Date: 01/10/2002

To

The Director (Commercial)
Bhushan Power and Steel Limited
Chandigarh.

Sub: A note on the proposed waste heat recovery project at BPSL.

Sir,

Since I joined this Company I have gone through the proposal of the Green Field Project being installed at Jahrsuguda in Orissa. Based on my experience of working with various Steel plants, I wish to draw your kind attention on the following points:

1. Technology:
Coal available in coal fields of MCL, which would be the source of our coal has high ash content and also contains high percentage of near gravity material. The Heavy Media Separation Technology would be preferable over jigging technology as the former will reduce the misplacement of coal during washing. By proper density control of the medium desired ash reduction to suit DRI Kiln can be obtained.

The proposed technology of DRI from Otokompu (Lurgi) is established worldwide and few plants in India are proposing this technology for steel manufacturing. However, the desired production from the Kiln can only be obtained if the quality of iron ore and coal are used as specified by Lurgi. Unfortunately neither the iron ore nor the coal of specified quality is available these days. In the absence of iron ore block, we will have to depend for procurement on local vendors/OMC from where we are unlikely to get ore of good quality. For efficient operation of Kiln, it is necessary to feed ore and coal of consistent quality. Wide fluctuation in input quality such as Fe content, LOI, contamination in form of laterite, blue dust, clay, etc. and fluctuations in ash content of the coal lead to poor quality of product and shorter campaign life of the Kiln which actually mean lower capacity utilization of the Kiln.

The proposal to recover the waste heat from the waste gases coming out of the Kiln is environmentally right decision as it has potential to generate power. However, this is unlikely to be achieved on consistent basis due to the following reasons:

i) The quality of available raw material is such that, it will be difficult to operate the Kiln at full capacity and the generation of waste gases will be accordingly reduced.

ii) The higher dust generation due to use of lower tumbler and higher abrasive index of ore will lead to higher erosion of boiler tube resulting in premature failure of tube. Since the dust of DRI is sticky in nature and moisture content is high; it has tendency to stick on to ESP electrodes leading to higher emission from the stalk. In both the above cases, Kiln will be required to be cooled for attending the problems. The stopping and starting of Kiln has to go through defined cooling and heating cycle which takes 4 to 5 days. Also after starting the Kiln it takes few days to reach the rated production. The steam generation from the WHRB will be accordingly affected and hence the power generation. Thus, consistent generation of power at rated capacity can not be ensured through WHRB connected with the Kiln which otherwise can be achieved through the AFBC which normally operates at rated capacity consistently. It may also be necessary to impart adequate training to the operating personnel to run the plant properly.

However, since the generation of steam from WHRB is by recovering the waste heat it will qualify for carbon credit since the equivalent amount of coal will not be required to be burnt in the boiler. The reduction in carbon emission may generate fund by selling of carbon credit which will mitigate the disadvantages of installing WHRB to some extent. I have seen such projects being installed in other steel plants for recovery of waste heat from blast furnace stove heating gases.

Based on my understanding of financials and operation the average power cost from WHRB will be in the tune of INR 1.4 -1.5/kWh while the coal based power generation will be INR 1.1 -1.2/kWh.

The above costs are based on the following assumptions:

Particular	**WHRB based power generation**	**Coal Based power generation**
Capital cost (only boiler)	80 Lakh/MW	50 Lakh/MW

Generation capacity (PLF)	60%	90%
Auxiliary consumption	10%	10%
Debt/equity ratio	2:1	2:1
Operation and maintenance	8% of capital cost	8% of capital cost
Interest rate	10.5%	10.5%
Return on equity (CERC order 2001)	16%	16%
Coal price		INR 400/ton
Depreciation	Plant & machinery = 5.28% Building = 3.34%	Plant & machinery = 5.28% Building = 3.34%
Minimum demand charges	INR 200/KVA	
Consumables	0.1%/MW generation	0.15%/MW generation

You may wish to discuss the above in case you so desire.

Yours truly,

Arunlalb.

Mr Arun Jalali
Vice president (Projects)
BPSL