NTPC SIPAT

1st Supercritical project of NTPC

CII National Award for Excellence in Energy Management 2021

Shri G. Prajapati
Head of Project

Shri S. Naik GM-O&M

- Award for excellence in Energy Management 2020 by CII
- Award for “Best water efficient plant” by Mission Energy Foundation
- Won “Golden peacock occupational health and safety award 2020”
- Won Greentech Safety Award 2020 for Safety excellence
- “Best Energy Efficient Plant – Coal ” by Mission Energy Foundation
- 6.5 Lakh MT/ year, CO2 avoided through inproved cycle efficiency by adopting Supercritical technology.

CREATING NEW BENCHMARKS IN REDUCING CARBON FOOTPRINT AND PREVENTING CLIMATE CHANGE

NTPC: Vision, Mission and Core Values

Vision

To be the World's Leading Power Company, Energizing India's Growth

Mission

Provide Reliable Power and Related Solutions in an Economical, Efficient and Environment friendly manner, driven by Innovation and Agility

Core Values

I	C	O	M	I	T

NTPC –India's Powerful Maharatna

65,165 MW under Operation & 17,874 MW Under Construction

10 Coal blocks, 103 MMTPA mining capacity

18,000+ committed workforce

18 JVs and 12 Subsidiaries in Generation, Services & other Business

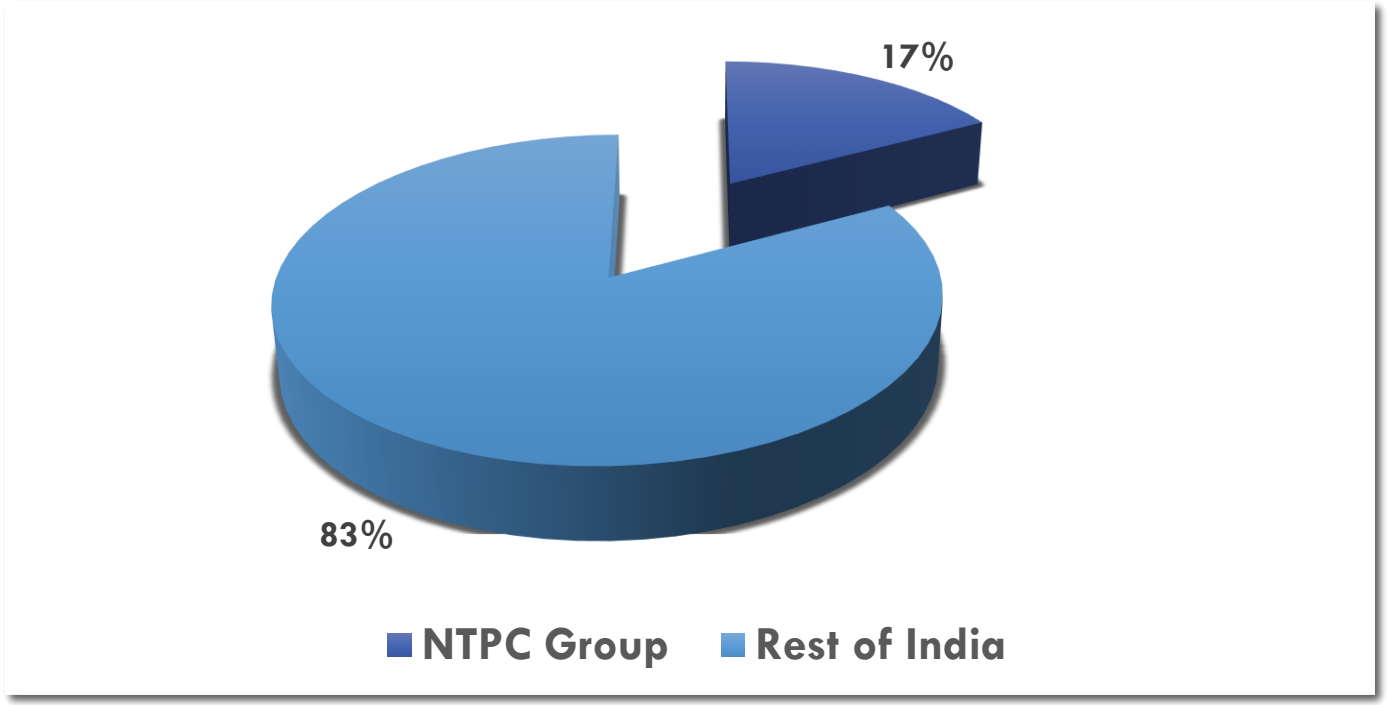
10th Largest Indian company in Forbes Global 2000 ranking-2021
#2 IPP & Energy Trader in the world as per Platt's ranking 2020
(Overall Platts Global Energy Company Rankings – 62)

Commissioned Capacity: 66,075 MW

Fuel Mix	No. of Stations	Capacity (MW)	% Share
Owned by NTPC			
Coal	23	46,660	70.62
Gas/ Liquid Fuel	7	4,017	6.08
Hydro	1	800	1.21
Solar/ Wind/ Small Hydro	15	1173	1.78
Sub-total	46	**52,650**	79.68
Owned by JVs and Subsidiaries of NTPC			
Coal	9	7,814	11.83
Gas	4	2,494	3.79
Hydro	8	2,925	4.43
Solar/ Wind/ Small Hydro	5	192	0.29
Sub-total	26	**13,425**	20.32
Total	**72**	**66,075**	**100.0**

NTPC's share in All India Generation and Capacity

NTPC Share in All India Capacity (GW)



NTPC Group – 65.825 GW
All India – 383.37 GW*

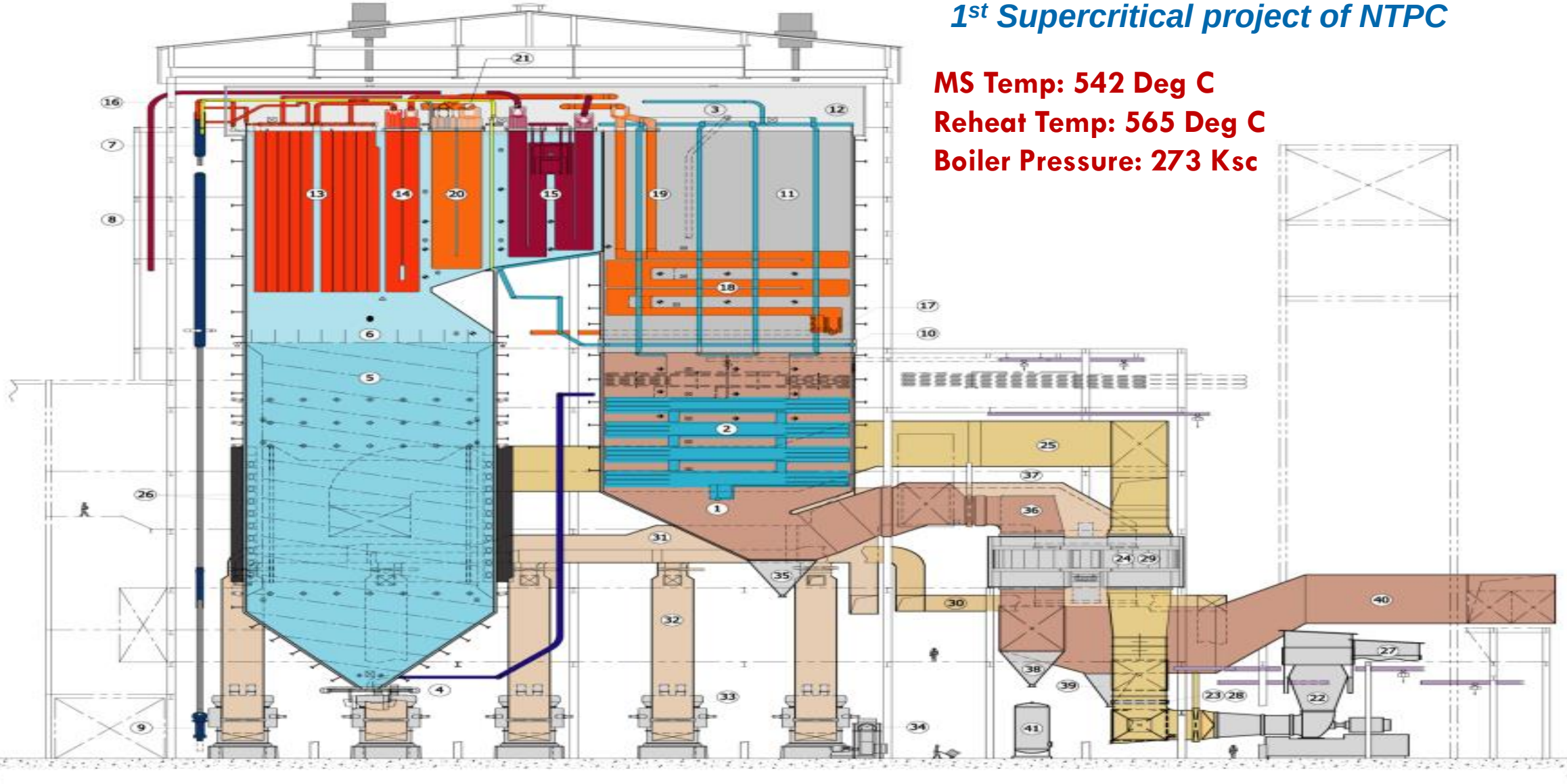
* Source: NPP

* Excluding Bhutan Import (Source: CEA & NPP)

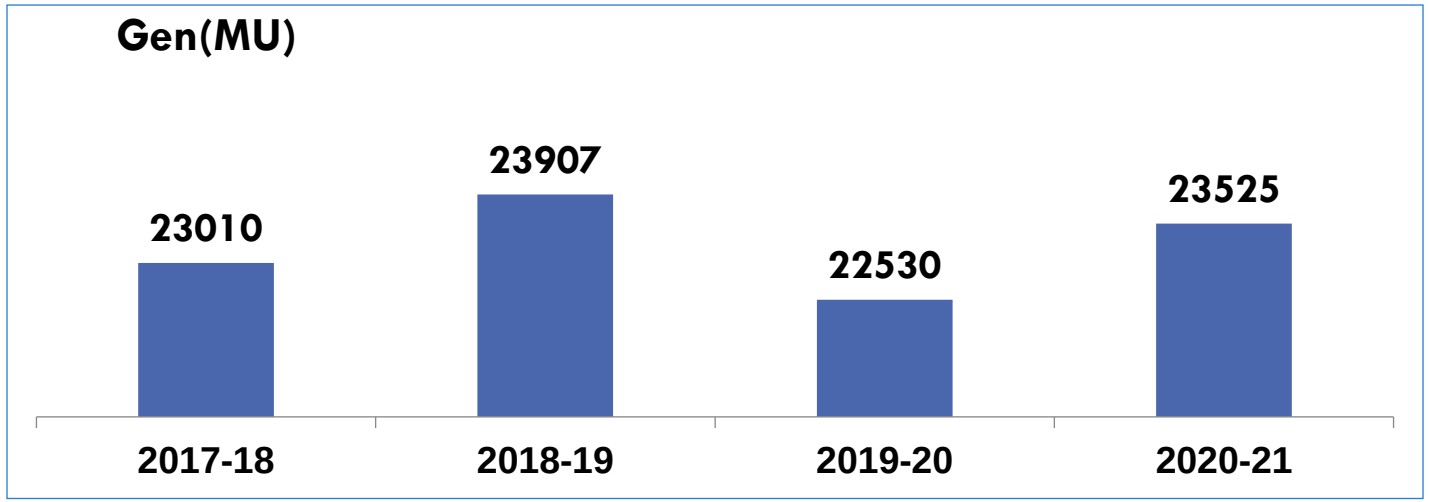
Sipat Super Critical Boiler

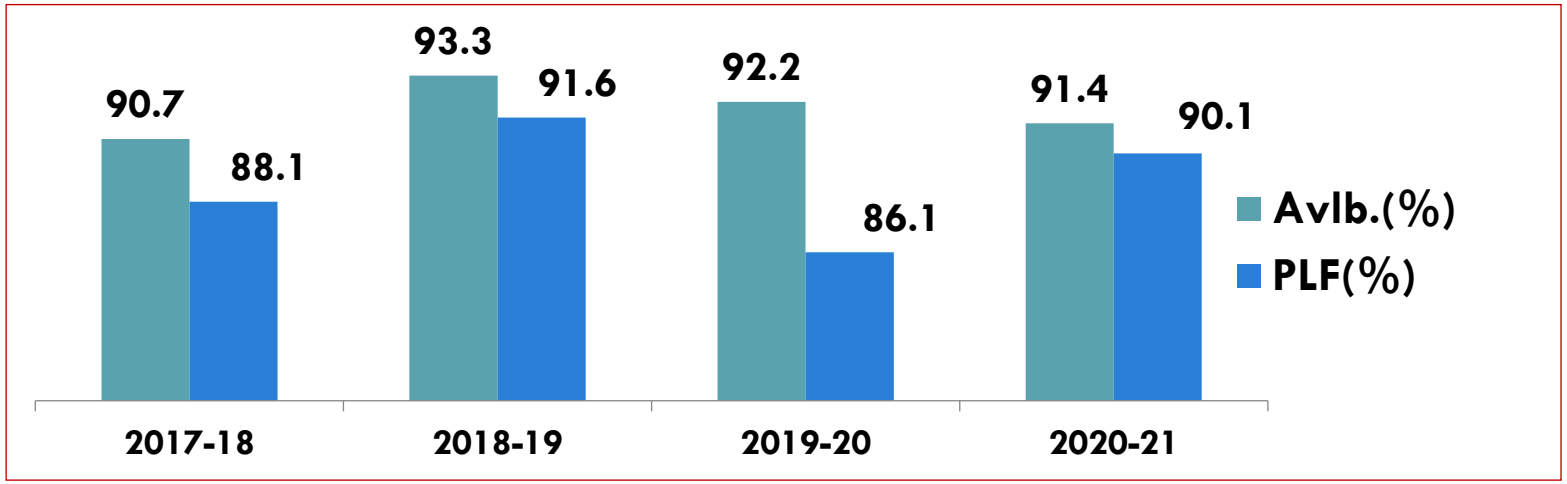
1st Supercritical project of NTPC

MS Temp: 542 Deg C
Reheat Temp: 565 Deg C
Boiler Pressure: 273 Ksc



SIPAT: *Consistent performer over the years*





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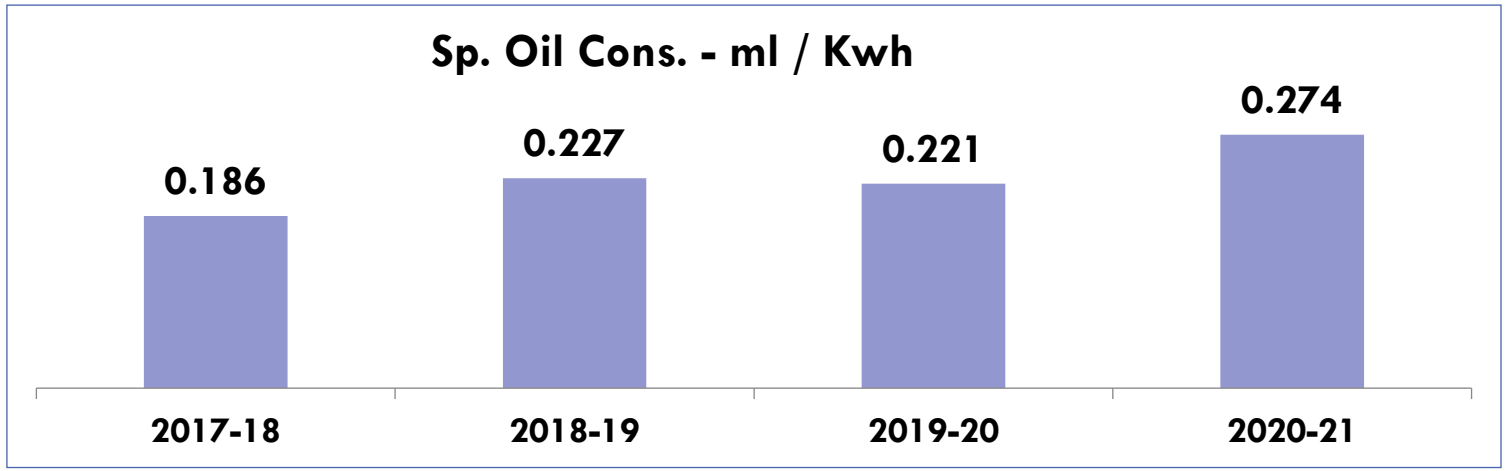
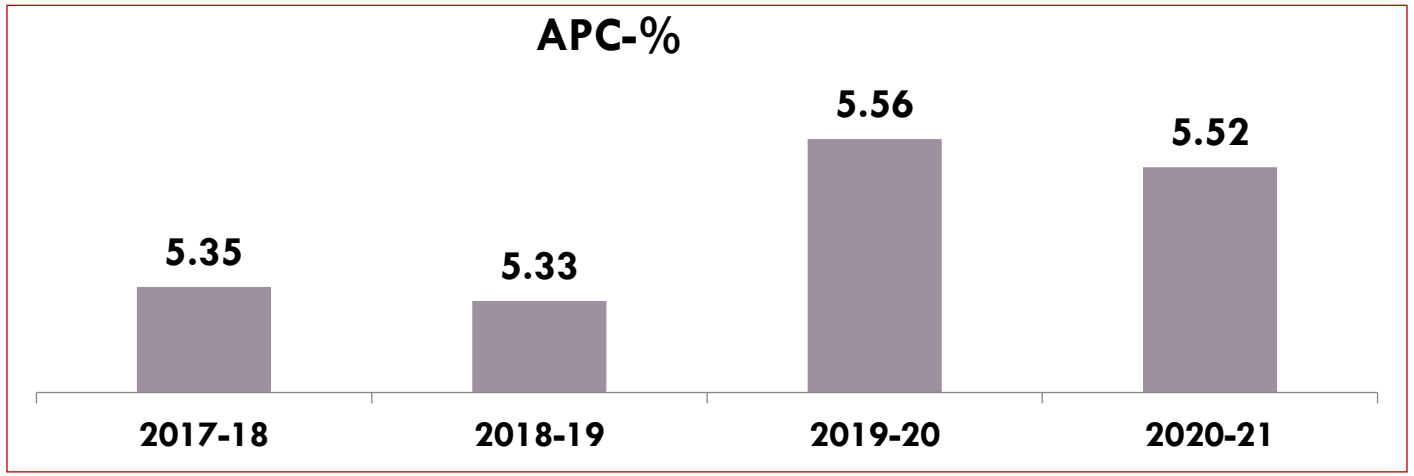
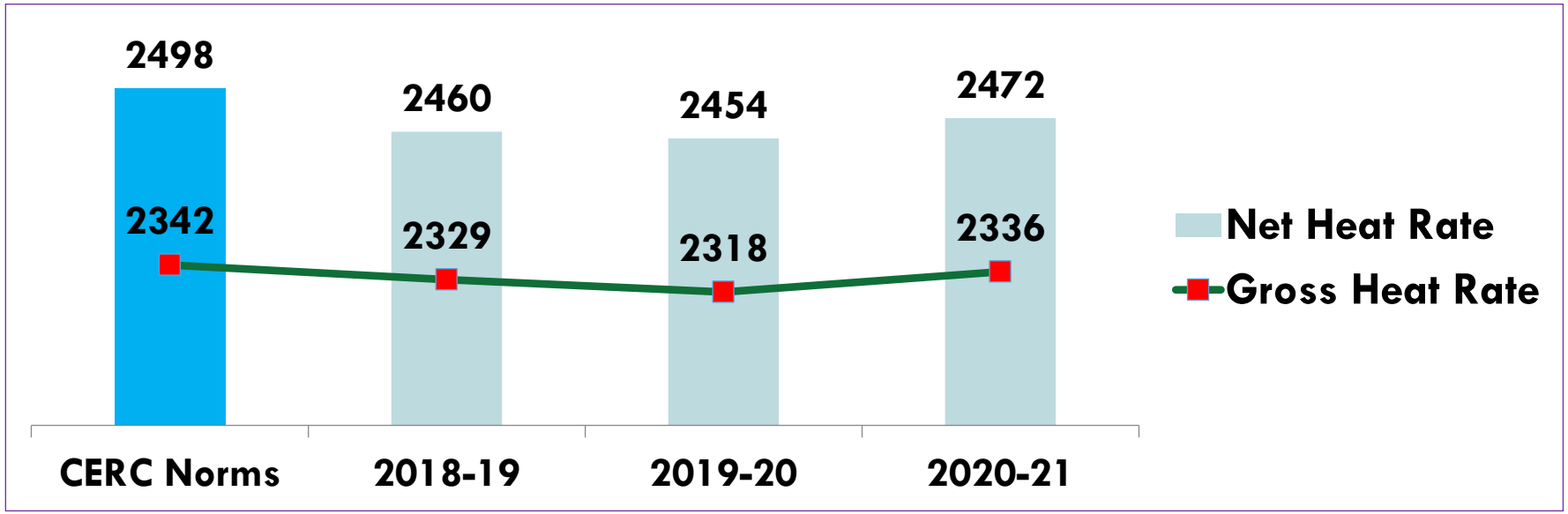




Net Heat Rate Trends



- Central electricity regulatory commission (CERC) has fixed a normative Heat Rate for NTPC Sipat at 2342 kcal/kwhr based on the technology.
- NTPC Sipat has been able to maintain Gross Heat Rate below 2340 kcal/kwh continuously for the past few years.
- NTPC Sipat has got Escerts for overall energy reduction in both PAT cycle-I and PAT cycle-II.

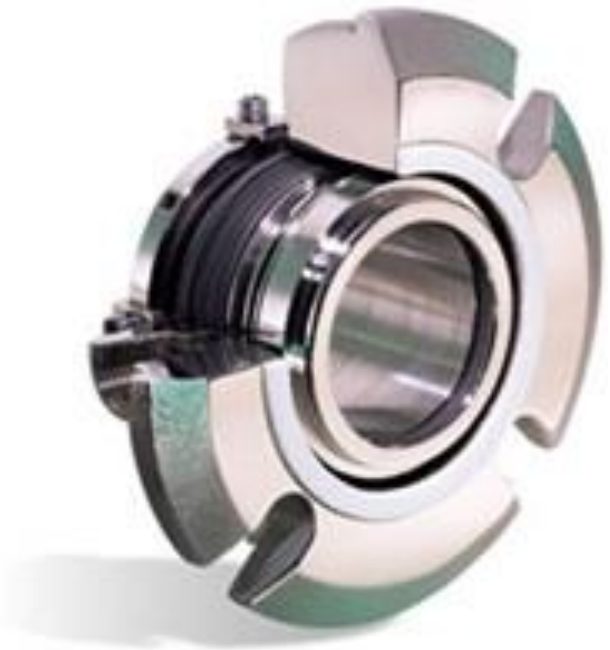
Innovative projects implemented

Turbine driven boiler feed pump(TDBFP) mechanical seal up-gradation

TDBFP

MECHANICAL SEAL UPGRADATION

- SILICON CARBIDE (LIFE 6 MONTH) SEALS REPALCED WITH DIAMOND FACED SEAL (2 YEAR)
- TDBFP DOWNTIME REDUCED BY FOUR TIMES, MDBFP(11MW) RUNNING HOURS REDUCED APPX. 300 HOURS
- TOTAL INVESTMENT – 2CR.



Energy saved: 3.2 MU

Major ENCON projects for 2021-22

	Activity/item	RE 21-22
1	Implementation of energy conservation schemes/modifications planned out of recommendations of energy audit reports	INR Million
i.	MAGNA DRIVE Coupling for AHP	1.45
ii.	Low power consumption Ash slurry Pump for ash handling Stage -II	4.47
iii.	LED LIGHTING (PLANT) – 70W	4.63
iv.	LED LIGHTING (PLANT) - 110W / 180W	6.40
v.	LED LIGHTING (PLANT) - 35W / 70W	15.56
vi.	LED LIGHTING (PLANT) - Township lighting	21.44
2	Non-Conventional / Others	INR Million
i	ROOF TOP SOLAR PLANT AT VARIOUS BUILDING 650 KW	24
ii	SOLAR POWERED LED STREET LIGHTING SYSTEM	18.48
	Total (EC)- Rs. Million	96.4

Benchmarking and Energy Savings target setting

NTPC Sipat has a strong system of Benchmarking with the best performer.

Internal benchmarking

- Done by Business Excellence(BE) department through BE position report.
- Energy savings is an important parameter for evaluation of the station in called PEM(Performance evaluation matrix). Marking is done on the energy savings done by the station through a Pan NTPC competition called PEM(Performance evaluation matrix).

External benchmarking

NTPC SIPAT is a designated consumer and has been notified in PAT cycle I & II of Bureau of Energy Efficiency. In PAT cycle-II Sipat got a Net Heat Rate Target of 2430 kcal / kwhr , Actual achieved was 2424 kcal / kwhr)

NTPC Sipat has been awarded Escerts for overall energy reduction in both PAT cycle-I & II.

- Escerts in PAT cycle-I: 36244 MTOE
- Escerts in PAT cycle-II: 13500 MTOE

NTPC SIPAT PERFORMANCE UNDER PAT CYCLE

PAT CYCLE	PERIOD	ASSESMENT YEAR	NHR TARGET	NHR ACHIEVED	ESCERTS
PAT CYCLE-I	2012-15	2014-15	2484	2438	+36443
PAT CYCLE-II	2016-19	2018-19	2430	2424	+13499
NTPC SIPAT TRADED CYCLE-1 ESCERTS ON IEX AND EARNED APPX 3 Cr.					
PAT CYCLE-II M&V AUDIT , AEA RECOMMENDED FOR 13499 ESCERTS –Yet to be Notified By BEE					

Energy Savings projects implemented in last 3 years

YEAR	No of Energy Savings projects	Investments (INR Million)	Electrical Savings (Million Kwh)	Thermal Savings (Million Kcal)	Electrical Savings (INR Million)	Fuel Savings (INR Million)
2018-19	9	41.7	38	3,20,257	50.16	173.1
2019-20	9	19.2	23.3	2,31,700	34.24	132.4
2020-21	11	46.5	25.3	80,850	35.93	46.2

150 KW ROOF TOP SOLAR PV AT NTPC SIPAT

50 KW SOLAR PLANT AT NTPC SIPAT SIMULATOR BUILDING

100 KW SOLAR PLANT AT SIPAT EMPLOYEE DEVELOPMENT CENTER & HOSPITAL ROOF

- Energy savings of approximately ~1.9 lakhs KWHr annually.
- Environment protection by reduction carbon foot prints. (1.6 Lakh kg CO_2 avoided)

150 KW ROOF TOP SOLAR PV AT NTPC SIPAT

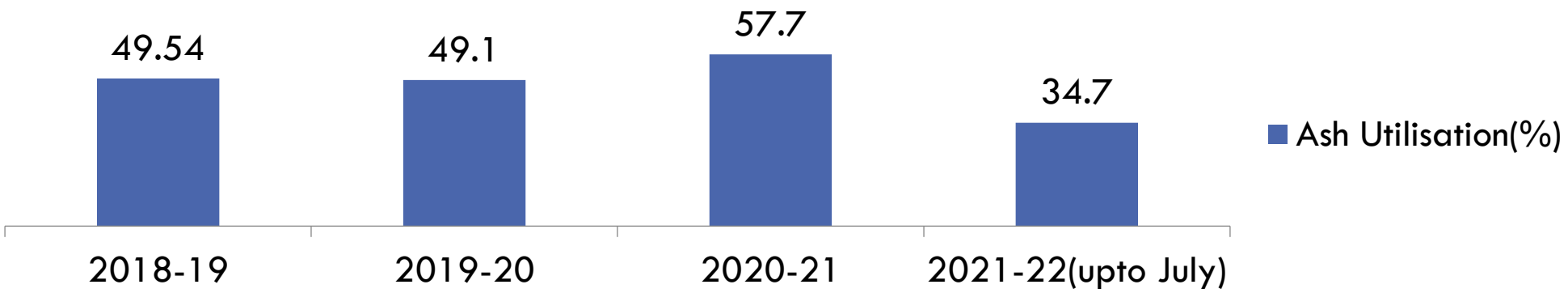
Type	Location	Installed Capacity	Investment (Lacs)	Annual Generation FY 2018-19 (MWHr)	Annual Generation FY 2019-20 (MWHr)	Annual Generation FY 2020-21 (MWHr)
Rooftop Solar PV	NTPC Sipat Hospital	50 KW	48	77.76	75.19	76.29
Rooftop Solar PV	Administrative Building	100 KW	78	148.25	127.88	131.65

Upcoming Solar PV in FY 2021-22 :

- 650 KW Solar PV at various building inside the plant
- 200 KW Solar PV for Township power consumption.

Use of Renewable has helped in reducing the power requirement of conventional power for powerplant auxillaries and township requirement.

Environment Management: Ash Utilisation



Modes of Ash utilisation:

- **Dry Ash: 77.8% (U#3 DAES system erected, commissioning in progress)**
- **Wet Ash: 22.2%**

Distribution of areas of Ash utilisation

- **Roads and Highways**
- **Low lying area development**
- **Mine filling / stone query filling**
- **Dyke raising**
- **Cement Manufacturers / Bricks & Blocks**

Environment Management: Ash Utilisation

Ash Utilization action Plan 2021-22	
Total Ash generation - 51.8 LMT	
Area	**Utilization (MT)**
Road & Highways	19.4
Low lying area development	7.3
Stone Quarry Filling	14.8
Dyke Raising	5
Cement	10
Bricks & Blocks	4
Total AU Plan	**60**
% Utilisation	**115%**

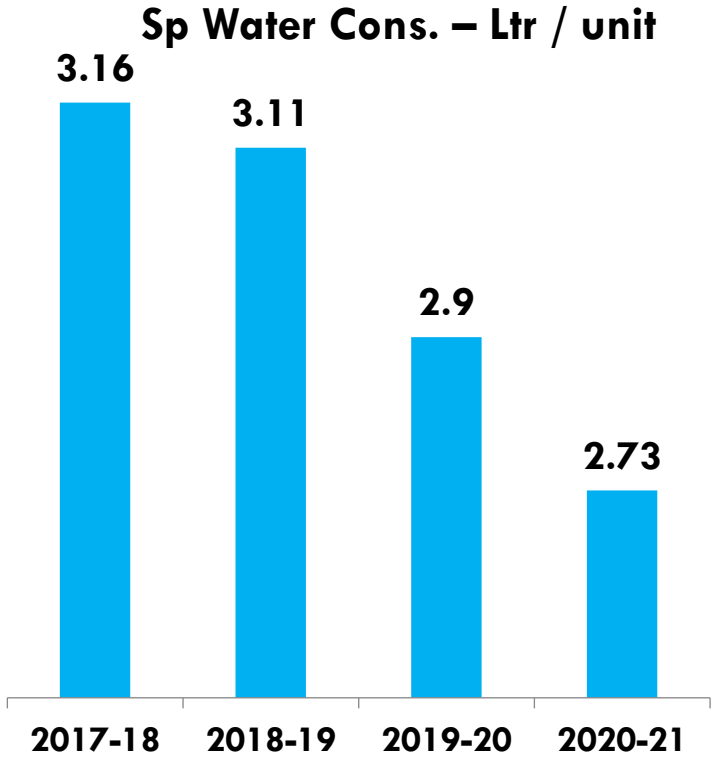
Environment Management: Emission

Particulars	UOM	2018-19	2019-20	2020-21
Total CO2 emissions per KW of generation	Ton/MWh	0.86	0.85	0.85
Current Sox emission at Full Load	Mg/Nm3	1240	1146	1029
Current NOx emission at Full Load	Mg/Nm3	310	246	210
Particulate matter	Mg/Nm3	36	37	35
Mercury	Mg/Nm3	0.0012	0.0011	0.0010

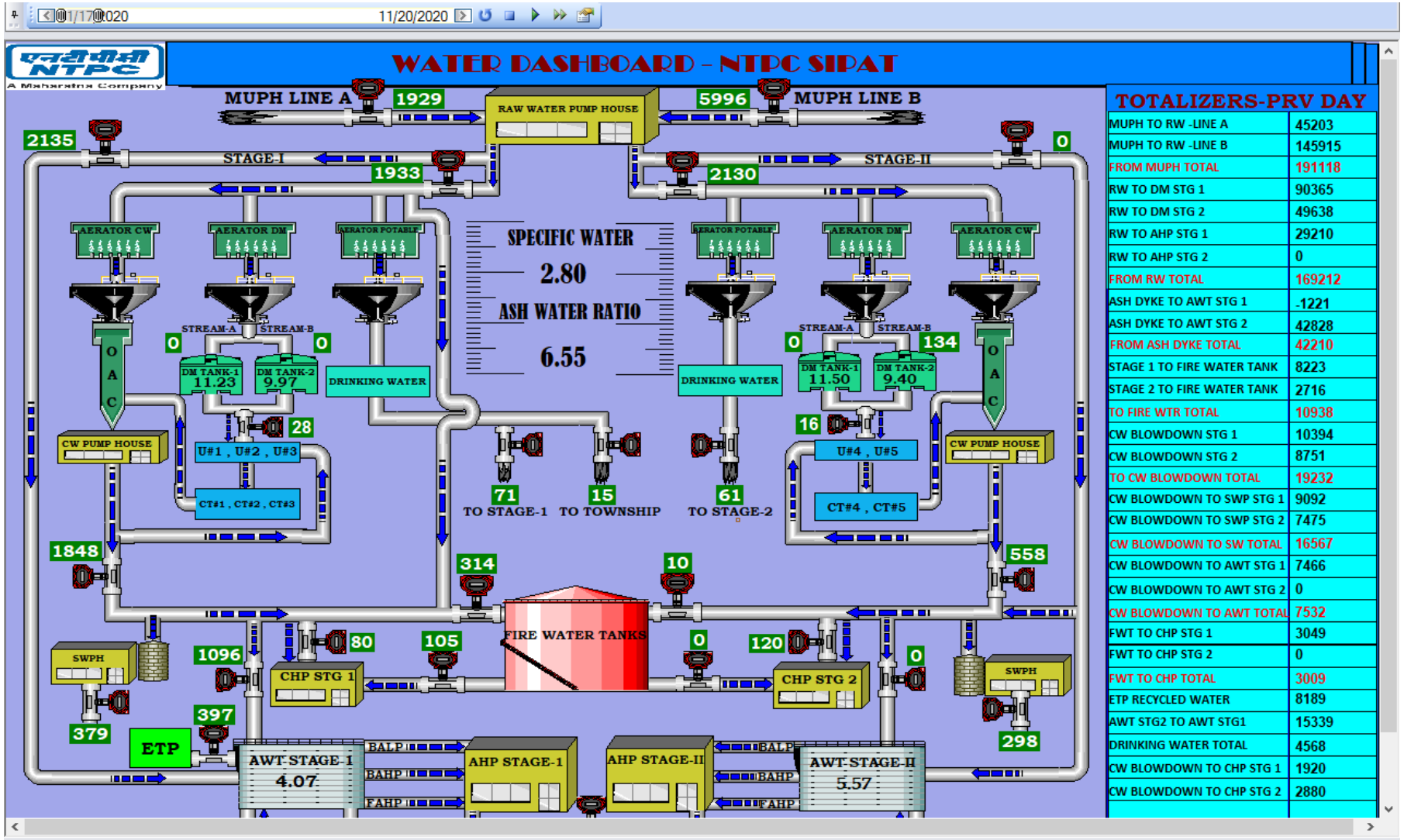
- **NTPC Sipat is installing Flue Gas Desulphurization (FGD) system to reduce Sox emissions and also contain Particulate matter(PM) in flue gas.**
- **For reduction of NOx emissions Combustion Modification work has been completed in two 500MW units. Work in progress in other three 660MW units.**

Environment Management: Water

- ZLD and Drain Separation Completed
- Daily Review of Dry Ash extraction system (DAES) with existing Facility – 2 Units in Stage-I and 2 Units in Stage II.
- DAES for Unit-1 (660MW) and Unit-2(660MW) of St-I is commissioned. Unit 3 erection is done commissioning in progress.
- Wet System –Daily Ash to Water Ratio Monitoring in Daily Planning meeting , Stringent Effort are being applied to reduce Ash to Water Ratio.
- CW Cycle of Concentration (COC) has been Improved from 4 to 7 with Lot of Modification and system improvement.



Environment Management: Water



TOTALIZERS-PRV DAY	
MUPH TO RW -LINE A	45203
MUPH TO RW -LINE B	145915
FROM MUPH TOTAL	191118
RW TO DM STG 1	90365
RW TO DM STG 2	49638
RW TO AHP STG 1	29210
RW TO AHP STG 2	0
FROM RW TOTAL	169212
ASH DYKE TO AWT STG 1	-1221
ASH DYKE TO AWT STG 2	42828
FROM ASH DYKE TOTAL	42210
STAGE 1 TO FIRE WATER TANK	8223
STAGE 2 TO FIRE WATER TANK	2716
TO FIRE WTR TOTAL	10938
CW BLOWDOWN STG 1	10394
CW BLOWDOWN STG 2	8751
TO CW BLOWDOWN TOTAL	19232
CW BLOWDOWN TO SWP STG 1	9092
CW BLOWDOWN TO SWP STG 2	7475
CW BLOWDOWN TO SW TOTAL	16567
CW BLOWDOWN TO AWT STG 1	7466
CW BLOWDOWN TO AWT STG 2	0
CW BLOWDOWN TO AWT TOTAL	7532
FWT TO CHP STG 1	3049
FWT TO CHP STG 2	0
FWT TO CHP TOTAL	3009
ETP RECYCLED WATER	8189
AWT STG2 TO AWT STG1	15339
DRINKING WATER TOTAL	4568
CW BLOWDOWN TO CHP STG 1	1920
CW BLOWDOWN TO CHP STG 2	2880

Water Dashboard:
Real time monitoring of water consumption

Teamwork Employee involvement & Monitoring

Daily Monitoring System:

Daily Planning Meeting(DPM) is conducted every day at 12:00 noon to discuss the critical issues and previous day performance. It is chaired by GM(Operation& Maintenance)

Review meeting:

Head of Plant(HOP) chairs this meeting twice a week to address long pending issues of varios departments.

A separate Energy conservation budget is allocated for each financial year to achieve energy savings. For FY 21-22 NTPC Sipat has allocated 10cr for ENCON activities.

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 give exams organized by Bureau of Energy Efficiency. Training is also provided to all Participants for BEE energy auditor exam.

Teamwork Employee involvement & Monitoring

Some of the areas of Significant Energy consumption which are being monitored real-time :

Boiler:

- Dry flue gas loss (major constituent of Boiler loss)
- Draft power (approx. 35% of auxillary power requirement)
- Unburnt Carbon % etc

Turbine:

- Cylinder efficiency,
- Gross Turbine Cycle Heat Rate (GTCHR),
- Condenser performance
- Cooling Tower performance

Offsite :

- Coal Handling Plant (CHP) specific power consumption (SEC)
- Ash Handling Plant (AHP) specific power consumption (SEC)
- Compressor house Energy Consumption Index (ECI)



Thank You

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