CII National Award for Excellence in Energy Management 2021

Chhatrapati Shivaji Maharaj International Airport, Mumbai

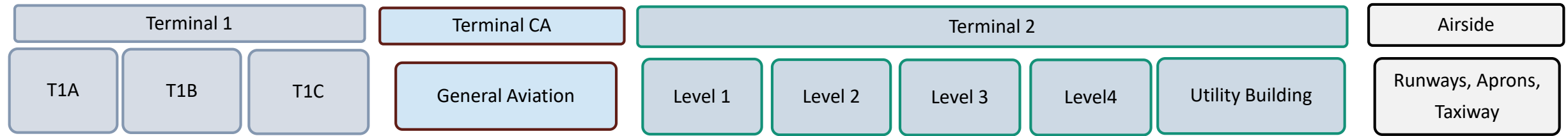| Presenters	
Pravind Kumar	GM & HOD (E&M)
Kalpant Tyagi	Asst. Manager
Sourav Chakraborty	Asst. Manager

About Mumbai International Airport Limited (MIAL):

Chhatrapati Shivaji Maharaj Mumbai International Airport Limited is managed by Adani Airport Holdings Limited (AAHL), a subsidiary of Adani Enterprises, the flagship company of the globally diversified Adani Group.

With a strong understanding of modern-day mobility requirements, the Adani Group's vision for CSMIA is to continue to strengthen Mumbai International Airport initiatives and reinvent it as India's biggest aerotropolis, where the traditional airport nucleus of passenger and cargo infrastructure will be reinforced by interdependent clusters of commercial and residential infrastructure to create the nation's busiest airport ecosystem.

CSMIA has been further envisioned as a global air-travel focal point where domestic and international flyers actively engage in business and leisure supported by metropolitan expansion that catalyses aviation-linked businesses and employment opportunities. At CSMIA, we intend to create distinctiveness with an experiential offering that puts Mumbai first.

Chhatrapati Shivaji Maharaj
INTERNATIONAL AIRPORT
MUMBAI

Mumbai International Airport Ltd.

Terminal 1			Terminal CA	Terminal 2					Airside
T1A	T1B	T1C	General Aviation	Level 1	Level 2	Level 3	Level4	Utility Building	Runways, Aprons, Taxiway

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.)

FY21 in a Nutshell

115 thousand ATMs

11 million passengers

68 million Electrical Energy consumed

Energy Policy

ENERGY POLICY

In pursuance of GVK Vision, Mission and Core Values, Mumbai International Airport Private Limited (MIAL) shall strive to provide World class airport services and related infrastructure for business excellence. We are committed to continually improve the systems, processes, procedures and work practices for improving energy performance through objective driven targets.

MIAL shall accomplish this through following:

- Compliance 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, equipments, systems, processes with active participation of our service providers

- Shall support the purchase of Energy Efficient products and services, and design for energy performance improvement in all MIAL Operations

- Creating awareness in energy conservation techniques by imparting training, conducting workshops and seminars to all Employees, Service providers and Stakeholders

- Ensuring the availability of necessary resources and all information to achieve objectives, targets and improvement action plans decided on ongoing basis

- Focus on use of Renewable Energy Sources wherever feasible

- Promoting active involvement of all personnel and service providers to follow the best practices so that the Energy Improvement initiatives are driven to accomplish MIAL policy on continual basis.

- Policy will be communicated and accomplished at all functions in a structured manner
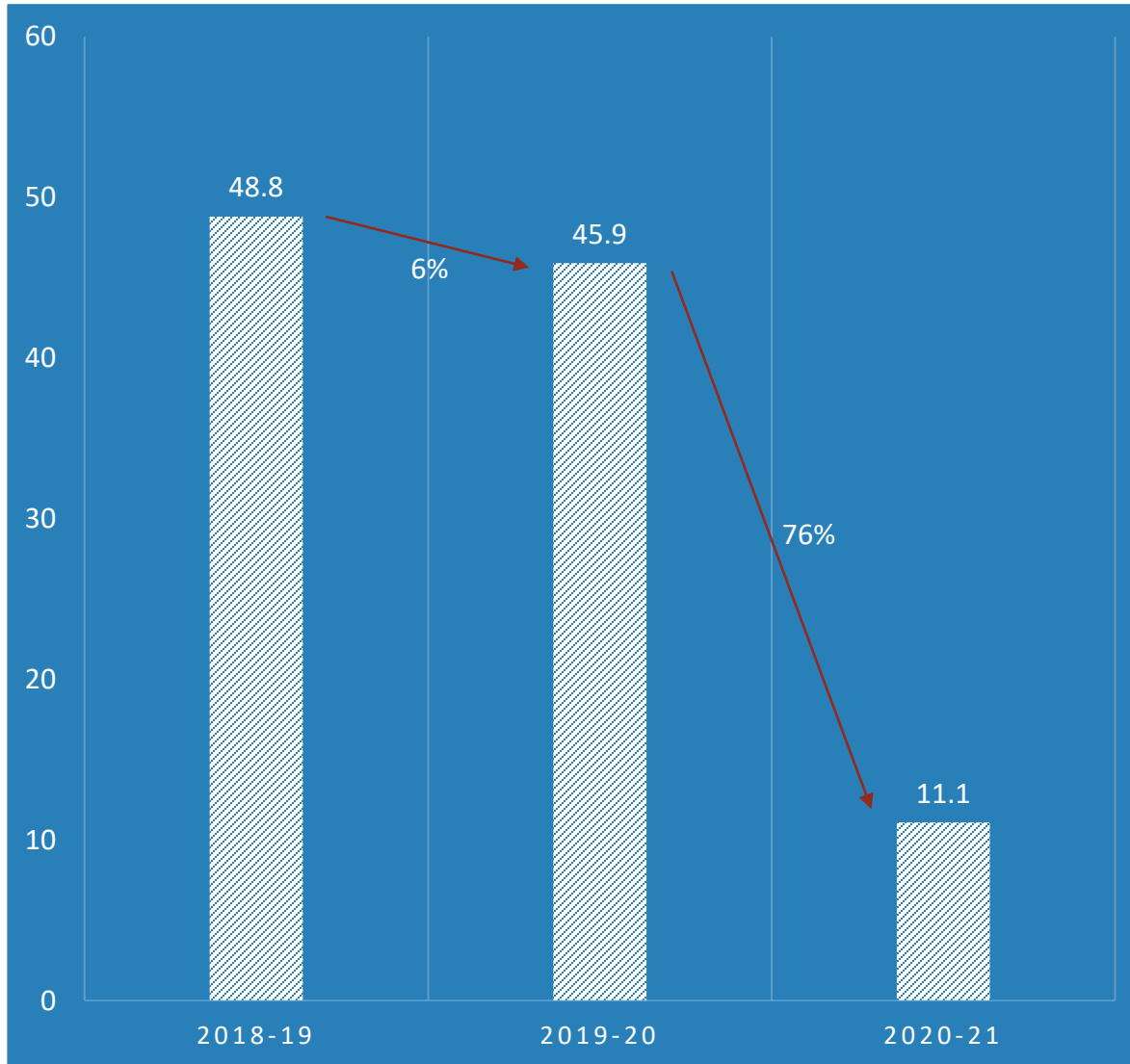
Date: 3 - 03 - 2015

(R. K. JAIN)
Chief Executive Officer, MIAL

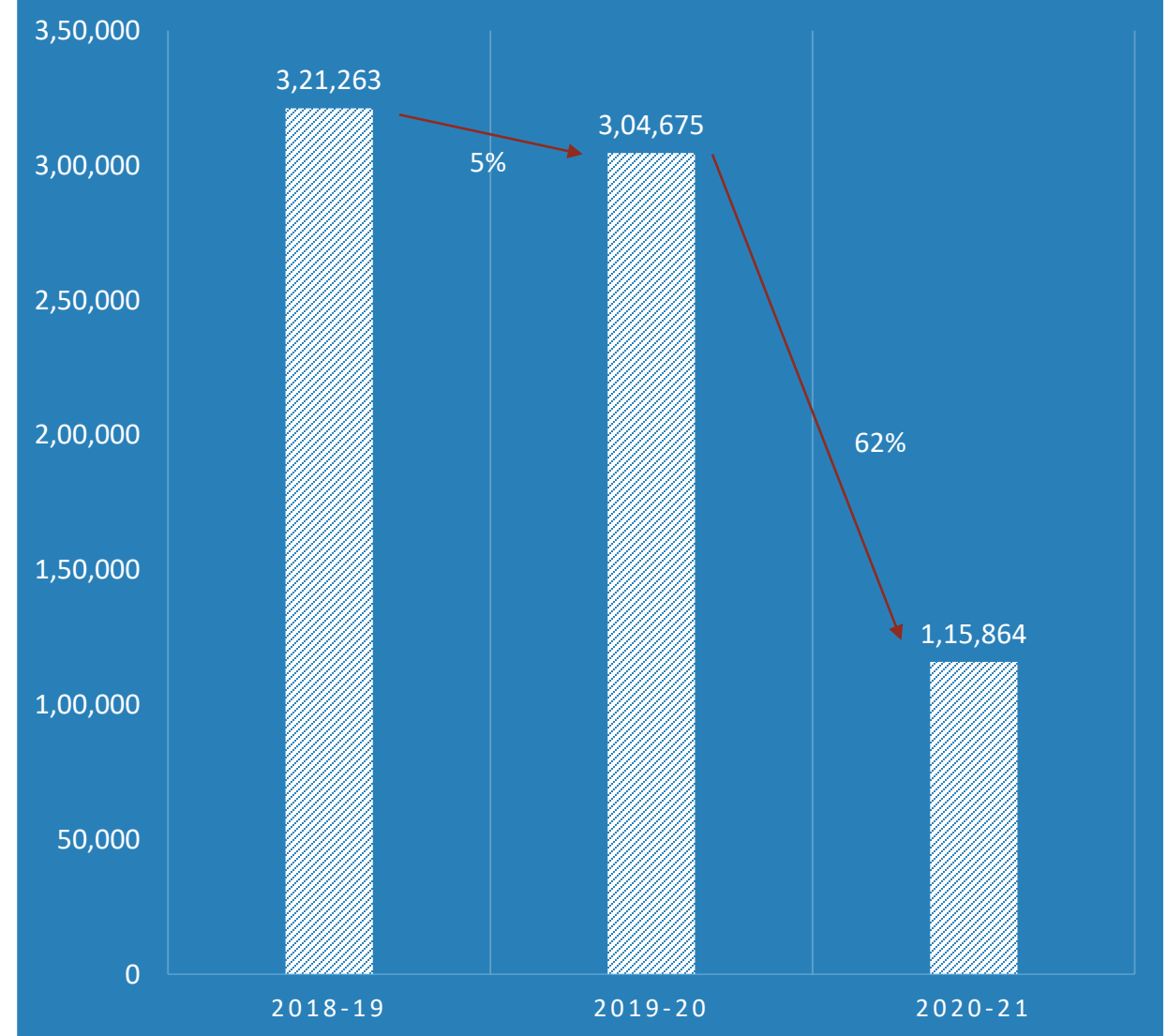Chhatrapati Shivaji
INTERNATIONAL AIRPORT
MUMBAI

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

Passenger & Air Traffic Movement (ATM)

Fight against Covid

A series of initiatives have been taken to reduce energy consumption → To **minimize SEC (kwh/pax)**

During lockdown → **Reduced kwh by almost 50%** w.r.t pre Covid level.

Few major steps include:

❑ Terminal 1 has been shut down.

❑ All operations at Terminal 2 were carried out from one side. All farthest points were closed.

❑ All Operations (HVAC, lighting etc.) were optimized based on flight timings

❑ Logic to start additional chiller changed from 12.5 deg. to 15 deg.

❑ AHUs of only strategic locations were turned on rest all was kept off.

❑ Equipment(s) with highest efficiency was only kept functional.

❑ Average building temperature was maintained 1 deg. higher.

❑ As a preventive measure, fresh air was taken for AHU operation which prevented in further energy optimization.
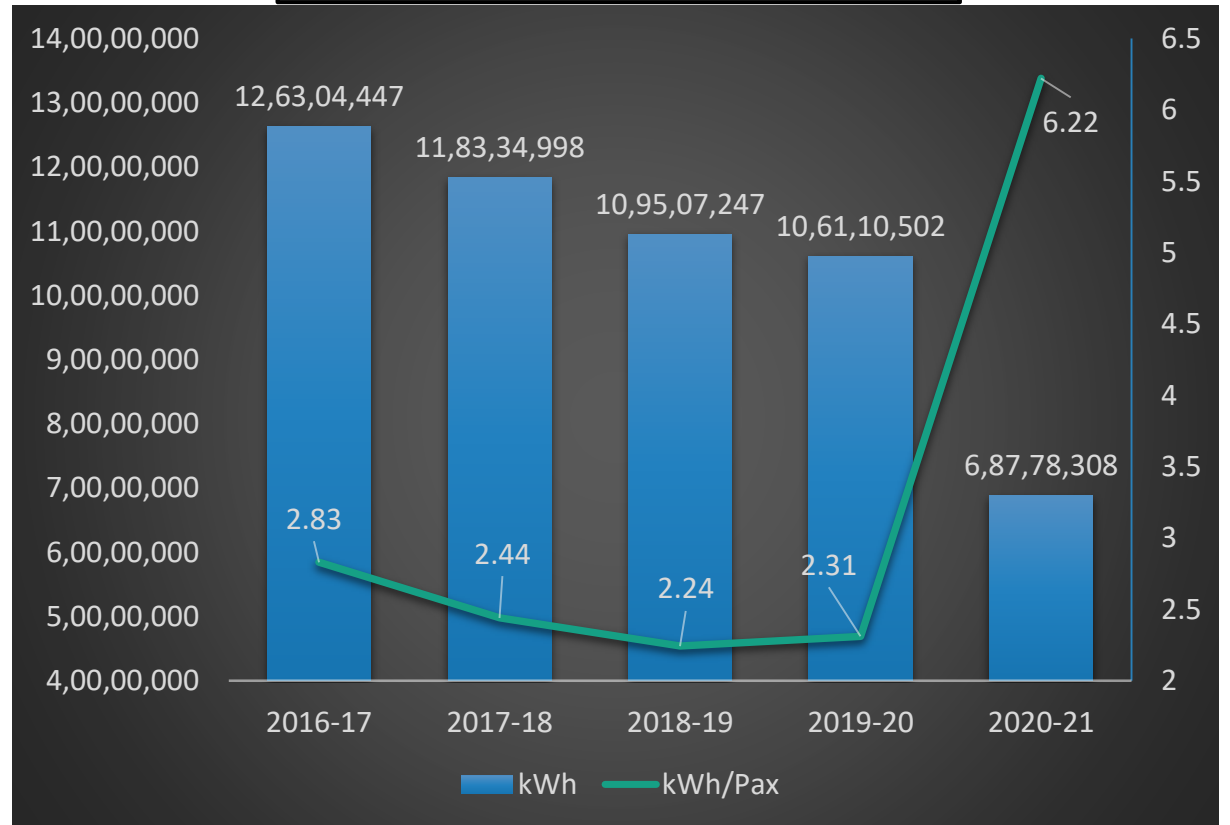
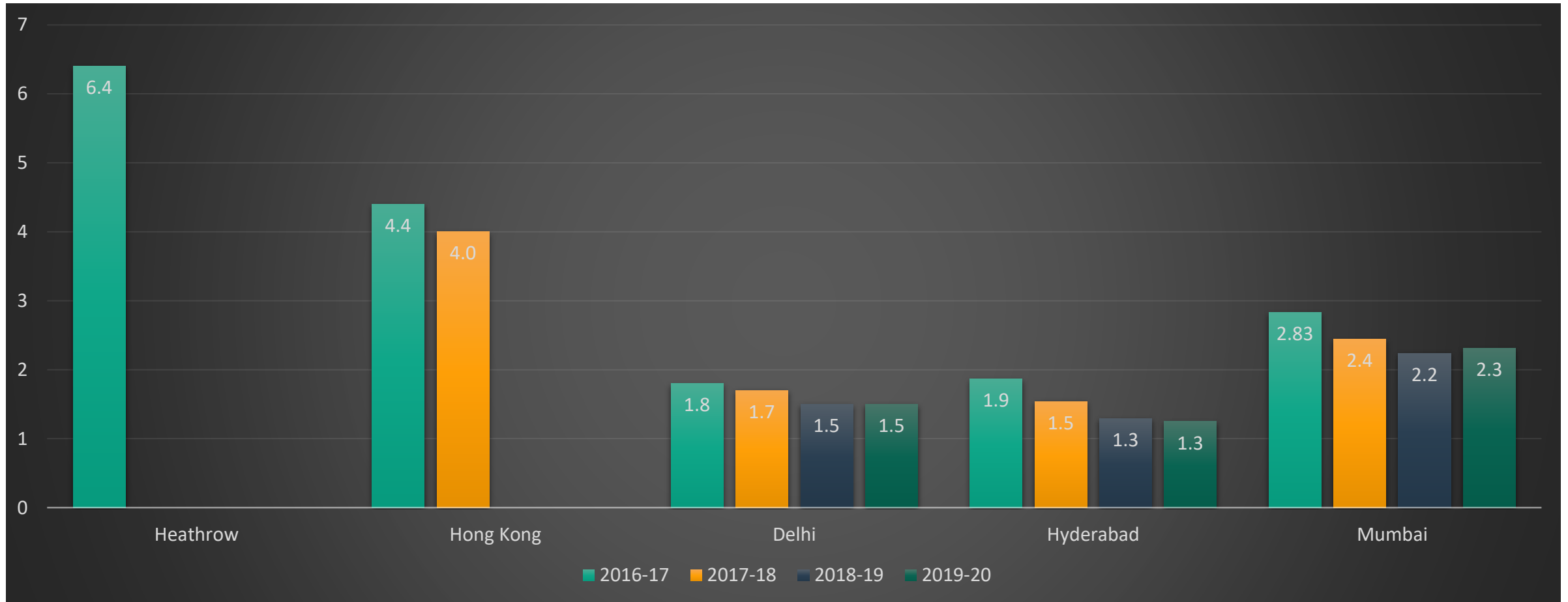# Specific Energy Consumption(SEC)

Energy Consumption & kWh/m2
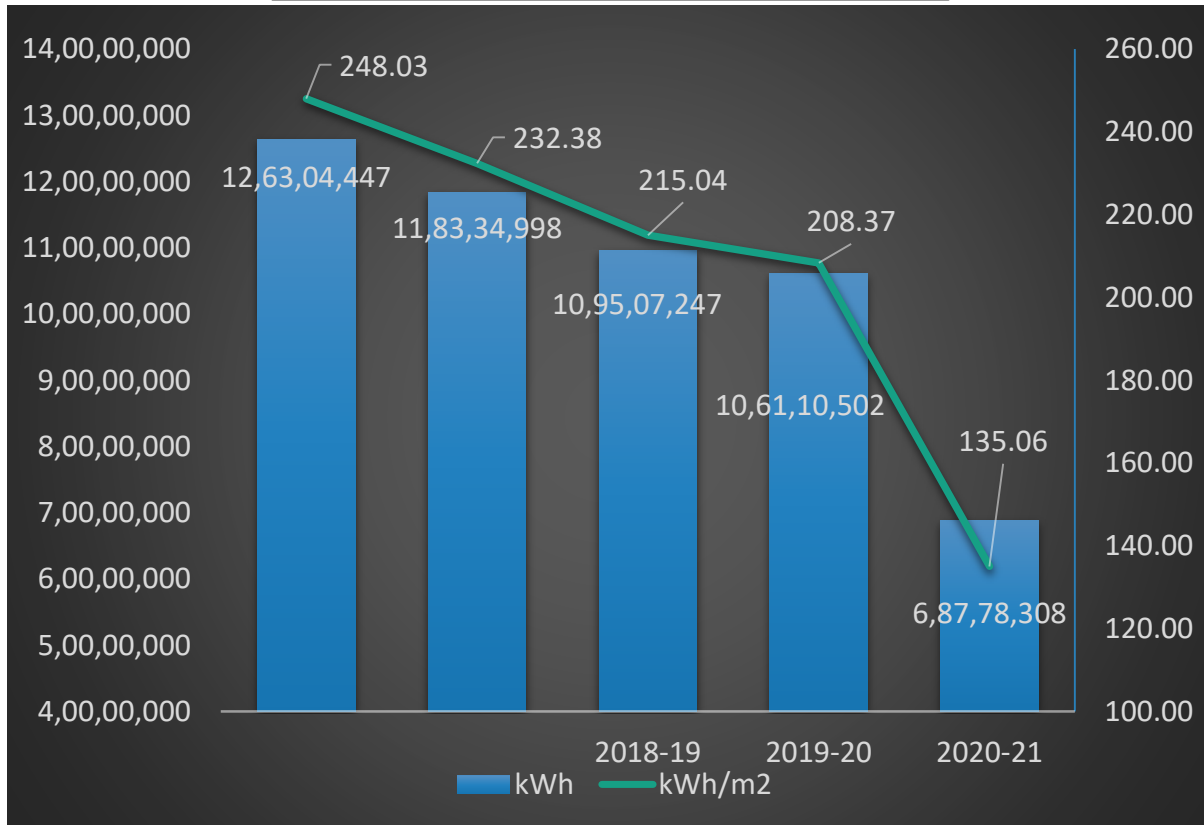
Energy Consumption & kWh/pax

Key Highlights

❑ FY19 vs FY20 → kWh reduced by 3% but **PAX reduced by 6%,** so marginal increase in SEC (kWh/Pax)

❑ FY20 vs FY21 → Steep **reduction in Pax** (76%), **no proportional reduction in operational area & increase in fresh air intake (by 3 times)** contributed to high SEC(kWh/Pax) even though **kWh reduced by 35%**

National & Global Energy Benchmarking

Chhatrapati Shivaji Maharaj INTERNATIONAL AIRPORT MUMBAI

	Heathrow	Hong Kong	Delhi	Hyderabad	Mumbai
2016-17	6.4	4.4	1.8	1.9	2.83
2017-18		4.0	1.7	1.5	2.4
2018-19			1.5	1.3	2.2
2019-20			1.5	1.3	2.3

■ 2016-17 ■ 2017-18 ■ 2018-19 ■ 2019-20

Key Factors Affecting Energy Benchmark

❑ Climatic Zones   ❑ Building Envelope   ❑ Operational Strategy

Energy Saving Projects

Year	No of Energy saving projects	Investments (INR Million)	Electrical savings (Million kWh)	Thermal savings (Million Kcal/ MTOE)	Savings (INR Million)	Impact on SEC-kwh/pax (Electrical, Thermal)
2018-19	2	11.84	2.5	0	27.54	5%
2019-20	3	8.67	0.24	0	2.69	0.5%
2020-21	1	0.25	0.10	0	1.15	0.22%

❑ Each year **dedicated budget gets allocated towards Energy Conservation Projects**

❑ Apart from technology up gradation, special focus is also given to **operational optimization**, to reduce energy wastage.

❑ Dedicated **Energy Management cell** looks after all Energy conservation projects and keep track of all regular energy saving activities.

Engineering and Maintenance
Capex Budget FY 22 (All Amount in Cr.)

Particulars	Final Budget
Standby Runway Edge-light Circuit for Runway 14-32	5.30
Improvement of BIS / WGS Signages, LED retrofitting	1.00
Replacement of old fixtures with new LED fixtures at airside	1.50
Stop bar , No entry bar lights at N7,E4,E8,F1,D1,W1	1.50
Sign Improvement, Sign sheet replace, LED retrofit, Signboard replace	0.25
Workshop upgradation and provision office cabinets - CCR 1 and CCR 2	0.50
Upgradation of Individual Lamp Control Monitoring System (ILCMS) at AGL system	0.05
Others - AGL	1.30
Total - AGL	**11.40**
Upgradation of Hold Baggage system (HBS) at T2	8.06
Explosive Trace Detectors -	1.50
Procurement of DFMD - T1	0.80
Others - Electronics	0.49
Total - Electronics	**10.85**
Replacement of Mega coloumn MH fixture to LED fixtures at T2	0.60
Energy efficient pumps/ blowers at T1 and T2	0.30
Conversion of MH Light & tubelight to LED Light in Tunnel area at Elevated road at T2	0.18
Energy Efficient Blowers for STP	0.14
Replacement of belt driven fan with direct driven fans for AHUs at T2	0.02
Total - Energy Efficiency	**1.24**

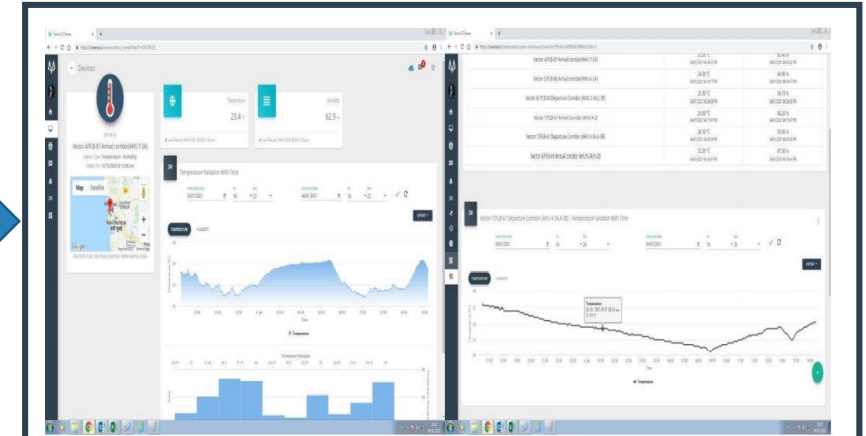# Innovative Projects Implemented

IOT Temperature Monitoring

Wi-fi Temperature Sensors at strategic locations across Terminal

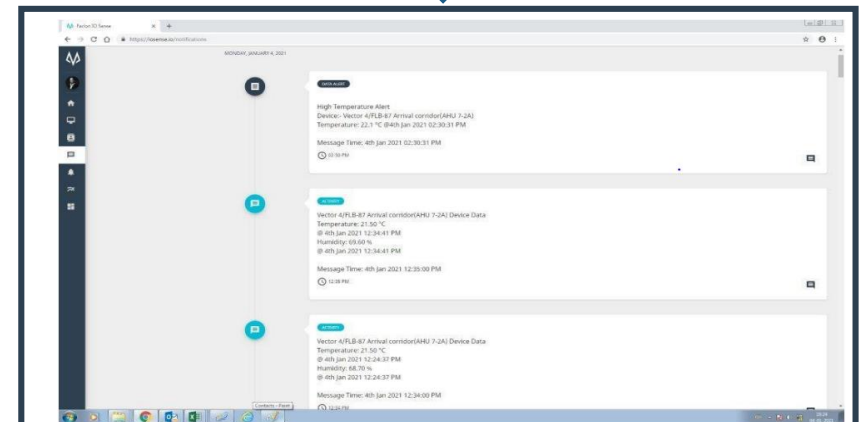**Temperature profile can be obtained on real time basis**

Dashboard to monitor Data

Alert when temperature goes beyond set limit

Project Status: Pilot Project completed in FY21

Impact: All necessary hot and cold pockets getting captured
→ HVAC losses gets minimised

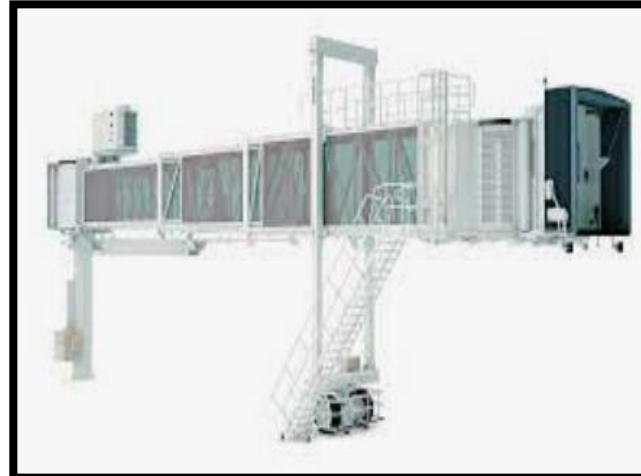Energy Saving Estimated: 1% of low side HVAC consumption

Replication Status: Yes

Innovative Project

Project: Smart PBB Lighting & HVAC Operation

Project Plan

Flight information → VDGS → PBB → PBB lighting & HVAC switched ON

Project Status: To be Implemented FY22/FY23

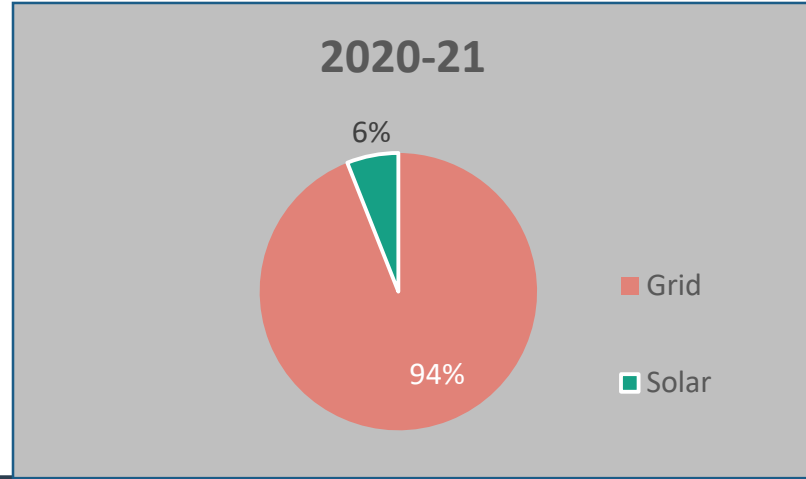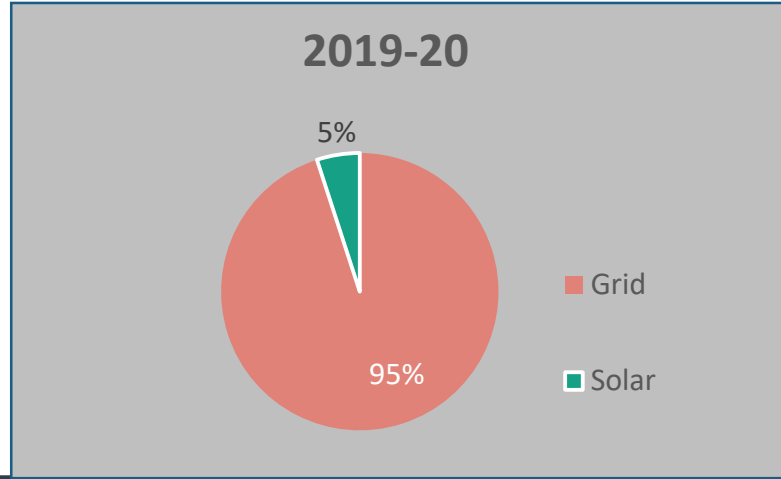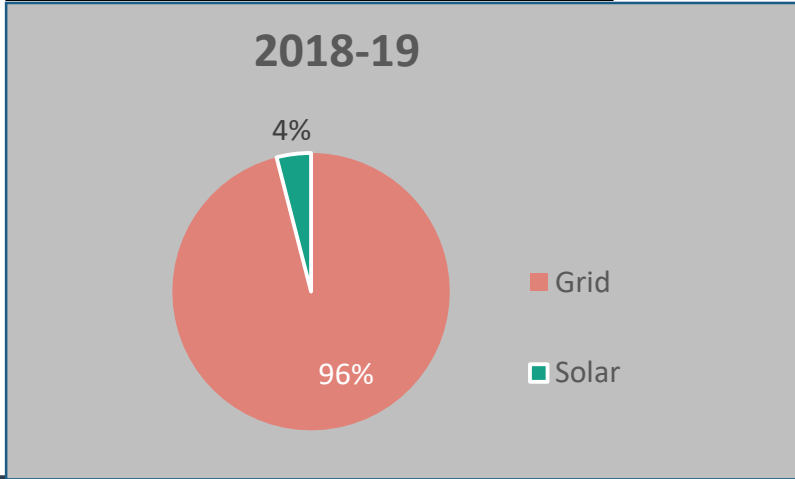Impact: Optimum utilization of HVAC & lighting system within PBB.

Replication Status: Yes

Major Energy Conservation Projects in FY22

❏ Replacement of cooling tower fills with energy efficient fills

❏ IOT for temperature monitoring inside terminal

❏ Replacement of belt driven fans with EC fans
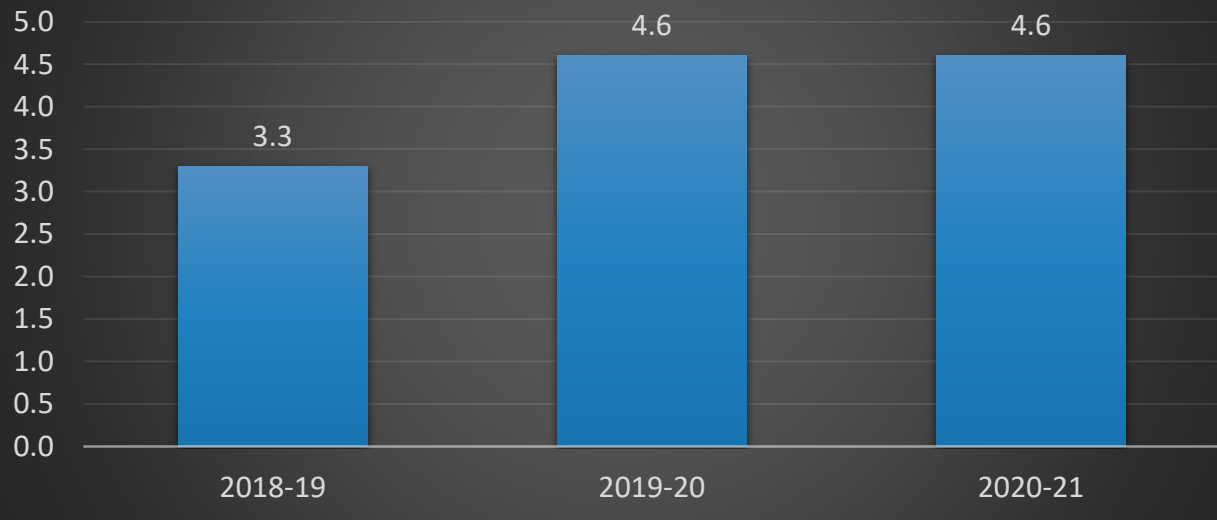
❏ Replacement of metal halides with LEDs
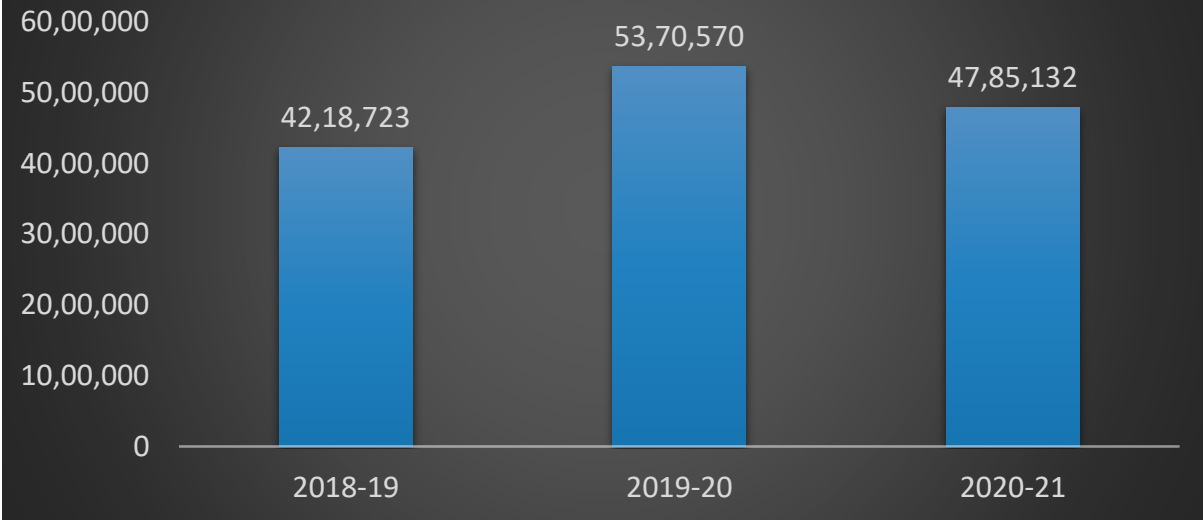
Renewable Energy

Net Renewable Energy Share

2018-19
- 4% Solar
- 96% Grid

2019-20
- 5% Solar
- 95% Grid

2020-21
- 6% Solar
- 94% Grid

Solar: Installed Capacity(MW)

2018-19	2019-20	2020-21
3.3	4.6	4.6

Solar Generation(kWh)

2018-19	2019-20	2020-21
42,18,723	53,70,570	47,85,132

Waster Management

- ❑ **CSMIA single use plastic free airport:** Single use plastic has been banned.

- ❑ Installed **in house composting system** for making organic compost by treating food waste generated within terminals and **augmented its capacity to 1.5 MT/day.**

- ❑ **Composting system capacity increased from 1 MT/day to 1.5 MT/day**

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

- ❑ **Sewage treatment plants (STPs)** with a cumulative capacity of **14 MLD** is installed for waste water treatment.

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 & set a time bound program to reduce carbon footprint by 25% by year 2020; **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,
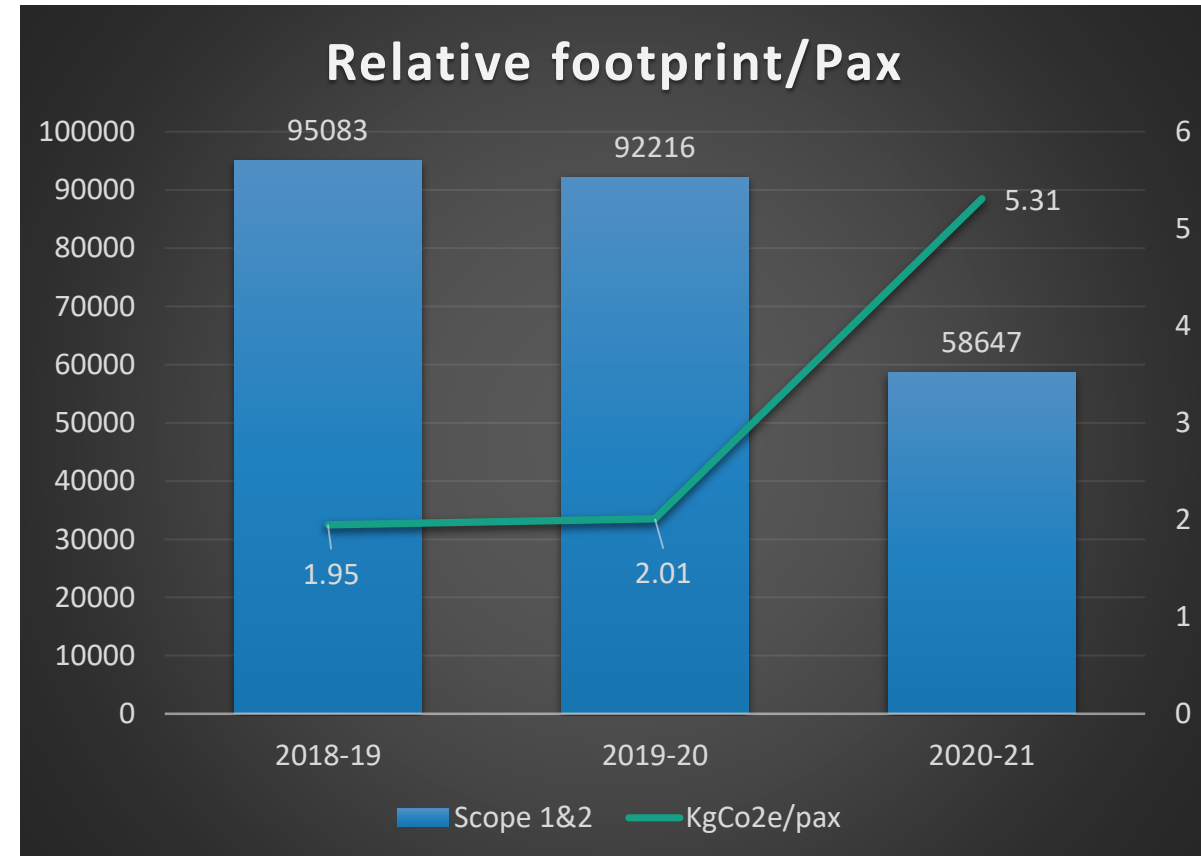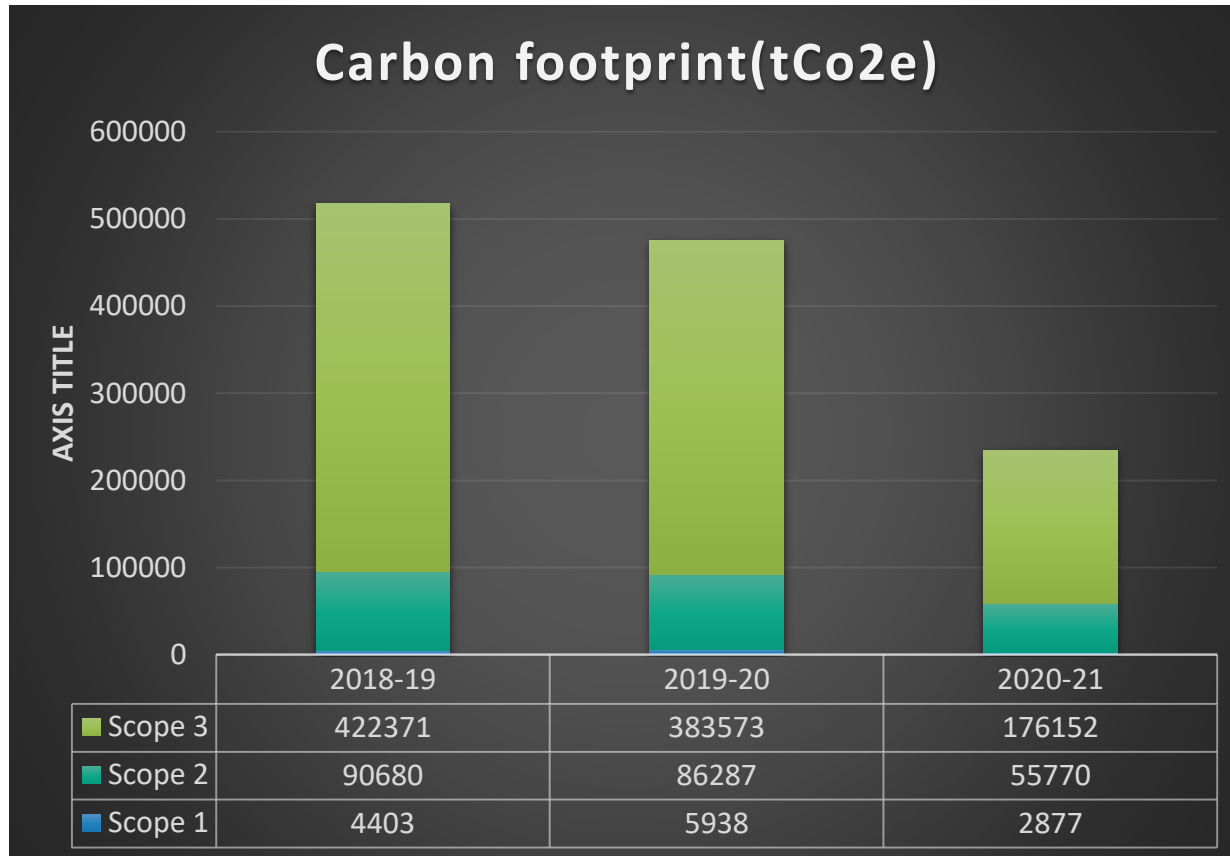
2017-18
- Total Roof top solar plant installations increased to 3.2 MW.

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

GHG emission

Carbon footprint(tCo2e)

	2018-19	2019-20	2020-21
Scope 3	422371	383573	176152
Scope 2	90680	86287	55770
Scope 1	4403	5938	2877

Relative footprint/Pax

95083   92216   58647

1.95   2.01   5.31

Scope 1&2   KgCo2e/pax

Key Facts

❏ MIAL is Airport Carbon Accreditation (ACA) Level 3+ "NEUTRALITY" accredited carbon neutral airport.

❏ Target: To reduce our Scope 1 and Scope 2 carbon emissions per passenger by 33% - 35% against baseline of 2014 which is in lines with Nationally Determined Contribution (NDC) commitments.

Monitoring System
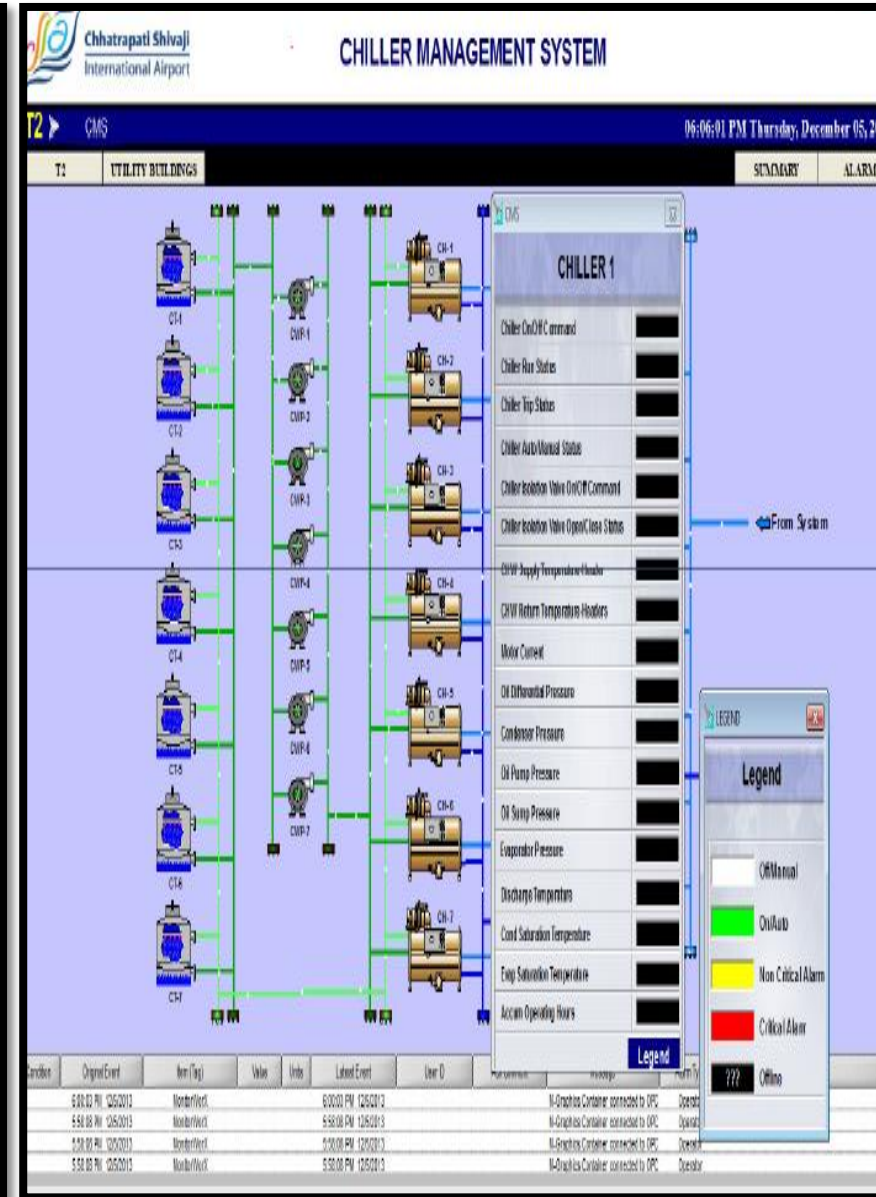
- ✓ 24*7 real time **SCADA** monitoring system

- ✓ **BMS** system for real time monitoring & operation of systems

- ✓ **Consumption reports** generated on daily basis to track progress towards target.

- ✓ **Regular meeting** with concerned team up optimization and system up gradation.

- ✓ **Targets** given to each section which gets mapped to **KRA**

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
17-Jan-19	11481	2357	35430	533	37433	19988	3637	928	31856	17505	1155	13200
18-Jan-19	11225	2187	37723	518	37326	20452	3444	958	32170	17475	1152	13300
Variance	-256	-170	2293	-15	-107	464	-192	30	315	-30	-3	100
Variance %	-2.23%	-7.21%	6.47%	-2.81%	-0.28%	2.32%	-5.28%	3.23%	0.99%	-0.17%	-0.28%	0.76%

Note:	
	Red Indicated Systems Consumed more units than previous day
	Green Indicated saving done in terms of units.

Services	Reason for Deviation	
	Date on 17.01.2019	Date on 18.01.2019
Chiller	Chiller 3 # RUNS 09:00 HRS. (84.0 % Load) Chiller 6 # RUNS 24:00 HRS. (88.5 % Load) A- Amb Temp. (Min 22.4 °C & Max 31.9 °C) B- RH (Min 23.4 % & Max 58.5 %) C- WB (Min 15.5 °C & Max 19.6 °C)	Chiller 2 # RUNS 16:00 HRS. (86.6 % Load) Chiller 6 # RUNS 16:00 HRS. (88.6 % Load) A- Amb Temp. (Min 22.1 °C & Max 31.1 °C) B- RH (Min 26.8 % & Max 56.6 %) C- WB (Min 16.0 °C & Max 19.0 °C)
HVAC	Consumption is more than previous day from SS1-3 6FA to 1-1EDH-4/MEP-4, SS7-1 8FB to 7-1EDH-1/MEP-12 , SS3-1 11FB to 3-1EDH-1/MEP-6, SS1-1 19FC to 1-1EDH-1/MEP-2, SS5-2 11FC to 5-1EDH-1/MEP-8, SS5-2 18FB to 5-1EDH-3/MEP-9, SS 4-1 13FB to 4-1EDH-1/MEP-7, SS 4-1 20FB to 4-1EDH-2/MEP-7, SS 2-1 15F2 to 2-1EDH-1/MEP-5.	

Kaizen – A daily practice

Kaizen

Description: Earlier, in BMS, for checking status of fans, one by one navigation of each fan was required, which was a lengthy and time consuming process. With the help of JCI, a consolidated system for monitoring of all the fans, at a time, has been created.
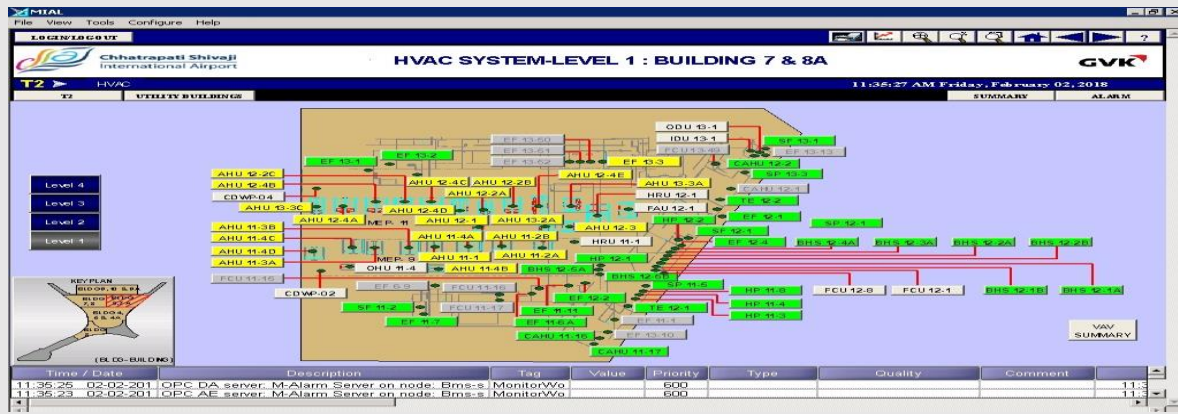
Identification Date : 16/01/2019

Completion Date : 31/01/2019

Category

- ☐ Maintainability Improvement
- ☐ Safety
- ☐ Productivity Improvement
- ☐ 5S
- ☐ Cost Reduction
- ● Time Reduction
- ☐ Energy Saving

Before	After

Benefit: Significant Reduction in operating time achieved along with better monitoring and control of the system

Training & Awareness Program

All MIAL staffs and Vendors are trained on regular basis based on calendar schedule. The training includes:

- **ENMS** meeting/training
- Energy conservation processes
- Technology up gradation
- **Awareness**

Awareness creation to all stakeholders happen 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 is CII GreenCO **"GOLD"** rated company

MIAL is **EnMS 50001:2018** certified company

Awards & Accolades

CII Excellent Energy Efficient Unit

Emerson Award

Greenest Building

IGBC Certification

ACA Level 3+ Neutrality
Certified Airport

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