PREFEASIBILITY REPORT

CHAPTER – I

EXECUTIVE SUMMARY

M/s.Yeshwanth Industrial Infrastructure Projects Pvt. Ltd. proposes to establish a 6 x 660 MW thermal power plant based on imported coal in three phases with each phase having a capacity 2 x 660MW at Vempadu and surrounding villages in Nakkapalli mandal of Visakhapatnam district.

The imperative need of the project is assessed and arrived at from the energy scenario at the National level and at the State level in the new State of Andhra Pradesh. This is a project being established in the private sector to bridge the gap / deficit to meet the 12^{th} plan targets enunciated by the Govt. of India and the State Government.

The project proponents have assessed various sites in the Visakhapatnam and Srikakulam districts and have arrived at the site in Nakkapalli mandal as an appropriate site for the project with the approval of the Expert Appraisal Committee.

Project site

The following sites have been considered by the Expert Appraisal Committee of the MOEF, GOI and selected the site at Vempadu village in Nakkapalli mandal of Visakhapatnam district.

- Site of 1000.00 acres located in DL puram village, Nakkapalli mandal informed as available by APIIC
- Site of 1800.00acres located west of Mutyalammapalem creek in Parawada mandal of Visakhapatnam district.
- Site of 2500.00acres located a north of Dondugullapalem and south of Tekkali in Srikakulam district.
- Site of 600.00 acres located east of coastal road in Ijjuvaram village of Srikakulam district.
- Site of 1800.00 acres located in DL Puram village of Nakkapalli mandal in Visakhapatnam district as earmarked by APIIC.
- Site of 2000.00acres located South of Tekkali of Srikakulam district.

The extract of the satellite imagery and the Survey of India sheets as well as the locational aspects of the project site are enclosed.

The project envisages establishment of 6 x 660 MW power project in three phases. The estimated cost is around 17820 crores for the 3 phases and the coastal and offshore infrastructure would require another 450.00crores for construction of jetty intake and outfalls. The total capital expenditure on the project would be 18270 crores.

Project Descriptions with process details

Layout of the power plant has been optimized considering the space requirements of all the equipment, systems, buildings and structures, coal storage area, ash silos, start-up

fuel oil tanks and pump house, water treatment plant, cooling tower, cooling water pump house, 400 KV & 230 KV switchyards etc for each phase of 2X660 MW plant. Necessary plant drainage system would be provided at the proposed power plant site. In laying out various facilities, consideration has been given to the following general aspects:

- *Provision to install 2x660 MW units in each phase including cooling towers and 400 KV &230 KV switchyards;*
- *Coal storage yard for 75 days requirement at site for 3960 MW units;*
- *Ash silos for fly ash and ash pond area for the total 3 phases.*
- *Water treatment facilities for the 3 phases and*
- *Availability of adequate space for fabrication / storage of construction equipment and materials.*

TECHNOLOGY	*Phase I Details*	*Phase II Details*	*Phase III Details*
Capacity (MWe)	*1320 MW*	*1320 MW*	*1320 MW*
Steam Generators	*2 x 2016tph*	*2 x 2016 tph*	*2 x 2016 tph*
Steam Turbine – Capacity, (MW)	*2 x 660*	*2 x 660*	*2 x 660*
Type of cooling	*Closed circuit with cooling towers*		
Fuel	*100% imported coal*		
Fuel consumption	*4.53 mtpa computed at 85% PLF for each phase*		
Type of Boilers	*Pulverised coal supercritical technology*		

The land requirement for the project has been estimated at 2563.00acres.

A total quantity of 209,800 m^3/day of sea water would be drawn from Bay of Bengal and fresh water component of 9072 m^3/day would be through desalination for each phase of 2 x 660MW.

WATER	***Phase I***	***Phase II***	***Phase III***
Source of Water	*Bay of Bengal*	*Bay of Bengal*	*Bay of Bengal*
Water Consumption (m3/d.)	*209800*	*209800*	*209800*
	Desalination plant will be installed to meet the fresh water requirement		

Coal consumption for each phase of 2 x 660MW will be about 4.53mtpa based on 85% PLF. The required infrastructure comprises of the various units technical and otherwise in the project site, the colony for the operational staff, the Environment Management aspect and the green belt.

The Coastal and Offshore infrastructure include construction and development of dedicated jetty for import of coal for the project as well as for the intake of sea water for the cooling towers and discharge of water in the outfall.

The total cost of the project is envisaged at 17820.00crores for the three phases with each phase having 2 x 660MW. With the addition of coastal infrastructure, the project cost would come to 18270.00crores.

CHAPTER – II

INTRODUCTION & BACKGROUND INFORMATION

M/s.Yeshwanth Industrial Infrastructure Projects Pvt. Ltd. proposes to establish a 6 x 660 MW thermal power plant based on imported coal in three phases with each phase having a capacity 2 x 660MW at Vempadu and surrounding villages in Nakkapalli mandal of Visakhapatnam district.

Project Proponents

The company is represented by Mr.P. Ramesh Babu, Chairman & Managing Director. He is a Post-graduate Technocrat, started his career in the year 1984 with Cheminor Drugs Ltd. His innovative skills and methodological approaches in R & D made him an

expert in developing and implementing cost effective processes and had hands on experience of achieving FDA.

His vision and dedicated approach over the years is very instrumental in expanding and introducing new series of API's under various health segments. Even today Mr. Ramesh Babu works very closely in providing driving leadership to the R & D Center and guides in developing cost effective processes for new API's. Mr.Ramesh Babu also played pivotal roles in the development of AP pharma industry.

SMS Pharmaceuticals was originally started by Mr. K G Suggula in the year 1987. The current promoter's viz. Mr. P Ramesh Babu and Mr. TVVSN Murthy acquired the Company in the year 1990 and almost immediately turned it around into to a profit making company with sheer technical skills and change of product mix basing on the market demand. SMS has now grown into a multi-location multi-product Company with 450 employees on rolls and 4 facilities and a full-fledged Research.

BRIEF DESCRIPTION OF THE NATURE OF THE PROJECT

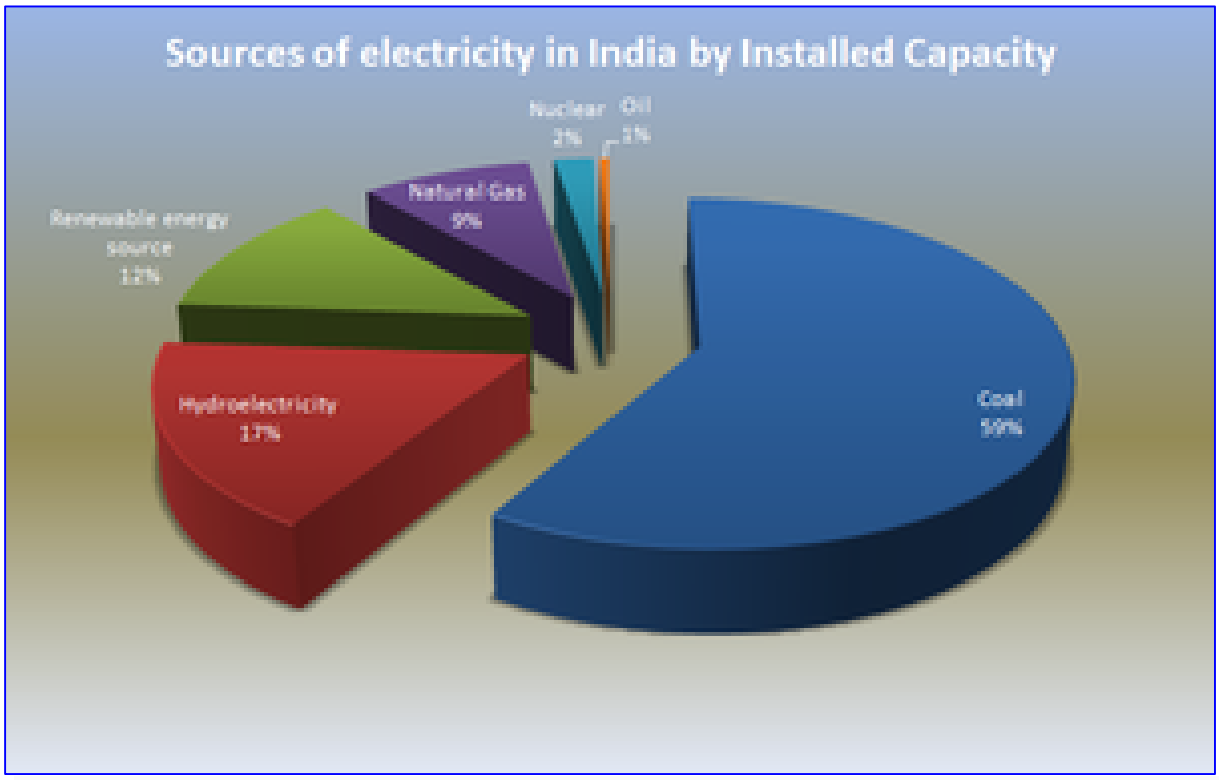
The proposed project is a thermal power plant based on super critical technology of 6 x 660MW capacity to be developed in three phases of 2 x660MW in each phase. Imported coal from Indonesia and Australia is proposed to be unloaded at a dedicated jetty or alternatively from nearby Kumarapauram port (approved by the MOEF) and transferred to the coal yard in the project site by closed conveyor. The water requirement is met from Bay of Bengal and the water supply to the plant site is drawn from the sea for the cooling water requirement. The plant water is from the desalination plant. All the environmental considerations and concerns would be addressed in the coastal and offshore sector as well as in the terrestrial sector.

The source of sea water for desalination plant would be from the dedicated jetty South of DL Puram on the coast line

Need of the Project and it's important to the country

Any development requires electricity to support it. Capacity addition in the existing conventional power generation plants might not be the solution. We need fuel to run

them. The Government of India has started promoting increasing use of renewable energy in the total energy mix. Renewable energy cannot solve this issue completely but can surely help to overcome it.



Sources of electricity in India by Installed Capacity as of 2013

The country currently suffers from a major shortage of electricity generation capacity, even though it is the world's fourth largest energy consumer after United States, China and Russia.

The International Energy Agency estimates India will add between 600 GW to 1200 GW of additional new power generation capacity before 2050.[10] This added new capacity is equivalent to the 740 GW of total power generation capacity of European Union (EU-27) in 2005.

According to some ambitious estimates, India has 10,600 MW of potential in the geothermal provinces but it still needs to be exploited. The growth capacity is as follows.

With various stages of implementation of various projects, a capacity addition of 44600 MW is required from other identified projects.

While efforts are being made to develop maximum capacity through central power sector undertakings, there would be requirement to create large capacity additions through private sector.

Though there is full effort at state level so far to develop power projects through private sector under competitive bidding route, there is need to develop large capacity projects at national level to meet the requirements of number of states under the competitive bidding guidelines dispensation.

While efforts are being made to develop maximum capacity through central power sector undertakings, there would be requirement to create large capacity additions through private sector. This is a project in private sector to bridge the gap / deficits requirements in the State and National Power Sector in the 12th plan.

Importance to the country and region

The following is the growth of installed capacity as on :

Growth Installed Capacity as on	**Thermal**
31-Dec-1947	854
31-Dec-1950	1,153
31-Mar-1956	1,825
31-Mar-1961	2,736
31-Mar-1966	4,903
31-Mar-1974	9,058
31-Mar-1979	15,207
31-Mar-1985	27,030
31-Mar-1990	43,764
31-Mar-1997	61,010
31-Mar-2002	74,429

31-Mar-2007	86,015
31-Mar-2012	131,603
30-June-2014	172,286

Growth Installed Capacity as on	**Thermal**
31-Mar-1979	14,875
31-Mar-1985	26,311
31-Mar-1990	41,236
31-Mar-1997	54,154
31-Mar-2002	62,131
31-Mar-2007	71,121
31-Mar-2012	112,022
30-June-2014[1]	148,478

Demand and Supply gap

McKinsey claims that India's demand for electricity may cross 300 GW, earlier than most estimates. To explain their estimates, they point to four reasons:

- India's manufacturing sector is likely to grow faster than in the past
- Domestic demand will increase more rapidly as the quality of life for more Indians improve
- About 125,000 villages are likely to get connected to India's electricity grid
- Currently blackouts and load shedding artificially suppresses demand; this demand will be sought as revenue potential by power distribution companies

A demand of 300 GW will require about 400 GW of installed capacity, McKinsey notes. The extra capacity is necessary to account for plant availability, infrastructure maintenance, spinning reserve and losses.

Against this background of power and energy requirements, the following generating capacity additions are likely to materialize:

Peak power & Energy Supply position during 2011-12

Sno	Details	Andhra Pradesh	Tamil-Nadu	Karnataka	Maharashtra	Total
Power Supply Position (Peak)						
1	Peak power availability (MW)	13162	10428	8652	18880	51122
2	Peak power	15213	11410	10460	22347	59430
3	Power Deficit (MW)	(-)2051	(-)982	(-)1808	(-)3467	(-)8308
Power Supply Position (Energy in million units)						
1	Energy Availability	87094	71392	56500	131049	346035
2	Energy Demand	93289	70769	60478	142911	367447
3	Energy Deficit	(-) 6195	(-) 177	(-)3978	(-) 1862	(-)

The peak power demand and the energy requirement of Andhra Pradesh in the year 2001-02, 2004-05, 2006-07 onwards upto 2011-2012 and 2016-17 as projected in the 16th Electric Power Survey Report.

Projected Peak Power Demand & Energy Requirement of Andhra Pradesh

S.No.	Year	Projected Peak Power demand (MW)	Projected Energy Requirement (MkWh)
1.	2001-2002	8234	50493
2.	2004-2005	8093	50416
3.	2006-2007	8991	68797
4.	2007-2008	11923	73118
5.	2008-2009	12672	77709
6.	2009-2010	13468	82590
7.	2010-2011	14314	87776
8.	2011-2012	15213	93289
9.	2016-2017	20532	125905

The state of Andhra Pradesh, rich in Agricultural as well as mineral resources, requires substantial addition to its power generating capacity to meet its demand for electrical power which has been increasing due to rapid industrial as well as agricultural growth. Despite of the steps taken by APGENCO to set-up new power plants, the demand for power exceeds the availability.

SITUATION IN THE STATE (AP GOVT. WHITE PAPER 2014)

The Government of Andhra Pradesh was one of the pioneer states to initiate the power sector reforms in 1998.

There is an urgent need to come out with a detailed roadmap of the steps to be taken to address the issues of the power sector in the state. A short to long term planning is required for augmenting the power capacity commensurate with the increase in demand by having a common integrated planning framework.

Key objectives

- Provide 24 hours availability to all industrial and domestic customers
- Provide 7 hours availability to agriculture sector with a view to gradually increase it to 9 hours over a period of time
- Ensure reliable and affordable power to all consumers
- Thrust for optimum harnessing of renewable sources of energy
- Monitor and improve customer satisfaction
- Reduce power loss levels to lowest in the country

The data available shows that the electricity availability against the demand is low and the deficit is increasing in each year. It is expected that the power deficit post 2012 will continue to increase as the demand for power is continuously surpassing supply.

Power shortage is getting worse in the state

Despite the discovery of natural gas in Krishna Godavari basin (KG-Basin), natural gas based power plants established near costal part of Andhra Pradesh are running on minimum plant load factors due to lower gas production. Generation in hydro power units has also come down due to low water levels in the reservoirs resulted by seasonal variability of monsoon.

Under these circumstances, power utilities are forced to impose power supply rationing. Major and medium industries in Andhra Pradesh experience increasing number of "power holidays" as the state power distribution companies are unable to meet the growing demand for electricity.

The Government has accorded the highest priority for development of power sector in Andhra Pradesh. The Government is committed to provide quality, reliable and affordable 24 hours power supply to all domestic, commercial and industrial consumers and 9 hours power supply to farming community.

Deficit in Energy Demand for the State of Andhra Pradesh

Details (Mkwh)	**2006-07**	**2007-08**	**2008-09**	**2009-10**	**2010-11**	**2011-12**
Energy Available	61373	65983	68810	74600	80618	87094
Energy Requirement	68797	73118	77709	82590	87776	93289
Energy Deficit	(-)7424	(-)7135	(-)8899	(-)7990	(-)7158	(-)6195

Imports Vs. Indigenous production

The project is being implemented in the power sector and it has no import component as far as production is concerned.

Export possibility

The product that is being generated in the industry is electricity which is consumed with in the country and there is no export possibility as it is not a product and manufacturing unit.

Domestic and Export market

The power plant is being established in the merchant mode category and the project proponents have the free way for providing the power to the requisite industries in the region and to support the grid operations if required. There is no export market.

Employment generation

The project would be promoting employment and ancillary business opportunities and improving the living standards of local population. The local area is backward and agriculture /horticulture income in the area is very low. The establishment of industrial estate shall enhance the socio economic status of the area. The requirement of man power during construction is estimated at 1500 at the peak level of skilled workers and about 600 during operation for construction of 2x660MW during first phase. Most of the employees would be drawn from Visakhapatnam district due to the fact that there are a number of universities and educational institutions in the field of Engineering and Technology available in the district.

Justification for setting up the project

It is seen from the foregoing that there exists a demand for installation of additional generating capacity urgently. Also the demand for large amount of power supply will exists since the government alone cannot meet the planned addition to the generation capacity and this scenario will continue in a sustained manner for a long time in the country in general. The policies and regulations by the Government are also encouraging leading to major thrust for private investment in power sector. Hence the time is conducive for private sector to actively participate in the power generation. Utilizing the opportunity offered by the present policies and regulations NPCL is investing in this coal fired power project in a location that is suitable for such a plant.

The peak power and energy supply position during 2011-12 has been estimated in the four productive states in the South India.

The gap in Peak power Demand and Energy requirements in 2011-12 increases to 8308 MW & 22202 MU respectively in all the above four states as seen from data

from the said stacks. Any delay in the implementation of power projects, due to any reasons such as lack of clearances, financial constraints, etc. would result in much larger deficit in subsequent years.

Considering this scenario the installation of the proposed project is justified to meet part of peak demand as well as energy demand for Andhra Pradesh state and the balance demands of other neighboring states namely Tamil Nadu, Karnataka & Maharashtra.

It is seen from the foregoing that there exists a demand for installation of additional generating capacity urgently. Also the demand for large amount of power supply will exists since the government alone cannot meet the planned addition to the generation capacity and this scenario will continue in a sustained manner for a long time in the country in general. The policies and regulations by the Government are also encouraging leading to major thrust for private investment in power sector. Hence the time is conducive for private sector to actively participate in the power generation. Utilizing the opportunity offered by the present policies and regulations NPCL is investing in this coal fired power project in a location that is suitable for such a plant.

CHAPTER – III

PROJECT DESCRIPTION

Salient features of the proposed project, the implementation schedule, the technological considerations, the process descriptions, the raw material requirements and handling and likely environmental effects due to the proposed project and proposed mitigation measures have been presented in brief in this report.

Type of the Project

This is categorized as 1-D as per the EIA notification of 2006. The Yeshwanth Industrial Infrastructure Projects Private Limited proposes to establish a power plant of 6x660 MW capacities in 3 phases of 2 x 660 MW each Visakhapatnam district of Andhra Pradesh. First two phases will be telescopically constructed. Two super-critical boilers will be installed for each phase which will be fired on imported coal to be sourced from Indonesia/Australia.

There is no inter linkage to any other project like coal field development as the entire coal requirement is being met from abroad.

Project Location and Layout

The project is located in Visakhapatnam district of new State of Andhra Pradesh. It is located in Vempadu and other surrounding villages in Nakkapalle mandal of Visakhapatnam district in Andhra Pradesh. The site is more or less fiat with minor undulations and is suitable to locate major heavy structures, buildings and foundation. The proposed plant layout is enclosed.

The project site is comprising Kagitha, Dl puram, Nellipudi and Vempadu is located within the following boundary limits – 17^0 21' 42'' due North and $17^0$20' 24'' due South and 82^0 39' 30'' due West and 82^0 41' 15'' due East. The hill located within these coordinates is not considered for the project. The detail of the coordinates is given in the site report.

Size and magnitude of operation

The project envisages establishment of 6 x 660 MW power project in three phases. The estimated cost is around 17820 crores for the 3 phases and the coastal and offshore infrastructure would require another 450.00crores for construction of jetty intake and outfalls. The total capital expenditure on the project would be 18270 crores.

Project Descriptions with process details

Layout of the power plant has been optimized considering the space requirements of all the equipment, systems, buildings and structures, coal storage area, ash silos, start-up fuel oil tanks and pump house, water treatment plant, cooling tower, cooling water pump house, 400 KV & 230 KV switchyards etc for each phase of 2X660 MW plant. Necessary plant drainage system would be provided at the proposed power plant site. In laying out various facilities, consideration has been given to the following general aspects:

- Provision to install 2x660 MW units in each phase including cooling towers and 400 KV &230 KV switchyards;
- Coal storage yard for 75 days requirement at site for 3960 MW units;
- Ash silos for fly ash and ash pond area for the total 3 phases.
- Water treatment facilities for the 3 phases and
- Availability of adequate space for fabrication / storage of construction equipment and materials.

Details of Proposed Power Plant

TECHNOLOGY	Phase I Details	Phase II Details	Phase III Details
Capacity (MWe)	1320 MW	1320 MW	1320 MW
Steam Generators	2 x 2016tph	2 x 2016 tph	2 x 2016 tph
Steam Turbine – Capacity, (MW)	2 x 660	2 x 660	2 x 660
Type of cooling	Closed circuit with cooling towers		
Fuel	100% imported coal		
Fuel consumption	4.53 mtpa computed at 85% PLF for each phase		
Type of Boilers	Pulverised coal supercritical technology		

TECHNOLOGY AND PROCESS DESCRIPTION

Each phase of 1320 MW power would be generated by a configuration of 2x660 MW units, with one boiler and one steam turbine for each unit in each phase. The project envisages three phases of 1320 MW in each in super critical technology.

Steam Generator Units

The steam generators would be of outdoor type, super-critical pressure, once through, natural circulation, reheat, balanced draft, dry bottom type units, designed for pulverized

coal firing. Capacity of steam generating units would be so selected as to ensure adequate margin over the requirement of steam turbine at 100% Maximum Continuous Rating (MCR) in order to cater to:

- Auxiliary steam requirement for soot blowing operation, fuel oil system heating and also for start-up of adjacent unit; and Derating of the steam generating unit over its life time.

The steam generator would be designed to operate with the High Pressure (HP) heaters out of service condition (resulting in lower feed water temperature at economizer inlet) and deliver steam to meet the turbine generator requirement at 100% MCR. The steam generator would also be suitable for operation with HP-LP turbine bypass system. Economizer section of the boiler would be of non-steaming type with provision of recirculation during start-up, chemical cleaning etc. Super heater and re-heater sections would be convection and radiation type and designed so as to maintain rated steam temperature of 568°C at super heater and re-heater outlet over the control range of 60% to 100% MCR. Super heater and re-heater would be provided with de-superheating stations with provision for water spraying for temperature control.

Each steam generator unit would be equipped with suitable pulverized coal firing arrangement comprising crushed coal silos, gravimetric raw coal feeders, pulverizing mills, primary air fans and seal air fans, fuel and air pipes, burners etc. as necessary.

The steam generating units will be provided with heavy fuel oil pressurizing and heating units for supplying HFO to the oil burners for hot start-up and for stabilization of combustion of pulverized coal. The HFO system would be of capacity sufficient to meet minimum 30% of boiler MCR load. Light oil system would also be provided for cold light-up / start-up and warming up purposes. The Boiler will be designed to meet the requirements of the Indian Boiler Regulation - Rules for Construction of Stationary Boilers.

Turbine Generator Unit

The steam turbine would be standard multi-stage, three cylinder, tandem compound, single reheat, condensing type system operating at 3000 RPM with seven (7) uncontrolled extractions for regenerative feed heating. The turbine will be designed for main stream inlet parameters of 247 kg/cm^2 at 566°C before emergency stop valve. High Pressure (HP) and Low Pressure (LP) Turbine bypass system would be provided as a part of turbine package. The bypass package would act not only as a protection to the turbine during pressure rise resulting from sudden load throw off, but would also enable quick start up of the unit following a trip out by proper matching of steam turbine metal temperatures which would reduce thermal shock.

A fully automatic gland sealing system would be provided which would have provision for receiving steam from auxiliary system. The turbine generator would be equipped with electro-hydraulic governing system backed up by -hydro mechanical system ensuring stable operation under any grid fluctuation and load throw off condition. The generator would be directly coupled to the steam turbine. Stator winding would be directly cooled by water, and stator core and rotor by hydrogen gas. All necessary protective and supervisory systems would be provided to ensure trouble free, safe and efficient operation of the turbine generator.

Electrostatic Precipitator

The steam generating units will be provided with the required electrostatic precipitators. Each precipitator would have parallel paths any of which can be isolated for maintenance when required, keeping the other paths in operation. Each path will comprise the required number of fields in series, for collection of fly ash. The ESP would have an efficiency of around 99.9%. Each ESP would be provided with adequate number of ash hoppers having capacity suitable for storing ash collected in 12 hours operation of the boiler at MCR.

Stacks

The 4x660 MW units will be provided with a common bi-flue concrete chimney of 275-m height and as such there would be three stacks for the 6 x 660 MW project.

RAW MATERIAL REQUIREMENT

Land Requirement

The land requirement for the project has been estimated at 2563.00acres.

Fuel Requirement Coal

Coal consumption for each phase of 2 x 660MW will be about 4.53mtpa based on 85% PLF.

Expected Range of Coal Quality

Moisture (% / wt) – 12.4

Volatile Matter (%/wt) – 23.60

Fixed Carbon (%/wt) – 48.7

Total Sulphur (%/wt) – 0.8

Gross Calorific Value-Air Dried (Kcal/Kg) - 5200

Fuel oils

Heavy Fuel Oil (HFO) and Light Diesel Oil (LDO) will be used as secondary fuel for start-up and coal flame stabilization during low load operation of the steam generator while firing coal. In the proposed power plant, the required HFO will be stored in two HFO storage tanks having capacity of 1500 KL each. In addition, two LDO storage tanks will be constructed having capacity of 300 KL each.

RESOURCE OPTIMISATION

Resource optimization and reuse is very much a part of the process in the power plant. The recycled water from the sewage treatment plants and Effluent Treatment Plants will

be utilized in a closed loop operations for various domestic toilet purposes and for greening programme.

The industrial wastes that are available from the project would be given to the appropriate industry.

WATER REQUIREMENT

The water requirement is essentially met from sea water.

A total quantity of 209,800 m^3/day of sea water would be drawn from Bay of Bengal and fresh water component of 9072 m^3/day would be through desalination for each phase of 2 x 660MW.

WATER	Phase I	Phase II	Phase III
Source of Water	Bay of Bengal	Bay of Bengal	Bay of Bengal
Water Consumption (m3/d.)	209800	209800	209800
	Desalination plant will be installed to meet the fresh water requirement		

Sea Water System

Sea water from the intake pump house will be used to provide water for Cooling Tower makeup and the RO plant. The RO plant will produce the service water, potable water and De-Mineralization (DM) water required for the entire power plant.

Water Treatment Plant

The Reverse Osmosis (RO) plant will have two stages. The output from the first stage will be used to meet the requirement of fire water, service water and provide input to the Stage II RO Plant. The Stage II RO output will be partly used as potable water after treatment. The other part will be polished in a DM plant and used for DM water make-up requirement for various systems.

Fire Protection System

An elaborate fire hydrant system covering all the buildings of the proposed power plant as well as outlying areas including coal stockyard would be provided. Part of the first stage RO output will be stored in a tank for further distribution to fire water storage tank and service water overhead tank.

In addition to the fire hydrant system, the following fire protection systems are proposed:

- Automatic High velocity water spray (HVWS) system for the protection of transformers;
- Automatic Medium Velocity Water Spray (MVWS) system and foam system for fuel oil tanks;
- Automatic MVWS system for coal conveyors, cable galleries, etc.;
- Automatic sprinkler systems for certain select areas;
- Manual HVWS system for the protection of turbine oil tanks; and Portable extinguishers and fire tenders as required

DM Plant

DM water would be used as heat cycle make-up and primary coolant in heat exchangers for the auxiliary cooling systems of boiler, Turbo-Generator (TG) auxiliaries and other auxiliaries. Assuming a plant capacity of 33 T/hr/unit for the heat cycle and other requirements accounting for four hours regeneration time, 2 x 100% DM plant with each stream of 80 m^3/nr are envisaged for the 1320 MW Plant. One stream would normally be in operation to meet the total DM water demand of the 2 x 660 MW station. The other stream will remain as standby. Besides meeting heat cycle make-up, DM plant will also supply the makeup water requirement to primary water circuit of stator cooling system, hydrogen generation plant and regeneration requirement of condensate polishing unit to be located in the power house building.

Each DM plant chain will comprise cation exchanger, degassifier tower, anion resin bed and mixed bed exchangers. DM water would be stored in two rubber lined mild steel tanks having capacity of 750 m^3 each. DM plant would also have acid/alkali preparation, storage and injection units used for regeneration of resins used in the exchangers. Effluent after regeneration would be treated in neutralization pit before utilizing it for gardening.

Cooling Towers

Sea water based Natural Draught Cooling Towers (NDCTs) would be installed for the proposed project. Circulating cooling water flow catering to dissipation of the heat load of the main condenser as well as auxiliary equipment is estimated at 77000-m^3/nr per 660 MW unit. Based on the source sea water quality the cooling tower is designed for 1.3 Cycles of Concentration (COC). Make up requirement for NDCTs on basis of water balance diagram works out to be 12,012 m^3/hr. The blow down from the cooling towers are expected to be around 9162 m^3/nr and the blow down will be partly utilized for ash disposal and the balance led back to the sea. Chemical dozing requirements in the water system include chlorination in cooling water circuit to contain algae growth, coagulant dozing in pre-treatment section for effecting coagulation and use of acid and alkali for regeneration of resin in demineralization plant and condensate polishers,

QUNTITY OF WASTE GENERATED

There are solid and liquid wastes generated in the plant which are treated or disposed to vendors as per the notifications of the MOEF.

Solid Waste Generation in Power Plant

Ash is the main solid waste generated in the coal based thermal power plant. The quantity of fly ash and bottom ash generated will be considerably less as imported coal is proposed to be use with a maximum ash percentage of 15%. Efforts will be made to utilize 100% fly ash as per the Fly Ash Notification, 2007 within few years.

The ash which is not lifted by the potential users will be disposed of by using High Concentration Slurry Disposal (HCSD) method. In this method of ash disposal, the

slurry is highly viscous and non-Newtonian fluid. This method helps in reduction of water requirement since the water required in this method is far less compared to conventional low concentration slurry disposal. The ash pond will be provided with trenches to collect the storm water during rainy days. Green belt will be provided enveloping the ash pond to arrest the fugitive dust emissions. Ash pond will also be provided with HDPE liner to prevent leaching of contaminants to groundwater.

Liquid Waste Generation in Power Plant

The quantum of wastewater generation from the proposed project is given. The water balance of the plant is enclosed.

FOR ONE UNIT OF 2 X 660MW

Unit	**Requirement of one unit of 2 x 660MW**	**Loss & usage in one unit of 2 x 660**	**Waste water in respect of 2 x 660MW**
A Cooling water - sea water			
Cooling water including auxillary cooling	209808	71184	138624
B. Non cooling water-Fresh water (Desalinated water)			
Boiler feed	3200	2496	704
DM CW makeup	16	16	0
DM Regeneration	32	0	32
AC Makeup	1520	1520	0
Seal water	1663	1103	560
Service Water	2528	1648	880
Fire protection water	80	80	0
Domestic plant	33	7	26.7
Total	**9072**	**6869**	**2203**

For 6 x 660MW

Unit	Requirement of 6 units of 660 MW	Loss & Usage for 6 x 660MW	Waste water in respect of 6 units
A Cooling water - sea water			
Cooling water including auxillary cooling	629424	213552	415872
B. Non cooling water-Fresh water (Desalinated water)			
Boiler feed	9600	7488	2112
DM CW makeup	48	48	0
DM Regeneration	96	0	96
AC Makeup	4560	4560	0
Seal water	4988	3308	1680
Service Water	7584	4944	2640
Fire protection water	240	240	0
Domestic plant	100	20	80
Total	**27216**	**20608**	**6608**

Waste Water Generation for 1 unit of 2 x 660 MW

Unit	Quantum of waste water for one unit of 2 x 660MW (M3/day)	Disposal quantities for one unit of 2 x 660MW	Disposal
Cooling tower blow down	138624	14400	Ash handling
Boiler blow down	704	1000	Green belt development
DM Regeneration	32	616	AHP & CHP
Service water	880		Ash handling
Seal water	560		Dust suppression
Domestic plant	27		Septic Tank followed by soak pit
Discharge to sea		124224	

Waste water generation for 6 units of 660MW

Unit	Quantum of waste water for 6 units of 6x660	Disposal quantities for 6 units of 6x660	Disposal
Cooling tower blow down	415872	43200	Ash handling
Boiler blow down	2112	3000	Green belt development
DM Regeneration	96	1848	AHP & CHP
Service water	2640		Ash handling
Seal water	1680		Dust suppression
Domestic plant	80		Septic Tank followed by soak pit
Discharge to sea		372672	

SOLID WASTE GENERATION				
Solid waste	**Phase - I**	**Phase - II**	**Phase - III**	**Disposal**
Fly ash	0.7 MTA	0.7 MTA	0.7 MTA	Sold to Cement plants
Bottom ash	0.0014 MTA	0.0014 MTA	0.0014 MTA	Used for land filling
ETP/STP Sludge	75 TPA	75 TPA	75 TPA	Sold to brick manufacturers
Used/waste lubricating oil	2000 KL/year	2000 KL/year	2000 KL/year	Sent to authorized recycler
Used lead acid batteries	20No.s / year	20No.s / year	20No.s / year	Sent to authorized recycler

Coal Handling System

Coal will be transported by sea and unloaded at the Project's coal unloading jetty from where it will be conveyed to the power plant through a coal conveying system of 2000 TPH capacity. At the power plant, the coal will be conveyed either to the coal stockyard or to the crusher house for crushing and conveying to the coal bunkers. The conveying system capacity within the power plant will be 1200 TPH. In the crusher house, coal would be sized to (-) 20mm in ring granulator type crushers after screening the fines in vibrating screens and directly transported to the mill bunkers. A coal stockyard storage capacity of 75 days is considered.

Necessary belt weighing at bunker level conveyors, electro-mechanical / capacitance type level indicators at bunkers, coal sampling units, flap gates, in line magnetic separators, suspended magnet type separators, metal detectors etc. would be provided to ensure proper operation. A centralized control room with microprocessor based control system is envisaged for operation of the coal handling plant. Necessary interlocks, control panels etc. would be provided for efficient and trouble free operation and supervision of the system.

Special precaution will be taken for pollution control by providing dust extraction and spray type dust suppression arrangements at different transfer points and in stockpile areas to contain dust under adverse wind condition. Ventilation system would be provided for the transfer points and at bunker level, Fire hydrant ring main encompassing the coal stockyard will be provided. Further, distribution network for drinking and service water system including pumps, piping, tanks, valves etc. would be provided for distributing water at all transfer points, crusher house, control room etc.

An alternative to the dedicated jetty is the consideration for importing coal through a new major port for which the site has been approved by MOEF at Kummarapuram on the other side of Tandava river. This port is located at a distance of 5.00 kms from the project site. Discussions have to be held with the project promoters to know their time schedule and handling considerations.

Ash Handling System

Considering 15% of ash content in coal, about 4104 TPD of ash wilt be generated from the proposed 2640 MW power station, which includes 80% fly ash (1642 TPD) and 20% bottom ash (410 TPD) (Phases I & II).

Bottom ash handling system

Bottom ash from the Boiler furnace wilt be collected in two [1]W type' water impounded hoppers and discharged to the ash slurry sump through a system of gates, clinker grinders and hydro-ejectors / jet pumps along with necessary piping, valves & fittings. Cooling tower blow down water will be used for hydro-ejector water. From the ash slurry

sump, the ash is then transported to the ash disposal area through ash slurry disposal pumps & piping.

Fly ash handling system

Fly ash will be separated from the flue gas and would be collected in air heater hoppers and electrostatic precipitator hoppers. A pneumatic pressure conveying system is envisaged for each unit. The system would be provided with heaters, fluidizing air blowers, conveying air blowers/compressors, feed vessels etc. for extraction of fly ash from hoppers and conveyance through pipeline. The plant and equipment would be designed for size and capacity accordingly.

The pressurized conveying system will deliver the fly ash to intermediate surge hopper of 12 hours capacity located near ESP. Ash from intermediate hoppers would be conveyed to fly ash silo on continuous basis for taking out separately for further use. Alternatively, the ash from the intermediate hoppers will be conveyed to the ash dump yard through slurry disposal system. Ash from the fly ash silo would be supplied to potential users by closed trucks. Water for the ash plant would be made available from the cooling tower blow down.

CHAPTER – IV

SITE ANALYSIS

Connectivity

The site is easily accessible from National Highway. The nearest railway station is Yelamanchili which is located at 31.2kms. from the site. Tuni station is located at 11.34 kms. Both these stations are located on the Eastcoast railway trunk route. The Visakhapatnam airport is located at a distance of 72.59 kms from the project site. The connecting roads of the Zillaparishad provide connectivity to the different parts of the area.

Land form / Land use

The 6 x 660 MW coal fired power plant is a base load station. It is to be located in the coastal area of Andhra Pradesh. The project proponents proposes to set up the power

plant in an area of around 2600.00 acres. An area of about 450.00 hects. has been earmarked for disposal of ash. The extract from the Survey of India topographic sheet and the extract from satellite imagery provides the information on physiographic setting of the site.

Land use

Type / Ownership	Vempadu	Nellipudi	DL Puram	Kagita
Revenue land	2.00	3.00	5.00	4.00
Forest land (type & density)	0.00	0.00	0.00	0.00
Double crop agricultural land	0.00	0.00	0.00	0.00
Single crop agricultural land	12.50	0.00	0.00	3.00
Waste land	420.00	510.00	42.00	38.00
Plantation land	918.60	565.40	332.16	277.54
TOTAL	**1353.10**	**1078.40**	**379.16**	**322.54**

The digitization of the topo sheet indicates the various land uses like water bodies and forest areas within the 15.00kms dia mtr. of the project site. The CRZ zonation in the area is at distance of 2.5 kms. from the project site Southern boundary. The delineation of CRZ is being carried out by NIO. The area is not notified as an industrial area in the master plan of the Visakhapatnam Urban Development Authority. The area has been newly included in the expanded limits of the Visakhapatnam Urban Development Authority and the master plan is presently under preparation.

The following environmental sensitivity aspects have been addressed in this project and these are briefly mentioned for the site selected by the

- There are no areas which have been declared as the ecological sensitive which are located within the 15 kms of the boundary.
- The water courses and water bodies and the beaches coastal zone are the areas which are located within the 15 kms from the site.
- None of the protected and endangered species in fauna and flora of ecological importance exist within the buffer / core areas.

- The site is within a district boundary and away from National and State boundaries
- The routes transportation are unaffected by any activity proposed
- It is a vacant site with hardly any rehabilitation.
- The project site selected does not contain important, high quality or scarce resources like ground water resources, surface resources, forestry, agriculture, tourism and minerals. The site is in tail end of the watershed of Tandava and the major tributaries. The impact on hydrological regime of surface and ground waters does not arise.
- There will be beneficial impact on agriculture and fisheries in the buffer area to meet the increased demand in the complex and there are no adverse affects.
- The project site is a virgin area and is being exposed to construction activity for the first time and with all the precautions for environmental conservation.
- The project site is not susceptible to natural hazards such as earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions.

Environmental Concerns that are considered for their presence within the impact area of 15.00 kms radius from the project site as per form-1 mentioned in the notification.

Item of Environmental Concerns	**Compliance**
Religious and Historic Places	There is no temple of major importance or religious places which are located within the impact area of 10kms. No impact from the project site.
Archaeological Monuments	Not present
Scenic Areas	Not present

Hill Resorts	Not present
Beach Resorts	Not present
Health Resorts	Not present
Estuaries rich in Mangroves, Breeding Ground of specific species	There are no breeding grounds reported. Mangroves are not recorded in the water course.
Gulf areas	Not present
Biosphere reserves	Not present
National parks and Sanctuaries	Not present
Natural Lakes, Swamps	Not present
Seismic Zones	Not present
Tribal Settlements	Not present
Areas of scientific and Geological interest	Not present
Defence installations, especially those of security importance and sensitive to pollution	Not present
Border Areas (International)	Not present
Airports	Not present

Existing Infrastructure

The present infrastructure is essentially that of road network established by the National Highways. NH5 is 5.52 kms. from the project site in the Northern boundary and the site is connected to the National Highway by Zillaparishad road.

A minor port has been recently sanctioned at Rajayyapeta in the Nakkapalli mandal by the State Government and this port is located 5.00kms. from the project site.

Soil Classification

The soil is mostly red soil which could be classified as red loam. Gravel is also noticed at the foothill region.

Climatic data

The climatic data base for the impact area extending over the project site. The data from the IMD station at Visakhapatnam has been taken in to consideration for the climatic database of the impact area.

The climate of the area is governed by its location in the tropics and the monsoons. The climate of the southeast coast of Bay of Bengal is characterized by the recurring seasonal monsoons, which divide the year into four seasons as follows:

The North- East monsoon period is from the end of November to the end of February with predominantly north-easterly winds. Cyclones are frequent during November.

The pre-monsoon period is from March to May, usually the beginning of the hottest period of the year, when the winds shifted in south-westerly direction, cyclones are frequent during May. South- West monsoon period falls between May and October with predominantly South-Westerly winds, cloudy weather and frequent rains. This is the rainy season. The post-monsoon period is from the middle of October to the end of November with variable weather and witness cyclones with relatively greater frequency. The climatic division is, of course, not absolute and there is some overlap between seasons.

Wind

Monthly variation of wind speed and direction is presented.

Month	Mean Wind Speed(Knots)		Predominant Directions	
	0800hr	1700hrs	0800hrs	1700hrs
January	2	4	NW,W	E,SE,S
February	2	6	SW,W	E,SE,S
March	3	6	SW,W	S,SW
April	4	6	SW,W	S,SW
May	5	6	SW,W	S,SW

June	5	6	SW,W	S,SW,W
July	5	6	SW,W	SW,W
August	4	6	SW,W	S,SW,W
September	3	5	SW,W	S,SW,W
October	3	5	NE,W	NE,E,SE
November	3	5	N,NE	NE,E
December	3	4	N,NE	NE,E
Mean	4	5	-	-

During south-west monsoon (June to September) the wind speed ranges from 3 to 6 knots and the predominant wind direction is from south-west quadrant. During north-east monsoon (November to January), the mean wind speed varies from 3 to 5 knots and the predominant wave directions are generally from north-east quadrant. January and February are transition months when the wind direction fluctuates. Wind starts coming from SW even before of SW monsoon from March onwards.

Storms and Cyclones

The east coast of India is frequented by storms of varying intensity with an average number of 4 or more per year. These storms ate generated in the Bay of Bengal during the months of July to November.

Visibility

Visibility is good throughout the year in all seasons. The sea is generally fog free. Visibility gets reduced however when there is heavy rainfall during the Southwest monsoon. The highest monthly average recorded fog is 0.1 day in some months from December to May.

Secondary data on Climatic Setting is enclosed in annexure

Social Infrastructure

The social infrastructure available in the buffer area is very limited as could be seen from the census data enclosed in the annexure in respect of Nakkapalli mandal.

CHAPTER – V

PLANNING BRIEF

The project site is located in Nakkapalli mandal of Visakhapatnam district. It is situated at a distance of 3.00kms. from the coast line. The area is surrounded by the land reserved for establishment of PCPIR. PCPIR has been included in the Viskhapatnam master plan as an industrial area. Keeping this aspect in view, this area could be reassigned the industrial use in the land use categorization.

PLANNING

The regional scenario around the project site is presented duly taking into consideration the various initiatives of the Govt. of Andhra Pradesh in regard to urbanization and industrialization. These are in the areas of administrative control exercised by the Visakhapatnam Urban Development Authority for the Metropolitan region and Greater Visakha Municipal Corporation for the Visakhapatnam city development and the Department of major industries, Govt. of Andhra Pradesh in respect of PCPIR.

PCPIR

The industrial development in the environs of the project area is detailed by Petro-chemical Project Investment Region (PCPIR) extending from Visakhapatnam to Kakinada along the coastline connecting both the ports. A number of thermal power plants are also being located in the PCPIR region in close proximity to the project site which would also have an impact on the economic development of the area. The Government of Andhra Pradesh vide G.O.Ms.No: 373, MA&UD (H-1) Dept Dated 24-5-2008 constituted VK-PCPIR SDA under section 3 of A.P Urban Areas (Development) Act, 1975.

The main objective of VK-PCPIR SDA is to promote developmental activities to attract investments relating to Petroleum, Chemical and Petro-chemicals and to address the concomitant issues of land use control, preparation of Master Plan, enforcement and regulatory functions besides promoting and improving circulation in surrounding areas and various other activities like developing the social infrastructure, housing, improving the quality of life, environment issues on account of large scale investments in Petroleum, Chemical and Petro-chemical activities. The VK-PCPIR SDA covers an area of 603.58 sq.kms stretching from Visakhapatnam - Kakinada consisting of 110 Rural villages in 10 Mandals of Visakhapatnam (Pedagantyada / Parawada / Atchuthapuram / Rambilli / S.Rayavaram / Nakkapalli / Payakaraopeta) and East Godavari district (Kothapalli / Thondangi / Kakinada rural). The advantage of locating the power plant site near the PCPIR envisages at the entire area is earmarked for industrialization and most of the lands for PCPIR are already under acquisition.

Population

There are no homesteads in respect of the site. The population of the villages / settlements which are in close proximity to the project site is marginal except in DL Puram which is a major village.

The demographic profile as available from the census 2001 is given in the annexure for Nakkapalli mandal which constitute the major part of buffer area.

BREAK-UP OF LAND USE

S.No	Description	Areas in acres
A	Main power plant	
	Main plant area including transformer yard & FGD	160.00
	Switch yard including transmission corridor	100.00
	Coal Handling plant area & stock yard	220.00
	Water system & Cooling towers	180.00
	Water reservoir	100.00
	Ash handling system	10.00
	Fuel oil system	10.00
	Lay down area & Fabrication Yard (green belt)	100.00
	Miscellaneous facilities	400.00
	Roads and drains	100.00
	SUB TOTAL	**1380.00**
B	Ash pond	450.00
C	Green belt	483.00
D	Coastal infrastructure for sea water and coal	150.00
E	Colony	100.00
	TOTAL	**2563.00**

ASSESSMENT OF INFRASTRUCTURE

The existing scenario of the infrastructure and facilities is available from the census data in the buffer area. There are no villages in the core area. A special socio economic survey would be undertaken in the villages of core and buffer area to arrive at the demands and requirements of village to be developed under CSR activities.

Project wise facilities would however be implemented.

Township

Township will be constructed for the employees of the power plant. The township will include the residential quarters for all the employees, guest house, recreation and health facilities.

As the APIIC finalizing an industrial township on the Western project site, one could also seek the permission of the APIIC to locate the township as a component of the township programme of the APIIC.

Transport Facilities

The coal requirement for the proposed project would be transported and imported by sea. A jetty for berthing the ship carrying coal is proposed to be constructed. The proposed jetty for berthing the ship would be about 1.0-km long projecting into the sea from the shore. At the time of ship unloading, about 25000 tonnes of coal would be handled per day. The proposed jetty would be of finger type. The jetty terminal would be at a natural depth of about 10.5 m. It is proposed to dredge the terminal area turning circle and approach channel up to 15-m depth for berthing the ships.

Health and Sanitation

To ensure optimum hygienic conditions in the plant area, proper drainage network will be provided to avoid water logging and outflow. Adequate health related measures and a well equipped safety and environment department will be provided to ensure clean and healthy environment.

Communication System

An effective communication system by way of automatic dial type telephones and public address system with paging and party modes will be provided.

Green belt

It is proposed to develop 30% of the plant area as the green belt of the project which includes peripheral and other greening areas.

Plot Plan

The general plant layout for the proposed power station is enclosed.

The plot plan shows the location of main plant equipment with its auxiliaries, raw water reservoir. The plant layout has been developed keeping in view of the following:-

- Location within the designated area best suited from the point of view of available land offering least site grading costs.
- Wind direction
- Proximity to road network and possible rail route line

The main plant equipment and auxiliary are selected on the basis of unit system design concept except for common facilities such as 400KV switchyard, raw water system, coal unloading and handling facilities, fuel oil systems etc.

SCHEDULE AND IMPLEMENTATION

It is envisaged to Synchronise the first 660 MW unit in 36 months, reckoned from the date of award of main plant contract. The synchronization of units will be three (3) months ahead of their commercial operation date (COD). The consecutive 660 MWs unit will be synchronised at every 3 months interval and commercially operated by 48^{th} month.

CHAPTER – VI

PROPOSED INFRASTRUCTURE

The following infrastructure for plant and other wise is proposed to be established. The plot plan shows the location of the Main Plant equipment and balance of plant. The Plant layout has been developed keeping in mind the wind direction, environmental constraints, power evacuation corridor, coal handling etc.,

The plot for the project has been developed taking into consideration various aspects like available land and its shape, ground features and terrain, corridor for outgoing transmission lines, road/conveyor approaches, prevailing wind direction, the water intake and the associated pipe corridor. The switchyard orientation has been planned taking into consideration the requirement of power evacuation. The Natural draft cooling tower has been located considering the safe distance from the switchyard and the main plant. The water treatment plant, DM water facilities and cooling towers are located based on the most economical layout considering the overall plant layout.

Industrial area

The plant infrastructure comprises the following. The plot plan is enclosed.

- Industries
- Steam generation unit
- Boiler feed pumps & drivers
- Pulverising plant
- Electrostatic precipitators
- Boilers
- Condensing equipment
- Feed cycle equipment
- Coal transportation & feeding system
- Ash handling system
- Fly ash removal system
- Dust precipitation and collection system
- Feed stock transportation system

Residential area

The proposed power plant will require skilled and semi-skilled personnel during construction and operational phase. Many of the people from neighboring villages, if found suitable shall be employed during construction and operational phase. The total manpower of power plant during operation period is estimated to be 450 persons in each phase.

MANPOWER	Phase I (For 2x660 MW) Manpower		Phase II (For 2x660 MW) Manpower		Phase III (For 2x660 MW) Manpower	
	Skilled	Unskilled and Semi-skilled	Skilled	Unskilled and Semi-skilled	Skilled	Unskilled & semi skilled
During Construction	325	1500	325	1500	325	1500
During Operation	150	300	150	300	150	300

It is proposed to develop a colony for operating personnel who are involved in the operations in the project site taking due care to the dispersal patterns of emissions.

Green belt

Landscaping will be done for the entire plant area. Necessary afforestation / green belt development work will be carried out as per the stipulation of Ministry of Environmental & Forests, Government of India. Plants and tree saplings planted will be maintained and irrigated by usage of treated waste water from the plant.

It is proposed to develop a peripheral green belt to cover an area of 30% of the plant site at the project site as well as specifically around the ash pond. A three tier green belt would be designed in respect of peripheral shelter belt and indigenous species only would be utilized in raising the green belt.

Social infrastructure

The colony would have a requisite infrastructure of school, primary health centre, a recreational complex and a cooperative stores along with a gas and diesel outlet.

Connectivity

The approach road to the project site from NH5 would be developed in to six lane road and it would be utilized for transportation of heavy equipment during construction. A network of roads with proper storm water drainage would be established.

Roads & Drains

The main approach roads inside the plant boundary will be with adequate width and shoulder on either side as per norms and the other roads shall be 7M wide.

Line open drains will be provided to carry to surface run-off; these drains will run alongside the roads and will lead to the final disposal plant. Plinth protection provided around buildings will slope to the drains. Reinforced concrete culverts or concrete pipe culverts will be provided at road crossings. A suitable Rain water harvesting scheme will be developed.

Drinking water management

It is proposed to establish a treatment plant for drinking water supplies to the plant site as well as to the colony. A overhead tanks would be established to supply water to various outlets by gravity. There would be a central sump from which the pumping systems would ensure the water supply.

Sewerage system

An underground sewerage system would be established connecting all the toilets in the colony as well as in the plant site and the system would be terminate at the sewage treatment plant. 40% of the treated effluent from the sewage treatment plant would be utilized for environmental greening programme for a closed loop operation for toilets and for dust suppression.

Industrial Waste Management

Main industrial waste in power plant is fly ash and as such special systems are designed for ash handling.

Ash Handling System

Ash Handling Plant (AHP) design would be based on the BMCR generation and worst coal quality. The System proposed is for dry extraction and dry/wet disposal of the Bottom Ash and dry extraction of the Fly Ash. However, disposal system of fly ash from silo is by closed tankers/ rail- In emergency wet disposal is proposed to ash storage area, which would be within 2 kms distance. The quantum of ash generation would depend on the plant load factor and the quality of coal being fed. Considering average ash content of 15 % in coal about 0.7 tonnes / hr. of fly ash will be generated from the proposed power plant at MCR condition. Each unit would generate about 0.0014 tonnes/ hr of bottom ash.

Bottom ash has been cooled by bed ash coolers and discharged to the pneumatic transfer system and the coarse particle taken out through the drag link chain to the transfer bunker. The bottom ash will be disposed of through wet system from the

bottom ash storage hopper to the ash pond. The capacity of the bottom ash hopper shall be designed for eight hours of operation for the worst coal.

Fly Ash would be collected in air heater hoppers, economizer hoppers, electrostatic precipitator (ESP) hoppers and the stack hoppers of each unit. Fly Ash would be extracted and conveyed pneumatically to Ash silos.

The combustor bottom ash removal system shall adequately control the bed inventory. Classification, removal, cooling and transfer of the bottom ash, over the full operating load range of the steam generator for the specified range of fuel. The bed pressure drop shall be monitored as the measure of ash inventory and the bottom-ash flow shall be adjusted to maintain the desired bed pressure drop. Bottom ash shall be cooled to about 150°C; sufficient for ash removal equipment to handle. Ash grinder shall be provided in the downstream of ash cooler to facilitate easier disposal of ash to Silo

(a) The design for total ash-collection shall be based on-maximum ash generated while firing worst coal (maximum ash & lowest GCV)

(b) The bottom ash removal system (ash coolers and all items upstream) shall be designed with 2 x 150% of mechanical redundancy for 100%.

Fly Ash would be collected in air pre-heater hoppers, economizer hoppers, electrostatic precipitator (ESP) hoppers and the stack hoppers of each unit. Fly Ash would be extracted and conveyed pneumatically to Ash silos. The ash from the units would be conveyed through pressure conveying system up to the fly ash silo. All points of natural dust deposition including that in the second pass and below the air pre-heaters shall be provided with hoppers to effectively and efficiently collect the fly ash. The ash hoppers shall be of welded steel construction. The hoppers shall be suitably insulated on the exterior. The total ash shall be based on 125% the maximum ash generated firing worst coal to achieve 100% SGMCR.

The ash management scheme for the ash generated from power plant will involve dry collection of fly ash, supply of ash to entrepreneurs for utilization, promoting ash

utilization and disposal of unused ash. MoEF has stipulated utilization of fly ash progressively for four years at the site and reaching zero storage.

Power Requirements and supply

This is a power project generating power. However, solar energy would be utilized for auxiliary purposes.

Infrastructure Facilities

- The proposed coal based project is a green field project with no infrastructure in existence. Adequate mobilization of construction facilities will be organized at various stages for timely and unhindered implementation of the Project. For this purpose, the plant layout has been developed to allow covered and uncovered storage yards, fabrication and pre-assembly yards and other associated facilities.
- Space will also be earmarked for labour hutments outside the plant area for temporary work force during execution stage.
- Construction office space and covered storage is proposed to be built during construction. These will be retained as offices, stores etc. after the power station is constructed.
- In addition to the above, temporary facilities for the construction staff are also needed apart from open storage space such as pre-assembly yard, canteen, garage, toilets etc., for which adequate open space will have to be provided.
- The staff colony to be developed will have all relevant facilities of roads, electrical distribution, water and sewage disposal arrangement, community centers, shopping complex, medical facilities and schools etc. one hostel building will also be built as a first priority and will be utilized for housing staff in the initial period. The hostel building will be for accommodating O&M staff/security staff and/o as a hostel for visiting personnel during plant operation.

CHAPTER – VII

REHABILITATION AND RESETTLEMENT

There is no rehabilitation and resettlement in respect of the site. However, initiatives under corporate social responsibility would be taken up as per the guidelines and stipulations of MOEF. The CSR activities would however be undertaken as stipulated.

CHAPTER – VIII

PROJECT SCHEDULE AND COST ESTIMATE

Starting date of construction- Feb'2015

Likely date of completion – 1st phase – Feb'2017

2nd phase – March 2018

Project Cost Estimate

The Project cost estimate is based on the plant layout as defined in the Plot Plan at the identified site location of the proposed power Plant at Vempadu and surrounding Villages in Nakkapalli mandal of Visakhapatnam District of Andhra Pradesh.

Basis of Cost Estimates

The project is to be executed by EPC contact route through International Competitive Bidding (ICB). Cost estimate break up includes the cost of steam turbine generators and auxiliaries, steam generators and auxiliaries, coal and ash handling systems, water systems, control and instrumentation system, electrical system and Balance of Plant required for the power plant within the battery limits of the power plant. The cost of external coal handling system and raw water system and cost of land, pre commissioning costs, overheads, and pre-operative expenses, interest during construction and financing costs at added to arrive at the total project cost.

The cost of the land for the plant to be acquired from private owners has been estimated based on a rate of around Rs. 10.00 Lakhs per acre.

The Project cost is based on the following assumptions.

- A plant building without basement and all other plant structure.
- The cost of ash disposal area development
- Non-Plant buildings such as gatehouse, warehouse and site offices and other infrastructures required during the construction areas.
- Cost of site grading for areas like SG/TG area, switchyard, cooling tower area, coal handling area and other non-service areas.
- Cost of railway siding with embankment inside the plant and the take-off railway line from the existing railway line of merry go round system.
- Boundary wall and anti climbing fencing for the area proposed to be acquired for the power plant.
- Raw material would be sourced from jetty / Bay of Bengal.
- Cost of transmission system has not been included in the project cost, as it has been assumed that the transmission between the switchyard and substation would be others.

- Cost of spares for mechanical and electrical equipment is considered as 2.5% of supply cost.
- External coal handling system cost includes the cost of captive jetty and conveyor system.
- Cost of erection, testing and commissioning for mechanical and electrical equipment has been considered as 8% of supply Cost.
- All the equipment/systems are considered indigenous and no foreign currency is assumed to be paid. For the main plant equipment (boiler and turbine islands), certain raw materials such as boiler drum plate, turbine shaft, etc. and certain finished goods are expected to be imported by respective vendors and the import duty for these will be included in the costs indicated.
- Taxes and duties have been considered as per prevailing rates.
- Price escalation has been considered during the execution period of the project.

Interest during Construction Period

The interest on loan during construction (DC) is to be calculated based on a debt equity of 80:20 and weighted average interest rate of 11% Since IDC can be capitalized, the overall project outlay includes this amount.

Project Cost

The total project cost excluding IDC and Financing Charges (FC) is arrived at for execution of 6 x 660 MW. The estimated capital cost of the proposed 6 x 660 MW project including cost of jetty and coastal infrastructure is Rs.18270 crores. The cost per MW of installed capacity works out of Rs.4.5 crores/MW.

Construction and Establishment

The project would be implemented either through EPC route or by grouping the various system based packages. In the package wise system grouping will have to be done in a

manner so that the interface terminal points are clearly defined otherwise interlinking/connecting problem will arise and the project execution target will be affected. The Project will be executed through a well defined EPC contract covering all works associated with development of infrastructure facilities, design, engineering, erection, testing and commissioning of plant and equipment within the power station boundary and other associated facilities like water intake system, etc. outside the plant boundary.

The selection of the EPC Contractor will be finalized through competitive bidding route. The selected EPC Contractor will be well known EPC Contractor familiar with issues associated with construction of power plants In India. The contract will be a fixed price, turnkey, with an entity having substantial financial backing and significant experience in the engineering and construction of similar plants. The contract will incorporate performance guarantees in respect of deliveries, outputs, heat rates, auxiliary power consumption etc. and liquidated damages provisions sufficient to preserve the projects' ability to service the debt and meet obligation to the project proponent of facility does not 'achieve commercial operation in time or does not meet expected performance level.

TRANSPORTATION/HANDLING OF EQUIPMENT

The power plant site is located at Vemapadu village in Visakhapatnam District, Andhra Pradesh. The connectivity to the plant site to move the heavy equipment is from NH5 to the site through a connecting road which is to be strengthened.

TRANSPORATATION OF EQUIPMENT

The list of heavy equipment that needs to be transported is furnished below.

Typical Weights of Heavy Components

SI. No.	Description	Weight in tonnes
1.	Generator stator	350
2.	Generator rotor	75
3.	Generator transformer	335
4.	L.P turbine outer casing - lower half	65

5.	L.P turbine rotor	90
6.	L.P turbine outer casing upper half	65
7.	HP Heater assembly	50
8.	Boiler Feed Pump	45

Route survey will have to be conducted by the main plant contractor for planning and safely implementing the transportation of all major materials and equipment to the Project.

The following mode of handling at site is envisaged for heavy equipment at the erection stage:

- The generator stator will be unloaded from the carriers by means of hydraulic jacks or mobile cranes in the maintenance bay of the station building. At the time of erection, the stator would be placed on the TG Pedestal using the hydraulic jacks or mobile cranes.

- All equipment in the station building including the generator rotor will be erected using the Station EOT. Cranes. The transport carriers will be brought into the maintenance bay of the station building to facilitate handling by the E.O.T. cranes.

- The generator transformer will be jacked up and unloaded on the railway track provided for transformers close to the foundations and moved to the position by means of the bi-directional rollers provided and using winches, the smaller transformers will be skidded into position.

CHAPTER – IX

ANALYSIS OF PROPOSAL

The project proponents are committed to establishing a clean thermal power project with due concerned to all the environmental issues. They are also committed to implement various programmes amounting to 0.4% of the capital cost in the impact area of 10kms. of the project site

The project proponents further proposes to adopt three villages for an integrated CSR approach to improve the quality of life of the people living in those villages. One of the villages would be a fishermen settlement. The project proponents would also contribute to the welfare of the fishermen population, a special socio economic survey would be undertaken to assess the needs of the population to improve their quality of life and social infrastructure within 10 kms. from the project area.

The Environment (Protection) Act of Ministry of the Environment and Forest (MoEF) is an umbrella act that covers the EIA notification. The proposed thermal power plant attracts Environmental Impact Assessment (EIA) requirement of the notification and thus requires Environmental Clearance. The MoEF has recently re-engineered the process of Environmental Clearance vide its Notification dated 14th September, 2006 superseding the EIA Notification of 27th January, 1994 and its various amendments.

The above notification requires industries to carry out EIA study in accordance with MoEF guidelines after scoping and determination of the Terms of Reference (ToR) on likely impacts on the existing environment. Based on studies carried out in respect of identified activities including atmospheric emission and effluent discharge, predictions are made on the anticipated effects. To ensure that expected levels fall within prescribed limits, delineation of mitigation including environmental management plan is necessary for compliance.

Coal fired thermal power station contribute to environmental pollution as follows:

a) Atmospheric pollution through particulate and gaseous emissions.

b) 'Thermal pollution of the surroundings.

c) Pollution due to discharge of liquid and solid wastes.

d) Noise pollution.

Every attempt would be made by the project proponents to address the environmental concerns with adequate pollution prevention and control measures so as to completely obviate the environmental impact on the surrounding population and villages.

ANNEXURE - I

CLIMATIC DATA

Temperature

The values of mean monthly maximum and minimum temperatures are given in the following enclosed. On an average it varies between 31°C and 24°C. The maximum recorded temperature was 44.4°C in the month of June 1923 and lowest was 12.8°C in the month of January 1958.

	MONTHLY MEAN (°C)												Annual Mean
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	
Maximum	29	29	31	33	34	34	32	32	32	31	29	28	31
Minimum	18	19	23	26	28	27	26	26	26	24	21	17	24

Relative Humidity

The humidity is comparatively high and fairly uniform throughout the year. The mean daily relative humidity is about 76% at 08:00 hrs and 72% at 17:00 hrs is given in the enclosed.

	MONTHLY MEAN (°C)												Annual Mean
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	
08:00 hrs	77	77	75	73	73	76	79	79	81	69	69	71	76
17:00 hrs	68	68	72	75	76	73	73	75	77	75	65	64	72

Rainfall

The area enjoys rainfall both from South-west as well as North-east monsoons. The average annual rainfall ranges from 980 mm. The rainfall distribution pattern shows that the isohyets are parallel to the hill ranges in general. The rainiest months are July, August and September.

Recent Rainfall record in District of Visakhapatnam is as follows.

SOUTH WEST MONSOON		
S.No.	**MONTH**	**NORMAL RAINFALL**
1	June	128.8
2	July	197.3
3	August	196.5
4	September	190
NORTHEAST MONSOON		
1	October	205.3
2	November	87.3
3	December	4.6
WINTER PERIOD		
1	January	10
2	February	12.3
HOT WEATHER PERIOD		
1	March	20.7
2	April	35
3	May	114.5

South- West monsoon contributes 57.1 percent and North-East monsoon accounts for 28.3 percent of the normal rainfall. But both the monsoons play truant, variations of South- West monsoon accounting for 15% of normal and North-East monsoon to 35 percent of normal. Since the variation for most periods is on the negative sides of log "Y" and since even the years of normal rainfall are characterized by long dry spells during one or more parts of the crop season, the district experiences drought conditions too often, as no major irrigation systems exist to cushion seasonal deficits.

60-year average of monthly rainfalls recorded at Visakhapatnam.

Month	**60-Year average, mm**
January	10
February	17
March	14
April	17
May	49
June	93
July	110
August	168
September	163
October	S217
November	102
December	20
Annual Total	980

60 year average of number of rainy days in a month recorded at Visakhapatnam

Month	60-Year Average
January	0.6
February	1.1
March	0.7
April	1.3
May	2.6
June	6.3
July	8.4
August	7.5
September	8.9
October	8.1
November	3.9
December	0.9
Annual Total	**50.3**

Month	Depressions	Storms	Severe Storms	Total
January	8	4	1	13
February	3	0	1	4
March	1	2	2	5
April	8	12	9	29
May	22	14	30	66
June	55	31	6	92
July	94	32	7	133
August	125	26	3	154
September	117	21	15	153
October	75	40	32	147
November	38	41	46	125
December	28	20	18	66
Total	**574**	**243**	**170**	**987**

Storms and Cyclones

The east coast of India is frequented by storms of varying intensity with an average number of 4 or more per year. These storms ate generated in the Bay of Bengal during the months of July to November. A total of 41 cycle/storms occurred in Bay of Bengal during the period 1971 of which 15 crossed the coast of Andhra Pradesh.

Cyclones

In the Bay of Bengal depressions are encountered in all seasons of the year with a local fall in pressure. The wind gusts towards the depression from all sides forming a revolving storm. Wind speeds over 47 knots are known as cyclones and between 33 to 47 knots are known as storms.

On an average 4 to 5 cyclones occur in the Bay of Bengal; however, at particular locations the average frequencies are lower. Hind casting studies indicate that Visakhapatnam is mainly affected by waves generated by cyclones from the South-East direction. Frequency of Occurrence of Depressions, Storms and Severe Storms over Bay of Bengal during 1890-1984.

Available Social Infrastructure

The social infrastructure that is available around the project site is essentially that of Nakkapalli mandal and secondary information on the infrastructure available is provided.