Clarifications on issues associated with validation requirements for project activity requested for review

"Vikram Cement Energy Efficiency by up-gradation of clinker cooler in cement manufacturing" UN- 0859

Request 1, 2, 3 and 4:

This project activity uses AMS II D which is a generic methodology for energy efficiency. Vikram Cement was the project participant that submitted large scale methodologies NM0101 and NM0154 for energy efficiency in clinker cooler, both of which were given a C by the Meth Panel. It should be assessed whether AMS II D is correctly applied to this project.
As this is not the first time this issue comes up, the Board may wish to ask the SSWG to review whether the concerns expressed by the Meth Panel with respect to the above not approved large scale methodologies need to be addressed by AMS II D.

The project proponent would like to explain the applicability of the methodology as per the section given in the methodology:
According to AMS II.D

Technology/measure

1. This category comprises any energy efficiency and fuel switching measure implemented at a single industrial facility. This category covers project activities aimed primarily at energy efficiency; a project activity that involves primarily fuel switching falls into category III.B.1 Examples include energy efficiency measures (such as efficient motors), fuel switching measures (such as switching from steam or compressed air to electricity) and efficiency measures for specific industrial processes (such as steel furnaces, paper drying, tobacco curing, etc.). The measures may replace, modify or retrofit existing facilities or be installed in a new facility. The aggregate energy savings of a single project may not exceed the equivalent of 60 GWhe per year. A total saving of 60 GWhe per year is equivalent to a maximal saving of 180 GWhth per year in fuel input..

The CDM project activity is retrofitting i.e. redesigning of the grate system of clinker cooler. The clinker cooler recovers sensible heat from the clinker and returns the heat to the pyroprocessing system thus reducing fuel consumption and improving energy efficiency. The project activity will result is increase recuperation efficiency of clinker cooler. In this CDM project activity the new clinker inlet distribution system is designed for efficient distribution of clinker (on the grate) and efficient air contact with clinker. The redesigned and retrofitted clinker cooler results in additional cooling of clinker with extra benefit of additional heat to tertiary air (from clinker cooler to pre heater). The increase in tertiary air temperature will result in saving of fuel fired in clinker manufacturing. The emission reduction is calculated based on this energy saving in the cooler. The project activity is following the applicability criteria in following manner:

1. The project activity is energy efficiency in single industrial facility
2. The primary objective of the activity is energy efficiency and applied for specific industrial process i.e. Clinker manufacturing.
3. The measure in retrofit in clinker cooler section
4. The energy saving is less than 180 GWHth.

Boundary

2. The project boundary is the physical, geographical site of the industrial facility, processes or equipment that are affected by the project activity.

The clinker cooler in discussion is attached to the kiln for exchanging the available heat between clinker and the air entering to the kiln. The project boundary selected is the clinker cooler and kiln system, including preheater section. All these components of the project boundary are located within single industrial facility *i.e.* Vikram Cement's campus at Khor. Thus project activity satisfies boundary criteria of AMS-II-D.

Baseline

3. In the case of replacement, modification or retrofit measures, the baseline consists of the energy baseline of the existing facility or sub-system that is replaced, modified or retrofitted. In the case of a new facility the energy baseline consists of the facility that would otherwise be built.

4. Each energy form in the emission baseline is multiplied by an emission coefficient (in kg CO2e/kWh). For the electricity displaced, the emission coefficient is calculated in accordance with provisions under category I.D. For fossil fuels, the IPCC default values for emission coefficients may be used.

The baseline selected for the project activity includes energy baseline for the cooler system which was replaced. The attached excel spreadsheet with the PDD shows data monitored for calculating the baseline.

The project activity is using the fuel as energy. The emission factor for fossil fuel has been calculated as per the equation given in *section E.1.2.1 under sub-heading Average emission factor*. IPCC 2006 default values are used for the calculation. Thus project activity satisfies baseline of AMS-II-D.

Leakage

5. If the energy efficiency technology is equipment transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered.

The project activity is an energy efficient technology and no equipment is being transferred from another activity; hence no leakage is considered while calculating the emission reductions. Thus project activity satisfies leakage of AMS-II-D.

Monitoring

6. In the case of replacement, modification and retrofit measures the monitoring shall consist of:
(a) Documenting the specifications of the equipment replaced;
(b) Metering the energy use of the industrial facility, processes or the equipment affected by the project activity;
(c) Calculating the energy savings using the metered energy obtained from subparagraph (b).
7. In the case of a new facility, monitoring shall consist of:
(a) Metering the energy use of the equipment installed;
(b) Calculating the energy savings due to the equipment installed.

The project activity is monitoring as per the point 6 mentioned above.
(a) Documenting the specifications of the equipment replaced - The specifications of pre and post scenario are available with project proponent and the performance guarantee test is carried out based on these specifications. Same has been submitted to DOE.

(b) Metering the energy use of the industrial facility, processes or the equipment affected by the project activity
(c) Calculating the energy savings using the metered energy obtained from subparagraph (b).

In the clinker cooler following are inlet and outlet energy (heat) streams:

Inlet streams

1. Hot clinker and clinker dust from kiln to cooler
2. Cooling air (ambient) to cooler
3. Electrical energy released as heat from cooler fans

Outlet streams
1. Cold clinker and clinker dust from cooler
2. Secondary and tertiary air from cooler
3. Exhaust air from the cooler
4. Radiations from cooler surface

The parameters of energy are measured in terms of mass and temperature. The formula $mCp\Delta T$ (mass * specific heat * temperature difference) is used for calculating the energy content.

In the monitoring plan all the streams as mentioned above are measured. (Please refer section D.3. of the PDD).

The project activity reduces heat loss, therefore streams with temperature loss are measured such as exhaust gas, clinker, clinker dust and radiation losses. Whereas the streams with heat gain i.e. secondary air and tertiary air streams are not measured directly. Accurate monitoring of secondary air and tertiary air streams is not possible due to challenges associated such as high temperature, dust loading *etc.*, Because of this, the efficiency of the clinker cooler is practically possible to calculate based on measured parameters by adopting indirect method i.e. heat balance approach, which is presented in the PDD.

Once efficiency of the equipment (Clinker cooler) is calculated, the difference of efficiencies (pre and post project) is translated in terms of fuel used which is again a metered quantity.

With this it is demonstrated that the approach taken by the project activity meets the requirements of monitoring methodology of AMS II.D ver 07.

Comparison with NM0101 and NM0154

When the original methodologies (NM0101 and NM0154) were submitted they both received C. Looking at the comment for NM0154 the reviewers had 2 main problems with the calculation method:

A) Methodology complexity - The methodology (NM 0154) proposes to estimate energy efficiency of a heat transfer and heat conversion equipment/s based on heat balance. This is based on the fact that such an approach is considered as a technically correct way to accurately determine efficiency of such equipment/s by following well established basic engineering principals {example technical data books accepted world wide viz Perry's Chemical Engineer's Handbook, McGraw-Hill, NY (1997) and many others}.

This is for sure that the project activity is increasing the efficiency of the equipments and reducing the fuel consumption. The only issue is how to estimate the reduction in the complex cement manufacturing process. By obtaining information from some of the leading manufacturers of international repute we observed the following:

(i) All of them use heat balance approach to demonstrate the efficiency of the device/equipment they supply and then translate the same to savings in monitory terms.

(ii) Many a times the heat balance conducted is based on short span of time (2-3 days) using only representative data. Which then for the conservativeness of methodology can not be used, as instantaneous data used by equipment supplier to demonstrate guarantee may not reflect the annual variation.

(iii) Again to establish that pre-defined energy savings are real and measurable during the credit period (i.e. few years down the line that is equipment is performing as guaranteed by technology supplier), the only available option is to conduct proper heat balance across the equipment.

(iv) One point also came up that in cases where revenue from ER is significant and ER values if they are only based on guarantees from technology supplier there is a possibility of gaming by introducing non-conservative pre-defined energy savings.

B) Heat Balance Approach - In the project activity all the parameters used are continuously monitored parameters and the quality of products depends on those parameters. The project proponent is reputed manufacturer of the cement and has its brand value and produces consistent quality of product. For the consistent quality the parameters will be more or less within the acceptable range of variations. The approach adopted is same for baseline and project scenario and the small variations are averaged out in determination of baseline efficiency. In this manner the calculation performed in the project activity will be as per the established practice in cement sector and will be within the acceptable variation.

The approach used in the project is well accepted engineering practice and followed by the technology suppliers.

Project proponent would like to mention here that the project is not financially attractive. CDM revenue stream in such cases will definitely promote the use of energy efficient technology in the cement sector.

Finally, project meets the small scale CDM project's requirements which other wise are also developed to keep the transaction cost low and project developer has already spend considerable time and effort because of their faith in the system and their approach.