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

TYPE III - OTHER PROJECT ACTIVITIES

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.

III.Q. Waste gas based energy systems

Technology/measure

1. The category is for project activities that utilize waste gas and/or waste heat at existing facilities as an energy source for:

- Cogeneration; or
- Generation of electricity; or
- Direct use as process heat; or
- For generation of heat in elemental process[1] (e.g. steam, hot water, hot oil, hot air).

2. The category is also applicable to project activities that use waste pressure to generate electricity at existing facilities.

3. The recovery of waste gas/heat may be a new initiative or an incremental gain in an existing practice.

4. In case the project activity is an incremental gain, the difference between the technology used before project activity implementation and the project technology should be clearly shown. It should be demonstrated why there are barriers for the project activity that did not prevent the implementation of the technology used before the project activity implementation.

5. Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO_2 equivalent annually. Wherever the measures lead to waste heat recovery which is incremental to an existing practice of waste heat recovery, only the incremental gains in GHG mitigation should be taken into account and such incremental gains shall result in emission reductions of less than or equal to 60 kt CO_2 equivalent annually.

[1] An "*elemental process*" is defined as fuel combustion or heat utilized in an equipment of an industrial facility, for the purpose of providing thermal energy. Examples of an elemental process are steam generation by a boiler and hot air generation by a furnace. Each elemental process should generate a single output (such as steam or hot air) by using mainly a single fuel (not plural energy sources). For each elemental process, energy efficiency is defined as the ratio of the useful energy (the enthalpy of the steam multiplied with the steam quantity) and the supplied energy to the elemental process (the net calorific value of the fuel multiplied with the fuel quantity).

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

III.Q. Waste gas based energy systems (cont)

6. The category is applicable under the following conditions:

- The energy produced with the recovered waste gas/heat or waste pressure should be measurable.
- Energy generated in the project activity shall be used within the facility where the waste gas/heat or waste pressure is produced. An exception is made for the electricity generated by the project activity which may be exported to the grid.
- The waste gas/heat or waste pressure utilized in the project activity would have been flared or released into the atmosphere in the absence of the project activity. This shall be proven by one of the following options:
  - By **direct measurements** of energy content and amount of the waste gas/heat or waste pressure for at least *three years* prior to the start of the project activity.
  - **Energy balance** of relevant sections of the plant to prove that the waste gas/heat or waste pressure was not a source of energy before the implementation of the project activity. For the energy balance the representative process parameters are required. The energy balance must demonstrate that the waste gas/heat or waste pressure was not used and also provide conservative estimations of the energy content and amount of waste gas/heat or waste pressure released.
  - **Energy bills** (electricity, fossil fuel) to demonstrate that all the energy required for the process (e.g. based on specific energy consumption specified by the manufacturer) has been procured commercially. Project participants are required to demonstrate through the financial documents (e.g. balance sheets, profit and loss statement) that no energy was generated by waste gas/heat or waste pressure and sold to other facilities and/or the grid. The bills and financial statements should be audited by competent authorities.
  - **Process plant** manufacturer's original specification/information, schemes and diagrams from the construction of the facility could be used as an estimate of quantity and energy content of waste gas/heat produced for rated plant capacity per unit of product produced.

7. For the purpose of this category waste gas/heat/pressure is defined as: by-product gas/heat or pressure of machines and technical processes for which no useful application is found in the absence of the project activity and for which it can be demonstrated that it has not been used prior to, and would not be used in absence of the CDM project activity (e.g. because of low pressure, heating value or quantity available). In the project scenario, this waste gas/heat/pressure is recovered and conditioned for use.

Boundary

8. The physical, geographical site of the facility where the waste gas/heat/ pressure is produced and transformed into useful energy delineates the project boundary.

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

III.Q. Waste gas based energy systems (cont)

Baseline

9. For computing the emissions in the baseline the procedure provided in paragraphs 6 to 13 of AMS I.C shall be used.

Capping of baseline emissions

10. As an introduction of element of conservativeness, this category requires that baseline emissions should be capped irrespective of planned/ unplanned or actual increase in output of plant, change in operational parameters and practices, change in fuel types and quantity resulting in increase in waste gas generation. In case of planned expansion a separate CDM project should be registered for additional capacity. The cap can be estimated using the two methods described below. In order to apply the cap the energy produced should be multiplied by a capping factor f_{cap}. In case electric energy and thermal energy are produced simultaneously appropriate conversion factors should be used to obtain total energy produced. Project proponents shall use method 1 to estimate the cap if data is available.

Method 1: The baseline emissions are capped at the maximum quantity of waste gas flared/combusted or waste heat released into the atmosphere under normal operation conditions in the last 3 years previous to the start of the project activity.

For that purpose f_{cap} is estimated as follows:

$$f_{cap} = \frac{Q_{WG,BL}}{Q_{WG,y}} \quad \textbf{(1)}$$

In case the calculated value of fcap is higher than 1, fcap is set to 1.

Where:

$Q_{WG,BL}$ Quantity of waste gas generated prior to the start of the project activity (Nm^3/yr)

$Q_{WG,y}$ Quantity of waste gas used for energy generation during year y ($Nm^{3/}yr$)

For waste heat or waste pressure projects, equation 1 should be adapted, changing quantity of waste gas by quantity of energy contained in the recovered waste heat or waste pressure.

Method 2: The manufacturer's data for the facility shall be used to estimate the amount of waste gas/heat/pressure that the industrial facility generates per unit of product generated by the process that generates waste gas/heat/pressure (either the product of a section of the plant or product of entire plant, whichever is more representative). In case any modification is carried out by project proponent or in case the manufacturer's data is not available, an assessment should be carried out by independent qualified/certified external process experts such as a chartered engineer to estimate a conservative quantity of waste gas generated by plant per unit of product manufactured by the process generating waste gas/heat/pressure. The value arrived at based on above sources of data shall be used to estimate the baseline cap (f_{cap}). The documentation of such assessment shall be verified by the validating DOE.

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

III.Q. Waste gas based energy systems (cont)

The basis for determining the capping factor (including manufacturer's design document/letter and the expert's analysis) should be provided to DOE during validation.

Under this method, following equations should be used to estimate $f_{cap.}$

$$f_{cap} = \frac{Q_{WG,BL}}{Q_{WG,y}} \quad \textbf{(2)}$$

$$Q_{WG,BL} = Q_{BL,product} \times q_{wg,product} \quad \textbf{(3)}$$

In case the calculated value of fcap is higher than 1, fcap is set to 1.

Where:

$Q_{WG,BL}$ Quantity of waste gas generated prior to the start of the project activity estimated using equation 3. (Nm^3)

$Q_{BL,product}$ Production by process that most logically relates to waste gas generation in baseline. This is estimated based on 3 years average prior to start of project activity.

$q_{wg,product}$ Amount of waste gas/heat/pressure the industrial facility generates per unit of product generated by the process that generates waste gas/heat/pressure.

For waste heat or waste pressure projects, equations 2 and 3 should be adapted, changing quantity of waste gas by quantity of energy contained in the recovered waste heat or waste pressure.

Project emissions

11. Project Emissions include emissions due to combustion of auxiliary fuel to supplement waste gas and emissions due to consumption of electricity by the project activity.

Emission reductions

12. Emission reductions are calculated as baseline emissions minus project emissions.

Monitoring

13. For baseline emissions determination, monitoring shall consist of:

(a) Metering the thermal and/or electrical energy produced. In case of thermal energy the enthalpy of the thermal energy output stream like hot water/steam should be monitored.

(b) Metering the amount of waste gas or the amount of energy contained in the waste heat or waste pressure.

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

III.Q. Waste gas based energy systems (cont)

14. For project emissions determination, the Tool to calculate project or leakage CO_2 emissions from fuel combustion and the Tool to calculate project emissions from electricity consumption shall be used.

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:

15. 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.

- - - - -

History of the document

Version	Date	Nature of revision
01	EB35, Annex 26 19 October 2007	Initial adoption