NTPC TAMILNADU ENERGY COMPANY LIMITED



NTECL

Vallur TPS



Team Members:

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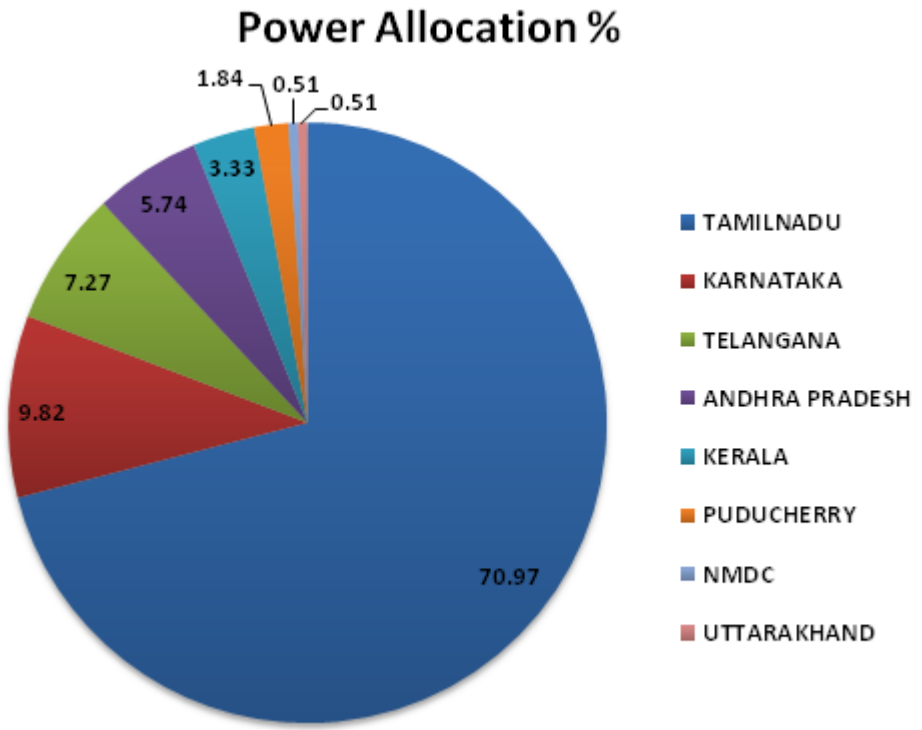
INTRODUCTION

- **NO.OF.UNITS: 3**
- **CAPACITY: 1500 MW** (3 X 500 MW)
- A 50:50 Joint Venture Company between NTPC Ltd and TANGEDCO
- Established under the Mega Power Project Policy of the Central Government
- Commercial Operation of full capacity since 2015
- **Unique Features:**
- Sea Water Solar Desalination Plant (Capacity: 20MLD)
- Gas Insulated Switchyard (80% lesser space than conventional)
- Spillage free Pipe Conveyor
- Grab Unloader for coal at Port (Capacity : 2 X 2000 MT/hr)



INTRODUCTION: Environment Friendly Features

- **Production of Packaged Drinking Water (with BIS License) from Sea water based Solar Desalination Plant**
- **Total Plant Water requirement is met with Sea Water intake (from CW forebay of NCTPS, TANGEDCO)**
- **Closed Cycle Cooling System with IDCTs (Induced Draft Cooling Towers)**
- **Spillage free Pipe Conveyor of 4Km length for transporting coal from Sea Port to Site which ensures dust free coal transportation and environment protection**
- **Land acquired is barren, salt pan Government Land**
- **Site levelling done with ash from nearby ash disposal areas of TANGEDCO**
- **Least area/MW among NTPC Plants**

ENERGY CONSUMPTION – Overview (FY21-22)

Operational

- *Annual Generation :* **7913.47 MU**
- *Station PLF:* **60.22%**
- *Station Availability Factor:* **89.82%**

Efficiency

- *Gross Heat Rate :* **2342 kcal/kwh**
- *APC:* **615.23 MU/ 7.77%**
- *Sp. Oil Consumption:* **0.50 ml/kwh**

Specific Water Consumption

- *Sp. DM Water:* **0.061 m3/MWh**
- *Sp. Raw Water(Sea Water):* **9.22 m3/MWh**

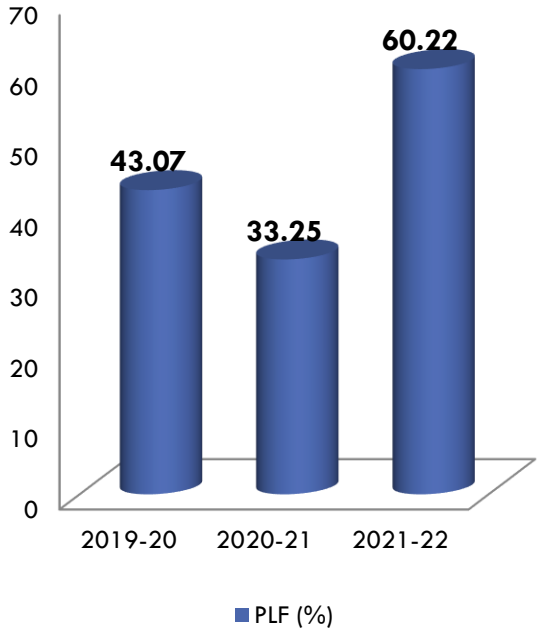
ENERGY CONSUMPTION – Overview (FY21-22)

Efficiency (Actual Test Values)

- *Boiler Efficiency:* ***(Design : 84.85%)***
  - *Unit #1:* ***84.71%***
  - *Unit #2 :* ***84.04%***
  - *Unit #3 :* ***83.5%***
- *Turbine Heat Rate:* ***(Design : 1932 kcal/kwh)***
  - *Unit #1 :* ***1992.49 kcal/kwh***
  - *Unit #2 :* ***1991.38 kcal/kwh***
  - *Unit #3 :* ***2017.22 kcal/kwh***

ENERGY CONSUMPTION – 3 years trend (FY19-20 to FY21-22)

Plant Load Factor (PLF) (%)



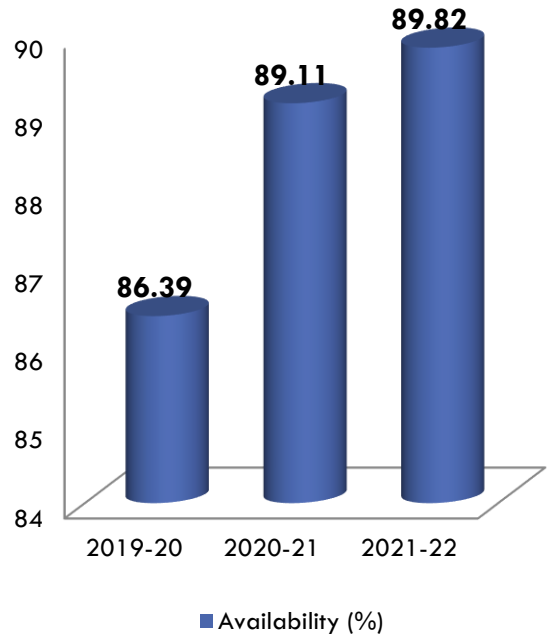
FY	PLF (%)	% Improvement over last FY
2019-20	43.07	
2020-21	33.25	**-22.8**
2021-22	60.22	**81.11**

Reasons for Variation/ Best practices for Improvement:

1. Dip in power demand in 2020-21 owing to the pandemic.
2. High demand by beneficiaries in 2021-22.
3. Better position in Merit Order Ranking in 2021-22.

ENERGY CONSUMPTION – 3 years trend (FY19-20 to FY21-22)

Station Availability (incl RSD) (%)



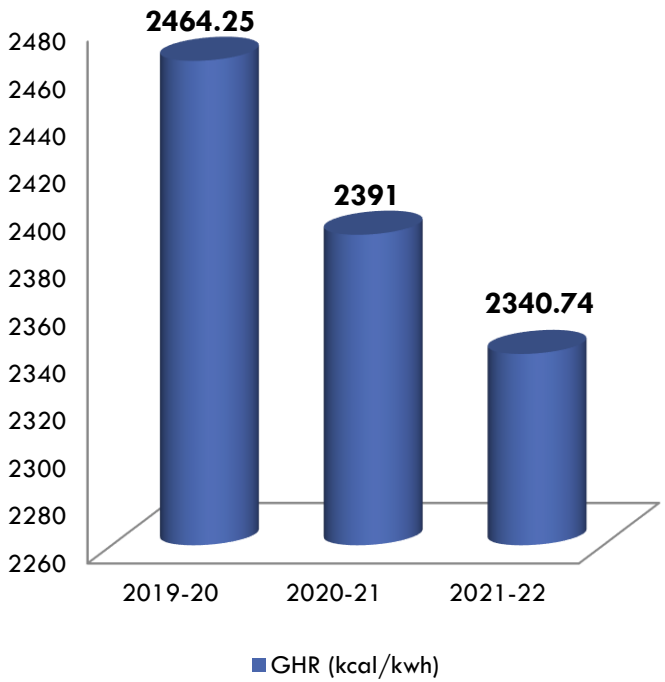
FY	Station Availability (%)	% Improvement over last FY
2019-20	86.39	
2020-21	89.11	**3.15**
2021-22	89.82	**0.8**

Reasons for Variation/ Best practices for Improvement:

1. Reduced Outages
2. Regular checks for unit healthiness

ENERGY CONSUMPTION – 3 years trend (FY19-20 to FY21-22)

Gross Heat Rate (kcal/kwh)



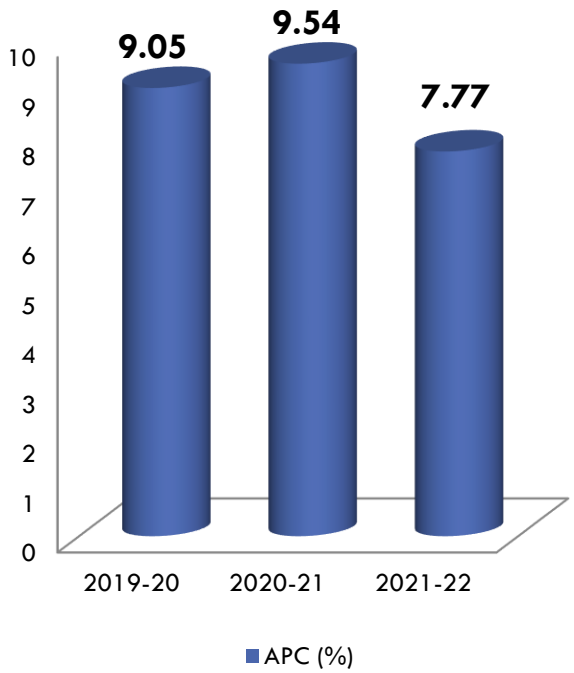
FY	GHR (kcal/kwh)	% Improvement over last FY
2019-20	2464.25	
2020-21	2391	**2.97**
2021-22	2340.74	**2.10**

Best practices for Improvement:

1. All APH baskets replaced as per rolling plan
2. Condenser acid cleaning, HP jet cleaning
3. Reduction of draft power after overhaul
4. Regular High Energy Drains checking, O2 mapping, furnace temperature mapping
5. Frequent coal mills isokinetic sampling for fineness
6. Mill DPT/CAFT as and when required

ENERGY CONSUMPTION – 3 years trend (FY19-20 to FY21-22)

Auxiliary Power Consumption (%)



FY	APC (%)	% Improvement over last FY
2019-20	9.05	
2020-21	9.54	**-5.41**
2021-22	7.77	**18.55**

Reasons for Variation/ Best practices for Improvement:

1. Decrease in Station On bar Availability & PLF in 2020-21 owing to the pandemic.
2. High demand with improved PLF in 2021-22
3. Using TDBFPs during Unit start-ups
4. APH water washing during shutdowns
5. Four Mill operation, Single CEP operation during Technical Minimum Load
6. Compressor air pressure set point reduced from 7.2 to 6.2 ksc

Benchmark

Normative Parameters :

Gross Heat Rate (kcal/kwh) : 2358.84 kcal/kwh

Auxiliary Power Consumption : 7.19% (6.25% + 0.94% additional expected)

Secondary fuel (LDO) Consumption : 0.5 ml/kwh

Energy Saving Projects

Year	No.of.energy saving projects	Investment (INR Million)	Electrical Savings (Million kwh)	Thermal Savings (Million kcal)	Savings (INR Million)
FY19-20	6	12.62	15.35	112383.806	203.4
FY20-21	8	47.4	4.18	54092.712	77.773
FY21-22	10	50.5	11.98	7132.406	191.427

Innovative projects implemented

Cooling Tower Fan Blades:

- Cooling Tower Fans (1A2 and 2B2) with 4 blades are replaced with 7 blades in June'22
- Measured Excess air flow (1A2/2B2) : 30% / 20%
- Measured Power Saving (1A2/2B2) : 10% / 17%
- All fan blades will be replaced by 7 blades once the 3 months trial period is completed.

Fan with 7 blades

Fan with 4 blades

Innovative projects implemented

Solar Desalination Plant:

- A Pilot research project of NTECL and NETRA (NTPC Ltd's Research Wing) started in Dec'20
- Capacity : 120 Tonnes/day
- Produces packaged drinking water from sea water (Christened as SURYA NEER)
- Received BIS Certification in July'22
- Green initiative to meet drinking water requirement of entire NTECL Plant and township
- It has been planned to distribute this water to nearby villages through CSR activity and also sell the remaining quantity

Environment Management – Ash Utilisation

Particulars	UOM	2019-20	2020-21	2021-22
Ash stock in plant (Yard + Pond)	Tons	5098436	3647853	4183784
Ash Generated	Tons	1744306	1276783	2446560
Ash Utilization	%	121.02	122.8	78.09
Ash utilization in manufacturing in cement/concrete	%	27.87	29.19	47.67
Ash utilization in fly ash bricks	%	10.97	11.02	10.90
Ash utilized in mine fiiling	%	0	0	0
Ash utilized in road	%	61.15	59.77	41.41
Expenditure on Ash Utilization (annual)	INR (Lakhs)	Nil	Nil	Nil
Methods of Ash Handling:				
Ash Handled (Wet method)	%	52.99	50.61	54.26
Ash Handled (Dry method)	%	47.01	49.39	45.74

Environment Management – Ash Utilisation

Best Practices :

- Recycling of sea water used for pumping ash slurry to dyke and using only the blowdown from turbine condenser cooling water.
- No ash water is discharged to sea or any water body.
- Options to take part in the nation's infrastructure building by offering pond ash to NHAI by transportation at NTECL's own cost are being explored
- A new initiative in ***tree plantation – Bio seed Roll*** is being experimented since June 2022. Bio seed roll is made of fly ash and manure produced by municipal solid waste.

Environment Management – Emission Control

Best Practices adopted for Emission Control:

ESPs (Electrostatic Precipitators) :

- High Efficiency, Always kept ON when units are in service (Each Unit ESP has 4 passes with 20 fields/pass)
- Kept ON even for few hours after unit shutdown for effective control of emissions

ESP

Coal Yard & Coal Handling :

- Wind Barriers of 12 m height are installed for prevention of dust emission
- Dry Fog dust suppression system is provided at coal handling area and transfer points

Wind Barrier at Coal Yard

Environment Management – Emission Monitoring

Best Practices adopted for Emission Monitoring

Emission Parameters Monitoring:

Connected to TNPCB since 2015 and CPCB since 2017

All emission and environmental parameters monitoring conducted **fortnightly** by MoEF&CC and NABL accredited laboratory from Chennai

Emission monitoring conducted at NTECL in Nov'21by a team ofofficials from TNPCB, MoEF&CC, Anna University as constituted by honorable **NGT.**Reports showed that emission parameters of NTECL are **within stipulated limits**

SO2, NOx Analysers:

In 2021, NTECL replaced its SO2, NOx analysers with efficient Forbes Marshall Codel 40 series analysers for a total cost of Rs 40 lakhs including AMC.

Analysers used for measuring are certified as per SPCB guidelines and are calibrated regularly.

Calibration in July'22

Internal Cross Checks:

Cross checks are done with internal measurement using analysers for values of emission parameters.

Recent calibration done in July 2022

Environment Management – Emission Levels

Total Emission and Specific Emission :

Year	Total Emission				Emission Intensity (gm/Kwhr)			
	Sulphur Dioxide -SO2 (MT)	Oxides of Nitrogen - NOX (MT)	Particulate Matter - PM (MT)	Mercury (MT)	Specific SO2 emission (gm/Kwhr)	Specific NOX emission (gm/Kwhr)	Specific PM emission (gm/Kwhr)	Specific Mercury Emission (g/Kwh)
2020-21	21486	11204	662.98	0.01	4.92	2.56	0.15	0
2021-22	39732.95	16376.75	1504.63	0.01	5.02	2.07	0.19	0

Current Emission :

	Unit	2019-20	2020-21	2021-22
Current SO2 emission at full load	mg/Nm3	694	850.3	947.48
Current NOx emission at full load	mg/Nm3	409	436.74	393.07
Particulate Matter	mg/Nm3	22	25.97	36.14
Mercury	mg/Nm3	0.01	0.01	0.01

Environment Management – New MoEF Norms

S.No	Description	New Norm applicable	Detailed Plan for achieving
1	Particulate Matter Emission	50 mg/Nm3	Already achieved and always with limits
2	NOx Emission	450 mg/Nm3 *(To be achieved by Dec'22)*	Combustion modification works (Retrofitting of Boiler) done in Dec'20 for Unit 1 and Sept'21 for Unit 2. New NOx emission level achieved in Unit 1 and 2. Unit 3 combustion modification works has been taken up in July'22 during overhauling and is in completion stage. NOx emission level will be achieved from Aug'22. **Thus NTECL is well ahead of timeline given by MoEF&CC/CPCB for achieving NOx emission standards.**
3	SOx Emission	200 mg/Nm3 *(To be achieved by Dec'22)*	Flue Gas Desulphurization installation contract awarded in March'20, work in progress since July'20. Supply of materials and work hampered to a great extent due to Covid Pandemic and lockdown. Work in progress at full throttle. Unit 1 FGD Chimney and Damper erection completed. Major civil foundations completed. Erection of machineries to be done. Unit 2 & 3 Chimney and damper erection in progress.

Environment Management – Water

Description	UOM	2019-20	2020-21	2021-22
DM Water Consumption (Cycle)	% of MCR	0.81	0.79	0.74
Raw Water Consumption	M3/MWh	11.24	13.43	9.22

Best practices in Water Management:

- ***Effluent treatment plants and Liquid waste treatment*** plants are kept in operation to ensure proper disposal of waste water.
- Effluent is cooled before discharge to the channel 4 km away
- ***Sewage Treatment Plant*** (STP) Unit inside Plant recycles 75KLD of water and the one in township recycles 1.5MLD of water. So a total of 1575KLD of water is recycled.

Best practices in the Plant

Efficiency/ O&M:

- Four mill operation during Tech Min loads
- Single CEP operation during Tech Min loads
- Regular HED drain checking, O2 mapping
- Using TDBFPs during Unit Start-up
- Unit Start-up analysis done after every start-up and findings are discussed for improvement
- Well laid down Location Management Instructions (LMI) and Standard Operating Procedures (SOPs) for every work being carried out.
- All needed testing instruments with latest features are available and are calibrated regularly

Environment/ Sustainability:

- Afforestation - Till March'22 NTECL has planted 19,760 trees inside and 24,000 trees outside its premises through Tamilnadu Forest Department. A contract for ***10,000 number of trees plantation*** is awarded to TN Forest department in April 2022.
- Near the existing mangrove forest in Ennore Backwater, ***NTECL has dedicated its own land of around 30 acres*** and started ***plantation of mangrove forest*** in June'19
- Construction of two ***Rain Water Harvesting Ponds*** of total capacity 75,250 m3 capacity completed in August 2020.
- ***Biogas plant*** of 200 Kg per day intake capacity installed in April 2022 for plant canteen.
- Ash Water recycling is being done.

Teamwork, Employee involvement & Monitoring:

Daily Monitoring System:

- Daily plant performance, auxiliary power consumption, water consumption, partial loss and heat rate deviation reports are prepared.
- Exceptions discussed in Daily Planning Meeting chaired by Head of Operation & Maintenance (O&M) Dept

Review Meetings/ Audits:

- Monthly Operation Review Team (ORT) Meeting chaired by the Head of Project to monitor and review all aspects of O&M
- Internal and External Energy Audits are conducted regularly. Regular follow-up of action plans regarding Audit points.
- Energy Audit by a dedicated group, CEETEM (Centre for Energy Efficient Technology and Energy Management) of NTPC Ltd to identify potential areas of improvement

Training Programs/ Certification Exams:

- 4 to 5 executives are sponsored for the National Certification Examination for Energy Managers and Energy Auditors every year.
- Various training programs on Power Plant Efficiency Improvement and Efficiency Testing are conducted by CenPEEP (Centre for Power Efficiency & Environmental Protection) and CEETEM (Centre for Energy Efficient Technology and Energy Management) of NTPC Ltd regularly to increase the awareness level of executives.
- Other training programs by BEE, NPC etc are attended by executives

Teamwork, Employee involvement & Monitoring:

Teamwork & Major areas of concern in terms of energy efficiency and reliability:

Performance Optimisation Groups with executives from cross-functional departments (Operation, Mechanical, Electrical, C&I, EEMG) are in place for the following.

- ESP Performance
- Dry Ash Extraction System
- Combustion Optimisation and Heat Rate
- Cooling Tower Performance Optimisation
- Water Balance Study and Optimisation
- APC Optimisation

The objective of the group is to study, carry out analysis of the system and bring out potential points for improvement every fortnight. Reports are discussed in daily meetings.

Other relevant information

Energy Saving Certificates (ESCs):

NTECL has been recommended **+41816 ESCs** after the PAT Monitoring and Verification for PAT Cycle III.

Awards and Accolades:

- Winner of **BEST ENERGY EFFICIENT PLANT** (Coal) award by Mission Energy Foundation in **April'22** for **reduction in Net Heat Rate**
- Runner of **TERI WATER SUSTAINABILITY AWARD** in **March'22** for it's unique **solar desalination plant**
- Winner of **GREENTECH ENVIRONMENT AWARD** in **Nov'21** under the category **"Innovations in Environment Technology"**
- Winner of **MISSION ENERGY FOUNDATION AWARD** in **Aug'21** for **"Implementation of New Environment Norms – Existing Thermal Power Plants"**

THANK YOU

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