Total Energy Management at PVBU, Pune

TATA MOTORS
Connecting Aspirations

TATA MOTORS
Chikhali

COMMITMENT TO GLOBAL CAUSE
ENERGY CONSERVATION CELL
PCBU-TATA MOTORS

CII

Presenting Team:

Mr. Anand Lapalkar (Deputy General Manager – Tech.Services)

Mr. Sudarshan R Hingangave (Sr. Manager – Tech.Services)

BRIEF INTRODUCTION OF COMPANY

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Part of USD 113 billion Tata Group, Tata Motors Ltd., a USD 35 billion organization, is among the leading global automobile manufacturer in world, providing integrated smart & e- mobility solution to over 125+ countries, with an over 75000 + employee base

✓

Delivering driving experiences that are 'NEW FOREVER'

Our PV offerings include a whole new generation of passenger cars and utility vehicles that redefine their respective segments with class-leading design, safety, technology and driving dynamics. The entire range is BSVI complaint and exemplifies the IMPACT 2.0 design language

✓

Winning sustainably in PVs

- 5-star Global NCAP rating attained by Altroz in 2020 and Nexon in 2018
- 4-star Global NCAP rating attained by Tiago and Tigor in 2020

✓

Winning proactively in EV s

O
viable environment to drive the adoption of EVs in India.

Sp. Energy Consumption in last 5 years (FY 2019-22)

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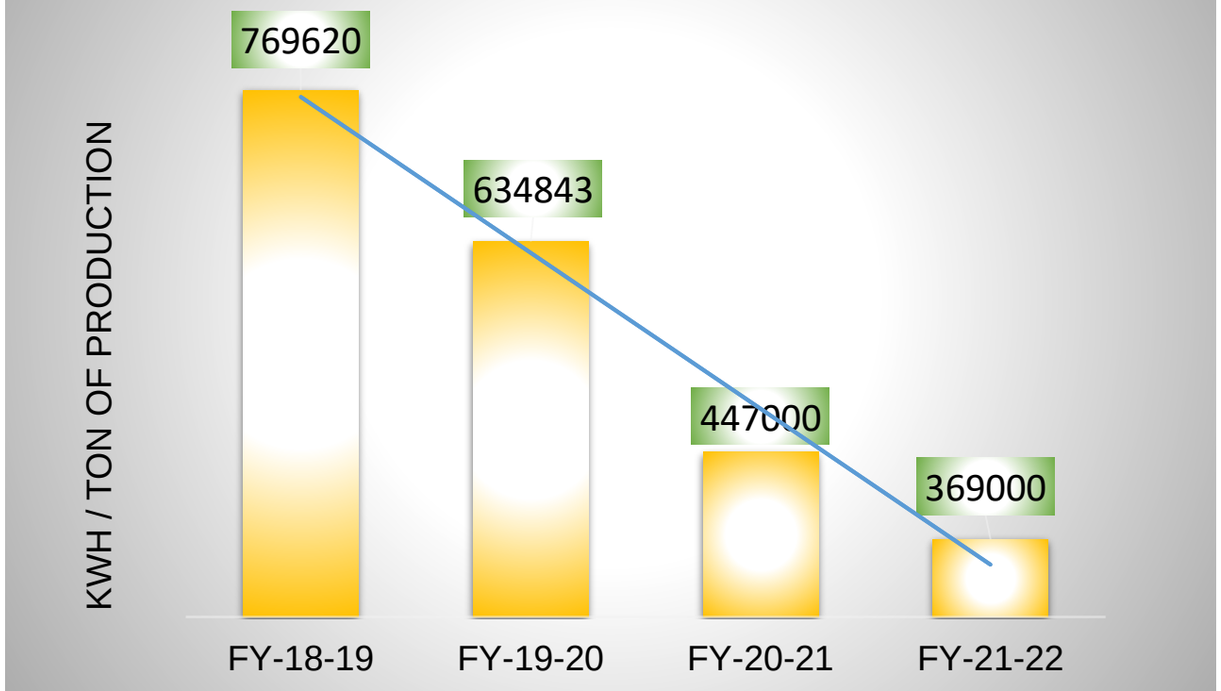
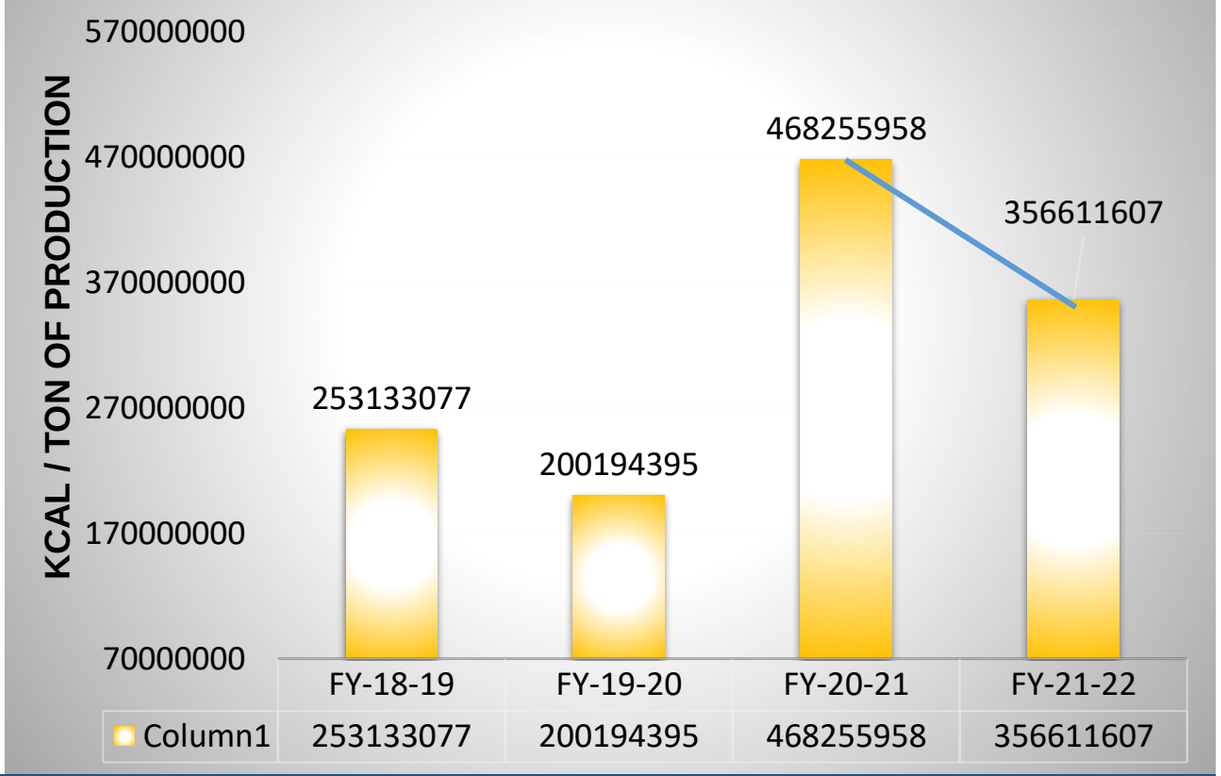
Capacity utilization & Energy performance

Financial Year	Installed Capacity	Eq.Vehicle
2017-18	225000	47711
2018-19	225000	53885
2019-20	225000	65451
2020-21	225000	133499
2021-22	275000	256162

Specific Electrical Energy Consumption (KWH / 1000 Production)



Specific Thermal Energy(Fuel) Consumption (Kcal / 1000 Production)

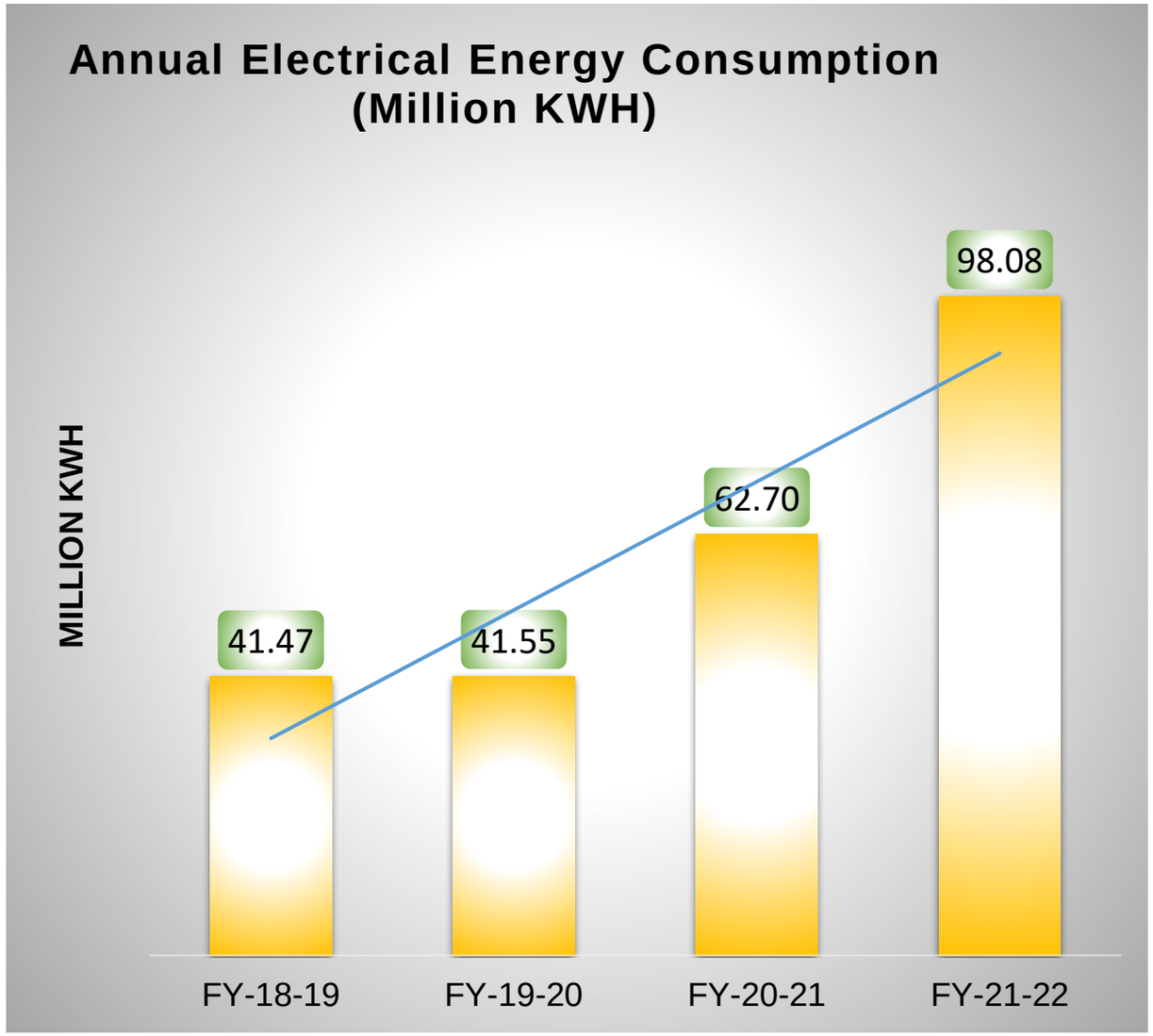


Take Away : Specific energy consumption reduced by 21% w.r.t last years due to various ENCON activities.

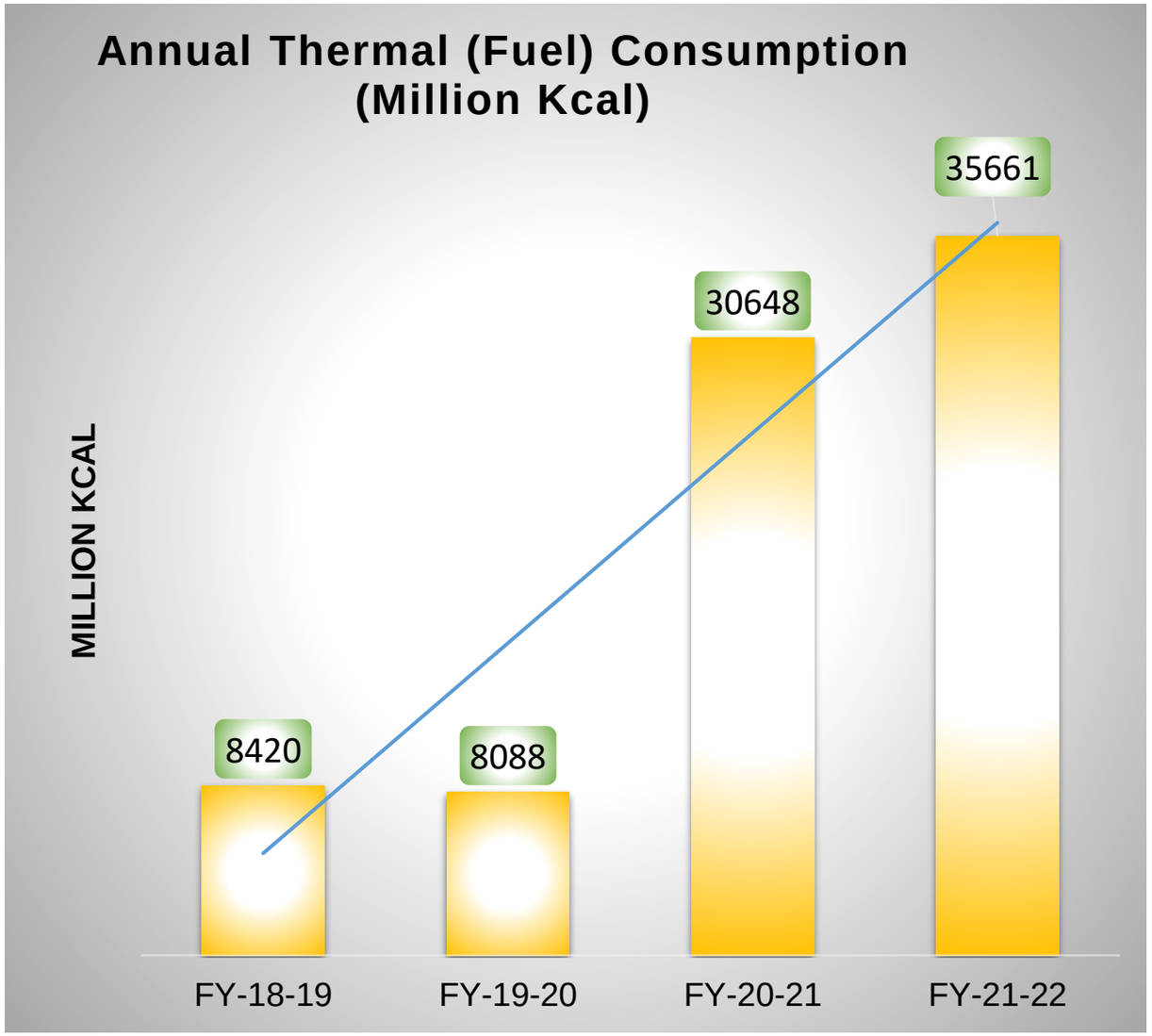
And specific fuel consumption reduced by 31 % with respect to last year.

Energy Consumption Overview

Electrical Energy Consumption

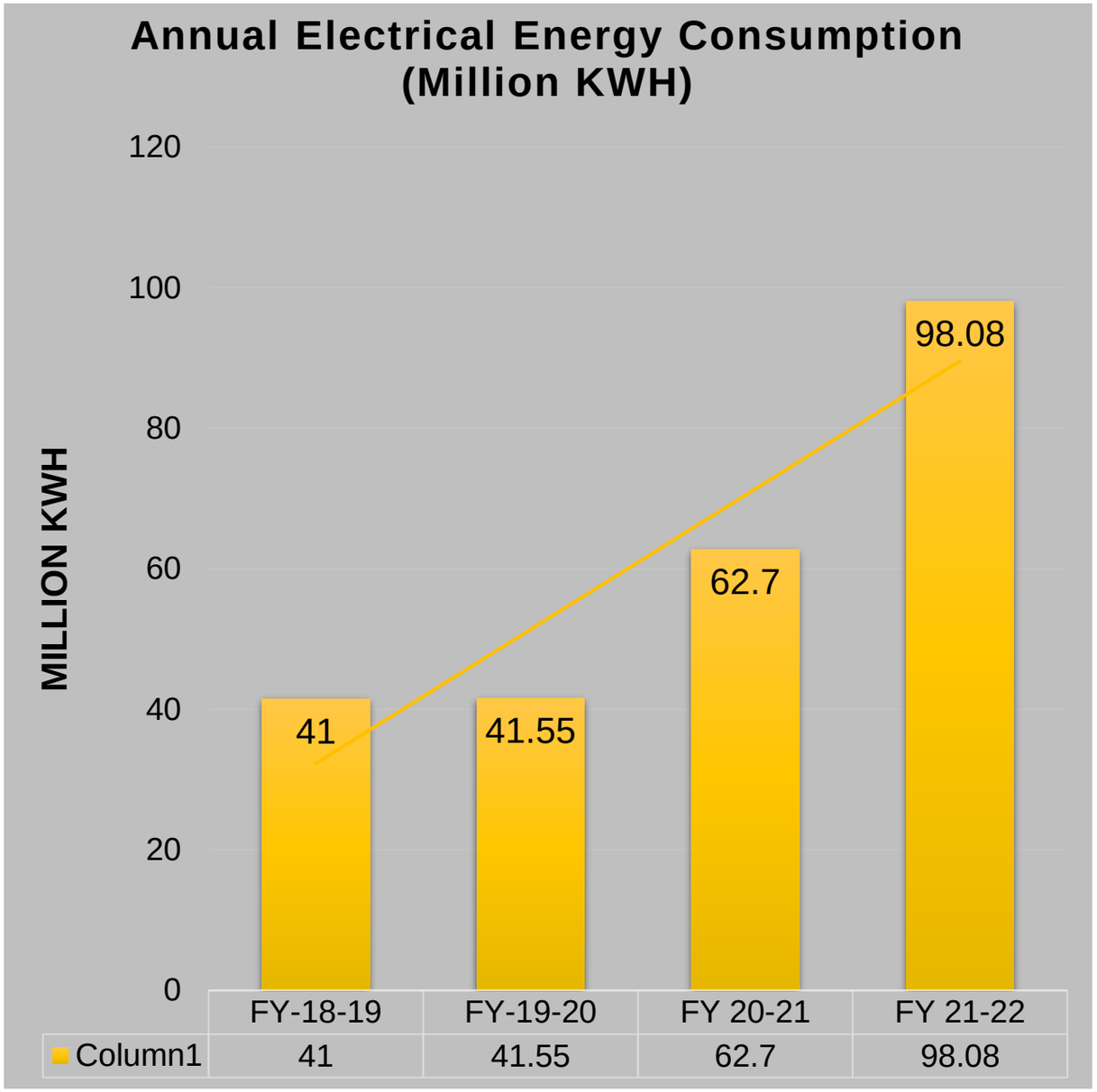


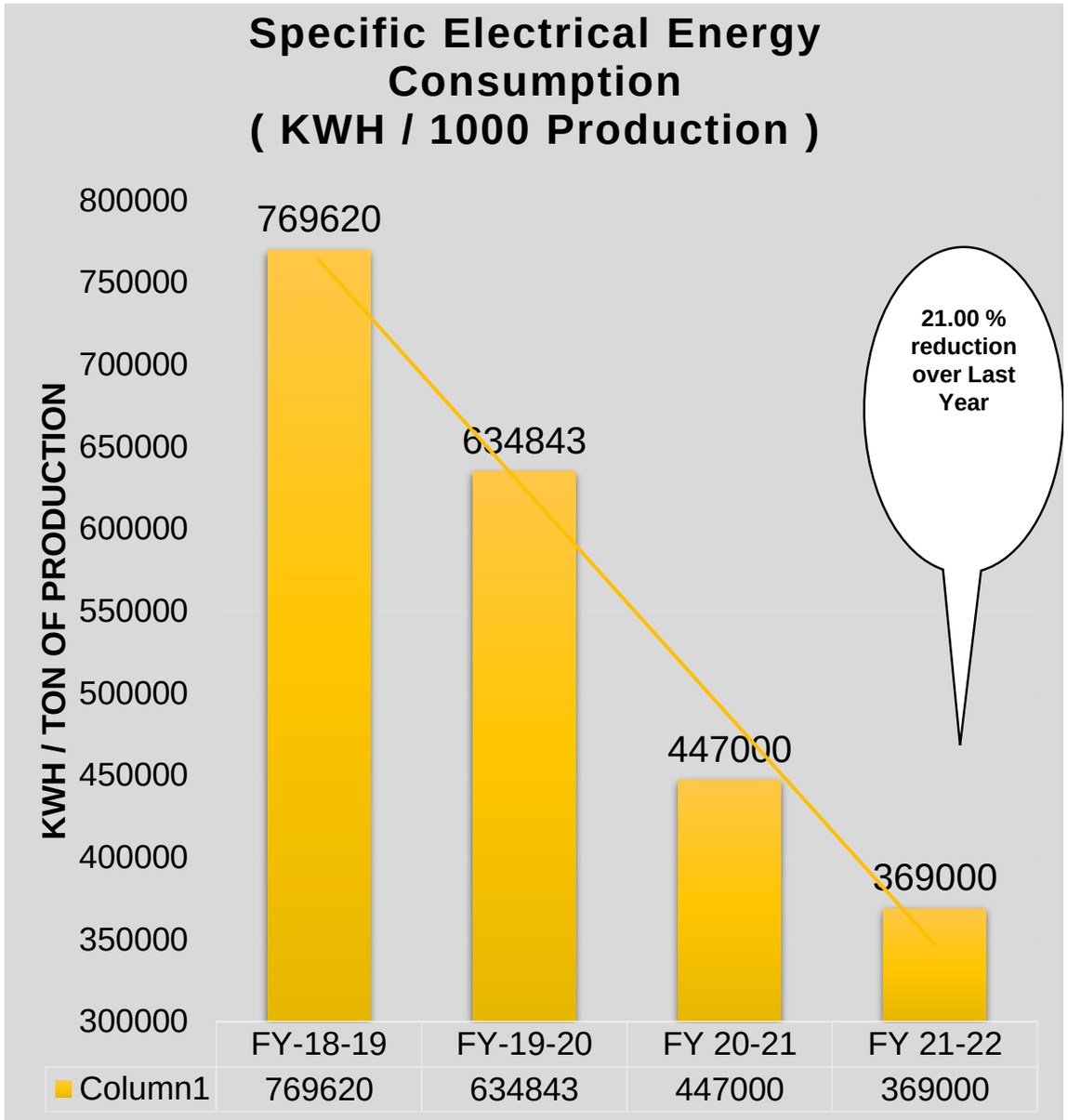
Thermal Energy Consumption



Take Away : Absolute consumption increased due to increase in production by 56%

Energy Consumption Overview





Take Away : As a result of various Encon initiatives specific Electrical Consumption is reduced by **21%** compared to last year

GJ Global Benchmarking

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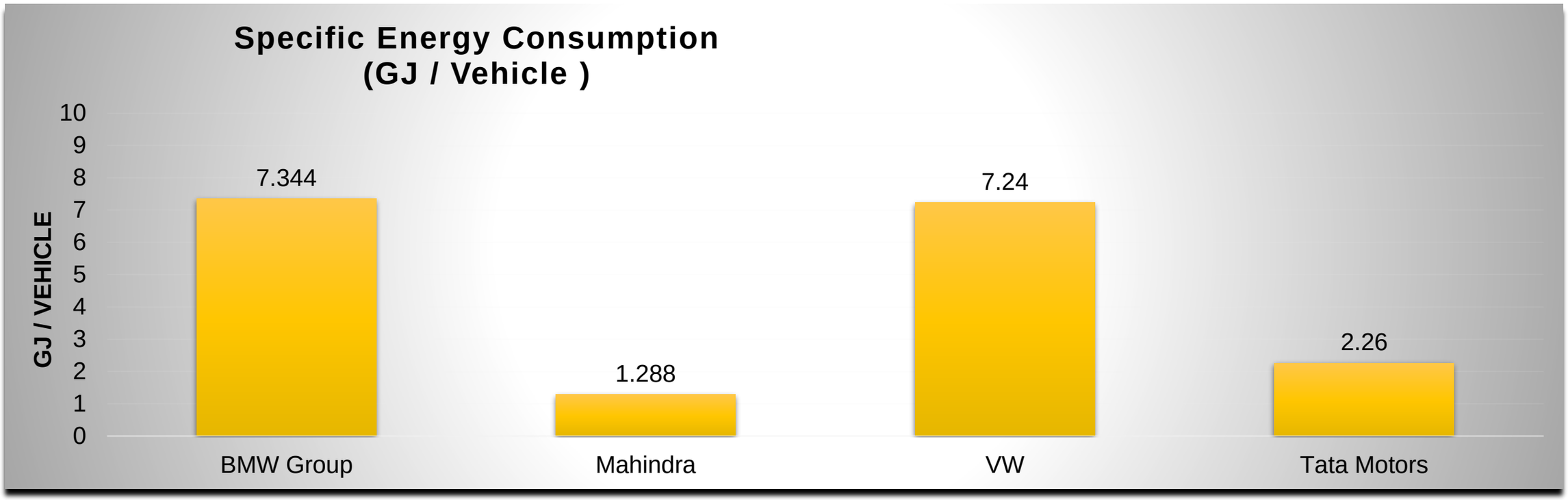
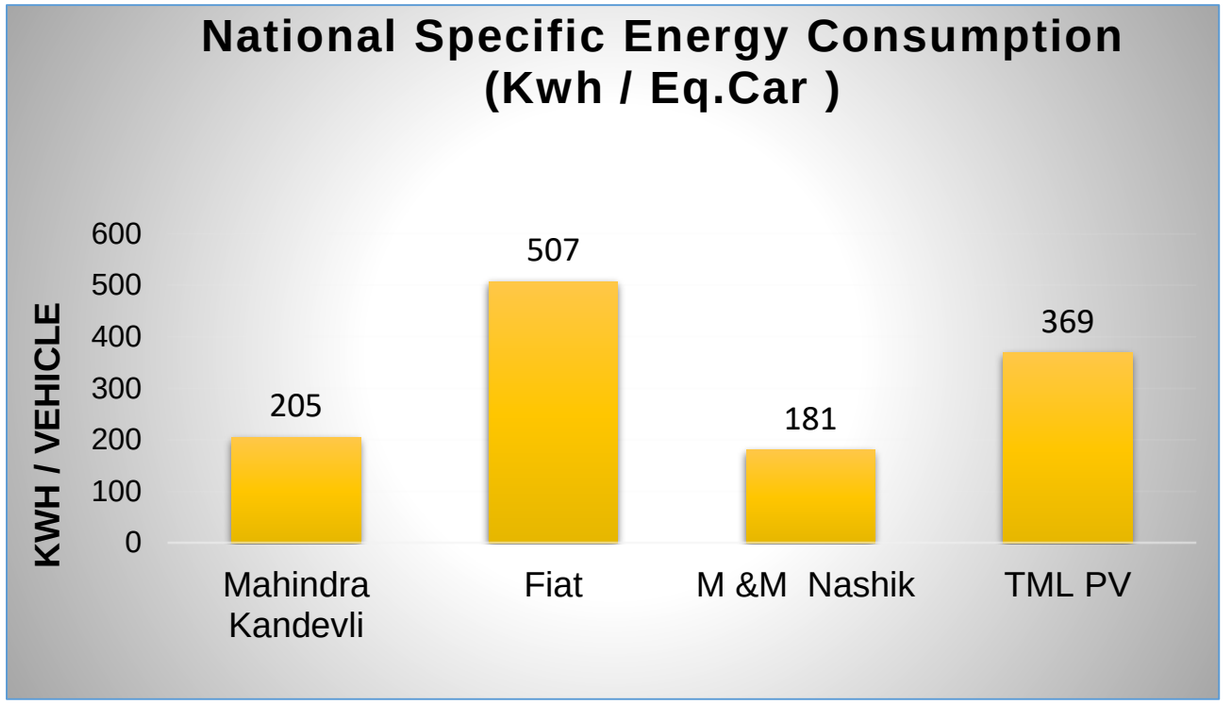
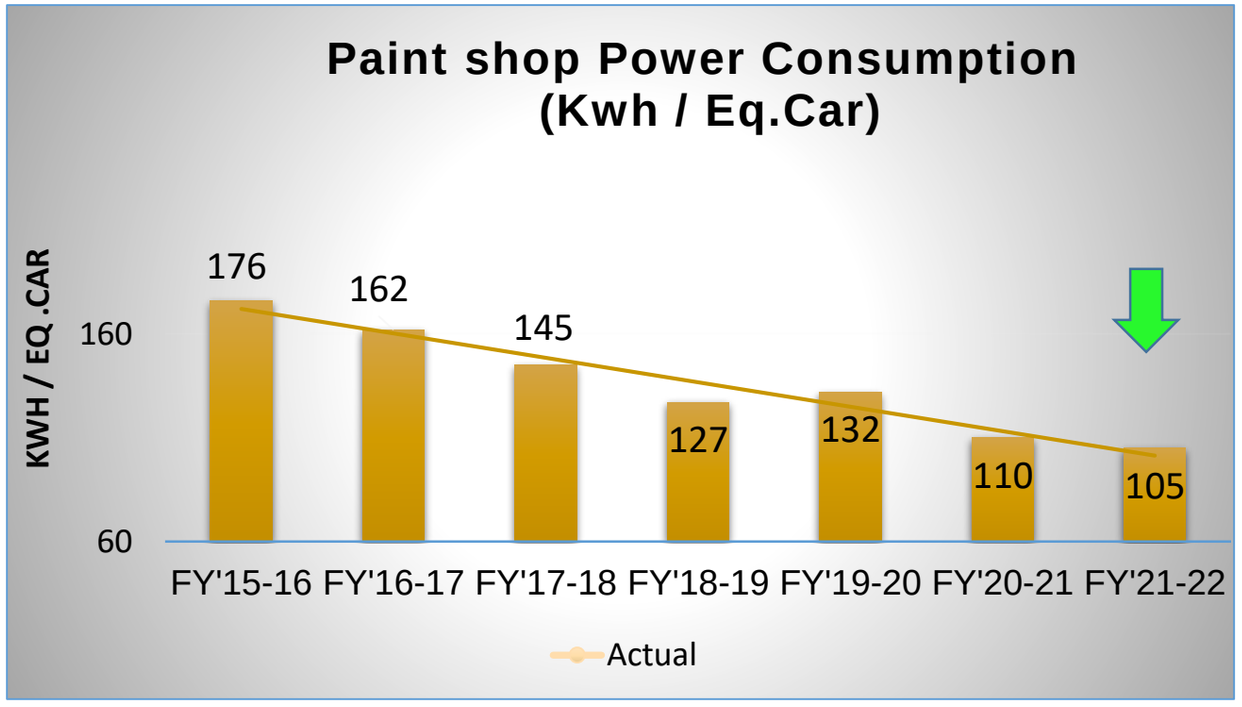
KPI	Honda Motor	BMW Group	Toyota Motor	GM	Daimler	Ford	PSA	Renault Nissan	M&M	VW
Reporting Year	2018-19	2019	2018-19	2018	2018	2018-19	2018	2018	2018-19	2019
Scope 1 emissions (tCO2e)	13,80,000	6,42,259	25,00,000	17,63,555	12,47,000	12,70,000	8,57,661	8,89,444	45,768	37,70,000
Scope 2 emissions (tCO2e)	40,90,000	3,02,574	51,50,000	43,22,761	16,87,000	31,10,000	4,16,827	23,39,883	2,34,351	38,00,000
Specific GHG emission (tCO2e/Veh)	-	0.3	0.712	0.670	1.216	0.730	0.345	0.490	0.191	0.675
Total Energy consumption (GJ)	4,95,00,000	2,15,08,650	9,25,00,000	6,30,16,506	4,17,85,200	4,96,80,000	2,24,71,391	3,43,00,382	-	8,43,12,000
Specific energy consumption (GJ/Veh)	-	7.344	8.610	7.308	18.504	8.489	7.452	6.288	1.288 (GJ/Eq Veh)	7.236
% RE	-	-	-	-	-	-	-	-	3%	-

National & Global Benchmarking







** Source - CII Report 2017-18*

Bench marking for energy and **focused approach** to reduced Paint Shop consumption.

Execution Strategy for VCC Reduction – PVBU Chikhali

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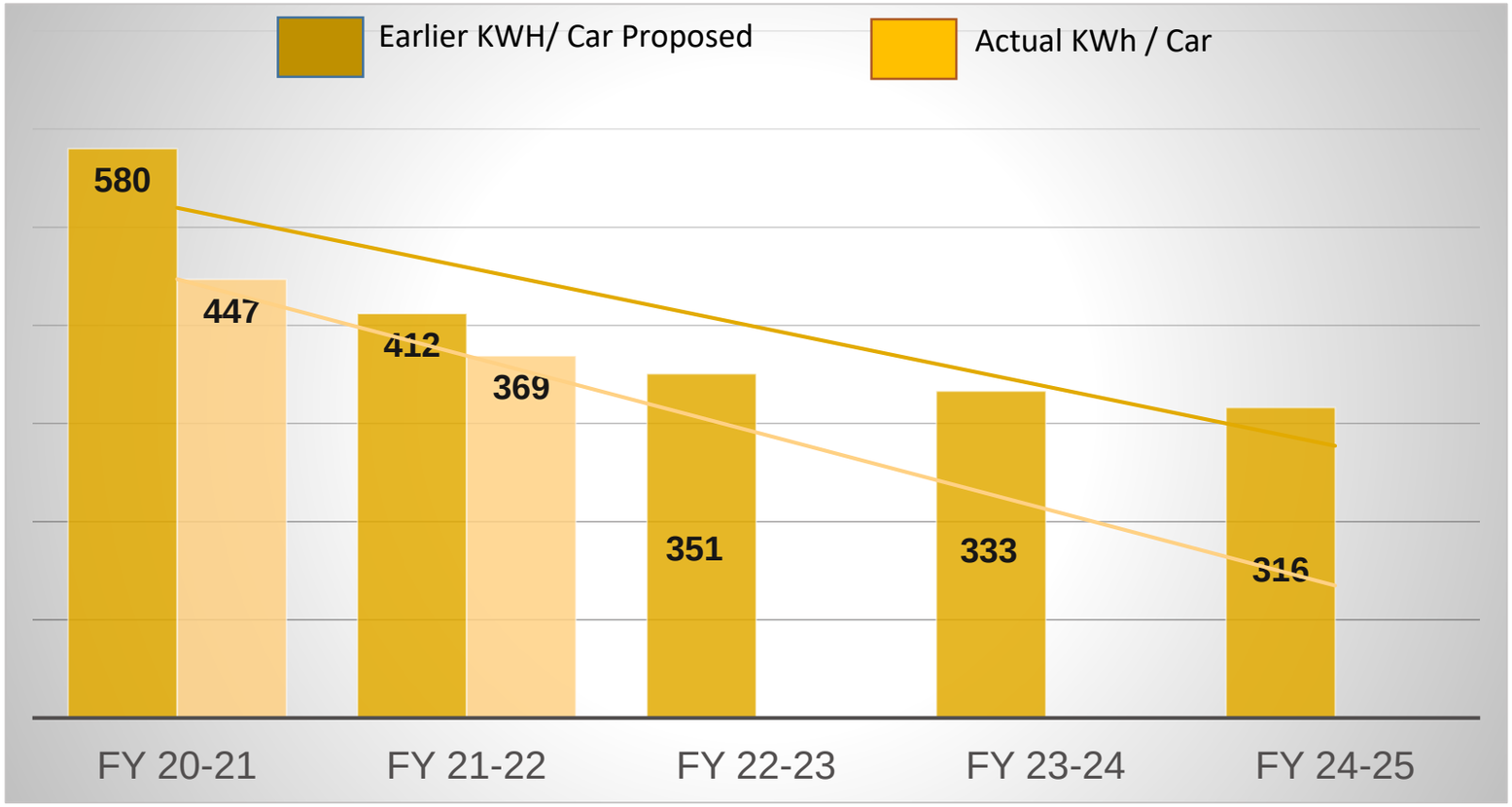
Target SEC , if you have any in short term/long term?



Methodology

- Opportunity identification and bench marking
- Prioritization of idea and identification of project
- Idea generation through people involvement
- Feasibility study for implementation
- Cost benefit analysis and business case
- Top management review and budget approval
- Implementation of project & Monitoring results
- Horizontal deployment across all plant

FY 20-21

1. Renewable Energy (Under installation – 86.40 L KWH/Yr.)
2. LED Lighting (Migration to LED – end Jan 21, 1 Cr./Yr. →3 Crs./yr.
3. Compressed Air leakage reduction : target 10% of overall consumption

FY 21-22

1. Waste heat recovery project for Compressor House
2. Electric Pump for Paint Kitchen
3. Compressed Air leakage reduction target 8% of overall consumption

FY 22-23

1. Multistage Rectifier CED Paint shop
2. Compressed Air leakage reduction target 6% of overall consumption

FY 23-24

1. New 1500 CFM compressor with VSD technology
2. New Air dryers of 2500 CFM's with VSD technology

FY 24-25

1. Energy Saving assessment and its implementation with pay by saving mode
2. Waste heat recovery projects in furnace at TA shop

List of ENCON Project Planned at Tata Motors PVBU, Pune

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List of Encon Project FY 22-23

Sr. No.	Shop	Equipment	Description of work	Saving expected in KWh / year	Investment in Rs. Lakhs	Power Tariff impact in Rs./ KWh	Cost Saving in Rs. Lakhs	Reduction in TCO@e / year	Project Mode
1	PVBU	9.4 MWp Solar	OPEX based 9.4 MWp Solar plant installation	13160000	0	4	468	10396	Lease
2	Press / Weld / J1 to J7 / JLR	LED lighting	OPEX based LED lighting installation	1860000	0	9	167	1469	Lease
3	Compressor house	IFC system	Effective Pressure controlling	501875	30	9	45	396	CAPEX
4	Compressor house	Compressor	System optimisation, new compressor installation	3300000	800	9	297	2607	CAPEX
5	Paint Shop	Paint Kitchen Pump	Conversion of pneumatic pumps to electrical	2064381	887	9	186	1631	CAPEX
6	Paint Shop	VFD	VFD installation across equipment - 40 nos	7277700	230	9	655	5749	CAPEX
7	TCF 1	Air supply plant - 6 nos.	Use of EC motor to ASP blower of 90 KW	972000	180	9	87	768	CAPEX
8	Engine Shop	Air supply plant - 2 nos.	Use of EC motor to ASP blower of 90 KW	324000	60	9	29	256	CAPEX
9	Engine Shop	Air supply plant - 1 nos.	Use of EC motor to ASP blower of 37 KW	81000	15	9	7	64	CAPEX
10	TA Shop	Air supply plant - 3 nos.	Use of EC motor to ASP blower of 90 KW	486000	90	9	44	384	CAPEX
11	TA Shop	Air supply plant - 3 nos.	Use of EC motor to ASP blower of 37 KW	243000	45	9	22	192	CAPEX
12	JLR Engine	Air supply plant - 3 nos.	Use of EC motor to ASP blower of 15KW	60000	30	9	5	47	CAPEX
13	PVBU offices	Remote controlled ceiling fan	Supply and installation of Remote controlled fan - 500 nos	60000	18	9	5	47	CAPEX
14	JLR Engine	Adiabatic chiller	Adiabatic Chiller for Voltas & Dainkin - 2 nos	63000	9	9	6	50	CAPEX

Total Invetment needed in Rs Lakhs	2394
Total Saving expected in Rs. Lakhs / year	2025
Total TCO2e reduction / year	24058

6.2 MWp RE Solar Project Completed in FY 21-22

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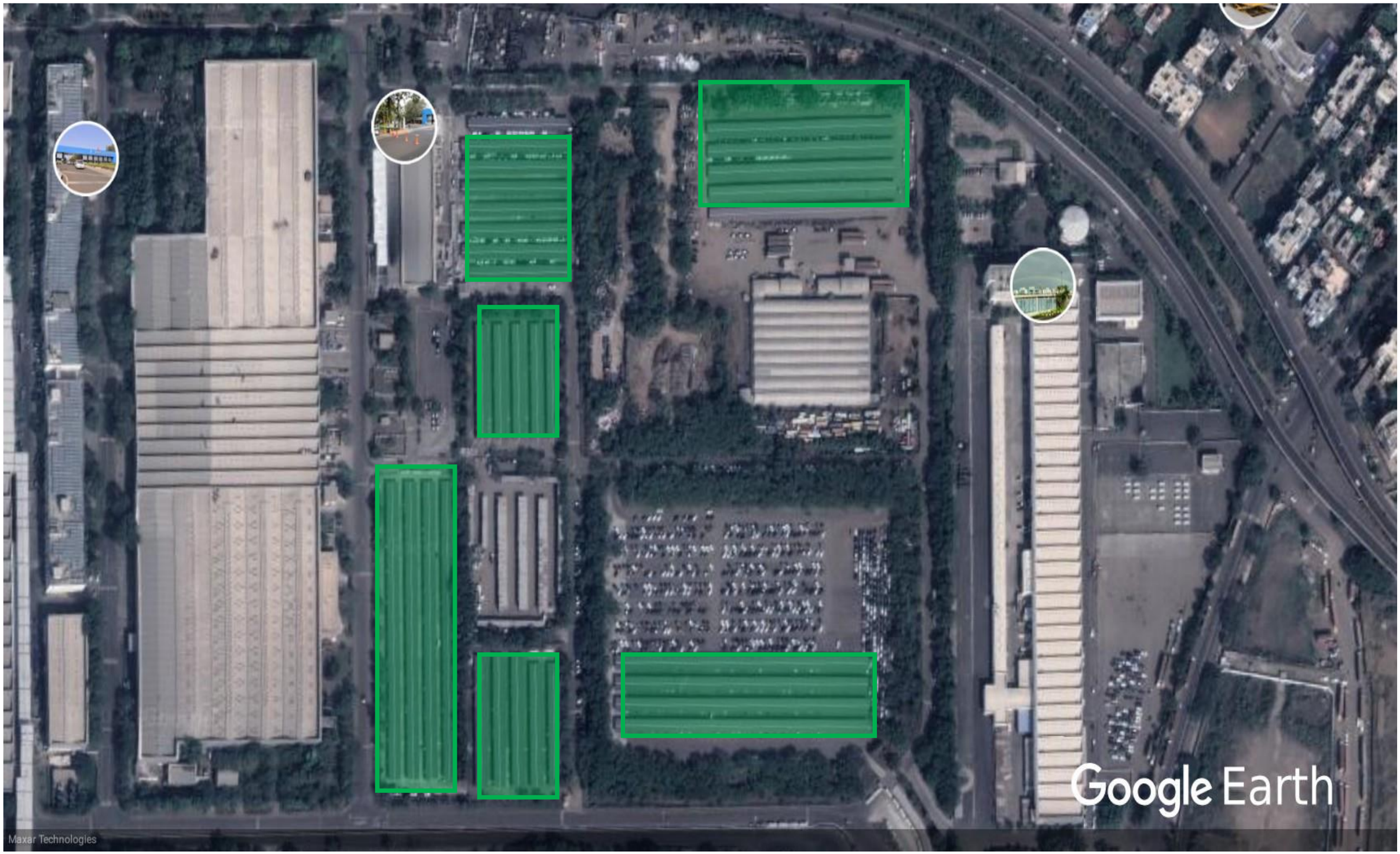
Solar Injected Block



3.0 MWp RE Solar Project Completed in FY 21-22

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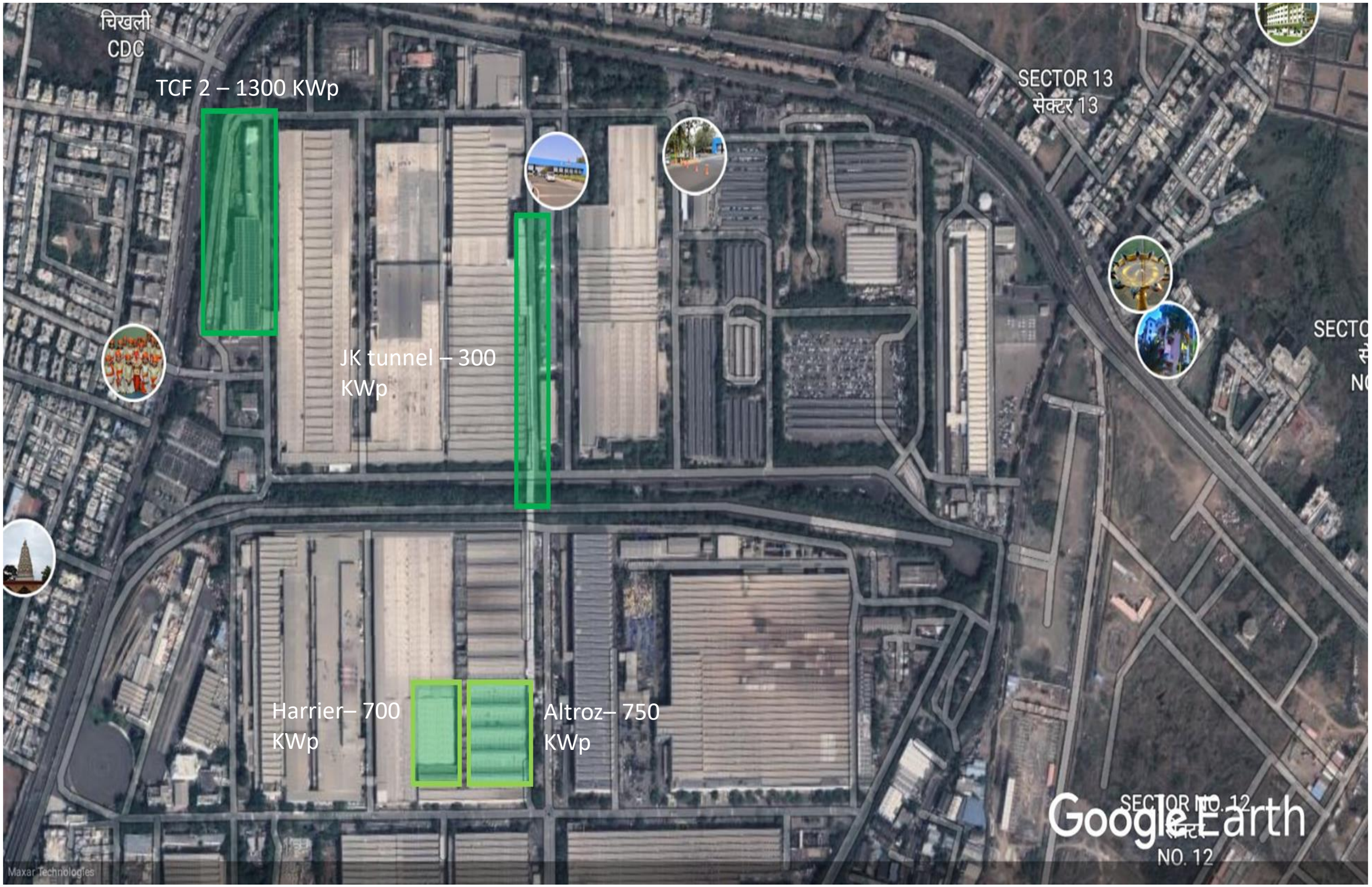

9.4 MWp RE Solar Project Planned in FY 22-23

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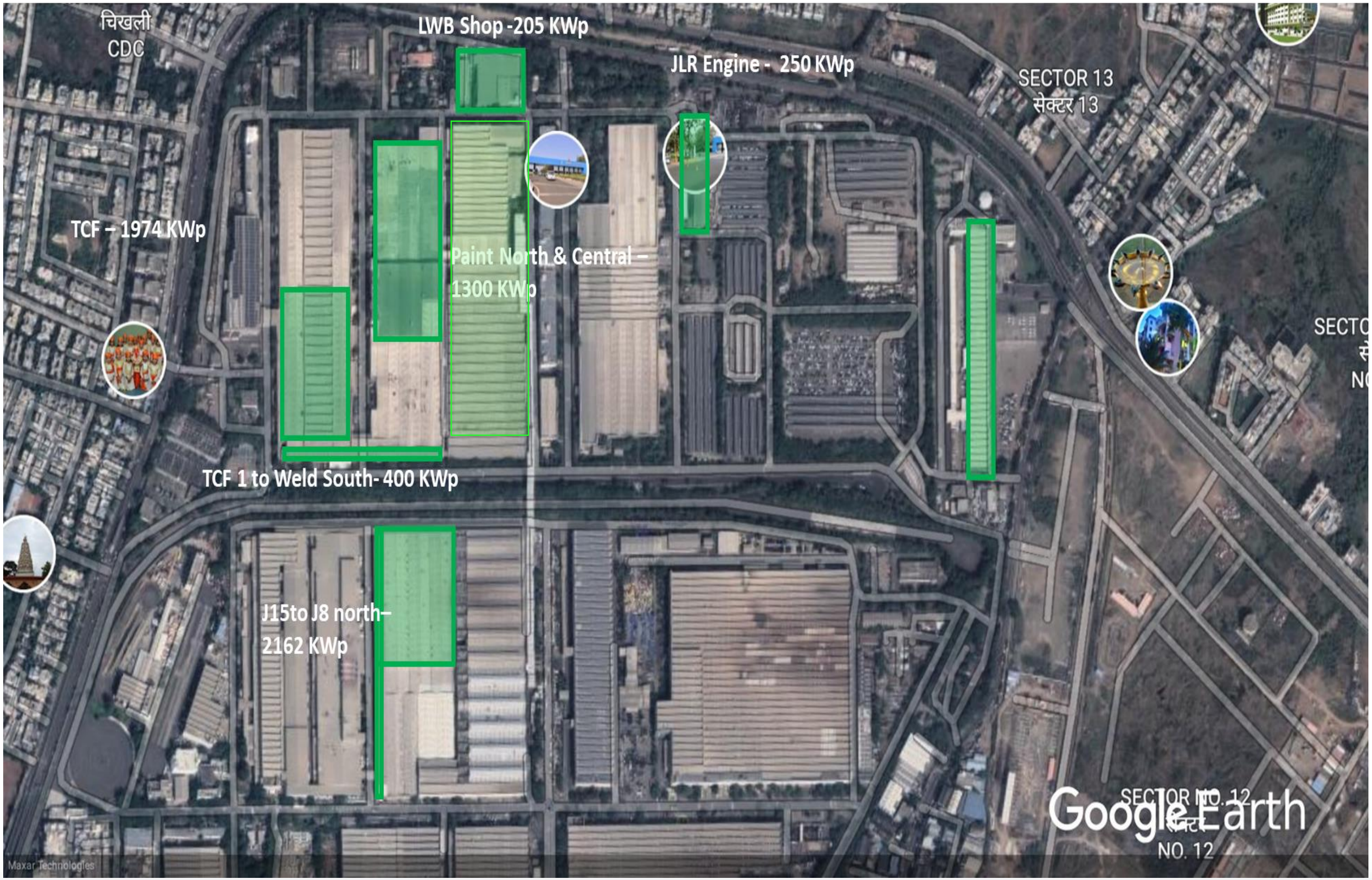

TCO2e Reduction Planned – 20539 TCO2e with RE Projects

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Sr. No.	Project	Capacity in KWp	Generation in KWh / year	Saving in Rs. Crore / year before 31st March	TCO2e reduction / year
1	6.2 MWp Car port Project	6200	8640000	4.32	6825.6
2	3 MWp Roof Top	3000	4200000	1.68	3318
3	9.4 MWp Roof Top	9400	13170000	5.0	10396
			Total	11.00	20539

Energy Saving projects implemented in last three years

TATA MOTORS
Connecting Aspirations

TML PV Pune (Chikhali) Plant - List of Energy Conservation Efforts during year 2019-20

Sr. No.	Description of Energy Consrvation Efforts / Encon Activity	Annual Saving in Lakh KWh	Annual Savings in GJ due to kwh savings	Fuel Savings SCM	Annual savings in GJ due to fuel savings	Annual CO_2 Reduction in tCO_2e	Annual Saving Rs. in Lakhs	Investment Rs. In Lakhs
1	HVLS fans	0.57	205	0	0	46.74	4.6	30
2	Chiller Unit Installation at Paint Shop, PVBU Pune	8.22	2959	0	0	674.04	65.8	42
3	LED highbay lamps (480 nos. in TA & Engine shop)	5.20	1872	0	0	426.40	41.6	0
4	LED street lights (80 nos.)	0.26	94	0	0	21.32	2.1	0
5	LED highmast lamps across PVBU plant (135 fitting - 15 high mast)	2.84	1022	0	0	232.88	22.7	0
6	LED tube lights at TA & Engine shop	1.40	504	0	0	114.80	11.2	0
7	Compressed air leakage reduction	15.00	5400	0	0	1230.00	120.0	0
8	Godrej AC units in J block	8.00	2880	0	0	656.00	64.0	7
9	Compressed air piping modification in engine and TA shop	4.38	1577	0	0	359.16	35.0	0.8
10	Paint Shop optimization by managerial control of Top Coat ASU/Exh booth frequency.	0.85	306	0	0	69.70	6.8	0
11	Paint ShopTopcoat running time optimization.	1.00	360	0	0	82.00	8.0	0
12	Paint Shop Switching off the wax booth exhaust by providing almonard fans in polishing area.	0.75	270	0	0	61.50	6.0	0
13	GMN spindle drives Kept off in B shift in Engine shop	1.08	389	0	0	88.56	8.6	0
14	Ingersoll Henry coolant system to be run on single coolant pump in engine shop	0.90	324	0	0	73.80	7.2	0
15	Use of Gehring machine for 4 cylinder block honning in engine shop	1.00	360	0	0	82.00	8.0	0
16	SC 1 Furnace kept at 760 deg for 2 days a week and 8 days in month in Hard Shop of TA area	0.75	270	0	0	61.50	6.0	0
17	Optimization in running hours of Zest Closure Pump House of Weld shop done	0.82	295	0	0	67.24	6.6	0
18	Paint Shop replaced conventional tube lights with LED tube lights - 1500 Nos.	1.18	426	0	0	96.97	9.5	0
19	Paint Shop Installation of new CED oven.	2.40	864	157894.7	5760	323.14	73.2	0
20	Paint Shop - increased load of Incinerator & optimized running time.	0.00	0	78947.4	2880	161.57	27.0	0
	Total - PV Pune(Chikhali) Plant	**56.60**	**20376.94**	**236842.11**	**8640.00**	**4929.32**	**533.82**	**79.80**

Energy Saving projects implemented in last three years

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TML PV Pune (Chikhali) Plant - List of Energy Conservation Efforts during year 2020-2021

Sr. No.	Description of Energy Consrvation Efforts / Encon Activity	Annual Saving in Lakh KWh	Annual Savings in GJ due to kwh savings	Fuel Savings SCM	Annual savings in GJ due to fuel savings	Annual CO_2 Reduction in tCO_2e	Annual Saving Rs. in Lakhs	Investment Rs. In Lakhs
1	Migration from Conventional lighting to LED lighting in complete TCF shop	6.23	2243	0	0	510.86	50.8	Opex based leased rental
2	Migration from Conventional lighting to LED lighting in paint shop	8.00	2880	0	0	656.00	65.3	Opex based leased rental
3	Compressed air reduction in Engine shop from 349CFM to 138 CFM	16.34	5882	0	0	1339.88	133.3	8.0
4	Compressed air reduction in TA shop 357 CFM to 227CFM							
5	Compressed air reduction in X1 BIW shop 357CFM to 219 CFM							
6	Compressed air reduction in J block							
7	Compressed air reduction in paint shop from 312 CFM to 205 CFM							
8	Compressed Air leakage reduction in TCF shop from 445CFM to 195CFM							
	Air leakage reduced from 15.63 percent to 8.82 Percent							
9	Installation of HVLS fans	1.07	385	0	0	87.74	8.7	25
	Total - PV Pune(Chikhali) Plant	**31.64**	**11390.40**	**0.00**	**0.00**	**2594.48**	**258.18**	**33.00**

PVBU Pune Glide Path for Compressed air leakage reduction – PV Pune

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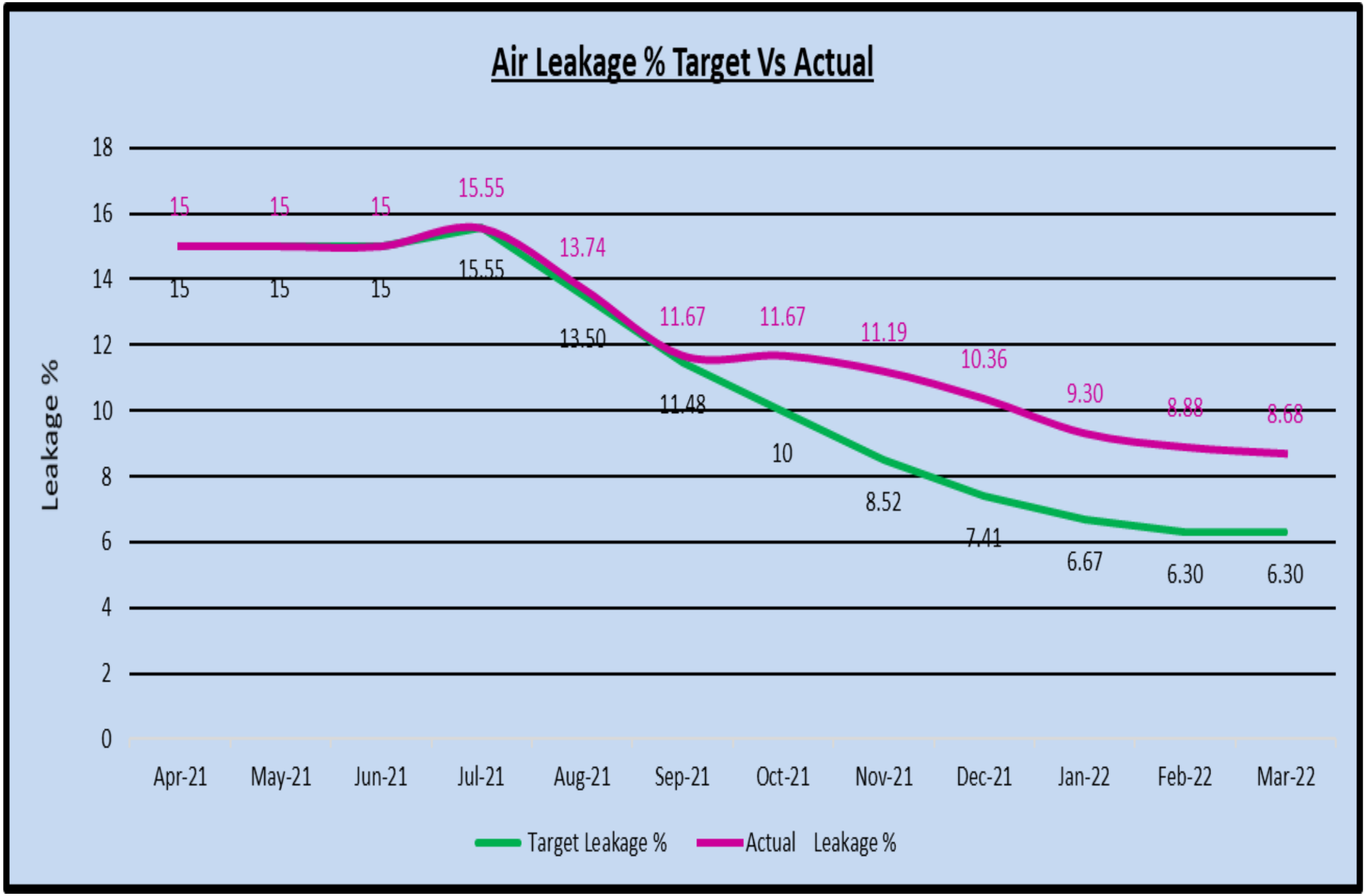

COMP. AIR REDUCTION ACTION PLAN & AIR LEAKAGES RECTIFICATION STATUS

Sr.no.	Action Plan for Leakage rectification	Leakage points Arrested till date	Prevoius leakage in Cfm as per leakage test on 1/3/22	Target leakage reduction after rectification to achive goal (Tentative)	Achive reduction after rectification Leakage test done on 30/3/22	Status	Target Date.
1	TCF-1 Shop leakages identified & rectified		113 cfm	100cfm	113 cfm	Completed	
2	TCF-2 Shop leakages identified & rectified		97 cfm	50cfm	97 cfm	Leakage rectification WIP.	
3	Engine Shop leakages identification & rectification ,Further WIP.		73cfm	80 cfm	73cfm	Completed	
4	Transaxel Shop, leakages identification & rectification done		97 cfm	95 cfm	97cfm	Completed	
7	Weld-X1 shop leakage identification & rectification	169	195cfm	100 cfm	195cfm	WIP	13-04-2022
8	Press shop leakage identification & rectification		73 cfm	80 cfm	73cfm	Completed	
9	Paint shop leakage identification & rectification	220	150 cfm	125 cfm	150cfm	WIP	15-04-2022
10	Q-5 leakage identification & rectification	151	186 cfm	100 cfm	166cfm	WIP	19-04-2022
11	X-451 leakage identification & rectification	14	113 cfm	100 cfm	105cfm	WIP	20-04-2022
12	Air leakage test planned on 24/04/2022 at plant level to identify effectiveness.						

PVBU Pune Leakage Rectification status

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Summary of Compressed Air Leakage Identification & Rectification work at Car Plant					
Shop Name	**TOTAL POINTS**	**Number of points Identify**	**Number of points Arrested**	**Pending Points**	**Remarks**
Engine Shop	685	685	685	0	5th round of leakage rectification completed
TCF Shop	905	905	905	0	5th round of leakage rectification completed
New TCF	105	105	105	0	4th round of leakage rectification WIP
Transaxle Shop	580	580	565	15	5th round of leakage rectification completed
Weld X-1 Shop	1480	1480	1457	23	5th round of leakage rectification WIP
Press Shop	52	52	52	0	5th round of leakage rectification completed
Paint Shop	1556	1556	1538	18	5th round of leakage rectification completed
Q-5	734	734	718	16	5th round of leakage rectification WIP
X-451	202	202	202	0	5th round of leakage rectification WIP
J-5 to 8	705	705	685	20	5th round of leakage rectification WIP
J-1 to 3	385	385	357	28	5th round of leakage rectification WIP
Till Date Total points rectified	**7389**	**7389**	**7269**	**120**	**Leakage reduction till date 8.68 % = 1215 cfm**

Energy Saving Summary for Last 3 years

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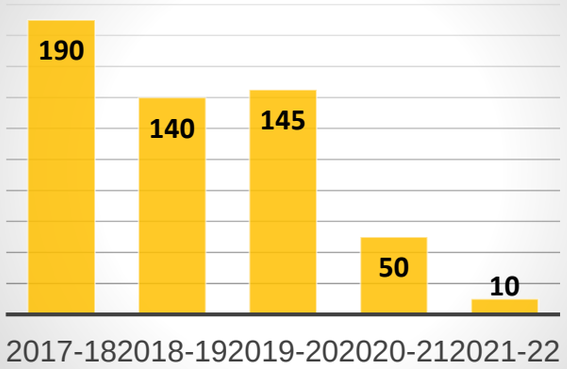

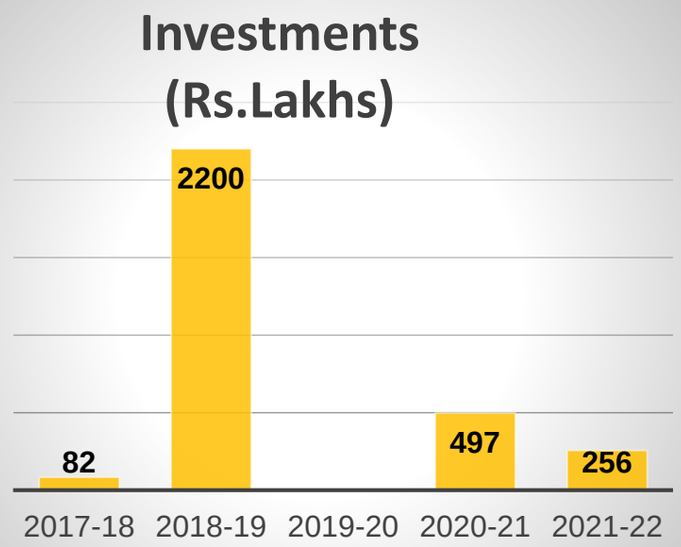

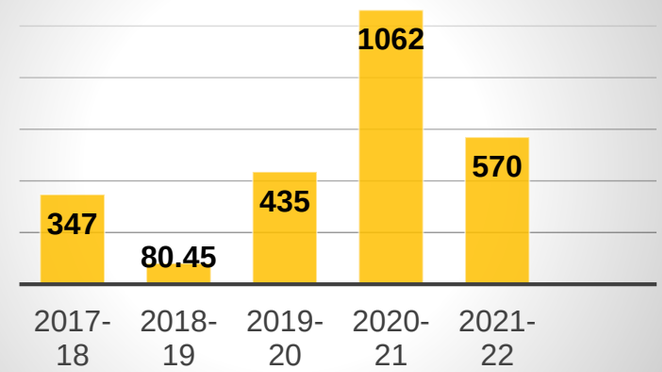

Year	No of Proposals	Investments Lakhs	Savings (Lakhs)	Remark
2017-18	190	82	347	
2018-19	140	2200	80.5	
2019-20	145	0	435	
2020-21	50	497	1062	OPEX -PPA(Solar) -LED
2021-22	10	256	570	OPEX -PPA(Solar) -LED
Total	535	3035	2494	

Methodology

- Opportunity identification and bench marking
- Idea generation through people involvement
- Prioritization of idea and identification of project
- Feasibility study for implantation .
- Cost benefit analysis and business case .
- Scope finalization.
- Top management review and budget approval
- Implementation of project
- Monitoring results
- Horizontal deployment

Cumulative Saving of **Rs.2494 Lakhs achieved against investment of Rs. 3035 Lakhs in last 5 years with 535 proposals** whose payback period varied from 12 months to 36 months.

KAIZENS: Energy savings

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Energy Saving KAIZENS

	Shop/Area : Engine Shop Date : 025/05/2021
Line/Station : E Block petrol trim line	Kaizen by– Mr. Sandeep deshmukh, Mr. S.k lokhande Mr. faizan Siddiqui., Hemant Ghule
Before Kaizen	**After Kaizen**
We used compressed air from E Block compressor house in all three shift and also on Sunday working , block closure , and E Block running in only A and B shift. So C shift power required to run compressor was booked on PVBU @ 500 kwh/day	To avoid compressed air losses we installed portable compressor ,and we used this portable compressor in C shift , block closure ,Sunday working and when E Block is not running.
	
Power debit on engine shop @ 500 kwh/day	Zero power debit as portable compressor installed

Energy saving KAIZENS on shop floor

	Shop/Area : Engine Shop Date : 13/06/2021
Line/Station : E Block petrol trim line	Kaizen by– Mr Uday Malgaonkar and team
Before Kaizen	**After Kaizen**
Petrol Trim Line Incoming Supply From P.P.NO 32.2 Column No 27, E2 Before there is no any separate energy meter for petrol trim line	Now installed new separate energy meter for petrol trim line to observed how much energy consumed by petrol trim line. And also we take reading on daily basis.
	
No actual measurement of Power consumption possible	Shiftwise power consumption monitoring started with use of Energy Meter

Kaizen Sheet	Shop/Area : Engine shop
Line/Station : Engine shop – Cylinder block line – Makino Machines	Date: Feb'20

Operation	Problem	Measures Taken	Results
Machining of cylinder block and head on makino machines. Total 8 machines	Panel AC and Oil cooling units of makino machines were getting on along with mains power ON. Panel AC-1KW, Oil Cooler – 3KW	Panel AC and Oil cooler units interlocked with machine control ON.	1. Power cost saving of 11520 Rs / Year due to panel AC 2. Power cost saving of 34560 RS / Year due to oil cooler

Panel AC Interlock with Control ON

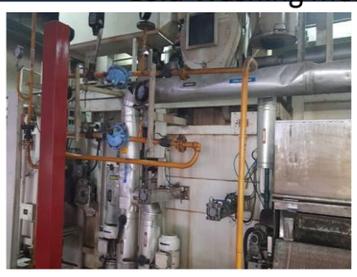
Oil cooler 3 KW ,8 Machines. Total Connected Load=24 kw

Cost saving: 0.46 Lacs / Year

Kaizen Sheet	Shop/Area : Engine shop
Line/Station : Engine shop – Washing machines	Date: Implementation started from June'20 onwards

Operation	Problem	Measures Taken	Results
Washing machines coolant media temperature required for process is 50 deg	Earlier electrical heaters were used to heat coolant media which are being converted into NG heating. NG price is Rs 43 / kg and also NG system requires lot of maintenance	Cold washing media is developed and implemented successfully on 2 machines. Rest 7 machines are WIP. NG supply is stopped for the 2 machines	1. Power cost saving due to change over from electrical to NG system is 34.28 Rs / Eq car 2. NG fuel cost saving due to cold washing media is 21.5 Rs / Eq Car

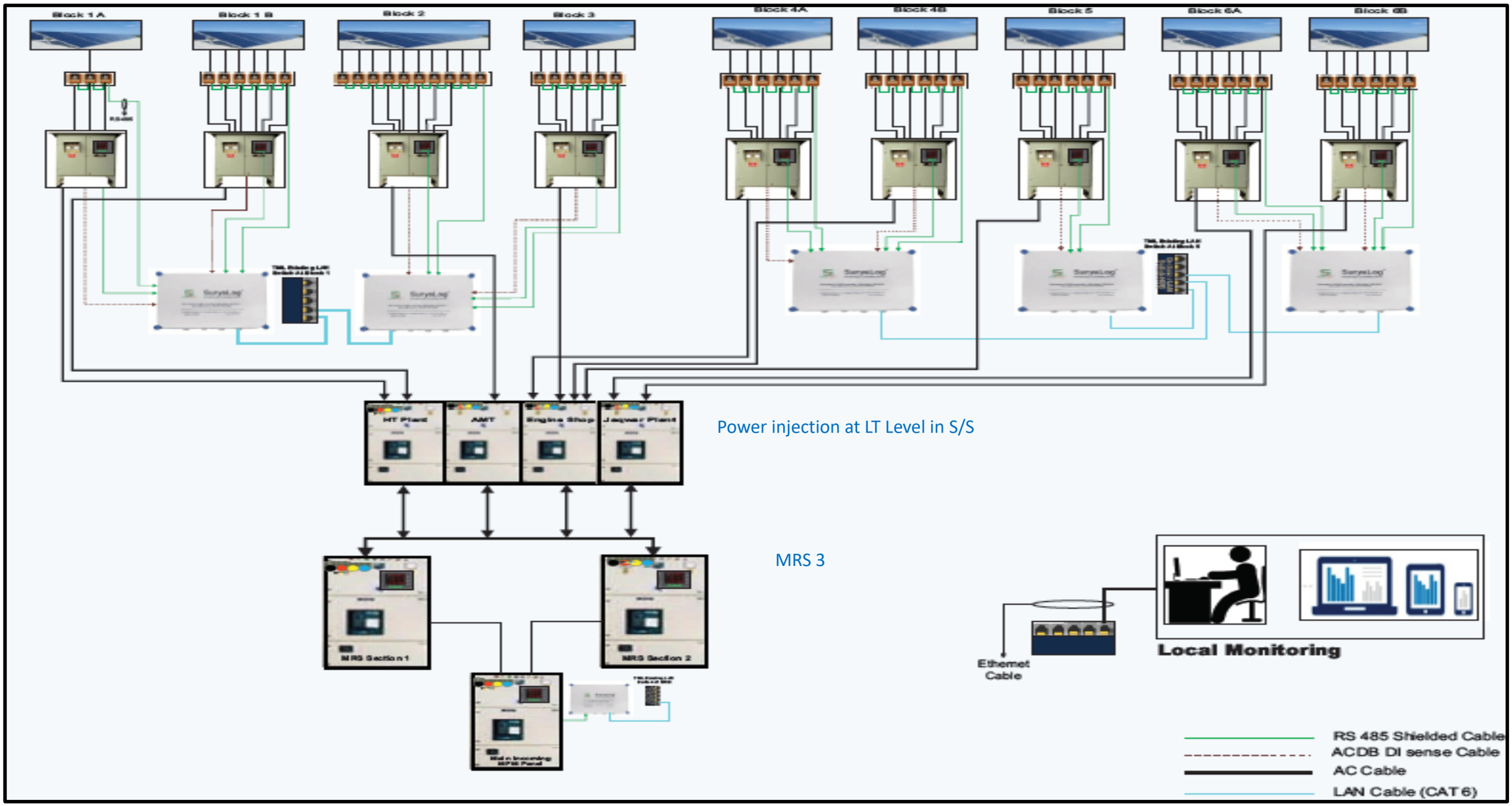
Electrical Heating NG heating Cold Washing media – Strub 1921



Cost saving: 12.9 Lacs / Year

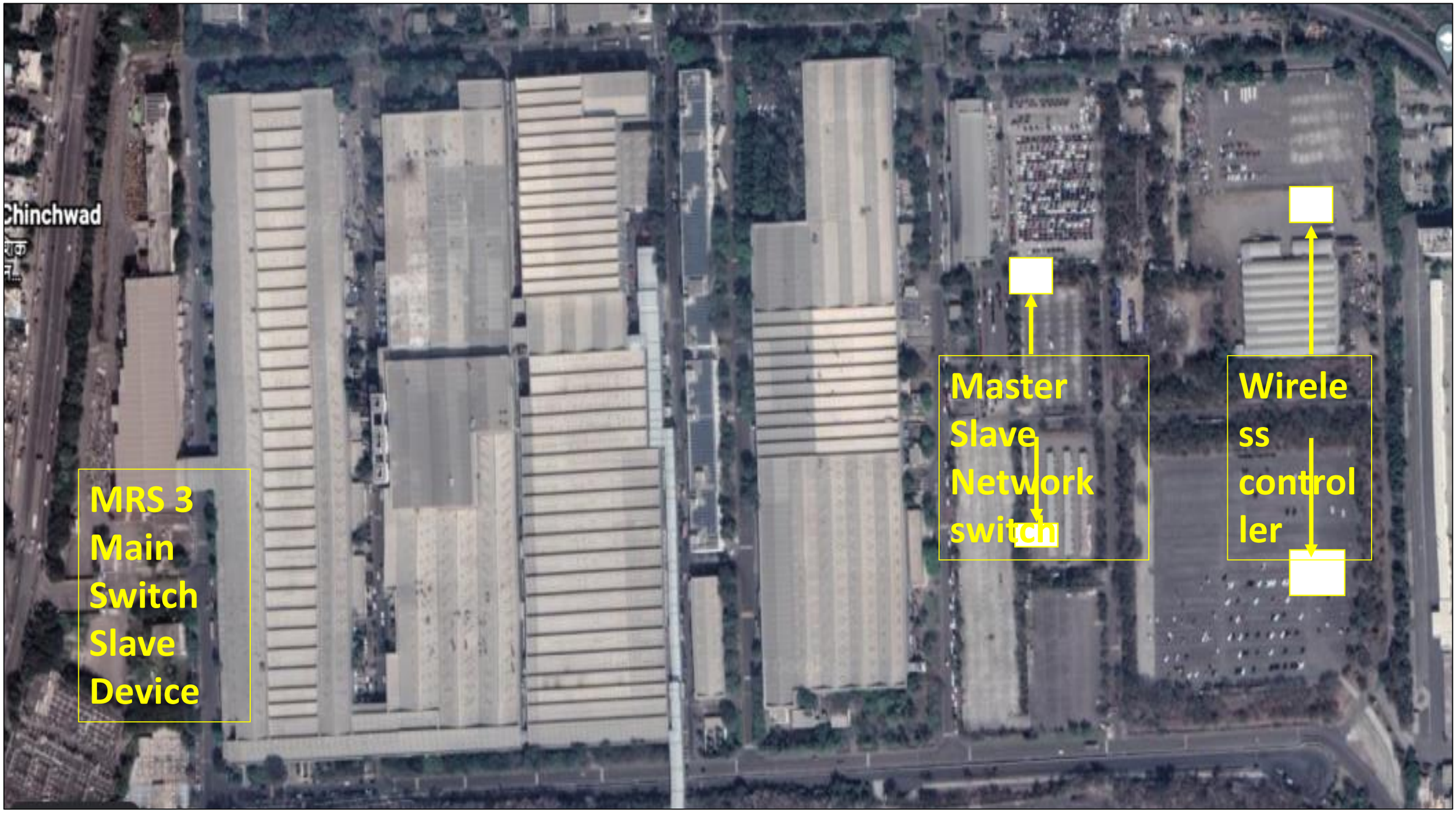
Innovative Projects implemented

Scheme Arrangement of Inverters & Solar ACDB



Innovative Projects implemented

Location of Network Switch



Innovative Projects implemented

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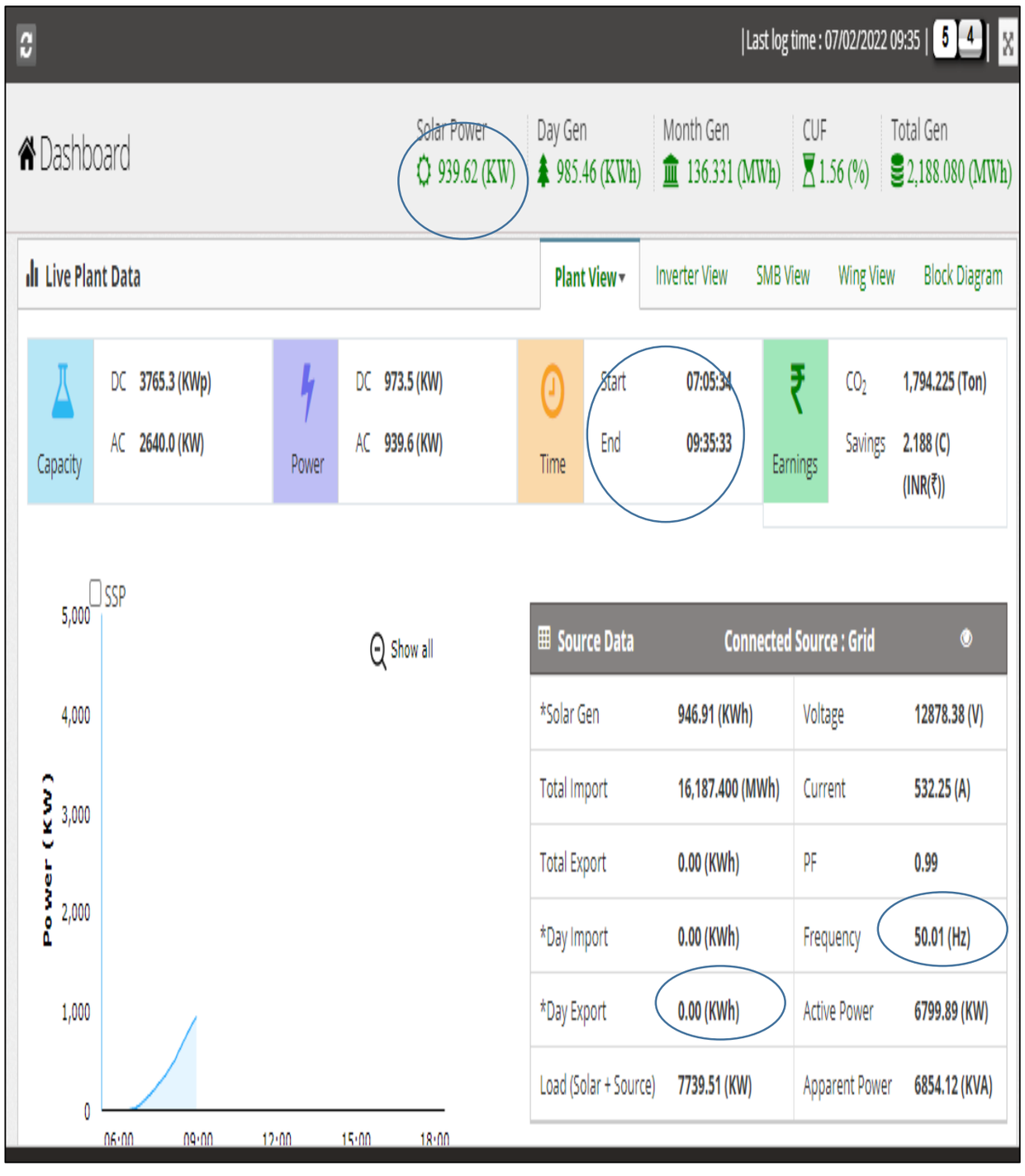
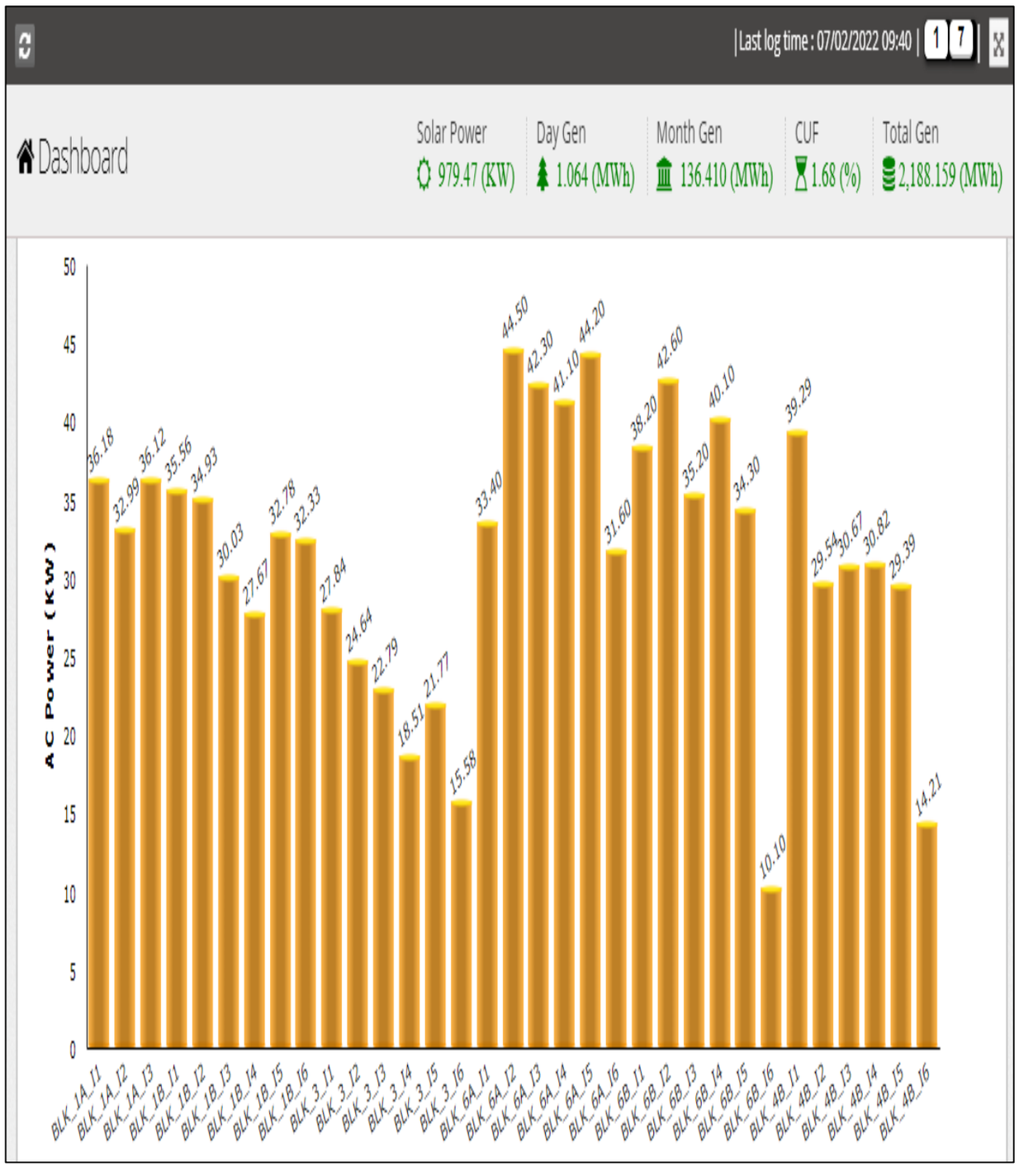
Actual Power Dashboard of MRS 3 Section 1



Power Generation Performance tracking of Inverters



Innovative Projects implemented

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Inverter Status Display

Plant Status & Error

Solar Status — Solar-ON — Source — Grid

Inverter Status

BLK_1A_I1 BLK_1A_I2 BLK_1A_I3 BLK_1B_I1 BLK_1B_I2
BLK_1B_I3 BLK_1B_I4 BLK_1B_I5 BLK_1B_I6 BLK_3_I1
BLK_3_I2 BLK_3_I3 BLK_3_I4 BLK_3_I5 BLK_3_I6 BLK_6A_I1
BLK_6A_I2 BLK_6A_I3 BLK_6A_I4 BLK_6A_I5 BLK_6A_I6
BLK_6B_I1 BLK_6B_I2 BLK_6B_I3 BLK_6B_I4 BLK_6B_I5
BLK_6B_I6 BLK_4B_I1 BLK_4B_I2 BLK_4B_I3 BLK_4B_I4
BLK_4B_I5 BLK_4B_I6

SMB Status

BLK_1A_S1 BLK_1A_S2 BLK_1A_S3 BLK_1B_S1 BLK_1B_S2
BLK_1B_S3 BLK_1B_S4 BLK_1B_S5 BLK_1B_S6 BLK_3_S1
BLK_3_S2 BLK_3_S3 BLK_3_S4 BLK_3_S5 BLK_3_S6
BLK_6A_S1 BLK_6A_S2 BLK_6A_S3 BLK_6A_S4 BLK_6A_S5
BLK_6A_S6 BLK_6B_S1 BLK_6B_S2 BLK_6B_S3 BLK_6B_S4
BLK_6B_S5 BLK_6B_S6 BLK_4B_S1 BLK_4B_S2 BLK_4B_S3
BLK_4B_S4 BLK_4B_S5 BLK_4B_S6

Failure — Inverter- No Failure Detected

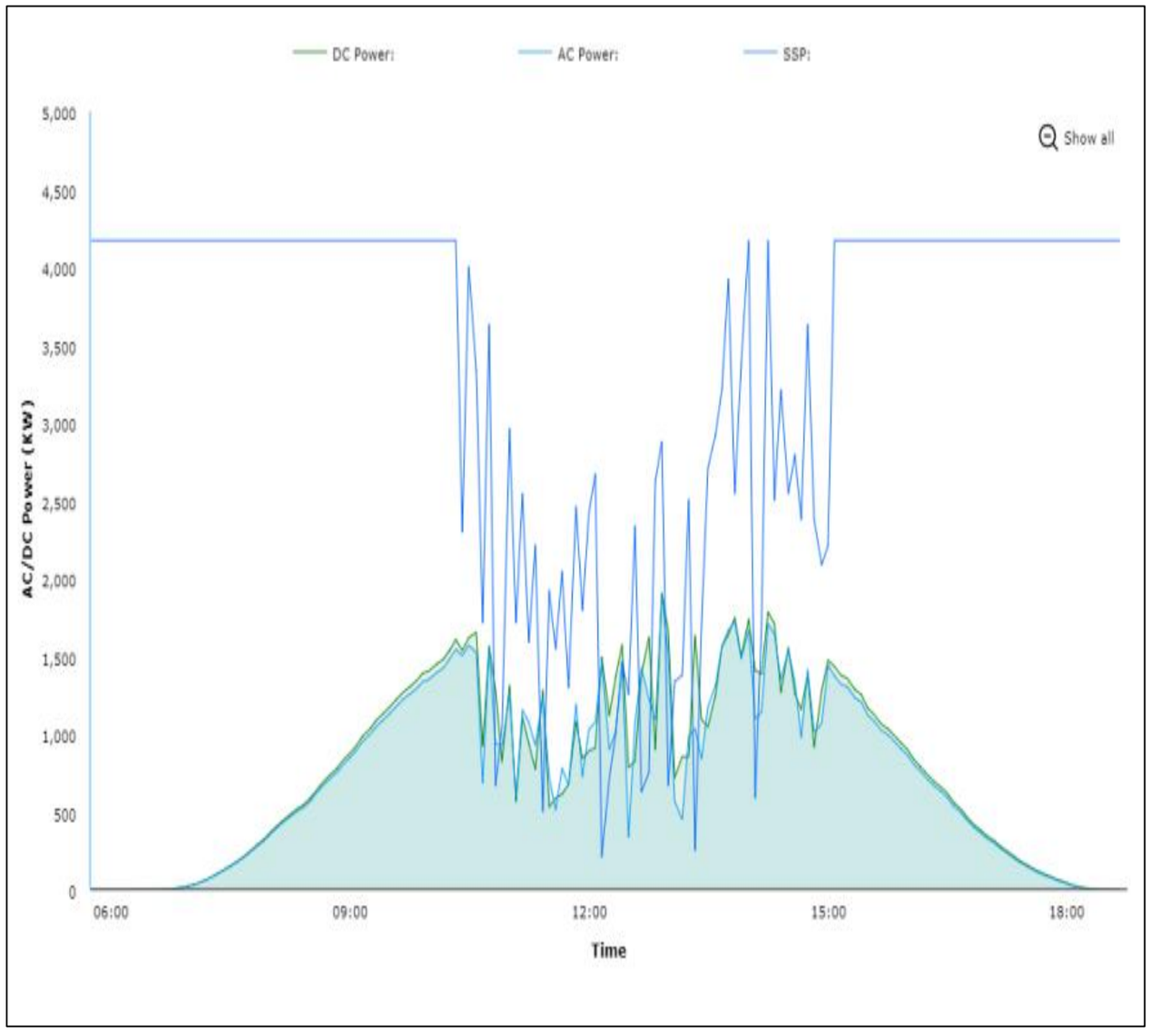
Inverter Parameters Monitoring

Error	BLK_1A_I1	BLK_1A_I2	BLK_1A_I3	BLK_1B_I1	BLK_1B_I2	BLK_1B_I3	BLK_1B_I4	BLK_1B_I5	BLK_1B_I6	BLK_3_I1	BLK_3_I2	BLK_3_I3	BLK_3_I4	BLK_3_I5	BLK_3_I6	BLK_6A_I1	BLK_6A_I2	BLK_6A_I3	BLK_6A_I4
Firmware Mismatch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Mismatch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Over Temperature	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Low Insulation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
String Reversed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Input Abnormal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DC Over Voltage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DC Under Voltage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DC Over Current	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AC Over Voltage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AC Under Voltage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AC Over Current	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Frequency Abnormal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ground Abnormal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IGBT Saturation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grid Abnormal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SPD Fail	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fuse Fail	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown Alarm-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
System Fault	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Firmware Error	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Error	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Flash Fault	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Groud Fault	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leakage Fault	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Temperature Fault	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grid Sequence Fault	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insulation Fault	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Isolation Fault	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Config Fault	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Relay Fault	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fan Fault	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Self Test Fault	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Int Comm Fail	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anti Islanding Fault	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Comm Fail	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Unknown Error-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ext Power Limit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fault Detected	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alarm Detected	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Derating	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Warning Detected	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown Event	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

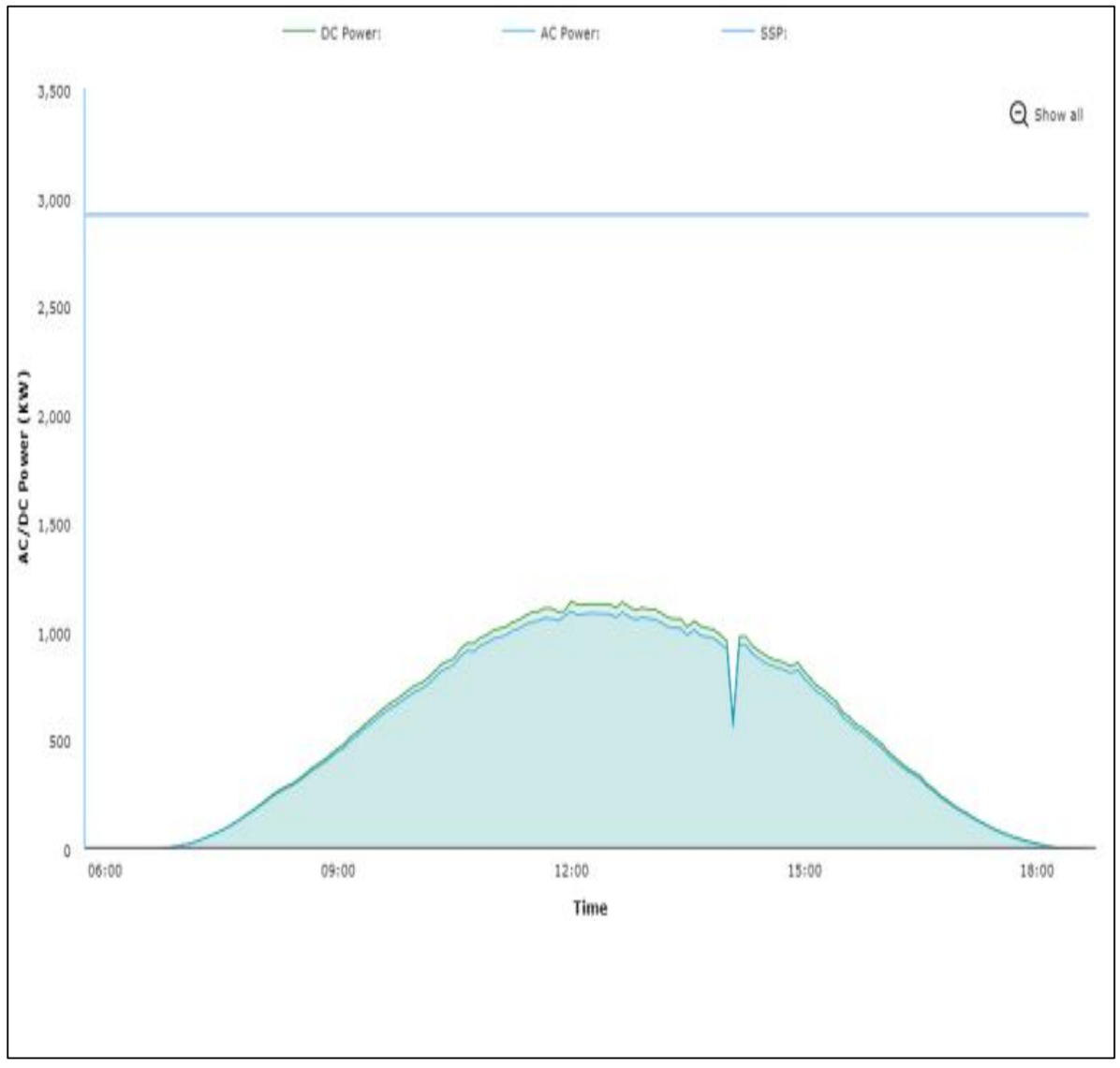
Error	BLK_6A_I5	BLK_6A_I6	BLK_6B_I1	BLK_6B_I2	BLK_6B_I3	BLK_6B_I4	BLK_6B_I5	BLK_6B_I6	BLK_4B_I1	BLK_4B_I2	BLK_4B_I3	BLK_4B_I4	BLK_4B_I5	BLK_4B_I6
Firmware Mismatch	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Mismatch	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Over Temperature	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Low Insulation	0	0	0	0	0	0	0	0	0	0	0	0	0	0
String Reversed	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Input Abnormal	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DC Over Voltage	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DC Under Voltage	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DC Over Current	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AC Over Voltage	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AC Under Voltage	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AC Over Current	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Frequency Abnormal	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ground Abnormal	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IGBT Saturation	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grid Abnormal	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SPD Fail	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fuse Fail	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown Alarm-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
System Fault	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Firmware Error	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Error	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Flash Fault	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Groud Fault	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leakage Fault	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Temperature Fault	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grid Sequence Fault	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insulation Fault	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Isolation Fault	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Config Fault	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Relay Fault	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fan Fault	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Self Test Fault	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Int Comm Fail	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anti Islanding Fault	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Comm Fail	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Unknown Error-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ext Power Limit	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fault Detected	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alarm Detected	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Derating	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Warning Detected	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown Event	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Innovative Projects implemented

Generation and Demand Control On Non Working Day 06-02-2022

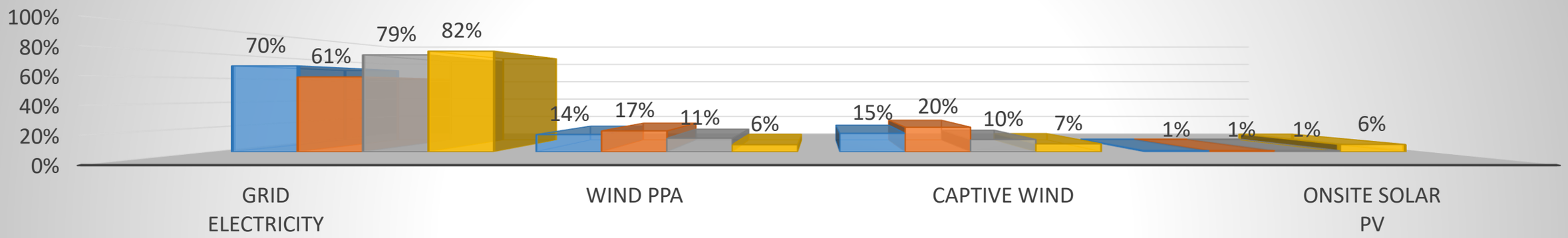


MRS 3 Section 1 Trend



MRS 3 Section 2 Trend

Utilisation of Renewable Energy sources



	Grid Electricity	Wind PPA	Captive Wind	Onsite Solar PV
18-19	70%	14%	15%	1%
19-20	61%	17%	20%	1%
20-21	79%	11%	10%	1%
21-22	82%	6%	7%	6%

Year	Technology	Type of energy		Installed Capacity (MW)		Generation (milion kWh)	% of Overall electrical energy
		Wind (Offsite)	Solar (Onsite)	Wind (Offsite)	Solar (Onsite)		
FY'2018-19	Renewable	12046977	449041	37	0.5	12.5	30%
FY'2019-20		15609701	600640			16.21	39%
FY'2020-21		12835081	450000			13.29	21%
FY'2021-22		12170632	5616508		9.7	17.79	18%

Waste utilization and management

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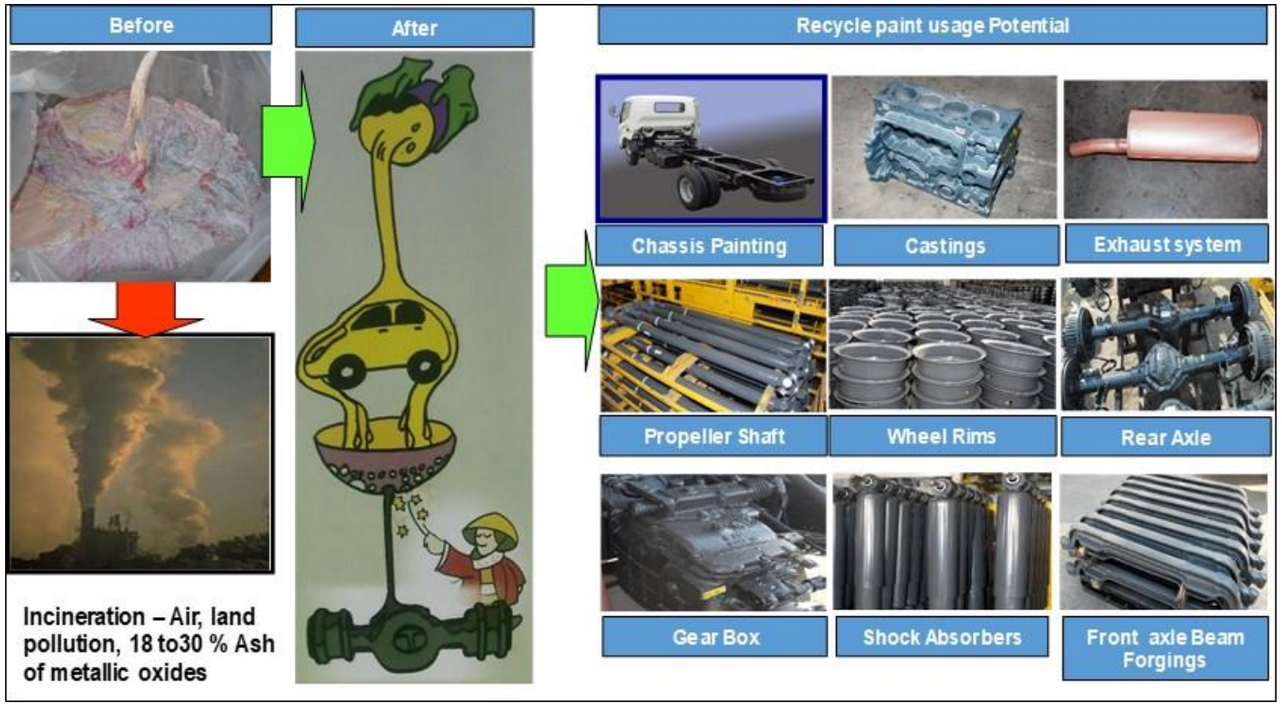
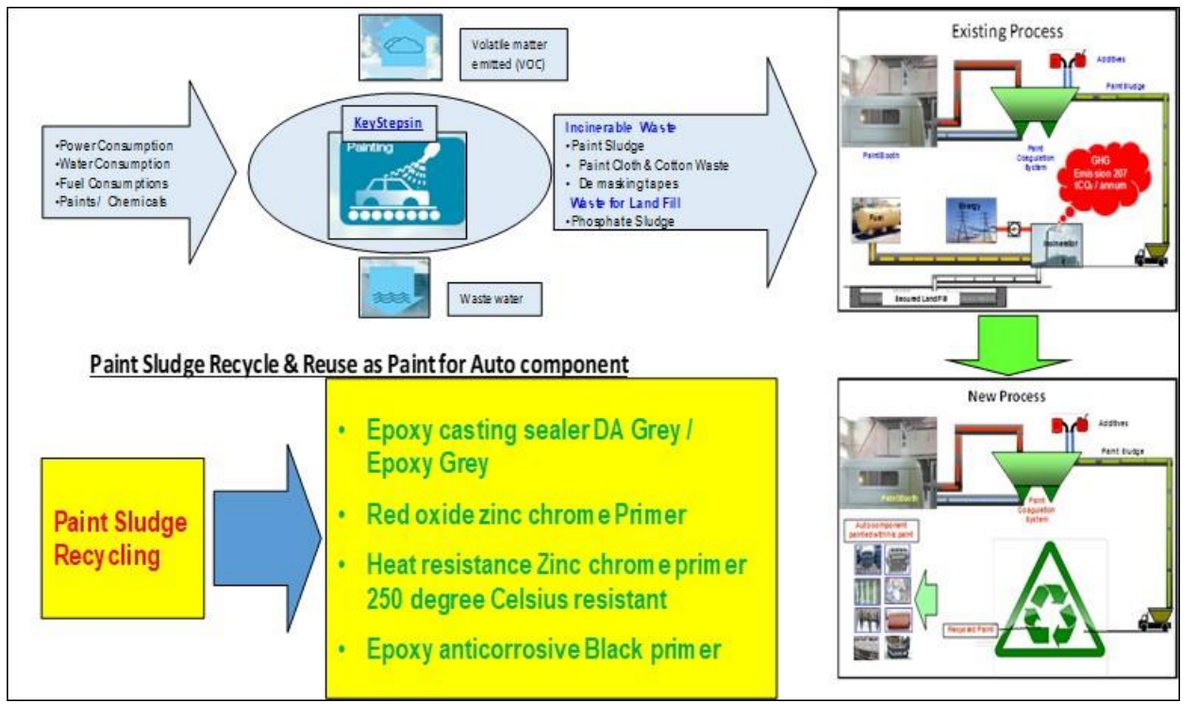
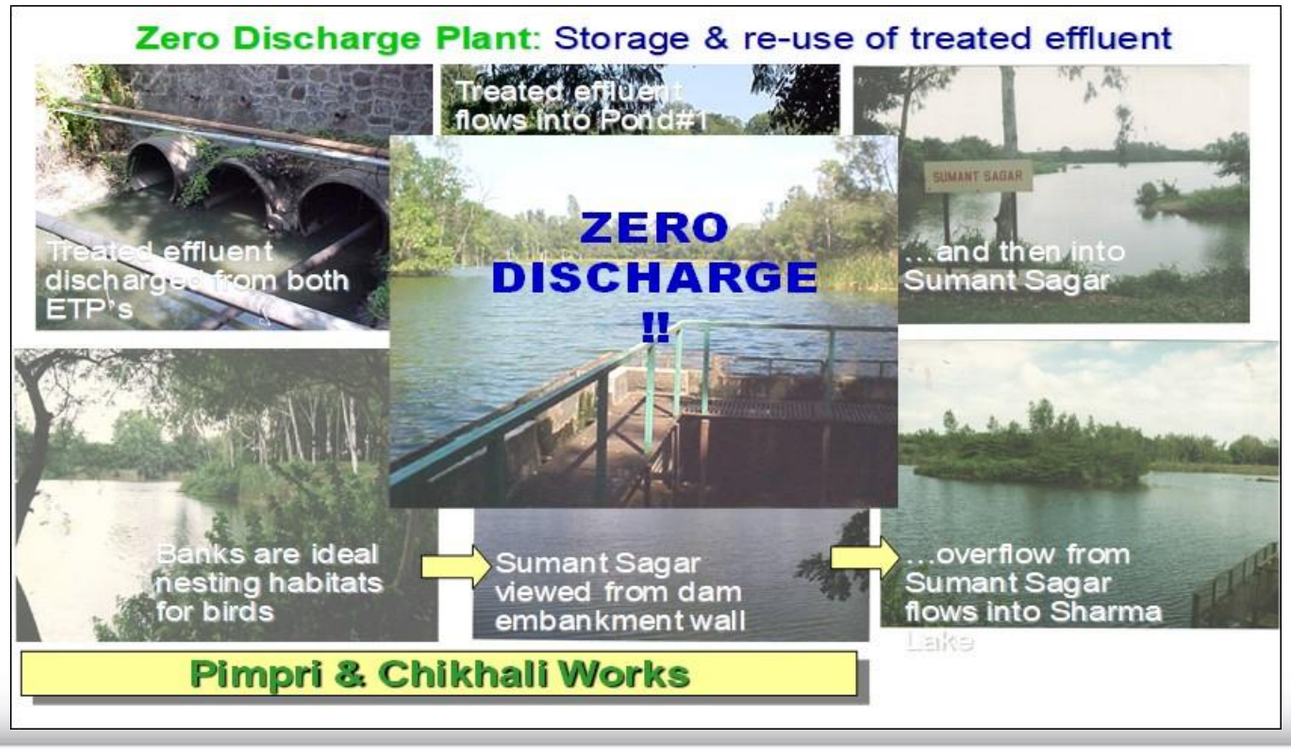
Paint Sludge recycling and usage potential



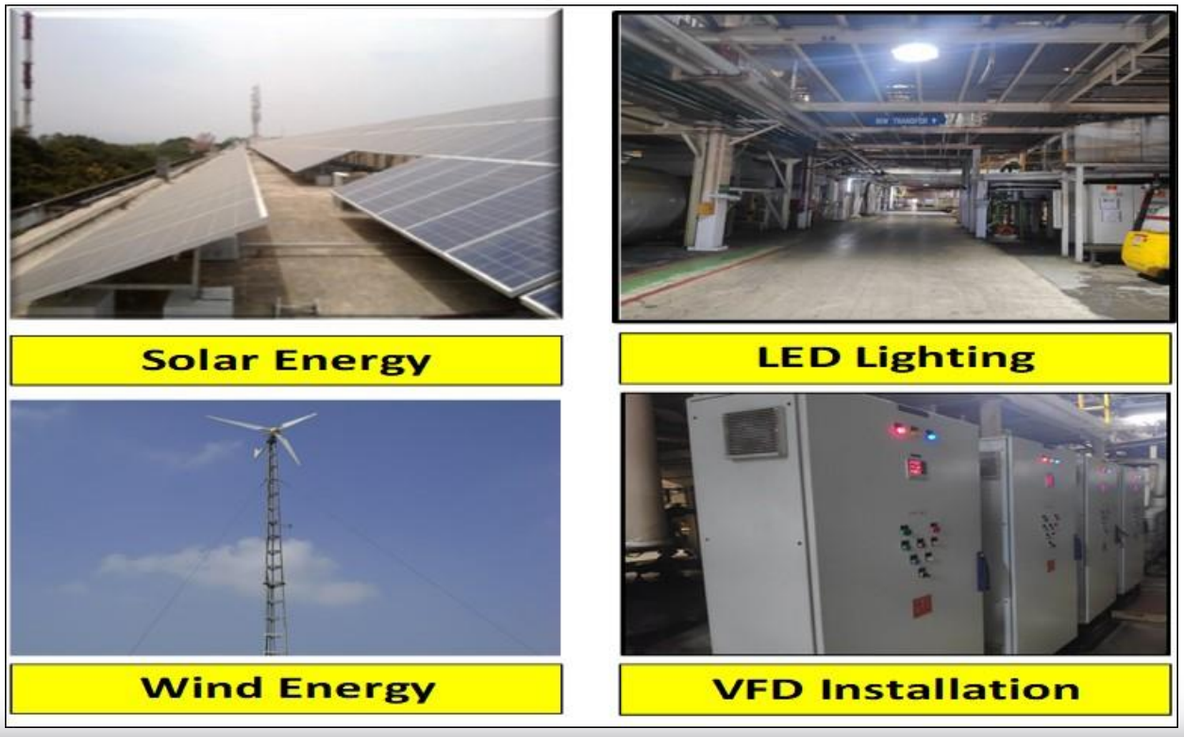
Paint Shop Hazardous Waste Process Mapping



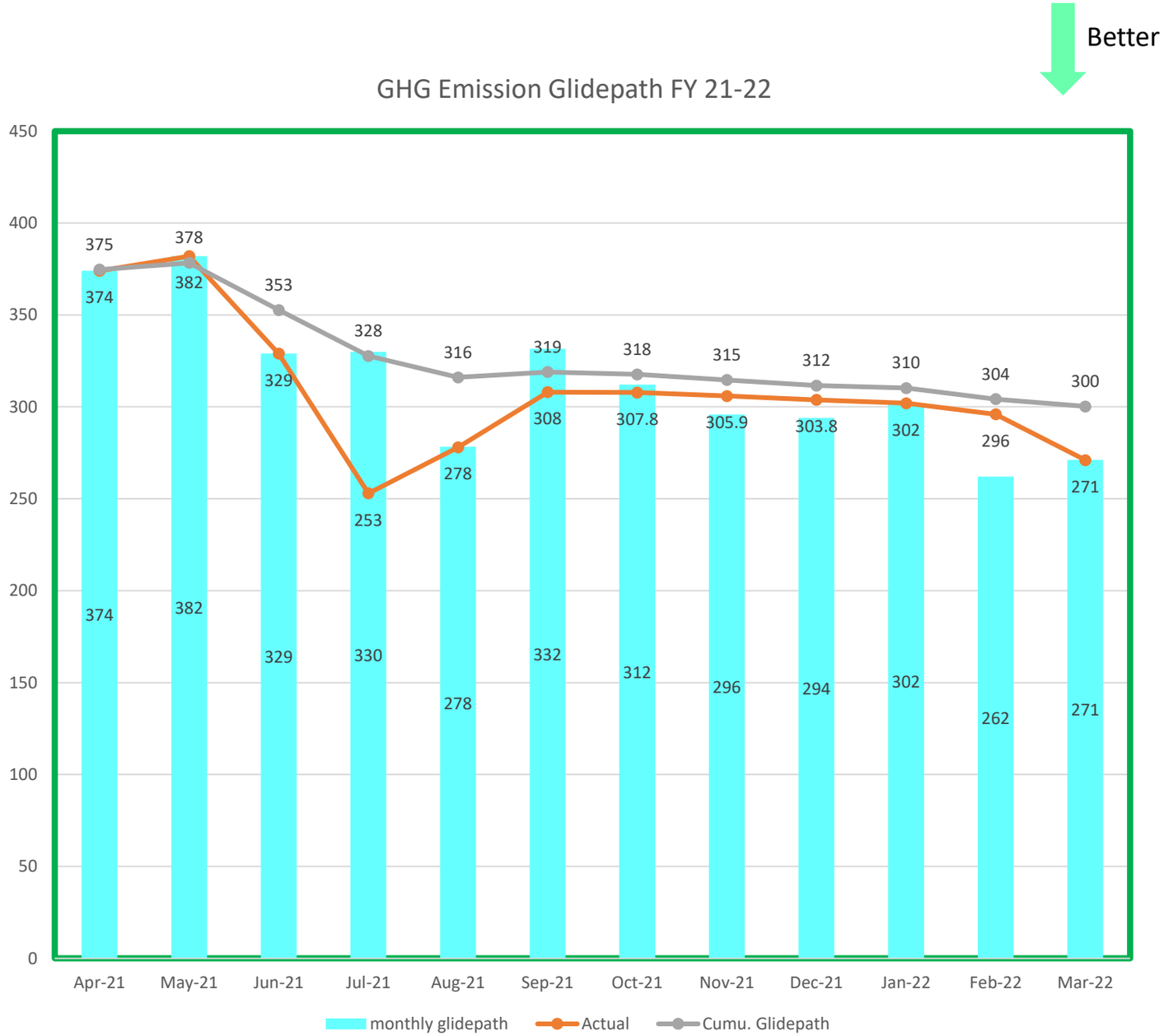
Zero Discharge Plant



Green Spots at Plant



TMPVL Pune : GHG Performance YTD Mar'22



Sr. No	Description of Energy Conservation Efforts / Encon Activity	KWh Saving in Lakhs / annum	KGCO2e reduction
1	LED light fitting installation at TCF & Paint shop	17	6.51
2	Compressed air leakage reduction & optimization of control system	12	4.60
3	6.25 MWp Solar Car Port installation at PVBU Chikhali	64.8	24.83
4	3 MWp Solar Roof top.	3.53	1.35
5	LED light fitting installation at TCF 2	6.0	2.60
	Total KGCO2e / Eq. Vehicle		39.89

TMPVL Pune : Water Consumption

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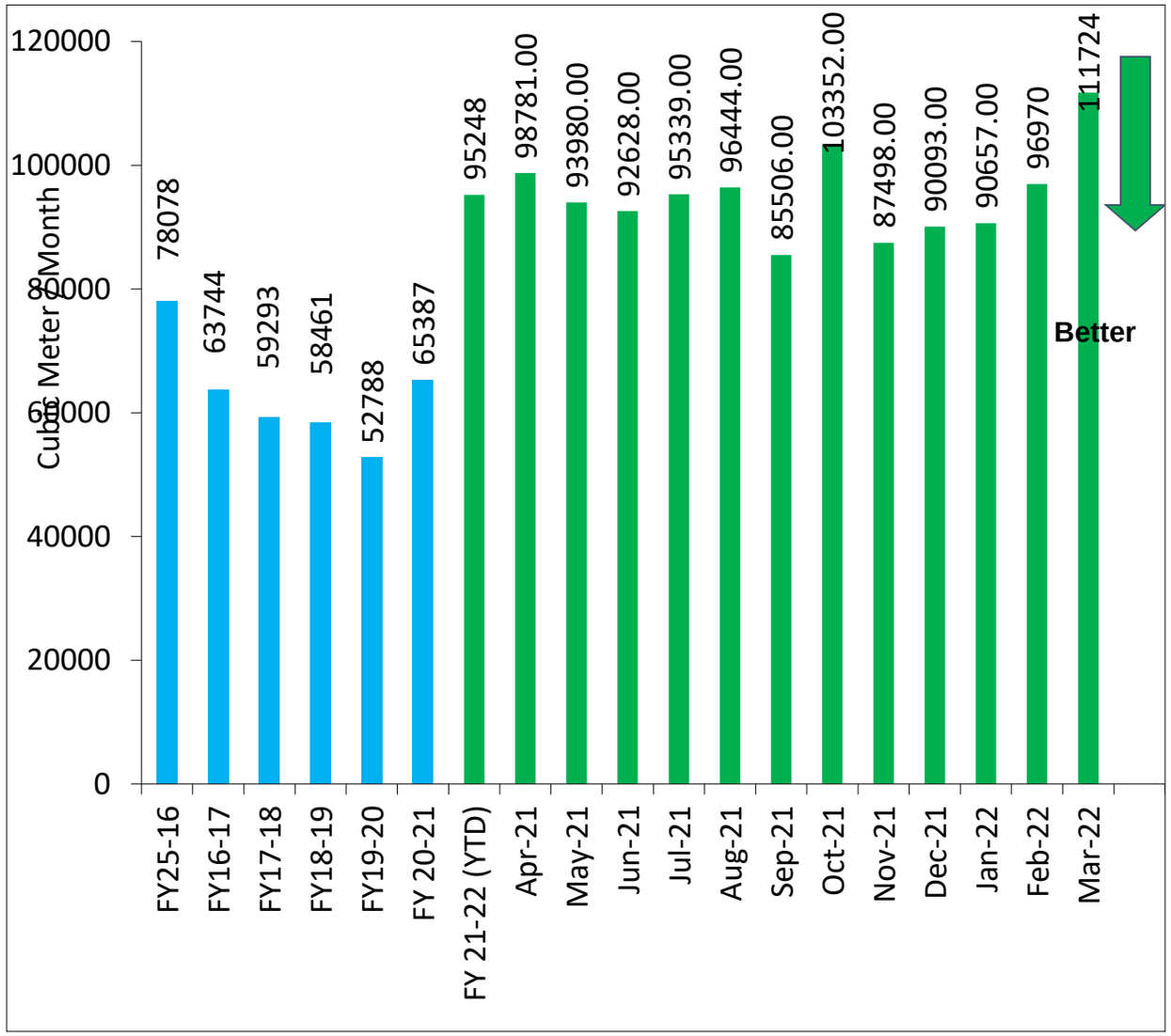
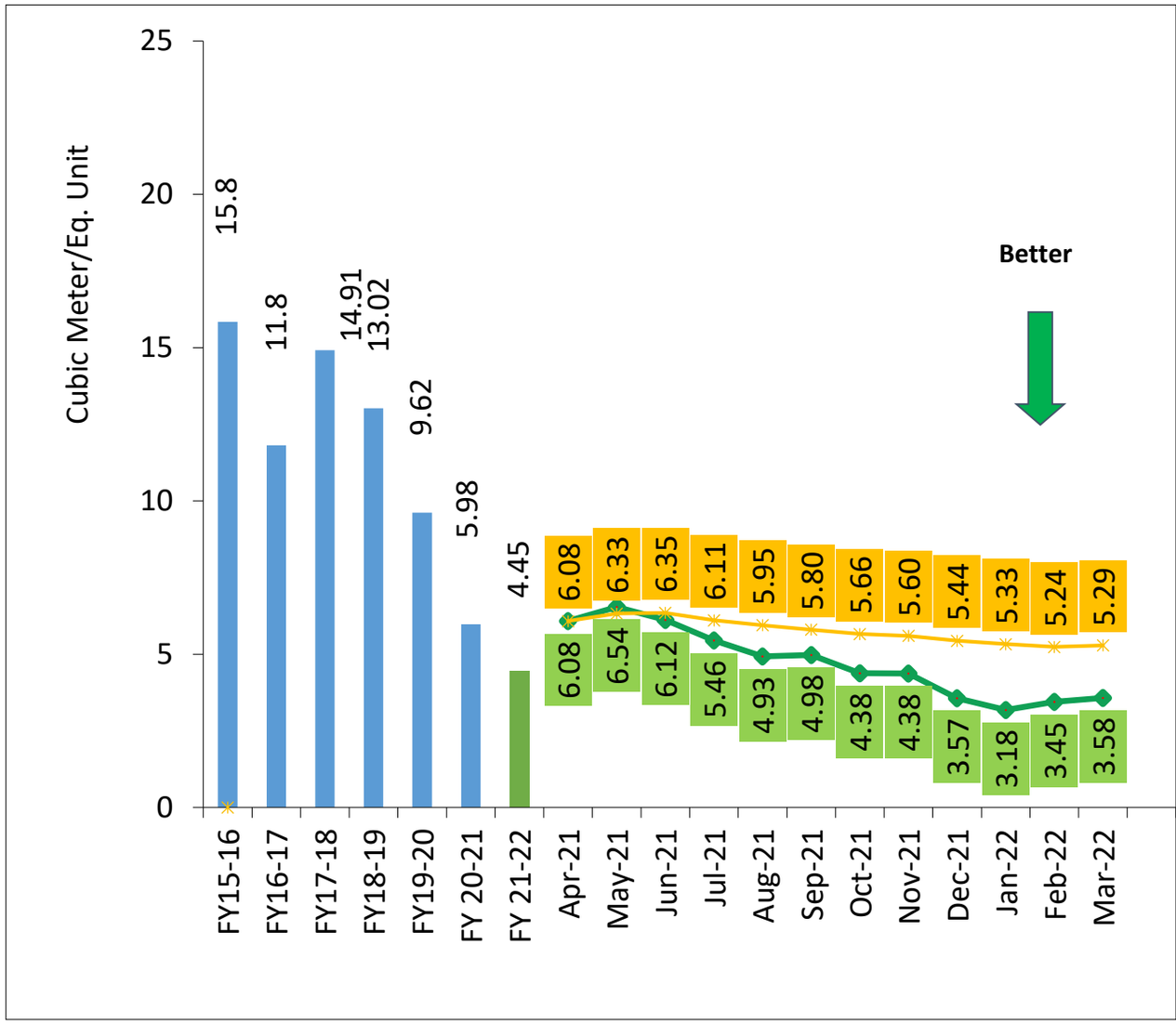
Absolute (MIDC+RP+Rain) water consumption in Cubic Meter



Sp. water (MIDC+RP+Rain) consumption in Cubic Meter/Eq. Unit



TMPVL Pune : Hazardous Waste Disposal

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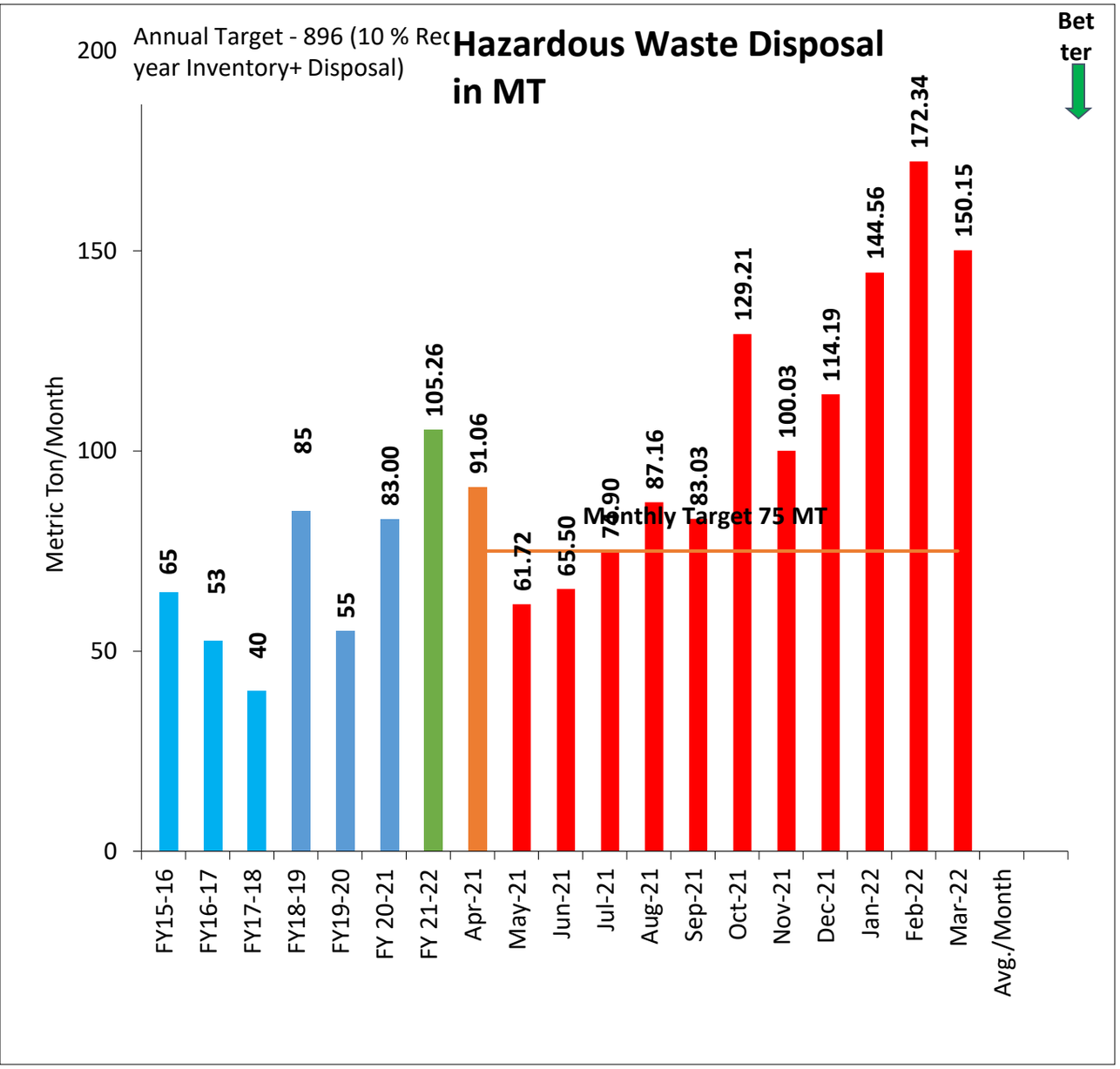
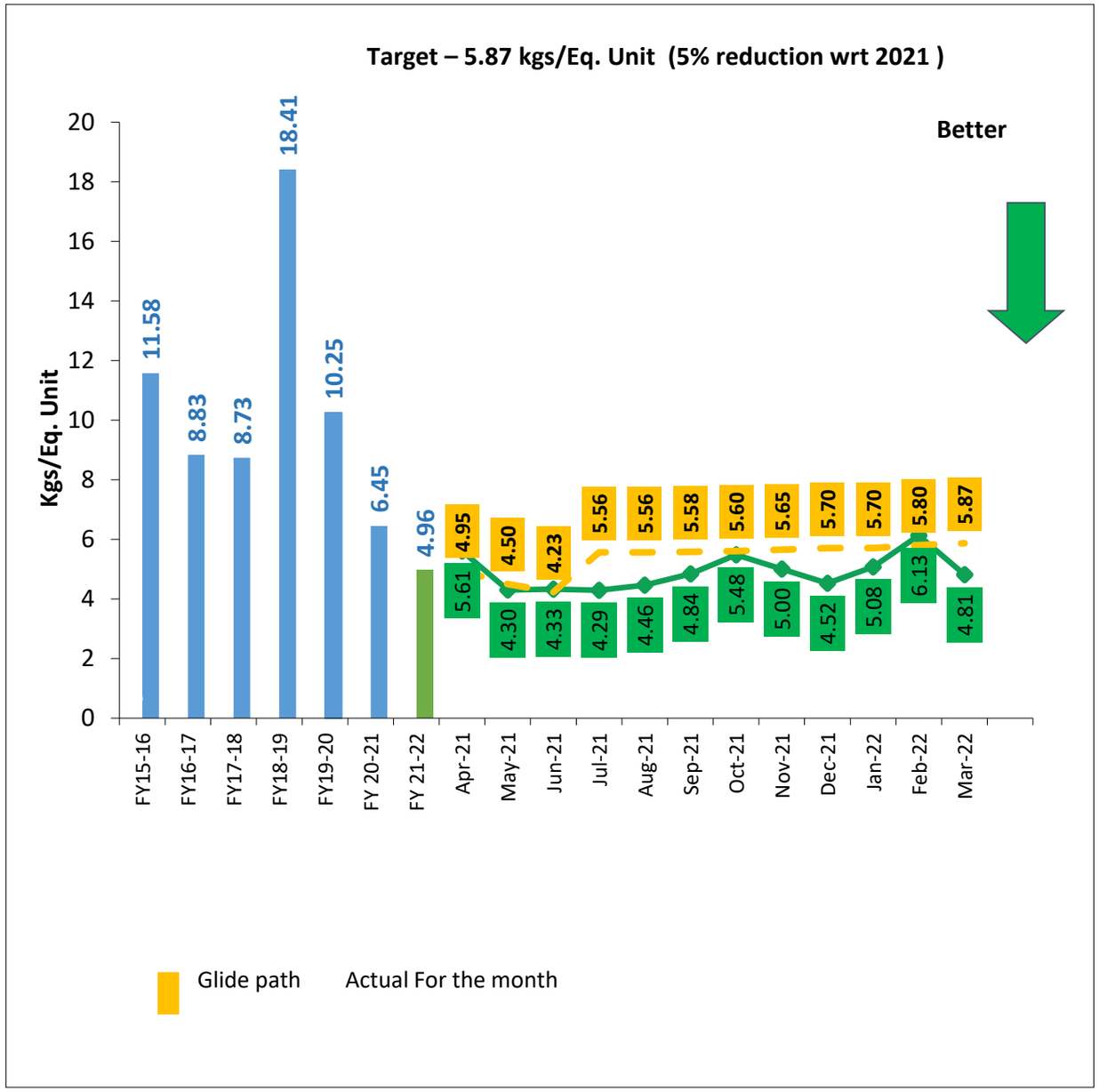
Status of Hazardous Waste Disposal in MT



Sp. Hazardous Waste Disposal in Kgs/Eq. Unit



World Water Day – 22 March, 2022

• **Senior Management & employee engagement:**	• **Employee engagement activities:**
• Plant Head and Plant Leadership Team address to employees on importance of water conservation. • Pledge taken at Shops/Non-manufacturing functions • Discussion in Operations Meeting with all Seniors regarding importance of water and in manufacturing.	• Awareness sticker about Water Conservation put in all wash rooms @Pune • Training & Awareness session on Shop Floor @Pune
• **Expert Hour sessions:**	
• Session by Mrs Vineeta Date, Chairperson, Environment Conservation Association on Rain Water Harvesting and Ancient Water Storage Systems @Pune • Online session by experts from Rotary Club Pune & HV Desai College on importance of water conservation @Pune	

700+ employees across both locations actively participated in various events held during World Water Day celebrations

Water KPI Lever	Project description	PDC	Reduction Potential (m^3/year)	Budget Required (INR, lakhs)	Status
Reduce losses	Chikhali: Above ground water line replacement	Mar'23	150,000	84	CAPEX Budget available. Saving will accrue in FY24
	Chikhali: Local overhead water tanks for JLR area	Dec'22	15,000	10	Support required under Rev Budget.
Process optimization	Sanand: VFD and IoT metering in water supply	Jun'22	5,000	4	Completed under Revenue Budget
	Sanand: Low-flow fixtures in canteen & toilets	Sep'22	2,000	4	Completed under Revenue Budget
Rainwater Harvesting	Chikhali: Hydrogeological Survey	Sep'22	---	5.2	Rev budget is available
Effluent re-cycling	Chikhali: Installation of Pre-filter	Dec'22	100,000	30	Trials underway; CAPEX Budget available.
	Chikhali: STP up-gradation (Dedicated tube settler & UF module)	---	100,000	246	Decision depends on outcome of pre-filter trial

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Driving Net Zero Carbon Emission Assessment across TML PVBU Plants

TATA GROUP DIRECTIONS	
Base line for Net Carbon zero plan	• 15%reduction in absolute CO2e emissions (Scope 1 + 2) from a [2020] baseline by 2025 • 35% reduction in absolute CO2e emissions (Scope 1 + 2) from a [2020] baseline by 2030 • Net zero CO2e emissions (Scope 1+2+3) before 2039
Projection of Energy Consumption	Derived from Vehicle Production Plan till FY 29-30 and KWh/ vehicle
Option available	• Exploring within plant solar roof top installation • Exploring group captive or Open access power purchase • Use of MSEDCL green power purchase with additional rate • Encon Projects implementation
External Factors involved	• Vehicle Production • Govt Regulations

Scope 3 CO2 Emission Reduction Current Practice

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Transportation of BIW & Non BIW Parts movement from PCMC & PMC supplier from TML Plant Pune

Before

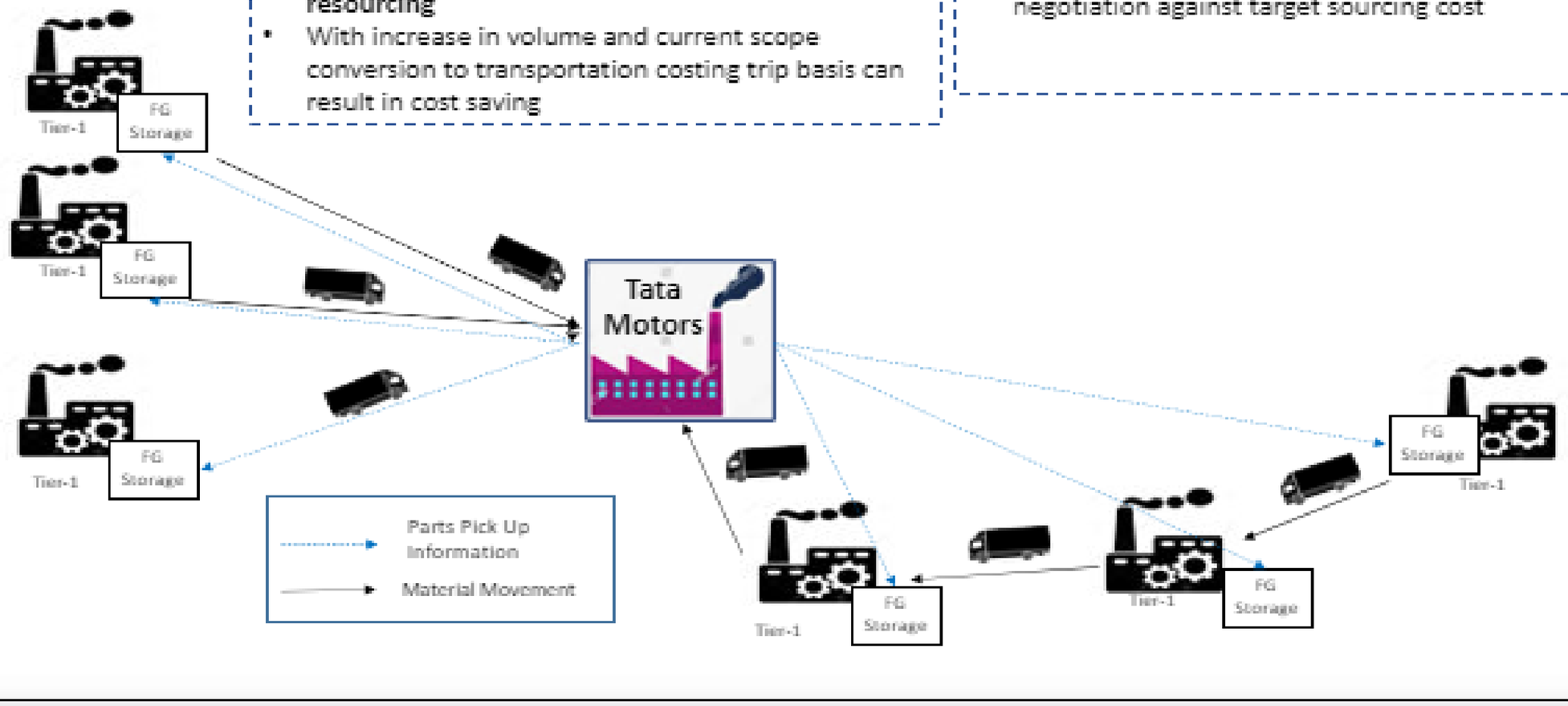
Existing Contract for Parts Movement:

- Transportation Contract was very old and settled on **CBM / Invoice value percentage basis**
- Existing contract is running on extension, **needs resourcing**
- With increase in volume and current scope conversion to transportation costing trip basis can result in cost saving

After

Revised Approved Contract for Parts Movement:

- **Milk run agreement with vendors.**
- Overall contract resourcing is being conducted
- Negotiation was based on E Bidding with additional negotiation against target sourcing cost



Green Supply Chain Management

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Sr. No.	Projects Implemented	Investment (Rs In Cr)	Benefits (Rs. 10.09 Cr)
1	Reduction of Ocean transit time & Port turnaround time for JLR imported shipments resulted in inventory carrying cost	Nil	5.5
2	Altroz pallet cost saving due to in house ICA family pallets modification	0.5	1.25
3	Transportation cost saving through trolley modification from J to K Block	0.5	0.51
4	Packaging improvement in Nexon BIW parts	Nil	0.27
5	Harrier engine Freight cost optimization from RJV to Pune	Nil	0.23
6	Freight cost optimization for Harrier projects	Nil	0.8
7	Export shipment cost optimization	Nil	0.43
8	Employee transport optimization	Nil	1.0
9	Cost optimization for material transportation from CCD (Console Centre Delhi)	Nil	0.1
11	Plastic waste reduction initiatives (8 Ton reduction / year), Reuse of Plastic (600 Kg / year)	Nil	Plastic weight reduction of 8030 Kg/ Year. 2. Reuse of 594 Kg / year of plastic

Environmental Procurement Policy commits to Expand awareness and evaluate by involving, Educating and Encouraging stake holders

Teamwork, Employee Involvement & Monitoring

TATA MOTORS
Connecting Aspirations

Energy Conservation Team

	Shop Champions	Power	Fuel	IMC	Tools	PTP	Rejection	Freight. (TPLP)
TCF	Vikas Kattimani	Ganesh Kapse	NA	Ritesh Rajput	Ritesh Rajput	Ritesh Rajput	Dinesh	NA
PAINT	Arjun Mahajan	D. Bhamere	Davinder Singh	Arjun Mahajan	Mukesh Inamdar	NA	Abhay Nahar	NA
WELD	Vikas / Prashant	Balasaheb Landge	NA	Vankateshh Kulkarni	Vikas Dhake	Surendra Shinde	Ajit Patil	NA
PRESS	Sunil Memane	Shrikant & Mali	NA	Mukund Jeodevkar	Shrikant Patil	Mahesh Tambe	Vijay Sagare	NA
ENGINE	Paresh Zende	Paresh Zende	Vaibhav Karandikar	Atul Patil	Sanjay Shejul	Atul Patil	Vaibhav Sawant	NA
T/A	Nilesh Tilak	Nilesh Tilak	Jaysankar	Deepak Mujumule	Suyog Mashelkar	Suyog Mashelkar	Hemant Mahamuni	NA
OTHERS	D. Suresh & Rahul & Deepak	D. Suresh	Suhas Kulkarni	Milind Shah	Deepak Barate	Deepak Barate	Milind Shah	Shirish Athavle

Shop wise and component wise teams created to drive VCC reduction

Rewards & Recognition

Energy Conservation team

- Mr. Jairaj Bhosale (Paint)
- Mr. Paresh Zende Engine)
- Mr. Jeevan Deshpande (UV)
- Mr. Vikas Dhake (BIW)
- Mr. Nilesh Tilak (TA)
- Mr. Vitthal Patil (Compresso

being appreciated by VP Operatio r Energy S
idea implementation May 2019

SHE and Sustainability Overall Performance - Pune PVBU - RUNNER

SHE and Sustainability Environment Performance - Pune PVBU – WINNER

Green Manufacturing Award & CII water Award

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MORE WHEN ONE
BE BOLD | OWN IT | SOLVE TOGETHER | BE EMPATHETIC

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Pune PV Plant Bagged National Best in Class Awards in Green Manufacturing and Productivity @ 7th Edition National Awards

Tata Motors PVBU Pune Teams have participated in 7th edition of **'National Awards for Excellence in Manufacturing 2021'** organized by **World Manufacturing Congress & Awards, India Chapter,** held at Taj Lands Mumbai to demonstrate the initiatives undertaken in last one year.

PV Pune Team presented case study on **Green Manufacturing and Productivity Improvement.** In Green Manufacturing Team presented sustainable initiatives and strategy over last 3 years in energy conservation including installation of India's Largest 6.2 MWp Solar Car Port. The team also presented initiatives to improve overall productivity to meet pent up customer demand for it's 'New Forever Range' of Vehicles and 'Nexon EV'.

Pune PV Teams were commemorated with 'Best in Class Green Manufacturing ' and 'Best in Class Productivity Improvement' awards.

Mr. Abhay Kulkarni (Head Paint Shop Manufacturing), Mr. D R Suresh (Head Central Maintenance and Utility) and Mr. Amol Madkar (Head Productivity & Business Excellence Services) from Pune PV received the awards during award ceremony held at Taj Lands Mumbai on 26th August 2021.

Mr. Swapnil Patil (Head Manufacturing Engineering PVBU) and Mr Rakesh Jha (Head Technical Services, PV Pune) mentored the team for excelling in Green Manufacturing and Productivity.

PV Operations Leadership team Mr. Rajesh Khatri, VP Operations PVBU, Mr. Shyam Singh, Plant Head PV Pune congratulated the team during DWM.

TMPVL Pune Plant bags First Place Award in CII-Excellence in Water Management Competition

CII Energy Efficiency Awards

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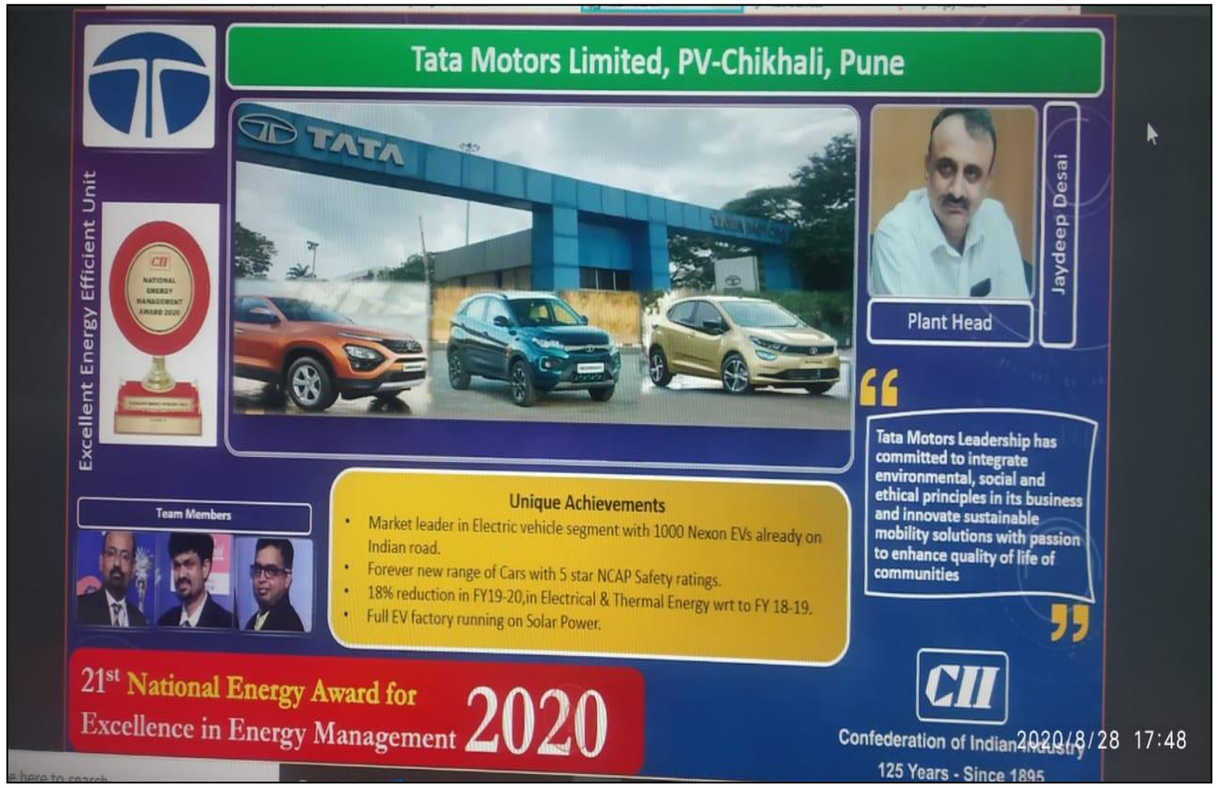

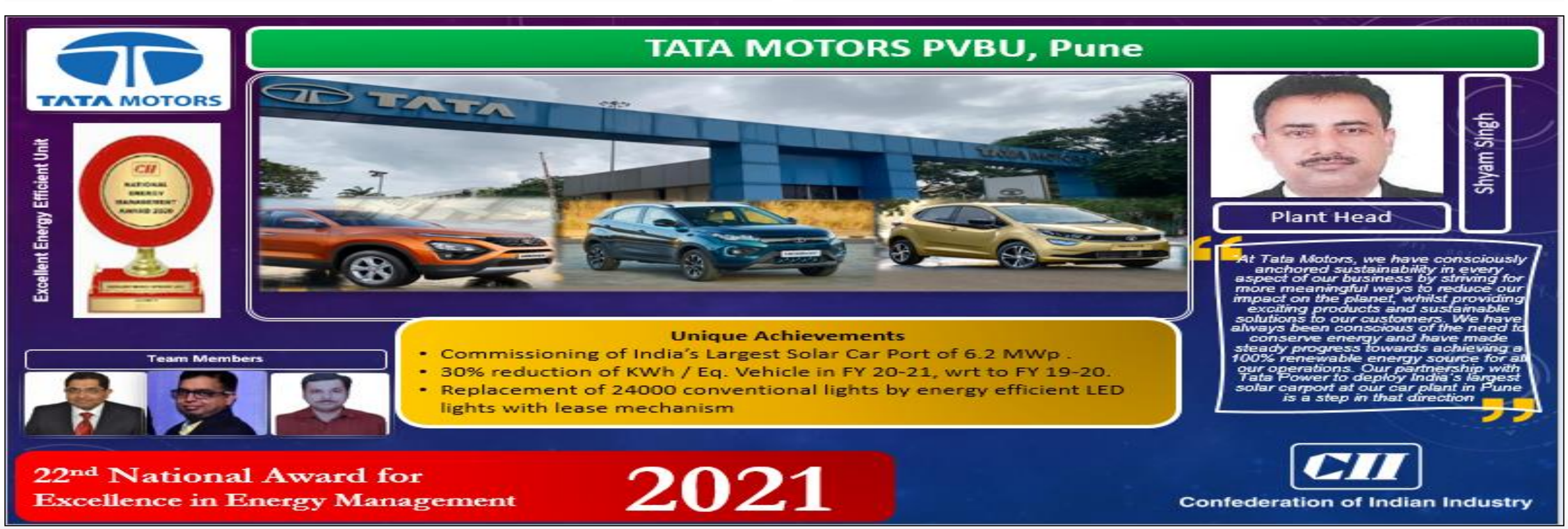

Learning from CII Energy Award 2021 or other award program

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CII Awards function we come to know ADDTECH solutions , we have interacted with them and now we have planned 4 such modifications in our Air supply plants, this will give us substantial energy savings.

Before

Old blower

ASU Area After Blower Removal

After

New EC fan Suction Side

New EC fan discharge Side

Other than above we have reduced our compressed air leakage from 13.6 % to 8.67 % last year with the feedback from CII judges and our target is to reach to industry bench mark in coming year,

Journey towards Energy Efficiency Excellence

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COMMITMENT TO GLOBAL CAUSE
ENERGY CONSERVATION CELL
PCBU-TATA MOTORS

2019-20
Encon Ideas:
Savings achieved:

201
Encon Ideas:187 2200
Savings achieved: 80.45

2017-18
Encon Ideas:190 82
Savings achieved: 347

2016-1
Encon Ideas:140 50
Savings achieved: 257.6

2015-16
Encon Ideas:223 34.8
Savings achieved: 76

2004-05
Encon Ideas:8 85.6
Savings achieved: 77.2

2003-04
Encon Ideas:24 65.4
Savings achieved: 29.76

2002-03
Encon Ideas:31 4.0
Savings achieved: 12.47

2001-02
Encon Ideas:28 7.0
Savings achieved: 1.391

RE 100

Leadership Vision, Policy and Plant Specific Promise

Tata Motors Leadership has committed to intergrate environmental, social and ethical principles in its business and innovate sustainable mobility solutions with passion to enhance quality of life of communities.

Q & A

Any Questions ?