



Chhattisgarh Energy

AES CHHATTISGARH ENERGY PVT. LTD.

EXECUTIVE SUMMARY

OF

**ENVIRONMENTAL IMPACT ASSESSMENT
STUDY REPORT**

FOR

**PROPOSED 2 X 600 MW INTEGRATED
THERMAL POWER PROJECT
DISTRICT RAIGARH, CHHATTISGARH**

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DEVELOPMENT CONSULTANTS PRIVATE LIMITED
CONSULTING ENGINEERS
24-B, PARK STREET, KOLKATA – 700 016.
E-mail : dcl@dclgroup.com

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EXECUTIVE SUMMARY

1.0 PROJECT DESCRIPTION

AES Chhattisgarh Energy Pvt Ltd. (hereinafter referred to as the "AES Chhattisgarh"), a subsidiary of the renowned multinational The AES Corporation, USA, a Fortune 500 company listed on NYSE and one of the world's largest global power companies with operations in 28 countries on five continents, has signed a Memorandum of Understanding with the Chhattisgarh Government to develop an integrated 1,200 MW $\pm 20\%$ coal-fired power project in the state Chhattisgarh, a new state, which was carved out of Madhya Pradesh on the 1st November, 2000.

☛ *Plant Capacity*

The maximum capacity of the proposed project is 1,200 MW (2 x 600 MW). The boiler capacity is considered approx. 1,920 TPH for each boiler.

☛ *Location*

The proposed power plant will be located at village Khamhar and Bhojpur, Tehsil: Dharmjaygarh, Dist. Raigarh, Chhattisgarh. The approximate longitude-latitude of the proposed site are 83° 15' 25" E (approx.) and 22° 35' 26" N (approx.) respectively. The nearest town is Dharamjaygarh (a Tehsil of Raigarh district), which is at a distance of about 12 km from the proposed site. The nearest railway station is Kharsia (which is at a distance of approx. 67 km from the proposed site) under Bilaspur – Raigarh broad gauge railway line.

☛ *Land Requirement*

The land requirement for the power plant is estimated at 1,100 acres. While selecting the land, as far as possible prime agricultural land/forest land is avoided. The proposed plant layout would confirm to MoEF's stipulation of maintaining a 500 m distance from the river. The land is identified and initial possession activity is in an advanced stage.

☛ *Fuel Source & Requirement*

AES Chhattisgarh has been allotted Sayang coal block Mand Raigarh coalfield in the state of Chhattisgarh for captive mining of coal by Ministry of Coal, Government of India. The identified coal block is within a distance of 20 km from the proposed project site.

Considering calorific value of fuel as 4,000 kcal/kg and Station Heat Rate (SHR) of 2,450 kcal/kWh, requirement of coal for the proposed extension units will be around 5.15 million metric tons per annum at 80% annual PLF.

☛ *Water Requirement and Source*

Total raw water requirement for the proposed project has been estimated at 3,701 m³/hr. The source of water for the proposed project is Mahanadi River which is at a distance of about 110 km from the proposed site. It can be mentioned here that AES

Chhattisgarh has got the allocation of 33.5 million meter cube of water per annum (i.e. around 3,824 m³ / hr) from Mahanadi River.

☛ *Cooling Towers*

Induced draft cooling tower for cooling of condenser water is envisaged for the project. Total circulating water flow is estimated at 1,17,858 m³/hr for the condensers and auxiliary cooler units.

☛ *Ash Handling & Disposal*

Bottom ash will be collected in wet form and disposed off in dry form.

As suggested by CPCB in “*Charter of Corporate Responsibility for Environmental Protection* (CREP)”, the proposed project shall adopt dry fly ash (FA) extraction only. The dry fly ash from this silo will be used for fly ash brick manufacturing, lightweight aggregates manufacturing, cement admixtures, mine backfilling, etc. **Under exigency**, the bottom ash and fly ash shall be allowed to settle in the ash pond with 60 % ash water recirculation system.

☛ *Electro Static Precipitator (ESP)*

Electrostatic Precipitator (ESP) of high efficiency will be provided to maintain particulate emission at chimney outlet limited to 50 mg/Nm³, which is well below the prescribed limit (100 mg/Nm³) of CREP.

☛ *Flue Gas Desulphurisation (FGD) Unit*

A space provision for future Flue Gas Desulphurisation (FGD) unit is also kept in the layout of the plant as per recommendations of MoEF.

☛ *Stack*

There will be one (1) R.C.C. twin flue stack of 275 m height, to cater to the proposed two units.

☛ *Project Cost*

The estimated **project cost including IDC is Rs. 6,800 crores** including a **cost of Rs. 250 crores towards environmental protection measures**.

2.0 DESCRIPTION OF THE ENVIRONMENT

2.1 Physical Environment

Predominantly it is a flat plain land about 220m above sea level and composed of mainly alluvial soil. The project area is to be graded by cutting and filling and kept above the high flood level.

2.2 Ecological Environment

The proposed plant site has no forest area. There is no National Park, Sanctuary, Elephant / Tiger Reserve (existing as well as proposed) in the Study Area (10 km of the

plant site). Further, there is no established migratory route and corridor for the daily/seasonal movement of the migratory wild animals.

2.3 Socio-Economic Environment

Study of socio-economic profile around the proposed project site is carried out primarily based on published documents by the Government of India through the “Census of India”. The **Study Area** has been considered to be an area covered within a radius of 10 km around the proposed project site beyond which no appreciable impact due to the project is envisaged.

The salient features of socioeconomic profile of the **Study Area** are as follows:

- The population density is 153 persons per square kilometer.
- The Sex Ratio (Female per 1000 Male) is 1006.
- Scheduled Tribes (ST) as percentage of total population is 74.91%. Scheduled Castes (SC) as percentage to the total population is 6.58%.
- Overall literacy rate, according to 2001 Census is 37.57%. The male literacy rate is 49.62% while female literacy rate is 25.58%.
- The percentage of main workers is 32.79% of total population and the percentage of marginal workers is moderate (22.43%).
- The land available in the Study Area can be categorized in the following manner:
 - a) About 1.56% of the total core area is “Irrigated”.
 - b) About 46.62% of the total area is “Unirrigated”.
 - c) About 16.64% of the total area is covered under “culturable waste”.
 - d) About 8.04% of the total area is “not available for cultivation”.
 - e) About 27.14% of total area is forest land.
- Communication facility is satisfactory.
- Bus service is present in this region.
- Medical facilities are not satisfactory and need improvement.

2.4 Air Environment

Ambient air quality was monitored for three consecutive months (October 2007 to January 2008) in and around the proposed project site in four monitoring stations. The results of ambient air quality monitoring, as obtained from all the monitoring stations are as follows :

| POLLUTANT | MAXIMUM | MINIMUM | AVERAGE |
|-----------------|---------|---------|---------|
| RPM | 89 | 23 | 49.15 |
| SPM | 185 | 48 | 108.63 |
| SO ₂ | 6.5 | 4.5 | 5.31 |
| NO _x | 42.5 | 11.5 | 19.63 |

** All figures in $\mu\text{g}/\text{m}^3$*

Recent ambient air quality data (October 2007 to January 2008) in and around the proposed plant reveals that the maximum values of RPM, SPM, SO₂ and NO_x in the area were 89, 185, 6.5 and 42.5 µg/m³ respectively. All the values are within the limit set for Industrial Area as well as for Residential, Rural & Other Areas.

2.5 Water Environment

To assess the background water quality, **four (4) surface water** samples and **one (1) ground water** sample were collected and analysed.

The results of analysis of surface water samples generally conform to Class-C, which means the water is suitable as drinking water source after conventional treatment and disinfection. Analysis of ground water sample reveals that the water is acceptable. However water of this bore well can be considered as safe sources of Drinking Water only after conventional treatment followed by disinfection.

2.6 Background Noise Level Data

Noise level was measured (in dBA) for three months in and around the proposed site at the same locations where ambient air quality was monitored. From the monitoring data it can be inferred that the noise level in and around the proposed site meets ambient standard for noise levels.

2.7 Background Soil Quality

To assess the background soil quality, top soil samples from three (3) different locations were collected from and around the site and were analysed subsequently conforming to IS:2720 and ASTM Part-XI.

3.0 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

3.1 Impact During Construction Phase

Appropriate environmental mitigation measures will be ensured during construction phase to eliminate/minimize detrimental impacts during this phase. These measures include dust suppression by arranging mobile water sprinklers mainly for unmetalled roads; providing workers' colony with electricity, sanitation and drinking water supply; arranging cooking fuel for the workers' colony, etc.

3.2 Impact during Operation Phase

Main aspects and activities during operation phase of the proposed project having potential for inducing environmental and/or social impacts are as follows:

- **Hydrology**

Required consumptive water for the proposed plant will be drawn from Mahanadi river, a perennial river and surface water availability in the Mahanadi river is around 22,945 million m³. As a very meager percentage of surface water available in Mahanadi river will

be drawn for plant operation and recycling and re-use of effluent water as well as closed cycle recirculation system of cooling have been conceived, this will reduce the consumption of raw water / river water. This drawl of water for the proposed units is not expected to cause any impact on the riverine hydrology.

- ***Air Environment***

The major pollutants of concern are Suspended Particulate Matter (SPM), Sulphur Di-Oxide (SO₂) and Oxides of Nitrogen (NO_x) emitted through the stack along with combustion gases. Apart from the above, the other sources of air pollution are fugitive dust from Coal Handling Plant (CHP) and dry fly ash handling and disposal system. Impact due to increase in dust/particulate matter during operation of these two sections will, however, be confined only to a small area around those units.

- ***Water Environment***

There are a number of sources of water pollution during the operation phase. All streams require attention before disposal to the environment. The wastewater treatment philosophy will be based on “minimum discharge approach”.

- ***Physical Environment***

Any project constructed on plain land (whether agricultural or otherwise) generally changes the land-use pattern and general aesthetics and sight of the area.

- ***Impact of Solid Wastes***

The quantum of total ash generation in such a power station using Indian power-grade coal having high ash content is large. Unless the ash management plan primarily aims at filling of low lying areas i.e., land reclamation (ideally backfilling of exploited open cast mines) and utilization in other activities like use in cement plants, as road sub-base, manufacture of bricks/tiles etc., dumping of ash on ground may lead to noticeable change in the topography and aesthetics of the area where the ash would be dumped.

Silt, generated in water pretreatment plant waste very small in quantity and disposal of the same does not invite concern like ash.

- ***Human Environment***

Unless there are a large number of land oustees and many people are rendered jobless, other impacts of such a project on human environment are generally positive when all probable adverse and beneficial impacts are analyzed and equated together.

AES Chhattisgarh is endeavoring for minimum homestead losers by avoiding hamlets while identifying the land to be acquired for the plant site.

3.3 Measures for Minimizing Adverse Impacts

- a) **Construction Phase**

- ***Compensatory afforestation***

For construction of such a project it will be necessary to cut and remove some trees to accommodate buildings, structures, equipment and other facilities. However, to compensate for this AES Chhattisgarh will plant, adequate number of trees as suggested by statutory authorities within their land. The species to be planted will be generally and as far as practicable same to those felled.

- ***Dust Suppression***

The main and visible pollution during construction phase is fugitive dust generated during excavation and other earthmoving activities. This problem will be mitigated by introducing dust suppression measure through sprinkling of water in dust prone activities.

- ***Resettlement and Rehabilitation (R & R)***

As far as possible prime agricultural land/forest land is avoided while selecting the land to minimize Resettlement and Rehabilitation (R & R) issue. AES Chhattisgarh has developed a well-formulated R & R package for Project Affected People (PAP).

- ***Workers' Colony***

To take care of the housing of construction workers to be migrated from outside, proper temporary housing arrangements will be ensured by AES Chhattisgarh through the respective contractors. The contractors will be made to accept to construct Workers' Colony while AES Chhattisgarh will temporarily make land available for the same. Workers' Colony will be provided with electricity, scientific and environmentally accepted drainage & sanitation and piped water supply systems.

b) Operation Phase

- ***Air Pollution Control***

Following steps will be taken to control air pollution:

- The height of the stack will be as recommended by CPCB / MoEF.
- High efficiency Electro-Static Precipitator (ESP) is being provided to limit SPM emission to 50 mg/Nm^3 , which is well below the prescribed limit (100 mg/Nm^3) of CREP for Thermal Power Plants.
- Low- NO_x burners to ensure NO_x emission level to 750 mg/Nm^3 , the present day World Bank standard.
- For abatement of fugitive dust nuisance suitable DE system employing bag house will be provided on fly ash silos. DS system comprising water atomizers shall be provided to minimize dust nuisance during retrieval of dry fly ash from silos.
- A green belt of adequate width is conceived around the air pollution sources and also along plant boundary to restrict air pollution.

- ***Quantification of Stack Emission***

The predicted increase in Ground Level Concentration (GLC) of different gaseous pollutants are as follows :

| SEASON | POLLUTANT | BACKGROUND MAXIMUM CONCENTRATION | MAXIMUM PREDICTED INCREASE IN GLC | MAXIMUM RESULTANT GLC |
|--------|-----------------|--|---|-----------------------------|
| Winter | SPM | 185 | 0.62 | 185.62 |
| | SO ₂ | 6.5 | 19.70 | 26.20 |
| | NO _x | 42.5 | 9.25 | 51.75 |

SPM : The maximum resultant SPM concentration will be 185.62 $\mu\text{g}/\text{m}^3$. This value is well within the specified limit of the 24-hourly GLC value of SPM (200 $\mu\text{g}/\text{m}^3$) for Industrial area and even lower than the limit set for Residential & for Industrial Area (500 $\mu\text{g}/\text{m}^3$) as well as for Residential, Rural & Other Areas (200 $\mu\text{g}/\text{m}^3$).

SO₂ : The maximum resultant SO₂ concentration will be 26.20 $\mu\text{g}/\text{m}^3$. This is below the limit for Industrial Area (120 $\mu\text{g}/\text{m}^3$) and even lower than the limit set for Residential, Rural & Other Areas (80 $\mu\text{g}/\text{m}^3$).

NO_x : The resultant NO_x works out to be 51.75 $\mu\text{g}/\text{m}^3$. This is below the limit for Industrial Area (120 $\mu\text{g}/\text{m}^3$) and even lower than the limit set for Residential, Rural & Other Areas (80 $\mu\text{g}/\text{m}^3$).

The above discussion reveals that the impact of the stack emission from the project on ambient air will be tolerable.

- Water Pollution Control*

The major sources of liquid effluents exclusively for the proposed project are :

- 1) Cooling Tower Blowdown (CTBD)
- 2) Boiler Blowdown (BBD)
- 3) Power House and Boiler Area Service Water Waste
- 4) Oil Handling Area Run-off
- 5) Coal Handling Plant's Wastewater and Coal pile area runoff
- 6) Water Treatment Plant Waste & Filtration Plant Backwash
- 7) DM Plant Regeneration Waste
- 8) Effluent From Ash Silo Area
- 9) Ash Handling System Waste (from emergency ash pond)
- 10) Sanitary Waste from plant toilets
- 11) Canteen Waste

The wastewater management philosophy will be based on “**Minimum Discharge**” approach.

- Solid Waste Management*

The main solid waste generated from the proposed plant is ash and water treatment plant sludge. Ash content is considered 31.86% for design coal and total (Bottom + Fly) ash production is estimated as follows :

| | | |
|------------|---|------------|
| Total Ash | : | 1.64 MMTPA |
| Fly Ash | : | 1.31 MMTPA |
| Bottom Ash | : | 0.33 MMTPA |

AES Chhattisgarh will have a dedicated *Ash Utilisation Division* for implementation of comprehensive ash management plan. Fly ash utilization will be as per MoEF's notification.

- *Noise Mitigation*

All general equipment will be procured with built-in noise abatement measures to restrict noise level not exceeding 85 dB(A) when measured 1 m away from the source surface. For equipment where this cannot be achieved, the noise generating equipment will be housed in suitable acoustic cover and building so that the noise level outside the building will be 75 dB (A). Personnel working in those areas will be provided with noise plugs/noise muffs to protect themselves from the evils of prolonged exposure to high noise levels.

The entire plant will be so procured/installed so that the resultant noise level within the plant premises remains within 75 dB(A) during day time and 70 dB(A) during night time respectively.

3.4 Assessment of Significant Impacts

☞ ***Land :***

Most of the identified land is uncultivated rain fed single crop agriculture land and at places covered with some scattered bushy vegetation. There will be a permanent change in the land use pattern. Conversion of some low fertile and less productive (rain fed single crop) agricultural land into industrial land will impart negligible detrimental impact.

☞ ***Water Source :***

As a very meager percentage of available water will be drawn for plant operation and recycling and re-use of effluent water as well as closed cycle recirculation system of cooling have also been conceived, this is not expected to be a problem of concern. As no ground water usage will be there, question of impact on ground water due to drawl of water does not arise.

☞ ***Water Quality :***

Wastewater management is based on "Minimum Discharge" approach. Treated effluent streams and unused wastewater, will be taken to the Central Monitoring Basin for equalization from where treated effluent will be reused to the extent feasible. Excess treated effluent conforming to the norm of discharges of Chhattisgarh Environment Conservation Board (CECB) will be disposed to nearby nullah. Hence no detrimental impact on the surface water quality is expected.

☞ ***Air Quality :***

The ambient air quality of the surrounding of the proposed site represents the expected scenario. The proposed units with the conceived pollution control measures are not expected to induce any impact beyond tolerable limit.

☞ ***Ecology :***

All emission and discharges from the proposed plant will be conforming to norms. Hence no detrimental impact on ecology is envisaged.

☞ ***Rehabilitation :***

With the proper implementation of a well structured Rehabilitation and Resettlement Plan project affected people will be rather benefited with compensation, improved civic facilities and amenities, job opportunities etc.

☞ ***Employment / Occupation :***

Non-workers and marginal workers constitute about 67.21% of the total population in the study area. The proposed project will generate further employment opportunity and further development of the area.

☞ ***Housing :***

A manpower of around 405 will be required in the operation phase of the project and they will be accommodated in the residential colony with all modern facilities. The local housing will not be affected to any degree of concern.

☞ ***Education and Health :***

Local literacy rate and educational facilities are fair. Wards of migrating personnel (during construction phase) should not have any problem of schooling. Reasonable medical facility will be made available for immediate attention. It is expected that existing medical and educational facilities will not be strained to any degree of concern.

☞ ***Services :***

The local villages have moderate civic services. The proposed colony will have proper civic facilities. The local villagers are also benefited through civic services like school, hospital, etc. The immigration of people will not strain existing facilities.

3.5 Environmental Impact Matrix

An Environmental Impact Matrix (EIM) has been developed to quantitatively assess the overall impact.

| E N V I R O N M E N T | | | | |
|-----------------------|--------------------------|------------|----------------------------|---------------------------|
| | PHYSICAL | BIOLOGICAL | HUMAN | TOTAL |
| Weightage | 45 | 20 | 35 | 100 |
| Impact value | -10 | - | +84 | +74 |
| Degree of Impact | -0.22 | - | +2.40 | +0.74 |
| Remarks | Adverse Insignificant | None | Beneficial Considerable | Beneficial Appreciable |

The overall impact has been found to be appreciably beneficial.

4.0 ENVIRONMENTAL MONITORING PROGRAM

To ensure the environmental quality in the post project scenario, a monitoring system is proposed. The components of proposed environmental monitoring programme include i) Water monitoring, ii) Land monitoring; iii) Air and noise monitoring; iv) Process and waste monitoring v) People and community monitoring and vi) Biological monitoring.

An **Environmental Management Cell (EMC)** will take the overall responsibility for co-ordination of the actions required for environmental monitoring programme and environmental management plan.

5.0 ADDITIONAL STUDIES

The additional studies include : *Public Consultation, Risk assessment and R & R Action Plans.*

The *Public Consultation* process will be carried out by CECB.

In the proposed project the following scenario of emergency may arise due to the accidental release of chemicals like HFO/LDO, hydrogen and chlorine. All safeguard measures as recommended by statutory authorities are conceived and a well-formulated DMP is also prepared for combating emergency scenarios.

AES Chhattisgarh Energy Pvt Ltd. has developed a well-formulated R & R package for Project Affected People (PAP).

6.0 PROJECT BENEFITS

The proposed project is expected to bring significant socio-economic and environmental benefits both at local and national level. The project would supply 7.5% of the electricity to Chhattisgarh state on variable cost basis which will lower the average cost of electricity for Chhattisgarh state. The physical and social infrastructure will improve in a significant manner. The project will also create some long term and short-term employment. Thus, the proposed project has ushered in the social and economic uplift of the persons living in the vicinity of the Project i.e. of society at large.

7.0 ENVIRONMENTAL MANAGEMENT PLAN

The EMP has been designed within the framework of various legislative and regulatory requirements on environmental and socio-economic aspects of different national and international bodies. EMP includes the following components:

i) Impact Mitigation Measures during Construction Phase : It includes Air Quality Management, Noise Level Management, Water Resource Management, Water Quality Management, Soil Quality Management, Land Use Pattern and Ecology Management, Traffic Movement, Socio-economic etc.

ii) Impact Mitigation Measures during Operation Phase : It includes Solid Waste Management, Air Pollution Control Measure, Water Pollution Control Measure, Noise Pollution Control Measure, Plantation (Green Belt Development), Socio – Economic Measures, Occupational Safety and Health, Emergency Preparedness (Disaster management Plan) and Audit.

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