

ITC Limited , Bangalore



Team :

Chandan Das
Govind Singh

--Branch Engineer

-- Utility Engineer-E

Ayush Kumar Saxena

--Utility Engineer-M



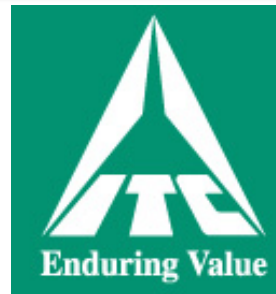
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Environment

- **Water Positive** : 18 years in a row
- **Carbon Positive** : 15 consecutive years
- **Solid waste recycling positive** : 13 consecutive years
- Soil & moisture conservation to 10.12 lakh acres
- Renewable energy: Over 42% of total energy Consumption
- Social & farm forestry initiative has greened over 7,30,000 acres



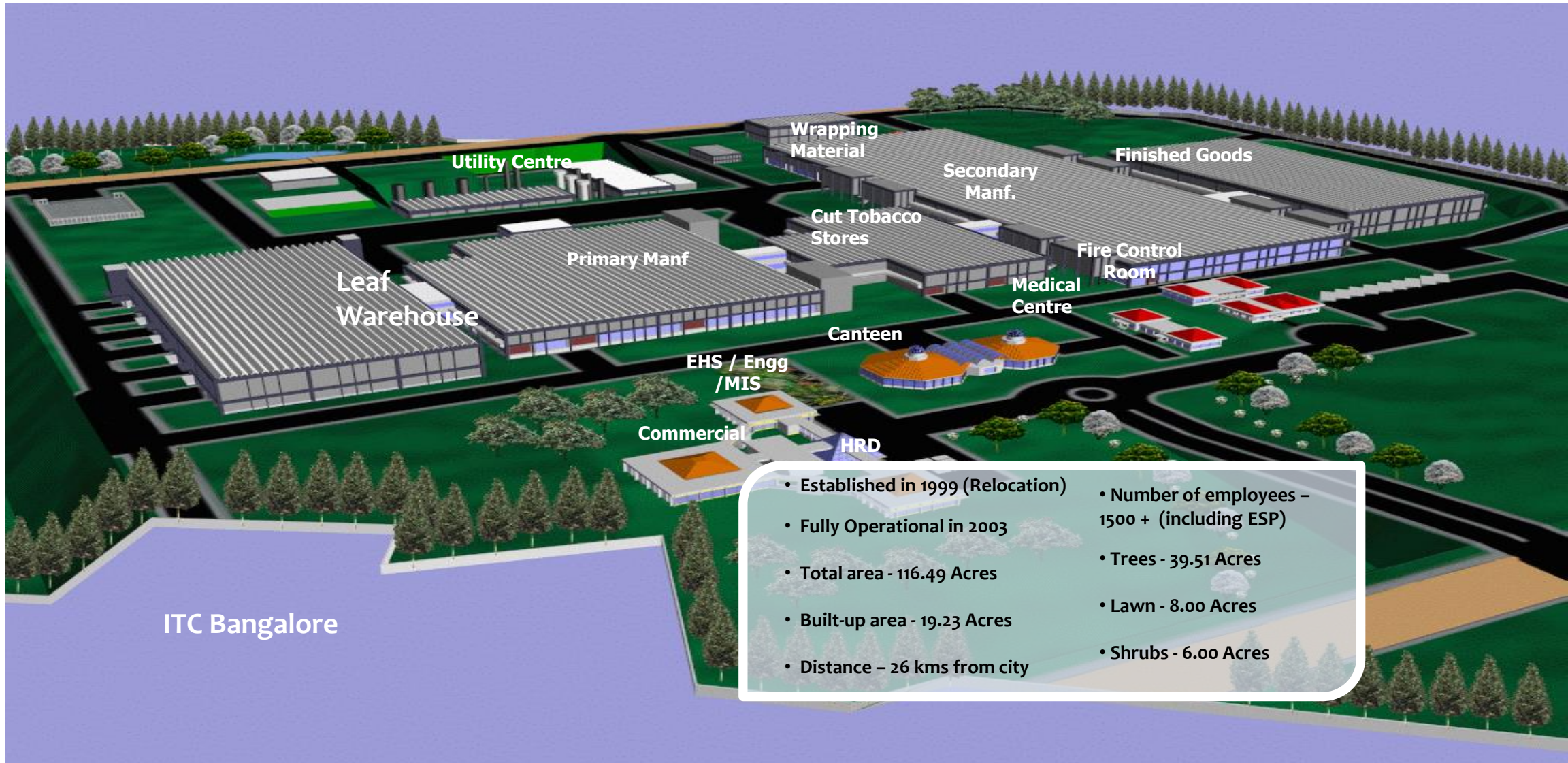
Economic

- Market Capitalization Over \$ 50 billion
- Turnover: Over \$ 10 billion
- Powered by the vitality of world-class brands

Social

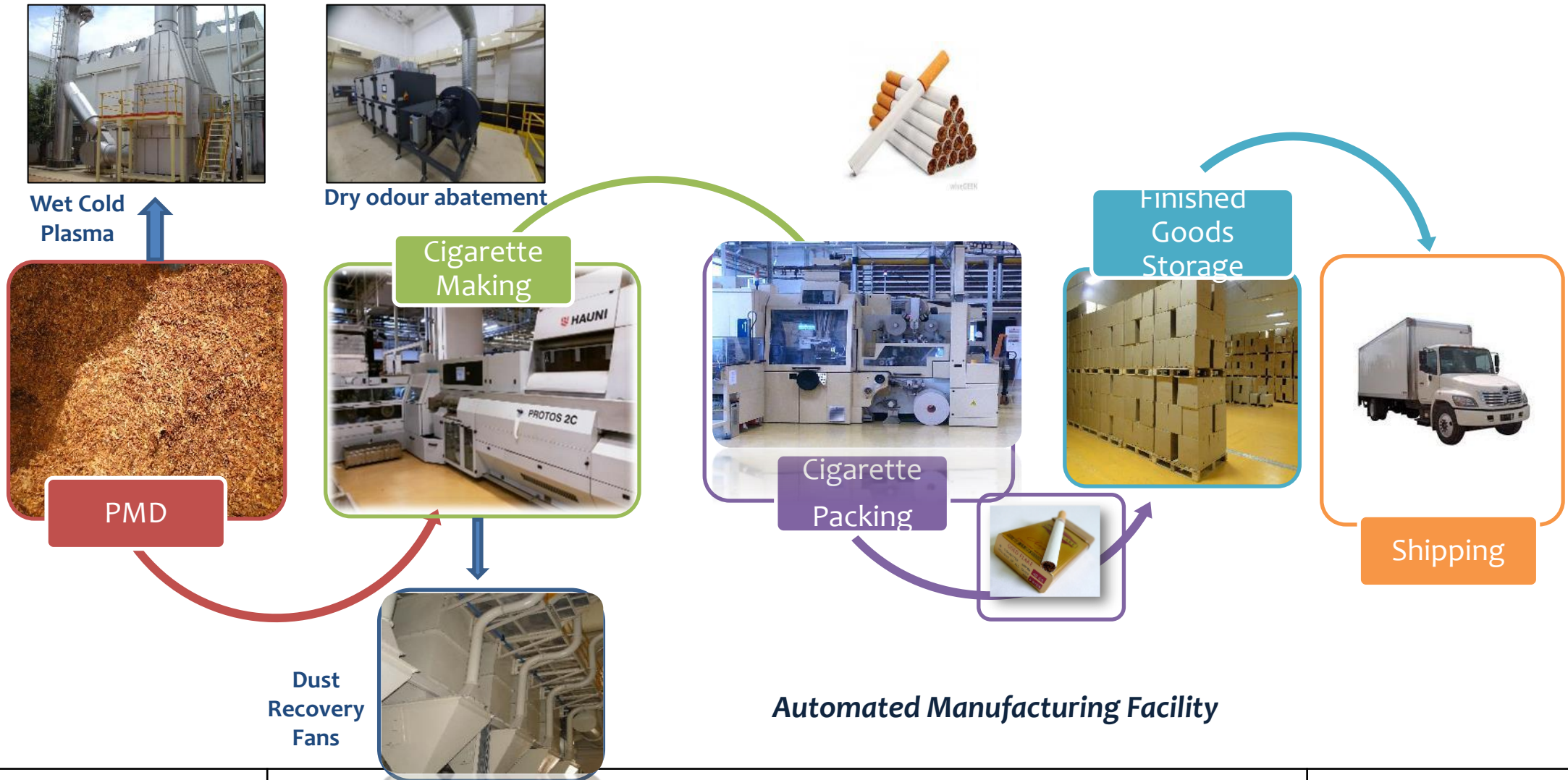
- Creating around 6 million sustainable livelihoods
- Educating 4,60,000 children
- Benefitting 4 million farmers
- 100 million person-days of employment generated

FACTORY OVERVIEW AND LAYOUT



- Established in 1999 (Relocation)
- Fully Operational in 2003
- Total area - 116.49 Acres
- Built-up area - 19.23 Acres
- Distance – 26 kms from city
- Number of employees – 1500 + (including ESP)
- Trees - 39.51 Acres
- Lawn - 8.00 Acres
- Shrubs - 6.00 Acres

Manufacturing Process Flow



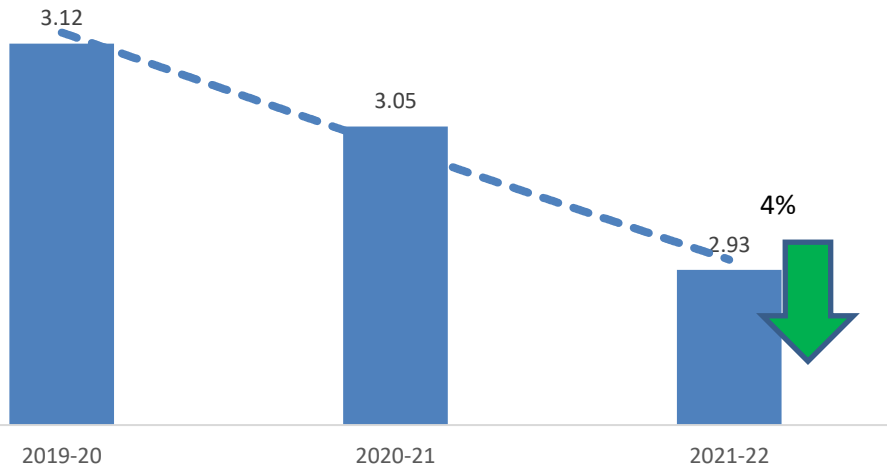
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Specific Energy Consumption

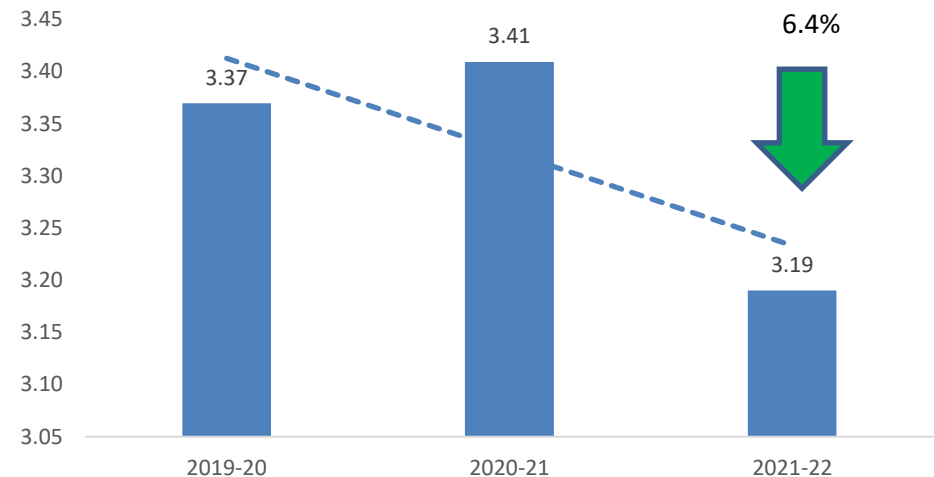
Thermal Energy GJ/ million Cigarette

GJ/MNC Thermal



Electrical Energy kWh/million Cigarette

GJ/MNC Electrical

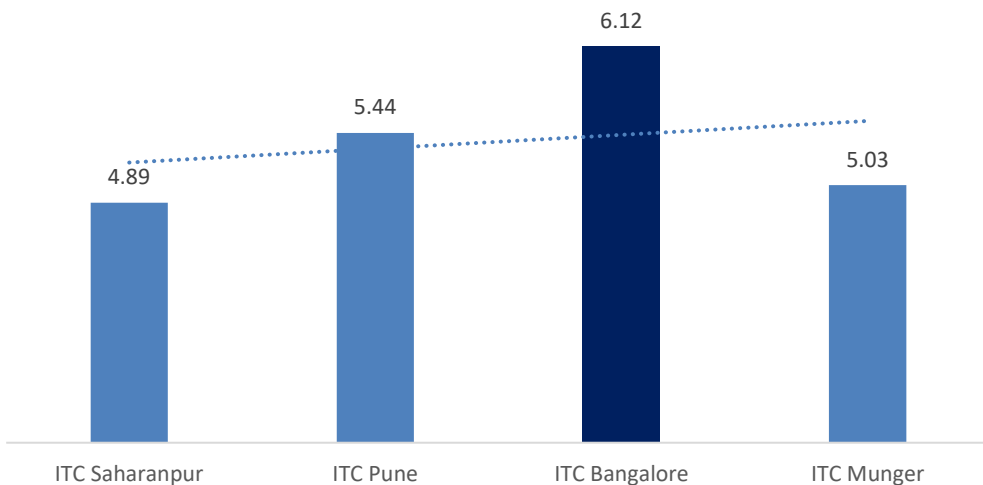


SEC of electrical energy is increased in FY 2020-21 on account of covid measure and introducing new technologies for manufacturing Of multiple cigarette brand which is consisting of complex process

Energy Benchmarking

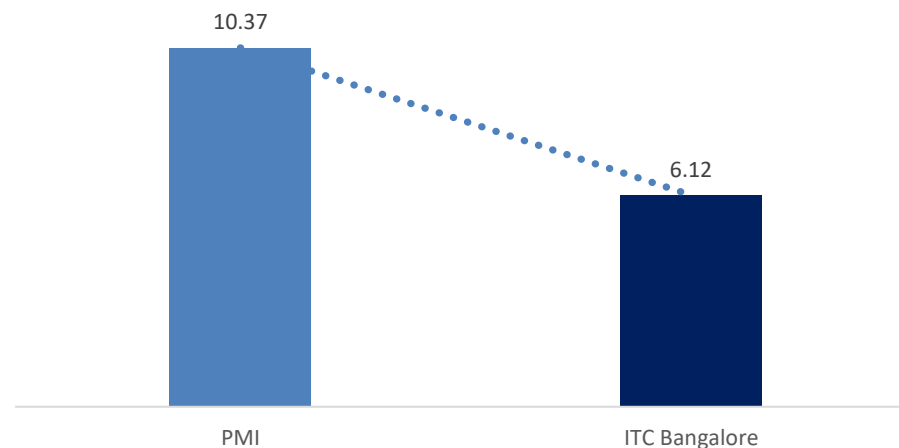
National Benchmarking

GJ/Million Cigarette



International Benchmarking

GJ/Million Cigarette



ITD being unique in size of its kind of product, specific energy consumption at national level comparison is done within different cigarette manufacturing units of ITC Limited

ITC Bangalore is having SEC higher than some of other ITD units as ITC Bangalore is processing multiple grade/ brand of tobacco which is consisting of complex process is being used as raw material by other ITD units



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Road map – Project planned for FY 2022-23

Project Title	Annual Electrical Saving (Million kWh)	Investment (Rs in Million)
High pressure humidification in PMD	0.207	4.9
DRF Cyclone Bypass with demand optimization	0.03	0.04
VFD for case packer	0.006	0.02
EC Fans for cooling tower	0.02	0.8
Energy Efficient fan for PMD and SMD DRF	0.04	2.5
Replacement of old motors with energy efficient motors	0.02	1.2
Demand based control of compressor	0.1	1.1
Energy Efficient fan for DRF	0.09	2.9
Total	0.513	13.46

ENCON –Project implemented 2019-20

SL No.	FY	Description Of the Project	Annual Electrical Saving (kWh)	Annual Thermal Saving (Million KCI)	Annual Electrical Cost Saving (Rs million.)	Investment Made (Rs million)	Payback (Months)
1	2019-20	Efficiency enhancement of waste steam recovery		400	1.560	1.1	8
2	2019-20	Auto Shut off of all Steam valve with Machines running		810	3.160	2.1	8
3	2019-20	Optimization of New FGS lighting and recalibration of automation system	64000	0	0.256	1.5	70
4	2019-20	Optimization of AHU running in SMD	119000	0	0.476	0.2	5
5	2019-20	Interlocking of PMD DRF with process running	57000	0	0.228	0.7	37
6	2019-20	Interlocking of Diet water pump ,cooling tower with the process	66000	0	0.264	1.4	64
7	2019-20	Replacement of energy efficient motor for AHU	386000	0	1.544	6.9	54



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ENCON –Project implemented 2020-21

SL No.	FY	Description Of the Project	Annual Electrical Saving (kWh)	Annual Thermal Saving (Million KCI)	Annual Electrical Cost Saving (Rs million.)	Investment Made (Rs million)	Payback (Months)
1	2020-21	Demand side optimazation of AHU	189000	0	0.756	0.25	4
2	2020-21	Energy Efficient BLDC Fan for Canteen and other area	12500	0	0.050	1.2	288
3	2020-21	AHU fan replacement with EC type	100138	0	0.401	4.4	132
4	2020-21	SMD lighting replaced with LED type (Savings of 7500 units/month X 7 months)	52500	0	0.210	1.8	103
5	2020-21	cDRF frequency optimization	48000	0	0.192	1.2	8



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Project Implemented for FY 2021-22

SL No.	FY	Description Of the Project	Annual Electrical Saving (kWh)	Annual Thermal Saving (Million KCl)	Annual Electrical Cost Saving (Rs million.)	Investment Made (Rs million)	Payback (Months)
1	2021-22	Advanced Analytics in HVAC	15409	0	0.07	0.26	44.57
2	2021-22	DRF purging valve timing optimization	33048	0	0.14	0.59	50.57
3	2021-22	VFD for FD fan and RO Pump	35136	0	0.15	0.08	6.40
4	2021-22	Substitution of base load water heating	91250	0	0.39	0.05	1.54
5	2021-22	Energy Efficient lights for PMD and other area	440000	0	1.87	5.6	35.93
		Total	614843		2.60	6.58	30.13



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Innovation Project-1: Advanced Analytics in HVAC

✗ Isolated nature of HVAC systems

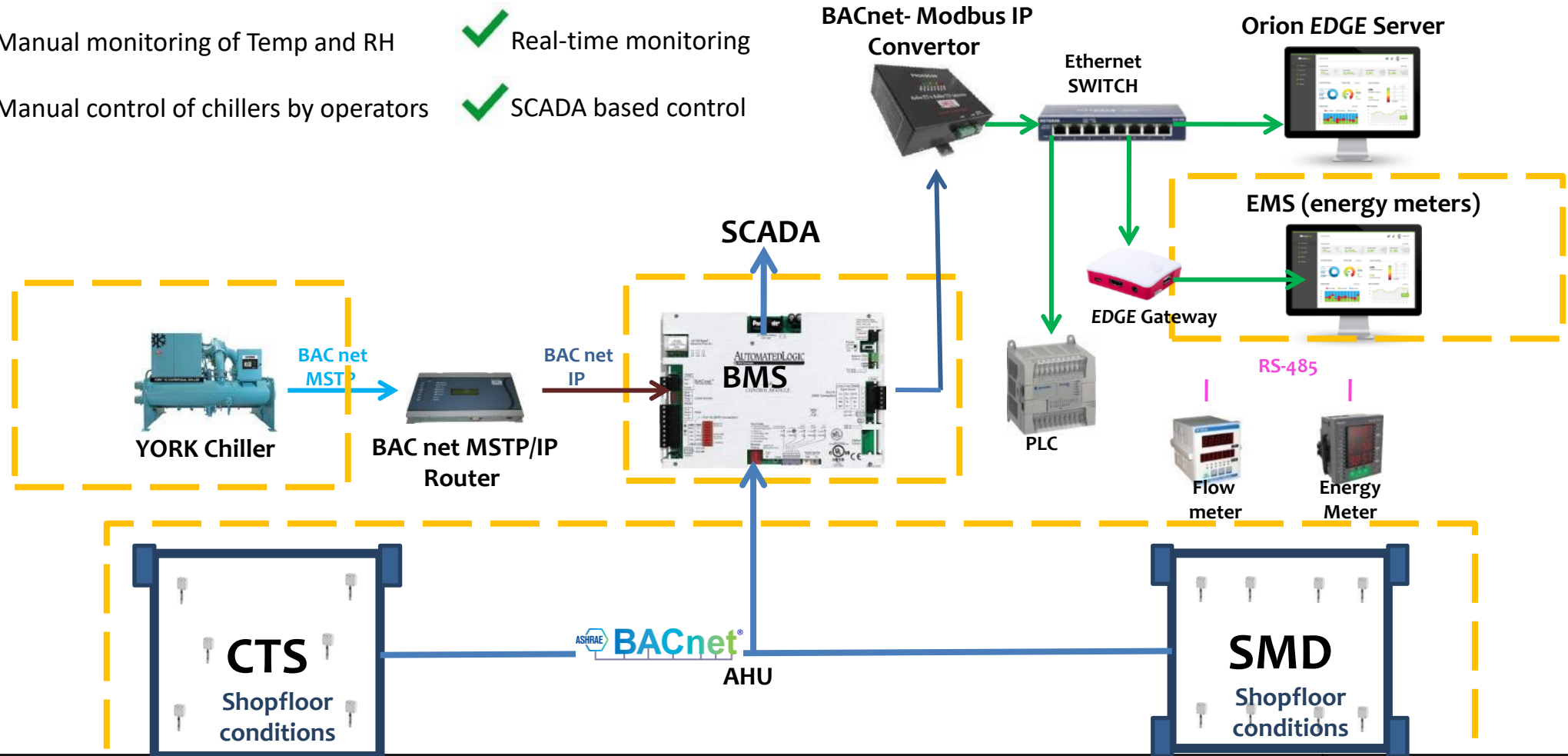
✓ Integrated

✗ Manual monitoring of Temp and RH

✓ Real-time monitoring

✗ Manual control of chillers by operators

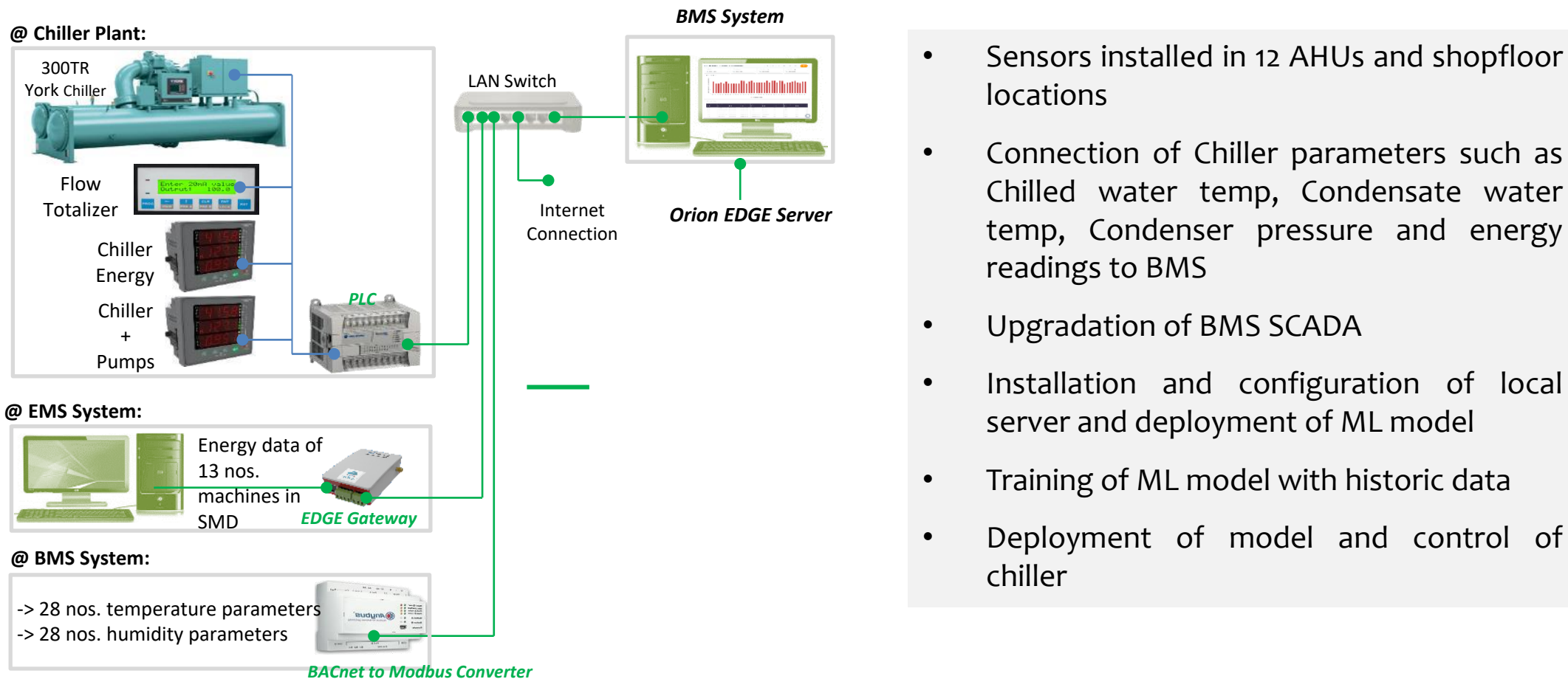
✓ SCADA based control



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Innovation Project-1: Implementation approach - based on ML Model



- Sensors installed in 12 AHUs and shopfloor locations
- Connection of Chiller parameters such as Chilled water temp, Condensate water temp, Condenser pressure and energy readings to BMS
- Upgradation of BMS SCADA
- Installation and configuration of local server and deployment of ML model
- Training of ML model with historic data
- Deployment of model and control of chiller

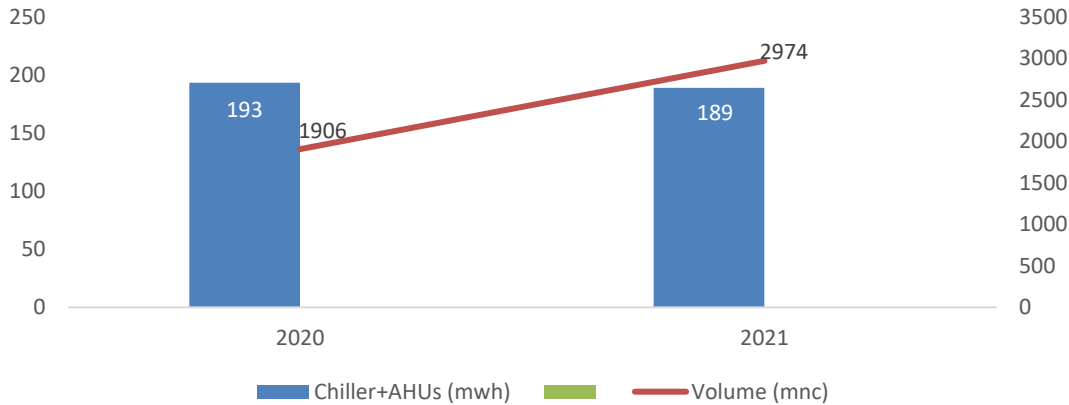
Innovation Project-1: Benefits

Confusion Matrix

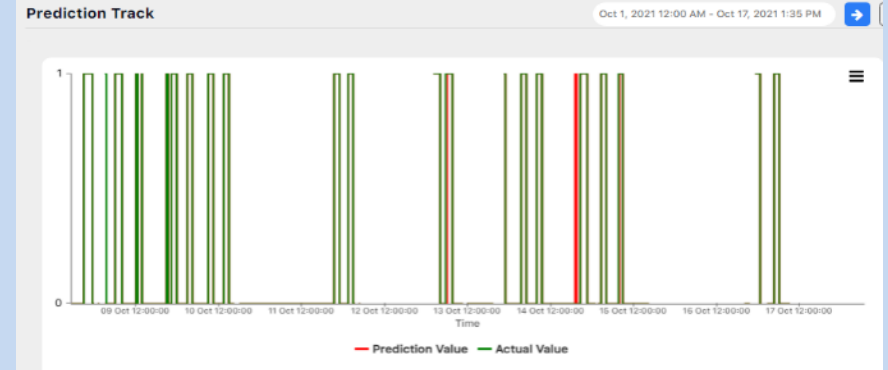
Actual	Command Turn OFF	Command Turn ON	Status OFF	Status ON	All
Status OFF	0.07	7.78	73.95	0.02	81.84
Status ON	5.57	0.07	0.19	12.34	18.16
All	5.64	7.85	74.14	12.36	100.00

Accuracy of 99.65% during testing

Energy comparison (AHU + Chiller) - Oct & Nov



Snapshot of predicted/Actual chiller run hours during testing



Energy Savings
Rs 6 lakhs/annum

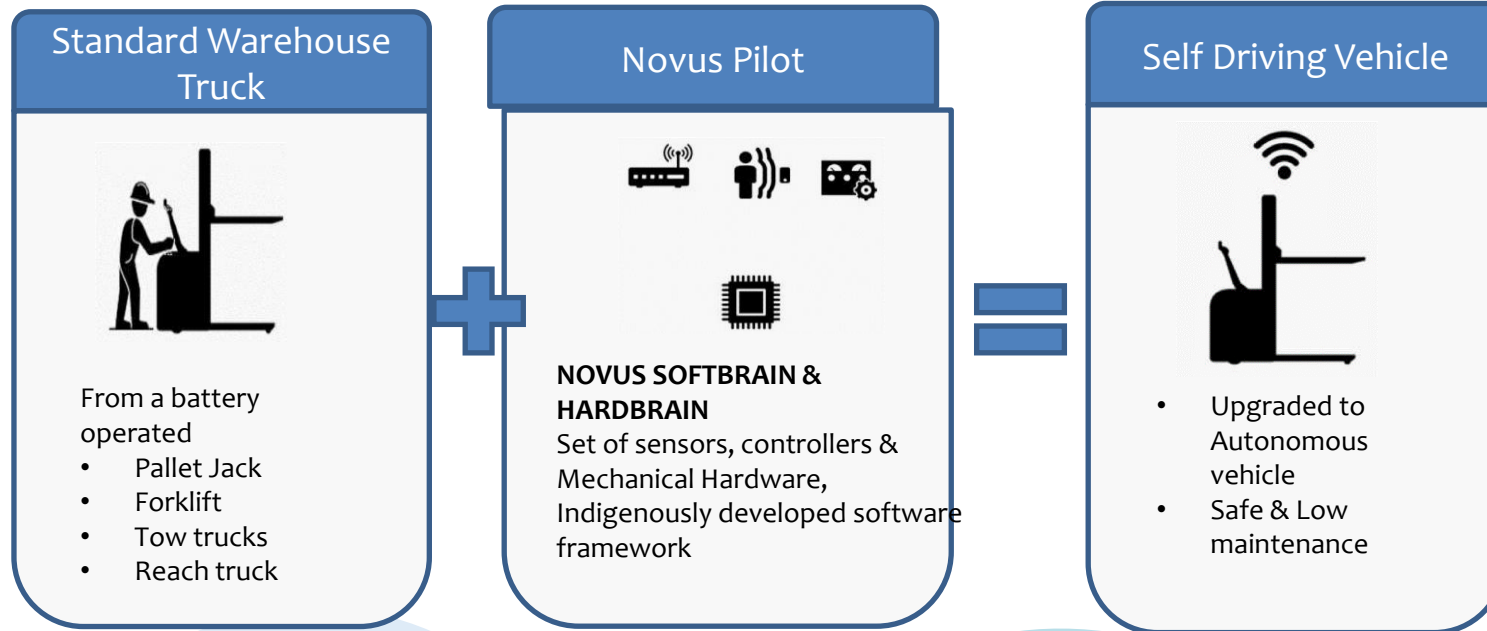
10 year
IRR 16.5%



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In-house conversion of BOPT to AVG



First time conversion of an existing BOPT to AGV in Asia .

KEY LEARNINGS IMPLEMENTED

- Simple user interface software
- Automatic Traffic Control
- New docking station

HIGHLIGHTS

- Commissioned 4 AGVs
- Configured 13 machine pick-ups
- Productivity gain- 9 ESPs/ day

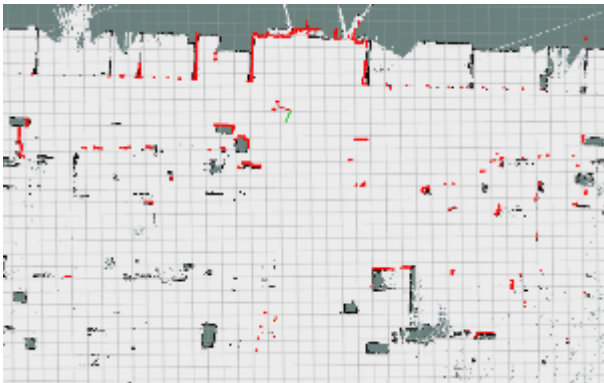
Appreciated by MD,
TOYOTA Europe and
Japan

Innovation Project-1

Path Planning & Navigation

AGV locator

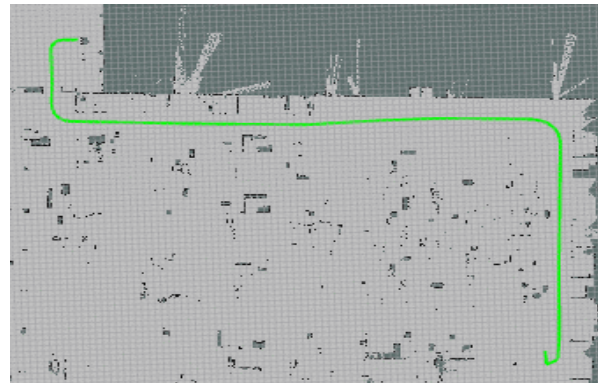
- 2D map generated by moving AGV across the shopfloor with laser scanner.



Safety Features

Path Planning

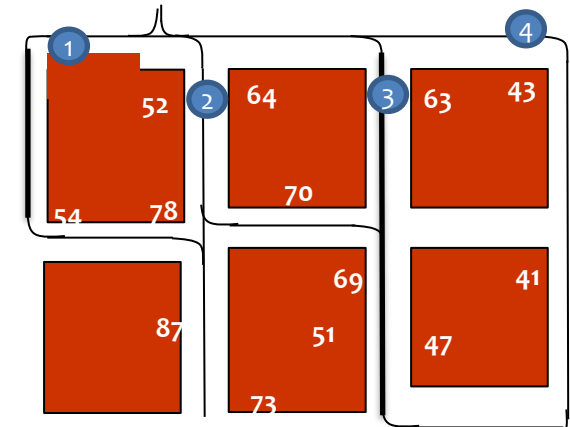
- Path follow algorithm will create a virtual path along with steering angle and velocity.



Operational Challenges

Traffic control

- If two AGVs are on a common path, central controller will stop one AGV at one of the designated location and let the other go.



Innovation Project-1

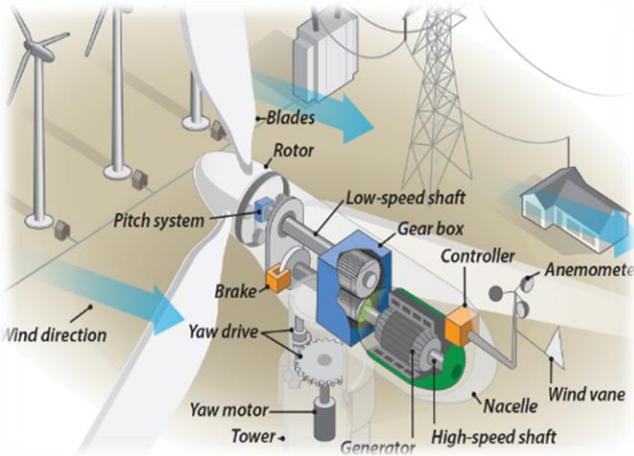


Benefits

- 100% Safe material movement
- Productivity gain- 9 ESPs/ day
- Cost Saving 50Lakh /machine
- IRR 30%

Innovation Project-3

IoT –ML based Analytics & Failure detection in Wind Turbine Generators



Benefits

- Detection of all Key parameter of WTG like vibration, temperature , Generation, PLF.
- Deviation based alarm to the monitoring team and management
- Error prediction with ~95% accuracy
- Trigger proactive maintenance alarm
- Augment Reliability of WTG >97%
- Increase in PLF >3%

Investment
6.5 Lakh

Annual Saving
20 Lakh

Payback period
4 Month

Sensor I&C at strategic locations

Identification of abnormality tags

Data monitoring using Trinity

Abnormality benchmarking

Big data analysis – Power curve, scatter plot etc.



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Utilisation of Renewable Energy sources

Year	Technology (electrical)	Type of Energy	Onsite/Offsite	Installed Capacity (MW)	Generation (million kWh)	% of overall electrical energy
2019 -20	Wind Turbine	Wind	off-site	21	51.2	336.18
2020-21	Wind Turbine	Wind	off-site	21	48.8	360.15
2021-22	Wind Turbine	Wind	off-site	21	49.1	274.89

Year	Technology (Thermal)	Type of Energy	Onsite/Offsite	Installed Capacity (Ton/hrs)	Usage (million kCal)	% of overall thermal energy
2019 -20	Biomass Boiler	Biomass	Onsite	10	11468	99%
2020-21	Biomass Boiler	Biomass	Onsite	10	9722	98%
2021-22	Biomass Boiler	Biomass	Onsite	10	10937	99%



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Renewable Energy Scenario

Effective RE portfolio management - Total Savings 40 Cr

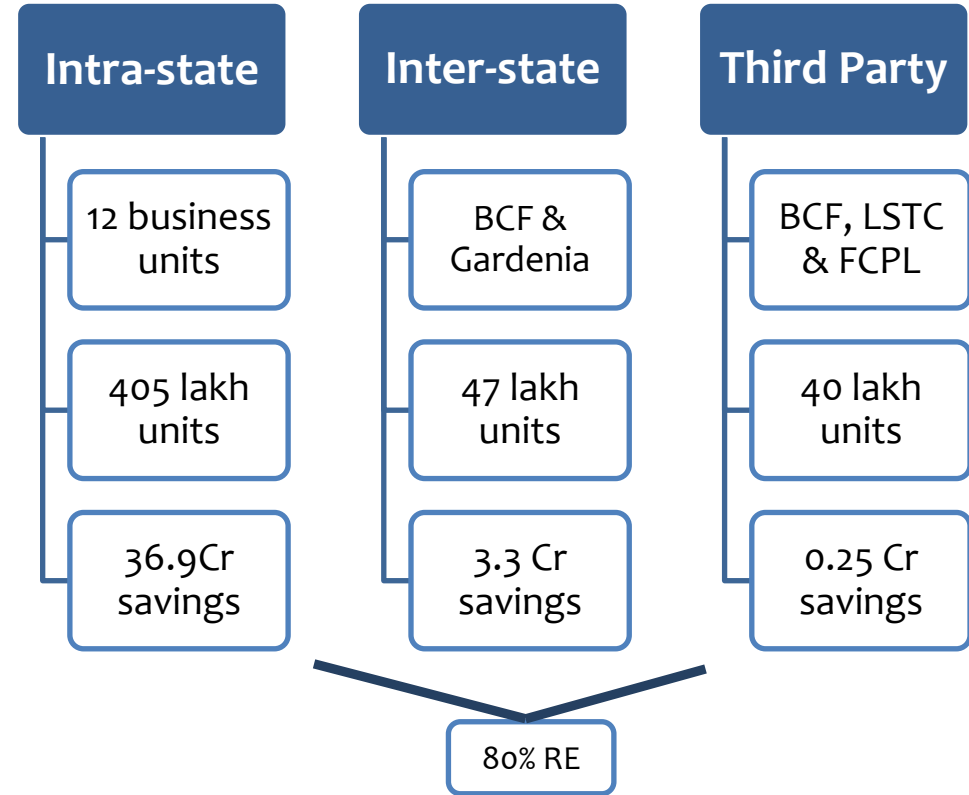
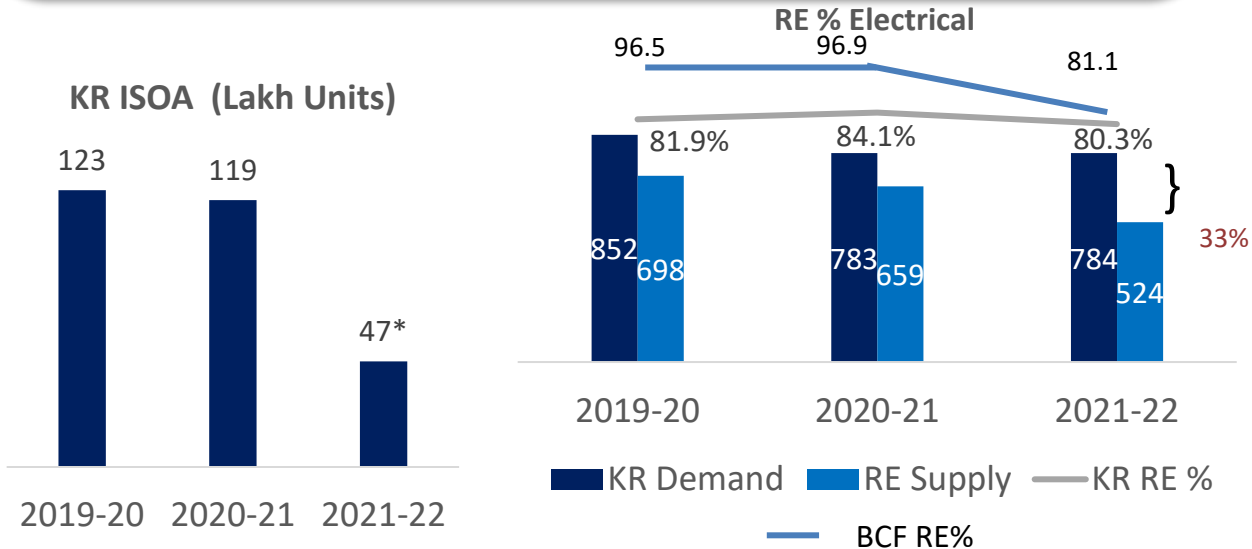
Key Challenges & Interventions

Challenges:

- ✓ Removal of Annual banking provision for 21 MW wind farm
- ✓ No ISOA allocation to B2 from Oct'21 – National coal crisis– Loss of ~ 109 Lakh units to Karnataka

Interventions:

- ✓ Successful wheeling of previously banked energy (~27 Lakh units)
- ✓ Procurement of RE power from third party (~40 Lakh units) to enhance RE portfolio by ~ 5%
- ✓ Energy banked with KGLT during peak generation

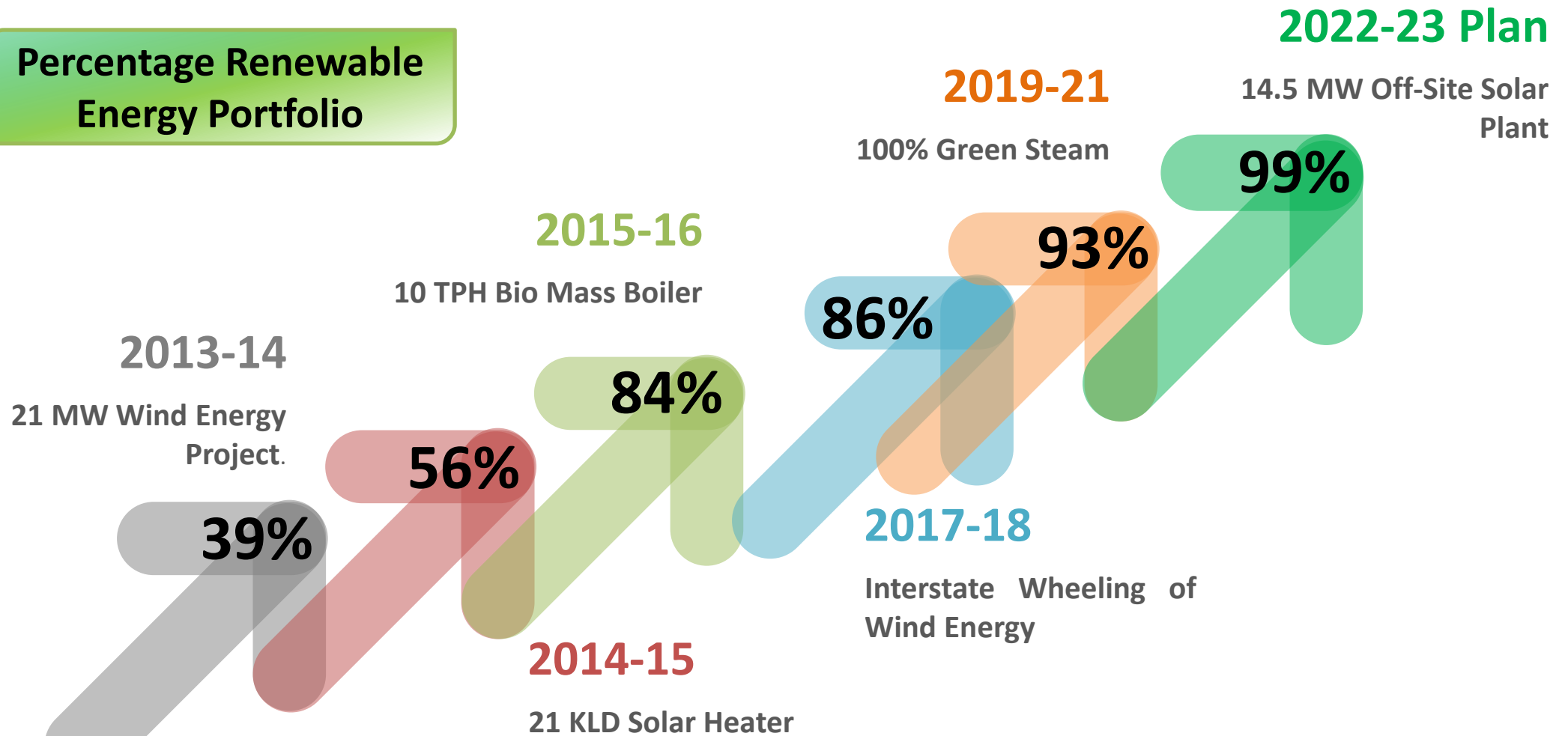


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ROADMAP-RENEWABLE ENERGY

Percentage Renewable Energy Portfolio



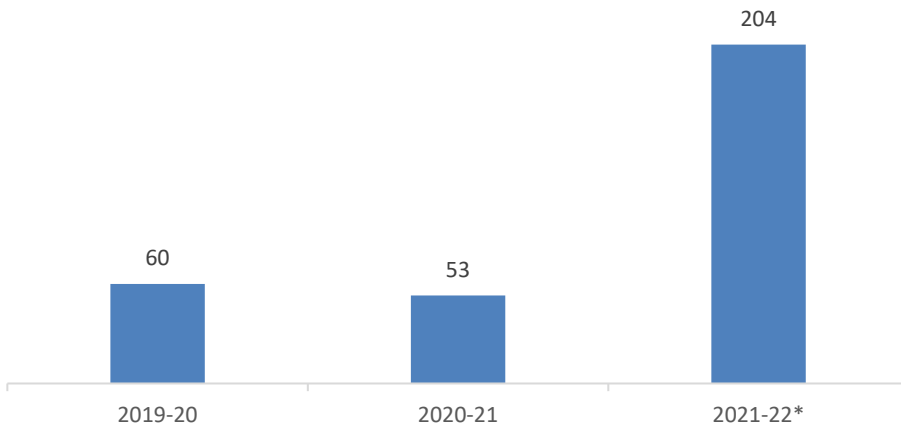
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GHG Inventorisation

Short Term & Long Term Plan For Co₂ Emission Reduction

Ton CO₂ / Million Cigarettes



- Sustenance of usage of Bio-waste Boiler – 99%
- Sustenance of usage of Bio-Diesel fuel in Canteen & CPD Boiler.
- Solar power generation – 14.5 MWp off Site solar plant in addition to the 21MW wind power plant
- Agreement with IPPs for green power supply
- Wheeling of energy through ISOA mechanism

**increase in CO₂ emission in 2021-22 due to nationwide coal crises and green energy diverted to run the coal based plant*



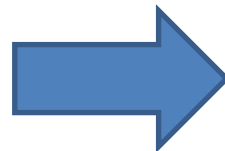
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Waste Utilisation and Management

Utilization Of Waste As Fuel: Use of biowaste briquette in bio mass boiler for steam generation

Year	Type waste	Quantity (Ton)	GCV	Waste as percentage of total fuel
2019 -20	Biowaste Briquette	3018	3800	99%
2020-21	Biowaste Briquette	2558	3800	98%
2021-22	Biowaste Briquette	3484	3829	99%



Solid Waste Management - Organic Waste Converter



Organic Waste Converter



Organic Waste Converter

- 
- Capacity of 1600 Kg/Day of Garden and Canteen Waste
 - Organic Waste Converter installed in Year 12-13 and able to generate quality manure after processing
 - Canteen vegetable and garden waste is converted into manure

Waste Management Process (Waste Stream Mapping & Disposal/ Recycling Process)



Metal Scrap



Wood Scrap



Drum Scrap



*Paper & Boards
Scrap*



Plastic Scrap

Online Monitoring & Auto controlling of ETP



KEY FEATURES

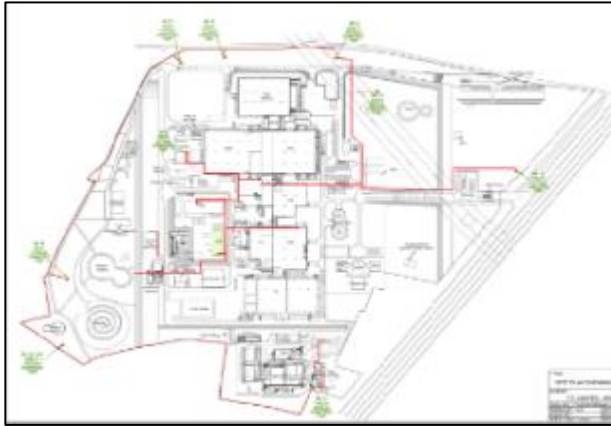
- Online Monitoring & Auto control of ETP operation
- Auto Logic based operations based on effluent load
- Continuous Quality Monitoring
- Deviation triggering & auto report generation

Dashboard of ETP

KEY BENEFITS

- Consistency in treated water quality
- ETP operations with optimized microbial load

Smart Water Management System



Communication Network

- ✓ Optical fiber network across water management areas
- ✓ Covered Areas- All Borewells, Piezometer RO Plants, ETP, WTP

Borewells & Major consumption points

- ✓ Individual smart PLC for each borewell
- ✓ Electromagnetic – SMART flowmeters at Borewell level
- ✓ Energy monitoring of submersible pumps

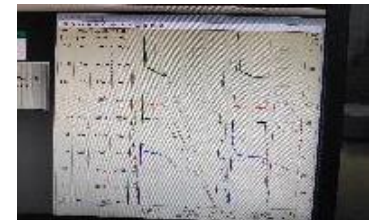


Ground water

- ✓ Revamping Old well to Piezometer
- ✓ Digital Piezometer installation
- ✓ 24X7 Realtime ground water monitoring
- ✓ Shift wise data capturing for future reference

Monitoring & Analyzing

- ✓ Upgraded Siemens based scada for data capturing
- ✓ Trend analyzing
- ✓ Deviation Triggering
- ✓ Auto generated daily reports



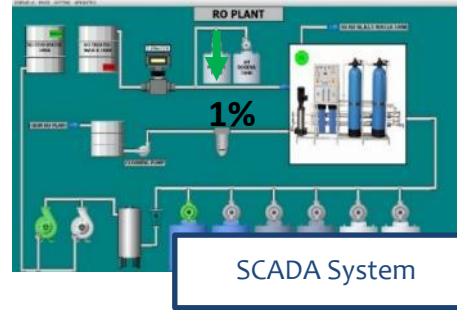
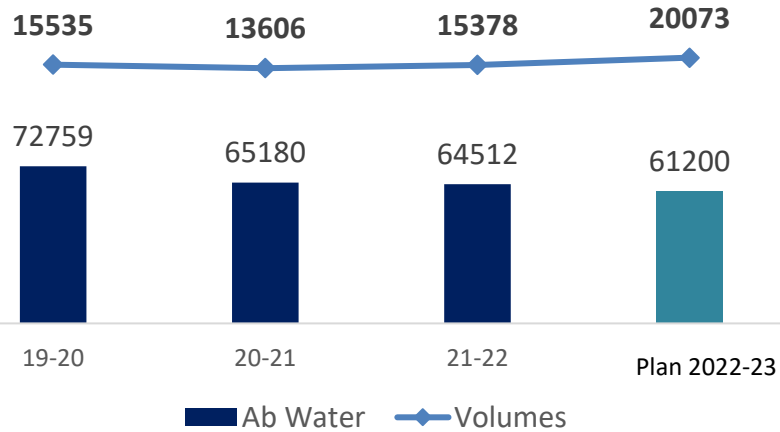
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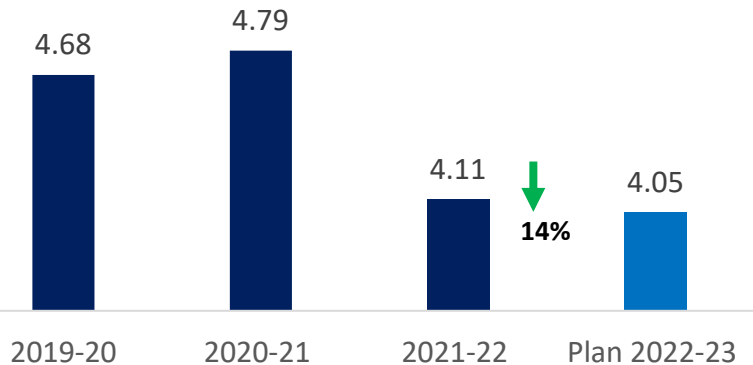
Water Management

Reduction in ground water abstraction by 8000KL – same volume

Absolute Water Consumption (KL)



KL/Million cigarette



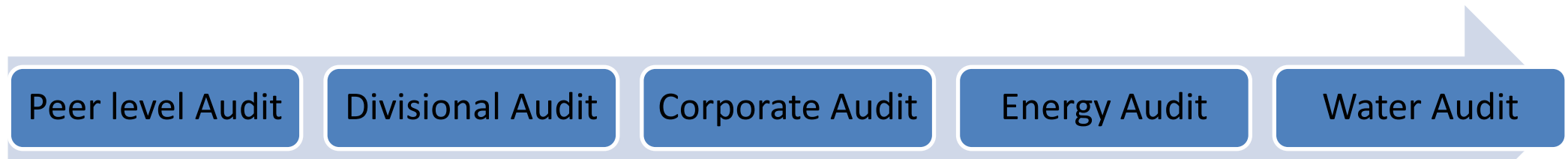
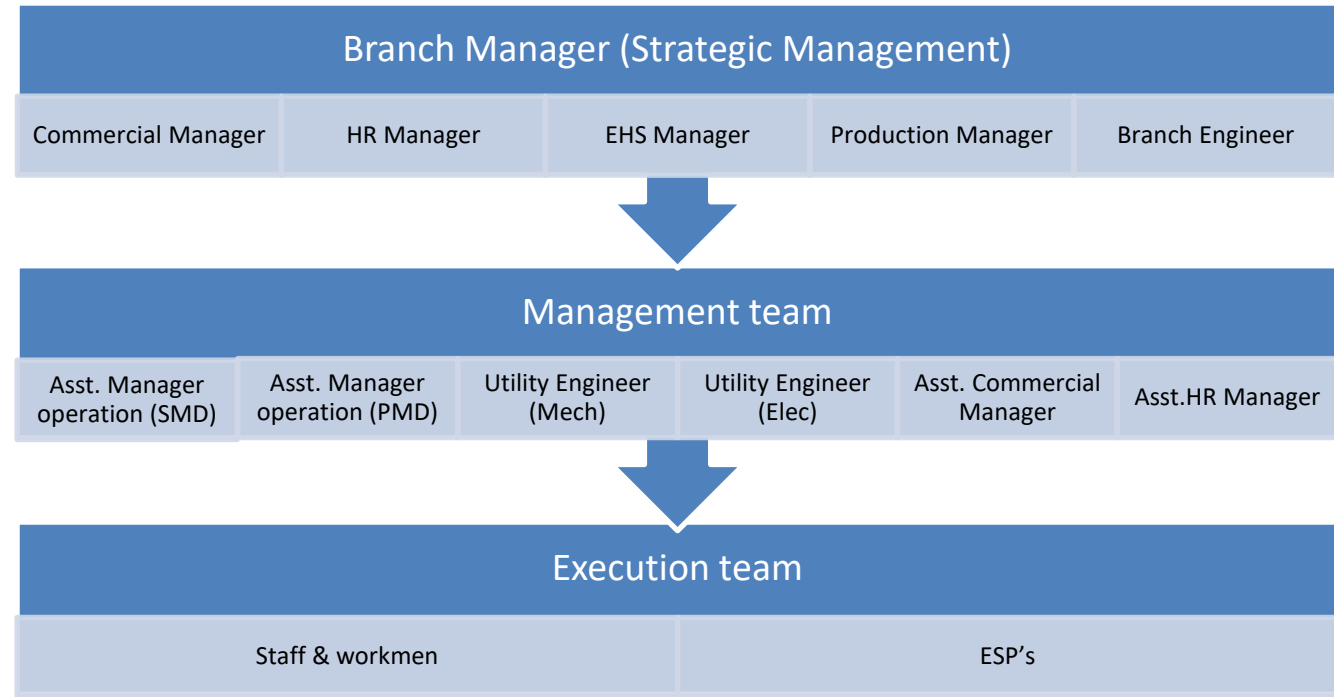
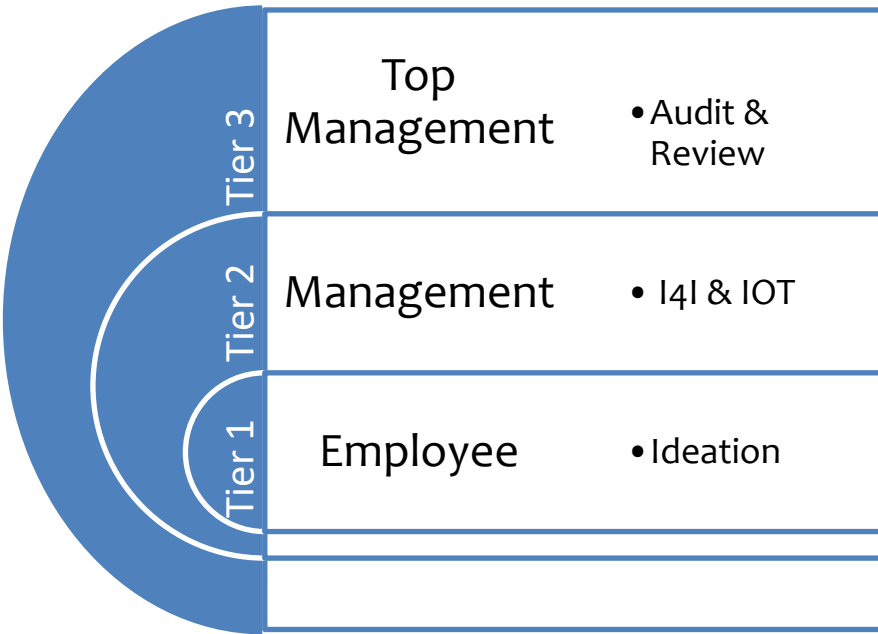
Key Interventions

- ✓ Foot operated cleaning - Canteens
- ✓ Rain water Harvesting systems -200% recharge
- ✓ Industry 4.0 in water treatment - WTP,RWH,TTW & RO Plants
- ✓ Pipeline Rerouting for better leakage detection
 - Hydrant line rerouting at CPD
 - Chilled water pipeline revamping
- ✓ ETP treated water for exhaust duct cleaning in PMD

Upcoming Plan

- ✓ Water proofing and depth increase of ponds
 - 2 M depth increase
 - Membrane water proofing
- ✓ Single window monitoring of Water management system
- ✓ HPLV cleaning system for PMD floor cleaning

Energy Management System And Performance Monitoring



ENERGY MANAGEMENT SYSTEM AND PERFORMANCE

Idea sharing platform

Organization structure

Audit and Review



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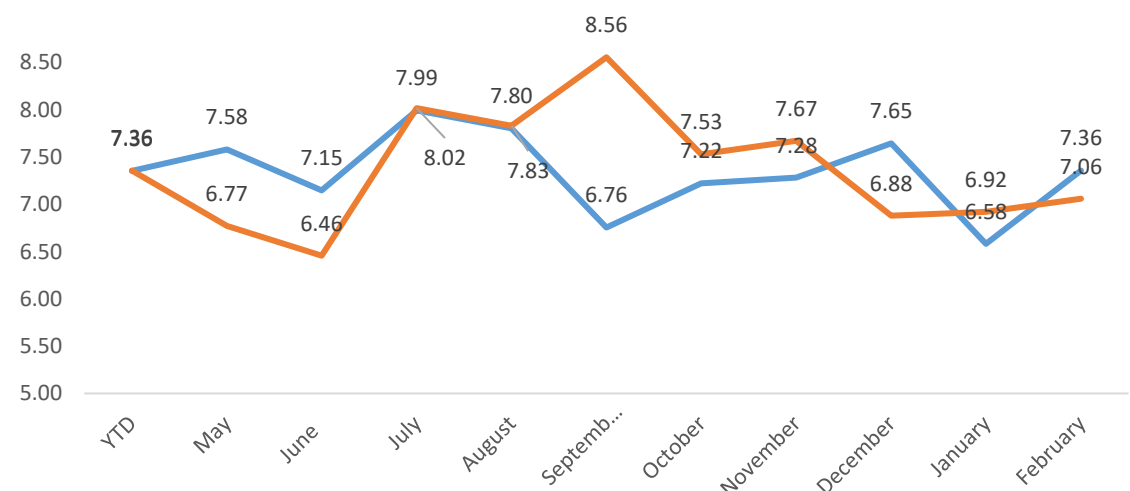
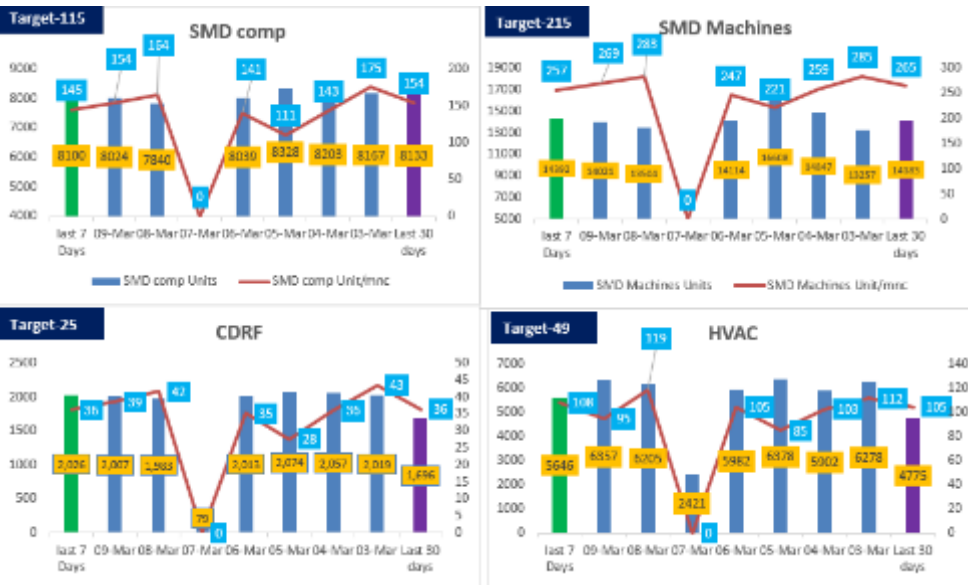
Energy Monitoring System



Report- Energy Monitoring System
ITC LTD, Bangalore

12/05/2021 6:00

FEEDER NAME	CONSUMPTION			VOLTAGE ANALYSIS			AMP			KW ANALYSIS			PF ANALYSIS		
	INITIAL KWH	FINAL KWH	CONSUMPTION	AVG.	MIN.	MAX	AVG.	MIN.	MAX	AVG.	MIN.	MAX	AVG.	MIN.	MAX
HT DG-1	38507823	38507823	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPD	1181269	1184116	2847	10938.36	10762.81	11195.04	6.50	3.23	12.39	116.74	57.03	234.64	0.94	0.90	0.99
LT DG1	772286	772286	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LT DG2	725404	725404	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LT DG3	682188	682188	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LT DG4	675845	675845	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LT DG5	716083	716083	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
O/P 1 TRMR 1	3194489	3197083	2594	411.86	406.94	415.79	153.69	113.88	239.93	108.57	79.59	170.20	0.99	0.98	1.00
O/P 2 TRMR 2	1206194	1212396	6202	417.16	411.91	421.65	363.16	202.70	536.45	258.12	132.01	387.75	0.99	0.98	1.00
ACPI	463112	465602	2490	417.20	412.48	421.70	176.10	32.76	386.51	108.27	20.46	237.08	0.87	0.76	0.92
KRETEK	255776	255905	129	416.99	411.92	421.43	9.08	3.35	23.28	5.24	2.28	13.44	0.84	0.72	0.97
AHMP 1	197567	198364	797	417.66	412.59	422.16	48.82	25.22	53.09	33.45	17.11	35.96	0.95	0.94	0.95
GALT	5063709	5064038	329	417.38	412.54	421.88	19.67	15.72	22.66	13.60	10.85	16.10	0.98	0.98	0.98
DIET	472267	472575	308	417.56	412.50	422.03	24.66	21.02	97.21	12.01	9.03	64.26	0.93	0.62	0.97
NEW FGS	2214405	2214548	143	417.69	412.54	422.16	8.40	5.56	10.81	5.84	3.78	7.57	0.96	0.94	0.97
MLP	1404264	1406042	1778	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MSNP 1	1814844	1814852	8	417.81	413.01	422.32	1.78	1.60	4.88	0.50	0.28	0.85	0.00	0.00	0.00
MBLP	2376409	2376578	169	417.44	412.71	421.96	10.35	9.73	14.09	7.08	6.68	9.15	0.95	0.89	0.96
DGAP 2	17328	17361	33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CCP 2	587548	587211	-133	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00



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Teamwork- Energy Awareness and trainings



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Implementation of IGBC rating

IGBC Platinum Rating Recertification in 2020 (Achieved highest score of 94 Points)



IGBC Platinum Rating Recertification



Green Built Environment- Excellence Award in IGBC Performance Challenge 2020



Awards



Sustainable Factory of the year by Frost & Sullivan and TERI –Overall Leaders



'Green Built environment- Excellence Award' in IGBC Performance Challenge 2020



Indian Wind Power Association (IWPA Award 2020-21)



Innovative Environmental Project in 'CII Environmental Best Practices Awards 2020'



NSC Shreshta Suraksha Puraskar



CII Water conservation award



CII - 5 Star Rating" for Commitment to EHS Practices



NSCKC Unnatha Suraksha Puraskar

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Awards



**CII Environment Awards
Best Bio-waste Management” company**

**CII Environment Awards
Best Solid waste management” company**

**CII Environment Awards
Water Management Company of
the year -2021**

**CII Excellence in Energy
Management –
“Energy Efficiency Unit” - 2021**



**Frost & Sullivan Award – Winner
Artificial Intelligence in Chillers**

**Frost & Sullivan Award – Winner
Quality Enterprise Leadership**

**CII - 5 Star Rating" for Commitment
to EHS Practices**

**Indian Wind Power Association
(IWPA Award 2021-22)**



23rd CII National Award for Excellence in Energy Management



Thanks

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