



**QUALITY360**

**AUDIT & ADVISORY**

(Registration No:- UDYAM-MH-33-0728710)

# Energy Audit Report

**For the year 2023-24 to 2024-25**

**As per ISO 50001:2018**

**Shri Vile Parle Kelavani Mandal's  
Pravin Gandhi College of Law, Mumbai,  
Maharashtra**

**Audit conducted by  
Quality 360 Audit and Advisory**

**Lead Auditor - Dr. Amelia Antony**

**Certification Number - TVEEN04C16769**

**Date of visit - 15/11/2025**

# ENERGY AUDIT REPORT

As per ISO 50001:2018

## 1. Introduction

### 1.1 Purpose of the Audit

This energy audit was conducted to analyze the energy consumption patterns of **Shri Vile Parle Kelavani Mandal's Pravin Gandhi College of Law, Mumbai**, identify inefficiencies, and recommend energy-saving measures in line with **ISO 50001:2018 Energy Management System**.

### 1.2 Scope of the Audit

The audit covered:

- **Buildings:** Academic block, library, administration block, and canteen.
- **Energy Systems:** Lighting, HVAC (heating, ventilation, and air conditioning), IT infrastructure, laboratory equipment, and renewable energy installations.
- **Data Collection:** Utility bills, onsite inspections, and interviews with facility managers.

### 1.3 Methodology

- **Data Collection:** Energy bills (past 12 months), equipment load analysis, and power monitoring.
- **Site Inspection:** Physical assessment of energy-consuming appliances and systems.
- **Energy Analysis:** Calculation of energy use patterns, inefficiencies, and benchmarking against best practices.
- **Recommendations:** Energy-saving measures, payback analysis, and implementation strategies.

## 2. College Energy Profile –

Parameter	Details
<b>Total campus area</b>	20000 sq. Ft. Approx.
<b>Number of buildings with title name</b>	1, Mithibai College
<b>Total students &amp; staff</b>	B.A.LL. B: 602 LL.M.: 36 PGD Cyber Law: 24  <b>Total students= 662</b>  Teaching Faculty-13 Non-Teaching Staff-13 Peons –6 <b>Total Staff = 32</b>
<b>Energy sources</b>	Solar, Grid

### 2.1 Major Energy Consumers

Lighting: Number of LED & CFL fixtures.	<b>268</b>
<b>HVAC</b> (heating, ventilation, and air conditioning): Number of air conditioners, exhaust fans	<b>58 fans</b> <b>43 AC</b> <b>4 exhaust fans</b>
<b>IT Equipment:</b> Number of computers, printers and servers	<b>Computers 66, Printers 7 and server 1</b>
<b>Laboratory Equipment:</b> Number of Autoclaves, centrifuges, and refrigerators	<b>NA</b>
<b>Canteen Equipment:</b> Number of Electric ovens, refrigerators, water heater	<b>Electric Oven- 2</b> <b>Refrigerator-1</b> <b>Water Heater-0</b>

### 3. Energy Consumption Analysis

#### 3.1 Baseline Energy Consumption

Energy Source	Annual Consumption (kWh)	Cost (INR)	Percentage Share
Grid Electricity	32,23,137 kWh/year	41,557,423.35/Year	99 %
Diesel Generator	-	-	-
Solar Power	14826	1,91,110/ Year	1%
<b>Total</b>	<b>32,37,963</b>	<b>4,17,48,533</b>	<b>100%</b>

**Peak demand** - The estimated peak demand of the institution is approximately **1,254 kVA**

**Load factor** - The annual load factor of the institution is calculated as **29.6%**

### 4. Energy Performance Indicators (EnPIs)

Parameter	Value	Benchmark (Best Practice)
Energy use per student	4,891.18 kWh/student/year	≤120 kWh/student/year
Energy use per building area	161.90 kWh/sq. ft./year	≤6 kWh/sq. ft./year
HVAC efficiency	2.8 COP	≥3.5 COP

### 5. Identification of Energy Wastage & Inefficiencies

Area	Issue Identified	Impact
Lighting	CFLs & inefficient placement	10% higher consumption
HVAC	Old ACs, poor maintenance	15% energy wastage
Computers	No auto-shutdown policy	5% unnecessary energy use
Labs	Equipment left on unnecessarily	8% energy loss

## 6. Renewable Energy & Energy Efficiency Measures

Sr. No.	Area / System	Existing Measure / Initiative	Status	Observations / Impact
1	Renewable Energy	Rooftop Solar PV system installed	Implemented	Annual solar generation of approximately 14,826 kWh contributing about 1% of total energy consumption
2	Net Metering	Net metering system implemented	Implemented	Supports renewable energy utilization and grid interaction
3	Lighting System	LED lighting fixtures installed in classrooms and offices	Implemented	Reduced lighting energy consumption compared to conventional lighting
4	Lighting Controls	Occupancy / motion sensors installed	Implemented	Helps minimize unnecessary lighting operation in unoccupied areas
5	Natural Lighting	Effective utilization of natural daylight	Implemented	Reduces daytime artificial lighting demand
6	HVAC System	Star-rated / inverter AC systems installed	Implemented	Improves cooling efficiency and reduces electricity consumption
7	HVAC Operation	AC thermostats maintained at 24°C or above	Implemented	Supports energy-efficient cooling practices
8	HVAC Maintenance	Periodic servicing of air-conditioning systems	Implemented	Enhances HVAC efficiency and operational reliability
9	Electrical System	Power factor correction equipment (APFC) available	Implemented	Helps maintain high power factor and reduces electrical losses
10	Motors & Pumps	Energy-efficient pumps and motors installed	Implemented	Contributes to lower electrical energy consumption
11	IT Infrastructure	Computers configured with auto power-off / sleep mode	Implemented	Minimizes standby power consumption
12	Server Room	Temperature-controlled server room maintained	Implemented	Improves equipment efficiency and operational stability
13	Water Management	Rainwater harvesting system available	Implemented	Supports sustainability and resource conservation
14	Green Building Practices	Green building measures adopted	Implemented	Enhances overall environmental and energy performance

Sr. No.	Area / System	Existing Measure / Initiative	Status	Observations / Impact
15	Awareness Programs	Energy-saving awareness boards displayed on campus	Implemented	Promotes energy conservation behavior among students and staff
16	Energy Management	Energy performance records maintained through monthly electricity bills	Implemented	Facilitates monitoring and analysis of energy consumption trends
17	Energy Audit Practices	Periodic energy audits conducted	Implemented	Enables identification of inefficiencies and improvement opportunities
18	Load Management	Peak load management practices limited	Improvement Required	Opportunity exists for demand-side management and scheduling optimization
19	Energy-Efficient Fans	BLDC / low-wattage fans not installed	Improvement Required	Potential area for future energy savings
20	Energy Monitoring	Advanced real-time energy monitoring system not available	Improvement Required	Installation of EMS/BMS can improve tracking and optimization

## 7. Recommendations & Action Plan

Sr. No.	Area / System	Recommendation	Proposed Action Plan	Expected Benefit	Priority	Target Timeline
1	Lighting System	Replace remaining CFL fixtures with LED lights	Complete campus-wide LED retrofitting program	15–20% reduction in lighting energy consumption	High	3–6 Months
2	Lighting Controls	Increase installation of occupancy/motion sensors	Install sensors in classrooms, corridors, washrooms, and offices	Reduction in unnecessary lighting operation	Medium	6 Months
3	HVAC System	Upgrade old air conditioners to high-efficiency inverter ACs	Replace low-efficiency AC units with 5-star/inverter models	20–30% HVAC energy savings	High	6–12 Months
4	HVAC Maintenance	Improve preventive maintenance practices	Schedule quarterly servicing and filter cleaning	Improved cooling efficiency and reduced energy wastage	High	Continuous

Sr. No.	Area / System	Recommendation	Proposed Action Plan	Expected Benefit	Priority	Target Timeline
5	HVAC Optimization	Maintain thermostat settings at optimum levels	Standardize AC temperature setting at 24°C–26°C	Reduced electricity consumption	Medium	Immediate
6	Ventilation System	Introduce BLDC energy-efficient fans	Replace conventional ceiling fans with BLDC models	50–60% fan energy savings	Medium	6–12 Months
7	Energy Monitoring	Install advanced Energy Monitoring System (EMS)	Implement digital sub-metering and real-time monitoring	Better tracking of consumption and energy losses	High	6 Months
8	Electrical Distribution	Improve load management practices	Shift non-critical loads during peak demand periods	Reduction in peak demand charges	Medium	3–6 Months
9	Renewable Energy	Expand rooftop solar PV capacity	Conduct feasibility study for additional solar installation	Increased renewable energy contribution and reduced grid dependence	High	12 Months
10	Power Quality	Maintain high power factor through APFC optimization	Regular inspection and calibration of APFC panels	Reduced transmission losses and penalties	Medium	Continuous
11	IT Equipment	Strengthen energy-saving settings for computers	Enable auto shutdown and sleep mode policies campus-wide	Reduction in standby power consumption	Medium	Immediate
12	Awareness & Training	Conduct regular energy conservation awareness programs	Organize workshops and awareness campaigns for students and staff	Improved energy-saving behavior	Medium	Quarterly
13	Building Infrastructure	Improve insulation and reduce cooling losses	Seal air leakage points and improve window shading	Reduced HVAC load	Medium	6–12 Months
14	Energy Audits	Conduct periodic internal energy audits	Annual review of energy performance indicators and systems	Continuous improvement in energy efficiency	High	Annually

<b>Sr. No.</b>	<b>Area / System</b>	<b>Recommendation</b>	<b>Proposed Action Plan</b>	<b>Expected Benefit</b>	<b>Priority</b>	<b>Target Timeline</b>
15	Documentation & Records	Strengthen ISO 50001 documentation practices	Maintain updated energy records, action tracking, and compliance reports	Improved energy management system compliance	Medium	Continuous
16	Water & Sustainability	Enhance rainwater harvesting and green initiatives	Integrate sustainability measures with energy conservation planning	Environmental and operational benefits	Low	12 Months
17	Equipment Management	Avoid idle operation of electrical equipment	Implement shutdown procedures after working hours	Reduction in unnecessary energy consumption	High	Immediate
18	Peak Demand Reduction	Implement demand-side management strategies	Schedule heavy loads during non-peak hours	Improved load factor and reduced maximum demand	Medium	6 Months
19	Benchmarking	Compare energy performance with peer institutions	Establish annual benchmarking and performance review process	Identification of improvement opportunities	Low	Annually
20	Continuous Improvement	Establish Energy Management Committee	Assign responsibilities for monitoring and implementation	Sustained ISO 50001 energy performance improvement	High	Immediate

## 8. Implementation & Monitoring Plan

- **Implementation Plan**

The institution shall implement an Energy Management System (EnMS) focused on improving energy efficiency, reducing energy wastage, and enhancing sustainability across campus operations. The implementation process shall be carried out in a phased and systematic manner under the supervision of the management, maintenance team, and Energy Management Committee.

The first phase shall focus on energy-efficient lighting improvements by replacing remaining CFL and inefficient fixtures with LED lighting systems throughout classrooms, offices, corridors, and common areas. Occupancy and motion sensors shall be installed in selected locations to reduce unnecessary lighting operation during non-occupancy periods.

The institution shall implement HVAC optimization measures through regular preventive maintenance, servicing of air-conditioning systems, cleaning of filters, and monitoring of operational performance. Existing old air-conditioning units shall gradually be replaced with energy-efficient inverter or star-rated systems. Thermostat settings shall be standardized at 24°C–26°C to minimize excessive cooling loads.

Energy-efficient BLDC fans shall be introduced in a phased manner to replace conventional ceiling fans. Electrical infrastructure including APFC panels and distribution systems shall be maintained to ensure high power factor and minimize electrical losses.

The institution shall strengthen renewable energy utilization by maintaining and optimizing the existing rooftop solar PV system and exploring opportunities for future expansion of solar capacity. Net metering practices shall continue to support renewable energy integration with the grid.

Implementation of energy-saving practices within IT infrastructure shall include activation of auto-sleep and automatic shutdown settings for computers, printers, and related equipment. Temperature-controlled operation of the server room shall continue to ensure efficient equipment performance.

Awareness programs, workshops, and training sessions on energy conservation shall be conducted periodically for students, faculty, and staff to encourage responsible energy usage practices. Energy-saving signage and awareness boards shall continue to be displayed across the campus.

The institution shall also implement operational controls to ensure that lights, HVAC systems, and electrical equipment are switched off after working hours and during non-operational periods. Internal energy audits and management reviews shall be conducted periodically to

identify additional opportunities for improvement and ensure continual enhancement of energy performance.

- **Monitoring Plan**

The institution shall establish a structured monitoring mechanism to evaluate the effectiveness of implemented energy conservation measures and ensure continual improvement in energy performance.

Monthly electricity bills and solar energy generation records shall be reviewed regularly to analyze energy consumption trends, peak demand patterns, and overall energy performance. Energy consumption data shall be compared with baseline values and established Energy Performance Indicators (EnPIs) to identify deviations and opportunities for improvement.

Periodic inspections shall be carried out to verify the operational status and effectiveness of LED lighting systems, occupancy sensors, HVAC systems, and other energy-efficient equipment installed on campus. Maintenance logs shall be maintained for HVAC servicing, electrical equipment inspection, and preventive maintenance activities.

Power factor readings and maximum demand values shall be monitored regularly to ensure efficient operation of the electrical system and APFC equipment. Any abnormalities in power quality or energy consumption shall be investigated and corrective actions shall be implemented promptly.

The performance of the rooftop solar PV system shall be monitored through generation records and periodic technical inspections to ensure optimum renewable energy utilization. Opportunities for improving solar system efficiency and expansion shall also be reviewed periodically.

The IT department shall monitor implementation of computer power management settings including auto-sleep and shutdown features to reduce standby power consumption. Compliance with shutdown procedures for lights, HVAC systems, and office equipment after working hours shall also be checked through routine inspections.

Energy awareness and training activities shall be monitored through attendance records, feedback collection, and periodic evaluation of staff and student participation. The effectiveness of awareness initiatives shall be assessed based on observed behavioral improvements and reduction in energy wastage practices.

Internal energy audits shall be conducted annually to review the performance of the Energy Management System and verify compliance with ISO 50001:2018 requirements. Audit findings, corrective actions, and preventive actions shall be documented and reviewed by the Energy Management Committee and top management.

All monitoring records including utility bills, maintenance reports, audit findings, inspection records, and energy performance data shall be maintained systematically as documented information under the Energy Management System to support continual improvement and regulatory compliance.

## 9. Conclusion & Summary

- **Conclusion**

The energy audit conducted for SVKM's Pravin Gandhi College of Law has provided a comprehensive assessment of the institution's energy consumption patterns, operational practices, and existing energy management initiatives in accordance with ISO 50001:2018 requirements.

The audit identified that the institution primarily depends on grid electricity, with a limited contribution from rooftop solar energy systems. The total annual energy consumption was recorded at approximately 32,37,963 kWh/year, with grid electricity accounting for nearly 99% of the total energy demand. The estimated peak demand of the institution was observed to be approximately 1,254 kVA, while the annual load factor was calculated at around 29.6%.

The major energy-consuming systems within the campus include HVAC systems, lighting infrastructure, IT equipment, and associated electrical systems. Several positive energy conservation initiatives have already been implemented by the institution, including installation of LED lighting, inverter-based air-conditioning systems, occupancy sensors, rooftop solar PV systems, power factor correction systems, and energy-saving operational practices.

Despite the implementation of these measures, the audit revealed opportunities for further improvement in energy efficiency and energy management. High energy use per student and energy use per building area compared to benchmark values indicate the need for optimization of HVAC systems, strengthening of energy monitoring practices, enhancement of renewable energy contribution, and improved operational controls.

The recommendations provided in the audit focus on reducing energy wastage, improving equipment efficiency, increasing renewable energy utilization, implementing advanced monitoring systems, and promoting awareness among students and staff. Implementation of these measures is expected to improve overall energy performance, reduce operational costs, and support environmental sustainability objectives.

The institution has demonstrated commitment toward energy conservation and sustainable campus management. Continued implementation of the recommended actions, periodic

monitoring, internal audits, and management reviews will support continual improvement of the Energy Management System and alignment with ISO 50001:2018 requirements.

- **Summary**

The energy audit of Pravin Gandhi College of Law was conducted to evaluate energy consumption patterns, identify inefficiencies, and recommend energy conservation measures in accordance with ISO 50001:2018 Energy Management System requirements.

The institution has a campus area of approximately 20,000 sq.ft. and serves a total student population of 662 along with faculty and administrative staff. The campus primarily utilizes grid electricity supported by rooftop solar power generation.

The annual energy consumption of the institution was calculated as approximately 32,37,963 kWh/year, with an annual electricity expenditure of about ₹4.17 crore. Solar power generation contributes nearly 14,826 kWh annually. The estimated peak demand was approximately 1,254 kVA, and the annual load factor was calculated at 29.6%.

The audit identified HVAC systems, lighting systems, and IT infrastructure as the major energy-consuming areas. Existing energy conservation measures include LED lighting, occupancy sensors, star-rated air-conditioning systems, rooftop solar PV installation, APFC systems, energy-efficient operational practices, and awareness initiatives.

The audit also identified several areas requiring improvement, including optimization of HVAC performance, replacement of conventional fans with BLDC fans, enhancement of energy monitoring systems, strengthening of peak load management practices, and expansion of renewable energy systems.

Recommendations were provided for improving energy efficiency, reducing operational energy consumption, enhancing renewable energy utilization, and strengthening the Energy Management System through regular monitoring, preventive maintenance, awareness programs, and periodic energy audits.

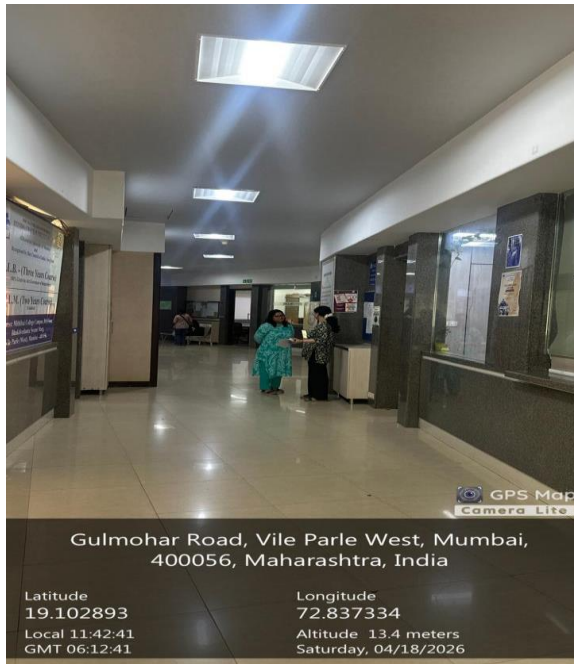
Overall, the institution has established a positive foundation for sustainable energy management. Continued implementation of the recommended measures and systematic monitoring will help improve energy performance, reduce energy costs, and support long-term environmental sustainability objectives.

## 10. Checklist

Sr. No.	Item / Parameter	Present / Absent	Remarks
1	Energy Policy displayed on campus	Yes	<a href="https://pgcl.ac.in/wp-content/uploads/2025/01/180_Download_7.1.6-institutional-energy-policy.pdf">https://pgcl.ac.in/wp-content/uploads/2025/01/180_Download_7.1.6-institutional-energy-policy.pdf</a>
2	Energy audit team appointed	Yes	
3	Monthly electricity bills available (last 12 months)	Yes	<a href="#">Attached</a>
4	Energy performance records maintained	Yes	Electricity bills
5	Power consumption monitoring system available	Yes	The energy meter is in the LT panel room at ground floor. There is no monitoring system.
6	Main electrical SLD (single line diagram) displayed	Yes	Main electrical panel is at ground floor-behind the cafeteria. The sub panels are on each floor. The sub panel for PGCL are at 8 <sup>th</sup> floor corridor.
7	Power Factor correction equipment (APFC panel)	Yes	
8	Load management practiced (e.g., DG, peak hours)	No	
9	Transformer capacity and load details available	Yes	
10	Energy-efficient motors installed (IE2/IE3/BLDC)	Yes	
11	LED lights used in classrooms/offices	Yes	
12	Occupancy/motion sensors installed	Yes	
13	Natural daylight used effectively	Yes	
14	Lux level measured and adequate	Yes	
15	Energy-efficient fans (BLDC or low-wattage) used	No	
16	Star-rated or inverter ACs used	Yes	
17	ACs serviced periodically	Yes	
18	AC thermostats set at 24°C or above	Yes	
19	Energy-efficient water pumps installed	Yes	
20	Solar water heating system used in hostels	Yes / No	<a href="#">NA</a>
21	Timers/controls used on water heaters	Yes / No	<a href="#">NA</a>
22	Lab equipment energy-efficient / maintained	Yes	
23	Computers have auto power-off or sleep mode	Yes	
24	Central server room temperature controlled	Yes	
25	Solar PV system installed	Yes	

26	Net metering system implemented	Yes	
27	Rainwater harvesting system present	Yes	
28	Green building measures adopted	Yes	
29	Energy-saving awareness boards displayed	Yes	
30	Staff/students trained in energy conservation		
31	Energy audits done previously	Yes	
32	Action taken on past audit recommendations	Yes	

## 11. Photographic Evidence



**Lights in Corridor**



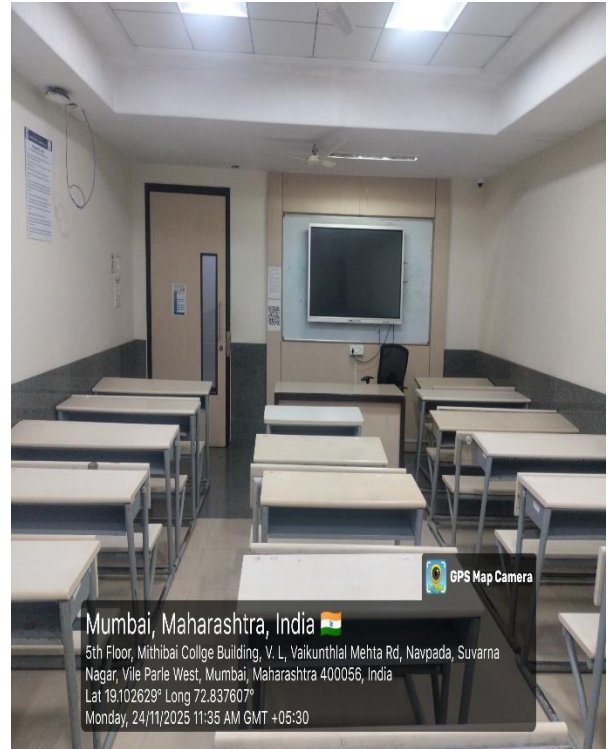
**Electronic Circuit board**



**Cassette AC**



**Printer & Xerox Machine**



**Classroom**



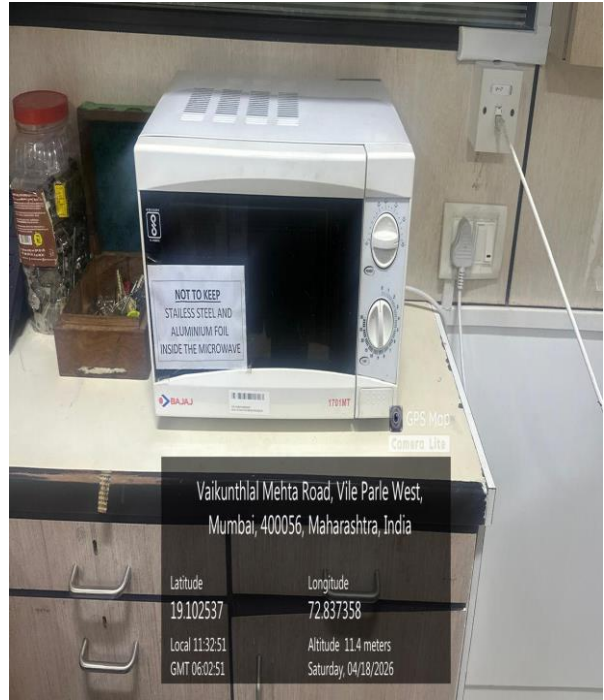
**Office**



**Cooler**



**Exhaust fan**



**Microwave**



**Refrigerator**



**Ceiling fan**



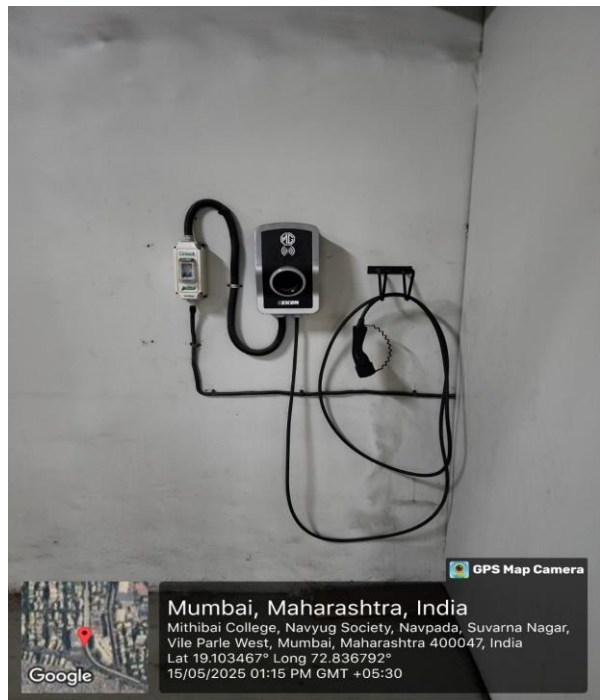
**Moot Court Room**



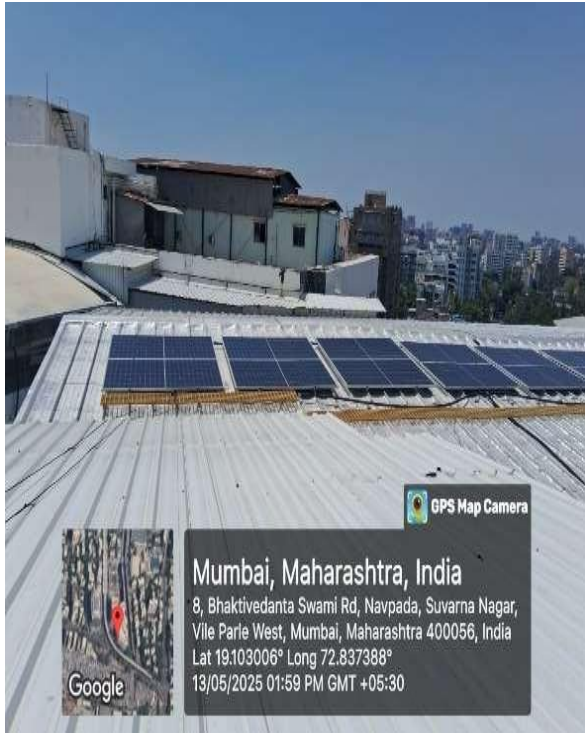
**Diesel Generator**



**Diesel Generator**



**EV Charging Points**



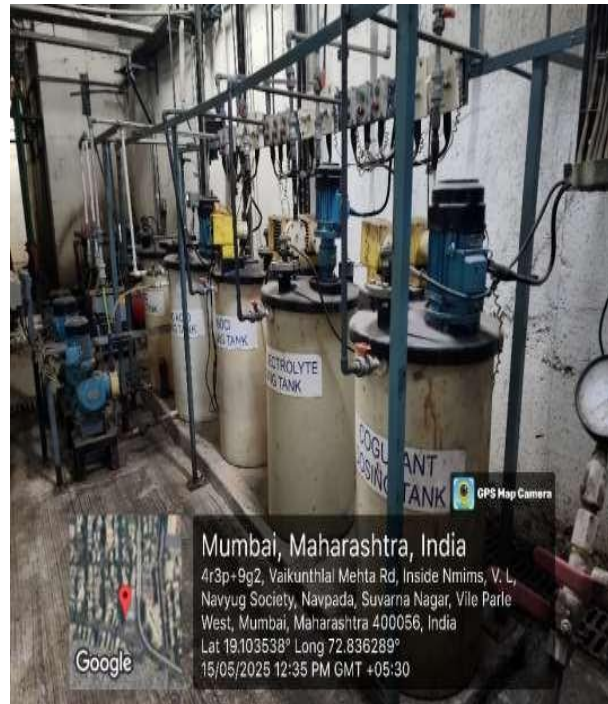
**Solar panel**



**Sewage Treatment Plant**



**Water Recycling**



**Sewage Treatment Plant**

## 12. Recommendation and Suggestion

- **Recommendations**

The institution should strengthen its Energy Management System by implementing a structured and continuous energy performance improvement program aligned with ISO 50001:2018 requirements. Priority should be given to reducing dependency on grid electricity through enhancement of renewable energy utilization and optimization of existing energy-consuming systems.

The institution should replace all remaining CFL and inefficient lighting fixtures with energy-efficient LED systems to reduce lighting energy consumption. Additional occupancy and motion sensors should be installed in classrooms, corridors, washrooms, and offices to minimize unnecessary lighting operation during non-occupancy periods.

The HVAC systems should be optimized through regular preventive maintenance, timely servicing, and replacement of old air-conditioning units with inverter-based or star-rated energy-efficient models. Thermostat settings should consistently be maintained between 24°C and 26°C to reduce excessive cooling demand and improve HVAC efficiency.

Conventional ceiling fans should gradually be replaced with BLDC or energy-efficient low-wattage fans to reduce electrical load and improve operational efficiency. Proper maintenance of electrical distribution systems, APFC panels, and wiring infrastructure should also be ensured to minimize transmission losses and maintain power quality.

The institution should strengthen energy monitoring practices by installing advanced energy monitoring systems and digital sub-metering for major electrical loads. Real-time monitoring will help identify abnormal consumption trends, peak demand conditions, and opportunities for corrective actions.

The rooftop solar PV system should be maintained efficiently and opportunities for expanding renewable energy capacity should be explored to increase the contribution of clean energy and reduce dependence on grid electricity.

The institution should continue implementing energy conservation awareness programs, workshops, and training sessions for students, faculty, and staff members to promote responsible energy usage behavior and sustainable operational practices.

Regular internal energy audits, periodic management reviews, and systematic documentation of energy performance indicators should be maintained to ensure continual improvement of the Energy Management System and compliance with ISO 50001:2018 standards.

- **Suggestions**

The institution may consider establishing a dedicated Energy Management Committee responsible for monitoring energy performance, implementation of energy-saving initiatives, and review of sustainability objectives. The committee may coordinate with administration, maintenance staff, and academic departments to strengthen campus-wide participation in energy conservation activities.

The institution may explore the feasibility of increasing rooftop solar PV capacity and integrating additional renewable energy technologies to improve long-term sustainability and reduce electricity expenditure. Battery storage systems and advanced solar monitoring systems may also be evaluated for improved renewable energy utilization.

It is suggested that detailed sub-metering be introduced for major energy-consuming areas such as HVAC systems, lighting systems, computer laboratories, and common facilities. This will support more accurate analysis of energy consumption patterns and enable targeted energy-saving actions.

The institution may adopt a preventive maintenance schedule for all electrical and mechanical equipment to ensure optimum operational efficiency and minimize energy wastage caused by equipment deterioration or malfunction.

Implementation of demand-side management practices such as scheduling high-load equipment during non-peak hours may help reduce maximum demand and improve overall load factor. The institution may also consider periodic review of contract demand and tariff optimization opportunities with the electricity utility provider.

The campus may further strengthen green building initiatives by improving natural ventilation, thermal insulation, daylight utilization, and shading systems to reduce cooling loads and improve occupant comfort.

It is also suggested that the institution introduce energy performance benchmarking with similar educational institutions to evaluate progress and identify additional opportunities for energy efficiency improvement.

Continuous awareness campaigns, energy-saving competitions, and student participation programs may further encourage responsible energy consumption behavior and strengthen the institution's sustainability culture.

The institution may also consider integration of digital energy management tools, smart controls, and automated building management systems in the future to support data-driven decision-making and long-term energy optimization.

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**Sign and Seal**

**Dr. Amelia Antony**

**Lead Auditor**

**ISO50001 Certification Number TVEEN04C16769**