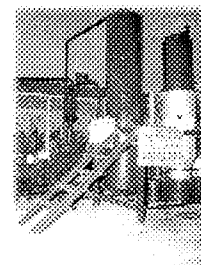
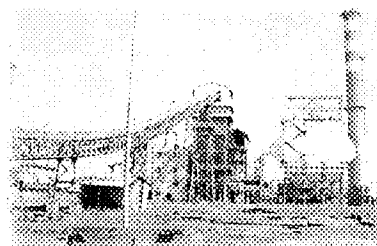


Hanuman Agro Industries Limited

Pre-feasibility Study for Setting up 1x2.5 MW Biomass Based Co-generation Captive Power Plant

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Background

Hanuman Agro Industries Limited (hereinafter referred to as "HAIL") was incorporated on 7th January, 1994 at Kolkata in the State of West Bengal. HAIL has set up an integrated manufacturing unit for manufacture of various types of paper and paper board in the year 1988 at Nawapara-Rajim, Dist.: Raipur (Chhattisgarh) initially based on waste paper. The paper plant was commissioned within a record period of fifteen months.

For economic growth of any country, development of energy resources at cheaper rate is of vital importance. Energy in the form of electricity is most convenient for generation, transmission and utilization and hence it is widely used.

Faced with the grim realities of load shedding, voltage fluctuations, trippings, consequent loss of production, damage to costlier/critical equipments and with no hopes of improvement in this scenario in the foreseeable future, many power intensive industries are in process of installing their own captive plants to ensure uninterrupted, quality power meeting the needs of the companies.

In view of the above facts HAIL has decided to set up 2.5 MW Co-generation plant for meeting captive heat & electricity requirement. The proposed fuel is coal. Taking into consideration the environmental benefits and the associated CDM benefits, HAIL is desirous of using agro waste preferable rice husk available in the surrounding areas as fuel. To ensure the feasibility of using agro-waste as fuel the company entrusted the responsibility of carrying out a pre-feasibility study to M/s S.R. Corporate Consultant Pvt. Ltd. Raipur, the leading consultancy organization in the field of renewable energy.

SRCL has conducted the preliminary survey to assess the biomass availability in the region and now present this pre-feasibility report to HAIL. The report highlights the technical feasibility, fuel availability and economic feasibility assessment of the proposed action.

Technical Feasibility

Coal and the agro waste are the most important commercial source of energy in India. Thermal power generation is most reliable one compared to other type of power plants. At present coal reserves in our country are sufficient which shall last for some hundreds of years. India being an



agricultural based country, plant of agricultural waste rice husk is available which can be effectively utilized in generating power.

The use of agro waste viz. rice husk, wood chips, nut shells etc. as an energy source is an outcome of the increasing pressure on fossil fuels and transportation network. The husk surrounding the kernel of rice accounts for about 20 per cent by weight of the harvested paddy. The characteristics of Rice Husk and Coal may vary with the source but typical values are given below:

Ultimate Analysis:

%	Rice husk	Indian Coal
Carbon	36.7	37.0
Hydrogen	3.00	2.50
Oxygen	31.02	5.30
Moisture	10.0	9.70
Sulphur	0.08	0.30
Ash	18.8	44.0
Nitrogen	00.4	1.20
GCV (kcal/kg)	3200	3570

The analysis of husk shows that it contains no pollutants like Sulphur and if burnt properly, does not produce harmful gases like NO_x and SO_x . Rice husk contains between 15 to 20 per cent of ash, though higher ash contents have been recorded in some cases. The high ash content and the characteristic of ash impose precise requirements on the design of combustion or Direct Combustion system for use with rice husk, especially the metallurgy of parts exposed to the erosive fuel gases. But the Boilers using rice husk as fuel are available from most of the reputed boiler supplier.

The CDM Benefits

Since the renewable energy projects are environment friendly project, the proposed project will also be able to claim CDM benefits that would be available from the global organization called United Nations Framework Convention on Climate Change (UNFCCC) which came into force on 21 March 1994. This Convention on Climate Change sets an overall framework for



intergovernmental efforts to tackle the challenge posed by climate change. To strengthen the developed country commitments under the Convention, the Parties adopted Kyoto Protocol in 1997, which commits developed country Parties to return their emissions of greenhouse gases to an average of approximately 5.2% below 1990 levels over the period 2008-12.

The Kyoto Protocol provides for quantified emission limitations and reduction commitments for the developed countries and mechanisms to facilitate compliance with these targets, reporting and review and it lists six greenhouse gases - Carbon dioxide (CO_2), Methane (CH_4), Nitrous Oxide (N_2O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs) and Sulphur hexafluoride (SF_6).

India acceded to the Kyoto Protocol in August 2002 and one of the objectives of acceding was to fulfill prerequisites for implementation of Clean Development Mechanism (hereinafter referred to as CDM) projects, in accordance with national sustainable priorities, where-under, a developed country would take up greenhouse gas reduction project activities in developing countries where the costs of greenhouse gas reduction project activities are usually much lower with the purpose to assist developing country parties in achieving Sustainable Development and in contributing to the ultimate objective of the Convention and to assist developed country Parties in achieving compliance with their quantified emission limitation and reduction commitments. The CDM allows emission-reduction (or emission removal) projects in developing countries to earn certified emission reduction (CER) credits, each equivalent to one tonne of CO_2 . These CERs can be traded and sold, and used by industrialized countries to meet a part of their emission reduction targets under the Kyoto Protocol.¹

Fuel Availability

Chhattisgarh is known as the "Rice Bowl" of the Country. Paddy is the main crop in the state and rice is the staple food. Around 40 rice mills are situated within the periphery of 0-15 kms from the plant site which is generating about 122 thousand MT of rice husk annually on the basis of 240 operating days with 80% load factor. The average calorific value of rice husk is 3200 kcal per kg which is slightly less than the calorific value of F-grade coal normally used in the boiler. The fuel consumption per unit of steam generation will be slightly higher when prime fuel is rice husk as compared to coal.

¹ More information available at UNFCCC CDM web site (<http://unfccc.int/cdm>)



The estimated rice husk consumption per unit of steam generation will be 3.03 tonnes per hour while 2.44 tonnes of coal would be need to run 22 TPH boiler at full capacity.

The annual requirement of rice husk is estimated at 24 thousand tonnes on the basis of 24 hours x 330 days operation which can easily be sourced from the surrounding rice mills.

Economic Feasibility

The expected capital cost of the Biomass based cogeneration plant is to some extent higher than the coal based option. The cost of generation will be higher due to increased cost of fuel. Though the company will be increasing the total expenditure on fuel but will have the additional benefit which would be available from claiming CERs.

The proposed switch will make the project activity as an eligible CDM project activity. The proposed project is expected to generate 528 TPD at full capacity of steam which will first be utilized to generate power and then the low pressure steam will be utilized to meet the heat energy requirement of the paper mill plant. The project activity will substitute the heat energy generation from existing 12.5TPH coal fired boiler and the power supply from the state grid. The project activity is expected to earn 40000 CERS annually and can bring additional stream of Rs 2.32 Crores to the project activity.

The invest analysis carried out for Biomass based cogeneration plant vis-à-vis coal based cogeneration plant is given overleaf which recommends the feasibility of setting up of 2.5 MW Biomass based Co-generation plant in place of 2.5 MW Coal MW power plant.



Description/Investment Options	Pre-feasibility Analysis	
	Option A	Option B
	Coal Based Cogeneration Plant	Biomass Based Cogeneration Plant
Gross Investment	10.80 Crores	12.18 Crores
Project IRR	14.07%	10.59%
Project IRR Considering CDM Benefits		24.70%
Strengths	<ul style="list-style-type: none"> Assured Fuel Supply Technically Proven Assured Market keeping in view the demand supply situation in the country Low capital cost due to competitive market 	<ul style="list-style-type: none"> Environmentally Friendly Technical proven Assured Tariff offered by State Electricity Board CDM Benefits associated with the project
Weakness	<ul style="list-style-type: none"> Depleting resources Highly Pollutant Industry 	<ul style="list-style-type: none"> Raw material supply linked with agriculture scenario in the state High Capital Cost due to limited market players
Opportunities	<ul style="list-style-type: none"> Forward integration by setting up of power intensive projects 	<ul style="list-style-type: none"> CDM Benefits can be availed Forward integration by setting up of power intensive projects
Threats	<ul style="list-style-type: none"> May face fuel supply problems due to depleting source of fossil fuel 	<ul style="list-style-type: none"> Failure of crop may impact the supply of biomass
Mitigation of Threat	<ul style="list-style-type: none"> Chhattisgarh being rich in coal resources, it is expected that the plant will not face any problem on coal supply. 	<ul style="list-style-type: none"> The crop scenario during last three years does not undergo any major changes and is expected to remain as of now. The project site is situated in Raipur having 28% area under forest cover. Woody biomass from the forestry area is also available in abundant and can supplement the biomass requirement of the plant
Investment Option Selected	Option B – Setting up of Biomass Based Power Generation Plant	

