PRE-FEASIBILITY REPORT

OF

EXPANSION OF 2 X 700 MW SUPERCRITICAL COAL BASED THERMAL POWER PLANT BY ADDING 1 X 700 MW UNIT

Near vill Nalash, Rajpura-140401

District Patiala (Punjab)

by

NABHA POWER LIMITED

November 2016

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1.0 EXECUTIVE SUMMARY

Power generation is one of the key infrastructural elements for the economic growth of the country. The development of the power sector in the country since independence has been predominantly through the State Electricity Boards formed in each state under the Electricity (Supply) Act 1948 with responsibility for generation, transmission and distribution of electric power. Central Electricity Authority (CEA) was identified as the nodal agency for centralised planning of power generation and transmission system.

Electricity Act, 2003 provides an enabling framework conducive to development of sector on open, non-discriminatory, competitive, market-driven environment with the interest of the consumer as well as the supplier of power, considering also supply of electricity to all including rural areas.

Nabha Power Limited (NPL) is a 100% subsidiary of L&T Power Development Limited (LTPDL) presently operating 1400 MW (2 x 700 MW) coal fired Thermal Power Plant near village Nalash of Rajpura Tehsil in District Patiala, Punjab, India. The plant is based on latest state of art supercritical technology.

This existing Project was awarded to L&TPDL, a 100% subsidiary of Larsen & Toubro Limited (L&T), through competitive tariff-based (Case-2) bidding process. Subsequently L&TPDL has purchased 100% of the shareholding in Nabha Power from PSEB vide Share Purchase Agreement dated January 18, 2010. NPL has signed a Power Purchase Agreement (PPA) with PSEB on January 18, 2010 for entire power from the plant for a period of 25 years from COD of the Plant.

Government of Punjab (GoP) has announced the Generation Policy for the State of Punjab. The Policy aims to transform the State from power deficit to power surplus State and ensure quality supply of power to all consumers at affordable prices. After restructuring of the electricity board this is a major power sector reform undertaken by

the Punjab Govt. that will give a quantum jump to the power generation capacity. The policy encourages setting up of power stations by private developers which should bring down the cost of power and promote development of ancillary industry related to power plants.

NPL intends to establish additional 1 x 700 MW Coal-fired Thermal Power Plant as an expansion unit adjacent to the operating plant of 1400 MW (2 x 700 MW) in line with the new Generation Policy .Accordingly this Feasibility Report is intended to establish the feasibility of the same.

1.1 Justification of the Project

The Northern Region shows energy deficit of -1.8%, compared to All India surplus of 1.1% and 2.6% surplus at peak. The energy availability is 351009 MU compared to requirement of 357459 MU. The peak energy deficit in Northern Region is –1.6%. Punjab shows energy deficit of -7.3%. The availability is 48296 MU compared to requirement of 52080 MU. The peak deficit in Punjab is -6% in FY 2016-17.

TABLE 1
Anticipated All India Power Supply Position for the year 2016-17

State / Region	Energy				Peak			
	Requirement	Availability	Surplus (+)/ Deficit (-)		Demand	Met	Surplus (+)/ Deficit (-)	
	(MU)	(MU)	(MU)	(%)	(MW)	(MW)	(MW)	(%)
Northern	357,459	351,009	-6,450	-1.8	55,800	54,900	-900	-1.6
Western	379,087	405,370	26,283	6.9	51,436	56,715	5,279	10.3
Southern	310,564	320,944	10,381	3.3	44,604	40,145	-4,459	-10.0
Eastern	151,336	135,713	-15,622	-10.3	21,387	22,440	1,053	4.9
North-Eastern	16,197	14,858	-1,339	-8.3	2,801	2,695	-106	-3.8
All India	1,214,642	1,227,895	13,252	1.1	165,253	169,503	4,250	2.6

Source: Load Generation Balance Report 2016-17 (CEA)

TABLE 2
Anticipated Power Supply Position in India during 2016-17

State / Region	ENERGY				PEAK			
	Require-ment	Availab-ility	Surplus(+)/ Deficit (-)		Require-ment	Availab-ility	Surplus(+)/ Deficit(-)	
	(MU)	(MU)	(MU)	(%)	(MW)	(MW)	(MW)	(%)
Chandigarh	1,705	1,689	-16	-0.9	350	343	-7	-2.0
Delhi	31,110	36,884	5,774	18.6	6,100	6,616	516	8.5
Haryana	49,800	51,069	1,269	2.5	8,950	9,263	313	3.5
Himachal Pradesh	9,209	9,504	295	3.2	1,525	1,645	120	7.9
Jammu & Kashmir	17,060	14,622	-2,438	-14.3	2,650	2,231	-419	-15.8
Punjab	52,080	48,296	-3,784	-7.3	11,200	10,525	-675	-6.0
Rajasthan	72,070	71,900	-170	-0.2	11,500	11,610	110	1.0
Uttar Pradesh	110,850	103,806	-7,044	-6.4	16,000	14,454	-1,546	-9.7
Uttarakhand	13,574	13,239	-336	-2.5	2,075	2,058	-17	-0.8
Northern Region	**357,459**	**351,009**	**-6,450**	**-1.8**	**55,800**	**54,900**	**-900**	**-1.6**
Chhattisgarh	27,176	28,722	1,546	5.7	4,190	4,588	398	9.5
Gujarat	104,845	109,225	4,380	4.2	14,860	15,480	620	4.2
Madhya Pradesh	74,199	83,052	8,853	11.9	11,481	12,439	958	8.3
Maharashtra	154,169	165,502	11,333	7.4	21,943	22,100	157	0.7
Daman & Diu	2,372	2,423	51	2.2	325	332	7	2.1
D.N. Haveli	5,615	5,737	121	2.2	713	737	24	3.4
Goa	4,367	4,366	-1	0.0	520	518	-2	-0.4
Western Region	**379,087**	**405,370**	**26,283**	**6.9**	**51,436**	**56,715**	**5,279**	**10.3**
Andhra Pradesh	54,215	50,079	-4,136	-7.6	7,859	6,773	-1,086	-13.8
Karnataka	69,781	73,021	3,240	4.6	11,152	9,905	-1,247	-11.2
Kerala	24,179	25,274	1,095	4.5	4,100	3,856	-244	-6.0
Tamil Nadu	103,806	115,455	11,649	11.2	14,800	15,511	711	4.8
Telangana	55,001	53,198	-1,803	-3.3	8,381	7,321	-1,060	-12.7
Puducherry	2,554	2,890	336	13.1	395	387	-8	-2.0
Southern Region	**310,564**	**320,944**	**10,381**	**3.3**	**44,604**	**40,145**	**-4,459**	**-10.0**
Bihar	26,369	19,713	-6,656	-25.2	3,900	3,183	-717	-18.4
DVC	20,365	21,062	697	3.4	2,855	4,139	1,284	45.0
Jharkhand	9,320	6,524	-2,796	-30.0	1,250	1,160	-90	-7.2
Orissa	29,805	30,464	659	2.2	4,400	4,576	176	4.0
West Bengal	52,867	45,610	-7,257	-13.7	8,439	8,138	-301	-3.6
Sikkim	423	954	531	125.3	90	164	74	82.1
Eastern Region	**151,336**	**135,713**	**-15,622**	**-10.3**	**21,387**	**22,440**	**1,053**	**4.9**
Arunachal Pradesh	830	756	-74	-8.9	147	195	48	32.7
Assam	9,309	7,227	-2,082	-22.4	1,560	1,306	-254	-16.3
Manipur	1,008	971	-37	-3.6	184	196	12	6.3
Meghalaya	2,215	2,065	-150	-6.8	430	482	52	12.0
Mizoram	533	589	56	10.6	101	123	22	22.1
Nagaland	849	722	-127	-15.0	140	145	5	3.4
Tripura	1,453	2,526	1,073	73.9	321	391	70	21.8
North-Eastern Region	**16,197**	**14,858**	**-1,339**	**-8.3**	**2,801**	**2,695**	**-106**	**-3.8**
All India	**1,214,642**	**1,227,895**	**13,252**	**1.1**	**165,253**	**169,503**	**4,250**	**2.6**

Source: Load Generation Balance Report 2016-17 (CEA)

TABLE-3
Projected Power Requirement

Region	Energy Requirement (MU)		Peak Load (MW)	
	2016-17	2021-22	2016-17	2021-22
Northern	422,498	594,000	60,934	86,461
Western	394,188	539,310	62,015	86,054
Southern	357,826	510,786	57,221	82,199
Eastern	163,790	236,952	24,303	35,928
North-Eastern	16,154	23,244	2,966	4,056
Andaman & Nicobar	366	505	67	89
Lakshadweep	52	65	11	18
All India	1,354,874	1,904,861	199,540	283,470

Source: 18th Electric Power Survey (EPS) of CEA

Considering the demand-supply gap and slippages in the 5 year plan capacity addition targets, it is expected that power from the Project will help meet the expected/anticipated demand for power. As per Load Generation Balance Report 2016-17 of CEA, Energy and Peak deficit still exists in Northern Region. Considering the above, and also the likelihood of shortfall in the projected capacity addition in the XIIth Plan periods, the 1 x 700 MW power plant scheduled to be commissioned in 13th plan, is justified from Demand Supply consideration.

1.2 Land Requirement

Presently NPL has 1078 acres of Main Plant land in possession, where 2 x 700 MW power plant including 33% green belt is established. This available land and plot plan is suitable for the construction of one more 700 MW unit. The proposed expansion comprises of Main Power Block adjacent to the 1st and 2nd unit, new Flue Gas Desulphurization, Natural Draft Cooling Tower. The proposed expansion comprises of Main Power Block adjacent to the 1st and 2nd unit, new Flue Gas Desulphurization unit and Natural Draft Cooling Tower. Existing Ash Pond, Water Reservoir, Water Treatment Plant, 400 KV Switchyard, Coal Handling Plant, Central Monitoring Basin and other

Utilities shall be augmented suitably for the 3rd expansion unit.

Presently entire land is in the possession of NPL. The project is not located near river, forest, national park or wild life sanctuary. The project has well established connecting rail and road. There is no habitation at project site and there are no R&R issues. The land utilization of the plot is shown below. No additional land shall be required for expansion unit.

Plant System	Land Allotted for 3 x700 MW (in acres)
Power Block with CT & Switchyard	500
Ash Dyke	197
Miscellaneous Facilities	25
Green belt	261
Water Reservoir	95
Total Plant Area (Acres)	**1078**

1.3 Water Requirement: Quantity and Source

The plant water requirement for proposed 1 x 700 MW supercritical power plant for condenser cooling, cycle make-up and other consumptive requirements after pre-treatment is estimated to be about 1750 m^3/hour including water requirement for recirculating closed cooling water system with the Natural Draft Cooling Tower. 6 Cycle of Concentration (COC) is considered to reduce the water consumption. The major quantity of clarified water will essentially be the makeup water for the cooling towers to compensate the loss on account of evaporation, drift and blow down. Blow down shall be treated through RO system and used as clarified water for DM plant, equipment washing. Surplus blowdown water shall be used for coal handling, ash handling and FGD.

NPL has water allotment of about 2548 m^3/hour (25 cusecs) for this expansion unit from Irrigation Department from Rajpura Distributary vide letter ref: Memo No 2010/Canals(4) 10751-52 dated 23.09.2010, located about 1 km from the power plant site specifically for this unit.

Water reservoir, pipeline, pump house and water treatment plant already exists. Per MW water consumption for the expansion unit would be maintained at 2.5 m^3/MW-hour as required under the MOEF Notification (December 2015).

Water Consumption Point	2x700 MW	1x700 MW
Condenser Cooling Water make-up	3844 (COC-5.5)	1500 (COC-6)
DM Plant	110	55
Plant service water	375	194
Potable water	12	1
Others (losses etc)	165	-
TOTAL	**4706 m^3/h**	**1750 m^3/h**
Specific consumption	**3.36 m^3/MW-hr**	**2.5 m^3/MW-hr**

1.4 Fuel

Domestic coal from CIL mines is considered as main fuel. The Annual coal requirement for the proposed 700 MW power plant at 85% PLF based on the Gross Plant Heat rate of 2176 kcal/kwh considering the design coal of GCV 3900 (ARB) kcal/kg would be 2.9 million Tons per annum. Washed coal will be transported from mines to the proposed power plant through rail. Railway siding already exists. The details about coal requirement are given below:

Parameters	2x700 MW	3X700 MW
Gross Calorific Value-ARB (Kcal/kg)	3900	3900
Plant heat rate (kcal/kwh)-GSHR	2176	2176
Plant load factor, %	85	85
Coal consumption (MTPA)	5.8	8.7
Coal consumption (TPH)	781.3	1172
Maximum ash content, %	34	34
Maximum Sulphur content, %	0.5	0.5
Ash generation (TPH)	265.6	398.5

Ash generation (MTPA)	1.972	2.958

The secondary fuel would be LDO conforming to IS: 1460. Fuel oil would be used for light up / initial warm and for flame stabilization at low loads. During normal operation, the annual fuel oil requirement is expected to be about 5000 KL/annum, considering CERC norms. Fuel oil for the power plant would be made available from any of the public sector oil companies nearest to the plant location. LDO will be transported by means of road Existing fuel tank infrastructure shall be used for 1x700 MW expansion requirement.

1.5 Power Evacuation

Evacuation of power from the proposed power plant will be done at 400 kV level through 400 kV transmission lines. Transmission lines already exist.

1.6 Manpower Requirement

The construction will be done through the EPC route. During construction of the project, over 1000 people will be employed on daily average basis for approx. 36 months. NPL's project monitoring team will carry supervisory activities. Operational manpower requirement estimate is 500, including contract manpower. Employment shall be generated for local people in surrounding villages and only highly skilled manpower will be sourced from outside area.

1.7 Type / Quantity of Solid & Liquid Wastes Generated and Management

About 0.986 million tons per annum (MTPA) additional ash will be generated due to the expansion unit. NPL proposes to achieve 100% ash utilization by selling ash to the surrounding cement plants and brick industries in line with the requirements of MoEF and dispose-off as per the stipulations of MoEFCC... Water effluent will be treated in existing STP (MLD) and shall be used in greenbelt development and Ash handling.

1.8 Greenbelt Development

The proposed 1 x 700 MW project is being established inside the premises of present power plant area. Greenbelt has been raised in 1/3rd plant area (261 acres) as per MOEF guidelines.

1.9 Rehabilitation and Resettlement Plan

The proposed project is within existing power plant land owned by NPL. No human settlement exists on the identified land. No agriculture activity is done on the identified land. The land does not belong to private ownership. Hence no Rehabilitation and Resettlement is required.

1.10 Project Schedule and Cost of Project

Likely date of start of construction: Within two months after obtaining Environmental Clearance & financial closure
Likely date of completion of construction: 36 months after getting EC
The estimated project cost is Rs.4400 crores

1.11 Financial and Social Benefits

The proposed project is expected to contribute towards upliftment of the quality of life of the local population and generate inputs for industrial/economic development in the region. The following on-going measures are being undertaken to minimize the adverse impacts on socio-economics and parameters of human interest:

Communication with the local community is being institutionalized and done on regular basis by the plant authorities to provide an opportunity for mutual discussion.

NPL undertakes regular awareness programmes to bring forth beneficial aspects of the project and social welfare measures being undertaken for improving Quality of Life in the plant vicinity.
Social welfare activities are being undertaken by the project authorities, in collaboration

with local administration, Gram Panchayat, Block Development/Tehsil Offices etc. for better co-ordination, records and also involving the local public.
Following measures will be further implemented for achievement of social benefits:

- Workforce locally available is employed depending upon their suitability.
- Medical check-up camps are organised for providing consultation & basic essential medicines to the villagers.
- Two welfare schemes for women empowerment – Shagan Scheme & Child Welfare scheme provide direct credit support .
- Job oriented skill training courses is being organized through Community Trainiing centres and Industrial / Technical Training Institutes for youth (both for male and female). Trades like Stitching , Tailoring & Embroidery, Beautician courses for females and Welding & Fabrication trade thru ITI .
- To strengthen existing education facilities in the surrounding villages, the following measures are undertaken:
- Required support for additional class rooms/schools, providing teaching aids to village schools, Scholarship or awards to meritorious students

Awareness programmes to help and educate the local population about potential hazards and the Disaster Management as well as Environmental Management Plan is being undertaken at project site in collaboration with local administration.

As regards, aesthetics & environment conservation - development of social forestry and road side plantations will be encouraged through tree plantation drives in the project region. Safety signs & on roads help make them accident free and safe**2.0**

2.0 INTRODUCTION OF THE PROJECT/ BACKGROUND INFORMATION

2.1 Identification of Project and Project Proponent

2.1.1 Project Proponent

Nabha Power Limited (NPL) is a 100% subsidiary of L&T Power Development Limited (LTPDL) presently operating 1400 MW (2 x 700MW) coal fired Thermal Power Plant near Nalash village of Rajpura Tehsil in District Patiala, Punjab, India. The plant is based on latest state of art supercritical combustion technology.

The Project was awarded to L&T PDL, a 100% subsidiary of Larsen & Toubro Limited (L&T), through competitive tariff-based (Case-2) bidding process. Subsequently L&TPDL has purchased 100% of the shareholding in Nabha Power from PSEB vide Share Purchase Agreement dated January 18, 2010. NPL has signed a Power Purchase Agreement (PPA) with PSEB on January 18, 2010 for power off-take from the plant for a period of 25 years from COD of the Plant.

2.1.2 Identification of Project

PROJECT AT A GLANCE	
Project Proponent	M/s Nabha Power Limited
Type of project	1 x 700 MW Super Critical Expansion Project
Category of Project	Category A ,
S.No in the schedule as per EIA notification, 2006	Schedule 3, Thermal Power Plant
Land Requirement (Additional)	Nil (proposed within the 1078 acres land of existing 2 x 700 MW Power Plant)
Latitude	30^{O} 32’ 36’’N to 30^{o} 33’ 51’’N

Longitude	76º 33’ 42’’E to 76º 35’ 05’’E
Near by Features	Patiala - 28 m Ambala - 32 km Rajpura - 8 km NH1 (Delhi to Amritsar) – 5 km NH64 (Chandigarh to Sangrur) – 7 km Sarai Banjara Railway Station - 5 km Rajpura Railway Station – 7 m Chandigarh Airport – 28 km
Eco- Sensitive area	No National Park, Wildlife Sanctuary, Biosphere Reserve area within the10 km radius of project site
Water Requirement & Source	1750 m^3/hour. Source Rajpura Distributary (Permission to draw 25 cusecs water for this expansion unit is available)
Coal Requirement & Source	4 Million Tons Per Annum from Coal India Ltd (ROM Coal Quantity)
Auxiliary Fuel Requirement	LDO, 5000 KL per Annum
Railway Siding	Existing in the plant (Code-NPSB)
Site Elevation	270 m AMSL, flat topography
Chimney height	275 m
PM Emission	30 mg/Nm^3
SO_2 Emission	100 mg/Nm^3
NOx Emission	100 mg/Nm^3
Hg Emission	0.03 mg/Nm^3
Flue Gas Desulphurisation	Shall be established

2.1.3 Demand Domestic/Export

Power produced from this proposed expansion project will be sold to primarily Punjab DISCOM and other DISCOMS through Power Purchase Agreement (PPA)

2.2 Brief Description of Nature of the Project

The expansion of the operational 1400 MW (2 x 700 MW) capacity thermal power plant to 2100 MW (2 x 700 + 1 x 700 MW) near village Nalash, District Patiala, Punjab, is an initiative of Nabha Power Limited (NPL) of L&T group. The electricity generated from this project will be sold to DISCOMS. Fuel requirement of the proposed project will be met through coal from the Coal India Limited mines located more than 1300 km from the project site, Proposed project will adopt clean fuel technology by installing Pulverised Fuel (PF) supercritical steam generator and steam turbine.. The supercritical power plants have higher efficiencies, therefore consumes lesser fuel and lesser environment impact. Canal water would be pumped to the plant by the existing canal water pumping system. All pollution control measures shall be undertaken to minimize any adverse impact expected on the surrounding environment. Generated fly ash shall be utilized in cement, concrete industry, fly ash aggregate making industry and road making/paving brick making from day one of the date of commissioning.

2.3 Employment Generation

The construction will be done by the contractors during construction of the project; about 1000 people will be employed on daily average basis for 36 months. NPL's project monitoring team will carry supervisory activities. For operational phase manpower requirement estimate is 500 for the proposed project. Employment shall be generated for local people in surrounding villages and only highly skilled manpower will be sourced from outside area.

3.0 PROJECT DESCRIPTION

3.1 Type of project including interlinked and interdependent projects, if any

The project is a brown field expansion project of 700 MW coal based supercritical electrical power generating power plant. The project will have interlinks with existing operating 2 x 700 MW project to optimise the existing resources and facilities. However, no coal block has been allocated to this project. Coal is purchased from existing mines of Coal India Limited, through long term agreements.

3.2 Location with Coordinates

Village	Nalash
Tehsil	Rajpura
District	Patiala
State	Punjab
Latitude	30^{o} 32’ 36’’N to 30º 33’ 51’’N
Longitude	76º 33’ 42’’E to 76º 35’ 05’’E

Location (map showing general location, specific location, and project boundary and project site layout) with coordinates is attached as Annexure.

3.3 Details of alternate sites considered and the basis of selecting the proposed site, particularly the environmental considerations gone into should be highlighted

Not Applicable. As expansion is proposed in the existing site

3.4 Size or Magnitude of Operation

With proposed expansion the magnitude of operation will become 2100 MW (2 X 700 MW Existing + 1 X 700 Proposed).

3.5 Project Description with Process Details

Process Details

The power generation process is based on Rankine steam cycle using high purity water converted to high pressure and high temperature steam with supercritical parameters as the working medium. The salient parameters of the process are as below.

Particulars	Units	Unit
Super heater outlet steam flow	T/hr	2322
Steam pressure at SH outlet (minimum)	Kg/Sq.cm (a)	257.15
Steam temperature at SH outlet	°C	568
Reheat steam flow	T/hr	1886.29
Steam temp. at RH inlet	°C	349.7
Steam temp. at RH outlet	°C	596
Feed water temperature at economizer inlet	°C	311.9

MECHANICAL SYSTEMS

Steam Generator & Accessories

The steam generator (SG) would be once through type and would be designed for firing coal of GCV 3800 - 4400 kcal/kg. The SG would be pulverised fuel (PF) reheat type, balanced draft outdoor type. The capacity would be 2% more than the VWO flow requirement of Steam turbine. Indicative design parameters for the steam generator are as below.

The steam generator would have a fuel burning system of corner fired or front and rear wall mounted type Pulverised fuel. The furnace would be appropriately sized to avoid slagging in the water wall section, pendant/platen super heaters and re-heaters and in the heat transfer surfaces in convection pass.

The coal burner system would be of proven advanced design to reduce NOx production

and the furnace would also be provided with over fire air ports to further reduce NOx production.

The SG would be provided with circulation system comprising steam separators to remove water moisture from the evaporator outlet and to recirculate the water into economizer inlet, for use during start-up. The SG and steam turbine generator (STG) would be designed for modified sliding pressure operation, which would increase turbine cycle efficiency and reduce boiler feed pump power consumption. The load range for sliding pressure operation would be from about 40% TG maximum continuous rating(TGMCR) to 90% TGMCR and constant pressure operation from 90% to 100% TGMCR.

The SG would consist of water cooled furnace, radiant and convection super-heaters, re-heaters, economizer, regenerative air pre heater, steam coil air preheaters. Sequential/selective type soot blower system would be provided with soot blowers located at strategic locations for cleaning the slagged and fouled heat transfer surfaces during operation.

The SG would be provided with the required number of coal mills, preferably with front mill arrangement which will occupy less space and ease the equipment layout in case of PF steam generator. The milling system would be so designed that two (2) mills would be spare with unit operating at BMCR capacity firing design coal and one (1) mill as spare with unit operating at BMCR capacity firing worst coal . The coal mills would be using the hot/cold Primary air for the drying of the coal.

These mills will be provided with classifiers to control the fineness of the ground coal thereby to control the un-burnt carbon losses. The coal mills would be provided with gravimetric coal feeders.

The SG would be designed to handle and burn LDO as secondary fuel up-to about 30%

SGMCR for start-up and for flame stabilization with steam atomization, during low load during mill changeover. For unit light up and warm-up purposes also, LDO firing system with air atomization would be used.

The draft plant would comprise primary air fans, forced draft fans and induced draft fans. The primary and forced draft fans would be of blade pitch controlled axial type. The induced draft fans would be blade pitch controlled axial type

Electrostatic precipitators (ESP) would be provided for the collection of fly ash. The ESP would be so designed that for worst coal firing an outlet dust concentration of 30 mg/Nm^3 with one field out of service as stipulated by the regulatory authorities would be achieved.

Steam Turbine, Accessories & Cycle Equipment

Steam Turbine

The steam turbine generator (STG) would be rated for 700 MW maximum continuous output at generator terminals, with throttle steam condition of 247 bar (a) at 565°C main / 593°C reheat steam, 0.0772/0.0977 bar(a) condenser back pressure The STG output at valve wide-open (VWO) condition would be 5% above the maximum continuous rating.

The steam turbine would be a three cylinder tandem compound, condensing reheat designed. The turbine generator would be complete with all accessories such as protection system, lube and control oil system, seal oil system, jacking oil system, seal steam system, turbine drain system, electro-hydraulic control system, automatic turbine run up system, on-line automatic turbine test system and turbine supervisory instrumentation.

The turbine generator would also have all necessary indicating and control devices to permit the unit to be placed on turning gear, rolled, accelerated and synchronized automatically from the control room.

Plant Water Steam Cycle

The condensing plant would comprise two water cooled condensers one each for the two LP turbines. The exhaust steam from the LP turbine will be received from each condenser would be of one pass design. 2x100% capacity vacuum pumps would be provided to create vacuum in condenser during start-up and to remove the non-condensable gases liberated during normal operation.

The regenerative cycle would normally consist of four low pressure heaters, a variable pressure Deaerator, three high pressure heaters, one drain cooler and one gland steam condenser.

Bypass system

The STG unit would be provided with a HP-LP bypass system having capacity of 60% of SGMCR flow.

Condensate Pumps

The condensate from the condensate hot-well would be pumped by 3x50% capacity condensate pumps (two working and one stand by) to the deaerator through the Condensate polishing unit, gland steam condenser, and low-pressure heaters.

Boiler Feed Pumps

Feed water would be pumped from deaerator to the steam generator through high-pressure heaters by means of 2x50% capacity turbine driven boiler feed pumps(TDBFP) during normal operation. or. Motor driven BFP is used mostly for start-up or during normal operation in case of non availability of any TDBFP of the unit.

Low Pressure Heaters

The low pressure (LP) heaters would be of shell and tube with stainless steel U-tubes (seamless/welded) welded with their ends rolled in carbon steel tube sheets.

Deaerator

The deaerating feed water heater would be a direct contact, variable pressure type heater with spray-tray type or spray type of deaeration arrangement.

High Pressure Heaters

The high-pressure (HP) heaters would be of shell and tube with stainless steel U-tubes (seamless/welded) welded with their ends rolled in carbon steel tube sheets.

Gland Steam Condenser

A surface type gland steam condenser would be used to condense the gland steam exhausted from turbine glands.

Condensate Polishing Unit

In order to maintain high purity of the feed water, 3X50% capacity condensate polishing units (CPU) are envisaged in the condensate system for each unit.

Chemical Dosing System

AVT (All volatile treatment) and oxygenated treatment shall be considered. Ammonia/hydrazine dosing system would be provided to ensure chemical conditioning of the condensate/feed water. The ammonia solution would be injected into the condensate at the condensate extraction pump discharge during start ups for controlling the alkalinity

Fuel Oil System

The annual requirement for the proposed 700 MW unit would be about 5000 KL based on consumption (CERC guidelines) of power generation.

Water System

The water would be used for condenser cooling (for water cooled condenser), cooling of SG and TG auxiliaries and various other requirements like SG makeup, service and fire

protection system etc. Various sub-systems water systems are indicated below.

1. Raw Water system
2. Condenser Cooling Water (CW) system for water cooled condenser
3. Clarified Water system
4. DM Water System
5. Condenser cooling water (CW/ACW) system
6. Condensate Polishing Unit
7. Service water system

Raw Water Supply System

The daily requirement of raw water for the proposed plant expected to be 1750 m^3/hour with water cooled condenser.

Condenser Cooling System

For water cooled condenser, recirculation type cooling system with Natural draft cooling tower (NDCT) of around 85500 m^3/hr is proposed. The cooling tower would be designed for a cooling range of 9^oC and an approach of 5^oC. The design wet bulb temperature would be about 28^oC. The design hot and cold water temperatures of the cooling towers would be 42^oC and 33 ^oC respectively.

Clarified Water System

The raw water will be clarified in clarifier. The clarified water will be directly used for the CW makeup, plant service & fire water system without any further treatment. The clarified water will be stored in tank sized for adequate storage. The possibility of augmenting the requirement of the expansion project with existing system shall be studied and same shall be adopted to the extent possible without compromising the reliability of the current system. Chlorination system will be provided at the inlet of clarified water storage tank.

Total clarified water requirement for 700 MW is estimated to be 1750 m^3/hour.

Blow Down and Make-Up Water Requirements for CW/ACW cooling tower

For WCC make-up water requirement of CW system is obtained as the sum of drift and evaporation losses from the cooling towers and blow down from the CW system. In order to conserve water, the blow down would be utilised to meet the water requirement of the coal and ash handling system. A stringent cycle of concentration (COC) of 6.0 has been adopted for CW system to conserve water.

Make-Up System

Make up water to condenser cooling system shall be supplied by CT makeup pump. 3X50% CT makeup pump will supply the Clarified water from clarified water storage tank.

CW Chemical Dosing System

Chemical dosing is required to prevent scaling and corrosion due to the operation of the CW system at this COC. To prevent / control algae growth in the CW system, chlorine dosing will be provided.

DM Auxiliary Cooling Water (DMACW) System

Closed loop system using passivated DM water ACW system shall meet the cooling water requirements of all the auxiliary equipment of the TG and SG units such as turbine lube oil coolers, seal oil coolers, stator water coolers, BFP auxiliaries such as lube and working oil coolers, seal water coolers, drive motors and sample coolers etc.

Water Treatment Plant

The water treatment plant broadly consists of filtration followed by a DM (Demineralisation) plant which will provide DM water to meet steam generator make up and CW/ACW system make-up.

Service & Potable Water Systems

The service water system supplies water required for HVAC system and misc. requirements of station building. Potable water system will be derived from the clarified

water after required chlorine dosing.

Fire Protection System

An elaborate fire hydrant system covering all the buildings of the proposed power plant boundaries including coal stockyard would be provided.

Effluent Re-Use

The effluents from DM plant neutralising pit, CPU neutralisation Pit, cooling tower blowdown are collected in CMB for further reuse as CT makeup after treatment in RO plant . Oily waste from all plant drains are collected in oily waste collection sump and for further re use in ash slurry conveying system after treatment in oily water separator in ETP... Effluent zero discharge concept will be adopted for the proposed plant using suitable effluent treatment plant, and RO.

Coal Handling System

The coal will be transported from coal mines in railway wagons. The CHP is developed for unloading coal through wagon tipplers. The wagon-tipplers provided on separate rail lines will be capable of unloading full rake of coal in the wagon-tippler hoppers in about 5 hours. Coal received in rakes shall unloaded through Wagon Tippler. The existing conveyor for the operating plant will be augmented with additional conveyors to meet the requirement with necessary redundancy. The Coal will be stored in the store yard using stackers. Coal for the power plant will be reclaimed from the coal storage yard and conveyed to the bunkers at the Boiler. When coal bunkers are full, coal will be transported to coal storage yard and stacked together with reversible yard conveyors.

System Capacity

For 700 MW TPP daily coal requirement considering the design coal would be 8960 tons. The annual coal requirement for the design coal is about 2.9 MTPA with 85% PLF. Coal handling system capacity will be 2850 TPH conveying capacity would be sufficient to meet the requirement.

Dust Control

Dry fog type dust suppression system would be provided at all transfer points in the junction towers. The bunker ventilation system would be provided with dry type bag filters with cyclone to trap the dust generated while loading coal into bunkers and to vent out dust free gases/air.

Ash Handling System

Ash handling plant will consist of bottom ash, and fly ash handling systems.

Bottom Ash will be collected continuously in a W shaped, water impounded, storage type, water cooled bottom ash hopper. Bottom Ash hopper will be located directly below the bottom water wall header of boiler, and will have an effective storage capacity of 8 hours ash generated while firing worst coal.

Fly ash collected in the ESP hoppers along the flue gas path will be extracted sequentially and conveyed pneumatically in dry form to storage silos. A wet fly ash emergency conveying system will also be provided as an alternative mode of disposal. The wet system will operate when disposal from the terminal fly ash silo is not feasible for some extraneous reasons.

Fly ash removal system would be vacuum-cum-pressure type with dry disposal by closed trucks for utilisation with provision for disposal to ash pond. The water required for slurry formation and ash conditioners would be met from clarified water. However, service water would be used for jacket cooling of air compressors, silo / ESP aeration blowers etc.

Bottom ash Handling System

A maximum of 20% of the total ash produced by each steam generator would be collected as bottom ash in wet form. The bottom ash hopper would have a capacity to store about eight (8) hours collection of bottom ash.

Fly ash Handling System

. The fly ash collected in the ESP hoppers, air preheater hoppers, economizer hoppers and stack hoppers would be evacuated pneumatically. Air compressors of suitable capacity would be installed for conveying fly ash from ash hoppers to fly ash silos. Clearance of ash from hoppers connected to common fly ash header would be done one after other. Shifting of ash clearance cycle from one hopper to the next will be automatic. The ash collected in each fly ash hopper would be conveyed to ash silo.

Fly Ash Storage Silo

There would be two (2) fly ash storage silos having a holding capacity of 2000 tones. Each silo would be provided with suitable no. of outlets. Outlets would cater to unloading into road trucks / tankers through paddle type dust conditioner or unloading spout. One outlet would be left blank.

Fly Ash Disposal System (Emergency)

The high concentrate slurry disposal system would be provided for ash disposal during emergency conditions. The concentration of ash in the high concentrate slurry would be about 55-60% by weight. This slurry would be pumped by HCSD pumps to ash disposal area.

Ash Disposal Area

The ash disposal area is already provided with HDPE membrane to prevent contamination of ground water.

Ash Utilisation

The ash will be evacuated and stored in silos in dry form so that most of it can be utilized in dry form. Ash generated from the proposed unit will be utilised in one or more of the following industries, to the extent possible:

a) Cement industry
b) Brick/ Block/ Tiles manufacturing

c) Ash aggregate making industry
d) Road making / paving.
e) Roads and embankment construction
f) Structural fills for reclaiming low lying areas
g) Agriculture, Forestry and Waste land development

Compressed Air System

For the requirement of instrument air and service air to meet the plant air requirement adequate number of compressors (working and standby) with suitable capacity will be installed.

Air Conditioning System

It is proposed to air-condition the unit control room, electronic cubicle room, shift charge engineers room, printer room, maintenance engineers room, UPS room, ESP control room, static excitation cubicle room, analyser panel room, coal handling control room, DM plant control room and switchyard control room. Inside design conditions of 24.5 ± 1.5^{o}C dry bulb temperature and relative humidity not exceeding 60% would be maintained in all air-conditioned areas.

Ventilation System

For the ventilation of the station building, evaporative cooling system (Air washer type) is envisaged. This system consists of air washers, supply air fans, air washer circulating water pumps, centrifugal fans and air distribution system for distributing the supply air inside the station building. The exhaust of hot air out of the station building would be achieved by provision of roof extractors and wall mounted exhaust fans. For ventilation of other buildings, supply air fans or louvers, exhaust air fans, roof extractors or a suitable combination of these complete with louvers, filters, ducting & grilles would be provided.

ELECTRICAL SYSTEMS

Generator

The generator would be rated to deliver 700 MW at 20 kV, 50 Hz, 0.85-power factor, at 3000 rpm.

Generator Bus Duct

The terminals of the generator would be connected to the generator transformer through Isolated Phase Bus Duct (IPBD).

Generator Transformers

The generator transformer would step up generator voltage of 20 kV to the switchyard voltage of 400 kV.

400 kV Switchyard

The switchyard equipment will be point of electrical connection to the state electrical grid for the transmission of power to the grid. The switchyard consists of breakers, isolators, lightning arrestors, current transformers etc.

Auxiliary Power Supply System

Auxiliary power system provides electrical power to various plant electrical equipments. The auxiliary power is derived from either generator output or from the switchyard using transformers at various voltage level depending upon the size of the power requirement of the auxiliaries using suitable switchgears.

Emergency Power Supply

The diesel generator of adequate capacity would feed an emergency electrical power to identified auxiliaries to enable safe shut down of the power station during a grid failure.

Battery DC System

Battery DC system of adequate capacity is used for power supply to certain critical plant

auxiliaries for the safety of the plant and personals during a complete blackout.

Un-interruptible Power Supply System

Un-interruptable power supply of adequate capacity and battery backup is provided to supply power to complete plant control and instrumentation system.

Electrical Equipment Protection Systems & Control

The selection of the protective scheme would be based mainly on reliability, sensitivity, selectivity and technical merits. All main protections would be of fast acting type in order to isolate the faulty system from the healthy system in the shortest possible time, to minimise damage to the equipment and ensure continuity of power supply.

Lighting System

Suitable illumination necessary to facilitate normal operation and maintenance activities and to ensure safety of working personnel would be provided.

Safety Earthing and Lightning Protection

A safety earthing system comprising buried steel conductor earthing grid would be provided for the 400kV switchyard and other outlying areas. This would be connected to the earth grids in various buildings. The buried earth grids would be further connected to earthing electrodes.

Communication System

For effective communication in the plant, public address system, Electronic private automatic branch exchange system (EPABX), landlines with ISDN / PSTN facility, walkie-talkie, OPGW (Optical fiber ground wire) communication link along with necessary terminal equipment will also be provided to ensure fast communication between Switchyard & Local Dispatch Centre (LDC).

Fire Detection / Alarm and Fire Proof Sealing System

Addressable type multi criteria detector based fire detection and alarm system would be provided to facilitate visual and audible fire detection at the incipient stage of fire in strategically important areas of the power station.

INSTRUMENTATION & CONTROL SYSTEM

Plant Control System

The instrumentation and control (I&C) system for the plant is proposed to be a comprehensive system integrating the functions of plant monitoring, control and protection to facilitate the task of integration, co-ordination and autonomous operation of the plant sub systems/equipment namely Steam Generators (SG), Steam Turbine Generator (STG) and their associated auxiliaries, balance of the plant equipment / systems, plant electrical system, utility plants like coal handling plant, Ash handling plant, DM water plant, compressed air plant, Station common electrical systems including Switchyard.

CIVIL ENGINEERING ASPECTS

Plant Layout

The layout of the main plant along with all the auxiliary systems for 700 MW unit is shown in PLOT PLAN. In laying out the various facilities, consideration has been given to the following general principles:

a) Least disturbance to existing habitation and vegetation, if any

b) Predominant wind directions as given by the wind rose are duly taken into account with a view to minimize pollution, fire risk, etc..

c) Power evacuation corridor for connection to Punjab state grid.

d) Approach road and railway siding to the power plant from the National Highway, State Highway and Sarai Banjara Railway station.

e) Availability of adequate space for fabrication / construction equipment within the power plant boundary.

f) Availability of adequate space for labour colony during construction stage

All facilities of the plant are laid out in close proximity to each other to the extent possible so as to minimize the extent of land required. The layout also facilitates communication of people and movement of materials between the various facilities both during initial construction and also during subsequent operation and maintenance.

Chimney

Flue can in existing windshield is already available for the proposed unit . The height of chimney (275 m) meets the requirement of Indian emission regulations. The flue can is of mild steel construction of 7.5 m outer diameter with rock wool insulation. The chimney windshield is of RCC construction. Appropriate aviation warning system is provided for the chimneys as per regulatory requirements.

Raw water reservoir

The required raw water for 700 MW plant will be supplied from the existing reservoir of adequate capacity.

ENVIRONMENT ASPECTS

Air Pollution

High efficiency Electrostatic Precipitators (ESP) shall be installed to control the emission of ash particles. The precipitators would be designed to limit the particulate and gaseous emission to as per MOEF&CC norms at 100% BMCR. To ensure safe and optimum operation of the ESPs, each stream of precipitator would be supervised and monitored by a separate microprocessor based rapper control EP Management System (EPMS).

A chimney / flue of 275 m height is available for the effective dispersal of air borne pollutants. The chimney will be provided with lift for regular monitoring of stack emissions. Online monitoring system shall be also installed in the flue can.

The coal will be drawn from the existing coal handling plant and to control the fugitive dust emission within and around the coal handling plant, dust extraction and suppression

systems shall be provided. Dust suppression system is installed at all the transfer points in Coal Handling Plant and at coal stockyard; no significant impact on air quality is expected. However, fugitive dust emissions and NOx levels may temporarily increase in the immediate vicinity of construction site due to soil excavation and vehicular movement. Such impacts will be confined to the construction site. These will be minimized by sprinkling water and proper maintenance of vehicles.

Waste Water

Water will be used in close circuit for circulating water system and service water requirement. DM plant regeneration wastewater will be taken to neutralization pit. All plant washings, boiler blow-down and water from neutralization pit will be taken to Central Monitoring Basin and reutilized for coal dust suppression and ash handling. Ash water sump, oil water separator and sedimentation tank will be provided at appropriate locations to collect the outflow from ash dyke, plant drains and coal storage yard. Plant domestic wastewater will be taken to Sewage Treatment Plant and the treated water will be reused for gardening & green belt development. No wastewater will be disposed outside the premises. Waste water from various systems as per enclosed water balance would be reclaimed, treated and reused to ensure zero discharge of liquid effluents from the power plant. Cooling tower blow down from CW system would be utilized for the RO system.

Effluent Treatment System: Main plant drains consisting of waste water having light density fine suspended particles from different areas as well as other effluents such as boiler blow-down, DM plant effluent (Regeneration water) from DM plant will be neutralized in a neutralization pit and will be collected in Central Monitoring Basin (CMB) for further treatment. Effluent from CHP primarily consisting of coal dust laden water from various dust extraction points as well as dust suppression system and run-off water from coal-pile will be led to a separate settling tank located near the coal yard conveniently and settled water will be recycled to dust suppression system.

Effluents from oil unloading area will be taken to oil-water separator from where the separated oil will be taken for mixing with coal for burning in the boiler furnace and the

water led to the CMB for further treatment. Skimming tank will be provided separately to remove contaminated oil etc. The Condensate Polishing System will be designed to remove dissolved and suspended solids, corrosion products & other impurities from condensate during startup, normal operation and periods of condenser tube leakage to maintain the feed water and steam purity requirements of the boiler and turbine. The condensate polisher will be located in condensate feed water cycle between the condensate pump discharge and the gland steam condenser.

Noise Pollution

The plant is expected to increase the noise level in the surrounding due to operation of plant and machinery. Necessary noise control and abatement measures will be adopted to minimize the noise level from the plant during construction and operation phase to a maximum of 85 dBA as per the requirement of OSHA (Occupational Safety and Health Administration) Standards. The major sources of noise during the construction phase are vehicular traffic, construction equipment like dozers, scrapers, concrete mixers, cranes, generators, pumps, compressors, rock drills, pneumatic tools, saws, vibrators, etc. The operation of these equipments will generate noise ranging between 75-90 dBA.

Ash Handling and Utilization

Bottom Ash Handling System:

Bottom Ash will be collected continuously in a W-shaped, water impounded, storage type, water cooled refractory lined bottom ash hopper. BA hopper will be located directly below the bottom water wall header of boiler; and will have an effective storage capacity of 8 hours ash generated while firing worst coal. The bottom ash of each unit collected in BA hopper will be removed in 90 minutes once in a shift of 8 hours.

Suitable sections will be provided for each hopper; installed directly below the feed gate assembly to crush the clinkers to suitable transportable size. Out of two clinker grinders, provided for each section of BA hopper, one grinder will operate while the other will be

standby. The slurry (mixture of bottom ash and water) from the clinker grinder will be conveyed to ash slurry sump by jet pumps through carbon steel pipes.

Coarse ash collected in Economizer hoppers along the flue gas path will be conveyed to the bottom ash hopper with the help of economizer water pumps. Two out of three economizer water pumps shall be working and one shall be a common standby; these pumps will be located at ash water pump house. The coarse ash slurry will be processed along with the bottom ash collected in the common ash slurry sump. The economizer water pumps will take suction from the discharge of 3 nos (2W + 1 S) LP water pumps located in ash water pump house. The contents of coarse ash from economizer hoppers of each unit will be pumped out in maximum four (4) hours in a shift of 8 hours simultaneously with bottom ash removal system.

Fly Ash System (Dry Collection)

Fly ash collected in the ESP hoppers, Air Pre heater hoppers & duct hoppers along the flue gas path will be extracted continuously. The ash will be extracted in dry form and conveyed to buffer hopper with the help of vacuum pumps for each unit and in wet form will be disposed into slurry form to Ash pond. The buffer hopper discharges the ash into the ash feeder located below the buffer hopper . The ash will be transported with the help of conveying compressors of suitable capacity common for both units. For conveying ash to silos, two stage conveying system will be adopted. Vacuum conveying systems to be provided for the first stage and pressure conveying system will be provided for second stage conveying to silos.

Ash Disposal System: The ash will be utilized as per MoEF guidelines / notification (November 2009) and any unutilized ash will be disposed off in ash dyke. Ash silos for collection of dry fly ash will be provided and provision will be made for disposal of ash

Fly ash generated from the proposed power plant will be commercially utilized to the fullest extent possible. The prominent bulk consumer for fly ash has been the cement Industry. Fine quality dry fly ash has been a major ingredient in cement. The Project's ability to directly deliver firm, quality fly ash is expected to attract potential cement manufacturers in

the vicinity. The ash slurry of the units will be collected in a common slurry sump and will be disposed-off through ash slurry pumps of adequate capacity to dispose slurry up-to Ash Pond. There shall be a series of ash slurry pumps with two pumps in each series for transportation of ash slurry upto the ash pond area.

Ash Water Disposal System: The water required for ash disposal will be tapped from cooling towers blow down and raw water ash pump and supplied to the ash handling system. The ash will be transported to ash pond area through wet ash slurry system. The water used for this system will be reclaimed and pumped back to ash water sump for re-use in the system.

The pumps required for ash disposal viz. HP water pumps, LP water Pumps, seal water pump etc. will be provided. At least 50% capacity of pumps will be standby. Unutilised fly ash in emergency and bottom ash shall be disposed-off in the ash pond. A land provision has been made in the plot plan for the ash pond. The ash pond has been lined using HDPE to prevent ingress of ash water in subsoil.

Ash Utilization: The fly ash and bottom ash will be utilized as per MoEF notification (November 2009). Ash generation and utilization for expansion unit is given below:

a)	Coal consumption	TPH	390
b)	Ash content	%	34
c)	Ash generated	TPH	135.32
d)	Bottom ash	TPH	27.06
e)	Fly ash	TPH	108.26

Afforestation and Green Belt Development

Adequate afforestation at plant area is planned which would not only act as lung space in the area but would also improve aesthetics and will be continued in all available space.

Pollution Monitoring and Control Measures

A well-defined environmental monitoring programme will be incorporated with trained and qualified staff who will monitor the ambient air as well as flue gas quality from the stack, to ensure that the quality of effluents are maintained within the permissible limit. PC based Continuous Emission Monitoring System (CEMS) would be provided to continuously record and display the SPM, , NOx and SOx constituents in the flue gas. CEMS would be provided with a remote transmission facility to DDCMIS. The ambient air qualities monitoring systems is already in place and is being monitored on continual basis (CAAQMS).

3.6 Raw Material required along with estimated quantity, likely source, marketing area of final products, mode of transport of raw materials and finished products:

S. No.	Name Of Raw Material	Estimated quantity	Source	Mode of transport
1	Coal (Washed-34% ash)	2.9 MTPA	Coal India Ltd Mines	Existing Railway siding
2	Water	1750 m^3/hour	Rajpura Distributary of sub-Bhakra Canal	Existing Pipeline

Finished Product

S.No.	Name Of Finished Product	Estimated Daily Quantity (MU/ann)	Market Area	Mode of transport
1	Electricity	5212	Punjab Discom, Open Excess	400 KV Electrical Transmission System

3.7 Resource optimisation / recycling and reuse envisaged in the project

Water effluent will be treated and reutilised in plant. Zero discharge will be achieved.

3.8 Availability of water, its source, Energy / Power requirement and source

Availability and source of water

NPL has sanctioned allocation of 25 Cusecs of water from Rajpura Distributary through Government of Punjab (Irrigation Department).

3.9 Schematic representations of the feasibility drawing which gives information of EIA purpose

The main unit, coal handling system, ash handling system and water system shall be fully integrated with the existing system to optimize the cost and space and minimize pollution issues.

4.0 SITE ANALYSIS

4.1 Connectivity

The connectivity of the project site with the major road/ railways/ ports and human settlement is as given in table

Patiala - 28 m

Ambala - 32 km

Rajpura - 8 km

NH1 (Delhi to Amritsar) – 5 km

NH64 (Chandigarh to Sangrur) – 7 km

Sarai Banjara Railway Station - 5 km

Rajpura Railway Station – 7 m

Chandigarh Airport – 28 km

4.2 Land Form, Land Use and Land Ownership

The proposed project site is located within the existing premises of NPL power plant at Nalash village. The land main plant area is 1078 acres. No additional land will be acquired for the expansion project. No forest land is involved in the proposed project site. 220 acres vacant land out of 1078 acres total land will be used for the proposed expansion. Land is already in possession of NPL and converted for Industrial use.

4.3 Topography

The land is flat, the soil is alluvium in nature with no rocks up-to 100 m depth.. There is no nearby water body or river.

4.4 Existing Infrastructure

NPL is operating currently 2 x 700 MW coal based power plant at the site. Following infrastructure facilities are available at site

- Roads
- Water Reservoir

- 400 KV Electric switchyard
- Drainage
- Communication system
- Admin building
- Guest House
- Laboratory
- Greenbelt
- Ash pond
- Stores
- Weighbridges
- Offices, canteen, IT Infrastructure
- Coal handling plant

4.5 Climate Data from Secondary Sources

Historical meteorological data were obtained from climatological tables pertaining to nearest representative IMD station at Ambala, which is presented in **Table 3.3.**

Month	Temperature (deg C) daily		Relative Humidity, %		Rainfall (mm)	Wind speed kmph	Pre-dominant wind direction (from)	Cloud cover (Oktas)
	Max	Min	Max	Min				
January	20.4	6.6	80	55	38.5	5.9	NW	1.9
February	23.3	9.2	72	48	28.4	6.8	NW	1.8
March	29.0	13.9	64	41	29.5	7.9	NW	1.6
April	35.8	19.6	47	28	6.1	7.4	NW	1.1
May	39.6	23.8	41	26	19.3	7.9	NW	1.1
June	39.4	26.6	55	38	73.2	8.6	SE	1.8
July	34.8	25.7	80	64	267.2	7.9	SE	3.9
August	33.3	25.1	84	70	267.2	6.2	SE	3.9
September	34.0	23.6	79	61	161.3	5.4	SE	1.7
October	32.6	18.1	69	46	32.9	5.2	NW	0.6
November	28.0	11.1	70	45	9.3	5.5	NW	0.7
December	22.5	7.4	79	52	13.2	5.1	NW	1.4
Annual	31.1	17.6	68	48	961.4 (total)	6.7	NW, SW	1.8

4.6 Social infrastructure available

The main infrastructural support for the proposed project is available in nearby towns

Patiala - 28 km

Ambala - 32 km

Rajpura - 8 km

Chandigarh – 32 km

Significant observations about infrastructure details are as follows:

- Most of the villages have primary and middle school.
- Medical facilities are available in most of the villages.
- Postal and phone services, power supply, market and communication facilities are fairly developed.
- Drinking water sources (supply) are sufficient in all the villages. Tank water, hand pumps, wells, tap water sources are available in all villages.

5.0 PLANNING BRIEF

5.1 Planning concept (type of industries, facilities, transportation etc) Town and country planning/ Development authority classification.

The proposed project is brown field project and the state government has allotted it as industrial land. Also the industrial area and the related facilities are already developed hence no planning is envisaged.

5.2 Population projection

There would not be any significant increase in the population of surrounding area as the workers for the proposed project will come from the local residents in the surrounding villages. No major influx of people in the area due to proposed project. Only highly skilled manpower will be taken from outside if not available in the nearby area.

5.3 Land use planning (break up along with green belt etc)

The detailed land use planning and the area break up is as given in the table

Main Plant, CHP, Utilities & Ash Pond Area	722 Acres
Green Belt Area	261 Acres (33.3 %)

5.4 Assessment of Infrastructure Demand (Physical & Social)

As the proposed project is with the existing industrial premises the basic infrastructure like water, electricity and road are available at the project site. Hence no major infrastructure is envisaged at the project site.

5.5 Amenities / Facilities

Following facilities are available in the existing industrial premises:-

Canteen, Guest House, Sanitation, Medical, Safety department with all safety training facilities, Fire Tender & Fire fighting services, Conveyance for staff and workers, Rest rooms for workers.

6.0 PROPOSED INFRASTRUCTURE

6.1 Industrial area (Processing area)

The total industrial area earmarked by the company is ~220 acres in present plant premises.

6.2 Residential area (Non processing area)

No labour colony is envisaged for proposed project. Temporary resting quarters are provided for the workers in the existing unit. Project site is very near to the Nalash village and Rajpura, so labour colony is not required.

6.3 Green belt

261 acres land has been developed as green belt. Locally available plant species has been planted in the greenbelt. Name of some plant species that were planted in the green belt area is given in below.

Sl. No.	Common Name
1.	Neem
2.	Amaltas
3.	Peepal
4.	Bargad
5.	Mango
6.	Peltaphorem
7	Gulmohar
8	Casia

6.4 Social infrastructure

The company is bound for the upliftment of social infrastructure in the surrounding area. Dedicated fund shall be contributed for the development of hospitals, schools and drinking facilities in the surrounding area.

6.5 Connectivity (Traffic and transportation road/rail/metro/ water ways etc)

The major road/ rail in the area are as given below

Patiala - 28 m

Ambala - 32 km

Rajpura - 8 km

NH1 (Delhi to Amritsar) – 5 km

NH64 (Chandigarh to Sangrur) – 7 km

Sarai Banjara Railway Station - 5 km

Rajpura Railway Station – 7 m

Chandigarh Airport – 28 km

6.6 Drinking Water Management (Source & Supply of water)

Water required for drinking purpose will be about 6 m^3/hour and met from available system.

6.7 Sewerage System

The infrastructure for sewerage exists. The sewage will be conveyed to the existing Sewage Treatment Plant.

6.8 Industrial Waste Management

The industrial waste generated mainly will be in form of liquid waste and solid waste, as shown below.

Waste generated	Quantity (approx.)	Disposal Plan
Used Oil, Spent oil and lubricants	15 kl/annum	Will be sold to registered recycler
Empty Drums		Will be sold to registered recycler or given back to manufacturer
Used Batteries		Will be sold to registered recycler or given back to manufacturer
E-wastes (computers, bulbs, wires, electrical parts, fridge, LCD, other electronic items, etc)	-	Will be sold to registered recycler

6.9 Solid Waste Management

Plant	Generation Point	Quantity	Use
Ash from 1 x 700 MW Plant	ESP & Boiler Ash	0.986 MTPA	Supply to Cement Industries and other Users

6.10 Power Requirement & Supply Source

Power requirement for plant auxiliaries will be met from its own generation.

7.0 REHABILITATION AND RESETTLEMENT (R & R) PLAN

Not Applicable – Proposed project Land owned by NPL

7.1 Policy to be adopted (Central / State) in respect of the project affected persons including home oustees, land oustees and landless laborers

Not applicable, because no human settlement or agriculture land is involved in the identified project land. The proposed expansion unit will be established within the existing power plant premises.

8.0 PROJECT SCHEDULE & COST ESTIMATES

8.1 Likely date of start of construction and likely date of completion

Likely date of start of construction: Immediately after obtaining EC

Likely date of completion of construction: 36 months after getting EC / Zero Date

8.2 Estimated project cost along with analysis in terms of economic viability of the project

Rs.4400 crores

9.0 ANALYSIS OF PROPOSAL

9.1 Financial and Social Benefits

Financial and social benefits to be obtained from the proposed project is described below:

- The plant will result in considerable growth of power infrastructure in the region.
- Provide direct & indirect employment opportunities and development of peripheral / supporting services and amenities.
- Supporting infrastructure development like road, power supply, reality sector
- No environmental significant impacts are envisaged.
- Best applicable mitigate measures have been proposed for management of anticipated environmental impacts.
- Community development activities will be initiated under CSR programs as per Company Act 2013.
- The project will provide significant revenue to the exchequer in the form of excise and taxes etc.
- The project will create opportunity for industrial development in the state.

CORPORATE SOCIAL RESPONSIBILITY

The company's Corporate Social Responsibility Programme voluntarily integrates Social and Environmental concerns into their operations. As a responsible corporate entity NPL shoulders many responsibilities.

To work in tandem with the environment without upsetting the ever-fragile eco-system is the philosophy. The organization attempts to give its workforce a quality life, hazard free working environment, and drive them to a higher standard of living by providing them access to amenities like housing, transportation, medical facilities, schools, and other civic infrastructure. As part of community service, NPL has adopted many villages surrounding the plants. Active volunteers from the organization undertake regularly literacy drives; organize free health camps and are continuously striving to make these villages independent and progressive.

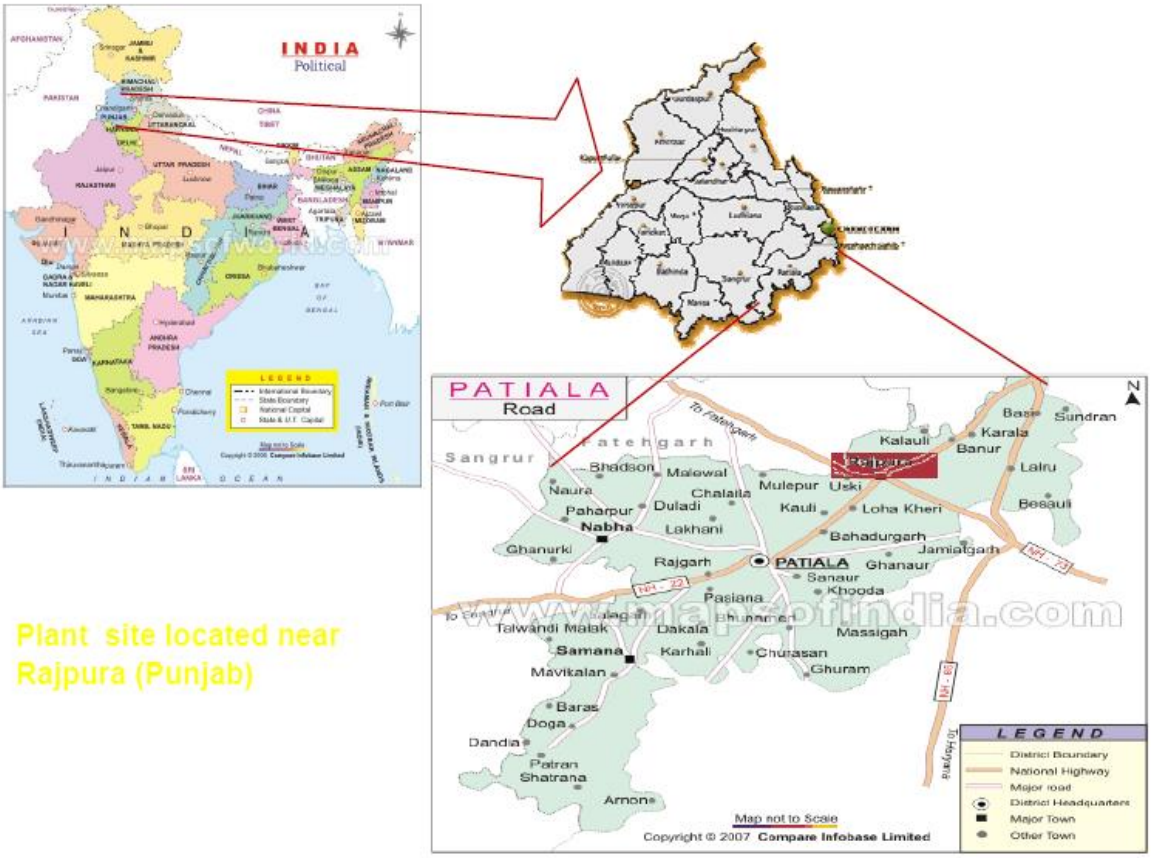

Figure 1. LOCATION MAP

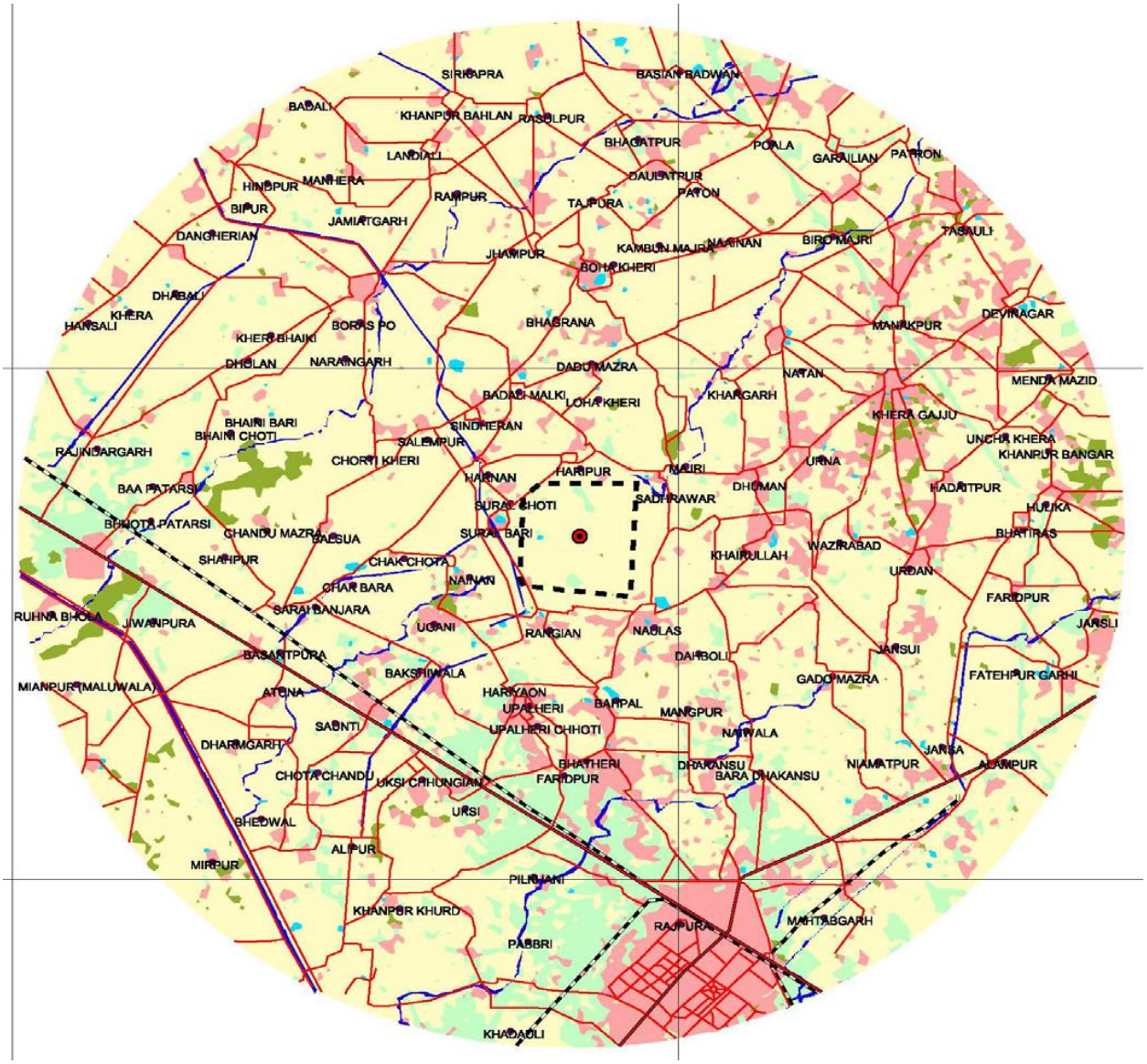

Figure 2 : MAP SHOWING PROJECT SITE & 10 KM AREA AROUND THE SITE

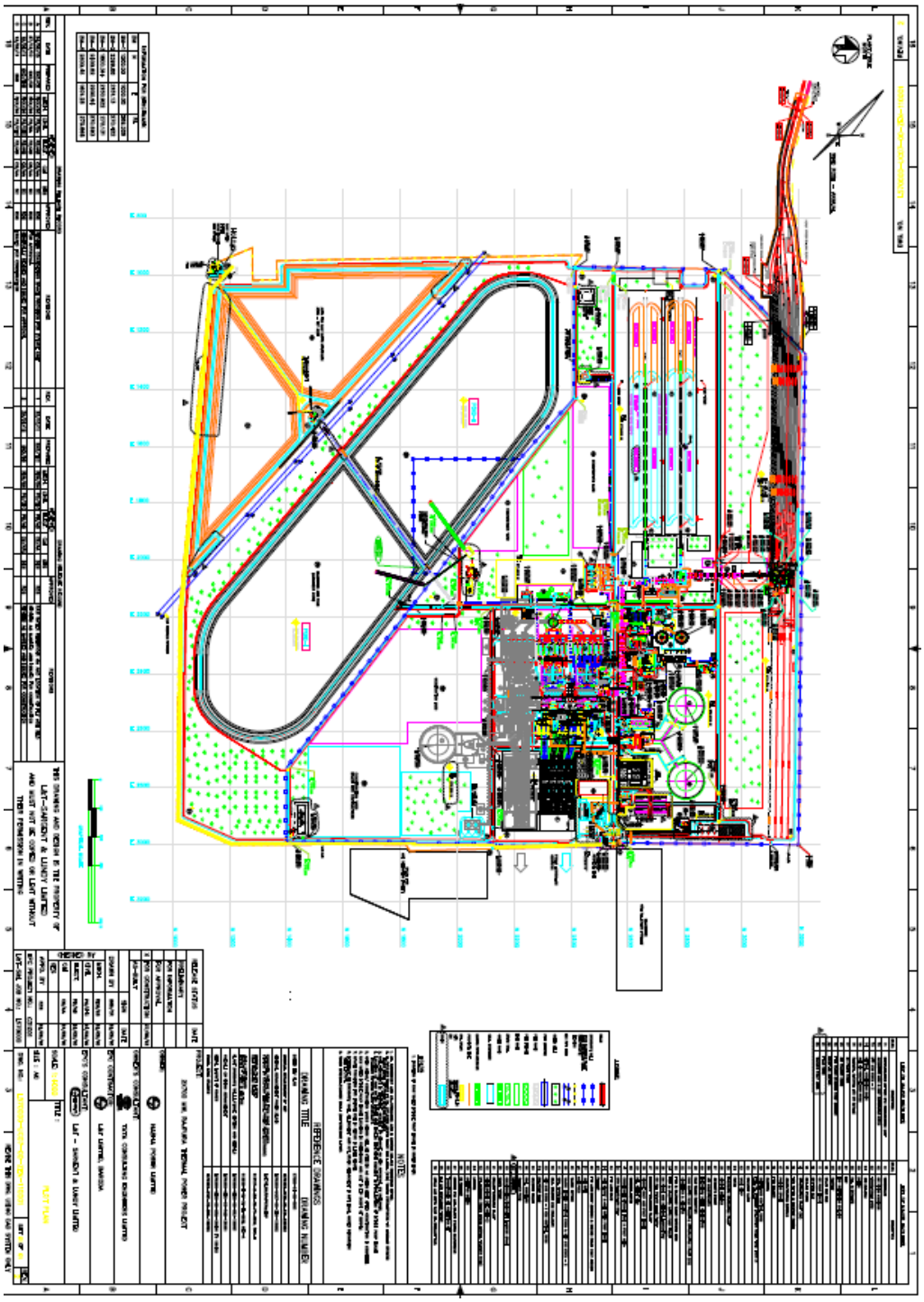

Figure 3 : GENERAL PLOT PLAN