REPLIES TO 'REASONS FOR REQUEST' FROM CDM EXECUTIVE BOARD

Title: Electricity generation at 8 MW captive power plant using enthalpy of flue gases from blast furnace operations of Kalyani Steels Limited, in Karnataka state of India.

Version number: 2

Date: 24 April 2006

Request for Registration #: 0427

The response of the project participant to the DOE based on the queries raised by the CDM EB is detailed below. In addition, to elaborate on how the project activity uses the calorific value of the wastes gases from mini blast furnace (MBF gases) by combusting it to generate electricity, sections A.2, A.4.3 and A.4.4 in the PDD have been updated; the updated text are highlighted in yellow. The new PDD version is 3 dated 17 August 2006.

REASONS FOR REQUEST	RESPONSES BY PROJECT PARTICIPANT
- It does not seem the project activity will result in a reduction of anthropogenic emission of GHG. Although the project designer indicates in the footnote that he will use specially designed boiler that permits to recover heat from gases at low calorific value (40 °C) to produce steam at high pressure that will expand in a turbine for electricity production, it seems impossible to recover heat from a waste gases at a so low temperature. So it is obvious that the boiler will need to use the combustion of another fossil fuel for the increase of the gases temperature and the production of high pressure steam. What is surprising is the fact that the DOE during the site visit of the validation activity found that the boiler uses LPG (Light Petroleum Gas) that is a fossil fuel, but it just mentions : 'As per the information provided by the designer of the boiler equipment, the boiler is designed to operate with low	✓ **Enthalpy recovery from waste MBF gases.** The project activity does not involve heat recovery from the waste MBF gases as is normally done for waste gases with high temperature. The project activity is not dependent on use of fossil fuel and LPG but depends on the calorific value of the waste MBF gases. The project activity uses enthalpy of the waste MBF gases by combusting it. This results in recovery of the calorific value of the waste MBF gases (about 650 kCal/NM^3). ✓ **Purpose of using Furnace Oil as support fuel.** The waste MBF gases alone cannot reach the required flame temperature at the start-up. Hence, furnace oil (FO) is required as a support fuel to initially raise the temperature to required levels. The combustion of CO is an exothermic reaction and is self sustaining by itself; however, when waste MBF gases, which is a lean CO gas is put into a hot furnace, it tends to cool down the furnace due to its lower temperature of 40-50°C. Hence, adequate re-radiation from hot refractory lining is required to sustain the high temperature (~745 - 760 °C) so reached. Therefore, in the design of the boiler, refractory lining are provided on the water wall tubes up to first 5 feet of the furnace heat transfer surface. This refractory re-radiates heat into the flame thereby enhancing the flame stability. Also, in the boiler design, for a load of less than 70% (where 100% load is 47 TPH), an oil support of only 5% is required. When operating within the boiler's maximum continuous rating (MCR) at 70 – 100% under stabilized operational conditions with waste MBF gases and subject to availability of these gases with adequate flow, consistent pressure and consistent quality in terms of gross calorific value (600-800 kCal/Nm^3), the boiler provided can be operated on waste MBF gases firing alone without any support fuel. Thus, the project activity in a steady state is not dependent on fossil fuel combustion for power generation but runs on waste MBF gases.

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calorific value blast furnace gas alone. He also qualified that the use of auxiliary fuel will be limited to a short duration of 1-2 years during the stabilization of the process. And the DOE concludes: 'During the site visit, LPG use was evident at the project activity'. For the DOE, this issue has been clarified with the statement of the project participant that says that this is very nominal consumption for the purpose of the pilot flame. The problem is not only the need of additional use of fossil fuel to upgrade the quality of energy content of the waste gases.	✓ **Purpose of using LPG for pilot flame.** LPG is used only for ignition of FO (i.e., to start the pilot flame). It is used only for 90 seconds of the total ignition cycle of 180 seconds. The consumption of LPG is solely required for boiler start up. This happens only after the shut-downs which are very infrequent. For example, statutory boiler shut-down happens once in a year. Hence the annual consumption of LPG is insignificant. The LPG used at site is stored in cylinders of capacity 19 kg, and not even a full single cylinder is expected to be consumed in a year. ✓ **Anthropogenic GHG Emission Reductions.** As explained above, the project activity generates electricity using the calorific value of the waste MBF gases and is not dependent on the heat energy input from fossil fuels for power generation. Thus, the project activity results in reduction of anthropogenic GHG emissions which would otherwise have occurred in its absence.
If as stated in the PDD the waste gases available at 40°C, there will be no recovery at all of waste heat. Even if the used boiler has a very large heat exchange surface, the temperature difference between the heating fluid (the waste gas) and the heated fluid at the inlet of the boiler (water for steam production) will have to be at least 7°C. This means if the water that feed the boiler is at 33°C (what is common for the temperature at the project site), the exiting gas from the boiler will have to be 40°C. So the waste gas will cross the boiler without any heat recovery. Only the heat from the fossil fuel used to elevate the waste gases temperature will be exchanged with the water for steam generation. The project will therefore lead to no emission reduction of GHG.	✓ Due to the typical characteristics of the waste MBF gases (as indicated below), the success of the boiler largely depends on the burner design. In the project activity, a scroll burner has been used to provide spin to the waste MBF gases as they enter the furnace for ensuring high mixing energy at the point of air fuel mixing. The scroll burner also uses the principle of pre-mixing fuel with air for better combustion by injecting a stream of air into the waste MBF gas stream before it enters the furnace. The temperature of the waste MBF gases is then raised (~745 - 760°C) by its combustion. The raised temperature so reached is used in the heat exchanger to produce steam and subsequently power. The typical characteristics of waste MBF gases are as follows. • ***High Inerts and Low Calorific Value.*** These waste MBF gases contain very low amount of combustibles (20-22% CO) and high amounts of inerts such as Nitrogen and Carbon dioxide resulting in low calorific value. Due to low calorific value, combustion of these gases is carefully stabilized. • ***Slow Burning:*** As a result of the low calorific value and high amount of inerts, the waste MBF gases burn slowly and hence in order to ensure complete combustion of these gases, higher residence time in the furnace is very essential. This higher residence time have been achieved by using larger boiler furnace and lower furnace volumetric heat release rate. ✓ Thus, in spite of low temperature (40°C) of the waste MBF gases at the inlet to the boiler, the required heat for steam generation is obtained from gas combustion and not from fossil fuel.

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- The application of the baseline methodology does not comply with the approved and consolidated methodology ACM0004. This approved and consolidated methodology clearly state that the applicability condition is the generation of electricity from waste heat or the combustion of waste gases. The proposed project activity cannot generate electricity from the recovery of the waste heat due to its low calorific value. The generation of electricity in this project activity will be exclusively a consequence of fossil fuel firing.	✓ As explained above, the temperature of the waste MBF gases is raised by its combustion in the boiler. The raised temperature (~745 - 760°C) so reached) is used in the heat exchanger to produce steam and subsequently electricity. As also explained above, fossil fuel is not used as a source of the heat for steam and electricity generation. The project activity therefore meets the applicability condition by 'combustion of waste gases'.
Also, the Table with estimation of ERs (PDD, E.6, P.23) has no source and has an obvious error as project emissions should be degressive if fossil fuel firing would be needed for 1-2 years only.	✓ As explained above, the ERs from the project activity are due to generation of power through combustion of waste gases. It is difficult at this stage to determine exactly the progressive reduction in the FO consumption during crediting period. Hence, as a conservative estimate, the project emissions have been considered to be constant over the crediting period. However during periodic verification, the actual project emissions will be used. Therefore, the actual project emissions during verification are expected to be degressive.