1. EXECUTIVE SUMMARY

1.1 Introduction

The project proponent, Gujarat State Electricity Corporation Limited (GSECL), is a company promoted in 1993 by Gujarat Urja Vikas Nigam Ltd.; (GUVNL-formerly GEB, Gujarat Electricity Board) as 100% owned subsidiary. Government of Gujarat approved GSECL as a generating company to undertake implementation of new power project. Consequent to the government orders for unbundling of State Electricity Board, all their power plants were transferred to GSECL. As present, GSECL is having total installed generating capacity of 5894 MW. The company is generating power from Coal, Lignite and Gas as fuel. In addition to thermal power plants, Hydro, solar and Wind power plants are also operated by the company.

Some of the Units under GSECL are of very old design/technology, have been operating for more than 25 years. Now, technology has improved and supercritical coal based units with higher capacity, higher efficiency, lower auxiliary power consumption and lower heat rates. In view of this, GSECL intends to replace existing and old ineffectual units at Ukai Thermal Power plant at Ukai. The total installed generating capacity at Ukai TPS is 1350 MW, comprising 2x120 MW (Units 1 & 2), 2x200 MW (Units 3 & 4), 1x210 MW (Unit 4), and 1x500 MW (Unit 5). The project proposal pertains to replacement of existing 2x120 and 1x200 MW Units (Units 1, 2 & 3) by 1x800 MW coal based Supercritical Unit.

1.2 Project Description

As stated earlier, the proposed 1x800 MW coal based super critical unit will be located within Ukai Thermal power Station at Ukai, where adequate land will be available, after dismantling of Units 1, 2 & 3, for the main plants and associated facilities.

Location of the proposed power plant unit has been identified taking into account intrinsic features such as: availability of adequate land, availability and transportation logistics of fuel, availability of nearby water source, availability of infrastructure facilities to evacuate generated power from the station and availability of supporting infrastructural facilities including road and rail connections as well as a full-fledged township. Evacuation of power from the proposed power plant will be done at 400 kV voltage level. Two nos. dedicated 400kV high capacity line is proposed for the power evacuation from the proposed plant. The transmission will be through connectivity to nearby 400 kV substation of Gujarat Electricity Transmission Company Limited (GETCO).

A reheat steam cycle with regenerative feed heating arrangement operating at supercritical range has been proposed. The proposed plant, consisting of one unit of 800 MW capacity shall adopt supercritical steam parameters to achieve higher efficiency and hence lower cost of generation and lower level of emissions. The plant cooling water system will be of re-circulating type cooling system with Induced Draft Cooling Tower. Other plant auxiliaries and accessories would be designed as per the state-of-the-art technology and proven design to ensure safe and continuous operation of the unit with minimum unscheduled outage.

The electric generator would be 3-phase, 50 Hz, hydrogen and water cooled, 3000 rpm machine with brush less/static type excitation system and would generate power at the voltage level of 22 to 27kV (as per the manufacturer's standard design) at 0.85 power factor (lagging). The proposed electrical system would be equipped with adequately sized equipment and with generous redundancy to ensure uninterrupted operation.

The proposed plant shall be operated with domestic coal as fuel. LDO will be used as start-up fuel, and HFO for flame stabilization during operation below 30% load. The Annual Coal requirement for the 1X800 MW Unit at 85% PLF based on the Gross Station Heat rate of 2150 kcal/ kwh and design domestic coal for the unit of 800 MW is around 3.34 Million Tonnes per Annum (MTPA). Coal shall be transported to plant site by existing railway line from Songadh and the existing railway siding. Coal will be unloaded from the railway wagons by the Wagon Tipplers and after crushing, the same is transferred to coal bunkers or stacked in stockpile. Coal shall be stored in the existing coal yard.

Estimated make-up water requirement for the proposed 1 X 800MW plant is about 1900m^3/hr. Ukai Thermal Power station is situated next to the Ukai left bank Main Canal and water requirement for the existing units is being met from the Main Canal. Availability of water in the canal is adequate to cater to the net consumptive water requirement of the new unit and also the existing units.

For Fuel Oil unloading existing system shall be used and for fuel oil forwarding a new system shall be provided for the plant. As per the practice adopted for the existing plants, fuel oil shall be brought to the plant for new unit by road tankers. Existing storage facility shall be utilized for the new unit, which consist of two (2) nos. LDO tanks of aggregate capacity of 460 m3 and two (2) nos. HFO tanks of aggregate capacity of 14000 m3. Likewise, existing unloading pumping facilities already available at site shall be utilized for the new proposed unit.

Estimated quantity of total ash generated from the proposed plant, firing Indian coal having an average ash content of 35.84%, is about 161 TPH at TMCR. Bottom Ash shall be either disposed off to open trucks or shall be led to High Concentration Slurry Disposal (HCSD) system for disposal to ash pond. The Fly ash shall be unloaded from silo into truck to facilitate utilization. In case of non-utilization of fly ash, HCSD system has been envisaged to dispose ash in wet form to ash pond. Existing ash pond will be used for storage of ash.

The proposed plant will be provided with necessary equipment and systems to meet all applicable environmental regulations. Low NOx burners have been envisaged in combination with Selective Catalytic Reduction to reduce the NOx generation and consequent emission. High efficiency Electrostatic Precipitators have been envisaged to limit the particulate emissions to 30 mg/Nm3. A flue gas desulphurization system (FGD) will be installed to meet the MoEF emission norms related to limitations of SO2 content in Flue gas. Limestone based wet type FGD is envisaged for this project. A 275 M tall chimney has been envisaged for the plant, in line with the MoEF guidelines, which will help dispersion of air borne emissions over larger area and thus reducing the impact of the power plant on ground level concentrations.

While developing the layout, maximum efforts have been made to utilize the existing facilities available in the UTPS and to optimum use of land available within the identified land limit, land contour, wind rose pattern of the area, direction of supplies of input, direction of road access and railway entry, operational ease and initial investment requirement.

For installing the proposed super critical unit of 800 MW in place of existing units 1, 2 & 3, the following existing structures within the plant premises will be demolished:

- Existing 220kV switchyard of Units 1, 2 & 3, used for evacuation of power from these units;
- Existing 220kV switchyard for Units 4 & 5, used for evacuation of power from from these units;
- Existing TG building, boiler house, ESP, Chimney, Service building and associated structures for units no. 1, 2 & 3;
- Existing coal handling and storage systems of unit 1, 2 & 3;
- Existing Canteen;

All necessary statutory and non-statutory permits and clearances will be obtained before implementation of the project.

1.3 Site Analysis

The project site is located at a distance of about 10KM from Songarh Railway Station and the site is also connected by roads from SURAT-DHULIA through highway SH-6 at a distance of 10 Kms from Songarh. The nearest Airport is Surat, which is about 93 Kms from the site. Nearest port is Surat which is approximately 93 Km away from UTPS. Established rail routes are already available and hence the transportation of materials to the project site will not be a major constraint.

The proposed 1x800 Unit will be built within the existing 280 acres of land that includes the existing Units in Operation. All the Projects Facilities as per standard norm has been provided within the provided land except the Ash Pond which is provided separately and is currently in use for the disposal of Ash from the Existing units. Land required for new project is 89 Acre within plant boundary, which includes BTG, Switch yard, Coal handling, Ash Handling Area, Water Treatment Area, Cooling Tower, CW system. Land requirement of 89 Acre for new plant has been catered by 32 Acre of Demolished plant area, 57 Acre of unused available land within plant boundary. For Ash Disposal, existing Ash Dyke area will be utilized.

The social infrastructure available at the site includes a full-fledged township, Urjanagar Colony, developed and maintained for the employees. These facilities are adequate to cater to the requirements of the proposed Unit. The township has been provided with all basic amenities, viz. educational, health care, entertainment, shopping, etc.

1.4 Planning Brief

The proposed unit will be located within the existing Ukai Thermal Power Station premises, where all infrastructure required for operation of coal based thermal power station, including railway siding for receipt of coal. For transmission of generated power, the 400 kV substation of Gujarat Electricity Transmission Company Limited (GETCO) is located near the station. The proposed unit will replace existing 3 Units of Ukai TPS, employment generation of increase in population is not envisaged. To accommodate construction workers during construction phase of the project, the fanilities created during construction of the 500 MW Unit will be utilized. Social infrastructure, amenities and facilities are already available.

1.5 Proposed Infrastructure

The proposed infrastructure within the main plants (industrial area) includes the following:

- Super critical Boiler and Turbo generator,
- Wagon tipplers and Coal handling facilities
- Ash Handling facilities,
- Water Treatment facilities,
- Cooling water system with ID Cooling Towers, and
- Switch yard.

Available residential facilities and social infrastructure within the township are adequate to cater to the needs of the proposed Unit. The site is well connected by road and railway siding for traffic and transportation. Green belt will be developed in the area available around the premises of the Station.

1.6 Rehabilitation and Resettlement

The proposed 800 MW super critical thermal power plant will be established within premises of existing Ukai Thermal Power Station of GSECL, where adequate land will be available, after proposed demolition of Units 1, 2 & 3 and their associated facilities. Railway siding, connecting roads and a full-fledged township are existing and will be utilized by the proposed plant. As the project proposal does not involve land acquisition, rehabilitation and resettlement are not required.

1.7 Project schedule and cost estimates

The total time required from start of the project to its commercial operation is estimated as 45 months. The project cost estimates are made based on supercritical technology based boiler and turbine-generator. The fixed cost as well as variable cost of generation has been computed for the proposed project as per prevalent GERC guidelines. The estimated cost of the proposed Project of 1x800 MW, considering GIS Switch yard is worked out to be Rs. 5113 Crores. The specific cost of the Project appears to be Rs 6.39 Crores per MW based on the estimated Project Cost.

1.8 Analysis of the proposal

Establishment of the proposed project within Ukai Thermal Power Station is justified on the basis of the following technical, environmental, social and economic considerations:

- The proposed project will replace the existing 3 Units, which are based on outdated technology, have been operating for more than 25 years and operating at much lower capacity utilization;
- Replacement of the existing units by the proposed Unit will result into significant conservation of resources like coal and water;
- Implementation of the project will result into significant reduction in pollution generation. High efficiency electrostatic precipitators, LNB with SCR system and FGD system will be installed to meet the latest emission norms. State of the art dust suppression and extraction systems will be installed to minimize fugitive emissions.

- Water consumption will be less than 2.5 Kl/MWH of generated power. The Unit will be operated with Zero Effluent Discharge.
- The project proposal does not involve land acquisition.
- Reduced consumption of coal and sharing of existing infrastructure will ensure power generation at lower cast as compared to a green field project.

2.0 INTRODUCTION AND BACKGROUND OF THE PROJECT

2.1. Introduction of the Project

The project is planned to supplement availability of power in Gujarat grid. Considerable number of old coal fired power plant of GSECL 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. Moreover, any surplus power may be diverted to power deficit state.

To aim with this GSECL proposes to set up 1X800 MW Coal based Supercritical Unit in the existing Thermal Power Plant at Ukai, Dist. Tapi , Gujarat. The proposed unit shall be set up by demolishing an existing 2x120MW & 1 x 200 MW GSECL thermal power plant.

2.2. Definitions

Project Developer	:	Gujarat State Electricity Corporation Limited (GSECL)
Project	:	1X800 MW Supercritical TPP, Ukai
Selected Location	:	GESCL Thermal Power Plant at Ukai
Nearest Major Town	:	Distt. Tapi
Seismic Zone	:	Zone III
Access by Road	:	Ukai TPS is connected by roads from SURAT-DHULIA through highway SH-6 at a distance of 10 Kms from Songadh.
Access by Rail	:	10KM From Songarh Railway Station
Access by Sea	:	100 kms from Magdalla and Hazira port 261kms from Dahej port
Access by Air	:	93 kms from Surat Airport
Distance from State	:	400 km

2.3. Preliminary Project Particulars

S. No	Particulars	Details
1.	Main Fuel	Domestic coal
2.	Fuel Transportation	Through railway wagons
3.	Water	River Water
4.	Land	280 Acre GSECL own land
5.	Power Generating Unit	1x800 MW
6.	Cooling System	Normal water condenser cooling
7.	Coal Handling System	Coal unloading through wagon tippler
8.	Ash Disposal System	High concentrated slurry disposal
9.	Power Evacuation	400 kV line
10.	Environmental Aspects	Ministry of Environment and Forests

2.4. Justification of the Project

2.4.1. Introduction

Electricity is the prime mover for growth and is vital for the sustenance of a modern economy. While the projected GDP growth of the Indian economy @6% in the medium term, the long term growth rate of 8-10% is predicted. Such a growth would depends heavily on the availability of electricity to propel around industrial, agricultural and commercial activity.

India's installed capacity has increased from 1,362 MW to over 258701 MW since independence and so far 563,238 villages have been electrified. However, the annual per capita consumption continue to be low at 917 kWh and this is amongst the lowest in the world. The end consumers of electricity viz. households, farmers, commercial establishments, and industries continue to grow subjected to frequent power cuts – both scheduled and unscheduled in many parts of the country.

The Electricity Act 2003 of India entrusts the Central Electricity Authority (CEA) under the Union Ministry of Power to prepare the National Electricity Plan for the next five years and the prospective plan for the next 10 years. The data and projections in this section are based on the latest published CEA surveys, studies & reports.

2.4.2. All India Power Scenario

India has an installed capacity of 288004.97 MW as on 31.01.2016. Coal (including lignite) based thermal power plants contribute about 60.85% of power generation in the country, followed by hydro of 14.81%, Wind & other renewal energy/other sources 13.48%, Gas based 8.51% , Nuclear 2.00%, Liquid fuel based 0.35%. The total thermal (coal, gas & diesel) is about 69.70%.

The State Sector contributes about 34%, the Central Sector about 26% and the Private Sector (IPPs) about 40%. The sector wise break up of installed capacity in the country is indicated in the following table:

Table 2.1

India: Sector wise Installed Capacity, rounded off in MW, as on 31-01-2016,Sector Wise

Sector	Hydro	THERMAL				Nuclear	RES	Total
		Coal	Gas	Diesel	Total			
Central	11491.42	49980.00	7555.33	0	57535.33	5780	0	74806.75
State	28052.00	60550.50	6975.30	438.57	67964.37	0	1934.22	97950.59
Private	3120.00	64707.38	9978.00	554.96	75240.34	0	36887.29	115247.63
Total	42663.42	175237.88	24508.63	993.53	200740.04	5780	38821.51	288004.97

(Source: CEA, Monthly Report, January 2016)

The All – India, region wise, installed capacity is shown in the following table. Gujarat comes under the Western Region and it has a total installed capacity of 29464.28 MW as on 31.01.2016. This is 10.23 % of the total installed capacity in the country.

Table 2.2

Region wise Installed Capacity, rounded off in MW as on 31.01.2016 (MW)

Region	Thermal				Nuclear	Hydro	RES	Total
	Coal	Gas	Diesel	Total				
Northern	42923.50	5331.26	0.00	48254.76	1620.00	18246.77	8166.92	76288.45
Western	68499.0	10815.41	0.00	79314.42	1840.00	7447.50	13698.15	102300.07
Southern	33822.50	6473.66	917.48	41213.64	2320.00	11518.03	16213.18	71264.85
Eastern	29682.87	190.00	0.00	29872.87	0.00	4209.12	469.54	34551.53
North-East	310.00	1698.30	36.00	2044.30	0.00	1242.00	262.62	3548.92
Islands	0	0	40.05	70	0	0	11.10	51.15
All India	175237.88	24508.63	993.53	200740.04	5780.00	42663.42	38821.51	288004.97

Source:- CEA Website

2.4.3. Energy Requirement & Peak Availability

Looking at the overall power supply position over the last 15 years, for the period 9th, 10th and 11th five year plans till 2012, the average energy shortage is about 71,588 MU, climbing from 39,187MU in 9th Plan end to 79,313MU in 2011-12. In percentage terms average energy shortage increased from from 7.5% in 9th Plan end to 8.5% in 2011 – 12 (12th plan end). In 2012-13, energy shortage went up to 8.71%. However, it came down to 4.2% in 2013-14 due slow down in Indian economy. This is illustrated in the following tables:

Table 2.3

India: Power Supply Position, Million Units (MU)

Period	Energy Requirement (MU)	Energy Availability (MU)	Energy shortage (MU)	Energy shortage %
9th Plan end	522,537	483,350	-39,187	-7.5
10th Plan end	690,587	624,495	-66,092	-9.6
2007-08	739,345	666,007	-73338	-9.9
2008-09	777,039	691,038	-86,001	-11.1
2009-10	830,594	746,644	-83,950	-10.1
2010-11	861,591	788,355	-73,236	-8.5
2011-12	937,199	857,886	-79,313	-8.5
2012-13	998,114	911,209	-86,905	-8.71
2013-14	1,002,257	959,829	-42,428	-4.2

(Source: CEA)

2.4.4. Power Sector Scenario in Gujarat

The state of Gujarat has an installed capacity of 29464.28 MW, as on 31.01.2016. The sector wise break – up of power generation in Gujarat is given in Table 2.4 below.

Table 2.4

Sector	Hydro	Thermal	Nuclear	Wind/Rest	Total
State	772.00	7291.82	0	8.00	8071.82
Private	0.00	12702.00	0	4695.15	17667.15
Central	0.00	3165.99	559.32	0.00	3725.31
Total	772.00	23159.81	559.32	4973.15	29464.28

(Source: CEA website), Rounded ofto whole number

2.4.5. Conclusion Justifying the Project

India continues to have both energy and peak deficits. Considering the sustained increase in both energy and peak demand forecast projected by CEA in its 18th EPS, India needs to keep adding generation capacity in coming decades to keep pace with the burgeoning demand of a growing economy. Further, after the realization of a synchronous national grid and anticipated increase in inter regional transfer capacity in coming years, supercritical unit of 800 MW in place of 2x120MW and 1x200 MW units in Ukai Thermal Power Station is well justified.

3. PROJECT DESCRIPTION

The Proposed Project which is being developed will consist of One (1) 800 MW supercritical unit based on domestic coal. The Project will be located within the GSECL premises of UTPS at Ukai, Distt. Tapi, Gujarat. The geographical location of UTPS is at Latitude 21^0 12' 36.5" North and the longitudes Longitude 73^0 33' 26.3" East. The project site is located at a distance of about 10 kms from Songarh Railway Station and Ukai TPS is connected by roads from SURAT-DHULIA through highway SH-6 at a distance of 10 Kms from Songarh. The nearest Airport is Surat, which is about 93 kms from the site. Nearest seaports Magdalla and Hazira, Surat are at a distance of about 10 km from the site.

Project Location map is placed as **Annexure-1.**

Techno -Economic feasibility has been considered as the prime criteria for site selection. This translates into locating adequate land with proximity to water source and feasible transport logistics for imported coal, which are the primary inputs for power generation. Besides, accessibility by rail and road, feasibility of power evacuation, sensitivity of the location, (s) with respect to environmental aspects as well as aviation clearance have also been given due consideration in the selection process.

3.1. Land

The proposed 1x800 MW power plant will be built on approximately 89 acres of land within the premises of existing plant. The approximate break up for the required land is as below:

Table 3.1 – Estimate of Land Requirement

S. No.	Item	Approx. Area in Acres
1.	Main Plant (including switchyard)	30.0
2.	Coal Handling Plant	20.0
3.	Ash Handling Plant	4.0
4.	Balance Of Plant	15.0
5.	FGD	5.0
6.	Ash Pond	Nil (existing to be used)
7.	Storage / Fabrication yard / Site office area during construction period	15

Note: The green belt shall be provided as per MoEF& CC stipulations.

3.1.1. Availability

The land area required for in plant facilities of the 1x800 MW power project is already available within the UTPS premises.

The proposed 1x800 MW power plant is proposed to be built within the existing 280 acres of land that includes the existing Units in Operation. All the Projects Facilities as per standard norm has been provided within the provided land except the Ash Pond which is provided separately and is currently in use for the disposal of Ash from the Existing units.

Approximate 18 Acre of Land will be available after demolition of 2 x 120MW and 1x200 MW Units which includes BTG, Transformer Yard, Canteen, Service Building and Administration Building. Further Approx 14 Acre of Land will be available with the demolition of 220KV switchyard dedicated for existing Unit No.#1 , #2 & #3. Hence around total 32 acre of land (approx 410m length and 235m width) will be available after demolition.

Except Ash Disposal Dyke all other facilities of plant are envisaged in the available plant boundary. For Ash Disposal, existing Ash Dyke area will be utilized. No additional land is to be acquired for new project.

Land required for new project is 89 Acre within plant boundary, which includes BTG, Switch yard, Coal handling, Ash Handling Area, Water Treatment Area, Cooling Tower, CW system.

Land requirement of 89 Acre for new plant has been catered by 32 Acre of Demolished plant area, 57 Acre of unused available land within plant boundary. For Ash Disposal, existing Ash Dyke area will be utilized.

For raw water requirement, pumping station for the proposed unit shall be accommodated in the existing intake pump house of units 1 & 2.

4.1.2. Advantages of Selected Site

The land is available within the running power plant. Power Plant facilities can be located within the available area.

3.2. Water

Ukai Thermal Power station is situated next to the Ukai left bank Main Canal , the water requirements for the existing plant of 1x210 MW, 2X200MW and 2X 120MW and 1 x 500 MW is being met from the supply from Main Canal. The two units of 120MW and one unit of 200 MW are being decommissioned for setting up the new proposed unit of 800MW. This water availability in the canal is sufficient to cater to the net consumptive water requirement of the new unit and also the existing units and it will be utilized for the complete plant water requirement. The existing raw water pump house shall be modified to cater the additional pumping requirements of proposed plant.

Necessary Clarifiers and the DM plant will be set up for the further treatment of water for the requirements of 1X800 MW proposed unit.

The maximum water requirement for the proposed 1X800MW unit is about 1900m^3/hr.

3.3. Fuels

3.3.1. Main fuel Selection

The proposed plant is conceptualized to be operated by firing Indian coal. The coal sources for the coal based power station of GSECL is from South Eastern Coalfields and Western Coal fields Ltd. the subsidiaries company of Coal India Ltd., Central Govt. Undertaking company. As per Fuel Supply Agreement (FSA), Annual Allocated coal quantity for UTPS (870MW) is 31.40 LMT from South Eastern Coal Fields Ltd.

Coal shall be transported by railway. Coal will be unloaded from the railway wagons by the two (2) nos. of Wagon Tipplers to be installed for this project and after crushing; the coal will be either stacked in stockpiles or directly fed to bunkers. Modification in the existing railway siding is proposed for this project.

The coal stock pile will be located near the railway siding. From there Coal will be transported to Plant by conveyors.

The Annual Coal requirement for the 1X800 MW Unitat 85% PLF based on the Gross Station Heat rate of 2150 kcal/ kwh and design coal for the unit of 800 MW is around 3.33 Million Tonnes per Annum (MTPA).

3.3.2. Start-up & Flame Stabilization Fuel

Heavy Furnace Oil (HFO) will be used for flame stabilization in case of low loads (below 30% BMCR loads). Light Diesel Oil (LDO) will be used for start up from cold condition.

3.4. Ash Handling System

3.4.1. Ash Quantity

Ash generation from the plant is classified as Bottom Ash and Fly Ash. Bottom ash will be about 20 % of the total ash generation and remaining is the fly ash.

Estimated quantity of total ash (BA+FA) which will be generated from the plant firing design coal (Indian coal) having an average ash content of 35.84% is about 161TPH with 1x800 MW at TMCR. Bottom Ash shall be either disposed off to open trucks or shall be led to High Concentration Slurry Disposal (HCSD) system for disposal to ash pond. The Fly ash shall be unloaded from silo into truck to facilitate utilization. In case of non-utilization of fly ash, HCSD system has been envisaged to dispose ash in wet form to ash pond.

3.4.2. Bottom Ash system

Bottom ash from boiler furnace and coarse ash from ECO hoppers shall be collected in water impounded hoppers. The ash from bottom of the boiler will be removed through crusher and will be mixed with water to form slurry. The ash slurry will be transported to the hydrobins. The ash shall be either disposed off to open/closed trucks from hydrobins or shall be led to High Concentration Slurry Disposal (HCSD) system through belt conveyors.

3.4.3. Fly Ash system

The fly ash handling system shall be provided to remove fly ash from ESP hoppers, APH hoppers, duct hoppers, if any and economizer hoppers to transport fly ash to fly ash silos. From the Fly Ash Silos, the ash will be collected by the mobile truck / closed tanker and taken to the utilization points.

Two(2) nos. main storage silos of RCC / Steel construction having each silo designed for 24 hrs storage capacity for one unit while firing coal at BMCR condition will be provided. Each fly ash silo shall be equipped with one dry type fly ash unloader and one wet type fly ash unloader. The user industries will take the wet/dry fly ash from these silos in closed/open tankers.

Provision for Slurry disposal from ash silos will be provided for disposal of the ash in case of non utilization. This ash will be further disposed to the ash pond by the high concentration slurry system

3.5. Ash Utilization and Disposal Options

Existing ash pond will be used for storage of ash. All efforts will be made to promote utilization of fly ash to the fullest extent. In the event not enough utilization is found, fly ash shall be disposed to the ash pond by HCSD system. Bottom ash will also be discharged by HCSD system to the ash pond as an alternate disposal arrangement. The ash pond will have a water cover always to prevent ash being carried by wind. The existing ash ponds are sufficient to store ash generated from the proposed 800 MW unit as per MOEF Guidelines. Waste water from the FGD will be discharged directly into the ash pond.

Project Developer plans to utilize ash from the coal-based power plants as a thrust area of its activities in environmental safeguarding. All possible measures are being undertaken to maximize utilization of ash produced. In the proposed project too, various means of ash utilization shall be explored. Supply of ash to cement plants in the region, for manufacture of cement, shall be taken up as a priority area.

3.6 Cycle Parameters Selection Criteria

The objective for the cycle parameters optimization for 1x800 MW proposed Unit is to achieve an efficient high performance power unit, using proven technologies with equipment having track record of high availability and high reliability.

It should however be noted that the thermal cycle parameters mentioned below are only indicative and will be finalized during the project implementation engineering stage.

The design criteria for the plant are based on the following points:

- Pulverized coal using Indian coal.
- Unit Gross Electrical Output at 100% TMCR 800 MW
- Proven operating experience on the Last Stage Blade (LSB) length & material at 3000 rpm
- Gross TG Cycle Heat Rate ≤1850 Kcal/ kWh (CERC normative level).
- Sliding / Modified Sliding pressure operation
- Use plant emissions limits to establish backend equipment design
- Circulating water temperature : 33.1 Deg. C

- Air heater exit temperature will be set at acid dew point temperature plus 9 Deg. C, for optimum boiler efficiency.
- Equipment history of high availability and high reliability
- Commercially available with reasonable number of competitors

For carrying out the cycle parameters optimization, keeping the above points in mind, several issues have been looked into and the same are briefly as discussed below:

3.7. Steam Cycle Parameters

The primary factors which govern the steam cycle selection are efficiency and equipment cost. With higher steam parameters, the investment cost goes up on account of increase in the cost of boiler and turbine equipment. However, on account of higher plant efficiency, the incremental investment cost is recovered within the initial years of operation.

Main steam parameters 274ata/602 deg. C and hot reheat outlet temp. As 601.4 deg. C have been adapted keeping in mind the applications to similar capacity supercritical units available in india and the availability of the equipment.

Cold Reheat pressure as 52.53 ata has been proposed to limit the volumetric flows of reheater circuit, which will eventually lead to optimum size of CRH / HRH pipe lines and will also be useful in the Stress Analysis of the critical piping.

With 28 Deg. C Design Wet Bulb Temperature, the optimum Cooling Water temperature which can be achieved is 33 Deg. C, with a temp. rise of 9 Deg. C. On this basis, the condenser back pressure has been proposed as 0.101 ata.

Keeping in mind the size of the Supercritical Unit, the Cycle configuration has been proposed as follows:

- No. of HP Heaters – 3 Nos.
- No. of LP Heaters – 4 Nos.

Taking the above into consideration, the complete cycle configuration has been proposed in the form of the Heat & mass Balance Diagram (HMBD) which is enclosed with this report. The extraction points for the extraction steam to these heaters have been identified in the HMBD.

The optimum value of the Final Feed Water temperature at the inlet of the Economizer has been calculated as 290.9 Deg. C

The proposed plant, consisting of one unit of 800 MW capacity shall adopt Supercritical steam parameters to achieve higher efficiency and hence lower cost of generation. After reviewing the parameters followed for unit of similar sizes and also keeping in mind the availability of equipment, the above steam parameters have been selected.

The advancement in metallurgical research coupled with rising fuel prices have contributed to the migration of manufacturers and project developers to higher steam parameters. The other major benefit of adopting higher steam cycle is reduction in emissions (SPM, CO_2, SO_2, NOx). Secondary benefits of higher steam cycle parameters are reduction in the capacities of auxiliary systems such as cooling water, coal and ash handling, also resulting in some savings in the capital cost.

3.8 Transportation Logistics

As the existing units are already in operation at the Ukai Thermal Power Station, the railway lines are already available which can be used for any movement of the heavy equipment by rail. In addition, the UTPS is situated in Urban Ukai with well connected road network and this existing road will be used for transportation of project equipment. Hence, transportation of materials to the project site will not be a constraint. However, detailed transport logistic study shall be reviewed during the project execution phase.

`3.9. Power Evacuation

Evacuation of power from the proposed power plant will be done at 400 kV voltage level. The generation voltage is envisaged as 22 kV or will be as per the standard design of manufacturer. For evacuation of power, three (3) nos. single phase 325 MVA, 22 / 420/√3 kV generator transformers are envisaged.

One 400 kV GIS switchyard will be constructed in the proposed power plant. Two nos. dedicated 400kV high capacity line is proposed for the power evacuation from the proposed plant. The transmission will be through connectivity to nearby 400 kV substation of Gujarat Electricity Transmission Company Limited (GETCO).

4. SITE ANALYSIS

4.1. Site Selection criteria

The land required for accommodating the plant facilities of the 1x800 MW project is already in the possession of GSECL in the premises of UTPS. The other factors considered while selecting the power plant site are:

a) Availability of adequate land for power plant, ash disposal and other facilities.
b) Availability of required quantity of water throughout the year
c) Easy transportation of coal
d) Evacuation of power,
e) Environmental compatibility,
f) Transportation of Over Dimensional Consignments (ODC).
g) Area does not fall within any restricted area.

4.2. Description of selected Site

4.2.1. Location and Approach

The Proposed Project which is being developed , will consist of one (1) 800 MW supercritical unit based on domestic coal. The Project will be located in the UTPS, the existing Power Plant in Ukai, Tapi, Gujarat. The project site is located at a distance of about 10 kms from Sonagarh Railway Station and is connected by roads from SURAT-DHULIA through highway SH-6 at a distance of 10 Kms from Songarh.. The nearest Airport is Surat, which is about 93 km from the site.

4.2.2. Land

The proposed 1x800 MW power plant is proposed to be built within the existing 280 acres of land that includes the existing Units in Operation. All the Projects Facilities as per standard norm has been provided within the provided land except the Ash Pond which is provided separately and is currently in use for the disposal of Ash from the Existing units.

Approximate 18 Acre of Land will be available after demolition of 2 x 120MW and 1x200 MW Units which includes BTG, Transformer Yard, Canteen, Service Building and Administration Building. Further Approx 14 Acre of Land will be available with the demolition of 220KV switchyard dedicated for existing Unit No.#1 , #2 & #3. Hence around total 32 acre of land (approx 410m length and 235m width) will be available after demolition.

Except Ash Disposal Dyke all other facilities of plant are envisaged in the available plant boundary. For Ash Disposal, existing Ash Dyke area will be utilized. No additional land is to be acquired for new project.

Land required for new project is 89 Acre within plant boundary, which includes BTG, Switch yard, Coal handling, Ash Handling Area, Water Treatment Area, Cooling Tower, CW system.

Land requirement of 89 Acre for new plant has been catered by 32 Acre of Demolished plant area, 57 Acre of unused available land within plant boundary. For Ash Disposal, existing Ash Dyke area will be utilized.

For raw water requirement, pumping station for the proposed unit shall be accommodated in the existing intake pump house of units 1 & 2.

4.2.3. Water

Ukai Thermal Power station is situated next to the Ukai left bank Main Canal , the water requirements for the existing plant of 1x210 MW, 2X200MW and 2X 120MW and 1 x 500 MW is being met from the supply from Main Canal. The two units of 120MW and one unit of 200 MW are being decommissioned for setting up the new proposed unit of 800MW. This water availability in the canal is sufficient to cater to the net consumptive water requirement of the new unit and also the existing units and it will be utilized for the complete plant water requirement.

4.2.4. Fuel Source and Transportation Logistics:

Domestic coal has been considered with Design Gross Calorific Value assumed to be 3831 kCal/kg and 35.84% Ash Content.

Domestic Coal will be brought to the plant by railways, through BOXN wagons.

For unloading the domestic coal carrying rakes, modification of existing railway siding facility available at site and installation of new wagon tipplers have been envisaged. For coal handling, new coal handling system has been envisaged for the new proposed unit.

LDO and HFO will be used for start – up and low load stabilization respectively.

4.2.5. Construction Water

The construction water for the power plant will be sourced from existing water sources.

4.2.6. Construction Power

Construction power will be sourced from the existing plant.

4.2.7. Climate and Meteorological Data

Ukai's climate is classified as tropical. This climate is considered to be Aw according to the Köppen-Geiger climate classification. The average temperature in Ukai is 27.5 °C. At an average temperature of 32.7°C, May is the hottest month of the year. The lowest average temperatures in the year occur in January, when it is around 22.2 °C.Most of the rain fall in the area occurs during the south-western monsoon season. The area receives approximately 1475 mm of precipitation annually. The

greatest amount of precipitation occurs in July, with an average of 585 mm.Precipitation is the lowest in January, with an average of 0 mm.

Table 4.1 Climatological data of Ukai

Month	Ambient temperature, ^{0}C			Precipitation, mm
	Average	Minimum	Maximum	
January	22.2	13.5	30.9	0
February	24	14.8	33.2	0
March	28	19.3	36.7	1
April	31.2	23.4	29.1	1
May	32.7	26.4	39.1	6
June	31	26.5	35.5	161
July	28.3	25.2	31.5	585
August	27.8	24.6	31	423
September	28	23.9	32.1	257
October	28	21.4	34.7	43
November	25.3	16.9	33.7	7
December	22.9	14	31	1

Source: Climate-data.org

5. PLANNING BRIEF

The project is planned to supplement availability of power in Gujarat grid. Considerable number of old coal fired power plant of GSECL 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. Moreover, any surplus power may be diverted to power deficit state.

To aim with this GSECL proposes to set up 1X800 MW Coal based Supercritical Unit in the existing Thermal Power Plant at Ukai, Dist. Tapi , Gujarat. The proposed unit shall be set up by demolishing an existing 2x120MW & 1 x 200 MW GSECL thermal power plant.

5.1 Population Projection

Unskilled and semi-skilled work force during construction and operational phases will be drawn from local population. Skilled work force during operation and construction phases will stay at Ukai, and commute to the site. Thus, the increase in population due to the proposed project is not envisaged.

5.2 Land Use Planning

For proposed Supercritical Unit of 1 x 800 MW will be established in place of 2 x 120 MW & 1 x 200 MW within the premises of existing Ukai TPP

Lay out map of the project area, demonstrating plants and facilities, has been presented in the layout plan, attached as **Annexure- 2**.

5.3 Infrastructure Demand

5.3.1 Physical Demand

Land: The proposed 1x800 MW power plant is proposed to be built within the existing 280 acres of land of UTPS that includes the existing Unit in Operation. All the Projects Facilities as per standard norm have been provided within the provided land except the Ash Pond. Existing ash ponds of UTPS which are under operation for existing units have sufficient capacity to cater future ash generation from the proposed unit of 1x800MW.

Approximate 18 Acre of Land will be available after demolition of 2 x 120MW and 1x200 MW Units which includes BTG, Transformer Yard, Canteen, Service Building and Administration Building. Further Approx 14 Acre of Land will be available with the demolition of 220KV switchyard dedicated for existing Unit No.#1 , #2 & #3. Hence around total 32 acre of land (approx 410m length and 235m width) will be available after demolition..

The fixed ground level is already established. No further levelling and filling is required for the project. Elevation of site is +82.200M with respect to mean sea level.

Water: Existing water storage facilities are sufficient to cater the demand of the proposed project.

Energy: Total power requirement of the complex is approximately 20.656MW.

Construction material: Construction materials include structural steel, corrugated sheets, bricks; sand, cement, stone chips, etc. are available in the area and will be sourced from Ukai.

5.3.2 Social Demand

On the basis of the preliminary site visit, the infrastructure demand in the villages assessed on the basis of need and priority. Health infrastructure of the study area are well established and are well connected through SH-22. Nangal having well established school and higher education institute for education purpose.

5.4 Amenities/ Facilities

As the plant is an existing unit, hence site office, small workshop, first aid room, stack yard & rest shelter are alreadypresent within the plant premises. Clean drinking water is available. The toilets are also; available separately for males and females.

6. PROPOSED INFRASTRUCTURE

Super-Critical steam parameters have been envisaged for the proposed 1x800 MW Unit. The plant will utilize Indian coal.

6.1. Mechanical Systems

6.1.1. Plant Performance Parameters

The steam parameters envisaged for the 800 MW unit shall be as follows:

- Main Steam pressure at HP Turbine Inlet :270ata
- Main Steam temperature at HP Turbine Inlet :600°C
- Hot Reheat Steam pressure at IP Turbine Inlet :50ata
- Hot Reheat Steam temperature at IP Turbine Inlet :600°C
- Steam quantity requirement at 100% TMCR :2277.4 TPH

The above parameters are preliminary and indicative. The final steam conditions will be as per the selected technology (Super-Critical) and guaranteed parameters, as agreed by original equipment manufacturer (OEM) during finalization of EPC Contract at the implementation stage of the Project.

6.1.2. Steam Generator & Auxiliaries

The proposed steam generator will be of the latest design concept. The design shall also be supported by successful operational history. The technical specifications of the Steam Generator will be in line with "Standard Technical Features of BTG System for Supercritical 800 MW Thermal Units "published by CEA. The Steam Generator will have following characteristic features:

- Once-through boiler
- Simple water / steam system
- Grinding and firing system with roller mills and low NOx burners
- Two line air and flue gas system

The above features result in the following benefits:

- The furnace platen design and the bundle design being less sensitive to fouling.
- Steam generation and steam temperature unaffected by varying coal quality and fouling of the heating surfaces
- High efficiency
- High availability
- Low auxiliary power consumption

- Low emissions
- Short start-up times
- Quick load following capability

6.1.3. Steam Turbine and Accessories

The technical specifications of the Steam Turbine - Generator will be in line with "Standard Technical Features of BTG System for Supercritical 800 MW Thermal Units published by CEA. The steam turbine generator (STG) shall be rated for 800 MW (nominal) at the TMCR condition. Steam turbine system shall be provided with regenerative feed heating system to achieve the best possible steam cycle efficiency.

6.1.4. FUEL OIL HANDLING SYSTEM

Fuel Oil unloading and forwarding system shall be provided for the plant.

The type of fuel oil shall constitute Light Diesel oil (LDO) which shall be used during start up, for running the plant upto 10% load at BMCR conditions, and Heavy Furnace Oil shall be used for normal start up, low load operation & flame stabilisation, for running the plant upto 30% load at BMCR conditions. As per the practice adopted for the existing plants, fuel oil shall be brought to the plant for new unit by road tankers.

Existing storage facility shall be utilised for the new unit, which shall consist of two (2) nos. LDO and of two (2) nos. HFO tanks. Likewise, existing unloading pumping facilities already available at site shall be utilised for the new proposed unit.

Fuel oil forwarding system shall consist of two (2) no HFO forwarding pumps and two (2) no LDO pump of adequate capacity and head. Each HFO & LDO forwarding pump shall be designed to cater to 100% oil requirement of the unit. One pump shall be working and other one shall serve as a standby.
HFO pipelines shall be provided with heat tracing using steam.

Suitable type of oil strainers shall be provided at suction of HFO and LDO forwarding pumps and as well as at discharge of each oil heater at fuel oil pump house.

6.1.5. ASH HANDLING SYSTEM

For the design of the Ash Handling System, the following data has been considered.

Table 5.1 – Design Parameter for Ash Handling Plant

Particulars	Percentage
Bottom ash (BA)	**20%**
Fly ash	**80%**

6.1.5.1 Bottom Ash system

Ash from furnace bottom will be collected in the water-impounded bottom ash hopper of adequate storage time. The bottom ash hopper will be furnished with water seal trough to prevent ingress of air. Adequate number of hydro-pneumatic operated discharge gates of adequate opening size shall also be provided. During ash evacuation from bottom ash hopper the gates will be opened and ash shall be crushed to smaller size by clinker grinders located below the discharge gates. The outlet of clinker grinders shall feed the crushed ash to jet pumps. Jet pumps shall receive high pressure motive water from HP water pump and accordingly, the ash slurry formed shall be conveyed to Hydrobin (De-watering Bin).

Each ECO hoppers shall be provided with water seal type expansion joints and flushing apparatus which shall continuously feed the coarse ash to Bottom Ash hopper in slurry form through pipes.

The overflow water from Bottom ash hopper and seal trough shall be led to a Bottom Ash overflow tank / Sump and thereafter shall be pumped to hydro bin.

In De- watering bin the water shall be separated from ash. The water recovered from the dewatering bin is led thorough settling tank and surge tank and thereafter flows to ash water tank by gravity . The make up to the ash water tank is done from CT blowdown water and also from service water. 3x 50% HP pumps, 3x50% LP Pumps , 2x100% HCSD water supply pumps and 2x 100% silo condition pumps pump water from the ash water tank to their respective consumption points. The ash water pump sealing is done by 2x 100% seal water pumps installed in the clarified water pump house. The ash shall be either disposed off to open/closed trucks or shall be led to High Concentration Slurry Disposal (HCSD) system through belt conveyors and fed into Agitator retention tank where in after mixing with fly ash and ash water the high concentration slurry is pumped to the ash pond by 1x100% HCSD piston diaphragm pumps (provided per silo).

6.1.5. 2 Fly Ash system

The fly ash handling system will be provided to remove fly ash from ESP hoppers, APH hoppers, economizer hoppers, Duct Hopper (if applicable) etc. to transport fly ash to fly ash silo via ash transfer piping system.

Fly ash collected in APH, economizer hoppers, Duct Hopper (if applicable) and ESP shall be pneumatically conveyed in dry form in two stages. The first stage conveying shall be from APH, Duct Hopper and ESP to 6 nos. buffer hoppers which shall be under negative pressure or vacuum system. 6W +6S liquid ring type vacuum pumps shall be provided to cater to this need. Water for the sealing requirement of mechanical exhausters shall be supplied from the clarified water.

To facilitate easy flow of dry ash in ESP hoppers and buffer hoppers, (1W+1S) fluidizing blowers will be provided.

The second stage conveying shall be from buffer hoppers to remote fly ash silos which shall be conveyed under positive pressure system. 3W + 2S oil free screw type compressors shall be

provided to cater to this need. The conveying system will be sized for continuous evacuation of ash from hoppers.

6.1.6. Ash Pond and Ash Water Recovery

Existing ash pond will be used for storage of ash. All efforts will be made to promote utilization of fly ash to the fullest extent. In the event not enough utilization is found, fly ash shall be disposed to the ash pond by HCSD system. Bottom ash will also be discharged by HCSD system to the ash pond as an alternate disposal arrangement. The ash pond will have a water cover always to prevent ash being carried by wind. The existing ash ponds are sufficient to store ash generated from the proposed 800 MW unit as per MOEF Guidelines. Waste water from FGD shall also be discharged directly into the ash pond.

6.1.7. Water System

It is proposed to install a closed re-circulating cooling water system using induced draft cooling towers, with 9□C temperature rise across the condenser. It is envisaged to design the system for five (5) cycles of concentration (COC). Clarified water shall be used in closed re-circulating cooling water system. Estimated clarified water requirement for cooling water circulation through the cooling tower is about 89640 m3/hr which includes auxiliary cooling water requirement of about 4600 m3/hr approximately. Considering evaporation, drift loss and blow down and selected COC, the cooling tower make-up water requirement will be about 1822 m3/hr. Accordingly, estimated raw water requirement for the consumptive needs is 1900 m3/hr. The clarified water, potable water & DM water requirements have been accounted.

6.1.8. Raw water Intake System

Ukai Thermal Power station is situated next to the Ukai left bank Main Canal. The water requirements for the existing plant of 1x210 MW, 2X200MW and 2X 120MW and 1 x 500 MW is being met from the supply from Main Canal. The two no 120MW units and 1x200 MW are being decommissioned for settling up the new proposed unit. The water requirement for the proposed 1 x 800 MW unit will also be met through the canal. Existing raw intake pump house shall be modified to cater the additional raw water requirement for the plant.

Water from raw water intake shall be supplied to clarifiers to remove the sludge, total suspended solids and improve the water quality being supplied to condenser. Clarified water shall be used for circulating water system, service water system and fire water system for the plant.

6.1.9. Water Treatment System

The water treatment system comprises of Demineralization Plant, Chlorination Plant, Condensate Polishing Plant, CW Treatment Plant, Sludge treatment plant etc. described below.

DM water system will consist of two trains of equal capacity. One no. will be in operation and one will be on standby. Each train will consist of a Duplex Filter, Activated Carbon Filter, Anion Exchanger, Degasser tower, Cation Exchanger and a mix bed Exchanger.

The DM Water cycle make-up system from 2 nos. DM water storage tank will consist of 2x100% (1w+1s) cycle make up pumps for feeding to condensate hot well. Besides, there will be 2 x 100% boiler fill pumps for plant for direct filling of boiler with Demineralized Water. These pumps will be located near DM Water Tanks.

Recommended DM water quality for boiler feed shall be as follows:

- pH – 7.0 ± 0.2
- Conductivity at 25 Deg.C – 0.1 uS/cm.
- Silica <10 ppb.

The final water analysis in line with boiler requirements shall be in the contractor's scope.

6.1.10. Effluent Treatment Plant

The proposed supercritical unit is designed for zero liquid discharge. Treatment will be provided for oil contained water effluent and for DM plant reject and other types of waste water/effluents. Sewage will be treated separately and reserved for horticulture. Cooling Tower blow down will be used for ash handling, dust suppression, horticulture etc . after necessary treatment. The following are the different type of effluents to be treated before reuse.

- The water from cooling tower blow down.
- Effluent from clarifiers– It has high turbidity. It will be treated in the thickners & belt press. Supernatant will be recycled in the sludge treatment plant and solid effluent will be disposed at site.
- All chemical area drains and CPU regeneration waste are directed to the neutralization basin. Once the pH of the wastewater has been adjusted to acceptable limit, the neutralization basin effluent will be transferred to CMB.
- Boiler blow down and HVAC waste.
- Effluent from Boiler, Turbine and other areas, which may contain oil traces, will be pumped to oil/water separator. The oil will be pumped out periodically and trucked out for offsite disposal. Treated water will be directed to CMB.
- The wastewater in transformer area, FOPH, workshop may contain oil. Disposal of wastewater from transformer yard will be directed to Oil/water separator. The separated water will be directed to common effluent treatment plant.
- Waste water from clarifier within ETP.

- Effluent generation is dependent to some extent, on the operating practices in the plant. Residual effluent will be reused, to the extent possible, for dust suppression (for coal handling plant and open areas), mill reject handling and green belt development. The effluent from CMB will be directed to ETP clarifier and RO plant in order to reuse the effluent inside the plant to the extent possible. The sludge from ETP clarifier will be directed to sludge treatment plant of pre-treatment plant. The recovered water from RO plant is directed to be used further in limestone based FGD plant. Waste water from RO is directed to Ash handling plant for ash disposal into existing plant.
- The total recovered water from sludge treatment plant of pre-treatment plant is directed to inlet of main clarifier for reuse while the sludge shall be disposed in trucks to outside of plant boundary.

6.1.11. Flue Gas De-Sulphurization (FGD) system

A flue gas desulphurization system (FGD) will be installed to meet the MoEF emission norms related to limitations of SO_2 content in Flue gas. Since the source of plant water is river water and location of the plant is far away from the vicinity of sea, hence Limestone based wet type FGD is envisaged for this project. Water for the FGD plant will be sourced from the service water tank and from Central monitoring basin.

FGD flue gas treatment system will be located after removal of particulate matter from flue gas by the electrostatic precipitator. The clean gas out of the wet FGD process will be discharged to the stack.

Flue gas will be treated in an absorber tower by passing the flue gas stream through a limestone slurry spray. The flue gas will flow upward through the absorber tower which will be in counter current direction to the limestone slurry spray liquid flowing downward in the absorber.

Slurry from the absorber reaction tank will be pumped through spray nozzles to atomize it to fine droplets and to obtain uniform contact with the gas. The droplet absorbs SO_2 from the gas, by the reaction of the SO_2 with the limestone reagent in the slurry.

Hydrogen chloride and hydrogen fluoride present in the flue gas are also absorbed and neutralized with this reagent.

The de-sulfurized flue gas then passes through mist eliminators to remove entrained liquid droplets before the flue gas is sent to the gas-gas heater and then the stack.

Waste water from FGD shall be directed to ash pond.

Limestone is envisaged to be brought to the plant by trucks and stored in limestone stock pile of 30 days storage capacity. Limestone shall be crushed and then stored in limestone storage bunker/silo. Limestone shall be fed to the lime stone crusher house through reclaim hopper and conveyor belt arrangements. Suitable crushing arrangement shall be provided to crush the limestone to size suitable to be handled in ball mills. The crushed limestone shall be fed to the limestone silo by

conveyor system. Gypsum produced as by product of this FGD system shall be collected by trucks and stored in Gypsum storage area and then sold off.

The FGD system is proposed such that the FGD for new unit (800 MW) and 500 MW unit shall have common facilities such as limestone handling, gypsum handing etc. to save the available land and optimise the overall plant layout.

6.2 Residential Area

The GSECL Township has been provided with adequate number of dwelling units, supported by Gest House and Expert Hostel. The proposed project will not generate additional employment opportunity. Further, skilled and un-skilled work force required during construction phase of the project will be drawn from nearby population, who will commute from their own homes.

6.3 Green Belt

Increasing vegetation in the form of greenbelt is one of the preferred methods to mitigate air pollution. Plants serve as a sink for pollutants, act as barrier to break up the wind speed as well allow the dust and other particulates to settle out there. It also helps to reduce the noise level to some extent. Being an environmentally conscious organization, Ukai TPP has developed green belt and plantation in and around the plants and the township. Plantation has also been developed over the ash pond and around the water reservoirs. GSECL Ukai TPP is committed to continually expend and maintaing green belt within the plant premises, the township, over the exhausted areas within the ash pond and around the water reservoirs.

6.4 Social Infrastructure

Ukai TPP Unit of GSECL is located within limits of Municipal Corporation, and has its own township for its employees. Township at Ukai has been provided with all infrastructure facilities, viz., family accommodations, Guest House, Expert Hostel, Hospital, power and water supply, School, parks, shopping Centre, etc. The existing facilities are adequate, and no additional facility is required.

6.5 Connectivity

The project site, located within premises of the fertilizer complex, is well connected by road and railway siding. No additional connectivity is required.

7. Rehabilitation and Resettlement Plan

The proposed project will be located within the premises of the existing power plant complex, adjacent to the existing operational plants. Therefore, implementation of the project does not involve, land acquisition, rehabilitation or resettlement.

8. PROJECT SCHEDULE AND COST ESTIMATE

8.1 Project Schedule

8.1.1 Pre-Project Activities

The pre-project activities to be completed before the physical execution of the project are briefly enumerated below:

i. Approval of the project by the board of the company.

ii. Submission of application for obtaining Environmental clearance to the concerned authority

iii. Appointment of Engineering Procurement Consultant (EPC).

iv. Firming up of list for procurmement.

All the activities mentioned above should be completed before the 'zero date' of the project i.e. before the commencement of the active phase of the project.

Project Implementation Period

The Unit of 1x800 MW (nominal) project would go in to commercial operation in 45 months from "Zero date". Date of Financial closure shall be considered as the Zero Date/ Notice to proceed (NTP). Notice to proceed (NTP) will be issued to the EPC Contractor to commence construction of the project.

8.2 Project Cost

The estimated cost of the proposed Project of 1x800 MW, considering GIS Switch yard is worked out to be Rs. 5113 Crores. The specific cost of the Project appears to be Rs 6.39 Crores per MW based on the estimated Project Cost. The Capacity Charge as well as Energy Charge of generation (i.e. two part tariff) has been computed for the proposed unit in order to assess overall financial viability of the project. For this purpose, a comprehensive financial model has been developed based on GERC Regulation for the purpose of determination of Tariff (Cost of Generation).

Table: 8.1
Project Cost Break-up

S.No.	Description	FC*	DC*	Total
1	Cost of Land & Site Development	--	--	--
2	Steam Generator, Turbine and Auxiliaries	386	1544	1930
3	SCR, FGD and Auxiliaries	240		240
4	Balance of Plant - Mechanical Systems	--	215	215
5	Balance of Plant - Electrical Systems	--	--	424
6	Sub Total of Equipment Cost (2 + 3 + 4 + 5)	--	--	2809
7	Initial Spares @4% of Sl. No. 6	--	--	112
8	Equipment Cost including Spares (6+7)	--	--	2921
9	Custom Duty@ 26% on Sl. No. 8 Foreign Component ***	--	--	0
10	Excise Duty@12.36% on Sl. No. 8 Domestic Component ***	--	--	0
11	CST@2 % on Sl. No. 8 Domestic Component	--	--	40
12	Equipment Cost including Spares, taxes and Duties (8+9+10+11)	--	--	2961
13	Freight & Insurance on Supply	--	--	97
14	Total Equipment including Freight & Insurance (12 + 13)	--	--	3058
15	Civil Works	--	--	538
16	Erection Testing and commissioning 10% of Sl. No. 6	--	--	281
17	Service Tax@15% on Sl. No. 16	--	--	42
18	Work Contract Tax @5% of Sl. No. 15	--	--	27
19	Total Works Cost (1 + 14 + 15 + 16 + 17 + 18)	--	--	3946
20	Contingency	--	--	121
21	Sub Total including Contingency (19 + 20)	--	--	4067
22	Establishment Cost	--	--	39
23	Consultancy & Engineering	--	--	10
24	Operator's Training	--	--	2
25	Auditing & Accounts	--	--	4
26	Start up, commissioning and trial run fuel	--	--	65
27	Start up commissioning and trial run Power	--	--	10
28	CSR expenses (0.4% on Project Cost at one time + 0.08% of Project Cost as recurring for the construction period of 54 months)	--	--	38
29	Sub Total including Overheads and Pre Operating Costs (21 + 22 + 23 + 24 + 25 + 27 +	--	--	4235

	28)			
30	IDC & Financing Costs	--	--	878
31	**Total Project Cost including IDC & FC (29 + 30)**	**--**	**--**	**5113**
32	**Specific Capital Cost (Rs. Crores / MW)**	**--**	**--**	**6.39**

9. Analysis of proposal (Final recommendation)

It is concluded that project of installing 1X800 MW Coal based Supercritical Unit by demolishing existing 2x120MW and 1x200 MW units in the GSECL Thermal Power Plant at Ukai, Dist. Tapi, Gujarat is feasible with the followings:

a. As per feasibility report land requirement for new plant is 45 Acre which will be catered by 32 Acre of Demolished plant area, 13 Acre of unused available land within plant boundary. Actual land requirement is further modified in this detailed project report.

b. Water from Ukai main canal shall be used for the proposed 1X800MW unit.

c. Water requirement of the plant shall be pumped from existing Intake water pump house.

d. Based on the constraint of space in the layout, IDCT is considered for the project.

e. Coal is being brought to the plant by railways, through BOXN wagons. Existing railway siding & unloading facility available at site shall be utilised to unload the coal carrying rakes coming for new unit.

f. Existing Stock pile arrangement will be used for the New Plant

g. For fuel oil requirement existing storage facility shall be utilised for the new unit, which shall consist of two (2) no LDO and of two (2) HFO tanks. Likewise, existing unloading pumping facilities already available at site shall be utilised for the new proposed unit.

h. Approximate 50 Acre of land will be required for Ash Disposal. For Ash Disposal, existing Ash Dyke area will be utilized.

i. Evacuation of power from the proposed power plant will be done at 400 kV voltage level.

j. As seen from the plot plan, the proposed main block space is bounded from all four sides. Unit 6 of 500 MW on one side, Existing Canal on Second side, 220KV switchyard and Unit#,4,5 on third side & Coal handling System on fourth side. As the construction space availability is less for the new plant and very less space is available for the movement of heavy machinery required for the erection activities, the construction and erection of the plant at the location may be

challenging. Detailed study and planning for construction and erection work and their sequence may be required during detail project execution stage.

k. Considering the Layout requirements, modifications in the existing plant roads are carried out.

l. Canteen is required to be constructed at suitable location prior to the demolition.