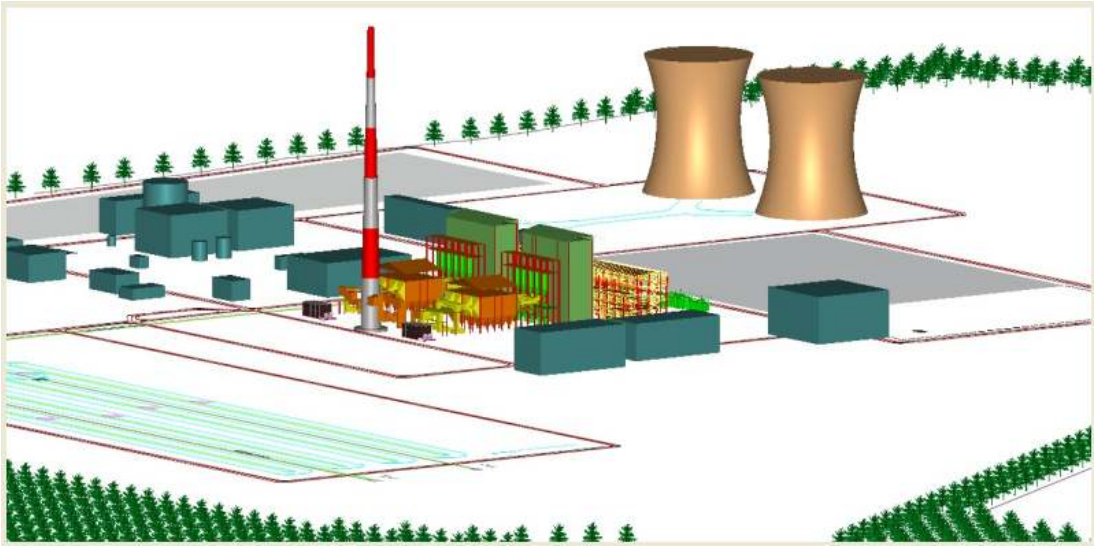
PRE FEASIBILITY REPORT

FOR

2X660 MW DOMESTIC COAL BASED THERMAL POWER PLANT
BASED ON SUPER-CRITICAL TECHNOLOGY

AT PATRATU, RAMGARH DISTRICT, JHARKHAND, INDIA



Proponent: Patratu Energy Limited

(A wholly owned subsidiary of Jharkhand State Electricity Board)

JSEB (HQ) Campus,

Engineering Building, H.E.C.

Dhurwa, Ranchi – 834004

Jharkhand, India

October, 2012

CONTENTS

LIST OF EXHIBITS

EXECUTIVE SUMMARY

1. Patratu Energy Limited was incorporated in October 2012 under the Companies Act 1956 as a wholly owned subsidiary of Jharkhand State Electricity Board (JSEB) and is a Special Purpose vehicle (SPV) for setting up a 2x660 MW domestic coal-based Thermal Power Plant (TPP) based on Super-critical Technology at Patratu (Latitude 23°37'30"N and Longitude 85°16'25"E) in Ramgarh District of Jharkhand State. The proposed TPP will be set up by a developer selected through tariff based International Competitive Bidding process following the "Guidelines for Determination of Tariff by Competitive Bidding Process for Procurement of Power by Distribution Licensees ("Guidelines") issued by Ministry of Power, Govt. of India.
2. JSEB was constituted on January 10, 2001 and with the appointment of Chairman and Members on March 16, 2001, the Board started functioning from April 1, 2001. The responsibility of JSEB is to promote and coordinate development of generation, transmission and distribution of electricity within the state in the most efficient and economical manner.
3. The Land required of about 1050 acre is in the possession of JSEB. The water requirement will be met from the Patratu reservoir (Nalkari Dam).
4. Ministry of Coal, Govt. of India has 'in principle' allocated Banhardih coal block (400 Million Tonnes) in Banhardih, Chandwa Tehsil, Latehar District (23°43'21"N and 84°41'03"E) to JSEB.
5. The total power generated from the power plant using coal from Banhardih coal block or any other coal source as may be decided by JSEB/Govt. of Jharkhand, will be procured by JSEB.

CHAPTER I

1.0 INTRODUCTION OF THE PROJECT AND THE DEVELOPER

1.1 Patratu Energy Limited, a wholly owned subsidiary of Jharkhand State Electricity Board (JSEB) is a Special Purpose vehicle (SPV) established for setting up a 2x660 MW domestic coal-based Thermal Power Plant (TPP) based on Super-critical Technology at Patratu (Latitude 23°37'30"N and Longitude 85°16'25"E) in Ramgarh District of Jharkhand State. The proposed TPP will be set up by a developer selected through tariff based International Competitive Bidding process following the "Guidelines for Determination of Tariff by Competitive Bidding Process for Procurement of Power by Distribution Licensees" ("Guidelines") issued by Ministry of Power, Govt. of India.

1.2 Ministry of Coal, Govt. of India has 'in principle' allocated Banhardih coal block (400 Million Tonnes) in Banhardih, Chandwa Tehsil, Latehar District (23°43'21"N and 84°41'03"E) to JSEB.

1.3 The Land required of about 1050 acre is in the possession of JSEB. The water requirement will be met from the Patratu reservoir (Nalkari Dam).

1.4 The total power generated from the power plant using coal from Banhardih coal block will be procured by JSEB.

CHAPTER II

2. PROJECT DESCRIPTION

2.1 THE PROJECT

The Project is proposed to be a 2x660 MW domestic coal based Super critical Thermal Power Project (TPP) and to be located at Patratu in Ramgarh District of Jharkhand State.

2.2 PROJECT LOCATION

The site location for the proposed TPP (**Exhibit-1 & 2**) is near to the existing Thermal Power Station of JSEB at Patratu having 10 units of 110 MW each. The Land is in the possession of JSEB. The water requirement will be met from the Patratu reservoir (Nalkari Dam). The coal is likely to be supplied from Banhardih Coal block. The site has excellent connectivity to road and rail links.

2.3 PROJECT SIZE

The Project will have a Gross capacity of 1320 MW.

2.4 PROJECT DESCRIPTION

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 from a coal based thermal power plant is shown in the **Exhibit 4.**

Power production from a coal-based plant has the following steps.

Coal would be received from mines through rail in BOBRN/BOXN wagons and unloaded inside the plant. Coal received from BOBRN wagons shall be unloaded into the Trackhopper and BOXN wagons shall be unloaded using Rotaside type Wagon Tipplers (WT) into the Wagon Tippler Hopper (WTH) (Both the options are indicated in Plot Plan at **Exhibit-3**). From hoppers the coal will be conveyed via crushers either to the coal stock pile for storage when the coal bunkers are full or directly to the coal bunkers through belt conveyor system.

The coal is transferred 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.

The chemical energy in the coal is converted to thermal energy in the steam generator furnace. The steam generator furnace is made up of water wall, where almost half of the heat generated is absorbed. Around 35-40 percent of the heat in the flue gas is absorbed by super heater, re-heater, economizer and air pre-heater and 10%-15% is lost to the atmosphere. The high enthalpy steam is expanded in the turbine where the thermal energy is converted to kinetic energy. Further, the kinetic energy is converted to electrical energy in the generator, which is then transmitted to user end by transmission system.

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 for subsequent disposal to ash disposal area.

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.

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. Unused part of fly ash shall be taken to ash ponds for disposal.

The steam, after passing through the turbines, is condensed back into water in the condensers and the same is re-used as a boiler feed water for making steam.

2.5 LAND REQUIREMENT AND AVAILABILITY

Approximately 1050 acres of land is required for the proposed 2x660 MW coal based Thermal Power Project including green belt around the complex **(Exhibit 3 – Plot Plan)**. The break-up of the land requirement is as follows.

Sl. No.	Particulars	Area (Acres)
1.	Main Plant Area and Balance of Plant Area	450
2.	Ash Disposal area with green belt	245
3.	Green Belt	175
4.	Township	60
5.	Corridors for raw water, coal etc	120
6.	**Total**	**1050**

2.6 COAL REQUIREMENT AND SOURCE

The plant has been identified as a coal fired Thermal Power Plant. Coal for power generation (E to F Grade) is likely to be made available from Banhardih Coal Block located in Chandwa Tehsil, Latehar District. The annual coal requirement at 85% PLF based on the unit heat rate of approx. 2300 kCal/kWh and the coal GCV of 3600 kCal/kg for a plant capacity of 1320 MW is around 6.3 Million Tonnes per Annum (MTPA).

2.7 COAL TRANSPORTATION

The coal extracted from Banhardih coal block will be transported to plant site through railways. The distance between power plant and the Banhardih coal block is about 100 Km. The coal transportation system envisaged would be capable of handling coal as per the requirement of project on Maximum Continuous Rating (MCR) conditions.

2.8 SUPPORT FUEL

Start-up, warm up and low load {up to 40% Boiler Maximum Continuous Rating (BMCR)} operation shall be carried out with Light Diesel Oil (LDO). Boiler will be so designed that oil firing for flame stabilization will not be required beyond 40% BMCR. Support fuel shall be LDO/HFO. LDO will be used only for start up and Heavy Fuel Oil (HFO) will be used as support fuel at low loads. Transportation of both LDO and HFO shall be through rail in rake loads. Alternatively, provision for unloading from road tankers will also be made.

2.9 WATER REQUIREMENT

Estimated annual total consumptive water requirement for the plant is about 37 Million Cubic Meter (MCM) (Approx. 4265 m^3/hr) for 1320 MW, considering re-circulating closed cooling water system with induced draft cooling tower and considering ash water recovery. A raw water reservoir of 5 days storage to cater the plant water requirements is proposed to be constructed near the project site. The raw water from the water source shall be supplied to plant water reservoir. The raw water from the reservoir shall be supplied to the raw water clarifiers to treat the raw water and the same shall be stored in two clarified water compartments.

The above quantity of water includes makeup water for the cooling towers (to compensate for water lost on account of evaporation, drift and blow down) and other consumptive requirement (**Exhibit.-5** for Water Balance Diagram is attached).

2.10 WATER SOURCE

Water is proposed to be drawn from existing Patratu Reservoir of JSEB. From the designed capacity of the reservoir and present use of water, adequate water for the proposed TPP is available and detailed water availability study is being carried out.

2.11 IDENTIFIED ASH UTILITIES

Possibility for utilization of ash in nearby locations is being explored, which in turn will help in reducing the land requirement.

The fly ash has high pozzolonic properties and when mixed with lime and water it is suitable for the following uses:

- Cement Industry
- Brick Making Industry
- Light Weight Aggregates
- Road Sub-base
- Grouting Material
- Roads/paving used as filler in asphalt mix for roads
- Road enlargement

Bottom ash will be utilized to the extent possible for the applications such as landfills of low lying areas, filling abandoned mines etc.

2.12 ASH DISPOSAL

Many institutions such as Central Building Research Institute, Roorkee, Central Road Research Institute, Central Power Research Institute and Central Fuel Research Institute have carried out extensive work in identifying the possibilities of utilizing fly ash. Ash utilization will be done as per the MoEF notification of 2009 and 100% fly-ash utilization will be done by the 4th year of plant operation.

The bottom ash and unutilized fly ash so generated will be disposed in the proposed ash disposal area (**Exhibit -3**) and will be utilized at proper time.

CHAPTER III

3.0 SITE ANALYSIS

3.1 INTRODUCTION

Setting up of a coal fired thermal power project involves project justification and techno-economic analysis of various alternatives available for coal source, water source, and power evacuation as well as less impact on the environment. An attempt has, therefore, been made to choose the techno-economically optimum option available for the inputs and power plant components like coal, steam generator, cooling system, ash handling and disposal system, dust suppression, particulate matter control and effluent treatment. This section summarizes the study of analysis of various alternatives considered.

The site identified for the power station is already in the possession of JSEB. The site identified for setting up of the power station is suitable in terms of availability of space for main plant, proximity to railways for transportation of coal from mines, proximity to water source; availability of cooling water, no R&R issue and issues related to land acquisition as the land for the proposed plant is in the possession of JSEB, suitability of land from topographical and primary geological considerations, environmental and ecological considerations and on the need for power in the State of Jharkhand.

3.2 SITE SELECTION CRITERIA

A number of factors related to economic generation, evacuation of power, and environmental aspects are involved in site selection. The important factors, which influence the project site selection include:

- Techno- economic Analysis
- Infrastructure logistics
- Environmental

3.3 TECHNO-ECONOMIC ANALYSIS

The techno-economic considerations are as detailed below:

- Suitable and adequate land
- Availability of fuel

- Availability of adequate quantity of consumptive and cooling water round the year within reasonable distance from site.

3.4 INFRASTRUCTURE LOGISTICS

Availability of infrastructure facilities like Railways and Road access to the site for ease of transportation of plant equipment, fuel etc.

- Facility for interconnection with transmission and distribution system for evacuation of power
- Optimum investment requirement for development of the infrastructure.
- Availability of facilities like medical, education, market and railway station within a reasonable distance.

3.5 ENVIRONMENTAL CONSIDERATION

Environmental considerations critical to the selection of a site include:

- Minimum use of agricultural land
- Minimum displacement of people
- Distance from thickly populated town
- Minimum requirement of felling of trees
- Avoidance of use of forest land

All the above factors have been considered for the proposed power plant.

3.6 SELECTION OF SITES

The State has high potential for indigenous coal based thermal generation of electricity. The proposed TPP site has been selected on the basis of general guidelines issued by MoEF applicable to setting up a Power Plant.

Selection of site has been carried out based on the desk top study of the relevant topo sheets, visit to the identified sites and collection of information through interaction with the locals and assessment of all pertinent factors like:

- Availability of land for main plant, ash pond, colony and various corridors
- Suitability of land from the point of view of its terrain, type of land and land use pattern
- Accessibility & distance from the coal block and coal transportation

- Approach to roads and railways
- Water source, its distance and availability
- Feasibility of transmission and grid connectivity
- Disturbance of the local population and R&R issues
- Environment & Forest issues
- Siting criteria for setting up industrial establishment

Details of the site is as under:

Description	Site
Availability of land for main plant (Acres)	1050 Acres (Approx.)
Suitability of land for main plant	Suitable
Availability of land for ash pond (Acres)	Around 245 acres (including green belt) of land is identified.
Availability of land for township (Acres)	Around 60 acres of land is available.
Availability of land for various corridors	Will be available
Distance from Banhardih coal block	Areal distance is around 100 Km
Accessibility & coal transportation	Accessibility to the site is feasible through the existing railway network
Approach to road	Easy
Approach to railways	Easy
Available water source	Patratu reservoir
Distance from water source	1.5 km
Availability of water	Likely
Grid connectivity	Easy
Environment & forest issues	Less
No. of villages to be displaced	Least
Project Affected Families	Least
Population affected	Less
Type of Structure in affected villages	Mostly temporary

The site was further surveyed and other aspects have been analyzed.

3.7 ANALYSIS OF SELECTED SITE

The selected site is already in the possession of JSEB and is suitable considering no forest land involved, availability of land, least R&R issues, nearness of water source, existing transport network and avoidance of prime agriculture land.

Sl. No.	Consideration	Site
1.	Latitude	23°37'30"N
2.	Longitude	85°16'25"E
3.	Village	Patratu
4.	Dist.	Ramgarh
5.	Nearest Railway Station (Approx. distance in Km)	Patratu Railway Station (~5.5 Km)
6.	Road Connectivity	Proposed site is about 27 km from NH 75. Kanke Road which is adjacent to plant boundary connects the plant with NH 75.
7.	Land Availability	Already in the possession of JSEB
8.	Forest Involved	No Forest cover
9.	Distance from Coal Source	~100 Km
10.	R&R issue in terms of Home Stead oustees	Least oustees, employees of JSEB
11.	Source of Water	Patratu reservoir (Nalkari Dam)
12.	Metropolitan Cities < 25 Km	No
13.	National Park and Wildlife sanctuaries < 25 Km	No
14.	Ecologically sensitive areas like tropical forests, biosphere reserves, important water bodies	No
15.	Does it fall within the approach landing funnel of the nearest airport	No
16.	Does it fall within 500m from the flood plain of any Riverine System	No
17.	Does it fall within 500m from the Riverine / National Highway / Railway Line	No
18.	Places of historical / cultural archeological /religious / tourist places / defense establishment <10 Kms	No
19.	Forest and prime agricultural land	No
20.	Coal bearing area	No

As seen from the above table, the site is found to be feasible for the power plant on the following basis.

- Availability of land which is already in the possession of JSEB with no impact on habitation;

- Nearness of railways, water source will have less impact on infrastructure and habitation due to transportation of the same;
- No Reserved Forest (RF), Protected Forest (PF) or Revenue Forest land involvement in the project site;
- The site is more than 500m away from any of the Riverine Flood Plain/ State & National Highway/ Railway Line; and

The site is fulfilling other siting criteria as given above.

3.8 CONNECTIVITY

In terms of connectivity, the site is connected by Railway line and State Highway. The project site is approximately 5.5 Km from Patratu railway station and 27 Km from NH 75, Kanke Road which is adjacent to plant boundary connects the plant with NH 75. This road is suitable for transporting the heavy equipments like boilers, turbine generator parts etc. during construction phase of the project.

3.9 LAND USE OF THE SITE

3.9.1 GEOGRAPHY AND NATURAL DISASTERS

The location is geographically suitable for project activity, and the project will not be disturbed by climatic and other geographical condition. The area is devoid of natural disasters like earthquake, cyclone, landslides etc.

The project site falls under Seismic Zone- III, which is a medium damage Risk Zone. The region falls in Moderate Damage Risk Zone in terms wind vulnerability. The wind speed in region is limited to 39 m/s. Also the site is free from any flood hazard as per flood hazard map of Jharkhand, prepared by Building Materials & Technology Promotion Council. While planning and designing the building structure, consideration of respective seismic zone and wind pressure will be taken care of.

3.9.2 ARCHAEOLOGICAL MONUMENTS

The location does not have any archaeological monuments in nearby 25 km radius.

3.9.3 BIOLOGICAL RESOURCES

No National Park, Wildlife Sanctuary or Biosphere reserve are found in 25 km radius from the project site. However, some Protected Forests and Reserved Forests are seen in the 10-km radius Study Area.

3.9.4 DEFENCE

There is no defence installation within 10 km radius of this unit.

3.9.5 METEOROLOGY

Both micro and macro meteorology is found to be suitable for this project.

3.9.6 POWER EVACUATION FACILITIES

The power generated by 2X660 MW Units will be stepped up to 400 kV by suitable step up transformers and connected to the power plant switchyard. The power from the power plant switchyard shall be evacuated through 400 kV transmission lines connected to the PGCIL's 400 kV switchyard at Ranchi or Tenughat. The viability of connection to either Ranchi or Tenughat switchyard will be decided on the advice of POWERGRID/CEA.

CHAPTER IV

4.0 PLANNING BRIEF AND PROPOSED INFRASTRUCTURE

4.1 PLANNING CONCEPT

Approximately 1050 acres of land is required for the proposed 2x660 MW coal based Super critical Thermal Power Project including the colony and a green belt around the plant boundary. The break-up of the land requirement are as follows.

Sl. No.	Particulars	Area (Acres)
1.	Main Plant Area and Balance of Plant Area	450
2.	Ash Disposal area with green belt	245
3.	Green Belt	175
4.	Township	60
5.	Corridors for raw water, coal etc	120
6.	**Total**	**1050**

4.2 INFRASTRUCTURE FACILITIES

The proposed 2x660 MW domestic coal based TPP is proposed to be located at Patratu (Latitude 23°37'30"N and Longitude 85°16'25"E) in Ramgarh district of Jharkhand State. The proposed project can enjoy the facilities already available in the area near the existing power plant. Industrial infrastructure facility is available at present. Adequate mobilization of construction facilities will be organized at various stages for timely and unhindered implementation of the Project. Adequate construction office space and covered storage space will be built to be utilized for construction activities, which may be retained as offices, stores, and workshop after the power station is constructed.

In addition to the above, facilities like open storage space, preassembly yard for construction period will also be provided. For the construction staff canteen, garage, yard toilets etc. will also be constructed.

4.3 LABOUR COLONY

A temporary labour colony for the construction labourer with all relevant facilities and basic amenities near the site will be provided for the power project.

4.4 WASTE / ASH MANAGEMENT

Fly ash utilization plan will be prepared in line with existing rules framed by MoEF under which utilization of fly ash is to be planned progressively for complete utilization in a specified timeframe as per ash management plan.

4.4 EMPLOYMENT GENERATION

The Thermal Power Project will generate employment in the surroundings for the local people during the construction as well as during operation period.

4.5 SOCIO-ECONOMIC

The project will improve the economy of District, State and Nation as well. The project will help in improvement of local infrastructure, education and medical facilities.

CHAPTER V

5.0 REHABILITATION AND RESETTLEMENT

No Rehabilitation & Resettlement (R&R) issues.

The complete land is in possession of JSEB which will be provided to SPV for the proposed project.

CHAPTER VI

6.0 PROJECT SCHEDULE

6.1 PROJECT IMPLEMENTATION SCHEDULE

Commissioning of units shall commence during XIII Plan (2017-2022). Units to be commissioned at intervals of 6 months with the first unit envisaged to be commissioned within 48 months from the date of award to EPC Contractor.

CHAPTER VII

7.0 SOCIAL BENEFITS

The industrial activity of the proposed project coupled with the ancillary facilities / industries, would contribute to the overall socio-economic development of the region.

7.1 DIRECT BENEFITS TO THE NATIONAL AND STATE EXCHEQUER

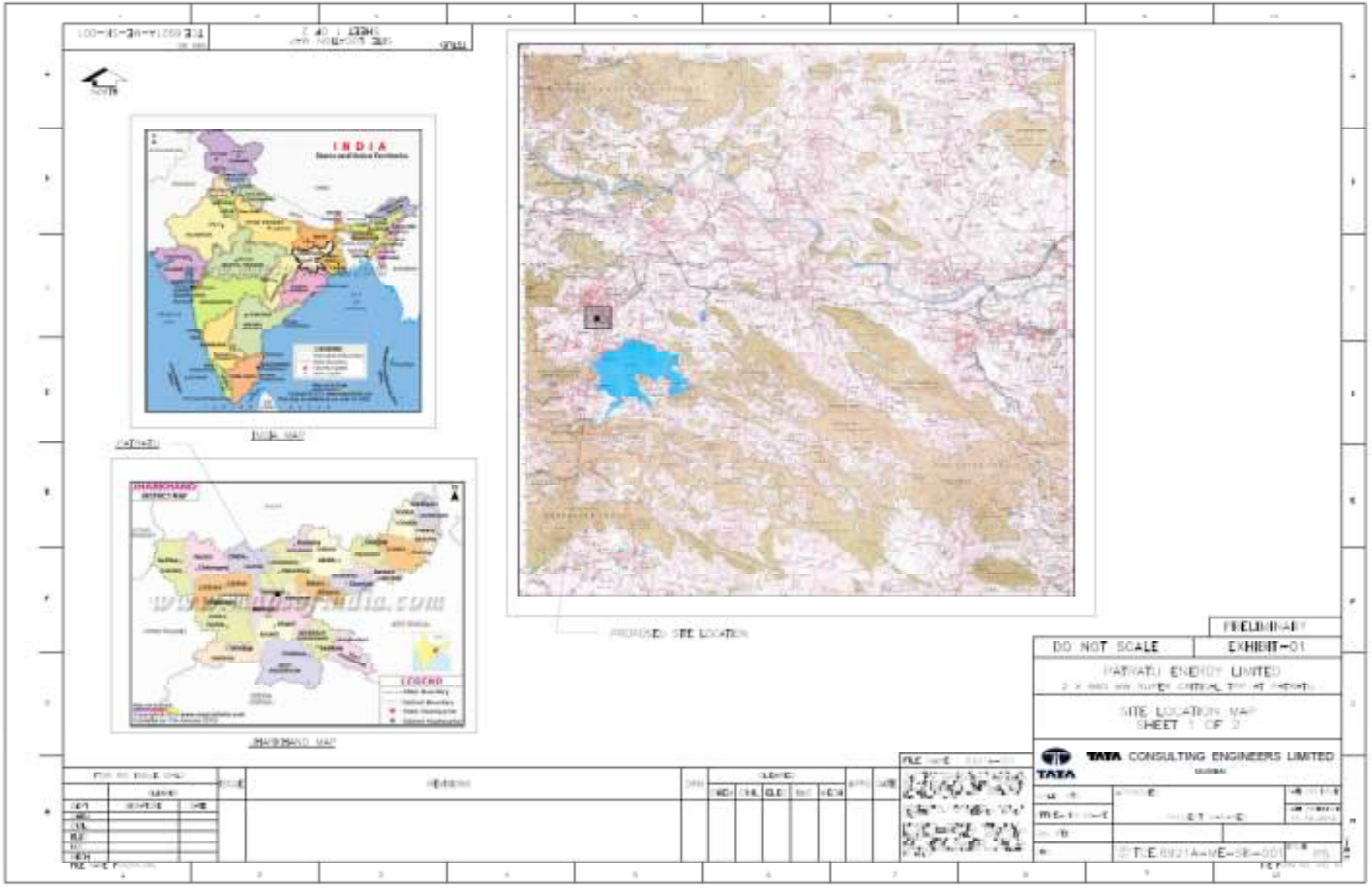
- Power Tariff
- Excise Duty
- State Sales Tax or VAT
- Income by way of registration of trucks, payment of road tax and payment of tax for interstate movements.
- Income by way of transporting clinker /coal / cement / fly ash for railways.
- Income Tax from individual as well as corporate taxes by the Cement Company and Ancillary units.
- Benefit to local community

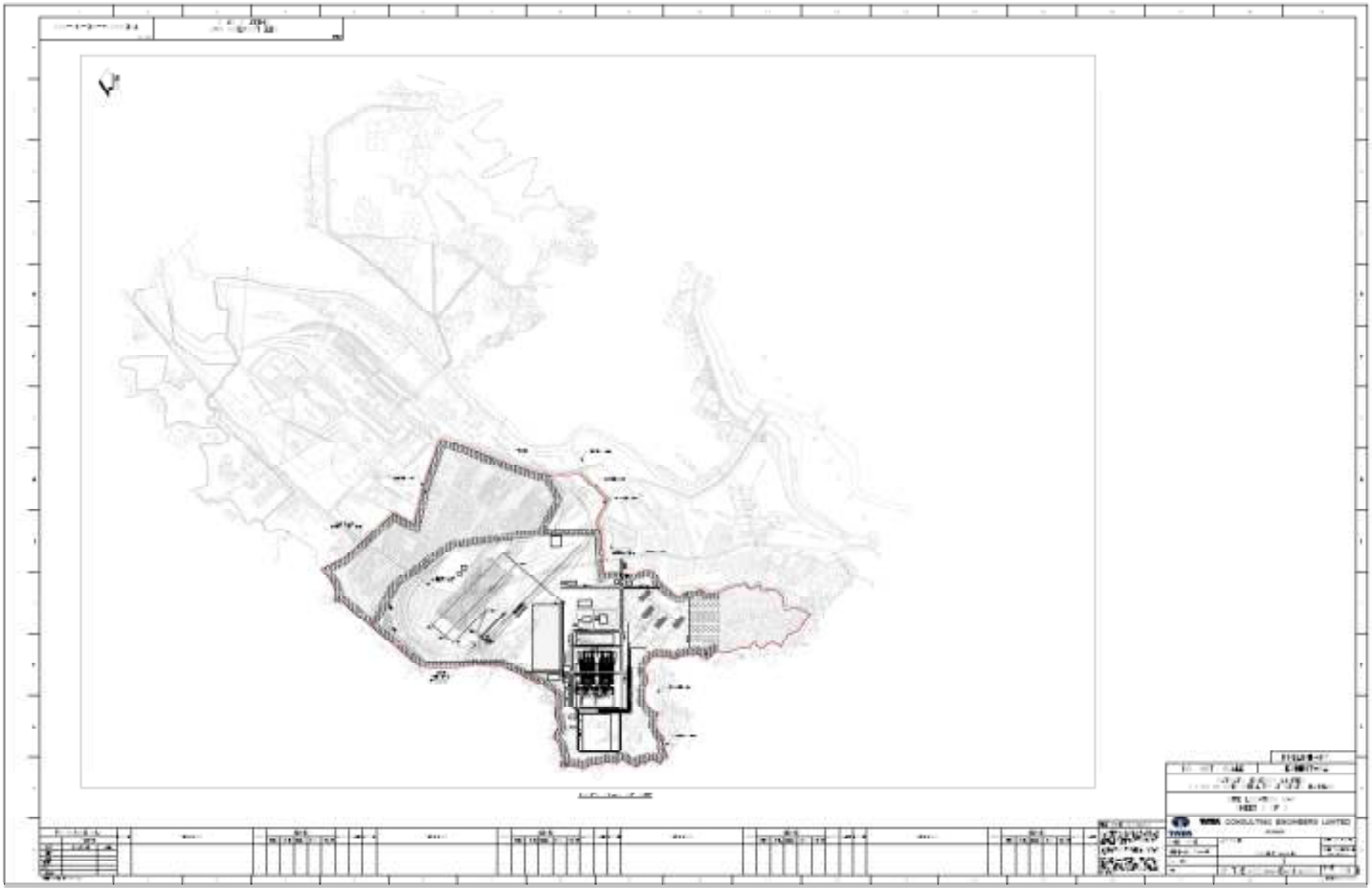
7.2 DIRECT EMPLOYMENT

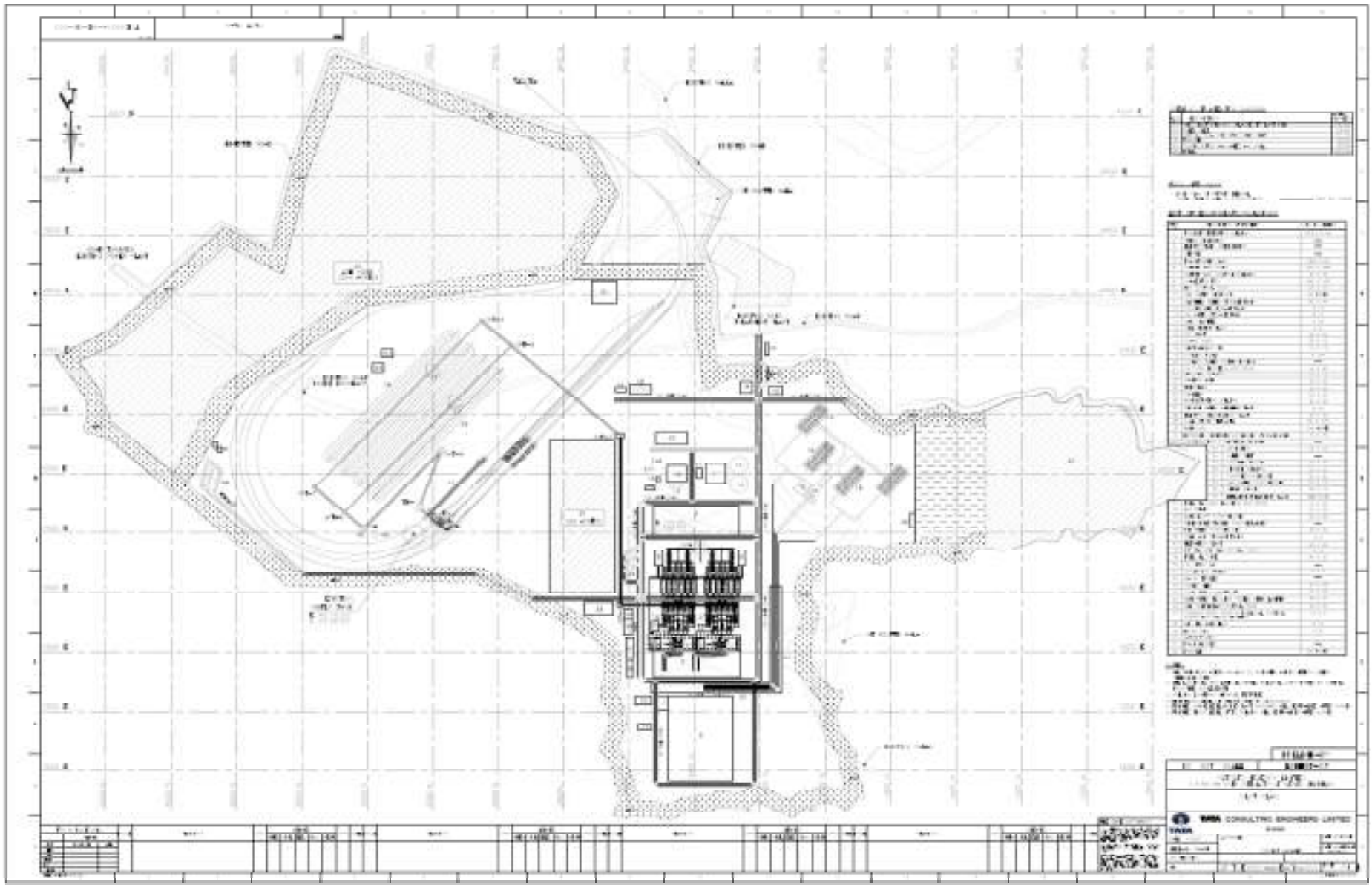
Skilled/Unskilled/semi-skilled manpower related to industrial activities will be drawn locally or from nearby places. Preference during recruitment will be given to the people of surrounding areas according to their qualification and experience

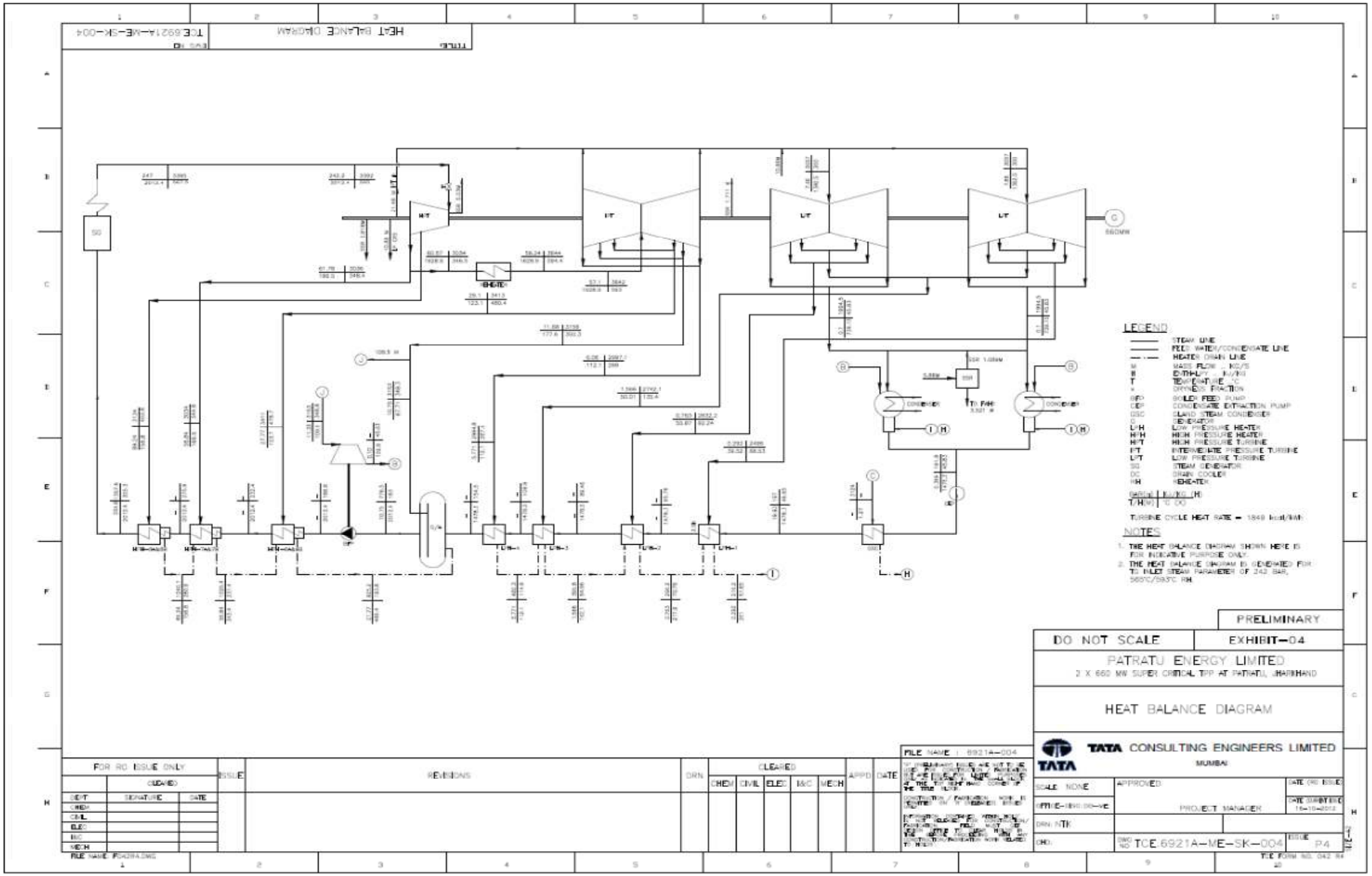
7.3 INDIRECT EMPLOYMENT

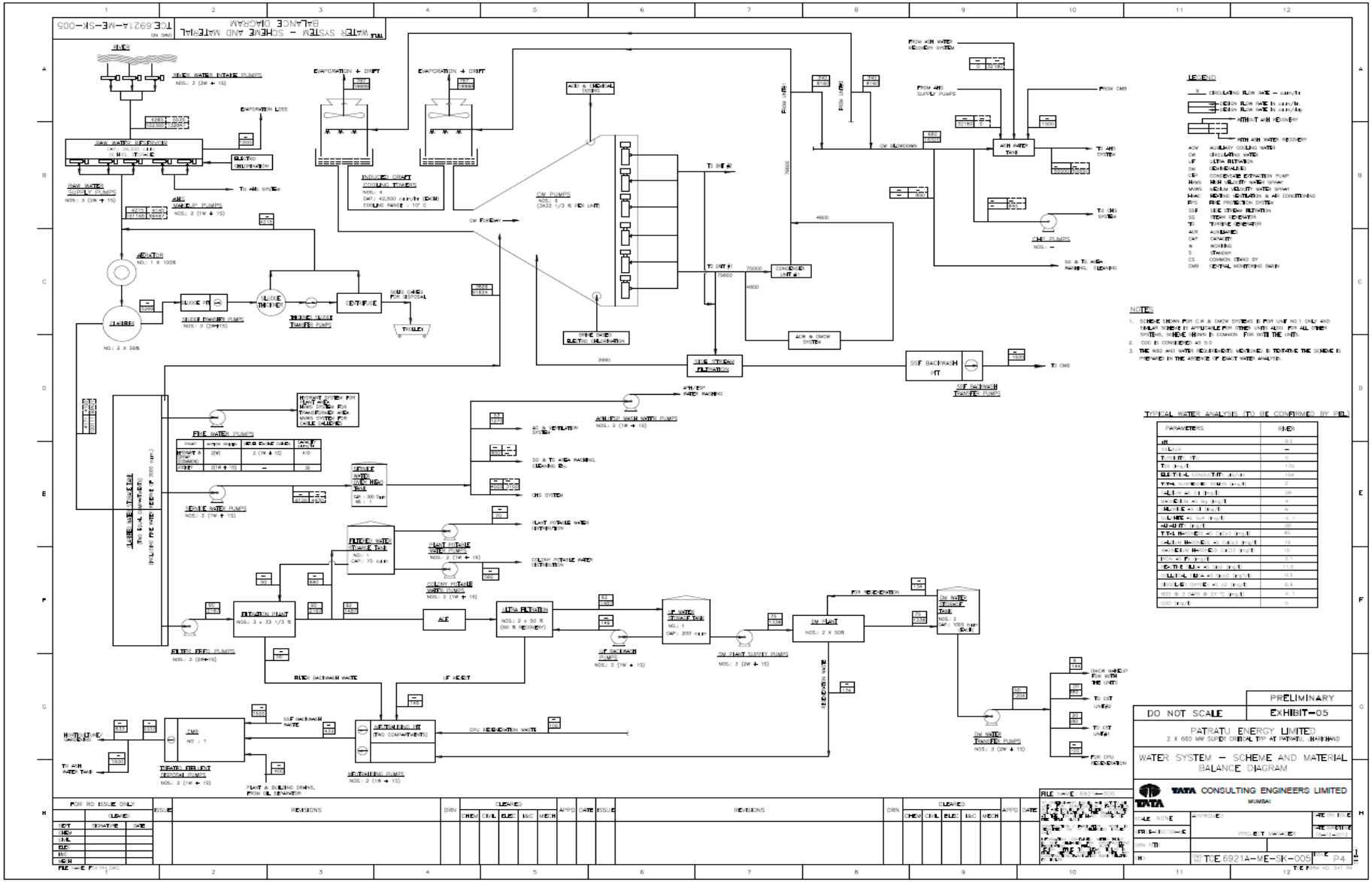
Apart from direct employment, indirect employment opportunity in term of transport operation, repair garages, various ancillaries, shops & market etc. will be generated.

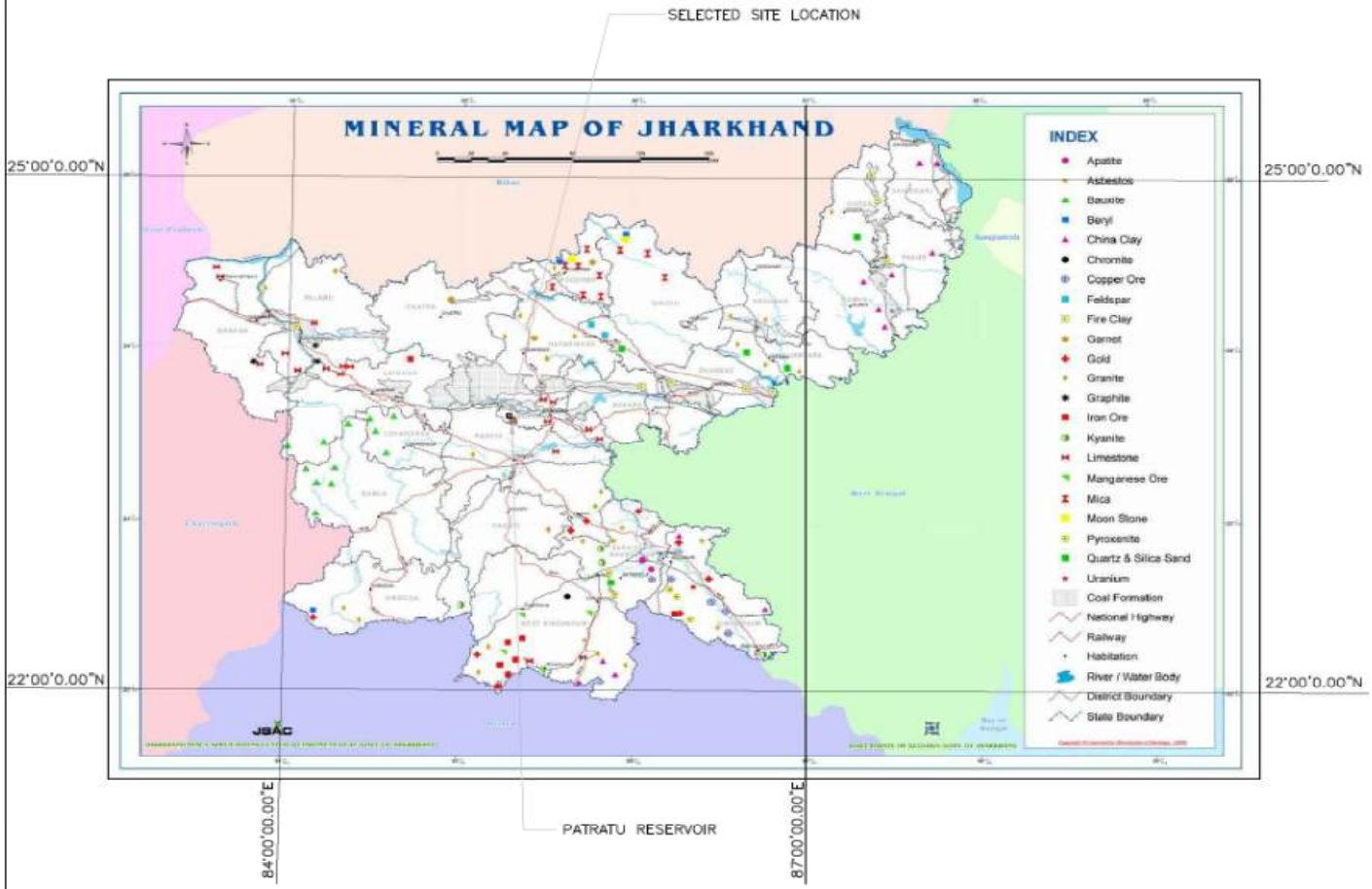

INDIA
PROPOSED SITE LOCATION
DO NOT SCALE
EXHIBIT-01
PATRATU ENERGY LIMITED
SITE LOCATION MAP
SHEET 1 OF 2
TATA CONSULTING ENGINEERS LIMITED






HEAT BALANCE DIAGRAM
TCE.6921A-ME-SK-004
LEGEND
STEAM LINE
FEED WATER/CONDENSATE LINE
HEATER DRAIN LINE
M MASS FLOW kG/S
H ENTHALPY kJ/KG
T TEMPERATURE °C
x DRYNESS FRACTION
BFP BOILER FEED PUMP
CEP CONDENSATE EXTRACTION PUMP
GSC GLAND STEAM CONDENSER
G GENERATOR
LP/H LOW PRESSURE HEATER
HP/H HIGH PRESSURE HEATER
HPT HIGH PRESSURE TURBINE
IPT INTERMEDIATE PRESSURE TURBINE
LPT LOW PRESSURE TURBINE
SG STEAM GENERATOR
DC DRAIN COOLER
RH REHEATER
660MW
CONDENSER
To Fdht
TURBINE CYCLE HEAT RATE = 1849 kcal/kWh
NOTES
1. THE HEAT BALANCE DIAGRAM SHOWN HERE IS FOR INDICATIVE PURPOSE ONLY.
2. THE HEAT BALANCE DIAGRAM IS GENERATED FOR TG INLET STEAM PARAMETER OF 242 BAR, 565°C/593°C RH.
PRELIMINARY
DO NOT SCALE
EXHIBIT–04
PATRATU ENERGY LIMITED
2 X 660 MW SUPER CRITICAL TPP AT PATRATU, JHARKHAND
HEAT BALANCE DIAGRAM
TATA CONSULTING ENGINEERS LIMITED
MUMBAI
FOR RC ISSUE ONLY
CLEARED
DEPT
SIGNATURE
DATE
CHEM
CIVIL
ELEC
I&C
MECH
ISSUE
REVISIONS
DRN
CLEARED
CHEM
CIVIL
ELEC
I&C
MECH
APPD
DATE
FILE NAME : 6921A-004
SCALE NONE
APPROVED
PROJECT MANAGER
DRN: NTK
CHD:
TCE.6921A-ME-SK-004
P4


WATER SYSTEM – SCHEME AND MATERIAL BALANCE DIAGRAM
TCE.6921A-ME-SK-005
FLUES
EVAPORATION + DRIFT
EVAPORATION + DRIFT
EVAPORATION LOSS
INDUCED DRAFT COOLING TOWERS
CW PUMPS
TO BFP
TO UNIT #1
CONDENSER UNIT #1
ACW & DMCW SYSTEM
SEA WATER INTAKE PUMPS
RAW WATER SUPPLY PUMPS
TO ARC SYSTEM
ARC WATER/DP PUMPS
ELECTRO CHLORINATION
AERATOR
SLUDGE PIT
SLUDGE THICKENER
CENTRIFUGE
SLUDGE THICKENER PUMPS
THICKENED SLUDGE TRANSFER PUMPS
SOLID CAKES FOR DISPOSAL
TROLLEY
FIRE WATER PUMPS
HYDRANT SYSTEM (FOR UNIT AREA, MDBFP, TDBFP, TRANSFORMER AREA, WORKS SYSTEM FOR COAL GALLERIES)
POTABLE WATER TREATED WATER TANK
POTABLE WATER PUMPS
AC & VENTILATION SYSTEM
SD & TG AREA WASHING, CLEANING ETC.
CHS SYSTEM
PLANT POTABLE WATER DISTRIBUTION
COLONY POTABLE WATER DISTRIBUTION
FILTERED WATER STORAGE TANK
FILTRATION PLANT
FILTER FEED PUMPS
ACF
LITH FILTRATION
DM PLANT
DM PLANT SUPPLY PUMPS
DM WATER STORAGE TANK
DM WATER TRANSFER PUMPS
FOR REGENERATION
FROM ARC WATER RECOVERY SYSTEM
FROM ARC SUPPLY PUMPS
FROM CHS
ACW BLOWDOWN
ACW WATER TANK
TO ARC SYSTEM
TO CHS SYSTEM
CHP PUMPS
SD & TG AREA WASHING, CLEANING
SSF BACKWASH PIT
SSF BACKWASH TRANSFER PUMPS
TO CHS
AIR/DEP WATER WASHING
AIR/DEP WASH WATER PUMPS
AC & VENTILATION SYSTEM
SD & TG AREA WASHING, CLEANING ETC.
CHS SYSTEM
FILTERED WATER STORAGE TANK
PLANT POTABLE WATER PUMPS
COLONY POTABLE WATER PUMPS
FILTRATION PLANT
ACF
LITH FILTRATION
UF WATER STORAGE TANK
UF BACKWASH PUMPS
DM PLANT
DM PLANT SUPPLY PUMPS
DM WATER STORAGE TANK
DM WATER TRANSFER PUMPS
FOR REGENERATION
CMB
NEUTRALISING PIT (TWO COMPARTMENTS)
NEUTRALISING PUMPS
TREATED EFFLUENT DISPOSAL PUMPS
HEATING STEAM
TO ARC WATER TANK
FILTER BACKWASH WASTE
UF REJECT
SSF BACKWASH WASTE
CPU REGENERATION WASTE
REGENERATION WASTE
PLANT & BUILDING DRAINS FROM OIL SEPARATOR
DMCW MAKEUP FOR WITH THE UNITS
TO CHT UNITS
FOR CPU REGENERATION
LEGEND
NOTES:
1. SCHEME SHOWN FOR C.W. & DMCW SYSTEMS IS FOR UNIT NO.1 ONLY AND SIMILAR SCHEME IS APPLICABLE FOR OTHER UNITS ALSO. FOR ALL OTHER SYSTEMS, WHERE SHOWN IS COMMON FOR BOTH THE UNITS.
2. COC IS CONSIDERED AS 5.0
3. THE RAW AND WATER REQUIREMENTS MENTIONED IS TENTATIVE THE SCHEME IS PREPARED IN THE ABSENCE OF EXACT WATER ANALYSIS.
TYPICAL WATER ANALYSIS (TO BE CONFIRMED BY BHEL)
PARAMETERS
RIVER
PRELIMINARY
DO NOT SCALE
EXHIBIT-05
PATRATU ENERGY LIMITED
2 X 660 MW SUPER CRITICAL TPP AT PATRATU, JHARKHAND
WATER SYSTEM – SCHEME AND MATERIAL BALANCE DIAGRAM
TATA CONSULTING ENGINEERS LIMITED
MUMBAI
SCALE: NONE
DRG. NO.: TCE.6921A-ME-SK-005
REVISIONS
CLEARED
CHEM
CIVIL
ELEC
I&C
MECH
APPD
DATE
ISSUE
FOR RO ISSUE ONLY
NAME
SIGNATURE
DATE


SELECTED SITE LOCATION
MINERAL MAP OF JHARKHAND
INDEX
Apatite
Asbestos
Bauxite
Beryl
China Clay
Chromite
Copper Ore
Feldspar
Fire Clay
Garnet
Gold
Granite
Graphite
Iron Ore
Kyanite
Limestone
Manganese Ore
Mica
Moon Stone
Pyroxenite
Quartz & Silica Sand
Uranium
Coal Formation
National Highway
Railway
Habitation
River / Water Body
District Boundary
State Boundary
25°00'0.00"N
22°00'0.00"N
84°00'00.00"E
87°00'00.00"E
PATRATU RESERVOIR
PROPOSED SITE LOCATION ON MINERAL MAP
PRELIMINARY
DO NOT SCALE
EXHIBIT–06
PROPOSED SITE LOCATION ON MINERAL MAP
TATA CONSULTING ENGINEERS LIMITED
MUMBAI
CLIENT : PATRATU ENERGY LIMITED
PROJECT : 2 X 660 MW SUPER CRITICAL TPP AT PATRATU
TCE.6921A–ME–SK–006