- **23rd National Award for Excellence in Energy Management,2022**

MUMBAI INTERNATIONAL AIRPORT LTD.

Presenters	
Pravind Kumar	AVP & HOD (E&M)
Suresh Thakre	AGM (E&M)
Sourav Chakraborty	Deputy Manager (E&M)

Introduction

Key Highlights:

- Major Segments: T1 → Domestic
  T2 → International+ Domestic
  CA → Corporate Aviation
  Cargo→ To handle Cargo Operation
  Airside→ Runway, Apron & Taxiway
  MLCP→ 2 Multi layer car parking.

- Once recorded the **busiest single runway airport in the world → >1000 flights per day**
- Handles more than **48 million passengers** in a year.
- **India's 1st Airport to Achieve ACI Health Accreditation**

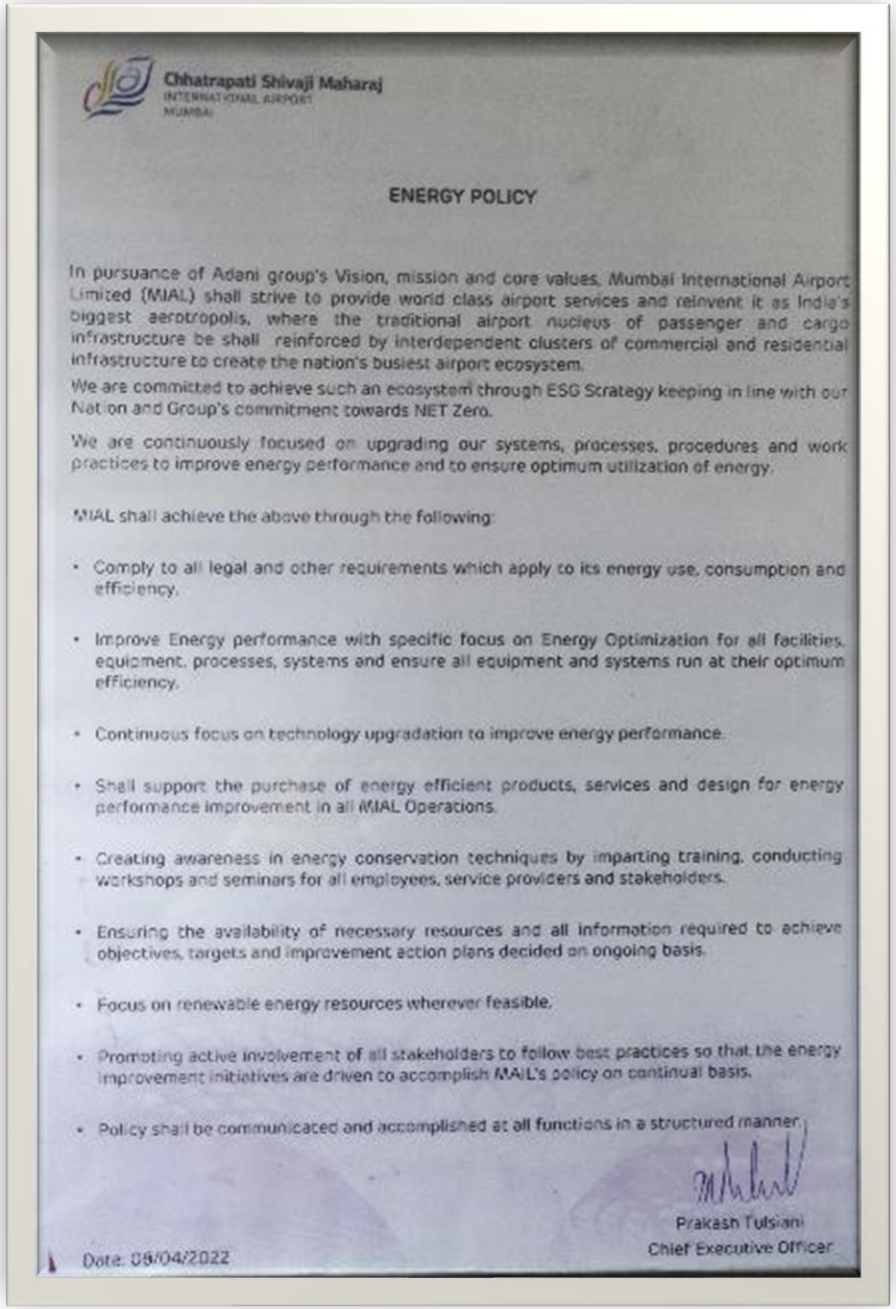
Salient Features

Design of Terminal 2 is inspired from India's national bird – The Peacock

3 Km Multi story art wall with 7000 Pieces of Artwork and Artefacts

ATC Tower, tallest in India(Height - 83.2 Mtrs, Built up area is 2800 Sq. Mtrs.)

Energy Policy



Chhatrapati Shivaji Maharaj
INTERNATIONAL AIRPORT
MUMBAI

ENERGY POLICY

In pursuance of Adani group's Vision, mission and core values, Mumbai International Airport Limited (MIAL) shall strive to provide world class airport services and reinvent it as India's biggest aerotropolis, where the traditional airport nucleus of passenger and cargo infrastructure be shall reinforced by interdependent clusters of commercial and residential infrastructure to create the nation's busiest airport ecosystem.

We are committed to achieve such an ecosystem through ESG Strategy keeping in line with our Nation and Group's commitment towards NET Zero.

We are continuously focused on upgrading our systems, processes, procedures and work practices to improve energy performance and to ensure optimum utilization of energy.

MIAL shall achieve the above through the following:

- Comply to all legal and other requirements which apply to its energy use, consumption and efficiency.
- Improve Energy performance with specific focus on Energy Optimization for all facilities, equipment, processes, systems and ensure all equipment and systems run at their optimum efficiency.
- Continuous focus on technology upgradation to improve energy performance.
- Shall support the purchase of energy efficient products, services and design for energy performance improvement in all MIAL Operations.
- Creating awareness in energy conservation techniques by imparting training, conducting workshops and seminars for all employees, service providers and stakeholders.
- Ensuring the availability of necessary resources and all information required to achieve objectives, targets and improvement action plans decided on ongoing basis.
- Focus on renewable energy resources wherever feasible.
- Promoting active involvement of all stakeholders to follow best practices so that the energy improvement initiatives are driven to accomplish MAIL's policy on continual basis.
- Policy shall be communicated and accomplished at all functions in a structured manner.

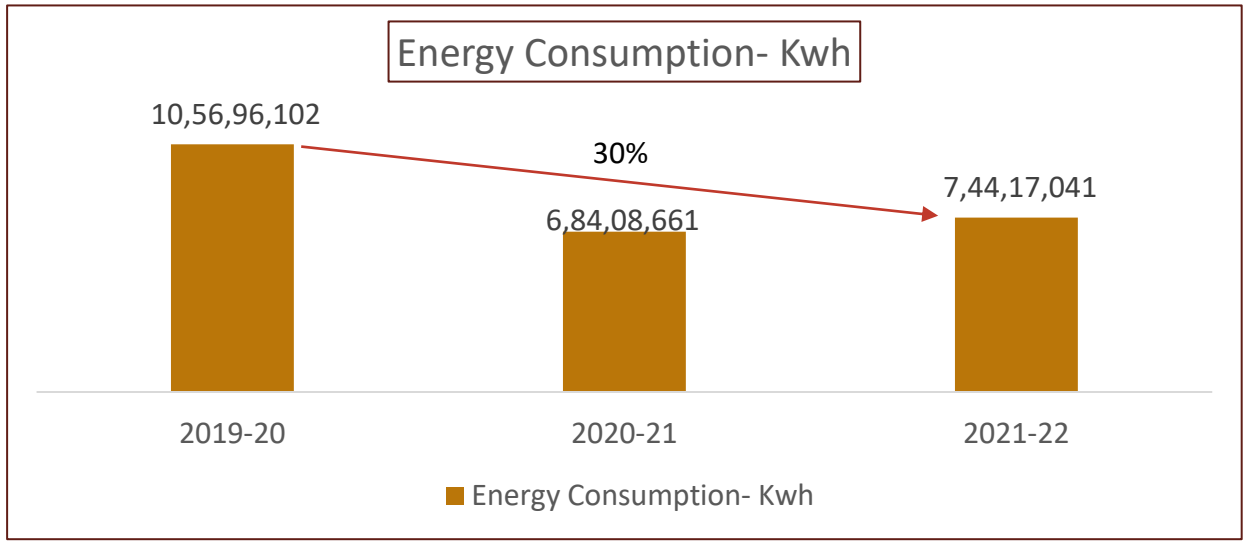
Prakash Tulsiani
Chief Executive Officer

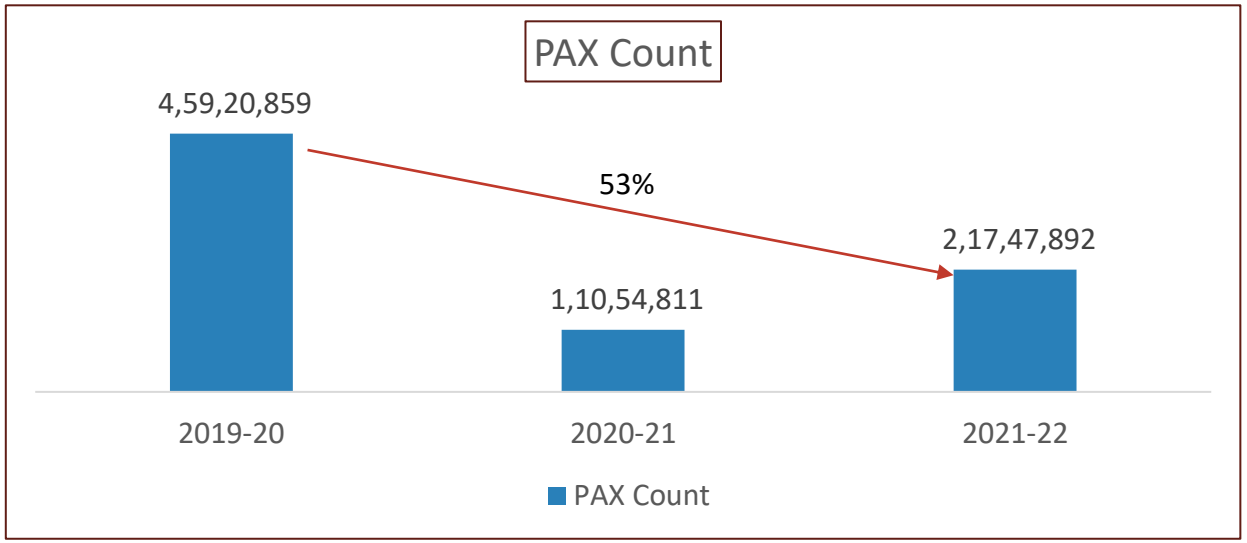
Date: 08/04/2022

Major highlights:

- Focus on energy optimization
- Use of energy efficient products
- Energy conservation awareness
- Using necessary resources to achieve targets
- Renewable energy
- Active involvements in energy conservation

Energy Consumption Overview:





How Architecture complements MIAL's Energy Saving..

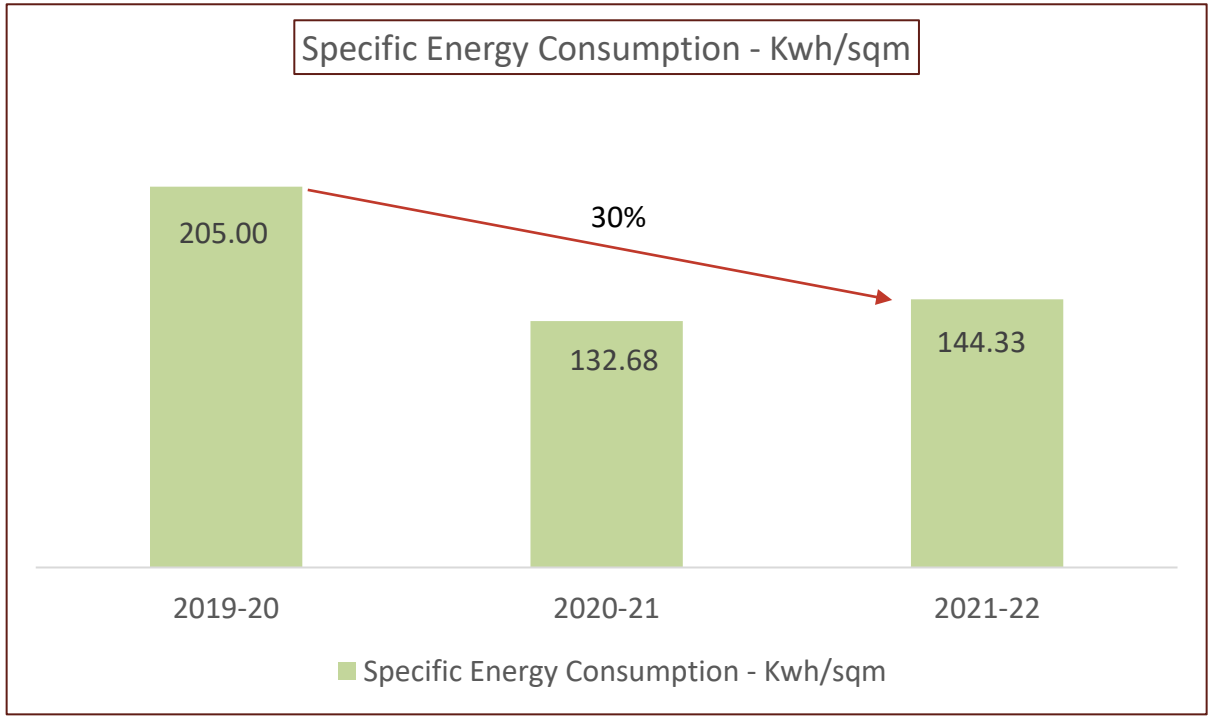
Substantial **daylighting** ensures:

- ✓ Sufficient illuminance
- ✓ Improved Aesthetics
- ✓ Reduce lighting energy consumption

Use of Insulated Glass Units

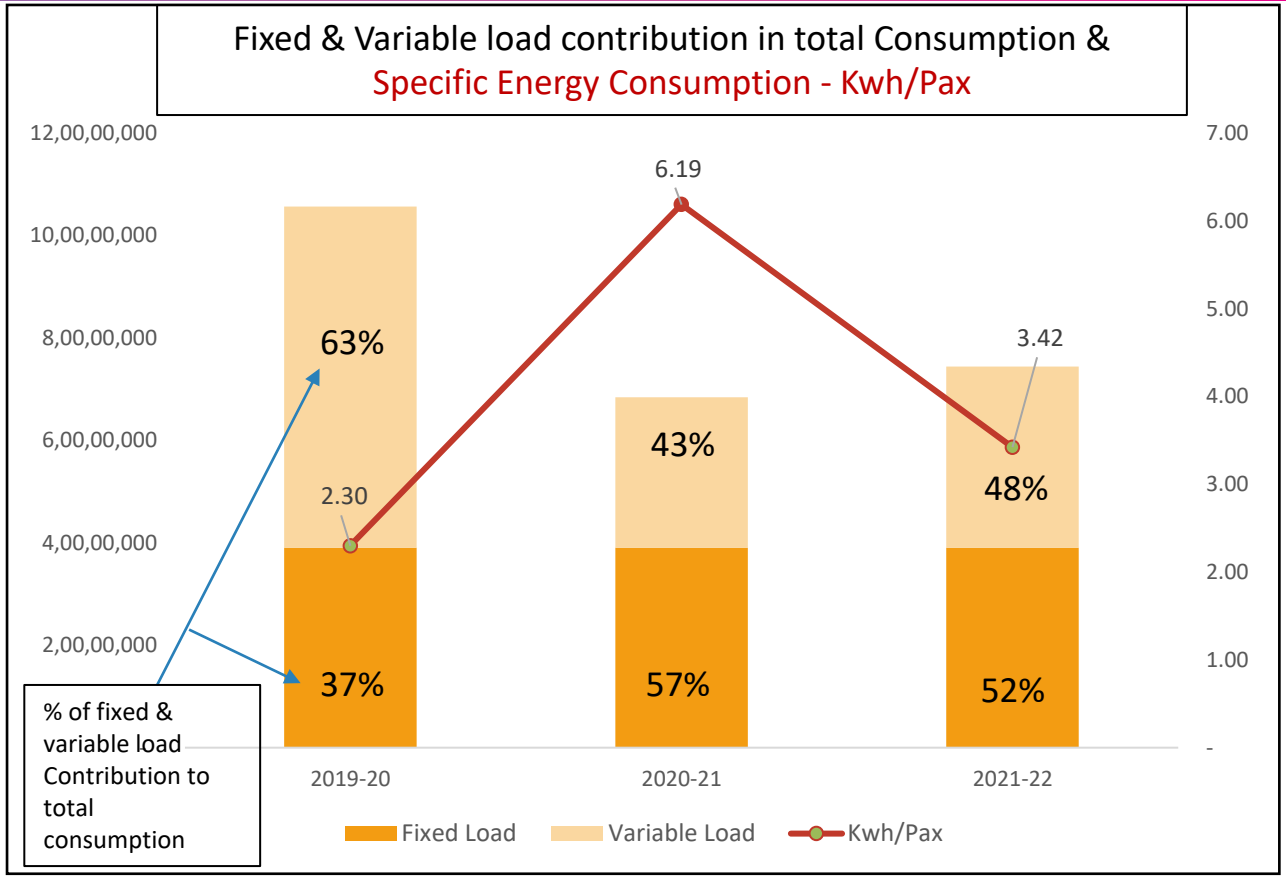
- ✓ Reduces heat ingress
- ✓ Improves Visual comfort
- ✓ Reduce HVAC energy consumption

Energy Consumption



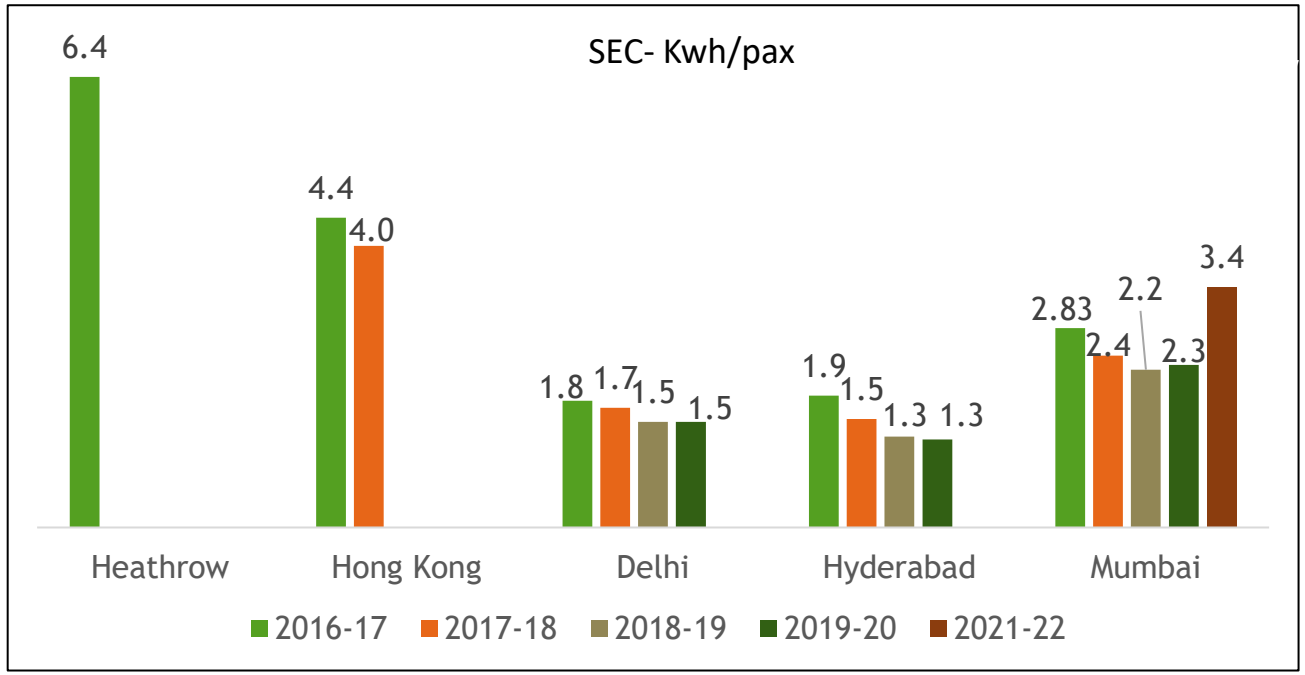
Energy Consumption can be classified into:

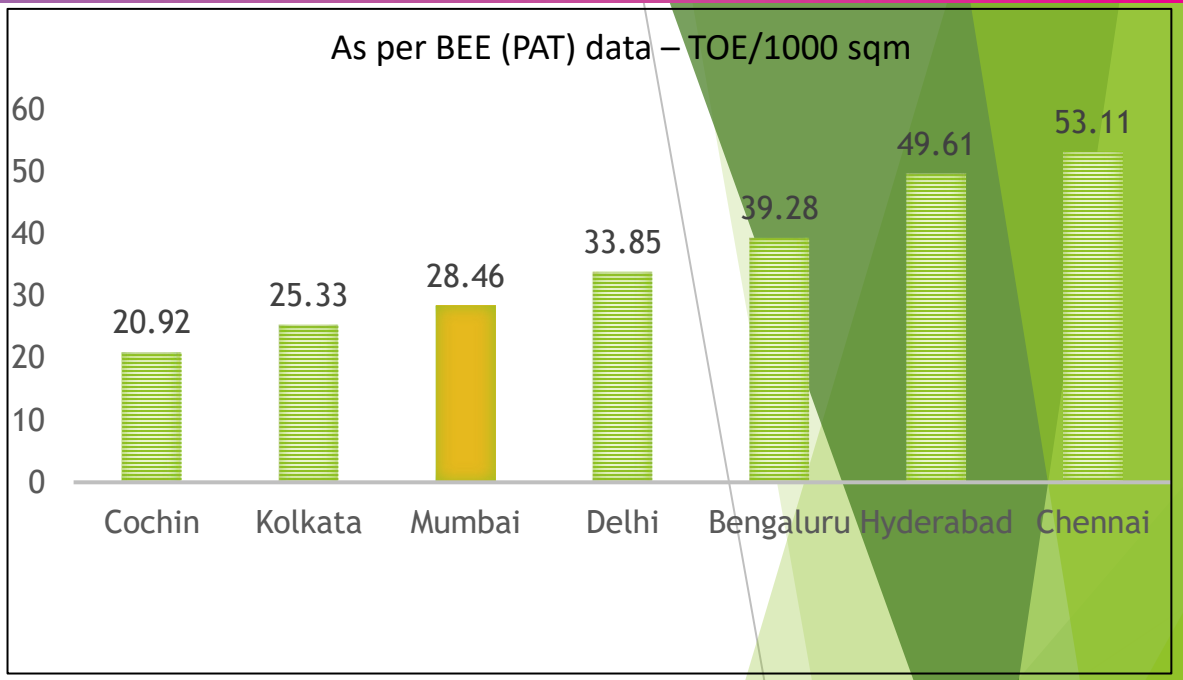
- Fixed Load→ Consumption does not depend on pax count – *Consumption of Offices, Server rooms, common area, parking, airside lightings etc.*
- Variable Load→ Consumption depending on pax count – *Terminal HVAC, lighting, VHTs.*



- Increase in Sp. Energy Consumption – Kwh/Pax is due to contribution of Fixed Load in total Consumption.
- Even though we have significantly reduced our variable load, impact of fixed load resulted in increased kwh/pax

Competitors, National & Global Benchmark





Key Factors Affecting Energy Benchmark

- **Climatic Zones** – Mumbai falls in hot & humid zone with little difference in ambient during summer & winter months so limited scope of optimization during winter.
- **Building Envelope** – AHUs in MIAL are mostly centralized(at ground floor) with vertical distribution, providing limited scope to switch off AHUs based on localized area of occupancy

Steps taken/Road map to achieve benchmark

- ✓ Operating all Equipment at **Optimum efficiency level**.
- ✓ Chillers run at **0.59 ikw/TR** whereas it's designed at **0.63ikw/TR**
- ✓ Operating **Chiller Set point** based on Ambient & building load
- ✓ **Scheduling of AHUs and lighting** based on occupancy.
- ✓ Reducing energy losses – installing sensors and improved operational procedures.
- ✓ Technology Upgradation – LEDs, EC fans, FRP fan blades etc.

Energy Saving Projects implemented in last three projects

Year	No of Energy Saving Projects Implemented	Investments (INR Millions)	Electrical saving (million Kwh)	Thermal savings (Million Kcal/ MTOE)	Impact on SEC- kwh/pax(Electrical, Thermal)
FY 2019-20	3	8.68	0.23	-	0.5% ↓
FY 2020-21	1	2	0.10	-	0.9% ↓
FY 2021-22	2	14	0.50	-	2.3% ↓

- Each year **dedicated Capex budget gets allocated towards Energy Conservation Projects.**
  (In FY23 – allocated Budget is ~**10 Cr**)
- In FY22, MIAL has spent **around 1% of its total Engineering Budget** in energy Conservation Project.
- Apart from technology up gradation, special focus is also given to **operational optimization**, to reduce energy wastage.
- **Energy Management cell** in place to looks after all Energy conservation projects, monitor energy consumption and analyse variances.
- **Energy Review meetings** with top management on regular basis.

List of Major Energy Conservation Projects Planned in FY23

Engineering and Maintenance

Approved Capex Budget FY 23 – Energy Efficiency Projects

Energy Efficiency Projects	Budget (In Cr.)
Retrofit for EC fan at AHU at Terminal-2, CSMIA, Mumbai.	7.00
HHR MH light to LED light	2.25
Energy efficient pumps/ blowers at T1 and T2	0.60
Installation of IOT based sensors for terminal temperature monitoring	0.10
Precision control of split and window ACs - to optimize consumption	0.02
Total	**9.97**

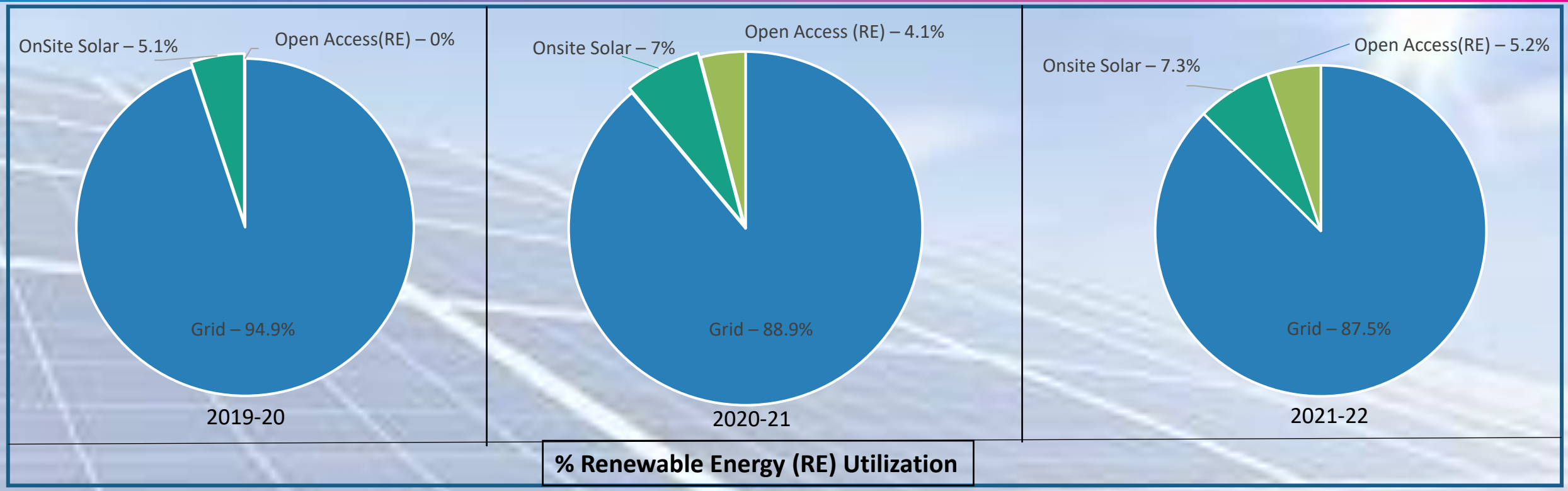
Innovative Project Implemented

Vertical Axis Wind Turbine & Solar PV System

- MIAL is **India's first airport** to launch this Hybrid Technology..

- **10Kwp Hybrid Solar Mill**
  - 2 Kwp Turbo Mill (3 Savonius type VAWT)
  - 8 Kwp Solar PV modules.
- Estimated minimum energy generation of 36 Kwh/day.
- Pilot program in collaboration with Wind Stream Energy Technologies India Pvt Ltd.
- Ensures 24/7 energy generation.
- Maximum energy to be harnessed through wind power systems.
- In Line with MIAL's NET ZERO emissions.
- Can be Gateway to highly efficient and low carbon future for aviation sector.
- Being modular & scalable, it's easy to mount the technology on any mobile or static rooftop.

Utilization of Renewable Energy Sources



- Inspite of severe space constraint, MIAL has continuously **increased its renewable energy share** over the last 3 years.
- At Group Level – Planning in process to set-up renewable plant to ensure 100% renewable power for all Adani Airports (Target – 2024)

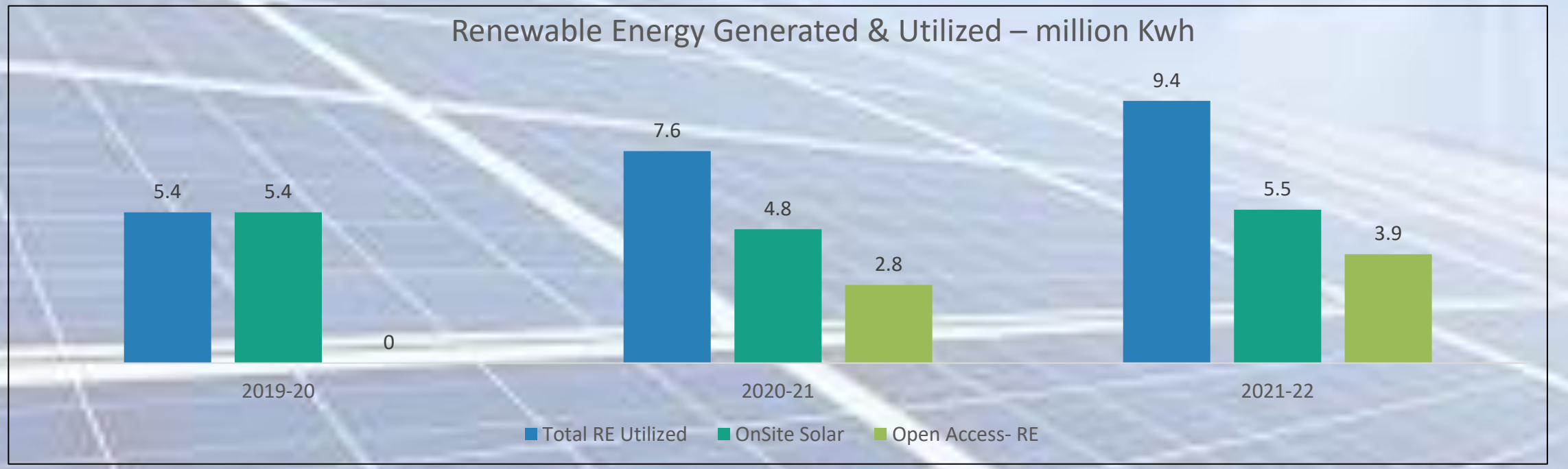
FY 2022-23 – 100% MIAL's NET Electricity is Renewable.

Utilization of Renewable Energy Sources

2019-20
Installed Capacity- **4.6MW**

2020-21
Installed Capacity- **4.65MW**

2021-22
Installed Capacity-**4.66MW**



- MIAL is incurring additional cost of Rs. 0.80/unit to procure 100% green power.
- In FY2022-23 – MIAL is exploring opportunity to install additional 30 Kwp of VAWT system.(Budget Approved – 0.45 lakhs)

Waste Management

Mumbai Airport is **single use plastic free airport**

Proper **Waste Management SOP** in place – being strictly followed for managing wastes.

Inhouse **Organic Waste Convertor (OWC)** of 1.5 MT/day - to make organic compost

Target- Zero Landfill waste

by channelizing all waste for reuse & recycle.

Replaced - conventional chemicals by Super Concentrated green chemical

(**93% chemical volume reduced**)

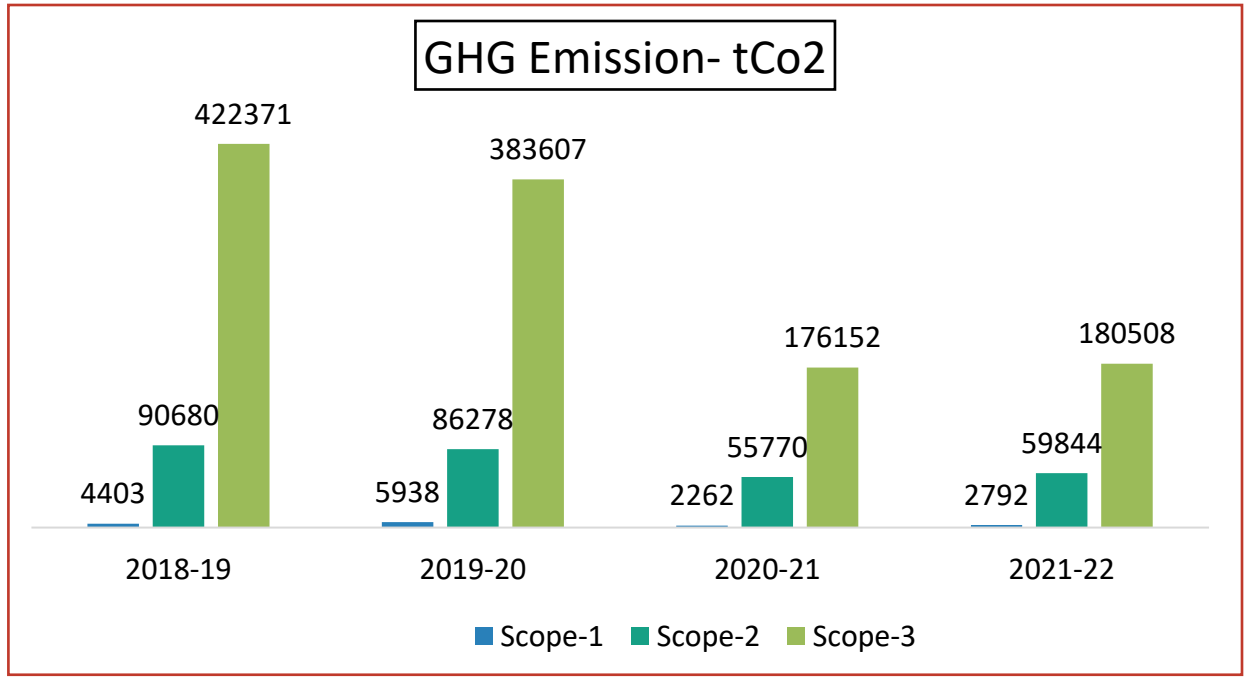
Reduced →plastic waste @78% p.a. & Cardboard @ 72% p.a.

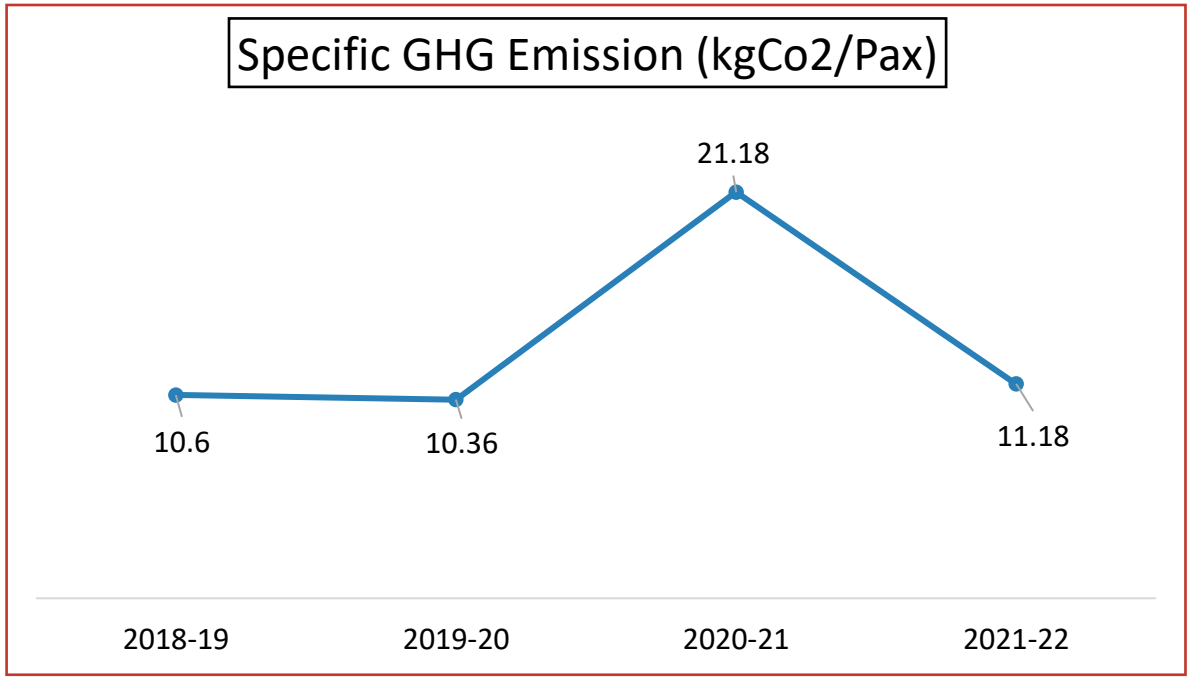
Commissioned dedicated Common Hazardous Waste Storage Facility- 2021 for Hazardous Waste Management for all CSMIA stakeholders.

Sewage treatment plants (STPs) with a cumulative capacity of 15 MLD is installed for wastewater treatment

GHG Emissions

Sources of Green House Gas Emission		
Type	Activities	Remarks
Scope-1	Fossil fuel, Fire Extinguishers, Refrigerant	Directly under control
Scope-2	Electricity	Directly under control
Scope-3	Stakeholder electricity, stakeholder fuel, LTO-Arrival/departure, passenger/staff/business travel, Offsite emissions	3rd party dependent – Can only suggest and influence





Steps taken to Reduce Green House Emissions

Green Power	**100% green power** from April'22 – estimated **emission reduction by 1.3 lakhs tCo2** **Self generate 100% renewable power** for all Adani Airports by 2024
Transition to Lower GWP refrigerant	All equipment with high GWP refrigerant being replaced with low GWP refrigerant – **reducing emissions by 719 tCo2**
EV Vehicles	Conversion of conventional fuels to EVs – in phase-wise manner In FY2022-23 →**Rs 8 crore on EV vehicles**.
Non-CO2 based fire extinguisher	All CO2 based fire extinguisher have been converted to non-CO2 based fire extinguishers

Journey towards Neutrality….

2010-11	IMS Policy & Environment Management System (ISO 14001)
2011-12	Green House Gas Policy & ACA level 1- Mapping achieved, Implemented Carbon Accounting & management System (CAMS); ISO 14064 certification
2012-13	ACA level 2 – Reduction achieved; Preparation of carbon road map & targets – to reduce carbon footprint by 25% **1st Airport in India to publish Sustainability Reporting**.
2014-15	Started Roof Top solar power plant installations (Installed 1.06 MW), The Sustainability Report 2014, ACA level 3 – Optimization Achieved
2015-16	Energy Management System (ISO 50001), Renewal of ACA level 3 accreditation
2016-17	Achieved ACA level 3+ Neutrality. Roof top solar plant installations 2.5 MW,
2017-18	Total Roof top solar plant installations increased to 3.2 MW.
2018-19	Total Roof top solar plant installations increased to 3.3 MW
2019-20	Total Roof top solar plant installations increased to 4.6 MW
2021-22	**Road Map of Net Zero carbon emission- 2029**. Installed **hybrid vertical axis wind & solar mill** of capacity 10 Kwh. Installed Solar-4.66 MW

Indoor Air Quality

MIAL strives to maintain healthy indoor air Quality.

- **3rd party air quality check** is done at regular intervals.
- Co2 sensors installed in return ducts of all AHUs & automatic fresh air intake when value crosses set parameters.
- Portable Co2 meters used to check Co2 level in all offices & crowdy areas multiple times in a day
- In FY2022-23, **UV lamps being installed in all AHUs** to upgrade the quality of indoor air.

Sr. No.	Parameter	Measured Value	Threshold Value	Method
1.	SO_2, µg/m³	14	80 µg/m³	IS 5182 (Part 2) RA2017
2.	NOx, µg/m³	20	80 µg/m³	IS 5182 (Part 6) RA2017
3.	PM_{10}, µg/m³	8.3	60 µg/m³	IS 5182 (Part 23) RA2017
4.	$PM_{2.5}$, µg/m³	5.4	25 µg/m³	IS 5182 (Part 24) 2019
5.	CO, ppm	< 0.10	9 ppm	APHA134-Air 3rd Edition
6.	CO_2, ppm	446	Ambient + 500 ppm	APHA134-Air 3rd Edition
7.	O_2, %	19.5	--	APHA134-Air 3rd Edition
8.	VOC, ppb	56.4	500 µg/m³	USEPA TO-17
9.	Formaldehyde, µg/m³	< 0.2	100 µg/m³	USEPA TO-17
10.	TMC	41	Organisms/100ml NA	APHA-2017(9215-B)

Latest Air Quality report – Inspection by 3rd party

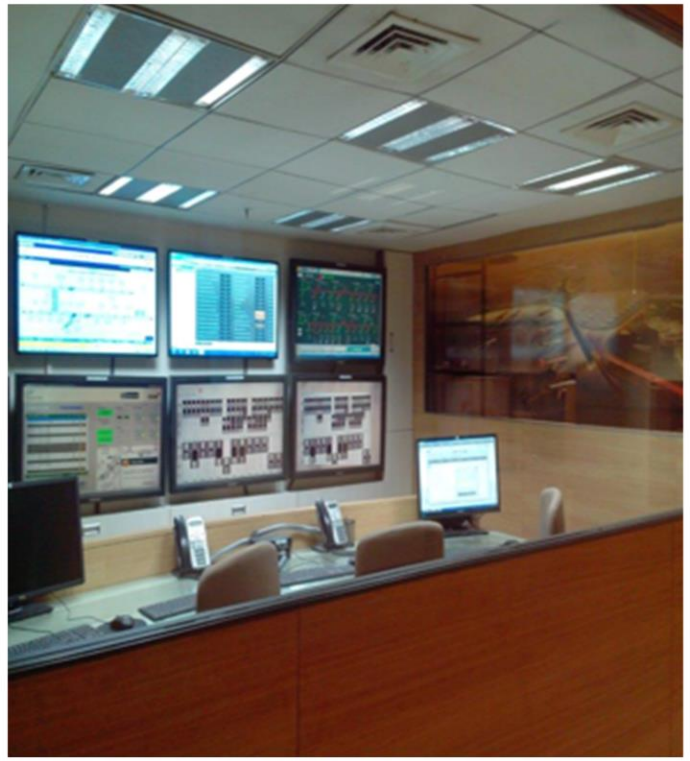
Rich landscape of Greenery is maintained inside terminal which further upgrades the air quality & gives a feel-good attitude to all stakeholder

Monitoring System

SCADA Generated - Daily Monitoring Report

DATE	BHS	PBB	HVAC	MAIN FIRE STATION	LIGHTING	POWER DISTRIBUTION	MACHINE ROOM PANEL	PUMP PANEL	RETAIL & TENANT PANELS	UPS	UTILITY AUX.CONSUMPTION	MLCP	STP	Chiller	TRITURATOR BUILDING
21-Oct-21	7330	2079	33679	801	31037	15485	2704	899	22840	16075	1108	12400	2160	79031	28
22-Oct-21	7153	2064	31854	767	31179	15738	2707	891	22527	16076	1092	12500	2360	76053	30
Variance	-177	-15	-1825	-34	142	253	3	-8	-313	1	-16	100	200	-2978	2
Variance %	-2.41%	-0.72%	-5.4%	-4.24%	0.46%	1.64%	0.12%	-0.89%	-1.37%	0.01%	-1.40%	0.81%	9.26%	-3.77%	7.14%

Services	Cumulative Energy Consumption (KWH) Till Date (OCT-2021)	Consumption in %
BHS	155951	2.77%
BRIDGE JUNCTION BOARD(PBB)	47813	0.85%
HVAC-LS	716048	12.73%
MAIN FIRE STATION	16636	0.30%
LIGHTING DISTRIBUTION PANEL	670887	11.92%
POWER DISTRIBUTION PANEL	344369	6.12%
MACHINE ROOM PANELS(VHT)	58557	1.04%
PUMP PANELS	19642	0.35%
RETAIL & TENANT PANELS	493826	8.78%
UPS PANELS	354321	6.30%
MLCP-HT PANEL	266600	4.74%
STP	47340	0.84%
TRITUATOR BUILDING	609	0.01%
UTILITY AUX.CONSUMPTION	24532	0.44%
HVAC-HS(CHILLER & CHILLER AUX. PANELS)	1885580	33.51%
CCR1-HT PANEL (Feeder from T2)	85800	1.52%
High Mast Light (Feeder from Utility)	3666	0.07%
GPU + PCA	431646	7.67%
GSD (Supply from utility)	2660	0.05%



- ✓ **SCADA & BMS for 22*7 real time** monitoring, Operation and Control.
- ✓ Daily section wise Consumption reports received through SCADA. Concerned person to justify variance.
- ✓ **Regular review meetings, being chaired by HOD**, on consumption and progress tracking.
- ✓ **Energy a key topic of MRM** being conducted by top management – Chief Airport Officer
- ✓ Targets given to each section → mapped with KRA.

Training & Awareness Program

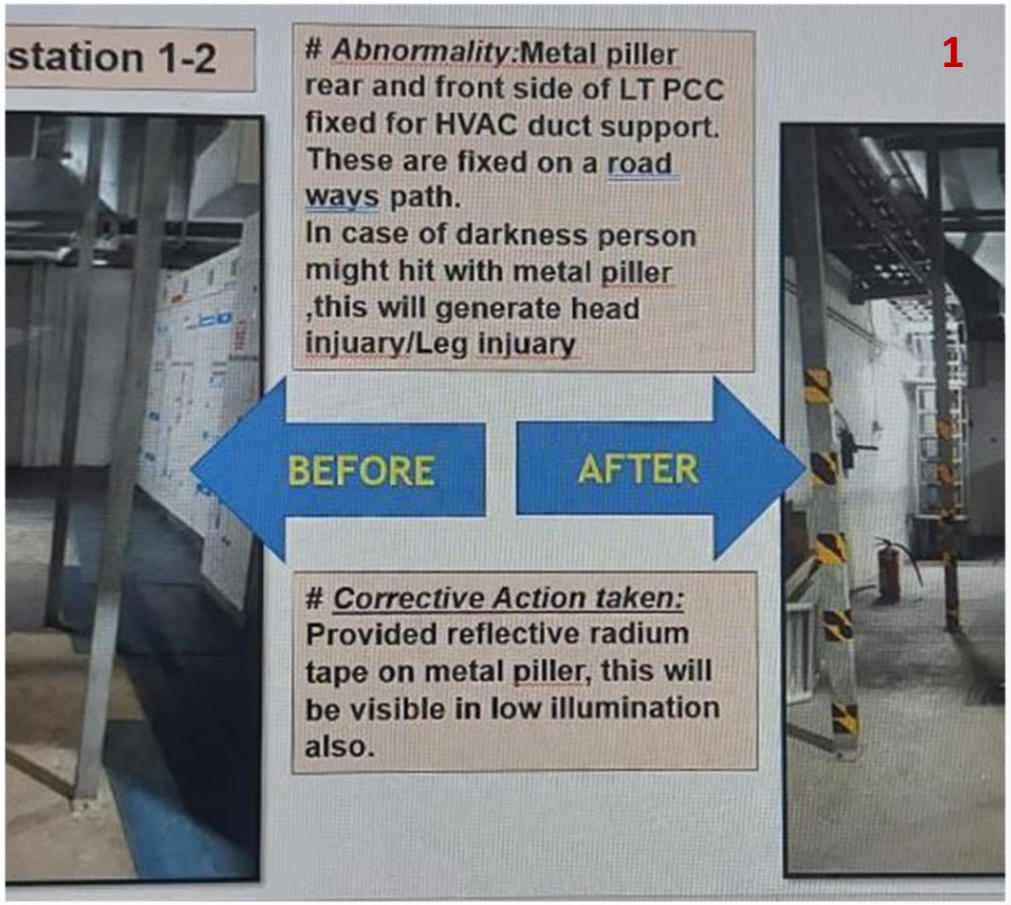
Awareness creation to all stakeholders on regular basis:

- Ramp Safety Meetings
- Energy awareness among vendors/stakeholder’s staff
- Training Programs: (Environment, Safety, Quality etc.)
- Interaction with the stakeholders through regular audits.
- Celebrations like **World Environment Day**

MIAL’s own staffs are also being trained as per schedule.

Few broad training area includes:

- **ENMS**
- Energy conservation processes
- Technology up gradation
- 5S & Kaizen



5S & Kaizen

Improvement through 5S & Kaizen has always been MIAL's focus.

Of all, few recent activities have been highlighted here:

1. Reflective tapes on metal pillars → visibility at low illumination.
2. Radium coating on stickers to ensure visibility even at during complete darkness
3. Proper tags on all panels → Easy & quick identification & operations.

EnMS & IGBC Certification

IGBC **Platinum** Certified

EnMS 50001:2018 certified company

How CII helps in our Journey of Energy & Sustainability Management….

- **Providing a National platform** to showcase efforts & getting recognized for the same indeed acts as huge motivation to act & perform better.
- **Opportunity to see other's performance** & where we stand → Forum helps in getting additional ideas from others.
- **Multiple companies showcase their energy efficient products** → Exposure to new available products in the market. Happy to say – An energy efficient technology "Precision Control of ACs" has been taken up this year after getting suitable contacts from CII's last year program.

Awards & Accolades

CII Excellent Energy Efficient Unit-2019

CII GreenCO **"GOLD"** rated company

ACA Level 3+ Neutrality Certified Airport

CII Energy Efficient Unit - 2021

Greenest Building

email id: pravind.kumar@adani.com