

GAIL INDIA LIMITED

VIJAIPUR

Presenting members: Umesh Gautam, SM (Electrical)
Kunal, Mgr. (Operations)

#WahKya**E** **ENERGY** Hai



#hawabadlo



GAIL India Limited



GAIL – India's Natural Gas Leader

#WahKya**E**NERGYHai



New **India**
New **Energy**



MISSION

Enhancing quality of life through clean energy and beyond



VISION

Be the leader in natural gas value chain and beyond, with global presence, creating value for stakeholders with environmental responsibility



GAIL – India's Natural Gas Leader

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GAIL (India) Limited
India's Youngest Maharatna

GAIL's Presence

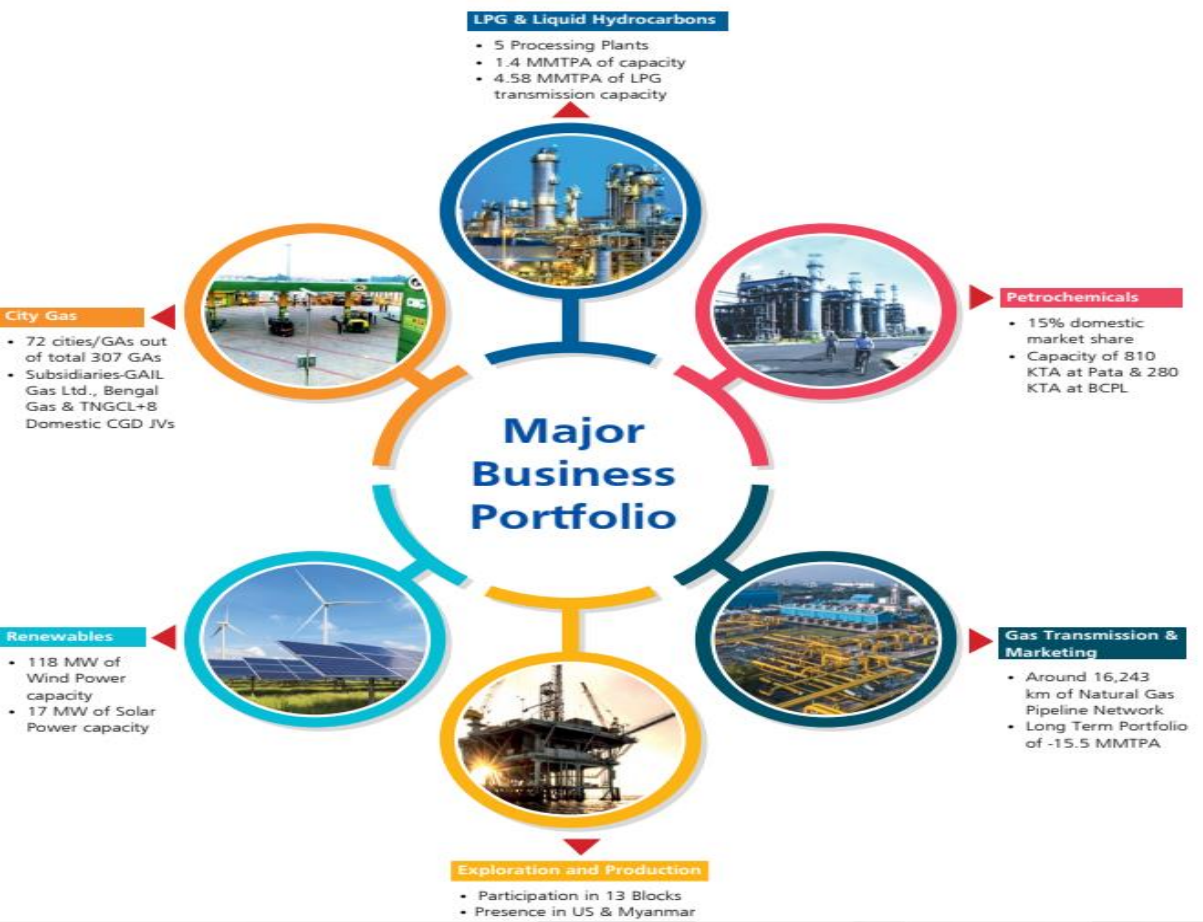
(As on Sep' 2023)

INDIA'S NATURAL GAS LEADER



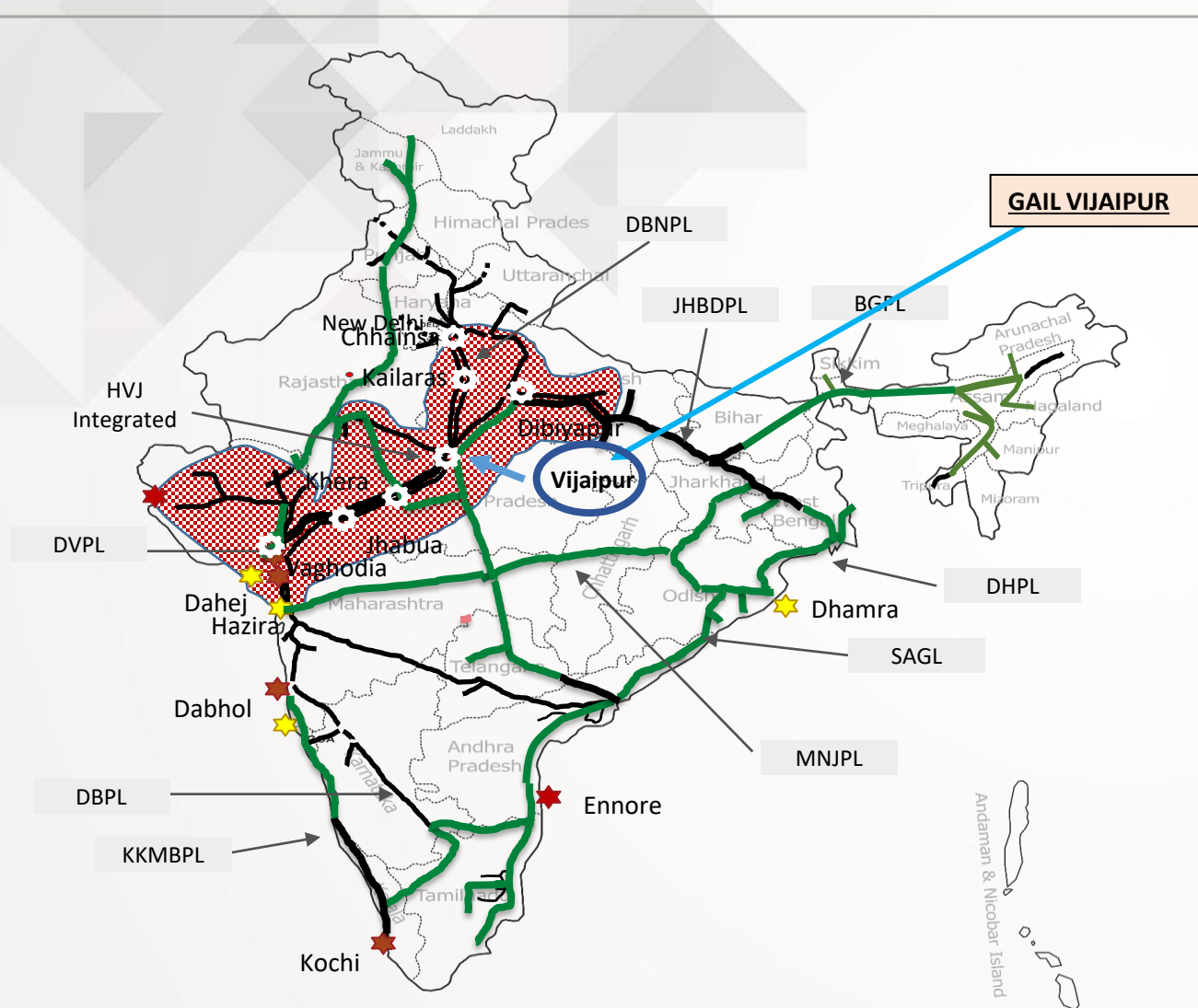
GAIL'S DIVERSIFIED PORTFOLIO

GAIL aims to maximise the value potential of its portfolio by capitalising on its market position and strengthening areas of value creation.



GAIL VIJAIPUR- Supporting India's Economy

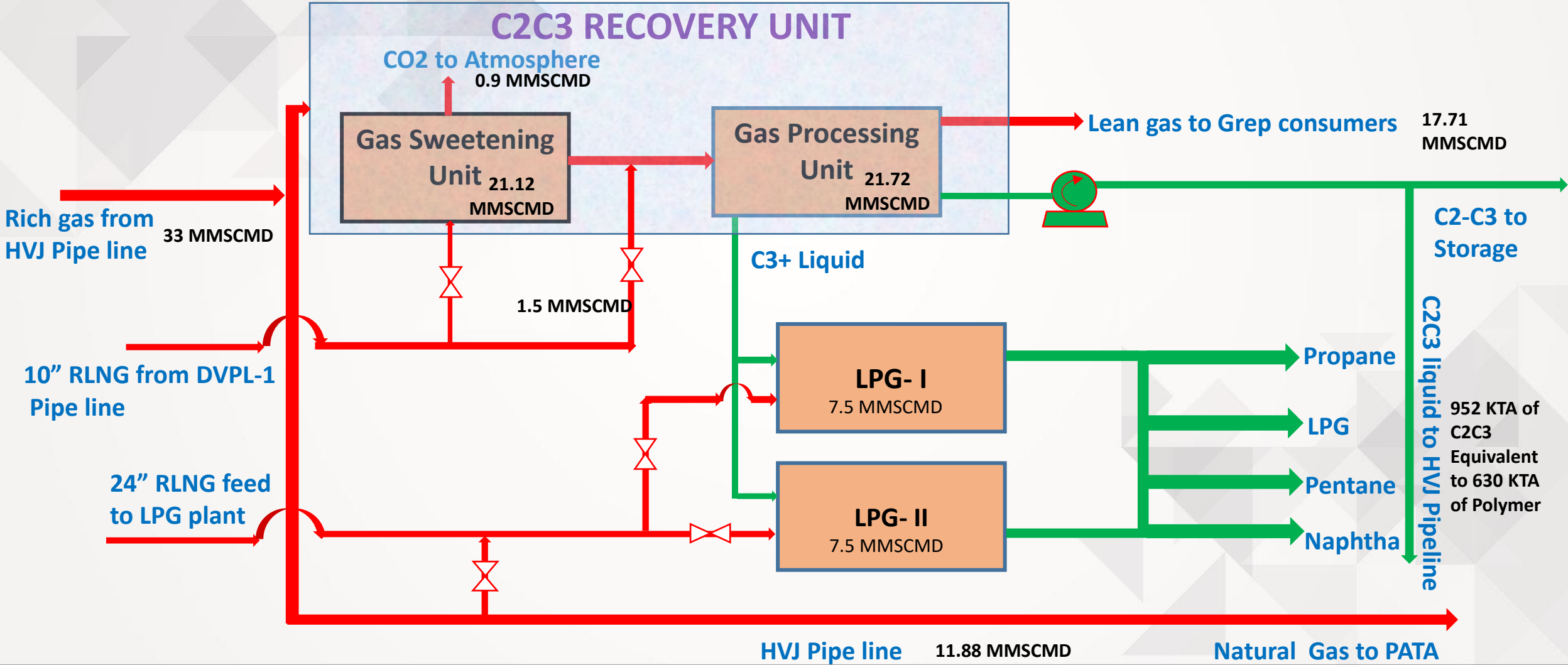
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Description	Nos.	Remarks
HVJ Pipeline System	6195 km	HVJ Integrated Networks Recently Commissioned VAPL – 36"x352 km
Regional Pipeline Total	693 Km 6888 Km	Regional Pipeline Network, Vadodara HVJ & Regional Combined
Compressor Stations	8	Hazira, , Vaghodia, Jhabua, Khera, Vijaiapur, Dibiyapur, Kailaras, Chhainsa
Other Work Centers/ Maintenance bases	13	- Vadodara, Dahej, Undera, Bharuch, Pithampur - Gadepan, Kota & Chittorgarh, Agra, Firozabad, Malanpur, Jhansi
Major Gas Sources	~82 MMSCMD	ONGC Hazira – 25 MMSCMD PLL Dahej - 45 MMSCMD PIL Ankot – 3 MMSCMD Shell Hazira – 4 MMSCMD CBM Shadol – 0.5 MMSCMD ONGC Anklewar /Gandhar - 4 MMSCMD & other regional sources
Major Customers	~36 MMSCMD ~10 MMSCMD (Int. Cons.)	KRIBHCO-Hazira, NFL Vijaiapur, CFCL, DCM, YARA, INDORAMA, IFFCO, KRIBHCO SHYAM FERTILIZERS LTD, KANPUR FERTILIZER & CEMENT LIMITED, IOCL, OPAL, GSFC, GNFC
Gas Processing Plants	3 GPU 1 C2C3	-2 nos. LPG Plants at Vijaiapur – 15 MMSCMD -1 no. LPG Plant at Vaghodia – 2.5 MMSCMD -1 no. C2C3 Recovery at Vijaiapur – 22.6 MSSCMD
Recent CGD Connectivity	34	Rajasthan, MP & UP Entities: IOCL, Torent, Adani, CUGL, GAIL Gas, AGL, IOAGL, Think Gas, Green Gas, HPCL, RSGL

GAIL VIJAIPUR- Supporting India's Economy

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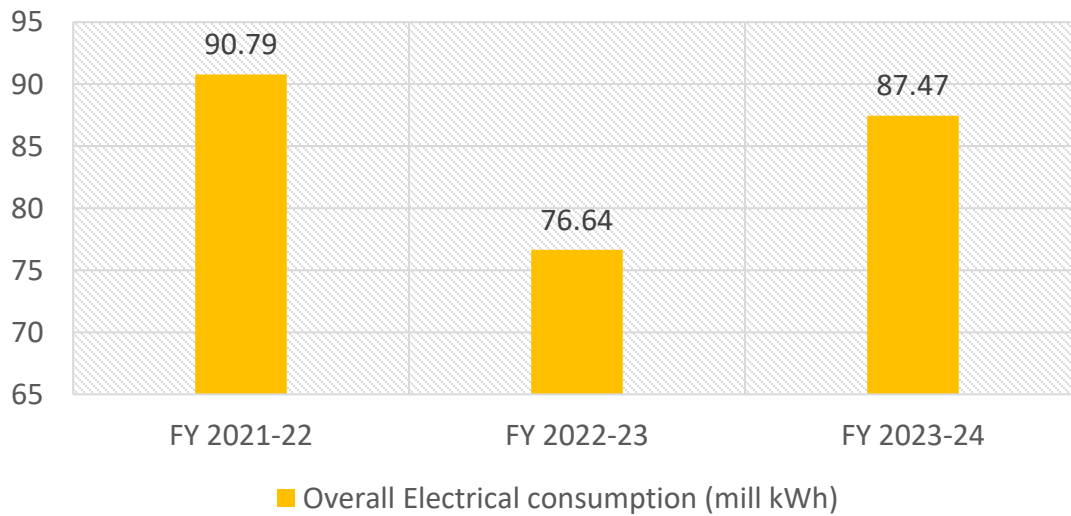


Overall energy consumption in last 3 years

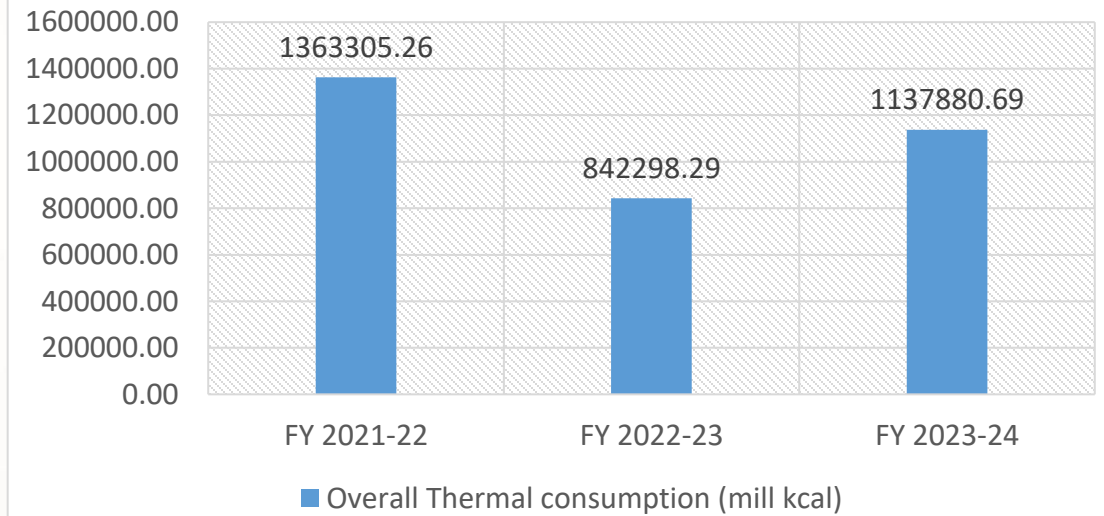
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Overall Electrical consumption of GPU (mill kWh)



Overall Thermal consumption (Fuel and Flare) of GPU (mill kcal)



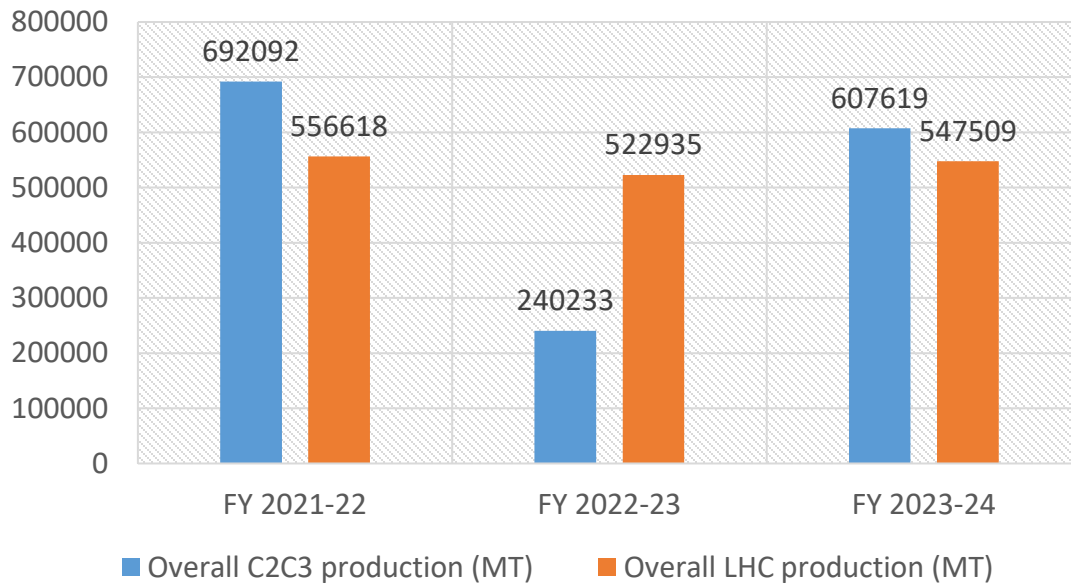
The Russia-Ukraine war in 2022 caused significant disruptions to global gas supplies, as the conflict affected key pipelines and supply routes. Gas supplies were disturbed globally affecting supplies of GAIL Vijaipur also. As a result production was reduced.

Overall production/Gas processed in last 3 years

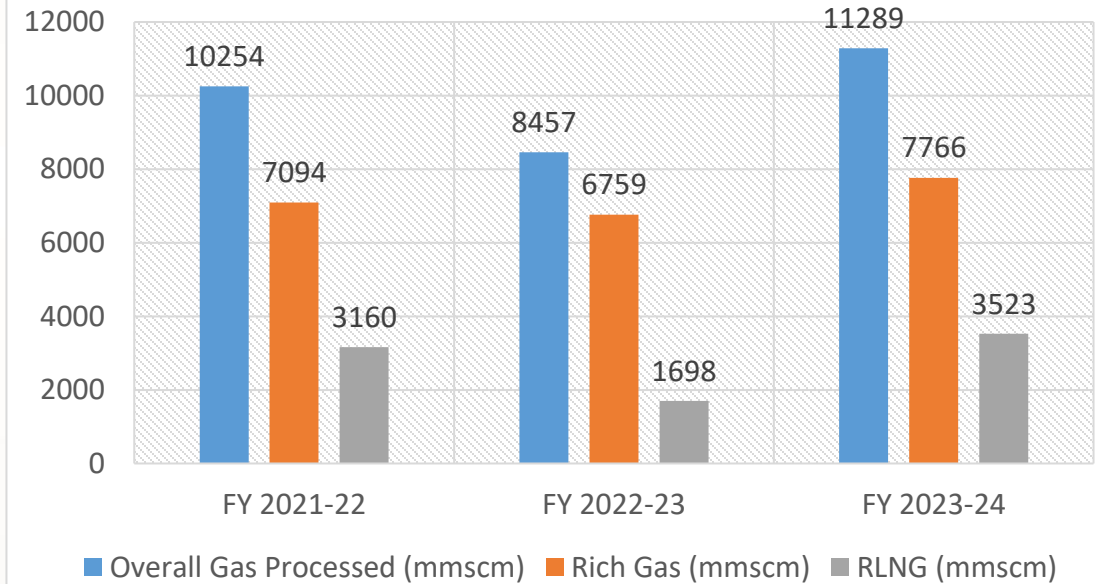
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Overall C2C3/LHC production (MT)



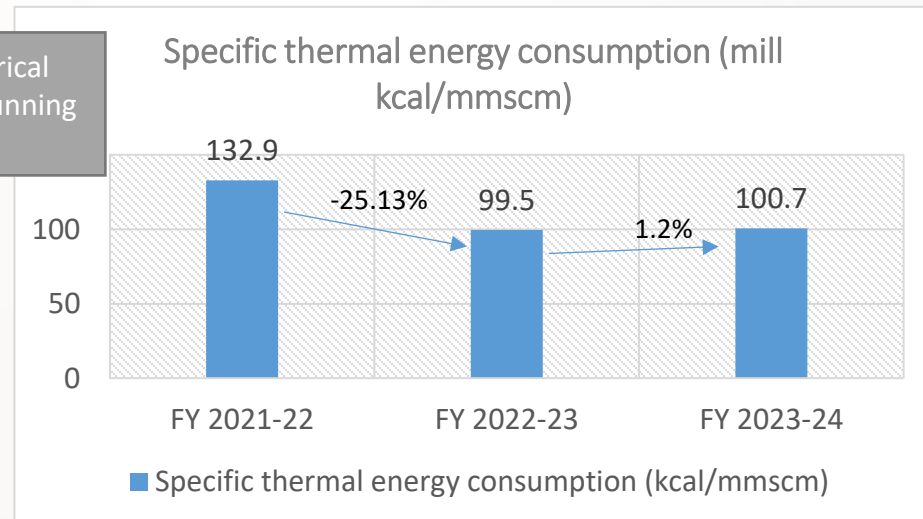
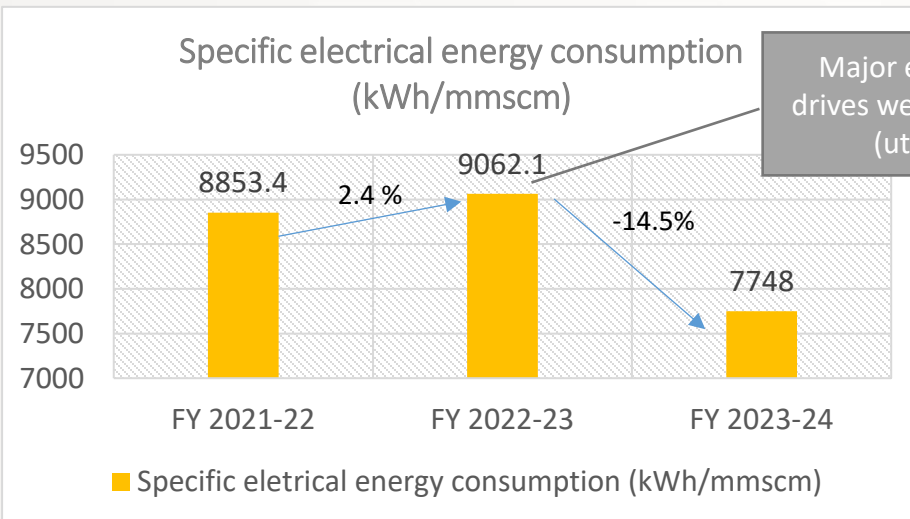
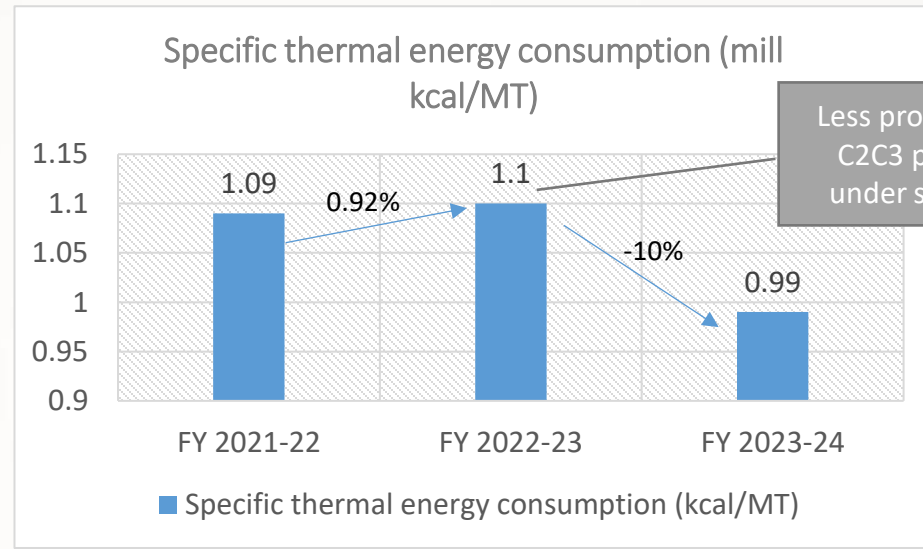
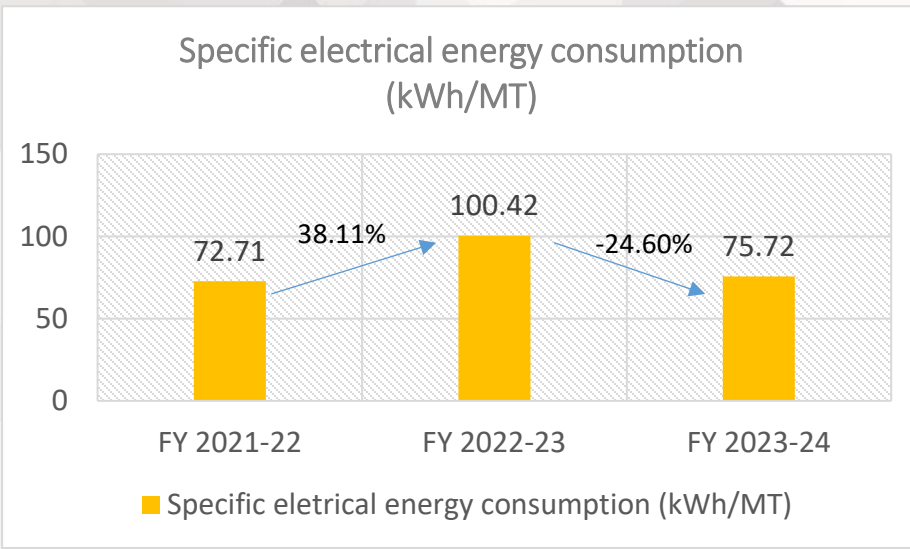
Overall Gas Processed (mmscm)



C2C3 acts as a feed stock for Pata petrochemical plant. LHC includes LPG, propane, pentane and naphtha. Production in FY 2022-23 was less due to gas supply issues as a result of Russia Ukraine war.

Specific energy consumption in last 3 years

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As gas composition varies and production depends on the same, it is prudent to define specific energy consumption on the basis of quantity of gas processed.

National/Global Benchmark

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Since there are a limited number of Gas processing units in India, getting their SEC is difficult. Hence data for oil refineries is used as both comes under oil and gas sector.

Competitor:

Specific thermal energy consumption for IOCL Mathura : 198 MMKcal/TMT of crude

Taking GCV of crude as 10755 kcal/kg

Specific thermal energy consumption for IOCL Mathura : 0.0184 Kcal of energy/kcal of crude

Now for GAIL Vijaipur

Specific thermal energy consumption = 111 kcal/scm of gas processed

Taking GCV of gas as 9200 kcal/scm

Specific thermal energy consumption for GAIL Vijaipur: 0.012 Kcal of energy/kcal of crude

National:

As per the research paper published by IIT Bombay the benchmark energy consumption for a refinery is 78650 Btu/Bbl that comes out to be 0.0135 Kcal of energy/kcal of crude

Process Units

#	Unit	Energy Number (Btu/Bbl)
		Benchmark
1	Crude distillation (stand-alone)	73,600-78,650
2	Vacuum distillation (stand-alone)	65,330
3	Crude and Vacuum (integrated)	88,000-109,000
4	Naphtha Splitter	102,150
5	Fluid Catalytic Cracker (with coke)	250,400
6	Delayed Coker (LR)	316,710
7	Aromatics Recovery	505,840
8	Hydrocracker (once- through)	262,320
9	Hydrogen	66,930
10	Propane Deasphalting	261,640

Major Econ project planned in FY 2024-25

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Efficiency Improvement Project (C2+ Recovery Enhancement) at LPG Plant Vijaipur

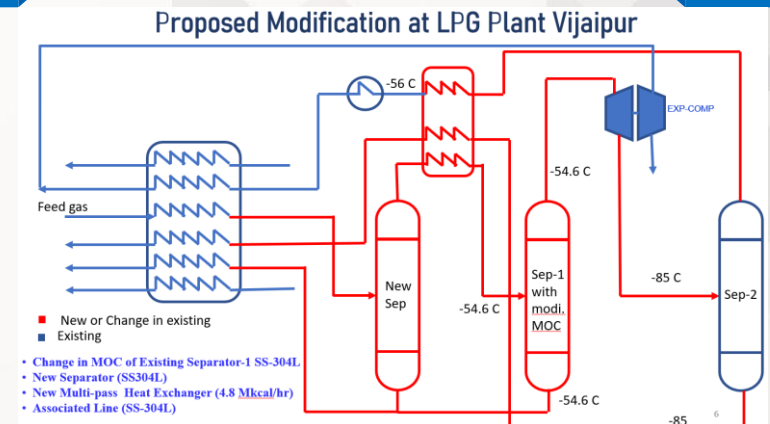
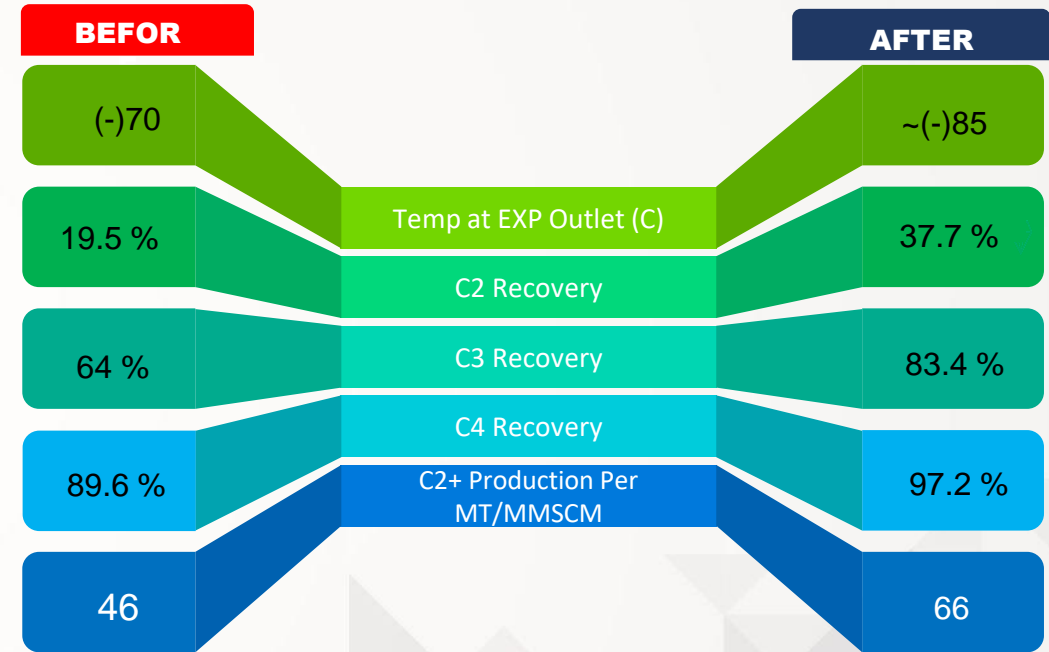
Incremental Production	MT per Day	KTA
LHC	100	33
C2C3 In LEF	192	64
Polymer at Pata	~120	40

Payback Period : 266 Days

Parameters	Improvements
Reduction in Specific Energy Consumption	~ 30%
Environmental impact	Positive



Annual Increase in Profit Rs. Cr.



Major Econ project planned in FY 2024-25

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Projects under implementation

LPG blowdown vessel project which will save approx. 100 MT LPG in case of draining of LPG headers.

Investment = INR 25 million, Savings = INR 5.6 million

Permanent provision is being done to recover BOG of C2C3 storage during C2C3 unit shutdown.

Investment = INR 4.5 million, Savings = INR 8.9 million

Flare gas recovery unit to be used in LPG flare.

Projects under conceptualization

Electrification of LEF compressor gas turbine in LPG plant.

Investment = INR 80 million, Savings = INR 108 million

Waste heat recovery of LGC compressor in LPG plant.

Investment = INR 250 million, Savings = INR 386 million

Waste heat recovery of DVPL B compressor.

Investment = INR 500 million, Savings = INR 446 million

Energy Saving Project in last 3 years

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Year	Project	Investment (INR million)	Annual electrical savings (Million kWh)	Annual thermal Savings (Million kcal)	Annual savings (INR Million)	Payback period (in months)
FY 2021-22	To save Energy in kWh by changing operational philosophy of HVAC MCR	0.475	0.3	-	2.18	2.61
FY 2021-22	Installation of Energy Efficient LED lights	50	3.3	-	26	24
FY 2021-22	Replacement of 109 No's Old In-efficient Air Conditioners with 5 Star Rated Inverter Air Conditioners at HVJ Compressor Station & Township {2 Ton-47 No's, 1.5 Ton -62 No's}	4.7	0.16	-	1.05	54
FY 2021-22	Installation of Flare Gas recovery unit in C2C3 flare	80	-	35725	125	7.7
FY 2022-23	VFD installation in ID fans of cooling tower-3	1.2	0.23	-	1.6	2.5
FY 2022-23	Stoppage of Utility Boiler and increasing load of HRSG	-	-	27131	131	-

Energy Saving Project in last 3 years

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Year	Project	Investment (INR million)	Annual electrical savings (Million kWh)	Annual thermal Savings (Million kcal)	Annual savings (INR Million)	Payback period (in months)
FY 2022-23	C2C3 instrument and plant air interconnection to HVJ CS	5	1.4	-	9	6.67
FY 2022-23	Boiler feed water pumps for utility boiler and HRSG interconnection	-	9.28	-	60	-
FY 2022-23	Vapor recovery during 5 year statutory inspection of LPG spheres	-	-	423	20	-
FY 2023-24	Interconnection of C2C3 BOG with LEF suction in LPG	0.2	-	9568	8.9	0.27
FY 2023-24	Steam trap replacement in steam headers	80	-	67789	215	4.5
FY 2023-24	Improving performance of HRSG by optimizing CPH bypass	-	-	7068	23.8	-

Energy Saving Project in last 3 years

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Year	Project	Investment (INR million)	Annual electrical savings (Million kWh)	Annual thermal Savings (Million kcal)	Annual savings (INR Million)	Payback period (in months)
FY 2023-24	VFD installation in DM water Transfer pump (32-PA-001A) at DM plant	1.1	3.05	-	2.57	5.13
FY 2023-24	Heating of HRSG supplementary fuel gas	7.5	-	3825	12.9	6.97
FY 2023-24	Utilization of UB fuel gas heater steam drain	0.5	-	430	1.45	4.14

Energy Audit

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PO placed : M.s TUV SUD
Value: Rs. 18 Lacs

Scope:

- ✓ Studying present level Energy Consumption pattern
- ✓ Identifying the energy saving possibilities
- ✓ Collection of relevant data and information
- ✓ Detailed Analysis of Data.
- ✓ Potential saving in Energy
- ✓ Recommendations
- ✓ Implementation

Detailed Energy Audit Report

AT

GAIL India Ltd

Vijaipur, Guna, Madhya Pradesh



Submitted By

TÜV SÜD South Asia Private Limited

Plot No. 344, Habibpur Village, Near Shri Krishna Hyundai Workshop,
Main Dadri Road, Greater Noida - 201306,
Uttar Pradesh, India



Document No. 2024/GES-001873/GA/NA/NA/55715



Innovative Projects- India's 1st Small Scale LNG plant

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Manufacturer:
Galileo
Technologies,
Argentina

Capacity: 36 TPD
(18TPDx2)

SSLNG

Mobile units, can
be transferred
and replicated
easily.

1st such unit in
India



1st time in
India, LNG is
produced from
natural gas



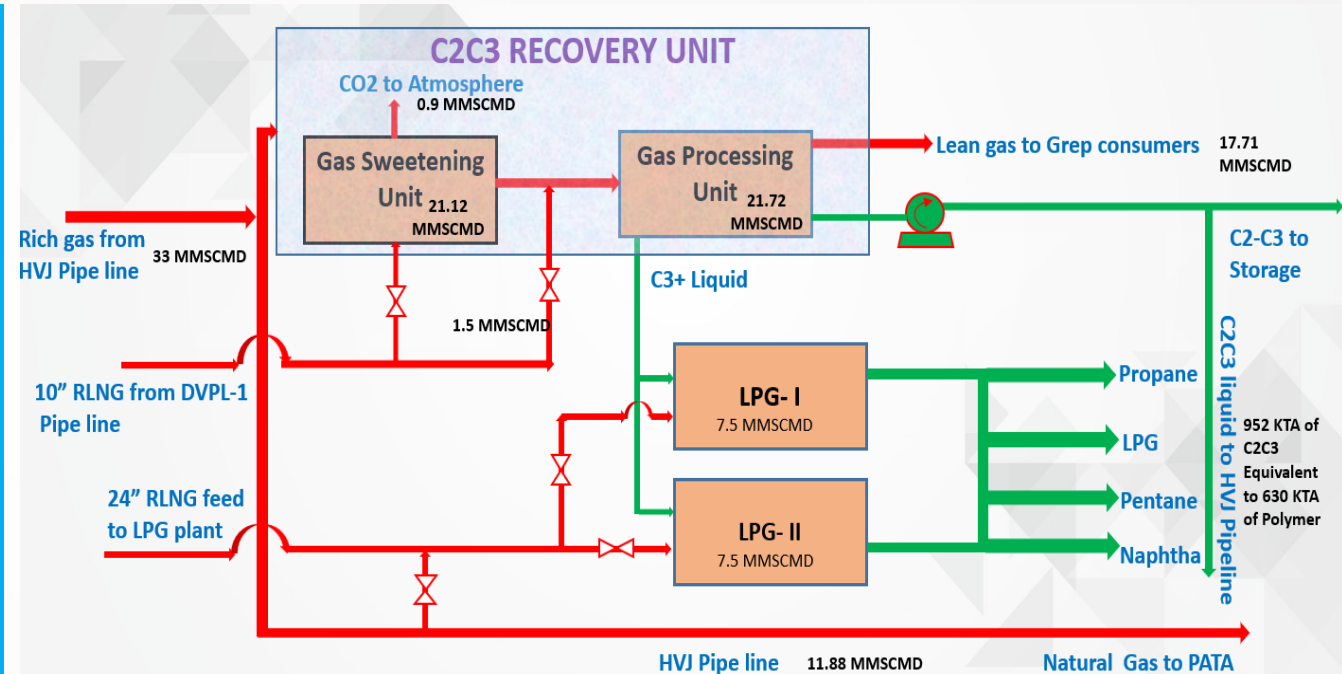
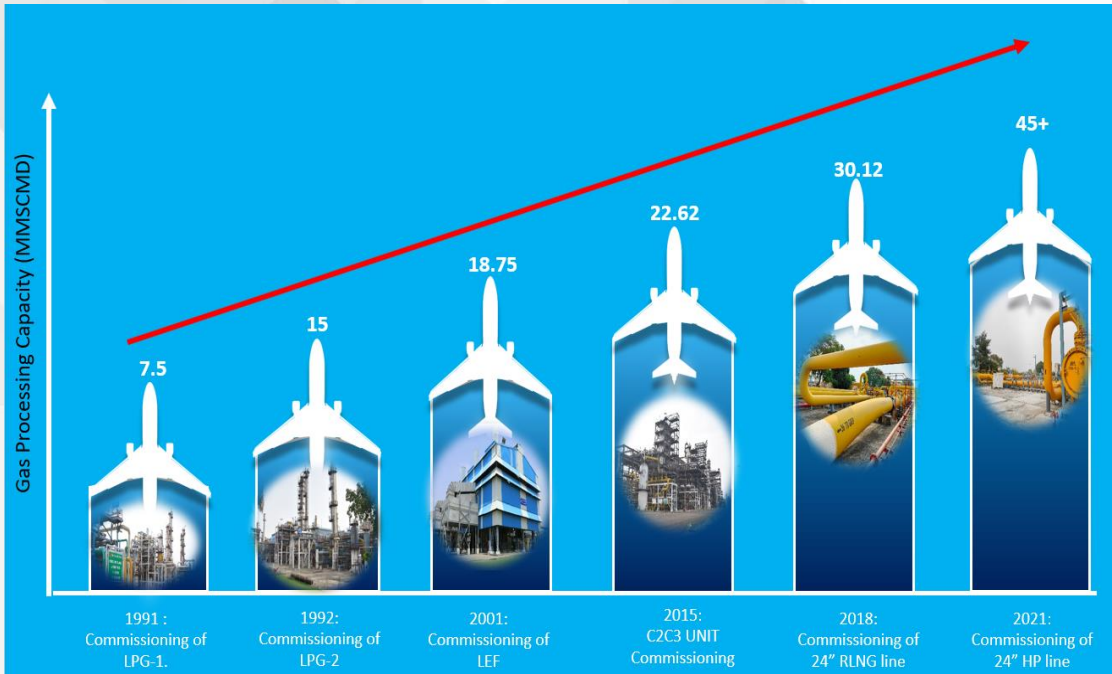
MAKE IN INDIA



Augmenting
supplies to a
growing domestic
gas demand
through LNG route

Innovative Projects- Enhancement of GPU Vijaipur processing capacity beyond 45 MMSCMD

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- ✓ After commissioning of C2C3 unit in 2015, no spare rich gas was available for directly processing by LPG plants.
- ✓ Through in-house study and modifications, existing LPG plants were run on rich RLNG feed gas.
- ✓ Thus GPU Vijaipur successfully processed more than 45 MMSCMD gas and became highest gas processing complex of its kind in India.
- ✓ Can be replicated at other GPUs also.

Innovative Projects - 5% blending of H2 in CGD network

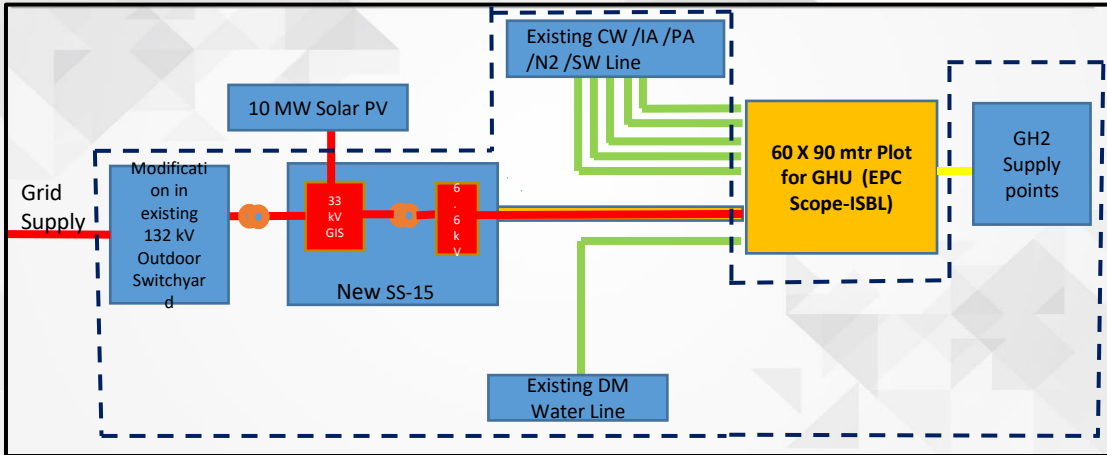
#WahKya**E**RGYHai



- ✓ Initially H2 blending was started at 2% (v/v) in CGD network.
- ✓ 1st project in India to blend H2 in city gas distribution.
- ✓ Impact Study on CGD Network/NG pipeline due to various levels of Hydrogen blending(1% till 2%) in NG was carried out by SME & results were neutral. (No Impact on p/l system observed)
- ✓ Currently is H2 blending being done **5% (v/v)** in PNG Network.
- ✓ Further, M/s. DNV has been hired to conduct a detailed impact study of 5% H2 Blending in CGD network. Study is under progress.
- ✓ Can be replicated to other CGDs too.

Innovative Projects – India's largest PEM based Green Hydrogen plant

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- ✓ 4.3 TPD capacity green hydrogen plant.
- ✓ Based on PEM electrolyzer technology.
- ✓ Green hydrogen produced will be blended in the fuel gas of various gas turbines in the plant.
- ✓ Cascade filling provision is also being implemented.
- ✓ Can be replicated at other sites.



Green Hydrogen:
***Fueling India's
Clean Energy
Future***

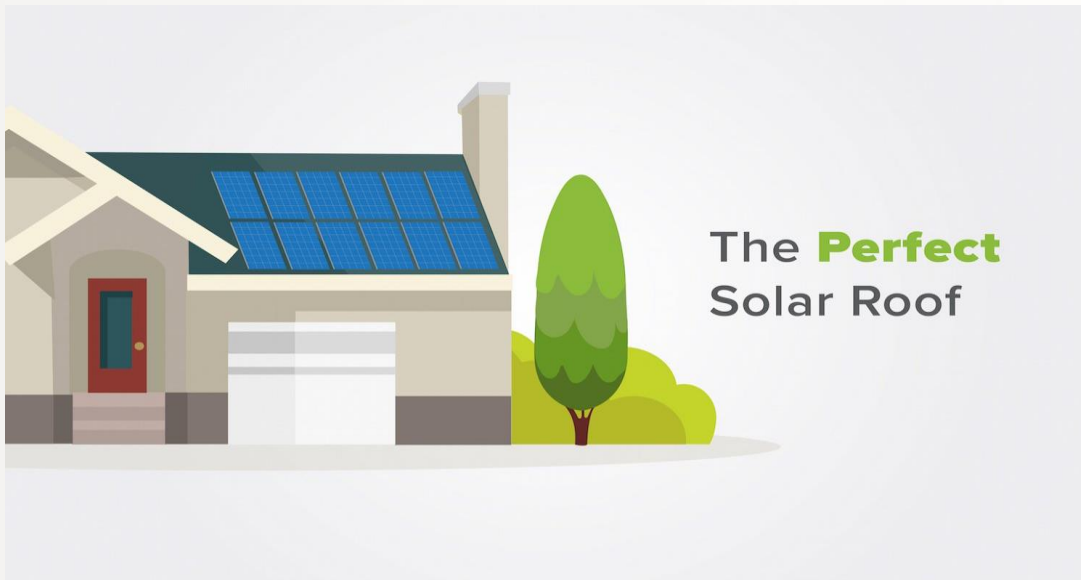


Renewable Energy Sources- Onsite

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Year	Source	Installed capacity (MW)	Capacity addition (MW) after FY 2021	Total Generation (million kWh)	Share % w.r.t to overall energy consumption
FY 2021-22	Rooftop solar	0.055	NIL	0.00825/annum	0.1
FY 2021-22	Rooftop solar	0.055	NIL	0.00825/annum	0.1
FY 2021-22	Rooftop solar	0.055	NIL	0.00825/annum	0.1



Renewable Energy Sources- Onsite (Upcoming)

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Year	Source	Installed capacity (MW)	Capacity addition (MW) after FY 2021	Total Generation (million kWh)	Share % w.r.t to overall energy consumption
FY 2024-25	Floating solar	7.75	Under Commissioning expected to be completed by March-25	1.16/annum	8.78%
FY 2024-25	Ground mounted solar	10	Under Commissioning expected to be completed by Sept-24	1.5/annum	11.3%
FY 2024-25	Ground mounted solar	1.8	Under Commissioning expected to be completed by Oct-24	0.27/annum	2.1%

CREATING THE PATH FOR GREENER FUTURE:-

In line with the MISSION AND VISION OF Government of India to make India an energy hub in respect of Green Hydrogen, GAIL has commissioned First Green Hydrogen plant of India. This plant will generate 4.3Tonne/day of Green Hydrogen through water electrolysis consuming renewable power.

GAIL has started sourcing Renewable Power for Green Hydrogen plant through open access which will be approximately 40% share of the total electrical energy consumed by the GAIL Vijaipur Complex.

Post Commissioning of above solar projects more than 75% of electricity will be from Renewable Source

GHG inventorisation

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Parameter (Kg CO2/Equivalent Product)	FY 2021-22	FY 2022-23	FY 2023-24
Scope 1 Emission	0.574	0.430	0.515
Scope 2 Emission	0.040	0.059	0.049
Scope 3 Emission	0	0	0



GAIL VIJAIPUR C2C3 + LPG-AIR EMISSIONS				
PARAMETERS	UNIT	2021-2022	2022-2023	2023-2024
SO2	TONS	45.41	95.32	99.07
NOX	TONS	163.90	121.07	103.43
PM	TONS	48.87	29.85	34.35
VOC	TONS	27.96	58.87	48.04
CO	TONS	105.00	131.13	60.66

Net Zero

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GAIL Vijaipur and central region team has laid the net zero roadmap and expects to be net zero by 2035 with following pillars.

- ✓ Bringing energy efficiency measures equivalent 20 MMSCM fuel up to 2040 by taking inhouse efforts and with the help of top-class consultants.
- ✓ Allocation/booking of Compressed Bio gas, setting up compressed bio gas plant equivalent 120 MMSCM quantity through NetZero Journey up to 2035.
- ✓ Replacing entire Gas based Power generation to solar and non-solar renewable energy.
- ✓ 20 % Hydrogen blending in natural gas-based Gas Turbines in phase manner and replacing 80 MMSCM natural gas.
- ✓ Conversion of Gas turbines into electric drives equivalent 110 MMSCM fuel up to 2035 and subsequently running electric drives from renewable energy.
- ✓ Rerouting entire flare and NG venting throughout Plant and pipeline network into fuel or source via innovative solutions.
- ✓ Utilization of direct vented CO₂ (approx. 420000 MT) into production of specialty chemicals, production of urea under carbon capture storage and utilization projects.
- ✓ Procuring power through long term renewable energy contracts and replacing all grid grey power.
- ✓ Maintaining 100000 mature trees and increasing size to 120000 trees up to 2035.
- ✓ Exploring carbon credit markets and offsetting 50000 TCo₂e via carbon credit purchase route.



Net Zero

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Major Steps taken for Energy Management and reduction of GHG Emissions in last 3-4 years:

- ✓ Installation of FGRU unit at C2C3 Flare which shall reduce approx. 18000 tCO₂ by recycling 1000 Sm³/Hr. flare gas to Process.
- ✓ Installation of 2 HRSGs on DVPL Compressor to utilize exhaust heat so converting into HP steam and same will reflect in reduction of fuel consumption in HRSG Boiler which shall lead to Reduction of 72 tCo₂e per day in atmosphere due less burning of 1096.5 SCM/Hr Natural Gas.
- ✓ Stopping of 1 BFW pump and saving 1 MWh per each hour.
- ✓ Implementation of IA/PA header interconnection between C2C3 and HVJ Offsites saving 150 KWh per hour.
- ✓ Installation of Solar PV having capacity 30KW HVJ, 25KW C2C3.
- ✓ Replacement by energy efficient equipment and led fixtures.
- ✓ Installation of VFDs on high power consuming motors.
- ✓ Installation of advance day lighting system on stores.
- ✓ Reducing fuel consumption of gas turbines by efficient use and optimization.



EMS System and other requirements

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Existing monitoring system:

- ✓ GAIL Vijaipur was given certification of ISO : 50001-2011 in March-2018.
- ✓ GAIL Vijaipur was given certification of latest version of ISO:50001 i.e. ISO : 50001-2018 in 2021.
- ✓ Since, March-2018 GAIL Vijaipur is complying all the requirement of the standard and the certification is being awarded continuously since then. The latest recertification was done on 30 March, 2024 which is valid until 29 March 2027.



EMS System and other requirements

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VEXIL BUSINESS PROCESS SERVICES

Certificate

This Certificate is issued to

GAIL (INDIA) Limited
(A Government of India Undertaking)
LPG & C2C3 Plant
GAIL Complex
Vijaipur 473 112
District Guna
Madhya Pradesh
INDIA

who have implemented a Quality Management System, which meets the requirements laid down in ISO 9001:2015, with the following scope:

Processing of Natural Gas for recovery and Supply of C2C3 and Liquid Hydrocarbons (including LPG, Propane, Pentane & Naphtha) by Road, Rail & Pipeline and associated activities (including Hospital Services)

Certificate No. : 09118824
Original Issue : 04 February 2013
Latest Issue : 14 September 2022
Valid Till : 13 September 2025

The continuing validity of this certificate is subject to timely conduct of surveillance audits

Surveillance 1 due before : 08 September 2023
Surveillance 2 due on : 08 September 2024

for Vexil Business Process Services Private Limited
109 D, Kanta Nagar, Delhi 110 007

ISO 9001:2015

To check the validity of this certificate, please email to info@vexil.com
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Copies of reproduction of this certificate is not permitted.
Upon request, the Certificate shall be returned to Vexil Business Process Services Private Limited.

VEXIL BUSINESS PROCESS SERVICES

Certificate

This Certificate is issued to

GAIL (INDIA) Limited
(A Government of India Undertaking)
LPG & C2C3 Plant
GAIL Complex
Vijaipur 473 112
District Guna
Madhya Pradesh
INDIA

who have implemented an Environmental Management System, which meets the requirements laid down in ISO 14001:2015, with the following scope:

Processing of Natural Gas for recovery and Supply of C2C3 and Liquid Hydrocarbons (including LPG, Propane, Pentane & Naphtha) by Road, Rail & Pipeline and associated activities (including Hospital Services)

Certificate No. : E9118838
Original Issue : 04 February 2013
Latest Issue : 14 September 2022
Valid Till : 13 September 2025

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ISO 14001:2015

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VEXIL BUSINESS PROCESS SERVICES

Certificate

This Certificate is issued to

GAIL (INDIA) Limited
(A Government of India Undertaking)
LPG & C2C3 Plant
GAIL Complex
Vijaipur 473 112
District Guna
Madhya Pradesh
INDIA

who have implemented an Occupational Health and Safety Management System, which meets the requirements laid down in ISO 45001:2018, with the following scope:

Processing of Natural Gas for recovery and Supply of C2C3 and Liquid Hydrocarbons (including LPG, Propane, Pentane & Naphtha) by Road, Rail & Pipeline and associated activities (including Hospital Services)

Certificate No. : H9118843
Original Issue : 04 February 2013
Latest Issue : 14 September 2022
Valid Till : 13 September 2025

The continuing validity of this certificate is subject to timely conduct of surveillance audits

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for Vexil Business Process Services Private Limited
109 D, Kanta Nagar, Delhi 110 007

ISO 45001:2018

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GREEN COMPANY RATING SYSTEM

Greenco

GAIL - SOHRAJI GODREJ GREEN BUSINESS CENTRE, INDIA

GAIL Vijaipur

SILVER

2021

Major accomplishments

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International Research Institute for Manufacturing
CNC TVS moneycontrol

DIAMOND AWARD

As Per NAMC, the diamond trophy is for organization that have performed beyond the expectation of the gold medals towards becoming globally competitive. The only criteria for the Award is that the facility should have won gold medal thrice in last editions of NAMC.

Received 3 GOLD Medal in NAMC in a row

The infographic shows a progression from three gold medals to a large diamond award. It includes logos for International Research Institute for Manufacturing, CNC TVS, and moneycontrol. A paper airplane icon is also present.

GPU Vijaipur, became the first unit of GAIL, recommended for “DIAMOND AWARD” in “National Award for Manufacturing Competitiveness 2022”

Another Feather in GPU Vijaipur Cap

“AATMANIRBHAR (SELF-RELIANT) NATION BUILDER AWARD ”

Issued by International Research Institute for Manufacturing

AWARDS & HONORS

GAIL STANDS COMMITTED FOR A AATMANIRBHAR BHARAT

Based on initiatives taken for making self-Reliant Nation

The infographic features the International Research Institute for Manufacturing logo, an 'AWARDS & HONORS' badge, and the text 'GAIL STANDS COMMITTED FOR A AATMANIRBHAR BHARAT'. It also includes icons for 'IMPORT SUBSTITUTION', 'IMPORT', and 'Aatmanirbhar Bharat'.

GAIL Vijaipur received AATMANIRBHAR (SELF-RELIANT) NATION BUILDER AWARD from International Research Institute for Manufacturing (IRIM).



GPU Vijaipur received Safety Innovation Award 2023 in 20th safety convention.

Major accomplishments

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GPU Vijaipur received suraksha puraskar by National safety council of India .



GAIL Vijaipur received gold award in the OHS category in the Grow Care India 7th annual safety and HR award.



GAIL Vijaipur has been declared the winner of British Safety Council's Merit Award



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#hawabadlo



THANK YOU

Yogesh Singh, DGM (GPU-OPS)

yogeshsingh@gail.co.in

9111999150