Executive Summary

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1.0 Introduction

Rajasthan Rajya Vidyut Utpadan Nigam Limited (RVUNL) is planning to develop Ultra Supercritical Thermal Power Station of 2x660 MW capacity at Chowki Motipura village, Baran dist., Rajasthan. This new facility will be situated on the same site where 2x250 MW phase-1, 2x250 MW phase-2 & 2x660 MW Chhabra Thermal Power Plant is already operational.

Proposed plant consists of Coal Fired Boiler, Steam Turbine Generator Units and Balance of Plant (BOP) Units. Based on proposed capacity, project is supposed to fall under category A of Project Activity 1(d), Thermal Power Plants (≥ 500 MW coal/ lignite/ naphtha & gas based) under the schedule as per EIA notification issued on 14th September, 2006. In order to assess likely impacts from proposed project on the surrounding environment and evaluating means of alleviating likely negative impacts, if any, from proposed project, RVUNL has engaged ***Pollution Control Research Institute (PCRI), BHEL, Haridwar*** as their environmental consultant.

The proposed project was discussed in 37th and 42nd EAC (thermal power) meetings held on 14th February 2023 and 1st June 2023 respectively, and the terms of reference was issued by MOEFCC vide its letter No. J-13012/15/2009-IA-II (T), dated: 17.07.2023.

Proposed Power Plant site is located at latitude 24.643256 °N and longitude 77.038675 °E. The ground elevation of the site is 390 m above MSL. Project is at a distance of approx. 20 Km from nearest town “Chhabra” in East Direction. Nearest railway station is Chowki Motipura which is at approx. 4 Km distance in south Direction. The nearest airport is at Jaipur, approx. 400 Kms from project site. Parbati River is at a distance of 2.6 Km in East Direction. Estimated project cost is Rs. 9606.06 Crores.

2.0 Project Requirements

2.1 Land Requirement

Total land available inside the CScTPP is about 726.858 Ha out of which 213 Ha land has already utilized in existing Thermal power plant of capacity 2x660 MW and out of balance 513.858 Ha, 252 Ha is earmarked for the proposed Project (2x660 MW). The land area of 252 Ha consists of power plant area, ash pond area and township area. Required land is available within existing plant boundary of CScTPP and in possession of RVUNL. There is no additional land acquisition and no rehabilitation or resettlement issues involved for the project.

2.2 Fuel Requirement

The annual coal requirement at TMCR condition for the proposed 2X660 MW power plant is estimated as 6.55 million tones duly considering average calorific value of coal as 3400 Kcal/kg

and annual plant load factor (PLF) of 85%. The coal will be brought to CUScTPP by rail and further it is transported by belt conveyors up to crusher plant. The crushed coal will bring by pipe conveyor to the project site. Ash & Sulphur content of the coal to be used is 41% & 0.45% respectively. Support fuel used is Low Sulphur Heavy Stock (LSHS)/ Light Diesel Oil (LDO) supplied from nearby availability. Quantity of support fuel required is 9400 KL/ annum.

2.3 Water Requirement

The total requirement of water would be drawn from Lhasi Dam & Parwan Dam at a distance of 20 km & 60 Km respectively from the CUScTPP. Intake pipeline would be laid for withdrawal of water from intake to draw the quantity of 3592 m^3/hr for proposed project. Major water requirement is for cooling water make-up 3041 m^3 /hr. This quantity of water is in line with the specific water consumption of 3.0 m^3/MWhr as specified vide Notification No. S.O. 3305I dated 07.12.2015 by Ministry of Environment, Forest and Climate Change (MoEF&CC).

2.4 Process Description

Ultra-Supercritical (USC) technology refers to a state-of-the-art power generation process that maximizes the efficiency and reduces the emissions of fossil fuel-based power plants. It represents a significant advancement in the field of thermal power generation. The key feature of USC technology is its ability to operate at higher temperatures and pressures compared to conventional power plants. By utilizing steam parameters above the critical point, typically around 600 °C and 275 Kg/cm^2, USC power plants achieve remarkable thermal efficiency levels of up to 50%, significantly higher than the 35-40% range of conventional plants.

The higher operating temperature and pressure in USC plants contribute to the improved performance by enhancing the steam cycle efficiency and reducing fuel consumption. The higher efficiency means that less fuel is needed to produce the same amount of electricity, leading to reduced greenhouse gas emissions. Additionally, the USC process facilitates better utilization of the coal, oil, or natural gas used as fuel, thereby reducing the overall environmental impact of power generation.

Electrostatic Precipitators (ESPs) with adequate efficiency to limit the particulate emission within prescribed limit is envisaged. The clean gas goes through 100 m chimney. Flue gas desulphurization (FGD) system with efficiency of 95% would be used for controlling Sulphur dioxide emission and Selective Catalytic Reduction (SCR) system to limit Nox level below 100 mg/Nm^3.

3.0 Baseline Environmental Status

Field investigations were undertaken for collecting existing baseline data for Land Use Land Cover (LULC) Air, Water, Noise, Soil, Ecological and Socio-economic conditions. A study area of 10 Km radius from project site is identified to establish present environmental conditions for above environmental components. The main aim of the EIA study is to identify critical environmental attributes affected and their adverse impacts on surrounding environment due to the proposed project. The field data generation was undertaken as detailed below

- ✓ Ambient air quality (AAQ) monitoring during 01st October 2023 to 31st December 2023.
- ✓ Water, Noise, Soil, Ecological, LULC, and Socio-economic conditions 01st October 2023 to 31st December 2023

3.1 Land Use Land Cover (LULC)

LULC features of the study area was collected by analyzing Survey of India topo sheets, Satellite imageries supplied by NRSC and Ground validation for through site visits. The land use pattern of study area mainly falls under following categories Agriculture; Forest; Waste lands; Scrub Land; Water Bodies Built-up land.

3.2 Meteorology (Climate)

Metrological data is collected from nearest IMD station at Kota and also at project site with the help of weather station. The pre dominant wind direction recorded is from North West (NW). Calm conditions prevailed for 39.73% of the total time. Average wind speed observed for the season is around 0.77 m/s.

3.3 Ambient Air Quality

AAQ was monitored at 5 locations within study area. Monitoring locations were identified in downwind, cross & up wind directions. Air pollutants monitored are Particulate Matter ($PM_{2.5}$ & PM_{10}), Sulphur dioxide(SO_2), Oxides of nitrogen (Nox), Ozone, Mercury & Carbon Monoxide (CO) as per standard MoEF&CC guidelines and results compared with NAAQ 2009 CPCB Standards.

The 98th percentile of particulate matter PM_{10}, recorded with in the study area in the range of 104 to 183 µg/m^3. The 98th percentile of particulate matter $PM_{2.5}$, recorded with in the study area in the range of 66 to 92 µg/m^3. The 24 hourly average values of PM2.5 & PM10 were compared with the national ambient air quality standards and found that all sampling stations recorded values within the applicable limits of residential and rural area limits for all locations for parameters SO2, Nox, O3 & Hg except PM10 & PM2.5 in study area where some values of PM10 & PM2.5 at all stations have been recorded above applicable limits.

The 98th percentile of SO2 recorded within the study area are in the range of 4.2 to 8.5 µg/m^3. The 24 hourly average values of SO2 were compared with the national ambient air quality

standards and it was found that the recorded values, of all the monitored locations, were much lower than the applicable limit of 80 µg/m3 for residential and rural area.

The 98th Percentile of Nox recorded within the study area are in the range of 11.2 to 31.9 µg/m^3. The 24 hourly average values of Nox were compared with the national ambient air quality standards and it was found that all the sampling stations recorded values much lower than the applicable limit of 80 µg/m3 for residential and rural areas.

The 98th Percentile of O3 recorded within the study area in the range of 47.5 to 54.8 µg/m^3. The 1 hourly average values of ozone were compared with the national ambient air quality standards and found that all sampling stations recorded values within the applicable limits (180 µg/m3) of residential and rural area limits for all locations in study area.

The 98th Percentile of Mercury (Hg) recorded within the study area below detectable limit (BDL).

3.4 Water Quality Monitoring

Ground water 15 samples and surface water 4 samples were collected from different sources and analyzed for all important physico-chemical and biological parameters to establish quality of water prevailing in the study area. Ground water samples were collected from open well, hand pumps & bore wells. Surface water collected from Parbati river (Upstream & Downstream), Baithali Dam & Natural Drain passing through plant boundary near village Akodiyapar.

Ground Water Samples: pH was varying for ground water from 7.38 to 8.08 indicating that all samples are within acceptable limits. Total dissolved solids were varying from 368 mg/l to 886 mg/l; Sample from seven locations is above acceptable limit but within permissible limit; rest all are within acceptable limits. The chloride levels in the ground water samples collected in the study were ranging from 18 mg/l to 44 mg/l; all samples are within acceptable limits. Hardness is varying from 206 mg/l to 222 mg/l; All samples are above acceptable limits but within permissible limits. The fluoride value is in the range of 0.52 mg/l to 1.12 mg/l; All samples are within acceptable limits except one sample.

Surface Water Samples: pH was varying for surface water from 8.24 to 8.56. Total dissolved solids are varying from 114 mg/l to 576 mg/l. Chloride levels in the surface water samples collected in the study were ranging from 8 mg/l to 42 mg/l. Hardness is varying from 248 mg/l to 262 mg/l. Fluoride value was in the range of 0.95 mg/l to 1.53 mg/l.

3.5 Noise Monitoring

Noise was monitored at 6 locations within the study area of the project site. The locations were identified for assessment of existing noise level status, keeping in view of the land use pattern, residential areas in villages, schools, bus stands, etc.

Industrial: 1 no; Commercial: 1 nos; Residential: 3 nos; Silent: 1 no. The day time equivalent noise levels (dB (A)) are in the range 40.8 to 58.3 for Industrial area, 42.2 to 59.2 for Commercial area,

31.1 to 56.1 for Residential area & 35 to 39 for Silence zone whereas night time equivalent noise levels (dB (A)) are in the range 40.8 to 41.9 for Industrial area, 42.3 to 47.5 for Commercial area, 31.1 to 46.5 for Residential area, 31.6 to 34.2 for Silence zone.

3.6 Traffic Survey

The traffic survey was carried out on the State Highway 51 (Kota to Dharnawada) which is connected to the power plant through a stretch of 1 Km road. Traffic volume recorded were 42 to 247 PCU/hr. As per IRC guidelines Level of Service of these roads falls under category "A" (Highest drive comfort, free flowing).

3.7 Soil Quality

Soil Quality was monitored at 5 locations within the study area. The locations were selected to assess the existing soil conditions representing various land use conditions and geological features. The important physical, chemical parameter concentrations were determined and compared with Standards of Indian Council of Agriculture Research, New Delhi.

The pH in the study area is ranging from 7.6 to 8.31 indicating that soils falling under normal category. The electrical conductivity in the study area is ranging from 121.8 to 212.6 µs/cm indicating that soils falling under normal category. The available Nitrogen as Total Kjeldahl Nitrogen in the study area is ranging from 0.07% to 0.13%. In the study area available Phosphorus is ranging from 0.86 g/kg to 2.94 g/kg. The available potassium in the study area is ranging between 2.14 g/kg to 4.17 g/kg.

3.8 Ecological Environment

A detailed analysis was done in the study area which includes compilation of secondary data from published literature of Forest Division and Primary data generation through systematic studies. Primary data was collected through visual observation of species in the study area.

The area within 10 Kms of proposed power project site covers no National Park, Wild life Sanctuaries, Elephant/Tiger Reserve (existing as well as proposed), migratory routes of fauna.

There is no endangered species of plant and animal existing within a radius of 10 kms of proposed project site.

3.9 Socio-Economic Environment

Total population sex ratio is 935 in study area. Based on "Baran District Primary Census Statistics" in study area 15.55%, 13.20% and 28.75% belong to ST, SC & socially weaker section respectively. Main workers & marginal workers constitute approximately 42.44% & 7.44% respectively.

4.0 Anticipated Environmental Impacts and Mitigation Measures

Field investigations were undertaken for collecting existing baseline data for Land Use Land Cover (LULC) Air, Water, Noise, Soil, Ecological and Socio-economic conditions. A study area of 10 Km radius from project site is identified to establish present environmental conditions for above environmental components. The main aim of the EIA study is to identify critical environmental attributes affected and their adverse impacts on surrounding environment due to the proposed. The field data generation was undertaken as detailed below

4.1 Impacts During Construction Phase

The possible construction activities that contribute to the environmental impacts are:

- Dust generation during leveling of earth, movement of vehicles on unpaved roads, unloading of raw materials and removal of unwanted waste material from site.
- Emission of pollutants from vehicular exhaust.
- Accumulation of excavated earth material

Impacts due to above activities would be temporary and confined within project boundary

4.2 Impacts During Operational Phase

4.2.1 Impacts on Air Quality

Emission rates in stack for PM, SO2 and Nox with ESP (with suitable efficiency), FGD (95% efficiency) and Selective Catalytic Reduction (SCR) system to limit Nox level are 27.86 g/s, 92.87 g/s and 92.87 g/s respectively.

With control measures result of dispersion modeling reveals a likely increase in maximum GLC for PM is 1.714 µg/m3, for SO2 is 5.712 µg/m3 and for Nox is 5.712 µg/m3. From the above value we can see that installation of control equipment will help in considerably reducing GLC values. Future predicted concentration (with control equipment) including existing baseline status for PM10 is 260.171 µg/m3, SO2 is 16.71 µg/m3 and Nox is 41.71 µg/m3. These values are within NAAQ standards 2009 except PM10. Proposed mitigation measures are:

- Dust suppression/extraction facilities will be provided to mitigate the dust generated at coal transfer points and coal stockyard.
- Dust collection system will be provided in coal bunkers to evacuate dust and hazardous gases like methane from the coal bunkers.
- To reduce the dust nuisance while loading the ash into the trucks from fly ash silos, the fly ash would be conditioned with water spray
- To control SPM, SO2 and Nox in flue gas, ESP with suitable, FGD with 95% efficiency and Selective Catalytic Reduction (SCR) system to limit Nox level below 100 mg/Nm3.

4.2.2 Impacts on Water Quality

Total waste water generation would be 2910 m^3/day. Areas are Non DM Clarifier sludge, DM Clarifier sludge, Rapid Gravity Filters Spent Backwash, DMF Spent Backwash, ACF Spent Backwash, DM regeneration waste, UF Spent Backwash.

All the waste treated water generated in the proposed extension to utilized for the internal process & miscellaneous water requirement to achieve ZLD and prescribed specific water consumption norms. However, excess effluent (if available) shall be suitably treated in ETP for further usage in plant process.

4.2.3 Impacts on Noise Level

The major sources of noise generation within plant are crusher unit; induced draft & forced draft fans; boiler feed pumps; turbines; generators; cooling towers; vehicular movement. The proposed mitigation measures are

- ✓ Properly designed plant and machinery (i.e. by providing inbuilt mechanisms like silencers, mufflers, and enclosures for noise generating parts) and shock absorbing pads at the foundation of vibrating equipment will be provided.
- ✓ In the high noise intensity working areas/zones ear muffs or ear plugs or any other suitable personal protective equipment would be provided to the workmen.
- ✓ Provision of isolation for major noise generating equipment's.
- ✓ Distribution of working hours among more personals working with major noise generating equipment's.
- ✓ Regular noise level monitoring would be carried out for taking corrective action, wherever required.
- ✓ Vehicular movement will be restricted and the drivers will be informed to blow horns only when required.
- ✓ The steam turbine generator would be housed in closed buildings, which would considerably reduce the transmission of noise from the generators to outside environment. The inlet air and exhaust gas streams would be provided with silencers for noise reduction.

4.2.4 Solid & Hazardous Waste

Plant, being coal-fired, would generate coarse (bottom ash) & fly ash of about 936 & 3744 TPD. Ash Management Plan will be developed for 100% utilization of fly ash (will be sent to needy vendors on e-auction basis) within time period prescribed by MoEF&CC.

Sludge generated from oil storage tank will be collected, stored in a safe and covered place to be disposed as per CPCB/SPCB/Hazardous wastes rules. Used oil from Lube oil & Transformer will

be sold to authorized re-processor registered with CPCB. ETP sludge being hazardous would be disposed to TSDF.

4.2.5 Emergency Preparedness Plan in Case of Natural or in Plant Emergencies

To handle consequences of a major emergency inside plant or immediate vicinity of plant, a detailed disaster management plan is formulated. Emergency control center will be set up with emergency response team and communication system. It is essential that emergency plan be regularly tested to identify and correct any defect by keeping plan up to date.

4.2.6 Occupational Health Measures

Plant will be equipped with a full-fledged Occupational Health Centre (OHC) within plant premises as mandated under the Factories Act, 1948. As part of surveillance program, following minimum medical examination will be undertaken during pre-employment phase: General physical examination and blood pressure, X-Ray of chest & ECG, Sputum examination, detailed routine blood & urine examination, Audiometry and Spirometer. As part of routine & annual medical examination on people working in high noise levels, stress and dust exposure areas, a comprehensive surveillance program will be adopted.

5.0 Environmental Management Plan

Environmental Management Plan (EMP) is required to ensure a sustainable development of plant and surrounding areas. EMP will be integrated in all major activities of the project, with clearly defined policies, to ensure ecological balance of area is maintained and adverse effects are minimized. EMP requires multi-disciplinary approach with mitigation, management, monitoring and institutional measures taken during implementation and operation phases, to eliminate adverse impacts or reduce them to acceptable levels.

The mitigation measures are planned for construction and operation phases and the overall management plan helps to improve the supportive capacity of the receiving bodies. The EMP aims to control pollution at the source level to the possible extent with the available and affordable technology followed by the standard treatments. The recommended mitigation measures will synchronize the economic development of the study area with the environmental protection of the region.

6.0 Environmental Monitoring Plan

Environmental Monitoring Program is designed for assessing efficiency of implementation of Environment Management Plan (EMP) and to take corrective measures in case of any degradation in surrounding environment. Different activities involved in proposed project (during construction and operation phases) and their impact on various environmental attributes is taken into account for designing a detailed environmental monitoring program.

Implementation of EMP and periodic monitoring is proposed to be carried out at plant level and area level for the proposed thermal power plant and allied activities like coal handling facilities, workshop, colony, etc. A comprehensive monitoring mechanism shall be devised for monitoring of impacts due to proposed project as a part of compliance to CTE/CTO.

Plant level environmental protection measures like dust suppression, treatment and recycling of wastewater, plantation and noise control in the plant premises, housekeeping, implementation of EMP and Environmental Clearance conditions will be monitored by the plant authorities in accordance with compliance to EC/CTE/CTO.

7.0 Project Benefit

Contribution of the plant on local social infrastructure is expected to be significant by stimulating growth of industrial and commercial activities in and around the district, by improving availability of the power. This project will provide a significant amount of direct and indirect employment opportunities to the local people with different skills and trades. Infrastructure & socio-economic status of surrounding areas will be benefited as follows:

- Improvement in education, housing, banking, postal & communication services.
- Improvement in power supply, water supply and sanitation
- Improvement in economic conditions and Recreation facilities
- Training will be given to local people to improve employment potential
- Increase in revenue to state from taxes & duties from development of local businesses

8.0 Conclusions

EIA study made an overall assessment of potential environmental impacts due to proposed plant and proposed mitigative measures to eliminate adverse environmental impacts or reduce them to acceptable levels as part of the EMP.

The demand for electricity has been steadily increasing. Setting up of Power Plant in this area will benefit society by providing better infrastructural, educational, medical facilities, improvement in indirect employment and economic growth of the area.