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)

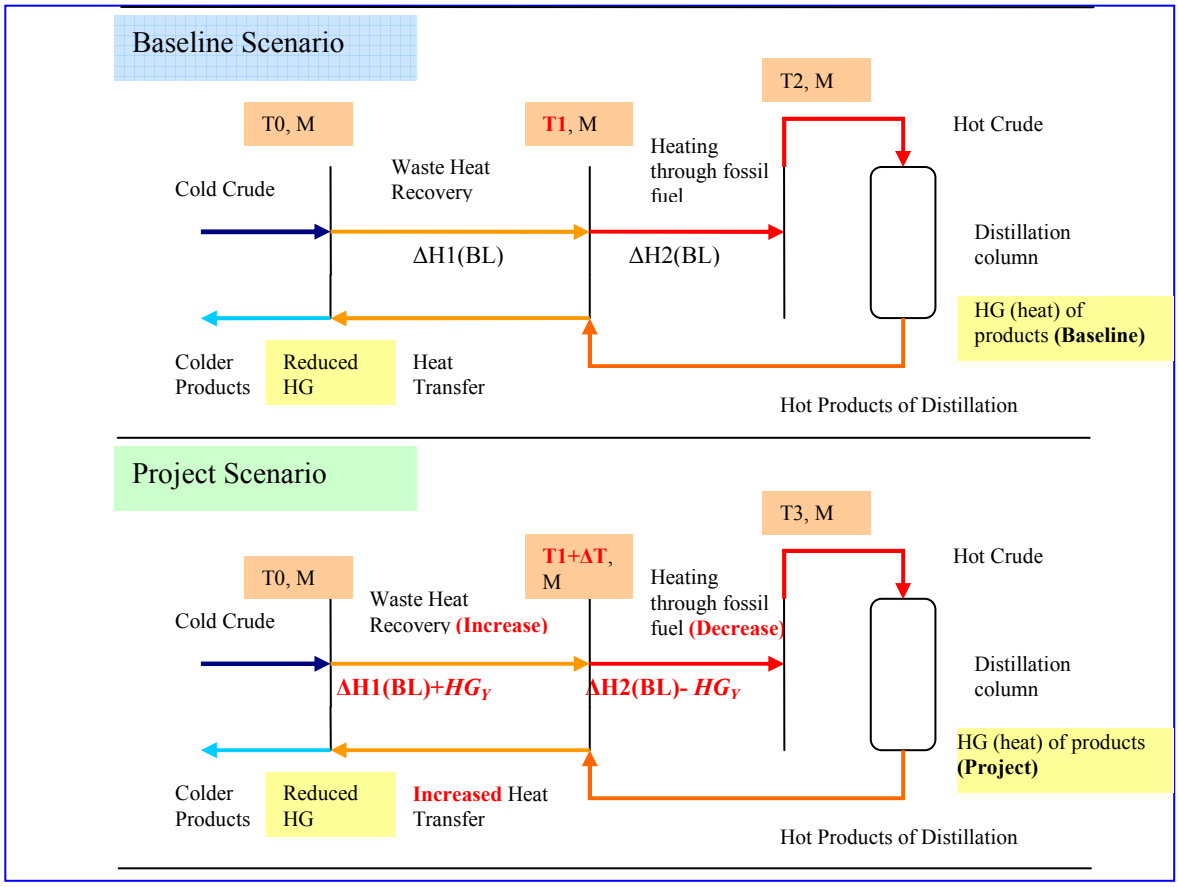
Date of SSC WG meeting:	21–24 September 2009, SSC WG 22
Title/Subject (give a small title or specify the subject of your submission, maximum 200 characters):	Revision of AMS-III.Q to include project activity involving enhanced waste heat recovery
Indicative methodology to which your submission relates (refer the items of Appendix B of the Simplified Modalities and Procedures), if applicable.	AMS-III.Q, version 2
Name of the authors of the query:	Kunal Sharma Institution: ICF International ksharma@icfi.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:

1. Objective: The purpose of this submission is to include the required formulas in the current version (Version 02) of the methodology AMS III Q, which can be applied to calculate the baseline emissions and attribute emission reductions where the waste heat recovered from a hot media (waste energy carrying medium or WECM), is used to heat another media directly through waste heat exchangers (without any mixing of medias). The proposed revision would be applicable to projects that involve direct heat transfer for final use without first converting the waste heat/energy into electricity or hot steam etc. Revisions proposed through the current submissions are:
    a. Proposed formulas (Equation 5 to 8) will provide mathematical basis for calculating baseline emissions. This applies to scenario where waste heat exchangers are installed to increase the overall waste heat recovery process through direct transfer of waste heat from WECM to the colder media to be heated.
    b. Associated changes in the applicability conditions have also been introduced.
2. The following picture depicts the situation being referred to:



3. **Description of above picture**: The baseline emissions correspond to the emissions that would have happened in the absence of the project activity to heat the colder fluid using fossil fuel to produce the heat: HG_Y. This heat (HG_Y) is being produced during the project activity using waste heat. The waste heat transferred is quantified by calculating the increase in the enthalpy of the media heated by the increased waste heat recovery process. In the project scenario due to installation of additional waste heat recovery equipment - the Waste Heat Carrying Medium (WECM) results into heating of cold crude to higher temperature (T1+ΔT: referred to as $T_{Project,y}$ in the methodology) than what would have happened in the baseline (T1: referred to as $T_{Baseline}$ in the methodology).

4. **Equation 5 to Equation 8**: The formulas currently included in the Version 02 of the methodology allows for calculation of Baseline Emissions where waste heat recovered is converted into electricity or heat (of steam) before being used at the end site. However, in our request for revision we have proposed inclusion of formulas for calculating baseline emission where direct transfer of waste heat through waste heat exchangers happen. All the underlying formulas have been included in the paragraph 12 of the revised methodology draft.

   a. **Equation 5**: Provides the mathematical approach to calculation of baseline emissions and its approach is very similar to three equations (Equation 1, 3 and 4)[1] currently in the version 02 of AMS.III.Q for calculating baseline emissions under several situations. Equations 6 to 8 provide guidance for calculating the parameters included in Equation 5.

   b. **Equation 6**: Provides the basis for calculating the emission factor for the increased waste heat recovery (HG_Y). The increased waste heat recovery displaces the fuel source (i) from the

[1] Equation 1, 3 and 4 of Version 02 are applied to following situations of waste heat recovery: Equation 1 applies to waste heat recovery through electricity production, Equation 2 applies to waste heat recovery through mechanical energy production and Equation 4 applies to waste heat recovery through a cogeneration plant for heat and electricity production.

baseline; the emission factor of fuel source (i) has been applied to calculate baseline emissions. The approach incorporated in Equation 6 is similar to the approach followed in Equation 2[2] currently in the Version 02 of AMS.III.Q.

c. **Equation 7**: Provides the basis for calculating the increased waste heat recovery (HG_Y) in the project activity due to increase in the enthalpy of the colder crude in the project scenario vis-à-vis the baseline scenario, achieved as a result of increased waste heat recovery in the project scenario.

d. **Equation 8**: Provides the basis to exclude increased waste energy utilization in the project year 'y' due to increased level of activity of the plant, relative to the level of activity in the base years before project start. The ratio is 1 if the waste energy generated in project year y is same or less than that generated in base years. Further:

i. The existing version (Version 02) of methodology AMS.III.Q incorporates a discounting factor already: but for that AMS.III.Q (Version 02) refers to the large scale methodology ACM0012 "Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects" for calculation of f(cap).

ii. The methodology ACM0012 provides different options for determining capping factor, assuming only one Waste Energy Carrying Medium (WECM). Whereas, in the current project activity there are more than one WECM (multiple products of the distillation activity). Therefore, a sigma function ($\sum_j$) has been proposed in the equation (1f) of ACM0012 so as to be able to account for all the carrying mediums. This has been incorporated in **Equation 8** of the revised methodology draft.

iii. Formula 1f also accounts for energy of the WECM (from a point of view that the waste energy might be gas) due to the NCV of the WECM and the waste pressure of the WECM – none of which is applicable from the context of waste heat transfer from a hot liquid media to a colder liquid media. Hence, the aspect of NCV and waste pressure has been removed from the formulas.

5. **Change in Applicability Condition**: Subsequently an inclusion of applicability condition has been proposed too. This is shown in Paragraph 1(f) in the revised version of the methodology. The applicability condition allows for direct waste heat transfer from one media (Waste Energy Carrying Medium or WECM) to another media through waste heat exchangers.

6. **Revised Methodology Form**: The detailed description of the formulae and changes in applicability condition has been highlighted in the draft of the revised methodology being submitted along with this form.

7. **Revised PDD**: The applicability of the revisions to the Version 02 of the methodology is visible in the PDD.

Recommendation by the SSC WG:

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

Please refer to paragraph 20 of the meeting report of the SSC WG 22 (http://cdm.unfccc.int/Panels/ssc_wg).

[2] Equation 2 of Version 02 of AMS.III.Q calculates the emission factor of the displaced source of electricity from the baseline by the project activity.

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 SSCWG agreed not to recommend the request for revision due to following reasons:

1. The SSCWG noted that the proposed project activity includes heat recuperation from hot products and its use in heating cold crude feedstock in the atmospheric distillation component which provides feeds to vacuum distillation unit and other subsequent units in an interconnected process may have considerable uncertainties in estimating emission reductions.
2. In determining energy savings (as a result of heat optimization) from energy efficiency improvements in complex processes, the key issue is to factor out the effects of energy efficiency improvement from other factors, such as varying load and changing process conditions. This is particularly complex in case of multiple outputs and inputs, such as in the underlying project of a refinery. In such cases, improvements of energy savings can only be calculated by either complex modeling or by measuring the improvements for either (a) defined process output conditions or (b) for different conditions as a function of key parameters. In calculating energy savings, a key requirement is that the same output or service level is considered in the baseline and the project".
3. It is unclear whether all the cold and hot streams going to the HEN and coming from the HEN are exactly the same (same mass flow, same inlet/outlet temperature) in the baseline and the project situation or to which extent there are differences. For example, a certain hot stream may only be used in the project activity and not in the baseline or vice versa. However, this may impact energy consumption / emissions outside the project boundary and should therefore not be neglected. Therefore applicability conditions should be added regarding the four different stream types entering and leaving the HEN / HECE system viz. the cold stream input, output, hot stream input and output.
4. In such complex process industry it is unclear how many heat conversion equipments (HECEs) may be used and in which exact configuration ,whether the revision of this methodology allows only one HECE that is connected in parallel or multiple adjacent HECEs connected in series can be considered as single HECE
5. The vintage requirement for the baseline data like the temp and mass are not available in the revision request.
6. Increased output as a result of the project activity: The methodology is unclear whether there will be any increase in the useful output (crude oil – mass) compared to the baseline situation .Please clarify whether a) more crude oil is produced in the project than in the baseline situation and whether b) the same crude oil temperature is reached in the project and in the baseline through the combination of the heat exchanger network and heat conversion equipments. The service level provided should be clearly defined (e.g., quantity of crude oil heated to a certain temperature from a certain raw temperature). Ensure that the service level is the same in the project and the baseline and calculate the emission reductions as the difference in emissions to provide the same service level.
7. Neither of the options a & b provided in NM0204 are used in emission reduction calculation, also in equation (7) provided in the proposed methodology, there are no provision to confirm that both the baseline and project will have same mass media and same specific heat so there for the only factor that will be used for the estimation of emission reductions will be the ΔT between the media.
8. The submission author may note the recommendations given by the CDM-MP for both the cases NM0204 and NM0154, and then provide a revision request clearly elaborating how the issues raised in those instances are addressed in revision request.
9. According to Gadalla et al (Energy, Volume 31, Issue 13, October 2006, Pages 2398-2408), the CO_2 emissions associated with ADU can be cut down by 22%, by changing the process conditions for energy recovery. For example, the process conditions of the distillation process can be changed to

increase the energy recovery. Hence, the energy conservation leads indirectly to lower CO_2 emissions, as a result of the non-burned fuel. The SSC WG is of the opinion that such emission reduction resulting from change in process conditions would be difficult to distinguish emission reduction from the activities for example from the described enhances waste recovery measures versus the change in process conditions.

The author of the submission also may note the following:

- If an energy saving measure (as a result of heat optimization) is not in a stand-alone facility but in complex industrial process and/or a sub-system of a large facility, it may not be eligible under the SSC methodology as there may be considerable uncertainties in estimating baseline and project emission using the framework of a simplified small scale methodology (see paragraph 58 of EB 47) which states "The Board considered the new small-scale methodology "AMS-II.K Industrial process optimization for energy efficiency and electricity generation" recommended by the SSC WG and agreed not to approve the methodology. The proposed methodology does not adequately capture baseline and project emissions associated with the complex industrial process to which the methodology is applicable. The Board was of the opinion that a simplified small scale methodology may not provide the right framework for the kind of technology/measure being addressed by the methodology."

The above issues are examples and may not cover all the uncertainties in the proposal.

Signature of SSC WG Chair ……..

(Hugh Sealy)

Date: 24/09/2009

Signature of SSC WG Vice-Chair ……..

(Peer Stiansen)

Date: 24/09/2009

Information to be completed by the secretariat	
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