CDM: Recommendation Form for Small Scale Methodologies (version 01)

(To be used for presenting questions/proposals/amendments to the simplified methodologies for small-scale CDM project activity categories)

Date of SSC WG meeting:	11–14 January 2011, SSC WG 29
Title/Subject (give a small title or specify the subject of your submission, maximum 200 characters):	Revision of AMS-III.Q to include multiple fuels in the baseline electricity source and multiple waste heat sources
Indicative methodology to which your submission relates (refer the items of Appendix B of the Simplified Modalities and Procedures), if applicable.	AMS-III.Q "Waste Energy Recovery (gas/heat/pressure) Projects"
Name of the authors of the query:	Luca Morganti Institution: First Climate Group Mischa.Classen@firstclimate.com, Luca.morganti@firstclimate.com

Summary of the query:

Please use the space below to summarize the query related to SSC methodologies/categories SSC Modalities and Procedures provide recommendation/analysis of the SSC WG.

Original text from PP:

This request for revision aims at extending AMS-III.Q to project activities that

(i) use multiple fuels in the baseline situation and

(ii) use multiple heat sources for electricity generation

The request relates to earlier requests to accommodate project activities with a multiple fuel baseline under AM0024 (AM_REV_0141), AM0014 (AM_REV_0125) and AMS-III.B (SSC_250). Whereas the requested revisions to the large scale methodologies could not be resolved by the panel, SSC_250 led to the new methodology AMS-III.AH "AMS III.AH Shift from high carbon intensive fuel mix ratio to low carbon intensive fuel mix ratio".

(i) Multiple fuel use in the baseline

This part of the request proposes two changes:

a. to eliminate the index j (denoting the recipient) in the emission factor calculation of the sources

b. to propose a calculation able to calculate the emission factor of multiple fuel sources.

a. Eliminate index j in equation 2, related editorial changes

In the current version of AMS-III.Q equation 2 at page 4 calculates $EF_{elec,i,j,y}$ as the CO_2 emission factor for an identified existing plant.

$$EF_{Elec,i,j,y} = \frac{EF_{CO2,i,j}}{\eta_{Plant,j}} \times 3.6 * 10^{-3} \qquad \textbf{(eq.2)}$$

However, the $EF_{Elec,i,j,y}$ is in no way related to the recipient of the electricity generated. $EF_{Elec,i,j,y}$ of a specific source i would be identical for every recipient j. It is also not dependent on the monitoring year y as it refers to the baseline situation that is set ex-ante.

As there is no meaning to calculate $EF_{Elec,i,j,y}$ per recipient and to avoid unnecessary calculations and inconsistencies, we propose to (1) eliminate the index j from equation 2, to (2) eliminate index y from $EF_{Elec,i,j,y}$ and (3) attach index i to the eta (plant efficiency) instead of "Plant":

$$EF_{Elec,i} = \frac{EF_{CO2,i}}{\eta_i} \times 3.6 * 10^{-3}$$

As equation 1 is referencing $EF_{Elec,i}$ the proposed change of the indices has to be reflected there (editorial change).

b. Emission Factor for multiple fuel sources

In some countries temporary supply restrictions of specific fuels requires plants to use multiple fuels. Equation 2, however, is designed for single fuel use only.

If the existing plant has been using more than one fossil fuel, the calculation becomes ambiguous with respect to which value $EF_{CO2,i,j}$ is to be used in equation 2. This is confirmed by the description of this parameter which refers to 1 fossil fuel:

$EF_{CO2,i,j}$ is the CO_2 emission factor per unit of energy of **the fossil fuel** used in the baseline generation source i in t_{CO2}/TJ, obtained from reliable local or national data, if available, otherwise, taken from the country specific IPCC default emission factors".

It is requested to revise the methodology by adopting also the following option for existing plants with sufficient historical data:

$$\eta_{i,k} = \frac{EG_{i,k}}{FC_{i,k} \cdot NCV_k} \cdot 3.6 \cdot 10^{-3}$$

(eq.2 revised 1)

$$EF_{Elec,i} = \sum_k \frac{EF_{CO2,k}}{\eta_{i,k}} \cdot \left(\frac{EG_{i,k}}{EG_i} \right) \cdot 3.6 \cdot 10^{-3}$$

(eq.2 revised 2)

Where:

FCi,k is the fossil fuel consumption of fuel k used by source i in the historical period (in appropriate unit, e.g. tons or m3)

NCVk is the net calorific value of the fossil fuel k (according to reputable sources, analysis or IPCC values) (in TJ per mass/volume unit, consistently with FCi,k)

EGi is the power generation by source i in the historical period (consistently with the period available for FCi,k) (in MWh)

η j,k is the partial plant efficiency related to the use of fuel k by source i in the historical period.

EFCO2,k is the CO2 emission factor of fuel k in tCO2/TJ.

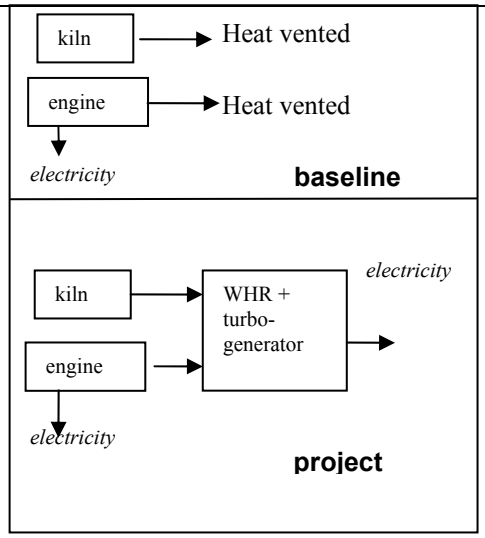
In summary, the proposed eq. 2 revised 1 and 2 allows to calculate EFelec,i,j,y as the weighted average emission factor for all the fossil fuels used in the baseline generation source i.

The quantity of fuels and of energy produced should be available from at least 3 years of historical records.

(i) Multiple heat sources

It is also requested to clarify the methodology applicability condition 6.c at page 2, which excludes cases where "the waste gas/heat recovery project is implemented in a single-cycle power plant where heat on site is not utilisable for any other purpose on-site except to generate power".

In a case of a cement factory waste heat is collected from the kiln AND from an internal combustion engine. Although steam is generated in separate waste heat recovery boilers, it is fed to the same steam turbine to produce electricity.



Whereas the waste heat from the kiln is heat from an elemental process and it is eligible under the methodology, the heat from the internal combustion engine is not. Using the waste heat from the internal combustion engine would constitute a combined cycle as electricity is generated in a second step, after the primary fuel has already been used to generate electricity in the internal combustion engine.

The project activity is therefore a mix of a single-cycle (heat from elemental process, i.e. kiln) and a combined-cycle (heat from engine). Furthermore, the heat from the engine has no other useful application on site (would be vented) and is only utilisable to produce power. This case seems to be excluded by clause 6.c cited above.

However, clause 6.c seems to be geared towards single-cycle power plants (and not captive power units) where waste heat cannot be used for anything else than further power generation in a combined cycle. Footnote number 10 in ACM0012 refers to the identical clause. There it is stated that ACM007 is to be applied in such cases. Both, ACM0012 and ACM007 relate to power plants and are not intended be applied to industrial on-site electricity production.

It is here requested to amend the methodology to distinguish between power plants and industrial captive power units. We propose to change clause 6.c in order be applicable to full scale power plants with the main purpose to provide electricity to the grid (as intended by ACM0007) but excluding single power generation units within a captive power plant serving a manufacturing plant:

"The projects recovering waste energy from such power plants for the purpose of generation of heat only can apply this methodology, as well as do single-cycle captive power units (e.g. serving manufacturing plants) where waste heat cannot be used for anything else than further power generation"

In that way the CDM could provide incentive to make best use of all of the potentially available heat sources in a plant. In the current form, however, the methodology is excluding even the application to the elemental process (e.g. the kiln) as it is not foreseen in the methodology to exclude part of the heat (e.g. from the internal combustion engine) from the project boundary.

Additional queries from the SSC WG and the response by the PPs:

1. "Please clarify whether the case is just an example and represents hypothetical situation or represents an actual project."

PP response submitted 13/01/2011:

The issue of multiple fuels used in captive generation is relevant for several real cases, in particular in Pakistani projects, e.g. DGKCC Waste Heat Recovery and Utilization for 10.4 MW Power Generation at Dera Ghazi Khan Plant, already published for GSC on 24 Mar 10 (http://cdm.unfccc.int/Projects/Validation/DB/XDNBLIDFFBLQR11A0SD86KIXIF 5KUM/view.html)

Please note, however, that this project is linked to the SSC_497 only for the multiple fuels part (not for the other issues of multiple heat sources for power generation). This other topic was raised by the project Waste Heat Recovery and Utilization for Power Generation at Maple Leaf Cement Factory Limited, Iskanderabad, Pakistan, published for GSC on 25 Jul 09 (http://cdm.unfccc.int/Projects/Validation/DB/YW549ZAEG1IIP5DDVUIE42U3ZZ 5CAH/view.html)

2. We understood that waste heat from Kiln and IC engine will be recovered to produce steam using waste heat recovery boiler. The steam will be used to produce additional electricity (addition to the amount that is produced by the IC engine) through an installation of a new steam turbo-generator. It is however stated in the submission that "Although steam is generated in separate waste heat recovery boilers, it is fed to the same steam turbine to produce electricity". Please clarify.

PP response:

The heat from the kiln is fed to a waste heat recovery boiler and steam is produced. The heat from the IC is fed to another waste heat recovery boiler and steam is also produced. The steam from the 2 sources is fed to the SAME steam turbine, built as part of the project activity. The metering of the electricity generated by the WHR equipment is done at the turbo generator, excluding the electricity produced by the IC directly.

3. It is not clear in the submission how the additional electricity would have been produced in the absence of the project activity. In other words, what is the baseline for the additional electricity produced? Is the facility connected to a grid and in the baseline electricity is imported while the additional electricity produced during the project displaces the grid and/or export to the grid?

PP response:

Baseline for all the electricity produced (from both heat sources, the kiln and the IC) is grid electricity. In absence of the project activity (which includes the installation of WHR boilers for BOTH sources and the common turbo-generator) the electricity would be supplied by the grid.

4. Please note that conversion from single cycle to combined cycle project activity is excluded from AMS-III.Q "Hydrogen production using methane extracted from biogas" and a new methodology (AMS-III.AL "Conversion from single cycle to combined cycle power generation") has been developed in response to the submission SSC-NM048 "Conversion from single cycle to combined cycle power generation "/SSC_359 "Clarification on AMS-III.Q for project activity using incremental gain of waste heat recovery". The rationale of having a separate methodology for this case is related to the fact that the operation of the single cycle (the turbine or the engine) could be affected (dispatch may be increased) once the conversion is implemented as the combined cycle is relatively more efficient. AMS-III.AL provides procedures to capture this situation. Please clarify how the proposed request for revision addresses this issue. Please note however that AMS-III.AL is not applicable to this particular case where waste heat from an engine is used together with waste from a kiln to produce additional electricity.

PP response:

We are aware that AMS.III.Q does not cover the conversion from single cycle to combined cycle. The problem is that it is ambiguous in our case whether "adding a WHR unit downstream an IC" in fact qualifies as "conversion from single cycle to combined cycle". In case it qualifies as such, our request is to amend the methodology in order to exclude cases related to single units in captive power plants serving industrial facilities, which are quite different from full scale grid-connected power plants. In addition, when AMS.III.AL is considered, it is clear that in this case the electricity produced in the baseline by the single cycle system is to be deducted from the total project power generation, and provisions are needed to ensure that the first part of the combined cycle is not modified once the second cycle is added. But this is automatically ensured in the proposed project case, as (i) the electricity produced by the IC is NOT included in the project power generation (only the electricity produced by the new turbo-generator is accounted for the ER calculation) and (ii) it is not possible to influence the IC through operation of the turbo-generator (so the IC will continue operating as in the baseline scenario). On the other hand, if the "addition of a WHR unit downstream an IC for power generation" is not to be interpreted as a conversion from single cycle to combined cycle, then AMS.III.Q is applicable to our case and only a clarification to this regard is needed from you, to make clear to the validating DOE that our case does comply with the applicability conditions of AMS.III.Q. In that case only the first part of our request would be geared towards revising AMS.III. Q to include multiple fuels in the baseline. The second request on multiple heat sources could be dealt with by a simple clarification from your side.

Recommendation by the SSC WG:

Please use the space below to provide amendments/change (in your expert view, if necessary).

Please refer to paragraph 22 of the meeting report of the SSC WG 29 <http://cdm.unfccc.int/Panels/ssc_wg>.

Answer to authors of query by the SSC WG:

Please use the space below to provide answer to the authors of the above query.

The small-scale working group of the CDM Executive Board would like to thank the author for the submission.

The SSC WG agreed to clarify as below:

(i) Multiple fuel use in the baseline;

(a) Request for revision to eliminate index *j* and *y* in equation (2);

The SSC WG agreed to clarify that $EF_{Elec,i,j,y}$ that is determined from equation (2) is used in equation (1) of AMS-III.Q to determine baseline for displaced electricity. The notations denotes emission factor for each identified source *i* at recipient *j* in year *y*. In case *i*=grid, EF could be estimated annually depending upon which options (*ex ante*/*ex post*) is chosen from the tool to calculate emission factor for electricity system. Hence the subscript *y* is needed.

The group noted that in most cases the displaced baseline plant is located in the facility where the waste energy is produced. However, as export of energy is allowed in the methodology, it may be needed to consider the different possible baseline situations for the recipient plants. One of the possible situations is that the recipient has its own captive plant (and hence the subscript *j* is needed).

(b) Request for revision to cover multiple fuel sources in the baseline;

The SSC WG agreed to include the case of multiple fuel use in the baseline in the ongoing/top down revision of AMS-III.Q being undertaken by the group. The proposed procedure in this submission will be considered.

(ii) Request for clarification about using multiple waste heat sources;

The SSC WG agreed to clarify that conversion from single cycle to combined cycle project activity is excluded from AMS-III.Q based on the fact that the operation of the single cycle (the turbine or the engine) could be affected (dispatch may be increased) once the conversion is implemented as the combined cycle is relatively more efficient. It shall be noted that if the single cycle unit is less efficient than the grid and due to the implementation of the project activity its dispatch is increased, there will be two impacts in the grid: (1) There would be an emission increase because of the additional energy generated in the single cycle unit; and (2) There would be an emission reduction because of the energy generated using waste heat. AMS-III.AL provides procedures to capture these situations.

The author of the submission however may consider submitting a request for revision to cover the use of multiple waste heat sources in an activity involving conversion from single cycle to combined cycle electricity production under AMS-III.Q. The following approach may be considered by the author:

The described project activity can be considered as having two components:

(a) The recovery of waste heat from the internal combustion engine to produce additional electricity constituting a combined cycle; and

(b) The recovery of waste heat from the kiln to produce electricity using the same steam turbine.

The energy output (electricity or steam energy input to TG sets) can be allocated to two different types of input waste heat sources and baseline for each source is determined.

For example:

Component 1: the amount of electricity that corresponds to the waste heat recovered from the engine constituting combined cycle-electricity. The base line for incremental electricity shall be determined following the provisions of AMS-III.AL.

Component 2: the amount of electricity that corresponds to the waste heat energy recoverd from the Kiln. The base line for electricity shall be determined using the current provision of AMS-III.Q.

The allocation could be done by considering the energy inputs to the waste heat recovery system. Monitoring procedure to determine the energy inputs would be required.

Signed by the Chair, Mr. Peer Stiansen

Date: 14/01/2011

Signed by the Vice-Chair, Mr. Hugh Sealy

Date: 14/01/2011

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