23rd National Award for Excellence in Energy Management 2022

Bharat Petroleum Corporation Limited

Pipelines

Mr. Saikumar P S - Head of Maintenance Department

Mr. Sanjeev Kakan - Head of Operation Department

Mr. Harshal Talele - Lead Presenter
(Chief Manager Elect & Instr Maintenance, Pipelines HQ)

- ***Msc Energy Policy, University of Sussex, UK***
- ***PGD in Renewable Energy Management***
- ***BEE Energy Manager***

Mr. Brajendra M Singh- Member
(Manager Electrical Maintenance, Pipelines HQ)

1. Brief introduction on Company / Unit

Refinery

2507 KM

Petroleum Pipelines

17.90 MMT

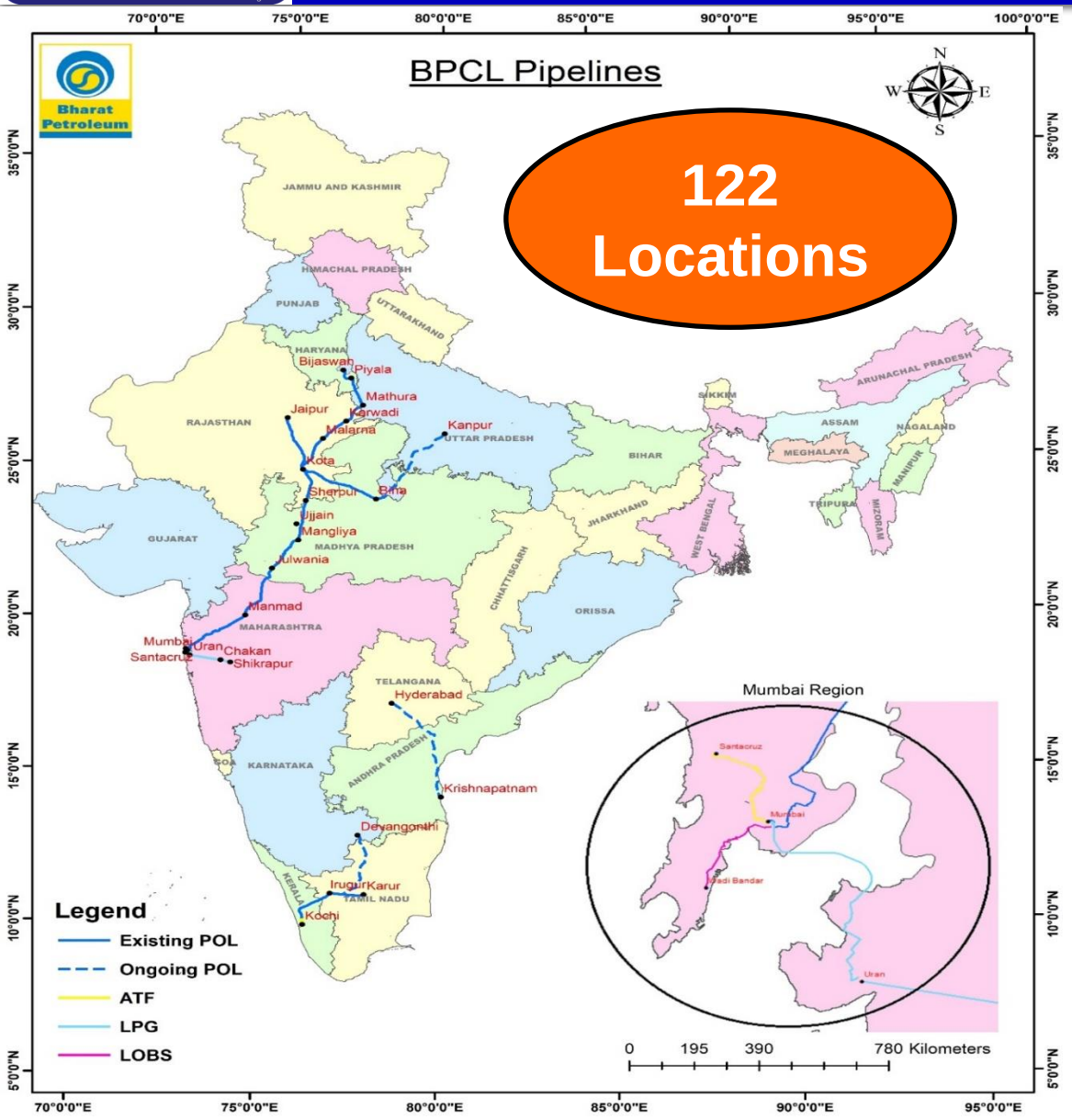
BPCL Depot

1. Bharat Petroleum Corporation Limited (BPCL) is an Indian government-owned oil and gas explorer and producer.

2. BPCL is *Maharatna Public Sector Undertaking* and *fortune 500* corporation.

3. Pipelines are “Lifeline of Refinery”.

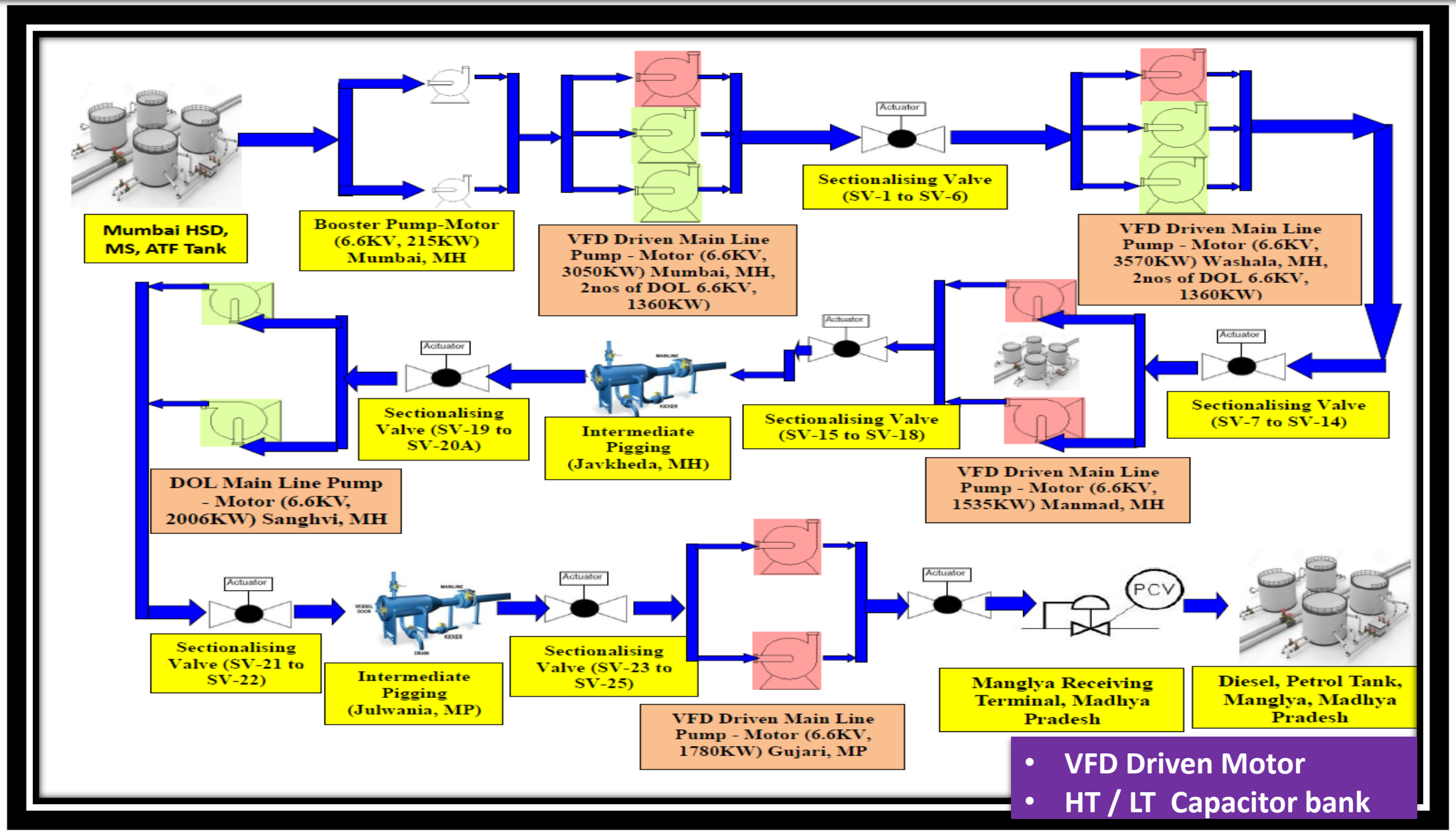
2. Manufacturing process



Petroleum Pipelines- HSD, MS & SKO

PIPELINE SECTION	PIPELINE DIA (INCH)	LENGTH (KM)	DESIGN CAPACITY (MMTPA)
MUMBAI-MANMAD	18”	252	6
MANMAD-MANGLYA	14”	358	3.5
MANGLYA-PIYALA	16”	722	2.2
PIYALA-BIJWASAN	8”	57	1
BINA-KOTA	18”	259	4.4
KOTA-JOBNER	14”	211	1.70
COCHI- COIMBATORE	18”	183	4
COIMBATORE - KARUR	14”	110	1.5
BINA-KANPUR	18”	355	3.50

2. Manufacturing process



- VFD Driven Motor
- HT / LT Capacitor bank

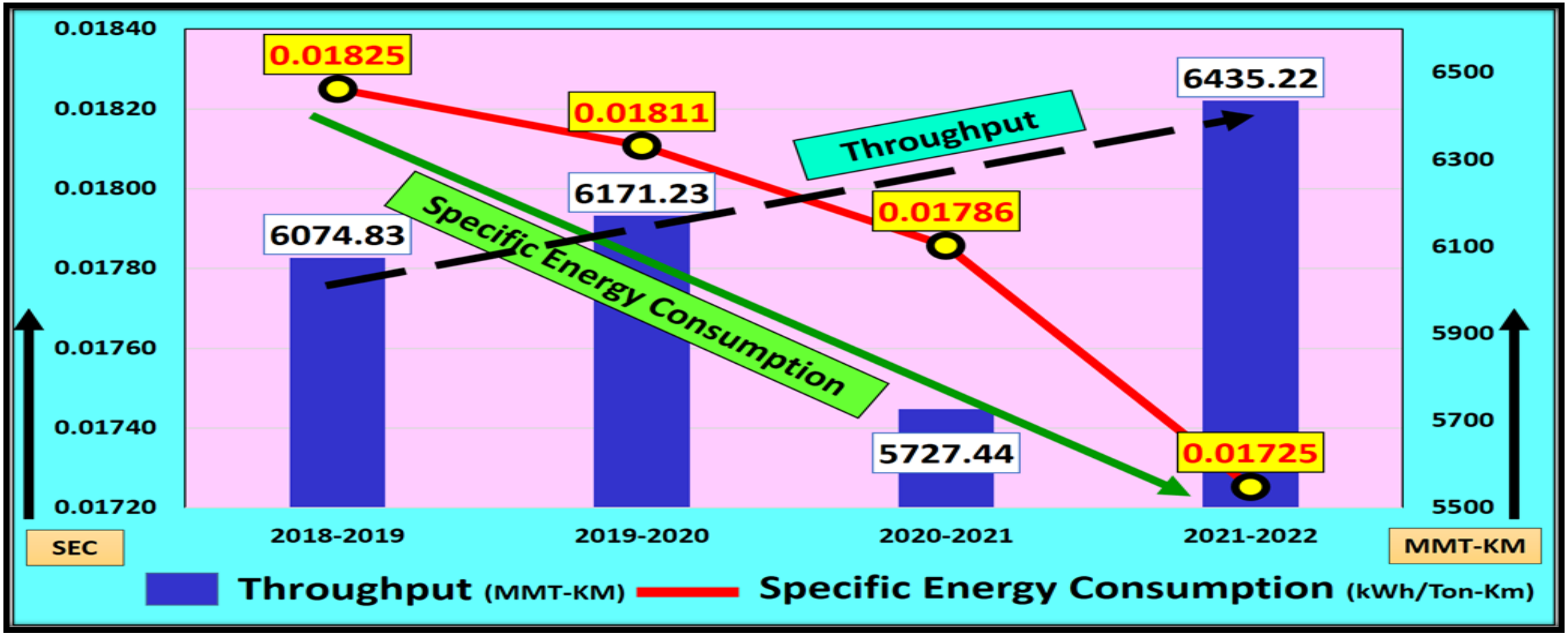
3. Sp. Energy Consumption in last 3 years (FY 2019-22)

❖ **Pipelines energy consumption is due to electricity only and thermal energy consumption is Nil.**

FY	Electrical Energy Consumption (million KWh)	Cost of Electricity Consumed (million INR)	Product processed (MMT-KM)
2019-2020	111.74	891.8	6171.23
2020-2021	102.28	776.5	5727.44
2021-2022	111.03	848.8	6435.22

3. Sp. Energy Consumption in last 3 years (FY 2019-22)

❖ **Specific energy consumption decreased since last 3 years (FY: 2019-2022)**



3. Sp. Energy Consumption in last 3 years (FY 2019-22)

Reasons for decrease in specific energy consumption

- ❖ Pipeline throughput (MMT-KM) increased by 6% but Specific Energy Consumption (SEC) decreased by 7%

- ❖ Effects of energy efficiency projects carried out in past 3 years (2019-2022).

- ❖ Optimised operation and increased operation efficiency even though low throughput requirement in COVID-19.

4. Information on Competitors, National & Global benchmark

- Solomon study carried out by Centre for High Technology (CHT) under Ministry of Petroleum & Natural Gas on Pipelines
- Solomon studied on 47 nos of national and international cross-country petroleum pipelines
- As per Solomon study average SEC for petroleum pipeline is 0.01941 KW/MMT-KM
- BPCL Pipelines SEC is 0.01786 KW/MMT-KM which is 8.7% lower than average SEC.
- BPCL Pipelines kept last year SEC consumption as a benchmark for next year and planning accordingly.

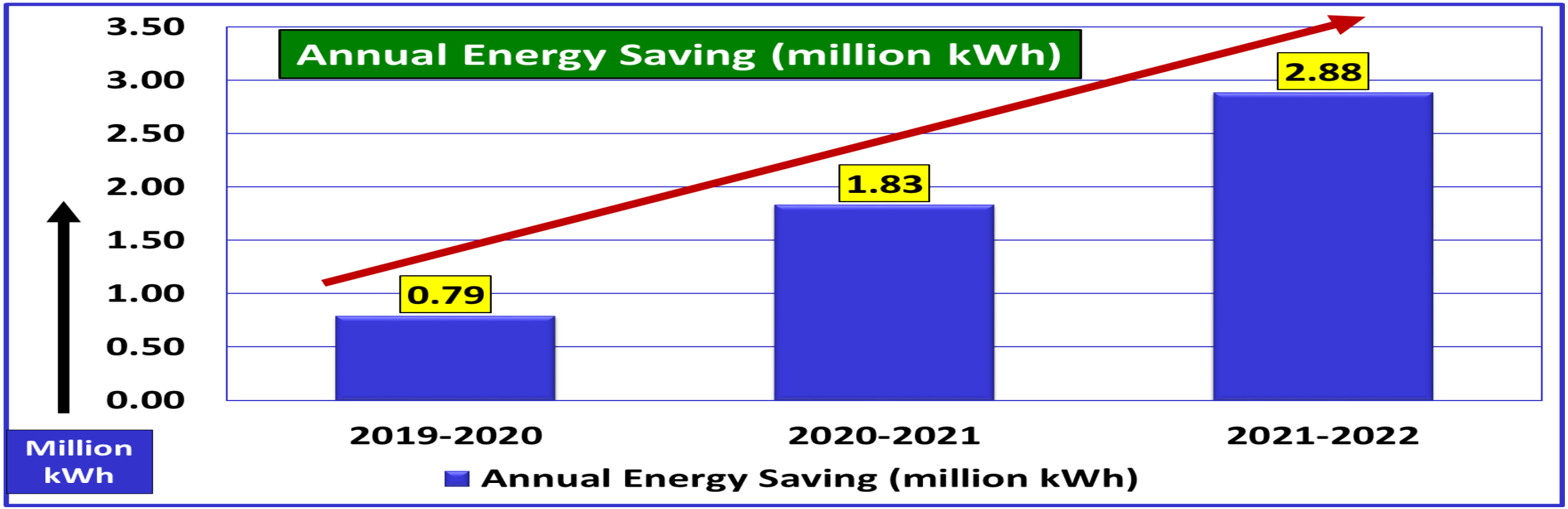
List of Major Encon project planned in FY 2022-23

Sr. No.	Project description	Location	Annual Electrical Saving (million kWh)	Investment (Rs in Million)
1	Installation of VFD with synchronous bypass panel (Already VFD available but obsolete and without synchronous bypass panel)	Mumbai, MH	0.6	25
2		Washala, MH	0.6	25
3	Installation of 120 kWp solar plant	Washala, MH	0.18	9.4
4	Installation of 1 MW solar plant	Sanghvi, MH	1.54	7.92
5	Replacement of conventional package AC by energy efficient new AC	11 TR X 3, Manmad, MH	0.1	1.09
6		17 TR X 2, Manglya, MP	0.13	1.11
7		17 TR X 7, Kota, RJ	0.38	3.56
8		17 TR X 5, Piyala, HR	0.29	2.57
9		17 TR X 3, Bijwasan, DL	0.16	1.91
10		17 TR X 4, Washala, MH	0.19	2.27
11	Energy saving by lighting automation with use of PIR sensor	11nos locations	0.24	0.55
12	Temperature controlled damper operation in centralized air conditioning system	11nos locations	0.42	2.2

Total Annual Electrical Saving Planned = 4.83 million kWh

5. Energy Saving projects implemented in last three years

FY	No of Energy Saving Projects	Electrical Saving (million kWh)	Electrical Cost Saving (Rs million)	Investments (Rs in million)	Payback (Months)
2019-2020	5	0.79	6.34	7.24	14
2020-2021	6	1.04	8.47	5.16	7
2021-2022	6	1.07	9.20	18.56	24



5. Energy Saving projects implemented in last three years

FY: 2019-2020

Sr. No	Project Description	Annual Electrical Saving (kWh)	Annual Electrical Cost Saving (Rs million)	Investment (Rs million)	Payback (Months)
1	Energy saving by lighting automation with use of passive infrared sensor (PIR) sensor at Piyala (160 nos of lights and 4hrs off period)	21900	0.19	0.05	3
2	Auto operation of retail LT capacitor bank to improve power factor from 0.96 to 0.99 at Piyala, Haryana	82152	0.70	0.10	2
3	Replacement of 334nos of Street light fittings from 72W HPMV to 40W LED light fittings	69733	0.56	1.43	31
4	Replacement of 297nos of Street light fittings from 125W HPMV to 100W LED light fittings	59623	0.48	1.71	43
5	Replacement of 687nos of Street light fittings from 250W HPSV to 100W LED light fittings	551661	4.41	3.95	11
	Total	785069	6.34	7.24	14

Reduction in CO_2 emissions in MT (Annual) = 722.26

5. Energy Saving projects implemented in last three years

FY: 2020-2021

Sr. No	Project Description	Annual Electrical Saving (kWh)	Annual Electrical Cost Saving (Rs million)	Investment (Rs million)	Payback (Months)
1	Replacement of 104 nos of Street light fittings from 72W HPMV to 45W LED light fittings	15450	0.13	0.31	29
2	Replacement of 4773 nos of Street light fittings from 36W tubelight fittings to 20W LED light fittings	689889	5.52	1.89	4
3	Replacement of 188 nos of Street light fittings from 18W CFL with chock to 18W LED light fittings	6039	0.05	0.07	17
4	Replacement of 294 nos of Street light fittings from 125W HPMV to 60W LED light fittings	106237	0.85	1.07	15
5	Temperature controlled damper operation in centralized air conditioning system at Piyala	37735	0.32	0.20	8
6	Replacement of conventional package AC (17TR X 4) by energy efficient new AC at Piyala	187818	1.60	1.62	12
	Total	1043168	8.47	5.16	7

Reduction in CO_2 emissions in MT (Annual) = 959.71

5. Energy Saving projects implemented in last three years

FY: 2021-2022

Sr. No	Project Description	Annual Electrical Saving (kWh)	Annual Electrical Cost Saving (Rs million)	Investment (Rs million)	Payback (Months)
1	Energy saving by operation excellence- Single pump operation in CCKPL was increased by 25% compared to last year which saved 7.74% energy units	322191	2.74	NIL	-
2	Energy saving by operation excellence- Ex-Mangliya PLTs were executed with optimum power consumption.	105000	0.89	NIL	-
3	Installation of Drag Reducing Agent System at Manmad and Gujari	189000	1.61	15	112
4	Supply & installation of 50 KVAR capacitor bank with APFC at Manmad (Power factor from 0.985 to 0.998)	57666	0.49	0.12	3
5	Supply & installation of 30 KVAR capacitor bank with APFC at IP-01 Guna (Power factor from 0.4 to 0.991)	37735	0.32	0.2	8
6	Replacement of conventional package AC (17TR X 8) by energy efficient new AC at Bina	362654	3.15	3.24	12
	Total	**1074246**	**9.20**	**18.56**	**24**

Reduction in CO_2 emissions in MT (Annual) = 988.31

6. Innovative Projects implemented

ENERGY SAVING PROJECT- Installation of Drag Reducing Agent (DRA) Skid at Manmad, Maharashtra and Gujari, Madhya Pradesh

- Targeted to increased pipeline flowrate and to reduce energy consumption.
- Earlier DRA were being used at other BPCL pumping locations. Further study revealed that DRA save significant amount of energy in petroleum pipeline.

Energy Saving= 0.19 million units (Annually)

Reduction in CO2 emissions in MT (Annual) = 173.88

Energy Consumption-Before (kWh/per day)	Energy Consumption-After (kWh/per day)	Electrical Energy Savings (kWh/per day)	Annual Electrical Saving (kWh)	Annual Electrical Cost Saving (Rs million)	Investment (Rs million)	Payback (Months)
198288	197658	630	189000	1.61	15	112

6. Innovative Projects implemented

Energy saving by operation excellence at CCKPL

- Optimized operation- Single pump operation in CCKPL was increased by 25% compared to last year.
- Energy Saving= 0.32 million units (Annually)
- Reduction in CO2 emissions in MT (Annual) = 196.42

Energy Consumption-Before (kWh/per day)	Energy Consumption-After (kWh/per day)	Electrical Energy Savings (kWh/per day)	Annual Electrical Saving (kWh)	Annual Electrical Cost Saving (Rs million)	Investment (Rs million)	Payback (Months)
55502.36	54428.39	1073.97	322191	27.39	NIL	-

6. Innovative Projects implemented

Energy saving by operation excellence at Manglya, Madhya Pradesh

- Optimized operation- The VFD output at Mangliya was significantly reduced by 20% by studying the hydraulic simulator of Mangliya-Kota section whenever PLT to Jobner, Rajasthan was in progress.

- Energy Saving= 0.11 million units (Annually)

- Reduction in CO_2 emissions in MT (Annual) = 96.60

Energy Consumption-Before (kWh/per day)	Energy Consumption-After (kWh/per day)	Electrical Energy Savings (kWh/per day)	Annual Electrical Saving (kWh)	Annual Electrical Cost Saving (Rs million)	Investment (Rs million)	Payback (Months)
3309.45	2959.45	350	105000	8.93	NIL	-

7.Utilisation of Renewable Energy sources

On-site Solar system installed at 74nos of Pipeline Locations

Total Solar plant capacity = 3.83 MW

Energy Saving= 0.11 million units (Annually)

Reduction in CO2 emissions = 96.60 MT (Annual)

7.Utilisation of Renewable Energy sources

On-site Solar system installed at 74nos of Pipeline Locations

Financial Year	Technology	Type of Energy	Installed Capacity (MW)	Generation (million Kwh)	% of overall electrical energy
2019-2020	Electrical	Solar	3.83	2.92	2.61
2020-2021	Electrical	Solar	3.83	3.98	3.89
2021-2022	Electrical	Solar	3.83	4.12	3.71

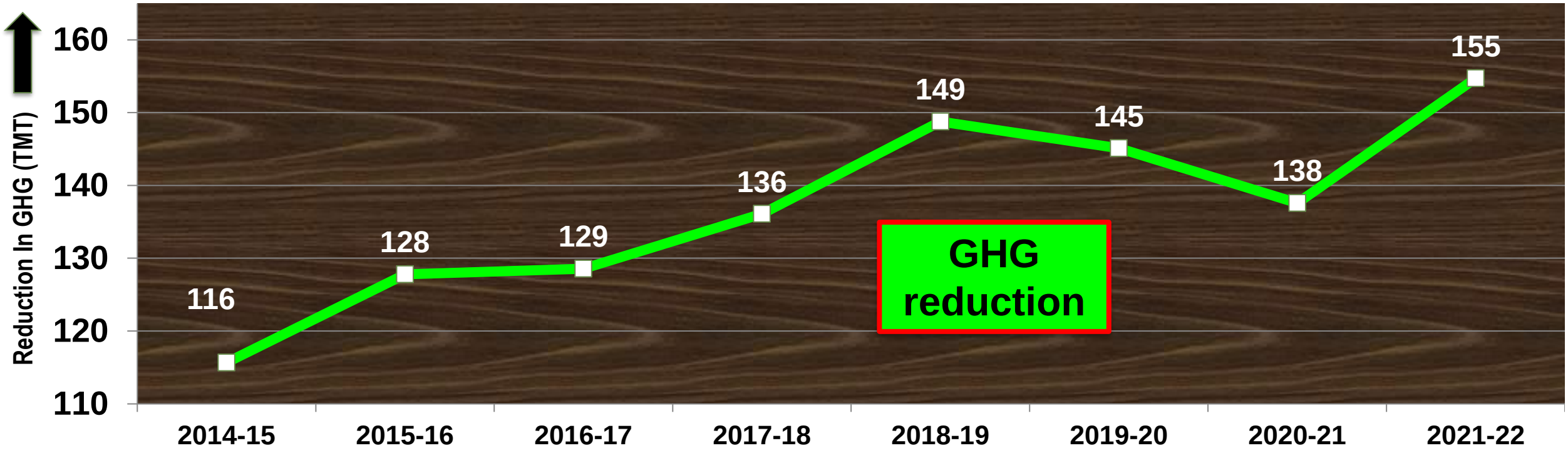
8.Waste utilization and management

❖ **No significant quantity hazardous waste generated in Pipeline transfer activity and energy use**

Sr. No.	Type of waste generated	Quantity of waste generated (MT/year)			Disposal Method
		2019-2020	2020-2021	2021-2022	
1	Used or Spent Oil (Pump lube oil)	0.05	0.01	1.665	In-house use (Recycled)
2	Waste or residues containing oil (Cotton waste or pig cups)	0.35	0.27	0.73	Pollution control board authorized party
3	Discarded Containers / Barrels / Liners contaminated with hazardous wastes	2.23	1.8	1.5	Pollution control board authorized party

9. GHG Inventorisation

- ❖ Pipeline transfer process does not generate any direct GHG emission.
- ❖ Indirect GHG emission is only due to electricity consumption
- ❖ CO2 emission reduced due to pipeline transfer process and initiatives taken in past 3 years



10. Green Supply Chain Management

- ❖ Management commitment to continual improvement in energy performance.
- ❖ Bringing energy efficiency in the design & tendering stage
- ❖ Ensuring energy efficient equipment use during execution by contractors. Implemented clause in tender condition.
- ❖ Responsible energy management team & BEE certified Energy Manager and Energy Auditor
- ❖ Certification of ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

23rd National Award for Excellence in Energy Management 2022

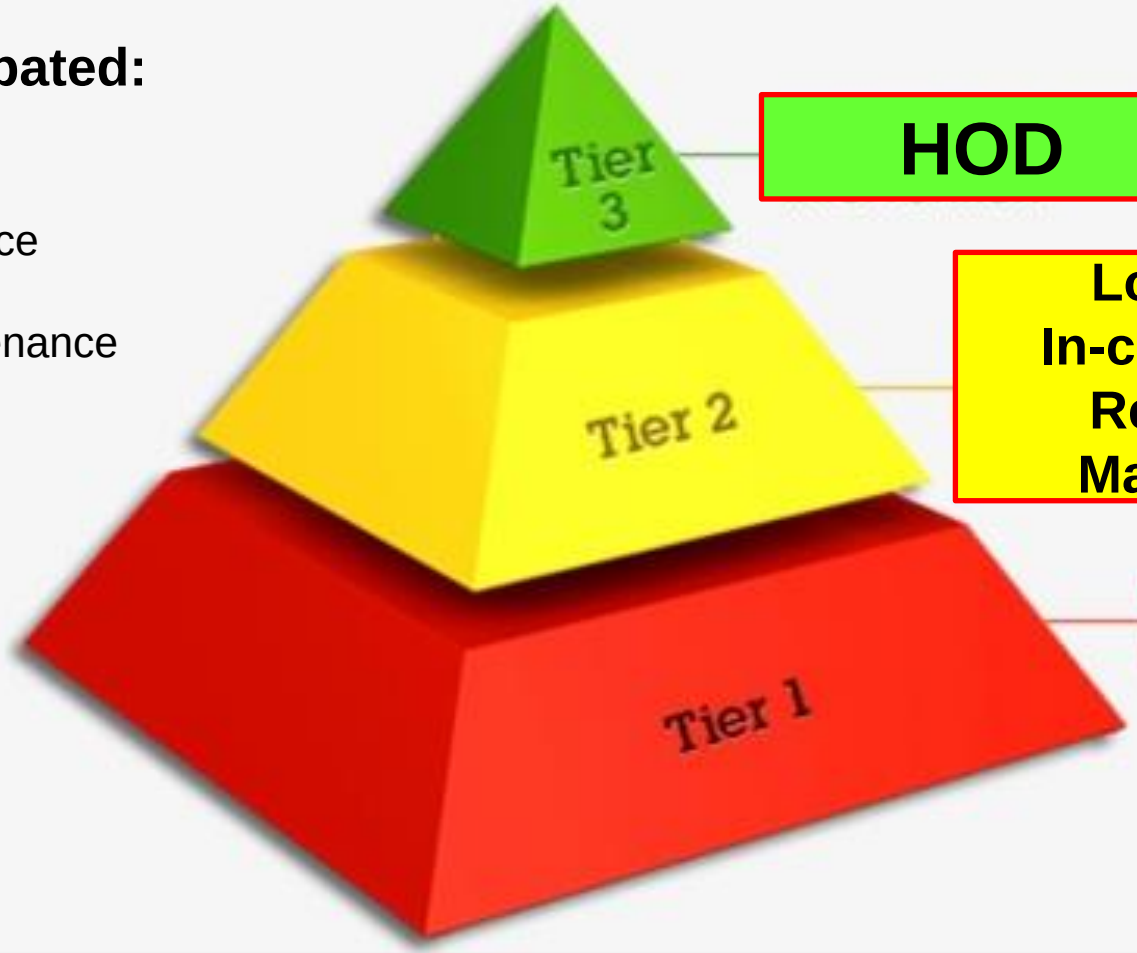
Energy Conservation Initiatives (2019-2022)

11. Teamwork, Employee Involvement & Monitoring

BPCL Pipelines 3 tier mechanism of energy performance review

Department Participated:

1. Operation
2. Mechanical Maintenance
3. Electrical Maintenance
4. Instrumentation Maintenance
5. HSSE



HOD	**Quarterly**
Location In-charges & Regional Managers	**Monthly**
Control Room Officer & Contract workmen	**Daily**

Energy Management team members supported by BEE certified energy manager and review meeting chaired by Head of Department

11. Teamwork, Employee Involvement & Monitoring

Classroom and hands-on training on energy efficiency improvement for workmen and management staff

Name of trainer : Ajay Kumar Verma

Topic of training : Energy Conservation / EnMS.

Topic Summary: Briefing on ISO 50001:2018, Energy performance Measurement & Improvement Methods, Calculation / Measures to improve Energy Efficiency of Pumps, Motors, transformers, Significant energy use Working Group Members & their role, Quiz on energy Conservation, Practical demonstration of activities.

Attended By:

Sr. No	Name	Designation	Organisation	Signature
1	Pravin Baisagi	Technician	Sanmarg	
2	Prakash maida	Fitter	Rotodyne	
3	Bhawa Gamwal	Gradman	MP. Multi S.	
4	Prakash Gamwal	Gradman	MP. Multi S	
5	Mukesh Kryadav	Supervisor	Sanmarg	
6	Rajendra Singh	S.G	CSPL	
7	Bhuwa Gamwal	Gradman	MP. Multi S	
8	Santosh pazgi	Sweeper	MP. Multi S.	Santosh
9	Kamlal Solanki	Sweeper	MP. Multi S	Kamlal
10	Shankar Gamwal	office boy	MP. Multi S	
11	Ramesh - Gola	S.G	CSPL	
12	Chandrashekhar Dubi	Electrical Tec.	Sanmarg	
13	Hemraj Dadjoti	Electrical Tec.	Sanmarg	
14	Yogendra Rothore	Driver	S.A. Travels	
15	Eshwar - Gola	S.G	CSPL	
16	Gopal Jaisy	Opr	Sanmarg	
17	Nandalal pazgi	Gradman	MP Multi S.	Nandalal
18				
19				
20				

Ajay Kumar Verma

Signature of Trainer

11. Teamwork, Employee Involvement & Monitoring

Daily monitoring of energy consumption and Specific energy consumption

DAILY MONITORING ENERGY CONSUMPTION & SPECIFIC ENERGY CONSUMPTION

Date	Power Consumption						MT	KWH/MT	Total Cost (Rs)	Cost Rs./MT
	Mumbai			Washala	Manmad	TOTAL Kwh				
	MLP	BP	TOTAL							
01-May-21	55737	3454	**60073**	62080	60133	**182286**	**22085**	8.254	1654086.75	74.90
02-May-21	56532	4442	**61857**	63840	58400	**184097**	**22243**	8.277	1667761.945	74.98
03-May-21	44172	3698	**48753**	54960	47867	**151580**	**20027**	7.569	1362983.55	68.06
04-May-21	32527	3278	**36689**	48480	36533	**121702**	**18444**	6.598	1083074.85	58.72
05-May-21	32680	3304	**36868**	49800	36800	**123468**	**18524**	6.665	1096314.69	59.18
06-May-21	36859	3236	**40980**	54080	42667	**137727**	**19470**	7.074	1213714.638	62.34
07-May-21	43599	3304	**47790**	58520	49867	**156177**	**19470**	8.021	1367215.658	70.22
08-May-21	44133	3255	**48276**	58040	50667	**156983**	**20248**	7.753	1371675.225	67.74
09-May-21	44734	3976	**49598**	58920	50667	**159185**	**20178**	7.889	1394475.48	69.11
10-May-21	45700	3835	**50423**	58640	50533	**159596**	**20254**	7.880	1397243.14	68.99
11-May-21	46070	3578	**50536**	59200	51733	**161469**	**20681**	7.808	1414333.175	68.39
12-May-21	45040	3564	**49492**	56720	49067	**155279**	**20443**	7.596	1358568.325	66.46

Voltage	KWH	MD	SEC
Current	P.F.	Trend	Cost/MT

12. Implementation of ISO 50001/Green Co/IGBC rating

- **BPCL Pipelines plan for commencement of ISO 50001:2018 in September'22.**

- **Even though ISO 50001 not implemented but all energy monitoring, SOP and action plan carrying out as per ISO 50001 only.**

- Total turnover of the BPCL FY 2021-22 = Rs. 10088.30 million
- Amount invested in EnCon Projects by Pipelines FY 2021-22 = Rs. 19.41 million

% investment of energy saving projects on total turnover of the company is 0.19%

13 Learning from CII Energy Award 2020 or any other award program

CII Energy Award

BEE Energy Award

World Energy Council

1. Facilitated sharing of information on best practices & technologies

2. Getting knowledge on proven best practices in energy efficiency projects of other industries

3. Good platform for sharing of other industries energy management and green supply chain policy along with networking of participants

4. In last 3 years, BPCL Pipelines learnt a lot from energy award and improved self by carrying out gap analysis in Energy Management and all best practices implemented at all sites

Implementation of ISO 9001, 14001 & 45001

ISO 9001:2015

DNV·GL

MANAGEMENT SYSTEM CERTIFICATE

Certificate No: 206630-2016-AQ-IND-RvA | Initial certification date: 24 September 2010 | Valid: 24 September 2019 - 23 September 2022

This is to certify that the management system of

Bharat Petroleum Corporation Limited
(Pipelines Entity)
Head Office: Mumbai Refinery, Mahul, Mumbai – 400 074, Maharashtra, India
and the sites as mentioned in the appendix accompanying this certificate

has been found to conform to the Quality Management System standard:
ISO 9001:2015

This certificate is valid for the following scope:
Operations and maintenance of cross-country pipelines transporting petroleum products like motor spirit, high speed diesel, superior kerosene oil, aviation turbine fuel and liquefied petroleum gas through (Mumbai- Manmad-Bijwasan, Bina-Kota, Kota - Jobner, Mumbai-Uran and Cochin- Coimbatore-Karur) pipelines

Place and date: **Chennai, 30 December 2019**

IAF MGMT. SYS. RvA C 024
The RvA is a signatory to the IAF MLA

For the issuing office:
DNV GL – Business Assurance
ROMA, No. 10, GST Road, Alandur, Chennai - PIN - 600 016, India

Sivadasan Madiyath
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

ISO 14001:2015

DNV·GL

MANAGEMENT SYSTEM CERTIFICATE

Certificate No: 206632-2016-AE-IND-RvA | Initial certification date: 24 September 2010 | Valid: 24 September 2019 - 23 September 2022

This is to certify that the management system of

Bharat Petroleum Corporation Limited
(Pipelines Entity)
Head Office: Mumbai Refinery, Mahul, Mumbai – 400 074, Maharashtra, India
and the sites as mentioned in the appendix accompanying this certificate

has been found to conform to the Environmental Management System standard:
ISO 14001:2015

This certificate is valid for the following scope:
Operations and maintenance of cross-country pipelines transporting petroleum products like motor spirit, high speed diesel, superior kerosene oil, aviation turbine fuel and liquefied petroleum gas through (Mumbai- Manmad-Bijwasan, Bina-Kota, Kota - Jobner, Mumbai-Uran and Cochin- Coimbatore-Karur) pipelines

Place and date: **Chennai, 30 December 2019**

IAF MGMT. SYS. RvA C 024
The RvA is a signatory to the IAF MLA

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ROMA, No. 10, GST Road, Alandur, Chennai - PIN - 600 016, India

Sivadasan Madiyath
Management Representative

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www.dnvgl.com/assurance

ISO 45001:2018

DNV·GL

MANAGEMENT SYSTEM CERTIFICATE

Certificate No: 10000328932-MSC-RvA-IND | Initial certification date: 24 September 2010 | Valid: 24 September 2019 - 23 September 2022

This is to certify that the management system of

Bharat Petroleum Corporation Limited
(Pipelines Entity)
Head Office: Mumbai Refinery, Mahul,Mumbai - 400074, Maharashtra, India
and the sites as mentioned in the appendix accompanying this certificate

has been found to conform to the Occupational Health and Safety Management System standard:
ISO 45001:2018

This certificate is valid for the following scope:
Operations and maintenance of cross country pipelines transporting petroleum products like motor spirit, high speed diesel, superior kerosene oil, aviation turbine fuel and liquefied petroleum gas through (Mumbai-Manmad-Bijwasan, Bina-Kota, Kota - Jobner, Mumbai-Uran and Cochin-Coimbatore-Karur) pipelines

Place and date: **Barendrecht, 10 March 2020**

IAF MGMT. SYS. RvA C 024

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

Erie Koek
Management Representative

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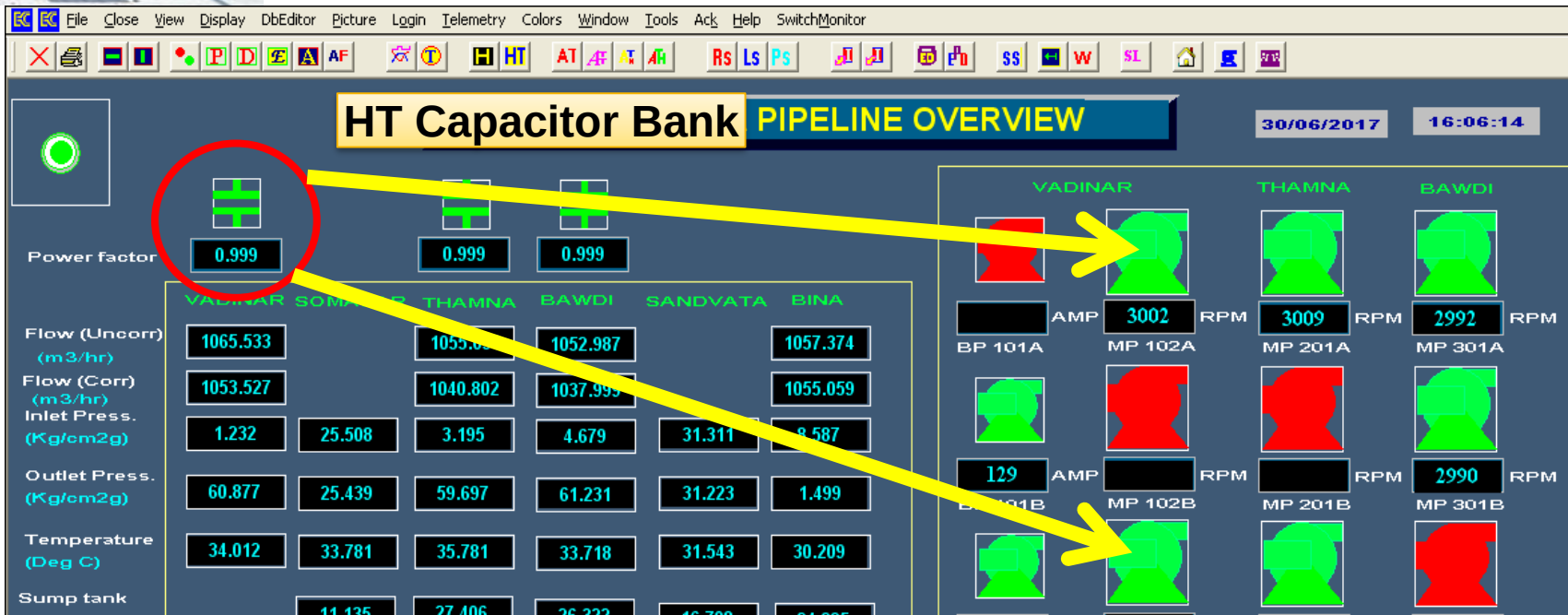
www.dnvgl.com/assurance

24th Sept'19 to 23rd Sep'22

Automation of HT & LT Capacitor Bank

All 122 nos Pipeline locations maintaining power factor above 0.995

Energy Monitoring by SCADA



Solar powered SV stations

100% Solar Powered Bina-Panki Multiproduct Pipeline SV stations

- 11nos of 19.2 kWp solar power plant
- Total Capacity: 211.2 kWp

Commissioned by Hon'ble
Prime Minister Shri Narendra Modi

Awards and Achievements

Oil & Gas Pipeline Transportation – Company of The Year 2015 by PetroFed

Best Construction Projects 'Bina-Panki Pipeline by 13th CIDC Vishwakarma Awards 2022

Shrestha Suraksha Puraskar" for Outstanding Safety Management from National Safety Council

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