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

TYPE II - ENERGY EFFICIENCY IMPROVEMENT PROJECTS

Project participants shall take into account the general guidance to the methodologies, information on additionality, abbreviations and general guidance on leakage provided at http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html.

II.C. Demand-side energy efficiency activities for specific technologies

Technology/measure

1. This methodology comprises activities that encourage the adoption of energy-efficient equipment/appliance (e.g., lamps, ballasts, refrigerators, motors, fans, air conditioners, pumping systems) at many sites. These technologies may replace existing equipment or be installed at new sites. In the case of new facilities, the determination of baseline scenario shall be as per the procedures described in the general guidance to SSC methodologies under the section 'Type II and III Greenfield projects (new facilities)'. The aggregate energy savings by a single project may not exceed the equivalent of 60 GWh per year for electrical end use energy efficiency technologies. For fossil fuel end use energy efficient technologies, the limit is 180 GWh thermal per year in fuel input.

2. For each replaced appliance/equipment/system the rated capacity or output or level of service (e.g., light output, water output, room temperature and comfort, the rated output capacity of air-conditioners etc.) is not significantly smaller (maximum - 10%) than the baseline or significantly larger (maximum + 50%)[1] than the baseline. In the case of water saving devices designed to replace, or be affixed unto, an existing water fixture or water pipe, the restriction on reduced water output does not apply and the project proponent shall ensure that the project activity device qualifies as a water saving device either through reference to applicable standards or provides an equivalent level of service in terms of functional comfort and cleaning performance (-10% or better) while reducing the amount of water consumed.

3. If the energy efficient equipment contains refrigerants, then the refrigerant used in the project case shall be CFC free. Project emissions from the baseline refrigerant and/or project refrigerants shall be considered in accordance with the guidance of the Board (EB 34, paragraph 17). This methodology credits emission reductions only due to the reduction in electricity consumption from use of more efficient equipment/appliances.

Boundary

[1] Project activities involving increase in output level compared to the baseline scenario are only eligible if they comply with the related and relevant guidance in the General Guidance for SSC methodologies which require a demonstration that the baseline scenario for the increased amount of output is the same as the baseline scenario defined by this methodology. Otherwise, in the event project output in year y is greater than the average historical output (average of three most recent years +/-10%) before the implementation of the project activity, the value of the output in year y is capped at the value of the historical average output level.

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II.C. Demand-side energy efficiency activities for specific technologies (cont)

4. The project boundary is the physical, geographical location of each measure (each piece of equipment) installed[2].

Baseline

5. If the energy displaced is fossil fuel based, the energy baseline is the existing level of fuel consumption or the amount of fuel that would be used by the technology that would have been implemented otherwise. The emissions baseline is the energy baseline multiplied by an emission factor for the fossil fuel displaced. ~~Reliable local or national data for the emission factor shall be used; IPCC default values should be used only when country or project specific data are not available or difficult to obtain.~~

$$BE_y = E_{BL,y} * EF_{CO2,FF} \quad (1)$$

$$E_{BL,y} = \sum_i (n_i * \rho_{BL,i} * o_{BL,i}) / \eta_{th}) \quad (2)$$

Where:

BE_y	Baseline emissions in year *y* (tCO2e).
$E_{BL,y}$	Energy consumption in the baseline in year *y* (TJ for fossil fuel; kWh for electricity).
$EF_{CO2,FF}$	Emission factor for fossil fuels (tCO2/TJ). Reliable local or national data for the emission factor shall be used; IPCC default values should be used only when country or project specific data are not available or difficult to obtain.
Σ_i	Sum over the group of *"i"* devices (e.g., 40W incandescent bulb, 5hp motor) replaced, for which the project energy efficient equipment is operating during the year, implemented as part of the project activity.
n_i	Number of devices of the group of *"i"* devices (e.g., 40W incandescent bulb, 5hp motor) replaced, for which the project energy efficient equipment is operating during the year.
$\rho_{BL,i}$	Power[3] of the devices of the group of "*i*" baseline devices (e.g., 40W incandescent bulb, 5hp motor, thermal energy dispensed). In the case of a retrofit activity, "power" is the weighted average of the devices replaced. In the case of new installations, "power" is the weighted average of devices on the market.
$o_{BL,i}$	Average annual operating hours of the devices of the group of "i" baseline devices.
η_{th}	Baseline efficiency of the thermal energy generation system (e.g., efficiency of a domestic water heater).

[2] The boundary can also be defined to encompass the entire system for example if two or more pumps are configured to operate in parallel at a pumping station and the project activity is retrofitting only one of the pumps the boundary can include entire pumping station to enable appropriate metering and monitoring.

[3] Throughout this methodology, "power" can mean or reference thermal energy.

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II.C. Demand-side energy efficiency activities for specific technologies (cont)

In the case of water saving devices that reduce fossil fuel consumption in hot water heaters, the thermal energy dispensed by "*i*" baseline devices can be calculated as follows:

$$\rho_{BL,i} = W_{BL,i} * \Delta T_i * Cp \quad \textbf{(3)}$$

Where:

$W_{BL,i}$	Baseline water flow at fixture *i* (litres/hour).
ΔT_i	Differential temperature between incoming cold water temperature and hot water temperature at point of use (fixture) *i*.
Cp	Specific heat of water.

6. If the energy displaced is electricity, the emission baseline is determined using one of the two following options:

- Option 1: The product of the baseline energy consumption of equipment/appliances and the emission factor for the electricity displaced:

$$BE_y = E_{BL,y} * EF_{CO2,ELEC,y} + Q_{ref,BL} \times GWP_{ref,BL} \quad \textbf{(4)}$$

~~$E_{BL,y} = \sum_i (n_i * \rho_i * o_i) / (1 - l_y)$~~ $E_{BL,y} = \sum_i (n_i * \rho_{BL,i} * o_{BL,i}) / (\eta_{ELEC} * (1 - l_Y))$ **(5)**

Where:

~~BE_y~~	~~Baseline emissions in year *y* (tCO2e)~~
~~$E_{BL,y}$~~	~~Energy consumption in the baseline in year *y* (kWh)~~
$EF_{CO2,ELEC,y}$	Emission factor in year *y* calculated in accordance with the provisions in AMS-I.D (tCO2/MWh~~)~~).
~~Σ_i~~	~~Sum over the group of "*i*" devices (e.g., 40W incandescent bulb, 5hp motor) replaced, for which the project energy efficient equipment is operating during the year, implemented as part of the project activity~~
~~n_i~~	~~Number of devices of the group of "*i*" devices (e.g., 40W incandescent bulb, 5hp motor) replaced, for which the project energy efficient equipment is operating during the year~~
~~p_i~~	~~Power of the devices of the group of "*i*" baseline devices (e.g., 40W incandescent bulb, 5hp motor). In the case of a retrofit activity, "power" is the weighted average of the devices replaced. In the case of new installations, "power" is the weighted average of devices on the market~~
~~o_i~~	~~Average annual operating hours of the devices of the group of "*i*" baseline devices~~

l_y	Average annual technical grid losses (transmission and distribution) during year *y* for the grid serving the locations where the devices are installed, expressed as a fraction. This value shall not include non-technical losses such as commercial losses (e.g., theft/pilferage). The average annual technical grid losses shall be determined using recent, accurate and reliable data available for the host country. This value can be determined from recent data published either by a national utility or an official governmental body. Reliability of the data used (e.g., appropriateness, accuracy/uncertainty, especially exclusion of non technical grid losses) shall be established and documented by the project participant. A default value of 0.1 shall be used for average annual technical grid losses, if no recent data are available or the data cannot be regarded accurate and reliable.
$Q_{ref,BL}$	Average annual quantity of refrigerant used in the baseline to replace the refrigerant that has leaked (tonnes/year). Values from Chapter 7: Emissions of fluorinated substitutes for Ozone depleting substances, Volume 3, Industrial Processes and Product Use, 2006 IPCC Guidelines for National Greenhouse Gas Inventories may be used.
$GWP_{ref,BL}$	Global Warming Potential of the baseline refrigerant (t CO_2e/t refrigerant~~)~~).
η_{ELEC}	Baseline efficiency the electric water heater in the case of water saving devices. Equals 1 for other devices.

In the case of water saving devices that reduce electricity consumption in electric water heaters, the power of "*i*" baseline devices can be calculated as defined in equation (3).

- Option 2: The specific energy consumption of the system in the baseline times the output in project year y times the emission factor for the electricity displaced. This option can only be used where comparable conditions for the output in the baseline and project can be established. For example in the specific case of a water pumping system comparable conditions can be established by one of the options below:

  (i) Show that average baseline water flow rate (discharge) is within +/- 10% of the flow rate during the project[4];

  (ii) Choose the nameplate head and discharge specifications of the baseline pump and corresponding power/energy consumption (weighted average values can be used when pumps are operated in parallel) for a conservative estimate of EER.

$$BE_y = E_{BL,y} \times EF_{CO2,ELEC,y} + Q_{ref,BL} \times GWP_{ref,BL} \quad \textbf{(6)}$$

$$E_{BL,y} = EER \times Q_y / (1 - l_y) \quad \textbf{(7)}$$

[4] Use 3 years historic data. For recent facilities (<3 years) a minimum of one year data would be required.

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II.C. Demand-side energy efficiency activities for specific technologies (cont)

Where:

EER	Specific Energy consumption in the baseline (MWh/unit). *EER* is calculated as total annual electricity consumed in the baseline divided by total quantity of annual output in the baseline. Data from at least 3 years prior to project implementation shall be used in the calculations, e.g., water supply from a pumping station (records of output can be used in lieu of actually monitored baseline data). For facilities that are less than 3 years old, all historical data shall be available (a minimum of one year data would be required~~)~~).
Q_y	Total quantity of supply in project year 'y' (unit~~)~~).
~~l_y~~	~~Average annual technical grid losses (transmission and distribution) during year *y* for the grid serving the locations where the devices are installed, expressed as a fraction. This value shall not include non-technical losses such as commercial losses (e.g., theft/pilferage). The average annual technical grid losses shall be determined using recent, accurate and reliable data available for the host country. This value can be determined from recent data published either by a national utility or an official governmental body. Reliability of the data used (e.g., appropriateness, accuracy/uncertainty, especially exclusion of non technical grid losses) shall be established and documented by the project participant. A default value of 0.1 shall be used for average annual technical grid losses, if no recent data are available or the data cannot be regarded accurate and reliable~~

7. For project activities that seek to retrofit or modify an existing unit or equipment resulting in an increase in capacity, the determination of the baseline scenario for the incremental capacity shall be based on the procedures described in the general guidance to SSC methodologies under the sections 'retrofit' and 'capacity increase'. For project activities where low flow project activity devices are not provided free of charge, a factor should be added to account for baseline penetration or "free ridership" installation rates of such devices.

Project Activity Emissions

8. Project emissions consist of electricity and/or fossil fuel used in the project equipment, determined as follows.

If the energy displaced is electricity, the project emission is determined as follows:

$$PE_y = E_{PJ,y} * EF_{CO2,ELEC,y} \quad \textbf{(8)}$$

Where:

PE_y	Project emissions in year *y* (tCO2e~~)~~).
$E_{PJ,y}$	Energy consumption in project activity in year *y*. This shall be determined *ex post* based on monitored values.
~~$EF_{CO2,y}$~~	~~Emission factor for electricity or thermal baseline energy. The emissions associated with grid electricity consumption should be calculated in accordance with the procedures of AMS-I.D. For fossil fuel displaced reliable local or national data for the emission factor shall be used; IPCC default values should be~~

~~used only when country or project specific data are not available or difficult to obtain~~

Project energy consumption in case of project activities that displace grid electricity is determined as follows using the data of the project equipment or system:

$$~~E_{PJ,y} = \sum_i (n_i * \rho_i * o_i)/(1-l_y)~~ \; E_{PJ,y} = \sum_i (n_i * \rho_{PJ,i} * o_{PJ,i}) / \left(\eta_{ELEC} * \left(1 - l_y\right)\right) \quad \textbf{(9)}$$

Where:

$\rho_{PJ,i}$ Power of the devices of the group of "i" project activity devices (e.g., 40W incandescent bulb, 5hp motor, thermal energy dispensed). In the case of a retrofit activity, "power" is the weighted average of the devices replaced.

$O_{PJ,i}$ Average annual operating hours of the devices of the group of *"i"* project activity devices.

In the case of water saving devices that reduce electricity consumption in electric water heaters, the power of "*i*" project activity devices can be calculated as follows:

$$\rho_{PJ,i} = W_{PJ,i} * \Delta T_i * Cp \quad \textbf{(10)}$$

Where:

$W_{PJ,i}$ Water flow in the project activity at fixture *i* (litres/hour).

If the energy displaced is thermal energy, the project emission is determined as follows:

$$PE_y = E_{PJ,y} * EF_{CO2,FF} \quad \textbf{11)}$$

Project energy consumption in case of project activities that displace thermal energy is determined as follows using the data of the project equipment or system:

$$E_{PJ,y} = \sum_i (n_i * \rho_{PJ,i} * o_{PJ,i}) / \eta_{th} \quad \textbf{(12)}$$

In the case of water saving devices that reduce fossil fuel consumption in hot water heaters, the power of the group of "i" project activity devices can be calculated as defined in equation (10).

9. Project emissions from physical leakage of refrigerants are accounted for. All GHGs as defined per Article 1, paragraph 5 of the Convention shall be considered as per the guidance by the Board[5]. $PE_{ref,y}$ is calculated as follows:

$$PE_{ref,y} = (Q_{ref,PJ,y}) \times GWP_{ref,PJ} \quad \textbf{(13)}$$

[5] Paragraph 17 of report of EB 34.

Where:

$PE_{ref,y}$	Project emissions from physical leakage of refrigerant from the project equipment in year *y* (t CO2e/y~~)~~).
$Q_{ref,PJ,y}$	Average annual quantity of refrigerant used in year *y* to replace refrigerant that has leaked in year *y* (tonnes/year). Values from Chapter 7: Emissions of fluorinated substitutes for Ozone depleting substances, Volume 3, Industrial Processes and Product Use, 2006 IPCC Guidelines for National Greenhouse Gas Inventories may be used.
$GWP_{ref,PJ}$	Global Warming Potential of the refrigerant that is used in the project equipment (t CO_2e/t refrigerant~~)~~).

Leakage

10. If the energy efficiency technology is equipment transferred from another activity, leakage is to be considered.

Monitoring

11. The emission reduction achieved by the project activity shall be determined as the difference between the baseline emissions and the project emissions and leakage.

$$ER_y = (BE_y - PE_y) - LE_y \quad \textbf{(14)}$$

Where:

ER_y	Emission reductions in year *y* (tCO2e~~)~~).
LE_y	Leakage emissions in year *y* (tCO2e~~)~~).

12. If the devices installed replace existing devices, the number and "power" of a representative sample of the replaced devices shall be recorded in a way to allow for a physical verification by DOE[6].

13. If the devices installed have a constant current (ampere) characteristics, monitoring shall consist of monitoring either the "power" and "operating hours" or the "energy use" of the devices installed using an appropriate method. Appropriate methods include:

(a) Recording the "power" of the device installed (e.g., lamp or refrigerator) using nameplate data or bench tests of a sample of the units installed and metering a sample of the units installed for their operating hours using run time meters;

OR

(b) Metering the "energy use" of an appropriate sample of the devices installed.

[6] This shall be monitored while replacement is underway to avoid, e.g., that 40W lamps are recorded as 100W lamps, greatly inflating the baseline.

14. In either case, monitoring shall include annual checks of a sample of non-metered systems to ensure that they are still operating~~.~~ and to account for potential removal or manipulation of devices by consumers who are not satisfied with the devices. For projects that do not involve direct installation of devices, the monitoring of such devices should include confirmation of actual installation rates at the beginning of the crediting period

15. If the devices have variable current (ampere) characteristics, monitoring shall consist of metering the "energy use" of an appropriate sample of the devices installed. Monitoring shall also include annual checks of a sample of non-metered systems to ensure that they are still operating.

16. For pumping systems monitoring of project activity shall consist of metering the pumping energy use, hourly or daily discharge (m^3 per day or hour) and the total delivery head (m).

Project activity under a programme of activities

The following conditions apply for use of this methodology in a project activity under a programme of activities:

17. In case the project activity involves the replacement of equipment, and the leakage effect of the use of the replaced equipment in another activity is neglected, because the replaced equipment is scrapped, an independent monitoring of scrapping of replaced equipment needs to be implemented. The monitoring should include a check if the number of project activity equipment distributed by the project and the number of scrapped equipment correspond with each other. For this purpose scrapped equipment should be stored until such correspondence has been checked. The scrapping of replaced equipment should be documented and independently verified.

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History of the document *

Version	Date	Nature of revision
13	EB 48, Annex 16 17 July 2009	To clarify the consideration of increased output over the historic average and boundary definition, and to add an option to use specific energy consumption for the baseline emission calculations.
12	EB 47, Annex 22 28 May 2009	Elimination of baseline penetration calculations and cross effect calculations.
11	EB 44, Annex 20 28 November 2008	The revisions clarify the consideration of capacity increase of the project equipment, electricity transmission and distribution (T&D) losses in the baseline and cross effects of lighting and heating. With regard to equipment containing refrigerants, the revisions clarify the calculations of direct emissions from refrigerants.
10	EB 41, Annex 17 02 August 2008	Additional guidance on baseline selection for new facilities and for capacity increase due to retrofit; consideration of electricity transmission and distribution losses; guidance on treatment of direct emissions from refrigerants where relevant.
09	EB 33, Annex 26 27 July 2007	Revision of the approved small-scale methodology AMS-II.C to allow for its application under a programme of activities (PoA)
08	EB 28, Annex 29 15 December 2006	The threshold of small-scale Type II methodologies was increased from 15 GWh to 60 GWh. The consideration of transmission and distribution losses in the baseline estimation was removed.
Decision Class: Regulatory **Document Type**: Standard		

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Business Function: Methodology

* This document, together with the 'General Guidance' and all other approved SSC methodologies, was part of a single document entitled: Appendix B of the Simplified Modalities and Procedures for Small-Scale CDM project activities until version 07.

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II.C. Demand-side energy efficiency activities for specific technologies (cont)

History of the document: Appendix B of the Simplified Modalities and Procedures for Small-Scale CDM project activities

Appendix B of the Simplified Modalities and Procedures for Small-Scale CDM project activities contained both the General Guidance and Approved Methodologies until version 07. After version 07 the document was divided into separate documents: 'General Guidance' and separate approved small-scale methodologies (AMS).		
Version	**Date**	**Nature of revision**
07	EB 22, Para. 59 25 November 2005	References to "non-renewable biomass" in Appendix B deleted.
06	EB 21, Annex 22 20 September 2005	Guidance on consideration of non-renewable biomass in Type I methodologies, thermal equivalence of Type II GWhe limits included.
05	EB 18, Annex 6 25 February 2005	Guidance on 'capacity addition' and 'cofiring' in Type I methodologies and monitoring of methane in AMS-III.D included.
04	EB 16, Annex 2 22 October 2004	AMS-II.F was adopted; leakage due to equipment transfer was included in all Type I and Type II methodologies.
03	EB 14, Annex 2 30 June 2004	New methodology AMS-III.E was adopted.
02	EB 12, Annex 2 28 November 2003	Definition of build margin included in AMS-I.D, minor revisions to AMS-I.A, AMS-III.D, AMS-II.E.
01	EB 7, Annex 6 21 January 2003	Initial adoption. The Board at its seventh meeting noted the adoption by the Conference of the Parties (COP), by its decision 21/CP.8, of simplified modalities and procedures for small-scale CDM project activities (SSC M&P).
Decision Class: Regulatory **Document Type**: Standard **Business Function**: Methodology		