# NAYARA ENERGY LIMITED

## CII National Award for Excellence in Energy Management 2022

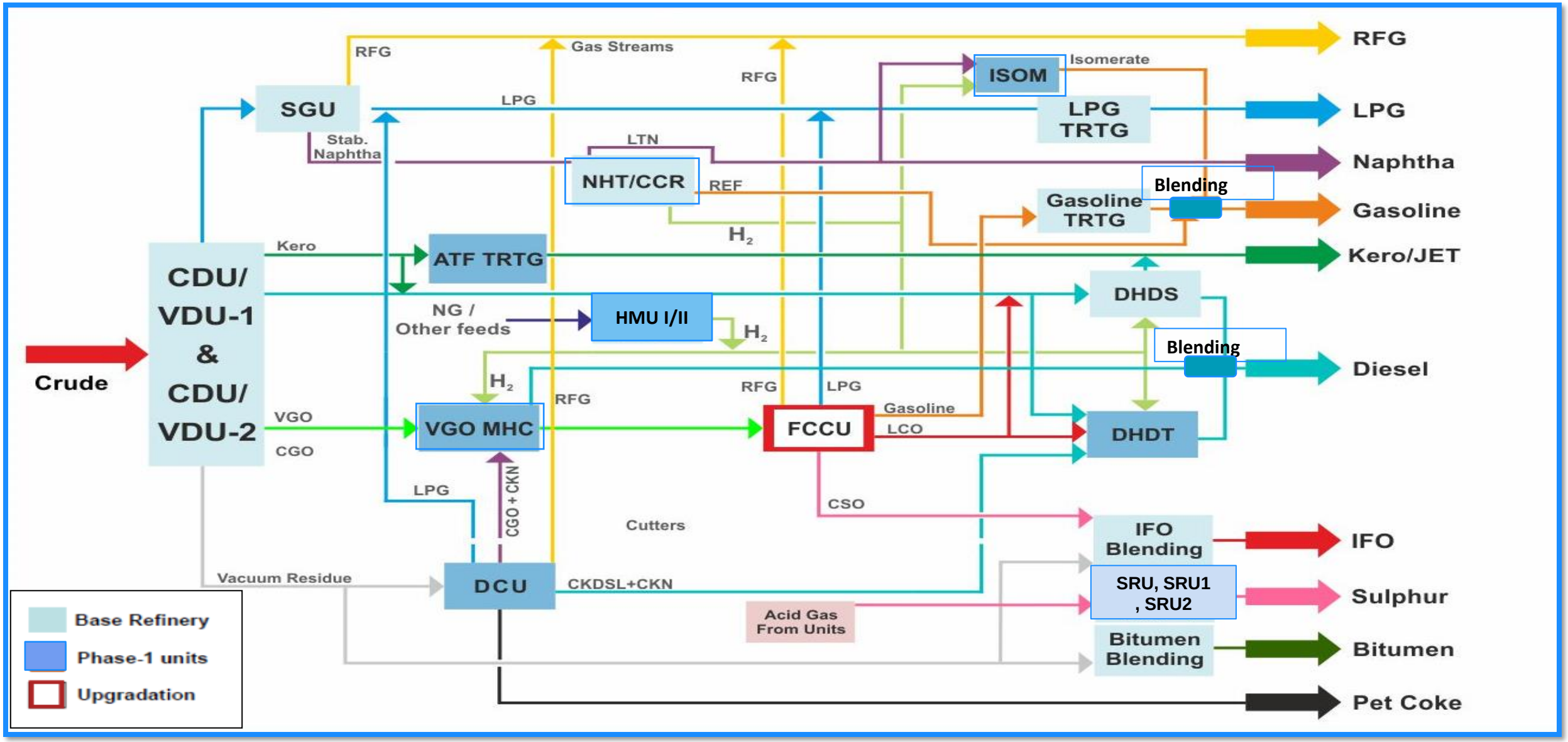

**Presenters:**

**J. Rajesh – Vice President**
**Nitinkumar Chokshi - General Manager**
**Mohamed Uwais – Deputy Manager**

# 1.Nayara Energy Executive Summary

- Vadinar refinery started commercial production in 2008 (10.5 MMTPA) and transformed to a complex, modern large refinery in 2012 (20 MMTPA). **Journey continues...**
- India's second largest single location modern and complex refinery with Nelson Complexity Index of 11.8
- Crude Diet comprises of Crudes sourced from different Geographies viz North America, Latin America, Africa, Far East, Middle East including India
- Fully integrated with captive infrastructure for crude receipt, product movement with sufficient steam/power and utility generation. First Refinery among Indian Refineries to run on coal based captive power plant from 2012.
- Refinery reliability consistently **> 99.95%**
- Safe, reliable, consistent and efficient Refinery operation in terms of capacity utilisation, energy efficiency, Opex etc.
- Diversification in Petrochemical with PRU and PP units under construction

# 2.Process Block Flow Diagram



# 2a. Unique Design Features

**CDU**
**18 MMTPA**

- Tallest crude column (90 metres height, 76 trays)

**VDU**

- Low pressure steam ejectors & vacuum pump.

**CDU-II**
**2 MMTPA**

- Converted to CDU from VBU.
- Capable to process ultra heavy crude on standalone basis.

**DHDT**
**4.5 MMPTA**

- Very high pressure hydro treatment
- Capable of producing Euro VI diesel

**VGO-MHC**
**6.5 MMTPA**

- Converted to Mild Hydrocracker in Sept'2015 Turnaround Shutdown

**FCCU-**
**3.9 MMTPA**

- 2 Stage Regenerators
- Running on Maximizing Middle Distillate Mode

**NHT/CCR**
**2.3/1.3 MMTPA**

- Producing Reformate with 101 RON
- NHT Revamped to 2.15 MMTPA in Feb'18.

**ISOM Unit**
**0.97 MMTPA**

- Capable to processing feed with 5% Benzene and 10% C7+
- Revamped to 0.9 MMTPA in Feb'18.

**DCU**
**7.5 MMTPA**

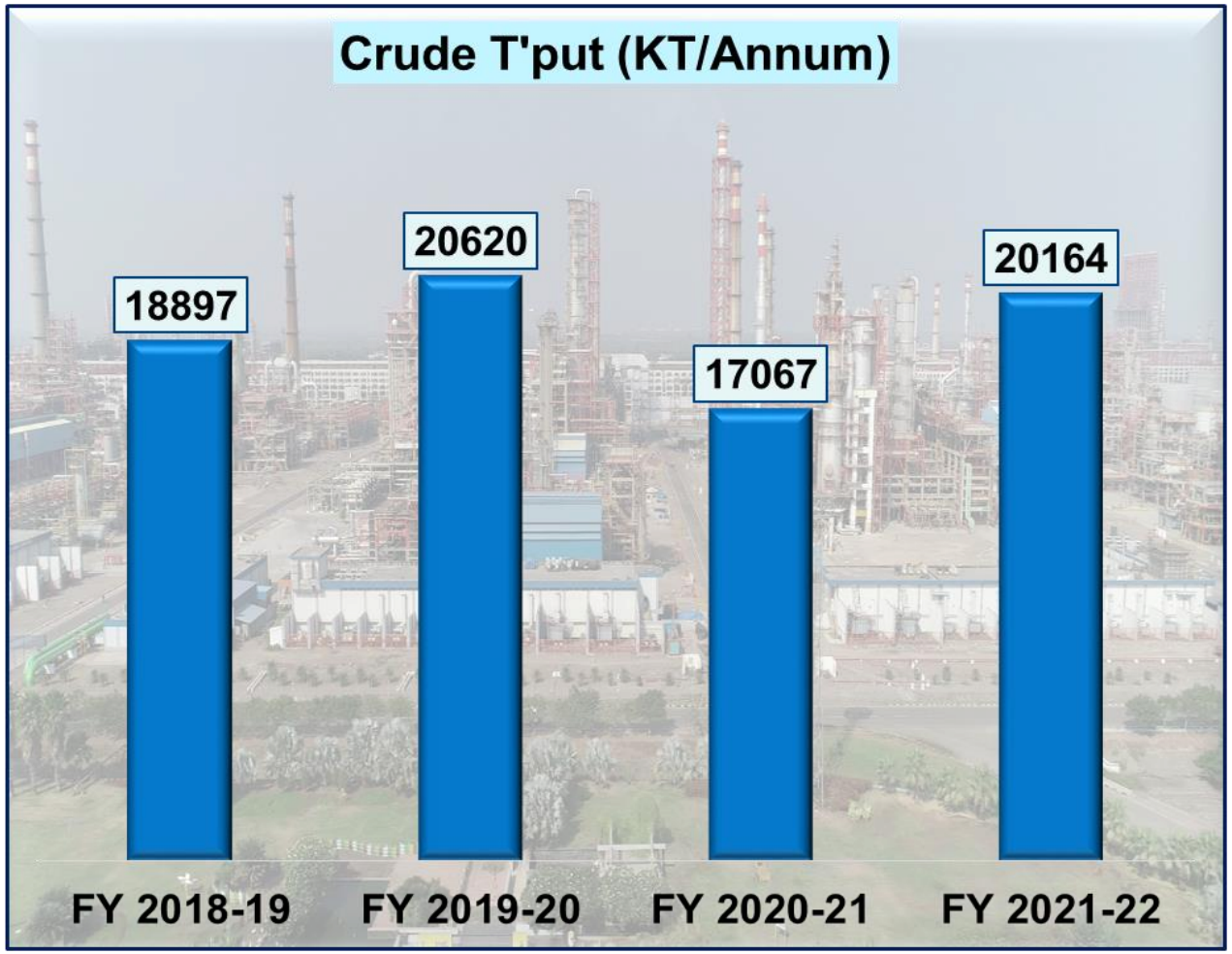
- 6 Coker drums
- One of the largest Coker unit in the world

**CPP (Captive power plant)**

- First refinery to use Coal fired Boilers for meeting Steam and power demands of the refinery

# 2b.Production Data

| Year | 2018-19 | 2019-20 | 2020-21 | 2021-22 |
|---|---|---|---|---|
| Crude Throughput (KT) | 18897 | 20620 | 17067 | **20164** |
| **Products(KT)** | | | | |
| MS | 3071 | 3631 | 3265 | **4019** |
| Diesel | 9647 | 10253 | 8734 | **9783** |
| Naphtha | 670 | 761 | 572 | **574** |
| LPG | 870 | 972 | 922 | **1006** |
| Kero | 55 | - | - | - |
| ATF | 758 | 1088 | 808 | **801** |
| VGO | 268 | 212 | - | - |
| Fuel Oil | 354 | 47 | 269 | **555** |
| Bitumen | 144 | 101 | 141 | **136** |
| Pet Coke | 2038 | 2342 | 1553 | **2181** |
| Sulphur | 280 | 384 | 280 | **328** |

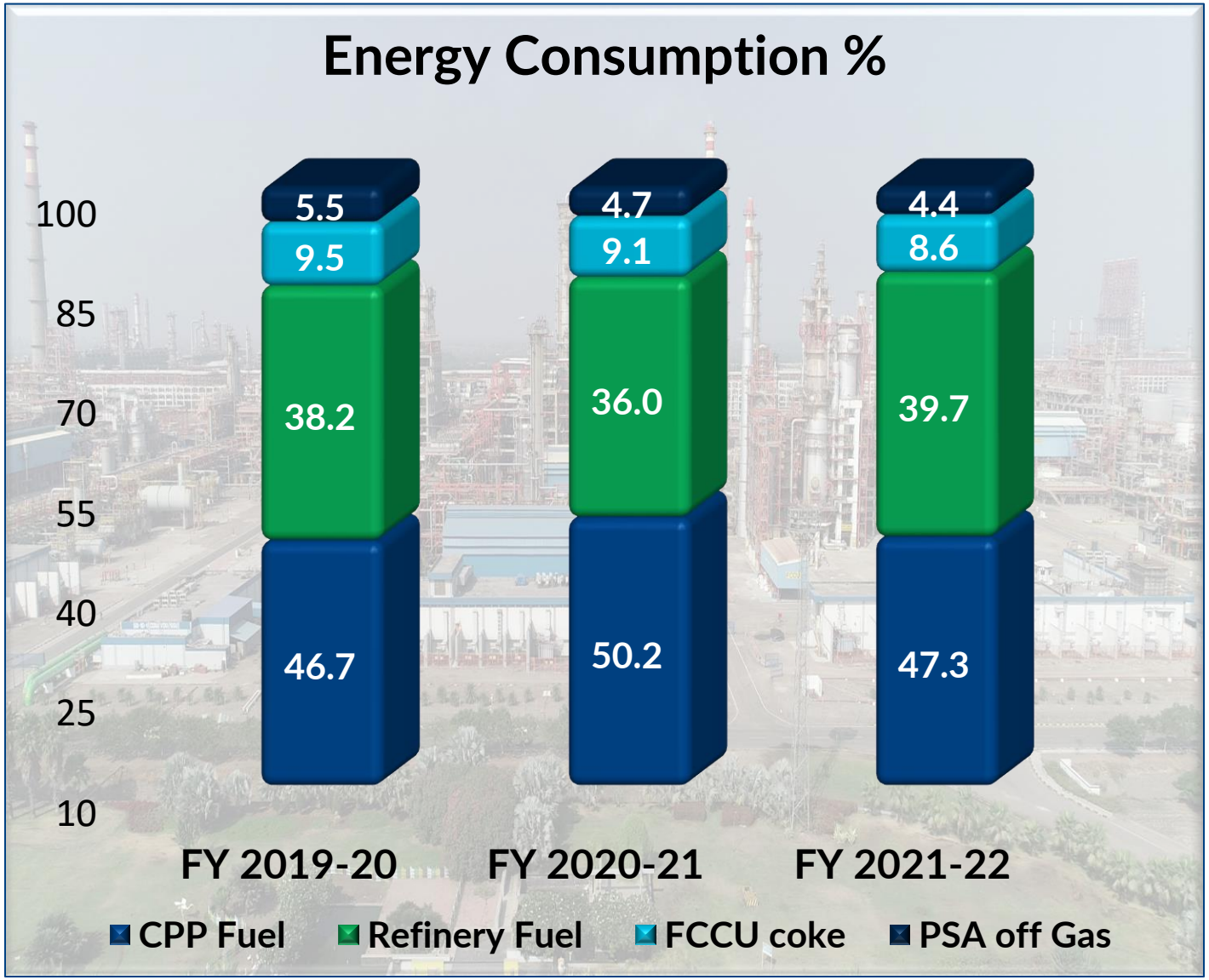



- FY 2018-19 - Refinery Turn Around.
- FY 2020-21 - Covid 19 Pandemic Impact & Short Shutdown

# 3.Energy Consumption of Nayara Energy Limited

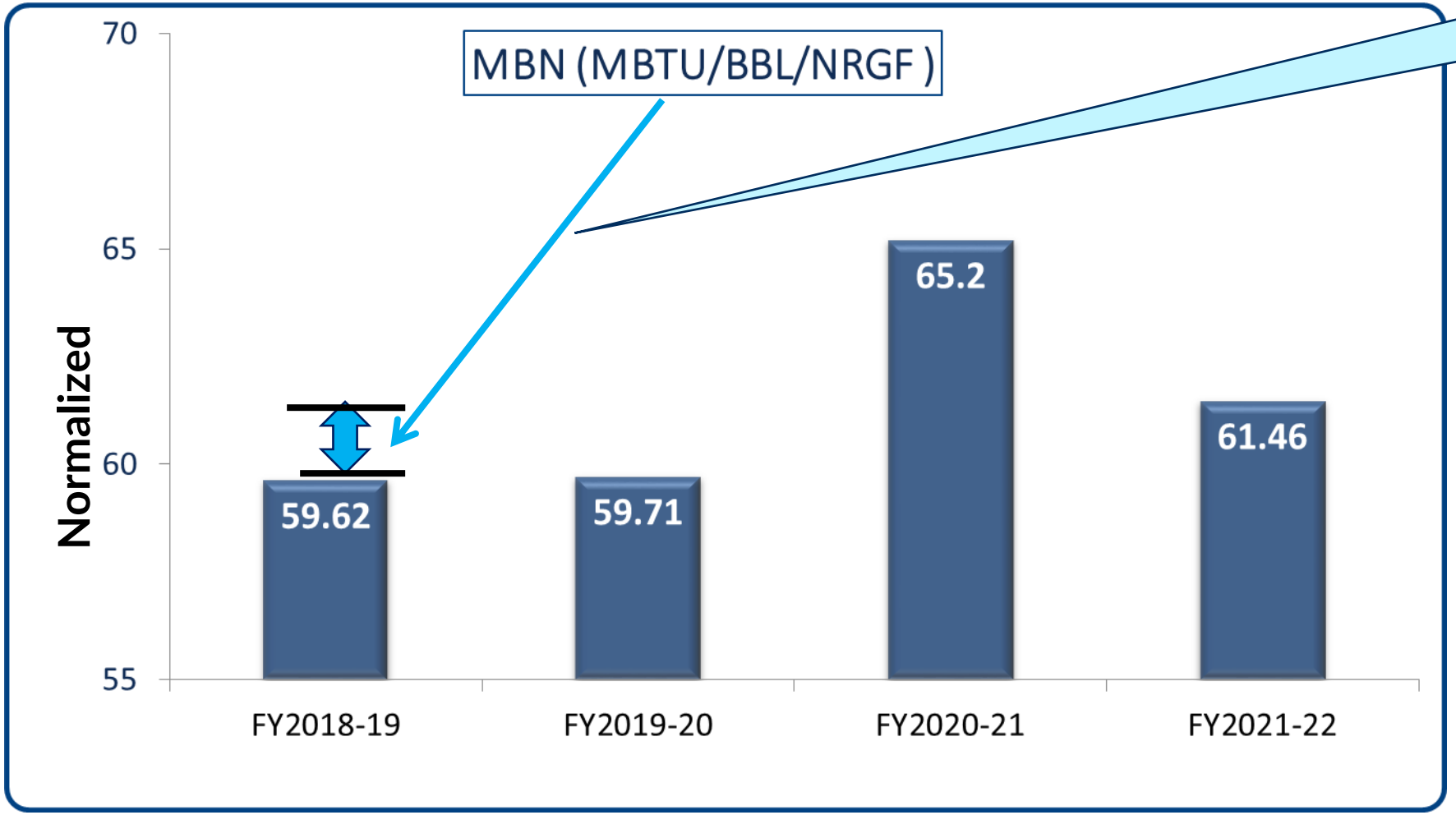
| Year | 2019-20 | 2020-21 | 2021-22 |
|---|---|---|---|
| Crude Throughput (KT) | 20620 | 17067 | **20164** |
| Fuel Type | MTOE/Hr | | |
| | FY 2019-20 | FY 2020-21 | FY 2021-22 |
| CPP Fuel | 93 | 88 | 88 |
| Refinery Fuel | 76 | 63 | 74 |
| FCCU coke | 19 | 16 | 16 |
| PSA off Gas | 11 | 8 | 8 |
| Total | **199** | **175** | **185** |

| Year | FY 2019-20 | FY 2020-21 | FY 2021-22 |
|---|---|---|---|
| Refinery Power (MWH) | 144 | 136 | 135 |



# 4. Specific Energy Consumption of Nayara Energy Limited

## Refinery's SEC in terms of MBN (MBTU/BBL/NRGF)

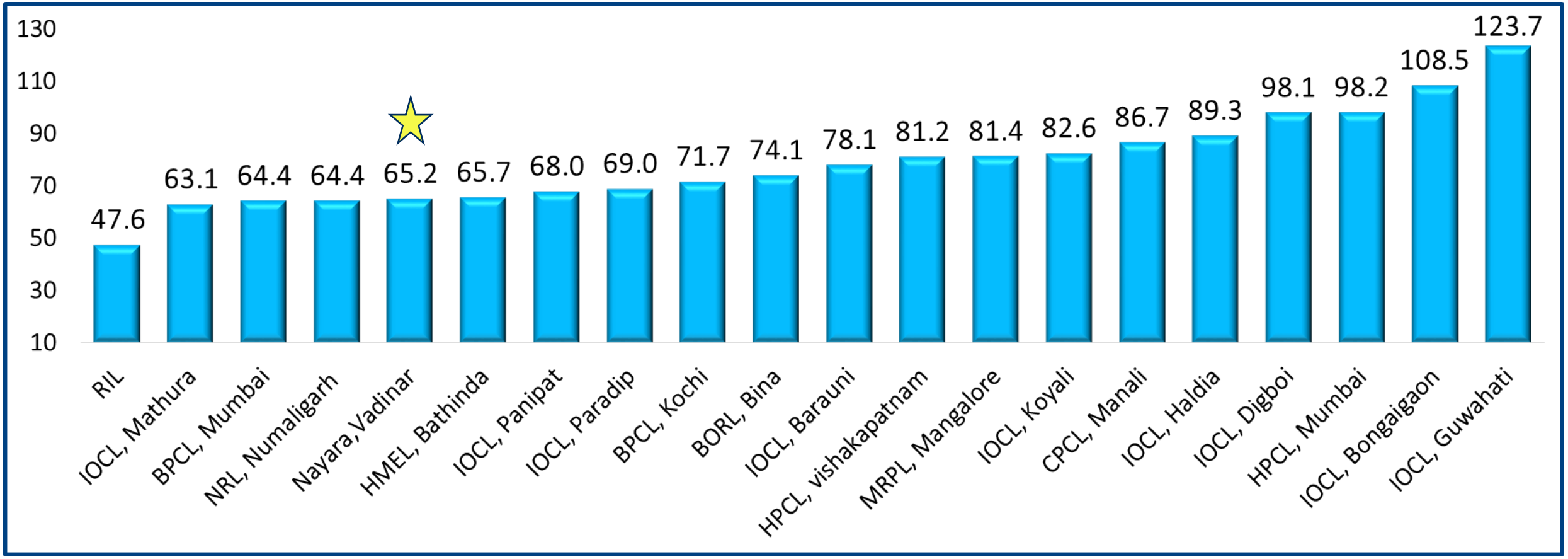



**PAT 2- Target**
**MBN- 60.35**
**ESCerts eligible**
**18235**

- **FY 2018-19 :** MBN – 59.62 after normalisation as per BEE/CHT Methodology
- **FY 2019-20 :** MBN 59.71 Start of Run after TA
- **FY 2020-21:** MBN 65.2 higher side in lieu of Covid 19 Pandemic, Lower Crude T'put, Low market demand and Short Shutdown
- **FY 2021-22 :** MBN 61.46

# 4a.Specific Energy Consumption Comparison with other Indian Refineries

## Specific Energy Consumption of Indian Refineries FY 2020-21




*Data Source : Data published by Ministry Petroleum and Natural Gas*

*FY2021-22 MBN data not published

# 5. List of Major ENCON Projects Planned in FY 2022-23

| | CFB - efficiency improvement by addition of economizer coil & RAPH seal modification (Potential Efficiency improvement ~1.0 % & Power saving by 476 KW | Low Pressure Flash vessel provision in at downstream of MP steam reboiler and exchangers. (Potential Saving 1.5 TPH LPS ) | CPP Fuel Oil - LP steam & condensate recovery from HP/MP/LP condensate by flash vessel system (Potential Saving - 0.81TPH LPS) |
|---|---|---|---|
| Benefits, INR Mn | 529.6 | 8.40 | 12.50 |
| Investment, INR Mn | 488 | 7.94 | 27.61 |

| | Mangala feed pump impeller trimming (Potential Saving - 100 KW) | Rich amine pumps Impeller replacement (Potential saving 29 KW) | Renewable power generation (Installed capacity 10MW) |
|---|---|---|---|
| Benefits, INR Mn | 2.30 | 0.62 | 70.08 |
| Investment, INR Mn | 1.68 | 1.56 | 560 |

# 5a. ENCON Projects in last 3 years : FY 2021-22

**With Investment**

| | Trimming of impeller of DIH Overhead pump to reduce throttling losses. (Power Saving : 61 KW) | Replacement of inefficient refrigeration Screw Chiller by new Screw compressor. (Power Saving : 110 KW) | Replacement of 1 nos. CT fans blade by efficient aerodynamic FRP Blades (Power Saving : 21 KW/ fan) | Replacement of 8 nos. Fin fans blade by efficient FRP Blades in DHDT . (Power Saving : 2 KW/FAN) |
|---|---|---|---|---|
| Benefits, INR Mn | 2.73 | 4.91 | 0.94 | 0.71 |
| Investment, INR Mn | 2.3 | 22.3 | 0.5 | 1.7 |

**Without Investment**

| | Power optimization in Ash handling electrical devices. (Power Saving : 70 KW) |
|---|---|
| Benefits, INR Mn | 3.13 |

# 5b. ENCON Projects in last 3 years : FY 2020-21

**With Investment**

Replacement of faulty steam traps

| | |
|---|---|
| Benefits, INR Mn | 46.16 |
| Investment, INR Mn | 20 |

**Without Investment**

| | Use of Low capacity standby pump in place of high capacity pumps for filter water make up | Power saving by running only one air dryer after adsorbent replacement |
|---|---|---|
| Benefits, INR Mn | 1.50 | 0.92 |

# 5c. ENCON Projects in last 3 years : FY 2019-20

NAYARA ENERGY

## With Investment

| | Installation of additional HKPA exchanger in crude PHT-2 circuit | STG- LPS extraction capacity increased which reduced letdown by 20 TPH. | STG Condensate re-routed to Train 1 Deaerator resulting in one DM water transfer pump stoppage in Base Plant | SRU2 - LP condensate pump impeller trimming done resulting in Savings of 15 KWh |
|---|---|---|---|---|
| Benefits, INR Mn | 57.60 | 65.52 | 9.83 | 0.49 |
| Investment, INR Mn | 14.8 | 0.18 | 2.0 | 0.05 |

## Without Investment

| | DIH Column optimization resulted in 5 MT MP steam saving per Hr. | VGOMHC - RPM reduction of process pump driven by turbine based on CV output, resulted in 1 MT/Hr. HP steam saving. | Optimization of steam flow to VGO fin-fan provided to avoid congealing 5 MT/Hr. of LP steam saved. |
|---|---|---|---|
| Benefits, INR Mn | 30.66 | 6.13 | 21.55 |

# 5d.Total Savings

| Savings | 2019-20 | 2020-21 | 2021-22 | Total |
|---|---|---|---|---|
| With Investment | 133.44 | 46.16 | 9.29 | 188.89 |
| Without Investment | 58.34 | 2.42 | 3.13 | 63.89 |

*All figures are in Million Rupees.

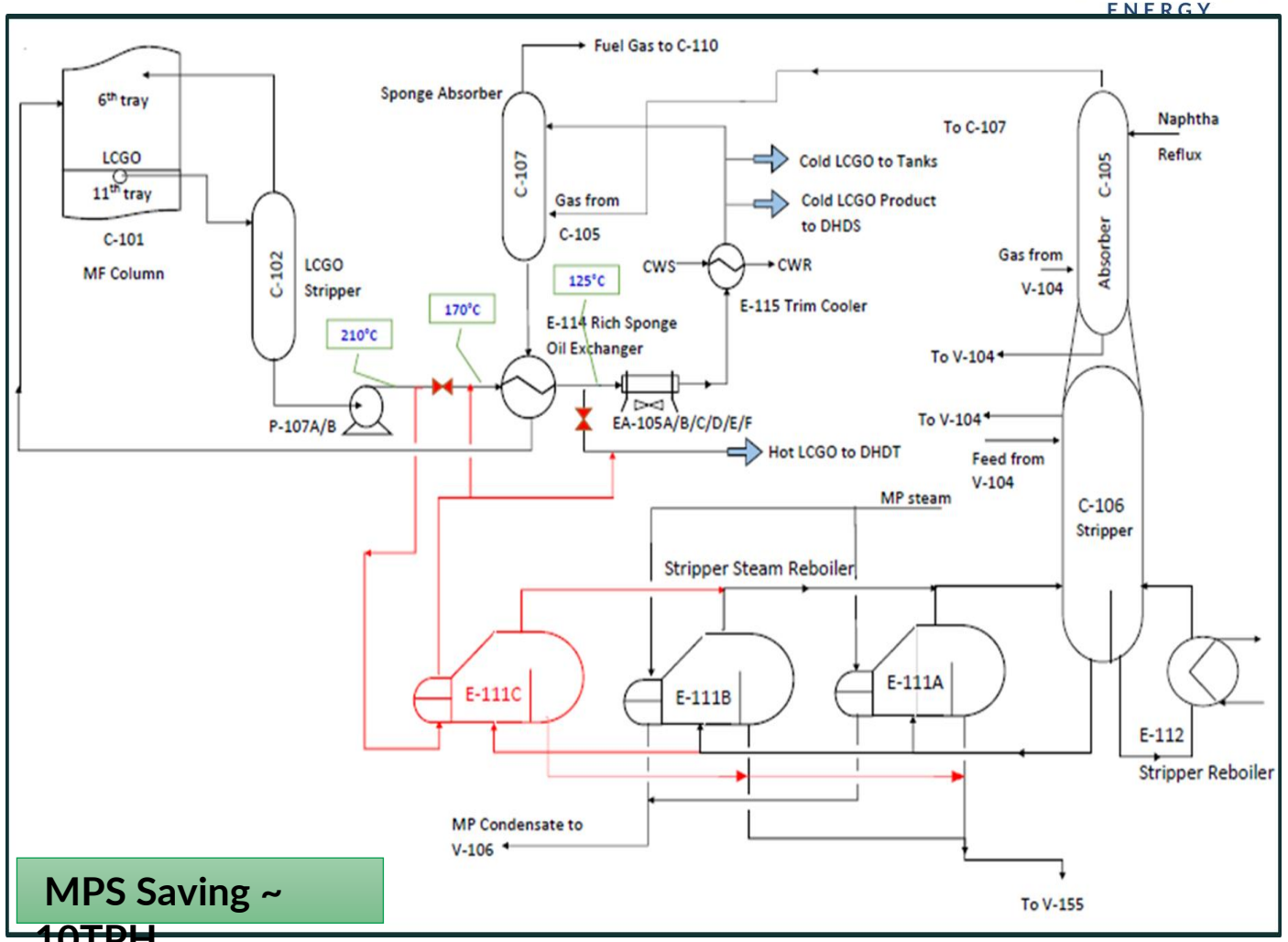
# 6.Innovative Project 01– Heat Recovery from LCGO product Circuit

## ❑ Trigger for the project

- Enormous amount of high level energy is being cooled in Lean sponge oil air cooler.
- Fin fan cooler duty is around 12.3 Gcal/hr, cooling Lean Sponge Oil stream from 180 ° C to 65 ° C(Flow ~200 TPH)

## ❑ Proposal

- Energy saving opportunity is available to utilize this high level heat in DCU Stripper Reboilers
- New Exchanger LCGO will be installed Parallel with existing MPS reboiler
- LCGO from pump will first be routed to new reboiler and then a partial stream (required for Sponge Absorber) will be directed through reboiler, fin fan cooler & Condenser.
- Hot LCGO to DHDT will be routed downstream of new reboiler and without affecting the downstream units
- Implementation planned during TA 2022




**MPS Saving ~ 10TPH**

**Investment : ₹71.4 Mn** **Saving : ₹50 Mn** **Payback : ~**

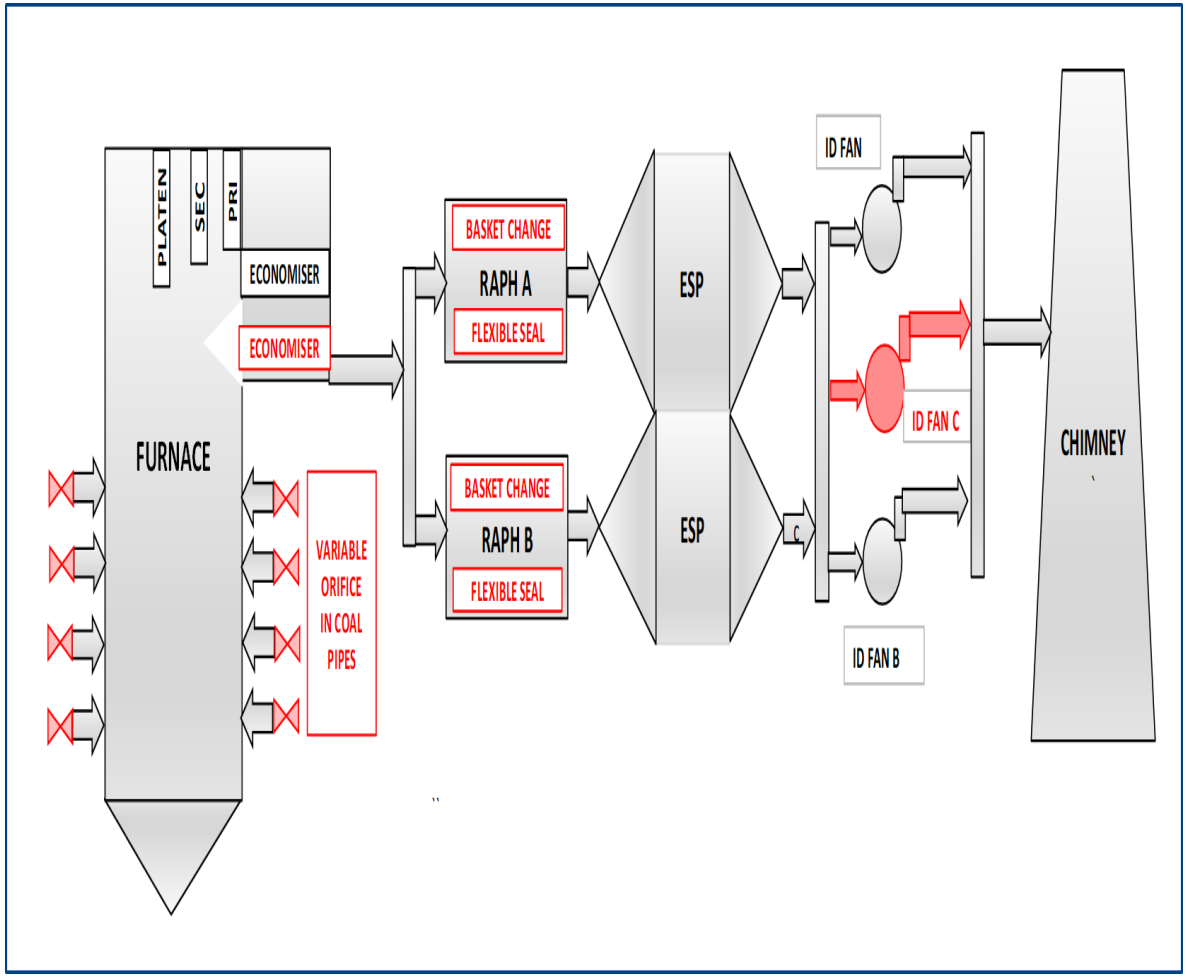
# 6a.Innovative Project 01 – Coal Fired Boiler Efficiency Improvement

## ❑ Trigger for the project

- Improve Boiler Efficiency
- Meet additional Steam & Power requirement of Petrochemicals

## ❑ Proposal

- Installation of additional Economizer coils in existing available space.
- RAPH Hot & Intermediate end baskets replacement with closed profile
- Installation of Bend Type Flexible bypass Seals at RAPH hot end and cold end.
- Installation of variable orifice in Pulverizer coal outlet to boiler.
- Installation of 3rd ID Fan (35% Capacity)
- Replacement of Rotary Soot Blowers of existing Economizer with Long Retractable Soot Blowers
- Implementation planned during TA 2022




**Benefits: RAPH leakage < 10% ; Boiler Efficiency improvement ~ 1%; Energy Savings ~**

**Investment : ₹488 Mn Saving : ₹518 Mn Payback : ~ 0.94 Year**

# 6b. Energy Efficient Project – Steam Loss Optimization:

## ❑ Trigger for the project

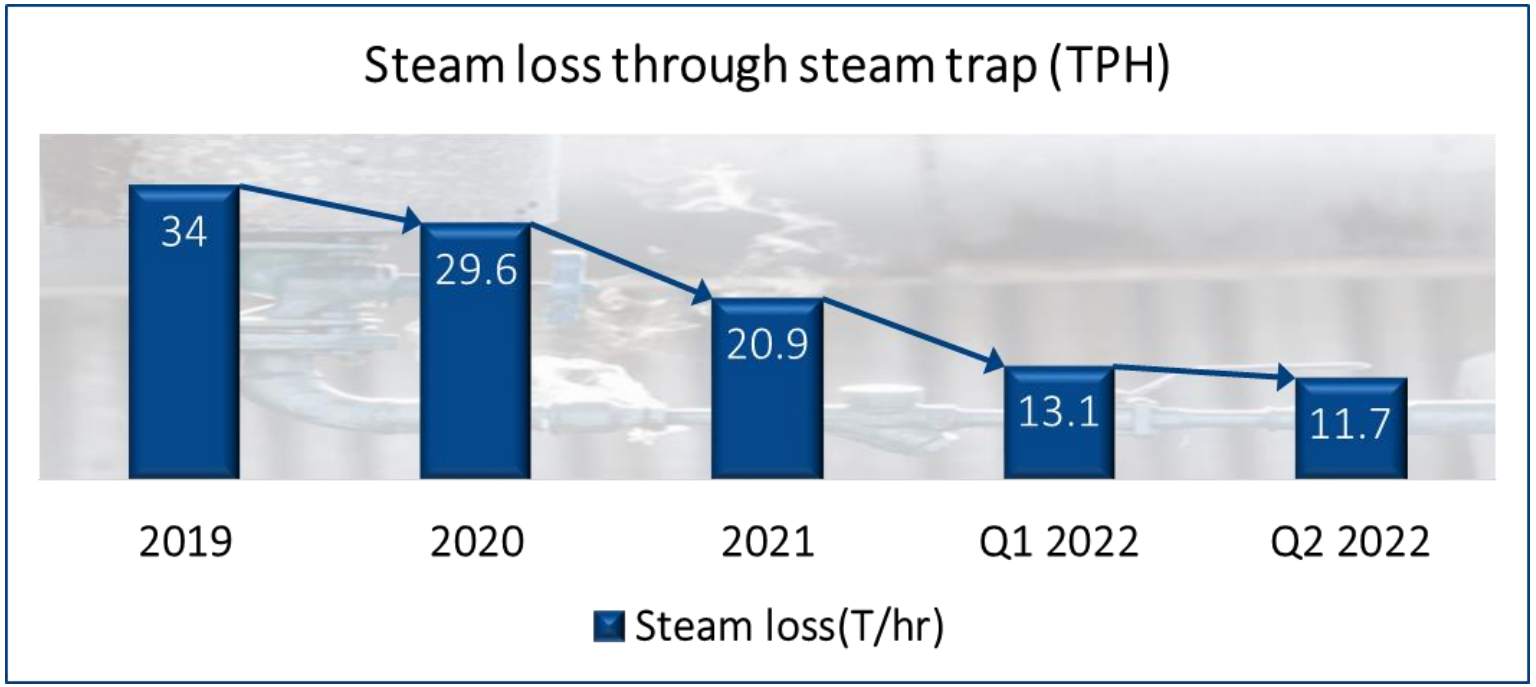
- Steam supply network system with ~ 14000 traps
- Steam loss due to faulty traps (Plugged/Passing) & Leakages

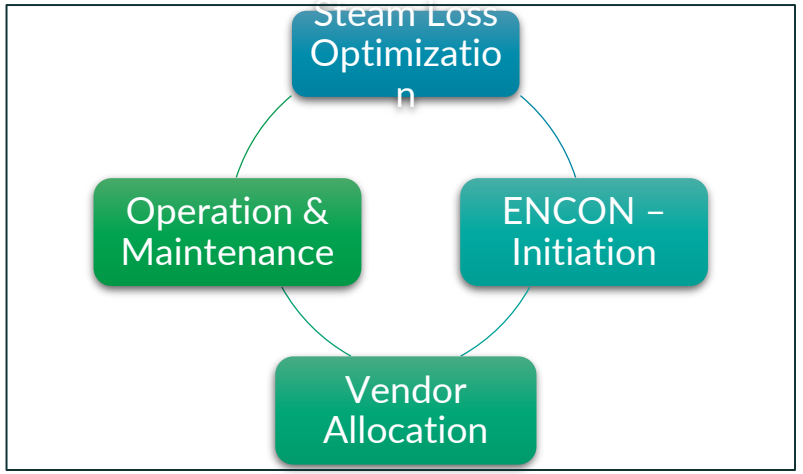
## ❑ Action Taken

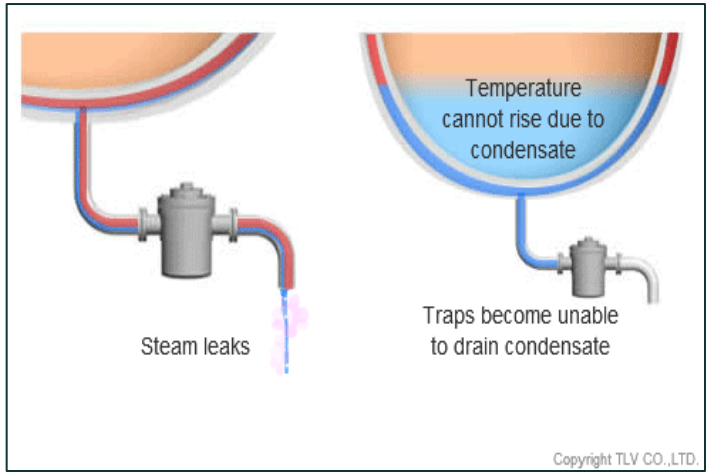
- Steam survey by Third Party
  - Monitoring all traps twice in a year
  - Identification of faulty traps
- Rectification by replacement of faulty traps

## ❑ Benefits, Investment & Payback

- Steam loss reduced by ~22 TPH
- Monetary Saving ~ ₹ 14 Cr.
- Investment: ₹ 5.5 Cr
  - Material Cost : 4 Cr / Service Cost : 1.5Cr.
- Payback: 0.39 years



# 7. Utilization of Renewable Energy Source – Solar

**Future Plan for Solar:**

- 10 MW installation capacity – Tender Evaluation under progress and expected project completion by next year
- 80 MW installation site allocation has been finalized
- Small scale Solar project study completed as tabulated below;

| S. No | System & Location | Capacity KWh | Usable area ( Sq.) | Cost (INR Crores) |
|---|---|---|---|---|
| 1 | Rooftop Solar on MRSS Substation | 216 | 2000 | 0.94 |
| 2 | Rooftop Solar on Nayara Hub | 140 | 2000 | 0.69 |
| 3 | Rooftop Solar on Substation-15 | 117 | 1021 | 0.56 |
| 4 | Rooftop Solar on Non-hazardous Scrap Store/Shed | 940 | 8000 | 4.45 |
| 5 | Rooftop Solar on Hazardous Scrap Store/Shed | 242 | 1760 | 1.03 |
| 6 | Floating Solar on Narmada Reservoir | 1585 | 56000 | 9.88 |
| | **Total** | **3240** | | **17.55** |

**Greening Power:**

- Solar photovoltaic cell in security watch tower in remote location.
- Solar Operated Traffic Flasher Lights installed near Refinery Main gate & Township gate.
- Solar Heater provided at Oil Club

Boundary Security watch towers provided with Solar Panel for lighting of Tower

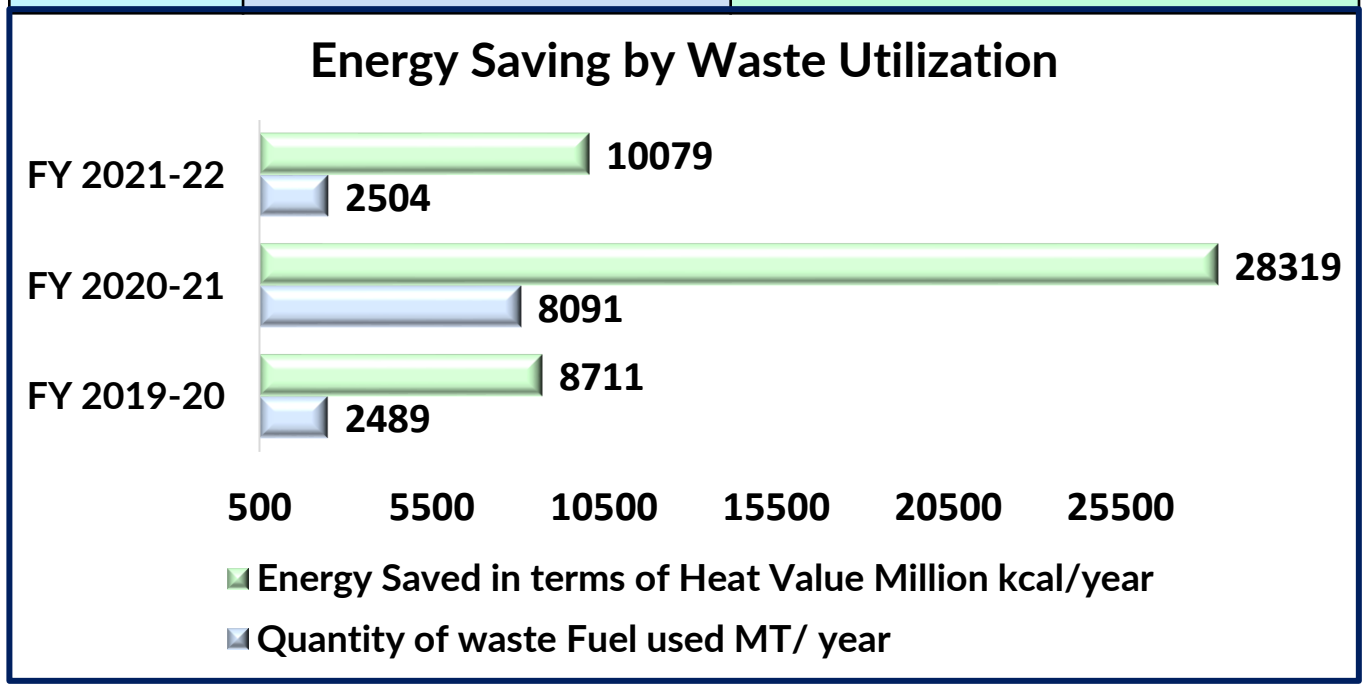
# 8.Utilization of Waste Material as Fuel

Oily Sludge reprocessing at Delayed Coker Unit

Reusing 100% Spent Carbon in Captive Power Plant Boilers

Co-processing of Oily Sludge, Oily Cotton Rags, Spent Resin and Heater Deposits at Cement Industry as Alternate Fuel

| Oil Sludge | | |
|---|---|---|
| Year | Quantity of waste Fuel used | Energy Saved in terms of Heat Value |
| | MT/ year | Million kcal/year |
| FY 2019-20 | 2489 | 8711 |
| FY 2020-21 | 8091 | 28319 |
| FY 2021-22 | 2504 | 10079 |



# 10. Green Belt at NAYARA

| Area Name | Maintenance Area :Acre | Area :Sq. m | Plants nos. |
|---|---|---|---|
| Fruit orchards at Refinery inside area | 379 | 1533760 | 74,190 |
| Orchards plants - Petrochemical | 82.0 | 331843 | 15,217 |
| Forest Species Greenbelt | 245.3 | 992614 | 1,65,482 |
| Avenue area at Refinery | 96.7 | 391327 | 68,710 |
| Landscape area at Refinery | 76.5 | 309539 | |
| Landscape area at NNT and Meera | 31.2 | 126308 | |
| Avenue area at NNT and Meera | 10.8 | 43640 | 4,369 |
| Total | 921.5 | 3729030 | 3,27,968 |

# 10 a.Resource Conservation Measures- Within Nayara Premises

| Year | NO.OF TRESS PLANTED | ACRE OF LAND PLANTED |
|---|---|---|
| FY2019-20 | 9097 | 8 |
| FY2020-21 | 1663 | 5.15 |
| FY 2021-22 | 2126 | 2.52 |

## Caring of pet Animals and birds

Aesthetic purpose

## Annual Horticulture show

## Vertical Garden at Refinery

# 10 b. Water Conservation Measures- Within Nayara Premises

## Save water !

- ✓ Six reservoirs / ponds have been created within refinery
- ✓ Total capacity of these ponds is **6,25,000 m3**.
- ✓ Three rain water harvesting pond in COT area of total capacity **3, 60, 000 m3.**
- ✓ Fire water reservoir of **84,000 m3** capacity

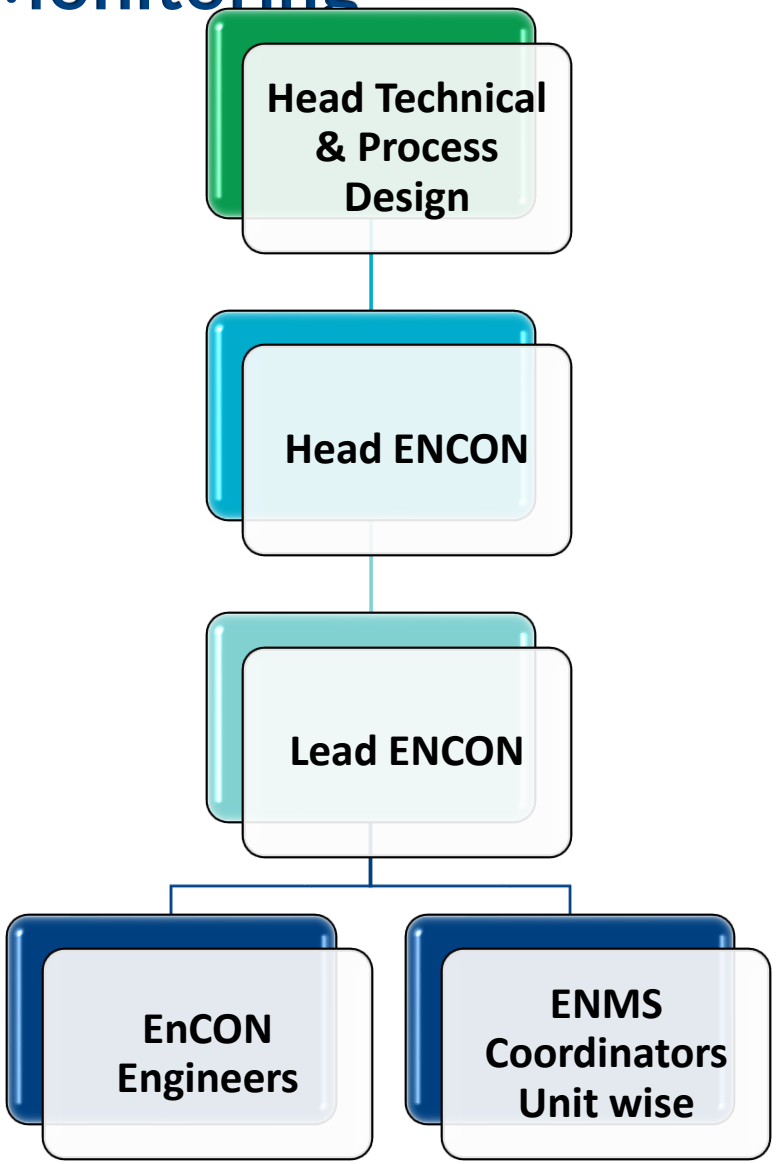
Ground water recharge well

Rain water Pond Near COT area

Rain water Pond Near sea water return

Rain water Pond Near Pet coke area

# 11. Team work, Employee Involvement & Energy Monitoring




## Daily monitoring system

- Daily energy performance report.
- Performance tracking of Energy intensive equipment.
- Online information through dash-board application.

## Review meeting chaired by Director and Head of Refinery

- Monthly performance review meeting (MPR )
- Quarterly Management Review Meeting (MRM)

## Employee Involvement:

- Energy Management System (ENMS Co-ordinators in each Units).
- On line portal for submission of improvement ideas.
- Training and encouragement programmes .

## Energy Saving Campaign:

- A total of 626 employees participated in Online Energy quiz
- Energy Slogan Competition -280 number of slogans received
  - English (140), Hindi (85) and Gujarati (55) .
- "Inter Unit Energy Optimization Competition" - continuous operational excellence in energy and promote a healthy competition amongst different Units for enhanced energy efficiency.

## Energy efficiency / awareness training program

- Quarterly ENMS 50001:2018 training.
- Unit wise Brain storming sessions.

# 12. Implementation of ISO 50001:2018-EnMS

DNV·GL

Nayara Energy Limited
P B no. 24, Head Post Office, Khambhalia,
Dist. Devbhumi, Dwarka - 361305, Gujarat

2020-05-27

**Subject: COVID-19 – Postponement of the recertification audit**
**Management System Certification according to ISO 50001:2011 standard**

Dear Customer,

As part of the COVID-19 contingency and with the aim of ensuring the safety of employees/collaborators for the benefit of the entire community of customers and stakeholders and at the same time the continuity of activities, DNV GL is committed to address the critical issues in carrying out certification verification activities, in accordance with the general and specific accreditation requirements.

For these reasons and as agreed by the Operation and Technical functions of DNV GL (with reference to the general requirements based on IAF ID 3 "Information document for the management of extraordinary events or circumstances affecting ABs, CABs and certified organizations" (chapter 4.1)), we inform you that your recertification audit will be carried out or completed within 6 months of the expiration of the current certificate no. **150918-2014-AE-IND-RvA**. The validity of the aforementioned certificate is considered extended for a maximum period of 6 months and will be renewed, as usual, upon the positive outcome of the technical audit review and certificaton decision by DNV GL management.

Thanks for the collaboration, we remain available for any further clarification.

Sincerely,
For DNV GL Business Assurance India Pvt. Ltd.

Sivadasan Madiyath
Technical Manager
India Subcontinent

- First certified in 2014 – ISO 50001:2011
- Recertified in 2017
- Migrated to ISO 50001:2018 in 2020

DNV·GL

MANAGEMENT SYSTEM CERTIFICATE

Certificate No: 10000361318-MSC-RvA-IND
Initial certification date: 16 May 2014
Valid: 16 May 2020 - 16 May 2023

This is to certify that the management system of

**Nayara Energy Limited**
P B no. 24, Head Post, Office Khambhalia, Dist., Devbhumi, Dwarka - 361 305, Gujarat, India

has been found to conform to the Energy Management System standard:
**ISO 50001:2018**

This certificate is valid for the following scope:
**Production and Supply of Petroleum Products including Captive Power Generation and Marine Operations**

Place and date:
**Barendrecht, 30 November 2020**

MGMT. SYS. RvA C 024

For the issuing office:
**DNV GL - Business Assurance**
**Zwolseweg 1, 2994 LB Barendrecht, Netherlands**

**Erie Koek**
Management Representative

Lack of fulfilment of conditions as set out in the Certification Agreement may render this Certificate invalid.
ACCREDITED UNIT: DNV GL Business Assurance B.V., Zwolseweg 1, 2994 LB, Barendrecht, Netherlands. TEL: +31(0)102922689.
www.dnvgl.com/assurance

# 13.Learning from CII Award 2021

**Spark from CII award presentation**

- Present Mode :-
  - MP Steam condensate routed to Atmospheric Flash vessel

- Proposed Mode
  - Major MPS condensate identified and it will be routed to LP flash vessel to generate LP steam.

# 14.Awards Received

| S.NO | Award Description | Organized By | Received On |
|---|---|---|---|
| 1 | Nayara Energy Limited, Vadinar has received prestigious award “Excellent Energy Efficient Unit” for the best performance in 2020-21 at National Energy Efficiency Summit held by CII Hyderabad Through WebEx. | Confederation of Indian Industry (CII) | 27th Aug 2021 |
| 2 | Winner trophy in 21st Annual Genentech Environment Award 2021” from Genentech foundation For Outstanding Achievement in Environment protection | M/s Genentech Foundation | 26th Nov 2021 |


# 15 .CSR - Reach and Impact

| Focus Area | Reach and Impact |
|---|---|
| **Health and Sanitation** | ❖ More than 60,000 patients provided with outpatient consultations annually.<br>❖ 1575 nutrition kits provided to 798 TB patients across Devbhumi Dwarka<br>❖ 500 handwashing stations set up across aanganwaadis, schools, and health centres of Devbhumi Dwarka<br>❖ 2 Child Malnourishment & Treatment Centres (CMTCs) operationalized.<br>❖ 2 Poshan Raths operationalized, reaching out to more than 1200 nos. of children via treatment and screening.<br>❖ 2 centres under Bal Poshan operationalized, leading to timely treatment of 67 nos, of SAM children.<br>❖ More than 2100 children counselled through home visits under Project Tushti<br>❖ More than 3000 beneficiaries touched via multiple initiatives in Poshan Maah (National Nutrition Month) |
| **Covid 19 Response** | ❖ 3 nos. of oxygen plants installed at 3 different hospitals in Gujarat -<br>❖ 280 LPM/833 LPM/500 LPM oxygen generation plant at GG Hospital & Military Hospital, Jamnagar , Deendayal Upadhyay Hospital, Rajkot<br>❖ Medical consumables provided to GG Hospital, Jamnagar<br>❖ Set up of 100 bed Covid care centre in two phases of 50 beds each at Jakhar village. |
| **Education and Skill Development** | ❖ More than 100 students across 15 villages connected to secondary education via the NIOS programme.<br>❖ 5000 FSMs provided with first responders training on road safety.<br>❖ Career development sessions held with more than 600 students under Project EXCEL.<br>❖ Aspiration mapping and introduction to 21$^{st}$ century skills carried out with more than 800 youths.<br>❖ 1000 unorganized sector workers linked to E-shram government scheme.<br>❖ 1500 households reached out to, via multiple awareness sessions. |
| **Sustainable Livelihood & Environment Sustainability** | ❖ 3800 households reached out in Khambhaliya through Baseline study<br>❖ 23 tonnes of plastic, and 139 tonnes of dry waste diverted from landfill.<br>❖ More than 400 safaai saathis trained on waste handling and communication.<br>❖ More than 18000 households and 2000 shopkeepers sensitized through the programme<br>❖ Close to 2000 students reached out to, via awareness sessions and school engagement programmes |

# 15a.CSR activity Glimpses

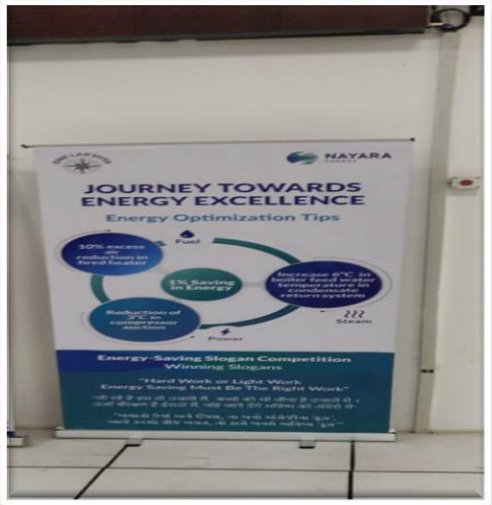


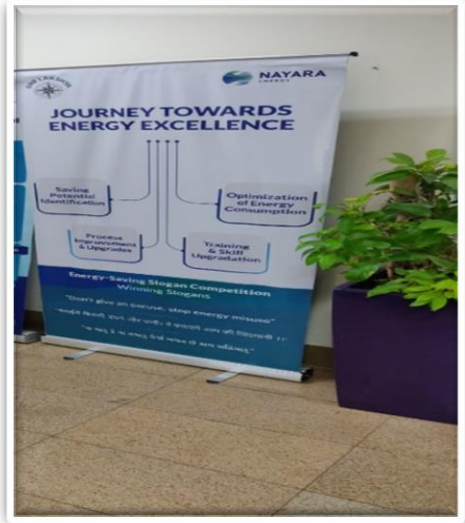


# 16.Best Practices Implemented on Energy Front

- ✓ **Top Management** commitment and consistent achievement in **ENCON,** Safety, Reliability & Plant Performance
- ✓ Well defined methodology and **daily follow up on ENCON, F&L reduction**
- ✓ **CEO and Director monthly performance review** meetings
- ✓ **"Idea Generation Challenge"** to encourage Employees for Identifying Energy saving Ideas and rewards
- ✓ Implementation of **ENCON schemes on priority**.
- ✓ **Unit Flare Flow meters** provided for monitoring of flare loss and periodic PSV checking
- ✓ Proven Online System for **Management of Change** (MOC)
- ✓ **Adopted best Turn Around Management** system
- ✓ **Monthly Safety time out** attended by senior executives covering all plant areas
- ✓ Integrated Refinery Management System.
- ✓ Online Training Simulators **(OTS)** for all Units .
- ✓ Refinery Performance Monitoring System **(RPMS**) for real time monitoring and immediate actions.
- ✓ Advance Process Control **(APC)** for real time process optimization





# THANK YOU


**J. Rajesh**
Vice President - Technical Services,
(M) +91 9099067842
Rajesh.Jagannathan@nayaraenergy.com

**Nitinkumar Chokshi**
General Manager
Lead EnCON
(M) +91 9925238879
Nitinkumar.Chokshi@nayaraenergy.com

**Mohamed Uwais**
Deputy Manager EnCON
(M) +91 9726419935
Mohamad.Uwais@nayaraenergy.com