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:	15–18 June 2010, SSC WG 26
Title/Subject (give a small title or specify the subject of your submission, maximum 200 characters):	Applicability of AMS-II.D and III.B to a fuel switch and energy efficiency measures implemented at same facility
Indicative methodology to which your submission relates (refer the items of Appendix B of the Simplified Modalities and Procedures), if applicable.	AMS-II.D "Energy efficiency and Fuel Switching measure for the industrial facility" (Version 11, EB 35); and AMS-III.B "Switching Fossil Fuels" (Version 14, EB 47)
Name of the authors of the query:	Sanjay Pawar Institution: Dy.General Manager-Engg.Services sanjay.pawar@vvfltd.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:

Energy Efficiency Activities at the Taloja plant of VVF Ltd.

VVF Ltd has a soap manufacturing plant at Taloja, Maharashtra, India. There are two different project developed under Climate Change mitigation program at VVF Ltd. The projects are a) Fuel Switching to meet the thermal requirement of the plant / to reduce the emissions and b) Energy Efficiency measures implementation to reduce emissions.

The energy efficiency activities are carried in two places in the Alcohol manufacturing unit. The measures and the monitoring procedures have been described below:

- **Hot Water System Fatty Alcohol plant:** In the pre project scenario, In fatty alcohol plant the heating was done by circulating hot thermic fluid and the cooling by circulating cooling water from cooling towers as process requirement .The hot thermic fluid being generated in the plant by thermic fluid heaters operating on furnace oil as fuel. The project activity utilizes the waste heat from the cooling process to keep the alcohol products & raw material in liquid state stored in tank farm by circulating the recovered hot water through coils inside tanks, instead of steam is used for the same purpose, thus achieving saving of steam required for heating and as result savings in furnace oil consumed to generate steam. The said reduction/saving in the furnace oil consumption leads to the reduction in emissions from the plant premises. The parameters monitored are the amount of steam consumed in the heating process before the project activity and the amount of heat that can be transferred by the hot water to the hot Water system for keeping the product and raw material in liquid state during the project activity (by measuring the flow rate and the temperature difference between the supply and return of water).
- **Hot Separation in Fatty Alcohol Plant:** This energy efficiency activity process takes places after the production of crude alcohol and hydrogen from the hydrogenation reactor located in the fatty alcohol plant in premises of VVF Ltd at Taloja. In pre project scenario the temperature of the products from

the hydrogenation reactor (crude alcohol and hydrogen) remains around 190°C.(end of run conditions) The products were then cooled to 75-80°C before being separated by a separator. The crude alcohol was again heated back to around 165-170°C which consumes the heat generated by thermic fluid heaters using furnace oil as fuel. In the project scenario, the products from the hydrogenation reactor at the outlet(After exchanging Heat with Incoming hydrogen feed) are at the same temperature of around 190°C but wherein the crude alcohol and the hydrogen separated initially and only hydrogen allowed to cool at 60-75°C. The crude alcohol at high temperature directly fed to the fractionation column and also recycled to wax esterification section ,where it would be otherwise reheated to a temperature of 165-170°C which saves the fuel which was initially used to heat it from a lower temperature. The savings in furnace oil consumption leads to a reduction in the emission reduction from the plant. The parameters monitored are the furnace oil used for the heating in the pre project activity and the flow and temperature of the crude alcohol in the pre and the post project activity to determine the energy savings.

At the same site VVF has planned fuel switch project activity from higher carbon intensive fuel lower carbon intensive fuel in boilers,thermic fluid heaters and hydrogen manufacturing unit (reformer). The fuel used for the generation of heat in the boilers,heaters and hydrogen unit was changed from furnace oil and naptha to natural gas and the same is being taken up as a separate CDM project under the methodology AMS-III.B "Switching Fossil fuel" (Version 14, EB 47). The above mentioned energy efficiency projects fall under the project boundary of the Fuel Switch Project. Both these projects are planned within one year of each other.

The project proponent seek a clarification whether the above mentioned Energy efficiency projects are applicable under the Para 3 of the methodology AMS-II.D "Energy efficiency and Fuel Switching measure for the industrial facility" (Version 11, EB 35) which states that "This category is applicable to project activities where the impact of the measures implemented (improvements in energy efficiency) by the project activity can be clearly distinguished from changes in energy use due to other variables not influenced by the project activity (signal to noise ratio)."

As per the para 19 of AMS-III.B (Version 14) the project emissions have been calculated using the amount of fossil fuel consumed in the project scenario. The amount of fossil fuel used in the project scenario will be reduced due to the above mentioned energy efficiency measures also. The monitoring systems would be thorough for all the projects independently resulting to demonstration of energy savings separately for each project. Considering the scenario the project proponent seeks clarification whether energy efficiency and fuel switch projects could be developed as two separate CDM Projects at the same site.

Additional queries from SSC WG:

1. It is understood that energy efficiency and fuel switch project activities are planned to be developed as two separate CDM projects at the same plant/site i.e., 1) energy efficiency project activity applying AMS-II.D and 2) fuel switch project activity applying AMS-III.B. Please provide baseline and project emissions (annual) for each project activity and explain how they are estimated.

PP Response:

Energy Efficiency Project:

1. Hot Water System Fatty Alcohol plant:

Baseline Emission Factor

$BEF_{heater} = (Q_{FF} * NCV_{FF} * EF_{FF} / Q_{heater})$

Where:

BEF_{heater}	Baseline emission factor of heater (tCO_2/TJ)
Q_{FF}	Quantity of fossil fuel consumed in heater in pre project scenario (tons)
NCV_{FF}	Net Calorific value of fossil fuel (TJ/ton)

EF_{FF}	Emission Factor of fossil fuel (tCO_2/TJ)
Q_{heater}	Heat generated in pre project scenario from heater (TJ)

Emission Reductions

$ER_y = Q_{hot\ water}$[1] $* BEF_{heater} + Q_{steam\ avoided}$[2] $* EF_{steam,boiler}$

Where:

ER_y	Emission reduction in year y (tCO_2)
$Q_{hot\ water}$	Quantity of heat recovered from hot water (TJ)
BEF_{heater}	Baseline emission factor of heater (tCO_2/TJ)
$Q_{steam\ avoided}$	Quantity of steam avoided to heat tank farm (tons)
$EF_{steam,boiler}$	Emission factor for steam generation (tCO_2/ton)

2. Hot Separation in Fatty Alcohol Plant:

[1] Determined based on flow rate and temperature difference between supply and return water

[1] Determined based on heat transferred to tank farm and heat content of steam required for heating in pre project scenario

Baseline Emission Factor

$BEF_{heater} = (Q_{FF} * NCV_{FF} * EF_{FF} / Q_{heater})$

Where:

BEF_{heater}	Baseline emission factor of heater (tCO_2/TJ)
Q_{FF}	Quantity of fossil fuel consumed in heater in pre project scenario (tons)
NCV_{FF}	Net Calorific value of fossil fuel (TJ/ton)
EF_{FF}	Emission Factor of fossil fuel (tCO_2/TJ)
Q_{heater}	Heat generated in pre project scenario from heater (TJ)

$Q_{hydrogenation}$ = flow *Cp * ($T_{out} - T_{in,baseline}$[3]) * hrs

Where:

$Q_{hydrogenation}$	Avoided heating of products for hydrogenation in year y (TJ)
Flow	flow rate (TPH)
Cp	Specific Heat (kJ/kg °C)
T_{out}	Out temperature of product in hydrogenation unit (°C)
$T_{in,baseline}$	In temperature of product based on historical data (°C)
Hrs	Total operating hours in year y

Emission Reductions

$ER_y = Q_{hydrogenation} * BEF_{heater}$

Where:

ER_y	Emission Reductions (tCO_2)

[1] Determined based on flow rate and temperature difference between supply and return water

[2] Determined based on heat transferred to tank farm and heat content of steam required for heating in pre project scenario

[3] This value will be fixed based on historical monitored value at the plant

$Q_{hydrogenation}$ Avoided heating of products for hydrogenation in year y (TJ)

BEF_{heater} Baseline emission factor of heater (tCO_2/TJ)

Fuel Switch Project:

[1] This value will be fixed based on historical monitored value at the plant

VVF Ltd. Has planned to switch from high carbon intensive fuels (FO and Naphtha) to natural gas which is a much cleaner fuel than the furnace oil/Naphtha.

The project is divided in to two activities:

Elementary process 1: In boilers and heaters

The fuel switch is from: Furnace oil to Natural gas (NG)

Elementary process 2: In hydrogen generation plants

The fuel switch is from: Naphtha to Natural gas (NG)

In elementary process 1 containing the steam generation in the boilers and heaters where earlier PP was using the furnace oil and is planning to switch over to natural gas. In elementary process 2, PP was using the Naphtha as a fuel in the reformer to produce the Hydrogen for internal purposes and planned to switch Naphtha with the cleaner fuel, Natural gas.

The emission baseline is the current emissions of the facility expressed as emissions per unit of output. Baseline emissions shall be determined as follows:

$BE_y = EF_{BSL} * Q_{PJ,y}$[4] **(1)**

Where:

BE_y Baseline emissions in the project activity in year y ($tCO2_e$)

EF_{BSL} Emission factor for the baseline situation (tCO_2/MWh)

$Q_{PJ,y}$ Net energy output in the project activity in year $_y$ (MWh)

The emission factor in the baseline situation (EF_{BSL}) is the coefficient for the fossil fuel used in the baseline expressed as emissions per unit of output (e.g., kg CO_2e/kWh).

$EF_{BSL} = \Sigma FC_{BL,y} \times NCV_j \times EF_{CO2,j} / Q_{BSL,j}$ (2)

where:

EF_{BSL} Emission factor for the baseline situation (tCO2/MWh)

$FC_{i,j,BL,y}$ Amount of fuel j consumed by the element process i during the year y operating

at the baseline energy scenario (mass or volume unit)

NCV_j Net calorific value of the fuel type j (kJ/unit)

$EF_{CO2,j}$ CO_2 emission factor of the fuel type j (tCO_2/kJ)

$Q_{BSL,j}$ Net energy generated in the element process j in the baseline situation during the corresponding period of time for which the total fuel consumption was taken, in accordance with paragraph 14 (MWh)

……

[1] In case of boiler the heat value of steam would be converted into MWh. In case of both heater & hydrogen unit where the output is heating the output will be monitored in form of m x Cp x (T2 - T1) and converted into MWh taken, in accordance with paragraph 14 (MWh)

[4] In case of boiler the heat value of steam would be converted into MWh. In case of both heater & hydrogen unit where the output is heating the output will be monitored in form of m x Cp x (T2 - T1) and converted into MWh

Project Activity Emissions:

Project activity emissions consist of those emissions related with the use of fossil fuel after the fuel switch. Project emissions are determined as follows:

$PEy = FCy * EFCO_2 * NCV$

Where:

PEy	Project emissions in the project activity in year y (tCO_2e)
FCy	Amount of fossil fuel consumed for captive energy generation in the project activity in year y (mass or volume unit)
$EFCO_2$	CO_2 emission factor for fossil fuel (tCO_2/TJ)
NCV	Net calorific value for the fossil fuel (TJ/mass or volume unit)

Leakage:

No leakage calculations are required

Emissions reductions:

The emission reduction achieved by the project activity will be calculated as the difference between the baseline emissions and the project emissions.

$ERy = BEy - PEy$

2.The schematic diagrams provided to us in the spreadsheet is not clear. Please provide us another version preferably in A4 format clearly depicting a project boundary.

PP Response:

We have enclosed the same for your reference in different version with separate sheets for pre project and project scenario in scanned in A4 format.

3. The fuel switch project activity (AMS-III.B) also may improve energy efficiency and thus fuel savings. Please substantiate how this issue will be taken into account while estimating energy savings using AMS-II.D?

PP Response:

The above calculation approach discussed clearly distinguishes the savings between fuel switch and energy efficiency emission reductions and both are claimed as two different project.

Recommendation by the SSC WG:

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

Please refer to paragraph 25 of the meeting report of the SSC WG 26 <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 follows:

With respect to the question, "whether the above mentioned Energy efficiency projects are applicable under the para 3 of the methodology AMS-II.D…", the SSC WG is of the opinion that the projects are not applicable. This is based on the available information that:

- It does appear that the projects overlap in their use of reclaimed heat (for example with respect to unit 02E6);
- The emission reduction equations provided for energy efficiency in Hot Water System Fatty Alcohol plant appears to double count some savings - the equation that was presented for the Energy Efficiency Project at the Hot Water System Fatty Alcohol plant seems to indicate a double counting of savings, by including both Qhot water and Qsteam avoided; and
- The hot water heat exchangers usually require a circulating pump; the energy consumption of such a pump motor does not seem to be included.

Furthermore, the submission proposes monitoring steam consumption for the first project and fuel consumption for second project. How much of a change in energy consumption and fuel use is due to the project(s) versus other factors depends on many factors and to sort this all out would require energy balances of the facility. Thus, in summary, with the limited information available it is decided that the project will not meet the requirement of para 3 of the AMS-II D.

With respect to the implied question as to whether fuel switch from naphtha/fuel oil to natural gas in boilers, thermic fluid heaters and hydrogen manufacturing unit (reformer) is applicable under AMS-III B, the SSC WG is of the opinion, the methodology AMS-III.B is not eligible for the third component i.e. fuel switch in reformer producing hydrogen whose energy output cannot be directly monitored. The production of hydrogen also depends upon the types of feedstock i.e. naptha versus natural gas. Application of AMS-III.B for fuel switch in boilers and heaters alone would be feasible however the major issue with this underlying project could be the complexity to separate out fuel savings due to efficiency actions versus fuel switch measures thereby avoiding double counting in emission reduction estimation.

With respect to the question posed by the project proponent: "Considering the scenario the project proponent seeks clarification whether energy efficiency and fuel switch projects could be developed as two separate CDM Projects at the same site." In the opinion of the SSC WG projects involving fuel switch and efficiency in principle may be developed as two separate CDM projects, at the same site, using two different methodologies IF AND ONLY IF the emissions savings associated with each project can be conservatively separated and thus no double counting would occur. One approach as an example to avoid double counting would be that the efficiency savings are calculated "first" and savings are based on emissions of project low carbon fuels. The fuel switch savings are then calculated "second" and savings are based on energy consumption after efficiency project. For example, the efficiency emission reductions are based on going from 100 units of consumed energy to 90 with low carbon fossil fuel and the fuel switch emission reductions are based on 90 units of consumed energy going from high carbon to low carbon fossil fuel.

Signed by the Chair, Mr. Peer Stiansen
Date: 18/06/2010

Signed by the Vice-Chair, Mr. Hugh Sealy
Date: 18/06/2010

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