

PRE-FEASIBILITY REPORT

Of

ARASMETA POWER PLANT

**Arasmeta village, Akaltra Tehsil
Janjgir-Champa district, Chhattisgarh**

For

**INSTALLATION OF 18 MW COAL BASED CAPTIVE
POWER PLANT WITHIN THE EXISTING CEMENT
PLANT COMPLEX**

By



LAFARGE INDIA LIMITED.

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1.0 EXECUTIVE SUMMARY

LAFARGE INDIA LIMITED (LIL), is operating Arasmeta Cement Plant at Arasmeta village, Akaltra Tehsil of Janjgir-Champa District in Chhattisgarh State. The plant is located in an area of 82 Hectares (Ha). The production capacity of the plant is 1.6 Million Tonnes per Annum (MTPA) of Clinker & 2.24 MTPA of Cement.

Lafarge India Limited (LIL) entered the Indian market in 1999. Lafarge has four cement plants in India: two plants in the state of Chattisgarh (Sonadih and Arasmeta). The plant is located at Arasmeta village, Akaltra Tehsil of Janjgir-Champa District, Chattisgarh.

The LIL Arasmeta cement plant is of clinkerisation capacity 5200 TPD and having two cement grinding mills. Capacity of grinding mills is 135 TPH and 105 TPH. Cement plant was commissioned in 1985.

Currently the cement plant electrical energy requirement is being met from the Chattisgarh State Power Distribution Company Limited (CSPDCL). Plant has 132kV/6.6kV receiving substation having three steps down transformer of 12 MVA, 132kV/6.6 kV.

Maximum power requirement of the plant is 23 MW whereas average power requirement is 21.5 MW. As on date the maximum contract demand from the grid is 27MVA.

LIL Arasmeta cement plant also has installed 3x 6MW HFO based DG power plant.

In view of the high power tariff & increasing trend in the tariff of energy by CSPDCL. LIL is contemplating to have Self Power generation to meet bulk power requirement of the cement plant.

LIL proposes to set up a 18 MW Coal based Thermal Power Plant to meet the power requirement of the existing cement plant. Salient features of the power plant are given below

CLIENT	LAFARGE INDIA LIMITED
Location	➤ Place : Chhattisgarh – Arasmeta ➤ Country : India
Plant Capacity	1 x 18 MW - Thermal Power Plant
Technology	Conventional steam cycle operating in Rankine cycle, consisting of 85 TPH CFBC boilers and 1 no. Turbine 535 deg. C at 105 Kg / cm ² pressure.
Main Fuel	Indian Coal / washery Reject
Type of Coal for design of boiler	Boiler design will be accept coal and Pet Coke
Source of water	River water from Lilagar river
Water Requirement	
Total raw water requirement	280 m ³ /day
Annual generation	123.0 mio kwh
Annual auxiliary consumption	12.3 mio kwh
Net output	110.7 mio kwh
Land Requirement	2.50 Ha
Manpower Requirement	43 persons & 24 contract labour
Project Implementation Schedule	➤ 3 months for Power Plant Order Placement ➤ 22 months from main machinery order placement to commissioning

The proposed new unit will be located within the existing cement plant complex. No additional land or site is required. Keeping in view of utilizing some of the common existing infrastructure.

Fuel proposed for thermal power plant will be imported coal or Indian coal or washery reject coal or Pet Coke or combination of above fuels.

The power plant is based on air cooled condensate system. The water requirement for the proposed CPP plant works out to be approximately 280 m³/ day. Water demand is proposed to be met from the present water source being received from Lilagar River.

Waste water generated from the power plant will be treated and used in the cement plant, and the treated effluent will be used for development/maintenance of the green belt. An effluent disposal pump will be used for this purpose.

The wastewater generated from the power plant will be used for development/maintenance of the green belt.

Ash is generated from the power plant will be consumed in existing cement plant.

There is no wild life sanctuary, national park, eco-sensitive area within the 10 km radius of the project site. Kotmi-sunar Crocodile Park is at a distance of 6.4 km in NNE with respect to the site.

Existing infrastructure include railway siding and well developed roads, storm water drains with adequate storage space for flyash and parking area.

All infrastructure facilities such as education, health facilities and other social facilities are adequate at nearest populated area

Dust collected from air pollution control equipment is 100% recycled in process and Ash generated in power plant will be consumed in existing cement plant.

LIL has well-defined CSR policy to Carryout social development and welfare measures in the surrounding villages. Under CSR activity LIL had carried out community development projects, in the fields of health, education and environmental preservation, in and around the plant.

The capital cost, for the proposed production enhancement project, works out to Rs 119.57 crore.

2. INTRODUCTION OF THE PROJECT/ BACKGROUND INFORMATION

(I) IDENTIFICATION OF PROJECT AND PROJECT PROPONENT

Lafarge entered the Indian market in 1999, through its cement business. Lafarge currently has 4 cement plants in India. In recent years, Lafarge has significantly enlarged its operations across its three business divisions - Cement, Aggregates and Concrete. The company has an established presence across all major cities and towns in India. Lafarge today is the market leader in the ready-mix concrete business with around 70 plants. To make advances in building materials, Lafarge places the customer at the heart of its concerns.

The Group's expertise in efficient industrial processes generate value, protects the environment, shows respect for societies & cultures and is sparing in its use of natural resources and energy.

Lafarge India Ltd. was formed in the year 1999 and it started operation in India by acquiring Cement Division of Tata Steel with integrated cement plant located at Sonadih, Dist.: Raipur, State: Chattisgarh & grinding unit at Jojobera, Dist.: Jamshepur, State: Jharkhand. Subsequently, in the beginning of the year 2001 it also acquired Raymond Cement Plant situated in Dist.: Bilaspur State: Chattisgarh and this plant is now renamed as Arasmeta Cement Plant. Lafarge India commissioned a green field project at Distt. Chhittorgarh in Rajasthan in 2013.

Lafarge India Ltd is operating 1.5 MTPA of Fly-Ash Cement grinding station which is a State-of-the-art cement grinding unit based on latest and most eco-friendly technology adjacent to Thermal Power Station of Damodar Valley Corporation, Mejia, District Bankura West Bengal and is committed to grow with the environment. The unit is utilising bulk quantity of Fly -Ash generated by Mejia Thermal Power Station (MTPS) of Damodar Valley Corporation in an eco-friendly manner thus is instrumental in abating the Pollution in the region.

(ii) BRIEF DESCRIPTION OF NATURE OF THE PROJECT.

The proposal is for setting up of 18 MW coal based captive power plant within the existing cement plant complex. Power plant is based on Circulating Fluidised Bed Combustion (CFBC) with air cooled

condensate system. Fuel proposed for thermal power plant is imported coal or Indian coal or washery reject coal or Pet Coke or combination of above fuels. One 72 TPH boiler will be installed to meet steam requirement of the power plant.

(iii) NEED FOR THE PROJECT AND ITS IMPORTANCE TO THE COUNTRY AND OR REGION

Currently the cement plant electrical energy requirement is being met from the Chattisgarh State Power Distribution Company Limited (CSPDCL) .Plant has 132kV/6.6kV receiving substation having three step down transformer of 12 MVA, 132kV/6.6 kV.

Maximum power requirement of the plant is 23 MW where as average power requirement is 21.5 MW. As on date the maximum contract demand from the grid is 27MVA.

LIL Arasmeta cement plant also has installed 3x 6MW HFO based DG power plant.

SECTION WISE SPECIFIC POWER REQUIREMENT

Sl.No	Description	Capacity	Peak Power Requirement	Unit	Value
1	Crushing		1.0 MW	Kwh/T	2.0
2	Raw mill 1 Grinding with transportation from crusher to Raw mill hopper	135 TPH	3.1 MW	Kwh/T	21.89
3	Raw mill 2 Grinding with transportation from crusher to Raw mill hopper	220 TPH	3.8 MW	Kwh/T	18.6
4	Coal Mill grinding 1	18 TPH	1.0 MW	Kwh/T	28.04
5	Coal Mill grinding 2	25TPH	1.0 MW	Kwh/T	34.53
6	Pyro(Kiln ,cooler, PH) and transport	5200 TPD	6.0 MW	Kwh/T	27.57
7	Clinkerisation Total			Kwh/T	66.15
8	Cement (PPC)	Mill-1-135 Mill-2-105	Mill-1-3.1 MW Mill-2-3.5 MW	Kwh/T	31.0
9	Packing plant			Kwh/T	1.85
10	Colony		0.5 MW		
11	Specific Power Consumption			Kwh/T	74.41
	Total - Power & Energy Requirement		23 MW		176.64 mio Kwh per annum (320 days of operation)

In view of the very high power tariff from CSEB, LIL intend to have own power generation comprising of WHR Power Plant & Captive thermal power plant for meeting major power and energy requirement of the cement plant.

In addition to above CSEB grid connection will be retained for meeting the peak load requirement/outage of any source consist of WHR power plant and coal fired captive power plant.

The objective of the study is to finalize Capacity of the Power Plant based on the best available option considering reliable and cost effective power generation.

A) POWER COST FROM CSEB GRID

The power tariff by CSEB is fixed in 2015 is with Demand charges as Rs 350 /KVA per month. The energy charges as per CSEB are as follows :

- Peak hours :Rs 6.91/kwh
- Off peak hours :Rs 4.01/kwh
- Normal hours :Rs 5.35/kwh

Based on the analysis of the Power tariff from 2014 to 2016, the average increase in the power tariff & demand charges is 7%.

The average Energy charges paid at Aresmeta considering Fixed demand charges & variable Energy charges is Rs 6.40 /kwh as per below details :

Sl.No	Power Cost from CSEB		
1	Total Energy Required	176.64	Mio Kwh per annum
2	Contract Demand with grid	27,000	KVA
3	Maximum Power Demand	23,000	kW
4	Fixed Charges	350	Rs/KVA/Month
5	Average Energy Charges	5.50	Rs/Kwh
6	Electricity Duty	0.34	Rs/Kwh
	Total Power tariff	6.40	Rs/Kwh

B) CAPACITY OF THE CAPTIVE POWER PLANT:

- Captive Power plant along with WHR power plant will meet bulk Energy requirement of cement plant while peak requirement will be met from CSEB grid.
- The power plant configuration / size under various options will be selected based on the unit size available from various power plant suppliers.

C) UNIT SIZING

The capacity of the power plant has been worked out under Present Operation condition with the proposed WHRS Plant with net available power-7.0 MW

Power deficit after the WHRS installation : 16 MW

D) GROSS POWER/CAPACITY OF PROPOSED POWER PLANT -18 MW

Based on the above, configuration & unit size of power plant under various options is defined as follows:-

PRESENT OPERATING CONDITION OF CEMENT PLANT

SL. NO	Plant	Generation/ Installed capacity	Auxiliary power in MW	Net available power for Cement Plant In MW (peak)	Energy available from CPP and WHRS
1.	CPP (Thermal Coal based)	18.00	2.0	16.0	111
2	WHRS	7.5	0.5	7.0	48.00
3	CSEB supply	7.0 MVA (demand)		4.0	17.64
Total in MW				27.00	

- Based on the above power requirement will be met from Thermal power plant , WHRS power plant & CSEB
- To meet complete power requirement of Cement Plant during outage of Captive Power Plant, CSEB power supply demand will be retained as 7.0 MVA.
- Based on the above the Optimum capacity of Power Plant will be 18 MW.

(VI) EXPORT POSSIBILITY

No export is proposed

(VII) DOMESTIC/EXPORT MARKETS.

Power generated will be used for captive consumption

(VIII) EMPLOYMENT GENERATION (DIRECT AND INDIRECT) DUE TO THE PROJECT

Additional employments of about 43 persons & 24 contract persons required for proposed power plant.

3 PROJECT DESCRIPTION

(I) TYPES OF PROJECT INCLUDING INTERLINKED AND INTERDEPENDENT PROJECT, IF ANY

LIL proposes to set up a 18 MW Coal based Thermal Power Plant to meet the power requirement of the existing cement plant.

The proposed new unit will be located within the existing cement plant complex. No additional land or site is required. Keeping in view of utilizing some of the common existing infrastructure.

(II) LOCATION (MAP SHOWING GENERAL LOCATION, SPECIFIC LOCATION AND PROJECT BOUNDARY & PROJECT SITE LAYOUT WITH COORDINATES.

Arasmeta Coal based Power Plant located near Arasmeta village, Akaltra Tehsil Janjgir-Champa district, Chhattisgarh state. **Fig - 1** shows the location map of the plant site. The plant is geographically located between 21° 57' 49.61" N to 21° 58' 22.66" N; 82° 20' 38.82" E to 82° 21' 27.92" E, N Latitude and E Longitude and part of study area falls within the Survey of India Toposheet No. 64 K/5 (Scale : 1:50000).

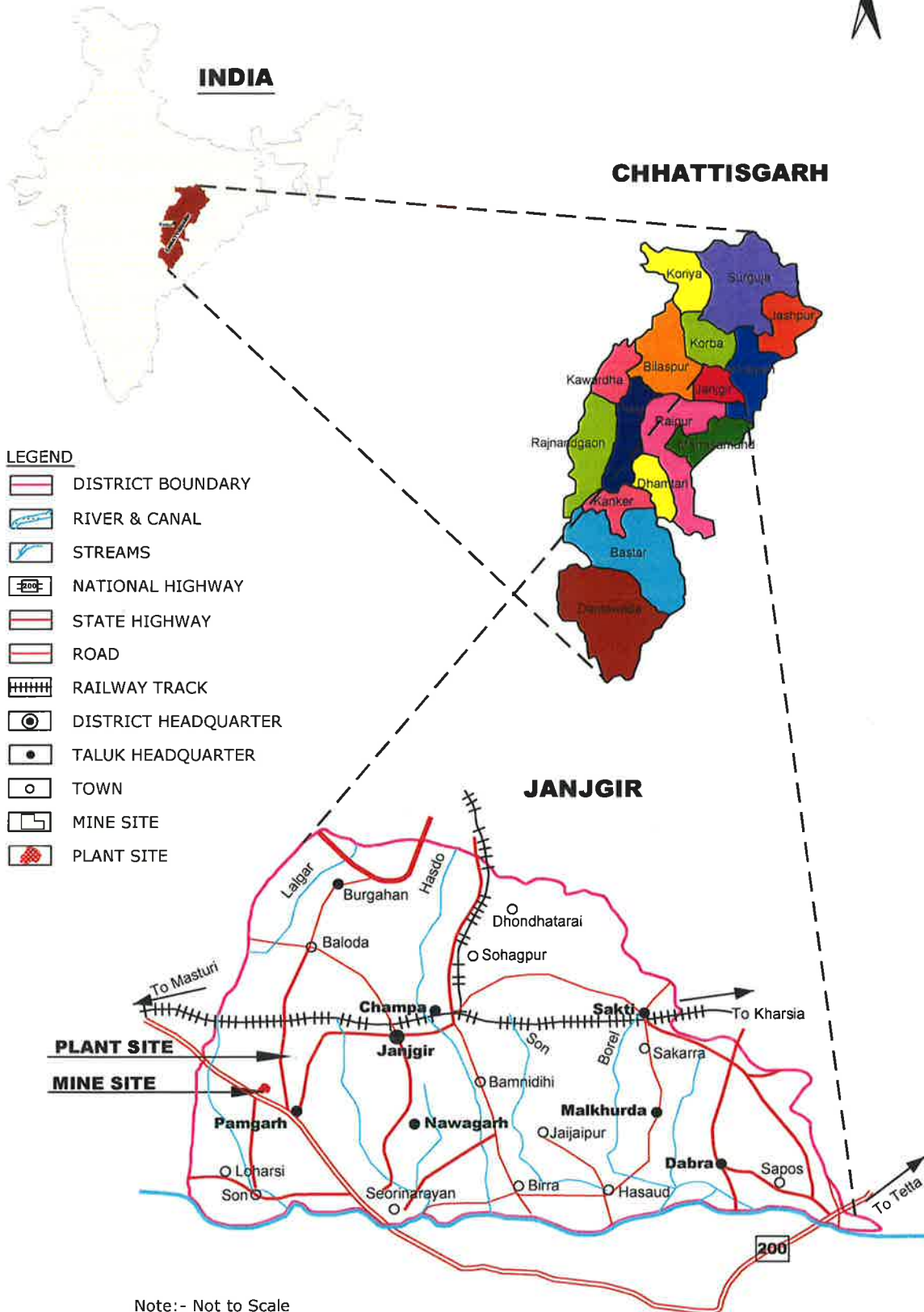
Nearest railway line connecting Bilaspur – Janjir of South Eastern Railway line is located at a distance of 5.6 km in Northern direction from the site. The nearest railway station is located at Kotmi – sunar passanger Hlt which is 6.0 km in NNE from the site. The major Railway Station is Bilaspur which is at a distance of 22.8 km in WNW with respect to the Plant site.

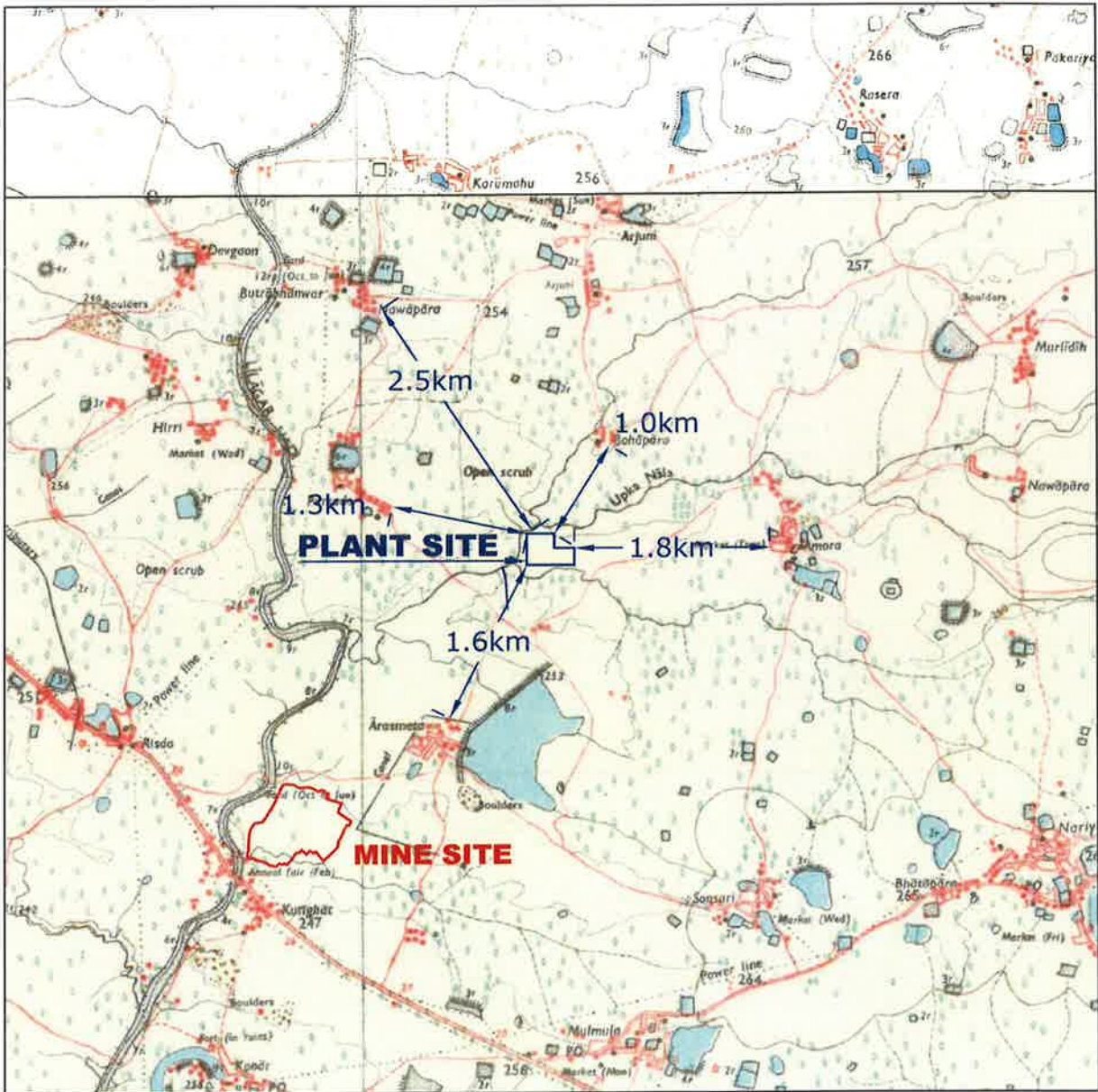
Lilgar Nadi flows at a distance of 1.8 km in SW with flow from N to S. Arna or Arpa River flows at a distance of 12.5 km in SW from the Plant site with flow from NW to SW. Seonath River flows at a distance of 22.4 km in SW from the site.

Key map showing the location of various features around the site is shows in **Fig - 2**.

Bilaspur is the major city which is located at a distance of 24.8 km from the site in WNW direction.

**FIG - 1
LOCATION MAP**





LEGEND



-  MINE SITE
-  PLANT SITE

FIG - 2

CLIENT :	M/s. ARASMETA CAPTIVE POWER COMPANY PVT. LTD.
PROJECT :	18 MW COAL BASED POWER PLANT Arasmeta Village, Akaltara Tehsil, Janjgir-Champa District, Chattisgarh.
TITLE :	KEY MAP
PREPARED BY  B.S.ENVI-TECH (P) LTD., SECUNDERABAD	

The National Highway (NH-200) connecting Bilaspur – Janjgir is located at a distance of about 4.0 km in Southern direction to the Plant site.

There are no wild life sanctuaries, elephant/tiger reserves within 10-km radius of the study area.

Kotmi-sunar Crocodile Park is at a distance of 6.4 km in NNE with respect to the site.

Nearest Settlements from the Plant site

- Arasmeta – 1.6 km – SSE
- Parsada – 1.3 km – WNW
- Nawapara – 2.5 km – NW
- Bohapara – 1.0 km – NNE
- Amora – 1.8 km – E

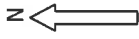
There are no Reserved and Protected forests within study area of 10 km Radius.

Salient features of the Plant site are given in **Table – 1.0 & Fig- 3** shows the study area of 10 km radius around the Plant site.

TABLE – 1.0
SALIENT FEATURES OF THE PLANT SITE

Feature	Details
Altitude	260 m above msl
Longitude & Latitude	21° 57' 49.61" N to 21° 58' 22.66" N, 82° 20' 38.82" E to 82° 21' 27.92" E
Village, District, State	Arasmeta Village, Janjgir-Champa District of Chattisgarh
IMD Station	Champa – 24.8 km - WNW
District head quarters	Janjir – 23.6 km - ENE
Max. Temp. °C	48
Min. Temp. °C	6.2
Relative Humidity%	19- 88
Annual rainfall	1354.1 mm
Topography	Plain
Soil Type	Black Cotton Soil
Nearest Water bodies River/nala	Lilgar Nadi – 1.8 km – SW Arna or Arpa River - 12.5 km – SW Seonath River- 22.4 km – SW Upka Nala – adjacent - N
Nearest Highway	National Highway (NH-200) Connecting Bilaspur – Janjgir –4.0 km – S
Nearest Railway station	Kotmi – sunar passanger Hlt - 6.0 km - NNE
Nearest Railway Junction	Bilaspur – 22.8 km - WNW
Nearest Industries	KSK Mahanadi power company – 5.9km – ESE KSK Power Plant – 0.5km – E Verdha Power Plant- 5.0 km – E
Nearest Village	Arasmeta – 1.6 km – SSE Parsada – 1.3 km – WNW Nawapara – 2.5 km – NW Bohapara – 1.0 km – NNE Amora – 1.8 km – E
wild life sanctuaries/Natioal Parks	Kotmisunar Crocodile Park- 6.4 km - NNE
Nearest City	Bilaspur – 24.8 km - WNW
Interstate boundary	Chattisgarh – Madhya Pradesh – 100.00 km- NW
Nearest Air port	Bilaspur – 24.0 km – WNW Raipur – 107.0 km - SSW
Nearest Forest	None
Historical places	None

**all distances mentioned in the above table are aerial distances*



LEGEND

-  MINE SITE
-  PLANT SITE

REFER TO THIS MAP AS:- 1:50,000
SHEET 64/K/5 FIRST EDITION

Published under the direction of
the Surveyor General of India - 1979

**Index to
Survey of India Toposheets**

64 J/4	64 J/8	64 J/12
64 K/1	64 K/5	64 K/9
64 K/2	64 K/6	64 K/10



FIG - 3

CLIENT : **M/S. ARASMETA CAPTIVE POWER COMPANY PVT. LTD.**

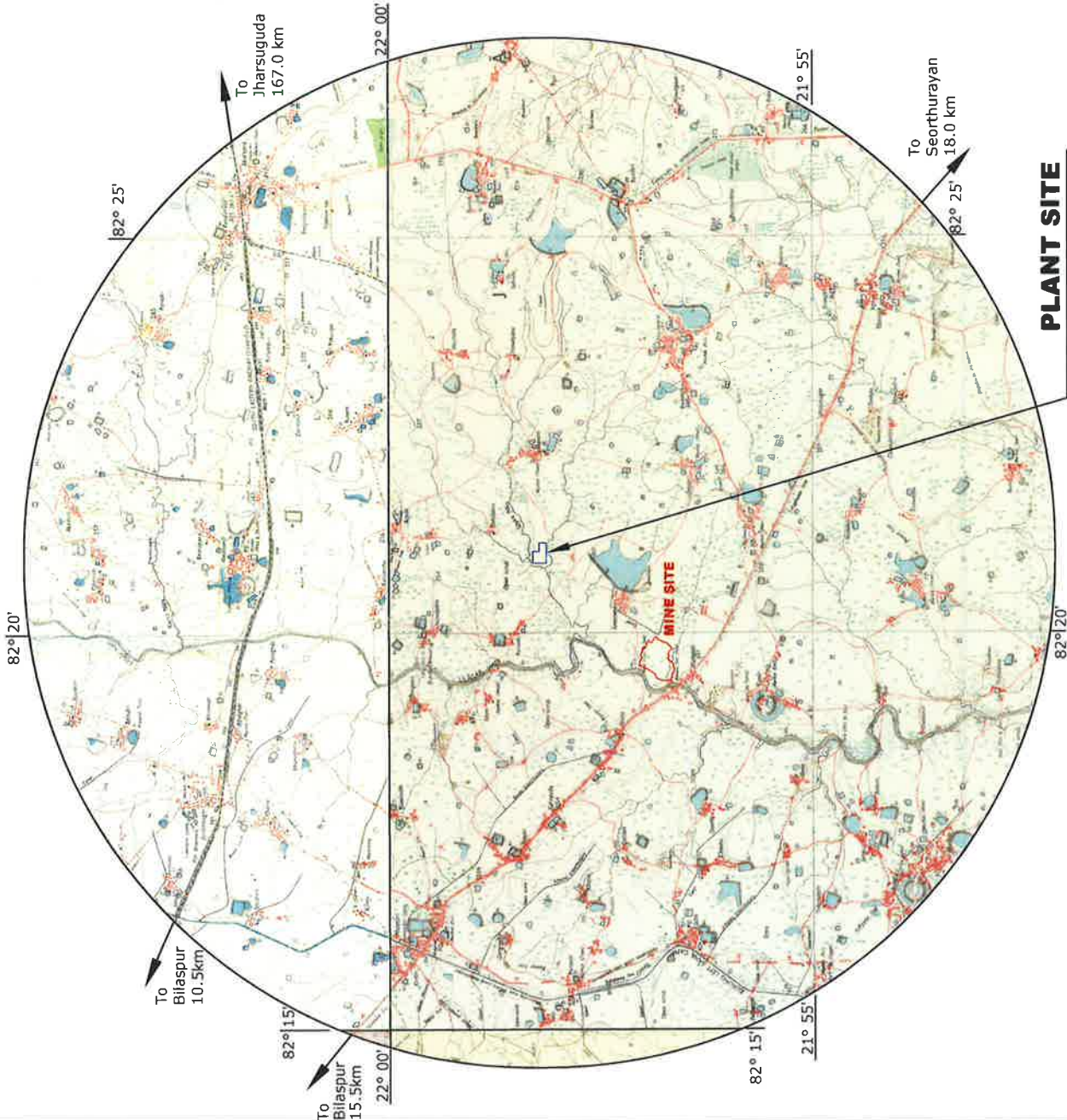
PROJECT : **18 MW COAL BASED POWER PLANT**

Arasmeta Village, Akaltara Tehsil, Janjgir-Champa District, Chattisgarh.

TITLE :

**TOPOGRAPHICAL MAP
SHOWING 10 km RADIUS**

PREPARED BY
**B.S.ENVI-TECH (P) LTD.,
SECUNDERABAD**



(III) DETAILS OF ALTERNATE SITES CONSIDERED AND THE BASIS OF SELECTING THE PROPOSED SITE, PARTICULARLY THE ENVIRONMENTAL CONSIDERATIONS GONE INTO SHOULD BE HIGHLIGHTED.

The proposed new unit Coal based 18 MW Power plant will be located within the existing cement plant complex, No additional land or site is required. Keeping in view of utilizing some of the common existing infrastructure.

(IV) SIZE OR MAGNITUDE OF OPERATION.

The Proposed new unit is Coal based 18 MW Power plant will be located within the existing cement plant complex.

Fuel proposed for the Power Plant is Coal/Pet-coke hence conventional Rankine steam cycle plant has been considered for 1 x 18 MW CPP.

POWER CYCLE CONFIGURATION

In the conventional steam system operating on Rankine cycle, the main equipment is the steam generator ,steam turbine & Air Cooled Condenser with their auxiliaries.

The utility system includes fuel storage system, fuel handling system, Water treatment plant, fire water system, cooling tower for auxiliaries, ash handling system and compressed air systems etc. The following factors have influenced the selection of major equipment's:

- The efficiency of steam power cycle improves with the increase in the inlet steam temperature and pressure, as has been established by thermodynamics.
- The basic power cycle configuration chosen for the 1x18 MW would be with pressure of 105 ata and temperature of 535o C at turbine inlet and following tap off for regeneration:
 - Two high pressure
 - One low pressure
 - One de-aeration

The following configurations will be adopted for the power plant:-

A Steam Turbine Generator		
A	Type of turbine	Condensing
B	No. and ratings of turbine	01no. (18MW) of inlet parameters, 105 kg & 535°C
C	Capacity	18 MW MCR
d	No. of Bleeds	4nos. 2HP, 1LP and 1 Deaerator

The steam generator design parameters will be as follows

B	Boiler type	CFBC
1	Super-heater outlet pressure ata	110
2	Super-heater outlet temperature (°C)	540 ± 5
3	Feed water inlet temperature (°C)	230
4	Excess air (%)	Not more than 25
5	Boiler outlet flue gas temperature(°C)	150 (max.)
6	Dust concentration at chimney (mg/Nm ³)	30 (max.)

The selected configuration consist of 1 x 18 MW power plant with CFBC boiler with a continuous rating of 85 TPH connected to a single turbo-generator of 18 MW nominal capacity.

The type of turbine & boiler are discussed below:

TURBINE

The 18 MW size turbine is having an axial length of approx. 4.5 meters. Hence it will be possible to provide 4 nos. of steam tap off nozzles in the turbine for feed heating making the turbine a four extraction cum condensing type. With this configuration the power cycle efficiency can be improved.

Based on the above analysis, following configurations will be adopted for the each units:

A Steam Generator		
a	No. and ratings of Boiler	1 no. with Maximum Continuous rating 85 TPH & 540°C
b	Type of Boiler	CFBC
c	No. of boiler fans	2 x 60% duty for ID & SA & SA Fan
d	Type of Atmospheric	Electro static precipitators with

		pollution control system	outlet dust concentration less than 30 mg / Nm ³ .
B	Steam Turbine Generator		
	a	No. and ratings of turbine	1 no. for each unit of inlet parameters, 105 kg & 535°C
	b	Capacity	18 MW Maximum Continuous rating
	c	No. of controlled extractions	4 nos.2 HP, 1MP and 1 LP
	d	Type of exhaust steam cooling	With Air cooled condenser

(V) PROJECT DESCRIPTION WITH PROCESS DETAILS (A SCHEMATIC DIAGRAM/FLOW CHART SHOWING THE PROJECT LAYOUT, COMPONENTS OF THE PROJECT ETC. SHOULD BE GIVEN.

Power generation process is based on Rankine Steam cycle. The steam generated in the boiler when expanded through a turbine, turns the turbine shaft, which is tandem coupled to an electric power generator. The schematic diagram of the power generation process are shown in **Fig- 4.**

The Power plant is aimed at generation of 18.0 MW of electric power with one CFBC boiler of 85 tph capacity connected to Turbo Generator set of 18.0 MW.

The steam generator design parameters will be as follows

Maximum continuous rating (MCR) (T/hr)	85
Super-heater outlet pressure (kg/cm ² (g))	110
Super-heater outlet temperature (°C)	540 + 5
Feed water inlet temperature (°C) at eco inlet	230
Excess air (%)	Not more than 25
Boiler outlet flue gas temperature (°C)	150 (max.)
Dust concentration at chimney (mg/Nm ³)	30 (max.)

The steam generator will be with following auxiliaries:

The steam generator will be provided with a steam drum and the drum will be of fusion-welded type. The steam drum will be with necessary nozzle connections for the steam outlets, safety valves, feed water inlets, down-comers, continuous blow down, level indicators, chemical dosing, sampling connection, drains and vents to assure the required steam purity.

TYPICAL FLOWSHEET FOR ELECTRIC POWER GENERATION

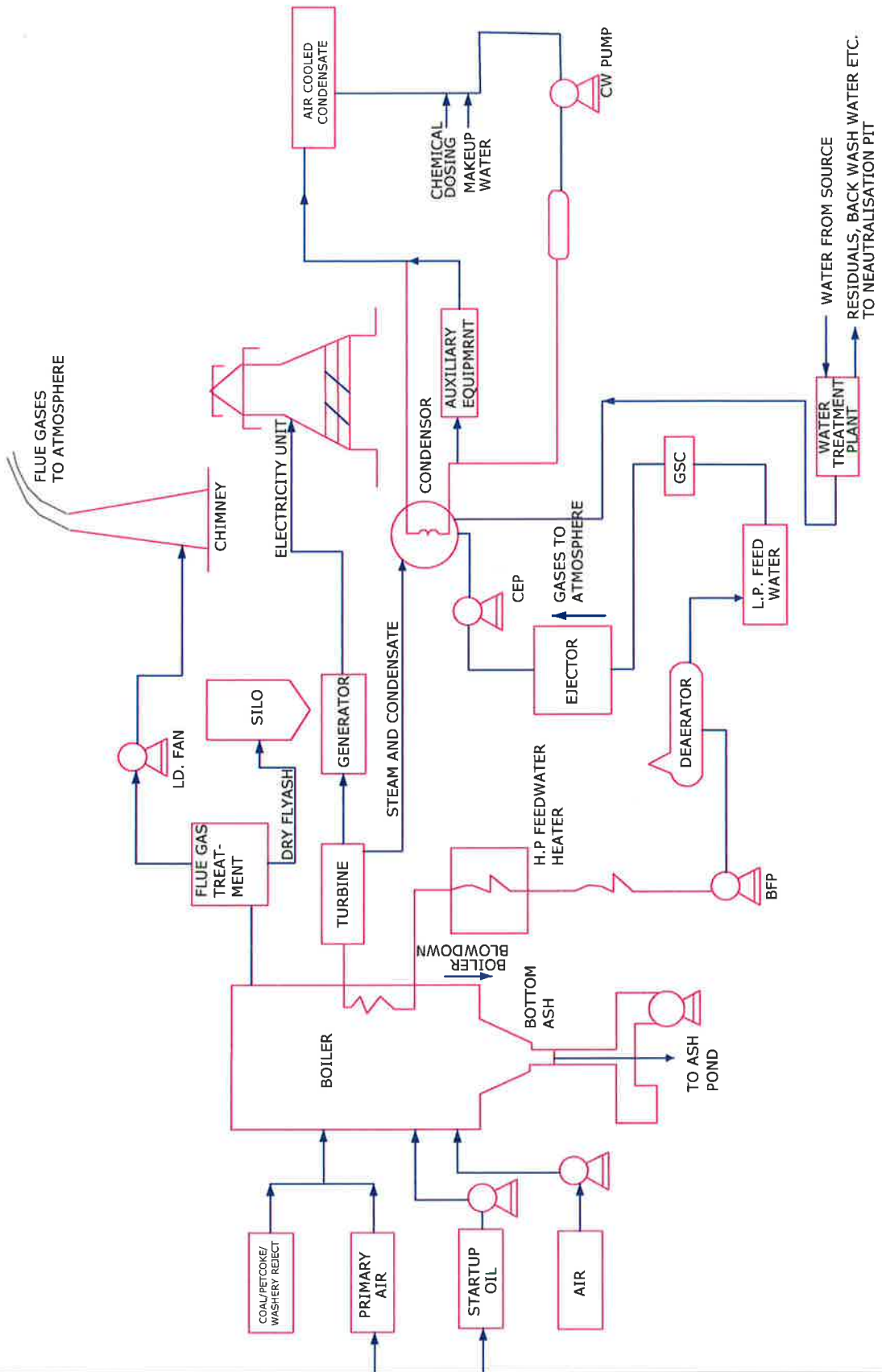


FIG - 4

STEAM TURBINE AND AUXILIARIES

STEAM TURBINE

This project envisages 18 MW multi extraction-cum-condensing turbo-generators.

- The turbine will be designed for the operation with the inlet steam parameters at 110 ata and 535 deg C and will be with automatic controlled extraction steam.
- The turbine will be horizontal, single cylinder, triple extraction-cum-condensing type. All casings and stator blade carriers will be horizontally split.
- The controlled extraction steam from the turbine will be delivered to the heaters/de-aerators in saturated condition.
- A de-super heater to bring the steam temperature from the extraction steam temperature down to the required level is envisaged.

(VI) RAW MATERIAL REQUIRED ALONG WITH ESTIMATED QUANTITY, LIKELY SOURCE, MARKETING AREA OF FINAL PRODUCTS/S, MODE OF TRANSPORT OF RAW MATERIAL AND FINISHED PRODUCT.

Fuel proposed for thermal power plant will be Indian Coal/Imported Coal/Washery reject/Pet Coke or combination of above fuels.

FUEL ANALYSIS (% BY WEIGHT)

Fuel & Lime stone analysis for design fuels for Boiler			
1	Imported coal		Design Parameter
	Proximate Analysis		
	Fixed Carbon	%	36-43
	Volatile matter	%	28.01
	Ash	%	14.14
	Moisture	%	15.5
	Ultimate Analysis		
	Carbon	%	61.89
	Hydrogen	%	4.39
	Oxygen	%	11.0
	Moisture	%	15.50

	Sulphur	%	0.50
	Nitrogen	%	1.24
	Ash	%	5.22
	Fuel Gross Calorific Value	kcal/kg	5950
	Ash analysis		
	SiO ₂	%	57-62
	Al ₂ O ₃	%	20-32
	Fe ₂ O ₃	%	4-14
	CaO	%	1-6
	MgO	%	0.6-2
	Na ₂ O	%	0.07-1.2
	TiO ₂	%	1-2
	K ₂ O	%	0.07-1.2
	SO ₃	%	0.06-0.22
	P ₂ O ₅	%	0.2-0.7
2	Petcoke		
	Proximate Analysis		
	Fixed Carbon - Actual	%	83.5
	- Design		70-91
	Volatile matter - Actual	%	10
	- Design		7-15
	Ash	%	3
	Moisture	%	3.5
	Ultimate Analysis		
	Carbon	%	81.0
	Hydrogen	%	2.50
	Oxygen	%	0.0
	Moisture	%	4.50
	Sulphur	%	8.0
	Nitrogen	%	1.0
	Ash	%	3.0
	Fuel Gross Calorific Value	kcal/kg	7955
	Ash analysis		
	SiO ₂	%	35-50
	Al ₂ O ₃	%	15-25
	Fe ₂ O ₃	%	10-20
	CaO	%	2-10
	MgO	%	1-3
	Na ₂ O	%	1-3
	TiO ₂	%	1-1.5
	K ₂ O	%	1-5
	SO ₃	%	10-25
	P ₂ O ₅	%	Traces
3	Indian Coal		
	Proximate Analysis		

	Fixed Carbon	%	24.5
	Volatile matter	%	20.5
	Ash	%	45
	Moisture	%	10
	Ultimate Analysis		
	Carbon	%	36.20
	Hydrogen	%	1.70
	Oxygen	%	6.0
	Moisture	%	10.0
	Sulphur	%	0.30
	Nitrogen	%	0.60
	Ash	%	45.0
	Fuel Gross Calorific Value	kcal/kg	3200
	Ash analysis		
	SiO ₂	%	45-65
	Al ₂ O ₃	%	10-20
	Fe ₂ O ₃	%	6-10
	CaO	%	2-10
	MgO	%	1-3
	Na ₂ O	%	1-5
	TiO ₂	%	1-1.5
	K ₂ O	%	1-5
	SO ₃	%	2-4
	P ₂ O ₅	%	0.5
4	Washery rejects		
	Proximate Analysis		
	Fixed Carbon	%	15
	Volatile matter	%	15
	Ash	%	60
	Moisture	%	10
	Ultimate Analysis		
	Carbon	%	22.92
	Hydrogen	%	1.59
	Oxygen	%	4.52
	Moisture	%	10.0
	Sulphur	%	0.30
	Nitrogen	%	0.47
	Ash	%	60.0
	Fuel Gross Calorific Value	kcal/kg	2150
	Ash analysis		
	SiO ₂	%	55-65
	Al ₂ O ₃	%	20-30
	Fe ₂ O ₃	%	2.5-7.5
	CaO	%	2.5-7.5
	MgO	%	1-2

	Na ₂ O	%	0.05-0.15
	TiO ₂	%	0.05-0.15
	K ₂ O	%	0.5-0.9
	SO ₃	%	0.1-0.15
	P ₂ O ₅	%	Traces
5	Density of fuel and ash		
	Fuel Density for volume calculation	kg/m ³	800
	Fuel Density for weight calculation	kg/m ³	1200
	Ash density for volume calculations	kg/m ³	600
	Ash density for weight calculations	kg/m ³	1100
6*	Lime stone analysis		
	CaCO ₃	%	75
	MgCO ₃	%	2.5
	SiO ₂	%	10
	Al ₂ O ₃	%	2
	Fe ₂ O ₃	%	0.5
	K ₂ O	%	0.25
	Ma ₂ O ₃	%	0.35
	Surface moisture	%	2-3
	Inherent moisture	%	1-2

**In view of high sulfur in petcoke and to meet the environmental norms, limestone dosing is envisaged in the boiler to restrict emission level within the environmental norms.*

The maximum consumption of any fuel at given time is given below

Fuel REQUIREMENT -18 MW COAL BASED POWER PLANT

Sl. No	Fuel Considered	GCV of Fuel Kcal/kg	Energy Generated per day	Fuel required per day ton	Fuel required per annum TPA
1	Imported Coal	5950	0.38016	182.0934	0.060091
or					
2	Indian coal	3300	0.38016	334.08	0.110246
or					
3	Pet Coke	7955	0.38016	138.5876	0.045734
or					
4	Washery Coal	2150	0.38016	521.6149	0.172133

The operation fuel will be based on the economic & reliable operation of the Power Plant.

Presently for cement plant coal is being transported to the site by means of rail. Wagon tippler system is available at site for unloading. Apron conveyor and primary crusher is available below the wagon tippler. Unloaded coal transported to the covered coal shed with the help of belt conveyor and staking is done with the help of boom conveyor.

(VII) RESOURCES OPTIMIZATION/ RECYCLING AND REUSE ENVISAGED IN THE PROJECT, IF ANY, SHOULD BE BRIEF OUTLINED.

The waste water generated from Power plant will be used in cement plant & the raw water requirement thus is reduced to that extent.

(VIII) AVAILABILITY OF WATER ITS SOURCES, ENERGY /POWER REQUIREMENT AND SOURCES SHOULD BE GIVEN,

POWER: The present power requirement of 27 MVA is met from CSEB grid.

Currently the cement plant electrical energy requirement is being met from the Chattisgarh State Power Distribution Company Limited (CSPDCL) .Plant has 132kV/6.6kV receiving substation having three step down transformer of 12 MVA, 132kV/6.6 kV.

Maximum power requirement of the Cement plant is 23 MW whereas average power requirement is 21.5 MW. LIL Arasmeta cement plant also has installed 3x 6MW HFO based DG power plant.

WATER: Water requirement of power plant is 280 m³/day and is sourced from Lilagar River. Raw water will be tapped from the existing raw water storage tank. Dedicated pumping system and will be installed at existing raw water tank to feed the raw water for CPP.

(IX) QUANTITY OF WASTES TO GENERATED (LIQUID AND SOLID) AND SCHEME FOR THEIR MANAGEMENT/DISPOSAL.)

Ash generated (0.105 MTPA) from the power plant will be consumed in cement plant.

Waste water generated in power plant is reused in cement plant

(X) SCHEMATIC REPRESENTATIONS OF THE FEASIBILITY WHICH GIVE INFORMATION OF EIA PURPOSE.

Not applicable.

4 SITE ANALYSIS

(I) CONNECTIVITY

Nearest railway line connecting Bilaspur – Janjir of South Eastern Railway line is located at a distance of 5.6 km in Northern direction from the site. The nearest railway station is located at Kotmi – sunar passanger Hlt which is 6.0 km in NNE from the site. The major Railway Station is Bilaspur which is at a distance of 22.8 km in WNW with respect to the Plant site.

The National Highway (NH-200) connecting Bilaspur – Janjir is located at a distance of about 4.0 km in Southern direction to the Plant site.

(II) LAND FORM, LAND USE AND LAND OWNERSHIP.

The proposed new unit will be located within the existing cement plant complex of 82.00 Ha. No additional land or site is required. Keeping in view of utilizing some of the common existing infrastructure, LIL proposes to locate the new units within the existing cement plant complex

(III) TOPOGRAPHY (ALONG WITH MAP)

It is a flat land and the average elevation is 260 m above MSL. **Fig – 3** shows the 10 km radius around the plant site.

(IV) EXISTING LAND USE PATTERN (AGRICULTURE, NON-AGRICULTURE, FOREST, WATER BODIES (INCLUDING AREA UNDER CRZ)), SHORTEST DISTANCES FROM THE PERIPHERY OF THE PROJECT TO PERIPHERY OF THE FORESTS, NATIONAL PARK, WILD LIFE SANCTUARY, ECO SENSITIVE AREAS, WATER BODIES (DISTANCE FORM THE HFL OF THE RIVER), CRZ. IN CASE OF NOTIFIED INDUSTRIAL AREA, A COPY OF THE GAZETTE NOTIFICATION SHOULD BE GIVEN)

The proposed new unit will be located within the existing cement plant complex. The land breakup of the plant is given below

LAND BREAKUP

	Area (ha)
Rooftop area of buildings/sheds	8.0
Road/paved area	7.68
Green belt area	31.9
Open land	31.92
Proposed new unit	2.50
Total area of land	82.00

There is no wild life sanctuary, national park, eco-sensitive area within the 10 km radius of the project site.

Kotmi-sunar Crocodile Park is at a distance of 6.4 km in NNE with respect to the site.

(V) EXISTING INFRASTRUCTURE.

Existing infrastructure include railway siding and well developed roads, storm water drains with adequate storage space for flyash and parking area

(VI) SOIL CLASSIFICATION

Predominantly clayey soil

(VII) CLIMATIC DATA FROM THE SECONDARY SOURCES.

In general the climate of this area is dry. Summer starts from mid of February and continues up to first week of June, when the monsoon breaks. The monsoon continues till the end of October. Winter is between November and middle of February. The peak of summer is in May. The maximum temperature is about 48°C. During the cold months of December the temperature falls to 6.2°C.

The average annual rainfall observed based on the 10 years IMD data is 1354.1 mm. More than 85% of the rainfall is received during the monsoon season. On an average there are about 65 rainy days in a year. The maximum numbers of rainy days occur in the months of July-August.

(VIII) SOCIAL INFRASTRUCTURE AVAILABLE.

All infrastructure facilities such as education, health facilities and other social facilities are adequate.

5. PLANNING BRIEF.

(I) PLANNING CONCEPT (TYPES OF INDUSTRIES, FACILITIES, TRANSPORTATION ETC) TOWN AND COUNTRY PLANNING/DEVELOPMENT AUTHORITY CLASSIFICATION

The proposed 18MW Coal based power plant will be located within the existing cement plant complex No additional land or site is required. Keeping in view of utilizing some of the common existing infrastructure, LIL proposes to locate the new unit within the existing cement plant complex. The site is well connected by Rail, road and air network.

(II) POPULATION PROJECTION.

No increase in population is anticipated due to increase of production

(III) LAND USE PLANNING (BREAKUP ALONG WITH GREEN BELT ETC)

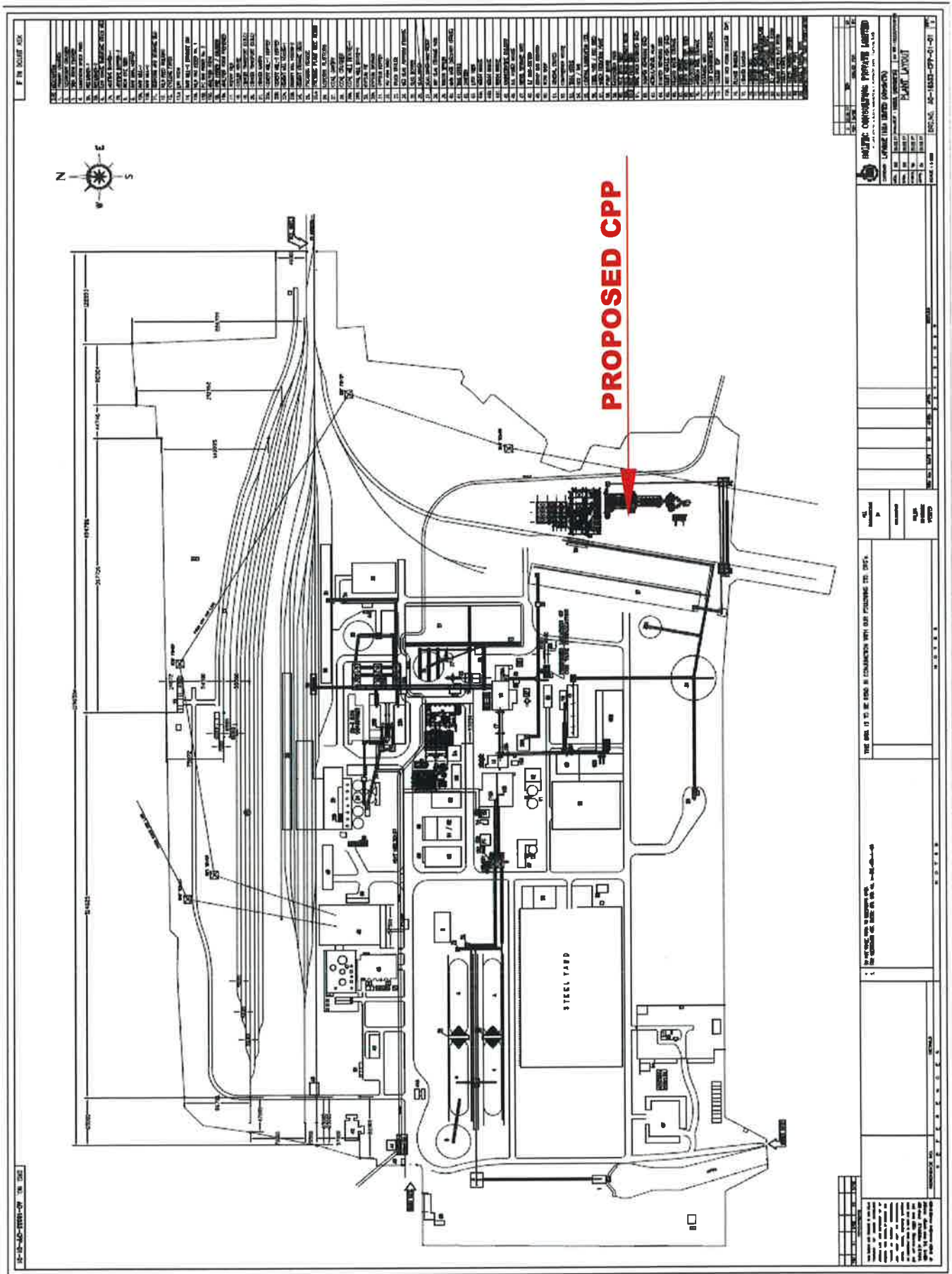
Land use breakup is given in following table:

LAND BREAKUP

	Area (ha)
Rooftop area of buildings/sheds	8.0
Road/paved area	7.68
Green belt area	31.9
Open land	31.92
Proposed new unit	2.50
Total area of land	82.00

Fig - 5 shows the location of new unit i.e., 18 MW Coal based Power plant within the existing cement plant complex.

FIG - 5



(IV) ASSESSMENT OF INFRASTRUCTURE DEMAND (PHYSICAL & SOCIAL)

The project will have the following:-

- Power house building
- Boilers and Auxiliaries
- Air Cooled Condenser
- Coal Handling system.
- Coal storage System after unloading coal from the Wagon
- Pump house / Aux Cooling Tower
- DM plant
- Ash handling system
- Water storage system

Following configurations have been proposed for Power Plant

Captive Power Plant	a.	No. and ratings	1 no. each of MCR 85 TPH & 540°C
	b.	Type of Boiler	Circulating Fluidised Bed Combustion (CFBC)
	c.	No, of boiler fans	2 x 60% duty ID & SA and PA-fan for boiler
	d.	Type of APCS	Electro static precipitators
Steam Turbine Generator	a.	No. and ratings of turbine	1 no. Turbine with inlet parameters, 105 kg/cm ² & 535°C
	b.	Capacity	1x 18 MW MCR
	c.	No. of controlled extractions	2 nos HP, 1no MP and 1no LP
	d.	Type of exhaust Condensate Cooling	Air cooled condenser

(V) AMENITIES/ FACILITIES.

All infrastructure facilities such as education, health facilities and other social facilities are adequate at nearest populated area

6 PROPOSED INFRASTRUCTURE

(I) INDUSTRIAL AREA (PROCESSING AREA)

The proposed infrastructure of the power plant is detailed below:

STEAM GENERATOR

The steam generating system for each unit of 18 MW power plant will consist of one no. 85 TPH capacity boiler with all the auxiliaries.

The boilers will be of circulating fluidized bed type, natural circulation, balanced draft, and membrane wall radiant furnace design with three (3) stage super-heaters and inter-stage de-super heater.

The steam generator design parameters will be as follows:

Maximum continuous rating (MCR) (T/hr)	85
Super-heater outlet pressure (kg/cm ² (g))	110
Super-heater outlet temperature (°C)	540 ± 5
Feed water inlet temperature (°C) at eco inlet	230
Excess air (%)	Not more than 25
Boiler outlet flue gas temperature (°C)	150 (max.)
Dust concentration at chimney (mg/Nm ³)	30 (max.)

The steam generator will be with following auxiliaries:

The steam generator will be provided with a steam drum and the drum will be of fusion-welded type. The steam drum will be with necessary nozzle connections for the steam outlets, safety valves, feed water inlets, down-comers, continuous blow down, level indicators, chemical dosing, sampling connection, drains and vents to assure the required steam purity.

FURNACE

The furnace envelope will be constructed of fully water-cooled membrane/fin welded walls and the construction will be gas pressure tight.

The furnace bottom will be covered with an air nozzle tube plate, below which the fluidizer air plenum will be located. The coal / pet coke of properly graded size will be brought to the furnace through over bed feeding system.

SUPER HEATER

Super-heater system will be of three (3) stage design with inter-stage de super heating to achieve the rated steam temperature over 60% to 100% MCR load. The super-heater will be combination of convection and radiation type.

The inter-stage attemperator or a de-super-heater of spray type will be located between the two super-heater stages, to control the final steam temperature at $540 \pm 5^{\circ}\text{C}$ between 60% to 100% MCR load

ECONOMISER

The economiser will be located downstream of the super-heaters and evaporator sections. The economiser will be of bare tube construction, inline arrangement, counter flow type and the economiser will be designed for inlet temperature of 230°C .

AIR HEATER

Air heater will be arranged as the last heat recovery section downstream of economiser. Air heater will be recuperative type with flue gas flowing inside the tubes and the combustion air flowing over the tubes. Considering usage of the pet coke the last bank of air heater is corton steel.

DRAFT SYSTEM

The draft system for the steam generator will be suitable of producing a balanced draft with sub-atmospheric pressure condition in the furnace.

The system will comprise of:

- 2 x 60% PA fan
- 2 x 60% ID fan
- 2 x 60% SA fan

AIR POLLUTION CONTROL SYSTEM

Environmental considerations and protection measures assume greater importance for the project. LAFARGE will ensure that the proposed power plant causes no adverse impact on the area.

The proposed project is planned to meet all environmental norms and further improve the environs in the area. LAFARGE propose to use State of Art Technology with computer controls to ensure high efficiency in plant operations. This would result in low per unit energy consumption and low particulate emissions.

Air pollution control system (APCS) comprising of Electro-static Precipitator with all its accessories for the boiler will be provided. The APCS will be designed to provide an outlet dust concentration less than 30 mg/Nm³, with the boiler operating with the range of fuel properties indicated.

The ESP will be designed to provide an outlet dust concentration level of 30 mg/N.Cu.m with all field in service, with the CFBC boiler operating with the design basis as specified for the worst operating condition of the fuel composition mentioned and overall dust collection efficiency 99.93% with all field in service.

The aspect ratio of the ESP (electrode zone) will be optimally selected, so as to minimize re-entrainment and carry over of the collected dust, and for assured ESP performance.

SO₂ emissions will be controlled by dosing lime stone to sulphur capture about 90% of emissions; use of appropriate technologies and emission control technologies such as sorbent injection.

In conclusion RCC Stacks with 90 mtr of height will considered and for further reduction in sulphur dioxide as well as stack height.

In addition to above, for coal handling system dedicated bag filters will be installed to restrict emission less than 30 mg/nm³.

HP & LP DOSING SYSTEM

Steam generator will be with High Pressure (HP) dosing and Low Pressure (LP) dosing system. The HP dosing system will be based on 'tri-sodium phosphate' dosing and this will be dosed in boiler water to take care of the ingress of the hardness salts and to increase the boiler water pH. The LP dosing system will be based on 'hydrazine' dosing and this is dosed in the feed water to scavenge the last traces of oxygen and to increase the feed water pH.

BLOW DOWN TANK

One Continuous Blow Down tank (CBD) and one Intermittent Blow Down tank (IBD) will be provided for boiler. The flash steam from the CBD tank will be piped to the de-aerator and outlet of the IBD tank will be vented to the atmosphere.

DE-AERATOR

One De-aerator of de-aerating capacity equal to twenty percent (20%) higher than the gross MCR steam generation capacity of boiler with a de-aerated water storage tank of minimum 10 minutes operation.

BOILER FEED WATER PUMP

One working and one standby boiler feed water pumps have been envisaged.

STEAM TURBINE AND AUXILIARIES

STEAM TURBINE

This project envisages 18 MW multi extraction-cum-condensing turbo-generators.

- The turbine will be designed for the operation with the inlet steam parameters at 110 ata and 535 deg C and will be with automatic controlled extraction steam.

- The turbine will be horizontal, single cylinder, triple extraction-cum-condensing type. All casings and stator blade carriers will be horizontally split.
- The controlled extraction steam from the turbine will be delivered to the heaters/de-aerators in saturated condition.
- A de-super heater to bring the steam temperature from the extraction steam temperature down to the required level is envisaged.

LUBRICATION SYSTEM

A pressure lubrication and control oil system will be provided for the turbo-generator unit to supply oil at the required pressure to the steam turbine, gearbox, generator and governing system. The lubrication oil system will supply oil to the turbine generator under all the load conditions, including the turning gear operation.

The oil system will be with the following:

One hundred percent (100%) capacity centrifugal/gear type, main oil pump.

- One (1) no. of one hundred percent (100%) capacity auxiliary oil pump of centrifugal type, arranged to cut in automatically if the oil pressure falls to a preset value. This pump will also meet the requirements during the start up and shut down.
- One (1) no., centrifugal type, DC emergency oil pump to provide adequate lubrication in the event of a failure of the main driven pump. This pump also will cut in automatically at a preset value of the oil pressure.
- Emergency gravity lube oil system comprising of overhead tank with SS lining and complete interconnecting SS oil piping.
- 2x100% capacity (one working and one standby) water-cooled air coolers.
- 2x100% duty oil filters

TURBINE GOVERNOR

The turbine governing system will be electro-hydraulic type, designed for high accuracy, speed and sensitivity of response. The governor will ensure controlled acceleration of the turbo generator and will prevent over-speed without tripping the unit under any operating condition or in the even of maximum load rejection. The governor will be configurable in the field.

The governing system will have the following important functions:

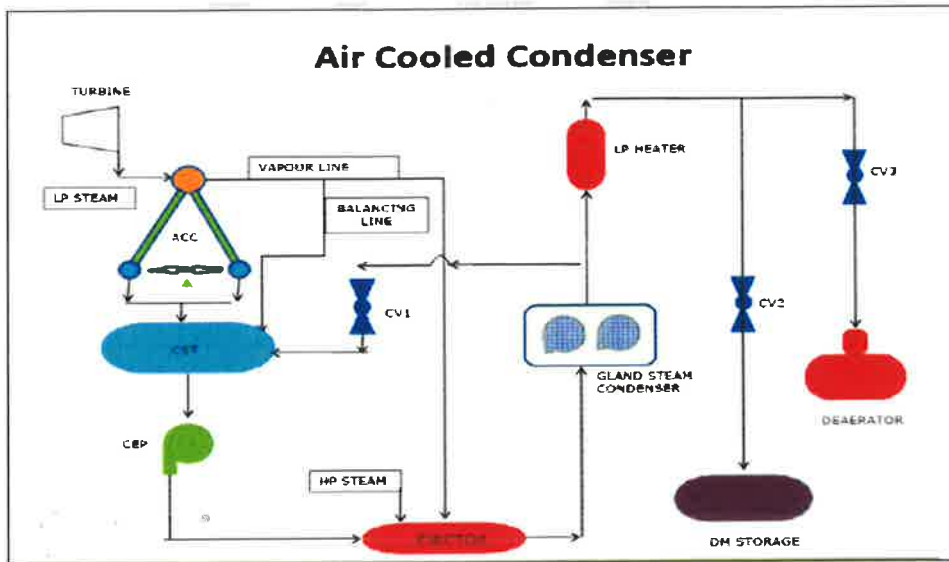
- Speed control
- Over speed control
- Load control
- Steam pressure control

The governing system will be digital governor with all parameter control from plant DCS system.

AIR COOLED CONDENSER

The waste heat produced in the thermal process of the plant has to be transferred to the atmosphere by using adequate cooling system. Environmental concern and climatic conditions are the main factors in the selection of the most suitable power station process.

Since water availability is concern as such to save natural resources & to have sustained generation Air cooled Condenser is considered with Air Cooled Condenser approx. 90% of the water is saved. The basic Configuration of Air cooled condenser is as follows



TURBINE CONTROL

The turbine control will be through the centrally located Distributed Control System. The control system will provide redundancy for key functions by use of separate sensors and monitors. The control system will include all the standard control monitoring and alarming.

In addition to centralised monitoring, some of the essential parameters mounted in local will be:

- Inlet steam pressure temperature and flow
- Controlled extraction steam pressure and temperature
- Exhaust steam pressure, temperature and flow
- Lube oil header pressure
- Control oil header pressure
- Steam turbine/generator speed indicator
- Steam turbine/generator stop push button
- Turbine back propose control
- Emergency shutdown push button

FUEL HANDLING AND PREPARATION

- Presently for cement plant coal is being transported to the site by means of rail. Wagon tippler system is available at site for unloading. Apron conveyor and primary crusher is available below the wagon tippler. Unloaded coal transported to the covered coal shed with the help of belt conveyor and staking is done with the help of boom conveyor.

- Designed capacities of the various components of the existing coal handling system is as under-

Sr.No.	Parameters	Unit	Value
1	Wagon tippler	TPH	600
2	Apron conveyor	TPH	750
3	Primary crusher	TPH	600
4	Boom conveyor	TPH	750
5	Covered storage capacity	TPH	15000
6	Grab crane	TPH	5

- Average coal requirement for the cement plant is around 800 MT per day. Adequate capacity is available in existing coal unloading and storage system and same will be utilised for the up coming power plant.
- Another garb crane will be considered for the feeding of the coal for the coming power plant.
- Dedicated secondary crusher, primary and secondary screening system will be installed for the coal fired power plant. Grab crane will be feeding the coal from the stock pile to the crusher cum screen house by means of belt conveyor and the product from the crusher cum screen house will be fed the power plant bunker by belt conveyor. Reject from the screen will be also re-circulated to system by belt conveyor.

COAL / PET COKE STORAGE & UNLOADING SYSTEM

Adequate capacity is available in existing coal unloading and storage system and same will be utilised for the up coming power plant.



Covered Coal Storage Yard & Stacker



Wagon Tippler

COAL STORAGE & RECLAIM AT POWER PLANT

Adequate capacity is available in existing coal unloading and storage system and same will be utilised for the up coming power plant.

COAL SECONDARY CRUSHING AND STORAGE IN BUNKER

For boiler application coal has to be reduced to average 6 to 8 mm size which necessitates crushing of the coal.

The vibrating flip flop primary screen will be provided up stream of crusher to screen out coal / Pet Coke size below 6 mm and course

particle will be fed to the impact crusher. The output from Crusher will be fed to the secondary Flip Flop vibrating screen. The oversize particle above 6mm from Screen will be re-circulated to the Crusher. The 6 to 8 mm Coal/ Pet Coke will be conveyed to the coal bunker near the boiler.

SIZING OF THE CONVEYOR, CRUSHER AND SCREEN

The Sizing of the Coal Handling system will be taking into consideration one shift working with worst fuel viz. Washery rejects.

Based on above, the sizing of the screen and crusher will be finalized as follows :-

- Screen : 75 TPH (Primary & Secondary)
- Crusher : 75 TPH

PET COKE FIRING SYSTEM / LIMESTONE DOSING

The boiler is designed for various types of the fuels as available covering petcoke, coal (imported / indigenous) and Washery rejects.

The fuel to be used for the power plant will be based upon the availability and economics.

In case, Petcoke is partly used along with the coal as the fuel for captive power plant, in view of high sulphur in the Petcoke as specified in above and meeting the environmental norms of SO_x, it is necessary to use limestone dosing for sulphur capture. The limestone will be dosed along with Petcoke in the boiler and size of the limestone will be approximately 1mm to 500 microns.

The dosing will be planned, so that the emission level of SO_x is restricted to 100 ppm.

It is estimated that sulphur capture will be 90%. The dosing of limestone will work in close loop with SO_x analyser installed on the stack.

Since, at ARASMETA limestone will be available from cement plant, limestone before feeding to boiler, 2 stage crushing is anticipated to bring the size within 1mm to 500 microns.

The estimated quantity of the limestone is approximately 70 tpd. Suitable crushing, screening and bunker feeding system will be considered for the power plant.

ASH HANDLING

The fuels proposed to be used in this project will have a gross calorific value elaborated in chapter 4 viz.

The ash generated from the above will be about 18 T / hr. maximum while using Washery rejects.

Out of this 30% is expected to be Bed Ash and rest 70% will be Fly ash to be collected from Boiler EP/ Economizer/ Cyclone. The details of quantity are as furnished below:-

- Fly ash will be transported pneumatically with the help of dense phase pneumatic to the fly ash silo from Economizer, Cyclone and EP. The fly ash from the silo will be transported to group cement plant by tanker.
- Bed Ash will be collected from overflow spouts into ash cooler hoppers. Ash from the hoppers, after sufficient cooling will be discharged through ash vessel of pneumatic conveying system to bed ash silo. bed ash will be disposed through trucks.
- Fly ash silo has been considered of capacity of 200m³.
- Bed ash silo has been considered of capacity 75 m³.

(II) RESIDENTIAL AREA (NON PROCESSING AREA)

Additional quarters to accommodate captive power plant employees will be provided within existing colony premises

(III) GREEN BELT.

Green belt in an area of 33% has been developed inside the plant boundary

(IV) SOCIAL INFRASTRUCTURE.

LIL has well-defined CSR policy to Carryout social development and welfare measures in the surrounding villages. Under CSR activity LIL has initiated community development projects, in the fields of health, education and environmental preservation, in and around the plant.

(V) CONNECTIVITY (TRAFFIC AND TRANSPORTATION ROAD/ RAIL/METRO/ WATER WAYS ETC)

Adequate facilities with railway siding and roads are existing. No additional connectivity is required

(VI) DRINKING WATER MANAGEMENT (SOURCE AND SUPPLY OF WATER)

Additional water of 280 m³/day will be required and the same will be met from River Lilagarh

(VII) SEWERAGE SYSTEM.

Plant waste water dispose in soak Pit via septic tank .

LIPL is operating a full-fledged sewage treatment plant (STP) designed for a maximum load of 400 m³/day to treat wastewater generated from Colony. STP capacity is adequate for taking additional wastewater.

(VIII) INDUSTRIAL WASTE MANAGEMENT.

Wastewater generated from the power plant will be treated and used in the cement plant

(IX) SOLID WASTE MANAGEMENT

Dust collected from air pollution control equipment is 100% recycled in process, Ash generated in the proposed power plant will be consumed in existing cement plant.

(X) POWER REQUIREMENT & SUPPLY / SOURCE.

SOURCES OF POWER ENERGY

Lafarge is contemplating to have an sustainable, reliable and economic power source to the operation of cement plant.

Based on the section 5.3 above the most optimum size of the power plant proposed is 18 MW gross with net power available as 16 MW, the power plant will meet 63% of the energy requirement of the cement plant. 27% of the Energy requirement will be met from WHR PP thereby in-house generation to operate cement plant will be 90%.

In addition to above the average loading of the power plant under present operating condition will be 85 % thereby operating efficiency will be optimum

The power generation will be at 6.6kV and it will be evacuated at 6.6kV only through power cables. Power cables from the outgoing feeder (HV switch board at CPP) of the CPP will be hooked up with the spare DG incomer feeder of 2500 A available at the bus section 2 of the HV switch board at existing MRSS.

The sources of power/energy with gross & net output and consumption are detailed below:

Proposed CPP	Gross generation (mio kwh)	Auxiliary power Consumption per annum (mio kwh)	Net generation (mio kwh)
1X18MW	123.70	12.30	110.7

7. REHABILITATION AND RESETTLEMENT (R & R) PLAN.

- (I) POLICY TO BE ADOPTED (CENTRAL/ STATE) IN RESPECT OF THE PROJECT AFFECTED PERSONS INCLUDING HOME OUSTEES, LAND OUSTEES AND LANDLESS LABORERS (A BRIEF OUTLINE TO BE GIVEN).**

Not applicable, since the plant is already existing and new unit will be located within the existing cement plant complex.

8. PROJECT SCHEDULE & COST ESTIMATES

(I) LIKELY DATE OF START OF CONSTRUCTION AND LIKELY DATE OF COMPLETION (TIME SCHEDULE FOR THE PROJECT TO BE GIVEN)

IMPLEMENTATION PLANNING

3 months' time would be required for pre-project activities from submission of Techno-Economic Feasibility Report till main machinery order placement

22 months' time would be required for project activities from main machinery order placement till commissioning in each phase

(II) ESTIMATED PROJECT COST ALONG WITH ANALYSIS IN TERMS OF ECONOMIC VIABILITY OF THE PROJECT

Total capital Investment Cost is Rs. 119.57 Crores and Rs. 20 crores will be spent for Environmental Management Plan.

Based on the infrastructure aspects Basic requirement, Concept and the Implementation Schedule described in Chapter 3, 4, 5 & 7 the project investment works out to be Rupees 119.57 Crores as summarised below:

The investment cost & Cost of Generation has been worked out and detailed in Tables below:

Estimates of Investment		
Sr.No.	Description	Power Plant cost in Rs Lakhs
1	Land and Site Development	166
2	Buildings and other Civil Structures	1161
3	Plant and Machinery	8909
4	Technical Know-how Fees	200
5	Expenses on training	25
6	Miscellaneous Fixed Assets	249
7	Pre-operative Expenses	877
8	Provision for Contingency	329
9	Working Capital	41
Total Rs in Lakhs		11957
Total in crores		(Say 119.57 Crores)

Mode of Financing	The financing of the project has been considered on the basis of Equity: Debt ratio of 30:70 to be met as under Rs in lakhs		
	Equity	Equity	3586
		Total	3586
	Debt	Term Loan from Financial Institutions	7694
		Interest & Up-front charges	674
		Total	8368
	Grand Total		11954
Estimated Cost of Generation 2nd year	Cost Head	Rs / KWH	
	Variable Cost	3.16	
	Cost of Coal , Water, Consumables and stores		
	Semi-Variable/Fixed Cost	1.34	
	Wages and Salaries, overheads, Depreciation, Interest Charges		
Total Cost of Generation		4.50	

9. ANALYSIS OF PROPOSAL (FINAL RECOMMENDATIONS)

(I) FINANCIAL AND SOCIAL BENEFITS WITH SPECIAL EMPHASIS ON THE BENEFIT TO THE LOCAL PEOPLE INCLUDING TRIBAL POPULATION, IF ANY IN THE AREA

The capital cost, for the proposed production enhancement project, works out to Rs. 119.57 Crores.

LIPL has implemented the following CSR measures which has benefited total of 5 villages around plant and 2 villages in Kirari Mines. All 7 villages fall under Akaltara block in radius of 24 kms from plant.

CSR Focussed on Health, Livelihood and Infrastructure. Details of the same are given below

CSR: Health Activity

- ❖ **Health Clinic** continuing in all 6 core villages i.e. Arasmeta, Sonsari, Parsada, Amora & Kirari & Chorbhatti. In During this period total approx 9400 patients were treated.
- ❖ Under the Swasth Bharat initiative, a **New Health centre** was started at the mining **village - Chorebhatti** by ACP.
- ❖ 10 Awareness Camp on Health and Sanitation, Adolescents camp, women's health awareness camp.
- ❖ Organized 7 awareness camp in ICDS centre for women and children and engaged professional to facilitate the community.

CSR: Livelihood Activity

Paddy Cultivation- 50 Beneficiaries

Nutrition Garden- 31 Beneficiaries

Mushroom Cultivation- 10 Women's

Vegetable Cultivation- 31 Farmers

Sewing Center- 20 Students

Four Animal Health Camp- Deforming 727 no. of Livestock & Removal of Parasites 473 no. of livestock.

CSR: Infrastructure

- ❖ Constructed **Approx 1300 meters of Cement concrete road** Job completed in village Arasmeta, Amora, Parsada, Sonsari, Murlidih, Chorbhatti.
- ❖ Construction of **Four Nirmala ghat** at the village ponds for the community at Amora, Sonsari, Arasmeta village.
- ❖ Construction of **Health center building** at Kirari village is under progress.
- ❖ Three solar lights installed at Amora village completed on 24-December-16 as per Panchyat proposal FY 2016-17.