PRE-FEASIBILITY REPORT

On

Proposed 1320 MW (2 X 660 MW) Coal Based Supercritical Thermal Power Plant At – Dimirimunda,Samasingha & Mahula-munda Villages, Tehsl – Rairakhol, Dist – Sambalpur, Odisha

OF

M/s. VISAKA THERMAL POWER LTD.

Prepared by:-

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CHAPTER – 01

EXECUTIVE SUMMARY

1	Name of the project	2 X 660 MW Coal Based Super Critical Thermal Power Plant at- Dimirimunda, Samasingha, Mahulamunda Villages, Tehsil- Rairakhol, District- Sambalpur, Odisha.
2	S.No in the schedule	Activity 1(d)
3	Registered Office	"Visaka Tower" 1-8-303/69/3, S.P Road, Secunderabad – 500003.
4	Name of the promoters	Er. U.S. Rath, Director M/s Visaka Thermal Power Limited
5	Area of plant	821 Acre
6	Topo Sheet No	73 D/5
7	Latitude Longitude	Latitude: 20°57'53.85"N Longitude: 84°19'39.89"E
8	Proposed capacity	1320 MW(2 X 660 MW)
9	Cost of Project	7616.24 Cr.
10	Man power Requirement	2100-4100 (During Construction) 450 (During Operation)
11	Water Requirement	4180 m^3/hr
12	Power Requirement	120MW
13	Nearest railway station/airport along with distance in kms	Nearest Railway station: Rairakhol -8 Km Nearest Airport: Bhubaneswar - 159km.
14	Nearest Town, City, District Head quarters along with distance in kms.	Nearest Town: Rairakhol Nearest district Head Quarters: Sambalpur
15	Village penchants, Parishad, Municipal corporation, local telephone nos to be given) body (complete postal addresses with telephone no.s to be given)	Village Panchayat: Kadaligarh, Tahasil:Rairakhol Dist: Sambalpur

1.0 INTRODUCTION

Visaka Thermal Power Ltd. has proposed to setup a 1320 MW (2X660 MW) Coal based Supercritical Thermal Power Plant at: Dimirimunda, Samasingha and Dimirimunda village, Rairakhol Tahasil, Sambalpur district of State Odisha.

2.0 IDENTIFICATION OF PROJECT AND PROJECT PROPONENT

The Visaka Industries Limited was incorporated under the Indian Companies Act, 1956 on 18th June 1981 as Visaka Asbestos Cement Products Limited. With effect from 9th August 1990, the name of the Company was changed to Visaka Industries Limited. The Company is an Rs.606 crores turnover, consistent dividend paying Company, engaged in the business of manufacturing and marketing of Building Products, Reinforced Building Boards and Synthetic Blended Yarn.

The Company's Building Product Plants are located at (i)Yelumala Village, R.C.Puram Mandal, Medak District, near Hyderabad (Andhra Pradesh), at (ii)Manickanatham Village, Paramati, Velur Taluk, Namakkal District, in the State of Tamilnadu, at (iii)Changsol/Krishnapur Village, Midnapore in the State of West Bengal, at (iv)Naganahalli Village,.Kora Hobli,Tumkur Taluq & District in the State of Karnataka, at (v)Kannava Village, Rae Bareily District in the State of Uttar Pradesh, at (vi)Jujjur Village, Veerullapadu Mandal, Kanchikacherla Sub-Registration, Krishna District in the State of Andhra Pradesh and at (vii)Village – Nandur, Taluk – Daund, Pune, Maharashtra acquired by way of merger of M/s. Shakti Roofings (Pvt) Ltd with the Company. The Synthetic Blended Yarn factory is located at Chiruva Village, Moudha Taluk, Nagpur District, of Maharashtra. The Reinforced Building Board Division of the Company is located at Gajalapuram Village, Near Miryalguda, Pedadevullapally Mandal, Tripuraram, Nalgonda District, Andhra Pradesh. As a part of corporate social responsibility, Company established a Charitable Trust to support initiatives that benefit the society at large. Visaka now is the second largest player in the Asbestos Cement Industry.

2.1 Need for the project & its importance to the country or Region

This Project is planned to supplement availability of power in Odisha grid. The total present installed capacity in the state is 4132.075 MW. In the 18th Electric Power Survey (EPS), the power requirements of the state would be 5,672 MW at Plant Busbars in the year 2016-17 and growing to 6,749 MW by the year 2021-2022. On All India basis, 88,000 MW are planned to be added in the current five year plan (2012-2017).

Considerable number of old coal fired power plants in Odisha state have completed their useful/economic life and are not able to meet their rated output/efficiency due to various reasons. A part of such capacity loss shall be compensated with this project. There is also shortage of gas resulting in lower utilization than installed capacity generation from the gas fired power stations in

the region. Any surplus power may be diverted to nearby power deficit states as Power grid has already established grid connectivity. Hence the marketability of the surplus power (if any) generated from the proposed power plant is ensured and the plant is expected to run as a base load plant.

2.2 Employment Generation

Direct and indirect employment will be generated to the local population, the total man power requirement during construction phase for the project will be 2100-4100, out of which 100 are the permanent workers and 2000-4000 will be the casual workers for gardening, packing, cleaning etc.

3.0 PROJCET DESCRIPTION

The proposed project is 1320(2 X 660 MW) coal based supercritical thermal power plant to generate 1320 MW electric power.

3.1 Location

Proposed site is located at Dimirimunda, Samasingha and Mahulamunda village, Rairakhol Tahasil, Sambalpur district of State Odisha. The proposed site falls under the Survey of India Toposheet No. 73 D/5 and the buffer zone falls under the Survey of India Toposheet 73 C/4, 73 C/8, 73 D/1 and 73 D/5. The Latitude and Longitude of the proposed site is 20°57'53.85"N and 84°19'39.89"E respectively.

3.2 Site Selection

The total project land area required is 821 Acre. The site selection of Power Plant has been based on the following considerations.

- Plant availability.
- Cooling Water availability.
- Compatibility of grid to withstand sudden outage of unit.
- Operating experience of the set size.
- Thermodynamic cycle efficiency and specific input consumption viz. fuel, water etc..
- Specific investment requirement & cost of generation.

3.3 Technology Selection

The proposed station is planned for total capacity of 1320 MW by installing two coal based Supercritical boiler of 660 MW electricity generation capacity each.

A supercritical steam generator is a type of boiler that operates at supercritical pressure.

3.4 Raw Material Requirement

The annual coal requirement considering E/F grade Indian coal for 2 x 660 MW units is estimated to be about 6.8 million tonnes (MTPA) as the proposed coal for the plant would be having an average calorific value of 3522 kCal/kg and plant would operate at annual Plant load factor (PLF) of 85 %. The coal requirement for 85% PLF would be 6.8 MTPA. Coal would be made available from the Talcher Coal fields of Mahanadi Coal Fields (MCL).

Table.1.1 Raw Material Requirement & Source

S. No.	Raw Materials	Source	Transportation Mode	Requirement MTPA
Coal Based Supercritical Thermal Power Plant				
1	Coal	MCL	Rail / Road	6.8 MTPA
2	LDO/HFO	IOCL/HPCL/BPCL Local depots	Rail/Road	11564 KLPY

3.5 Water and Power Requirement

The total water requirement is 4180 m^3/hr. Water requirement for the project is as follows:

Table 1.2 Water Requirement

Sl. No.	System Description	Water Requirement in m^3/hr
A	Water Consumption (1.1+1.2+1.3+1.4+1.5+1.6)	3677
1.1	Condenser Cooling system make-up	3302
1.2	DM Plant make-up	70
1.3	Drinking & Sanitation water for plant & colony	19
1.4	Plant Service water	164
1.5	Clarifier Sludge	120
1.6	Filter Backwash waste	2
2	Recovery from clarifier sludge	100
3	Make up to ash water(Non recovery stage of ash water) CHP emergency, cooling & Quenching etc	164
B	Net water requirement in the system (Item A- Item 2+ Item 3)	3791
C	Loss in resevoir	70
D	Total water requirement(Optimal)	3791
E	Considering exigency and margin over the net water	389

	requirement	
Total water allocation		**4180 m^3/hr**

Source of Water

The water requirement will be met through **Mahanadi river** which is about 11 Km from proposed plant site. VTPL got approval from Water Resources Department of Government of Odisha of 41 cusecs.

Power Requirement

The requirement of construction power supply would be met from existing nearby (within 5 km) Rairakhol 33/11 KV S/S.

3.6 Waste Generation and Management

The principal solid wastes would be fly-ash and bottom ash apart from neutralization tank sludge, which would be dried and stored within the Plant. The fly ash and bottom ash generation would be in the range of 8000-8500 tons/day. The system to be adopted for bottom ash removal would be an intermittent jet pump system and for fly ash removal, pressure-pressure type or vacuum pressure type pneumatic system. The flyash would be stored in dry for min ash silos for direct evacuation of ash in trucks to prospective agencies operating in the region. However, for the fly-ash which could not be timely evacuated, provision would be kept for pumping surplus ash in high density slurry form similar to the bottom ash and stored in a dyked ash pond in a total earmarked area of 200 acres as shown in the layout. 100% ash utilization is planned to be achieved within four years of commissioning of the Plant as per the MoEF guideline. Options for ash utilization would be explored in cement making, wasteland reclamation, making embankments, roads, building materials, etc. in the region. M/s Visaka Industries Ltd would be entering into MOU with prospective cement plants and brick manufacturers and other construction agencies within 100 km distance of the proposed project for utilization of the fly ash and accordingly an action plan would be prepared for ash evacuation. Apart from this, option of filling up of abandoned mine pits would also be explored at a later stage of the Project operation.

4.0 SITE ANALYSIS

4.1 Connectivity

The site is at 12km east away from nearest city Rairakhol. The national highway NH 42 runs at 8 km adjacent to the site. Rairakhol railway station is at about 8 km north from the site. Nearest airport is at Bhubaneswar 159 km from the proposed project and sea port 300km from the project site by road.

Selection of the site for any project is the most important aspect for its successful operation & better economic viability. Proximity to raw material source, assured supply of fuel and other infrastructural support are required to be essentially examined while selecting the site of the plant. The following basic requirements are necessarily required to be fulfilled.

1. Easy & nearer assess to raw material such as Coal etc.
2. Availability of water from continuous source.
3. Power supply/evacuation arrangement
4. Nearer access through road.

The proposed site has the following preliminary advantages.

1. Water is available nearer to the site throughout the year.
2. The site is already well connected with Road as well as Rail. Thus the approach is excellent
3. Power is available nearer to the site throughout the year.
4. Soil condition of the site is also favorable

4.2 Present land use

The present land use is over 85% non-agriculture land remaining single crop land.

Topography and Existing Land use Pattern

The topography of the land is generally flat and well suited for development of industrial projects. Land for the proposed project is industrial land & Plant is not coming under the dense forest category land. This area also does not form part of any National Park, Wild Life Sanctuary and Natural/Biosphere reserve.

4.3 Existing Infrastructure

There is no infrastructure prevailing in the existing project site.

4.4 Climate Data from secondary sources

May month is usually the hottest with daily maximum of 46º C and December is the coldest month with mean daily minimum of 11 ºC. The average annual rainfall of the area is 1451.2 mm with 4 months of total rainy days.

5.0 PLANNING BRIEF

5.1 Planning Concept

Technical Concept

This technical concept indicates the plant capacity, size and type of main machinery, storages, design of systems, plant layout, flow sheets etc. It covers process, mechanical, electrical, instrumentation and civil engineering aspects. The concept has considered quality, pollution control, operation, maintenance and utility services.

Process Control, Instrumentation and Automation

Integrated & Distributed Microprocessor based, Control & Instrumentation system has been considered for effective control of various process variables.

Human Resources

Human Resource is the most valuable asset in any industry. The accelerating pace of technology advancement and fierce competition in the market has led to the increasing importance of human resources. Continuous skill updating of the existing human resources and generating new talents in consonance with the needs of the industry are vital for the progress of the industry.

5.2 Land Use Planning

Total land acquired for the proposed project is 821 Acre. The unit has already acquired 47 acres of private land in Dimirimunda/Samasinga village. Rest land is under process through IDCO i.e Nodal Agency for land acquisition in Odisha.

6.0 PROPOSED INFRASTRUCTURE

6.1 Industrial and Residential Area

The setting up of the thermal power plant, their auxiliary equipments, coal storage areas, electrical power receiving and evacuation substation, administrative buildings is envisaged.

Green Belt

A greenbelt development plan will be prepared and implemented along with the project. Total green belt area shall be of 271 Acre (33% of total area) of green belt will be developed in the plant.

Green belt Development plan

1. Green belt of 271 Acre will be developed in the plant premises as per CPCB guidelines.
2. 10m wide greenbelt will be developed all around the plant.

The tree species to be selected for the plantation are pollutant tolerant, fast growing, and wind firm, deep rooted. A three tire plantation is proposed comprising of an outer most belt of taller trees which will act as barrier, middle core acting as air cleaner and the innermost core which will act as barrier, middle core acting as air cleaner and the innermost core which may be termed as absorptive layer consisting of trees which are known to be particularly tolerant to pollutants.

6.2 Others

1. A garland drain around the plant is envisaged to collect surface run-off during rainy season.
2. Drinking water facilities will be provided for employees as well as nearby villagers.
3. Existing road and rail network will be utilized for raw material and final products transportation. However existing road network will be strengthened.

7.0 REHABILITATION AND RESSETTLEMENT (R & R) PLAN

M/s Visaka Thermal Power Pvt. Ltd. will adopt the R & R policy of the Govt. of Odisha, 2006. Three villages are coming under the project site. There are about 101 families who will be displaced from the 3 villages (Dimirimunda, Samasingha & Mahulamunda) and Visaka Thermal Power Ltd. will resettle them in the adjacent areas nearer to the project site. Basic amenities will be made available to them in the new places like drinking water facility, proper sanitation, roads, medical facilities, school & college, parks etc. will also be provided.

8.0 PROJECT SCHEDULE AND COST ESTIMATES

8.1 Project Schedule

The unit -I will be completed in 44 months & Unit-2 will be completed in 50 months.

An effective project team has been formulated with an experienced Project Manager as its leader.

8.2 Project Cost

An indicative estimated capital cost of the proposed power plant is 7616.24 Cr. Including the Pre-operative expanses, contingency and interest during construction.

9.0 ANALYSIS OF PROPOSAL

The benefits of the proposed unit as follows,

1. Improving and building road network in the adjoining villages.
2. Strengthening local school buildings with playgrounds.
3. Social awareness programme will further improve by the local authority such as sanitation and hygiene, HIV Prevention Program.
4. Through this project, adult education and female education will be provided to the illiterate adults and backward females of the villages in the project surrounding area. Sponsor the education to Poor Students of the Proposed Area.
5. Plus additional jobs generated by local business in the supply of raw materials, finished products and services. Development of the local area in terms of an enlarged market will

provide the farmers with a good outlet of their agricultural products to enjoy the price effect, which is likely to be strong enough to offset the impending local inflations through real-balance effect. Thus, the proposed project will be ushered in the social and economic upliftment of the persons living in the vicinity of the Project i.e. of society at large.

CHAPTER – 02

INTRODUCTION

2.1 Identification of Project and Project Proponent

Visaka Industries Ltd. has proposed to setup a 1320MW (2X660 MW) Visaka thermal power project at: Dimirimunda, Samasingha and Dimirimunda village, Rairakhol Tahasil, Sambalpur district of State Odisha. For the purpose of implementation of the 1320 MW Visaka thermal power project in the state of Odisha, Visaka Industries Ltd. has established a Special Purpose Vehicle (SPV) called Visaka Thermal Power Limited (herein after referred to as VTPL). The company has signed MoU with Govt. of Odisha., to establish this power project.

Company Background

The Visaka Industries Limited was incorporated under the Indian Companies Act, 1956 on 18th June 1981 as Visaka Asbestos Cement Products Limited. With effect from 9th August 1990, the name of the Company was changed to Visaka Industries Limited. The Company is an Rs.606 crore turnover, consistent dividend paying Company, engaged in the business of manufacturing and marketing of Building Products, Reinforced Building Boards and Synthetic Blended Yarn.

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2.2 Description of Nature of the project

Visaka Thermal Power Ltd. has proposed to setup a 1320 MW (2X660 MW) Coal based Supercritical Thermal Power Plant at: Dimirimunda, Samsingha and Dimirimunda village, Rairakhol Tahasil, Sambalpur district of State Odisha.

Table.2.1 Project Profile

Sl. No.	Unit	Total Capacity
1	2x 660 MW Coal based Supercritical Thermal Power Plant	1320 MW

Table.2.2 Raw Material Requirement & Source

S. No.	Raw Materials	Source	Transportation Mode	Requirement MTPA
Coal Based Supercritical Thermal Power Plant				
1	Coal	MCL	Rail / Road	6.8 MTPA
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2.3 Need of the Project and its Importance to the Country and/or Region

This Project is planned to supplement availability of power in Odisha grid. The total present installed capacity in the state is 4132.075 MW. In the 18th Electric Power Survey (EPS), the power requirements of the state would be 5,672 MW at Plant Busbars in the year 2016-17 and growing to 6,749 MW by the year 2021-2022. On All India basis, 88,000 MW are planned to be added in the current five year plan (2012-2017).

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Demand – Supply Gap
POWER DEMAND ANALYSIS AND JUSTIFICATION OF PROJECT

India is one of the largest growing economies of the world. It is the fourth largest economy and has shown consistent GDP growth over the past few years. It has been seen from the historical data that the growth in GDP has a direct relation with the sustained growth of all area of electricity– Generation, Transmission and Distribution. Therefore to maintain the projected level of growth in country's economy, it is to be ensured that rapid growth in power sector is maintained. Availability of power is one of the major infrastructure requirements for overall development of a nation. Rapid industrial growth, ever increasing demand in domestic, manufacturing and service sectors coupled with progressive extension of power transmission and distribution system have led to the rapid

growth of electricity demand. Despite appreciable capacity additions in Power Sector, the demand for power has outstripped the availability in many parts of the country. Unlike the ideal conditions where the system should have some spinning reserves to meet unforeseen outages and surges of demand, Power demand in India has always outstripped the availability. The demand analysis and justification for setting up of a power plant at any part of the country needs to be corroborated with the facts and figures of the existing as well as future demand-supply scenario of the area concern in light of India's perspective.

From the below provided monthly report, the deficit and available power details of entire India are provided, in which Gujarat is seen to have 2.1% deficit every month. The demand was 41,184 MW against a supply of 40,331 MW. The demand for power requirement is more and produced power is less. Hence, this project would reduce the deficit to certain extent.

Table 2.3 Peak Demand and Peak Met in India

अधिकतम मांग और अधिकतम उपलब्धि (पूर्वावलोकन) / Peak Demand and Peak Met (Provisional)

आँकड़े मेगा वाट नेट / Figures in MW net

राज्य /State	अक्तूबर, 2013 / October, 2013				अप्रैल,2013 -अक्तूबर,2013/ April,2013 to October, 2013			
	अधिकतम मांग	अधिकतम उपलब्धि	अधिशेष/ कमी (-)		अधिकतम मांग	अधिकतम उपलब्धि	अधिशेष/ कमी (-)	
प्रणाली / System	Peak Demand	Peak Met	Surplus / Deficit (-)		Peak Demand	Peak Met	Surplus / Deficit (-)	
क्षेत्र / Region	(MW)	(MW)	(MW)	(%)	(MW)	(MW)	(MW)	(%)
चंडीगढ / Chandigarh	238	238	0	0.0	345	345	0	0.0
दिल्ली / Delhi	4,495	4,306	-189	-4.2	6,035	5,653	-382	-6.3
हरियाणा / Haryana	6,430	6,243	-187	-2.9	8,114	8,114	0	0.0
हिमाचल प्रदेश / Himachal Pradesh	1,428	1,270	-158	-11.1	1,428	1,270	-158	-11.1
जम्मु कश्मीर / Jammu & Kashmir	2,322	1,852	-470	-20.2	2,450	1,852	-598	-24.4
पंजाब / Punjab	7,386	7,386	0	0.0	10,089	8,632	-1,457	-14.4
राजस्थान / Rajasthan	7,899	7,707	-192	-2.4	7,899	7,753	-146	-1.8
उत्तर प्रदेश / Uttar Pradesh	12,134	10,984	-1,150	-9.5	13,089	12,115	-974	-7.4
उत्तराखंड / Uttarakhand	1,670	1,670	0	0.0	1,760	1,709	-51	-2.9
उत्तरी क्षेत्र / Northern Region	**41,154**	**38,385**	**-2,769**	**-6.7**	**45,752**	**42,523**	**-3,229**	**-7.1**
छत्तीसगढ / Chhattisgarh	2,935	2,911	-24	-0.8	3,365	3,320	-45	-1.3
गुजरात / Gujarat	11,077	11,077	0	0.0	11,814	11,772	-42	-0.4
मध्य प्रदेश / Madhya Pradesh	7,663	7,663	0	0.0	7,663	7,663	0	0.0
महाराष्ट्र / Maharashtra	16,346	15,980	-366	-2.2	17,381	16,670	-711	-4.1
दमन और दिउ / Daman & Diu	316	291	-25	-7.9	316	291	-25	-7.9
दादर व नगर हवेली / Dadra & Nagar Haveli	660	660	0	0.0	661	661	0	0.0
गोवा / Goa	434	432	-2	-0.5	494	490	-4	-0.8
पश्चिमी क्षेत्र / Western Region	**37,411**	**37,371**	**-40**	**-0.1**	**38,054**	**37,371**	**-683**	**-1.8**
आन्ध्र प्रदेश / Andhra Pradesh	11,914	11,914	0	0.0	14,072	11,914	-2,158	-15.3
कर्नाटक/ Karnataka	8,754	7,957	-797	-9.1	9,934	8,256	-1,678	-16.9
केरल / Kerala	3,424	3,233	-191	-5.6	3,538	3,233	-305	-8.6
तमिल नाड / Tamil Nadu	12,419	11,877	-542	-4.4	13,380	11,877	-1,503	-11.2
पुडुचेरी / Puducherry	358	319	-39	-10.9	358	332	-26	-7.3
लक्ष द्वीप / Lakshadweep #	8	8	0	0	9	9	0	0
दक्षिणी क्षेत्र / Southern Region	**33,702**	**32,968**	**-734**	**-2.2**	**39,015**	**34,151**	**-4,864**	**-12.5**
बिहार / Bihar	2,423	2,273	-150	-6.2	2,465	2,273	-192	-7.8
डामोदर घाटी निगम / DVC	2,978	2,963	-15	-0.5	2,978	2,963	-15	-0.5
झारखण्ड / Jharkhand	1,008	998	-10	-1.0	1,111	1,069	-42	-3.8
ओड़िशा / Odisha	3,740	3,730	-10	-0.3	3,740	3,730	-10	-0.3
पश्चिम बंगाल / West Bengal	6,443	6,403	-40	-0.6	7,325	7,290	-35	-0.5
सिक्किम / Sikkim	116	116	0	0.0	116	116	0	0.0
अंडमान- निकोबार / Andaman- Nicobar #	40	32	-8	-20	40	32	-8	-20
पूर्वी क्षेत्र / Eastern Region	**15,615**	**15,405**	**-210**	**-1.3**	**15,885**	**15,528**	**-357**	**-2.2**
अरुणाचल प्रदेश / Arunachal Pradesh	115	113	-2	-1.7	115	113	-2	-1.7
असम / Assam	1,266	1,220	-46	-3.6	1,314	1,220	-94	-7.2
मणीपुर / Manipur	114	111	-3	-2.6	122	118	-4	-3.3
मेघालय / Meghalaya	278	276	-2	-0.7	290	286	-4	-1.4
मिज़ोरम / Mizoram	61	60	-1	-1.6	70	68	-2	-2.9
नागालैण्ड / Nagaland	99	99	0	0.0	109	103	-6	-5.5
त्रिपुरा / Tripura	254	250	-4	-1.6	254	250	-4	-1.6
उत्तर -पूर्वी क्षेत्र / North-Eastern Region	**2,140**	**2,048**	**-92**	**-4.3**	**2,158**	**2,048**	**-110**	**-5.1**
सम्पूर्ण भारत / All India	**130,022**	**126,177**	**-3,845**	**-3.0**	**135,561**	**126,964**	**-8,597**	**-6.3**

Lakshadweep and Andaman & Nicobar Islands are stand- alone systems, power supply position of these,does not form part of regional requirement and availability

Installed Capacity and Production

The Proposed project is intends to produce 1320 MW power by installing 2X 660 MW coal based Supercritical Thermal Power plant.

Imports vs. Indigenous production.

Since the Project is Power generation, only indigenous production envisaged. The proposed power plant will use the Indian coal supplied from Mahanadi Coal Blocks in Talcher coal fields of Orissa.

2.4 Export Possibility

The proposed Project is not prospecting export to any foreign country. As it has been planned to operate as a IPP, the generated power will be connected to grid and further transmitted through state grid transmission lines to cater to the requirements of Odisha and surrounding states.

2.5 Employment Generation (Direct and Indirect) Due to the Project

The organizational structure that would be required for the Plant operations has been given due consideration. The total man power requirement for the project will be 2100-4100 during construction phase, out of which 2000-4000 will be the workers for security, cleaning, packing and loading, material handling etc. The total requirement of manpower including management staff and workmen for complete operations and maintenance of the plant unit will be about 450. The manpower requirement has been planned keeping in view the following:

1. Smooth & efficient running of the plant with optimum manpower.
2. Capacity utilization with optimum energy consumption.
3. Effective coordination
4. Rational distribution of responsibilities
5. The organizational development would be started from the project phase itself as those involved with the project would also be trained for Operations.

The total manpower requirement for the Plant and Administration has been estimated on the basis of functional requirement of a modern plant. For raw material handling yard and for housekeeping, contract / casual labour have been considered.

Table 2.4 Manpower Requirement during operation

Description	Company's Employees	Contractor's Employees	TOTAL
During construction	100	2000-4000	2100- 4100
During operation	350	100	450

Training of Personnel

Training of the required manpower for the proposed project shall be planned, well in advance. The key personnel shall be selected and trained suitably. The training shall be carried out in the following manner:

1. Onsite training during the construction phase of the Project
2. On job training during the commissioning phase of the project.
3. On job training during operation of the plant immediately after commissioning.

The training of the key engineering personnel such as Process Engineer, Mechanical Engineer, Electrical Engineer and Instrumentation Engineer shall be carried out in all the facets.

The training of the key operating personnel such as boiler operator, mechanic, welder, fitter and electrician shall be suitably carried out during the construction, erection and operation phases.

The training program shall include the following aspects among others so as to impart knowledge and training to the key personnel in relevant aspects of the plant design, operation and maintenance:

1. Understanding the functions of various units.
2. Understanding the equipment in respective sections and the
3. Important parts and control in each equipment.
4. The hazards in respective sections and precautions to be taken for safety of the equipment & personnel.
5. Inspection, preparation and start up of equipment in respective sections.
6. Routine operation of respective sections.
7. Shut down procedures for respective sections.
8. Procedure for attending to emergency stoppage due to failure of power, water and air supply.

CHAPTER - 3

PROJECT DESCRIPTION

3.1 Type of Project

Visaka Thermal Power Ltd. has proposed to setup a 1320 MW (2X660 MW) Coal based Supercritical Thermal Power Plant at: Dimirimunda, Samasingha and Mahulamunda villages, Rairakhol Tahasil, Sambalpur district of State Odisha.

3.2 Location

Proposed Project site is located in at Dimirimunda, Samasingha and Mahulamunda villages, Rairakhol Tahasil, Sambalpur district of State Odisha. The proposed site falls under the Survey of India Toposheet No. 73 D/5 and the buffer zone falls under the Survey of India Toposheet 73 C/7, 73C/18 73D/1 & 73 D/5. The Latitude and Longitude of the proposed site is 20°57'53.85"N and 84°19'39.89"E respectively.

3.2.1 Plant Location

Figure 3.1 Plant Location

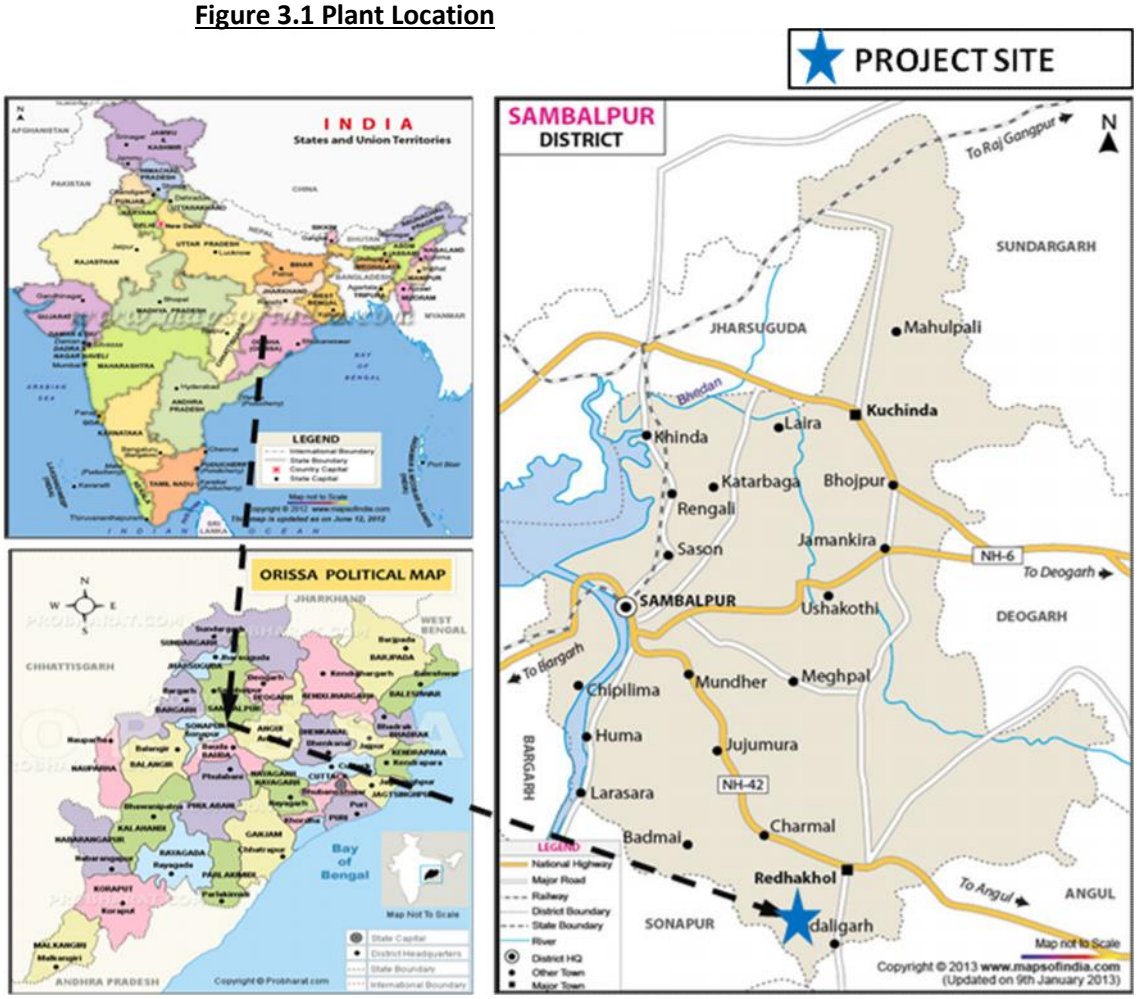
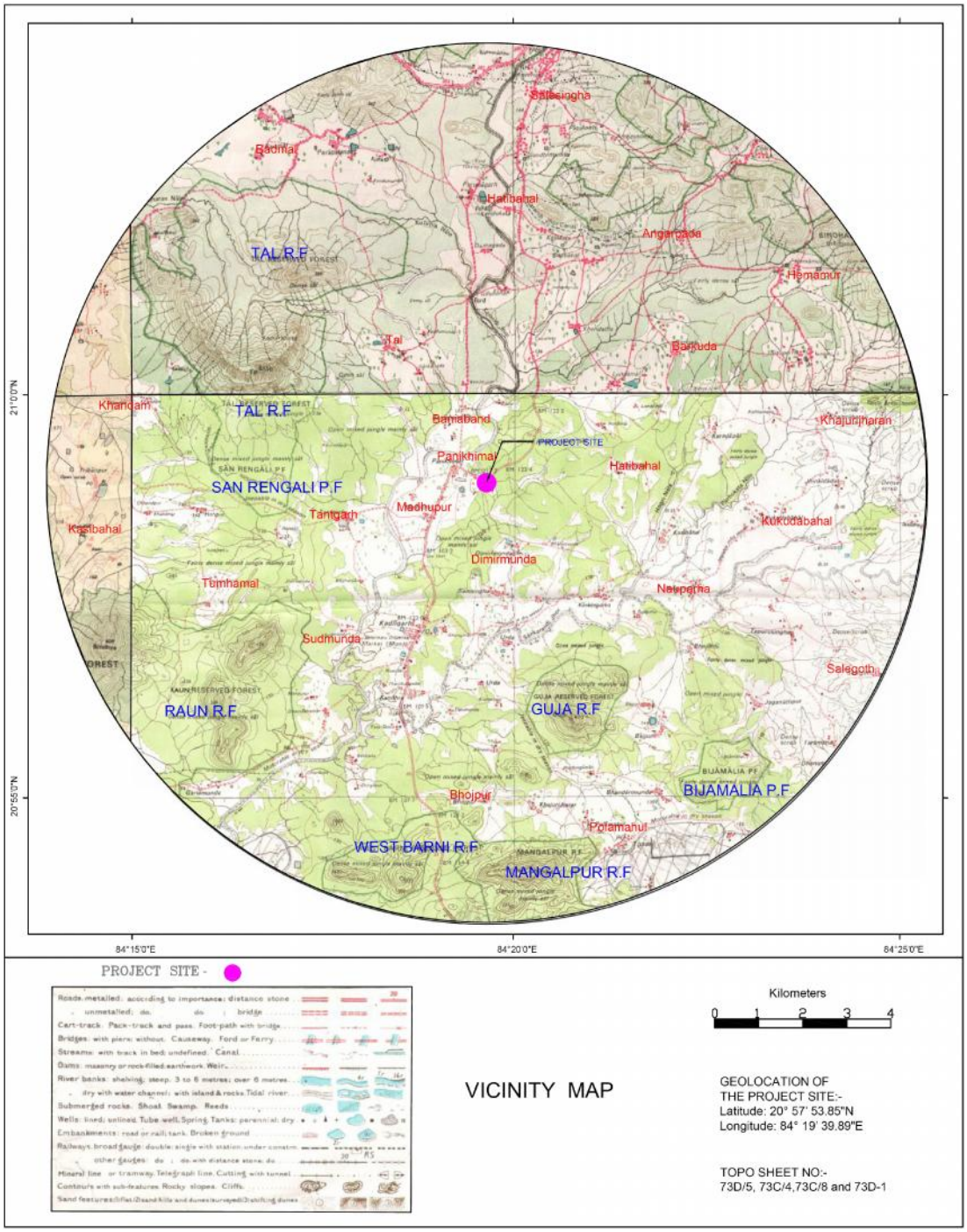


Figure 3.2 Topo map- 10Km Radius



3.2.2 Land Requirement

The requirement of total land including Green Belt is 821 Acres, details given in Table below. The proposed plant shall be located at Dimirimunda, Samasingha and Dimirimunda villages, Rairakhol Tahasil, Sambalpur district of State Odisha. The unit has already acquired 47acres of private land in Dimirimunda/Samasingha village. Rest land is under process of acquisition.

Table.3.1 Land Requirement for the Project

Item Wise Break Up Of Land Use		
Sl No	**Plan Layout Units**	**Total Lands In Acres**
1	Land for Main Plant with Switchyard, Transform Yard, Roads etc.	60.00
2	Land for Water Reservoir, Rain Water Harvesting, Water Treatment Plant & Cooling Towers	140.00
3	Land for Coal Handling Plant Area	100.00
4	Land for Ash Disposal Area	225.00
5	Land for Green Belt Area	271.00
6	Land for Colony Area	25.00
	Grand Totals	**821.00**

3.2.3 Plant Layout

The general layout of the main plant along with all the auxiliary systems has been shown in plot plan (Exhibit – 0002). In laying out various facilities, considerations have been given to the following general principles:

a. Flexibility to have future expansion unit with particular reference to the switchyard and main plant.

b. Predominant wind directions as gathered from the wind rose to minimize pollution, fire risk, etc.

c. Power evacuation corridor for connection to national/state grid.

d. Location of existing railway infrastructure from Rairakhol railway stations upto point of coal unloading inside plant, with augmentation of infrastructure as required.

e. Usage of existing approach road to the power plant from the national highway and state highway.

f. Availability of adequate space for fabrication yard / construction store (both open & covered), workshop, Fire-station, H2 generation plant and storage (adequate fire protection of the same as per NFPA) shall also be considered.

g. Availability of adequate space for labour colony during construction stage.

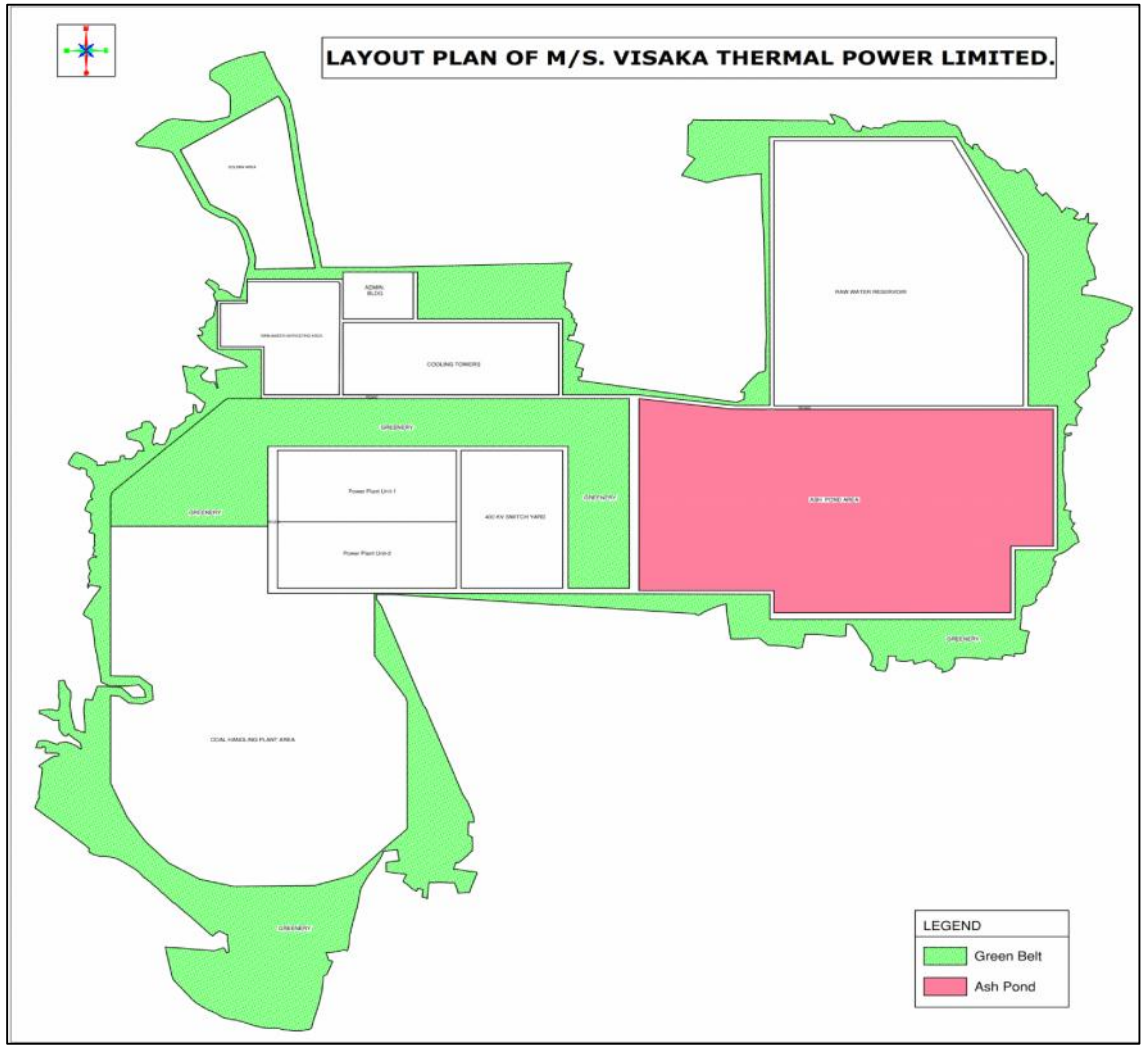
h. Optimal use of three patches of land as found during walk through survey.

i. Plant layout shall also satisfy 'VASTU' requirements as per VTPL's comments.

All facilities of the plant are laid out in close proximity to each other to the extent practicable so as to minimize the extent of land requirement. The layout also facilitates communication of men and movement of materials between the various facilities both during initial construction and also during subsequent operation and maintenance. Besides taking into consideration the above aspects, the plot plan is made to permit coal receipt by wagons through non MGR rail track.

The entire 821 Acre land is divided into four segments viz. main plant block, raw water reservoir and water pre treatment block, ash pond block and township block. The plot plant (Exhibit-0002) attached in this report indicates different blocks after preliminary walk through survey of the land. In the main plant block, main power house system is expanding from switch yard (South) to chimney (North) with all permanent facilities like cooling tower, ash handling, DM plant, service building, workshop etc. located towards the east of the boiler turbine building (BTG), keeping the western side free for lay down, fabrication and pre-assembly activities. The coal handling plant has been kept on the further east of the main plant block. Raw water block is placed to the extreme east of the plant. The intake pipe would be routed in the corridor on the south side of raw water block. A 400 kV switchyard is envisaged for the proposed plant. Space provision for FGD has been kept towards north of main plant beyond chimney. A single twin flue chimney for both the units has been planned.

Figure 3.3 Plant Layout



3.3 Site Selection

The proposed project will be located at Villages Dimirimunda, Samasingha and Mahulamunda, Tehsil- Rairakhol, District- Sambalpur, Odisha. Alternative site for the project is at- Bhandaripokhari, Bhadrak district of Odisha but State Government advised to shift. The selection of power plant location has been based on the following considerations.

- Easy & nearer assess to raw material such as Coal etc.
- Availability of water from continuous source.
- Power supply/evacuation arrangement
- Nearer access through road.

3.4 Technology Selection

3.4.1 Technical concept

Larger capacity units are available with reputed manufacturers in the range 500- 600 MW in subcritical range and 660 MW and above in supercritical range. Selection of supercritical technology has an edge over subcritical from energy conservation and environmental point of view. The 660 MW units are well established in world market with number of units operating in many countries. In India also, few units of this size are under construction and few projects of 660 MW are in the advanced stage of implementation. Installing 660 MW would give more power output with reduced energy consumption and fuel efficienency. This would reduce per MW capital cost as well as operating cost of the unit and gives better flexibility in operation. The Table – 3.2 below gives the advantages 660 MW unit.

Table 3.2 Performance data for 660 MW Units

Sl. No.	Particulars	Units	660 MW Units
1	Operating Availability	%	92
2	Plant Load Factors(PLF)	%	85
3	Auxiliary Power Consumption	%	6.0
4	Reduction in heat rate	%	4
5	Gain in efficiency	%	6
6	Planned outages	%	5
7	Forced outages	%	3

3.5 Main Plant Equipment & System

3.5.1 Steam Generator & Accessories

The Steam Generators (SG) would be of super-critical, once through type, single/double pass (tower type/two pass type) type gas path, water tube, tangential/wall fired pulverized coal fired, balanced draft furnace, single reheat, radiant, dry bottom type, suitable for outdoor installation, top supported. The gas path arrangement would be single pass or two pass type.

Boiler is generally designed with variable pressure operation ranging between 30% and 100% of BMCR. However, depending upon standard manufacturer's practice, this variable pressure operating range differs from manufacturer to manufacturer. However, this would be finalized based on integral operational range (combined ramping) of boiler turbine generator.

The main parameters at 100% TMCR would be as follows:

Table 3.3 Major parameter of Steam

Sl. No	Description		Parameters
1	Main steam flow at superheater outlet	:	1955.0 T/hr
2	Pressure at superheater outlet	:	248 kg/cm² (a)
3	Temperature at SH outlet	:	567.8°C
4	Steam flow to RH	:	1542.9 T/Hr
5	Steam temperature at reheater outlet	:	594.4°C

3.5.2 Boiler Load Conditions

Boiler maximum Continuous Rating (BMCR)

Boiler Maximum Continuous Rating (BMCR) is the maximum rating specified for the boiler. This corresponds to 110% of Turbine maximum continuous rating depending upon manufacturer's standard practice.

Turbine Maximum Continuous Rating (TMCR)

Turbine Maximum Continuous Rating (TMCR) is the basis of steam generator output and is equal to the turbine generator maximum guaranteed rating.

Normal Operation

The steam generator is designed to be operated as follows:

Constant Pressure Operation

Above 90% TMCR, the main steam pressure would remain constant at the rated value, condition, while the load would be controlled by throttling main steam flow with the designated partial arc control valve. Below 30% TMCR, the main steam pressure would remain constant at the minimum.

Sliding Pressure Operation

Between 30% and 90% TMCR, the steam pressure and steam flow rate would be controlled by the load directly.

Minimum once through load

The minimum once-through load would be designed for 30%-35% TMCR, where the transition is made from wet to dry operation. Below once through load, water wall flow must be kept constant to ensure adequate water wall tube cooling. Accordingly, the start-up and re-circulation system would be designed for minimum once through TMCR condition.

Steam Generator Circulation System

Once Through Boiler

The steam generator start up system envisages boiler start up drain system with start up circulation pump. A separator would be used for start up as well as separating the steam water mixture up to a load of 30% TMCR, above which it would be running dry. For start up, the drain from the separator would be routed through start up heat exchanger before being fed into deaerator /flash tank or the drain would be routed partly through mixing box into the system and partly to flash tank.

Air & Flue Gas System

A balanced draft system would be provided. There would be two axial FD fans, PA fans and two radial ID fans with VVFD drive & two (2) pairs of regenerative rotary type air pre-heaters. One pair of air pre-heater would be used for primary air system & second pair for secondary air system. Four (4) numbers of steam coil air pre heaters (two on primary and two on secondary air system) would be provided for start-up, low load operation or abnormal conditions when an increased air inlet temperature is considered desirable to minimize the cold end corrosion of regenerative air pre-heaters.

Fuel burning System

Start-up, warm up and low load (upto 22.5%) carrying would be done by heavy furnace oil. Boiler would be so designed that oil firing for flame stabilization would not be required beyond 22.5% MCR.

Necessary pumps, filters and heaters would be provided. The burners, air registers etc. would have independent pneumatic drives and the entire operation of purging, insertion, air and fuel sequencing removal and blow off would be automatic. Ignition of heavy oil would be directly by high energy arc igniters. All interconnection piping from existing tanks to pump house, including valves and other fittings, would be provided. There would be Light Diesel Oil (LDO) firing atleast in one burner elevation having a minimum capacity of 7.5% Boiler Maximum Continuous Rating (BMCR) to facilitate a cold start-up of the unit when no auxiliary steam is available for HFO heating and atomization. LDO system would be sized for 7.5% BMCR capacity for each boiler.

Coal Burning System

The coal burning system would comprise coal mills of vertical spindle type which include bowl mills or roller mills or tube mills or any approved equivalent. The number and capacities of the mills would be so selected that while firing the worst and design coals at BMCR, the following spare capacities would be ensured.

1. With 90% loading of the working mills, at least one mill would be spare at 100% BMCR while firing the worst coal.
2. With 90% loading of the working mills at least two mills would be spare at 100% TMCR (660 MW) load with worst coal firing
3. With 90% mill loading of the working mills, at least two mills would be spare while firing the design coal at 100% BMCR
4. Mills would be capable to operate with indigenous coal, the design moisture and hard grove index (HGI) of the coal would be finalized during detail engineering. Since imported coal is not thought of in this project, mill selection at this stage may be considered on indigenous coal only.

Steam Turbine Generator & Accessories

TG unit of 660 MW would comprises of Steam Turbine along with its integral systems and auxiliaries like lube oil system, control-fluid system, condensers, condenser air evacuation system, HP&LP Bypass system, feed water heaters, complete regenerative feed heating system, condensate extraction pumps along with their drives, boiler feed water pumps along with their drives, automatic turbine run-up system, instrumentation and control devices, turbine supervisory instruments, turbine protection and interlock system, automatic turbine testing system. Condensate polishing unit and turbine hall EOT cranes.

The steam turbine would be tandem compound, single reheat, regenerative, condensing, multi-cylinder design with HP, IP and LP casings, directly coupled with the generator suitable for indoor installation. The plant would be designed to operate as a base load station. The turbine design would cover adequate provision for quick start-up and loading of the units to full load at a fast rate. Apart from constant pressure operation, the turbine would also have the facility for sliding pressure operation. The turbine would be provided with suitable margins for VWO flow and operate in line with boiler startup and operation.

The turbine-generator would be complete with all accessories such as protection system, lube and control oil systems, seal oil system, jacking oil system, seal steam system, turbine drain system, 60% MCR HP / LP bypass system, electro- hydraulic control system, automatic turbine run-up system, on-line automatic turbine test system and turbine supervisory instrumentation. The turbine-generator would also have all necessary indicating and control devices to permit the unit to be placed on turning gear, rolled, accelerated and synchronised automatically from the control room. Other accessories of the turbine-generator would include an oil purification unit with transfer pumps and clean and dirty oil storage tanks of adequate capacity.

Plant Cycle

The turbine cycle heat rate would be restricted to 1850 Kcal/KWhr in line with Central Electricity Regulation Commission (CERC) regulations at 100% load and performance test condition and considering 2x 50 % Turbine driven Boiler Feed pumps (TDBFP) + 1 x 50 % motor driven Boiler Feed pumps(MDBFP).

These limiting values of turbine cycle heat rate would be suitably incorporated in the procurement specifications to be prepared during detailed engineering stage to ensure compliance by the Main plant package suppliers. During detailed engineering stage when procurement of Main plant package comprising of Steam Generator (SG) and Steam turbine Generator (STG) would be carried on, techno economic evaluation of the following options for selection of drive for Boiler Feed pump would also be evaluated and most techno economically option would be considered for implementation.

1. 2x 50 % Turbine driven Boiler Feed pumps (TDBFP) + 1 x 50 % motor driven Boiler Feed pumps (MDBFP).
2. 2x 50 % Turbine driven Boiler Feed pumps (TDBFP) + 1 x 30 % motor driven Boiler Feed pumps (MDBFP).
3. 4 x 33 1/3% motor driven Boiler Feed pumps (MDBFP).

Feed Cycle Equipment

Condensate Pumps

The condensate from the condensate hot well would be pumped by 3 x 50% or 2x100% capacity condensate pumps, two working and one standby to the de- aerator, through the gland steam condenser, and low pressure heaters. The pumps would be vertical, cannister type, multistage centrifugal pumps driven by AC motors.

Boiler Feed Pumps

Feed water would be pumped from the de-aerator to the steam generator through the high pressure heaters by means of 2 x 50% capacity boiler feed pumps (steam turbine driven pumps) and 1x30% AC motor driven standby pump (for startup) pump per unit or as per module specified in sl no. 7.9.1 of this chapter. The boiler feed pumps would be horizontal, multistage, centrifugal pumps of barrel type with variable speed hydraulic coupling. Motor driven BFP would be used during start-up.

De-aerator

The de-aerating feed water heater would be a direct contact, variable pressure type heater with spray-tray type or spray type of de-aeration arrangement. The feed water storage tank would have a storage capacity between normal and low water level which is adequate to feed the steam-generator for 6-10 minutes when operating at MCR conditions. The de-aerator would be designed to give dissolved oxygen content not greater than 0.005 ml/litre in feed water at the de-aerator outlet at all operating condition.

High Pressure Heater

The high-pressure heaters would be of horizontal shell and tube type with stainless steel U-tubes welded into carbon steel tube sheets. The HP heaters would be provided with a de-superheating zone and a drain cooling zone in addition to the condensing zone. The equipment would be designed in accordance with latest applicable standard /codes of Heat Exchanger Institute, ASME etc.

Gland Steam Sealing System & Gland Steam Condenser

A fully automatic gland sealing steam supply system would be provided for the TG set & the turbine drives for BFPs. HP and IP turbine shaft glands would be sealed to prevent escape of steam into the atmosphere and the LP turbine glands would be sealed for preventing leakage of atmospheric air into the turbine. Steam would be used for sealing these spring backed labyrinth glands. During startup and low loads (say up to 35% load), seal steam would be supplied to the turbine glands from

the auxiliary steam header or cold reheat line (CRH) through a seal steam regulating valve. During normal operation, the HP and IP turbines would be of self-sealing type and under that condition the auxiliary or CRH steam source would be cut off and the leak-off steam from HP and IP glands would be used for sealing the LP glands. The excess leak-off steam would go to the condenser. A gland steam condenser would be provided to condense and return to the cycle, all gland leak off steam including that from BFP turbines. A de-superheating type bypass would be provided during outage of gland steam condenser. 2x100% capacity vapour exhausters would be provided to remove non-condensable gases from the gland steam condenser. The exhaust gases would be left above the TG Hall roof level.

Turbine Lube Oil & Control Oil System

A complete lubricating oil system would be provided for the steam turbine generator unit. The control fluid system may be fully separated from the lubricating oil system or integrated with the lube oil system as per the turbine manufacturer's standard. The lube oil system would comprise of lube oil pumps, main oil tank, lube oil coolers, lube oil filters, piping, valves fittings etc. The control fluid system would have its own pumps, motors, coolers, strainers, piping, valves and fittings.

BA HOPPER

The BA hopper would have a capacity to store 8 hours of bottom ash generation. It would be made of MS welded with construction having external supports. A seal trough would be provided around the top periphery of the BA hopper for furnace sealing and to prevent ingress of air into the furnace. The hopper would be lined with monolithic refractory. The outlet of the BA hopper would have double „V" or triple „V" section with four or six outlets. Each outlet would be provided with hydraulically operated gate.

CLINKER GRINDERS

A heavy-duty clinker grinder housed in steel enclosure with suitable liners would be provided below each outlet of BA hopper. Out of the four (4)or six(6), two (2) or three (3) sets would be working and the other two (2) or three (3) would be standby. The grinders would crush the ash clinkers to (-) 25mm size.

JET PUMP

Each BA hopper outlet would consist of two no. of jet pump out of which one would work & one would be common stand by. Each jet pump has minimum 90 TPH capacities (dry basis).

BOTTOM ASH DEWATERING BIN

There would be three bottom ash dewatering bins each having storage capacity of 12 Hrs BA generation for two units. The bottom ash from each dewatering bin would be disposed into trucks in moist form at the rate of 100 TPH.

SLURRY SUMP

Slurry sump is Semi underground, RCC construction conical surface & at trough along with alloy CI liner. There would be minimum three (3) no‟s compartment & each compartment having minimum 5 min of storage capacity. Slurry sump & slurry trough would have proper access for maintenance purpose. Slurry sump consists of fixed SS rung ladder inside the slurry sump.

HCSD PUMP

Three sets (3) of HCSD pumps would be provided to dispose off High Concentration slurry to disposal area.

BELT CONVEYOR

Belt conveyor along with Junction tower would be provided for disposed Bottom ash from dewatering bin to the mixing tank (ART) . Belt conveyor can also used to feed fly ash to the mixing tank.

FLY ASH TRANSMITTER VESSELS

The fly ash transmitter vessels would be designed to operate on the principle of pressure type pneumatic system. The size of the transmitter vessel below fly ash hoppers would be selected based on number of cycles per hour to be limited to 10 on continuous operation basis or it would be based on evacuation of ash collected in a shift of 8 hours in 5 hours 29 min. time, whichever gives higher size of vessel.

CONVEYING AIR COMPRESSORS/BLOWERS

The requirement of compressed air for conveying fly ash from ESP hoppers, APH hoppers and stack hopper to fly ash storage silos would be met by screw compressors /blowers of suitable capacity with adequately sized air receivers. Each compressor/blowers would be sized for evacuation of fly ash from one unit in 5 hours 29 min. time per shift excluding line purging. The requirement of compressed air for instruments, operation of pneumatic valves in the system and bag filter cleaning would be met by the instrument air compressor.

The piping for conveying mixture of fly ash and air from fly ash hoppers to the storage silos would be of mild steel electric resistance welded (ERW) pipes (min 9.5 thick) in case of pressure pneumatic system. For vacuum system, dry fly ash pipes would be of CI, with class D thickness. The ash hopper isolation valves would be of knife gate type with SS gate.

ESP HOPPER & BUFFER HOPPER FLUIDISING BLOWERS AND FA SILO FLUIDISING BLOWERS

The requirement of fly ash hopper & buffer hopper fluidizing air would be met by air blowers (one operating for each unit and the third one as common standby). Fluidizing would be done continuously & simultaneously for all ESP hoppers. Similarly, silo aeration requirement would be met by three (3) blowers (two operating for both unit and the third one as common standby).

AUTOMATIC SEQUENTIAL CONTROLS FOR ASH REMOVAL SYSTEM

Operation of all the compressors/blowers, pumps, valves, etc., of complete ash evacuation and conveying up to storage silos would be controlled from a centralized control panel. PLC would be provided in the control room for the ash handling system. The PLC system would provide for continuous cyclic operation of fly ash evacuation system. The opening and closing of the valves below fly ash hoppers would be controlled with help of level switches provided on the transmitter vessel/ fly ash hoppers. The hopper from which fly ash is being removed would be indicated on the monitor. The equipment and valves in the bottom ash handling system would be controlled automatically through a separate PLC system provided in boiler area. The status of operation of bottom ash handling system would be available on the monitor in ash handling system control room.

FLY ASH SILO

Each fly ash silo would have 1800 T capacity. There would be three fly ash silos for two units. Each Fly ash silo would have minimum six outlets.

Figure.3.4 Process Flow Diagram

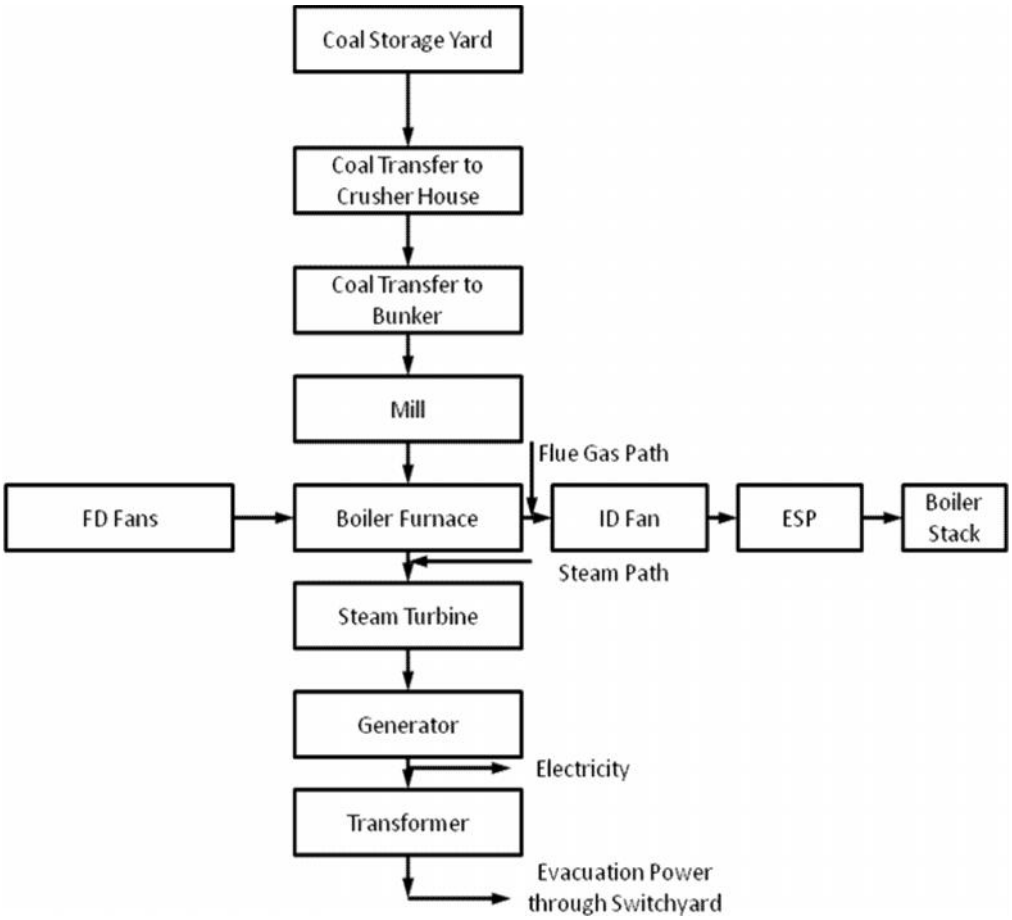


Fig.3.5 Schematic Diagram of Power Plant

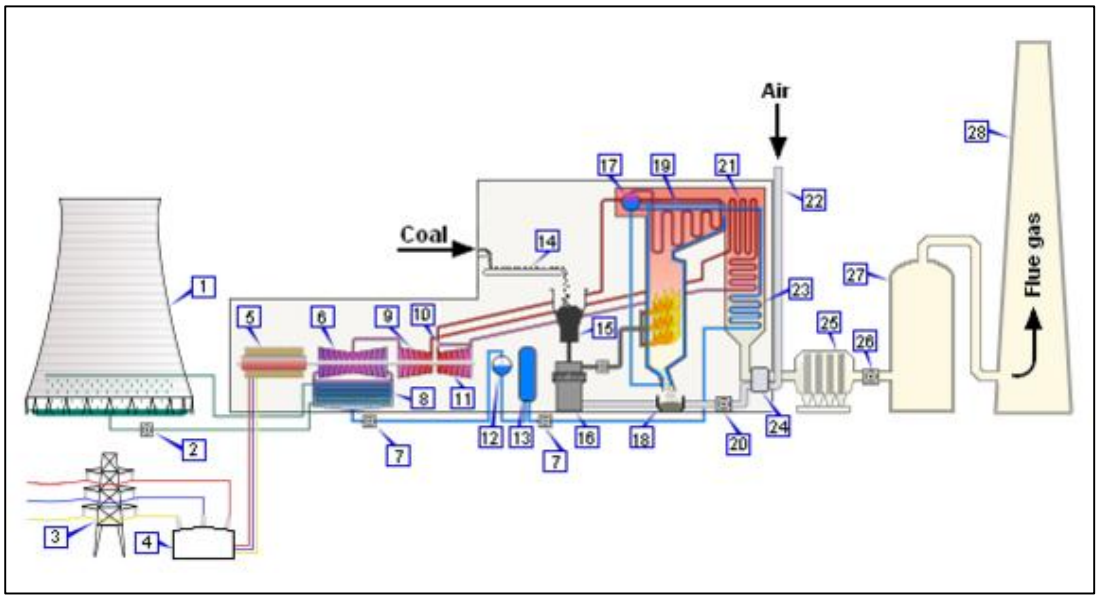


Table.3.4 List of equipments in Power Plant

Sl. No.	Equipment	Sl. No.	Equipment
1	Cooling Tower	15	Coal Hopper
2	Cooling Water Pump	16	Coal Pulverizer
3	Transmission Line(3 Phase)	17	Steam Drum
4	Transformer(3 Phase)	18	Bottom Ash Hopper
5	Electrical Generator(3 Phase)	19	Super heater
6	LP Steam turbines	20	Fan
7	Condensate & FW Pumps	21	Re Heater
8	Surface Condenser	22	Combustion air intake
9	Intermediate PS turbine	23	Economiser
10	Steam Control Valve	24	Air Preheater
11	HP Steam turbine	25	ESP
12	Deaerator	26	Fan
13	Feed water Heater	27	FGD
14	Coal Conveyor	28	Flue gas Stack

Conceptual Design of Plant

The structures shall be designed to primarily meet the functional requirements and the load data conditions, taking due care of maintenance, erection, access to various floors and storage for raw materials / finished products as per the process / technological requirements in line with the process concept of the plant.

Civil Construction

Plant structures and non-plant building structures in a modern power plant plant, primarily, have to meet the load conditions and functional requirements stipulated by the main machinery suppliers and storage for raw materials, as per the technological requirements of process departments. All major structures shall be constructed in RCC. Steel structure shall be used for main plant and generally for roof covering and where flexibility is desired. The use of reinforced concrete has been limited to heavy equipment foundations, silos, column foundations and wherever it is essentially required from aesthetic point of view. Due considerations would be given on architectural aspects of design of these buildings to harmonize with the plant visual aesthetics.

Description of Various Structures

Salient features of the involved structures are given below:

Table 3.5 Major Building/ Structures/ Area

Sl. No.	Building/ Structure	Remarks/ Type of Construction
1	ESP/ VFD control room	Ground plus three floors; for each unit. Structural steel construction with brick walls. Floors and roof would be of RCC.
2	Air washer rooms	One per unit; on first floor of DG / Compressor house. Structural steel construction with brick walls. Floors and roof would be of RCC.
3	Ware house / stores and Workshop	Workshop required for 2x660 MW. The building would be made of structural steel columns with bricks for side cladding. Build up area for workshop and store are 2500 m^2 and 3000 m^2 respectively.
4	D.G and compressor House	Structural steel construction with RCC roof. On first floor air washer would be installed.
5	Hydrogen cylinder shed	Hydrogen generation facilities would be required for 2x660MW plant. The building would be made of structural steel columns with bricks for side cladding.
6	CW pump house & MCC room	Substructure would be RCC of suitable concrete grade. Super structure would be structural steel construction with pre-coated metal cladding. Roof of pump house would have permanent steel deck with cast-in-situ RCC laid over it. Stop log and trash rack would be provided with sprayed zinc coating. Intake and discharge duct would require internal diameter steel lined concrete encased ducts. The grade of concrete for duct encasing would be M 20. The cold water discharge from cooling towers would flow by gravity to the CW pump house forebay through RCC open channel of concrete grade M 30.
7	PT plant and pump house	Partly underground RCC clarifier, Two storied chemical building with RCC slab and in-filled brick masonry wall. Pump house of RCC frame structure with RCC slab and brick masonry wall. Clarified water storage tank of RCC construction, water tight and having partly above and partly underground construction. Filtered water pump house and tanks would be RCC structure PT chlorination building of RCC framed structure and in-filled brick masonry.
8	D.M Plant	Two storied building with RCC/Structural steel columns with pre-coated sheets for roof. Roof is supported on structural steel trusses. Sides are kept open. Floors

		would be of acid/alkali resistant bricks. Flexible pad type foundations using well-graded sand & bit mastic anticorrosive layer at top for DM water storage tanks of required capacity DM water pump house would be RCC with brick masonry. Neutralizing pit would be underground RCC water retaining structure with AR lining.
9	Coal handling plant and switch gear cum control room	Track hopper shed shall be of steel cladding. Track hopper underground structure shall be of RCC with maintenance bay at both end. External wall shall have waterproofing treatment comprise of chemical injection grouting & polymer modified cementitious coating. Ironite flooring has been envisaged for track hopper floor. Inside surfaces of hopper would have 50mm thick guniting Crusher house made of Structural steel with floors and slab as RCC Transfer point would be structural steel With RCC floors, Tunnel of RCC construction with chemical injection grouting and polymer modified cementitious coating as water proofing treatment. Ironite flooring would be provided on tunnel flooring. Conveyor galleries would be structural steel and open foundation for trestle foundation. The stacker/re-claimer rails would be supported on RCC longitudinal beams which in turn would be supported on Open foundation. Coal stockyard shall be on suitable moorum bed with geotextile membrane at bottom.
10	Switch yard control room	RCC/Structural steel construction with brick walls
11	Ash handling Compressor room + MCC room	RCC structure with brick structure and covered shed would be provided for protection.
12	Ash handling Compressor room + MCC room	RCC structure with brick structure and covered shed would be provided for protection.
13	Effluent treatment system	RCC central monitoring basin(CMB) Single storied RCC building for pump house Tube settler area near CMB
14	Fuel oil pump house (unloading and forwarding) and system	RCC framed structure with RCC slab and in-filled brick masonry wall. Unloading trench (450m approx.) For unloading oil from rail tankers OR unloading trench (60 m) for unloading oil from road tankers (firmed up during detail engineering). RCC foundation for tanks. RCC construction for all drains pits.

15	Raw water reservoir	Reservoir bund would be constructed with earthen embankment in two compartments. Top width of the embedment would be about 4 m. Free board of 1.5 m and dead storage of 0.5 m for silting would be provided. In order to arrest seepage/percolation losses through reservoir bed, 750 microns thick HDPE liner would be provided over sand cushion of 300 mm thickness. On slopes of the upstream side, 50 mm thick pre-cast concrete tiles would be provided on the 25 mm thick cement sand mortar over HDPE liner. On the top of embankment, 3.5 m road would be provided for the inspection and maintenance purpose. At the downstream side, rock toe, rip-rap, turfing and toe drain would be provided.
16	River intake pump house	Consist of raw water intake well cum pump house in the river and an energy dissipation tank, de-silting basin & make-up water pump house, silt flushing pump house at the river end. The substructure of make-up water and raw water pump house would be of RCC and superstructure would be of RCC frame with brick masonry wall. The roof of pump house would have permanent steel deck with cast-in-situ RCC laid over it. Stop log and trash rack would be provided with sprayed zinc coating
17	Admin Building	RCC/Structural steel construction with brick walls. Floors and roof would be of RCC. Area covering 400 m^2
18	Canteen Building	RCC/Structural steel construction with brick walls. Floors and roof would be of RCC. Build up area of 500 m^2
19	Service Building	RCC/Structural steel construction with brick walls. Floors and roof would be of RCC.
20	Fire Station Building	RCC with brick masonry covering 400m^2
21	Car / Scooter parking	Structural steel construction with pre- coated sheet for roof. Sides are to be kept open. Build up area of 1500 m^2.

3.6 Electrical System

3.6.1 Electrical Generator Features

The key one line diagram furnished in figure 3.5 describes the plant electrical system. The two numbers of STFs each rated 660MW, 0.85 lag to 0.95 leading PF,21 kV,3000 rpm, 50 Hz are proposed. The generator winding will be star connected with the phase and neutral terminals brought out separately. The generators would deliver the rated MVA output under ±5 % variation in voltage and +3 to -5% variations in frequency. The generator winding (Stator & Rotor) would be

provided with Class-F insulation or better. However temperature rise would be limited to that of Class-B. The star point of the generator would be connected to earth through an earthing transformer, the secondary of which is connected to an earthing resistor.

All generator components, rotor winding, stator core end region flux shield structures and lead box, stator coils, parallel rings, main leads and terminal bushings are Hydrogen cooled. Hydrogen coolers would be built into the stator frame of the generator and would be sized to ensure at least 80% of the rated O/P when one hydrogen cooler is taken out for maintenance.

The generators would be provided with either brushless or static excitation system. Suitable fast acting non-dead band type continuous acting digital type automatic voltage regulator to maintain steady generator terminal voltage within ±0.5 % of the pre-set value under different load conditions. The voltage regulator would also be capable of maintaining stability under steady state and transient conditions. The excitation cubicles will have necessary sections to house the apparatus and accessories required for field flashing and control. Table 3.5 indicates the major parameters of the generators.

Table 3.6 Major Parameters of the Generators

Sl. No.	Generator Parameter	Rating
1	Rating, MW	660
2	Voltage Rating,kV	21
3	Rating P.F	0.85 lag
4	Rating Frequency, Hz	50
5	Rated Seed, rpm	3000
6	Minimum sub- transient reactance on Generator MVA Base.	21.71%
7	The generator should deliver the rated MVA output under voltage and frequency as per.	IEC-60034-3

3.6.2 Generator Bus Duct

The terminals of the generator would be connected to the generator transformer using Isolated Phase Bus Duct (IPBD) of adequate short circuit withstand capability with suitably rated tap-offs to the Unit Transformers (UT-1 & UT-2). The tap-offs to the HT terminals to UT will be provided with Segregated Phase Bus Duct (SPBD) of adequate short circuit withstand capability. The bus duct will be natural air cooled and will run partly indoors and partly outdoor. The rating of the IPBD will be as furnished in Table 3.6.

Table 3.7 Generator Busduct

Sl. No	Generator Parameter	Busduct
1	Type of Bus Duct	IPBD
2	Type of cooling	Natural Air cooled
3	Nominal service frequency	50 Hz
4	Rated Voltage(or as per Alternator manufacture's standard rating)	21 kV
5	Continuous current rating	21500 A(Main Run & Neutral side Run),1250 A(Tap off),2000 A(Delta run for Generator transformer)
6	Basic impulse insulation level (102/50 micro- sec)	125 kV9 peak)
7	Bus bar conductor material	Al as per IS 5082
8	VT and SP cubicle	
	1. Voltage transformer	21000/√3/ 110V/√3/ 110V/√3, 3 nos., 100 VA/ ph
	2. Lightning Arrestor	24 kV Gapless Zinc oxide with nominal discharge current of 10 kA
	3. Surge Capacitor	24 kV capacitance 0.25 µF at 50 Hz

3.6.3 Generator Transformer

The GT's would be 3 X 1-phase, 2 winding, 270MVA rated ONAN / ONAF / ODAF cooled with on-load tap changer on the HV side. The HV side neutral will be solidly earthed. Lightning arrestors will be provided near the generator transformer HV side. The HV terminals of the transformers will be connected to the associated bays in 400 kV by overhead conductors.

The rating and details of the generator transformer are as in Table–3.6 below:

Table 3.8 Rating of Generator Transformer

Sl. No	Generator Parameter	Rating
1	Type of cooling	ONAN/ ONAF/ ODAF
2	Rating	3 x 1- phase, 270 MVA(ONAN/ ONAF/ ODAF)
3	No load voltage ration	21 kV/ (400/√3) kV
4	Vector group	YNd1

5	Percentage impedence	15%
6	Type of tap changer	Off Circuit Taps @1.25% per change in taps
7	Tap range	To be decided during detailed engineering
8	Impulse voltage withstand (1.2/ 50 micro-sec)	1425 kV peak.
9	Terminal connection HV side MV side	HV side Terminals on bushings for overhead line connection. Throat type with matching flanges for connection to IPBD.
10	Applicable standard	IS 2026

3.6.4 Evacuation of Power

Power generated in the power station is proposed to be evacuated at 400 kV level. For this purpose, a 400 kV outdoor type switchyard with one and half breaker scheme is proposed. Dedicated 400 kV Two numbers of power transmission lines will be constructed up to the nearest 400 kV pooling substation of PGCIL.

The proposed scheme for power evacuation is shown in enclosed single line diagram (Exhibit-16). The units will be connected to 400 kV switchyard through generator transformers. The generator transformers will step up generator voltage of 21 kV to the switchyard voltage of 400 kV. The one and half breaker scheme is reliable and provides continuity in power supply even during outage of a bus or circuit.

The proposed 400 kV switchyard would consist of the following circuits:

a) Generator transformer – 2 Nos

b) Outgoing lines – 4 Nos

c) Station Transformer – 2 Nos.

d)Bus reactor Bay – 2 Nos

e) A detailed electrical network power system study needs to be carried out by M/s Visakha Power for finalizing the details of the receiving end substations as well as for finalizing the number of lines. A separate survey for the transmission line route survey has to be carried out to establish transmission line length and the right of way. Line Reactor may be envisaged depending on the length of lines , this point shall be suitably considered during further course of engineering.

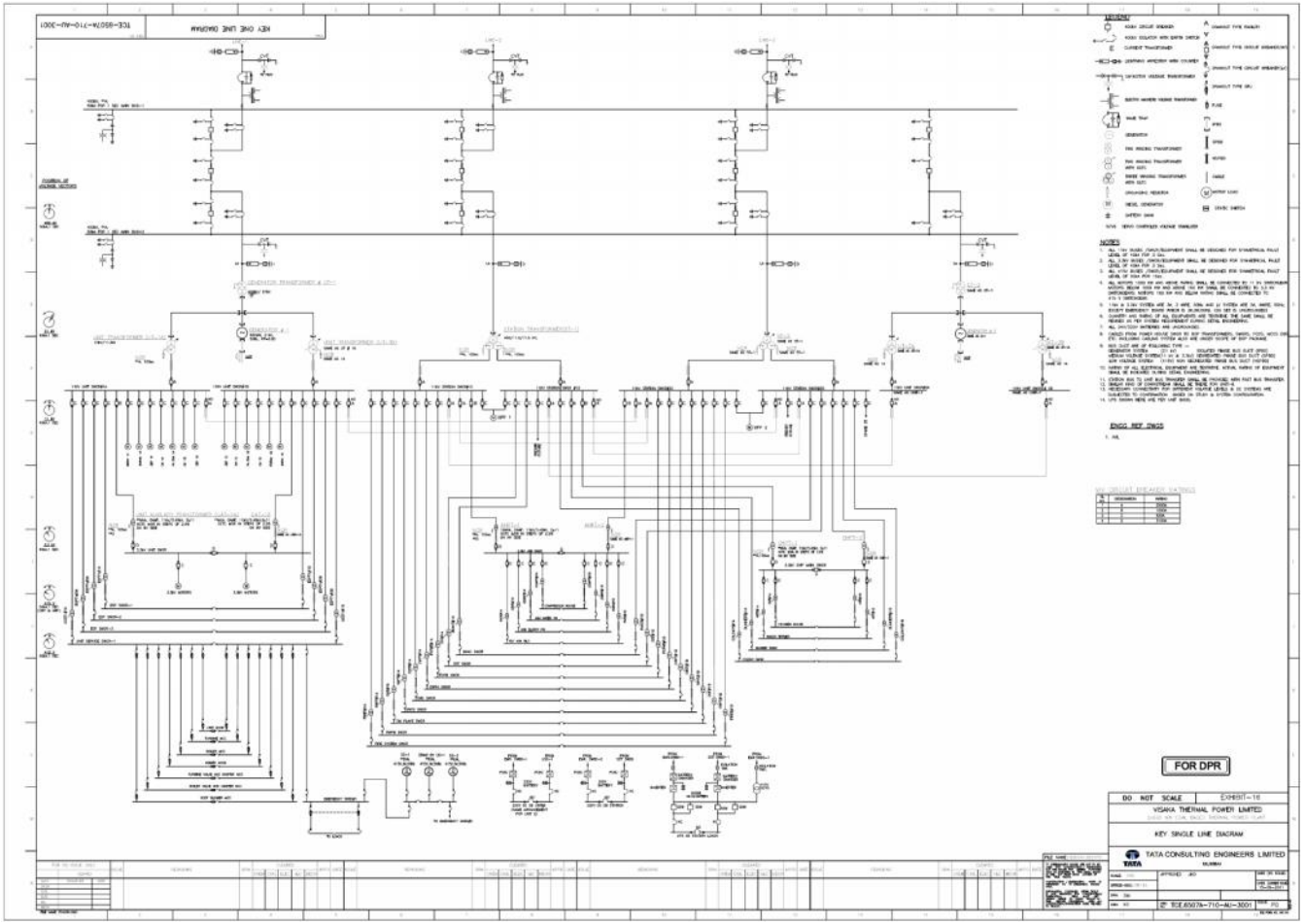
3.6.5 400 kV Switchyard

The power evacuation from the proposed power plant will be done through new 400kV lines. The switchyard equipment i.e., breakers, isolators, lightning arrestors, current transformers and buses would be rated for a short circuit current rating of 50kA for three (3) seconds.

For each of the outgoing lines, precision energy metering will be provided. It is proposed to provide dedicated 2 core CTs and 2 core EMVTs of accuracy class 0.2S for tariff metering purpose for each line. The metering panel will be located near the tariff CTs / EMVTs such that the length of the metering cable is kept to a minimum to reduce errors in energy recording. Main metering panel shall be provided by PGCIL and space will be provided adjacent to this metering panel to enable Bidder to install check metering for their verification. The metering panel will have ABT (Availability Based Tariff) energy meters with 0.2S accuracy class.

Power Line Carrier Communication (PLCC) system shall be provided for data and voice communication, carrier aided protection, telemetry, telecontrol and monitoring purposes. Each end of transmission line shall be provided with identical PLCC equipment. PLCC system shall be provided in all the lines. The carrier current equipment comprises of coupling capacitor, line trap unit, tuning unit, data & communication panels. All the necessary control and protection panels shall be housed in the Switchyard control room. Necessary interlocks and level control logic , Bay Control Unit and Substation Automation System (SAS) shall be provided. Interconnectivity with Plant DDCMIS shall also be provided.

Fig. 3.6 Single Line Diagram



3.7 Fuel Storage and Handling:

This section will include all the necessary equipments like coal crusher, conveyor and drives. Coal from the source shall be crushed into required size and taken to the fuel bunkers feed hopper of the boiler. Coal yard will have separate arrangements for incoming coal and crushed coal to be sent to the bunker.

The steam generators would be designed primarily for pulverized coal firing. Heavy Fuel Oil (HFO) and Light Diesel Oil (LDO) would be used as supporting fuel for start-up and flame stabilization at low loads.

3.7.1 Annual Coal Requirement

The annual coal consumption at TMCR condition for the proposed 2 x 660 MW power plant is around 6.8 million tonnes duly considering average calorific value of As fired coal as 3522 kcal/kg and annual plant load factor (PLF) of 85%. The above calculation also considering the loss in calorific value of coal due to open stock (3%), loss due to shale and sand in coal (2%), transit loss and additional requirement during VWO condition.

Estimated coal requirement for 2X660 MW power project:-

Gross Turbine Cycle heat rate – 1850 Kcal/KWh

Boiler efficiency – 87.0%

Gross calorific value of coal – 3522 Kcal/Kg (Design)

Gross calorific value of coal – 3300 Kcal/Kg (worst)

Plant load factor – 85%

Sl No.	Unit condition	Coal firing rate (TPH)		Annual Coal
		Design	Worst	6.8
1	100% TGMCR	800	850	MTPA (approx.)
2	TGVWO	836	893	
3	100% BMCR	861	920	

Note: Coal handling plant would be designed with BMCR condition using worst coal.

3.8 Raw Water Treatment

As raw water is expected to have high turbidity / suspended solids particularly during monsoon and the quality of water required for various systems in the plant is clarified water (with suspended solids less than 20 ppm), it is proposed to treat the water before being used for plant services. The pre-treatment plant will consist of 2 x 100% capacity Main clarifier (Solid contact/Lamella/Tubular type) of capacity 3750 m3/hr. Clarifier will cater to the requirements of CW make up, Fire Protection system, plant service water and DM plant. Clarified water from the clarifier will be stored in a clarified water storage tank of capacity 15000 m3 (exclusive of Fire protection reserve of 2500 m3). This tank will be divided into two compartments, one for misc. plant services and other for fire water storage. Clarified water storage tank is to be sized for 4 hours water requirement for various services.

3.8.1 Clarified Water Pump House

Clarified water pump house will be located adjacent to the clarified water storage tank and will house the following pumps:

1. Rapid Sand Gravity Filter (RGF) supply pumps (if gravity feed to RGF.is not possible).
2. Service water pumps.
3. Fire water pumps.
4. CW makes up & fills pumps.
5. Ash water make-up pumps.

The above mentioned pumps will take suction from clarified water storage tank. These pumps will be of vertical turbine /horizontal centrifugal type.

Alum dosing/Polyelectrolyte dosing equipment for the Main plant clarifiers and Chlorination dosing system for the Water treatment plant will be housed in a separate building located close to the clarified water storage tank.

3.9 Ash Handling System:

3.9.1 Bottom Ash handling System

A maximum 20% of the total ash produced by the steam generator would be collected in the water impounded, refractory lined Bottom ash hopper below the furnace as bottom ash (BA). Bottom ash would be collected in water impounded; refractory lined W-type Bottom Ash Hopper (BAH) having

four (4) outlets. With "W-type" BA hopper arrangement, all equipments will be over ground. In case due to fixed elevation of boiler seal plate these equipments cannot be placed over ground for specified storage capacity, Triple „V" type BA Hopper arrangement may also be considered and accordingly capacity of equipment below hopper needs to be distributed into three steams instead of two steams. The outlets of BAH would be provided with hydraulically operated (using air-water converter) feed gates. Each outlet would be connected to a clinker grinder and a jet pump. The BAH would have capacity to store about 8 hours of bottom ash generation. The ash from BAH would be fed to the clinker grinders where it would be reduced to (-) 25mm size. The jet pumps located below the clinker grinders would convey the crushed ash using high pressure water to the ash slurry sump and then to the dewatering bins (hydro bins) through centrifugal slurry pump and pipes. Bottom ash would be disposed by trucks after allowing ash slurry to settle in the hydro bins and decanting water from Dewatering bin decanting water is feed to the setting tank and surge tank for further used. Bottom ash can also be disposed along with Fly ash through sets of Belt conveyor by HCSD system Two sets of clinker grinders and jet pumps would be in operation once in every shift. Each jet pump would have minimum 90 TPH capacity. With help of HP water, bottom ash would be conveyed to slurry sump. Bottom ash would be cleared with 2 hr. 25 min in a shift of 8 hrs. Including line flushing. The other two sets of clinker grinders and jet pumps would serve as standby. 5% of total ash generated in economizer hopper would feed to bottom ash hopper by flushing apparatus continuously & same would be evacuated through bottom ash hopper.

Further bottom ash would be conveyed to dewatering bin in semi dry condition through trucks or by HCSD system along with fly ash. Decanted water from the dewatering bin would be recycled through settling tank & surge tank for reuse in ash plant. This water would be considered as makeup to ash slurry sump. Minimum three no‟s dewatering bins would be provided for two units.

Suitable makeup water arrangement for BAH refractory and bottom ash cooling would be provided by LP pump. The leakage in BAH area and the overflow from BAH would be collected in nearby drain sump and pumped to the ash slurry sump or to the dewatering bins.

The dewatering bins would be provided with a suitable type gate at the outlet along with vibrating feeders to load the dewatered bottom ash to trucks. Bottom ash collected in the bottom ash hopper would be conveyed to any one of the three dewatering bin by jet pumps. One bin would be in loading condition, while 2nd bin would be in decanting mode and 3rd one would be in unloading mode.

The changeover of bin would be automatic either based on time or based on level of water.

Decanted water from the dewatering bin is transferred to settling tank and then the surge tank, this water is re used. Sludge pumps would be provided to remove the sludge settled in the settling tank and the surge tank.

3.9.2 Fly Ash Handling System

The fly ash (FA) system would be designed to evacuate fly ash in dry form from fly ash hoppers using pressure-pressure type pneumatic conveying system or by vacuum-pressure type pneumatic conveying system as described below:

In case of pressure-pressure type pneumatic conveying system the fly ash collected at various hoppers would be gravity fed into individual transmitter vessels provided below each hopper. In case the level probes are mounted inside the fly ash hoppers to sense the level in the fly ash hoppers, on actuation of level probe, the inlet valve would open and allow the fly ash to be fed into individual ash transmitter vessel for predetermined time after which inlet valve will close and in case of ash transmitter vessels with the level probe mounted inside them for sensing the ash level, the ash would be unloaded into the ash transmitter vessel by opening of the inlet valve until the ash level in the vessel raises to the level of the level probe. Afterwards, the conveying compressed air would be allowed to flow by opening the air inlet valve. The fly ash would be conveyed to the main silo via intermediate silo (if required) with the help of compressed air through transport piping. The conveying air would be vented through the bag filter mounted on top of the silo in order to limit the dust concentration in the vented air below 50 mg/Nm3. Fly ash removal would be 4X68 TPH per unit & fly ash removal time would be maximum 5 hours 29 min. Compressor/Blower capacity would be design based on the maximum ash to air ratio 20:1.

Generally, the fly ash conveying system would operate continuously but with time gaps between cycles. The vessel sizes would be selected in such a way that when they are operated without any gap, the ash collected in 8 hours should be cleared in 5 hours 29 min. The fly ash removal system would be designed on a continuous basis with 10 cycles of operation per hour. The level probe would be provided in each hopper in such a way that the ash collected in the hopper would be equal to the volume of the ash transmitter vessel. There would be one (1) manually operated isolation valve (knife gate type) below each fly ash hopper, which would be used during maintenance of the ash transmitter vessel. Fly ash can also be disposed in form of high concentration slurry by HCSD system to ash disposal area.

In case of vacuum-pressure type pneumatic conveying system the fly ash would be collected in various hoppers located in the flue gas path, viz. air pre- heater (APH), electrostatic precipitator

(ESP) and AH-ESP duct hoppers. Once in a shift (8 hours) the fly ash is sequentially extracted from all hoppers, by creating vacuum in the extraction piping circuit with the help of vacuum pumps. The total ash removal system would be divided into four numbers of parallel paths having minimum 68 TPH capacities. In each path, clearance of ash from hoppers connected to common fly ash header would be done one after another. Total fly ash removal provided /unit would be 5 hours 29 min. Shifting of ash clearance cycle from one hopper to the next would be automatic and based on vacuum level. The system controls would be such that it would be possible to stop removal/ evacuation of fly ash from any hopper in case of emergency or while fine ash & coarse ash segregation required conveying the ash in to the dedicated silos (fine ash & coarse ash silo).

Vacuum required for extraction of fly ash from various hoppers of ESP and APH would be created by liquid ring type vacuum pumps of adequate capacity.

Fly ash would be collected in buffer hopper/intermediate silo while evacuation is in dry mode & further ash would be conveyed to coarse ash/ fine ash silo.

Fly ash would be disposed off in either dry / conditioned mode from silo or by HCSD system. Remote operated diverting valves would be provided for selection of the desired mode of disposal.

3.9.3 Disposal of Fly Ash & Bottom ash

Primarily bottom ash would be disposed through truck in semi dry condition & fly ash would be fully utilized.

Bottom ash would be disposed either in lean slurry form through jet pump to slurry sump and from slurry sump bottom ash would be disposed in semi dry form from Dewater bins. Further ash would be disposed through closed truck. Bottom ash can also be fed to HCSD mixing (ART) tank through belt conveyor for disposal of bottom ash after mixing with fly ash with 80:20 ratio by HCSD system.

Fly ash would be disposed either in dry form or in semi-dry form or with bottom ash through HCSD system. The disposal and utilization in dry form would be primarily adopted followed by HCSD system.

There would be three (3) fly ash storage silos, with interconnection facility provided in EIA/EMP. Each fly ash storage silo would be designed to have a storage capacity of 16 hours for both the units. The ash collected in the storage silos would be disposed primarily to ash utilization project.

High concentrated slurry disposal system from silos up to ash dyke has also been considered when fly ash utilization will not be present.

The silos for fly ash would be designed to have two discharge points each, one to dispose ash to the ash utilisation project directly by pneumatic means or second to directly load the trucks below the silos. Trucks would be utilised to dispose both bottom ash and fly ash in case of contingency to the disposal area. The ash outlets would have ash conditioners (moisture up to about 20%) for the nozzles designed to load on to trucks for disposal.

3.9.4 High Concentration Slurry Disposal System

In slurry disposal process, rotary feeders and ash conditioners of fly ash silos would feed a common belt conveyor which would in turn feed respective mixing tanks located near the fly ash silos. The bottom ash from dewatering bin and the fly ash from the fly ash silo located nearest to the bottom ash silo would be fed to a common mixing tank. Water would be fed into these mixing tanks. The quantity of water depends upon the theology of the slurry to be achieved. The resultant high concentration slurry from the mixing tanks associated with three (3) silo would be lead to three (3) high concentration slurry disposal pumps. These pumps are used to dispose high concentration slurry in to the designated slurry disposal area.

A nominal storage area of about 200 acres including ash bund area has been identified to disposal ash. This can be used progressively by creating an enclosure by bunding to create storage area. The water spray / conditioned moisture would also evaporate from the surface. In addition, arrangement for water spray would be provided in the dump area to prevent dust emission. Cut off drain along the periphery of the disposal area would be provided to prevent the water going out of the area. When the area gets filled up progressively, the same can be covered by thin layer of earth and plantation to be developed over the dump area. The available ash disposal area can accommodate only for a few years of total bottom ash and fly ash generation. However, the progressive usage of fly ash is envisaged as per CEA norms which would increase this duration of ash dumping.

3.10 Raw Materials Requirements

The annual coal requirement considering E/F grade Indian coal for 2 x 660 MW units is estimated to be about 6.8 million tonnes (MTPA) as the proposed coal for the plant would be having an average calorific value of 3522 kCal/kg and plant would operate at annual Plant load factor (PLF) of 85 %. The coal requirement for 85% PLF would be 6.8 MTPA. Coal would be made available from the Talcher

Coal fields of Mahanadi Coal Fields (MCL).

3.10.1 Raw Material Analysis

Table 3.9 Coal Analysis

Sl. No.	Description	Unit	Design Coal	Worst Coal
Proximate Analysis				
1	Fixed Carbon	%	26.0(upto 28)	23.0
2	V.M	%	22.0(Upto 24)	20.0
3	Moisture	%	10.0	12.0
4	Ash	%	42.0	45.0
5	Gross Calorific Value	K Cal/ kg	3522	3300
Ultimate Analysis				
1	Carbon	%	39.35	35.08
2	Hydrogen	%	2.61	2.34
3	Sulphur	%	0.40	0.35
4	Nitrogen	%	0.74	0.66
5	Oxygen	%	4.89	4.41
6	Moisture	%	10.00	12.0
7	Ash	%	42.0	45.0
8	Hard Grove Index	--	50	50
Ash Characteristics				
1	Ash initial deformation temp.	°C	1120-1360	1120-1360
2	HT(Hemispherical Temp.)	°C	1400	1400
3	Fusion Temp.	°C	>1400	>1400

Table 3.10 Analysis of Fuel Oils

Sl. No.	Description	Unit	Details
Heavy Furnace Oil(HFO)			
1	Flash point, min.	°C	66
2	Viscosity@ 15°C. max	Cst	370
3	Pour Point, max	°C	20
4	Ash Content by weight, max	%	0.1
5	Free water content by volume max	%	1.0
6	Sediment by weight, max	%	0.25
7	Total Sulphur by weight, max	%	4.5
8	Calcium	PPM	30.5
9	Sodium	PPM	10
10	Lead Content	PPM	0.2
11	Vanadium	PPM	40.50
12	Carbon residence	%wt	7.74
13	Approx. Gross Calorific value	Kcal/kg	10,000
14	SP gravity at 15°C	--	0.89-0.95
Light Diesel Oil(LDO)			
1	Flash Point	°C min	66
2	Pour point	°C min	12(winter) 21(Summer)
3	Density at 15°C	Kg/m³	850-870
4	Viscosity	Cst	2.5-15.7 At 40°C
5	Ash Content by weight	% max	0.02
6	Water content by volume	% max	0.25
7	Sediments by weight	% max	0.1
8	Total sulphur by weight	% max	1.8
9	Approx. gross calorific value	Kcal/kg	10,000

Resource Optimization/Recycling and Reuse Envisaged In the Project

1. **Fire Protection Facilities:** In order to combat any occurrence of fire in plant premises the following tire protection facilities have been envisaged for the various units of the plant.
2. **Portable Fire Extinguishers:** All plant units, office buildings, stores, laboratories etc will be provided with adequate number of portable fire extinguishers to be used as first aid fire appliances. The distribution and election of extinguishers will be done in accordance with the requirement of IS: 2130-92.

3. **Hydrant System:** Internal hydrants will be provided at suitable locations and at different levels inside the major plant units. Yard hydrants will be provided normally along the road and in the close vicinity of the units to meet the additional requirement of water for existing fire.
4. **Automatic Fire Detection System:** Unattended and vulnerable electrical premises like electrical control rooms, cable tunnels, MCC. Transformer rooms, switch gear rooms, etc. will be provided with automatic fire detection and alarm systems.

3.11 Water & Power Requirement with its Source

3.11.1 Water Requirement

The total water requirement is 4180 m^3/hr. as per day as per details given below.

Table.3.11 Water Requirement

Sl. No.	System Description	Water Requirement in m^3/hr
A	Water Consumption (1.1+1.2+1.3+1.4+1.5+1.6)	3677
1.1	Condenser Cooling system make-up	3302
1.2	DM Plant make-up	70
1.3	Drinking & Sanitation water for plant & colony	19
1.4	Plant Service water	164
1.5	Clarifier Sludge	120
1.6	Filter Backwash waste	2
2	Recovery from clarifier sludge	100
3	Make up to ash water(Non recovery stage of ash water) CHP emergency, cooling & Quenching etc	164
B	Net water requirement in the system (Item A- Item 2+ Item 3)	3791
C	Loss in resevoir	70
D	Total water requirement(Optimal)	3791
E	Considering exigency and margin over the net water requirement	389
Total water allocation		**4180 m^3/hr**

The water requirement will be met through **Mahanadi river** which is about 11 Km from proposed plant site. VTPL got approval from Water Resources Department of Government of Odisha.

3.11.2 Power Requirement

The requirement of construction power supply would be met from existing nearby (within 5 km) Rairakhol 33/11 KV S/S.

Quantity of Wastes to Be Generated (Liquid and Solid) and Scheme for their Management/Disposal

The principal solid wastes would be fly-ash and bottom ash apart from neutralization tank sludge, which would be dried and stored within the Plant. The fly ash and bottom ash generation would be in the range of 8000-8500 tons/day. The system to be adopted for bottom ash removal would be an intermittent jet pump system and for fly ash removal, pressure-pressure type or vacuum- pressure type pneumatic system. The fly ash would be stored in dry form in ash silos for direct evacuation of ash in trucks to prospective agencies operating in the region. However, for the fly-ash which could not be timely evacuated, provision would be kept for pumping surplus ash in high density slurry form similar to the bottom ash and stored in a dyked ash pond in a total earmarked area of 200 acres as shown in the layout. 100% ash utilization is planned to be achieved within four years of commissioning of the Plant as per the MoEF guideline. Options for ash utilization would be explored in cement making, wasteland reclamation, making embankments, roads, building materials, etc. in the region. M/s Visaka Industries Ltd would be entering into MOU with prospective cement plants and brick manufacturers and other construction agencies within 100 km distance of the proposed project for utilization of the fly ash and accordingly an action plan would be prepared for ash evacuation. Apart from this, option of filling up of abandoned mine pits would also be explored at a later stage of the Project operation.

Table. 3.12 Air Quality Environment & Management (Air Environment – Mitigation Measures)

Source of air pollution and control measures

Sl.No	SOURCES	POLLUTANTS	MITIGATIVE MEASURES
Coal Handling Section			
1.	Transfer Points/Junction House	Fugitive Dust	All transfer points will be fully enclosed with provision for access doors. Spillages will be periodically removed. Dry fog dust suppression system would be provided. Air borne dust at all transfer points will be extracted through dust extraction system to the bag filters.

3.	Belt Conveyers	Fugitive Dust	All the belt conveyers will be covered and it will be connected to Bag Filter.
4.	Weigh feeder discharge	Fugitive Dust	The weigh feeder vents will be connected to bag filters.
5.	Raw materials hoppers	Fugitive Dust	The vents of the hoppers will be connected to dust extraction system i.e. bag filter.
	Crusher House & Bunker	Fugitive Dust	dust extraction system i.e. bag filter & Bunker Ventilation System will be provided.
Power Plant			
1	Boiler	PM	ESPs would be provided to control the emissions. Dry low NOx burners(DLNB) would be installed for control of NOx.
ROADS			
1.	Internal Roads	Fugitive Dust	The internal roads will be made of Concrete/ Black topped. Manual sweeping/vacuum sweeping will be carried out regularly followed by water sprinkling.

Table 3.13 List of Pollution Control Equipments

Sr. No.	Description of item	Capital Cost (Rs in Cr)	Recurring Cost/ Annum (Rs. In Cr.)
1	Electro Static Precipitator	326	11.00
2	Stacks	115	3.00
3	Surface water management and conservation (stone pitching)	0.96	---
4	Ash handling unit	88.21	6.00
5	Ash pond dyke	86.30	2.00
6	ETP	19.18	0.50
7	Dust Suppression System	2.88	---
8	Control of Fire Explosion Hazards	29.72	1.00
9	DM Plant Waste Treatment Systems	0.96	---
10	Sewage Collection Treatment and Disposal (STP)	1.92	0.05

11	Environmental Lab Equipment and online monitoring equipments	1.92	0.02
12	Green Belt	1.92	---
	Total	**675.00**	**23.57**

3.12 Liquid & Solid Waste Generation & Management

3.12.1 Waste Water Generation and Treatment

Water would be required for steam generation and condenser cooling purpose. The hot water would be taken to cooling towers and after cooling it would be recycled back for condenser cooling. The cooling tower blow down would be taken to Common Monitoring Basin (CMB).

DM plant regeneration waste water would be taken to neutralization pit and then to Common Monitoring Basin. Boiler blow down would be taken to CMB. The quality of water from CMB would be checked and then it would be used for coal dust suppression and ash handling. Run-off water generated from coal stockyard would be collected in sump followed by settling tank where the coal dust particulates would be separated out and clear water would be stored in surface impoundments for reuse within the plant. The water used for ash conveying to ash pond would be recycled back after solids settling in the ash pond. No waste water would be discharged outside the plant premises.

The plant sanitary waste water including canteen effluent would be treated in a sewage treatment plant for separation of floating oil and reduction of BOD and the treated effluent would be partly used for plant greeneries, road washing etc. and the balance would be taken to the pond.

The storm water drain would be provided with sedimentation pits and oil-water interceptors. The storm water would be harvested in the rainwater harvesting pond and surplus water overflow would be discharged into nearby nalla.

Figure-3.7 Water Balance Diagram

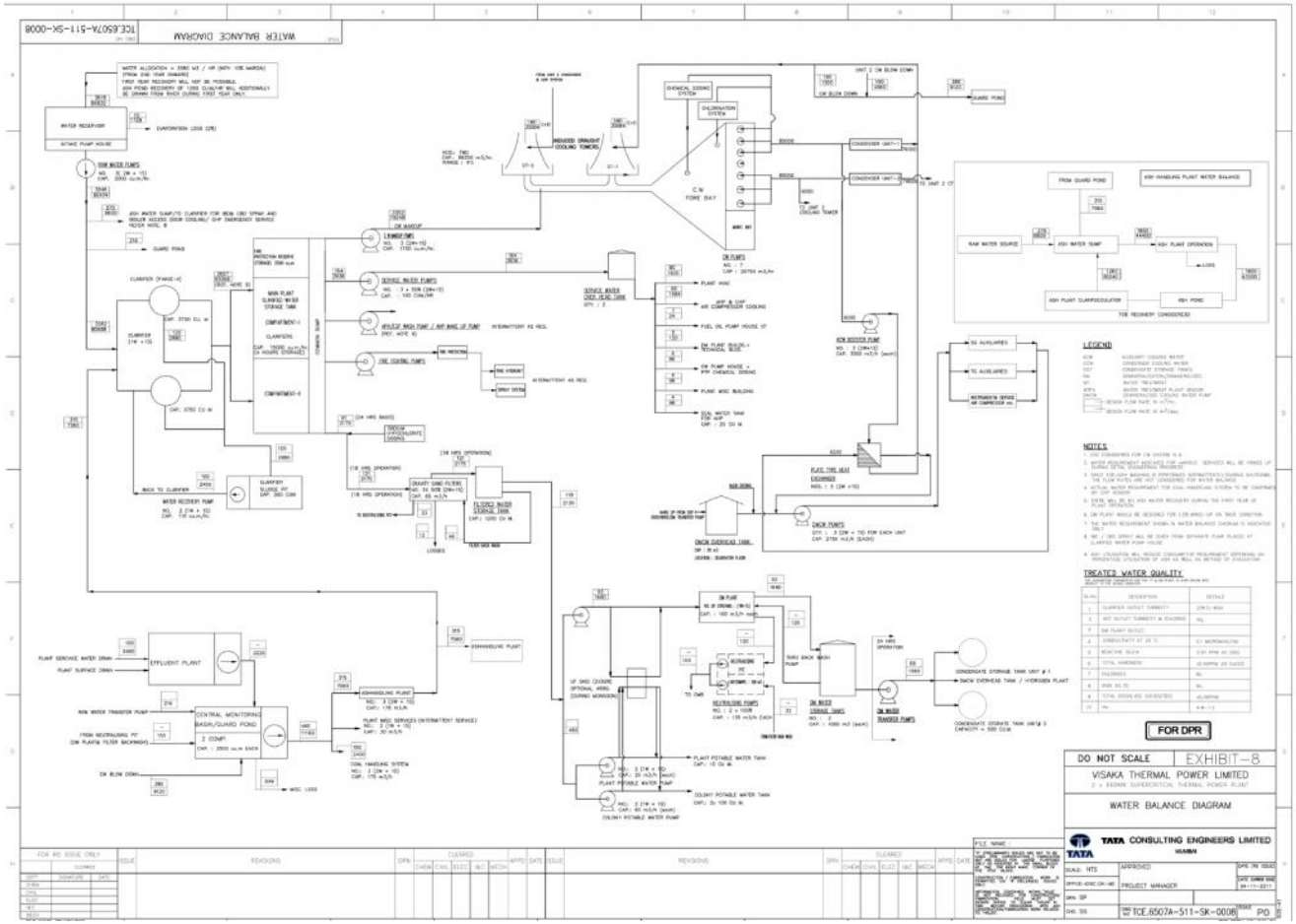
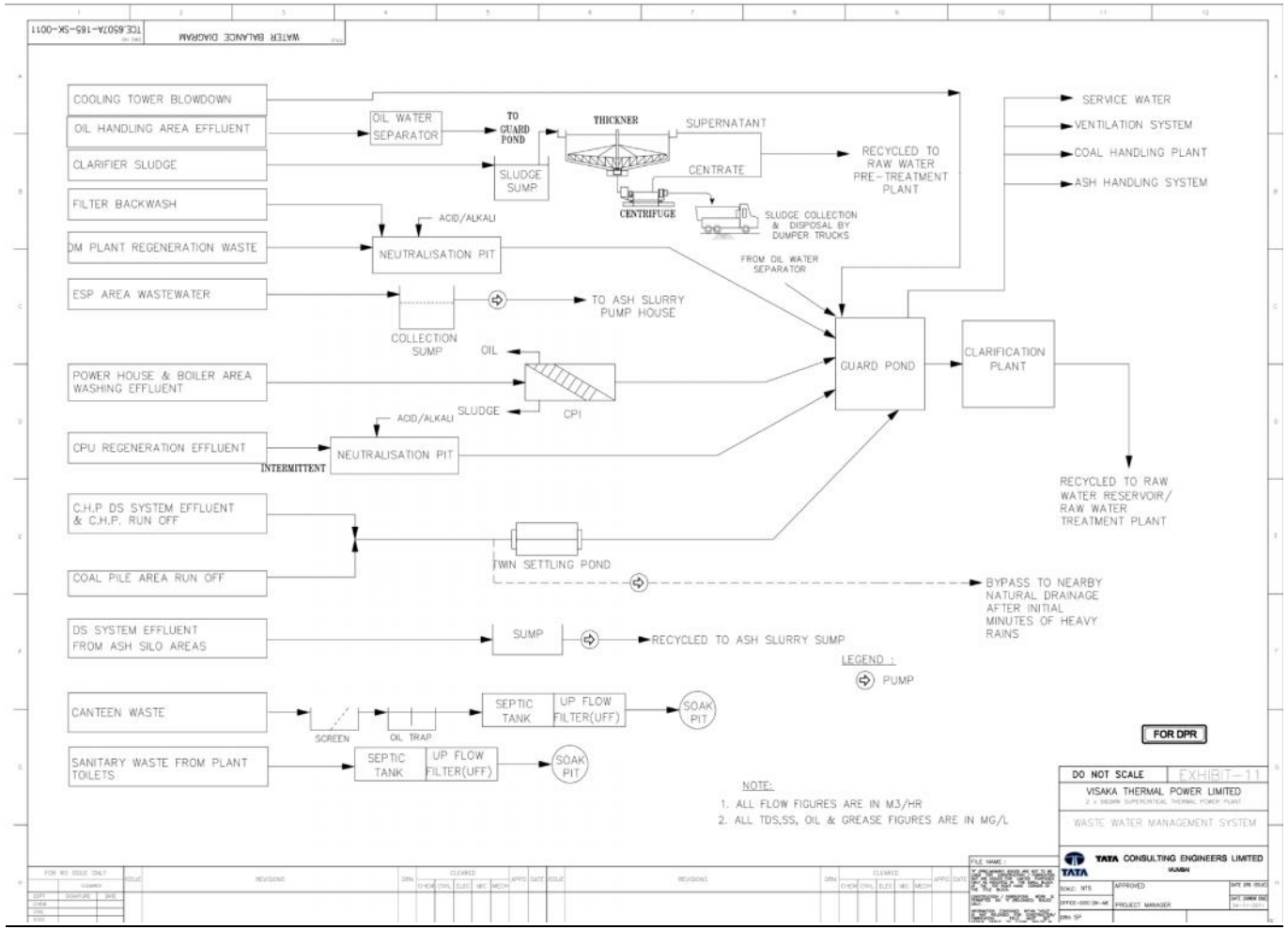


Figure 3.8 Waste Water management System



3.12.2 Solid Waste Generation and Utilization

No hazardous waste will be generated either in the process or pollution control facilities. Dust collected from air pollution control equipment will be 100% recycled in the process and there will be no solid wastes in the plant. Sludge from settling tank of water treatment plant will be used as manure for greenbelt development. All domestic waste will be routed to septic tank and then to soak pit.

Waste oil in small quantities will be generated from gear box and other machineries and will be disposed off to authorized recyclers registered with Pollution Control Board.

Table 3.14 Solid Waste Generation & Management

Sl. No.	Source of Generation	Maximum Quantity (Domestic Coal)	Maximum Quantity (Imported Coal)	Management Plan
1	Fly Ash	2.20 MTPA	0.42 MTPA	Will be sent to cement industries/Brick industries/ Fly Ash aggregate making industry/Road making
2	Bottom Ash	0.56 MTA	0.11 MTPA	

3.13 Noise Levels

The noise generation from the power plant can be broadly categorized into two type's viz. Area and Point sources. All the equipment used can be categorized as point sources and the vehicular traffic movement can be treated as area source. All the equipment is designed to comply with the International Norms, Rules and Stipulations on not exceed 75 dB (A).

All these noise generating equipment will be within the buildings and the presence of workers at these equipment is either not required or Intermittent. People required for intermittent work near high noise generating equipment will be provided with earplugs and their working hours in these areas will be regulated.

The noise levels at the periphery of the plant will be well within the stipulated norms of noise pollution.

3.14 Green Belt Development

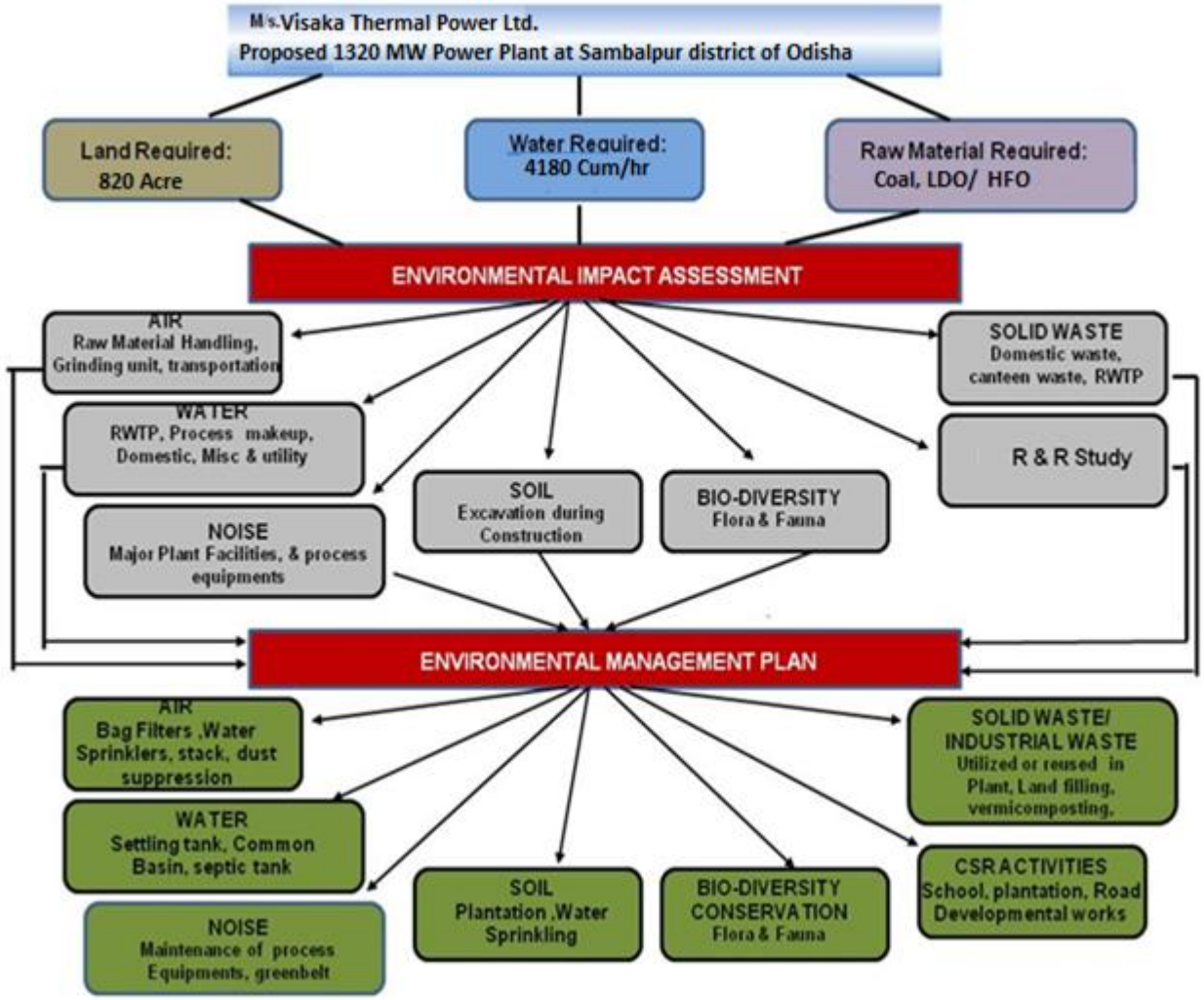
A greenbelt development plan will be prepared and implemented along with the project.

The main objective of the greenbelt is to provide a barrier between the plant and the surrounding areas. The greenbelt helps to capture the fugitive emissions and to attenuate the noise generated in the plant apart from improving the aesthetics of the plant site.

The Greenbelt will be adequately sized and will have a suitable density so as to mitigate the effects of emissions from the plant. The treated effluents from the plants will be utilized for the greenbelt development.

The landscaping of the plant will be carried out. Roads for vehicular movement will be paved and adequate mitigation measures will be provided to prevent fugitive emissions.

Figure 3.9 Schematic Representations of the Feasibility Drawing Which Give Information of EIA Purpose.



CHAPTER-04

SITE ANALYSIS

4.1 General

Visaka Thermal Power Ltd. has proposed to setup a 1320 MW (2X660 MW) Coal based Supercritical Thermal Power Plant at: Dimirimunda, Samasingha and Dimirimunda villages, Rairakhol Tahasil, Sambalpur district of State Odisha.

4.2 Connectivity

Selection of the site for any project is the most important aspect for its successful operation & better economic viability. Proximity to raw material source, assured supply of fuel and other infrastructural support are required to be essential examined while selecting the site of the plant. The following basic requirements are necessarily required to be fulfilled.

1. Easy & nearer access to raw material.
2. Availability of water from continuous source
3. Power supply/evacuation arrangement
4. Nearer access through road.

The above site has the following preliminary advantages.

1. Water is available nearer to the site throughout the year.
2. The site is already well connected with Road as well as Rail. Thus the approach is excellent
3. Power is available nearer to the site throughout the year.
4. Soil condition of the site is also favorable

Topography

The topography of the land is flat without undulations.

4.3 Existing Land Use Pattern

The present use is mostly flat.

Rail Linkage

The nearest railway station Rairakhol road is around 8 km away from project site. Talcher coal field is around 105 Kms from the proposed power plant site and is connected through the railway link to the railway Rairakhol Road station on South Eastern Railways. Necessary railway siding and allied infrastructure will be provided for transportation of coal from Rairakhol to project site.

Port

The Paradeep port is the nearest port for this plant site, which is about 300 km away, capable of berthing large sized vessels.

4.4 Existing Infrastructure

Over 85% are non-agriculture land and remaining is single crop land of total Present land use.

4.5 Climate Data

Temperature

The climate of Sambalpur district is normal. All the seasons come in the district. May month is usually the hottest with daily maximum of 46°C and mean daily on yearly basis is 11 °C. December is the coldest month with mean daily minimum of 11 °C. Overall, the climate of the district is neither hotter nor cooler.

Rainfall

More than 75 percent of the annual rainfall occurs during monsoon in the period from June to October. Average annual rainfall is 1451.2 mm.

CHAPTER – 05

PLANNING BRIEF

5.1 Planning Concept

5.1.1 Technical Concept

This technical concept indicates the plant capacity, size and type of main machinery, storages, design of systems, plant layout, flow sheets etc. It covers process, mechanical, electrical, instrumentation and civil engineering aspects. The concept has considered quality, pollution control, operation, maintenance and utility services.

5.1.2 Power to be produced

Electric power of total 1320 MW will be generated which will be evacuated through 400 kV transmission network to the Odisha Grid.

5.1.3 Human Resources

Human Resource is the most valuable asset in any industry. The accelerating pace of technology advancement and fierce competition in the market has led to the increasing importance of human resources. Continuous skill updation of the existing human resources and generating new talents in consonance with the needs of the industry are vital for the progress of the industry. The human resource requirement for the project, organization structure and HR Strategies for success of the project is hereby defined.

5.1.4 Organization Structure

An organization structure has been developed for the management of the Project. The project will be headed by Managing Director who will be the overall in charge and Project will be implemented by experienced Project Leader with a core team having extensive experience in thermal power plant execution and operation. The entire project activities have been divided into four broad functions,

1. Project Design, Engineering and coordination
2. Project Execution and site management.
3. Project commercial services
4. Project financial services

Each of the above functions is headed by a Functional Head having substantial exposure and experience in management of large thermal power projects.

5.2 Project Engineering

The basic engineering of the project will be done with in house resources for which an organization structure has already been put in place. The Detailed Engineering for the project will be done with the help of experienced Designers and Consultants in the following areas

1. Environmental Impact assessment.
2. Geo Technical Soil Investigations and site survey
3. Civil Structural Design
4. Mechanical Plant Design
5. Electrical and Instrumentation Systems Design.

5.2.1 Project Conceptualization

This would consist of formulating the project, defining the project objectives and scope, examining the preliminary feasibility with respect to markets, location, infrastructure, environmental conditions and aspects, social infrastructure etc.

5.2.2 Project Planning

Preparing overall plans and schedules and identifying resources requirement for various activities related to the project

5.2.3 Budgeting

This activity entails working out a detailed budget for the defined project scope, taking necessary approvals and sanctions as per company's policies, and controlling all activities, to ensure that the project is completed within the sanctioned budget amount.

5.2.4 Procurement

The procurement function would consist of developing detailed specifications for the required plant, machinery and equipment and services, evaluation of bids, coordination with bidders and provide support for finalization of contract.

5.2.5 Design and Engineering

This function starts with the selection of consultants, development of basic engineering, concepts, plant layout, general arrangement drawings and floor plans, civil design of structures, mechanical and electrical designs etc.

5.2.6 Project Execution

This activity will consist of developing specifications for site works related to civil mechanical, electrical and other installation work, tendering activities and evaluation and selection of various contractors, and developing works contract.

5.2.7 Coordination with Site Management

Coordination with site management shall be done on regular and ongoing basis, to ensure continuous flow of construction drawings and interactions with consultants and suppliers

5.2.8 Overall Time and Cost control

Develop and implement management reporting system, periodic review of the project schedule and other objectives and initiate preventive and corrective action.

5.2.9 Project Site Management

The organization for the site management function will be headed by a Project Manager who will be overall responsible for all the site functions. The technical functions will be divided into three groups i.e. Civil, Mechanical and Electrical and Instrumentation each headed by highly experienced Personnel and assisted by a group of Engineers and Supervisors.

Personnel for highly specialized nature of work will be drawn from the supplier of respective equipment. It is also proposed to deploy experienced personnel from power plant Operations during the project implementation so as to facilitate the transition from project to operations phase.

A separate team of commissioning Engineers will be deployed who would eventually be responsible for the operation of the plant. The Project Manager will also be assisted with adequate numbers of personnel for materials management, accounting and administration functions. The materials management function will be responsible for Receipt, Storage and issue of various plant and machinery. The administration function will be responsible for Safety, HR&IR, Liaoning and Security.

5.2.10 Commercial and Financial Services

The Procurement and Logistics functions will be carried out with the help of in-house resources.

The commercial functions will comprise of a) Procurement and Ordering. b) Inspection and Expediting and c) Logistics management.

5.2.11 Financial Services

The Financial functions will be carried out with the help of in-house resources. The finance functions will comprise of a) Project Financing b) Accounting and control.

5.3 Organizational Structure for Operational Phase

The organizational structure that would be required for the Plant operations has been given due consideration. The total man power requirement for the project will be 2100-4100 during construction phase, out of which 2000-4000 will be the workers for security, cleaning, packing and loading, material handling etc. The total requirement of manpower including management staff and workmen for complete operations and maintenance of the power plant unit will be about 450. The manpower requirement has been planned keeping in view the following:

- Smooth & efficient running of the plant with optimum manpower.
- Capacity utilization with optimum energy consumption.
- Effective coordination
- Rational distribution of responsibilities
- The organizational development would be started from the project phase itself as those involved with the project would also be trained for Operations.

5.3. Training

The training, be it induction training or on the job training for skill up-gradation, will be given due importance. The sources for training will be

1. Main machinery suppliers
2. In house training programs
3. On the job Training

CHAPTER – 06

PROPOSED INFRASTRUCTURE

6.1 Industrial Area

The setting up of the 1320(2X 660MW) coal based supercritical thermal power plant with two super critical units, their auxiliary equipment, raw material storage areas, electrical power receiving substation, and administrative buildings will require about 821 Acre of land. The proposed plant shall be located at- Villages Dimirimunda, Samasingha, & Mahulamunda, Tehsil- Rairakhol, District- Sambalpur, Odisha.

6.2 Residential Area

The area around the site is under development with reasonably good communication facilities. Other social infrastructure like Housing, Schooling and Medical facilities are being developed and will be available when the plant becomes operational. Residential colony over 25.00 Acre is envisaged for employees.

6.3 Green Belt

A greenbelt development plan will be prepared and implemented along with the project. Total green belt area shall be of 271 Acre. The main objective of the greenbelt is to provide a barrier between the plant and the surrounding areas.

Comprehensive greenbelt/plantation program will be undertaken in and around the project. The species selection will depend upon crown shape, surface of bark and leaves, flower, color, capacity of growth in the wide variations of ecological conditions etc. A mixture of soil should be prepared by mixing commercial fertilizer, cow dung, BHC powder in the topsoil.

6.4 Social Infrastructure

Over the past decade Emami Group have earned the trust of local community through community service in the areas of healthcare, education and infrastructural development. Some glimpses of the developmental activities are presented below:

Primary Education & Sports

1. Sponsorship to the bright students studying at nearby villages
2. Infrastructural Development at nearby schools
3. Sponsored the state level players in various sports

Health Care

1. Have provided vital medical care equipments and infrastructure at its mines and plants and units
2. Health Camps are organised in villages for providing basic medical care and also create awareness about hygiene and methods for prevention of diseases explained.

Infrastructure Development

1. Construction of toilets in schools
2. Excavation and digging of water tank/ Tube well
3. Construction of concrete roads is underway
4. Construction of boundary wall for the school
5. Providing water supply to the nearby villages

Safety and Environment

1. Strong team of medical personnel
2. Implements regular safety training sessions for employees and contract labour
3. Posters displaying the incorporation of safety measures
4. Introduced plantation drive to improve greenery in industrial region

6.5 Connectivity

Proposed project is well connected to NH-42 and also has rail connectivity to the important areas of Odisha from Rairakhol. Existing road and rail network will be utilized for raw material and final products transportation. However, existing road network will be strengthened.

6.6 Drinking Water Management

Drinking water facilities will be provided for employees as well as nearby villagers. A fresh water tank will be constructed for this drinking purpose.

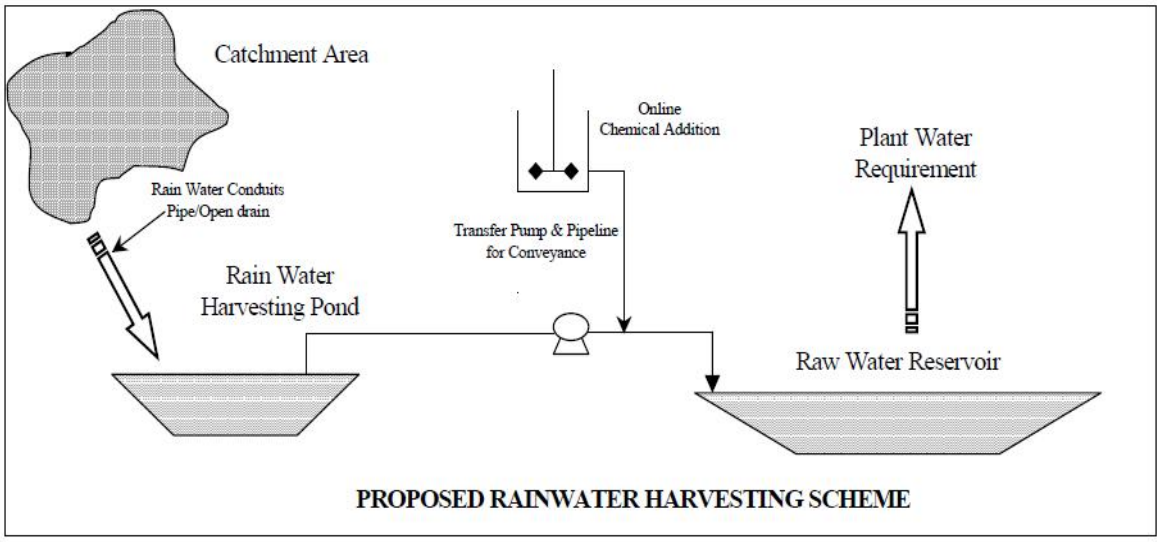
6.7 Sewerage System

A garland drain around the plant is envisaged to collect surface run-off during rainy season. Internal drainage system will be constructed to collect domestic and industrial effluent. A common basin will be constructed for the treatment of effluents the plant.

6.7.1 Run-off Management

The rain water collected from the roof of buildings will be channelized through drains around the buildings and will be recharged into the ground by providing recharging pits. Overflow, if any, will be discharged to the nearby plant drainage. Also one rain water collection pond has been considered in the layout. All the plant storm water drains will be routed to the rain water collection pond and overflow, if any, from the pond will be discharged to any existing natural outfall outside the plant area. The rain water collection pond will be unlined.

A Rain Water Harvesting Pond has been contemplated to act as collection basin for rainwater. The collected water will be 100% reused in the raw water reservoir in dry season. The pond will be located at the lowest area of the plant so that it can effectively collect all the rainwater by gravity. The Tank shall be earthen. The pond will be lined at the bottom and sides with two layers of HDPE lining of appropriate thickness to prevent percolation of the harvested rainwater in to the ground. Figure below depicts schematically the proposed rainwater harvesting scheme for the proposed plant. The Rain Water Harvesting Pond is depicted below:



Proposed Rainwater Harvesting Scheme

Garland drain will be provided around raw material stock pile area. The run-off collected from these areas will be treated in adequate settling pond and will be taken to rain water harvesting pond.

Suitable pump house will be installed adjacent to the rain water collection pond so that the settled water from the collection pond can be pumped and supplied to the plant for meeting some of the daily requirement.

6.8 Solid Waste Management

The principal solid wastes would be fly-ash and bottom ash apart from neutralization tank sludge, which would be dried and stored within the Plant. The fly ash and bottom ash generation would be in the range of 8000-8500 tons/day. The system to be adopted for bottom ash removal would be an intermittent jet pump system and for fly ash removal, pressure-pressure type or vacuum- pressure type pneumatic system. The fly ash would be stored in dry form in ash silos for direct evacuation of ash in trucks to prospective agencies operating in the region. However, for the fly-ash which could not be timely evacuated, provision would be kept for pumping surplus ash in high density slurry from similar ti the bottom ash and stored in a dyked ash pond in a total earmarked area of 225 Acre as shown in the layout. 100% ash utilization is planned to be achieved within four years of commissioning of the Plant as per the MoEF guideline. Options for ash utilization would be explored in cement making, wasteland reclamation, making embankments, roads, building materials, etc. in the region. M/s VTPL would be entering into MOU with prospective cement plants and brick manufacturers and other construction agencies within 100 km distance of the proposed project for utilization of the fly ash and accordingly an action plan would be prepared for ash evacuation. Apart from this, option of filling up of abandoned mine pits would also be explored at a later stage of the Project operation.

CHAPTER – 07

REHABILITATION AND RESETTLEMENT (R & R) PLAN

M/s Visaka Thermal Power Pvt. Ltd. will adopt the R & R policy of the Govt. of Odisha, 2006. Three villages are coming under the project site. There are about 101 families who will be displaced from the 3 villages and Visaka Thermal Power Ltd. will resettle them in the adjacent areas nearer to the project site. Basic amenities will be made available to them in the new places like drinking water facility, proper sanitation, roads, medical facilities, school & college, parks etc. will also be provided.

CHAPTER – 08

PROJECT SCHEDULE & COST ESTIMATES

8.1 Project Schedule

In the power plant industry, any one of the following three alternate modes of project execution is adopted:

1. Turnkey
2. Semi Turnkey
3. Packaged procurement mode

In the turnkey mode, there is one implementing agency for the project having the total responsibility. Hence, the project cost is the highest and at the same time, control on timely execution is also high. The project cost is minimum in the last mode, also known as shopping mode, where different items (major machinery or auxiliary; clubbed section wise or type wise) of the project form the different packages, which are considered for procurement. Thus control on timely execution is lowest. The semi turnkey mode falls in between the above two modes, having 4 to 6 packages for procurement and construction & erection and is therefore the most preferred mode.

Based on the consideration of cost and time, the package procurement mode will be followed, by clubbing various activities to the extent possible.

Planning of Activities

Careful planning of all the activities is one of the pre-requisite for timely completion of the project. Following activities will be given special attention

Pre Project Activities

1. Management Approvals.
2. Selection of location
3. Land acquisitions
4. Statutory Clearances
5. Financial Approvals and Tie ups.
6. Selection of Consultants

7. Conceptual Design
8. Preparation of main machinery tender
9. Evaluation of tenders

Project Activities (Implementation Stage)

1. Firm up basic design
2. Main Machinery Order placement
3. Detailed engineering of the project
4. Statutory approvals of Building Plans.
5. Preparation of Tender, Evaluation of tenders received and Order placement for balance machinery
6. Completion of procurement activities on time
7. Release of civil drawing for civil construction
8. Civil construction
9. Supply of mechanical & electrical equipment
10. Inspection of major machinery at supplier's works
11. Erection of all plant & machinery
12. Commissioning of the plant

Statutory Clearances

The proposed project will require various statutory approvals and clearances from various authorities of The Government. Some of these will be required before start of the construction activities, while others would be required during the course of execution of the project and upon completion of the project before commencing operations. A list of Plan sanction authorities is as given in However other clearances, if any required shall be identified in due course and necessary action will be taken to obtain the same.

Project Schedule

The commissioning of the plant is 24 months from ordering of main machinery. A Bar Chart with duration showing the main activities for the implementation of the project is attached. Following activities have been considered.

TABLE - 8.1 Project Schedule

Sl. No.	ACTIVITY	DURATION (Months)
1	Appointment of Consultant, Basic engineering and issue of tender enquiries	2
2	Main machinery order placement	6
3	Detail engineering, Mechanical	6
4	Detail engineering, Electrical & Instrumentation	6
5	Civil design	12
6	Civil construction	18
7	Equipment delivery	18
8	Mechanical erection	8
9	Electrical, Instrumentation and Automation-	6
10	Trial runs and Commissioning	2

The external agencies such as consultant, machinery suppliers, contractors of civil construction and equipment will be selected carefully well in advance. An effective project team has been formulated with an experienced Project Manager as its leader.

Strategies for Timely Execution of the Project

The following strategies would be adopted for smooth functioning as well as timely execution of the project:

1. The task of implementing the project in time shall be achieved be ensuring a well coordinated project implementation task force in- house and from external agencies.
2. A well chosen team of experienced personnel for project execution shall coordinate the implementation of the project from in-house.
3. Experienced engineering consultants with proven track records shall be selected for detailed engineering of the project.
4. Reputed and experienced contractors with adequate resources of finance, men, material and

tools and tackles, will be engaged for execution of the construction and erection work.

5. Effective project monitoring including project planning schedule and monitoring shall be employed in this project. Timely execution and resources will be monitored using computer base project monitoring tools. In case of deviations in project progress, all possible corrective actions such as crashing of network etc. will be carried out.

Effective monitoring and reporting procedure for review of progress and coordination among various agencies shall be used. At least a monthly coordination meeting, if not earlier, shall be held to closely monitor the project and take corrective action as required. The schedule may vary depending on the project status.

8.2 Project Cost

The total project cost including IDC, financing charges is estimated at Rs. 7616.24 Cr (Rs. 5.7699 Cr/MW) for the 1320 MW capacity.

Table 8.2 Project Cost

Estimated Cost Of The Project		
S.no	**Particulars**	**Estimated cost in Rs. Cr**
1	Preliminary investigation	0.7
2	Land Acquisition & Site Development	116.25
3	Steam & Turbine Generator island including Taxes & Duties	3363.59
4	Balance of Plant(Mechanical + Electrical and I & C)	1149.00
5	External Water Supply System	85.52
6	Inplant rail (Mechancial) transportation system + Outside plant rail system.	44.2
7	Initial Spares	91.58
8	Civil & Structural Works	872.15
9	Erection, testing & Commissioning	350.89
10	Freight, Taxes & Duties	304.23
11	Contingency	60.43
12	Pre operative expenses	160.20
13	Design, Engg & Inspection etc	32.01
14	Start up fuel	71.00
15	Legal Expenses	5.18
16	Security, Audit & Accounts etc.	1.92
17	Construction Insurance	11.44
18	Finance Cost	18.81
19	IDC	877.50
TOTAL		**7616.24 Cr**

Table 8.3 Cost of Pollution control Equipment

Sr. No.	Description of item	Capital Cost (Rs in Cr)	Re-Curring Cost/ Annum (Rs. In Cr)
1	Electro Static Precipitator	326	11.00
2	Stacks	115	3.00
3	Surface water management and conservation (stone pitching)	0.96	---
4	Ash handling unit	88.21	6.00
5	Ash pond dyke	86.30	2.00
6	ETP	19.18	0.50
7	Dust Suppression System	2.88	---
8	Control of Fire Explosion Hazards	29.72	1.00
9	DM Plant Waste Treatment Systems	0.96	---
10	Sewage Collection Treatment and Disposal (STP)	1.92	0.05
11	Environmental Lab Equipment and online monitoring equipments	1.92	0.02
12	Green Belt	1.92	---
	Total	**675.00**	**23.57**

CHAPTER – 09

ANALYSIS OF PROPOSAL

9.1 Financial and Social Benefits

9.1.1 Improvements in the Physical Infrastructure

M/s. Visaka Thermal Power Limited has envisaged a lot of infrastructure developmental works in the periphery area.

1. Improving and building road network in the adjoining villages.
2. Strengthening School buildings with playgrounds.
3. Providing the Drinking Water Facilities.

Improvements in the Social Infrastructure

1. Social awareness programme will further improve by the local authority such as sanitation and hygiene, HIV Prevention Program.
2. Through this project, adult education and female education will be provided to the illiterate adults and backward females of the villages in the project surrounding area. Sponsor the education to Poor Students of the Proposed Area
3. The proposed project will set up training centre or tie up with Industrial Technical Institutes to educate local youth as skilled labour.
4. Provide & conduct the Free Eye & Health Check up Programmes

9.1.2 Employment

The project is going to create substantial employment and income. Due to this project activity, some person in the project area will be recruited as skilled, semi skilled and unskilled workers by the company as per its policy. Therefore, substantial amount of employment and income is likely to be generated for the local people. So, the project will contribute in a positive manner towards direct employment in the project area. Some employment potential benefits are given below:

1. Expected to employ a peak workforce of about 258 persons (peak demand) and 200 persons (average demand) during construction phase.
2. Long term employment of up to 58 people in the operation of the proposed plant apart from contract labours.

3. Plus additional jobs generated by local business in the supply of raw materials, finished products and services.

9.2 Other Benefits

1. Development of the local area in terms of an enlarged market will provide the farmers with a good outlet of their agricultural products to enjoy the price effect, which is likely to be strong enough to offset the impending local inflations through real-balance effect.
2. Besides above, indirect benefits shall also occur to the region by way of increase in industrial production.

Relief

1. Operation and Treatment Expenses for Poor People referred By Authenticated Organizations.
2. Extend Required Help to Different Seva Trusts at the Time of Natural Calamity.

Thus, the proposed project will usher in the social and economic upliftment of the persons living in the vicinity of the Project i.e. of society at large.