

NTPC SIMHADRI

Transforming Lives



ENERGY SAVIOR

Case Study Snapshot

Industry	Power Generation
Product/Service	Thermal Power
Location	Andhra Pradesh, India
Energy performance improvement percentage (over the improvement period)	1.27 % improvement 6 years
Total energy cost savings (over 6 years)	11.96 Million USD
Cost to implement Energy Management System (EnMS)	USD 2064
Total energy savings (over 6 years)	4.78 GJ
Total CO₂-e emission reduction (over the improvement period)	100661 Metric Tons

Organization Profile / Business Case

NTPC Simhadri is the first coal fired, coastal thermal power station set up by NTPC which uses sea water for condenser cooling and for ash transportation. The project was launched in the year 1997. The station has an installed capacity of 2000MW (4x500MW). The station has largest sea water intake well in the Bay of Bengal. It has set a benchmark for 500MW greenfield project by commissioning first unit within a record time of 39 months from “ZERO” date. Simhadri Plant meets more than 85% of its water needs from Sea, thereby contributing to the Nation's efforts in conserving Fresh Water. 25MW floating solar system installed and commissioned in the year 2021.

Our Motivations/Drivers: SIMHADRI Energy Policy

- Efficient utilization of input resources like coal, water and oil by following proven operational practices and innovative methods.
- Sustaining energy efficiency gains through objectives and targets and procurements of energy efficient products and services.
- Compliance to all applicable legal and other requirements related to energy usage and efficiency.
- Establish an energy management system and ensure its periodic review.

Role of Energy Management in the organization's larger Business Strategy

NTPC SIMHADRI has been a pioneer in the energy conservation policy. Our energy management system is robust and mainly deals with heat rate (HR), Auxiliary Power Consumption (APC), Specific oil and water consumption. It aims at minimising the losses and maximising the efficiency. To achieve this objective on a consistent basis, implementation of ISO 50001 has become quite easier. The broader frameworks of the energy management system are as follow:

- Regular assessment energy management system.
- Involvement of employees & interested parties.
- Formulation of Baseline performance data of Energy performance indicators (EnPI) like Heat Rate, Auxiliary Power consumption , Specific oil consumption.
- Assessment of energy performance indicators like Heat Rate, APC Gap.
- Setting the Energy consumption saving target based on the baseline data & deviation from design value.
- Formulation of action plan to achieve the set targets of EnPI.
- Top management’s review at different forums and getting the feedback.
- Monitoring and verification at the end of year.

“NTPC SIMHADRI’s achievement in reducing the GHG and substantial energy saving has become possible through the successful implementation of ISO 50001.”

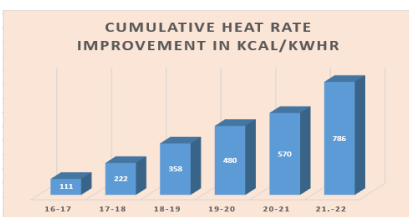
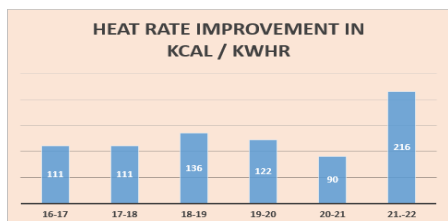
—Girish Chandra Choukse, Head of the Plant

Business Benefits

Implementing EnMS & ISO 50001 have yielded significant benefits beyond energy and energy cost savings. It has guided NTPC Simhadri to create additional market value and to be better prepared for government/utility sponsored energy efficiency programs, carbon or energy taxes and international climate agreements. Some of the business benefits achieved so far are as follow:

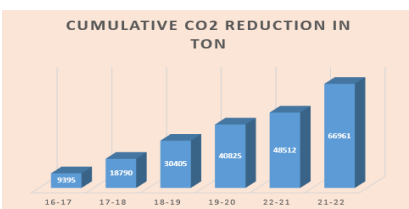
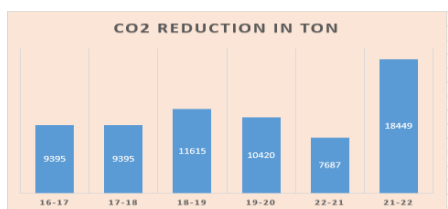
(i) Energy Performance Improvement & Cost Saving:

From Jan 2016 to March 2022, the total energy savings into the monetary benefits of 11.96 Million USD.



(ii) Environmental benefits: Reduction in Co2 emission

Upon implementation of EnMS, there was consistent reduction in the Co2 emission. This has resulted in substantial gains in Co2 savings.



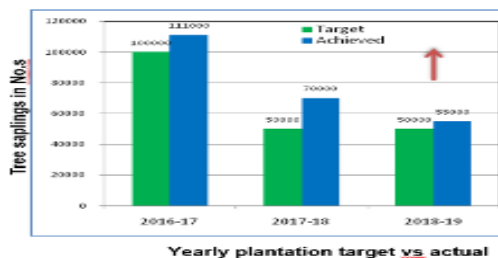
The above Co2 reduction figure is exclusively for coal. NTPC Simhadri has installed and commissioned 25MW floating solar plant and the same is commercialized on 21st Aug 2021. It's contribution towards Co2 reduction from its date of commercialization upto 31st March 2022 is 33700T.

(iii) Benefit on Statutory Compliance

Performa Achieve & Trade (PAT) is the initiative of Ministry of Power, Govt. of India under Enhance Energy Efficiency Mission. Under this scheme, the Energy Improvement Target for each PAT cycle (every three years) are set which has to be achieved during Assessment Year (AY). Due to implementation of EnMS, our station has surpassed the given target of both PAT-1 cycle (Cycle I AY 2014-15). Station achieved a NHR of 2452 kcal/kwhr against the target NHR of 2468 kcal/kwhr. Thus, Station as awarded with 11511 nos. Escerts equivalent to around 0.015 Million USD.

(iv) Non Energy & other associated benefits

NTPC Simhadri has planted more than 6 Lakh trees in and around NTPC Simhadri and 5.50 Lakh Trees in and around the city of Visakhapatnam under “**Green Visakha Plantation**” program. NTPC Simhadri was awarded the ‘Certificate of Merit’ in the year 2017 by Honable Dist. Collector as Best Performing station for its contribution towards Green Visakha. Apart from the above, 2.8 Lakh trees are planted in Paderu under Accelerated Afforestation program and 40000 tree plantations in progress in association with Social forestry department, Government of Andhra Pradesh. NTPC-Simhadri has conducted Ash utilization Awareness workshops for various ash users in the radius of 300 kms. This has led to increases fly ash users from 120 to 310. 100% ash utilization has been achieved consistently from 2017 onwards.



(v) Improved thrust on solar power integration to reduce Emission:

EnMS has guided us to use renewable energy to its full extent. In addition to the energy saving, it has resulted into considerable amount of reduction in GHG. Our main achievements in terms of RE are as follow:

- Installation and commissioning of 25MW floating solar on reservoir.
- Installation and commissioning of solar tree of 3.3kwp capacity comprising of 10 leaves, each having 300wp solar PV panels.
- Installation of EV use and charging station.



ISO 50001 Energy Management System – Case Study

2022

INDIA

(vi) Recognition & Brand Building

- Station received “International Safety Award -2022” by British safety Council.
- Station received prestigious “Safety Innovation Award” for the year 2021 for implementing innovative safety management.
- Station received GOLD AWARD for “Environment Excellence” from APEX India Green Leaf for the year 2020.
- Station awarded with “Energy Efficient unit “by CII for 2020-21.



Plan

Top Management’s Commitment towards EnMS:

Energy Performance through EnMS is the continuous process. NTPC Simhadri’s top management is committed for its continual improvement. To sustain and grow the business, energy efficiency is the key driving force which enhances operational profit margin with regulatory compliances. For achieving the Energy efficiency target set for every year, provision is made to sufficiently allocate the budget which is required for new project implementation or renovation and modernization. It is always ensured by top management that the entire budget is getting utilized on regular basis. As per ISO 50001 guidelines, management approves the Energy Policy for the station and form the EnMS team led by Certified Energy Auditor & Energy Managers with a coordinating members of other departments.

Present Energy Consumption Pattern in NTPC Simhadri

NTPC Simhadri is a coal fired thermal power plant. The present heat design rate loss for turbine and the design boiler efficiency loss and their detailed break up are as follow.

Turbine Heat Rate Loss Break Up					Boiler Efficiency Loss Break Up				
Heat Losses (%)			Design	Test	Heat Losses (%)			Design	Test
1	Load	MW	500.00	499.78	1	Dry Flue Gas Loss	%	4.15	4.84
2	Main Steam Pressure before ESV	kg/cm2	170.00	170.31	2	Hydrogen in Fuel Loss	%	5.47	4.35
3	Main Steam Temp before ESV	Deg C	537.00	539.95	3	Moisture in Fuel Loss	%	2.60	2.10
4	HRH temp	Deg C	565.00	566.14	4	Moisture In Air Loss	%	0.10	0.23
5	SH Spray	TPH	25.00	23.60	5	Unburnt Carbon Loss	%	1.50	1.09
6	RH Spray	TPH	0.00	7.35	6	Mill Reject Loss	%	0.01	0.49
7	HPT Efficiency	%	93.41	88.39	7	Radiation Loss	%	0.23	0.23
8	IPT Efficiency	%	93.79	89.64	8	Unaccounted Loss	%	0.95	0.95
					9	Total Loss	%	15.01	14.29
					10	Boiler Efficiency	%	84.99	85.71

Gross Turbine Cycle Heat Rate and Boiler Efficiency tests are performed in every month. In addition to these, APH , Condenser & Cooling Tower Performance tests conducted on the regular basis. Offline monthly field tests of major equipment are carried out to find out energy gaps.

EnMS Team’s Support in Strategy & Target:

Once the test reports are generated, EnMS team assesses the energy gap against the expected values & baseline data and they put up their observations and recommendations with the target improvements to the top management for approval. EnMS team is always a part of monthly strategic review meeting of top management.

Process of Review & Analyzing Energy Use, prioritizing resource & action:

- Exhaustive past energy data collection.
- Performance gap analysis: Actual Vs Design performance.
- Comparison with similar equipment performance.
- Identification of potential improvement area & fixing the target.
- Energy Efficiency Performance Monitoring System at different levels is as follow:

Energy Efficiency Performance Monitoring System			
Meetings	Frequency	Chaired By	Management Remark
Planning Meeting	Daily	O&M Head	Corrective actions generated from monitoring & review meetings implemented in O & M Practices
Operational Review Meeting	Monthly	Plant Head	
Regional Operational Review Meeting	Half Yearly	Director	

- Preparation of action plan with responsibility for implementation.
- Prioritization and recourse allocation are done from O&M and Energy conservation budget.

“Bridging energy gap, protecting earth, branding the business through ISO -50001.”

—Jhimli Dhar, AGM (EEMG)

Energy Efficiency Activities
❖ PA Header pressure optimisation at part loads for safe & efficient operation of Fans
❖ Single CEP and Single ARCW pump operation at 55% Load
❖ Replacing conventional lights with LED lights
❖ VFDs for suitable LT Drives
❖ Energy Efficient Coating on Pump Impellers
❖ Flue Gas duct Modification with CFD Modelling in Unit-3 & Unit-4
❖ Boiler Modification in Unit-1 & 2
❖ NDCT 3 & 4 Performance Improvement
❖ Flue gas heat recovery based de-salination plant (120 TPD)
❖ APC – Advanced Process Control Implementation

Do, Check, and Act

Implementation Process & Involvement:

Once the action plan is made, department wise responsibility is fixed. The implementation of the identified areas is taken up either in routine maintenance, short term planning , during Overhaul or renovations & retrofitting . The responsibility matrix for all the areas is as follow

Responsibility Matrix	
Area	Responsibility
Boiler Efficiency Loss	AGM (BMD)
GTCHR Loss	AGM (TMD)
Condenser HR Loss	AGM (TMD)
AHP HR Loss	AGM (BMD)
Cooling Tower HR Loss	AGM (Offsite)

Top Management’s motivation and support

Top management has always been committed to the implementation of the EnMS. Their support and motivation are always found in the following manner.

- Clear communication to employees about the importance of effective energy management.
- Ensured that the EMS policy is established based on the guidelines of EnMS standards and in line with organization’s long-term goal.
- Ensured the formation of Energy Management Team.
- Timely allocation of the required budget.
- Conducting regular management reviews.

ISO 50001 Energy Management System – Case Study

2022

INDIA

Improvement undertaken by NTPC Simhadri

Energy Conservation Achievements

FY	Budget (Rs Lacs)	SAVINGS Achieved		
		Energy (MU/MT of Coal)	Rs Lacs	Emission (Tons of CO2)
2015-16	41.47	27.92	714	17774
2016-17	6.3	26.55	652	15610
2017-18	194.5	45.59	1163	30694
2018-19	355	7.53 MU / 10248 MT of Coal	654	14082



A Tree Absorbs 1 Ton of CO₂ In its Life Of 50 years

Continual Improvement In Efficiency

1 KG of Coal with 25% fixed carbon produces 0.916 KGs CO₂

ENERGY Savings



AREA	TYPE OF ENERGY SAVED	Quantity (Energy) Jan2020			Total savings achieved (MU)
		Due to operating practices	Due to equipment maintenance	Due to modi./ replacement by efficient eqpts.	
Single CEP Operation	Electrical	1.528			1.528
Single ARCW Pump Oprn	Electrical	0.354			0.354
Replacing lights with LED lights	Electrical			2.620	2.620
PA Header pressure Optimization at part loads	Electrical	0.040			0.040
Unit #3 Cooling tower	Electrical		3.858		3.858
Unit #3 ESP Duct	Electrical	0.509			0.509
Unit 1 HPT eff. improvement	Thermal		14.243		14.243
Unit 1 IPT eff. improvement	Thermal		8.445		8.445
Unit 1 Boiler Modification	Thermal		23.301		23.301
Total					54.897

Baseline and Reporting Period:

Both baseline period & reporting period are fixed as per Govt. of India and covered under Perform, achieve & trade (PAT) Cycle. The first PAT Cycle was 2012-13, 2013-14 & 2014-15. It had the baseline period of 2012-13 based on past three years data. The assessment period was FY 2014-15. The baseline data for second cycle was the achieved value of first cycle. The second cycle assessment period was 2018-19. Now the 3rd cycle is going on for the period 2020-21, 2021-22 & 2022-23 and the target year is 2022-23 for monitoring & verification purpose.

Transparency

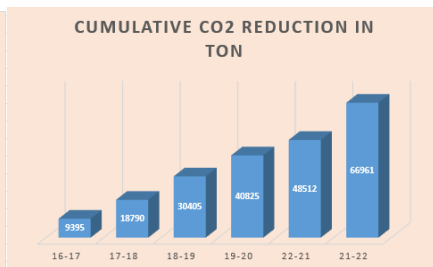
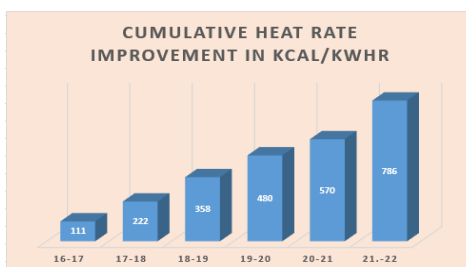
- Publication of integrated annual sustainability report as per GRI by NTPC Ltd.
- Online Environment monitoring screen to pollution Control board of the State Government.
- Submission of audit reports to Government.

What We Can Do Differently

- Display of management instructions regarding EnMS in strategic locations.
- Display of financial impacts on parametric variations affecting the EnPI.
- Minimum Man-days training on EnMS processes & its benefits to all employees in advance
- Advance Budget allocation for EnMS speedy implementation.
- Development of professional expertise through advance training on EnMS.

Quotes and Visuals

“An ISO:50001 Energy management standard promotes sustainability of the business”.



The Energy Management Leadership Awards is an international competition that recognizes leading organizations for sharing high-quality, replicable descriptions of their ISO 50001 implementation and certification experiences. The Clean Energy Ministerial (CEM) began offering these Awards in 2016. For more information, please visit www.cleanenergyministerial.org/EMAwards.