CISIL

EXECUTIVE SUMMARY

INTRODUCTION: Energy is a critical success factor in the economic development process of any country. It is well known that our commitment for the cause of development requires assured supply of affordable and reliable energy. The demand for energy has grown rapidly with the development of society. In spite of the increase in electricity generation a wide gap still persists in the supply and demand.

Chhattisgarh Electricity board (CSEB) is responsible for meeting the entire power demand of the consumers within the state of Chhattisgarh. In addition to the installed capacity, presently Chhattisgarh has Central Sector Share to the State.

The installed capacity in the Chhattisgarh State is insufficient to meet the demand for power. At present the Power availability in the State is 1660 MW only against Power demand of 2300 (as per 2006-07). It is estimated that the peak power demand would rise to 3700 MW by 2011-12. Based on the data, peaking power availability in Chhattisgarh will be surplus 2010-11 on the projected demand, only which the help of existing and proposed power projects of State and Central Sector. However, with the rapidly increasing industrial development, the per capita energy consumption level is an aspect of importance in the standards of living in both Urban and rural areas, agricultural growth etc. which will increase the power demand to a greater extent.

In view of the above projections, it is clear that the State of Chhattisgarh would face a shortage of power in the years to come, if power projects are not implemented. Hence, an addition in generating capacity id mandatory to reduce power shortage. It can be achieved through setting up new power plant and augmentation of generating capacity of existing power plants. The proposed project of 8MW rice husk based biomass thermal power plant at

Village Chorha will help in little to bridging the gap between supply and demand of power in the State of Chhattisgarh.

In order to assess the environmental implications due to the setting up of the proposed thermal power plant, *Chind Iron & Steel Industries Ltd* retained M/s. The Care, Raipur, as consultants to carry out Rapid Environmental Impact Assessment (EIA) for proposed thermal power plant. The study has been carried out based on the Base line date collection covering one season of three months during October- December 2007.

Site Selection

In order to establish a rice husk based biomass power generating station close to the rice husk source, Chind Iron & Steel Industries Ltd has selected the site at Village Chorha, Tehsil Chamita in Durg District (Chhattisgarh) as it is favourable in view of:

- Adequate un-inhabited land availability
- No reserve forest/protected forest within 20 km radius
- General soil Characteristic is suitable
- The length of approach road to be constructed is minimum
- Ground water Availability
- Availability of Rice husk within 50 kms.

Site and its Salient Feature.

The proposed power project would be located in Village Chorha of Dhamta Thesil and District Durg. The proposed site located at latitude $21^0$14'36"N

longitude $81^0$31'11"E at an attitude of 280 m above MSL. The distance of proposed project by road from Raipur 15 Km and Durg 25 km on National Highway No. 6.

Climatic Conditions

The climate of district is characterized by hot summer and well distributed rainfall during the monsoon season. The location near to tropic of cancer results in tropical climate with high pressure belt through the year, but due to its height above MSL controls its high temperature. The climatic condition of Durg district is characterized by hot dry summer and cold winter. The average rainfall in the district is around 1400 mm.

Minerals

The proposed site is towards North East to district head quarter Durg. Iron Ore and Limestone deposits of Dallirajhara and Nandini are situated 80 kms South East and 15 Km North West of the site. The mineral exploration study available with State Geological & Mining department indicates that proposed project is non mineral bearing areas.

Sanctuary, National Park, Wild life & Forests

The area within 10 km of proposed site covers no National Park and Wild life Sanctuaries. Forests situated about 70 kms to south east, residential activities permitted. There is no endangered species of animal existing within a radius of 10 kms of the proposed projects.

Socio - Economics of the Area

Around 65% of the total workers are engaged in the agriculture activities and only 10% is engaged in family enterprises in the development block. Out of this total work force, only 75 % are main workers and balance 25 % are

marginal of which are employed for agriculture work as per their requirements. Only 40 % of the population in the region is non worker, which indicates under-developed conditions of the region. The proposed project will help in development of the nearest village through better job opportunities in service s and infrastructure improvement.

Major Industries

Chorha is an industrially undeveloped village in Durg District. There are some small scale industries engaged in steel converting in neighboring Kumhari is the industries in this zone. The industrial Estate in this district is away from 20 & 30 Kms.

Selection of Technology & Unit size

The plant is proposed to be established 8 MW rice husk based thermal power station in single unit with critical boiler and other equipments due to following reasons:

Economy of scale to achieve least per MW installed cost.

Better efficiency of boiler, steam turbine and lower overall heat rate.

Lower land requirement

Lower operation and maintenance cost and staff requirement

Higher net saleable power due to higher efficiency and lower auxiliary power consumption due to use of steam turbine driven boiler feed pumps.

Environmental Aspects

The various measures proposed to be adopted to minimize the pollution from the proposed Power Project are as follows:

Air pollution Control System

High efficiency (99.89) Electrostatic precipitator (ESP) would be installed to control the mission of ash particles, The ESP would be designed to limit the particulate emission to 50mg/Nm^3. Also State of Art system like Ammonia injection, is planned to be envisaged to maintain desired particulate emissions from the stack. The facilitate wider dispersion of pollutants and in accordance with the regulatory requirement, a chimney of 55 m height above plant grade level is envisaged for this project.

Water Pollution Control System

An effluent management scheme would be implemented with the objective of optimization of various water systems so as to reduce intake water requirement, which would result in lesser waste water discharge. The effluent management scheme would essentially involve collection, treatment and re – circulation/disposal of various effluents. Adequate treatment facilities would be provided to all the waste steams emanating from the power plant to control water pollution. This would include physico-chemical treatment for plant effluent and biological treatment for sanitary effluents.

Noise Pollution

The major noise generating sources are turbines, generators, compressors, pumps, fans, rice husk handling plant etc. Acoustic enclosure shall be provided to control the noise below 90 dB (A). Personal protective equipments shall be provided to the persons working in high noise area. Noise level of 75 dB (A) will not be exceeded at the plant boundary.

Ash utilization

Chind Iron & Steel Industries Ltd shall consider utilization of ash produced by its rice husk based thermal power stations as a thrust area of its activities. The company proposed to fill the abounded Morrum Quarry of 3 acres having depth of 2 to 4 meters, about 3 km from site. And also proposed to bricks manufacturing plant in future.

Land Requirements

The Company has already purchased 10.75 acres of land for the complete activity. Out of this total area required for plant & machinery, office building is about 6316 sqmtrs and about 3000 sqmtrs for internal road that is on 22% and the balance of 78 % is proposed for Green Belt development. The plant area is already covered with Neelgiri plant of 15 to 20 mter heights by 20 to 30 mtr width.

Rehabilitation of Displaced Population

The proposed land is quietly un-inhabitant and inhabitants are about 1km away from the site, hence rehabilitation points not raised.

Impact during Construction Phase

The construction of a new power plant usually involves significant changes in land use, which may be accompanied by direct social and ecological impacts. The environment impact during construction will be localized and short term with no changes is use of the surrounding land as compared to the current conditions. Impacts will primarily relate to the civil works period and less intensive impact is expected during erection of the equipment and trail operation. The time schedule of the main civil works (Foundation of steam generator, turbine, Air cooled condenser, and transformers) is about 18 months including trail run.

The construction phase of the project will have some impacts on the impacts on the environment. These impacts will be minimized/neutralized with the help of State of Art construction equipments and appropriate environmental management practices.

Air Quality

Ambient Air monitoring was carried out to assess the air quality in the vicinity of the proposed power plant. Ambient air monitoring sites at 10 locations were selected covering all four directions with respect to proposed project site and also existences of sensitive locations like hospitals, schools etc. within a radius 0f 10 kms from the proposed project site. It was ensured that the monitoring sites are free from any obstructions, availability of power and easy accessibility to the village/locations while selecting the monitoring sites.

These stations were selected so as to provide representative ambient air quality data on Back ground Air Pollution Level in the vicinity of the proposed power plant site. Due to consideration was given to the meteorological parameters and local conditions (e.g. local sources of pollution) while these sites.

various statistical parameters like 98 percentile, average, maximum and minimum values have been computed from the observed raw data for all the Ambient Air Quality Monitoring Stations. The obtained values are compared with the standard prescribed by Central Pollution Control Board (CPCB) for rural residential Zone. The interpretation of these data is as follows:

Suspended Particulate Matter.

24 hourly average arithmetic mean concentration of SPM at various locations around the proposed power plant site varied from 40.0 to 224.5 µg/m^3. The lowest and the highest mean values were found at Murra and Chandandih village respectively.

98^{th} percentile concentration values of SPM varied from 76.0 to 216.5 µg/m^3 at village Murra and Chandandih respectively which is below the standard value for residential areas.

Sulpher Dioxide.

24 hourly average arithmetic mean concentrations of SO_2 at various locations varied between 03.4 to38.9 µg/m^3. The highest mean value was observed at Dadar and lowest mean value which is at Urla. The 98^{th} percentile concentration value of SO_2 varied from 06.7 to 37.5 µg/m^3 at Dadar and Urla respectively, which are well within the corresponding NAAQS allowable limit of 80ug/m^3 for residential area.

Oxides of Nitrogen

24 hourly average arithmetic mean concentrations of NOx at various locations varied between 03.9 to 51.2 µg/m^3. The highest mean value was observed at Urla and lowest mean value which is Dadar. The 98th percentile concentration value of NOx varied from 06.0 to 49.0 µg/m^3 which are well within the corresponding NAAQS allowable limit of 80ug/m3 for residential area.

Air Quality Impact Assessment by means of Computer Modeling

Impact due to operation of proposed power plant on ambient air quality in the surrounding region has been predicted through mathematical modeling. The change in the incremental concentration in SPM, SO_2, and NOx were computed through computer dispersion model.

The monitoring station equipped with monitoring equipment to record hourly wind speed, direction, relative humidity and temperature was set up at the project site. The data logger attached with the station records the observations and the data was down loaded from it from time to time. The maximum temperature during the study period was recorded as 09.4 to 24.4 deg. C.

Model Output

The output of model provides ground level concentration of pollutants due to the proposed 8 MW rice husk fired thermal power plant. Impact on ambient air quality due to the proposed thermal power plant has been assessed by superimposing predicted concentrations on background air pollution level. Baseline ambient air quality data indicated that maximum 98th percentile

concentration of SPM, SO^2 and NOx was observed 478.5, 37.5 and49.0 ug/m^3 respectively. And these concentrations have been considered as background level of pollutants.

The total concentrations are compared with National Ambient Air Quality Standards prescribed for residential areas as specified under National Ambient Air Quality Standards as notified by Central Pollution Control Board. It is concluded that total concentrations of pollutants would be below the allowable for residential areas.

Water Availability

The proposed rice husk fired thermal power plant requires 63 m^3 water per day including DM plant make up water. We have already dug a bore will with permission of District Collector, Durg, and yield has been tested in the month of June and 4" yield will be there. The yield is sufficient for our proposed project.

Water Quality

During the operation of the thermal power plant, waste water would also be generated from DM plant. Therefore, it is necessary to assess the water availability, existing quality of the water body around the proposed plant, quality of the raw water and the assessment due to the impact of the power plant on near-by water bodies.

Water Quality Assessment Methodology

For the purpose of water quality assessment, sampling points were selected for surface and ground water within the area of study. The proposed power project site is presently single crop agricultural land. Ground water is the major source of water use in the nearby villages of the proposed power plant. The sampling

points were selected in these villages in order to asses the existing quality of the ground water and surface water from water tank.

It may seen from analysis results that some of the parameters fall in Class “B” and some in Class “C” as per Best Designated uses as specified by Central Pollution Control Board. Therefore the overall surface water sources are presently being used for agricultural purpose. The water quality of both these sources is suitable for agricultural activities. The water quality is also suitable for power plant after treatment. As no water is planned to be discharged directly, no impact is envisaged on the surface of water quality due to proposed power project.

Assessment of Ground Water Quality

The ground water in 10km radius of the site is mainly developed dug well for domestic and irrigation purpose. The dug cum bore wells are also used for irrigation. The bore well fitted with hand pumps are used for the rural drinking water supply requirements of the village community. The average ground water depth in the district during pre-monsoon (May - June) varies from 10 - 20 m while post monsoon these levels vary from 4 – 6 m.

Ground water is also the major source of drinking water the region. The ground water samples were collected from various existing sources around the proposed power project site.

On comparing the water quality analysis results with IS: 10500, it id observed that the values of Alkalinity, Fluoride, Manganese, Iron, Total Dissolved Solids and Zinc are higher than limits but within the permissible limits in some of the villages. But all the parameters are within the desirable limits. Therefore it could be concluded that Ground water is safe for drinking and other purposes.

The surface water and ground water sample analysis shows that there is not much source of pollution in the region and base line data for surface water and

ground water is well within the limits prescribed in “Primary Water Quality Criteria” laid down by CPCB and IS;10500 respectively.

Water Management System

Water is one of the important requirements for power generation. Keeping into consideration of the amount of water required and effluent discharged after Treatment, it can be concluded that proposed project will neither affect the availability of water nor the surface/ground water quality in the region. However, detailed ground/surface water monitoring schedule would be developed for monitoring of water quality around the proposed power project site.

Soil Quality

For studying soil profile of the region, sampling locations were selected to assess the existing soil conditions in and around the proposed project area representing various land use conditions. The physical, chemical parameters and heavy metal concentrations in soil samples were determined.

Soil samples were collected from different places based on survey conducted around the site. At each location, soil samples were collected from three different depths viz. 50 cms, 100 cms, and 150 cms below the surface. The samples were then packed in a polythene plastic bag and sealed. The samples from three different depths were homogenized. Large stones, gravels and plant roots were removed from the soil. The soil was then crushed and passed through 100 mesh sieve. Sieved soil was used of analysis. The present study on the soil profile establishes the baselines characteristic around the proposed project site.

Single crop agriculture is the main activity in the surrounding area of proposed power project. The soil samples were collected from various villages around the proposed power project. As the proposed project is not likely to generate any material which will affect the soil quality, therefore no adverse compact is envisaged due to proposed power plant site.

Rice Husk & Ash

The daily requirement of rice husk for the proposed 8 MW thermal power plant shall be about 224.08 tonnes based on average Gross Calorific Value of 3300 Kcal/kg. The rice husk requirement for the proposed power project shall be met from the husk available from the rice mill within 50 kms distance in Durg District.

The bottom ash shall be extracted and disposed. The fly ash shall be extracted in dry form the electrostatic precipitator hoppers. This dry ash can be taken to buffer hoppers for its onward transportation for its Morrum quarry filling area or the proposed bricks manufacturing units.

Noise.

The noise monitoring stations were selected for measurement of ambient Noise Levels to establish the base line status of noise level in and around the proposed site. It has been observed that in all the locations, the noise level during day time and night time is well within limit specified for Residential areas during monsoon post seasons.

However appropriate measures would be taken at the design stage itself attenuate noise level to the acceptable limit during operation stage of the power plant. Moreover, provision would be made within the power plant to insulate areas such as the control room from the turbine hall noise. The control rooms

and adjacent offices would have double glazed windows facing to the turbine hall with wide spacing for better sound attenuation. Beside, ear muffs/plugs will be provided to the workers in the close vicinity of noise sources. Also effort will be made to use special construction equipment having low noise generation during construction stage. The generated noise would be controlled to reduce it to an acceptable level at the project site boundary by means of isolation and as further mitigation measure planting of trees along the plant boundary as well as within the plant premises would be done to form a sound barrier.

This measure would bee adequate to limit the incremental change in background noise level to a minimal. It is expected that the setting up of rice husk based thermal power plant at Village – Chorha would not have any major adverse impact on community noise level.

Impact Assessment

Thermal power plants invariably have potential environmental effects during both the construction and operational phases including effects on air, water, noise & land environments as well as socioeconomic conditions during construction phase. The significance of construction impacts will be limited, however the mitigation measures will be taken for traffic management, appropriate timing and routing of materials, delivery etc.

The probable environmental impacts during construction as well operational phase of proposed 8 MW rice husk based thermal power plant have been identified. The impacts during the construction/development phase may be regarded as temporary or short term; while during the operation phase the impact has to be taken as long-term effects. The overall impacts during construction and operation phase of proposed rice husk based power plant have been assessed and area as given below:

Air Quality

Ambient air quality studies within 10 kms. Radius of proposed power plant at Village Chorha indicate that the 98 percentile concentration of Suspended particulates (SPM), Sulpher Di-oxides (SO2) and Oxides of Nitrogen (NOx) are well within permissible limits of National Ambient Air Quality Standards for Residential & Mix Use areas as prescribed by Central Pollution Control Board.

The mission from the proposed power plant will mainly consist of suspended particulate matter and SO2. In order to control SPM from the power plant. High efficiency Electrostatic precipitator (ESP) would be installed. The ESP would be designed to limit the particulate emission to 50 mg/Nm3. To facilitate wider dispersion of pollutants and in accordance with the regulatory requirement, a chimney of 55 meter height above plant grade level is envisaged for this project. Emissions through these tall stacks will help in effective dispersion of gaseous pollutants in the atmosphere and thereby minimizing effect on ground level concentration of pollutants. The chimney shall be provided with sampling points for continuous online monitoring system for stack emissions.

Fugitive dust emission at Rice Husk handling point, other vulnerable areas of the plant will be controlled by filter bag with ID Fans and by regular sprinkling of water and Green Belt development.

Current baseline air quality study indicated that background concentrations of suspended particulate matter, SO2, NOx are within limits for residential areas. The air dispersion prediction model shows that during normal operation with one stack of 55 meter height, maximum ground level concentration of SPM, SO2, Nox will not exceed the permissible norms of National Ambient Air Quality for residential & mix use areas.

There will be marginal impact on ambient air quality in and around the proposed project site due to construction activities, transportations, handling and storage of construction materials. However, the impact on air quality will not have long term effect in the region.

The air quality impact of operation of proposed power plant would be within allowable limits for residential and rural area. Thus, there will not be significant impact on air quality due to emission of suspended particulate matters, Sulpher Dioxide and oxides of Nitrogen due to operation of rice husk based thermal power project at Village Chorha.

Water Pollution

Water is one of the important requirements for power generation. Total requirement for the proposed power plant would be drawn from ground water source (Bore well).

During the operation of the thermal power plant, waste eater would also be generated from various viz. DM Plant waste, blow down waste etc.

The effluent management scheme would essentially involve collection, treatment and recirculation/disposal of various effluents. Adequate treatment facilities would be provided to all the waste streams emanating from the power plant to control water pollution. This would include physico-chemical treatment for plant effluent and biological treatment for sanitary effluents.

Effluent operation of treatment plants would be ensured so that the quality of effluents conforms to the relevant standards prescribed by the Regulatory Agencies.

The discharged effluent quality will meet the norms laid down by Chhattisgarh State Pollution Control Board for Discharge on land. Hence, there will be no significant impact due to discharge of waste water on the environment.

Employment

The installation of proposed power plant project will generate employment opportunities during construction as well as operation phase and thus will provide direct and indirect jobs to the local population. The project will not disturb the existing social pattern of the area and due to the employment opportunities generated; it will have beneficial economic impact on the area.

Aesthetics

The effective population control equipment help to maintain the visual quality of air and water environment. Natural vegetation and its diversity will increase due to green belt development. The aesthetics of the area is expected to improve after installation of 8 MW biomass power plant.

Socio-Economic Environment

The impacts on socio-economic status of the project area are predominantly positive and no adverse changes are expected.

The proposed project at Village Chorha will generate employment opportunities during construction as well as operation phase and thus will provide direct and indirect jobs to the local population. The project will not disturb the existing social pattern of the area and due to the employment opportunities generated in the society where majority of population has no regular jobs it will have beneficial economic impact on the area.

The power generated would lead to availability of power to the area and the state. This would result in increased power supply to rural areas. An increase in transportation facilities in expected due to proposed project. The economic output due to proposed project would be positive besides enhancement of community services.

The proposed project will lead to development of the area. Hence, it will have beneficial effect on the society.

Ecology

The proposed project site does not fall the under forest area. No major forest area is near to the site; however the patches of revenue forest are present about 60 kms south east of the site. There no endangered species of animals existing within a radius of 60 kms of proposed project site.

There may be some negative impacts on terrestrial ecosystem namely crops and vegetation due to dispersion of fly ash. However, with efficient control systems for particulate and tall stacks for gases, no significant adverse impacts are foreseen which can disturb the ecological balance of the area.

There are no major water bodies or aquatic biosystems in the study area. The only water body in the study area is Kharun River. However, the aquatic life will not be affected because of low water requirement, no effluent discharge from the proposed thermal plant and closed cycle system for cooling water. Hence, the proposed plant will not have any significant detrimental impacts on plant, animals, soil and other ecological targets around the proposed site as a whole.

Environmental Impact Matrix

The overall environmental impact of the project can be quantitatively assessed through environmental impact matrix by assigning weightages to various environmental parameters in the matrix. The weightage values are subjective but have been achieved after considering inter-disciplinary judgment based on the type of the project. It is found from the environmental impact assessment matrix that there will be impact on environment but it will not be injurious, in general. However, mitigation measures are important.

The assessment indicates that with the adoption of the mitigation measures established by the Environment Impact assessment process, the overall Environmental impacts of construction and operation of the proposed project, there will be Impact on Environment but on injurious in general. However, mitigation are important during the construction as well as operation stage of Proposed Thermal Power Project.

The changes in air, water quality with the introduction of proposed mitigation measures would allow compliance with appropriate standards and confine negative effects within acceptable limits. No appreciable operational impacts are expected in relation to factors such as visual amenity and ecology.

The green belt development plan envisaged in and around the power plant will improve the surrounding environment.

On the whole it can be concluded that installation of 8 MW rice husk fired Thermal Power Plant at Village – Chorha, Thashil Dhamta, District Durg (Chhattisgarh) will be an environment friendly project.