IndianOil

Confederation of Indian Industry

Indian Oil Corporation Limited
Mathura Refinery

Presenting Members :
Ms. Srishti Singh, Assistant Manager (Process)

IOCL – The energy of India

IOCL – The energy of India

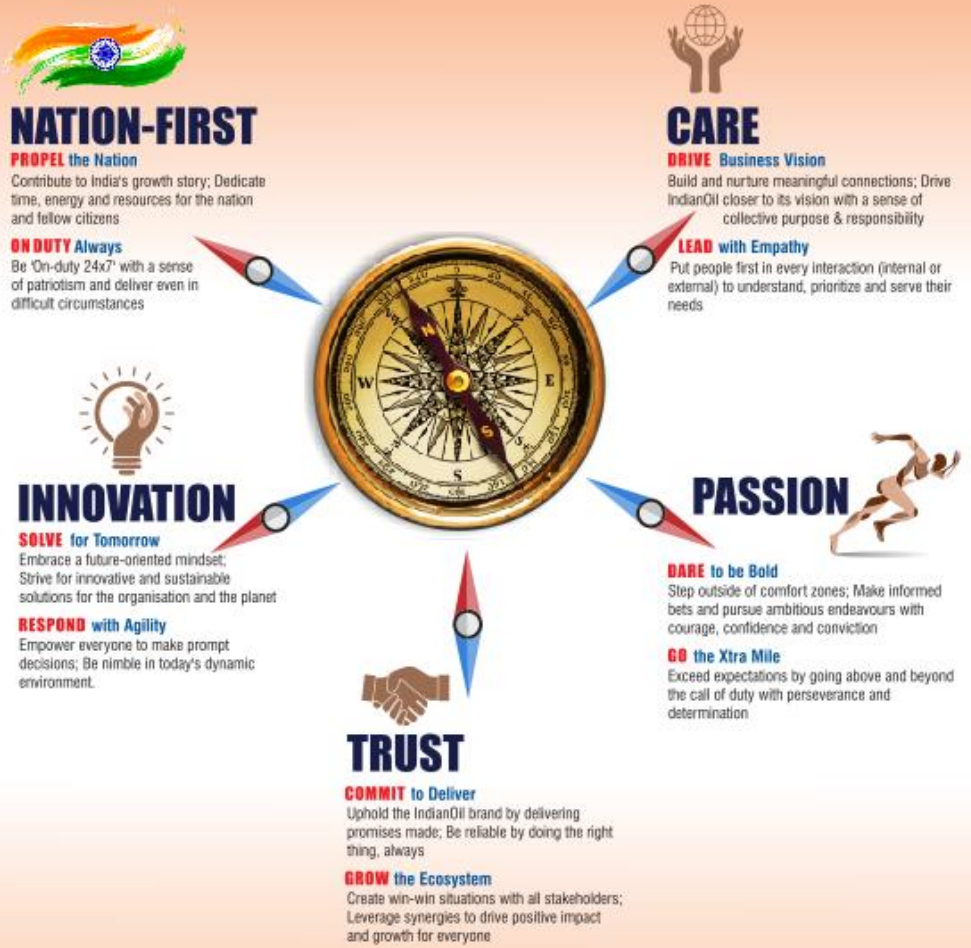
IndianOil

Confederation of Indian Industry

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

1982

MATHURA REFINERY
8 MMTPA

Merged in 1981

1975

HALDIA REFINERY 7.5 MMTPA

1965

GUJARAT REFINERY 13.7 MMTPA

196 4

BARAUNI REFINERY 6 MMTPA

196 2

GUWAHATI REFINERY 1 MMTPA

1998

DIGBOI REFINERY 0.65 MMTPA

Merged in 2009

2016

PANIPAT REFINERY 15 MMTPA

BONGAIGAON REFINERY 2.35 MMTPA

0.8 MMTPA

1962

80.7 MMTPA (Including subsidiaries CPCL: 11.5 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.

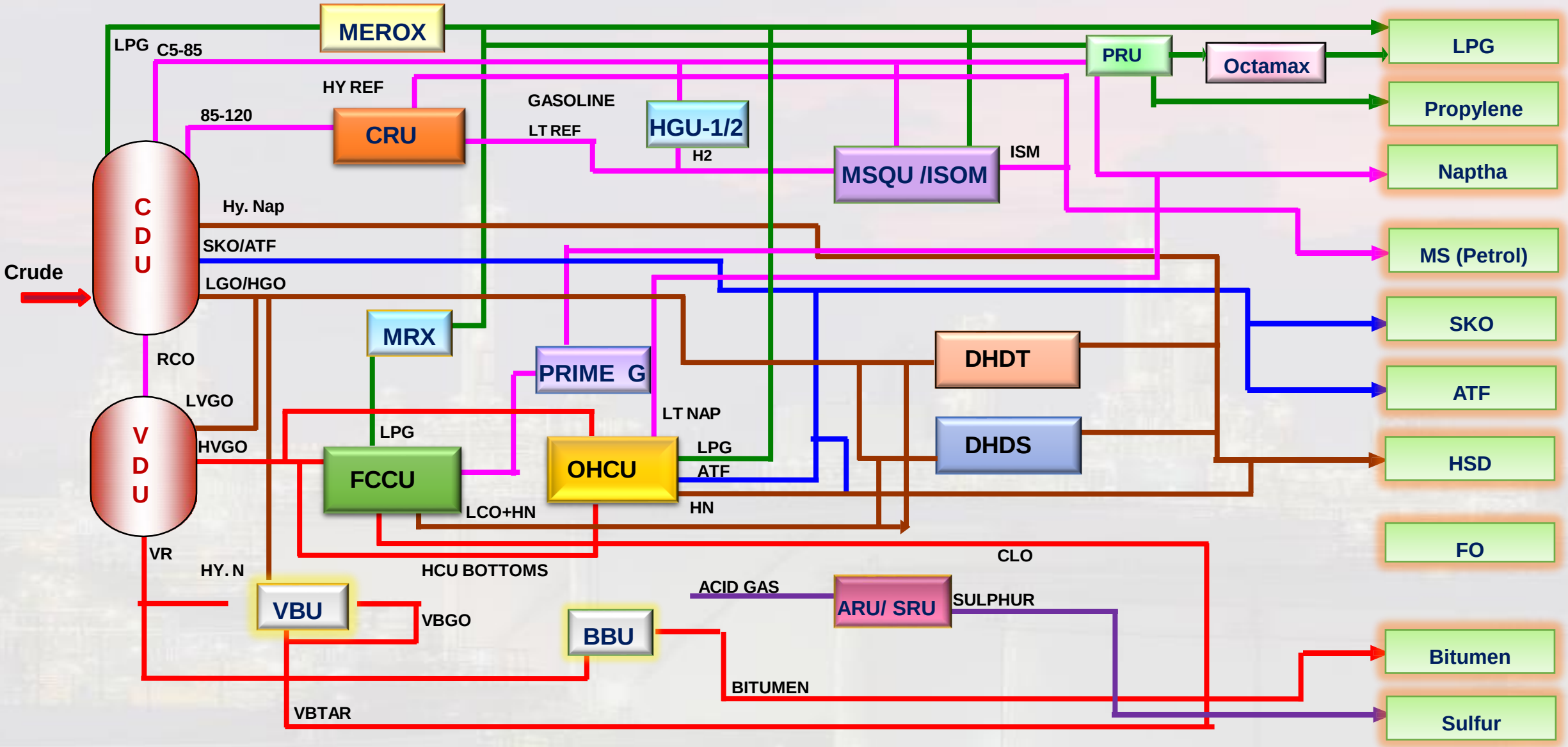
First Indian refinery to produce Ethanol blended Motor Spirit at refinery location

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

MATHURA REFINERY – A UNIQUE REFINERY

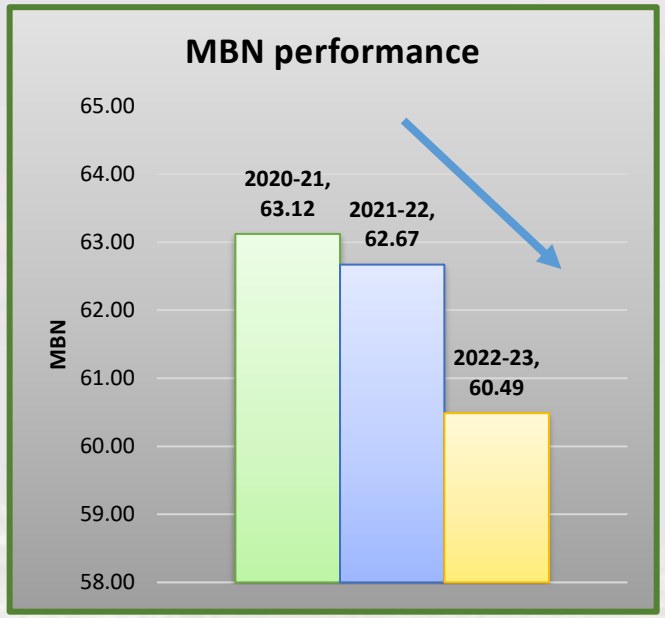
IndianOil

Confederation of Indian Industry



Specific Energy Consumption in last 3 years

MBN

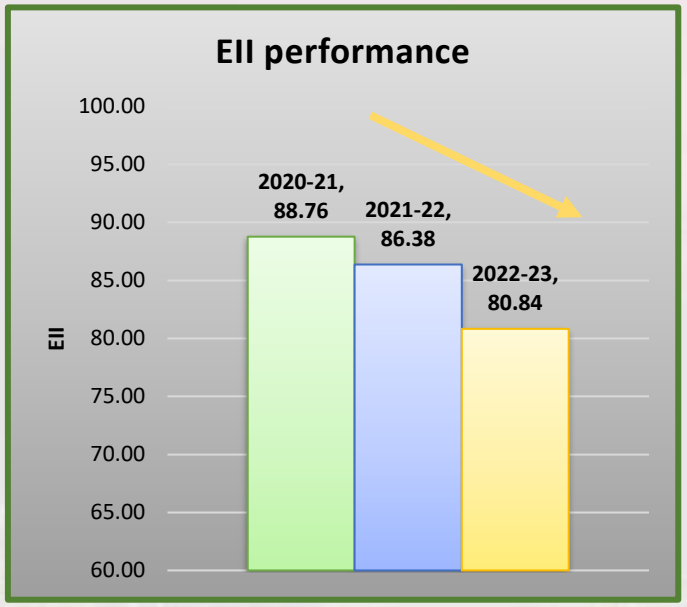


63.12 in (2020-21)

7 %

60.49 in (2022-23)

Energy Intensity Index

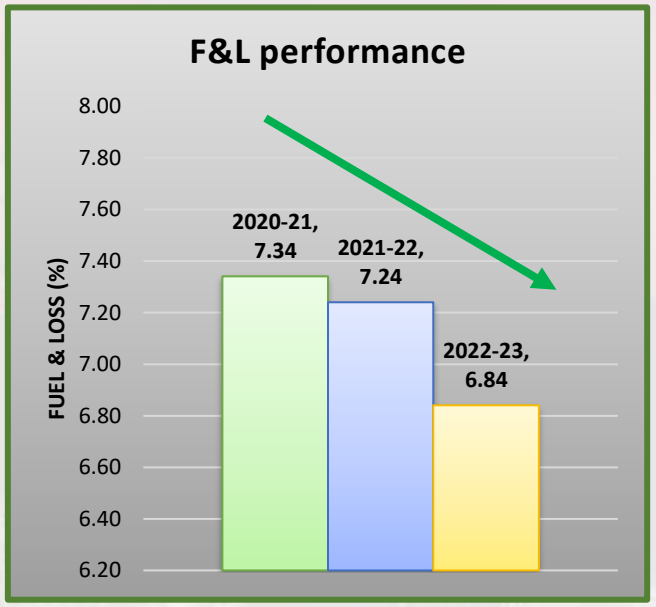


88.76 in (2020-21)

9 %

80.84 in (2022-23)

Fuel & Loss %

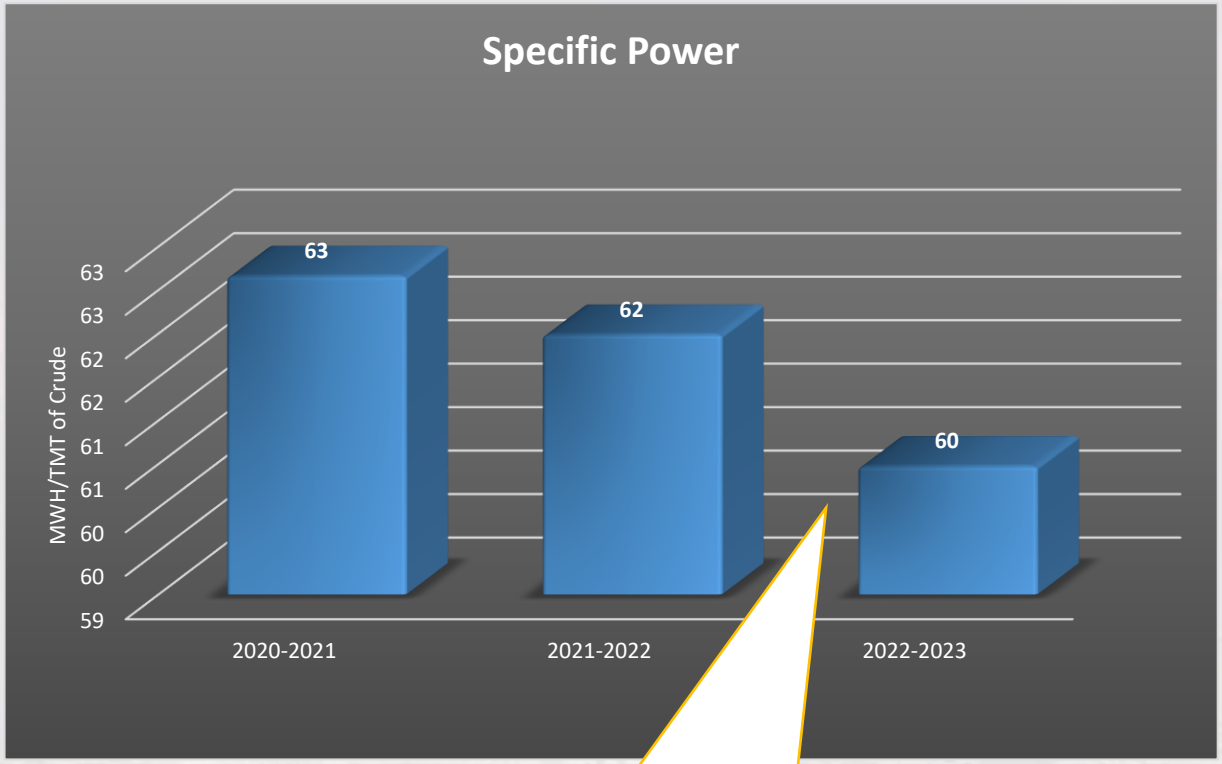


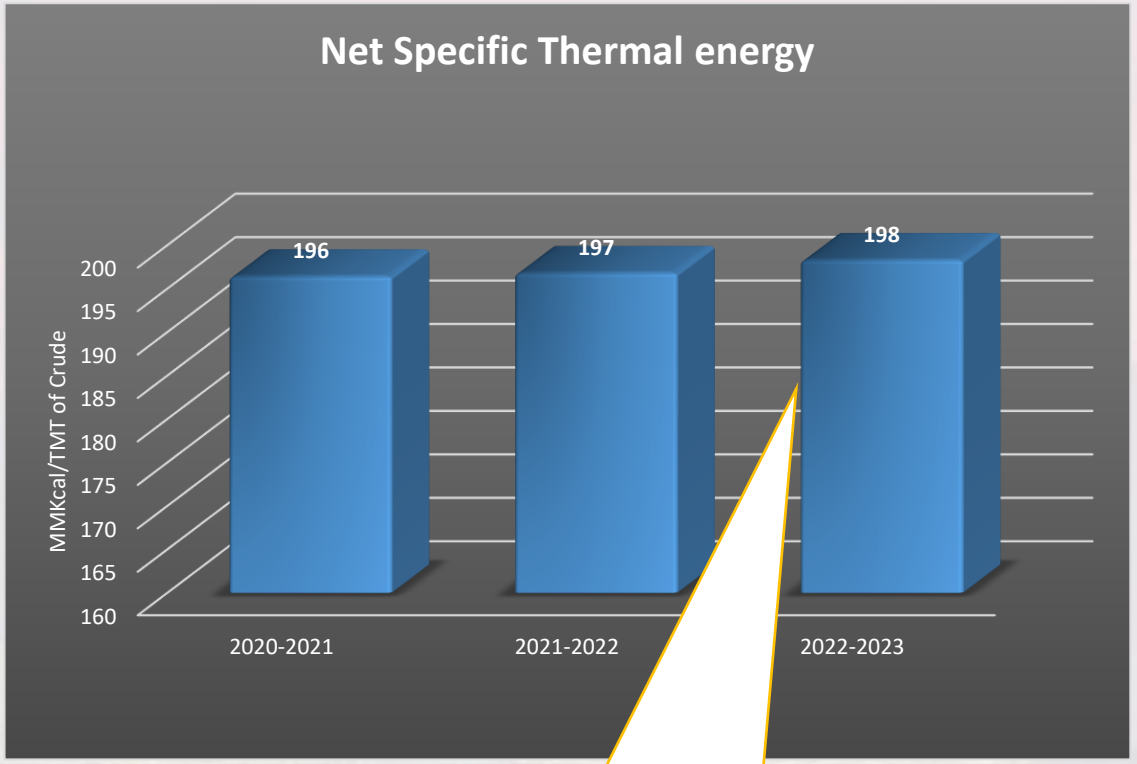
7.34% in (2020-21)

9 %

6.84% in (2022-23)

Specific Energy Consumption Thermal & Electrical





- Stoppage of HGU-1,
- BBU operation on Single reactor and producing bitumen from VDU

- Running of additional SRU,
- Running of additional STG during GT-3 crises

Awards & Accolades/Certifications

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

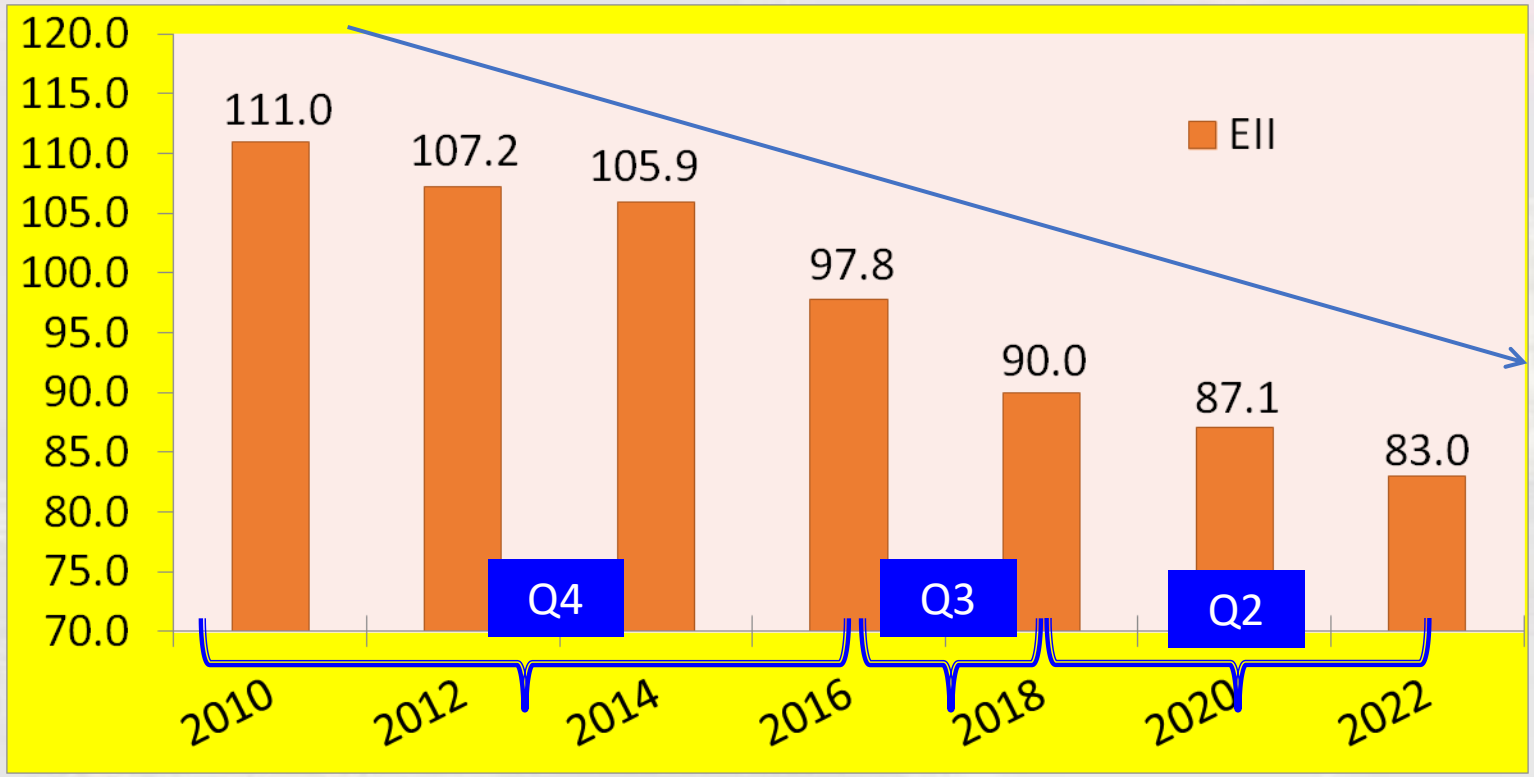
Award of Excellence in Consistent TPM Commitment in 2019

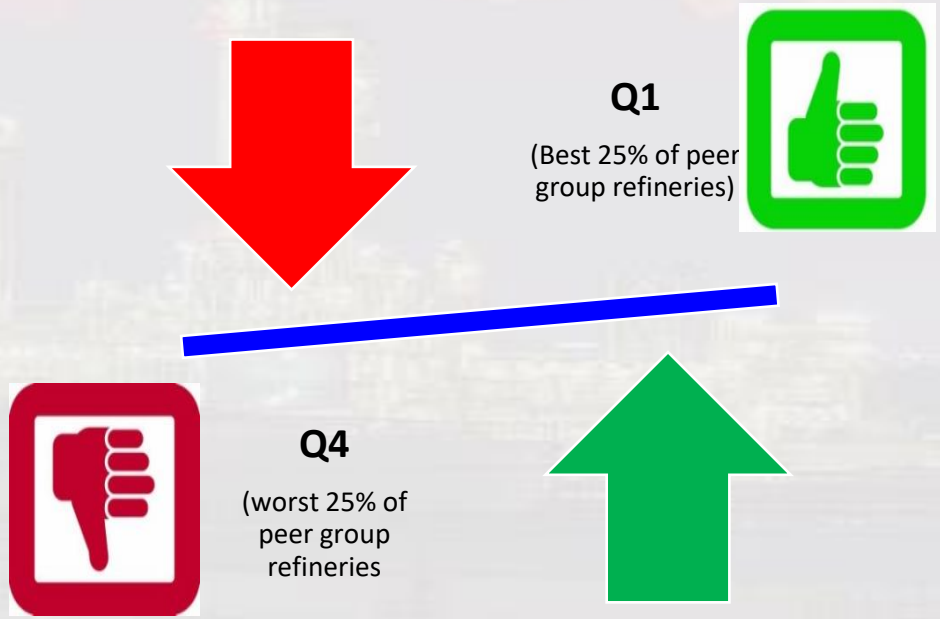
ISO 50001:2018 Certification

ISO 16064 recertification

Solomon Benchmarking : Energy Performance

- **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**

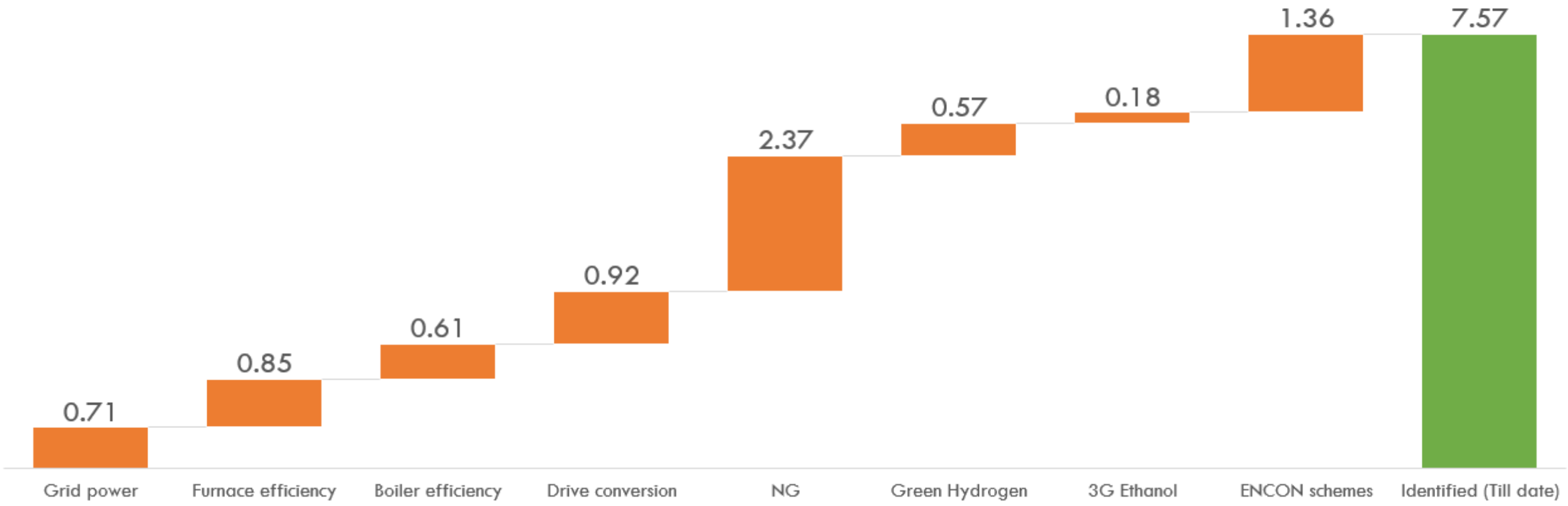




IOCL's Emission Reduction Plan – Refinery Operations

Emissions in $MMTCO_{2e}$ per annum

Overall reduction of 7.57 $MMTCO_{2e}$



* For existing Refinery, excluding projects.

20.53 $MMTCO_{2e}$ for 2021 is Scope 1 & Scope 2 for IOCL Refineries & PNC excluding CPCL (23.77 $MMTCO_{2e}$ incl. CPCL)

Mathura Refinery's Future Energy Conservation Projects for achieving- Net Zero Milestone

Projects approved/under implementation

(~100,000 SRFT ⇔ 3 MBN ⇔ 225 MTPA CO2 eq)

- FCCU WGC steam turbine replacement with motor (10,500 SRFT)
- Conversion of steam tracing with electrical tracing (VGO, VR, Vac. Slop, IFO & Bitumen lines) – 4000 SRFT
- Stoppage of 2 out of 3 GT post grid power import (65,500 SRFT)
- Converting TPS STG from condensing cum backpressure to fully backpressure type(4000 SRFT)
- Replacement of steam turbine with motor in NPRU HPC (12,000 SRFT)

First ever implement of high speed motor in India

Projects under conceptualization

(~30,000SRFT ⇔ 1 MBN ⇔ 121 MTPA CO2 eq)

- Replacement of HP steam exchanger with electric heater (6000 SRFT)
- Hot Water belt in the FCCU (6000 SRFT)
- Conversion of steam tracing with electrical tracing in 14 no of Bitumen Tk (3000 SRFT)
- Replacement of steam turbine with motor in MAB & Installation of PRT across orifice chamber in FCCU (15000 SRFT)

Major ENCON projects planned in FY 2023-24

Sr No.	Scheme	Category (Inhouse/PCRA/EIL/CHT/RPIP etc)	Savings (SRFT/Yr)	Savings (Million Kcal/Yr)	Savings Millions	Completion Date (MMM-YY)	Investment in Millions
1	Perlite Insulation on HP Steam Header (2nd Phase-8.8 KM)	In-house	1905	19050	65	FY 2023-24	72.2
2	Installation of additional CPH module in HRSG 2	In-house	1300	13000	76	Completed	50.9
3	High emissivity furnace coating in the AVU furnaces	In-house	920	9200	54	Completed	17
4	DHDT complete off gas routing to PSA-140 (Stab offgas, stripper offgas)	In-house	350	3500	20	FY 2023-24	0.5
5	Reduction in LP steam consumption in HGU-1 Deareator 06-V-004.	In-house	1200	12000	70	Completed	0
6	Modification in IGV modulation to increase Cogen efficiency of GT/HRSG-2	In-house	200	2000	12	Completed	0
7	Cleaning of the AVU preheat exchangers through online chemical cleaning to reduce downtime	In-house	2300	23000	135	FY 2023-24	
8	Implementation of coracoat coating in the cooling water pumps	In-house	1200	12000	70	FY 2023-24	7

Major ENCON projects planned in FY 2023-24

Sr No.	Scheme	Category (Inhouse/PCRA/EIL/ CHT/RPIP etc)	Savings (SRFT/Yr)	Savings (Million Kcal/Yr)	Savings Millions	Completion Date (MMM-YY)	Investment in Millions
9	Application of Electrical tracing in offsite piping and tank farm in place of stream tracing (MP steam cons in Bitumen tank Farm: 15 TPH; Power requirement: 2.5 MW).	In-house	3000	30000	176	FY 2023-24	80
10	Provision of HP rich amine flash vessel in OHCU to recover fuel gas	In-house	800	8000	47	FY 2023-24	70
11	Replacing WGC condensing turbine drive with motor in FCCU	In-house	4900	49000	287	FY 2023-24	800
12	Replacing MAB Condensing Turbine Drive with Motor Drive in FCCU	In-house	5000	50000	293	FY 2023-24	800
13	Conversion of existing STG (partial condensing type) to back pressure turbine	In-house	4000	40000	234	FY 2023-24	140
14	Converting turbine to motor in Heat pump compressor in NPRU	In-house	5500	55000	322	FY 2023-24	900

Major ENCON projects executed in FY 2023-24

Installation of additional CPH module in HRSG 2.
Stack temperature reduced by > 30 °C

High emissivity coating in the AVU, VBU & DHDT furnaces.
Total 7 number of furnaces, 3% of fuel saving

ENCON Schemes implemented in 2022-23

IndianOil

Confederation of Indian Industry

Water washing of GT-2/3(848 SRFT)

Overhauling & vaccum improvement of STG1 (2015 SRFT)

Perlite insulation in low lying steam lines (500 SRFT)

Net saving: (4100 SRFT ⇔ 0.5 MBN)

Installation of WPHE in AVU (500 SRFT)

CDU COT reduction – 170 SRFT

Stoppage of 1 DMW pump by modification of Morpholine dosing facility in CPU pump (70 SRFT)

ENCON Schemes implemented in 2021-22

IndianOil

Confederation of Indian Industry

Stoppage of MP steam in TPS deaerator (3500 SRFT)

Repair /replacement of faulty steam traps (3446 SRFT)

Stopping 1 BFP in TPS by increasing reliability of auto start logic

Overhauling & water washing GT-1 (2565 SRFT)

Overhauling & vaccum improvement of STG1 (1915 SRFT)

Attending step less controller in OHCU(1200 SRFT)

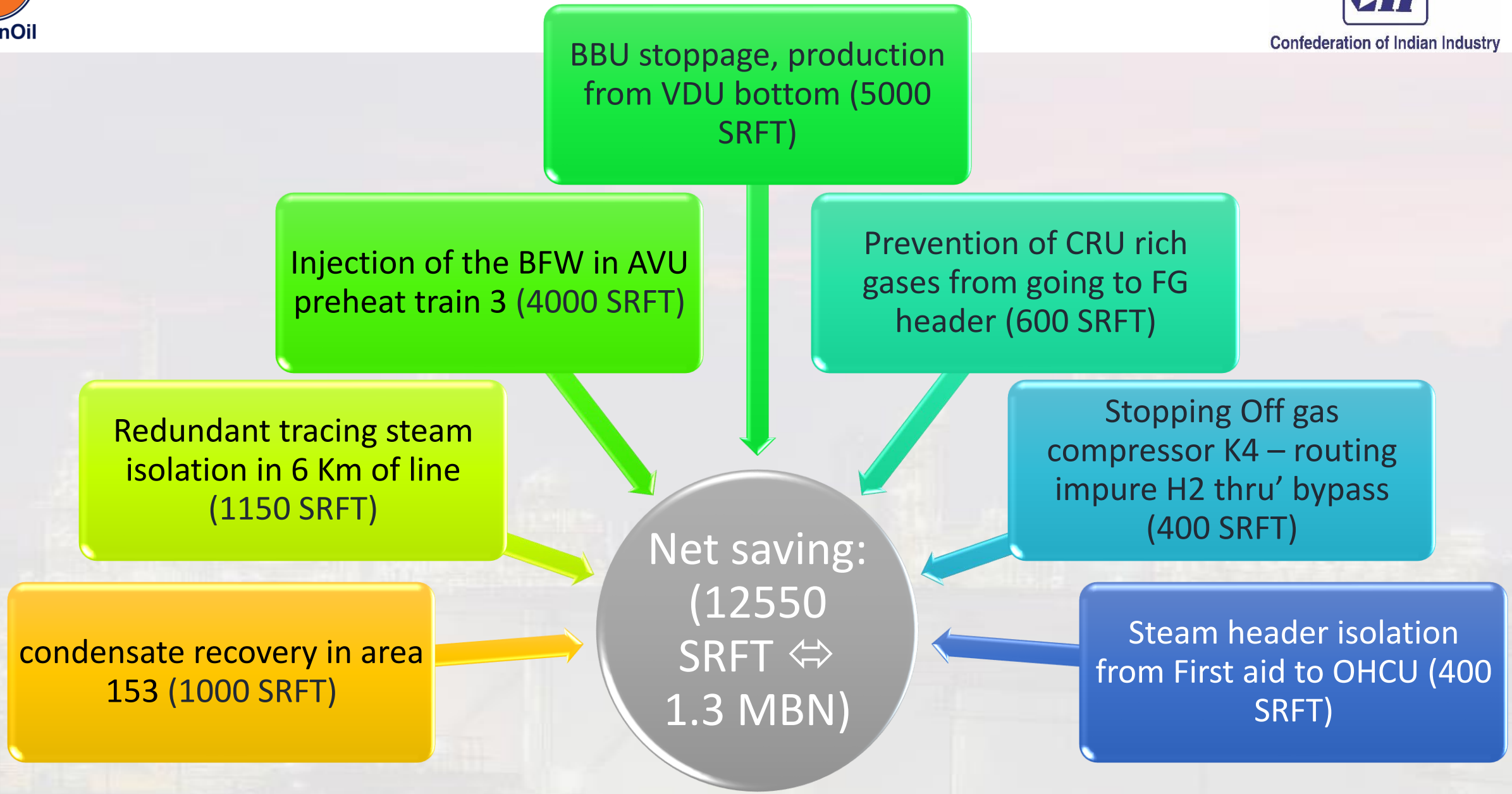
Net saving: (14610 SRFT ⇔ 1.4 MBN)

Routing of propylene analyzer purge to HPC suction KOD (1570 SRFT)

Replacement of thermal insulation in TPS

Overhauling of pumps in AVU, OMS (144 SRFT)

ENCON Schemes implemented in 2020-21

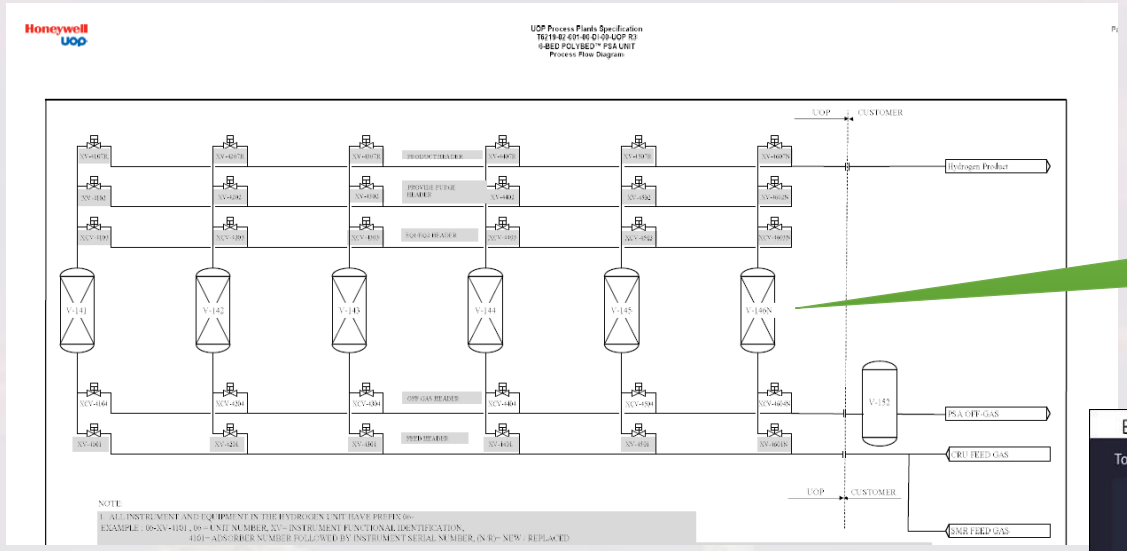


Innovative Project

Name of Project	Description	Trigger for implementing	Year of implementation	Annual savings	Investment
Hydrogen recovery from LP off gases through PSA 140 Revamp	PSA 140 was revamped to incorporate LP off gases from other units which were originally routed to FG header. After revamp hydrogen was recovered from LP gases and routed to Hydrogen header, there by reducing load on HGU.	**Hydrogen savings** and reduction in HGU plant load which is a huge energy consumer.	2022-23	4574	140
Energy Management System	Online monitoring tool of refinery, which provides updates on **hourly basis on all energy key performance indicators**.	Stringent monitoring	2022-23	4000	140
BFW injection for improving AVU pre heat	improvement in PHT-3 of 3 °C, was observed after BFW injection. This activity is carried out on quarterly basis or when ever pre heat drops significantly.	Online exchange cleaning and **pre heat improvement**	2022-23	854	5

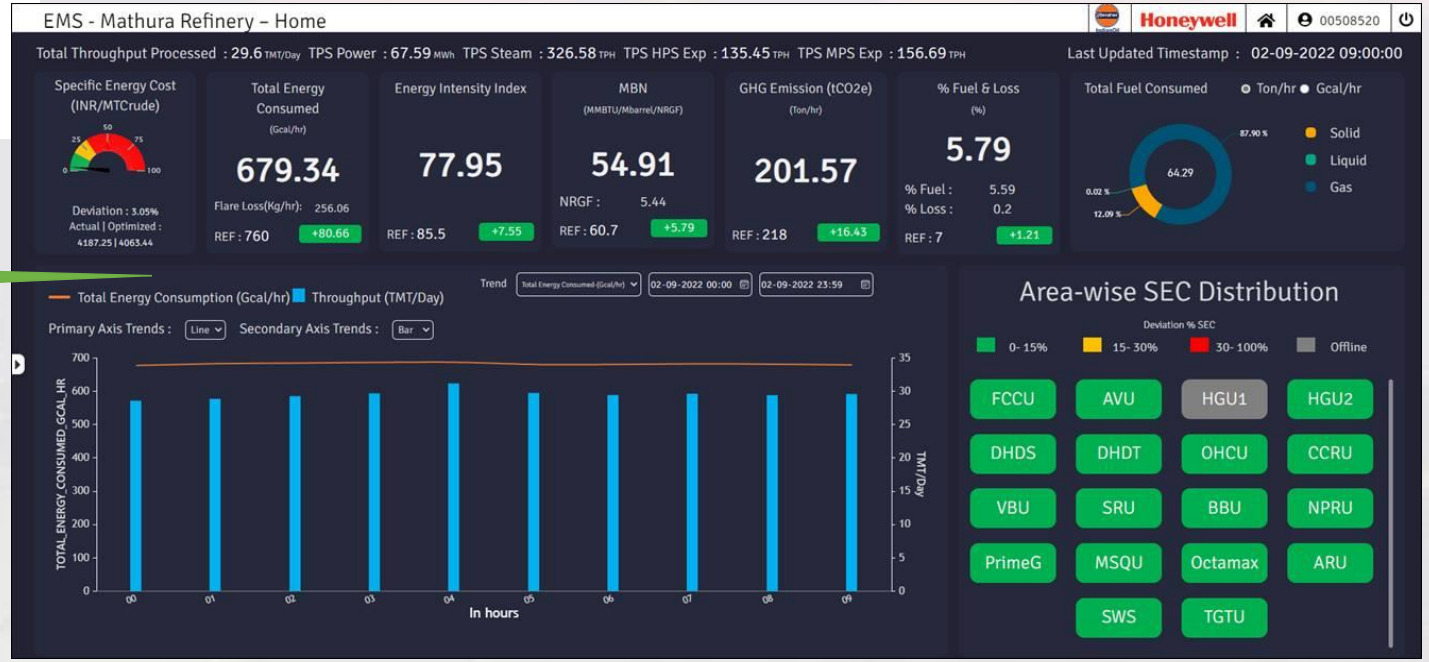
Innovative Projects

Confederation of Indian Industry



Hydrogen recovery from LP off gases through, PSA-140 revamp (new PSA bed)

Energy Management System



BFW injection in Pre Heat train-3 for improving AVU pre heat

Renewable Energy

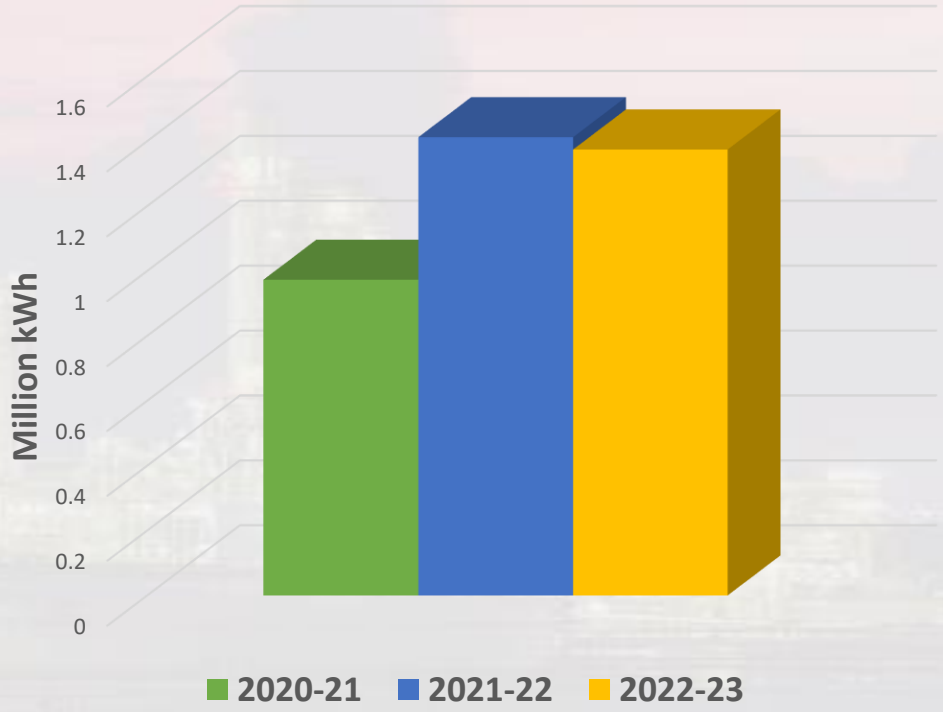
On Site generation

	Technology	Installed capacity (MW)	Consumption (Million kWh)	Share
2022-23	Solar	0.89	0.912205	0.16
2021-22	Solar	0.89	0.96972	0.17
2020-21	Solar	0.89	0.708281	0.13

Off Site generation

	Solar	Installed capacity (MW)	Consumption (Million kWh)	Share
2022-23	Solar	0.35	0.461960	0.08
2021-22	Solar	0.35	0.442281	0.08
2020-21	Solar	0.35	0.264576	0.05

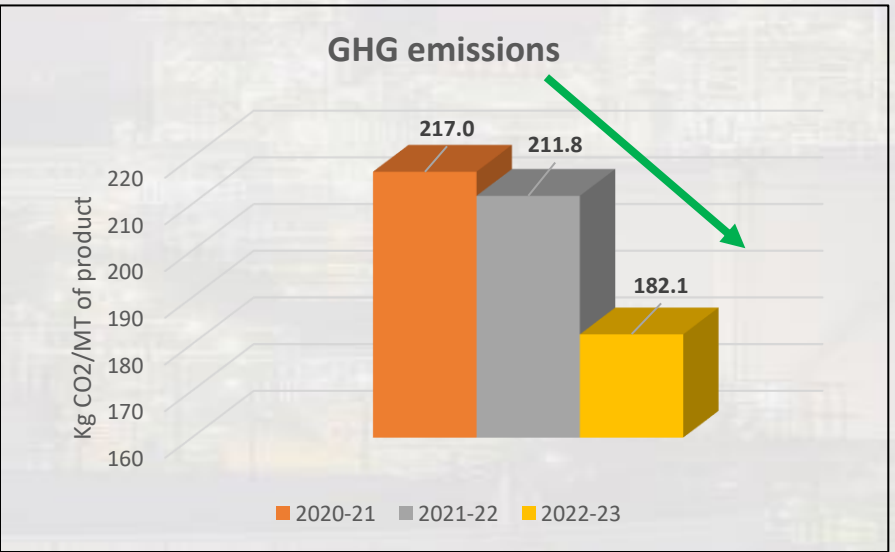
Total Solar Energy generation

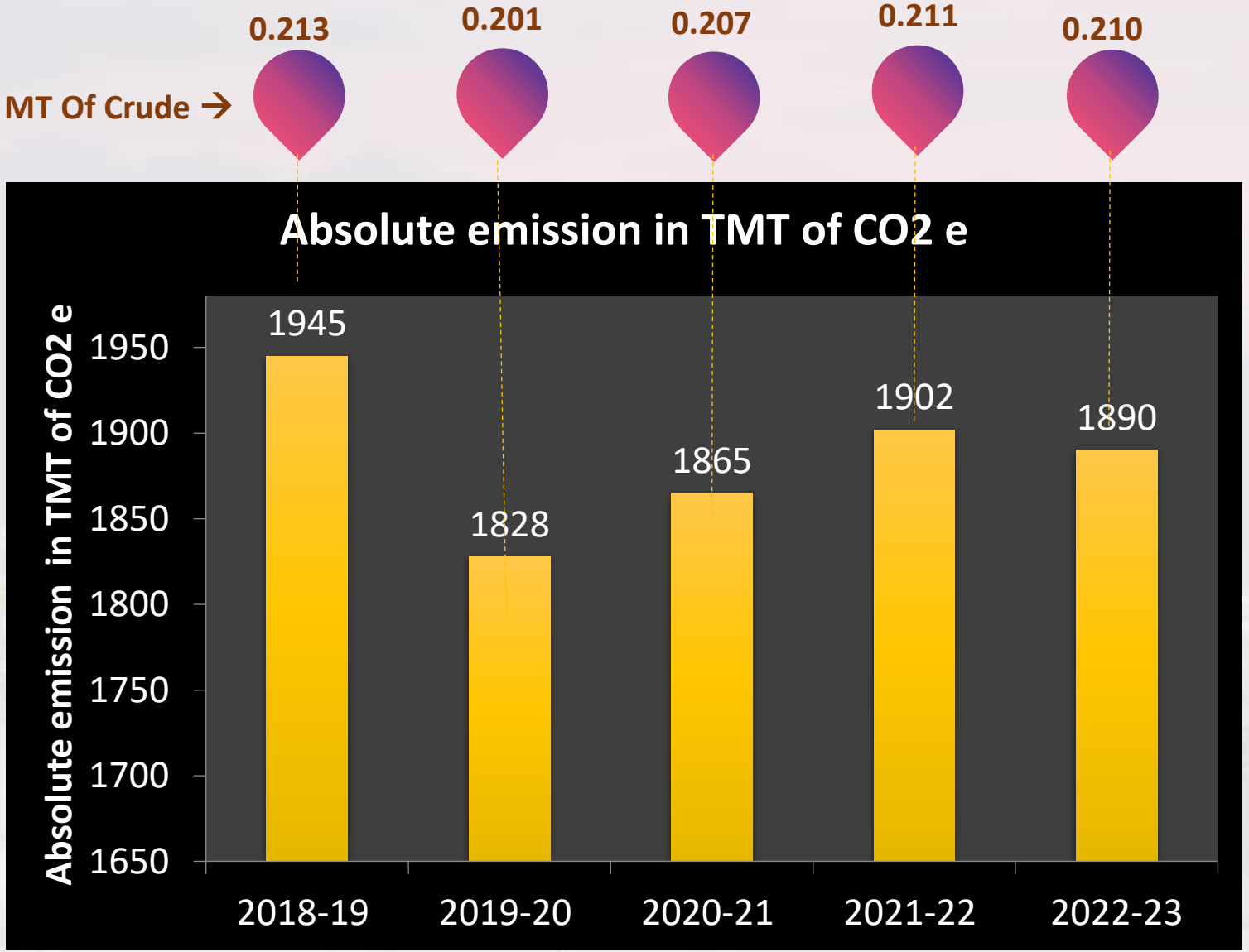


GHG- Emission in TMT of CO2e

GHG emissions:

Year	Scope 1 kg CO2/MT of product	Scope 2 kg CO2/MT of product
2022-23	181.92	0.20
2021-22	211.59	0.20
2020-21	216.78	0.18



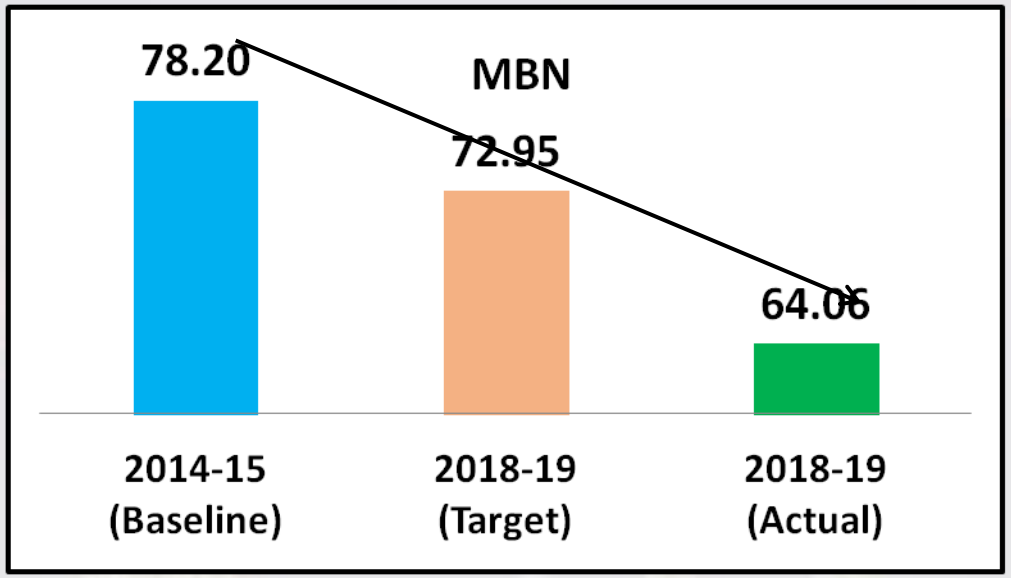


PAT CYCLE II to VI : IOCL-MR Performance

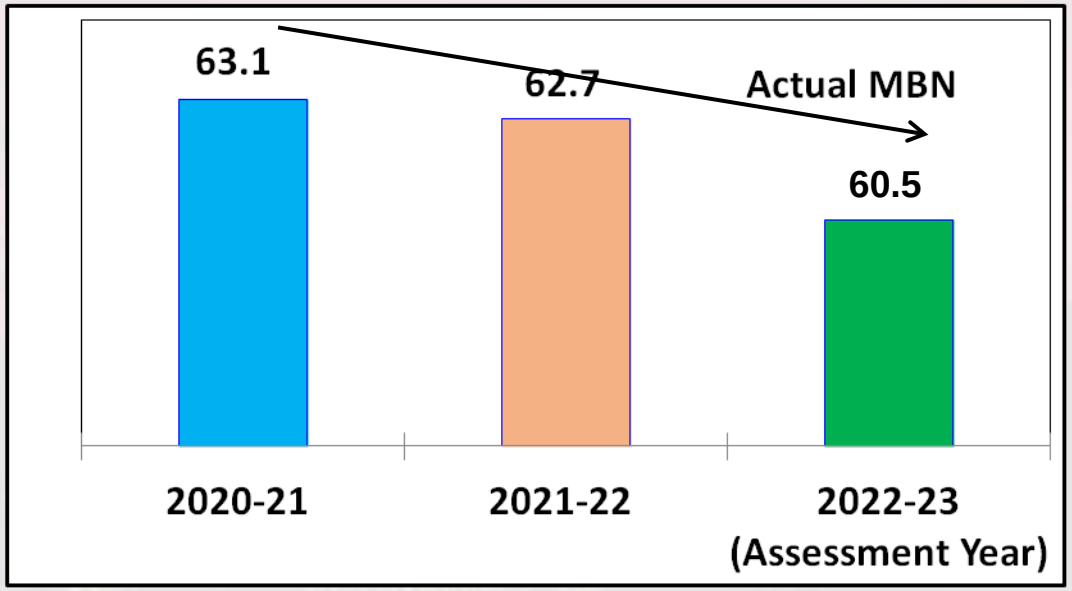
IndianOil

Confederation of Indian Industry

PAT Cycle-II : FY 2016-2019



PAT Cycle-VI : FY 2020 -23



14 MBN Reduction against

5.2 MBN Target

No of Escerts issued:

71718 Escerts

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

Achieved in the Year **2022-23: 60.5 MBN (⇔ 1669 Escerts)**

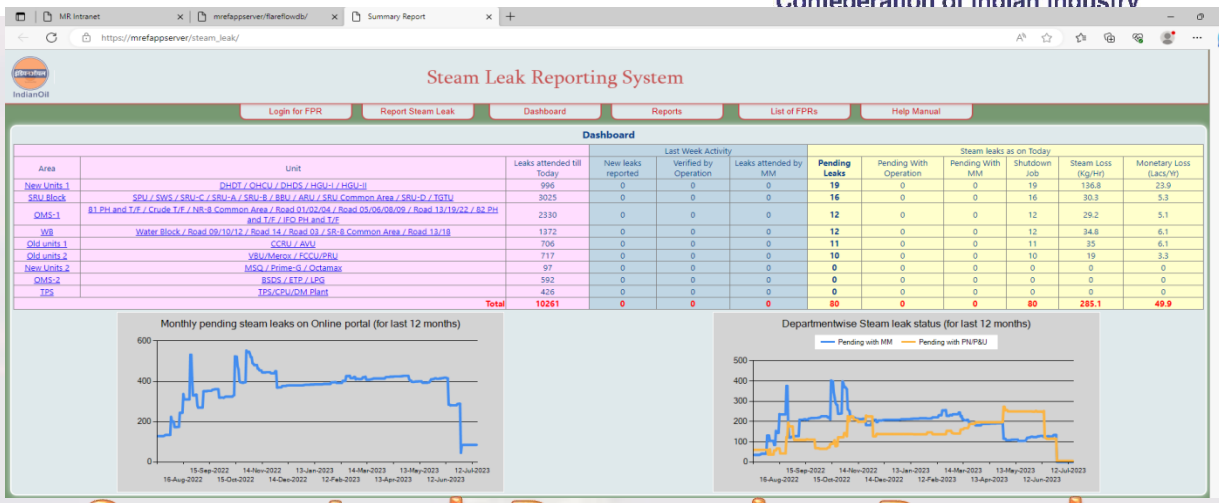
With focused approach, IOCL- MR has not only achieved but surpassed the target in both PAT II, VI.

Digitalization in Mathura Refinery

IndianOil

Confederation of Indian Industry

EMS dashboard



Steam Leak Reporting Portal

Flare dashboard

AVU PHT Monitoring dashboard

INNOVATION: Ethanol Blended MS : First refinery in India

Challenge I –transportation due to Ethanol being polar in nature.

Overcame by : Addition of Coupler at refinery location

Challenge II – costlier w.r.t MS due to high ethanol cost.

Overcame by – addition of low cost Naptha stream with high Octane Ethanol in MS pool to maintain overall Octane and low cost

Thus Mathura Refinery was able to maintain

1. **overall margin in EBMS production**
2. **reduce the associated carbon footprint of MS**
3. **helped local farmers/agriculture industries to grow**

इंडियनऑयल

IndianOil

CLEAR BLUE

Diesel Exhaust Fluid is the necessity to comply with the NOx emission norms of BS-VI fuel and it is a remarkable sustainable effort of IOCL towards producing vehicle additives for making the engine exhaust cleaner

IndianOil

Confederation of Indian Industry