Annexure – D to the Directors' Report

Conservation of Energy, Technology Absorption and Foreign Exchange Earnings and Outgo Information as required under Section 134(3) (m) of the Companies Act, 2013 read with Rule 8(3) of the Companies (Accounts) Rules, 2014 are set out as under:

A. Conservation of Energy:

a) The steps taken or impact on conservation of energy:

Mundra TPP

- Switching off one CW Pump in 330 MW Units during the winter season (Units 1 to 4), saving around 18.68 MU's per year.
- Replacement of 09 Nos. of Parag/ Hamon fans with Encon (energy efficient) fans- in Phase-2, leading to a saving of around 0.47 Mus.
- Deployed efficiency optimisation solutions like soot blowing optimisation and AHP-APC reduction under advanced analytics initiatives
- Unit-2 Heat Rate improved 21.7 Kcal/KWh after overhauling (Dec/Jan-24) by
  - (a) APH 2A and 2B Hot End, Intermediate End & Cold End Basket Replacement
  - (b) Boiler water washing of 1st Pass & 2nd Pass
  - (c) Turbine Overhauling,
  - (d) Condenser High pressure water jet cleaning and other overhauling activities.
- Unit-2 Boiler Feed Pump Total APC saving 408 KWh after BFP-2A Booster pump replacement and BFP-2C cartridge replacement. Total APC saving after Overhauling Unit-2: 0.8 MWh/Hr.
- Unit-6 Heat Rate improved 25 Kcal/Kwh after overhauling (Mar/Apr-24) by
  - (a) APH 6A & 6B Hot End, Intermediate End & Cold End Basket Replacement
  - (b) Boiler water washing of 1st Pass & 2nd Pass
  - (c) condenser High pressure water jet cleaning
  - (d) Re heater Damper modification and other overhauling activities.
- Total APC saving after Overhauling in Unit-6: 0.8 MWh/Hr.
- Unit-8 Heat Rate improved 41 Kcal/Kwh after overhauling (Aug/Sep-24) by
  - (a) APH 8A & 8B Hot End, Intermediate End & Cold End Basket cleaning
  - (b) Boiler water washing of 1st Pass & 2nd Pass
  - (c) Turbine Overhauling,
  - (d) Condenser High pressure water jet cleaning,
  - (e) Debris Filter installation
  - (f) Re-heater Damper modification and other overhauling activities.
- Total APC saving after Overhauling in Unit-8: 0.65 MWh/Hr.

Tiroda TPP

- Unit#2 APH, Basket Replacement, rotor levelling, Seal plate alignment, By-pass seal and radial seal setting, Axial seal & Radial seal setting resulting in saving of 0.438 Kcal/kwh in station level.
- Unit#2 condenser, water box Tube cleaning, LPBP-2, Boiler Side Safety Valves, ERV, Turbine Side Safety Valves, high energy valves attended resulting in saving of 0.708 Kcal/kwh in station level.
- Unit#2 APH leakages and flue gas duct leakage arresting resulting in saving of 493KWH
- Unit#2 Boiler WW water washing, Furnace air infiltration points attending, FSH coils replacement, RH spray reduction, MST, HRHT improvement resulting in saving of 2.028 Kcal/kwh in station level.
- Unit#5 APH, Basket Replacement, rotor levelling, Seal plate alignment, By-pass seal and radial seal setting, Axial seal & Radial seal setting resulting in saving of 2.262 Kcal/kwh in station level.

- Unit#5 condenser, water box Tube cleaning, Boiler Side Safety Valves, ERV, Turbine Side Safety Valves, High energy valves passing attended resulting in saving of 0.372 Kcal/kwh in station level.
- Unit#5 APH leakages and flue gas duct leakage arresting resulting in saving of 482KWH
- Unit#5 Boiler WW water washing, Furnace air infiltration points attending, FSH coils replacement, RH spray reduction, MST, HRHT improvement resulting in saving of 0.83 Kcal/kwh in station level.

Kawai TPP

- Unit-2 Heat rate improved by approx. 7.05 kCal/kWh after rectification work in APH seal, replacement of Intermediate & Cold end basket, Water washing, attending leakages from boiler flue gas ducts and bellows etc. which had improved the boiler combustion by replacing of 24 no's burners, boiler water washing, rectification of SADC and SOFA defects.
- Unit-2 Heat rate improved by approx. 2.36 kcal/kwh due to improvement in Main steam and RH steam temperature after increasing of metal temperature excursion limits by replacement of shot pinned tubes in FSH coils.
- Unit-2 Heat rate improved by approx. 3.71 kCal/kWh, due to improvement in condenser vacuum by 0.25 kPa, after carrying out condenser tube jet cleaning, debris filter cleaning, attending of air ingress points identified during flood test.
- Replacement of HPSV lamps with LED lamps in CHP & BOP area resulted in savings of 431.1 kWh. Annual energy saving estimated of 0.133 MU's for FY: 2024-25.
- Replacement of Old AC in plant with energy efficient Inverter AC at different locations resulted in Annual energy saving estimated of 0.08 MU's for FY: 2024-25.
- ACW Pump stopped in both the units in winter season to optimise Plant APC resulting in annual energy saving of 0.89 MU's for FY '24-25.
- Unit-2 APH basket replacement (Intermediate & Cold End), water washing, and seal rectification work carried out during AOH and duct, bellows leakages were also arrested, resulted in reduction in draft power consumption by 0.35% (51.85 MWh 94% PLF @ Unit Level). Annual energy saving estimated of 7.98 MU's for FY: 2024-25.
- Unit-2 CW system power reduced after overhauling of CWP A & B and replacement of CWP-B impeller with refurbish impeller, approximate savings of 0.01% (1.97 MWh) 94% PLF. Annual energy saving estimated of 0.304 MU's for FY: 2024-25.
- 03 CWP operation during winters when operating conditions are favorable for both units resulted in savings of 5224 MWh (71.56 MWh per day for 73 days). Annual energy saving estimated of 5.22 MU's for FY: 2024-25.
- Unit-2 Feedwater system power reduced after overhauling of both TDBFP's booster pump and attending recirculation valve passing, approximate savings of 0.002% (0.32 MWH) @ 94% PLF. Annual energy saving estimated of 0.05 MU's for FY: 2024-25.
- Unit-2 Condensate system power reduced after overhauling both CEP's, approximate savings of 0.002% (0.28 MWH) @ 94% PLF. Annual energy saving estimated of 0.22 MU's for FY: 2024-25.
- APC savings after change in operational philosophy by operating 04 mills in place of 05 mills during part load conditions for approx. 10 hours during the day resulted in Annual energy savings of 0.43 MU's for FY: 2024-25.

Raigarh TPP

- Operation of Low-Capacity CW Pump based on condenser performance and atmospheric temperature- 11.24 MUs saving in FY 2024-2025.
- APH duct and bellows leakages arrested during short shutdown of unit resulting in reduction in Induced Draft fan power consumption – 2.67 Mus in FY 2024-2025.
- Wind box leakage attended, and end air damper automation done during short shutdown of unit resulting in reduction

in Forced Draft fan power consumption – 0.34 MUs in FY 2024-2025.

- CW pump B overhauling done during short shutdown of unit resulting in reduction of CW pump B power consumption – 100 kW.
- NDCT performance improvement by 1.5% post NDCT V-bars and nozzle repairing work during short shutdown of unit resulting in SHR improvement of 2.1 kCal/kWh in FY 2024-2025, resulting in a coal saving of ~ 3000 MT per year.

Raipur TPP

- Installation and commissioning of VFDs in the 55KW Bottom Ash Overflow Pump-1 & 2 have been completed, saving around 0.065 MU's per year.
- U#1 COH completed successfully in 35 days with SHR saving of 20 Kcal/kWh, APC Saving of 1.03% at Unit level, DM makeup improvement observed 0.11 %
- The PA-2A discharge bellow was replaced. In Mills A to G Mix air MS duct replaced with erosion-resistant plate, resulting in annual savings of approximately 1.64 MU.

Udupi TPP

- To reduce Flue Gas Exit losses, APH Hot & Intermediate Basket replacement carried out during AOH, Total 1728 No's of Basket were replaced. Impact on Heat Rate- 12 Kcal/Kwh; Impact on APC- 0.36% observed post implementation.
- NDCT fills replacement carried out in Unit#2 during AOH. A total of 135 No's Nozzles were found in damaged condition. All 135 No's of header dummies were opened and inspected for any choke. 03 Nos headers were choked by silt and the same was cleared by manual cleaning. Impact on Heat Rate- 3 Kcal/Kwh observed post AOH.
- Mill-2D overhauling carried out during U#2 AOH, Impact on APC- 55 KW (0.01%).
- Unit-2 Both FD&PA fans suction silencer replaced with modified design. Impact on APC- 52 KW(0.01%).
- Replacement of existing Tube lights, Sodium Vapor lamps, with LED lights for energy savings. By replacing with LED energy saving per day is 4.24 MWh.
- Plantation Drive –35414 No's of saplings planted in FY 24-25 as a measure towards enhancing carbon footprint.

Dahanu TPP

- Unit#1 HP heater 5 and 6 parting plate leakage attended, and net saving in heat rate of 8 Kcal/Kwh noticed which result ₹ 2.5 crore saving

Korba TPP

- 7 nos. CT fills (Shock wave type 21 mm flute size) replacement in Unit#2(6 nos.) and Unit#1 (one nos.) in place cross corrugated 19 mm flute and heat rate improvement 15 Kcal/KWH achieved.
- Replacement of HPSV lights of CHP area, BOP area, Track Hopper and BC 5A/5B area done with LED Lights, 24 MWh saving was achieved.
- APH exit temperature decreased by 8.88 Deg C after partial replacement (50%) of baskets (768 nos) and APH seals and sector plate replacement during major overhaul, due to which heat rate improved by 10.66 kCal/kWh.
- Mill#1A, 1B, 1C & 1E roller replacement done during FY 24-25. 1.25 MU saving was achieved due to reduced SEC.
- Feed water outlet temperature was increased by 9.06 Deg C after parting plate leakage arresting work of HP heaters due to which heat rate improved by 7.25 kCal/kWh.
- Mill#2E roller reversal done in FY 24-25. 0.24 MU saving was achieved due to reduced SEC.
- In U#1 Fan Power Consumption reduction of 5.92 MU was achieved.
- (ID+PA+FD by Duct leakages Attending, APH seals & sector plate replacement during major overhaul).
- In U#2 Fan Power Consumption reduction of 1.29 MU was achieved. (ID+PA+FD by Duct leakages Attending, HAD seal and leakage arresting work during short shutdown from 15th Nov-24 to 21st Nov-24).

- CEP#1B & CCCW pump of U#1 overhauling done during major overhaul. 0.01 MU savings were achieved.
- CEP & BFP#2B (U#2) R/C valve passing attended during short shutdown (from November 15, 2024 to November 21, 2024). 1.37 MU savings were achieved.
- Condenser tube bullet shot cleaning was done in major overhaul, due to which condenser vacuum was improved by 1.12 kPa resulting in heat rate improvement by 14.52 kCal/kWh.
- Condenser tube jet cleaning & water box cleaning done in short shutdown (from November 15, 2024 to November 21, 2024), due to which condenser vacuum was improved by 2.19 kPa resulting in heat rate improvement by 28.52 kCal/kWh.
- Stopped Poly Aluminum chloride dosing pump and new line erected for poly Aluminum chloride dosing by gravity. 6570 kWh Energy was saved during the year
- Process changes: For exhaust CPU anion pot resin washing, earlier practice was using forward washing as per manual and it was 40 times washing. By doing the process change by back washing, the same result was achieved in 12 times washing leading to reduction in DM water consumption and APC optimisation during the CPU regeneration process. By this 2400 m3 D M water and 1440 kWh saved during the year.
- MDBFP stopped during part load operation. (1.22 MU of energy saving achieved during the year)
- OCCW pumps stopped during winter season or during part load when CCCW water temperature maintains below 36 Deg (0.350 MU of energy saving achieved during the year).

Mahan TPP

- Replacement of conventional lights with LED lights led to reduction in lighting load by 110 KW.
- Unit-1 AOH and duct air leakages/ingress has resulted in improvement in draft power consumption by 0.15%
- Unit-2 AOH, both APH baskets replacement and duct air leakages/ingress has resulted in improvement in draft power consumption by 0.23%
- Unit-2 Both APH baskets replacement & seals correction and setting. APH air leakages reduced from 15.6% to 10.7%, resulted in improvement of flue gas exit temp by 6.1 deg C; thereby Gain of 6.7 Kcal/kwh in Unit Heat Rate.
- Unit-1 APH-1B baskets cleaning, seal setting and replacement of damaged HE baskets & APH 1A seal replacement and setting. Improvement of 2.5 Kcal/kwh
- Unit-1 Condenser tube cleaning and fills cleaning of CT-1B & CT-2B led to improvement in condenser inlet temperature by 0.7 Deg C; resulted in saving of 1.7 Kcal/Kwh.
- Unit-2 Coal burner replacement (24 nos), burners alignment and SADC correction, boiler water washing has reduced SH/RH spray substantially and resulted in saving in of 9.5 Kcal/kwh.

Godda TPP

- By optimising pressure setpoint of Transport Air compressor and attending leakages, TAC running hours and its Specific power consumption reduced, resulted in saving of 5.10 MU.
- DM make up reduction from 0.63% to 0.47% resulted in coal savings of 2089 MT.
- Unburnt carbon reduction in Fly Ash from 1.235% to 0.50% and Bottom Ash from 1.955% to 1.41% resulted in savings of 19180 MT coal.
- Switching off CT Fans during favorable ambient conditions in both units resulted in saving of 3.66 MU.
- Reduction of CEP VFD speed by optimising pump discharge pressure resulted in power savings of 0.98 MU.
- Controllable Loss reduction by optimising critical parameters like Main steam and Hot reheat temperatures etc. resulted in savings of 4022 MT coal
- Four Mill operation at part load resulted in savings of 0.25 MU.

- APC saving by reducing Primary Air to Coal ratio from 2 to 1.8 through PA Header pressure optimisation resulted in saving of 0.772 MU.

Tuticorin TPP

- Daily BTG operational parameter deviation were monitored and highlighted to operation and take necessary corrective action to operate the unit at optimal performance.
- 69,500kWh energy saved by replacing the halogen bulbs to LEDs
- Unit-2 APH baskets cleaning was done to improve the performance and APC reduction.
- Condenser air ingress was identified by helium leak test method and leakages were attended.
- Turbine high energy drain valves four numbers were replaced to reduce the losses.
- IDCT cells damaged V-bars replacement and nozzle cleaning done in six number of cells and improvement was observed.

b) The steps taken by the Company for utilising alternate sources of energy:

Mundra TPP

a. Generated 35743 kWh (till March 31, 2025) power through solar panels installed inside APL-Mundra plant.

Tiroda TPP

- Continuing admin building loads from installed 10kW solar panels. Total 14807.28kwh was generated for this FY.

Kawai TPP

- 14.53 MWh Solar power generated from solar panels installed inside APL-Kawai plant (Roof top solar panels).

Raigarh TPP

- Continuing SWYD loads from installed 10kW solar panels (Roof top solar panels). Total 12858 kwh was generated for FY 2024-25.

Raipur TPP

- 9.402 MWh Solar power generated from solar panels installed inside APL Raipur plant (Roof top solar panels).
- Six battery-operated vehicles were procured and are now being used for in-plant movement, replacing one diesel-operated vehicle. This transition to cleaner energy source has improved the carbon footprint.

Dahanu TPP

- Continuing admin building loads from installed 50 kW solar panels. Vanagaon AAQM 1.3kW Roof top and Ashagad AAQM 1.7kW
- Roof top total 5299009 kwh was generated for this FY.

Korba TPP

- 649 MT biomass pallets (393 MT in U#1 & 256 MT in U#2) was fired during FY 2024-25 (Mar'25).

Godda TPP

- 30 Solar lights were installed.

c) The capital investment on energy conservation equipment:

Mundra TPP

- Capital Investment of ₹ 76.5 lakhs On 9 no's of CT Fan blades replacement in Ph-2
- Capital Investment of ₹ 1.5 crore On Centrifugal compressor replacing Screw compressor to save 0.03 KWh/CFM.
- Capital Investment of ₹ 2.82 crore On Unit-2 APH Basket replacement.
- Capital Investment of ₹ 6.2 crore On Unit-6 APH Basket replacement.
- Capital Investment of ₹ 1.1 crore On Unit-8 Turbine Diaphragm replacement.

Tiroda TPP

1. RCM & APM Implementation for performance monitoring and improvement: 2.6 crore.
2. APH Basket replacement in Unit 2&5 - ₹ 7.34 crore.
3. DCS Controller processor, METS PLC TDBFP, Ash handling PLC upgradation: 4.37 crore.

Kawai TPP

- Procurement and Replacement of Unit-2 APH Basket (Intermediate & Cold End): ₹ 1.89 crore.

- Procurement and Replacement of HPSV lamps with LED lamp in CHP & BOP area: ₹ 1.00 crore.
- Procurement and replacement of Old AC's with energy efficient Inverter AC's: ₹ 0.62 crore.

Raigarh TPP

- 1138 numbers of conventional lights replaced with LED light at various location of the plant with a capital investment of 36 lakhs.

Raipur TPP

- U2 Both APH hot end basket replacement during COH: ₹ 4.05 crore
- NDCT Fills 3500 M3 replacement carried out during COH: ₹ 2.87 crore
- BA Overflow Motor VFD Installation (1 no.): ₹ 3.08 lakhs

Udupi TPP

- Capital investment on energy conservation equipment: ₹ 8.4 Cr
  - i. Replacement of Hot & Intermediate baskets for APH – ₹ 7.0 crore
  - ii. Replacement of existing Tube lights, Sodium Vapor lamps, with LED lights for energy savings – ₹ 1.4 crore

Korba TPP

- CT fills replacement was carried out in 7 Cells (6 in U#2 & 1 in U#1): Capital Investment - ₹ 2.43 crore

Mahan TPP

- Cost of LED Lights – ₹ 28.07 lakhs

Godda TPP

- capital investment on energy conservation equipment: ₹ 12 lakhs

B. Technology Absorption:

(i) The efforts made towards technology absorption:

Mundra TPP

- Successfully installed Debris filter in Unit-8 to prevent condenser tube choking.
- Successfully completed installation of Aluminum scaffolding project to provide safe approach for inspection and maintenance activity and improve human safety and reducing Overhauling scaffolding erection/dismantling time by approximate 25 Hrs.
- Use of scissor lifter to reduce boiler tube leakage repairing time by 9 Hrs.
- Project Drishti for Predictive maintenance and Anomaly detection Implemented VISTA What-If (M/s Black & Veatch) for strategic decision making analyzing the impact of coal quality on performance of power plant and reduction in power generations cost.
- Successfully installed Advanced Road Tanker Earth Monitoring System.
- Boiler IDAS System (Chinese make) is upgraded with MASIBUS make 8040 Datalogger system in Unit-5
- Development of DCS logic and graphics for GCV compensation for fuel control.
- Development of DCS graphic for Boiler Water wall metal temp
- Marked operation steps were disabled from PLC logic for smooth operation and to avoid any false operation of CPU in auto mode
- Indigenisation of existing Chinese make vibration system of ID / PA fans with CTC make in Unit-2
- Replacement of existing ABB makes BFP scoop actuator with BECK make scoop actuator in BFP-2C to overcome hunting issue.
- Installation of Fire LHS (Linear heat sensing) cable at U#5 coal mill area cable tray.

Tiroda TPP

- APH Basket replacement
- Replacement of conventional HPSV, FTL by LEDs.
- IFC for Compressor.

DCS Control processor upgradation

Kawai TPP

- External ICCP system in Cold Water (CW) pipes.
- Use of advanced maintenance techniques i.e. Boiler quick erect scaffolding during Unit-2 annual overhauling for optimisation in unit overhauling time, enhancing unit availability and improvement in overhauling quality.
- Implemented 5S and Quality Circle practices for workplace management, including adherence to detailed floor plans for Unit overhauling.
- Use of SAP mobility application for remote access in the PTW system thereby enhancing PTW system.
- HV Detector Mounting In Man lifter Basket, thereby enhancing human safety.
- Inhouse development of test bench for calibration of Fuel Injection Pump (FIP), resulting in cost savings of ₹ 2.3 lakhs approx. (For 16 nos. FIP's).
- Back door Interlocking System for 11 KV Switchgear and 6.6 KV Switchgears, thereby enhancing human safety & unit reliability.
- Installation of LED Display Board for LEL at H2 plant with 6 nos. H2 gas leak detectors LEL values displayed on LED Board for clear visibility at outside the H2 plant.
- Installation of Biometric system in forklift at warehouse to avoid unauthorised access and real time data monitoring.
- New travel and slew encoder installed and commissioned at SR-2, which will show the exact position of Stacker reclaimer in SCADA.
- Inhouse modification of suction line of flame scanner cooling fan from cold PA duct for improvement in system reliability and redundancy as this modification will keep both the existing AC and DC Scanner fan standby in case of emergency.
- **Major ACoE initiatives undertaken:**
  - Combustion & RH spray optimisation_v2 – Machine learning based optimisation tool has been developed using python and Stream lit to provide recommendations to operation for SHR improvement. This tool is an upgraded version of the initial tool developed by consultant.
  - Soot blowing optimisation_v2 – An upgraded tool has been developed to optimise soot blowing in 1st and 2nd pass which provides both schedule and condition-based recommendations.
  - CT fan fills choking prediction – A tool has been developed which predicts the real time choking & in each CT fan fills. This tool helps the maintenance team to prioritise their work, have real time monitoring and gives the operation an idea about the efficient fans. Recommendations are being generated for nozzle and LABSA cleaning while considering choking %.
  - Coal crushing/milling cost optimisation to control APC – A tool has been developed to provide recommendations to operation for mill PA flow and to maintenance in form of mill maintenance index to prioritise maintenance on mills to optimise APC.
- **Digital Transformation Initiatives:**
  - Digital Contactless Boiler Expansion Indicator for real time monitoring, Enhanced system reliability, safe operation and Historical back up for analysis.
  - Use of digital furnace temperature mapping and using AI/ML to predict furnace temperature with available real time data.
  - Developed Power BI Dashboard for monitoring of major plant KPI's.
  - QR code-based Power Transformer maintenance / condition monitoring for Remote monitoring of power transformer healthiness, Early detection of any abnormality, Ease to perform trend analysis and saving time for examining equipment performance.
  - Lifting Tools & Tackles Details Through QR Code at Work Location thereby providing TPI information immediately, reduced paperwork & ease of access.

- Digital management of condition monitoring using Mobile based thermography of electrical Motors and switchgears for Hot spot or high temperature, real-time high and low temperature capture, Comprehensive temperature analysis for spot, line and area, supported with the thermal imaging mobile software, Real-time image sharing with the help of thermal camera and mobile for fast and easy communication.
- Automation of Material Issue through Fiori Application in phone/ Tablet thereby saving time and paper consumption.
- Safety Initiative for automatically released the access control gate at service building in case of fire, through digital communication between Fire Alarm System PLC and Security access control system.

Digital intervention for immediate access to protection relay settings, test reports and drawings on mobile at site thereby reducing troubleshooting time and time savings.

Raigarh TPP

- Deployed advanced analytics based initiatives like ML based Coal Cost Optimisation and APC Optimisation
- Lean Six Sigma (LSS) project led to cost saving of 1.89 crore through specific water consumption reduction and AHP, ESP, CHP area APC reduction.

Raipur TPP

- **Digitalisation of Material Vehicle Gate Pass System through SAP BTP platform (Phase 1):** Reduction in overall process time by approximately 50% (from 14 minutes to 7 minutes) for both inward and outward material vehicle movements. Elimination of paper-based processes, reducing printing and storage costs. Improved resource utilisation by minimising manual interventions.
- **Migration of Apconic Application to New Application for SAP BTP Integration:** Enhanced features and a more user-friendly interface.
- **Digitalisation of Vehicle Pass System and Safety Inspection of Vehicles (Phase 1):** Timesaving and environmentally friendly. Reduced wait time, with the current turnaround time (TAT) for the entire process decreasing from around 3 days to 2-3 hours. Reduction in paper waste and carbon footprint.
- **AI Smart Electrical Isolation Handle Locker at Switch Gear Unit:** Enhances electrical safety and contributes to the realisation of zero harm.

Udupi TPP

- AI implementation of Arc Suit Flash Detection project towards electrical safety.
- New earth integrity monitoring system installed and commissioned in LDO unloading system.
- Many Data Analytics projects on Asset Health Index (AHI), AI Smart Electrical isolation handle locker, ML Model deployment route tunnel in local IT network were taken.

Dahanu TPP

- Upgradation of Analog Governor (ISKAMATIC)to Digital Governor (Max DNA).
- Replacement of flame scanners from Analog to Digital for detection of low frequency signals for flexible operation low load condition
- Digitalisation absorbed in the following project at ADTPS
- Automated Email Alert of low Diesel stock
- Provision of Camera for Mill Internal inspection to eliminate Confined space Hazards
- Reliability improvement of Chlorine leak detectors through digital technology
- Installation of safe load indicator
- Installation of safety projector light on EOT Cranes
- Provision of digital hydrant pressure at main control room, fire water pumphouse & fire station
- Ensuring reliable functioning of turbine oil by performing MPC oil test.

- Improvement in reliability of DC system by Installing advance battery chargers
- Maintaining business continuity through vibration analyzer upgradation.
- Improvement in monitoring of DC system by online battery monitoring system

Korba TPP

- DSM monitoring system - KPL Korba commissioned DSM system successfully in FY 2024-25. Total 12 no's Apex100 meters installed for communication in DSM system (06 Nos in 400KV switchyard & 06 Nos in CCR).
- OPMS implementation carried out at KPL site.
- Air sealing technology implemented in PLSH and MRH inside penthouse to arrest false air ingress and minimise ash leakage.
- RFID system (for 100MT WB & 60MTWB-1) installed with SAP integration.
- Boiler Tube Leakage Detection (BTLD) installation done in both units for early boiler tube leak detection consequently avoiding secondary damages.
- Belt conveyer fire detection system upgradation- UV (Ultraviolet) detectors replaced by the IRD (Infrared Detector) detectors. This upgradation has improved accuracy and faster response to fire incidents. A total of 20 UV detectors are installed.
- Floating Pontoon fabricated and installed along with Goodwin make dewatering pump in ash dyke to control ash dyke water level
- Chemical saving by adopting new technology, Using auto pipet instead of glass pipet (conventional technology).

PJT failure detection mechanism – PJT failure detection mechanism developed in-house and installed. It detects the PJT valve passing & notify the desk engineer at control room. Early detection & rectification reduces the loss of instruments air.

Mahan TPP

- Implementation of Asset-360 (M/s B&V) in U-2 for online Monitoring & Diagnostics of equipment to improve performance and enable early detection of Potential Critical System Failures
- CFD Analysis conducted in U1 and U2 boilers for assessment of flow distribution, recommendations (diverter plates) were implemented during planned outages to achieve uniform flow distribution.

Godda TPP

- Online Unit Heat Rate Dashboard display in DCS to reduce controllable losses on real time basis.
- Asset performance management tool deployed to start monitoring predictive anomaly detection.
- Realtime display of Mill Operating Window in DCS.

Tuticorin TPP

- DCS system upgradation done October 2024.
- Na analyzer installed in CEP discharge to have a early detection condenser puncture.
- DSM software upgraded as per CERC amendment.
- 400Kv transmission line conductor defects attended by providing bypass conductor.
- Main turbine TV spindle upgraded to higher grade material to avoid frequent failure.

(ii) The benefits derived like product improvement, cost reduction, product development or import substitution:

Mundra TPP

- Reduction in Auxiliary Power Consumption
- Improvement in Heat-rate
- System reliability improvement

Tiroda TPP

- Monitoring & Reduction of Auxiliary Power Consumption
- Improvement in Heat-rate
- System reliability improvement

Kawai TPP

- Monitoring & Reduction of Auxiliary Power Consumption
- Improvement in Heat-rate
- System reliability improvement.

- Enhancement in human and equipment safety.

Raigarh TPP

- Improvement in Net power export
- O&M Cost optimisation

Raipur TPP

- Reduction of specific oil consumption
- Monitoring & Reduction of Auxiliary Power Consumption
- Improvement in Heat-rate
- Reduction of Startup time
- Reduction in railway demurrages & EOL (Internal reasons)
- Improvement of Belt Utilisation Factor
- Reduction in Specific raw water consumption
- Reduction in DM water consumption
- System reliability improvement

Udupi TPP

- Post obsolescence of online vibration monitoring system supplied by GE, an alternate system implemented by Forbes Marschall, which resulted in cost saving of approximately ₹ 3.00 crore in product substitution category.
- In-house in-situ balancing of PA Fan carried out successfully, which saved approximately 35 lakhs, which would have occurred if the same was carried out at external facility.
- RFID based confined spaced entry system installed and commissioned to monitor people entering any confined space. It uses IOT sensors and cloud-based applications to track the people inside and provide alert if anyone is inside for extended period.

Dahanu TPP

- System reliability improvement
- Reduction of specific oil consumption
- Reduction of Auxiliary Power Consumption
- Improvement in Heat-rate

Korba TPP

- Accuchain for coal feeder calibration procured. Coal feeders' calibration for both units carried out by using Accu-chain
- Flexible operation implementation completed in both units: CCS & associated loops tuning for flexible operation carried out.
- FGMO implementation completed in both units.

Mahan TPP

- Monitoring & Reduction of Auxiliary Power Consumption
- Improvement in Heat-rate
- System reliability improvement:
  - Upgradation of Unit-2 DCS and PLC's to address obsolescence.
  - Installation and commissioning work of RWIS remote monitoring system.

Godda TPP

- Reduction in Auxiliary Power Consumption
- Improvement in Heat-rate

System reliability improvement

iii) In case of imported technology (imported during the last three years reckoned from the beginning of the financial year)

NIL

(iv) The expenditure incurred on Research and Development

Mundra TPP

- 3.22 crore JPY (Equivalent to ₹ 1.9 crore) against the feasibility study of Ammonia Co-firing

C. Details of Foreign Exchange Earnings and Outgo of the Company during the year:

The particulars relating to foreign exchange earnings and outgo during the year under review are as under:

(₹ in crore)

Particulars	2024-25	2023-24
Foreign exchange earned	8,395.54	7,370.11
Foreign exchange outgo	13,089.21	17,041.58