First Wet FGD in India

NTPC Vindhyachal : Largest power plant of India (4760 MW thermal)

15MW Solar Plant

एनटीपीसी NTPC

Vindhyachal Super thermal power station

8MW Hydro Plant

23rd National Award for Excellence in Energy Management, 2023

Team Members:

- Ram Sewak Jayswal,DGM (EEMG)
- Vijay Kumar, Sr Manager (CCUS)

20 TPD CO2 Capture Plant

Vindhyachal: Largest Power Plant of India

Thermal	Capacity Thermal = 4760 MW (210 MW X 6 + 500 MW X 7) Tangentially fired pulverised fuel Boilers
Solar PV	15 MW (Mono Silicone crystallite Cells)
Small Hydro	2 x 4 MW= 8 MW (Kaplan-S turbines)
Grand Total Capacity	**4760+15+8= 4783 MW**
Land	6000 Acres
Water Source	Discharge canal from NTPC Singrauli
Coal Source	Nigahi, Dudhichua Coal Mines of NCL

Milestones towards Green Energy

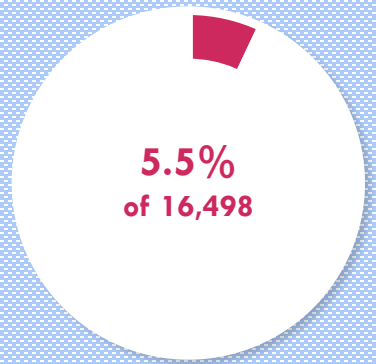
- Solar plant Commissioned on 31.12.2014.
- Hydro plant Commissioned on 05.03.2018.
- First Wet FGD of India Commissioned on 05.03.2017
- CCUS Project : First Carbon captured on 15.08.2022.
- 567KW Roof top Solar in Plant and Township.
- Low NOx burners commissioning completed in 2022.

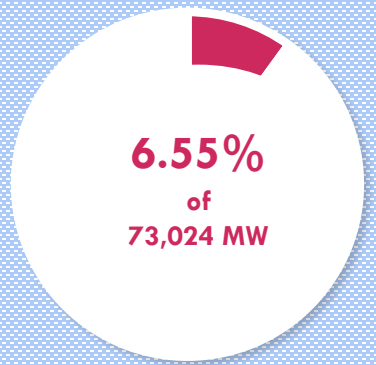
Upcoming Project

- 20 MW Solar project
- 1 MW Roof top Project.
- FGD in all thermal units.
- 100% Ash utilisation.
- Carbon to Methanol (CCTM)
- 210MW turbine R&M.

- First Thermal unit (U#1, 210 MW) was commissioned on 10.10.1987
- Last Thermal unit (U#13, 500 MW) was commissioned on 06.08.2015

Vindhyachal: The Most Productive Business Unit

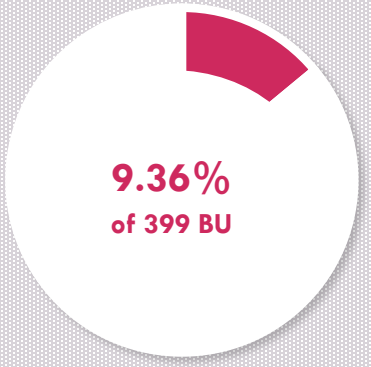


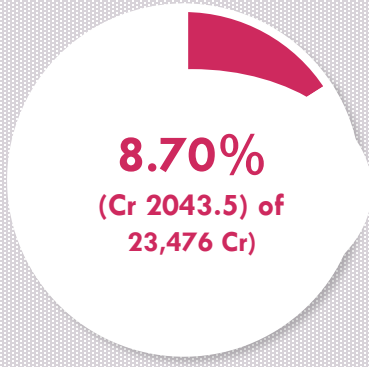


Employee Strength

Installed Capacity

As on 31st March 2023





Power Generation

Profit before tax

As on 31st March 2023

VSTPS: Visualising Success Through the Progress of its Stakeholders

Vision

"To be India's Leading Power Station exceeding Stakeholders' expectations."

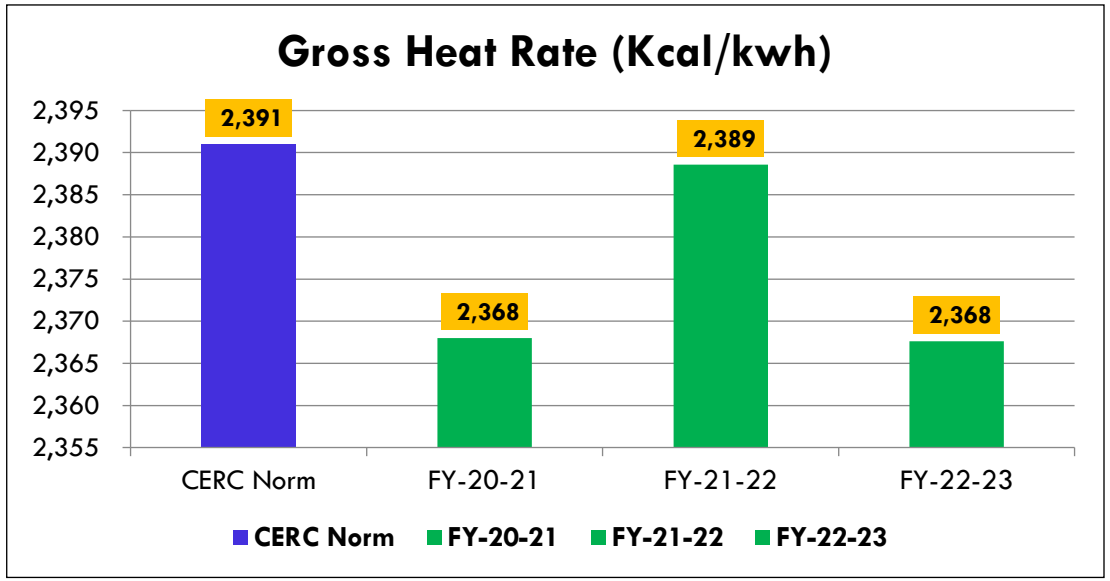
Mission

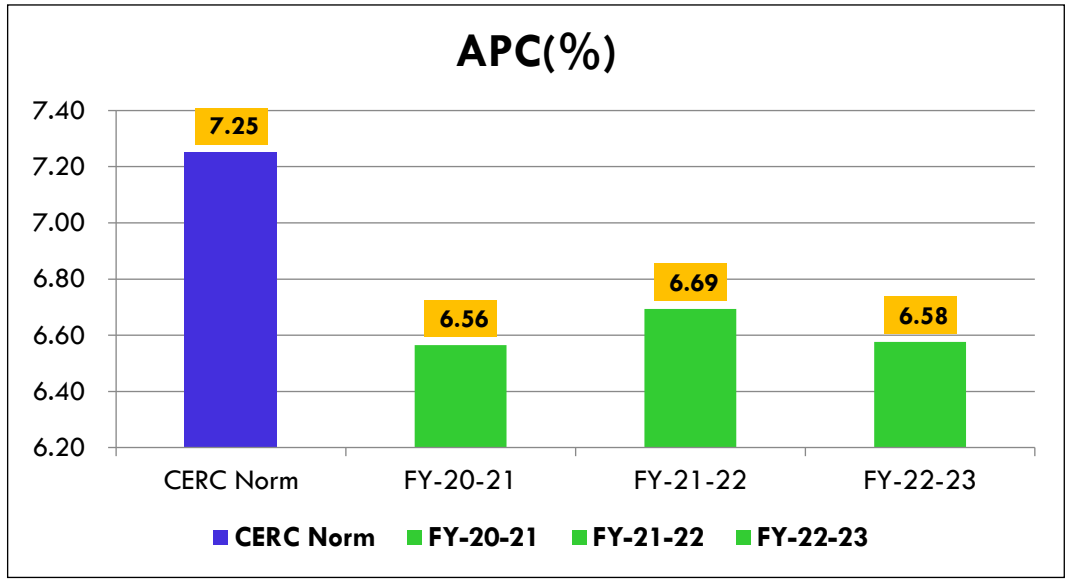
- Generating Affordable, Reliable and Sustainable Power.
- Adopting Safe, Eco-friendly and Innovative approaches.
- Applying State-of-the-art Technologies in changing Business Scenario.
- Caring & Uplifting Community & Society around us.

Vindhyachal Performance : Past three years

Sr. No.	Parameter	Unit	Norms/ Target	FY 20-21	FY 21-22	FY 22-23	Remark FY 2022-23
1	**Annual Generation**	MU	Different targets for each year	36,997.78	35,730.08	37,337.13	Highest generating station
2	**PLF**	%		88.73	85.69	89.54	4th Rank in all India PLF ranking.
3	**Availability**	%		92.31	90.26	92.85	Least forced outage in NTPC
4	**Gross Heat Rate**	Kcal/kwh	2391(Norm)	2,368	2,389	2,368	Best in Vindhyachal history
5	**Auxiliary Power**	%	7.25(Norm)	6.56	6.69	6.58	
6	**Boiler Efficiencies**	%	87.6/84.6	86.8/85.1	86.7/85.5	87.3/85.4	210MW/500MW
7	**Turbine Heat Rates**	%	2021/1932	2100/1970	2110/1975	2090/1965	210MW/500MW
8	**Specific DM Water consumption**	%	0.50	0.54	0.53	0.55	
9	**Specific Raw Water Consumption**	L/kwh	3.50 (Norm)	2.93	2.98	3.13	
10	**Specific Oil Consumption**	ml/kwh	0.50(Norm)	0.21	0.24	0.18	Best in NTPC

Specific energy consumption past 3 years :

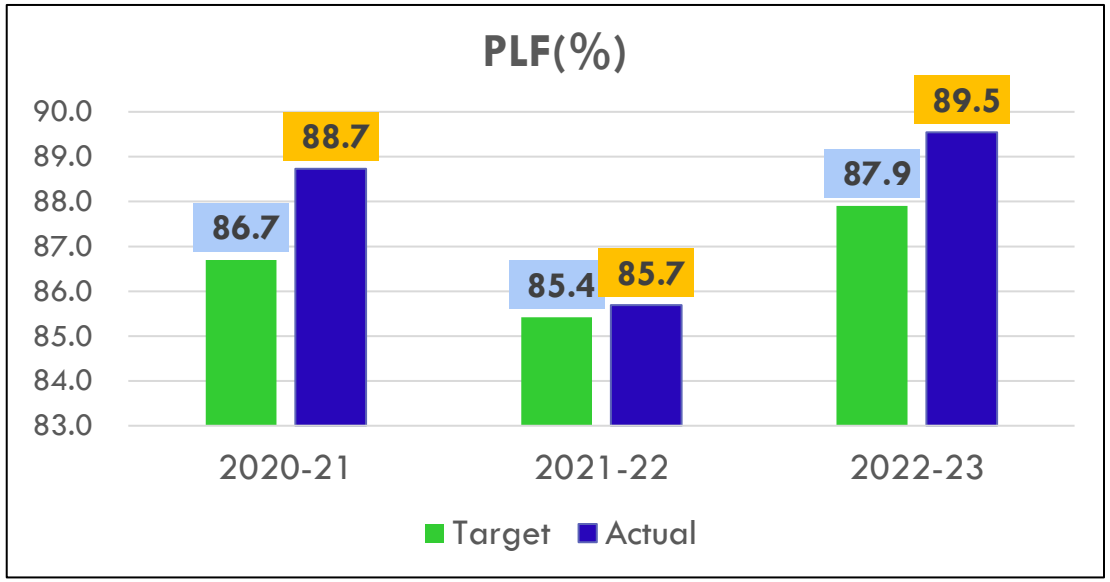


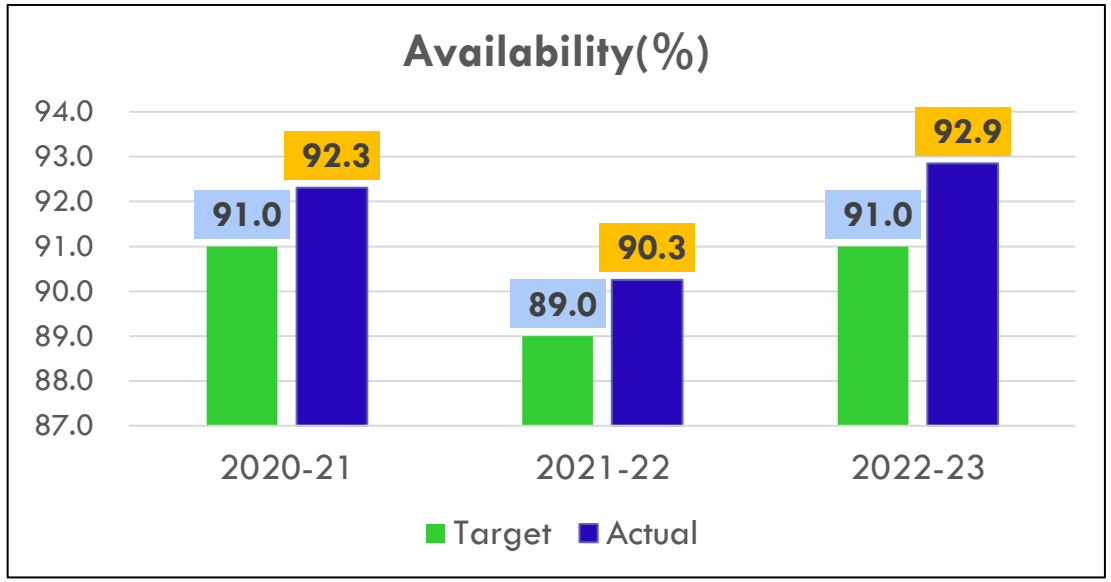


- FY 22-23 Heat rate @ 2368.55 Kcal/kwh was best in history of Vindhyachal. Despite of fact that stage-1 210MW units are 35 years old and stage-2 500MW units are 25 years old.
- Heat rate was high in FY 21-22 due to Covid impact (Delayed Overhauling).
- 1 % improvement in heat rate has been achieved in FY 22-23.

- APC in FY 22-23 has increased slightly as compared to FY 20-21 due to additional APC in FGD operation.
- APC was high in FY 21-22 due to Covid impact (Delayed Overhauling).
- 10 % improvement in APC has been achieved in FY 22-23 over normative APC.
- APC of Vindhyachal all stages are always within CERC norms.

PLF and Availability past 3 years :





- Vindhyachal stations always remains in top 10 position in All India PLF ranking.
- 22-23 Vindhyachal was at 4th Rank on all India Generators ranking and 2nd rank in NTPC ranking.
- If we consider AGC (Automatic generation control) impact on PLF then Vindhyachal PLF was historical best in FY 22-23. (Loss of approx. 1% PLF due to AGC.)
- Vindhyachal was among few stations of India with AGC system operational.

- Vindhyachal availability is comparable to best stations in India.
- Forced outage and partial loss due to station problem was 1.2 % only in FY 22-23. This was historic best of Vindhyachal and best among all NTPC stations in FY 22-23.
- As consequence, Specific oil consumption was also best among all NTPC stations in FY 22-23.
- Stations takes 7 planned shutdown(Out of 13 Units) for overhaul every year, Highest for any station.

Vindhyachal 5 Year Targets :

The 5-year Rolling business plan serves as the integrating link between long-term corporate plan, Annual plans (Internal MOU and annual budgets) and Performance Evaluation Matrix (PEM).

Key Parameters	Unit	2023-24	2024-25	2025-26	2026-27	2027-28
Gross Generation	MU	36690	37110	37320	37520	37520
APC	%	6.56	6.54	6.52	6.5	6.5
FO+ PL	%	1.4	1.3	1.2	1.1	1.0
Availability	%	92.1	92.2	92.3	92.5	93.0
DC	%	93.0	93.2	93.6	94.2	94.5
Heat Rate	Kcal/KWH	2376	2371	2367	2364	2360
Specific Oil	ml/ KWH	0.205	0.200	0.195	0.180	0.170
Specific water	ml/kwh	2.93	2.91	2.87	2.85	2.80
Ash utilization	%	60	80	100	100	100

Major Strategic Challenges

- Ash Utilisation and Ash Dyke management
- Stringent Emission Norms SPM, SOx and NOx
- Maintaining merit order, meeting upcoming stringent CERC Norms
- Flexible Operation, Sustaining performance with ageing of units, Selling of Surplus Power with growing Renewable Energy

Benchmarks :

- Benchmarks are set via discussions in Workshop, knowledge sharing, Learnings, Internal MOU etc.
- NTPC BE Model is followed and benchmarking is shown in annual report for each parameter.
- Benchmarking is done with pit head stations having unit configuration in 200MW and 500MW combination, like NTPC Korba and Ramagundam stations.
- All performance parameters have separate benchmarking station, comparison is done with best.
- Various maintenance departments has done benchmarking with respect to international best standards and practices.
- CERC Norms and PAT Target are very basic benchmark targets for station.
- Continuous improvement and providing result beyond customer expectation is our moto so strict benchmarks are set.

Road map to achieve benchmark target :

- After target setting lead and lag indicators are identified.
- SWOT Analysis is done.
- Responsible leaders are selected to achieve set target.
- Periodic reviews are done to check progress.
- Vendor development for old Russian technologies.
- 100 % Safety and Zero Accident action plan.
- Employee Engagement is key to success.

Critical Success Factors

01

Effective Health and Safety Management

02

Minimizing Impact on Environment

03

Efficient, Economical, Reliable Generation

04

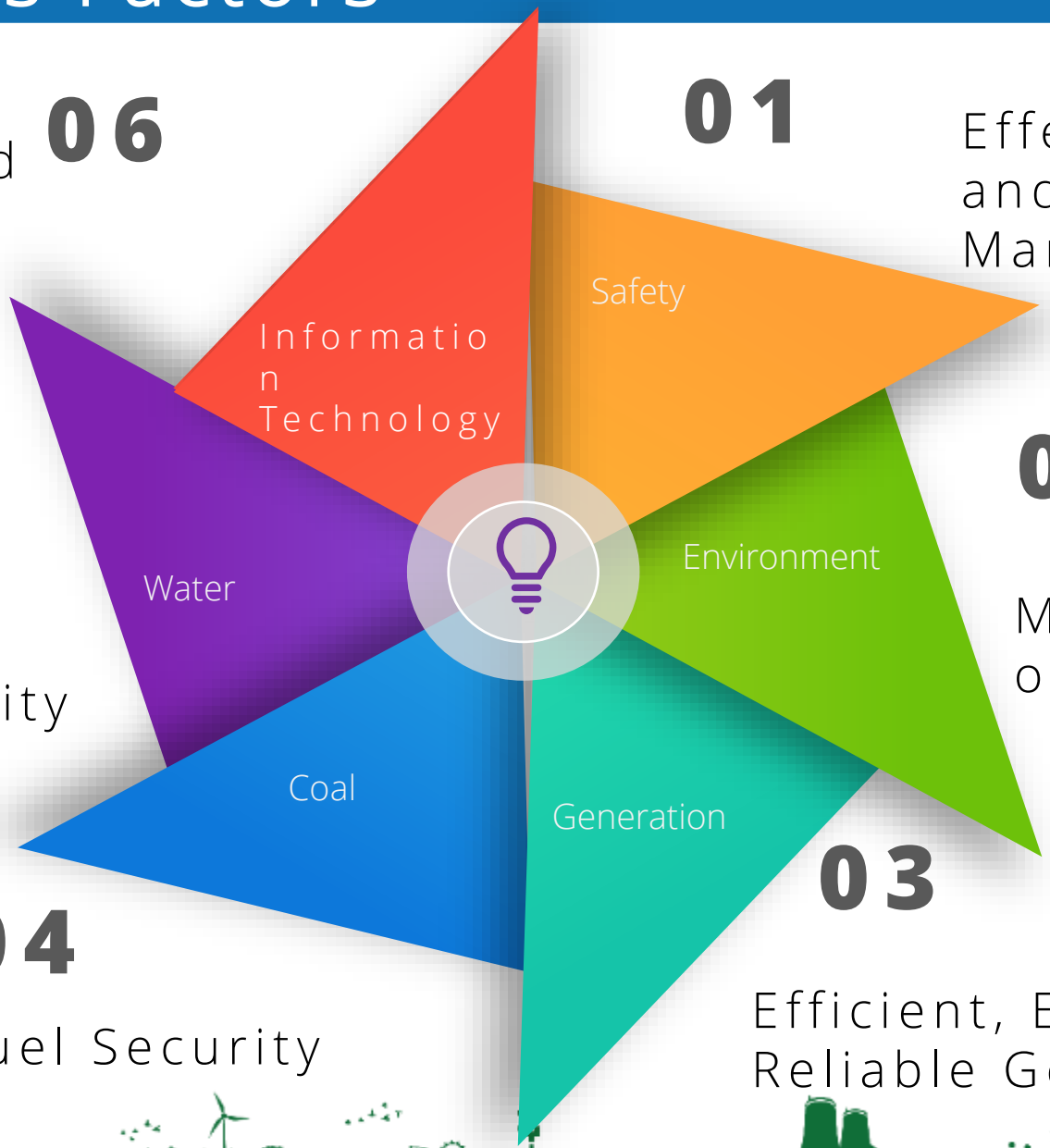
Fuel Security

05

Water Security

06

IT Enablement and Digitization of Processes



Save Energy, Save Earth

Major Encon project planned in FY 2023-24

Sr. No	Project	Electrical Saving (Million kWh)	Thermal Saving (Million Kcal)	Investment (Rs Million)
1	Renewable (Solar) addition	0.45	0	1.41
2	Replacement of old motors with IE3 grade motors.	0.85	0	7.50
3	Cartridge replacement/Refurbishment in stage-1 MDBFP's. 3 numbers total.	0.5	0	10.00
4	Stage-1 Old Instrument air compressors in (reciprocating compressors) replacement with new IACs (screw compressors). 3 numbers total.	1	0	24.50
5	Polymer Coating on stage-1 CW pumps & Other Pumps - 7 numbers.	0.14	0	1.87
6	Replacement of Ash Slurry Pumps, Drain Sump Pumps along with drives and accessories of Stage-1,2.	0.9	0	24.90
7	Replacement of existing metallic shaft of Cooling Towers with Carbon Fiber shaft. 110 Numbers total.	3.3	0	8.20
8	Application of Ceramic Pad in place of LRB mattress in different areas of PA Fan, APH Guide Bearing area and Burner Block Stage-I.		1620	4.83
9	Complete replacement of 30 years old boiler insulation in unit-2,3		4860	87.80
10	Stage-1 LPH-4 Assembly replacement in 6 units		29163	28.16
	Total planned	**14.75**	**35643**	**200.00**

Energy Saving projects 2020-21

Sr. No	Energy saving Projects	Investments (INR Million)	Electrical Saving (Million kWh)	Thermal saving (Million kcal)	Saving (INR Million)
1	Unit-7 boiler modification with BHEL-Global settlement	11.00	-	23,835	14.93
2	Unit-1 APH Basket replaced. Gain 19.5 kcal.	21.00	-	78,606	44.92
3	**Annual Electrical energy saving in FY 20-21 under various heads.**	**51.00**	**13.41**	**-**	**22.12**
4	Cartridge replaced due to poor performance of BFP.	7.50	0.15	-	2.48
5	Old Fans replaced with Energy Efficient Fans (EESL) in Township and plant.	3.75	0.09	-	0.15
6	Conventional Lights replaced with LED in Plant and township.	31.00	5.30	-	8.75

Energy Saving projects 2021-22

Sr. No	Energy saving Projects	Investments (INR Million)	Electrical Saving (Million kWh)	Thermal saving (Million kcal)	Saving (INR Million)
1	**Annual Electrical energy saving in FY 21-22 under various heads.**	**69.5**	**13.79**	**-**	**22.48**
2	Draft power reduction due to air sealing in various 6 numbers Units.	8.00	2.25	14,000	13.28
3	VFD installation in stage-2 RC feeders and feeder motors replaced , R&M of feeders.	6.10	0.34	-	0.55
4	old motor of stage- 1, 2 replaced with new high efficiency IE3 motor.	8.70	1.70	-	2.77
5	Cartridge replaced due to poor performance of BFP- 3 numbers.	8.20	0.21	-	3.32
6	Stage-IV Common CT: Old blade replaced with Aero foil type blade.	30.00	0.17	7,714	5.13
7	Old Fans replaced with Energy Efficient Fans (EESL) in Township.	2.50	0.06	-	0.10

Energy Saving projects 2022-23

Sr. No	No of Energy saving Projects	Investments (INR Million)	Electrical Saving (Million kWh)	Thermal saving (Million kcal)	Saving (INR Million)
1	Annual Electrical energy saving in FY 22-23 under various heads	75.00	14.70	-	22.56
2	Replacement of old HT motors with energy efficient motors in stage-1 units.	2.00	1.64	-	2.62
3	Ash handling drives efficiency improvement based on audit.	5.00	0.29	-	9.15
4	VFD installation in stage-1 RC feeders, feeder motors replaced , R&M of feeders.	10.40	0.24	-	0.76
5	Old PACs were replaced with new PACs : earlier 4 reciprocating compressors were operating 160 KW each along with stage-4 interconnection. Now only 2 new screw compressors remain in service 275 KW each.	30.42	0.89	-	1.42
6	Draft power reduction due to air sealing in Unit-13 APH and Penthouse, Ceramic PADs in burner are and manholes for complete sealing.	2.50	0.95	-	1.52
7	Replacement of existing metallic shaft of Cooling Towers with Carbon Fiber shaft.	5.00	0.21	-	0.33
8	Replacement of old LT motors with energy efficient motors in stage-1 units	11.11	2.04	-	3.21
9	Unit-9 & 10 Cooling Tower Performance improvement	77.40	1.55	2,28,133	141.96
10	Replacement of BFP Cartridge- 3C & 1A	8.50	3.33	-	5.23
11	CW impeller and internals energy efficient coating	1.00	0.08	-	1.19

Innovative project :10 TPD CO2 to Methanol Project -CCUS

Commitment :

Reducing carbon emission to 50% by 2050

Net-zero carbon emissions target by 2070

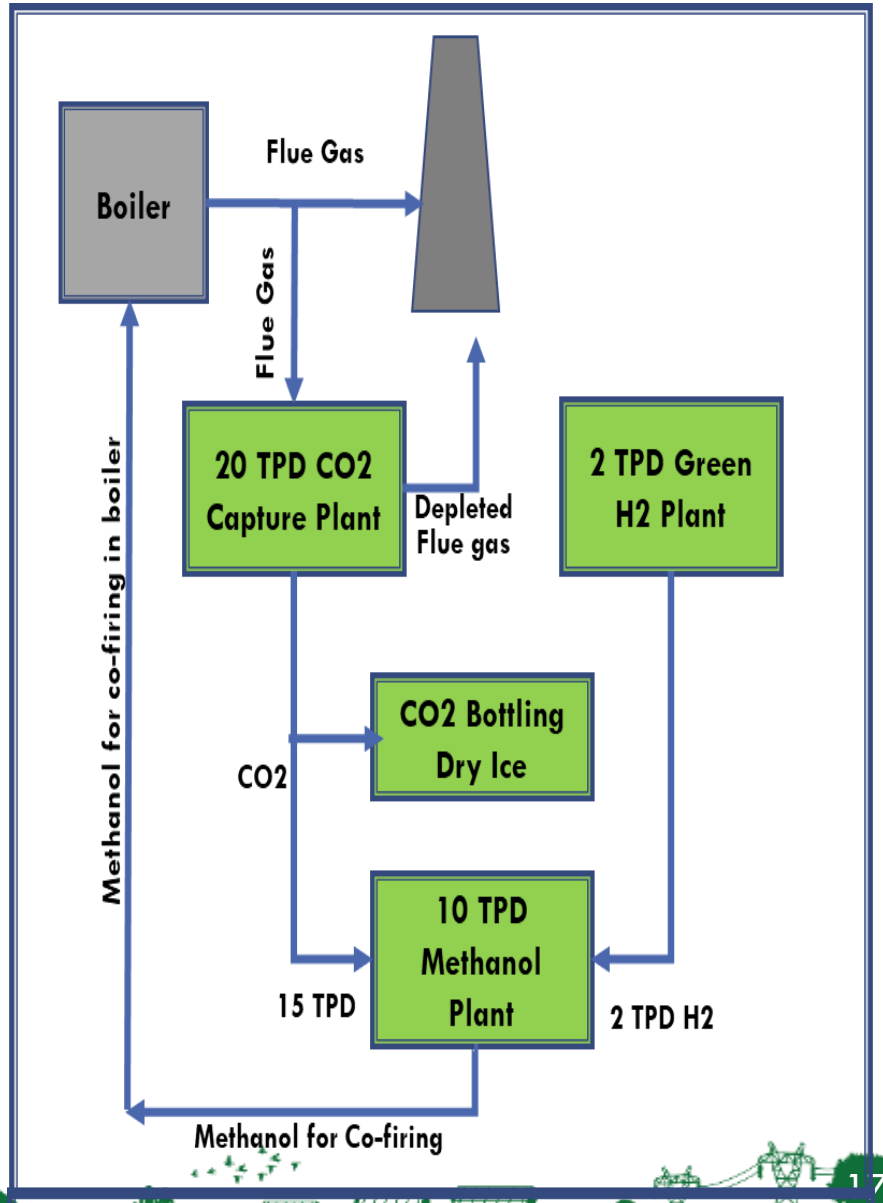
Net Zero by 2070

Reaching a non-fossil fuel energy capacity of 500 GW by 2030

Fulfilling 50 percent energy requirements via renewable energy by 2030

Reducing CO2 emissions by 1 million tons by 2030

Reducing carbon intensity below 45 percent by 2030



CO2 to Methanol (CTM) : Snapshot

	1 CO2 Block	2 Hydrogen Block	3 Methanol Block 3(A)	3 Methanol Block 3(B)
Package	20 TPD CO_2 Capture Plant	2 TPD H_2 Generation Plant	Technology Package: Reactor, Catalyst, Technology	EPC Package: 10 TPD Methanol (sequential package following 'Methanol Technology Package')
Technology	Solvent Absorption	Proton Exchange Membrane	Hetero Catalytic Hydrogenation	
Status	Awarded (March'21) & Commissioned	Awarded (July'21) and Under Execution	BDEP* Awarded(Sept'21) Engineering completed	Awarded Feb'23 Drawings Approval
Price	14.14 Cr	49.5 Cr	3.64 Cr	55.79 Cr
Contractor	Green Power, India + Carbon Clean Solutions, UK	Technip, India + Plug Power, US	Toyo Engineering(India+ Japan)	Jakson Lt
Completion	15.08.2022	Commissioning planned by Oct-23	Mar-22	Dec 23 As Schedule

Experience of CO2 Capture:

- **20 TPD CO2 Plant Footprint- 20mx20m**
- CO2 Capture configuration is complex:

It consists of:

- 16 Pumping System, 11 Heat Exchangers
- 5 Storage Tanks, 2 Reboilers, 2 Condenser, 1 CT
- 96 Transmitters, 37 Control loops

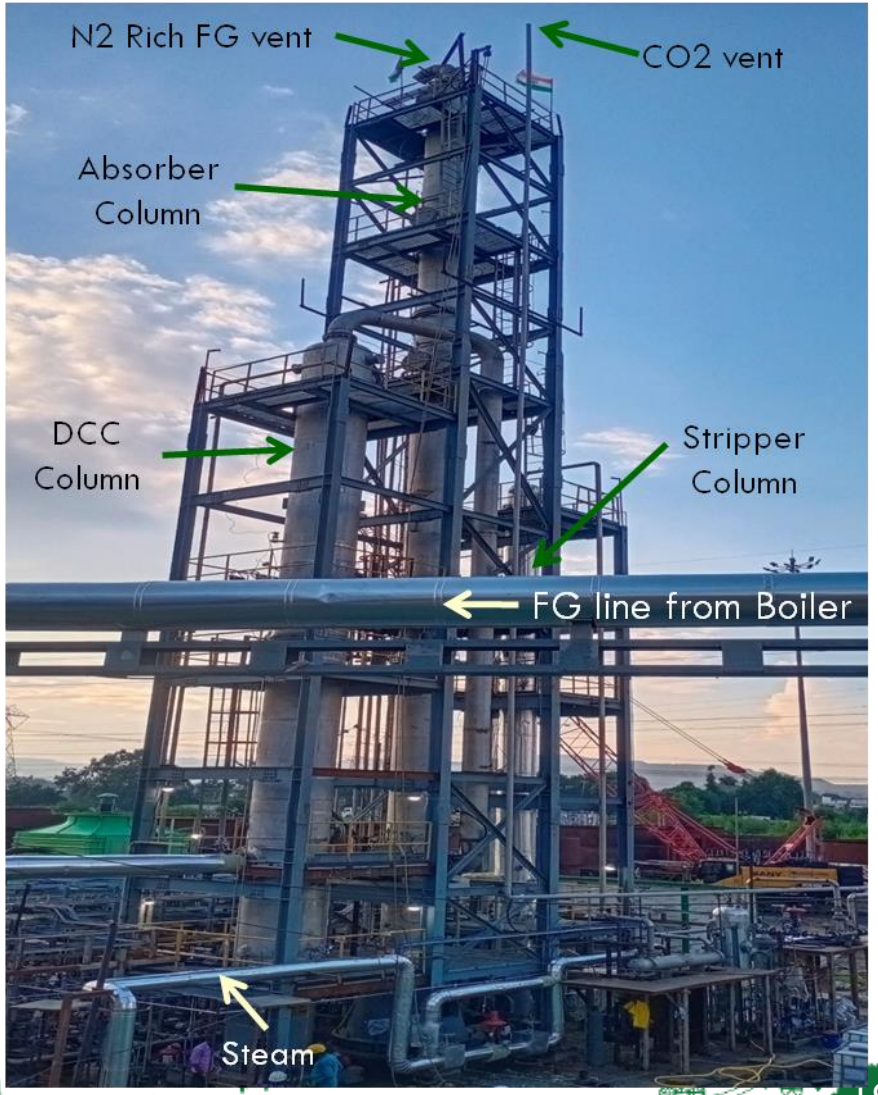
- Trial Run, Functional And Performance Guarantee Test Cleared

SN	Description	Unit	Required	Measured
1	Captured CO2 Quality	Dry vol %	99.4	99.95
2	CO2 Capture	vol % of CO2 in FG	80	86.9
3	Steam Consumption	Ton/ Ton of CO2	1.39-1.54	1.42
4	Solvent Consumption	kg/Ton CO2	<0.35	0.285
5	CO2 Production	TPD	20	20.9

- **CO2 Utilization for Cylinder filling and dry ice manufacturing**

  - CO2 purification, compression, liquefaction, bottling and dry ice making
  - System sourced, process integration done, Technical Specification prepared

A view of 20 TPD CO2 Capture Plant at VSTPS



Utilisation of Renewable Energy sources

Year	Technology	Type of Energy	Onsite/Offsite	Installed Capacity(MW)	Generation (Million kWh)	% of energy used in consumption
2020-21	Mono silicone crystallite Cell.	Solar Power (Commercial)	On-Site	15	21.181	5.00
2021-22				15	20.065	5.02
2022-23				15	20.870	5.01

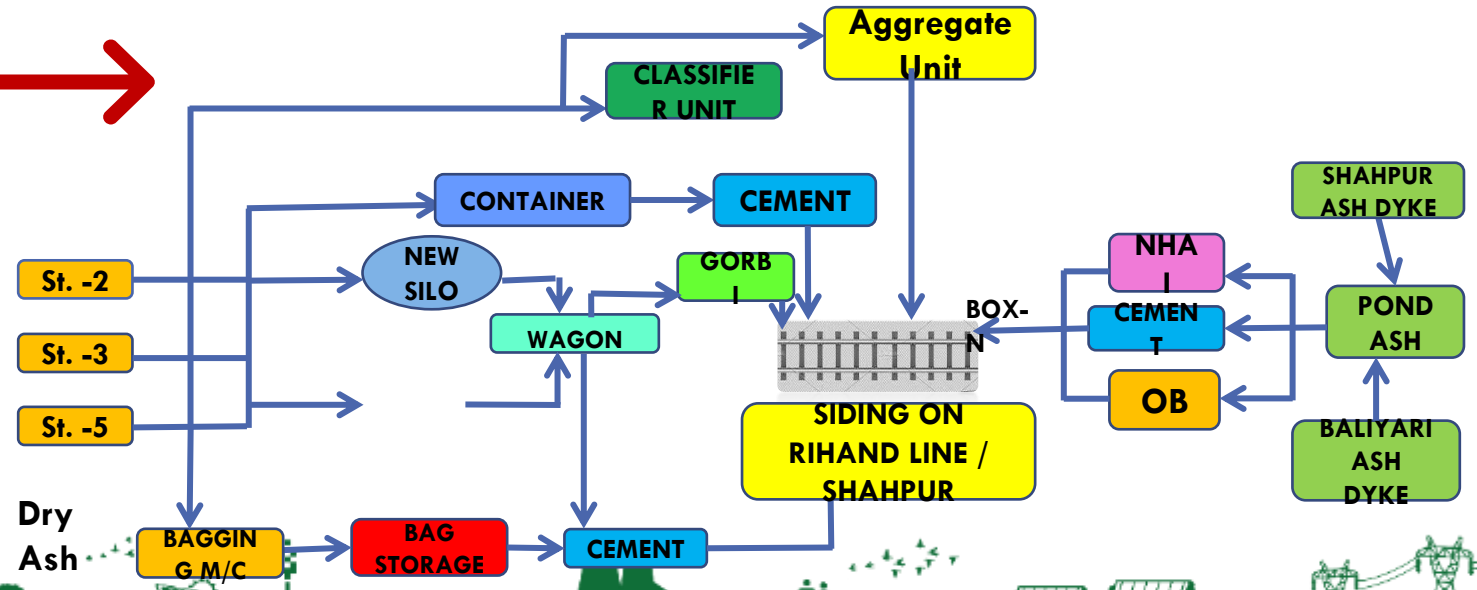
Year	Technology	Type of Energy	Onsite/Offsite	Installed Capacity(MW)	Generation (Million kWh)	% of energy used in consumption
2020-21	Mono silicone crystallite Cell.	Solar Power (Roof top Solar)	On-Site	0.569	0.61	100
2021-22				0.569	0.60	100
2022-23				0.569	0.61	100

Year	Technology	Type of Energy	Onsite/Offsite	Installed Capacity(MW)	Generation (Million kWh)	% of energy used in consumption
2020-21	Kaplan-S turbine. Small hydro plant on canal.	Hydro Power	On-Site	8.00	19.68	4.99
2021-22				8.00	22.89	4.85
2022-23				8.00	32.40	4.60

Environment Management - Ash Utilization

Particulars	Unit	2020-21	2021-22	2022-23
Ash Stock in Plant(yard + pond)	Tons	155,00,000	198,00,000	241,00,000
Ash Generated	Tons	87,25,547	82,38,221	76,63,620
Ash Utilization	%	37.66*	53.05*	48.31
Ash Utilizes in manufacturing of Cement/concrete etc.	%	2	2	1
Ash Utilized in Fly Ash Bricks	%	3	4	4
Ash Utilized in Mine filling	%	14.76	15.95	19.20
Ash Utilized for Roads pavements	%	2	5	13
Ash Utilization in Other Areas-mentioned below -				
1 NCL abandoned mines are being filled	%	0	4	6
2 NHAI ash supplied for Highway	%	1	2	8
Expenditure on Ash Utilization(annual)	INR (Crore)	21 Crores	62 Crores	187 Crores

Infra development for 100% Ash Utilisation



Ash Handling done through various methods

Ash Handled(Wet Method)	%	75
Ash Handled(Dry Method)	%	25
Ash Handled (Semi Wet Method)	%	0

Roadmap to 100% Ash Utilisation :

2021-22

Road Infra

- NHAI 26%
- Land-Filling 24%
- Gorbi 8%
- Cement/ Brick 21%
- Dyke Raising 21%

AU	2021-22	2022-23	2023-24	2024-25	2025-26
Ash Generation (LMT)	88	88	88	88	88
Ash Utilization (LMT)	36	36	44	57	88
Ash Utilization (%)	**40%**	40%	50%	65%	**100%**

2025-26

- DAES #1
- DAES #4
- DAES #2,3,5

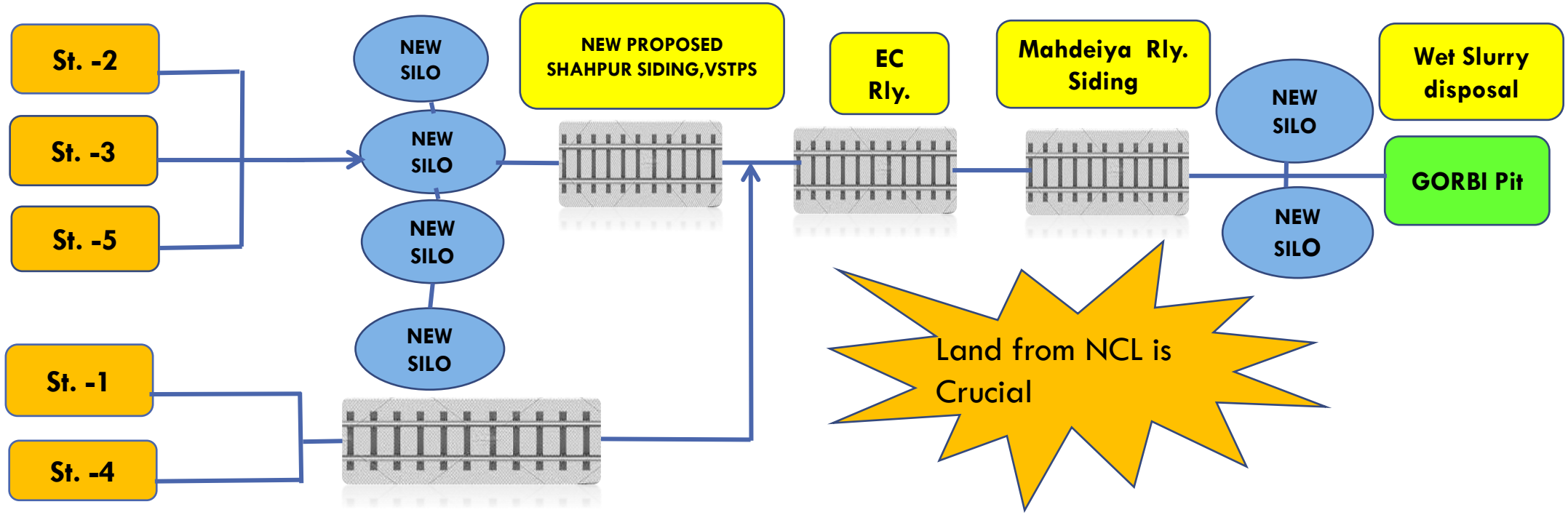
→ **Rail**

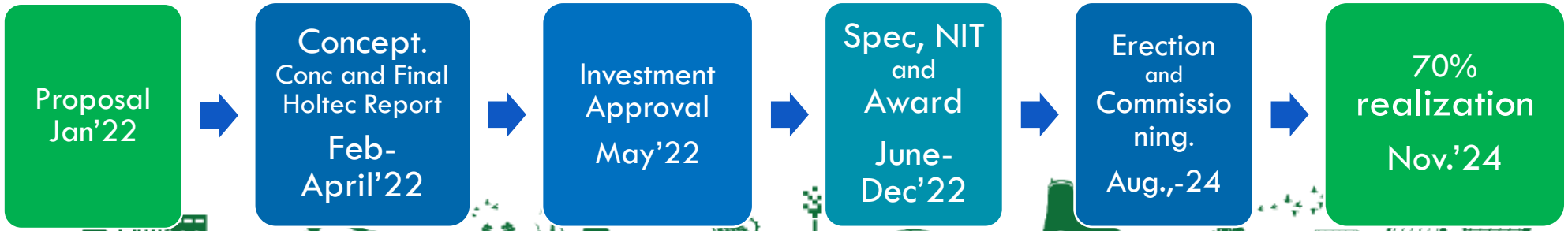
7 rakes daily

- Gorbi Mine 50-70% (4-6 rakes)
- Cement Plants 20% (2 rakes)
- NHAI 5% (1-2 rakes)
- Land Filling / Bricks 5%
- OB 20%

Gorbi Long Term scheme for 70% Ash utilisation

Schematic plan for Ash disposal to Gorbi: Rail/Slurry Piping





Environment Management - Emission

Particulars	Unit	2020-21	2021-22	2022-23
Total CO2 Emissions Per KW of Generation	Ton/Kw	6.897	6.706	6.958
Current SOx Emissions at Full Load	mg/Nm^3	940	935	925
Current NOx Emissions at Full Load	mg/Nm^3	500	450	300
Particulate Matter	mg/Nm^3	44.83	44.55	44.54
Mercury	mg/Nm^3	0.0078	0.0075	0.0078

Target Planning for Major Improvement initiatives :

2023-24		2024-25	2025-26
Q1-Q2	**Q3-Q4**		
• Conocorpus tree plantation in ash dyke areas • Cotton bag distribution to discourage polythene bag use • Mass tree plantation on ash fill areas • Follow-up Flora-Fauna study in GORBI. • Deployment of truck-mounted fog cannon in Ash dyke area. • Ash Dyke stability study. • Bio-diversity mapping study	• Vetiver grass plantation for slope protection in ash fill areas • Miyawaki plantation • Completion of ESP R&M in Unit 4 • Completion of DAES installation in Stg 1. • Township Rainwater harvesting completion • Stg 1 Track Hopper DE system installation • DFDS installation in Stg 1,2,3 CHP • Integrated Water Dashboard. • Stage-4 FGD Commissioning	• Switch to low-sulfur LDO • Physical structure erection around SILO area to contain fugitive emission • Unit 1-4, stage-2,3 FGD commissioning • Stage-1 all units Flue gas NOx to be reduced below CPCB limits	• Water Treatment plant for GORBI overflow • Unit 5,6 FGD commissioning. • 100% utilization of CCUS methanol.

Environment Compliance :

SPM	SO_X & NO_X	CO2 to Methanol	ZLD	Monitoring
ESP R&M in Unit # 1,2,3,5,6,7&8 completed. R&M completion of Unit#4 by Dec'23.	In St#5 FGD is operational for other stages FGD project in full swing. De NOx SOFA for all units completed in unit 9 to 13. Combustion tuning in U#1 to 8	10 TPD CO2 TO Methanol Pilot project of NTPC . Flue gas captured from U#13 .	ZLD System commissioned in all stages. AWRS functional in all dykes. Toe drain R/C available in Biliary dyke. 100 % recycling from ETPs and STP.	Online continuous monitoring system available for Flue Gas Emission, Effluent water and Ambient Air Quality.

Environment Management – Water

DM water Consumption of Plant			
Unit	**2020-21**	**2021-22**	**2022-23**
%	0.54	0.53	0.55

Raw water Consumption of Plant			
Unit	**2020-21**	**2021-22**	**2022-23**
m3/MWH	2.93	2.98	3.13
m3/MW	22,799	22,373	24,566

Vindhyachal plant has been declared as Zero Liquid Discharge.

Best Practices in Water Management :

- COC maintained on higher side up to 7 to reduce blow down water.
- Reducing plant overflow to zero via ZLD scheme.
- 100% Ash water recirculation pump house utilization. Tow drain pump house in all ash dykes.
- Rainwater harvesting is done inside plant and township. Three huge reservoir of total 2,40,000 Cubic meter capacity were prepared and connected to plant ZLD schemes via pipelines for rainwater harvesting system.
- Construction of new STP with 6MLD capacity completed for use in horticulture, gardening of public buildings.
- Proper metering at each consumption location helped us to identify wastage and reduction in water consumption.

Best Practices at Vindhyachal :

Flexibilization :

- Pilot project has been started for stable operation at 40% of MCR capacity as per CEA guidelines.
- At present our units can operate at 50% load without oil support.
- All units have 1% ramping capability and trials are in progress for 2% ramping capability.

Maintenance and reliability:

- Every year Station completes Major Overhauling of 7 units (Out of 13) and 5 to 7 days mini-Overhaul of 2 to 3 units depend on condition assessment to increase reliability and Improve heat rate.
- Even during Covid-19 period mini overhauls of all units were taken one by one due to scarcity of external workforce.
- Station has achieved best historical Forced outage, Boiler tube failures, Partial loss due to breakdown in FY 22-23.
- Vindhyachal was best station in NTPC with minimum forced outage and equipment partial loss.
- Heat rate achieved in FY 22-23 was best in history of Vindhyachal even though stage-1 units (6 numbers) are 35 years old and stage-2 units (2 unit) are 25 years old.
- Quality of Overhaul is daily monitored not only by station management but also by corporate offices.
- All overhauling's are completed within stipulated time frame.
- 100% SAP monitored reliability centered maintenance practices are used.

Best Practices at Vindhyachal :

Digitization:

- Station is completely paperless.
- All communication, reporting, Note sheets, Payments, Data recording, Contracts are handled in digital mode only.

Asset Management:

- Station has set target-based inventory management.
- Status of assets are closely monitored by management.
- Stores department has started using RFID and Bar code ID for each material available.
- GPS Monitoring of dozers heavy vehicles etc.

Biodiversity:

- Bio-diversity mapping study was done recently in 2022. It is being done on regular interval as per requirement.
- Vindhyachal is biodiversity rich Rihand reservoir area and efforts are taken by station for preserving it.

Afforestation:

- 80,000 plantations are being done through MP forest department annually.
- Miyawaki plantation, Conocorpus tree plantation in ash dyke areas are some of practices started recently.
- 26 Lakh tree plantation has been done by station till date.
- Green coverage in and around Vindhyachal station is significantly higher.

Best Practices at Vindhyachal :

Research:

- Vindhyachal is lead station of NTPC to experiment and absorb any new technology. 1st Wet FGD system was installed at Vindhyachal unit-13.
- Most recent project is Green technology project CTM (Carbon to methanol) with an investment of approx. Rs 122 Cr. Carbon capture to methanol conversion is unique project of India, first for any power plant.
  - 20 Ton per day CO2 capture plant has been commissioned.
  - 2 Ton per day green hydrogen generation plant has been commissioned.
  - Using captured CO2 and Hydrogen generated, 10 ton per day Methanol will be generated.
  - Methanol conversion plant will be commissioned within next 3 months.
  - Methanol will be substitute of Coal and LDO for firing in boilers. This will help in reducing green house emission.

New Initiatives:

- **Automation: Mill scheduler** in house developed to minimize human intervention and improve automation. Various in-house tools for data analysis and performance monitoring.
- **Infrastructure : Railway siding and tracks** are being created for 100% Ash, Gypsum transportation goal.
- **Drones** : are used for Coal yard survey, Ash dyke and pipelines survey . Robotic inspection of ash dyke wells using under water drone etc.
- **Renovation and Modernisation : To remove** Obsolescence particularly in stage-1 and 2 units. Stage-1 Turbine R&M planned will met all CERC requirement and improve heat rate.
- **Unified control rooms: To optimise** manpower and knowledge sharing

Teamwork, Employee Involvement & Monitoring :

Daily monitoring system : Online live monitoring of all parameters. Results are monitored in daily planning meeting.

- Pi system for online data and efficiency parameters monitoring.
- EnMS softwares, Online CT Capability and Condenser performance monitoring.

Review meeting chaired by:

- Daily meeting by head of O&M.
- Monthly Regional ED review.
- Weekly HOP Review.
- Quarterly review by Director operations.

Separate budget for Energy Conservation : EC budget Allottment each year approx Rs 7 to 10 Cr.

Energy efficiency / awareness training program: EC week is celebrated every year not only within station but also with local communities. Industry and Retired experts take various awareness and learning program each month.

Projects implemented through Kaizens (Workers and Supervisor level) : Business excellence is theme of our all activities and projects. More than 30 innovative projects were implemented by workers in past two years Station has achieved various Quality circle awards for some of these projects.

Major Areas of concern in terms of energy efficiency and reliability : Obsolescence and spares for stage-1 Russian units. Indian Vendors are being developed for that using station efforts.

Implementation of AFR/EMS/ISO Certification :

% Utilisation of alternative fuel and associated retrofits :

- Biomass co-firing started at Vindhyachal in FY 23-24. Accordingly, systems are modified, and infrastructure created.
- Stage-3 Boiler modification with BHEL is planned for Methanol firing generated from CCUS project in place of LDO .

Existing energy monitoring system / IOT system:

- 100 % remote monitoring of all parameters is available.
- Vindhyachal has received CII award for APC guidance software.

Implementation of ISO certifications like ISO 50001/55001 certification etc :

- Vindhyachal is ISO 50,001 Certified station, certification valid till 28.03.2025.
- VSTPS received IMS Certificate for ISO 9001:2015, ISO 14001:2015 & ISO 45001:2018, valid upto 5th July 2025.
- 5S certification received valid till 2025.

AFR : Biomass Co-firing: (Reducing CO2 intensity)

- Biomass - Carbon Neutral
- Biomass briquette prepared locally
- Tested in NETRA Combustion Lab
- Results favourable for co-firing
- Biomass for co-firing started in April'23

Coal & Combustion Laboratory
Test Report

1.	Name and Address of Client	: Sh. Mithilesh Kumar Sr Manager	
2.	Test Report No. & Date	: Coal/22/12/34	dt 26.12.2022
3.	NABL URL No.	: NA	
4.	Client's Reference No.	: Mail Dated	dt 06.12.2022
5.	Nature of Sample	: Biomass	
6.	NETRA Reference No.	: 12138	
7.	LAB Entry No.	: 12987-12988	
8.	Date of receipt of sample	: 14.12.2022	
9.	Date of Testing	: 15.10.2022	
10.	Details of Test Procedure	: IS 1350 Part 1(Proximate analysis), ASTMD 1857-18 (C,H &N), ASTM D 4239 (S) ASTMD 5865 (GCV) ASTMD 1857-18 (AFT),	
11.	Enclosure	: nil	
12.	Total no. of pages	: 01	

A] Proximate analysis & GCV,Ultimate

S.No.	Sample ID	Condition	M (%)	Ash (%)	V.M (%)	F.C. (%)	GCV	%C	%H	%N	%S
1.	R H Biomass	Air dried	9.16	13.62	60.05	17.17	3523	41.25	5.60	0.91	0.07
2.	D G Biomass		8.70	17.13	58.38	15.79	3581	39.69	5.47	1.20	0.10

[B] Ash Fusion temperature (°C)

S.No.	Sample ID	Condition	IDT	ST	HT	FT
1.	R H Biomass	Reducing	1220	1225	1233	1260
2.	D G Biomass		>1500	>1500	>1500	>1500

Learning from CII Energy Award or other award Program

- Vindhyachal has participation in various award programs of CII. Like National award for excellence in energy management, water award, CII National Excellence Practice Competition - Customer engagement and satisfaction practices award etc.
- CII Awards always focus on deep understanding of system and encourage participants to have 360 deg look at their systems.

Major Achievements : Awards in FY 2022-23

1. CBIP (Central board of irrigation and power) Award in power sector.
2. "Overall Excellence Award" for FY 2021-22 BE assessment at “Indian Power Stations-2023” O&M Conference.
3. "Heat Rate Runner up Trophy" for FY 2021-22 at "Indian Power Stations-2023” O&M Conference.
4. Kalinga Safety Award in National safety Conclave 2022 at Bhuvneshwar.
5. British safety council merit award 2022.
6. National safety council awarded Prashansha Patra to NTPC Vindhyachal on 4th June 2022.
7. Vindhyachal has received Gold award in Best CSR implementing PSU (HR-CSR), Silver in Community Impact Award (HR-CSR) & House Journal (Print Regional& English) and Bronze in Health Care Communication (HR-PR) in 16th Global Communication Conclave Public Relation Council of India 2022.
8. Vindhyachal received two Awards at the Public Relation Society of India PRSI awards 2022.
9. Team from Vindhyachal won the NTPC Global Management Challenge competition for Year 2022-23.
10. Team form Vindhyachal won 3rd prize in GMC international level competition 2021-22.
11. Team form Vindhyachal won Asian Management Games conducted by Macau Management Association.

FY 23-24 Vindhyachal received - Kalinga Environmental Excellence 5 Star Award , "Exceed environment award " in gold category. Team from Vindhyachal won "Asian Management Games 2023“, Green tech employee engagement award etc.

Thank You !!

Artefacts made of Gypsum – A Vindhyachal Exclusive