JAIPRAKASH POWER VENTURES LIMITED

JAYPEE GROUP

JAYPEE NIGRIE SUPER THERMAL POWER PLANT

(A Unit Of Jaiprakash Power Ventures Limited)

24th National Award for Excellence in Energy Management 13th -15th Sep 2023

Team Members :-

1) Nadim Ahmad Khan- Vice President (DM Plant)

2) Manohar Lal Jaiswal – Plant Engineer (Operation)

3) Chetan Lohiya – Senior Engineer (EEMG)

4) Himanshu Gupta- Assistant Manager (Environment)

Our Source of Inspiration

Hon'ble Shri. Jaiprakash Gaur
(Founder Chairman of Jaypee Group)

Shri. Manoj Gaur
(Executive Chairman of Jaypee Group)

Shri. Suren Jain
(Managing Director of JPVL)

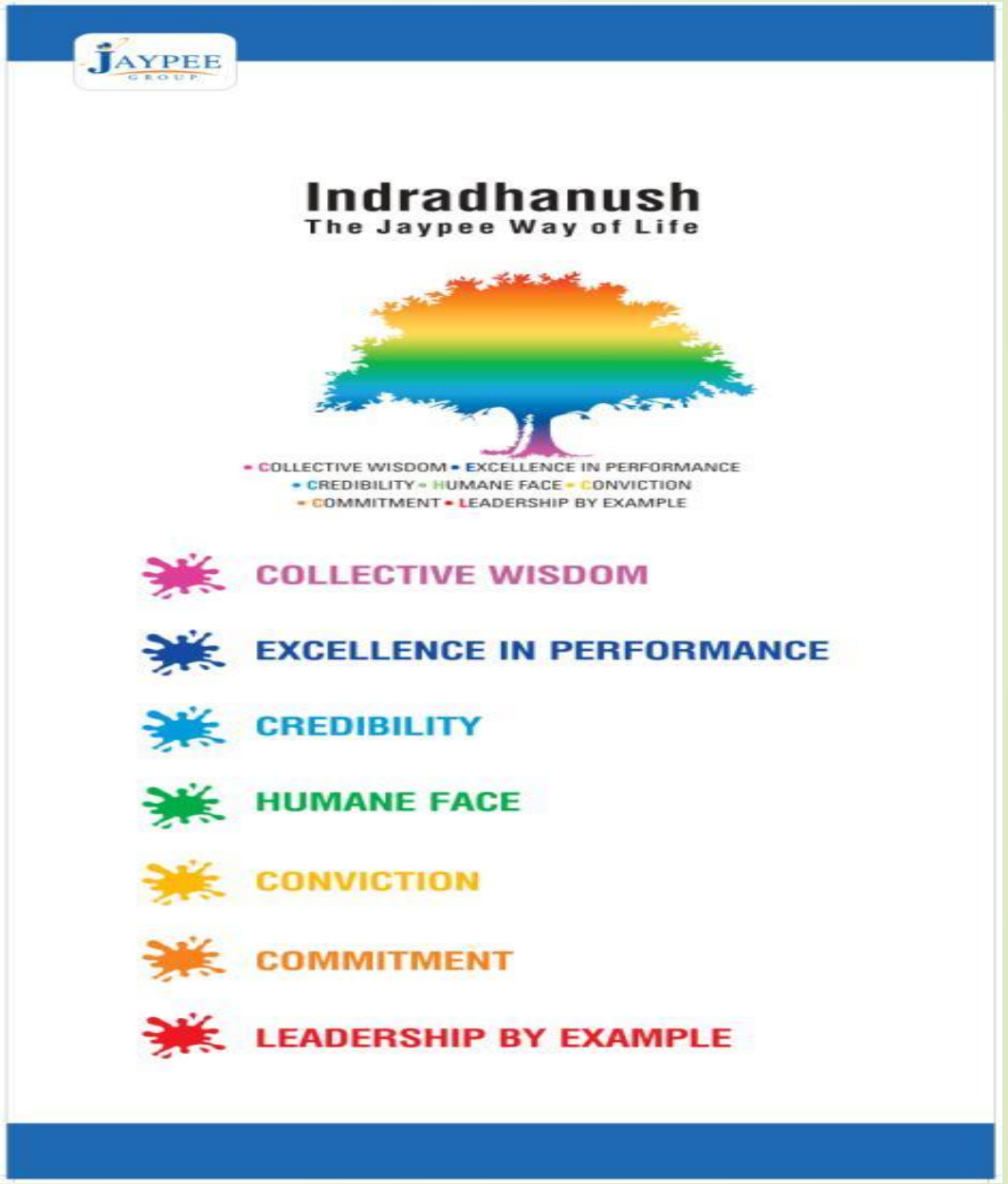
JPVL Organisation Vision & Mission

Vision

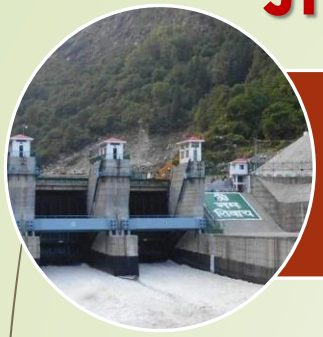
- To be the most efficient Power company of the country with optimum utilization of resources, to provide power to all, while bringing reward to all its stakeholders continuously.

Mission

- To develop & operate technically sound projects in cost effective manner.
- To ensure best monitoring & maintenance techniques which would offer us a competitive advantage in the industry.
- To become a world class, diversified & transnational power company with diversified sources of revenue & low business risk.
- To play a significant role in the growth of the Indian power sector.
- Expand our installed capacity to develop a superior portfolio of assets.
- Maintain a high level of social responsibility in the communities in which we operate.
- To uphold the principles of trust, corporate governance and transparency in all aspects of business.



JPVL Total Generation Capacity– 2220MW

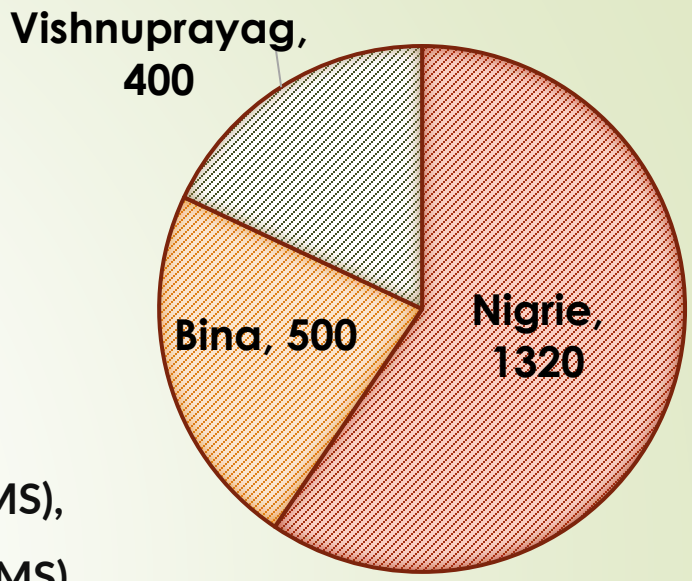


Vishnuprayag
Hydro Power Plant
4X100 MW

Jaypee Bina
Thermal Power Plant
2X250 MW

Jaypee Nigrie
Super Thermal Power Plant
2X660 MW

Amelia (North) Coal Mines
3.36 MMTPA Mining Capacity



- Certifications:

  ISO 9001:2015 (QMS),

  ISO 14001:2015 (EMS),

  ISO 45001:2018 (OHSAS),

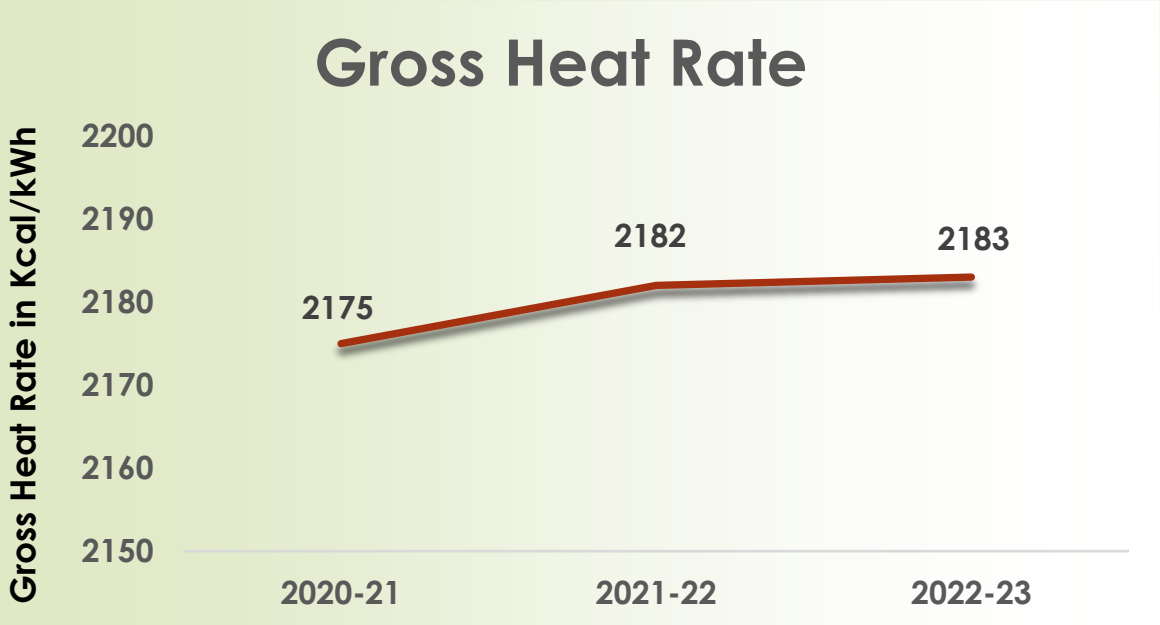
  ISO 27001:2015 (ISMS)
- Boiler Details: L&T MHI Make, 2322 TPH, Supercritical Twin Vortex, Coal Fired Boiler.
- Turbine Details: L&T MHI / MHI Reheat and Condensing, 3 casing, 4 exhaust flow type (TC4F-30).
- COD Unit # 1 03/09/2014
- COD Unit # 2 21/02/2015
- 100% Transmission Line availability

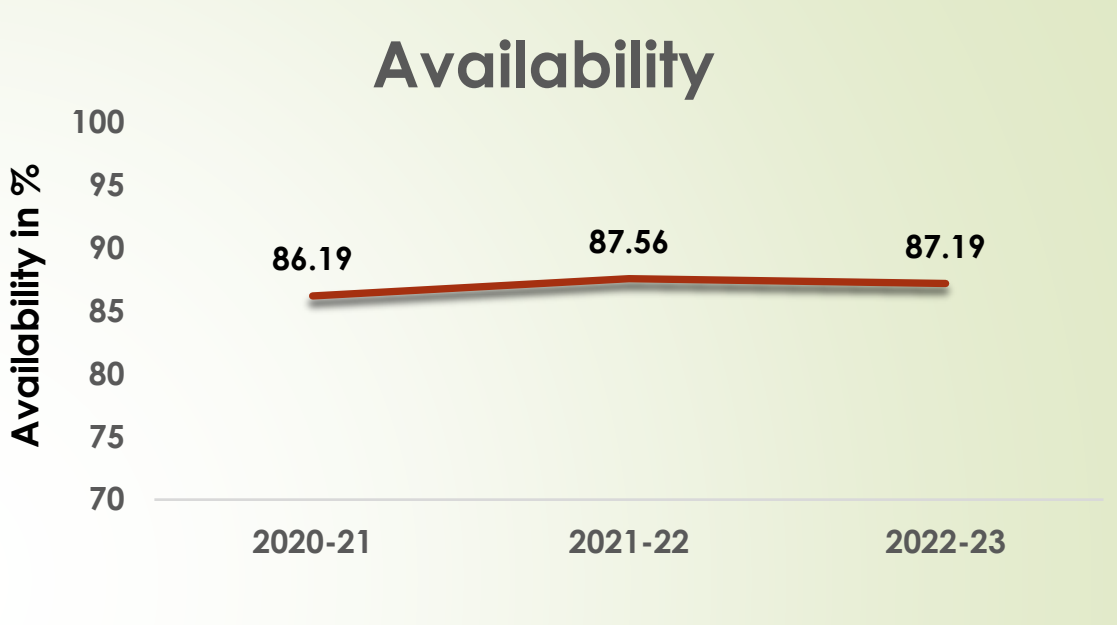
Glimpses of JNSTPP, Nigrie

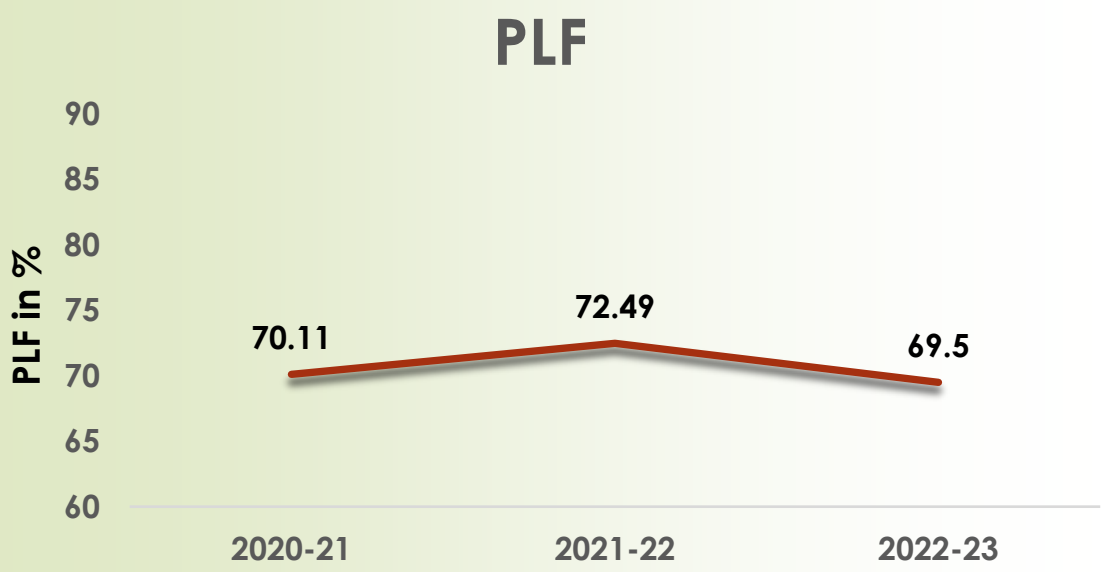
JNSTPP, Nigrie -Station Performance FY 2022-23

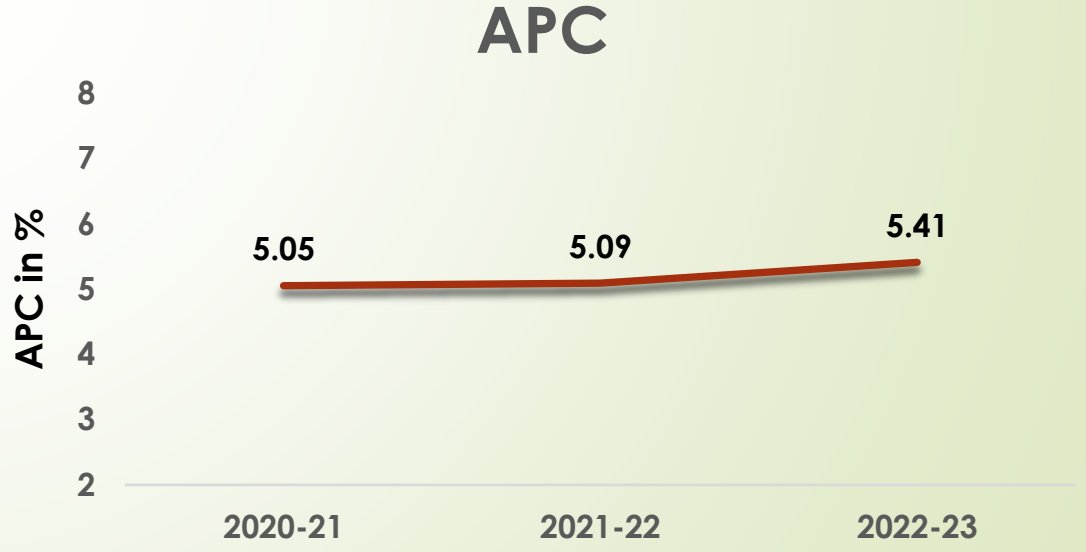
Sr. No.	Parameters	Unit	FY 22-23
1	Annual Generation	MU's	8036.35
2	PLF	%	69.50
3	Availability	%	87.19
4	Gross Heat Rate	Kcal/kWh	2183
5	APC	%	5.41
6	Boiler Efficiency	%	85.22
7	Turbine Heat Rate	Kcal/kWh	1860.3
8	DM Water Make Up	%	0.37
9	Sp. Raw Water Consumption	M^3/MWh	2.05
10	Sp. Oil Consumption	ml/kWh	0.313

Station Performance - Consecutive 3 Years









Energy Benchmarking

FY 22-23	Target	Achieved	Competitor-1	Competitor-2	Competitor-3
Plant Name	JNSTPP	JNSTPP	PPGCL, Prayagraj	Mahagenco, Koradi	NTPC, Barh
Gross Heat Rate (Kcal/kWh)	2175	2183	2222	2486	2163
Aux Power Consumption (%)	5.00 %	5.41%	5.75 %	7.34 %	5.87 %
PLF (%)	75 %	69.50 %	72.04 %	63.88 %	75.79 %

PAT CYCLE	PERIOD	ASSESMENT YEAR	NHR TARGET	NHR ACHIEVED	ESCERTS
PAT CYCLE - V	2019-22	2021-22	2303.34	2294.74	5469*

- *PAT CYCLE-V M&V AUDIT : AEA RECOMMENDED FOR 5469 ESCERTS –Yet to be Notified By BEE

Road Map to Achieve National Energy Benchmarking

Internal

- **Daily Monitoring** of Key Parameters related to Heat Rate, APC, DM Cycle Make up & other parameters.
- **Monthly Performance Test** Boiler Efficiency, Turbine Heat Rate, NDCT & Condenser Effectiveness, Fan & Mill Performance etc.
- **Monthly ORT -** Detailed review of station parameters and comparison with NTPC & other similar plant performance.
- **Monthly Monitoring of Deviations in HMBD –** Corrective actions based on parameter deviations.
- **Interdepartmental Benchmarking** –Quarterly Monitoring of KPI targets & progress at department level.
- **Performance Test- Pre & Post Overhauling** Pre Overhauling Test to find the gap with respect to design for implementation during overhauling & evaluating the performance of unit by Post Overhauling Test.

External

- **Site Visits to Similar Capacity Plants** like NPL Rajpura, Koradi Power Station & others.
- **Sharing of Best Practices** & incorporating the learnings through Participation in Paper presentations, Awards, Workshops etc.
- **Performance Test by Sector Expert** External Agencies like NTPC, CPRI, EPRI, STEAG & TUV etc.
- **Implementation of New Technologies** from similar power plants.

List of Major Encon Project Planned In FY 2023-24

- Chemical coating of ACW pump, CW Pump, Fire Fighting Pump, Vacuum pump.
- Optimisation of Air short circuiting at NDCT # 1.
- Unit # 1 Condenser HP Jet Tube Cleaning.
- Unit # 1 RAPH Washing & Seals Servicing .
- Unit # 1 SCAPH Washing.
- Unit # 1 Air & Flue Gas Path Duct Repairing & NMEJ replacement.
- Unit # 1 ESP Washing & Leakage Rectification.
- Unit # 1 Turbine Seal replacement.
- Unit # 1 High Energy Passing Drains replacement with Zero Leak Valve.
- Replacement of Conventional Light's with LED's.
- Improvement in Unloading Duration of Instrument Air Compressor Ash Handling Plant.

Energy Saving Projects Implemented In Last 3 Years

Year	Nos. of Energy Saving Projects	Investments (INR Million)	Electrical Savings (Million kWh)	Thermal Savings (Million Kcal)	Total Savings (INR Million)
FY 2020-21	06	0.68	1.2934	0	3.065
FY 2021-22	16	17.38	6.596	32348.8	56.34
FY 2022-23	4	343.33	4.4392	109296.1	204.39

Major Encon Project FY 2020-21

Sr. No.	Name of Energy Saving Projects	Investments (INR Million)	Electrical Savings (Million kWh)	Thermal Savings (Million Kcal)	Total Savings (INR Million)
1	Energy saving by replacement of 70 Watt HPSV Lamp by 27 Watt LED lamp	0.44	0.183	0	0.434
2	Energy saving by replacement of 400/250/150 Watt HPSV Lamp by 27/30/50 Watt LED lamp	0.24	0.269	0	0.6375
3	Light Optimization of 70 Watt HPSV in Boiler & ESP Unit#1 &2	Nil	0.501	0	1.1874
4	Energy saving by stopped the all air dryer for STG-II Compressor for three months in a year.	Nil	0.190	0	0.4503
5	Energy saving by changing the Set pressure (Loading & Unloading) of Stage-I Compressors.	Nil	0.150	0	0.356

Major Encon Project FY 2021-22

Sr. No.	Name of Energy Saving Projects	Investments (INR Million)	Electrical Savings (Million kWh)	Thermal Savings (Million Kcal)	Total Savings (INR Million)
1	Replacement of Conventional lights with LED	0.61	0.1767	0	0.4647
2	Energy Saving by arresting of Air Ingress in ID Fan Line at Boiler-1 by duct repairing	1.652	0.7186	0	1.8899
3	Energy Saving by arresting of Air Ingress in ID Fan Line at Boiler-2 by duct repairing	7.446	2.167	0	5.6992
4	Reduction of RAPH Flue Gas Exit Temperature At Boiler-1	0.687	0	15685	18.90
5	Reduction of RAPH Flue Gas Exit Temperature At Boiler-2	5.906	0	16369	19.73

Major Encon Project FY 2021-22

Sr. No.	Name of Energy Saving Projects	Investments (INR Million)	Electrical Savings (Million kWh)	Thermal Savings (Million Kcal)	Total Savings (INR Million)
6	Energy Saving by Reduction of Compressed Air Pressure of Instrument Air Compressor (BOP)	0	0.2031	0	0.5342
7	Energy Saving by Reduction of Compressed Air Pressure of Service Air Compressor (Stage-1 CAC)	0	0.7887	0	2.0743
8	Energy Saving by Reduction of Compressed Air Pressure of Service Air Compressor (Stage-2 CAC)	0	2.2475	0	5.911
9	Energy Saving by Reduction of Compressed Air Pressure of Instrument Air Compressor (AHP)	0	0.1040	0	0.2735

Major Encon Project FY 2022-23

Sr. No.	Name of Energy Saving Projects	Investments (INR Million)	Electrical Savings (Million kWh)	Thermal Savings (Million Kcal)	Total Savings (INR Million)
1	Unit # 2 Burner Replacement & Repairing, Mill Roller Tyre Replacement.	280	0	48953.8	84.09
2	Unit # 2 Turbine Capital Overhauling & HIP Seal Fins Replacement, Condenser HP Jet Cleaning	51.14	0	60342.3	103.66
3	Unit # 2 RAPH Basket Cleaning, Sector Plate Replacement, Duct Welding, Damper Repairing & Fan Maintenance	11.80	4.34496	0	16.29
4	ACW Pump Chemical Coating	0.387	0.094257	0	0.35

Innovative Projects 2022-23

1. Replacement of High Energy Drain Valve by Zero Leak Valve.

- No. of Valve Replaced :16 Nos.
- Yearly Thermal Savings :6,098 Million kcal.
- Cost Benefit: Appx. 43%.

2. Caustic Flakes Dosing in Pre-treatment Plant.

- Caustic Flakes Consumption : 0.31 PPM (0.000031%).
- Avg. pH of Clarified Water: 7.84.
- Benefit: Reduction in Water Pipe Line Corrosion & maintenance cost of pipe.

Ash Utilisation – Last 3 Yrs

Particulars	UOM	FY 2020-21	FY 2021-22	FY 2022-23
Ash Stock in Plant (yard + pond)	Tons	2,19,051.80	2,18,457.44	3,83,521.93
Ash Generated	Tons	14,39,906	15,79,399	14,54,697
Ash Utilization	%	100.04	89.55	100.09
Ash Utilized in manufacturing of cement/concrete - other	%	68.21	72.16	74.43
Ash Utilized in Fly Ash Bricks	%	0.80	2.23	4.63
Ash Utilized in Mine filling	%	NA	NA	8.48
Low Lying area filling	%	30.99	25.61	12.45
Expenditure on Ash Utilization (Annual)	INR (Lakh)	1076	1161	1911

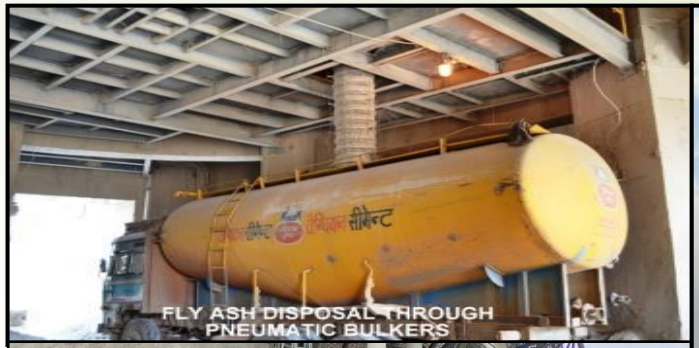
Ash Handling done through various methods in FY 22-23

Ash Handled (Wet Mode) 24.96 %

Ash Handled (Dry Mode) 75.04 %

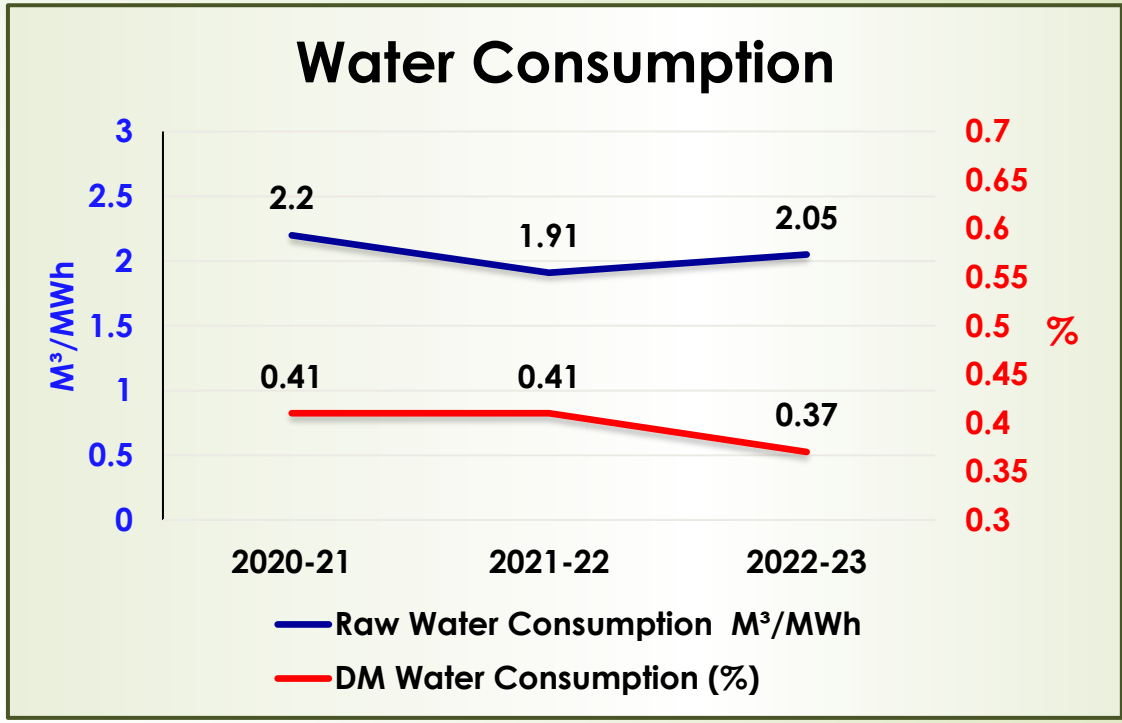
Ash Utilisation – Best Practices

- Storage silo of 20,000 MT capacities (4-5 day storage capacity)
- 2 Nos Automated Ash Unloading facility.
- Ash Pond Top layer always covered with water .
- 100% Fly Ash collected in Dry Form.
- Two fly ash line directly connected to receiving fly ash bin of 450 MT capacity in Cement Grinding Unit of 02 MTPA capacity.
- Closed Bulkers are only allowed for Dry ash transportation.
- Tarpaulin covered vehicles used for low lying area filling.
- Ash Dyke has been constructed with HDPE lining on inner side and over that PCC (75mm) layer.
- Ash pond Structural Stability Study was got done by competent third party as per MoEF & CC guidelines.
- Regular Water Sprinkling arrangement in and around the Fly Ash dispatch Area, associated roads and on ash pond bunds whenever evacuation of ash from ash pond is carried out.



Water Management & Best Practices

- 100% ZLD implemented and specific water consumption below prescribed limit of 3.5 m^3/MWh
- Daily monitoring of reservoir level & filled when turbidity low in the river.
- Avoiding filling of the reservoir when turbidity high in rainy season.
- Water is stored in the reservoir long enough for reducing turbidity to optimize chemical consumption.
- The frequency of sludge discharge from the clarification system is controlled due to the low turbidity of reservoir water.
- Utilization of RO reject water for dust suppression in CHP area & internal plant roads by regular water sprinkling.
- Mixed Sludge Water from PTP & WWTP disposed in the ash sludge tank and the decanted water reused for deashing purpose.



- DMF & ACF Backwash water of DM Plant treated at PT Plant & reused.
- Daily Close monitoring of Raw Water, CT Makeup & DM Water consumption and Pump Running Hrs and reservoir water levels.
- 100 % Ash Water Recirculation System. Ash Water ratio being maintained approx 1: 2.8.
- Keep eye on water clarity during bottom ash deashing for optimum raw water consumption.
- Yearly Water Saving: 6 - 6.5 % of Yearly Raw water Consumption.
- The Sewage water is being used in horticulture after treatment.
- The Sludge of STP is used as manure for soil conditioning.
- Collection of all effluents in CMB & treated to meet the prescribed norms to reused in Cooling Tower Makeup and HVAC system.

Environment Management - Emission

Particulars	UOM	FY 2020-21	FY 2021-22	FY 2022-23
Generation	MUs	8106.41	8381.88	8036.35
Total CO2 emissions per KW of generation	Ton/kWh	0.000609	0.000610	0.000577
Current Sox emission at Full Load	mg/Nm3	1262.65	1276.11	1389.20
Current Nox emission at Full Load	mg/Nm3	234.81	209.41	229.15
Particulate matter	mg/Nm3	39.61	44.20	38.87
Mercury	mg/Nm3	ND	ND	ND

For SOx Emission Reduction:

Flue Gas Desulphurization (FGD) unit shall be installed for both Boiler within the prescribed timelines of MoEF&CC. Commercial bids from the bidders has been received on 18/07/2023 & Placing of Order is under process.

For NOx Emission Reduction:

Low NOx Burner have been installed (48 Nos. each boiler) & at top elevation Additional Air Nozzles have been provided.

Environment Management- Best Practices

For Particulate Matter Reduction:

- Highly efficient (Efficiency 99.95%) BHEL make Electrostatic Precipitators (ESPs).
- Adequate Air Pollution Control measures such as Dust Extraction System (Cyclone followed by Bag Filters).

Infrastructure for Emission Monitoring & Control

- Continuous Emission Monitoring System
- Ambient Air Quality Monitoring System
- Coal Pre Wetting system installed in Wagon Tippler.
- All Conveyor Belts are covered in CHP area .
- Water sprinkling system installed in Coal Yard.
- Water sprinkling arrangement near Fly Ash silo area.

Environmental Management Practices:

- Dust Suppression System
  - Jet Sprinkler type
  - Dry Fog
- 33% of total area has been developed as Green belt area within plant i.e. Total 5.785 Lac saplings have been planted over an area of 144.21 hectares of suitable native species.
- JNSTPP, Nigrie have taken membership from authorized TSDF site for Hazardous Waste Management.

Environmental Management Practices

- 100% coal transportation through railways.
- Plant roads made Pucca (Concrete) and maintained.
- Regular Water Sprinkling on Plant roads.
- Road Sweeping Machine purchased and Operationalised for cleaning.
- Ash Dyke has been constructed with HDPE lining on inner side and over that PCC (75mm) layer.
- Closed Bulkers are only allowed for Dry ash transportation.
- In-House Truck Tyre Wheel Washing Facility.
- Good housekeeping practices are adopted to avoid leakages, seepages, spillages etc.
- Municipal Solid Waste is collected door to door in Township and also from Waste bins in Power plant area on regular basis, after collection & handling segregation of waste carried out.
- Operationalisation of 1000 KLD and 100 KLD STP and treated water being used in horticulture.

Environment Management

Alternative Fuel - Biomass

- JNSTPP Nigrie, started Biomass Cofiring in FY 2021-22.
- Agro Residue Non Torrefied Biomass Pellet.
- Total Biomass cofired till July23 : 673.32 MT.
- Green Power Generated : 1.13 MU's.
- CO_2 generation averted : 413 MT
- Helping Beneficiaries to meet RPO Obligations.

Electric Vehicle's

- JNSTPP Nigrie, Purchased 03 Nos. of Tata Nexon EVs, promoting electric vehicle for reducing emission.
- Around the plant area 02 Nos. of Electric Vehicle Charging Station developed.
- Total Vehicle run till July23 : 22462 KM
- Total Diesel Saved till July23 : 2275 Liter.
- CO_2 generation averted : 6.06 MT
- Reduced Noise Emission.

Beyond the Fence Best Practices -CSR Activity

Healthcare:

- Well equipped hospital. Trained doctors and medical staff
- Pathological, radio graphical and minor surgical facilities.
- 03 nos. of modern ambulances.
- Free Cataract operation to 26 peoples.
- Free Health Check-Up & Health cards provided to the 229 students.

Education:

- Jay Jyoti School (CBSE Class X, English Medium).
- Sardar Patel Uchchatar Madhyamik Vidyalaya (State Board Class X, Hindi Medium).
- Free uniforms, books, scholarship and mid-day meals.
- Construction of Boundary wall in Govt. Middle School, Nigrie

Skills Development:

- The Kutir Udyog in our Township runs tailoring classes for women
- Honey bee keeping.
- The scope of activities in Kutir Udyog is being enlarged in consultation with our stakeholders.
- Free electricity & water supply is provided to the Street Lights in R & R Colony.

Rural Development:

- Constructed a bridge in Niwas Village.
- A Kitchen Shed in Viklang Vidyalaya, Katai.
- PCC Road at Papal.
- A community hall, a temple and a clinic has been constructed in Aawaas Colony.
- Deepening, Restoration & Refurbishment of ponds in nearby villages Niwas and Papal.
- Construction of 6 Nos. Borewell for Drinking water supply.

Afforestation:

- Planted over 5 lakh trees in the plant & township.
- 50,000 trees are added every year.
- Created a Herbal & Medicinal Park over an area of 5 acres.
- 144 Hectares of land has been set aside for plantations
- Rain water harvesting pond in township.
- Distribution of Jute Bags and LED Bulb to nearby villagers.

Teamwork, Employee Involvement & Monitoring

Daily Monitoring System

- Daily Planning Meeting(DPM) is conducted every day to discuss the critical issues and previous day performance. It is chaired by Unit Head. Wet System –Daily Ash to Water Ratio Monitoring in Daily Planning meeting , Stringent Effort are being applied to reduce Ash to Water Ratio, Raw water Consumption.

Operation Review Meeting

- Chief Technical Officer chairs this meeting once in a month to discuss plant performance & to address long pending issues of various departments.

Systems and Practices

- System-wise and equipment-wise efficiency and gap analysis done (Design vs Actual), Metal Temperature monitoring, Historical data extraction for detailed analysis and reporting, Various other initiatives to improve efficiency, Monitoring of high energy drain valve passing in every 15 Days. Timely inspection & maintenance of Transmission line ensure 100% plant availability.

Training

- All Operation desk engineers have been provided training regarding Energy Efficiency performance of thermal power plant including boiler, turbine and other auxiliaries during 01 year induction training.
- Employees are encouraged to attend exams organized by Bureau of Energy Efficiency.

Awards & Recognitions

Winner for **National Efficiency Award** 2023 for The Best Energy Efficient Plant-Coal from Mission Energy Foundation

Winner for **National Environment Excellence Award** 2023 for The IPP Coal Above 500 MW from Council of Enviro Excellence

Winner for **Efficient Management of Fly Ash 500 MW** & Above (Private) FY 2021-22

Winner for **Best Zero Liquid Discharge Plant** from Mission Energy Foundation FY 2021-22

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