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Att: CDM Executive Board

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Response to request for review "4MW Waste Heat Recovery based power project by GRSPL, India" (1114)

Dear Members of the CDM Executive Board,

We refer to the requests for review raised by three Board members concerning DNV's request for registration of the "4MW Waste Heat Recovery based power project by GRSPL, India" (1114) and would like to provide the following initial response to the issues raised by the requests for review.

Comment 1:
Many of the technological barriers listed appear to be operational problems related to the use of the kilns rather than the implementation of the project activity. The prevailing practice barriers appear to relate to the further investment and corporate restructuring taken by the project participant to avoid wheeling charges. Further justification of the identified barriers and how the CDM will overcome them is required.

DNV Response:

As noted by the members of the Board requesting a review, the technological barriers listed in the PDD and verified during the validation site-visit are related to proper operation of the kiln. However, please note that for waste heat power generation activity steady operation of the kiln is a pre-requisite. Improper operation of kiln results in inconsistent generation of hot gases generated both in terms of quantity as well as heat content. Therefore, successful implementation of any waste heat recovery based power generation project depends solely on steady operation of kiln, failing which the power generation capability from the waste heat of the gases becomes uncertain. A detailed analysis of the waste heat availability and power generation capacity of a 100 tpd sponge iron kiln has been presented as **Annex-I**. The table enclosed in Annex-I demonstrates that operational problems in the kiln directly affects the power generation from the project activity and hence presents significant barrier to the project activity.

DNV would like to clarify that the barrier related to corporate re-structuring was not regarding assessment of prevailing practice but related to institutional barrier. The prevailing practice in the state was validated as per report of Joint Plant Committee of the Government of India, which states that only 16 sponge iron plants out of total 147 plants have installed captive power plants (CPP). This indicates that in-spite of considerable wastage of energy, waste heat based power projects are not a favourable practice in sponge iron industry. Of the 16 plants that have installed CPPs, 8 plants are located in the state of Chhattisgarh, India. Of these 8, 5 plants are already registered as

CDM projects and the others are also in the various stages of CDM validation. Extracts from this report have already been submitted to the EB along with the request for registration of the project.

DNV would also like to clarify that the organisational efforts in corporate restructuring would not have been necessary if the project proponent would have established only a 4 MW CPP based on a coal fired AFBC. The in-house power consumption of the plant is around 3 MW and hence a CPP of only 4 MW would have been sufficient to meet the power demand of the plant. However, since the project proponent also took the effort of utilizing the waste heat from the kilns and generating power, it was necessary for the project proponent to gain captive status for the power plant by acquiring a new unit and also sell 26% of its stake to the new unit. Thus, to make the implementation of the project possible, GRSPL had to additionally invest in acquiring a new unit and had to overcome institutional barriers to achieve captive status for its power plant unit.

It has been conceived by the project proponents that the CDM benefits would help in covering the financial risks associated with the project activity due to the uncertainty of power generation which is related to the proper operation of the kilns. The CDM benefits will increase the viability of the project by enabling the project proponent to acquire higher quality and costlier raw materials for its sponge iron production operation. Consistent and better operation of sponge iron kiln will in-turn enhance the viability of project which otherwise is affected by low PLF, unavailability of DRI gas due to shut-down or break-down and other factors related to low capacity utilization of kiln and subsequent lower availability of waste gases at high temperature. The CDM benefits will also cover some of the risks and additional investments associated with the corporate re-structuring of the company.

Comment 2:

The project activity involves steam generated from a waste heat recovery boiler to produce 4MW of power through a 8MW turbine at the same time a coal based boiler is installed to generate the remaining 4MW of power. The two boilers are connected via a common header. Therefore, 4MW of grid power is displaced by the project activity and at the same time 4MW of grid power is displaced by coal based power. Because an 8MW turbine is installed, they are interdependent. Therefore, the emissions from the coal based power should be included in the project emissions. If they are not considered to be interdependent, then the baseline scenario should have included the installation of 4MW of coal based power. Therefore, it is unclear if the methodology is applicable and/or whether the methodology is correctly applied. Further, it is stated in the PDD that "…unit power generation is the lowest for the coal/char based power plants." However, electricity from the grid has been chosen as the baseline scenario.

DNV Response:

As noted by the requests for review, the steam from the WHRB is fed to a common steam header which is also fed by the atmospheric fluidised bed combustion (AFBC) and the steam from the common header is fed to the turbine. However, the power generation from the turbine depends on the steam fed to the turbine only and steam generation from the waste heat recovery boiler (WHRB) and the AFBC is independent of each other. There is no dependency of the steam generation of the WHRB with the steam generation from the AFBC. The turbine is designed to operate at 25%, 50% or 75% of its rated capacity of 8 MW. Thus the steam from the AFBC is not required for upto 50% of the rated capacity of the turbine or 4 MW power generation. Hence the emissions from the coal fired AFBC is not required to be considered as project emissions. Further, as established in the PDD and validated in the validation report the coal fired AFBC was considered as a baseline alternative and had been established as the baseline scenario since the cost of power per kWh is lowest for a coal-based CPP. Thus any emissions from the coal fired AFBC is part of the baseline scenario and not the project activity. However, as noted by the requests for review, electricity from the grid has been considered for calculating baseline emissions. This has

been done to ensure conservativeness of the emission reduction figures. The grid emission factor of the western regional electricity grid to which the project is connected is 0.89 t CO_2/MWh as compared to an emission factor of coal-fired power plant of 1.03 t CO_2/MWh. The calculation of the coal-based emission factor has been provided in **Annex-II**.

Comment 3:
It is unclear whether the monitoring methodology is applicable and/or has been correctly applied. In the project activity, the net electricity supplied to the facility is calculated using a pro-rata for the fraction of total steam supplied by the waste heat recovery boiler to the turbine. This is not in accordance with the methodology which requires the net electricity supplied to the facility to be calculated by subtracting the measured auxiliary electricity from the measured total electricity generated.

DNV Response:

The net electricity generated by the CPP has been monitored as per the methodology. Both the electricity generated by the CPP and the auxiliary electricity consumed by the CPP are monitored and the net electricity is calculated by subtracting the auxiliary electricity from the total generation. As this is generated by utilizing steam from both the WHRB and the AFBC, the potential amount of electricity to be displaced by the WHRBs in the project scenario has been estimated by proportionate of the total steam available from the WHRB and the AFBC boiler respectively. This is in our opinion acceptable taking into account the clarification provided by the methodology panel in its 26th meeting in response to the request for revision AM_REV_0033 whereby the methodology panel approved the method used by the project proponent.

In the project scenario, the total electricity generated, the auxiliary electricity consumption, the steam fed to the turbine from the WHRB and the AFBC and properties of the steam fed from the two sources will be monitored.

The Board is also requested to note that this same procedure has been used by the following registered project activities and the same has been acknowledged by the methodology panel:

Registered on	Title	Ref
4/16/2006	Waste heat based 7 MW Captive Power Project Godawari Power and Ispat Ltd (GPIL)	264
7/3/2006	8MW Waste Heat Recovery based Captive Power Project at OCL	367
7/10/2006	Waste heat recovery based captive power project at Monnet	394
7/17/2006	JBSL–Waste Heat Recovery Based Captive Power Project	433
12/17/2006	“Waste Heat Recovery based captive power generation by SKS Ispat Ltd”	674
12/23/2006	Usha Martin Limited - Waste Heat Recovery Based Captive Power Project activity	696
2/12/2007	Waste Heat based 4.75 MW captive power project "RSIPL- WHRB(1&2)" CDM PROJECT ACTIVITY	783
2/18/2007	Waste Heat based 10 MW captive power project “GPIL- WHRB 2” CDM PROJECT ACTIVITY	772
3/24/2007	MSPSPL Waste Heat Recovery Based Captive Power Project	818

Comment 4:
The proposed start date of the crediting period should be changed to the date of registration.

DNV Response:

The project participants will request a change of the start date of the crediting period once the project is registered to ensure that the start date of the crediting period will not be prior to the date of registration.

We sincerely hope that the Board accepts our aforementioned explanations.

Yours faithfully
for DET NORSKE VERITAS CERTIFICATION AS

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ANNEX – I

For a 100 TPD DRI kiln

Waste gas generation = ~25000 Nm3/ hour at 950-1000 ^{0}C as per standard kiln operation figures.

Temperature of waste gas as available at the waste heat recovery boiler (WHRB) = 950 ^{0}C

Temperature of gas post heat recovery in WHRB system = 170 ^{0}C

Specific heat of waste gas = 0.27 kcal/ Nm3

Hence, the heat energy available for utilization in WHRB and subsequent power generation = 25000 x 0.27 x (950-170) = 5265000 kcal/ hour.

If the conversion efficiency of the system from waste heat to power is taken as ~33%

Then, Power generation potential from the waste heat would be = 5265000 x 33% kcal/ hour

Or,

7274.70 MJ/ hour which is equivalent to ~2 MW of power generation

Based on the above information it can be assessed how the power generation would vary with capacity utilization of the kilns in the project activity.

Power Gen Potential vs. Kiln Utilization

Capacity Utilization Factor – Kiln (100 TPD) %	Available heat energy in Waste Gas GJ/ h	Power Gen Potential MW
20%	4.41	0.40
30%	6.61	0.61
40%	8.82	0.81
50%	11.02	1.01
60%	13.23	1.21
65%	14.33	1.31
70%	15.43	1.41
75%	16.53	1.52
80%	17.64	1.62
85%	18.74	1.72
90%	19.84	1.82
100%	22.04	2.02

ANNEX – II

Parameter	Unit	Value	Comments
Station Heat Rate - Coal based TPP	kcal/ kWh	2605	Considering 33% efficiency for coal fired power plants
Boiler efficiency	%	100%	For conservative estimation
Fuel input energy	kJ/ kWh	10909	
EF-coal	tC/TJ	25.8	As per IPCC
EF_y	**tCO2/MWh**	**1.03**	

Thus the grid based emission factor of 0.89 t CO_2/MWh used in the calculation will provide a more conservative estimate than using the emission factor for coal based power plant.