INOX GFL GROUP
BEYOND INFINITY

GFL®
GUJARAT FLUOROCHEMICALS
VALUE THROUGH GREEN CHEMISTRY

Secure. Sustainable. Green

CII National Award for Excellence in Energy Management

1. Sh. Nitin Chaudhary : AGM (TS)
2. Sh. Hardik Barot : Manager (Power Plant)
3. Sh. Jagdish Bharvad : DGM (Production)

GFCL Products Limited ev | SOLAR & GREEN HYDROGEN GFCL PRODUCTS LIMITED | INOXWIND Greening INDIA | INOXGreen ENERGY SERVICES LIMITED

ABOUT

- Headquartered in Noida, India, Gujarat Fluorochemicals Limited (GFL) is an Indian Chemicals Company with over 30 years of expertise in Fluorine Chemistry
- An ISO 9001:2015, ISO 14001:2015 and ISO 45001:2018 certified organisation
- Established player in Fluoropolymers, Fluorospecialities, Refrigerants and Chemicals
- 1989 - commencement of Company's first commercial operations with India's largest Refrigerant manufacturing unit at Ranjitnagar, Gujarat, India
- 2007- started operations at Dahej, Gujarat, India - manufacturing facility for Fluoropolymers
- Vertically integrated Operations - from natural minerals to Fluoropolymers
- Three manufacturing facilities in India, Fluorspar mine in Morocco, offices and warehouses in Europe and USA
- Accredited by CRISIL, India's largest rating agency - AA (stable) rating for long term credit and A1+ rating for short term credit

1. Product Portfolio

FLUOROPOLYMERS

- PTFE
- PFA
- FEP
- FKM
- PVDF
- ADDITIVES

FLUOROSPECIALITY

- HF BASED
- TFE BASED
- KF BASED
- CHLOROFORM

REFRIGERANTS

- R22
- R125

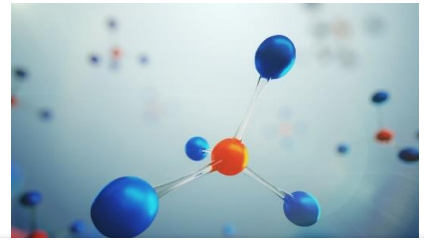
CHEMICALS

- CAUSTIC SODA
- CARBON TETRACHLORIDE
- CHLORINE
- METHYLENE DI CHLORIDE
- HYDROCHLORIC ACID
- HYDROGEN GAS

FLUOROPOLYMERS

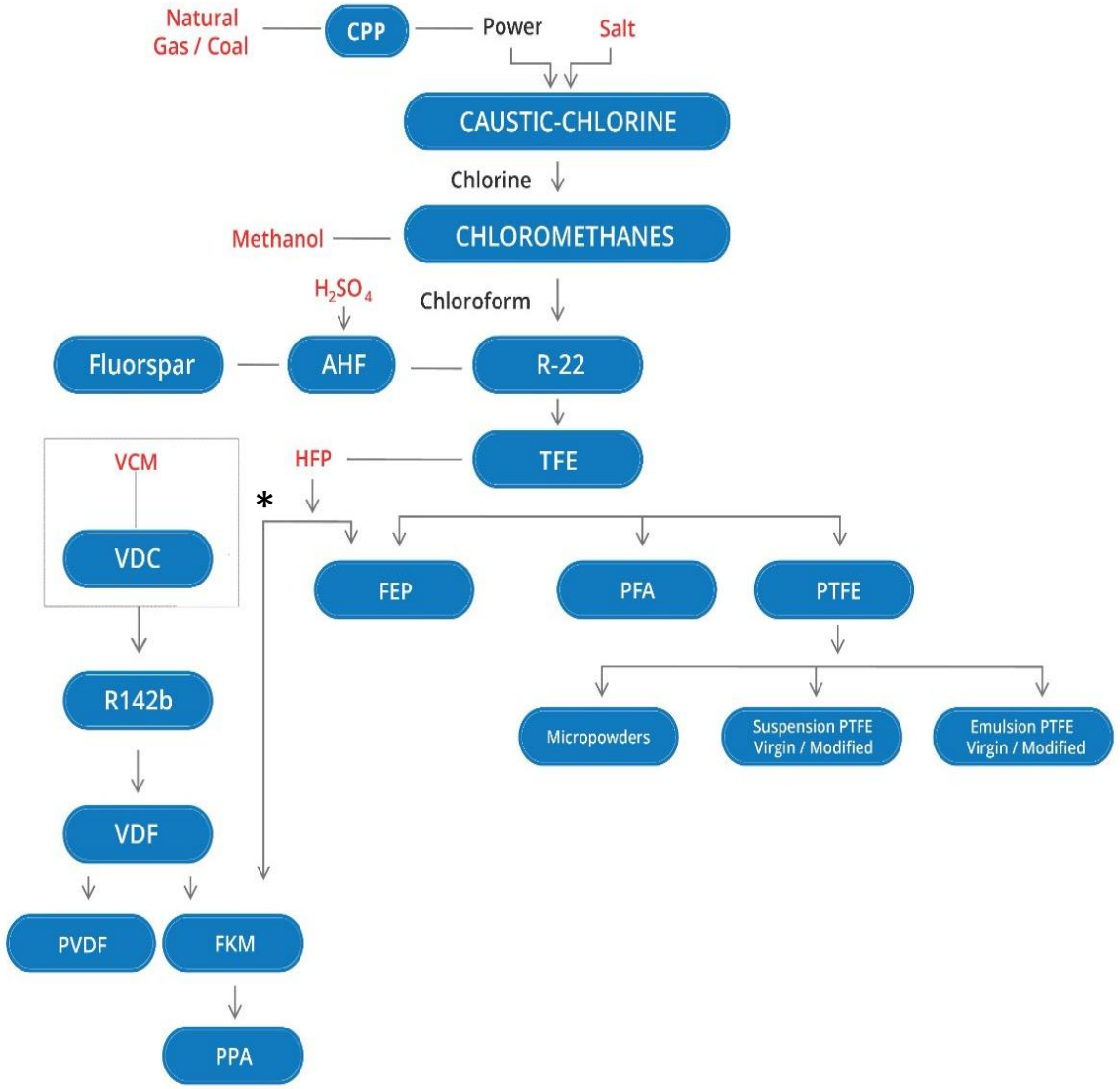
FLUOROSPECIALITIES

REFRIGERANTS



CHEMICALS

Manufacturing Process



* *Proposed*

GFL is a major manufacturer of PTFE and other TFE and VDF based polymers (namely PVDF, FKM, FEP, PFA, PVDF etc)

The process starts with manufacturing of Chlorine in Chloroalkali plant, which reacts with Methanol in Chloromethane plant to generate Chloroform.

In AHF plant, Fluorspar is reacted with Sulphuric Acid and Oleum to generate Hydrogen Fluoride.

Hydrogen Fluoride reacts with Chloroform to generate R-22.

R-22 is cracked under high temperature to form TFE, which is the base monomer for further Polymerization processes.

Also, R-142b is cracked under high temperature to form VDF, which is also a monomer for our Polymerization processes.

Monomers at different compositions reacts in the Polymerization Reactors to generate different grades of Polymers

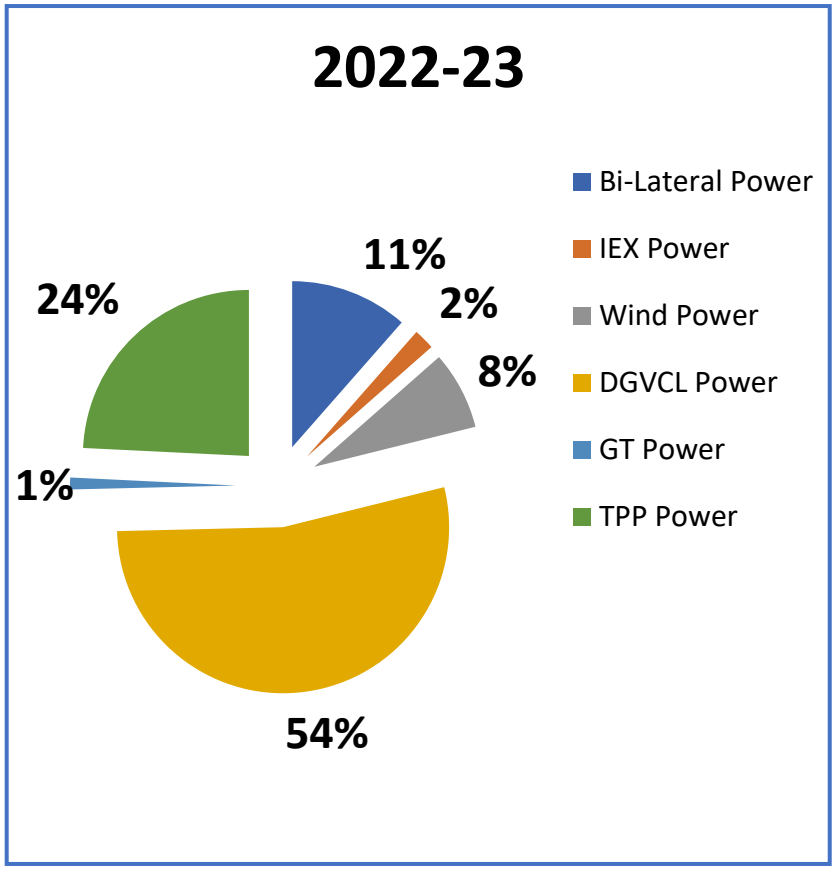
Our one of the product PVDF, is being used for renewable energy through solar panel film as well as in Lithium battery for EV segment.

2. Power / Steam Generating Installations with capacity

- **STG-1** — 18 MW Condensing Turbine (Siemens Make)
- **STG-2** — 8 MW Back Pressure Turbine (Siemens Make)
- **STG-3&4** — 4.5 MW Each (Condensing Turbine, Triveni Make)
- **STG-5** — 3.95 MW Back Pressure Turbine (Siemens Make)
- **GT-1** — 5.5 MW Gas Pressure Turbine (Solar Turbine Make)
- **GT-4&5** — 13.5 MW Each Gas Pressure Turbine (Solar Turbine Make)

71.45 MW

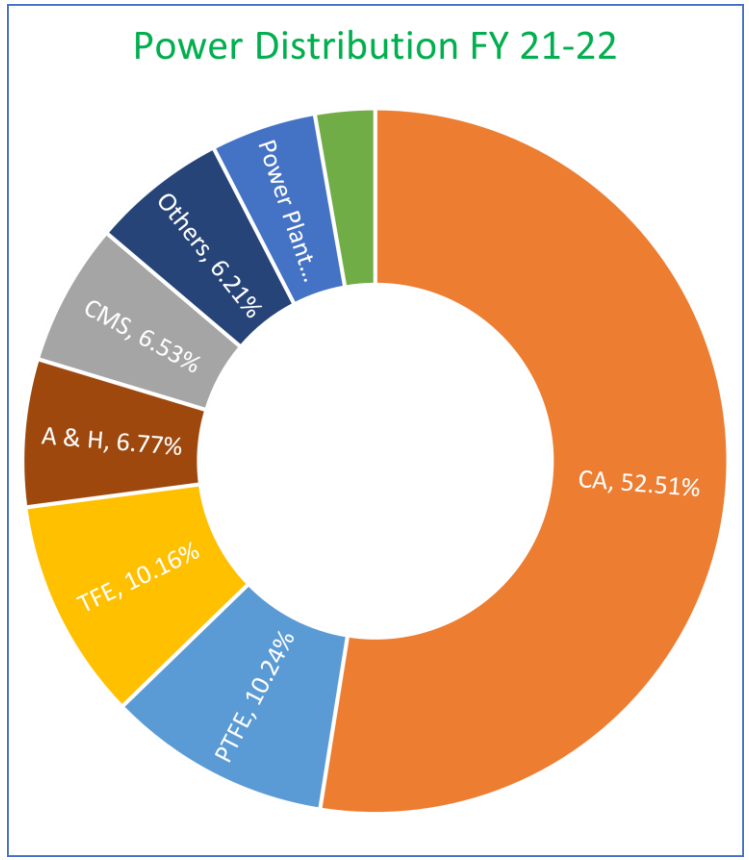
Power Mix

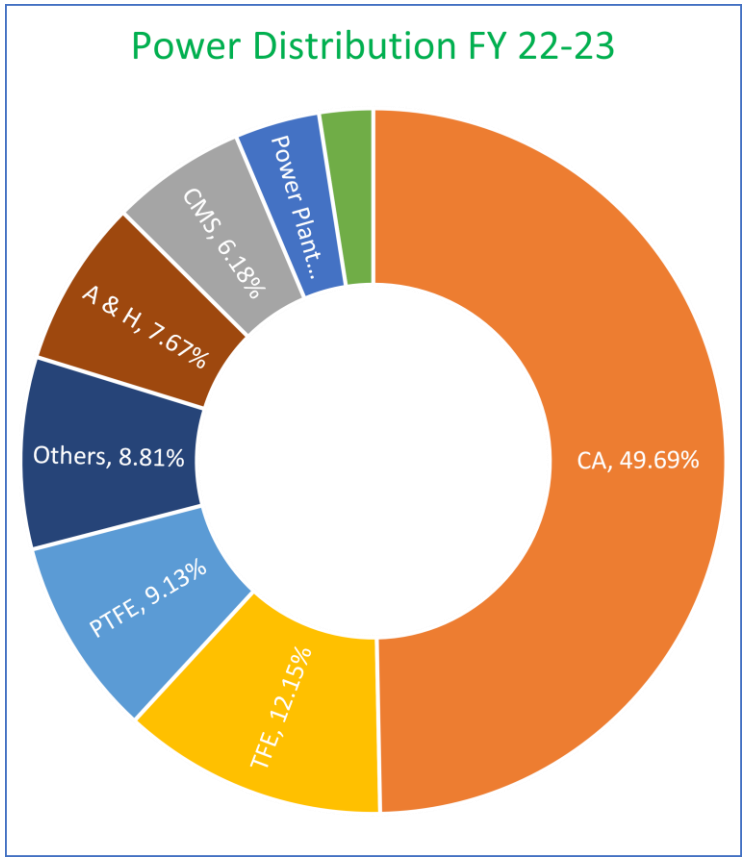


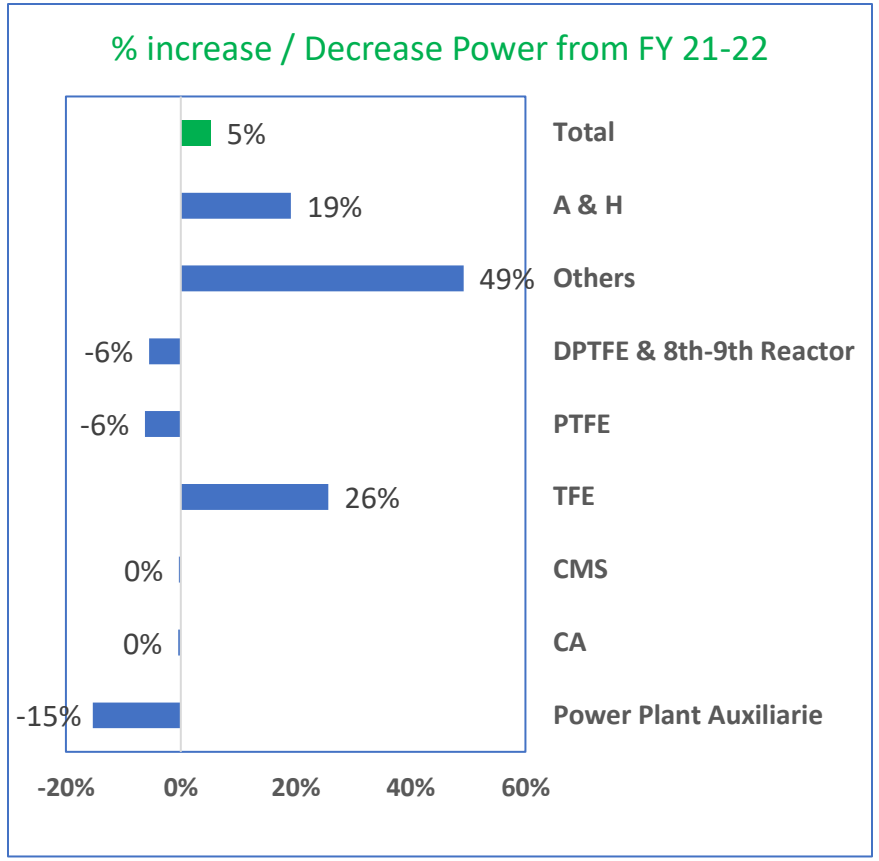
- 2 X 100 TPH AFBC Boilers (ISGEC Make)
- 2 X 20 TPH HRSG Boilers (ME Make), Associated with GT-4 & GT-5
- 1 X 10 TPH H2 Boiler (Chinese Make)

Total Complex Demand : 80 MW
25% : Self Power Generation
75% : Import + IEX + Wind Power

Power Distribution across complex



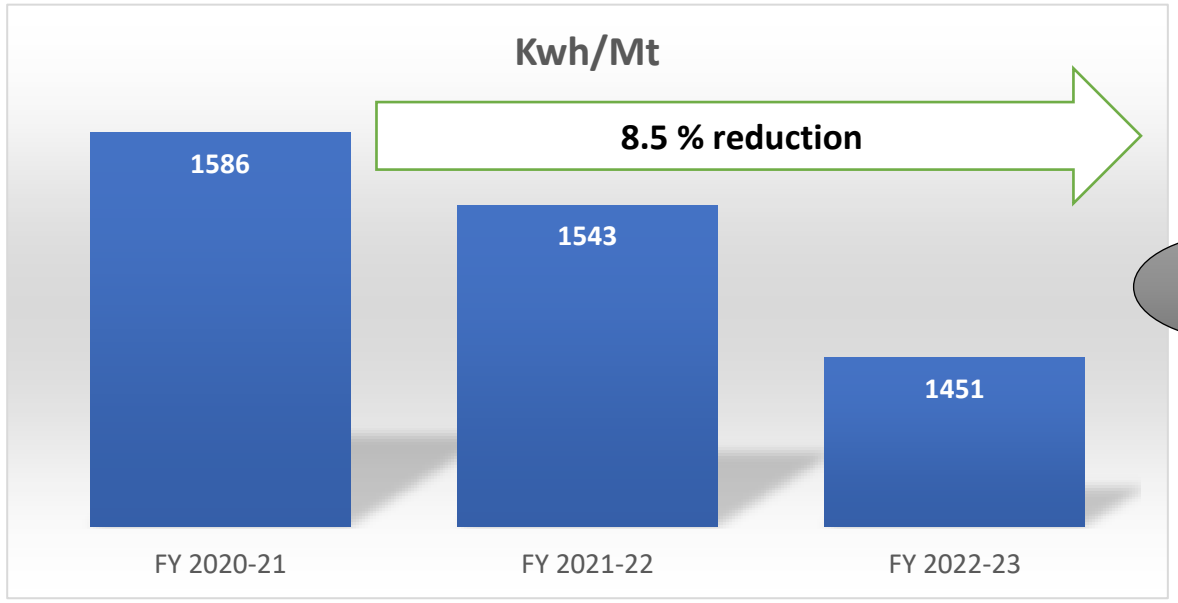




3. Specific Energy Consumption in last 3 years (FY 20-21 to FY 22-23)

Electrical Energy

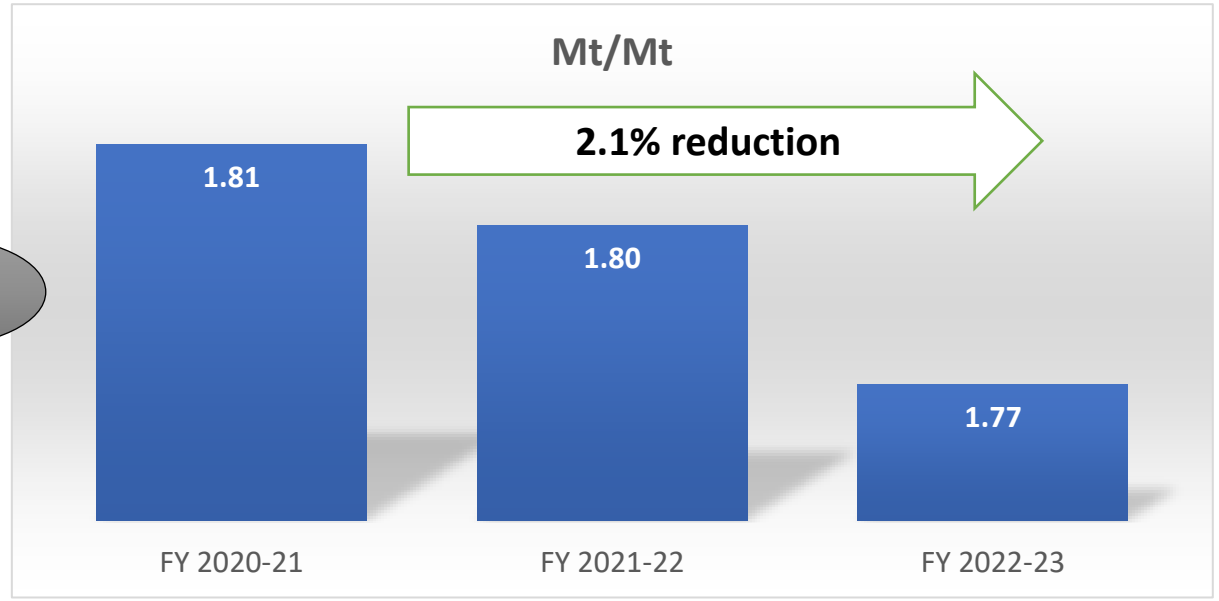
Items	FY 2020-21	FY 2021-22	FY 2022-23
Overall Energy Cons (Kwh)	616175781	664181317	698405079
Total Prod (Mt)	388466	430490	481276
Kwh/Mt	1586	1543	1451



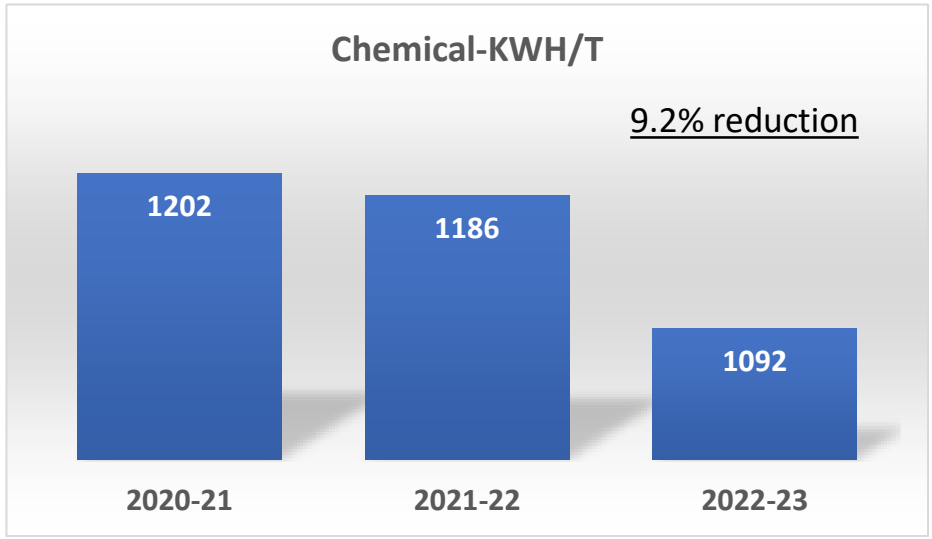
OVERALL

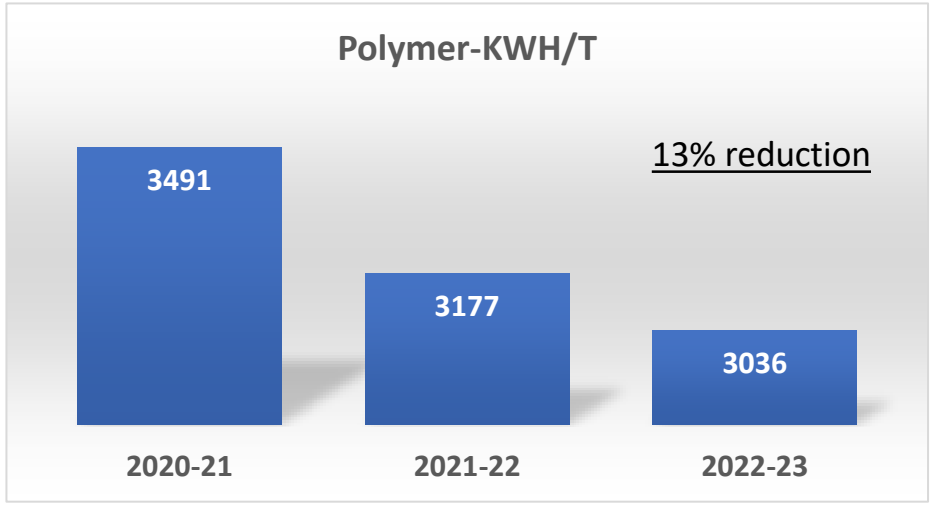
Thermal Energy

Items	FY 2020-21	FY 2021-22	FY 2022-23
Overall Energy Cons (Mt)	704704	775006	853427
Total Prod (Mt)	388466	430490	481276
Mt/Mt	1.81	1.80	1.77



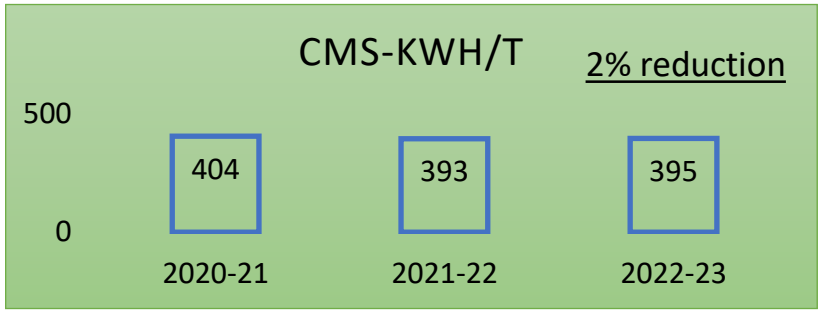
Specific Electrical Energy Consumption -Product Specific

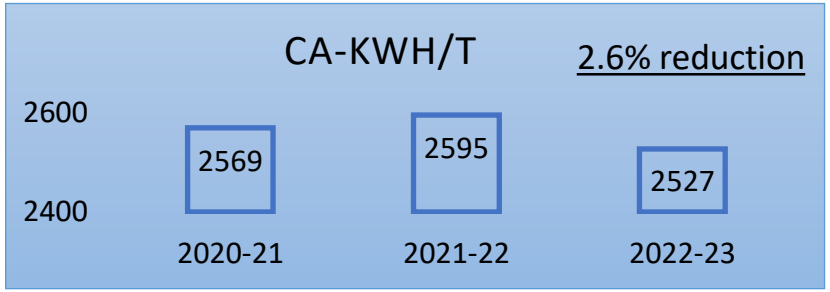


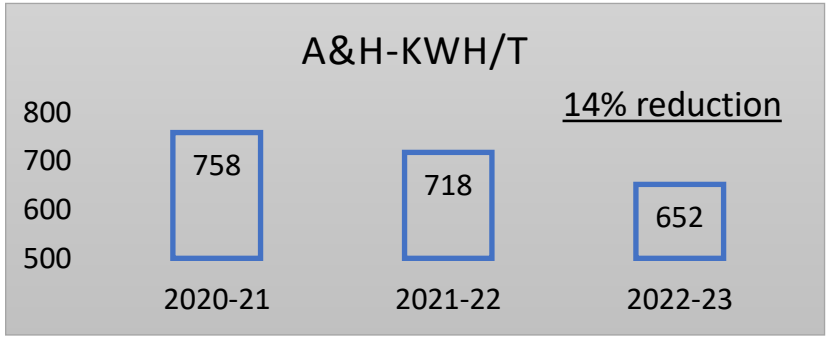


Through Various ENCON Projects

-Remembraning
-Ref system optimization
-Insulation losses optimization
-Heat recovery in Distillation section
-Improved Assets Utilization

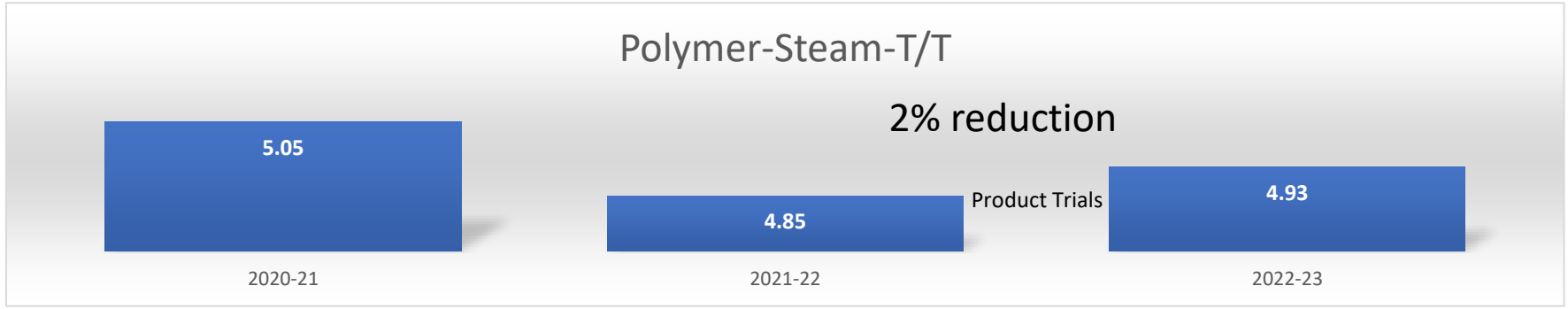


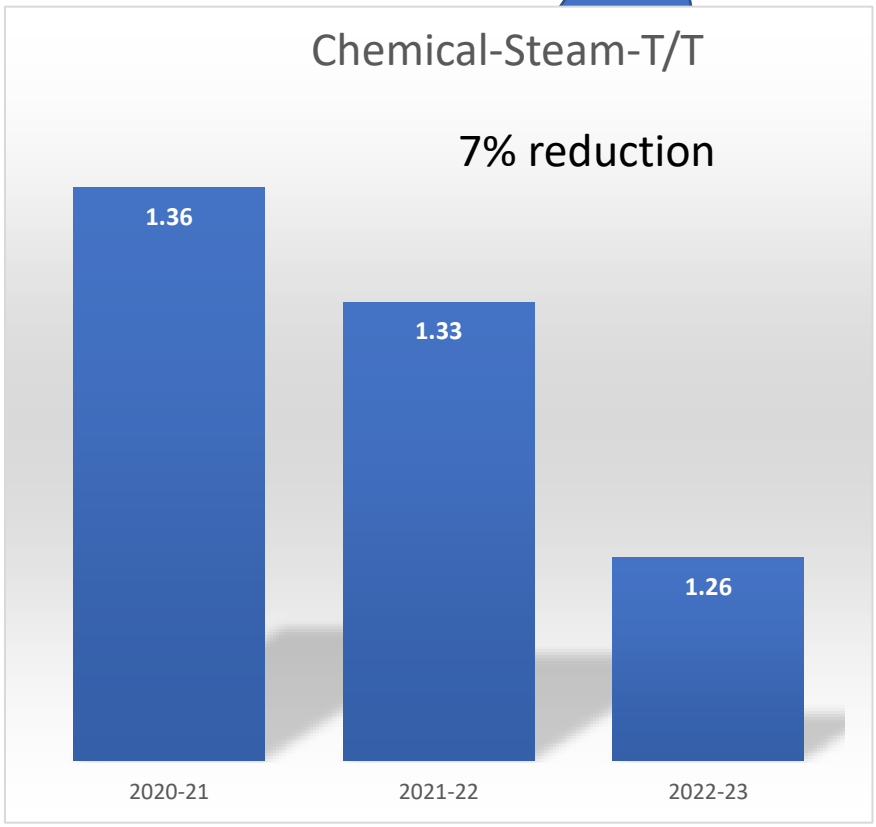


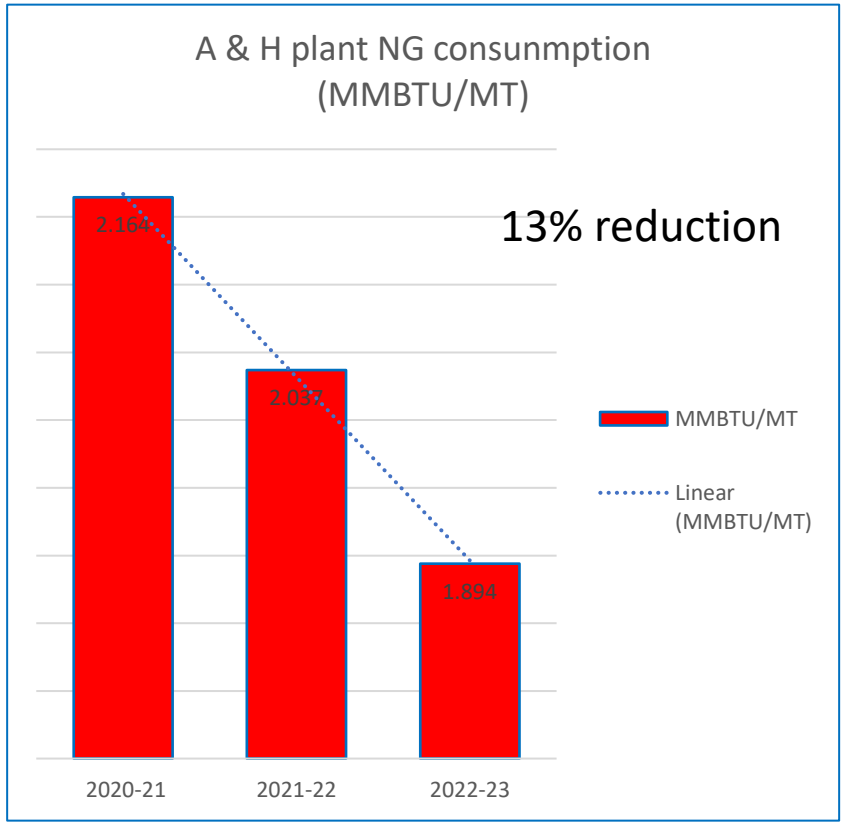


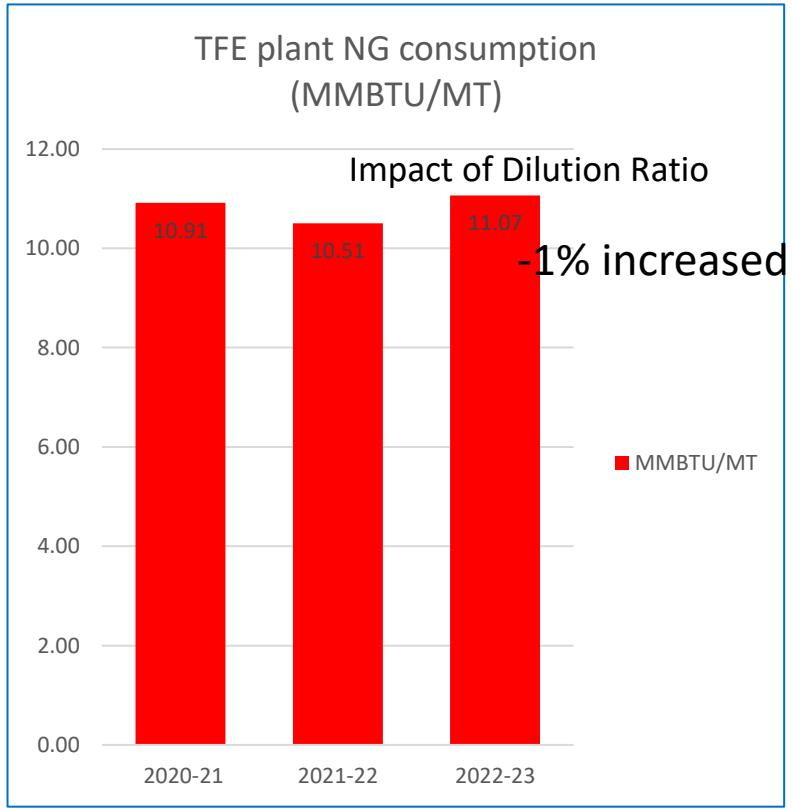
Specific Thermal Energy Consumption -Product Specific

Through various ENCON projects

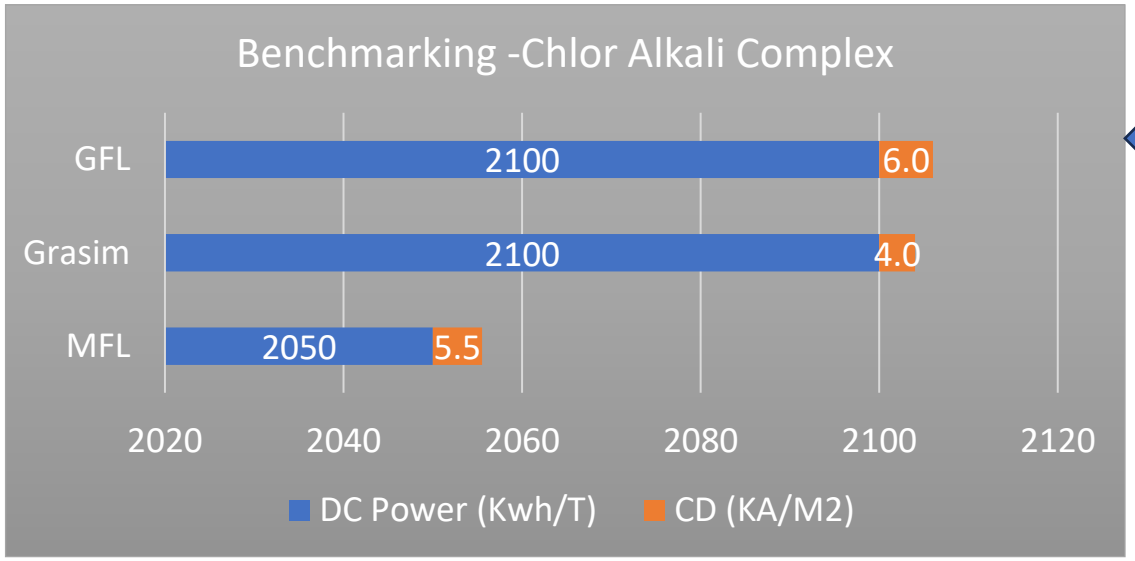








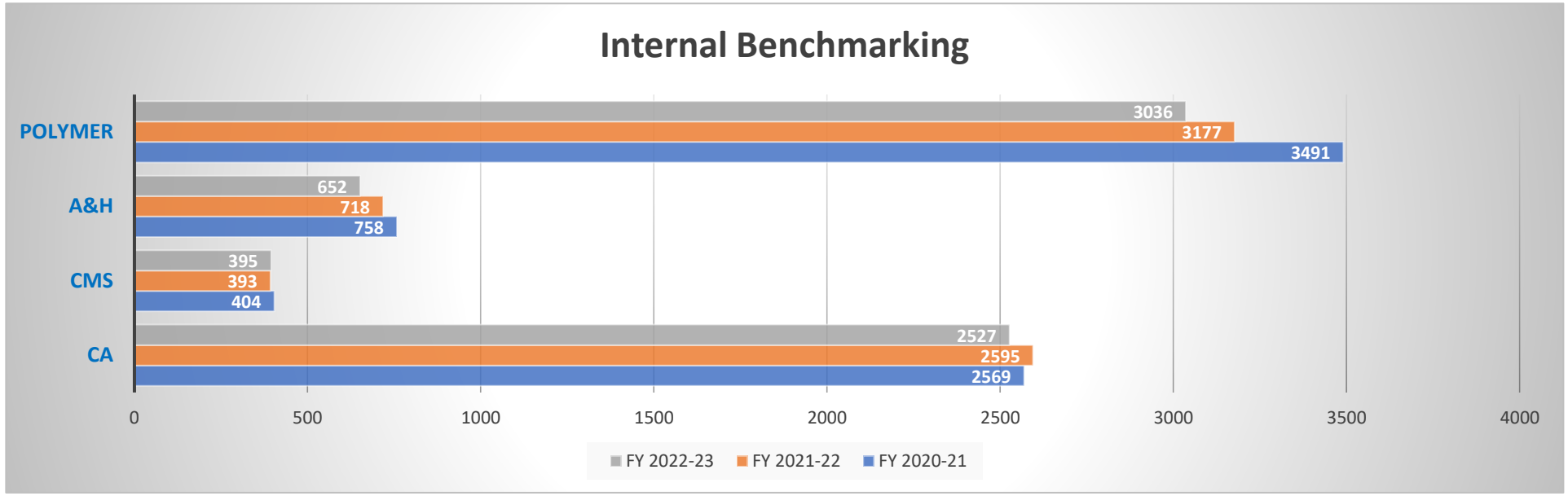
4. Information on Competitors , National & Global Benchmark



Chlor-Alkali Sector

- Benchmarking is difficult—
- A unique player in POLYMER & FLUOROPOLYMER
- Completely forward & backward integrated complex

Internal Benchmarking→



Roadmap – To Achieve Target –ENCON Projects Planned in FY 23-24

Steam condensate recovery to be improve from 71% to 80%
Energy Saving : 180 KLD
Investment : 0.2 Cr ,Saving : 0.5 Cr

Installation of 900TR chiller in place of 600 TR VAM
Investment : 5.19 Cr, Saving : 2.66 Cr

Installation of Zero Gap Membranes in Electrolyser
Power Saving :7.8 MKwh
Investment : 3 Cr , Saving : 2 Cr

1586 Kwh/Mt

1451 Kwh/Mt

FY 23-24

FY 20-21

FY 21-22

FY 22-23

1425 Kwh/Mt

1543 Kwh/Mt

1.8 % Reduction

De-staging of Boilers Feed Pumps
Investment : 0.13 Cr,
Expected Saving : 0.25 Cr

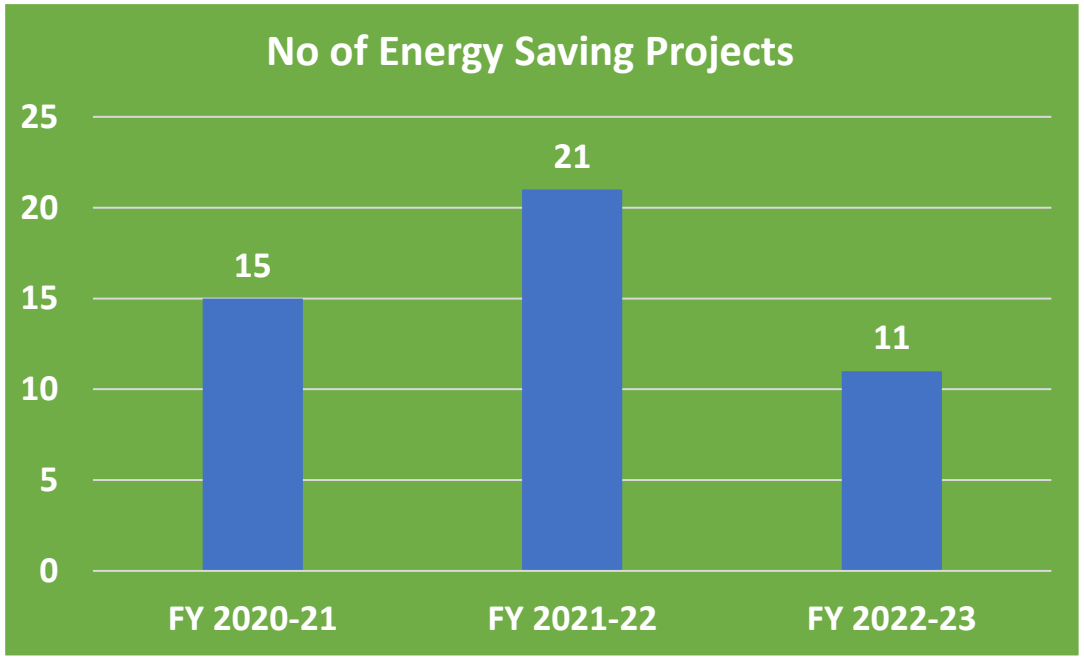
Installation 20 MVAR HT capacitor bank to improve overall Power Factor from 0.91 to 0.98 on 66kV grid .
Investment : 8 Cr , Saving : 3.2 Cr

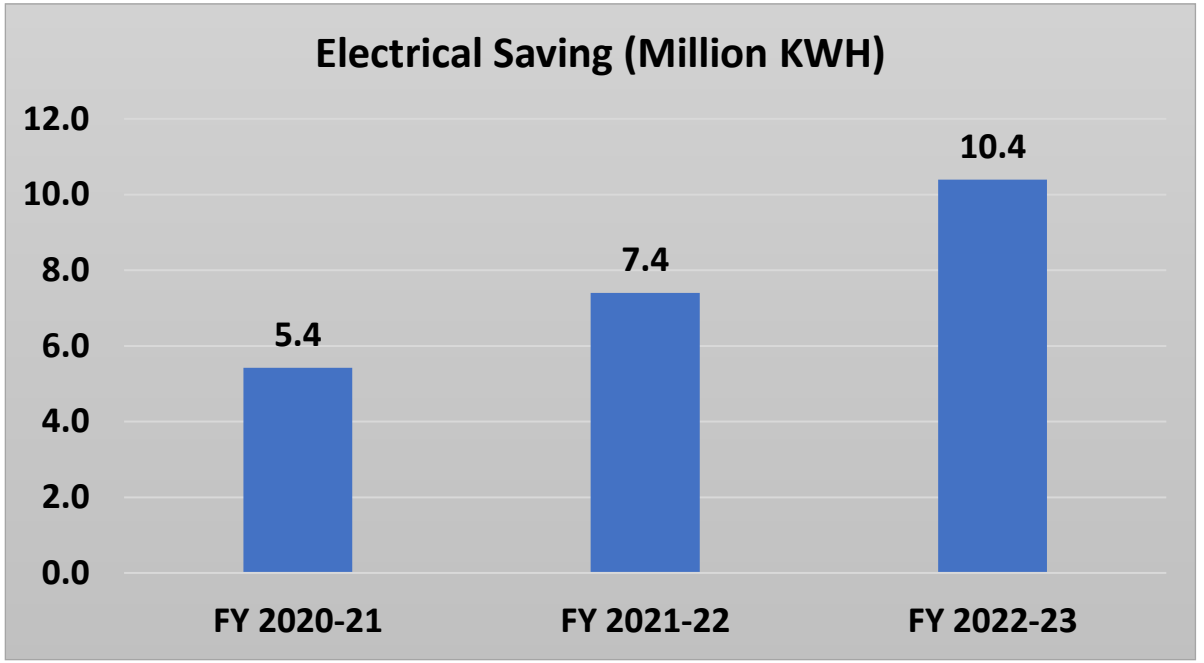
Ref System Losses Optimization
Power Saving : 6.5 MKwh
Investment : 0.6 Cr, Saving : 0.5 Cr

STG-1 Turbine Steam Path clearances optimization through Overhauling. Expected Saving - 2 Cr

5. Energy Saving Projects Implemented in Last 3 Years

Year	No of Energy Saving Projects	Investment (INR-Million)	Electrical Saving (Million KWH)	Thermal Saving (Million Kcal/MTOE)	Savings (INR-Million)	Impact on SEC (Thermal,Electrical)
FY 2020-21	15	60	5.4	44941	165	0.1%, 5%
FY 2021-22	21	40	7.4	-	59	0.2%, 2%
FY 2022-23	11	127	10.4	7767	211	5.5%, 1.7%





Initiatives Taken For Energy Conservation

Condensate Polishing Unit with High Temp Resin

- Steam consumption reduction by 0.5% in turbines
- Conservation of natural resources, Water & Coal
- Makeup water saving reduction by 1250 KLD
- Reduction in carbon footprints
- Investment :50 Lakh
- Benefit : 291 Lakh/An

Energy Efficient FRP Blades in all Cooling Towers

- Reduction in Power Consumption
- Investment :50 Lakh
- Benefit : 55 Lakh/Annum

Insulation Thickness Survey Across Complex of Refrigerant Lines

- Reduction in power consumption across polymer complex by 0.4%
- Reduction in carbon footprint
- Investment : 120 Lakh
- Benefit : 150 Lakh/Annum

Utilisation of Generated Flash Steam

- Reduction in steam consumption by 17% in DPTFE plant
- Reduction in carbon footprint
- Investment : 144 Lakh
- Benefit : 156 Lakh/Annum

Reduction in Coal Consumption in Boilers

- Conservation of natural resources
- Reduction in coal consumption by 0.5%
- Reduction in carbon footprint
- Benefit : 51 Lakh/Annum

Conversion of Electrolyser to Zero Gap at Chlor-Alkali Plant

- Power saving by approx 6.7 MW

There are many other energy conservation recommendations , identified during audit, are under regular review for timely implementation.

Energy Saving Projects implemented in last 3 years (FY 2022-23)

#	Year	Project	Investment (Million INR)	Electrical Saving (million KWH)	Thermal Saving (Million Kcal)	Total Saving (Million INR)	Payback (In Months)
01	2022-23	Re-membraning and replacement of anode & cathode mesh towards zero gap technology	127	7.3	0	62	25
02	2022-23	Boiler feed pump ARC (Automatic Recirculating Valve) overhauling / repairing work was carried out resulted saving in terms power as daily power consumption	5	0.3	0	2	25
03	2022-23	VFD enabled New Air compressor installation	7	0.2	0	1	63
04	2022-23	Usage of Chillers instead of VAM during CPP annual shutdown	0	0	3192	8	0
05	2022-23	Blowdown Tank Flash Steam recovery system has been taken in line through Deaerator-1	0	0	1890	5	0
06	2022-23	Distillation column operation optimization through Aspen simulation	1	1.2	0	11	1
07	2022-23	Utilization of reactor heat recovery and optimization of distillation operation.	0.2	0	5531	13	0
08	2022-23	TFE#1 Utility Section (-)35'C Evaporator tube cleaning work taken in SD_Sept22	6	0.8	0	7	11
09	2022-23	TFE#1 Utility Section (-)15'C Evaporator tube cleaning work taken in SD_Sept22	1.6	0.20	0	2	11
10	2022-23	Usage of Chillers instead of VAM during CPP annual shutdown	0	0	3192	8	0

Energy Saving Projects implemented in last 3 years (FY 2021-22)

#	Year	Project	Investment (Million INR)	Electrical Saving (million KWH)	Thermal Saving (Million Kcal)	Total Saving (Million INR)	Payback (In Months)
01	2021-22	Electrolyser E-Zero gap	55	2.85	0	24	27
02	2021-22	Utilities – TFE2: Installation & commissioning of efficient standby pump (-15) DegC . BEFORE: with P804A: Amp was = 160 amp. AFTER: with P804C: Amp = 140 amp. Savings = 20 amp.	1	0.10	0	1	14
03	2021-22	VDF & TFE2 Utilities: Refrigeration systems & associated pipelines cold insulation losses reduction of VDF and TFE2 plant & Utilities.	3	1.12	0	10	4
04	2021-22	TFE2 Utilities: Refrigeration systems COP – Coefficient Of Performance improvement through execution of various identified jobs apart from CT: Cooling Tower's refurbishment / design changeover from cross to counter / 1 cell addition to improve CT efficiency to max possible extent as executed at TFE1 Utilities during last FY.	7	1.32	0	11	8
05	2021-22	At TFE-1 Utilities: Stoppage of 1 No. (-5) DegC refrigeration compressor (Old : 3# was in ops, Now: 2# are in ops) through integration of (-15) compressor suction header with (-5) compressor suction header by laying down additional 4" R22 refrigerant pipeline.	4	0.99	0	8	6

Energy Saving Projects implemented in last 3 years (FY 2020-21)

#	Year	Project	Investment (Million INR)	Electrical Saving (million KWH)	Thermal Saving (Million Kcal)	Total Saving (Million INR)	Payback (In Months)
01	2020-21	Replacement of 25 Nos. of old identified FRP CT (Cooling Tower) fans by ENCON make high efficiency energy saving E-GLASS EPOXY FRP fans for CA, CMS, S&A and VDF Cooling Towers of respective Plants & Utilities	5	0.87	0	7	8
02	2020-21	Commissioning of 2 Nos. (-35) DegC & 1 No. (-15) DegC BRINE chilling plants at Polymer Complex with high quality Cold Insulation for Power Savings.	25	3	-	28	11
03	2020-21	Interconnection of refrigeration compressor's suction pipe line of (-15) DegC to (-5) DegC for power savings through maximum utilization of (-15) DegC refrigeration compressors energy.	6	1	-	7	11
04	2020-21	Utilization of generated flash steam based on forbes marshall energy audit at A & D-PTFE plant. i. e. D-PTFE plant's Specific Steam consumption reduction from earlier 22-23 MT/T to 15-16 MT/T	10	-	19551	47	3
05	2020-21	Reduction of Specific Steam consumption from 4.25 MT/MW to 4.23 MT/MW at STG-1 steam turbine, of power generation	1	-	1245	3	4

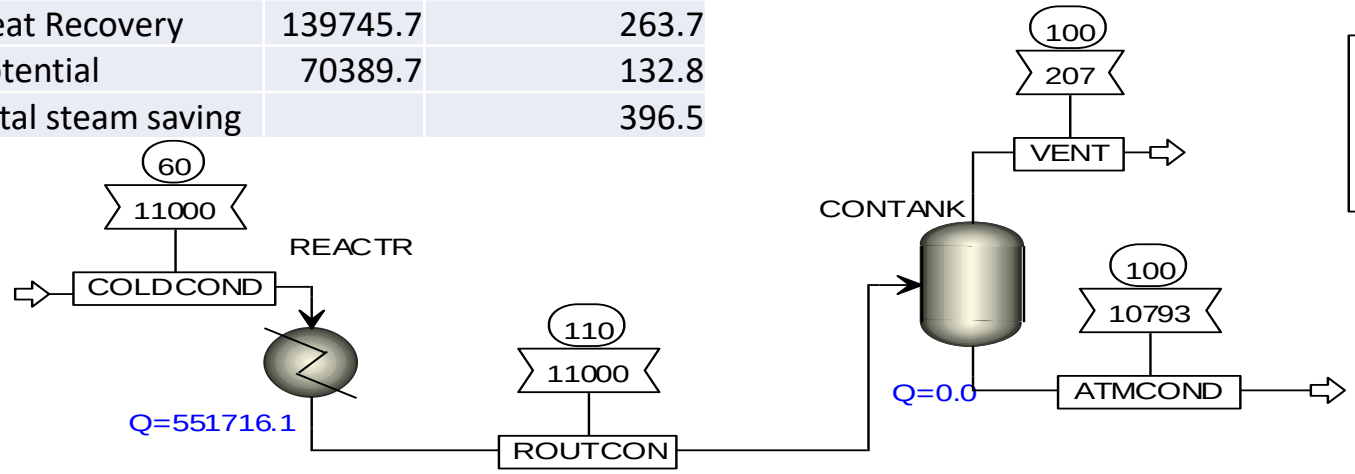
6.1 Heat Recovery from Reactor Condensate

Innovative

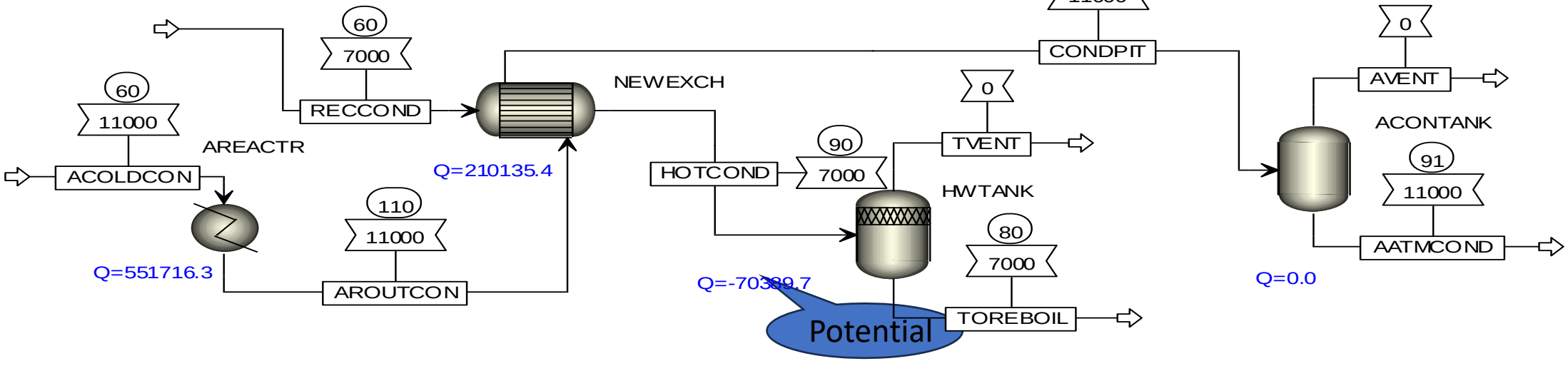
R-125 Reactor condensate heat which was getting unused would be used for heating the distillation column reboiler heating medium fluid. Simulation study of the same which was done is displayed below.

	kcal/hr	Eq. Steam kg/hr
Heat Recovery	139745.7	263.7
Potential	70389.7	132.8
Total steam saving		396.5

Before



After

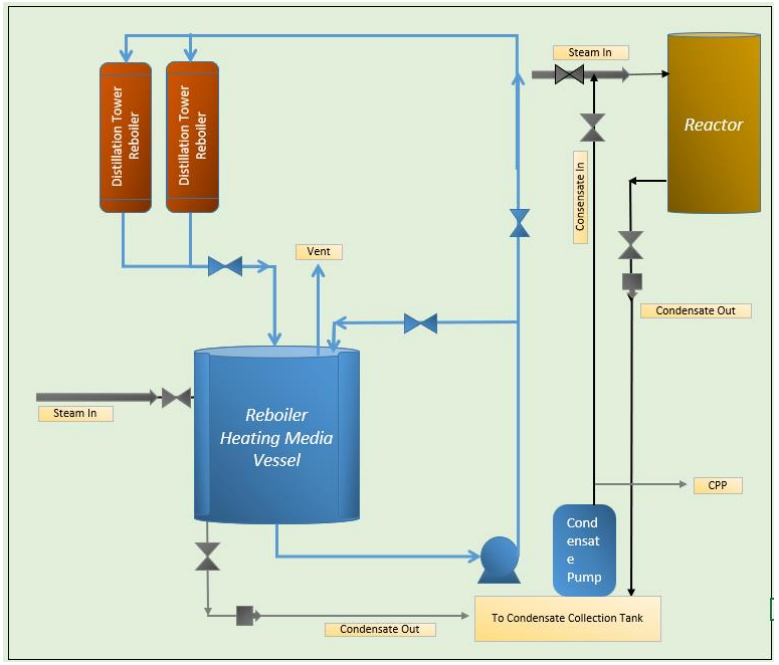


Heat Recovery from Reactor Steam Condensate

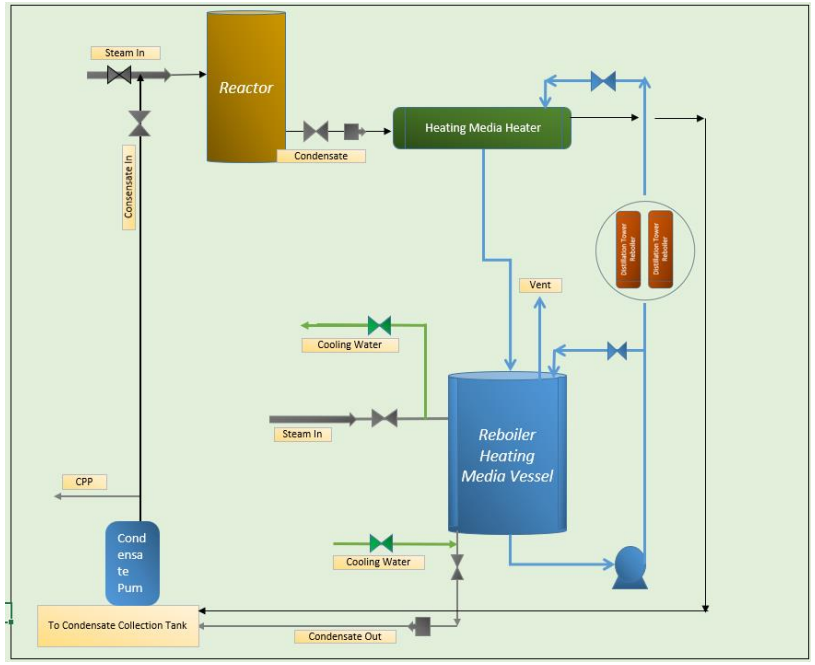
Innovative

- We are using the recovered heat in two reboiler *(which were using 80˚C Heating Medium and in this vessel's loop)* and saved equivalent to 30 Lakh INR per annum.
- Also, we have plan to extend it to Four Reboilers *(1.5 kg/cm2 steam is used here)*. For which study is going on. Completion of the same would mean additional saving of 15 Lakh INR per annum.

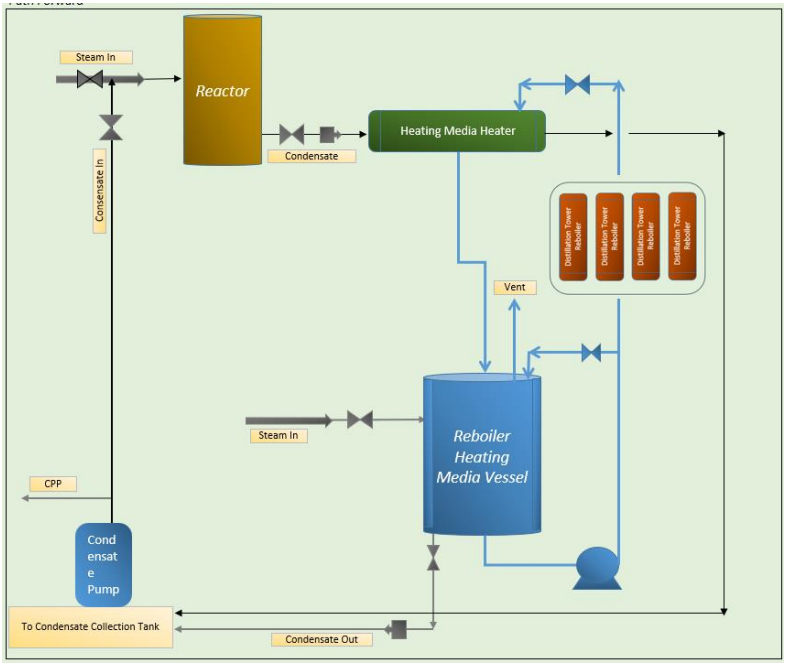
Before



After



Path Forward

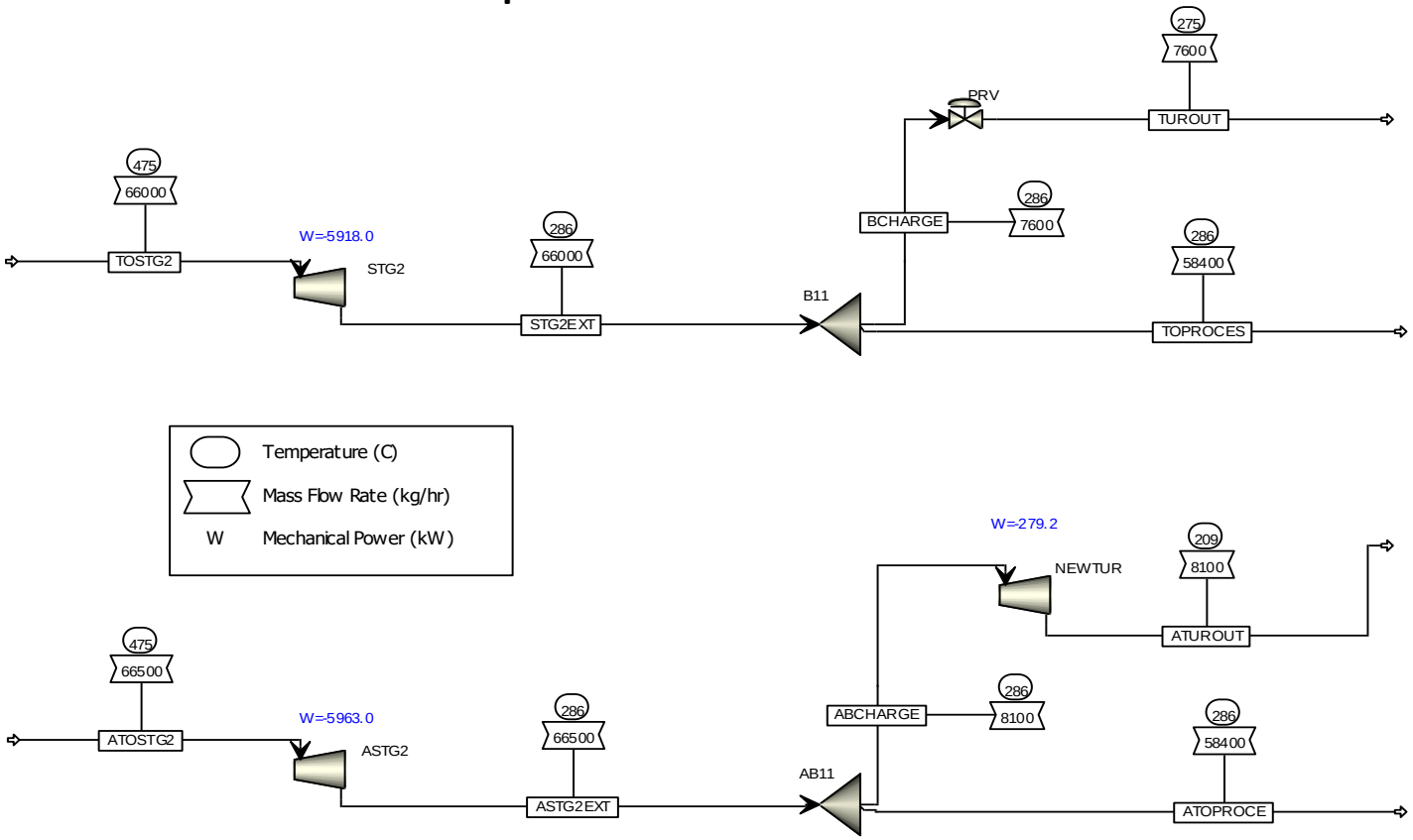


6.2 Micro Turbine

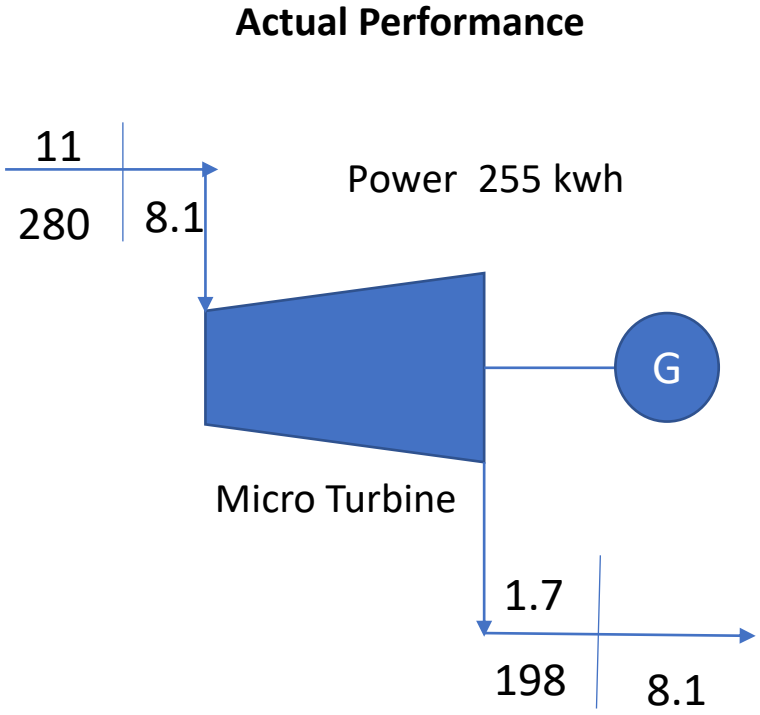
Best Practice

Presently Deaerator steam (1.7 kg/cm2, 7.6 TPH) requirement is fulfilled by the MP steam (12 Kg/cm2) with two sets of PRV in line. It was proposed to installed micro turbine to conserve energy as per the CII recommendation. Detailed Simulation study of Power and Steam network done to evaluate the benefit of the scheme by Central Technical Services.

Expected Theoretical Performance



Actual Performance



Micro Turbine of 350 Kw

Best Practice

Investment: 200 Lacs

Installed capacity: 350 KW@ 10 TPH

Operation condition: 255 kw@ 8.1 TPH

Expected power in a year: 1744000

Power Cost: 8.5 Rs/Kwh

Operating hrs.: 8000

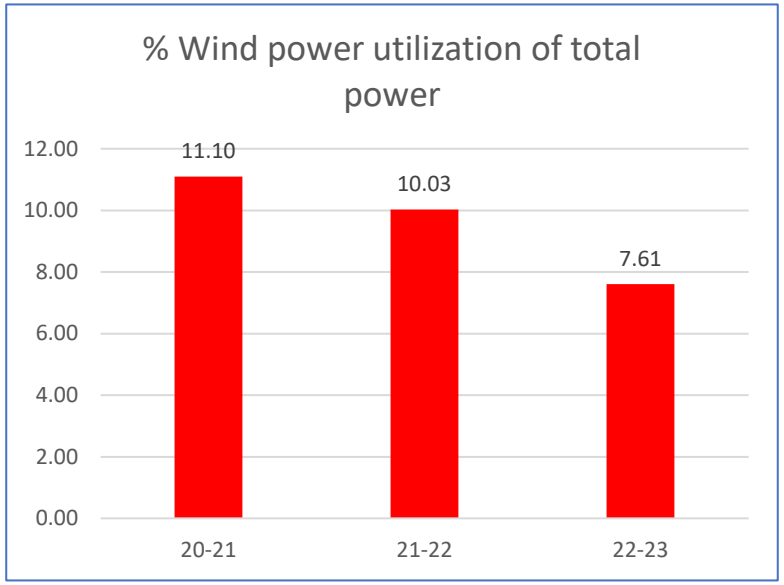
Auxiliary power consumption (AOP, cooling water, lighting ,UPS): 40000 kw/year

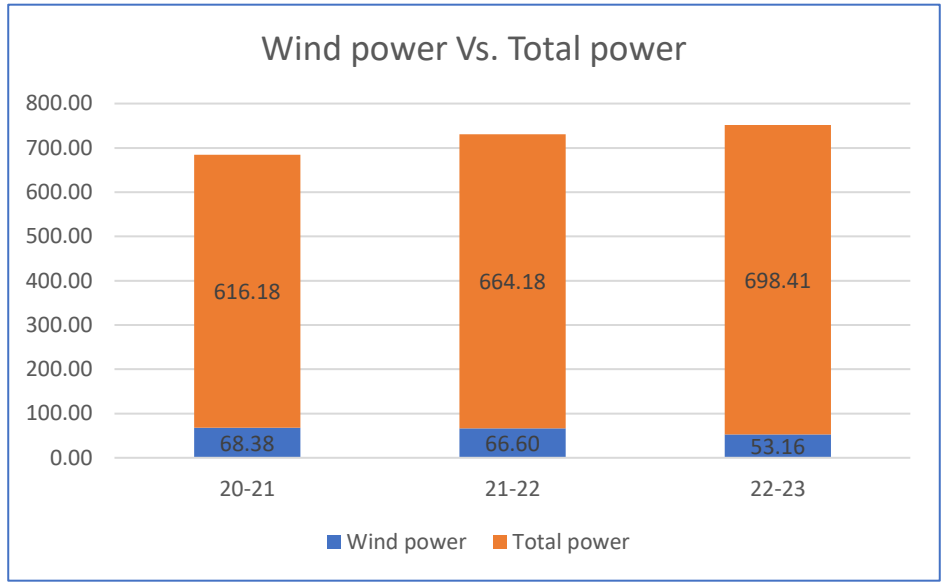
Additional steam consumption 500 kg/hr at deaerator.

PAYBACK= 18 Months

	Before	After
Steam to dearetor, kg/hr	7600	8100
Power recovery	0	255
Auxilury consumption, power kw		5
STG2 steam, kg/hr	66000	66500
STG2 Power	5918	5963
STG2 power increase, Kwh		45
Auxilliary Power consumption, kwh		5
Net Power Increase		295
Nwt steam increase at Boiler, kg/hr		500
Power cost, Rs/kwh		8.5
Steam cost, Rs/kg (Rs 2100 per ton)		2.1
Power saving Rs. Lacs		200.6
Steam generation cost		84
Net Saving Rs. Lacs		116.6

7. Utilization of Renewable Energy Sources

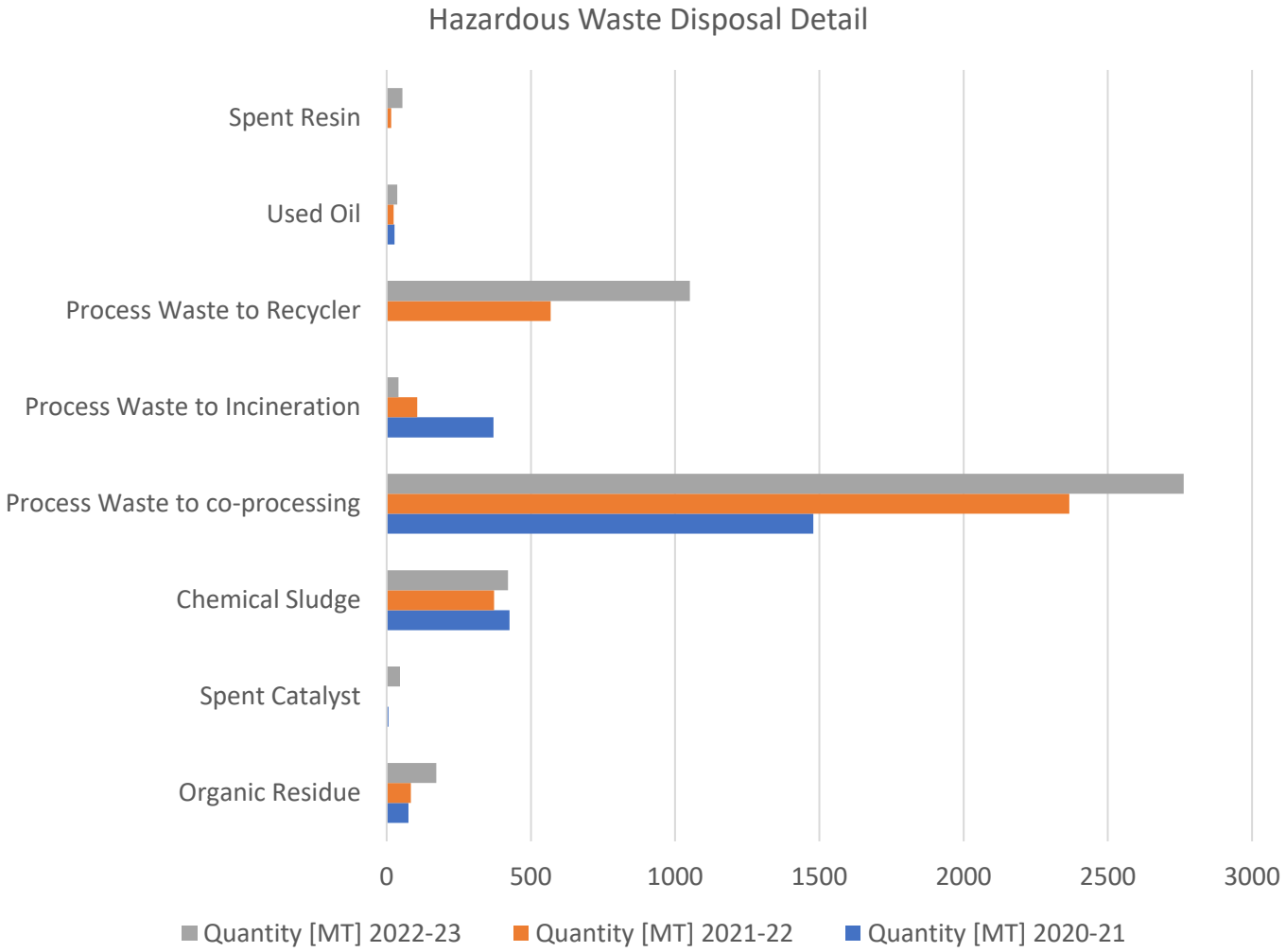


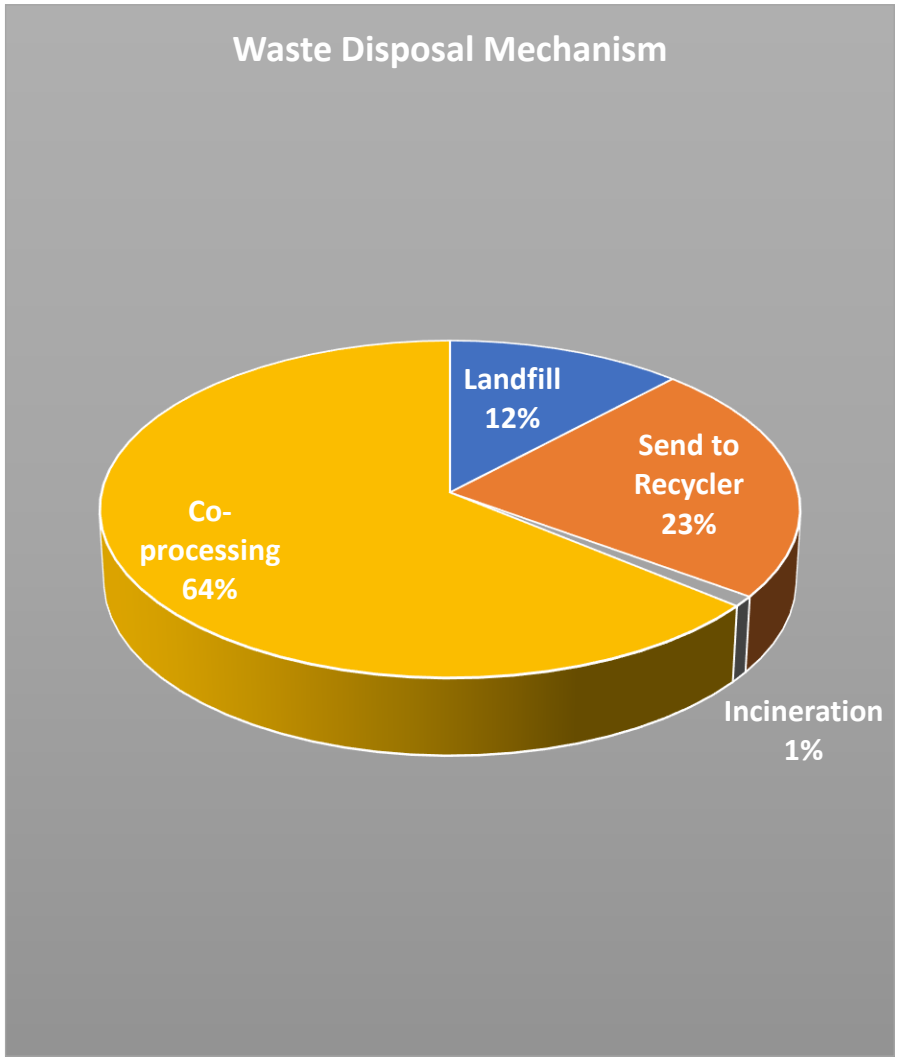


To increase % of RENEWABLE POWER--8 MW + 12 MW : 20 MW : Solar-Wind Hybrid Tied Up Done (50% PLF considered)

Year	Technology (Electrical)	Type of Energy	Onsite/Offsite	Installed Capacity (MW)	Generation (Million KWH)	% Overall Energy
2020-21	ELECTRICAL	WIND POWER	OFFSITE	50 MW	68.38	11.10
2021-22	ELECTRICAL	WIND POWER	OFFSITE	50 MW	66.60	10.03
2022-22	ELECTRICAL	WIND POWER	OFFSITE	50 MW	53.16	7.61

Waste Utilization & Management



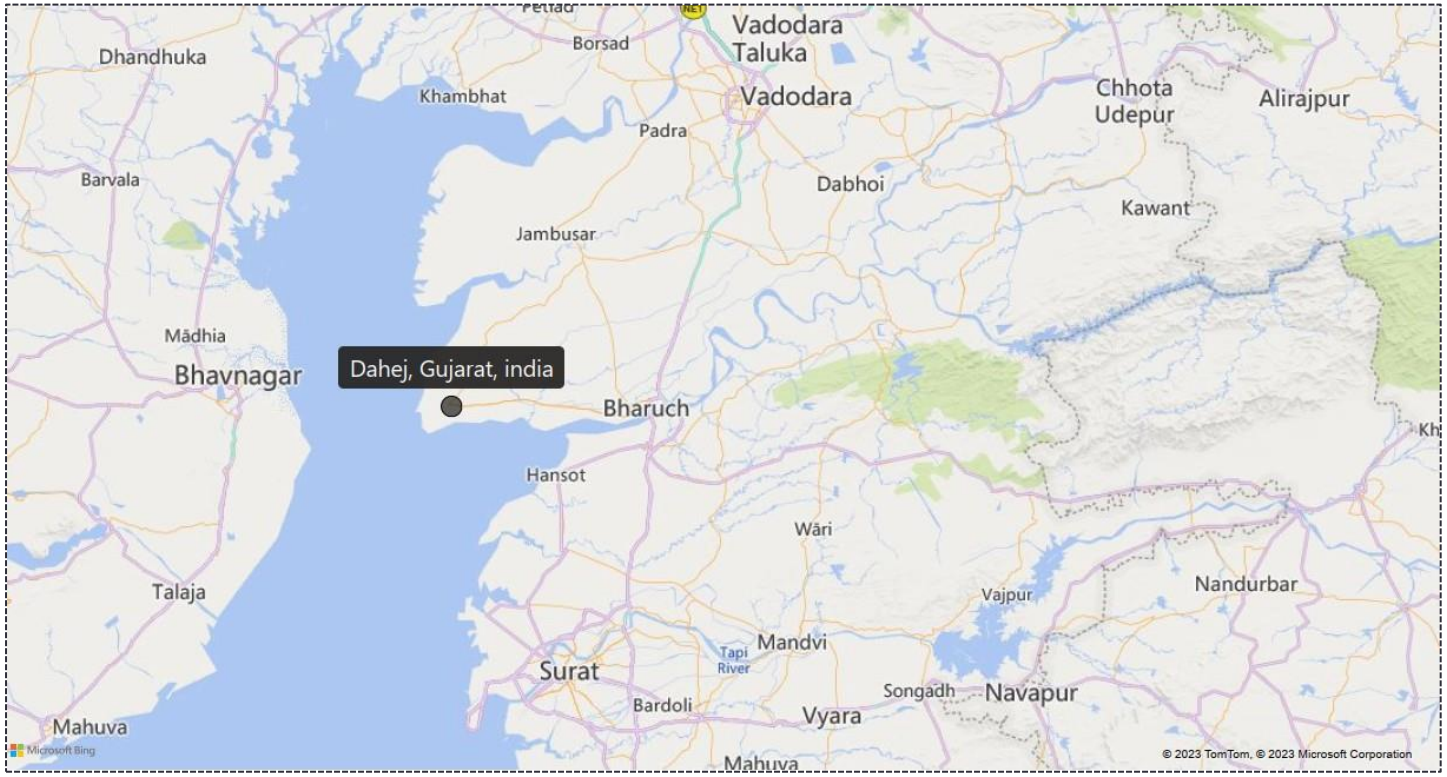


GHG Inventory

GHG Scope & Boundary

1. *Scope 1: High Speed Diesel (HSD), Natural Gas, Coal

2. *Scope 2: Purchased (Grid) Electricity, Bilateral and IEX (Non-RE)



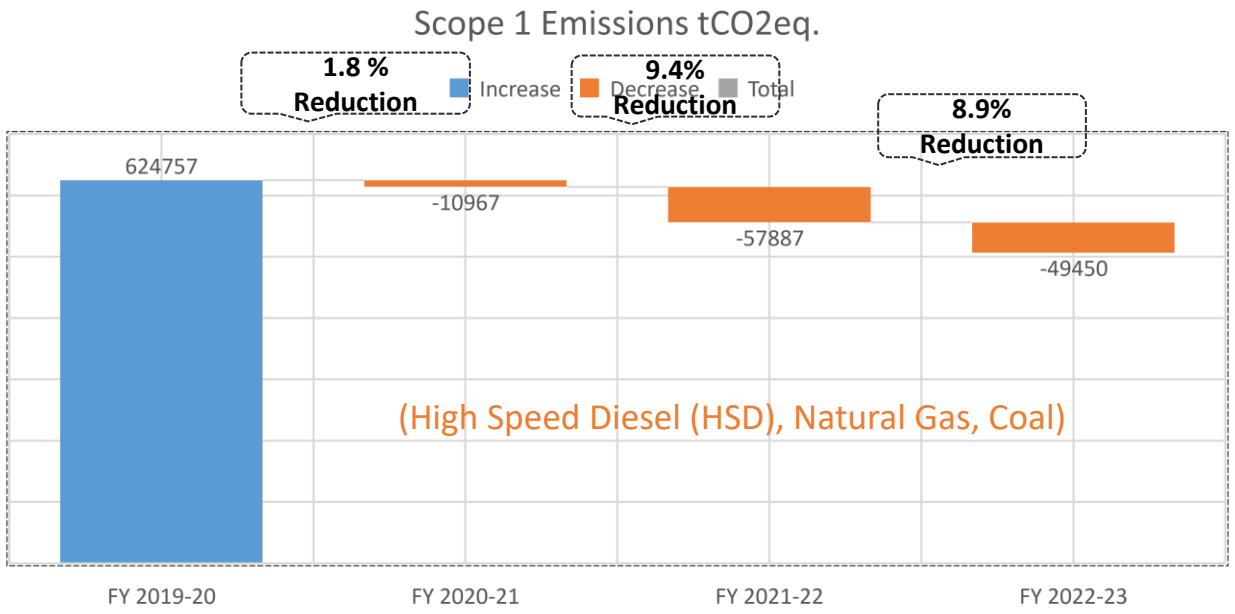
Sustainability Achievements, Goals & Targets

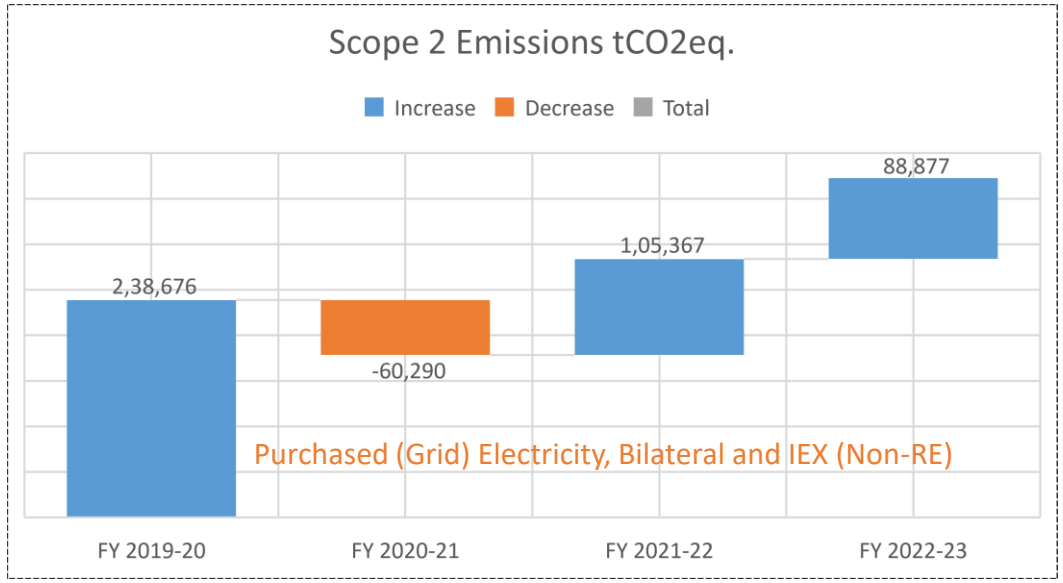
►To increase the % of
Clean energy in our overall
ENERGY CONSUMPTION

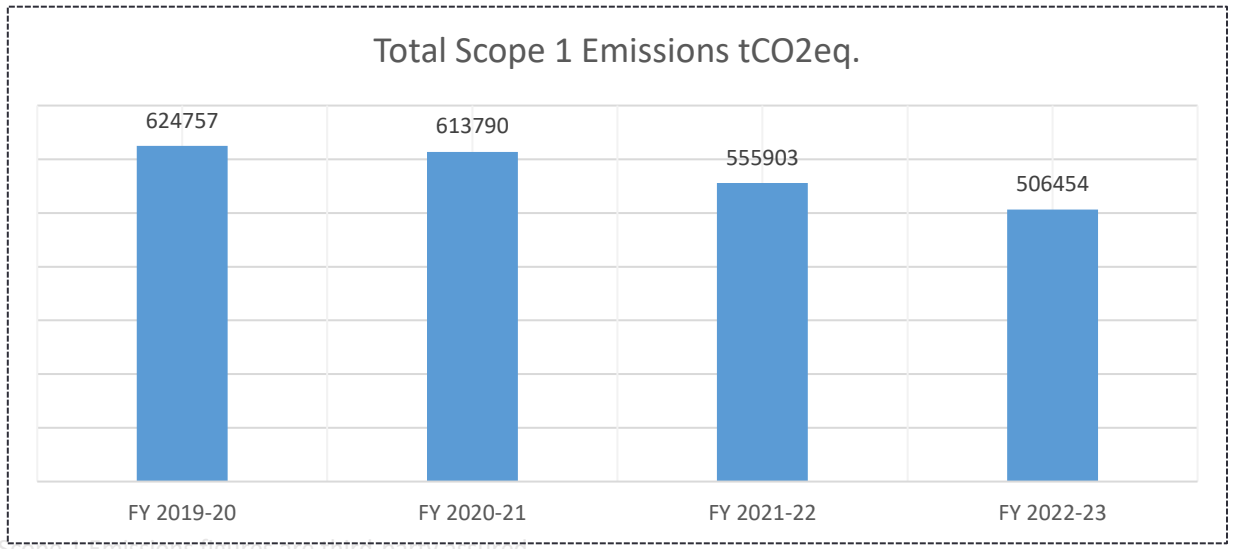
- 20 MW Solar-Wind Hybrid Tied Up Done
- As per roadmap of FY 23-24
- This contract reduces 5-7 % of
Carbon foot print
- Enhances overall sustainability efforts

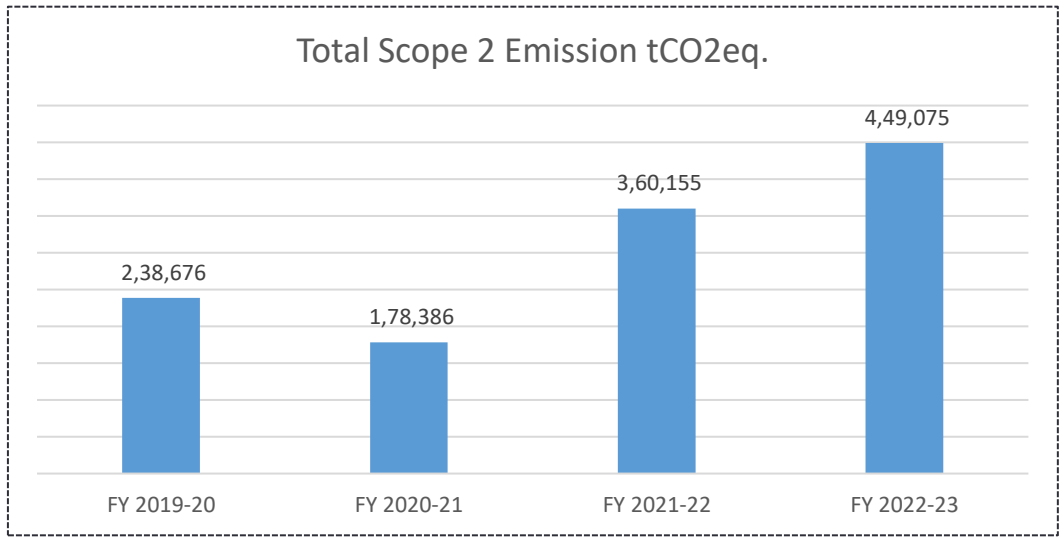
Scope 1 & 2 Emissions figures are third-party assured

Scope 1 & 2 Emission ::





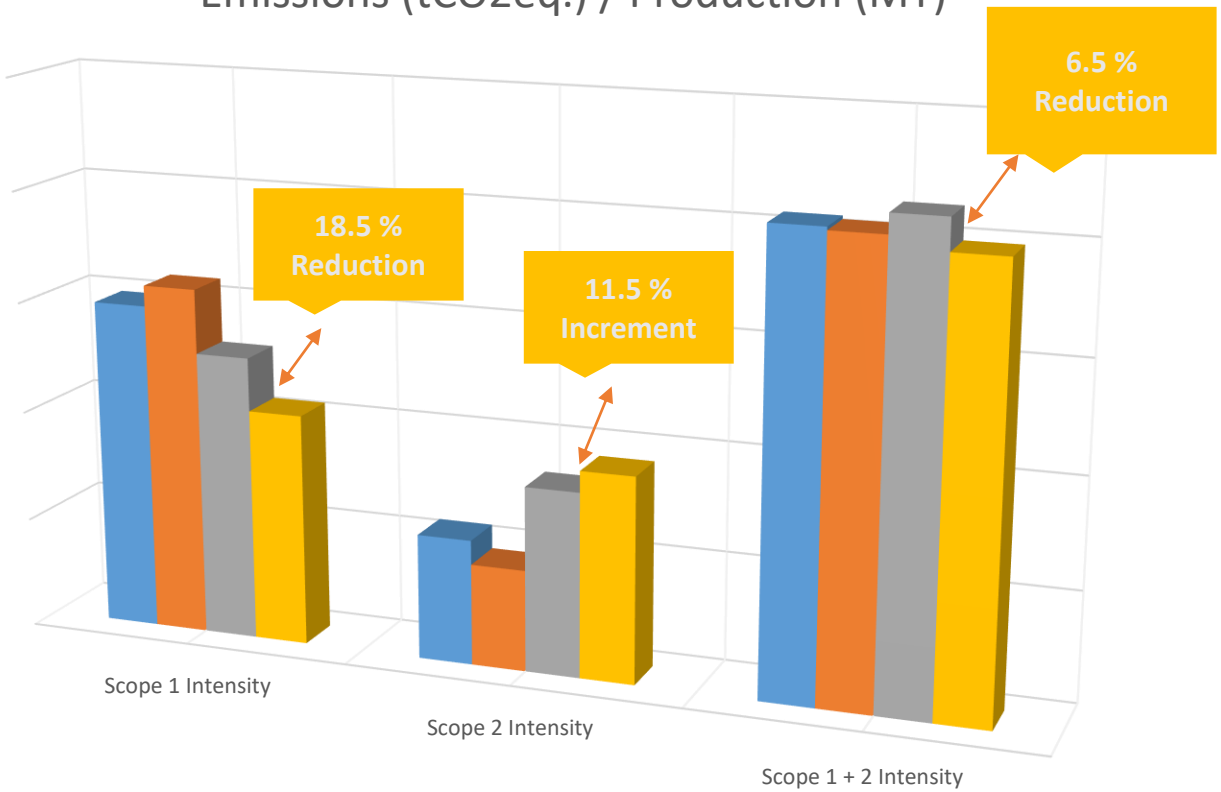




Scope 1 Emissions figures are third-party assured

Scope 1& 2 Intensity & Emissions ::

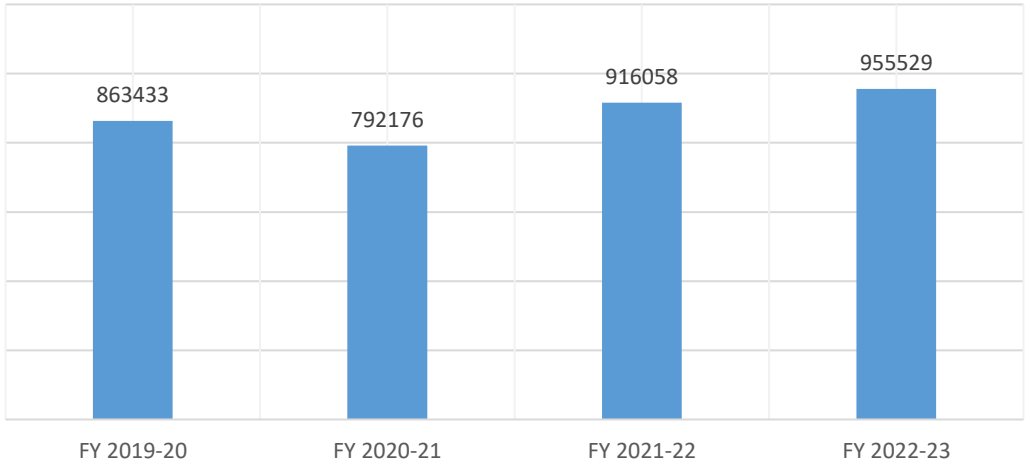
Emissions (tCO2eq.) / Production (MT)



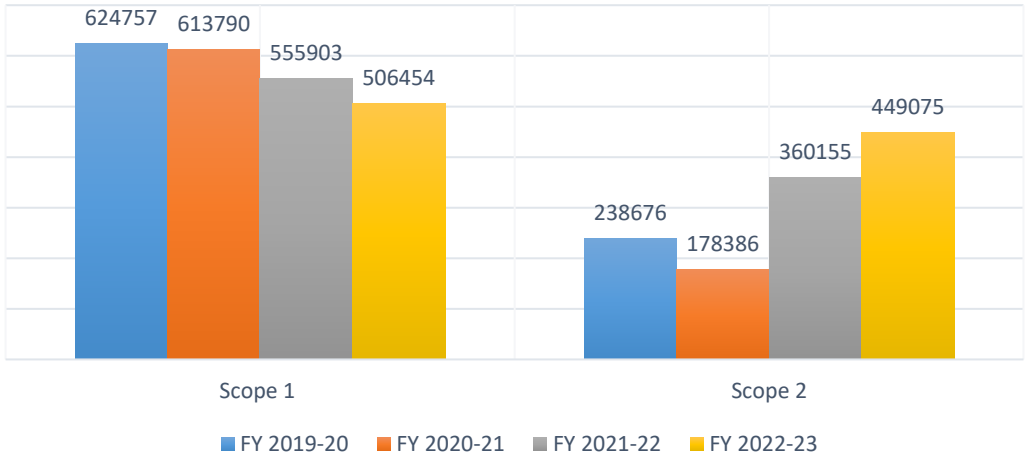
	Scope 1 Intensity	Scope 2 Intensity	Scope 1 + 2 Intensity
FY 2019-20	1.49	0.57	2.05
FY 2020-21	1.58	0.46	2.04
FY 2021-22	1.29	0.84	2.13
FY 2022-23	1.05	0.93	1.99

FY 2019-20 FY 2020-21 FY 2021-22 FY 2022-23

Scope (1 + 2) Emissions tCO2eq.

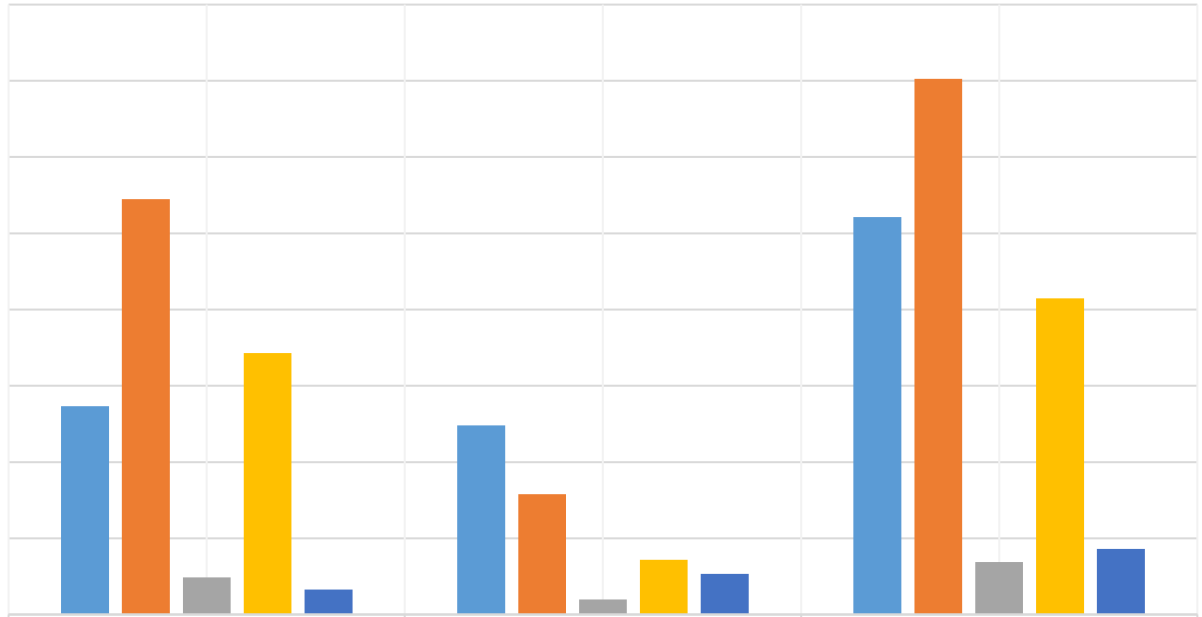


Scope 1 & 2 Emissions tCO2eq.



Scope 1 & 2 : Peer Analysis

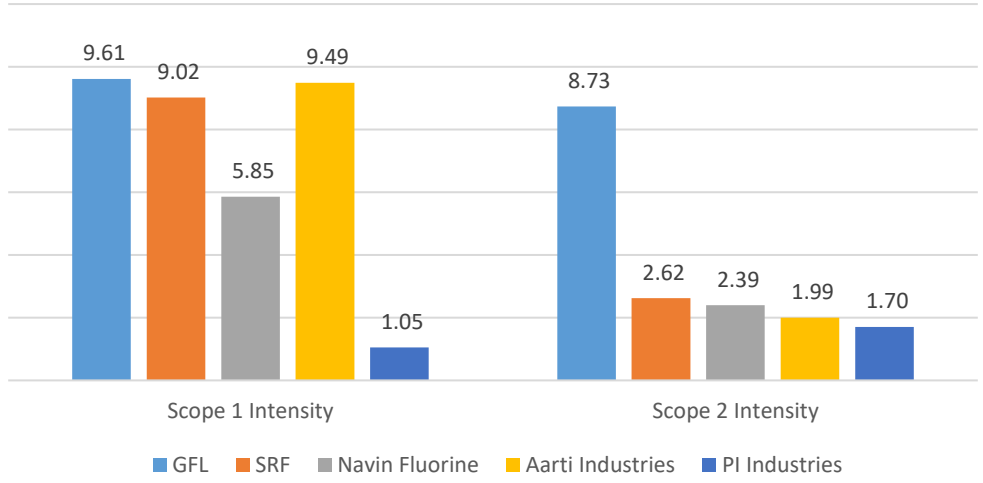
Scope 1 & 2 Emissions tCO2eq.



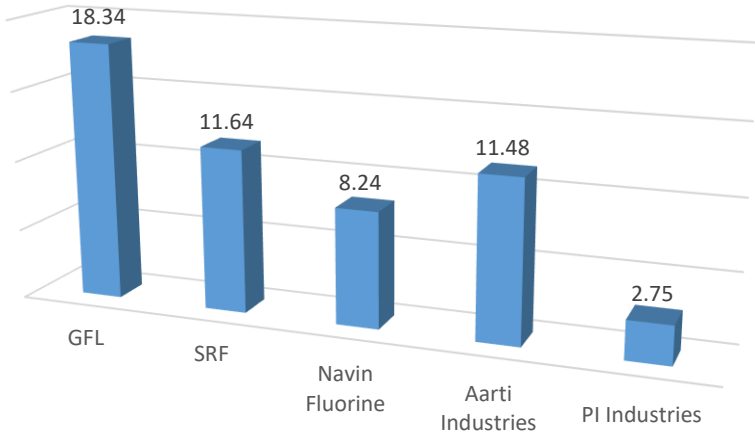
	Scope 1 Emissions	Scope 2 Emissions	Scope 1 + 2 Emission
GFL	5,46,562	4,96,229	10,42,791
SRF	10,89,283	3,15,771	14,05,054
Navin Fluorine	97,659.95	39960	1,37,620
Aarti Industries	6,85,701	1,43,959	8,29,660
PI Industries	65,695	1,06,785	1,72,480

GFL SRF Navin Fluorine Aarti Industries PI Industries

(Scope 1 , Scope 2) / Revenue (million INR)



Scope 1 + 2 / Revenue (million INR)



9. Green Supply Chain Management

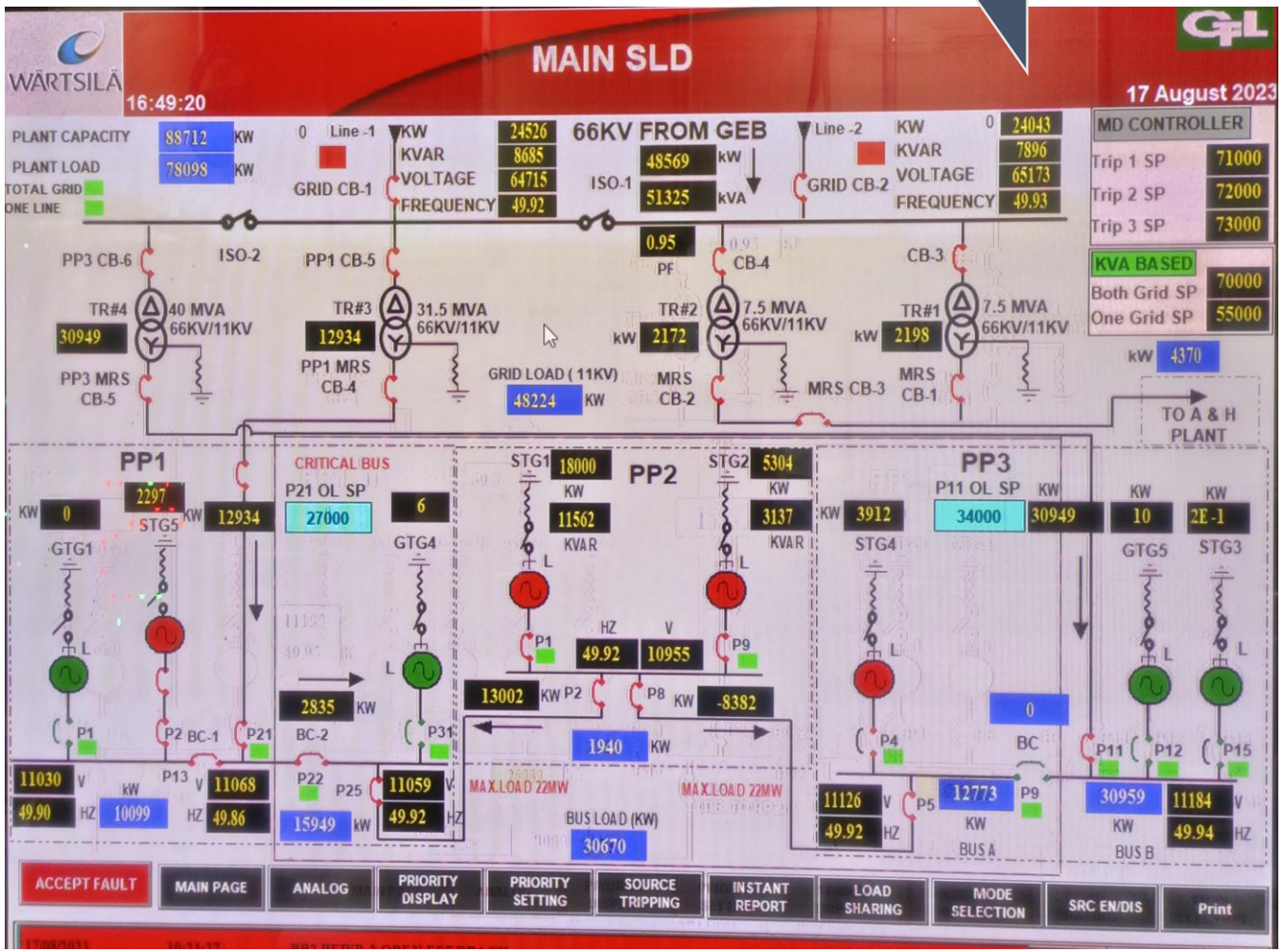
- Buying major Raw Material like Sulphuric Acid & Salt from nearby location Dahej and thereby have been saving on diesel cost used in transportation
- Similarly we have been buying coal from Adani which is getting landed in nearby Dahej port thereby have been saving on diesel cost used in transportation
- We have stopped using Asbestos Cement Sheet, all our new projects are done with metal sheets
- For bulky packaging material like HM HDPE Drums we have developed nearby Dahej based sources and hence started saving on diesel cost used in transportation
- Forward Path : To monitor CO_2 emission of RMs suppliers & Transporters -Giving the priority , those having lowest norms
- Flash steam recovery
- Reduction in usage of hazardous RMs in Polymer
- Reduction in packing material across polymer complex

10. Teamwork, Employee Involvement & Monitoring

ENCON Review Meeting – Chaired By EP(O)

ENCON Team- Individual Plant Coordinator

SLD for PMS



EMS Tracker

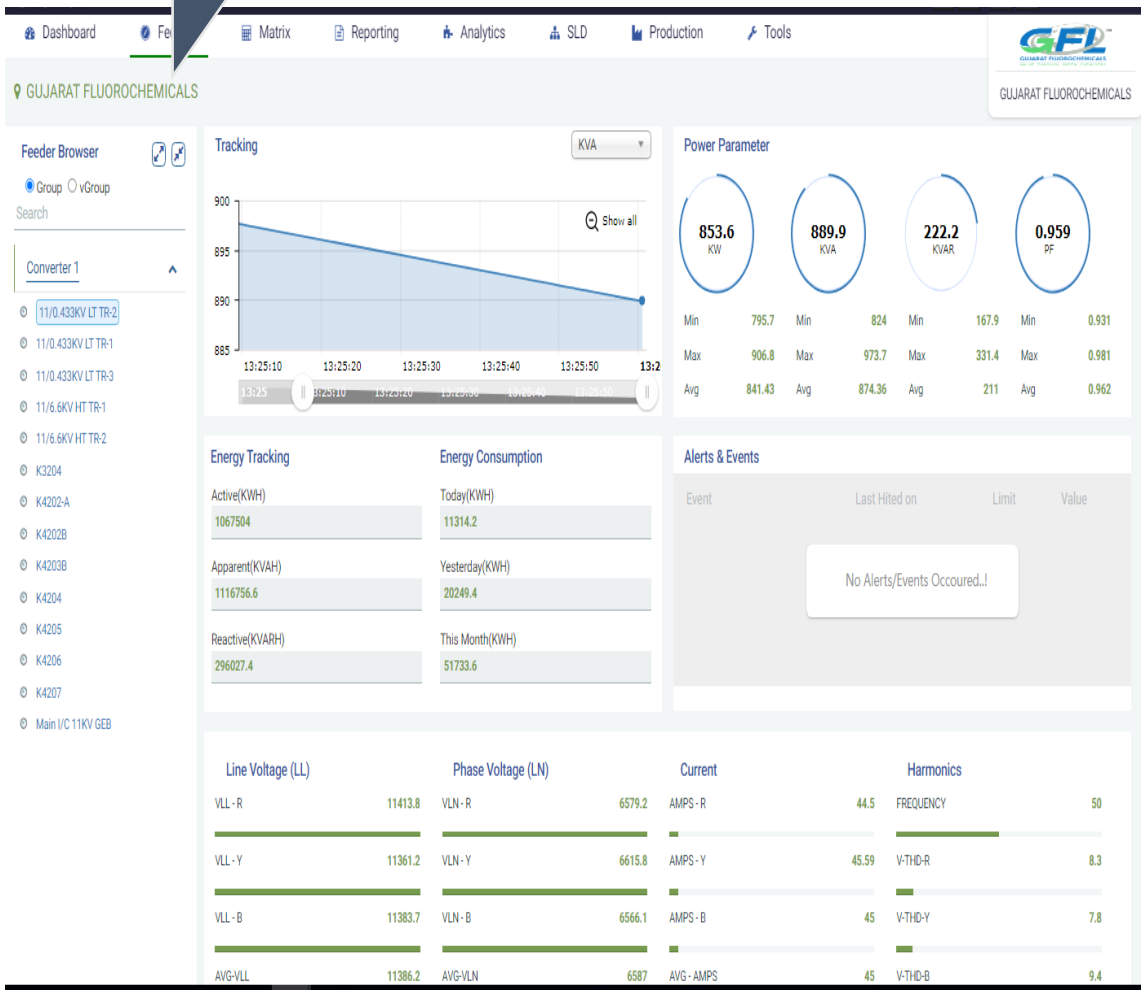


Photo Gallery - Achievements

CPP Team won "PLATINUM" award at National level in QC competition at Dhaka, Bangladesh FY 2020

CPP Team won "Excellent" award at National level in QC competition at Aurangabad FY 2021

National award "GFL as Energy Efficient Unit" from CII -FY 2022

Awards & Certificates

Energy Saving Certificates :
FY 2018-19 : PAT Cycle 2 : 336 ECerts
FY 2014-15 : PAT Cycle 1 : 437 ECerts

Year 2018-19

IMC RBNQA MQH Best Practice Award for **TFE Vent Gas Recovery System**

Year 2019-20

IMC RBNQA MQH Best Practice Award for **Effluent Recovery System**

Year 2020-21

IMC RBNQA MQH Best Practice Award for **Condensate Polishing Unit**

Nov 2021

Par Excellence Award in the International Convention on Quality Control Circle 2021

Dec 2021

CII-15th National Water Excellence Award 2021

Aug 2022

CII-22nd National Energy Efficient Award 2022

Sustainability Awards & Certification

CERTIFICATIONS

Health – Safety - Environment	ISO 14001 : 2015 ISO 9001 : 2015 ISO 45001 : 2018
Ethics	ISO 37001 : 2016 ISO / IEC 27001 : 2013 SA8000:2014
Social Responsibility	We have aligned all our Internal & Supply chain processes as per the following standards ISO 26000 : 2010 ISO 20400 : 2017

Thank you