PVUNL	**Pre-Feasibility Report for Patratu Super Thermal Power Project Phase-1 (3x800 MW)**

1.0 Executive Summary

Name of Project:	**Patratu Super Thermal Power Project, Phase-I (3 x 800 MW)**
Name of Project Proponent:	Patratu Vidyut Utpadan Nigam Limited (PVUNL), Ranchi, Jharkhand
Location of the Project:	The proposed site is located near Patratu town in Ramgarh district of Jharkhand. The latitudes and longitudes of the site are as follows: Main Plant & Township: Corner name / Latitude / Longitude Top Corner / 23° 39 ' 00 '' N / 85° 17' 51.5" E Bottom Corner / 23° 38 '12.5 '' N / 85° 17' 27" E Left Corner / 23° 38 ' 22.5 '' N / 85° 17' 10.6 '' E Right Corner / 23° 38 ' 40 '' N / 85° 17' 57 '' E The vicinity map of the project is shown in Exhibit-I.
Capacity & Unit Configurations:	Current Proposal :Phase-I, 2400 MW (3x800 MW) Ultimate Capacity : Phase-I & Phase-II, 4000 MW (3x800 MW+ 2x800 MW)
Land Requirement, Current Land Use and Availability:	The total land to be transferred to JVC is 1859 acres. Out of 1859 acres, about 1234 acres of land has been envisaged for Plant, Ash pond and Land on railway track of the for Phase-I (3X 800 MW).
Water Requirement and Availability:	The make-up water for Patratu Thermal Power Station (PTPS) is met from Patratu Dam/reservoir on Nalkari River. Govt. of Jharkhand (GoJ)/Jharkhand Urja Utpadan Nigam Limited (JUUNL) owns and controls water Patratu Dam. PVUNL shall require water supply of 27 Cusecs to generate electricity from PSTPP (3X 800 MW) with "Air Cooled Condenser" based power plant. The water requirement considering water cooled condenser shall be 72 Cusecs. The cooling system shall be selected based on optimization of water requirement vis a vis plant efficiency. The type of cooling system shall be decided during detailed feasibility/design stage.
Fuel Requirement:	Coal requirement for the proposed Phase-I of project is about 12 MTPA. The Banhardih captive coal block at a distance of about 60 km from plant is allocated to JUUNL for end use of Patratu expansion shall be transferred to the PVUNL for the usage of PSTPP if allowed by Ministry of Coal, GOI. In case of coal linkage is not provided to PVUNL, JUUNL will supply the entire coal extracted from the coal block allocated for end use of PSTPP and if the coal requirement is more than the available from the coal block allocated to JUUNL for PSTPP, the GOJ will request to ministry of coal for providing additional coal as per requirements for operation of the PTPS and its expansion.

Environmental Setting of the Project	The proposed site almost conforms to the siting criteria for thermal power plants. No wildlife sanctuaries/ national parks or any ecological sensitive area of national importance exist within 10 km. radius of proposed site. However, some Protected forests are located within 10 km radius from site (an indicative list of forests are given in Form-1 of TOR application). No archaeological monument of national importance & defense installations exist within 10 km. radius of the proposed site. National Highway no. 33 & 23 are located at approx. 21 km from plant boundary. The nearest Railway Station is Patratu which is at a distance of about 4 km on Barkakhana-Barwadih Railway line. Site is located about 6.5 km, aerial distance from Damodar river. However, Nalkari river flows at approx. 300 m from plant boundary. No archaeological, historical, cultural, and defense installations within 10 km radius from plant.
Cost of the Project:	The Cost/MW is estimated at about Rs. 6 Crore/MW (based on site specific BOQ). The estimate shall be revised in due course.

2.0 Introduction of the Project & Background Information

2.1 Identification of Project & Project Proponent

Existing Patratu Thermal Power Station (PTPS) of erstwhile SEB has six Russian units of 36 to 42 years old and four BHEL manufactured units of 26–31 years old. The installed & derated capacity is given as below.

Installed: 840 MW (4x50 + 2x100 + 2x110 + 2x110)
Derated: 770 MW (4x40 + 2x90 + 2x105 + 2x110)

A JV agreement was recently signed on 29.07.2015 amongst Govt. of Jharkhand (GoJ), Jharkhand Urja Vikash Nigam Limited (JUVNL), Jharkhand Urja Utpadan Nigam Limited (JUUNL), Jharkhand Bijli Vitaran Nigam Limited (JBVNL) and NTPC Limited to form a Joint Venture Company of NTPC Limited & JBVNL, for transfer of Patratu Thermal Power Station(PTPS) located in Ramgarh District of Jharkhand State to the Patratu Vidyut Utpadan Nigam Limited, (JV Company) for Performance Improvement of existing capacity & 4000 MW Capacity expansion of Patratu Thermal power station (PTPS), District Ramgarh, Jharkhand.

JBVNL is state owned company of Govt. of Jharkhand and NTPC is a leading power sector company of India. As per JV agreement:

(i) Revival, refurbishment and R&M of Unit no. 07, 09 &10 with total derated capacity of 325 MW (performing existing units) based on studies to be carried out of existing ten units (Existing Units).

(ii) Unit nos. 1,2,3,5 and 8 of the existing PTPS are in the process of being phased out as per CEA recommendations.

(iii) Unit no. 4 & 6 will be phased out after revival of Unit no. 7 & 9.

(iv) Expansion of capacity of project through 5 new units in two phases with a total generating capacity of 4000 MW (Phase-I: 3x800, Phase-II: 2x800).
(v) Current Proposal is for installation of Phase –I (3x800 MW) by JV Company (Patratu Vidyut Utpadan Nigam Limited)
(vi) Phase-II (2x800 MW) is envisaged after dismantling of existing units subject to techno-economic feasibility.

The Joint venture company "Patratu Vidyut Utpadan Nigam Limited" with NTPC and JBVNL as promoters having a shareholding of 74% and 26% respectively.

2.2 Brief Description and Nature of the Project

Patratu Thermal Power Project Phase-I (3X 800 MW) shall be a pulverised coal fired thermal power project based on super critical boiler parameters. The proposal involves construction and operation of three units of 800 MW each. The main components of the projects include:

- Steam Generator, Turbine Generator and Auxiliary Units.
- Coal Handling System including Dust Extraction and Suppression System
- Air Cooled Condenser / Water Cooled Condenser along with cooling towers
- Water & Effluent Treatment System
- Fire Protection System
- Air Conditioning & Ventilation System
- Electrostatic Precipitators
- Chimney
- Ash Handling System with Dry Ash Extraction and wet mix system, Storage and Disposal Facilities.
- Electrical Systems: Generator Bus Duct, Transformers, Switchgears, Switch Yard etc.

2.3 Need for the Project & Its Importance to the Country & Region

Power is one of the key infrastructural elements for the economic growth of a country. Proposed PTPP Stage-I is envisaged as a base load station to meet the power demand of Jharkhand and other States in Eastern Region. The project is expected to start yielding benefits during 13th Plan period.

2.4 Demand Supply Gap

The anticipated power demand & supply Scenario for 13th Plan based on demand as per 18th EPS and with certain assumptions are enclosed in **Annexure-I** as provided by CEA.

(i) Anticipated power demand supply position of Jharkhand for 13th Plan period including Patratu TPS Expansion Phase-I.

(ii) Anticipated power demand supply position of Jharkhand for 13th Plan period excluding Patratu TPS Expansion Phase-I.

From the above, it is observed that Jharkhand would experience overall peak and energy deficit during 2017-2022 excluding PTPS Ph-1. It is also observed peak and energy deficit during 2017-2021 based on projections by CEA including PTPP Ph-1.

2.5 Imports vs. Indigenous Production

Not Applicable

2.6 Export Possibility

Not Applicable

2.7 Domestic/ Exports Market

Eighty five (85) % of power from the project is envisaged to be allocated to Jharkhand State subject to approval of Ministry of Power, while balance 15% would be as unallocated portion. No export of power from this project, is planned currently.

2.8 Employment Generation (Direct & Indirect) due to the Project

The project will generate direct and indirect employment opportunities as well as opportunities for self-employment. Power projects have mechanised and automated plants. Therefore, the direct opportunities for employment during operation phase are limited. However, during construction phase additional manpower may be deployed by contractors. In addition to the people directly involved in construction and operation of the power project, employment opportunities in subsidiary industries and service sectors as well as self employment opportunities shall also be generated.

3.0 Project Description:

3.1 Type of Project, Interlinked Project & Interdependent Project

PSTPP Phase-I shall be a pulverised coal fired thermal power project based on super critical boiler parameters. There are no other projects interlinked/ interdependent to PTPS Phase-I.

Location

The proposed site is located near Patratu town in Ramgarh district of Jharkhand. The four corner coordinates of site are given as follow. The vicinity map of the project is shown in Exhibit-I.

Main Plant and Township

Corner name	Latitude	Longitude
Top Corner	23° 39 ‘ 00'' N	85° 17’ 51.5” E
Bottom Corner	23° 38 ‘12.5'' N	85° 17’ 27” E
Left Corner	23° 38 ‘ 22.5''N	85° 17’ 10.6''E
Right Corner	23° 38 ‘ 40'' N	85° 17’ 57'' E

The proposed project draft site layout is enclosed as Exhibit-II.

3.2 Details of Alternate Sites

Not Applicable. Since the project is an expansion project and no additional land is envisaged to be acquired, hence alternative sites are not explored.

3.3 Size & Magnitude of Operation

The capacity of proposed power project would be 2400 MW. It will consume about 12 Million Tonnes of Coal per annum and 27 cusecs of water (with Air Cooled Condenser) or 72 Cusecs (with Water Cooled Condenser). The project will operate round the clock in three shifts of operation. Some existing infrastructure may be demolished.

3.4 Project Description & Process Details

In a thermal power plant, the chemical energy of the fuel (coal) is first converted into thermal energy (during combustion), which is then converted into mechanical energy (through a turbine) and finally into electrical energy (through a generator). The schematic diagram of the process of power generation a coal based thermal power plant is shown in Exhibit III. It has the following steps.

(1) The coal is transferred from the coal handling plant by conveyor belt to the coal bunkers, from where it is fed to the pulverizing mills, which grind it to fine powder. The finely powdered coal, mixed with air is then blown into the boiler by a fan where it burns like a gas.

(2) The process of combustion releases thermal energy from coal. The boiler walls are lined with boiler tubes containing high quality demineralized water (known as boiler feed water). The combustion heat is absorbed by the boiler tubes and the heat converts the boiler feed water into steam at high pressure and temperature. The steam, discharged through nozzles on the turbine blades, makes the turbine to rotate, which in turn rotates the generator coupled to the end of the turbine. Rotation of generator produces electricity, which is passed to the step-up transformer to increase its voltage so that it can be transmitted efficiently. The power is evacuated via switchyard through a Transmission System.

(3) During combustion, the non-combustible part of coal is converted into ash. A small part of ash (about 20%) binds together to form lumps, which fall into the ash pits at the bottom of the furnace. This part of ash, known as bottom ash is water quenched, ground and then conveyed to pits for subsequent disposal to ash disposal area or sale.

(4) Major part of the ash (about 80%) is in fine powder form, known as Fly Ash, and is carried out of the boiler along with the flue gas. The flue gas, after heat recovery, is passed through the electrostatic precipitators, where the ash is trapped by electrodes charged with high voltage electricity.

(5) The flue gases exiting from the Electrostatic Precipitators (ESPs) are discharged through a tall chimney for wider dispersal of remaining ash particles and gases. The ash collected in the ESP hoppers is extracted in dry form and conveyed to dry ash storage silos from where it is supplied to user industries.

(6) Any unused part of fly ash is mixed with water and conveyed to ash disposal area in a slurry form.

(7) The steam, after passing through the turbines, is condensed back into water in condensers and the same is re-used as a boiler feed water for making steam. The reasons for condensing and reusing the steam are following: -

- The cost of boiler feed water is very high as it is very pure demineralised water hence reuse is economical.
- The use of condenser lowers the temperature at the exit end and hence increases the efficiency of the turbine.

(8) Air Cooled Condenser (ACC) is envisaged for the proposed project. In ACC, steam from turbine exhaust is cooled by using atmospheric air. Alternatively water cooled condensers may be utilized. The cooling system shall be selected based on optimization of water requirement vis a vis plant efficiency. The type of cooling system shall be decided during detailed feasibility/design stage.

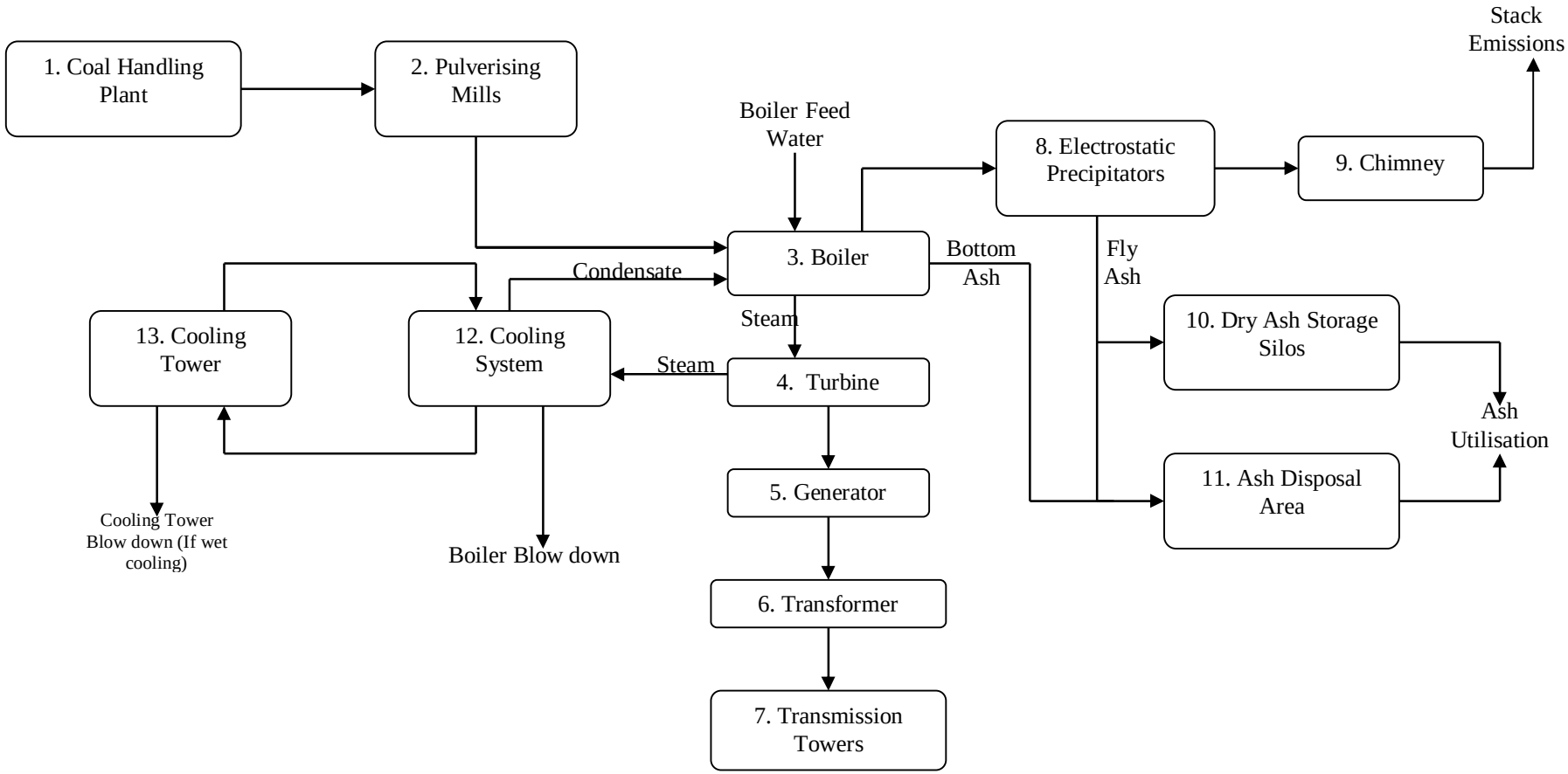


Exhibit-III: Schematic Representation of Thermal Power Generation in Coal Based Thermal Power Plant

3.5 Requirement of Raw Materials

Coal and Water are the main raw materials proposed to be used in Patratu STPP Ph-1, for power generation. The coal requirement is estimated about 12 MTPA.

The make-up water for PSTPP Ph-1 (3x800 MW) will be met from Patratu Dam/reservoir on Nalkari River. PVUNL shall require water supply of 27 Cusecs to generate electricity from PSTPP (3X 800 MW) with "Air Cooled Condenser" based power plant. The water requirement considering water cooled condenser shall be 72 Cusecs.

In addition, Heavy Furnace Oil/ HPS/ LSHS shall be used during start-up, warm up and low load (up to 30%) operations. Light Diesel Oil (LDO) firing shall be used to facilitate cold start-up of the unit when no auxiliary steam is available for HFO heating and atomization.

3.6 Resource Optimisation, Recycle & Reuse

Coal, Water and Land are the three main natural resources required for setting up of

PSTPP Phase-I (3 X 800 MW). PVUNL shall make the best efforts to optimize the utilization of resources.

Expansion of existing power project is always environmentally more compatible than a green field project of similar capacity. In present case, the land for existing project is being utilized for setting up of 3X 800 MW units by reorganizing land use.

PSTPP Ph-I (3 X 800 MW) shall be based on super critical boiler parameters, which higher thermal efficiency as compared to conventional pulverised coal has fired units based on sub-critical boiler parameters. The increase in efficiency results in lower coal consumption as well as lower generation of ash and gaseous emissions per unit of electricity generated. PVNL shall make maximum efforts to utilize the ash generated from the project.

While developing the details of water system for the project utmost care shall be taken to minimize water requirement as well as effluent generation. Main features of the water system shall include:

- Utilization of blow down for Coal dust suppression and extraction system, Service water system, Ash handling and Fire fighting
- Recycle and reuse of effluents from coal dust suppression and extraction system and service water system
- Ash water recirculation system/HCSD.
- Recirculation of filter backwash to clarifier inlet.

3.7 Availability of Water & Power

The water requirement is estimated to be about 27 cusecs (with Air cooled Condensers), which is proposed to be drawn from met from Patratu Dam/reservoir on Nalkari River at a distance of about 1.5 kms. from the project. In case of water cooled condensers the water requirement will be about 72 cusecs. The cooling system shall

be selected based on optimization of water requirement vis a vis plant efficiency. The type of cooling system shall be decided during detailed feasibility/design stage.

PTPS itself is a power generating project, hence there will be no long term requirement of power from external source. The construction power requirement of the project is proposed to be met from 132 kV switchyard of PTPS.

Similarly water for construction purposes is proposed to be sourced from the water supply system of existing station.

3.8 Quantity of Wastes to be Generated and scheme for their management/disposal

The wastes generated in a coal based power station consist of flue gas and ash generated due to combustion of coal and liquid effluents generated due to cooling, various industrial processes and domestic use of water.

Ash generated due to combustion of coal will be the main industrial/ solid waste generated from the project. About 80% of the ash shall be generated as Fly Ash while 20% of the ash shall be generated as bottom ash. With average annual coal requirement of about 12 MTPA, it is estimated that about 3.96 MTPA of ash shall be generated annually. The details of ash utilization and management are given in Sr. no. 9.0.

The project will have effluent treatment plant and various systems for recycle and reuse of treated effluents. However, a small quantity of effluents shall be generated from the project. The exact quantity of effluents shall be known at the design stage.

3.9 Schematic Representation of Feasibility Drawing

A schematic of power generation process is presented in Section 3.4 above. Further details like Lay-Out Plan, Plant Sections etc. shall be worked out during Detailed Engg. Stages.

4.0 Site Analysis

4.1 Connectivity

Proposed project site is well connected through rail, road and air routes. The site can be approached from Patratu Railway Station at about 4 km. distance (located on Barkakhana-Barwadih Railway line) and National Highway no. 33 &23 (approx. 21 km) & NH-75 (approx. 27 km). Nearest commercial Air Port is Ranchi at about 45 km by road. Ranchi (at distance of about 30 Km) being state capital of Jharkhand is also well connected by train & flight services.

4.2 Existing Land Form, Land Use, Ownership & Topography

The plant facilities for this expansion stage would be accommodated within the land available with the existing power station. Total land requirement for Phase-I (3x800 MW) and Phase-II (2x800MW) is 1859 acres. The land required for proposed expansion Project at Phase-I is about 1234 acres approx. The expansion of Patratu Thermal Power Station with addition of Phase-I (3x800 MW) of Patratu Super Thermal Power Project, shall also involve demolition of some existing infrastructure.

The land is already under industrial use for the last several decades. The topography of project site is generally plain. However, a preliminary topography survey is under progress. But some hillocks are located at about 5 km from site. No forest land is envisaged for the plant.

4.3 Existing Infrastructure/ social infrastructure

The existing infrastructure and facilities are hospital, schools, post office, and banks available in the study area. The expansion of Patratu Thermal Power Station involves demolition of some infrastructure of existing project. The project site has already railway siding for transportation of coal. There are three National Highways (NH-23, 33 & 75) within 30 km from site. A detailed analysis of social infrastructure available at site will be provided in EIA report.

4.4 Soil Classification

Generally two types of soil is found in Ramgarh district -Red Soil and Sandy loam.

However, as preliminary Soil investigation is under progress and the classification and analysis will be provided in EIA report.

4.5 Climatic Data

The area lies in the sub-humid region of Chotanagpur Plateau and enjoys semi-extreme type of climate. The day temperature rises around 40 °C during the summers and drops down to around 10 °C during the winter. Three broad seasons can be recognized:

- The winter season: November to February.
- The summer season: March to May.
- The rainy season: June to October.

However, detailed meteorological data will be provided in EIA report.

5.0 Planning Brief

5.1 Planning Concept

As discussed in Para 2.4 above, the planning of power projects is based on demand & supply scenario of the country/ region, which is based on Electrical Power Survey conducted by CEA. Once the necessity of the project, based on demand and supply gap is established, the site for project is selected based on the following considerations:

i. Availability of suitable and adequate land within the existing premises of Project
ii. Availability of reliable source of water
iii. No issue related to displacement and R&R
iv. Road and railway access
v. Availability of infrastructural facilities
vi. Conformity of Environmental setting Guidelines

5.2 Population Projection

Power projects are highly mechanised and automated plants. Therefore, the direct opportunities for employment during operation phase are limited. However, during construction phase an additional manpower will be deployed by contractors. Temporary labour colonies with amenities like water supply and sanitation facilities shall be developed for the construction phase.

5.3 Land Use Planning

The plant facilities for this expansion stage would be accommodated within the land available with the existing power station. Total required Land for Ultimate capacity of Proposed Expansion Project (5x800 MW) is 1859 Acres. Out of 1859 acres, about 1234 acres of land has been envisaged for Phase-I (3X 800 MW).

Suitable afforestation programme in and around plant areas shall be undertaken wherever feasible. Additional plantation would be done at the available space.

The proposed land use (tentative) of expansion project Phase-I (3x800 MW) is as follow.

TABLE-1

PROPOSED PLANT AREA LAND USE BREAKUP (TENTATIVE)

Sr. No.	Description	Tentative Area in acres
1	Plant and other facilities	485
2	Ash Pond	600
3	Pipeline Corridor and railway siding/Approach Road	50
4	Miscellaneous	99
	Total	1234

Ash disposal of PSTPP Phase-I is envisaged in the ash pond in the land available with the project.

5.4 Assessment of Infrastructure Demand and Amenities/ Facilities Planned

The study area possesses infrastructural facilities like the township, Hospital, School, Bank, Post Office, market etc. New common facilities like field hostel and CISF Quarters etc. for proposed project will be developed.

6.0 Proposed Infrastructure

6.1 Industrial Area

The land is already under industrial use since many decades. The General Layout Plan for the project shall be developed taking into consideration the various aspects like existing units, ground features, ground contours, villages in the vicinity, corridor for outgoing transmission lines, road/rail approaches, prevailing wind direction and associated pipe corridors etc. Major components of main power house complex are

- Main Plant Building
- Coal Stock Yard
- Fuel Oil Handling & Storage Area
- Makeup Water System and Water Treatment Plant
- Cooling System with Air Cooled Condensers / Water Cooled condensers with Cooling Towers
- Effluent Treatment Plant
- Electrostatic Precipitators and Chimney
- Ash Handling Plant
- Switch Yard etc.

Space provision shall be been kept for lay-down and pre-assembly activities, stores, contractor's offices etc. Construction offices and storage sheds are located close to the main approach road to the plant. Administration Building is proposed to be located inside the plant boundary.

6.2 Residential Area

The existing project already has a township consisting of various residential and non-residential buildings. Non-residential Buildings are already developed in study area (10 km radius) like include, Hospital, School, Bank, Post Office, market, CISF accommodation etc.

6.3 Afforestation / Green Belt

Suitable afforestation programme in and around plant areas shall be undertaken wherever feasible. Additional plantation would be done at the available spaces.

6.4 Social Infrastructure

The proposed site is semi-urban in nature located near Patratu town. The social infrastructure available in area is of moderate level and shall be improved.

6.5 Connectivity

Proposed project site is well connected through rail, road and air routes. The site can be approached from Patratu Railway Station (located on Barkakhana-Barwadih Railway line) and National Highway no. 33 &23 (approx. 21 km) & NH-75 (approx.. 27 km). Nearest commercial Air Port is Ranchi at about 45 km by road. Ranchi (at distance of about 30 Km) being state capital of Ranchi is also well connected by train & flight services.

6.6 Drinking Water Management

Entire Main Plant shall be provided with piped drinking water supply with a water treatment plant.

6.7 Sewerage System

Main Plant areas shall be provided with an underground sewerage system with an appropriate treatment system.

6.8 Industrial Waste/ Solid Waste Management

Ash generated due to combustion of coal will be the main industrial/ solid waste generated from the project. About 80% of the ash shall be generated as Fly Ash while 20% of the ash shall be generated as bottom ash. The total ash generation will be approx. 3.96 MTPA.

The fly ash shall be extracted in dry form from the electrostatic precipitator hoppers. This dry ash shall either be taken to buffer hoppers for its onward transportation in dry form for utilization or shall be slurrified in wetting units for its ultimate disposal in ash disposal area. The bottom ash shall be extracted and disposed off in wet form. It is envisaged to have disposal system sized for 100% generation of ash.

The ash management scheme for fly ash and bottom ash involves dry collection of fly ash, supply of ash to entrepreneurs for utilisation, promoting ash utilisation and safe disposal of unused ash. PVUNL shall make maximum efforts to utilise the fly ash for various purposes.

6.9 Power Requirement & Source

The construction power requirement of the project is proposed to be met from 132 kV switchyard of PTPS.

7.0 Coal Transportation

Currently the mode of transportation is by Indian Railways Systems.

For the proposed expansion, the envisaged mode of coal transportation from the coal mines to the power plant is by Indian Railways System / Captive MGR.

8.0 Power Evacuation

Eighty five (85) % of power from the project is envisaged to be allocated to Jharkhand State subject to approval of Ministry Of Power, while balance 15% would be as unallocated portion.

The issue of power evacuation of the proposed project shall be taken up with appropriate Transmission Utility (STU or CTU) as per regulatory provision, based on allocation of power.

9.0 Ash Utilization and Management

The Ministry of Environment, Forests & Climate Change has issued a Gazette Notification dated 03-11-2009 which is an amendment to its earlier notifications dated 14-09-1999 and amendment dated 27-08-2003. The new notification stipulates that all coal based power stations/ units commissioned after the date of issue of notification

have to utilize at least 50% of ash generated within 1 year, 70% within 2 years, 90% within 3 years and 100% within 4 years respectively from the commissioning of the units.

In order to have maximum ash utilization in various areas and also to comply with the requirements of MoEF&CC's Gazette Notification on fly ash dated 03-11-2009, following actions are proposed to be taken up by PVUNL:

i. PVUNL shall provide a system for 100% extraction of dry fly ash along with suitable storage facilities. Provision shall also be kept for segregation of coarse and fine ash, loading this ash to closed/ open trucks and also for loading fly ash into rail wagons. This will ensure availability of dry fly ash required for manufacture of Fly Ash based Portland Pozzolana Cement (FAPPC) for cement plants and Ready Mix Concrete plants located in the vicinity of proposed project & also for fly ash traders/ exporters.

ii. PVUNL shall make efforts to motivate and encourage entrepreneurs to set up ash based building products such as fly ash bricks, blocks tiles and other fly ash based products from proposed power plant.

iii. PVUNL shall set up fly ash brick manufacturing plants at proposed power plant, so as to make fly ash bricks available for in-house construction works and also for other construction agencies etc.

iv. PVUNL shall make efforts with authorities of mines of metals & other minerals for use of ash in reclamation of mines located within 50 km of proposed power station with prior approval of MOEF &CC.

v. All government/ private agencies responsible for construction/ design of buildings and road embankment within 100 km of the plant areas shall be persuaded to use ash and ash based products in compliance of MoEF&CC's Gazette Notification on fly ash dated 03-11-2009.

With all the efforts mentioned above, it is expected that fly ash generated at proposed thermal power station shall be utilized in the areas of cement, concrete & building products manufacturing, road embankment construction and mine filling etc. However in order to prepare realistic road map for 100% ash utilization, a detailed market study shall be carried out. Based on recommendations of the study, detailed Road Map for achieving 100% Ash Utilization in the line with MoEF&CC's Gazette Notification on fly ash dated 03-11-2009 shall be prepared.

In addition to above, Ash disposal of proposed expansion Project (3x800 MW) will be done in the nearby ash ponds located within the project area.

10.0 Rehabilitation and Resettlement (R&R) Plan

Not Applicable. Since no additional land is proposed to be acquired. However, community development and CSR activities will be continued as per company policy in consultation with state government and local people.

11.0 Roof Top Solar Plant

Solar Photo Voltaic Plant will be set up on rooftop of buildings roofs as per techno-economic feasibility. About 15 m^2 area per kW is required for roof top Solar PV Plant. Effective area for utilization for roof top solar PV on rooftop building will be estimated after detailed study.

Solar PV panels shall be mounted on the roof through non-corrosive module mounting structure. The support structure shall not disturb the water proofing of the roof

12.0 Project Schedule & Cost Estimates

Commercial Operation Date (COD) of first 800 MW unit of PSTPS Phase-I is estimated in 52 months from the Investment approval and subsequent units after an interval of 6 months thereafter.

The Cost/MW is estimated at about Rs 6 Crore/MW (based on site specific BOQ). The estimate shall be revised in due course.

13.0 Analysis of Proposal (Final Recommendations)

Keeping in view the no requirement of additional land and nearness of source of water, proximity to Indian Railway system & proposed coal source and generally meeting the requirements of most of environmental guidelines, the site is considered prima-facie feasible for setting up a power project of capacity 3x800 MW.

Construction and operation of the project will generate employment potential both directly or indirectly. Local people will have employment opportunities as skilled, semi-skilled and unskilled laborers as well as self employment opportunities. Thus there will be overall improvement in the socio-economic status of the people of the surrounding areas. Power plant will have a positive effect on the socio-economic conditions of the people nearby, the project and service activities will generate steady source of income for local people. With the implementation of the project, employment opportunities, communication, medical facilities, education and skill up-gradation facilities etc. in the area will be further improved.

Besides, there will be marked improvement for various facilities in the local areas as shown below.

- Improvement in medical and health care system.
- Improvement of drinking water & sanitation facilities.
- Vocational training facilities for local eligible youth of local community to enable them to seek employment in suitable project operations and elsewhere.
- Benefit to the State and the Central governments through financial revenues from this project directly and also indirectly.
- Employment opportunities to local persons of different skills and trades.
- Improvement in the socio-economic conditions of the inhabitants of the area.

Exhibit-I: Vicinity Plan of Patratu Super Thermal Power Project, Phase-I (3 x 800 MW)

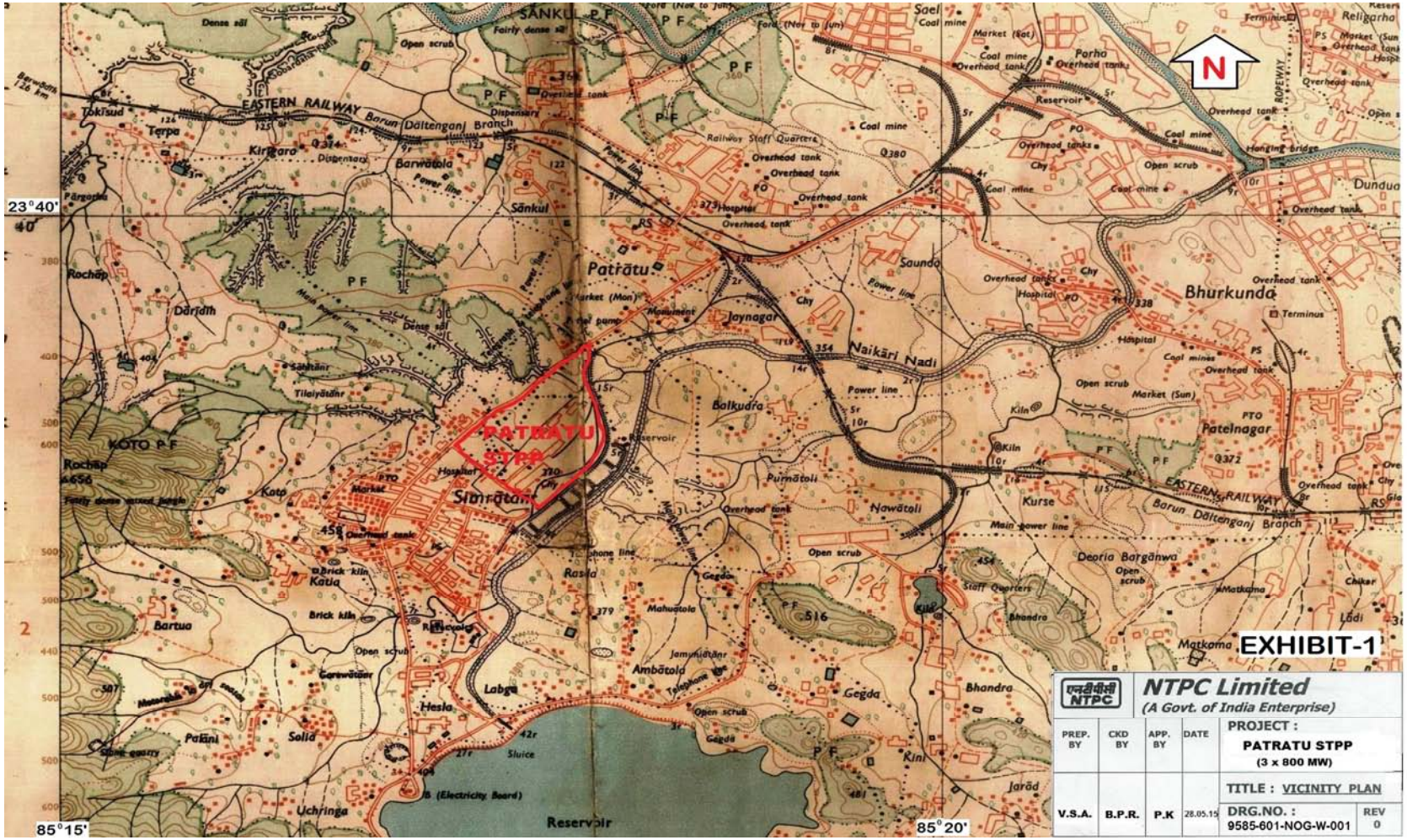
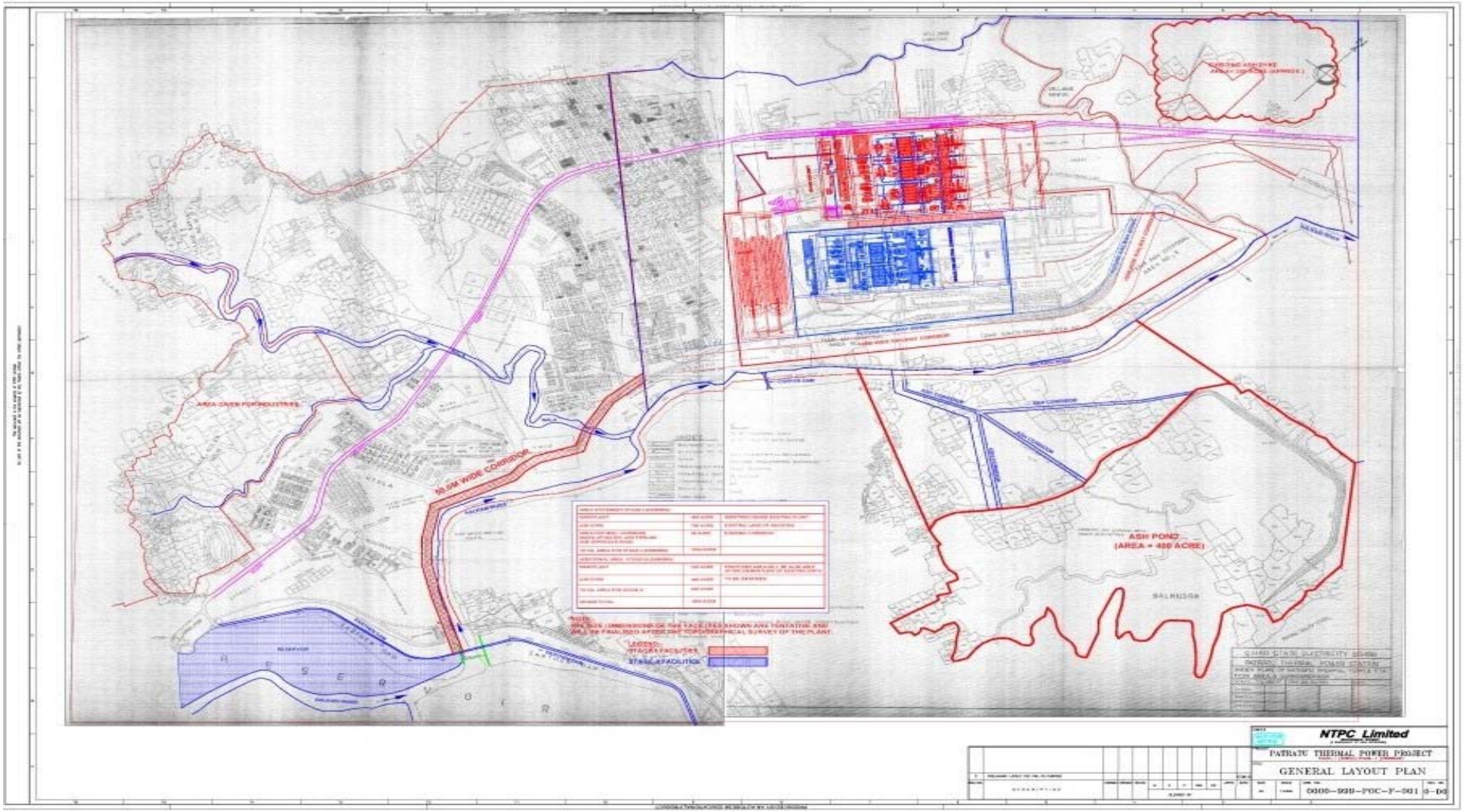


Exhibit –II: Draft Tentative Layout Plan of Patratu Super Thermal Power Project, Phase-I (3x800MW)



Annexure-I

ANTICIPATED POWER SUPPLY POSITION DURING 2017-18 TO 2021-22

INCLUDING PATRATU TPS EXPN. PH-I (2400 MW)

JHARKHAND

REGION	UNITS	2017-18	2018-19	2019-20	2020-21	2021-22
PEAK AVAILABILTY	MW	3206.2	3513.7	3538.3	5184.1	5698.7
PEAK LOAD	MW	4948	5262	5598	5957	6341
SURPLUS/DEFICIT	MW	-1741.8	-1748.3	-2059.7	-772.9	-642.3
SURPLUS/DEFICIT	%	-35.20	-33.20	-36.80	-13.00	-10.10
ENERGY AVAILABILTY	MKWH	20488.7	27068.3	27737.2	34790.5	44873.4
ENERGY REQUIREMENT	MKWH	29592	31381	33287	35318	37482
SURPLUS/DEFICIT	MKWH	-9103.3	-4312.7	-5549.8	-527.5	7391.4
SURPLUS/DEFICIT	%	-30.80	-13.70	-16.70	-1.50	19.70

ANTICIPATED POWER SUPPLY POSITION DURING 2017-18 TO 2021-22

EXCLUDING PATRATU TPS EXPN. PH-I (2400 MW)

JHARKHAND

REGION	UNITS	2017-18	2018-19	2019-20	2020-21	2021-22
PEAK AVAILABILTY	MW	3206.2	3513.7	3538.3	3621.1	3745.1
PEAK LOAD	MW	4948	5262	5598	5957	6341
SURPLUS/DEFICIT	MW	-1741.8	-1748.3	-2059.7	-2335.9	-2595.9
SURPLUS/DEFICIT	%	-35.20	-33.20	-36.80	-39.20	-40.90
ENERGY AVAILABILTY	MKWH	20488.7	27068.3	27737.2	28189.7	29300.8
ENERGY REQUIREMENT	MKWH	29592	31381	33287	35318	37482
SURPLUS/DEFICIT	MKWH	-9103.3	-4312.7	-5549.8	-7128.3	-8181.2
SURPLUS/DEFICIT	%	-30.80	-13.70	-16.70	-20.20	-21.80