

EXECUTIVE SUMMARY

ENVIRONMENT CLEARANCE

FOR

**EXPANSION OF EXISTING POWER PLANT PHASE I
600 MW (OPERATIONAL) AND PHASE II 2X800
MW ULTRA SUPER CRITICAL (UNDER
CONSTRUCTION) BY ADDING PHASE III 2X800 MW,
ULTRA SUPER CRITICAL TPP**

AT

VILLAGES CHHOTE & BADE BHANDAR, BARPALI, KOTMARA AND
SARWANI, TEHSIL PUSSORE, DISTRICT RAIGARH, CHHATTISGARH



Submitted to-
Chhattisgarh Environment Conservation Board

Sector: Thermal Power Plant, 1(d)

Category: A

ToR No.: J-13012/57/2008.IA. II(T) dated- 06.12.2025

Project Proponent

adani

Power

Adani Power Limited

Environment Consultant

greencindia
Consulting Pvt Ltd

Greencindia Consulting Pvt Ltd.

NABET/EIA/2326/ RA 0297

April, 2026

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EXPANSION OF EXISTING POWER PLANT PHASE I 600 MW (OPERATIONAL) AND PHASE II 2X800 MW ULTRA SUPER CRITICAL (UNDER CONSTRUCTION) BY ADDING PHASE III 2X800 MW, ULTRA SUPER CRITICAL TPP AT VILLAGES CHHOTE & BADE BHANDAR, BARPALI, KOTMARA AND SARWANI, TEHSIL PUSSORE, DISTRICT RAIGARH, CHHATTISGARH

PROJECT PROPONENT: **ADANI POWER LIMITED**



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1.1 Introduction

Adani Power Limited (APL), Raigarh (Formerly Known as Raigarh Energy Generation Ltd. (REGL)) is a company primarily engaged in the business of power generation. **Adani Power Limited (APL)** currently operates a **1x600 MW coal-based thermal power unit**, with **2x800 MW ultra-supercritical units** under construction. The company now proposes to **expand the existing facility** by adding **2x800 MW coal-based Ultra Supercritical** Thermal Power Units at Villages Chhote & Bade Bhandar, Barpali, Kotmara, and Sarwani, Tehsil Pussore, District Raigarh, Chhattisgarh.

The Environmental Clearance granted for Coal Based Thermal Power Plant of capacity 600 (1X600) MW at Villages Chhote Bhandar, Bade Bhandar, Sarvani, & Amlhi Bhanuna, Tehsil Pussore, District Raigarh, Chhattisgarh from Ministry of Environment, Forest & Climate Change (MoEF&CC) vide letter no J-13012/57/2008.IA. II(T) dated: 20.05.2010 and subsequent amendments dated 16.04.2015, 26.11.2019, 30.07.2020 & EC transferred dated; 22.10.2019 (KWPCCL to REGL) & 24.04.2023 (REGL to APL) as enclosed in **Annexure 1.1 and Annexure 1.3**. The project was commissioned in March'2014 and plant/unit is operational. CECB has granted Consent to Operate (CTO) with validity up to 31.03.2028 for Phase I, Earlier, the proposal for Phase II expansion of existing 600 MW TPP to 2200 MW by addition 1600 (2x800) MW Coal based TPP was granted EC by MoEF&CC vide letter no J-13012/57/2008.IA.II (T) dated: 01.01.2025. Copy of the EC letter is attached as **Annexure 1.1**. The expansion in Phase II is under construction for which CTE was acquired from Chhattisgarh Environment Conservation Board vide letter no **10731/TS/CECB/2025** dated: 14.02.2025, enclosed as **Annexure 1.4**. CTO for Phase I is attached as **Annexure 1.5** and the same for Phase II will be obtained after completion of construction phase.

Elevation & Topography: Average site elevation is 226 m amsl. The topography of land is plain.

Plant Capacity: Existing 2200 MW and Proposed 1600 MW

Technology: Ultra super Critical.

Land Area: Existing area 355.71 ha and Proposed 185 ha

Main Fuel/Coal Consumption: Requirement for proposed plant-6.67 MTPA

Water Requirement: Existing requirement 50 MCM and proposed 32 MCM was granted by WRD govt of Chhattisgarh for the proposed expansion.

The Project Proponent

The proposed project shall be constructed and operated by Adani Power Limited.

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Location of the Project

Adani Power Limited (APL) is proposing a brownfield project for development of a 2x800 MW Ultra Supercritical Thermal Power Plant at village- Chhote & Bade Bhandar, Barpali, Kotmara and Sarwani, Tehsil Pussore, District Raigarh, Chhattisgarh in an area of 185 Ha of land adjacent to the existing plant area of 355.71 Ha. The site is at a distance of about 9km from Raigarh and is approachable from NH 153 (Sakti Malkhoda Chhapora road).

Demand Justification

Electricity is a cornerstone of national infrastructure, driving economic development and enhancing quality of life. The proposed Adani TPP aims to support this growth by providing a significant boost to the power supply in the Central Region and beyond. As of October, 2025, India's total installed power generation capacity stands at 5,05,023 MW, with substantial contributions from both fossil fuels and renewable sources.

The Central Electricity Authority (CEA) has observed a consistent increase in power generation, with notable growth in both overall and coal-based electricity production over recent years. According to a recent study conducted by the Central Electricity Authority (CEA) on the optimal generation capacity mix for the year 2029-30, the estimated total installed capacity for India in 2029-30 is projected to be 7,77,144 MW with significant expansions in solar and wind energy, alongside traditional coal and hydro power.

Process of Obtaining Environmental Clearance

The proposed project can be classified as Category A under 1(d) type of project [Thermal Power Plants] as per the EIA notification 2006 and subsequent amendments. All such A category projects will be appraised by MoEF&CC, New Delhi for issuing the prior Environmental Clearance.

1.2 Project Description

Adani Power Limited (APL) is proposing an expansion project for development of a 2x800 MW Ultra Supercritical Thermal Power Plant at village- Chhote & Bade Bhandar, Barpali, Kotmara and Sarwani, Tehsil Pussore, District Raigarh, Chhattisgarh in an area of 185 hectares.

Sl. No	Parameters	Existing 1x600 + 2x800 MW	Proposed 2x800 MW	Total after proposed expansion (3800 MW)
1	Technology	1x600- 2x800- Ultra Super Critical	Ultra Super Critical	
2	Land in Ha	355.71	185	540.71
3	Water Requirement	50	32	82

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Sl. No	Parameters	Existing 1x600 + 2x800 MW	Proposed 2x800 MW	Total after proposed expansion (3800 MW)
	Source: Mahanadi River			
4	Coal Requirement in MTPA Source: SECL/CCL/NCL	9.85	6.67	16.52
5	Ash in MTPA	3.638	2.66	6.298
6	Green Belt in hectares	117.4	46.25	163.65
7	Project cost	16,500	15,792	32,292

Ash Handling & Disposal

Bottom ash will be collected in wet form and targeted for 100% utilization as per MoEFCC guidelines; any surplus will be disposed in ash ponds. It will be slurry-transported from hoppers to hydro bins (via jet/slurry pumps) for dewatering. In emergencies, it will be crushed, mixed with fly ash and water, and sent to the ash dyke via MCSD/HCS D systems. Normally, dewatered bottom ash will be transported to users by covered trucks. Evacuation is scheduled 1 hour every 4 hours per unit (2 hours per 8-hour shift), with one unit at a time; three hydro bins serve two units.

Fly ash from ESP and APH hoppers will be conveyed (vacuum + pressure system) to silos and dispatched dry via rail/trucks for utilization. The system can evacuate 8 hours of ash in 5.5 hours. Six compressors (4W+2S) serve two units. Fluidizing blowers (with heaters) support flow—4 (3W+1S) for three main silos and 2 (1W+1S) for the MCSD silo. Three RCC main silos (16-hour total capacity) are provided with multiple outlets for conditioned loading, dry unloading, and future use. One MCSD silo feeds slurry disposal to the ash dyke and includes outlets for MCSD, conditioned loading, dry loading, and future use.

Water Requirement and Source: Existing Water requirement is 137091 m³/day (41095 m³/day Phase I + 95996 m³/day Phase II) obtained from Mahanadi River and the permission for the same has been obtained from WRD vide letter no INCG20016765166330T date 23/02/2021 and Lr. No. क्रमांक / 299/ एसआईपीबी/2021/239 dated 15.03.2024. The water requirement for the proposed project is estimated as 87,672 m³ /day (32 MCM per annum) which will be obtained from the Mahanadi River. The application for drawl of surface water have been recommended by State Investment Promotion Board to WRD, Govt. of

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Chhattisgarh Vide Ir.no. क्रमांक / 299 एसआईपीबी/2025/772 dated 23.09.2025. The water will be transported to the plant site through dedicated pipeline. The specific water consumption for the power plant will be < 2.5 m³/MWhr.

Power Generating Unit: The proposed Thermal Power Plant will be a pulverized coal-fired thermal power project utilizing Ultra Super Critical boiler technology. The plan includes building and operating two units, each with a capacity of 800 MW.

Power Evacuation: Power evacuation from the proposed project will be at 400 kV level switchyard.

Project Time Frame: The schedule of commissioning of first unit is envisaged as 63 months from the NTP (Notice to Proceed) to EPC Contractor or the Main Plant (BTG Contractors) and second unit shall be commissioned within a gap of 4 months thereafter.

Project Cost

The estimated Cost of the proposed Project is Rs. 15,792 Crores.

Pollution Control System

- **Air Pollution Control System:**

- **Electrostatic Precipitators (ESP):** High-efficiency (99.98%) ESPs will limit particulate emissions to 30 mg/Nm³.
- **SO₂ Control:** Chimneys with height of 275m proposed
- **Dust Suppression:** Systems for coal dust extraction and suppression in critical areas like Coal Handling Plant (CHP) and ash handling facilities.
- **NO_x Control:** SCR/SOFA & low NO_x burner to meet NO_x emission as per MoEFCC norms.

- **Water Pollution Control System:**

- **Effluent Management:** Comprehensive system for treatment including both STP and ETP, recycling, or disposal of effluents from various plant processes, ensuring zero liquid discharge (ZLD).

- **Noise Pollution:** Acoustic enclosures and personal protective equipment for personnel working in high-noise areas to keep noise levels below 90 dB(A).

- **Solid Waste Management:**

- **Ash Management:** Dry collection of fly ash and decantation-based collection of bottom ash. Emphasis on ash utilization; surplus disposed in ash dyke with dust control measures for future utilization.
- Solid, plastic, e-waste battery waste all will be disposed following the respective norms and regulation.

- **Afforestation and Green Belt Development:** Continued planting initiatives to enhance green cover and biodiversity within and around the project site. A total of

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46.25 Ha out of 185 Ha of project area will be developed as greenbelt, covering 25% of project area.

- **Sustainable Development Mechanism (SDM):** Intent to leverage SDM or Article 6.2/6.4 mechanisms of the Paris Agreement for emission reductions and revenue generation once operational.
- **Post Operational Monitoring Programme:** Continuous monitoring of air and water quality parameters, stack emission and Effluent monitoring program will be implemented for new units. Data to be submitted to Chhattisgarh Environment Conservation Board.

Environmental Management Group (EMG): Existing EMG oversees monitoring activities, collaborates with regulatory bodies for compliance and issue resolution

1.3 Baseline Condition

The baseline study was conducted during the post monsoon season, 2025 i.e. October to December, 2025. There is no National Park, Wildlife Sanctuary or wildlife corridor within 10km of the project site.

Physical Environment

- **Topography:** The elevation in the study area is observed to range from 111 m to 316 m above mean sea level. The project site is surrender with higher elevation levels in South South-West part. General slope is directed toward Eastern part of the study area. Project site falls under area having elevation between 222m to 230m.
- **Drainage:** Two perennial rivers- Mahanadi River and Mand Nadi are flowing in the study area. Mahanadi River is flowing from the West to East direction and is located at 5.6 km in the South direction from the project site. Another River Mand is flowing from South to North direction and located at 1.7 km in West direction the project site.
- **Geology:** The Study area and overall, the district is underlain by Archaean to Cretaceous age rocks with limited Recent alluvium. Hydro-geologically, the area comprises hard crystalline and metamorphic rocks along with semi-consolidated Gondwana formations. The Chhotanagpur gneissic complex and associated metamorphic belts occupy a significant portion of the district, influencing groundwater occurrence and movement in the area.
- **Geomorphology:** the district comprises two major physiographic units, namely the Mahanadi Plain (Chhattisgarh Plain) and the Northern Hills of the Chhotanagpur Plateau. The southern part is characterized by fertile, gently sloping plains associated with the Mahanadi River, while the northern part comprises hilly terrain with increasing elevation, forest cover, and pediments. These physiographic features control the drainage pattern, slope, and land use of the district.

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- **Hydrogeology:** Groundwater is the principal source of irrigation in the district and during pre-monsoon ground water were recorded in the level of 9 mbgl to 15 mbgl, the same for the post monsoon season was recorded as 6 mbgl to 10 mbgl. The state of groundwater in the district is characterized as safe.

Vulnerability of Study Area:

- **Earthquake:** The district Raigarh has fall under Zone III: Moderate Damage Risk Zone (MSK VII) and Zone II : Low Damage Risk Zone (MSK VI or less). The district Raigarh also has both the zones mentioned here i.e. Zone II and Zone III. The project site falls in low damage risk zone.
- **Wind:** The project site falls in Moderate Damage Risk Zone - A ($V_b=44$ m/s) Moderate Damage Risk Zone - B ($V_b=39$ m/s), where V_b is the basic wind speed. Raigarh district as well as the project site fall in Moderate Damage Risk Zone B.

Soil Quality:

- **pH:** The pH value recorded in the study area varies from "Neutral" to "Slightly Alkaline" as per ICAR report.
- **Electrical Conductivity (EC):** In the study area soil conductivity varies between 345 $\mu\text{mhos/cm}$ at S1 to 505 $\mu\text{mhos/cm}$ at S5.
- **Soil Texture:** According to the study of soil texture, the soil of the study area varies from 26.6% - 31.8% Clay, 65% - 78.5% silt and 60.5% - 85.4% Sand. The soil texture in the project site and in the surrounding is classified as sandy clay loam.
- **Bulk Density:** Bulk density of the study area ranges between 1.1 gm/cm^3 at S1 to 1.31 gm/cm^3 at S5.
- **Moisture:** The field moisture of all the samples from the study area ranges between 13.6% at S4 to 18.5% at S3. The moisture of the study area remains lower than the wilting point.
- **Soil nutrients:**
 - **Phosphorus:** Available Phosphorus ranges between 44 kg/ha at S1 site to 62 kg/ha at S5. As per ICAR classification the phosphorus in the study area present is classified as "medium" to "average sufficient".
 - **Potassium:** Potassium content in the study area ranges between 101 kg/ha at S1 to 152 kg/ha at S5. As per ICAR classification the potassium in the study area present is classified as "very less" to "medium".
 - **Nitrogen:** Nitrogen content in the surface soil of the study area varies between 508 kg/ha to 744 kg/ha. As per ICAR classification the nitrogen in the study area presents as "Better" to "Sufficient".

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- **Organic Matter:** In the study area organic matter varies between 1.48% to 0.72%. As per ICAR classification, the organic matter found in the study area is "more than sufficient".

Climatology and Meteorology

- **Temperature:** The maximum temperature was recorded in the month of May (40.3°C) & minimum temperature is recorded in the month of December (6°C).
- **Rainfall:** The annual rainfall is 1400mm. It rains 12 months and the intensity varies from 9.3 mm to 367.7 mm per month. The maximum annual rainfall is received during the months from June to September.
- **Relative Humidity:** The humidity is highest in July to September with average relative humidity of 58.4%.
- **Wind Pattern:** The wind rose shows that the dominant directions of the wind flow throughout the year is WSW and during the post-monsoon the dominant wind direction is from NE.

Air Environment

- **PM₁₀:** The 98th percentile value of PM₁₀ varies between 51.2 µg/m³ at AAQ8 to 79.5µg/m³ at AAQ1.
- **PM_{2.5}:** The 98th percentile value of PM_{2.5} varies between 30.2 µg/m³ at AAQ8 45.9 µg/m³ at AAQ1.
- **SO₂:** The 98th percentile value of SO₂ in the study area ranges from 22.5µg/m³ in AAQ7 to 36.9µg/m³ in AAQ2.
- **NO₂:** The 98th percentile of NO₂ varies between 11.2 µg/m³ at AAQ6 to 23.8 µg/m³ at AAQ2.
- **CO:** The 98th percentile of NO₂ varies between 0.22 µg/m³ at AAQ10 to 0.92 µg/m³ at AAQ1.
- **Ammonia, Lead, Nikel and Mercury** were below detection limit at all locations.

Noise Environment:

- **Day Time:** The minimum Leq observed was 50.4 dB(A) near N8, Sensitive area while maximum Leq in daytime observed was 54.7 dB(A) near N5 Residential area.
- **Night Time:** The minimum Leq during night was 40.4 at N8, sensitive zone while maximum Leq in night time observed was 44.7 dB (A) at N10.
- Overall, the ambient noise pressure level in the monitored locations was found to be within the permissible limits stipulated for residential area.

Water Environment:

- **Surface Water Quality**

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- **pH:** pH of the study area varied from 7.26 at SW4 to 7.55 at SW10 in the Post Monsoon season, which is neutral to slightly alkaline in nature.
- **TDS:** TDS was observed in the range of 217 mg/l at SW6 to 419 mg/l at SW10 in the post monsoon season
- **TSS:** Below detection limit at all locations.
- **Conductivity:** Conductivity of water samples indicated non saline in nature it was varied between 323.9 $\mu\text{S}/\text{cm}$ at SW6 to 625.4 $\mu\text{S}/\text{cm}$ at SW10 in the monitoring period.
- **Nitrate:** Nitrate was recorded in the study area 6.5 mg/L at SW6 to 11.9 mg/L at SW2.
- **Fluoride:** Fluoride was recorded in the study area 0.31 mg/L at SW6 to 0.57 mg/L at SW10.
- **DO:** Dissolved oxygen was recorded sufficient in the study area i.e 4.6 mg/l at SW10 to 6.9 gm/l at SW4.
- **BOD:** BOD in surface water found high which is varied between 4mg/l at SW(3,4,5,&6) to 26 mg/l at SW10 during Post monsoon months.
- **Alkalinity:** The maximum alkalinity of water bodies samples was found to range between 61mg/l – 124 mg/l in the study area.
- **Chloride:** The minimum chloride concentration (46 mg/l) was found at SW5 and the maximum (89 mg/l) was recorded at SW10 during the Post monsoon season.
- **Ground Water Quality**
 - **pH:** The pH value of ground water samples varied from 7.33 to 7.54.
 - **Electrical Conductivity (EC):** Electrical conductivity of ground water ranged between 212 $\mu\text{S}/\text{cm}$ to 868 $\mu\text{S}/\text{cm}$ during the study period.
 - **TDS:** All the samples are within the permissible limits.
 - **TH:** The total hardness of ground water was found to be minimum 150 mg/l in sample at GW6 in the post monsoon period and the maximum was observed as 220 mg/l in the sample at GW5.
 - **Calcium and Magnesium:** The range of Ca^{2+} and Mg^{2+} are also remaining within the acceptable limits 44-85 mg/l and 0.4-17.8 mg/l respectively.
 - **Alkalinity:** The alkalinity of Hand pump water was found to be 108 mg/l at GW1 and the minimum was observed as 198 mg/l at GW10 during the monitoring period.
 - **Chloride:** The maximum chloride concentration 154 mg/l was found at GW3 and the minimum 30 mg/l was recorded at GW7. The samples were compared with the BIS standard and all the samples were within the acceptable limit of 250 mg/l.

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- **Fluoride:** The minimum level of fluoride 0.26 mg/l was found in GW7 and the maximum value 0.72 mg/l was found at GW3. All samples were within permissible limits of 1.5 mg/l.
- **Nitrate:** The concentration of nitrate in ground water samples ranged from 22.8 mg/l at GW3 to 5.8 mg/l at GW6. All the samples were compared with the BIS standard and found within the acceptable limit of 45 mg/l.

Heavy Metals: Zinc concentration in the ground water samples were within the acceptable limit of 5 mg/l prescribed by BIS. Other heavy metals like arsenic, cadmium, chromium, copper, lead and selenium were recorded below detection limit.

Traffic Scenario:

The results of the survey, the existing passenger car unit (PCU) of each location were compared with the capacity of each type of road as suggested by Indian Road Congress thus determining the existing Level of Service (LoS) for each location. The existing conditions shows Level of service A at NH 153 representing a condition of free flow.

Terrestrial Ecological Survey and Biodiversity Study:

- **Forest type:** As per the Champion and Seth classification (1968) Raigarh lies in the Tropical Dry Deciduous Forest and Tropical Moist Deciduous Forest.
- **Floral Study:** During the survey, an inventory of the various plant groups discovered in the study region was created. In the research region, 145 species of flora were identified. Out of which 67 species of trees and small trees, 17 species of Grasses & Bamboo, 21 species of Climbers, 40 species of Shrubs & Herbs have been recorded in the study area based on primary observation as well as based on information collected from the secondary data.
- **Faunal Study: 10 Schedule-I species** were found during the field survey within 10 km radius of the plant site. A 63 number of faunal terrestrial species comprising mammals, reptiles, Amphibians & birds were recorded from the study area. Among fauna, 18 species of mammals, 4 species of reptiles, 2 species of amphibians & 39 species of birds were recorded from the study area.
- **Aquatic Ecology:** The aquatic ecology of Raigarh, is characterized by its river systems, especially the Mahanadi and Mand River and several ponds and wetlands. Studies indicate that the water quality is affected by both natural and anthropogenic factors, including contamination from industrial and agricultural activities. The region's groundwater, heavily relied upon for irrigation and drinking, faces quality issues due to contamination. Additionally, the area is rich in aquatic biodiversity, supporting various fish species and aquatic plants.

Social Environment

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There are 164 villages in the study area. These villages have total population of 1,14,532 (in 2001) & 1,43,521 (in 2011). The average household size in the study area was found to have reduced from 4.8 in 2001 to 3.8 in 2011. According to the survey, gender ratio of study area was 1020 in 2011 and 993 in 2001.

- **Vulnerable Group:** As per 2011 census, the study area has about 14.92 % scheduled caste population and 27.59% scheduled tribe population.
- **Literacy Rate:** The female literacy rate of the study area has increased with time (53.80% in 2001 & 57.73% in 2011) along with the male literacy rate which was 73.50% in 2001 and 75.63% in 2011. The data shows that the average literacy rate of the area has increased with time.
- **Occupational Structure:** In the villages around the study area, people mainly earn from agriculture and animal rearing. Then can be said that the percentage of non-workers is high (> 50%) in the study area as compared to the total workers. It can also be seen that the percentage of workers have decreased marginally from 2001 to 2011.

Infrastructure

- **Educational Facilities:** There is a total of 195 Primary Schools, 83 Middle Schools, 19 Secondary School and 10 Senior Secondary Schools in the study area as per Census 2011. It can be seen that there has been a substantial increase in the number of schools over the 10 years in the study area. This is a very healthy sign which is reflected in the increase of literacy rate of the area.
- **Banking and Post Office Facilities:** Within the 10 km study area the number of Post Offices increased from 22 in 2001 to 27 in 2011. Banking infrastructure has improved, with Commercial Banks increasing from 1 to 5 and Cooperative Banks from 1 to 5 during the same period, indicating overall improvement in basic service facilities in the study area.
- **Drinking water facilities:** One of the most important factors responsible for the emergence of a settlement is availability of water. Many water sources such as wells, hand pumps, tanks, etc. are available in rural areas. In the villages under study, the main source of water is tap water, well, followed by hand pump and service reservoirs.
- **Health Facility:** The number of healthcare facilities in the study area shows mixed trends between 2001 and 2011. Mother and Child Welfare Centres have increased from 0 to 8, while the number of Primary Health Centres (PHCs) has increase from 1 to 4. The number of Primary Health Sub-Centres (PHSCs) has increased from 1 to 27, and one TB Clinic is present in 2011.

1.4 Impacts Assessment & Mitigation Measures

Ambient Air: Construction activities, including site preparation, material handling and storage, civil works, mechanical and electrical erection, and debris disposal, as well as

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EXPANSION OF EXISTING POWER PLANT PHASE I 600 MW (OPERATIONAL) AND PHASE II 2X800 MW ULTRA SUPER CRITICAL (UNDER CONSTRUCTION) BY ADDING PHASE III 2X800 MW, ULTRA SUPER CRITICAL TPP AT VILLAGES CHHOTE & BADE BHANDAR, BARPALI, KOTMARA AND SARWANI, TEHSIL PUSSORE, DISTRICT RAIGARH, CHHATTISGARH

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operational activities such as coal handling, combustion, water use, and ash management, are expected to impact ambient air quality; however, predictive modelling indicates that resultant ground level concentrations during operation will remain within prescribed NAAQS limits, with PM ranging from 52.12 to 80.22 $\mu\text{g}/\text{m}^3$, SO_2 from 33.06 to 50.51 $\mu\text{g}/\text{m}^3$, and NO_2 from 16.43 to 26.59 $\mu\text{g}/\text{m}^3$. Mitigation measures during construction will include regular water sprinkling, road surface treatment, and proper maintenance of vehicles, while operational phase controls will comprise high-efficiency (99.98%) electrostatic precipitators, NO_x control systems, and a 275 m tall stack.

Water Resources: Water resources may be impacted during the construction phase due to site preparation, labour influx, temporary housing, and debris disposal, while water quality may be affected by material handling, civil works, mechanical and electrical erection, and debris management; during operation, impacts on water quality will arise from plant operations, coal handling, water withdrawal and treatment, and ash handling. Mitigation measures include routing runoff to sedimentation basins before discharge, storing fuel and lubricants in closed containers, and ensuring proper drainage and wastewater disposal, along with the provision of an ETP of 1,440 KLD for treatment and reuse and implementation of a zero liquid discharge (ZLD) system to prevent any wastewater discharge outside the plant boundary.

Ambient Noise: Construction activities such as site preparation, material and equipment handling, civil works, mechanical and electrical erection, and debris management will increase ambient noise levels, while during operation, unloading and storage of raw materials will contribute to noise disturbance; mitigation measures include regular maintenance of high-noise equipment, use of personal protective equipment, deployment of well-tuned vehicles, daily monitoring of noise levels, incorporation of noise-reducing design features such as acoustic enclosures and optimized building design, development of greenbelts, and provision of acoustic enclosures for DG sets used during the construction phase.

Soil Quality: Transportation related activities during construction phase including raw materials and construction debris and during operation phase coal combustion, ash handling and will adversely impact the soil quality. To mitigate the impacts, it is recommended that the truck movement shall be carried out through existing roads, trucks shall be covered with tarpaulin and overloading shall be avoided and appropriate soil conservation measures associated with improved construction techniques should be implemented.

Ecology: Fugitive dust deposition during construction may lead to temporary reduction of photosynthesis in nearby flora. The runoff from construction area may lead to a short-term increase in suspended solids and decrease in DO near the discharge point in receiving waterbody. For mitigation of those impacts' measures like sprinkling water in dust-generating

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areas, green belt development and channelizing stormwater runoff through sedimentation basin is to be implemented both during construction and operation phases.

Traffic: After the proposed expansion, there will be increase in number of vehicles. It is considered that 100% of the additional traffic shall travel through the selected locations. In that scenario the level of service will remain LOS B a zone of stable flow for the NH 153. To reduce load on Traffic 100% coal will be transported through Rail.

1.5 Analysis of Alternative Technologies

Technology Alternative: Super Critical and Ultra-Super Critical Boiler

Summary of Advantages of Ultra Super Critical Thermal Power Plant:

- Improve thermal efficiency attainable.
- Reduce fuel cost.
- Reduction of CO₂ emission by as much as 15% per unit of electricity generated compared to typical sub-critical units. This may help in meeting country's GHG Intensity Reduction target.
- Very good part load efficiency.
- Initial investment requirement marginally higher than super critical technology and less than other clean coal technology. This, however, depends on the unit size considered.

1.6 Environmental Monitoring Programme

The monitoring program is designed to verify the implementation of environmental measures and confirm their effectiveness in delivering the intended benefits to the target population. The primary aims are to monitor impacts of the surrounding environment and the effectiveness of mitigation measures during the construction and operation phases, to ensure that environmental control systems are installed and operating satisfactorily and to suggest ongoing improvements in mitigation measures, if required for subsequent effective monitoring.

Environmental Monitoring Cost: Total environmental monitoring cost during construction phase (recurring) is Rs 10.84 Lakhs. During operation phase the capital cost of monitoring is estimated to be Rs. 606.7 Lakhs and Rs. 31.94 Lakhs as recurring cost.

1.7 Additional Studies

APL, Raigarh is carrying out additional studies of Public Consultation, Risk Assessment, Social Impact Assessment, hydrogeological study, watershed development study, Biodiversity Study and Rehabilitation and Resettlement Action plan as suggested in EIA Notification 2006.

Public Hearing & Consultation: According to the provisions of Environment Impact Assessment Notification No. SO 1533, dated 14.09.2006 of Ministry of Environment and Forests, Government of India, the project was granted ToR identification no-

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TO25A0601CG5462191N dated 06.12.2025. As per the ToR condition public consultation (Public Hearing and written submission) shall be conducted for the proposed project.

Hydrology & Hydrogeology Study: Hydrology and Hydrogeological study is being conducted in the study area to assess the ground water dynamics, water quality, soil characteristics for ground water recharge potential and to identify potential impacts on ground water due to the project. Action plan for implementation recommended mitigation measures will be provided along with the Final EIA report.

Biodiversity Study: Biodiversity analysis of the surrounding area was conducted to assess the Floral and Faunal diversity of the area and potential impact of the proposed project on the ecological environment and to recommend mitigation measures.

Watershed Development Plan: Watershed development plan is being furnished to identify the watersheds that might have inverse impact due to the project and to recommend measures for slope stabilisation, check dams and other irrigation measures for development of the surrounding watershed.

Need based Social Impact Assessment: A Need Based SIA was carried out in the village falling within the 10 km study area to determine the infrastructure and services that were prioritized by the residents. Special focus was given for the Tribal villages and needs. Along with the study proposals were also furnished for inclusion in the CSR/CER programmes. Based on which Rs 26.5 Cr have been allocated for 5 years for CER programs.

Risk Assessment: Risks present in a thermal power plant operation mostly arises due to involvement of hazards like High pressure super-heater, re-heaters, economizer units exchanging heat with the hot flue gases, Turbines utilizing HP steam, Fuel oil storage and handling units, Coal handling units, Hydrogen as coolant in turbo generators drawn from hydrogen cylinders, Chlorine as water treatment chemical drawn from cylinders and Switchyard including transformers, isolators etc.

Hazard Identification: Hazard identification involves three components: **Component-1:** identifying hazardous contaminants released and assessing the probability and consequences of such events to evaluate risks to property, environment, and human health, considering the type, quantity, location, and conditions of release; **Component-2:** estimating the quantities of contaminants released from various sources, including limited use of fuel oils (LDO/HSD) during start-up and chemicals such as chlorine in water treatment and DM plants, with appropriate precautions for safe handling; and **Component-3:** estimating contaminant concentrations through Preliminary Hazard Analysis, focusing on scenarios like chemical spillage during handling and chlorine leakage.

Mitigation Measures of Fire & Explosion Hazards: Fire prevention and relevant code enforcement is one of the major responsibilities of project proponent. The fire service facility shall be equipped with- Smoke and fire detection alarm system, Water supply, Fire hydrant

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and nozzle installation, Foam system, Water fog and sprinkler system and First aid appliances. Apart from the general mitigation measures site specific mitigation measures are also suggested for LDO Storage.

Disaster Management Plan: APL TPP will implement a comprehensive Disaster Management Plan for the proposed project. Emergency preparedness planning is divided in two subsections:

- **Onsite Disaster Management Plan:** The Onsite Disaster Management Plan aims to ensure safety of life, environmental protection, asset protection, restoration of production, and salvage operations, with key elements including early detection of emergencies, well-defined command and coordination structure, trained personnel, adequate resources, effective response actions, communication systems, and regular review and training; it outlines clear action sequences, assigns responsibilities through an organizational structure, and provides for necessary infrastructure such as marked assembly points, evacuation routes, alarm systems, and fire protection.
- **Off-site Disaster Management Plan:** The Off-site Disaster Management Plan, as per the Environmental Protection Act, 1986, is the responsibility of the State Government, typically prepared by the District Collector or Deputy Collector.

Natural Disasters: Chhattisgarh State Disaster Management Authority is a nodal agency for preparation of disaster management plan of natural disaster of Chhattisgarh. The plant and surrounding area fall in a low damage risk zone as per the recent earthquake categorization zone and subsequently general precautions and safety measures are recommended to be taken by the people before and after the earthquake.

Occupational Health and Safety Management Plan: Large industries, in general, and power plants in particular where multi-functional activities are involved during construction, erection, testing, commissioning, operation and maintenance, occupational health needs attention during all phases. However, the problem varies both in magnitude and variety in the above phases.

Assessment of Endemic Diseases of Environmental origin: Diarrhea and malaria are the endemic diseases in the region which occurs due to lack of hygiene and health facilities. District Health Department is a nodal agency to prevent the occurrence of diseases of environment origin. During construction of project, community toilets and sanitation facilities will be provided in labour colony so that stagnation of wastewater can be prevented. The following activities will be undertaken by APL to maintain sanitation & hygiene.

Corporate Social Responsibility: APL is committed to balanced development of the surrounding area while safeguarding environmental and social aspects through its CER/CSR programmes, including support for local educational infrastructure such as schools, primary learning centres, and repair or construction of primary schools in nearby villages. The

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company will promote inclusive development by strengthening initiatives in education, sanitation, health, livelihoods, rural infrastructure, and sports, thereby contributing to the region's overall socio-economic growth. CSR/CER activities will extend to nearby villages and will be aligned with Sustainable Development Goals, covering key sectors such as education and training, livelihoods, infrastructure development, sports and culture, horticulture, and health and sanitation.

The cost allocated for Corporate Social Responsibility (CSR)/ Corporate Environmental Responsibility (CER) activities, amounting to INR 26.5 crore for Phase III.

1.8 Project Benefit

The proposed expansion of Adani Power Ltd. - Raigarh Ultra Super Critical Thermal Power Plant by adding 1600 (2x800) MW will benefits local and regional economy. The benefits include-

- Infrastructure development.
- Direct & indirect employment opportunity
- Revenue generation to central & state government.
- Trickle-down effect of enhance profitability to the local populace
- Skill development and capacity building like vocational training, income generation programmes and entrepreneurship development program
- Awareness programme and community activities, like health camps, medical aides, family welfare camps, sanitization/ cleanliness awareness programme, immunization camp, sports & cultural activities, plantation, etc.
- Awareness about water borne diseases and pandemic diseases etc. will be done to local villagers.

Improvement in Physical Infrastructure & Community Development: Establishment of large developmental projects improve the availability of the physical infrastructure (like approach roads, drainage, communication and transportation facilities etc.) and social infrastructures (like education and health care system). These will also benefit the local population. The power generated from this plant will benefit to large extent leading to industrial/ commercial development in the state of Chhattisgarh and also in the country.

Improvement in Social Infrastructure: Implementing the proposed project is expected to have a favourable impact on existing infrastructure, creating conditions conducive to urban development in the region. Company will employ additional workers, supervisors and engineers available locally to the extent possible. Necessary medical facility will upgrade under CER/CSR activities/ programs which will be beneficial to locals residing in the study area as per Companies Act.

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Employment Potential: Employees required for an expansion unit of 2x800 MW Units the number of APL's employees during construction is estimated to be 6230 and operation phase will be 1772 including both permanent and contractual workers.

1.9 Environmental Cost Benefit Analysis

The project cost benefit ratio for the proposed project is evaluated to be 1.13, indicating in favour of the project. The financial expenditure incurred in preventing, containing, mitigation or removing environmental contaminations occurring as a result of the proposed project activity will further add to the environmental benefits.

1.10 Environment Management Plan

EMP Implementation, Inspection and Monitoring: This covers description of the administrative aspects of ensuring that mitigative measures are implemented and their effectiveness monitored, after approval of the EIA/ EMP report and grant of Environmental Clearance (EC). The assessment of environmental impacts and mitigation measures have been identified for effective operation of environmental management activities in the pre-construction, construction, commissioning and operation & maintenance (O&M) activities.

Components of EMP: Environmental Management Plan comprises of the components of i) Institutional Arrangements; ii) Monitoring Programme/ plan; iii) Environmental Enhancement Measures; and iv) Social Enhancement Measures.

Institutional Arrangements: An Environmental Management Cell (EMC) is envisaged which is responsible for monitoring EMP and its implementation. Environment management is the responsibility of the environment management cell headed by the Head Environment and comprising of Engineers, Chemists etc. Head Environment is directly reporting to the Plant Head of the organization. Plant Head is responsible for environment management activities for the organization. The company has well established compliance management system. A separate legal team available for the same.

Operation and Maintenance Group: O&M team head would have primary responsibility for the operation & maintenance of the power station. APL Raigarh has Operation & Maintenance Group Management Organization headed by a GM (O&M) and is assisted by a team of managers & engineer. This O&M Group Organization will take up additional responsibility of operations, maintenance and monitoring of pollution control equipment/system related to proposed Ultra Super Critical Thermal Power Plant. O&M team is expected to comprise four broad functional areas viz. operations, maintenance, engineering, support service and administration.

Occupational Safety: In power plant, primary safety hazards include burns, slips, falls, fire and explosions. Electrical hazards and the risk of electrocution are significant due to high voltage in electrical lines. To prevent and reduce accidents safety measures including spatial measures, insulation, guard rails, shield guards, grounding of electrical equipment, protective

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measures, mock drills and regular safety awareness programs and training will be conducted for all workers.

Ash Utilisation Plan: 100% Ash will be utilised in Cement Industries, reclamation of abandoned mines and low-lying areas, manufacturing of bricks and road construction.

Environment Enhancement Measures:

- **Tubular Daylight Devices (TDDs):** Tubular daylighting devices are a versatile alternative to traditional skylights because they can be used to provide light to areas that are not in a direct line of sight with the sun. Tubular daylighting devices (TDDs) utilize a rooftop dome to harness sunlight, which is then directed through a reflective tube. TDDs are more effective than traditional skylights or windows because of the reflective tubing, delivering maximum daylight with minimal heat transfer.
- **Solid Waste Management:** Solid waste generated during construction will be managed as per Construction and Demolition Waste Management Rules, 2016. Ash and Gypsum shall be the major solid waste likely to be generated from the project. Ash shall be generated due to combustion of coal. 80% of the ash shall be generated as Fly Ash while 20% of the ash shall be generated as bottom ash. Solid waste generated during operation period will be disposed following respective Govt. issued rules and regulation.
- **Greenbelt:** Out of the total area for the Proposed plant of 185 Ha, greenbelt encompasses 46.25 Ha, accounting for 25% of the project area. Density of 2500 trees/ha will be maintained. An estimated of total 1,15,625 trees will be plant within the plant premises. The greenbelt shall have 3-tire plantation as per the CPCB guidelines densification & strengthening of greenbelt
- **Rainwater Harvesting:** The rainwater available for harvesting is calculated 6,33,780 m³ or 0.63 MCM per annum. There is no extraction of groundwater for project. Provision is made for rainwater harvesting to collect stormwater from roof top, road/paved areas, greenbelt and open areas.

Social Enhancement Measures:

- **Training:** Management will be responsible to instruct employees in proper use of all equipment operated, safe lifting practices, location and handling of fire extinguishers, and use of personal protective equipment and overall education and training in good safety practices.
- **Welfare Activities & Facilities for Employees:** In addition to the plants & equipment for the generation of power facilities like construction offices and stores, time and security offices, first aid and fire-fighting station, canteen, parking, training stations, toilets and restrooms shall also be adequately furnished and equipped. The work atmosphere will be monitored for SPM, SO₂, and NO_x etc. to avoid excessive exposure.

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Cost of Environment Management Measure: A capital cost provision of **Rs. 1324 Crores** towards environmental protection measures/EMP and for operation and maintenance, recurring cost of **Rs. 13.05 Crores have** been earmarked. Additional cost will be incorporated based recommendation provided in additional studies.