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

## 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 for Full version of appendix B (http://cdm.unfccc.int/Projects/pac/ssclistmeth.pdf) to find General guidance / Abbreviations

### *I.A. Electricity generation by the user*

**Technology/measure**

1. This category comprises renewable generation units ~~technologies~~ that supply individual households or users with a small amount of electricity. These units include technologies such as ~~include~~ 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.

**Boundary**

~~3.~~ **4.** The physical, geographical site of the generating unit and the equipment that uses the electricity produced delineates the project boundary.

**Baseline**

~~4.~~ **5.** 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:

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

**Where**

$E_B$ = annual energy baseline in kWh per year.
$\Sigma_i$ = the sum over the group of "i" renewable energy technologies (e.g. residential, rural health center, 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 roup 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:

$$E_B = \Sigma_i O_i / (1 - l)$$

**Where**

$E_B$ = annual energy baseline in kWh per year
$\Sigma_i$ = 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.

~~5.~~ **6.** If the project participants wish to use a different formula to determine $E_B$, 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).

~~6.~~ **7.** 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 $CO_2$equ/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

**Leakage**

~~7.~~ **8.** If the energy efficiency technology is equipment transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered.

**Monitoring**

~~8.~~ **9.** 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).

[2] Potential oversizing 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%.

OR

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

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

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### *I.B. Mechanical energy for the user*

**Technology/measure**

1. This category comprises renewable energy generation units ~~technologies~~ that supply individual households or users with a small amount of mechanical energy. These units include technologies such as ~~include~~ 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.

**Boundary**

~~3.~~ **4.** The physical, geographical site of the renewable energy technology and the equipment that uses the mechanical energy produced delineates the project boundary.

**Baseline**

~~4.~~ **5.** 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.1

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).

**Leakage**

~~5.~~ 6. If the energy efficiency technology is equipment transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered.

**Monitoring**

~~6.~~ 7. 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.

8. In the case of co-fired and hybrid systems, the amount of fossil fuel input and its energy content shall be monitored.

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### *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 fuel or non-renewable sources of biomass. Examples include solar thermal water heaters and dryers, solar cookers, energy derived from 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 ~~total 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 the ~~primary~~ boiler shall not exceed 45 $MW_{thermal}$.

**Boundary**

**~~3.~~ 4.** The physical, geographical site of the renewable energy ~~technologies~~ generation~~ng thermal~~ energy delineates the project boundary.

**Baseline**

**~~4.~~ 5.** 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.~~ 6.** For renewable energy technologies that displace non-renewable sources of biomass, the simplified baseline is the non-renewable sources of biomass consumption of the technologies times an emission coefficient for the non-renewable sources of biomass displaced. IPCC default values for emission coefficients may be used.

**~~6.~~ 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 28 and 29.

**Leakage**

**~~7.~~ 8.** If the energy efficiency technology is equipment transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered.

*I.C. Thermal energy for the user (Cont.)*

**Monitoring**

~~8.~~ **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 and its energy content 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.

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### *I.D. Renewable electricity generation for a grid*

**Technology/measure**

1. This category comprises renewable~~s~~ generation units, such as photovoltaics, hydro, tidal/wave, wind, geothermal, and biomass, that supply electricity to an electricity distribution system that is or would have been supplied by at least one fossil fuel or non-renewable biomass 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 [non-]renewable biomass and 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 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 the ~~primary~~ boiler shall not exceed 45 $MW_{thermal}$.

**Boundary**

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

**Baseline**

5. 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 electricity generation the baseline shall be calculated in accordance with paragraph 28 or 29 below. If the recovered methane is used for heat generation it is eligible under category I.C.

6. For a system where all generators only use ~~fossil fuel fired generating units use~~ 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 $CO_2$equ/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)<br>ii)Productive applications<br>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

7. For all other systems, the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg $CO_2$equ/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 $CO_2$equ/kWh) of all generating sources 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, which capacity additions are defined as the greater (in MWh) of most recent[4] 20%[5] of existing plants or the 5 most recent plants.";

OR,

(b) The weighted average emissions (in kg $CO_2$equ/kWh) of the current generation mix.

[4] Generation data available for the most recent year.

[5] If 20% falls on part capacity of a plant, that plant is included in the calculation.

**Leakage**

8. If the energy efficiency technology is equipment 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 metering the electricity generated by the renewable technology. In the case of co-fired plants, the amount of biomass and fossil fuel input and its energy content shall be monitored.

## TYPE III - OTHER PROJECT ACTIVITIES

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### *III. D. Methane recovery*

**Technology/measure**

1. This project category comprises methane recovery from coalmines, agro-industries, landfills, wastewater treatment facilities and other sources. Measures shall both reduce anthropogenic emissions by sources and directly emit less than 15 kilotonnes of carbon dioxide equivalent annually.

2. $CO_2$ emissions from combustion of non-biogenic methane shall be accounted for in the project activity.

**Boundary**

3. The project boundary is the physical, geographical site of the methane recovery facility.

**Baseline**

4. The emission baseline is the amount of methane that would be emitted to the atmosphere during the crediting period in the absence of the project activity.

5. The baseline shall cover only the capture and flaring that would not have happened in the absence of the project activity.

6. In the case of landfill gas, waste gas, waste water treatment and agro-industries projects: If the recovered methane is used for electricity generation, the project activity is also eligible under category I.D. If the recovered methane is used for heat generation it is also eligible under category I.C. In these cases project participants may submit one single project design document for all of the components of the project activity.

**Leakage**

7. No leakage calculation is required.

**Monitoring**

8. The amount of methane recovered and used as fuel or combusted shall be monitored~~. Periodic samples of the methane content of the gas recovered may be needed to calculate the amount of methane recovered.~~ using flow meters and analysing the methane content of the combusted gases either online, or with samples taken at least quarterly, and more frequently if the results show significant deviations from previous values.

9. Regular maintenance should ensure optimal operation of flares. The flare efficiency, defined as the fraction of time in which the gas is combusted in the flare, multiplied by the efficiency of the flaring process, shall be monitored.

10. Flow meters, sampling devices and gas analysers shall be subject to regular maintenance, testing and calibration to ensure accuracy.