



# CII NATIONAL AWARD FOR EXCELLENCE IN ENERGY MANAGEMENT - 2023

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Peter Paul – Director, Workplace Experience

13-15 September 2023

**JUNIPER**  
NETWORKS

Driven by  
Experience™





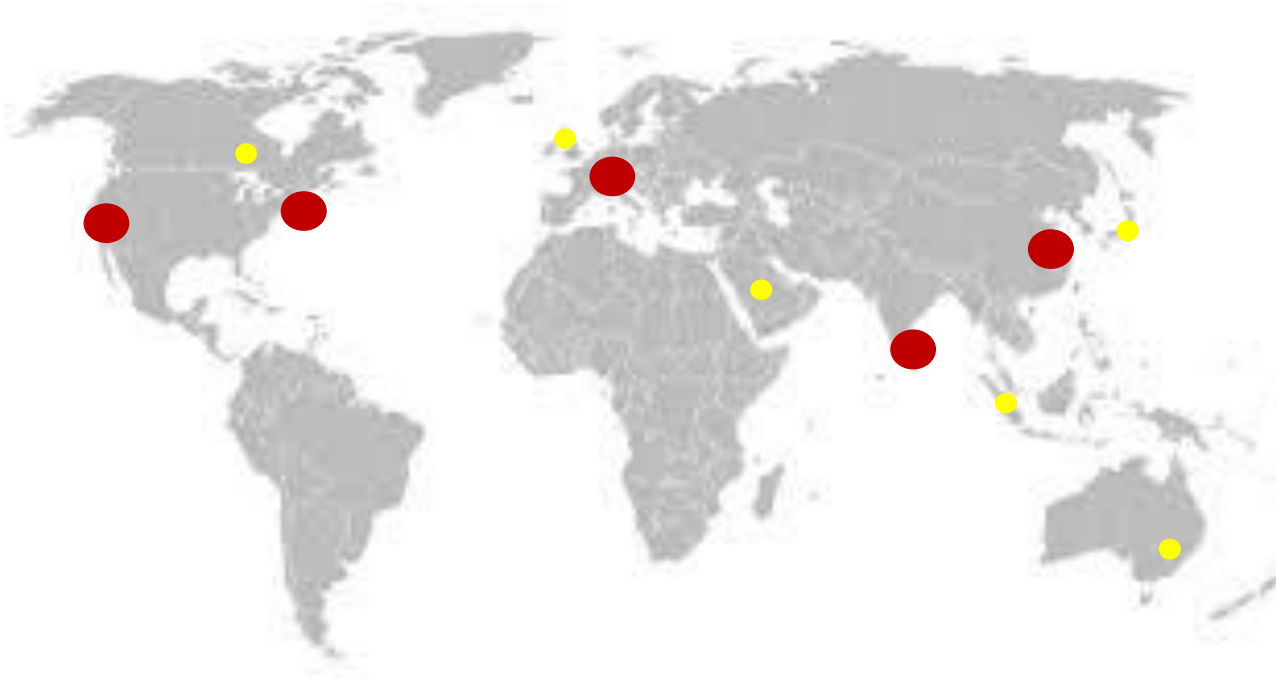
# AGENDA:

1. Company Profile
2. Bangalore office introduction
3. Energy Consumption Trend
4. SEC & PUE Trend and Benchmarking
5. Major EnCon Projects plan : 2023-24
6. EnCon Projects Summary : 2020-22
7. Major EnCon Projects Completed – 2022
8. Kaizen Projects update
9. Renewable Energy
10. GHG Emissions
11. Indoor Air Quality
12. Monitoring & Engagements
13. Awards & Certification
14. Employee Engagement & CSR

# Juniper Networks : Company Profile

Juniper Networks is pioneer in Networking, Switching & Routing business. Company started in 1996 & has it's headquarters in Sunnyvale, California US and has operations across the globe. Major R&D centers in Sunnyvale, Bangalore, Westford, Beijing & Amsterdam with labs & Data Centers.

Juniper Networks started India Operation in 2002. At present offices are located in Bangalore, Delhi & Mumbai location comprising up to 722 K SFT with 4000+ staffs



## Solutions We Offer

- Switching & Routing
- Software Defined Networking
- Internet Security
- Application Management
- Network Edge Services
- Network Management & Operations
- Network Operating System
- Pocket Optical & Wireless etc..





# Juniper Networks : Elnath - Bangalore



Location : Prestige Tech Park, Elnath - Bangalore

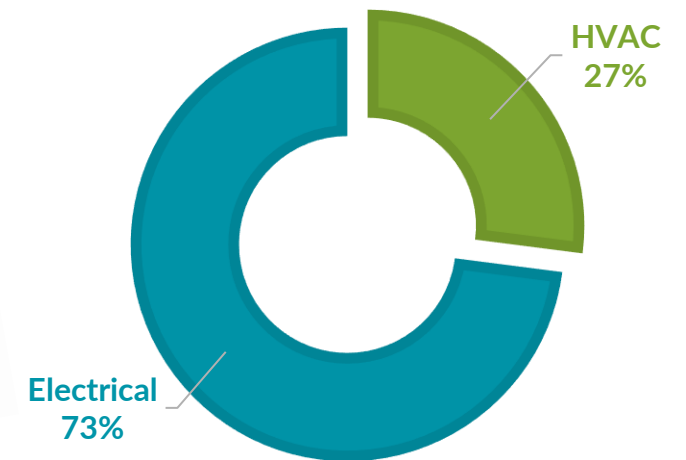
Total Area : 365,692 Sft

Key Features : Double glazed façade, SRI Paint, LEED –Gold

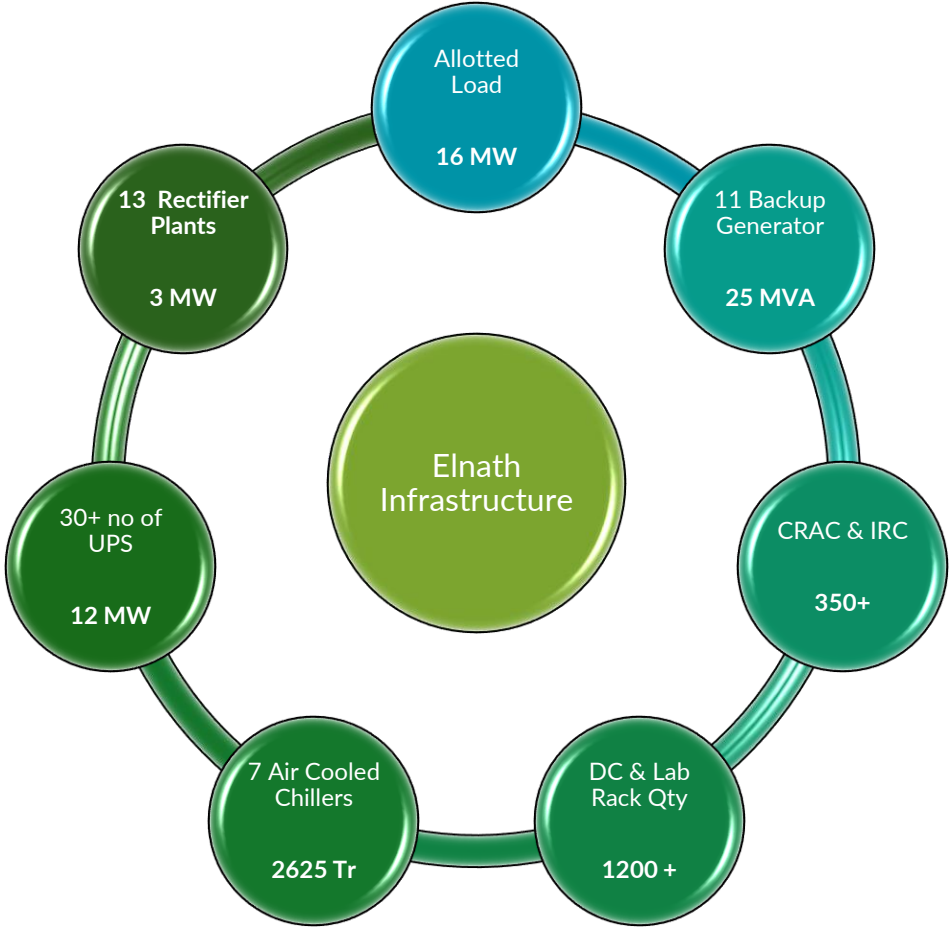
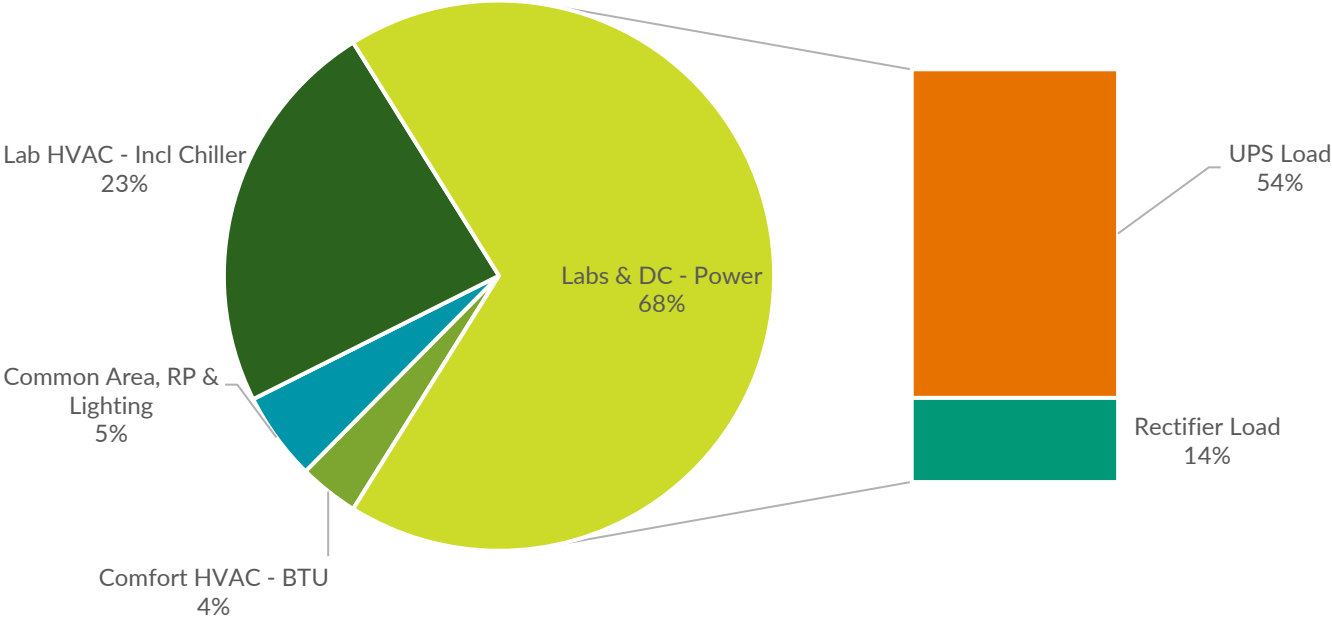
Climate Zone : Moderate (Tropical) climate



Building Orientation : S-E



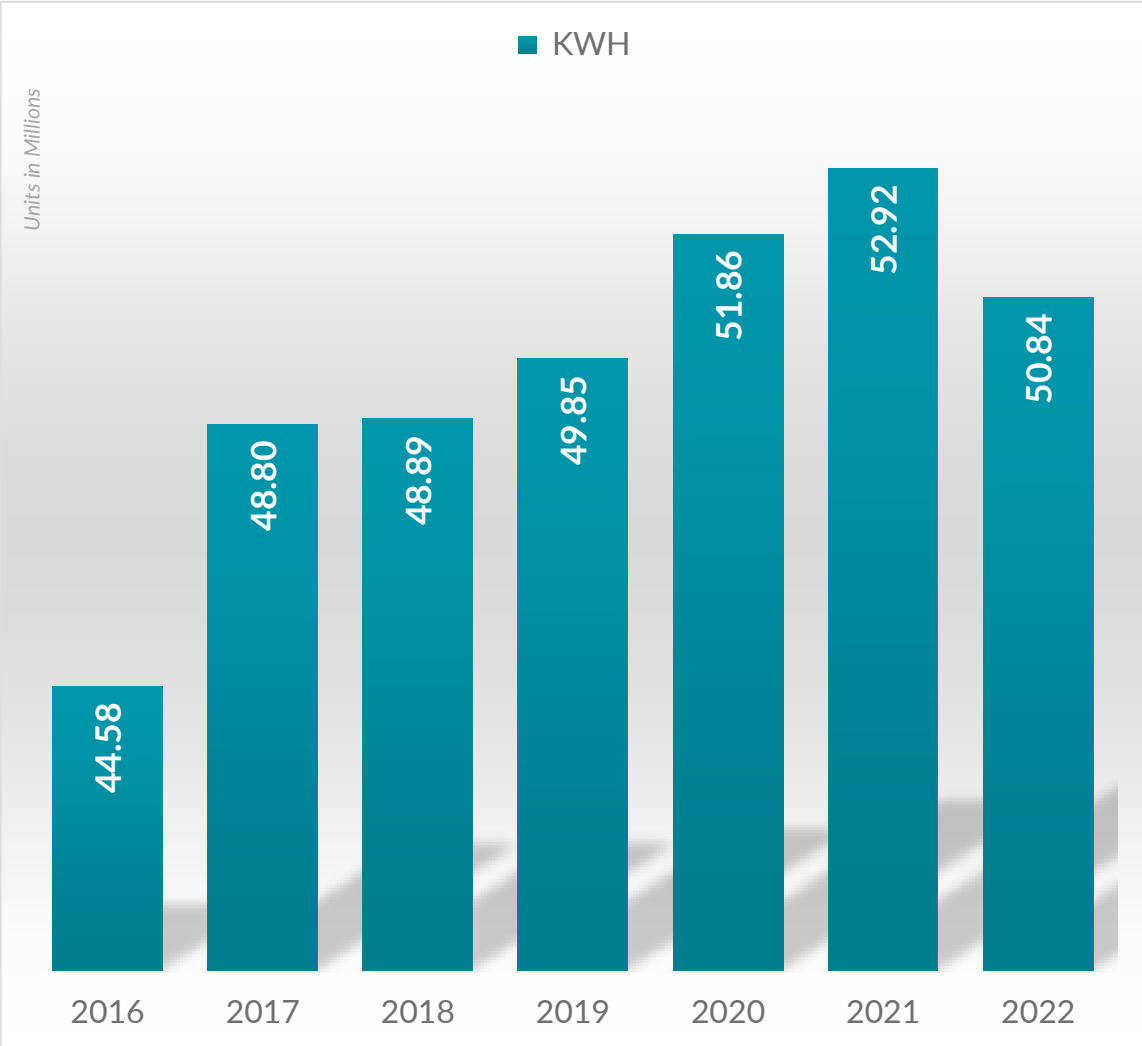
# Juniper Networks : Elnath - Bangalore



The above load pattern of Juniper Networks - Elnath building illustrates >85% of the overall power is utilized by the labs & Data Centre. However, the lab area is <15% of the overall building footprint.

Typically, 25% to 30% of the overall building energy consumed by the HVAC system to provide necessary cooling for both office and labs / DC. The above chart shows comparison between electricity consumed by labs, DC, cubicles, kitchen, common area etc and HVAC consumed by labs, DC & office area including kitchen exhaust

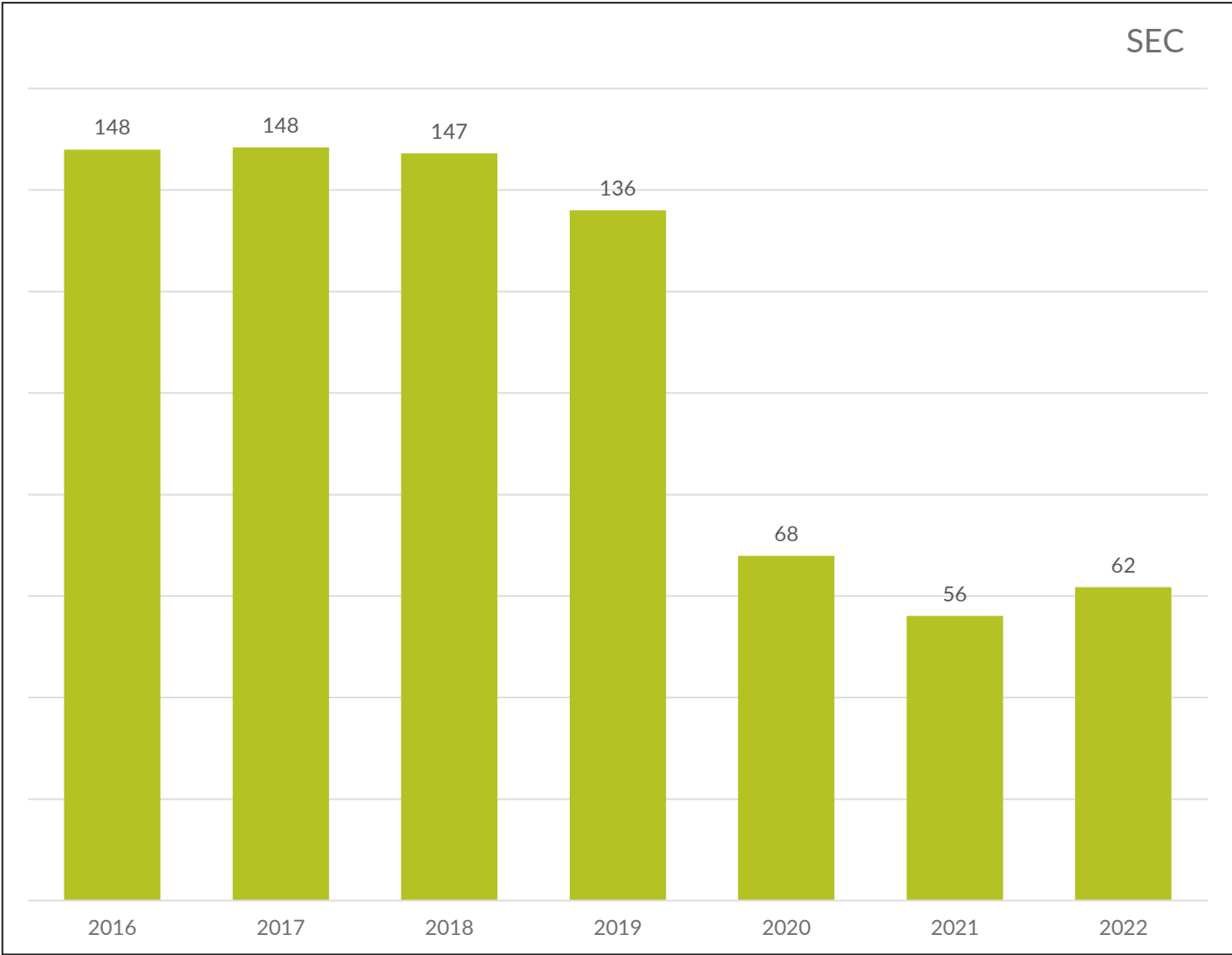
# Energy Consumption Trend : 2016-22



Year	Total KWH	Difference YoY	Variance %
2016	44579145		
2017	48799137	4219993	9.5%
2018	48887031	87894	0.2%
2019	49854410	967378	2.0%
2020	51860704	2006294	4.0%
2021	52921067	1060363	2.0%
2022	50843885	-2077182	-3.9%

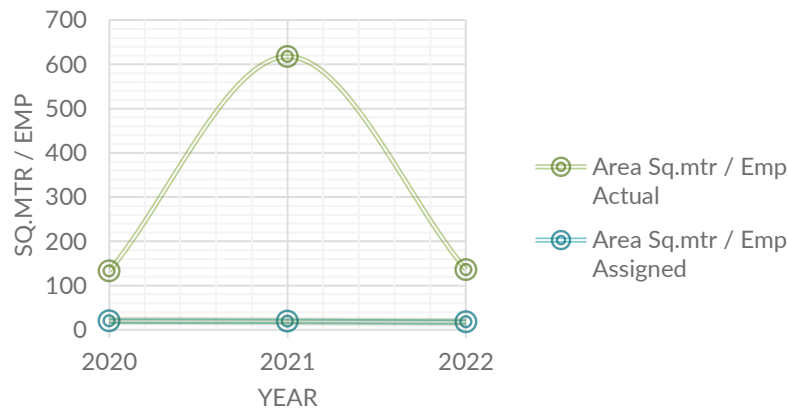
The power consumption at Juniper Networks is mainly derived from the labs & Data Centers. Around 85% of the overall power is supplied to these critical spaces (including HVAC). Hence the consumption is in upward trend even during pandemic though there was no office area utilization. There is an increase of around 10% consumption since inception of the building due to growth factors & ramping up of equipment's in the labs.

# Specific Energy Consumption (SEC) : 2016-22

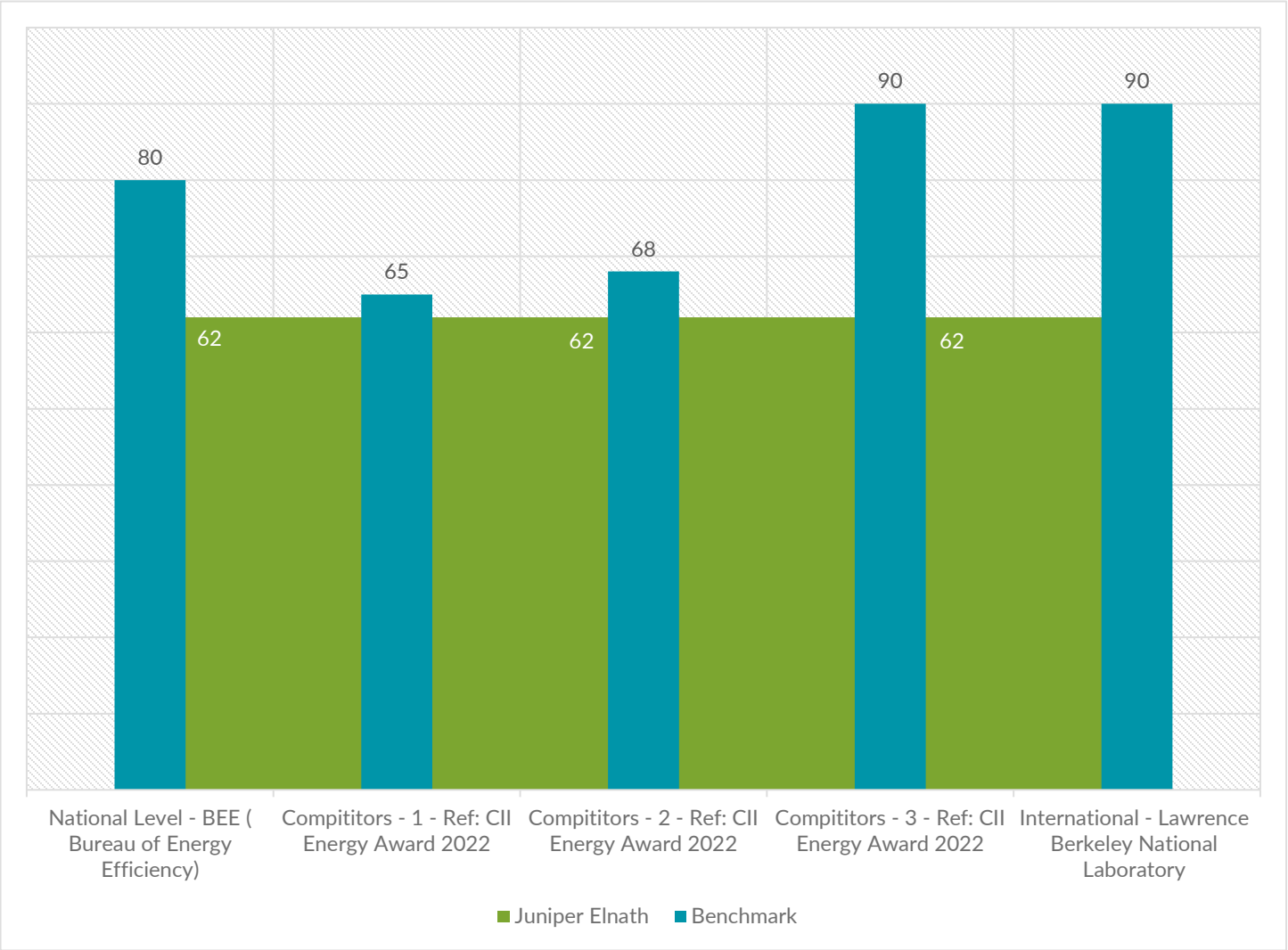


At Elnath building Labs & data center, there are 1100+ Racks of equipment's consuming ~85% of the overall building power consumption. The graph shows SEC **without Data Center & Lab racks** power consumption & covers only the workstation & common area.

- 1. The SEC reduced by 50% in 2020 due to pandemic & <10% occupancy (Except Jan & Feb 2020)
- 2. SEC further reduced by 18% in 2021 due to continued pandemic (2nd wave). Occupancy <10%
- 3. SEC increased by 11% in 2022 as the return to work started from July 2022 onwards. Occupancy <20%



# Benchmarking : SEC



62  
★★★★★

Office area SEC recorded for the year 2022 is 62 which is 5 Star gold rating as per BEE EPI index. The major driver for the reduction is pandemic & >80% of the employees worked from home.

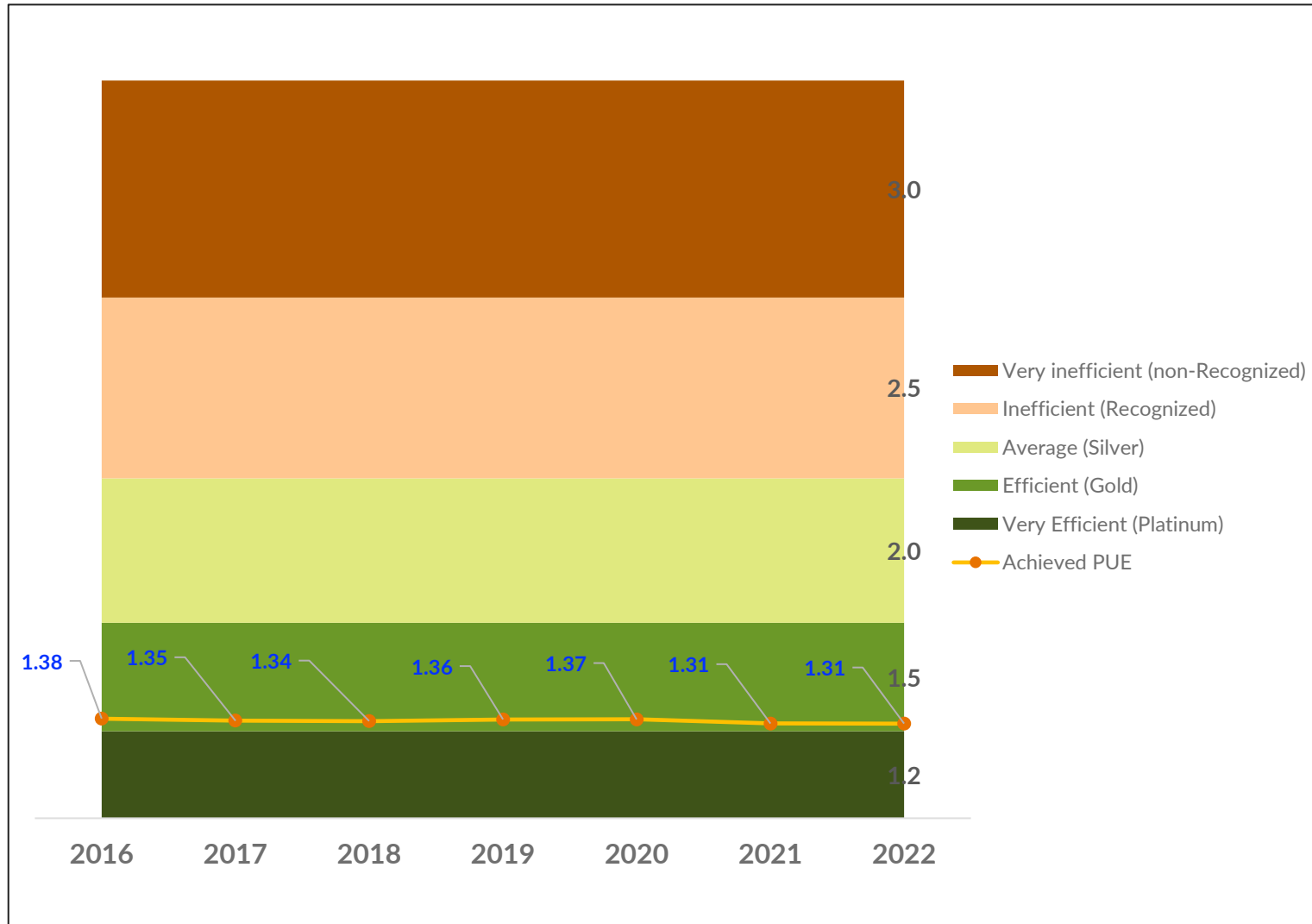
The present SEC for 2023 is measuring around 85 as on June 2023.

Working towards improving the SEC by implementation of below initiatives before 2024

- CFL to LED conversion
- EC Fans for AHU (Based on occupancy improvement)
- Day-light & occupancy sensors for glazing side cubicles



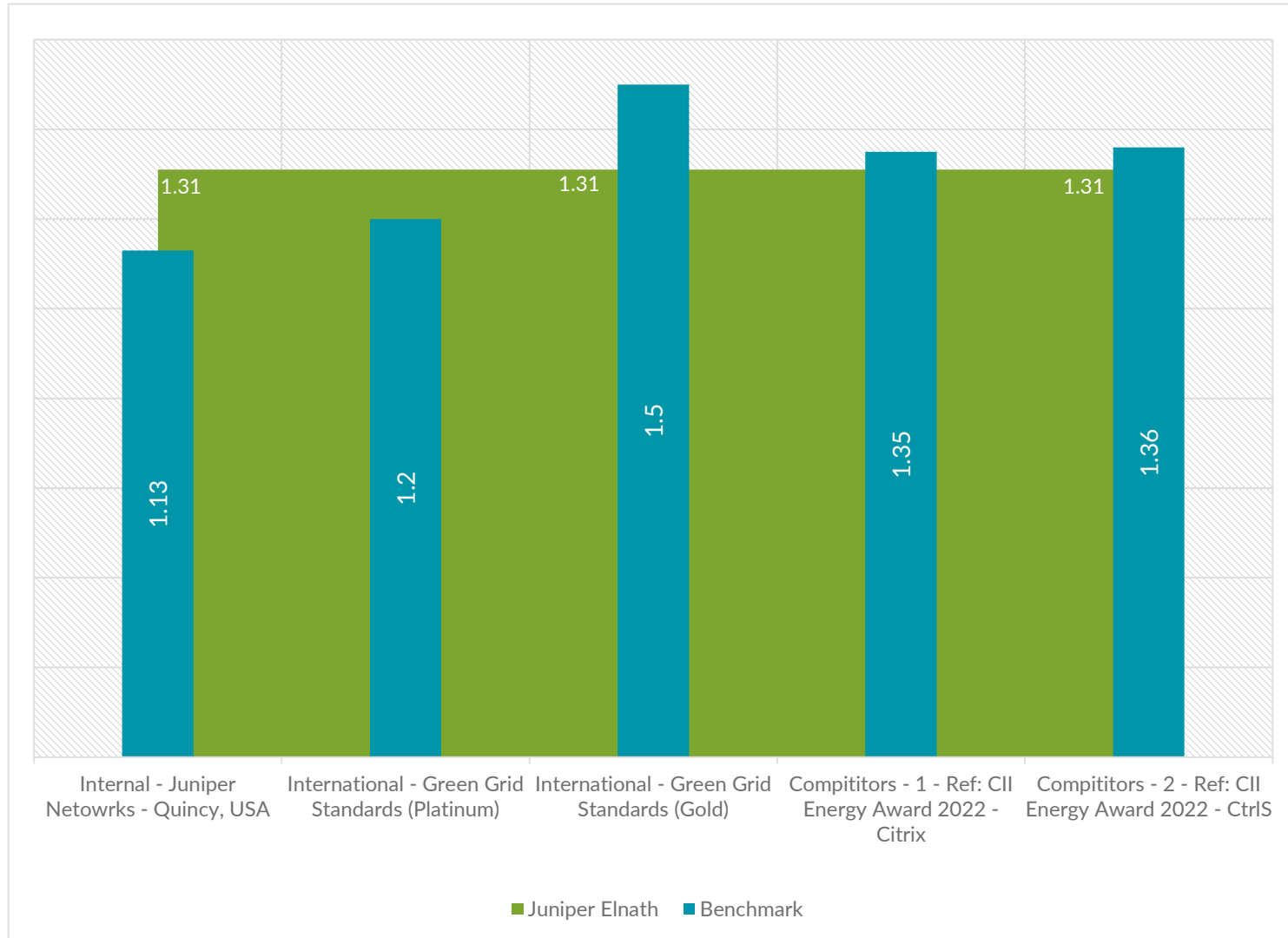
# Power Usage Efficiency (PUE) : 2016-22



The **PUE & DCiE** for labs & data Centre. The data from Energy meters are effectively measured and updated regularly:

Juniper Networks performing with **1.31 PUE** (~75% of DCiE) which is considered **Efficient** with **Gold category** in the industry as per **Green Grid Standards**

# Benchmarking : PUE



1.31

★★★★

Lab PUE recorded for the year 2022 is 1.31 which is Gold rating as per Green Grid Standards. The major driver for best-in-class PUE is:

- High temperature chiller design
- LED light fixtures
- Highly efficient IRC units

The PUE further improved by 3% during 2022 due to:

- Implementation of lab lighting automation
- Grouping of IRC units
- Lesser lab footprint due to pandemic

# Major EnCon Projects Planned – 2023/24

## Battery Optimization

- Optimization of DC Rectifier plant battery system by reducing the capacity & charging current requirement
- Total investment : 0 INR
- Anticipated Energy Savings per Year : 15,700 KWH
- Impact : Improved PUE, Space savings & Cost avoidance

## Lab Consolidation

- Consolidation of labs to highly efficient building
- Total investment : Capex project (part of building consolidation)
- Anticipated Energy Savings per Year : 14,31,000 KWH
- Impact : Improved PUE & efficiency of operations

## Lab Equipment Retire plan

- Retirement of 25% legacy lab equipment's during lab consolidation project
- Total investment : 0 INR
- Anticipated Energy Savings per Year : 10,22,000 KWH
- Impact : Improved PUE, rack space savings & cost avoidance

## Solar Water Optimization

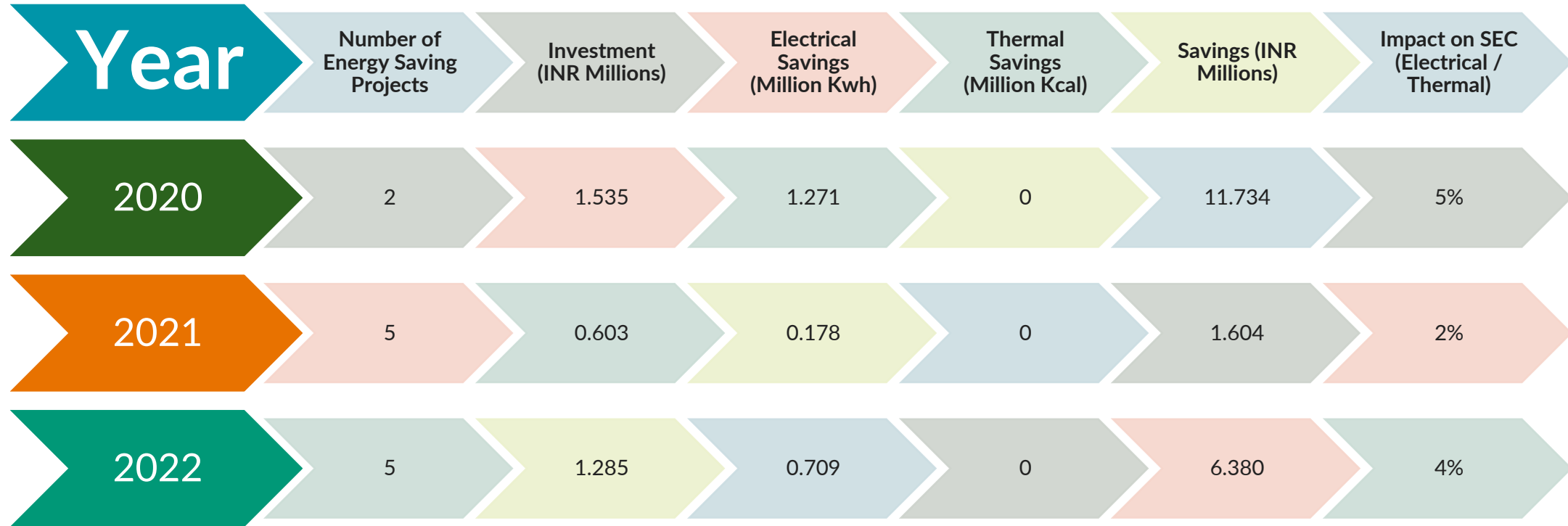
- Utilization of Solar water to the Café bain-marie units
- Total investment : 20,000 INR
- Anticipated Energy Savings per Year : 4050 KWH
- Impact : Improved SEC, Reduced heating coils inventory & cost avoidance

## CFL to LED

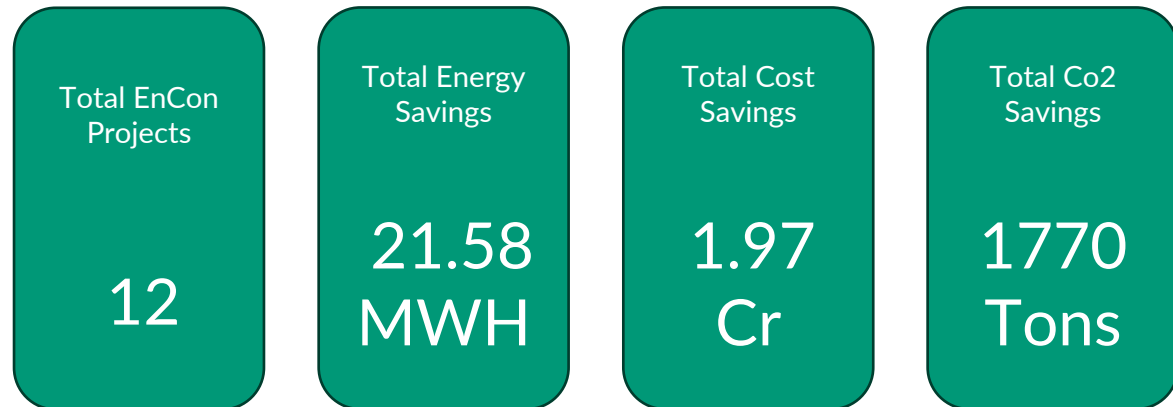
(Last mile conversion)

- Conversion of CFL to LED light fixtures inside M&E spaces – AHU, Electrical etc
- Total investment : 2,32,000 INR
- Anticipated Energy Savings per Year : 22,600 KWH
- Impact : Improved SEC & cost avoidance

# EnCon Project Summary – 2020/22



At Juniper Networks, we strongly believe in “**Energy Conserved is Energy Produced**” concept. Hence, we are taking all possible measures to conserve Energy which will help the company & the environment in the long run.. This is the Juniper Way of contributing towards a sustainable future





# Project 01 : Lab Lighting Automation

## Background:

- There are 656 x 28 W LED light fixtures installed inside the labs & Data Center
- The light fixtures operate 24x7, as the end-users never put efforts to turn them off
- Lighting consumption of these critical spaces are high & impacting the PUE.

## Solution:

- Introduction of lighting occupancy sensors for both hot & cold aisles

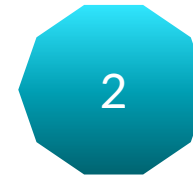
## Installation & Considerations:

- Mounting Height: Optimal placement for effective coverage.
- Sensor Calibration: Adjust sensitivity and delay settings for desired functionality.
- Avoid Obstructions: Ensure sensors have a clear line of sight to the monitored area
- User Comfort: Balancing between energy savings and ensuring occupants' comfort and safety



Load Reduction **>75%**

*Lab light operation has been reduced by 3/4<sup>th</sup> after implementation of occupancy sensors which helped to improve PUE*



Energy Savings **136 Mwh**

*Energy consumption reduced due to reduced operations of light fixtures per year*



Cost Avoidance **1.2 M INR**

*Achieved cost avoidance through electricity bills per year*



Carbon Savings **122 Tons**

*Achieved carbon footprint reduction per year*



Adoptability **High**

*The implementation of occupancy sensors inside DC is highly adoptable & recommended*

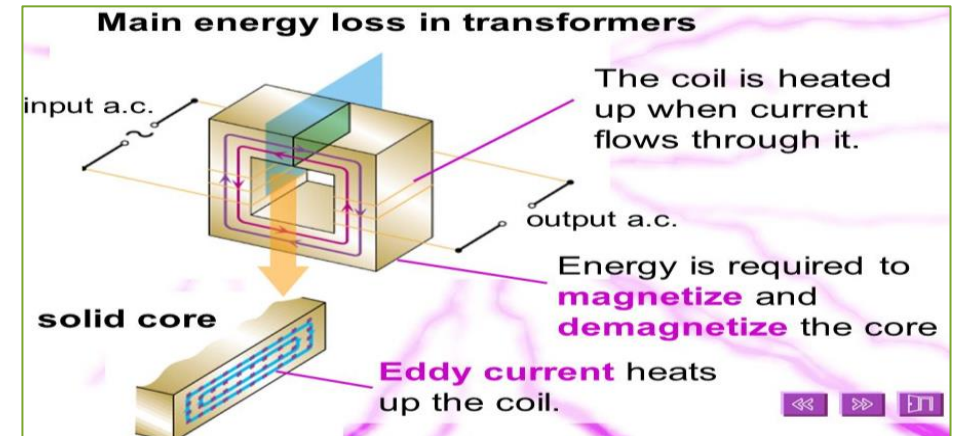
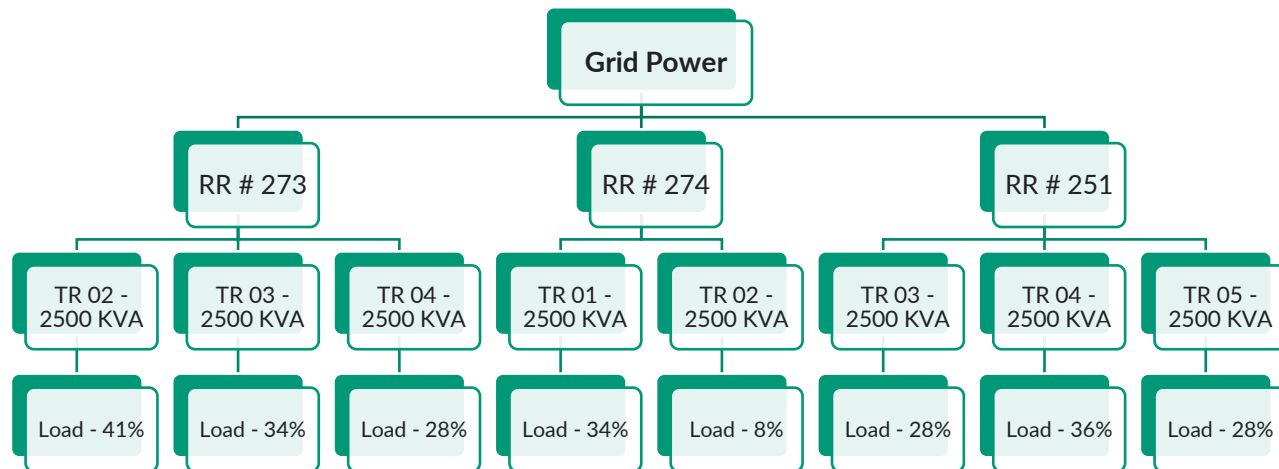
# Project 02 : Building Transformer Optimization

## Background:

- There are 8 HT/LT step-down Transformers feeding power to 3 towers of Elnath
- Transformers possess multiple losses while stepping down like copper & Iron loss
- Transformer efficiency defers based on load & most efficient between 35% to 75%

## Previous Set-up

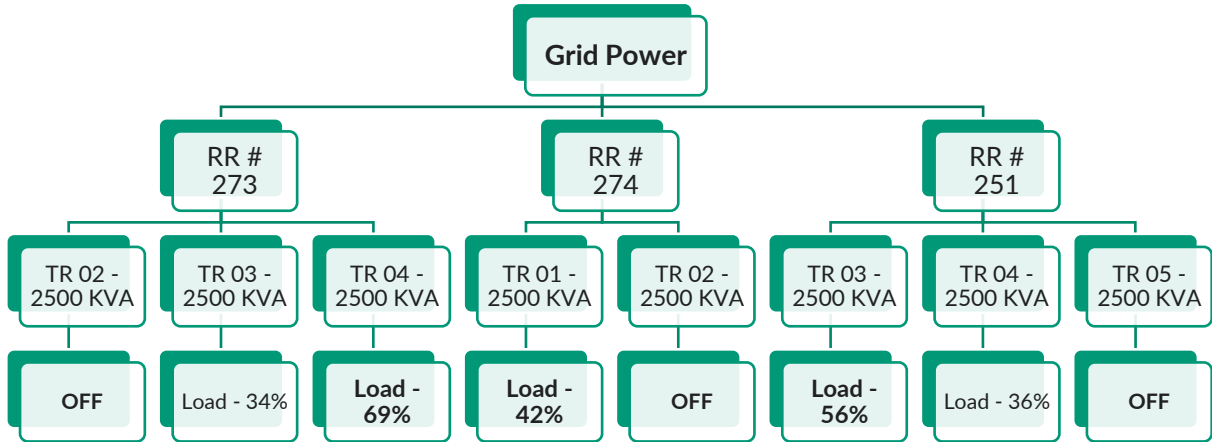
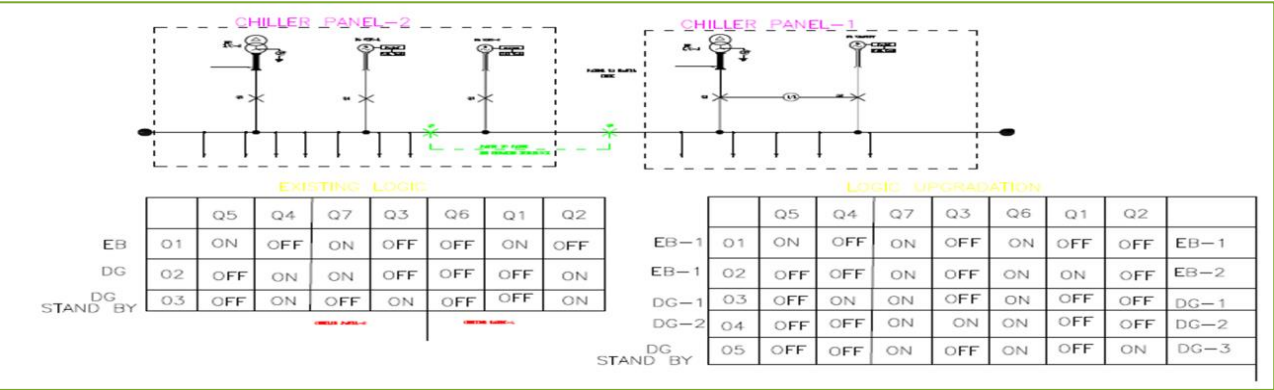
There are 8x2500 KVA transformers feeding grid power supply to these 3 towers at Elnath. These transformers are loaded not more than 40% since inception. Below is the schematic of existing set-up with load details:



# Project 02 : Building Transformer Optimization Continued...

## Proposed Solution:

The system need some minor modification on Program Logic Control system to enable load sharing between transformers. By changing logics in the controller, we shall power down 3x2500 KVA transformers without impacting business & redundancy in system. Revised logic & distribution will be as below:



Load Reduction **~1%**  
Around 1% of grid power consumption reduced through transformer loss prevention



Energy Savings **191 Mwh**  
Energy consumption reduced due to transformer optimization & loss prevention



Cost Avoidance **1.7 M INR**  
Achieved cost avoidance through electricity bills per year



Carbon Savings **157 Tons**  
Achieved carbon footprint reduction per year



Adoptability **Medium**  
The implementation of this initiative is depending on the load & adoptability is around 50%

# Project 03 : Emergency Lighting Automation

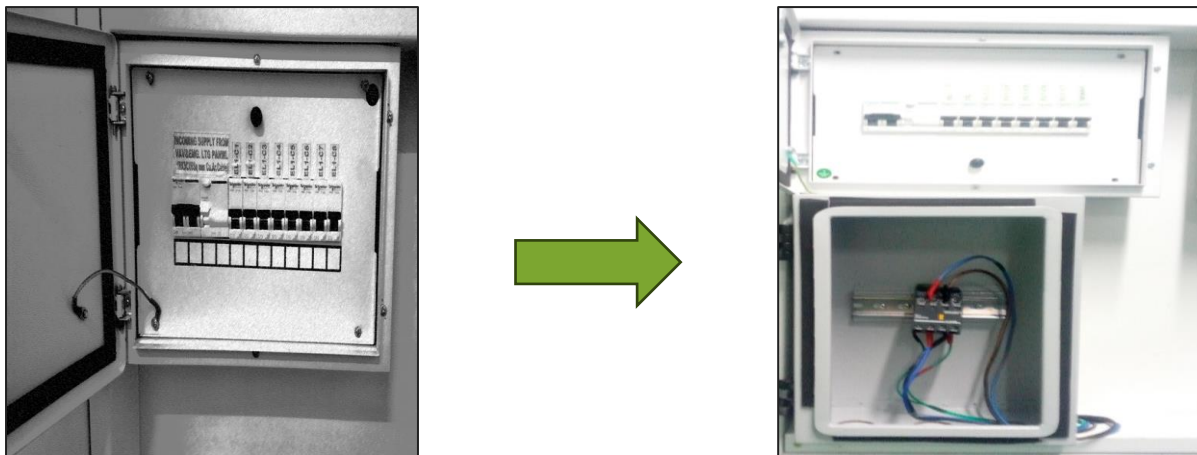
Kaizen Project

## Background:

Juniper Networks, Bangalore Elnath building has Emergency light fixtures in all floors which is connected to a dedicated UPS situated in 1st Floor A Wing UPS room. There are 7.5W, 15W, 28W LED fixtures in passage, WS & critical areas respectively and working 24X7X365 irrespective of building main lighting availability. This is needed only incase of main lighting failure. Hence this is an additional power consumed by the fixtures on regular basis which is impacting the SEC

## Solution:

- Implementation of programmable relay contactors in the distribution board
- Relay in NO condition while Grid or Generator power available
- Relay get's energized during power changeover, weekends & after office hours
- This will ensure both energy conservation, safety & building norms



1

Load Reduction **>75%**

Emergency light operation has been reduced by 3/4<sup>th</sup> after implementation of relay which helped to improve SEC

2

Energy Savings **51 Mwh**

Energy consumption reduced due to reduced operations of light fixtures per year

3

Cost Avoidance **470 K INR**

Achieved cost avoidance through electricity bills per year

4

Carbon Savings **42 Tons**

Achieved carbon footprint reduction per year

5

Adoptability **High**

The implementation of relay contactors for Emergency light fixtures is highly adoptable & recommended



# Kaizen Projects:

There are multiple projects done by the in-house Engineering team in-order to conserve energy, improve efficiency, reduce time & cost optimization. Out of the box thinking abilities developed on team through regular training & mentorship.

- Electrical room exhaust automation
  - Electrical rooms are equipped with exhaust system part of CEIG requirement
  - There are 54 fans used to operate 24x7
  - Implemented thermostat sensing based operation
  - 6,845 KWH reduction per year with an investment of 80 K INR (2 months ROI)
- IRC Dew pump rectification
  - IRC units used for lab & DC cooling
  - There are sensitive boards in the unit which failed due to a minor surge voltage
  - OEM recommended to replace the entire board with long lead time & high cost
  - In-house team took an initiative & rectified the issue by replacing a capacitor
  - This resulted in increased up-time & cost avoidance of ~ 2. M INR
- Water conservation
  - Utilization of dehumidifier water for chilled water make-up system
  - Water conserved per year 110 K ltrs with an investment of 100 K INR



# Renewable Energy:

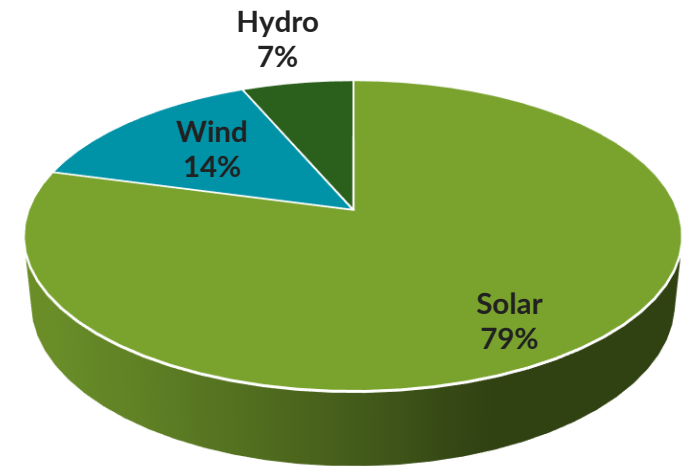
## On-site RE:

Juniper Bangalore offices doesn't have on-site solar or other RE generation capability due to lack of space. The buildings are leased & multi-tenant with very limited space on terrace and ground floor.

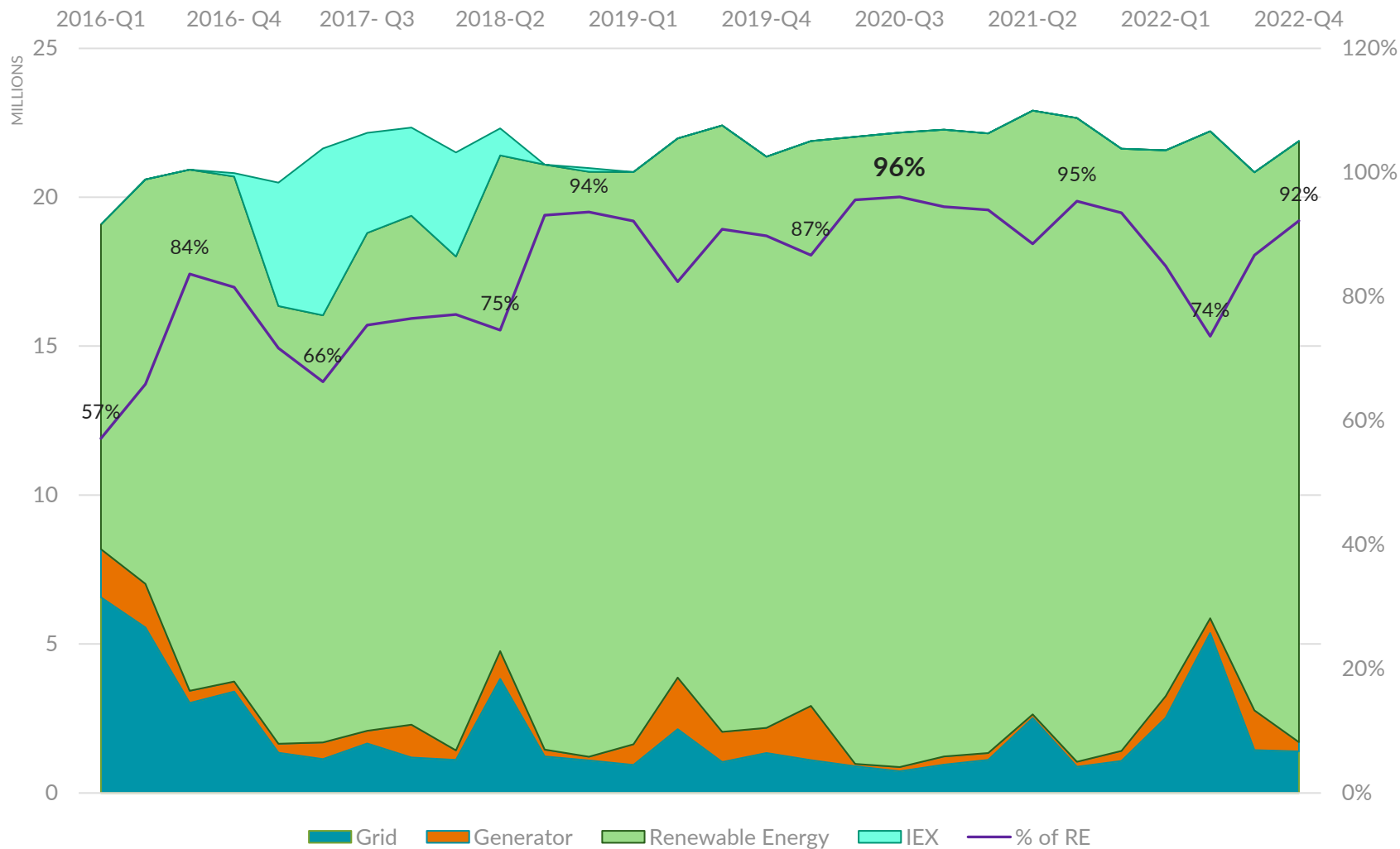
## Off-site RE:

Juniper has both PPA and Agreement based power purchase programs with Renewable Energy power generators for Bangalore offices. These PPA's are long term (5+5 years) and the Agreements are yearly.

Year	Source	Mode	Off-site installed capacity in MW	Contract Demand in MW	Consumption of RE (In Million units)	Share % w.r.t overall Energy consumption
2020	Solar	PPA	62.13	6.9	47.53	11
2020	Wind	Agreement	7.2	0.33	0.24	5
2020	Hydel	Agreement	24	0.07	0.05	1
2021	Solar	PPA	62.13	6.9	38.24	11
2021	Solar	Agreement	9	0.42	0.3	5
2021	Wind	Agreement	26.75	2.92	2.1	11
2021	Hydel	Agreement	24.75	2.18	7.86	8
2022	Solar	PPA	62.13	6.9	29.19	11
2022	Solar	Agreement	9	0.9	0.65	3
2022	Wind	Agreement	32.3	3.7	8.15	12
2022	Hydel	Agreement	48.75	1.29	2.78	3



# Renewable Energy Trend : 2016-22



90%

Average power procurement through renewable sources for last 5+ years by

\$ 22 M

Around 154 Cr Cost avoidance for last 5 years through Renewable Energy power procurement program

# Renewable Energy : Group Captive Project



Located in the Chitradurga district of Karnataka, the installation consists of 26,628 solar modules and incorporates cutting-edge technologies to optimize performance

The clean energy resulting from the solar power plant contributes to the greening of Karnataka's electricity grid. By investing in a solar farm location close to Juniper's second-largest office and labs presence, the company is demonstrating its commitment to making renewable energy a mainstream source of power in the region.

This significant milestone enables the production of new, utility-scale renewable energy, in line with Juniper's carbon-neutral strategy. Additionally, for those interested, the inauguration event can be experienced by clicking on the provided video link, offering a glimpse into this significant milestone. By adopting a Group Captive model, in which Juniper invested 26% equity in the power plant, secures exclusive power consumption rights and a competitive supply of renewable energy units for the next 10-15 years.



Going live **Apr 2023**



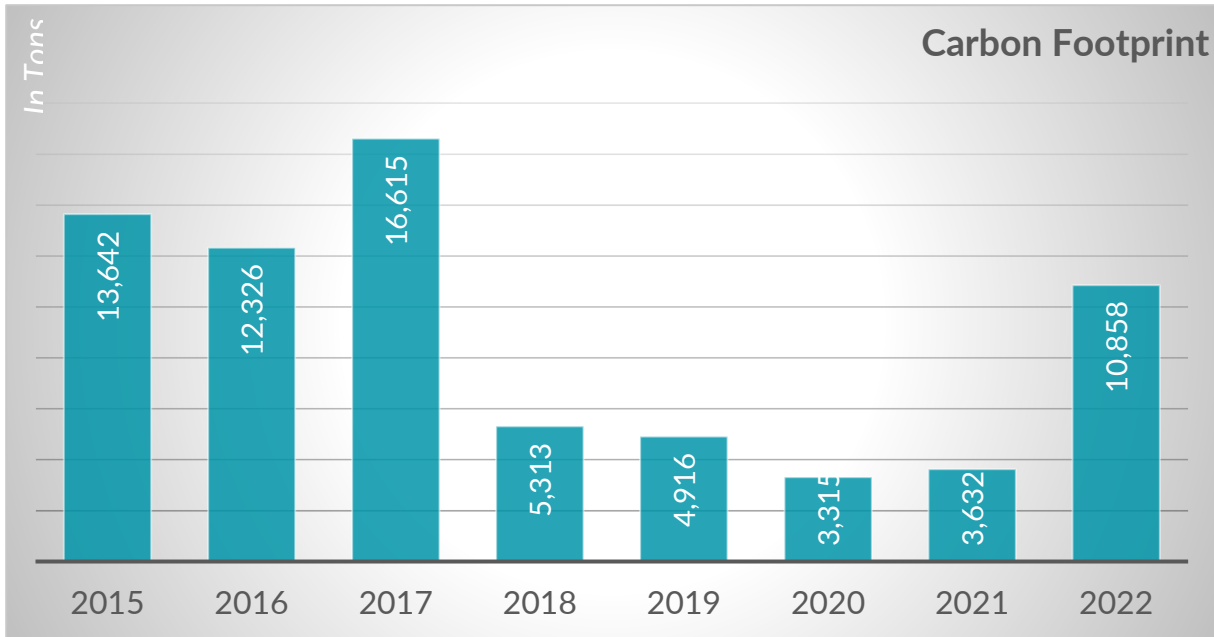
Capacity **11.5 MW**



Expected KWH / Month **2 M**



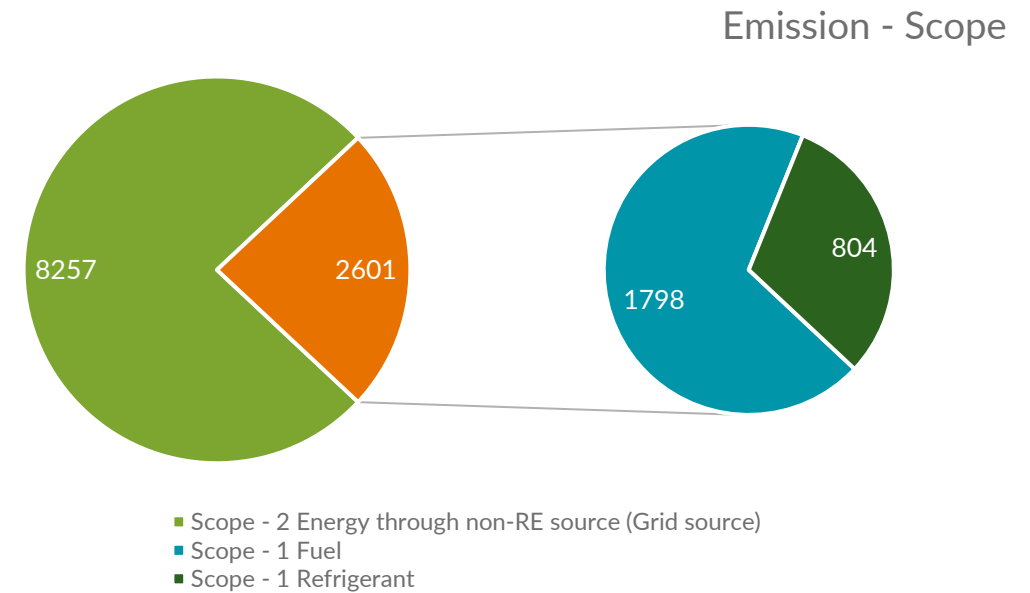
# GHG Emissions:



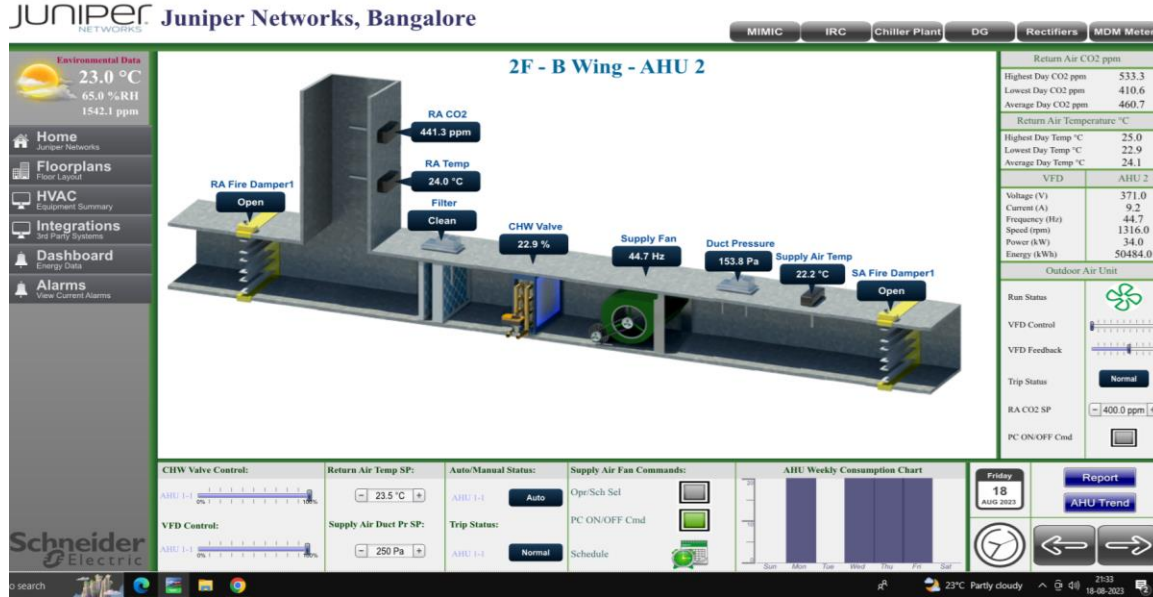
- Procuring energy through renewable sources helped in carbon footprint reduction from 2018 onwards
- However, emission increased in 2022 due to:
  - Reduced RE procurement
  - Generator operation during flood impact

## Improvisation Target:

- **Short Term Plan:** Energy conservation projects initiated to reduce CO2 emission.
- **Long Term plan:** Group captive power project kick-started from 2023

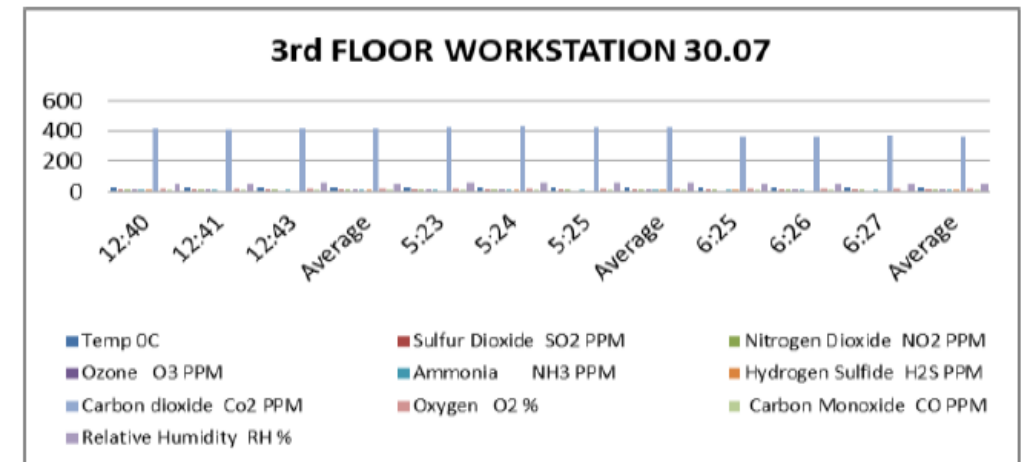


# Indoor Air Quality:



- All Indoor parameters are within the ASHRAE limit
- MERV-13 Air filters installed for all AHUs to improve air quality
- Indoor air quality monitored through BMS on regular basis
- Automated fresh air dampers integrated with the BMS to operate based on CO2 presence in each zone
- Real time fresh air intake through automated BMS system across the building
- Automated work order system to notify cleaning of AHU filters on a periodical basis
- Implemented Oxygen monitoring sensor for Electrical rooms to ensure IAQ during gas-based suppression system activation

3rd FLOOR WORKSTATION 30.07										
No of persons -02					Suspended Particulate Matter (SPM)					
					Mass Concentration Total					
TVOC Concentration in ppm -0.09					PM:2.5		27 µg/m3			
					PM:10		33 µg/m3			
Formaldehyde in ppm (CH2O) -0.10										
Time	Temp	Sulfur Dioxide	Nitrogen Dioxide	Ozone	Ammonia	Hydrogen Sulfide	Carbon dioxide	Oxygen	Carbon Monoxide	Relative Humidity
	°C	SO <sub>2</sub>	NO <sub>2</sub>	O <sub>3</sub>	NH <sub>3</sub>	H <sub>2</sub> S	Co <sub>2</sub>	O <sub>2</sub>	CO	RH
		PPM	PPM	PPM	PPM	PPM	PPM	%	PPM	%
12:40	24.2	0.3	0.55	0.02	0.4	1	416	20.9	0.6	53.6
12:41	24.2	0.4	0.56	0.01	0.4	0	411	20.9	0.7	54.2
12:43	24.3	0.4	0.55	0.00	0.4	0	415	20.8	0.6	54.8
Average	24.2	0.4	0.55	0.01	0.4	0.3	414.0	20.9	0.6	54.2
5:23	24.3	0.4	0.61	0.01	0.4	0	428	20.8	0.5	55.7
5:24	24.1	0.4	0.58	0.01	0.3	1	429	20.8	0.6	55.8
5:25	24.2	0.4	0.06	0.00	0.4	0	426	20.8	0.3	57.9
Average	24.2	0.4	0.45	0.01	0.4	0.3	427.7	20.8	0.5	56.5
6:25	24.3	0.4	0.04	0.00	0.2	1	362	20.7	0.1	53.5
6:26	24.1	0.3	0.05	0.01	0.1	0	365	20.6	0.1	52.2
6:27	24.2	0.4	0.08	0.00	0.1	0	369	20.9	0.0	52.3
Average	24.2	0.4	0.06	0.00	0.1	0.3	365.3	20.7	0.1	52.7

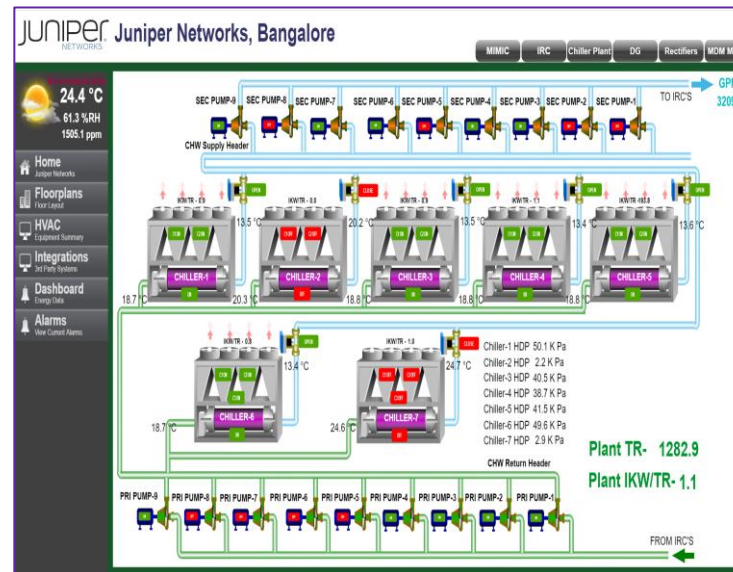
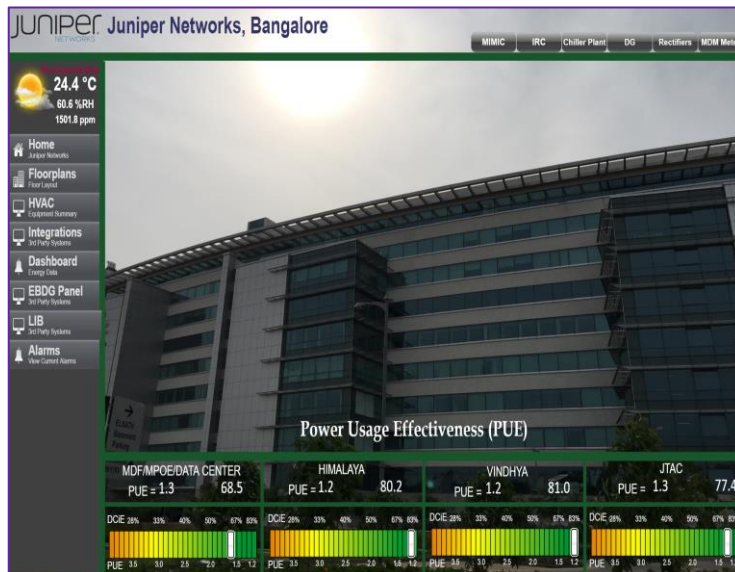
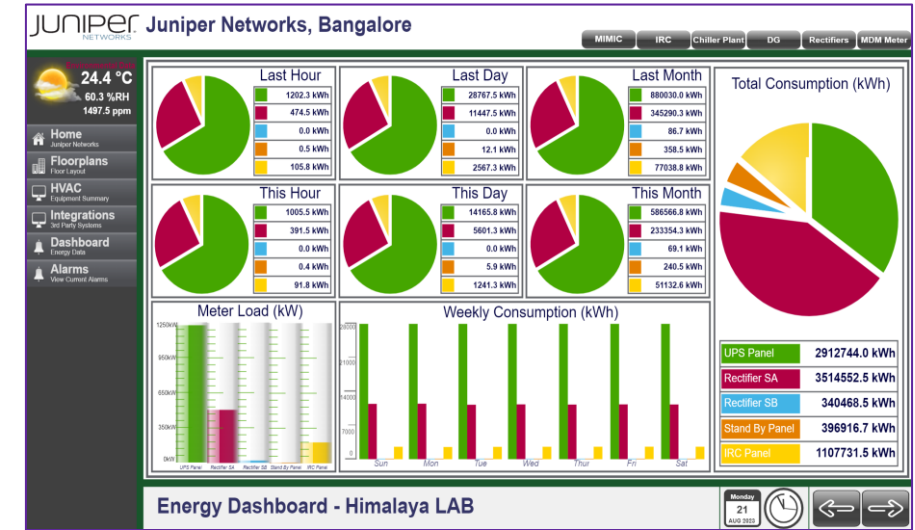


# Monitoring & Engagement:

- Electrical panels are monitored with Energy meters hooked into central BMS through Network ports which pulls the reading every 5 mins interval
- 142 Energy meters integrated to the BMS

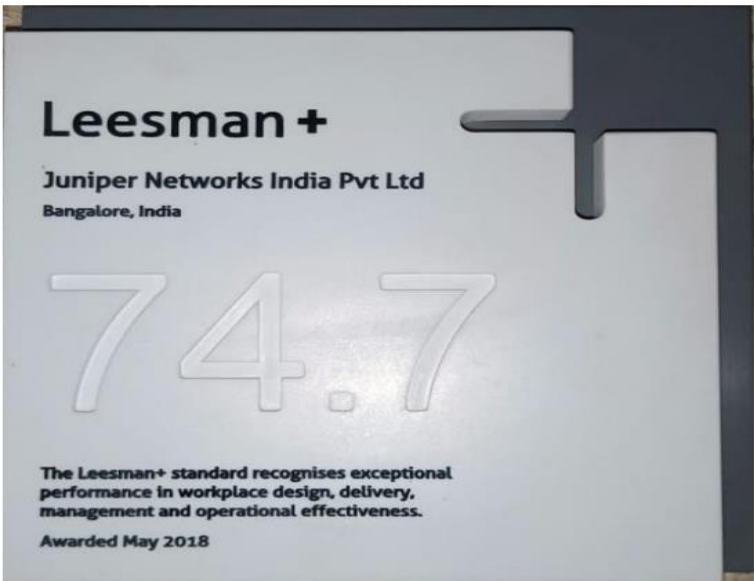
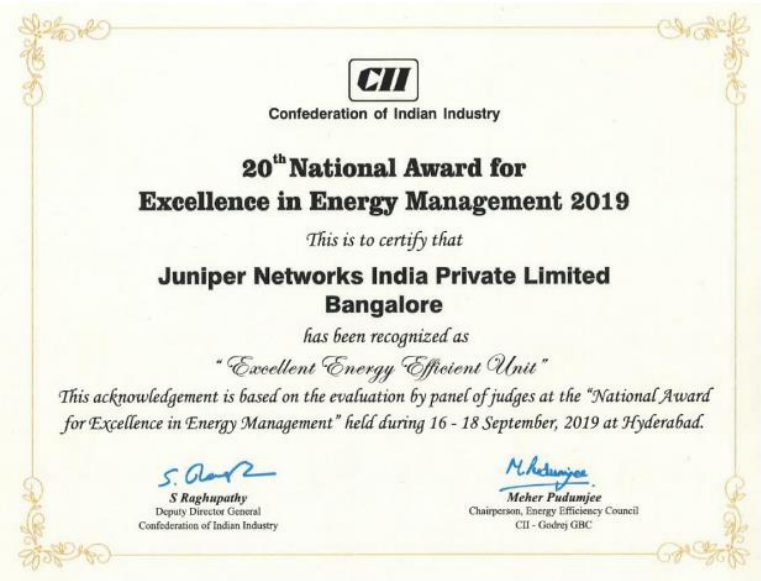
As part of employee engagement program, display units are installed outside the Lab & Data center, which provide an overview of the Power consumption of that area (DC/Lab)

- This displays the KWH readings like “Last hour, Last Day & Last Month” v/s Present hour, Present Day & Present Month”.
- This helps end users (IT Team) to understand Energy consumption pattern in lab / data centers which enables to reduce power consumption





# Awards & Certifications:





# Employee Engagement - CSR:



Tree Plantation drive with a motive to plant 10,000 trees



Blood donation camps



Juniper Mela to support SWM effort in a local village



Support 25 underprivileged girl students for JEE & NEET



Livelihood & skill development of local village people



Disaster support





# THANK YOU

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