Indian Oil Corporation Limited
Mathura Refinery

Presenters-
Srishti Singh, PSM

IOCL – THE ENERGY OF INDIA

Making a Mark Among
Top Global Corporates in

Globally Acclaimed Proudly Indian

IndianOil

FORTUNE 500 2023

In an impressive leap, IndianOil has ascended 48 places to secure the 94th rank in the prestigious Fortune 500 list for 2023. With this surge, IndianOil becomes one of only two Indian corporations and the only PSU to have been listed in the top 100 ranking. It is remarkable that IndianOil has consistently featured in the list since 1995. This is a validation of the company's unbroken record of excellence for over two decades.

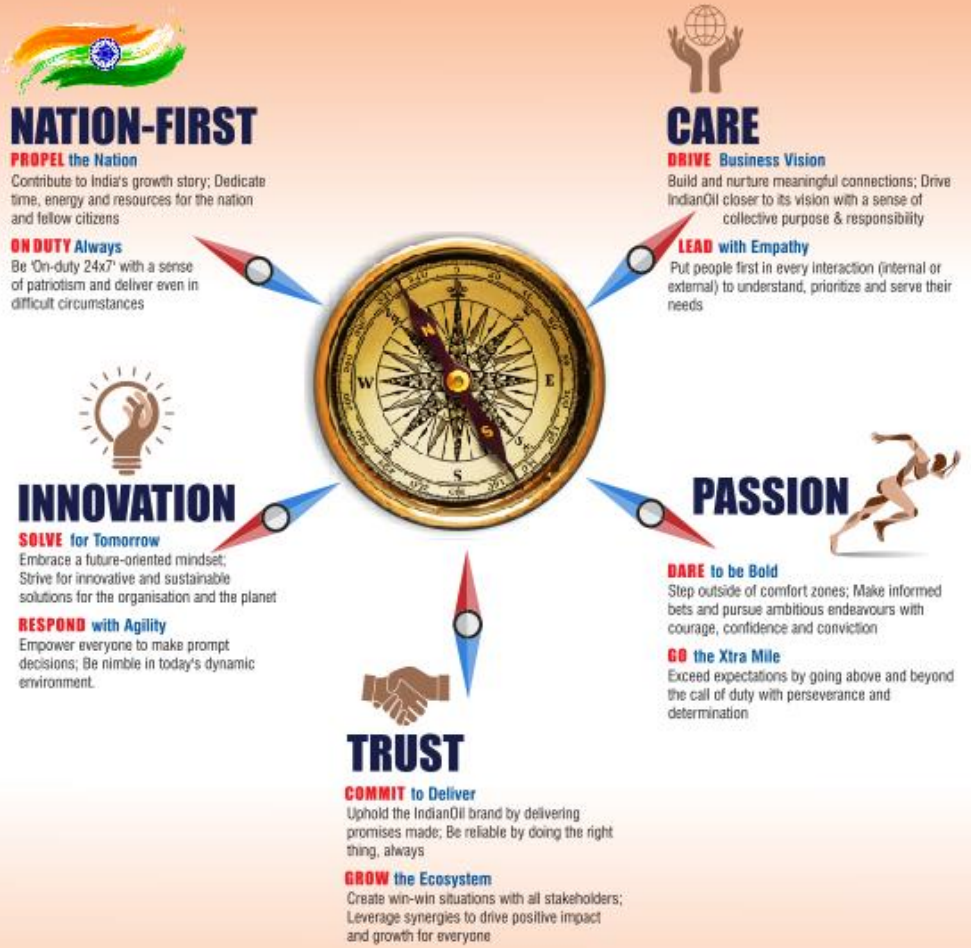
The Fortune Global 500 list ranks corporations globally based on their total revenues for their respective fiscal years.

IOCL – THE ENERGY OF INDIA

IndianOil

Values at our Core, Guiding us Forever More

IndianOil Values : The North Star guiding our Thoughts and Actions



Our Core Values: **Nation-First I Care I Innovation I Passion I Trust**

MATHURA REFINERY

1962

GUWAHATI REFINERY 1 MMTPA

1964

BARAUNI REFINERY 6 MMTPA

1965

GUJARAT REFINERY 13.7 MMTPA

1975

HALDIA REFINERY 7.5 MMTPA

1981

DIGBOI REFINERY 0.65 MMTPA

1998

PANIPAT REFINERY 15 MMTPA

2009

BONGAIGAON REFINERY 2.35 MMTPA

2016

0.8 MMTPA

80.7 MMTPA (Including subsidiaries CPCL: 11.5 MMTPA)

1982

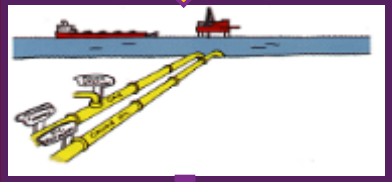
MATHURA REFINERY 8 MMTPA

Late Prime Minister Smt. Indira Gandhi, laid the foundation stone of Mathura Refinery on 2nd October, 1973.

Mathura Refinery is a Public Sector Refinery, built in collaboration with erstwhile USSR

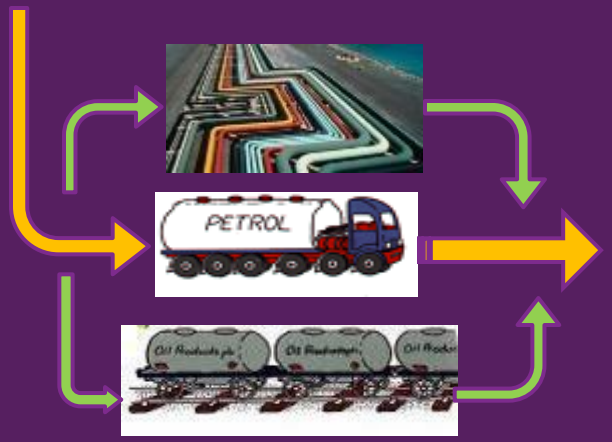
MATHURA REFINERY

CRUDE SUPPLY



CRUDE FROM SALAYA PORT

MATHURA REFINERY



TRANSPORTATION

Liquefied Petroleum Gas

Propylene

Naphtha

Motor Spirit

EBMS

Aviation Turbine Fuel

Kerosene

Diesel Fuel (HSD)

Furnace Oil, Bitumen

Sulfur

1st refinery in the world to be accredited with **ISO-18001 (Occupational Health & Safety Management System)** certification in Nov'98, **ISO-14001 (Environment Management System)** certification in July'96.

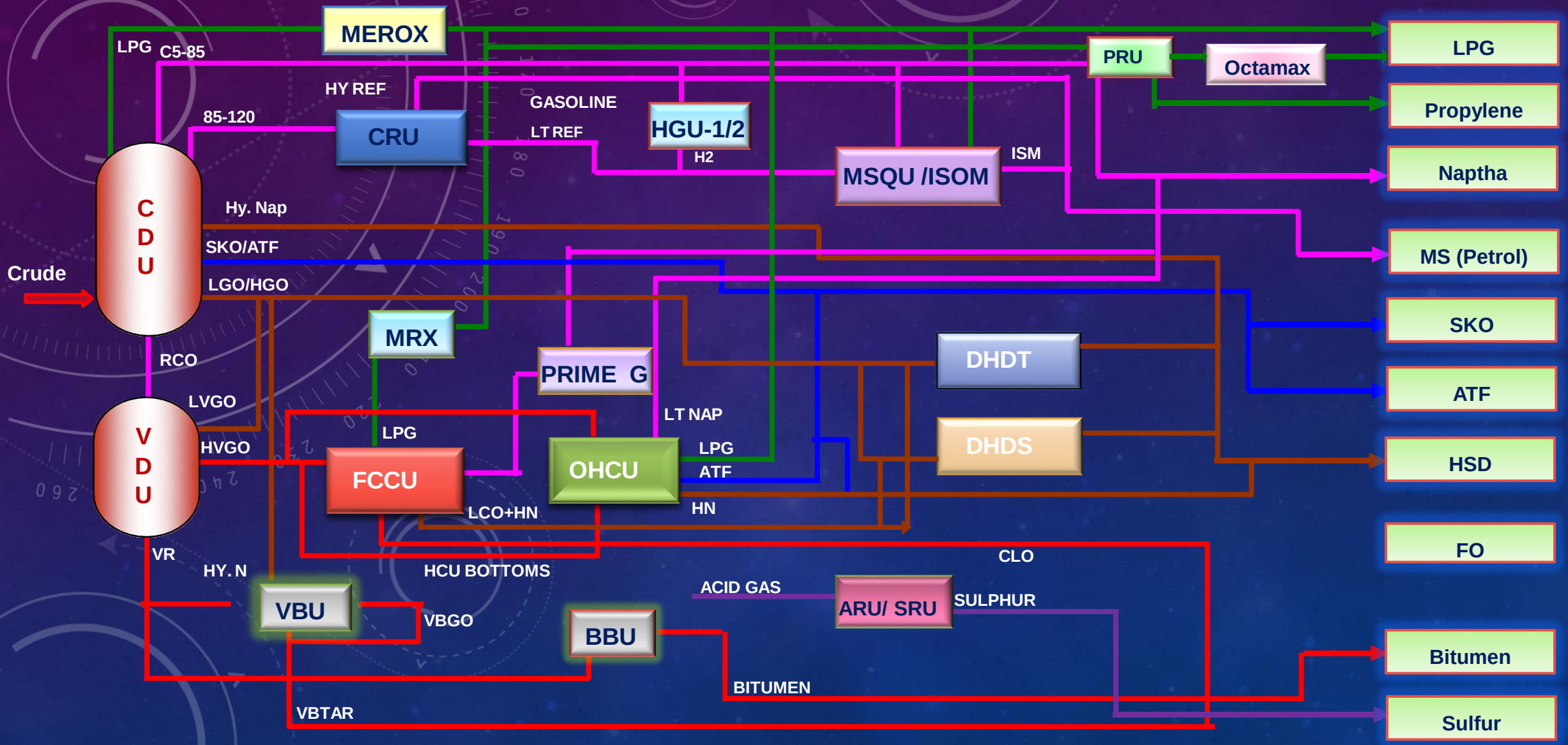
1st industry in India for which **Scientific Environmental Impact Assessment (EIA)** was study carried out before commissioning due to its location sensitive Taj Trapezium Zone (TTZ).

Set up a Hospital **(Swarn Jayanti Samudaik Hospital)** outside township for community welfare in April'99.

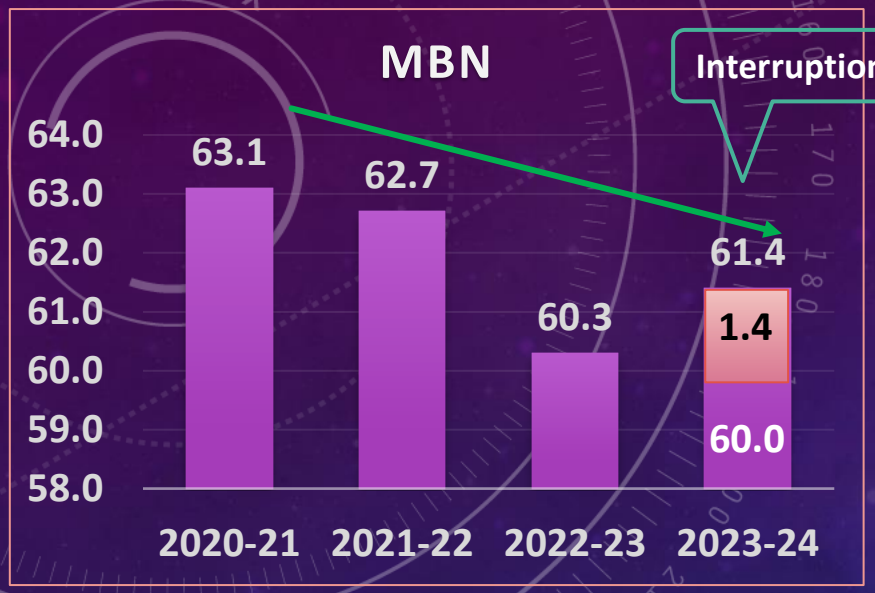
First Indian refinery to produce Ethanol blended Motor Spirit at refinery location

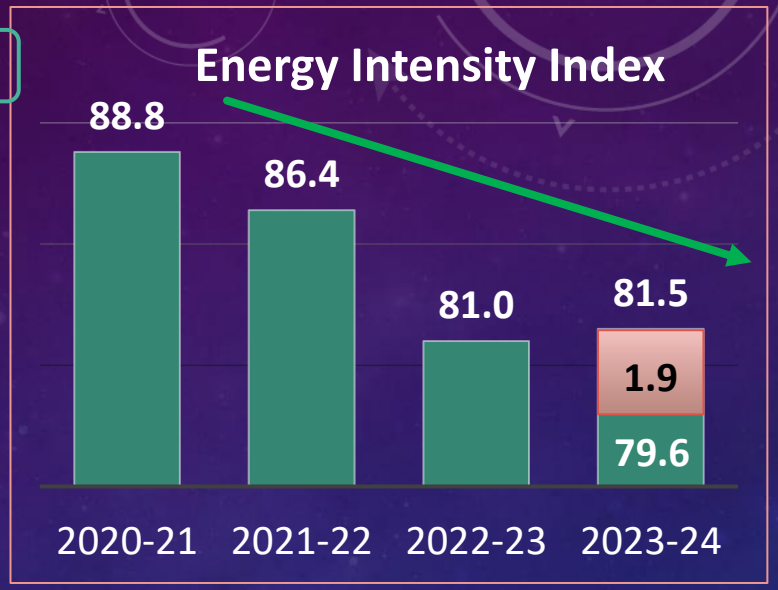
First refinery in India to produce XP 100 – step towards Atma Nirbhar Bharat

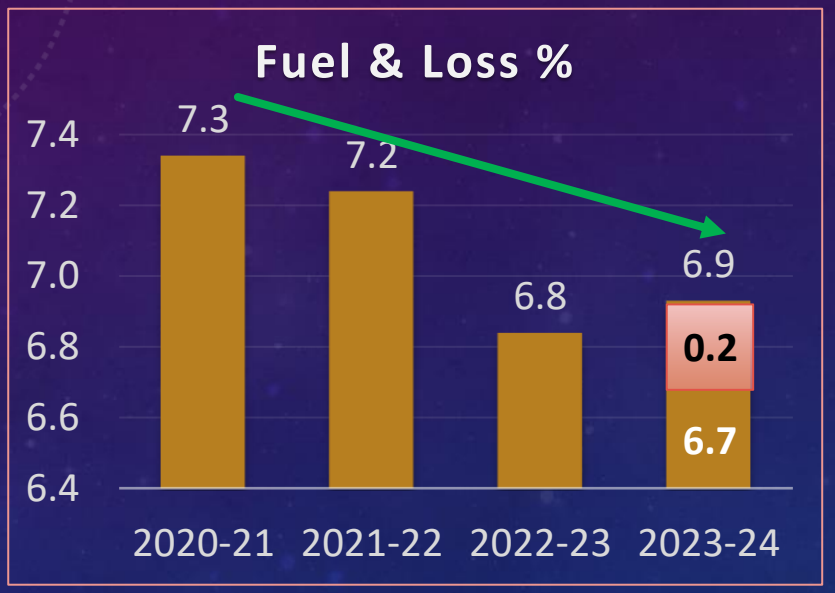
MATHURA REFINERY



Specific Energy Consumption in last 3 years







63.1 in (2020-21)

2.7 %

61.4 in (2023-24)

88.8 in (2020-21)

8.2 %

81.5 in (2023-24)

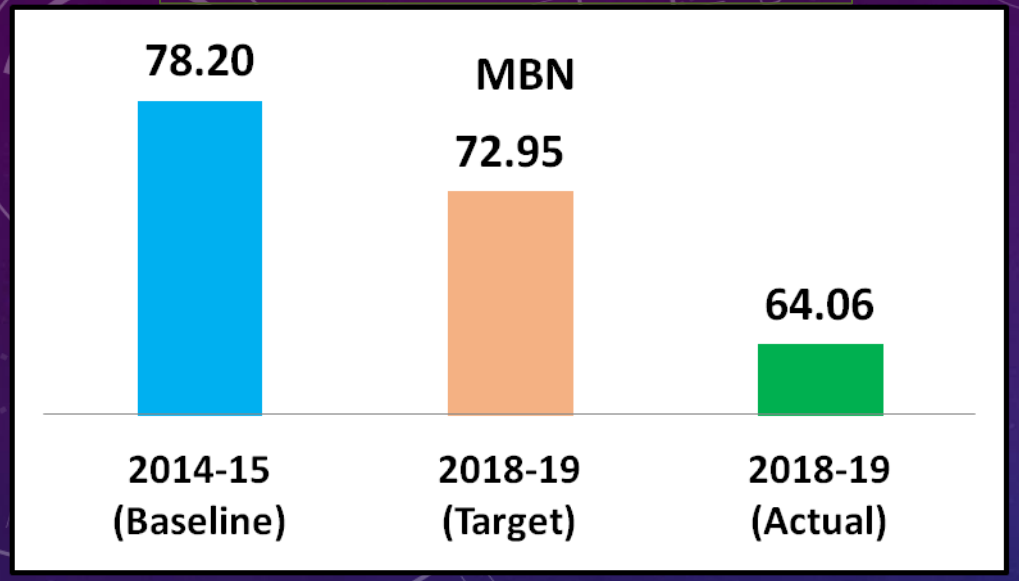
7.3 in (2020-21)

5.6 %

6.9 in (2023-24)

MR Performance over the year: PAT Cycle

PAT Cycle-II : FY 2016-2019



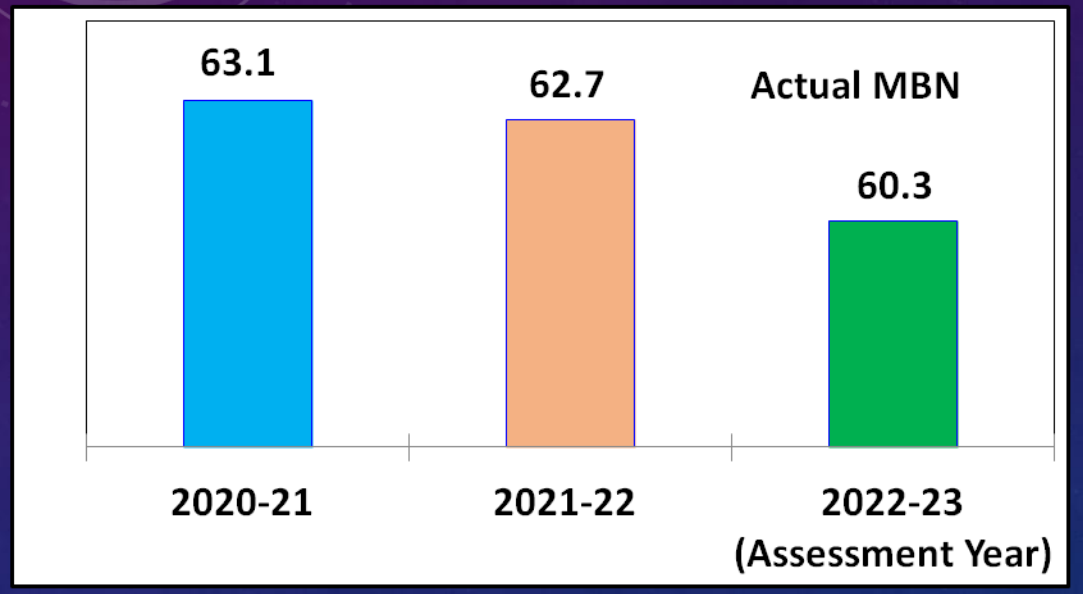
14 MBN Reduction against

5.2 MBN Target

No of Escerts issued:

71718 Escerts

PAT Cycle-VI : FY 2020 -23



Target for Year **2022-23 : 60.7 MBN**

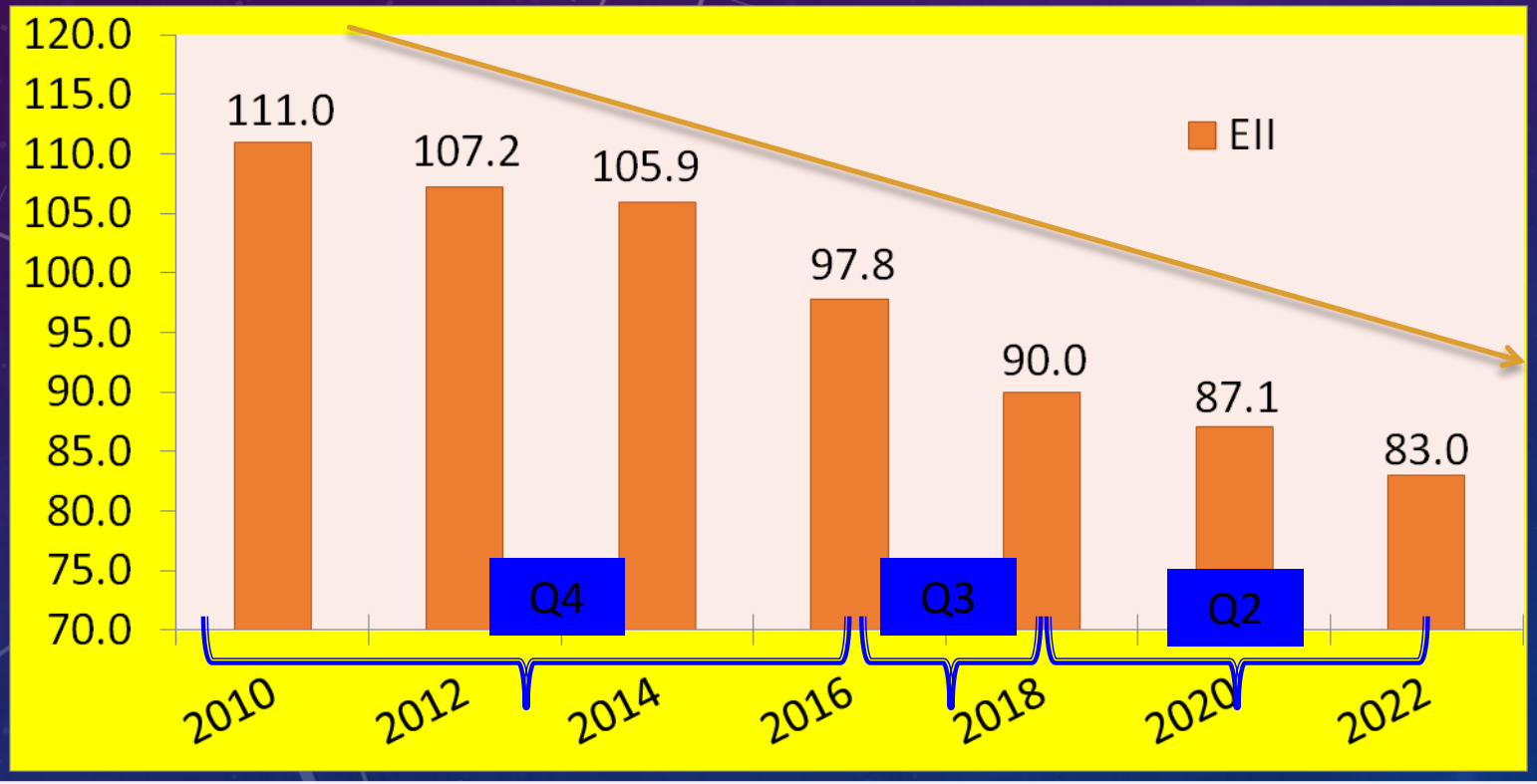
Achieved in the Year **2022-23: 60.5 MBN**

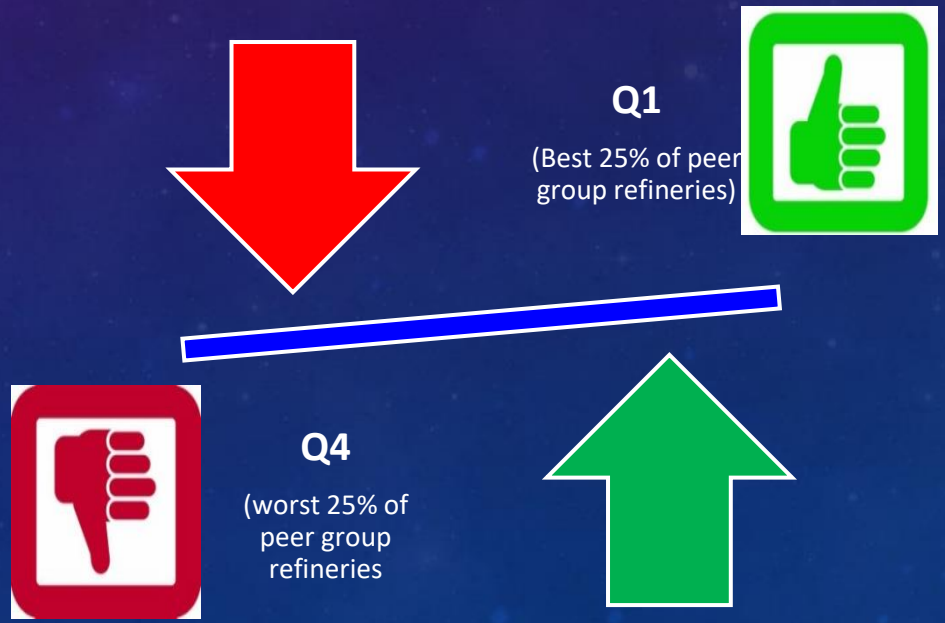
1669 Escerts

With focused approach, IOCL- MR has not only achieved but surpassed the target in both PAT Cycle-II and PAT Cycle-VI.

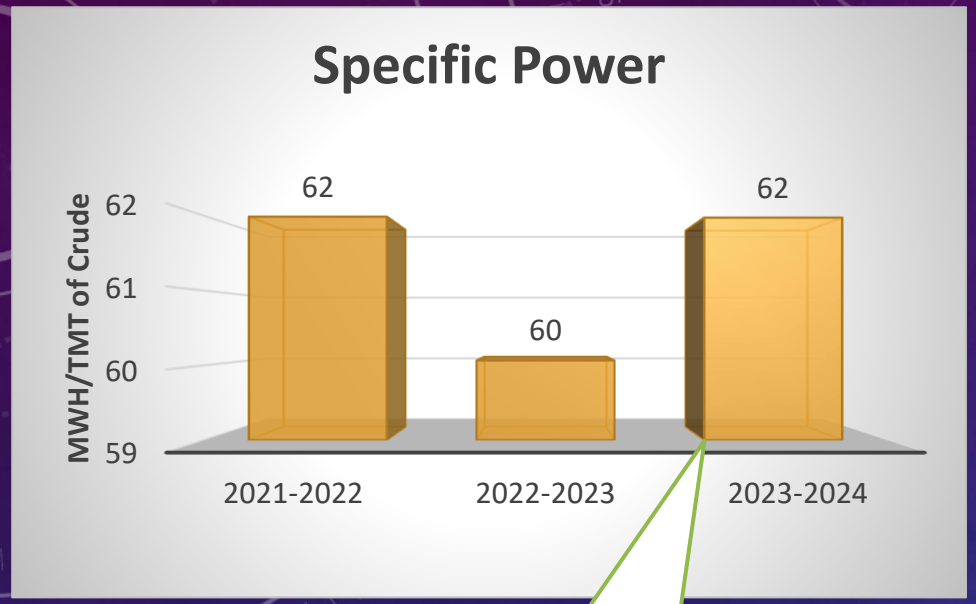
MR Performance over the year: Solomon Benchmarking

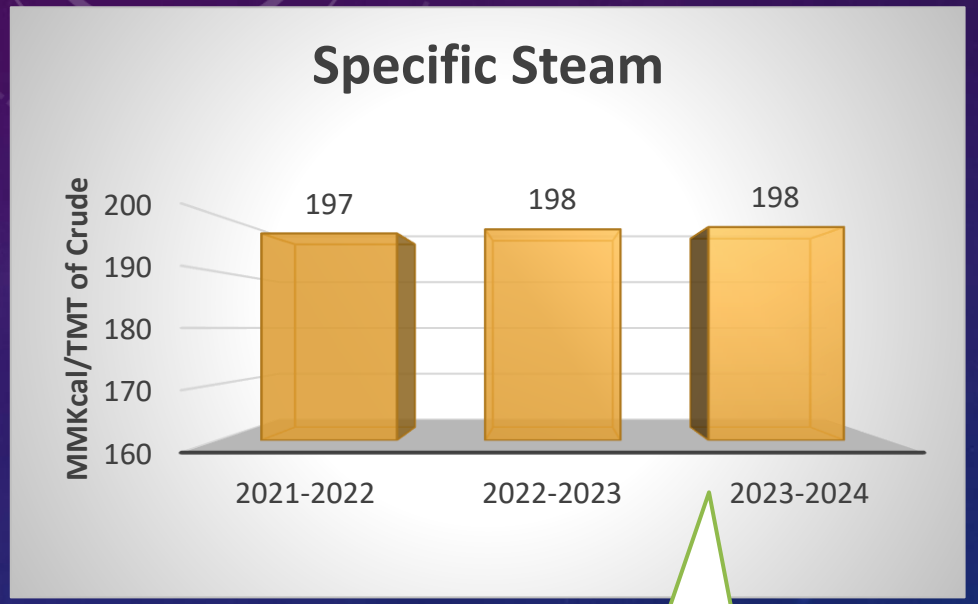
- Worldwide Average Refinery EII reduction : 1 EII/ year
- 28.0 EII Reduction in 12 years (2.3 EII/Year reduction)
- One quartile reduction in EII from Q3 to Q2 in Solomon study of 2020.
- MR performance has further improved its performance in Solomon study 2022 . EII further reduced from 87 to 83





SPECIFIC ENERGY CONSUMPTION THERMAL & ELECTRICAL





- Specific power has increased due to lower crude processing
- Running additional rich gas compressor for Hydrogen recovery

- Running of additional STG during GT-3 crises

ENERGY SAVING PROJECTS IMPLEMENTED IN LAST 3 YEARS

Year	No of Energy saving projects	Investment (INR Million)	Electrical savings (Million kcal)	Thermal savings (Million kcal)	Total savings (Million kcal)	Payback period (in months)
FY 2021-22	6	44	13460	108108	121569	1.0
FY 2022-23	6	221	0	155029	155029	2.9
FY 2023-24	12	140	0	116968	116968	2.9

DETAILS OF MAJOR PROJECTS IMPLEMENTED IN LAST 3 YEARS

Sr. No.	Name of Energy Saving Project	Investment (INR Million)	Thermal savings (Million kcal)	Payback (in months)	Year
1	Scheme for "Routing the propylene analyzer purge in NPRU to HPC suction KOD to reduce flaring" implemented in Jun'21 which led to significant reduction in flare flow from FCCU Flare KOD	1	15555	0.2	2021-22
2	Steam to old deareator in TPS reduced from 12T/hr to 4 T/hr on sustained basis in Jan'22 by reducing the deaerator operating pressure.	0	49778	0	2021-22

DETAILS OF MAJOR PROJECTS IMPLEMENTED IN LAST 3 YEARS

Sr. No.	Name of Energy Saving Project	Investment (INR Million)	Thermal savings (Million kcal)	Payback (in months)	Year
3	ARU V-14 off gas routing to normal flare commissioned on 01.03.2023	10	24000	0.9	2022-23
4	Hydrogen recovery from LP off gases through PSA 140 Revamp	140	78179	3.7	2022-23
5	Perlite Insulation on HP Steam Header (2nd Phase-8.8 KM)	72	19327	13.3	2023-24
6	Installation of additional CPH module in HRSG 2	51	19297	4.4	2023-24
7	Installation of globe valve in steam reboiler of FCCU GasCon stripper for shifting heat load to LCO CR .	0	16000	0	2023-24

Innovative Project: Stoppage of flaring from LPG bullet before handing over for M&I

Old system for handing over LPG bullet for M&I:

1. Pump out liquid LPG up to dead bottom as per present SOP
2. *Vapour LPG is flared as per current practice.*
3. *After that water filling is done to displace remaining low pressure vapour H/C*
4. Manhole opening and over flowing of water
5. Handing over of Bullet for M&I after blinding

Innovative Project: Stoppage of flaring from LPG bullet before handing over for M&I

Horton sphere planned for M&I

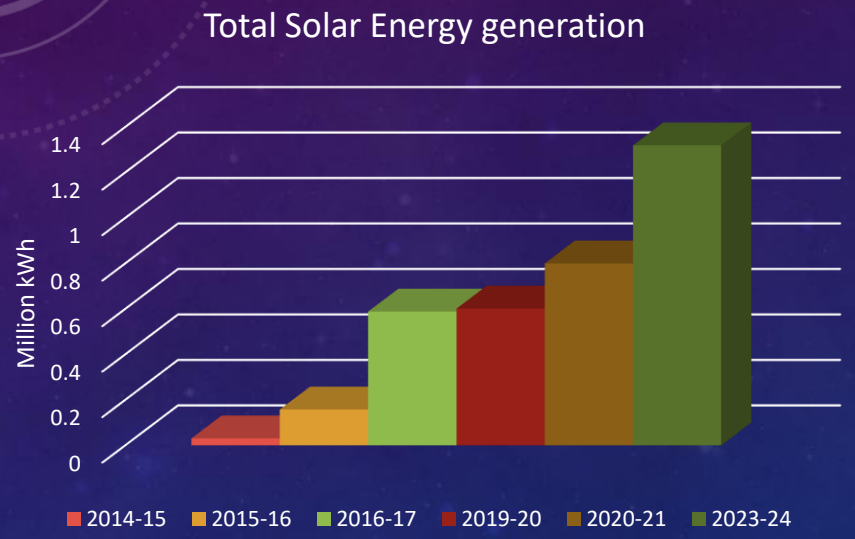
Vapor equalization line

Operational Horton sphere

Pumping Water

UTILIZATION OF RENEWABLE ENERGY SOURCES

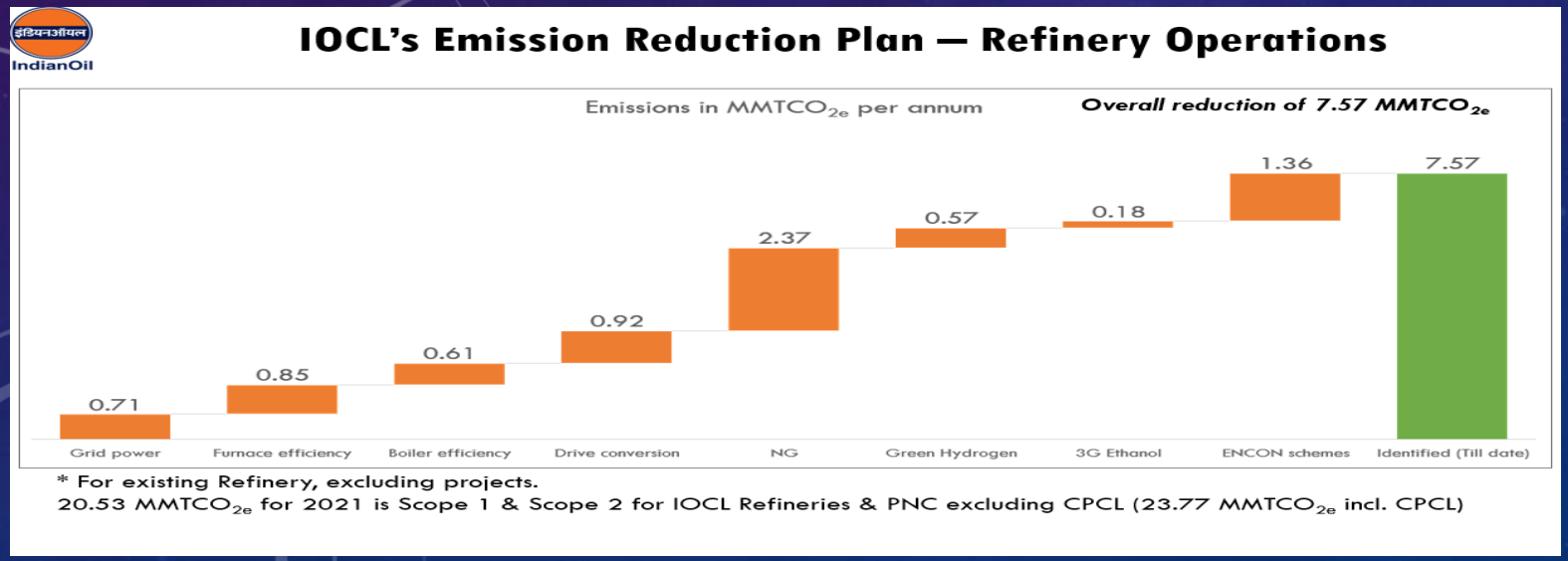
Year of Installation	Installed capacity (in MW)	Generation (in Million kWh)	Share in the overall consumption (%)
2014-15	0.05	0.03	
2015-16	0.25	0.16	0.03
2016-17	0.55	0.59	0.10
2019-20	0.6	0.60	0.11
2020-21	1.24	0.80	0.14
2023-24	1.24	1.32	0.23

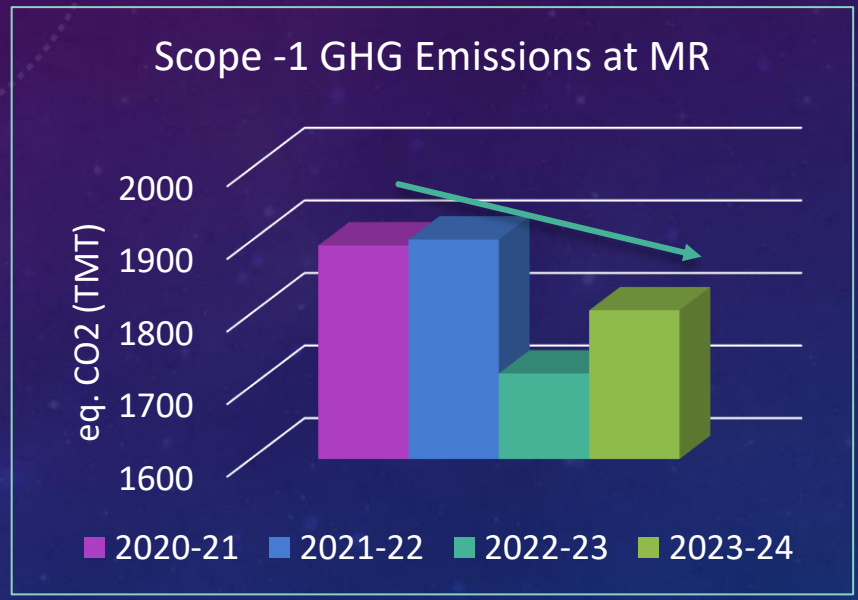


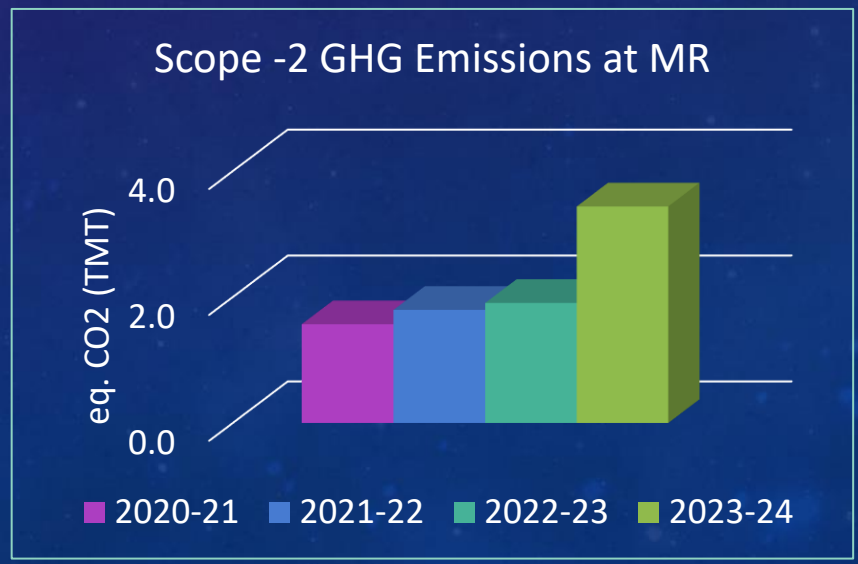
GHG

year	scope 1	scope 2
	kg CO2/MT of product	kg CO2/MT of product
2021-22	211.59	0.20
2022-23	181.92	0.20
2023-24	197.69	0.38

- Measures for GHG reduction:
- 10% Reduction target for FY 2024-25
- GHG Inventorization and public disclosure: through BRSR
- Half yearly Methane emission survey.
- IOCL's Road map for Net Zero:







Awards & Accolades/Certifications

CII Excellent Energy Efficient Unit Award 2023 for 2nd time

CII Energy Efficient Unit Award 2022 for 3rd time in a row

Uttar Pradesh State Energy Conservation Award-2022

Refinery of the year FIPI Award 2022

Award of Excellence in Consistent TPM Commitment in 2019

ISO 50001:2018 Certification

ISO 16064 recertification

EnMS ISO 50001: Initiatives for energy improvement

- ✓ Mathura Refinery is Energy Management System ISO 50001 certified refinery.
- ✓ EnMS ISO 50001 implemented adapting systemic approach for energy reduction.

bsi.

By Royal Charter

Certificate of Registration

ENERGY MANAGEMENT SYSTEM - ISO 50001:2011

This is to certify that: Indian Oil Corporation Ltd.
(Refineries Division)
P.O. Mathura Refinery
Mathura 281 005
Uttar Pradesh
India

Holds Certificate No: ENMS 687634

and operates an Energy Management System which complies with the requirements of ISO 50001:2011 for the following scope:

Refining and Supply of Petroleum Products, Generation of Steam & Electricity for captive use from Natural Gas.

For and on behalf of BSI: Chris Cheung, Head of Compliance & Risk - Asia Pacific

Original Registration Date: 2018-01-25
Latest Revision Date: 2018-01-25
Effective Date: 2018-01-25
Expiry Date: 2021-01-24
Page: 1 of 1

...making excellence a habit.

ANAB

INTERCERT

CERTIFICATE OF REGISTRATION

INTERCERT hereby certifies that the Energy Management System of

Indian Oil Corporation Limited- Mathura Refinery

Indian Oil Corporation Ltd. (Refineries Division)
P O. Mathura Refinery, Mathura 281005, Uttar Pradesh, India

Has been successfully assessed as per the requirements of

ISO 50001:2018

For the scope of

Refining and Supply of Petroleum Products, Generation of Steam & Electricity for Captive use from Natural Gas.

Initial Certification Date : 25-01-2018
Certificate Issue Date : 30-11-2020
Surveillance Validity Date : 29-11-2021
Recertification Date : 29-11-2023

Registration Number: IC-En-2011109

Issued on behalf of InterCert
Head - Certifications

INTERCERT REGISTERED

IAF

IAS

EnMS ISO 50001, Version:2011 Certification: Jan'2018

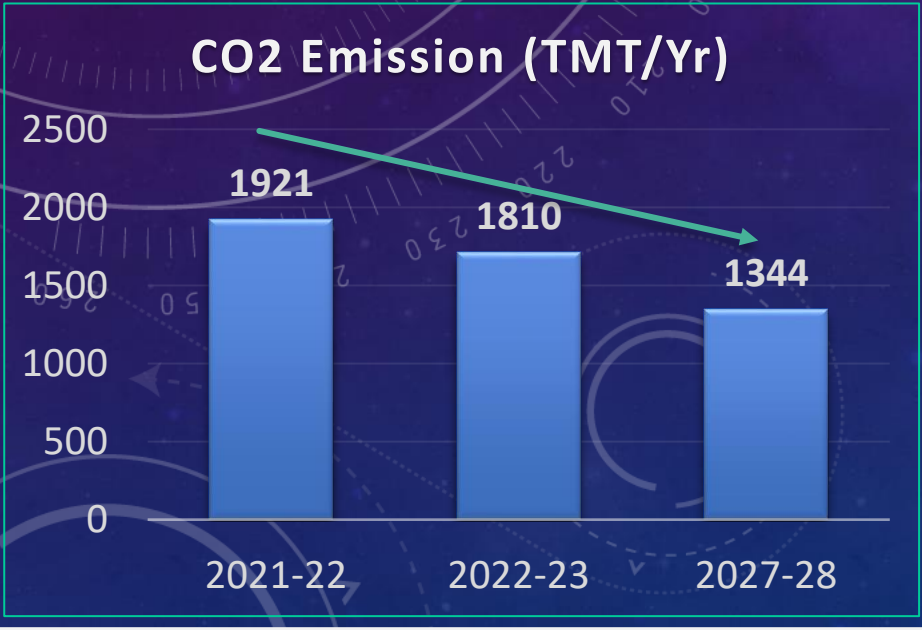
EnMS ISO 50001, Version:2018 Certification: Dec'2020

Towards Net Zero

Net Zero initiatives: 37 Nos. of Encon project/schemes are identified

- **16** Nos. of Encon project/schemes were implemented in FY 23-24
- **21** Nos. of Encon project/schemes are under implementation/conceptualization

➢ ***30 % CO_2 reduction*** envisaged by above projects/schemes till FY 27-28 w.r.t. to FY 21-22 (CO2 emission reduction: 1921 TMT/Yr → 1344 TMT/Yr).



Net zero Projects/Schemes	Nos.	Energy Saving (SRFT/Yr)	Reduction in CO2 emission (MT/Yr)
Implemented in FY 23-24	16	17272	40244
Planned for FY 24-25	8	25137	58569
Planned for FY 25-26	3	66001	153782
Planned for FY 26-27	5	23347	54408
Planned for FY 27-28	5	68235	158988
Total	**37**	**199992**	**465991**

Net Zero initiatives planned for execution in FY'24-25

SN	Name of Project	Saving (SRFT/Yr)	CO_2 emission red^n. (MT/Yr)
1	Stoppage of 1 STG post grid power import	13636	31772
2	Installation of CPH module in HRSG-1.	1300	3029
3	Implementation of coracoat coating in the cooling water pumps	1200	2796
4	Installation of TDLS analyzer in CDU furnaces	680	1584
5	Conversion of steam tracing with electrical tracing (VGO, VR, Vac. Slop, IFO & Bitumen lines)	4286	9986
6	Installation of additional tubes in convection section of VDU furnace for Improving Furnace Efficiency	2715	6326
7	Installation of Thermo-compressor for flash steam recovery in SWS	1000	2330
8	Installation of floating Solar panel	320	746
	Total	**25137**	**58569**

Net Zero initiatives planned for execution in FY'25-26

SN	Name of Project	Saving (SRFT/Yr)	CO_2 emission red. (MT/Yr)
1	FCCU WGC steam turbine replacement with motor	10286	23966
2	Converting TPS STG from condensing cum backpressure to fully backpressure type	3896	9078
3	Stoppage of 2 out of 3 GT post grid power import	51819	120738
	Total	**66001**	**153782**

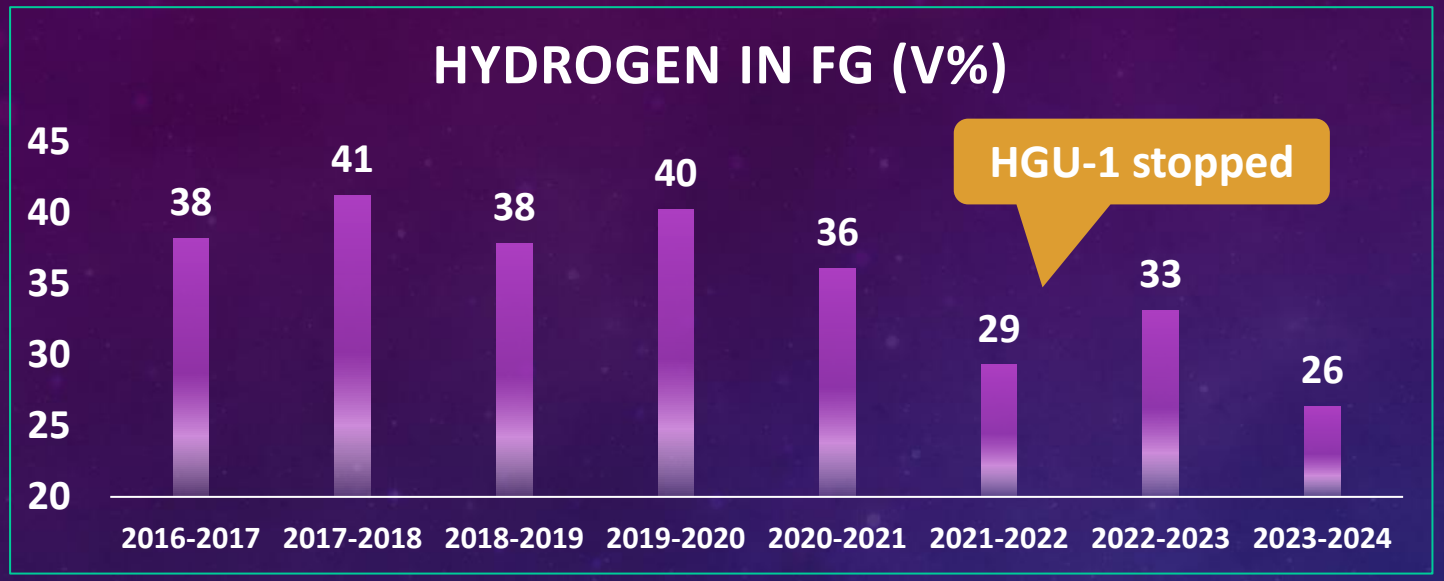
Net Zero initiatives planned for execution in FY'26-27

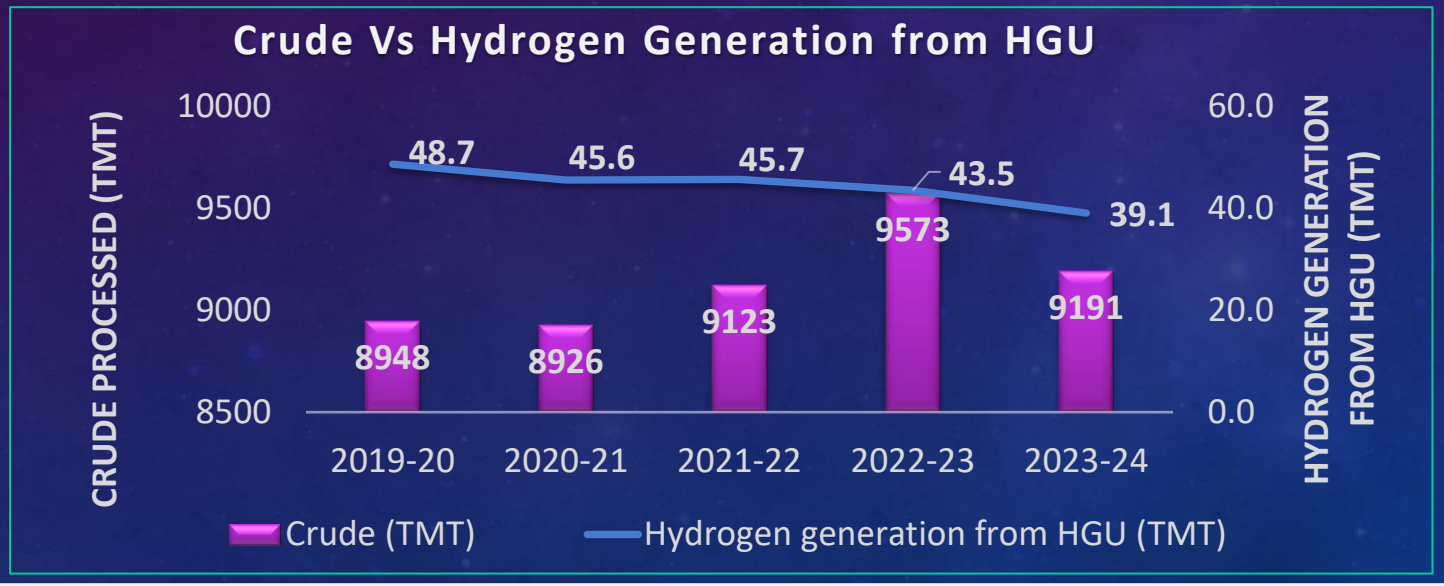
SN	Name of Project	Saving (SRFT/Yr)	CO_2 emission red. (MT/Yr)
1	Replacement of steam turbine with motor in NPRU HPC	12510	29148
2	Replacement of HP steam exchanger with electric heater	4571	10650
3	Installation of Fan-less Jet Cooling Tower	200	466
4	Hot Water belt in the FCCU & NPRU	5126	11944
5	ORC implementation in DHDT	940	2200
	Total	**23347**	**54408**

Net Zero initiatives planned for execution in FY'27-28

SN	Name of Project	Saving (SRFT/Yr)	CO_2 emission red. (MT/Yr)
1	Electrification of DHDS Furnace 02-F-01	4746	11058
2	Installation of LRVP in VDU column	5212	12144
3	EHT Phase -2: Electrical tracing in 14 no of Bitumen Tanks	5734	13360
4	Replacement of steam turbine with motor in MAB & Installation of PRT across orifice chamber in FCCU	17143	39943
5	Commissioning of Green Hydrogen plant of 1 MT/Hr hydrogen generation capacity.	35400	82482
	Total	**68235**	**158988**

Case Study 1: Hydrogen Recovery





How we did that!

2020-21 40% to 29%

- Running additional rich gas compressor for CCRU rich gas H2 recovery

2022-23 29% to 26 %

- **PSA 140 revamp**

2023-24 26%

- DHDT complete off gas routing to PSA Aug'23

Even with increased Crude Processing, Hydrogen load on HGU kept decreasing!!

Case Study 2: Fuel Fired & Efficiency Improvement

2022-23

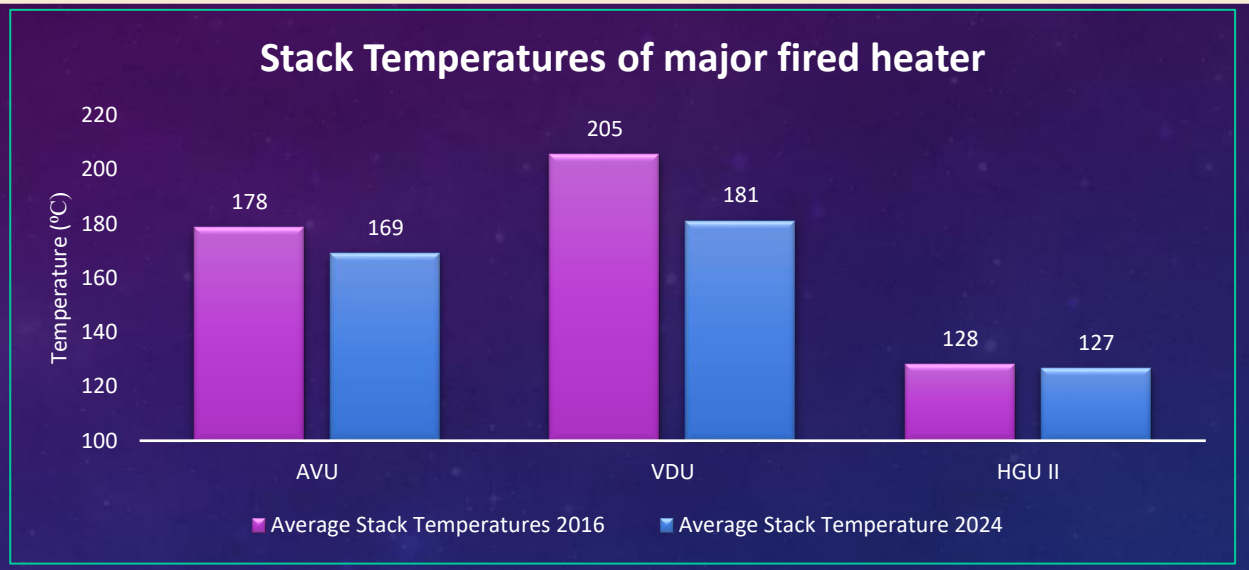
5000 SRFT/year

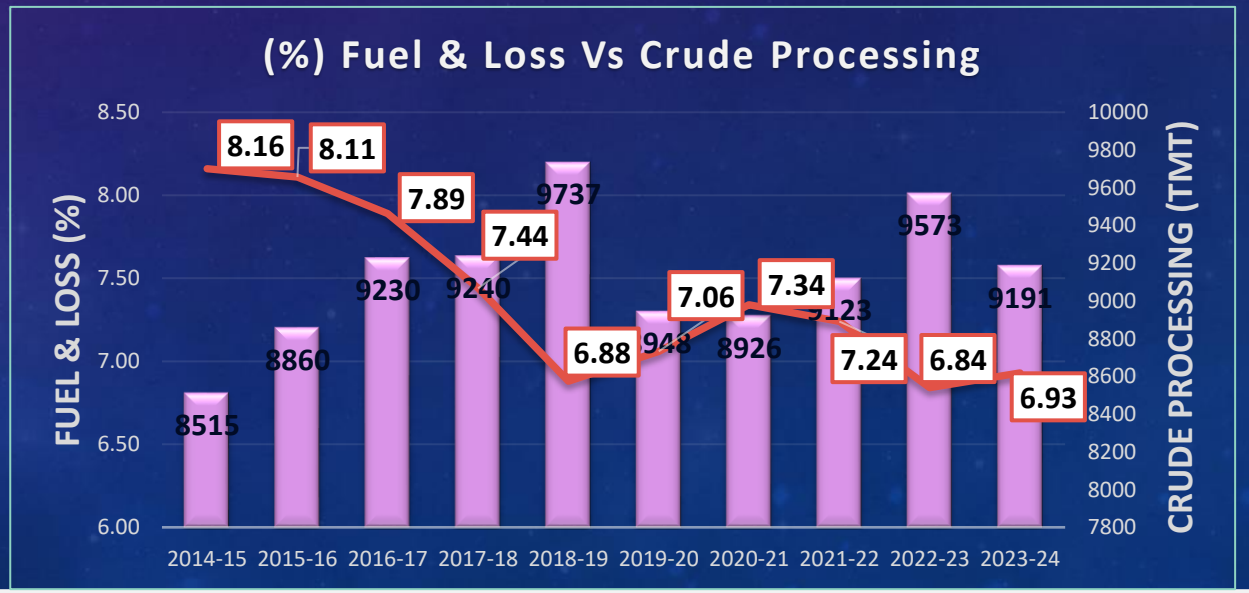
- APH replacement in HGU-II
- Online BFW injection for improving AVU PHT-3 by 3°C
- Welded Plate type heat exchanger in AVU HVGO preheat circuit

2023-24

2900 SRFT/year

- High emissivity furnace coating in the AVU furnaces
- Installation of additional CPH module in HRSG 2





Case Study 3: Steam network reduction

2019-20 6.5 MT/hr

- Installation of MLP steam generator in FCCU MCB circuit

2020-21 2 MT/hr

- Removal of redundant steam tracings and changing insulation of existing ones

2021-22 10 MT/hr

- **Stoppage of MP steam in two of TPS de-areators**

2022-23 2 MT/hr

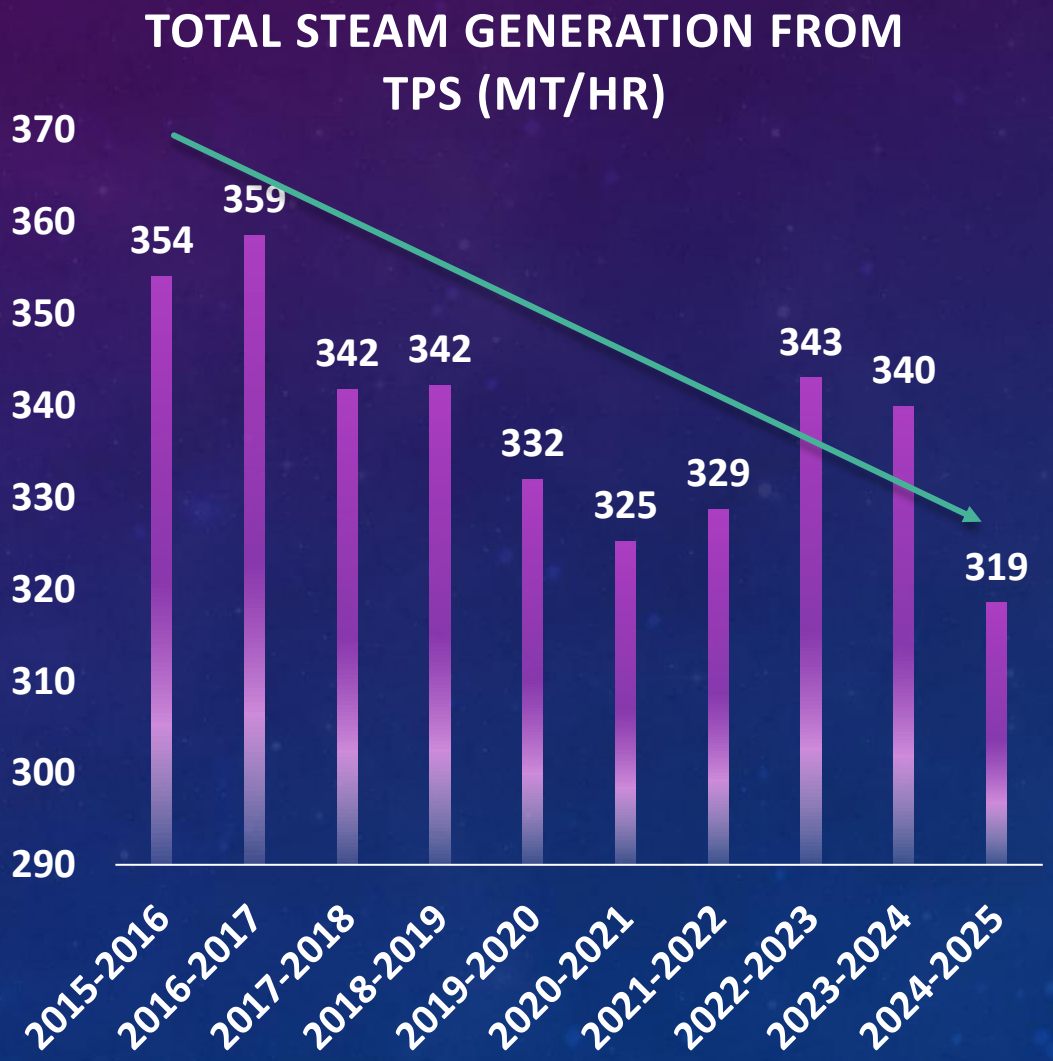
- Zero steam leaks by implementing Steam Trap Management System

2023-24 6.5 MT/hr

- Installation of globe valve in steam reboiler of FCCU GasCon stripper for shifting heat load to LCO CR (4 MT/hr)
- Stoppage of HGU-1 deaerator (2.5 MT/hr)

2024-25 3 MT/hr

- Stoppage of steam in HVGO and SR tanks



Case Study 4: Flare Control

Active Measures for reducing Flare losses

2014 500 kg/hr

- Commissioning of 2 Nos. of **Flare Gas Recovery Compressors**

2016 1000 kg/hr

- Routing of VBU off gases to FCCU- WGC

2019 1000 kg/hr

- Recovery of LPG during depressurization of Horton sphere

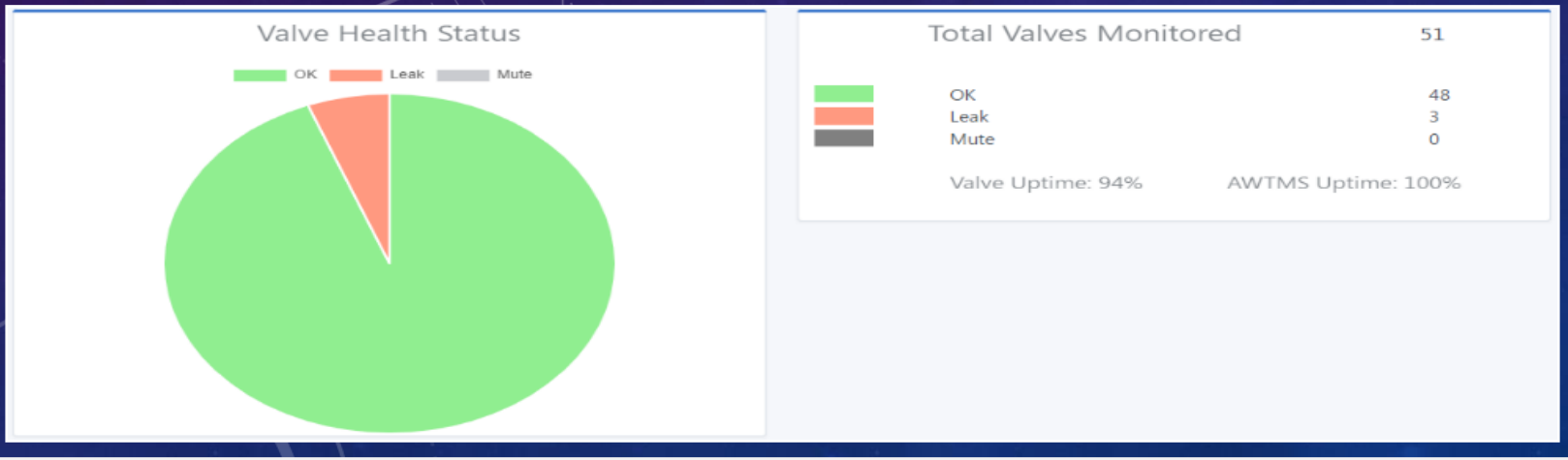
2020 380 kg/hr

- Flare tip replacement to reduce flare purging up to 70 Kg/Hr from 450 Kg/Hr
- PSV survey on daily basis

2021 400 kg/hr

- Routing the propylene analyzer purge in NPRU to HPC suction KOD to reduce flaring

Case Study 4: Flare Control



- **In-house developed Flare Dashboard** monitors flare molecular weight, sources of flare, flare gas recovery from FGRS and opening of flare CV/ flare flow meter.
- **Installation of IIOT based PSV/CV passing monitoring system**: IIOT bases PSV Monitoring System (AWTMS) devices installed in Hydrogen service for leakage monitoring of PSV/CV
- Flare loss is reduced from 2.5 MT/Hr to 0.5 MT/Hr by continuous monitoring and Encon schemes. MR is achieving zero flare loss from last 2 years on intermittent basis.

Case Study 5: Power

2021-22 1700 SRFT/year

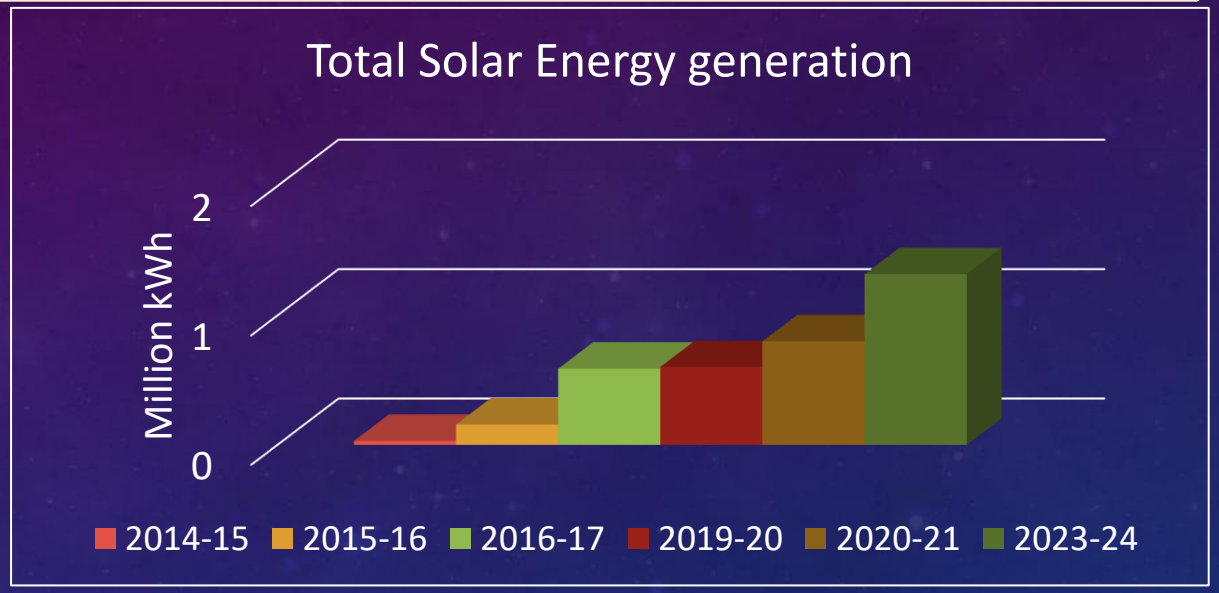
- Step-less controller in OHCU attended in Jul'21. Post this, spillback opening of compressor reduced to 0% & compressor loading has also come down from 95% to 68%.
- Stoppage of one BFP in old deaerator of TPS

2023-24 150 SRFT/year

- Scheme for HVGO and SR tempered water cooler bypass leading to stoppage of 4 Nos. of air fin coolers
- Solar power generation including township (1.65 MWp)

2024-25 SRFT/year

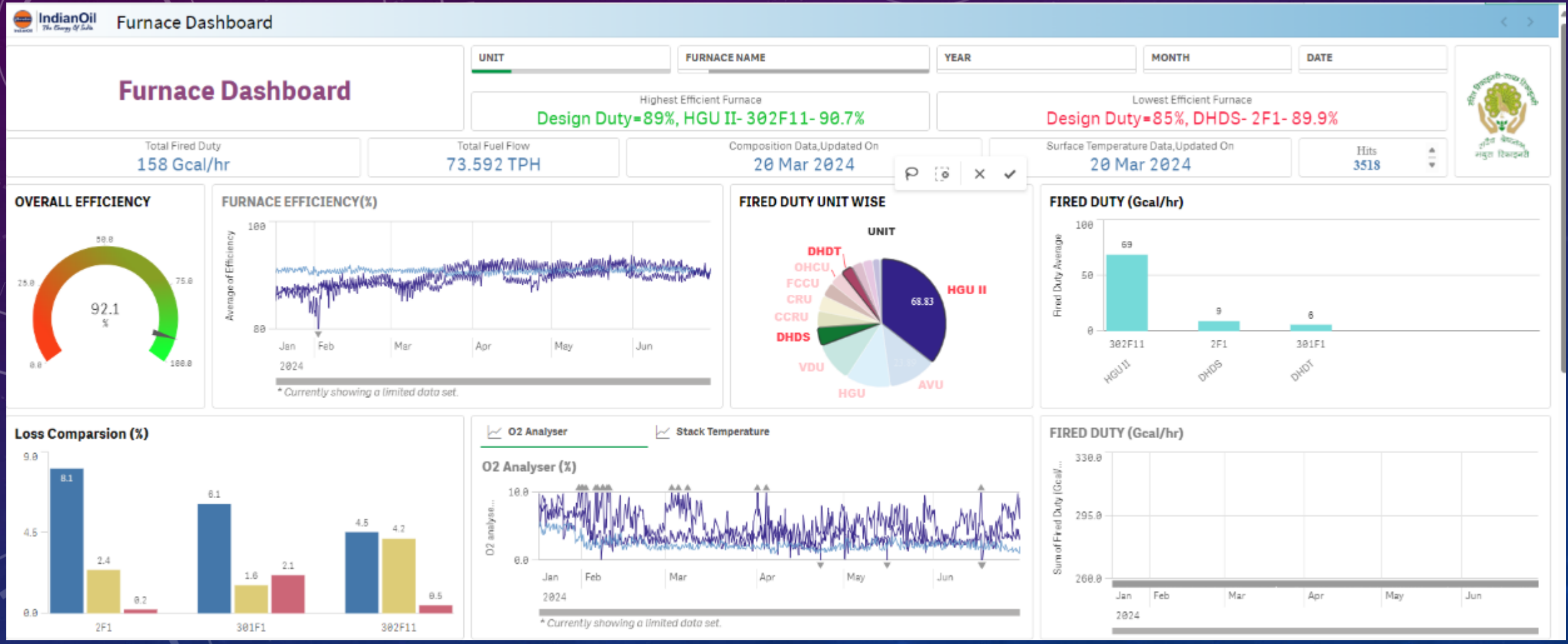
- Changing I1 & I2 motors to I4
- Stoppage of HGU-II PDS offsite pump by direct routing from NSU top



Solar Tree

Digitalization: Measurement, Monitoring & Analysis

Furnace dashboard




THANK YOU