paragraph 6 and 7, times the electricity supplied by the project activity to the grid (EG_y in MWh) minus the baseline electricity supplied to the grid in the case of modified or retrofit facilities ($EG_{baseline}$ in MWh), as follows:

$$BE_y = (EG_y - EG_{baseline}) \cdot EF_y$$

EGhistorical is the average of historical electricity delivered by the existing facility to the grid, spanning all data from the most recent available year (or month, week or other time period) to the time at which the facility was constructed, retrofit, or modified in a manner that significantly affected output (i.e., by 5% or more), expressed in MWh per year. A minimum of 5 years (120 months) (excluding abnormal years) of historical generation data is required in the case of hydro facilities. For other facilities, a minimum of 3 years data is required[8]. In the case that 5 years of historical data (or three years in the case of non hydro project activities) are not available -- e.g., due to recent retrofits or exceptional circumstances as described in footnote[9] 1 -- a new methodology or methodology revision must be proposed.

All project electricity generation above baseline levels (EGbaseline) would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described below.

In order to estimate the point in time when the existing equipment would need to be replaced in the absence of the project activity (DATEBaselineRetrofit), project participants may take the following approaches into account:

(a) The typical average technical lifetime of the type equipment may be determined and documented, taking into account common practices in the sector and country, e.g. based on industry surveys, statistics, technical literature, etc.

(b) The common practices of the responsible company regarding replacement schedules may be evaluated and documented, e.g. based on historical replacement records for similar equipment. The point in time when the existing equipment would need to be replaced in the absence of the

[9] Data for periods affected by unusual circumstances such as natural disasters, conflicts, and transmission constraints shall be excluded

project activity should be chosen in a conservative manner, i.e. if a range is identified, the earliest date should be chosen.

Leakage

12. If the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered.

Monitoring

13. Monitoring shall consist of metering the electricity generated by the renewable technology. In the case of co-fired plants, the amount of biomass and fossil fuel input shall be monitored.