



ipem Estd. 1996
Law Academy

ENVIRONMENT AUDIT REPORT

(Jan 2020)



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EFS Engineering Facility Services

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2 ACKNOWLEDGEMENT

EFS Engineering Facility Services acknowledges the cooperation and support of the management and staff of **IPEM LAW ACADEMY**, in particular, the support and disposition of Energy Audit Coordinator - Ms. Neha Garg, Environment Audit Coordinator – Mr. Neeraj Sharma & Green Audit Co-coordinator – Ms. Sonam Singh & Teaching & Supporting Staff of IPEM Law Academy has been invaluable to the success of this report. EFS Engineering Facility Services wishes to stress that in line with its policy, all information obtained in the course of this Audit exercise as well as those contained in this report will be accorded the strictest confidentiality.

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The Principal

IPEM LAW ACADEMY

Report by: (Deepak Bajpai) Lead Auditor (Certified

Energy Auditor and Chartered Engineer)

4 INTRODUCTION

Green Audit is a process of systematic identification, quantification, recording, reporting and analysis of components of environmental diversity of various establishments. It aims to analyze environmental practices within and outside of the concerned sites, which will have an impact on the eco-friendly ambience. Environment audit can be a useful tool for a college to determine how and where they are using the most energy or water or resources; the college can then consider how to implement changes and make savings. It can also be used to determine the type and volume of waste, which can be used for a recycling project or to improve waste minimization plan. It can create health consciousness and promote environmental awareness, values and ethics. It provides staff and students better understanding of Green impact on campus. If self-enquiry is a natural and necessary outgrowth of a quality education, it could also be stated that institutional self-enquiry is a natural and necessary outgrowth of a quality educational institution. Thus it is imperative that the college evaluate its own contributions toward a sustainable future. As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher educational institutions in relation to environmental sustainability is more prevalent.

4.1 OVERVIEW OF INSTITUTE

IPEM Law Academy is conducting LL.B. and B.A., LL.B. programmes. It is NAAC accredited, affiliated with Choudhary Charan Singh University, Meerut and approved by Bar Council of India. It has been organising various academic and extra-curricular activities for creating confidence and improving overall personality of the students. We make effort not only to produce good professional but good human beings also.

IPEM LAW ACADEMY: Infrastructure

IT: Lab

The focus of IPEM LAW ACADEMY has always been to be at the forefront of optimum utilization of IT resources and leverage the power of IT in making the learning process, informative and engaging. The students are provided with hands on experience and learning with the state-of-the-art technology. The network architecture for IPEM LAW ACADEMY involves laying down the foundations for a multi services network, capable of providing the basic connectivity services & also facilitate new world technology drives, to empower the faculty & students with the most current learning tools & infrastructure. The state of the art computer labs cover over 6000 sq ft carpet area, having more than 450 latest Pentium based computers. The internet facility is available round the clock using wide band dedicated to an RF link of 4 Mbps. Each student is provided with a laptop of latest configuration which becomes his/her property after successful completion of the course.

Wi-Fi: Campus

Students at IPEM LAW ACADEMY Ghaziabad are privy to a unique Wi-Fi campus. The Wi-Fi campus enables the students to get on-line anywhere on campus without the hassle of wires and plug-ins. The campus truly is the high tech face of the new-age IPEM LAW ACADEMY.

Communication: Lab

The communication lab aims is to develop English Language Communication Skills. This gives detail knowledge of Communication like English vowels, diphthongs & consonant phonetic sound, telephonic conversation. It also cultivates the habit of reading passages from computer monitor. Students are prepared for placement in National & Multinational Companies/Firms. The communication labs are fully furnished with the latest Software & Electronic Communication Equipment like Voice Recorder, Mic, Video & Audio Broadcasting etc.

IPEM LAW ACADEMY: Library

IPEM LAW ACADEMY has a well-stocked and fully automated Library with over 4, 500+ titles, 45,000+ books, 800 video/audio cassettes and CDs, 600 Project Reports, Encyclopedia as well as Industry and company information sources. Library subscribes to around 145 reputed International and National Journals besides a number of Magazines and Newspapers. It provides access to reading material, information trends and vast collection of books & journals. The library has separate sections on IT and Management related books, a section on Journals & Magazines and a Reference section. The Reading Halls in the Library have a seating capacity of over 250. The automation of library enabled to track the availability of any book easily and also help in accessing journals and books available electronically.

IPEM LAW ACADEMY: Lecture Theatre

Spacious Lecture Theatres are thoughtfully designed to induce high quality learning and are equipped with high end teaching aids such as LCD and OHP projectors. Priority is attached to achieve optimal convergence of stimulating pedagogy & enabling environment. The latest audio-visual aids and multimedia technology enables the Faculty members to have interactive sessions. Classroom learning is meant primarily for theoretical and conceptual input & consolidated by combining lectures with Case Methods and Group Discussions for group learning. Extensive use of laptops is made by students in the well networked class rooms.

IPEM LAW ACADEMY: Auditorium & Halls

The conferencing needs at I.P.E.M are taken care of by air-conditioned Auditorium and Seminar Hall with latest state-of-the-art audio/video facilities with a total seating capacity of more than 300. The facilities are engaged round the year hosting intra and inter college events like Seminars, Conferences, Debates & Cultural Activities. A number of Professional Bodies and Government Departments in the vicinity also use these facilities from time to time.

IPEM LAW ACADEMY: Cafeteria

The cafeteria at IPEM LAW ACADEMY takes care of providing students with healthy meals. Eating at college campus helps students develop companionship skills. Students can also develop social skills in these spaces. IPEM LAW ACADEMY cafeteria allows our students to spend time with their classmates outside of the classroom, in a more relaxed and pleasant environment.

IPEM LAW ACADEMY: Hostels

To provide accommodation to the students coming from far-off places, the IPEM LAW ACADEMY Group has provided separate hostel facilities for Boys and Girls located within the Campus. The Boys hostel has a capacity of 125 students and Girl's hostel has capacity of 80 students on double sharing basis. The hostels are centrally air cooled and have excellent standard of living with round-the-clock availability of basic facilities such as separate beds, study tables and cupboards. Hot water is provided during winters.

Each of the hostels is managed by a dedicated Warden & has facilities of 24 hour Power back up, Mess, Common Room, Recreational Facilities- T.V/Indoor Games, Laundry, Phone, etc.

IPEM LAW ACADEMY: Sports Facility

It is not all work at IPEM LAW ACADEMY Ghaziabad. A state of the art Sports Facilities provides the students ample opportunity to relieve stress. IPEM LAW ACADEMY has facility for both indoor and outdoor games such as Basketball, Badminton, Table Tennis, Chess, Carom, etc.

IPEM LAW ACADEMY: Medical Facility

The IPEM LAW ACADEMY has Doctor Clinic within the Campus to take care of the student's immediate medical assistance. However, for other cases the Group has a tie up with hospitals in Ghaziabad. A vehicle with a driver is also available 24 X 7 in the Campus to take care of commuting needs for this purpose.

5 OBJECTIVES

The Environment Audit of an institution is becoming a paramount important these days for self-assessment of the institution, which reflects the role of the institution in mitigating the present environmental problems. The college has been putting efforts to keep the environment clean since its inception. But the auditing of this non-scholastic effort of the college has not been documented. Therefore, the purpose of the present environment audit is to identify, quantify, describe and prioritize framework of Environment Sustainability in compliance with the applicable regulations, policies and standards. The main objectives of carrying out Green Audit are:

1. To document the quality drinking water
2. The document the quality of recycled waste water for gardening
3. To document the solid Waste disposal system
4. To document the ambient environmental condition of air, water and noise in the campus.
5. Benchmarking for environmental protection initiatives
6. Reduction in resource use
7. Financial savings through a reduction in resource use

6 AUDIT TEAM

Audit was conducted by the EFS team:

Name	Position	Qualification
Deepak Bajpai	Lead Auditor	B.Tech (Mechanical Engineering) Bureau of Energy Efficiency Certified Energy Auditor, Chartered Engineer
Sandeep Sharma	Safety Auditor	Certification in Industrial Hygiene, NEBOSH National General Certificate. Advance Diploma in Fire & Safety Engineering. And Environmental Management
Om Pal	Auditor	B. Tech
Shubham Agarwal	Auditor	B. Tech

7 EXECUTIVE SUMMARY

An environmental audit is a snapshot in time, in which one assesses campus performance in complying with applicable environmental laws and regulations. Though a helpful benchmark, the audit almost immediately becomes outdated unless there is some mechanism in place to continue the effort of monitoring environmental compliance.

This is the second environmental audit of institute for NAAC affiliation; QS Programme and doing their bid towards environmental protection and environmental awareness at local and global front. Audit criterion is environmental cognizance, waste minimization and management, biodiversity conservation, water conservation, energy conservation and environmental legislative compliance by the campus. A questionnaire is used during audit. This audit report contains observations and recommendations for improvement of environmental consciousness.

8 AREA OF IMPROVEMENTS

- Water Meter should be installed and maintain the inventory of water resource
- Stack height should be as per DG Rules.
- Internal inspection system should be developed for various equipments available in campus.
- Waste Management plan should be prepared for the campus.
- Environmental drills for response against spillage and leakage of chemicals in the campus
- The monthly inventory of e-waste is required to be maintained in formats on regular basis.

9 ENVIRONMENTAL AUDIT -QUESTIONARE

The areas of eco/environmental/green auditing to be followed/practiced by participating institutions:

- I. Waste Minimization and Recycling
- II. Greening
- III. Energy Conservation
- IV. Water Conservation
- V. Clean Air
- VI. Animal Welfare
- VII. Environmental Legislative
- VIII. General Practices

Dose any Environmental Audit conducted earlier?

No, this is first time a systematic way of monitoring their environmental eminence initiative taken by IPEM LAW ACADEMY for environment protection.

What is the total permanent population of the Institute?

Particulars	Total
Students	660
Teachers	29
Non-Teaching Staff	8
Sub Total	697
Approximate Number of Visitors (Per day)	10

Which of the following are available in your institute?

1 Garden area	Available
2 Play ground	Available
3 Kitchen	Available
4 Toilets	Available
5 Garbage Or Waste Store Yard	Not Available
6 Laboratory	Available
7 Canteen	Available
8 Hostel Facility (numbers)	Yes
9 Guest House	Available

Which of the following are found near your institute?

1 Municipal dump yard	Not in vicinity of institute
2 Garbage heap	No Garbage heaps
3 Public convenience	Yes , public convenience is available
4 Sewer line	Yes
5 Stagnant water	No stagnant water
6 Open drainage	No
7 Industry	Yes
8 Bus / Railway station	Yes
9 Market / Shopping complex / Public halls	Yes

I – WASTE MINIMIZATION AND RECYCLING

<p>1. Does your institute generate any waste? If so, what are they?</p>	<p>Yes, Solid waste Canteen waste, paper, plastic, Horticulture Waste etc.</p>	
<p>2. What is the approximate amount of waste generated per day? (in Kilograms/month) (approx.)</p>	<p>Bio Degradable</p>	<p>Non-Biodegradable</p>
	<p>200 kg</p>	<p>200 kg</p>
<p>3. How is the waste generated in the institute managed? By</p> <p>1 Composting</p> <p>2 Recycling</p> <p>3 Reusing</p> <p>4 Others (specify)</p>	<p>Reuse of one side printed Paper for internal communication. Sewage water used for gardening. Two types of Waste bins are provided at campus for biodegradable and non-biodegradable waste. Horticulture waste is also disposed by the land fill method near the IPEM LAW ACADEMY .</p>	
<p>4. Do you use recycled paper in institute?</p>	<p>Yes</p>	
<p>5. Do you use reused paper in institute?</p>	<p>Yes</p>	
<p>6. How would you spread the message of recycling to others in the community? Have you taken any initiatives? If yes, please specify.</p>	<p>Done in locality for awareness of resource crunches (Pics in Annexure)</p>	
<p>7. Can you achieve zero garbage in your institute? If yes, how?</p>	<p>Not yet achieved. Possible through waste management plan.</p>	

II – GREENING THE CAMPUS

8.	Is there a garden in your institute?	Yes, Approx. 50% areas are developed as Gardens.	
9.	Do students spend time in the garden?	2-4 Hours during winters	
10.	Total number of Plants in Campus	Plant type	Approx. number
		Trees	280
		Ornamental	460
11.	Suggest plants for your campus. (Trees, vegetables, herbs, etc.)	Ashoka, Ficus Religeosa, Boganvella, Alovera and many more as per geographical regime.	
12.	Is the Academy campus have any Horticulture Department	Yes	
	Number of Staff working in Horticulture Department	Tree Gardeners, One Civil Engineer and Services of External Experts are also taken	
13.	Number of Tree Plantation Drives organized by college per annum. (If Any)	Yes, three Tree Plantation Drives are Organized Annually. 20 trees and 100 shrubs planted in this financial year.	
14.	Number of Trees Planted in Last FY.	25	
	Survival Rate	99%	
15.	Plant Distribution Program for Students and Community	Yes, Saplings are distributed to Students and visitors at various Occasions. Besides this landscape of some area in city are developed by Institute.	
16	Plant Ownership Program	Various Trees are Planted and owned by Visitors as well as students. The Name plates are also displayed near the plants.	

III– ENERGY

17.	List ten ways that you use energy in your institute. (Electricity, LPG, firewood, others). Using this list, try to think of ways that you could use less energy every day.	Electricity saves by use of CFL/LED bulbs for illumination, LPG saves by use of Pressure cookers for cooking food. Alternate source of energy i.e. Solar Heater Installed.
18.	Are there any energy saving methods employed in your institute? If yes, please specify. If no, suggest some	Yes, Renewable source of energy through solar plant (100 KW) in commissioning phase. Massages are displayed at various locations to Aware the Peoples about Energy Savings. Use of Natural Lights and Natural Ventilation are promoted.
19.	How many CFL/LED bulbs has your institute installed?	100 % of Total Conventional bulbs are replaced by LED Lights.
20.	Are any alternative energy sources employed / installed in your institute? (photovoltaic cells for solar energy, windmill, energy efficient stoves, etc..) Specify.	Yes, photovoltaic cells for solar energy, energy efficient stoves
21.	Do you run “switch off” drills at institute?	Yes
22.	Are your computers and other equipment’s put on power-saving mode?	Yes, In Practice
23.	Does your machinery (TV, AC, Computer, weighing balance, printers, etc.) run on standby modes most of the time? If yes, how many hours?	No

IV– WATER CONSERVATION

24.	List four uses of water in your institute	<p>Basic use of water in campus:</p> <ol style="list-style-type: none"> 1. Drinking – 82 KL/month 2. Kitchen and Toilets – 82 KL/month 3. Others – 100 KL/month
25.	How does your institute store water? Are there any water saving techniques followed in your institute?	<p>01 Nos of Overhead Water Tanks installed for storage of water.</p> <p>Avoid overflow of water controlled valves are provided in water supply system. Close supervision for water supply system.</p> <p>Rain water harvesting pit 01</p>
26.	If there is water wastage, specify why and How can the wastage be prevented / stopped?	No
27.	<p>Locate the point of entry of water and point of exit of waste water in your institute.</p> <p>Entry-</p> <p>Exit-</p>	<p>Entry- Water comes from Submersible Pumps at campus</p> <p>Exit- From Water Drainage System to authority STP</p>
28.	Write down four ways that could reduce the amount of water used in your institute	<p>Basic Four ways:</p> <ol style="list-style-type: none"> 1. Close the taps after usage 2. Maintenance and monitoring of valves in supply system to avoid overflow, leakage and spillage 3. Water Conservation awareness for new Students 4. Reuse STP water for gardening
29.	Record water use from the institute water meter for six months (record at the same time of each day). At the end of the period, compile a table to show how many litres of water have been used.	No, Water Meters available for calculation of usage of total quantity only.
30.	Does your institute harvest rain water?	One number of Modern rain water harvesting system are available.
31.	Is there any water recycling System.	Yes

V – CLEAN AIR

32.	Are the Rooms in Campus are Well Ventilated?	Yes				
33.	Window Floor ratio of the Rooms	Very Good				
34.	What is the ownership of the vehicles used by your school? (Please Tick ✓ only one)	Yes				
		Operator-owned vehicles				
		✓	School-owned vehicles			
		A combination of campus-owned and operator-owned vehicles				
35.	Provide details of school-owned motorised vehicles?	Buses	Cars	Vans	Bike +Other	Total
	No. of vehicles	2	4	0	0	6
	No. of vehicles more than five years old	0	0	0	0	0
	No. of Non Air conditioned vehicles	2	4	0	0	6
	PUC done	Yes	Yes	Yes	Yes	Yes
36.	Specify the type of fuel used by your school's vehicles:	Buses	Cars	Vans	Other	
	Diesel	0	4	2	4	
	Petrol+CNG	2	0	0	2	
	CNG	0	0	0	0	
	LPG	0	0	0	0	
	Petrol	0	0	0	0	
	Electrical	0	0	0	0	
37.	Air Quality Monitoring Program (If Any)	Yes, Monitoring is being done by approved Laboratory				
38.	Students suffer from respiratory ailments? (If Any)	No				
39.	Details of Genset	Yes, 02Numbers of Silent DG Set The capacities of DG's are 82 and 42 KVA				

VI– ANIMAL WELFARE

40	List the animals (wild and domestic) found on the campus (dogs, cats, squirrels, birds, insects, etc.)	Birds and Squirrels are commonly found in campus. A variety of birds species and other flora and fauna available but these are not harmful to human so institute doing their bid for its conservation.
41.	How many dogs in your area have undergone Animal Birth Control - Anti Rabies (ABC - AR)?	Not required
42.	Does your institute have a Biodiversity Programme or a KARUNA CLUB?	Not Available

VII– ENVIRONMENTAL LEGISLATIVE COMPLIANCE

43.	Are you aware of any environmental Laws pertaining to different aspects of environmental management?	Yes
44.	Does your institute have any rules to protect the environment? List possible rules you could include.	No
45.	Dose Environmental Ambient Air Quality Monitoring conducted by the Institute?	No
46.	Dose Environmental Water and Wastewater Quality monitoring conducted by the Institute?	Yes
47.	Dose stack monitoring of DG sets conducted by the Institute?	No
48.	Is any warning notice, letter issued by state government bodies?	No
49.	Dose any Hazardous waste generated by the Institute? If yes explain its category and disposal method	Yes (Disposal of hazardous waste by dilution method)
50.	Dose any Bio medical waste generated by the Institute? If yes explain its category and disposal method	No

VIII– GENERAL

46.	Are you aware of any environmental Laws pertaining to different aspects of environmental management?	Yes
47.	Does your institute have any rules to protect the environment? List possible rules you could include.	No
48.	Does housekeeping schedule in your campus?	Yes, Swatch Bharat movement
49.	Are students and faculties aware of environmental cleanliness ways? If Yes Explain	Yes, Periodically pollution reduction, plantation, energy conservation awareness campaigns carried out by institute
50.	Dose Important Days Like World Environment Day, Earth Day, and Ozone Day etc. eminent in Campus?	Yes
51.	Dose Institute participated in National and Local Environmental Protection Movement?	Yes, Swatch Bharat Abhiyan by students at campus.
52.	Dose Institute has any Recognition/certification for environment friendliness?	No
53.	Dose Institute using renewable energy?	Yes
54.	Dose Institution conducts a green/environmental audit of its campus?	No, This is first environmental audit done by institution
55.	Has the institution been audited / accredited by any other agency such as NABL, NABET, TQPM, NAAC etc.?	No

10 BEST PRACTICES/INITIATIVES FOR ENVIRONMENT

A	<p>Renewable Energy A clean source of energy is utilized at campus. Efforts towards Carbon Neutrality The capacity of 100 KW Solar plant on building roofs is already installed.</p>	Installed 50 KW Solar energy Plant
B	<p>Biodiversity Conservation Flora and fauna conservation</p>	It is in schedule plan of Campus Environment committee
C	<p>Tree Plantation Drives Two Drives Annually as well as Every Guest is honored by Tree Plantation at Campus.</p>	Yes
D	<p>Ground Water Recharge 03 units of Rain Water Harvesting System.</p>	Yes
E	<p>Pollution Reduction Personal Vehicles (Students) not allowed at campus</p>	Reduction in Air Pollution through vehicular emission.
F	<p>E Waste Management</p>	Dispose by buy back method
G	<p>Solid Waste Management Lifting of garbage from IPEM LAW ACADEMY campus daily for landfill.</p>	Yes
H	<p>Adoption of Village School CSR</p>	Under Planning
I	<p>Water Conservation</p>	Awareness to save water
J	<p>Corporate Resource Center (CRC)</p>	IPEM LAW ACADEMY College Corporate Resource Center (CRC) is dedicated to nurturing future leaders
K	<p>Mitigation measures for Air pollution at construction stage and operation stage by developing adequate green belt.</p>	Yes
L	<p>Mitigation measures for noise pollution by isolation of noise generation activities</p>	Yes
M	<p>Disaster management plan</p>	Yes
N	<p>Fire protection system</p>	Yes

11 RECOMENDATIONS

- Environmental Monitoring i.e. (Ambient Air Quality monitoring, Stack Monitoring of DG sets, Water and waste water monitoring need to be conducted by Uttar Pradesh State Pollution Control Board, approved laboratory with frequency of six month.
- E-waste monthly inventory be maintained at campus as per E waste rules 2016.
- Water Meter should be installed at institute for monitoring of water consumption per capita.
- Environment/Green committee formation for regulating eco-friendly initiatives at campus premises and periphery as already Unnat Bharat Abhiyan and NSS team exists.

CONCLUSION

This audit involved extensive consultation with all the campus team, interactions with key personnel on wide range of issues related to Environmental aspects. The IPEM LAW ACADEMY has Environmental Committee for sustainable use of resources. The audit has identified several observations for making the campus premise more environmental friendly. The recommendations are also mentioned with observations for college campus team to initiate actions.

The audit team opines that the overall site is maintained well from environmental perspective. There is no major observations but few things are important to initiate urgently are waste management records by monthly inventory of hazardous waste, water balance cycle and periodic inspection of buildings and initiation of composting at campus.

REFERENCE

- The Environment [Protection] Act – 1986 (Amended 1991) & Rules-1986 (Amended 2010)
- The Petroleum Act: 1934 – The Petroleum Rules: 2002
- The Central Motor Vehicle Act: 1988 (Amended 2011) and The Central Motor Vehicle Rules:1989 (Amended in 2005)
- Energy Conservation Act 2010.
- The Water [Prevention & Control Of Pollution] Act – 1974 (Amended 1988) & the Water (Prevention & Control of Pollution) Rules – 1975
- The Water [Prevention & Control Of Pollution] Cess Act-1977 (Amended 2003) and Rules-1978
- The Air [Prevention & Control Of Pollution] Act – 1981 (Amended 1987) The Air (Prevention & Control of Pollution) Rules – 1982
- The Gas Cylinders Rules – 2016 (Replaces the Gas Cylinder Rules – 1981)
- E-waste management rules 2016
- Electrical Act 2003 (Amended 2001) / Rules 1956 (Amended 2006)
- The Hazardous Waste (Management and Handling and Trans-boundary Movement) Rules, 2008 (Amended 2016)
- The Noise Pollution Regulation & Control rules, 2000 (Amended 2010)
- The Batteries (Management and Handling) rules, 2001 (Amended 2010)
- Relevant Indian Standard Code practices

THANKS





ENERGY AUDIT REPORT

(Jan 2020)



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ACKNOWLEDGEMENT

We take the opportunity to express our deep sense of gratitude towards **IPEM LAW ACADEMY**, in particular, the support and disposition of the Energy Audit Coordinator - Ms. Neha Garg, Environment Audit Coordinator – Mr. Neeraj Sharma & Green Audit Co-ordinator – Ms. Sonam Singh, Teaching & Supporting Staff of Collage for awarding the work of executing Energy Audit in IPEM law Academy . In particular we wish to thank him for his timely initiative, advice and valuable support extended to the project.

We are also grateful for extending all sorts of help while carrying out energy audit and also for their valuable help regarding the data collection and details at various stages of the project. We are also thankful to them for providing support while conducting survey in IPEM law Academy.

We would be failing in our duty if we do not thank our respondents who gave their valuable time and answered the survey questions with tremendous patience and understanding.

CERTIFIED ENERGY AUDITOR & CHARTERED ENGINEER

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1. ABOUT ENGINEERING FACILITY SERVICES ENERGY DELHI

1 ABOUT ENGINEERING FACILITY SERVICES

PROFILE OF THE COMPANY

“ENGINEERING FACILITY SERVICES” is an energy centric organization involved in Generation (Renewable), Measurement & Efficiency enhancement of energy. Our focus is towards greener & cleaner economy with three dimensional approach viz Generation of power from renewable sources, manufacturing of world class energy monitoring devices and Energy Audit Services. Our Manufacturing facilities are located in North India.

VISION & MISSION

We shall “**GENERATE**”, “**MEASURE**” & “**MANAGE**” the “**ENERGY.**”

It is evident that organization has been launched with a very thoughtfully nurture division of being the leader in a basket of High Technology Business fields with far-reaching & all-encompassing implication on the Industry, Society & Ecology. We

- ✓ Shall “Generate” only “Renewable” or “Green” Energy;
- ✓ Shall Design & Manufacture the most advanced, accurate & reliable “Measurement” Products & Systems for Energy & Power Sector;
- ✓ Shall “Manage” the “Energy Consumption” by helping Monitor the “wastage” and/or “consumption” terms of commercial, industrial, municipal organizations; hence help improve their “Energy Efficiency”.

Our Vision to dedicate all our Resources in ‘Generation’, ‘Measurement’ and ‘Management’ of ‘Power& ‘Energy’ is very unique in a way that shows our deep compassion for the Society & Ecology.

The promoters have committed their organization to the business, which shall practice & advocate the tenet of “Sustainable Development” which makes us responsible & account to “Meeting the needs of the present generation without compromising the ability of future generations to meet their needs”.

APPROVALS/CREDENTIALS

BEE Accredited Energy Auditors & Certified Energy Auditors/Managers (Under Ministry of Power, Govt. of India).

PRODUCTS & SERVICES

In Brief, our company operates in several business

Segments:- Power Generation- Green Energy

Consultancies & Services

Energy Audit

PAT

Assistance

Support for energy efficiency enhancement

projects Green Buildings

Renewable energy project
implementation Trainings to improve
Energy Efficiency

ENERGY AUDIT & MANAGEMENT

The Objective of this division is to provide solutions for the efficient management of every form of energy. The management service begins with the energy audit process comprising of an inspection and survey of the total energy consumption in a building, process system with the end objective to reduce the amount of energy used without any negative effect. The available consumer base of this division covers a single residential consumer to the largest industrial establishment or commercial complex however the focus for now is on 4 main areas:

Commercial - Malls, Commercial Buildings etc.

Power Plant – Energy audit of thermal power plant and captive power plant.

Industrial – Energy intensive industrial establishments.

Hospitality – Building and Resort complex

2. INTRODUCTION TO ENERGY AUDIT & METHODOLOGY

2 INTRODUCTION TO ENERGY AUDIT & METHODOLOGY

OBJECTIVE OF ENERGY AUDIT IN IPEM LAW ACADEMY

The objective of this study is to carry out investment grade audit of building followed by submission of Detailed Energy Audit Report to the building management & maintenance department. The implementation support provided is for the benefit of the building management so as to make sure that the recommended savings potential are met and monetary savings achieved to the fullest.

SCOPE OF WORK

Broadly, the following scopes are limited to the building:-

- Review of present electricity, fuel oil, fuel gas, lighting, HVAC and Water consumption.
- Review and Study of existing Electrical Distribution System, Lighting System, HVAC System, and Diesel Generator sets etc. along with respective energy conservation options.
- Review and Study of Energy Monitoring & Accounting System. Review of present maintenance practices.
- Cost benefits analysis of each energy conservation options.
- Preparation and submission of Detailed Energy Audit Report.

METHODOLOGY

The study has been conducted by the Energy consultants, Auditors of ENGINEERING FACILITY SERVICES and consists of the following components.

Preliminary visits to each of the sub-systems to obtain an overview. Brief discussions with concerned executives, preparation of data collection forms/checklists instrumentation requirements, etc.

We have used diagnostic portable instruments for power measurement, Water Flow measurement, Thermograph study, Lux meter, Infra-red and conventional temperature measurement instruments, and would also draw upon the inferences from onsite instrumentation data, etc.

Carried at field studies in each of the sub-systems, involving performance assessment trials of Refrigeration & Air Conditioning System, vis-à-vis existing conditions. To the extent possible, trials have been conducted without disturbing normal operation of working equipment.

Detailed analysis of field data outputs and evaluation of energy performance of equipment studied, with respect to operation efficiencies, comparison of these values with Performance Guarantee figures, or typical industry norms and establishing margins for improvements.

Identification of Energy Conservation opportunities (ENCON).

APPROACH

The Energy Audit & Investment Grade Audit is planned in five parts:

Part-I: Energy Audit

This part involves performance assessment of the key energy consuming equipment such as A/C machines, Fans, Deep freezers, Lighting, and all major electrical motors to establish margins for improvement.

Part-II: Energy Conservation

This part as a fall out of the Energy Audit Study would involve identification of Energy Saving measures, detailing of measure to achieve improvements in efficiency and reduction in energy consumption, backed by operational trial data wherever possible, in-depth analysis and techno- economic feasibility reports along with relevant vendor information.

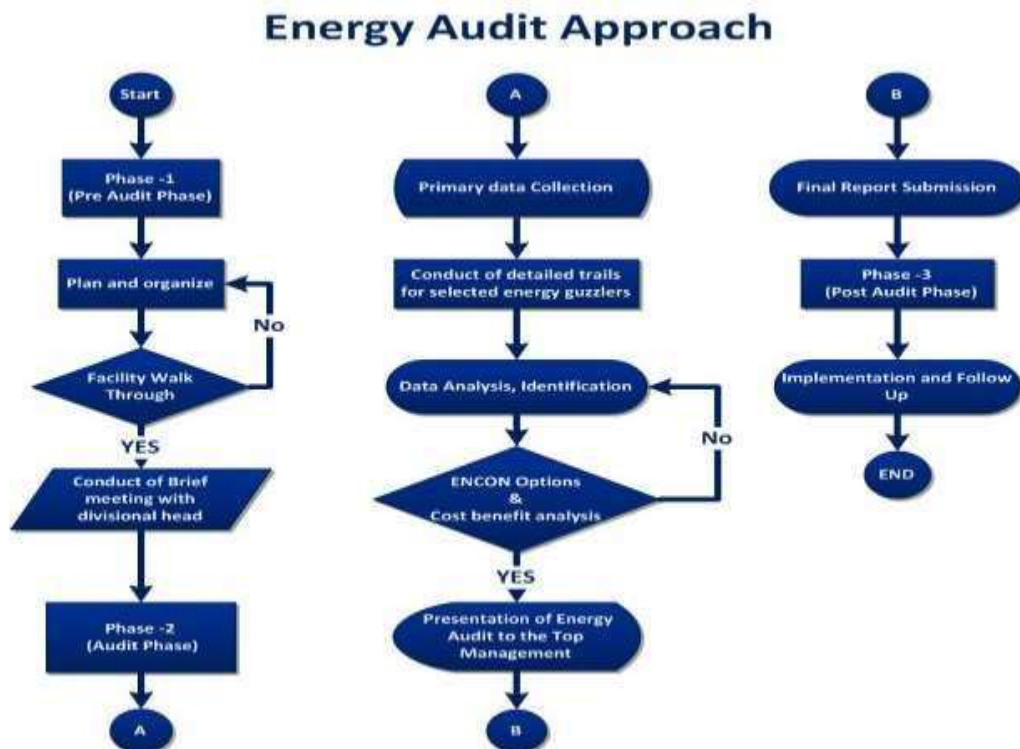
Part-III: Preparation of Investment Grade Proposals

This part involves preparation of Investment Grade proposal, based on the identified Energy Conservation Options with cost benefits and vendor details

Part – IV: Preparation of Draft Report

In this phase, the draft report would be prepared and submitted to Building

Management. **Part – V: Final Report Submission**



After presentation of the report and getting comments from Building Management the final report would be submitted after incorporating all the comments and suggestions.

Figure 1: Energy Audit Approach

INSTRUMENTS USED IN ENERGY AUDIT

Master List Of EA Instruments					
Sr. no.	Instruments	Model	Instrument Number	OEM	Image of Instruments
1	Power Analyzer	ALM 30 ALM 35	00302929	KRYKARD INDIA	
2	Flow Meter	PT878	PT 7 6186 E	GE USA	
3	Thermal Imager	881 – 2	02214667	TESTO GERMANY	
4	Infrared Thermometer	62 Mini	14841880	FLUKE USA	
5	Digital Thermo Hygrometer	288 ATH	2027386	HTC CHINA	
6	Digital Anemometer	AM 4201	AE.09961	LUTRON CHINA	
7	Digital Lux Meter	LX 101	AE.09143	LUTRON CHINA	
8	Digital Multimeter	801 AUTO	201061078	MECO INDIA	
9	Digital Clampmeter	DT 3150	YC-209634	MECO INDIA	
10	Digital TDS Meter	CD 610	S358236	HANNA ITALY	

Figure 2: Energy Audit Instruments

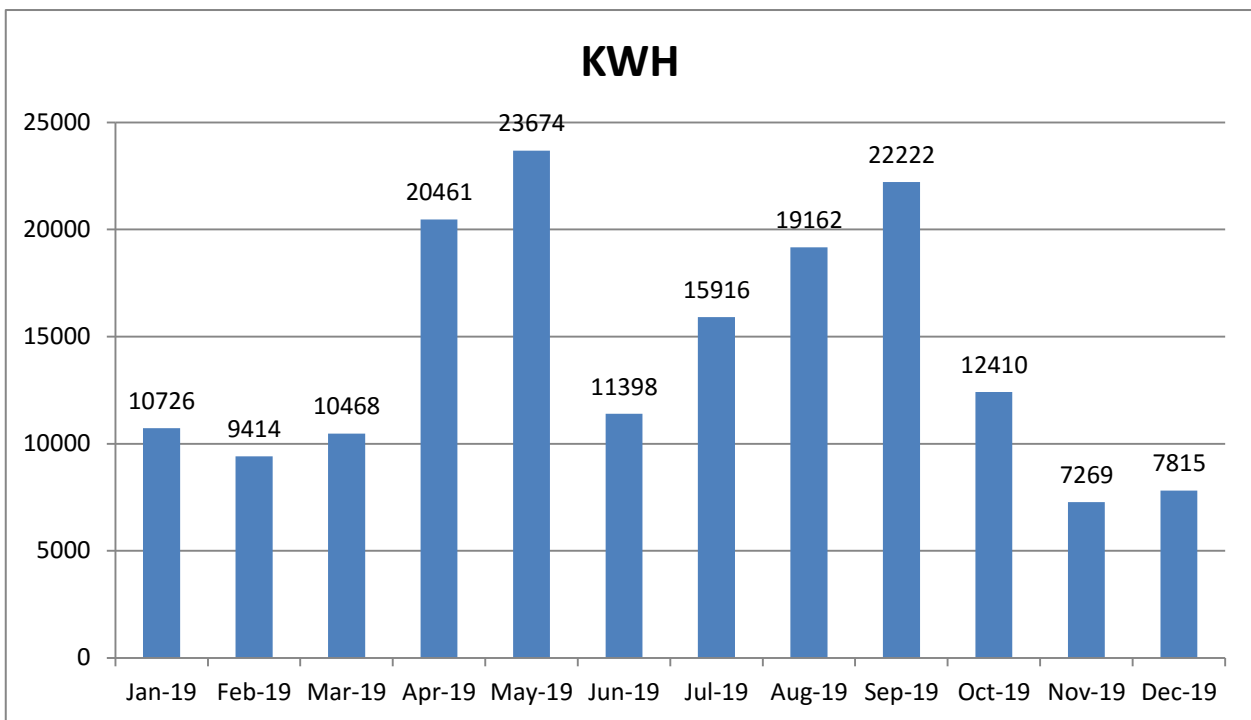
3. Baseline Energy Consumption

3 BASELINE ENERGY DESCRIPTION

Building is consuming different sources of energy - Grid Electricity, Solar Energy & Electricity from Diesel Generating Sets. Electricity is generally used for all electrical devices while diesel is used to operate the DG sets.

The Building is obtaining the power supply from Paschimanchal Vidyut Vitran Nigam Limited through 11kV line which directly feeds into transformer (250KVA) which steps down voltage from 11kV to 433V.

Graph shows the total billed amount in KWH



Lighting, pump/ motor load and HVAC are the major energy consuming components in the building, followed by diesel (very less consumption) used in DG sets.

The building utilizes various energy resources to provide best of the amenities in the management, break up of different resources is given below and this consumption of resources forms the baseline/ benchmarking of the energy use.

Sr. no	Fuel used	Units	consumption	% share
1	Electricity	KWH	170935	64.88 %
2	Solar	KWH	92530	35.12 %

Billing details of Institute is given below:

MONTH	KWH CONSUMPTION	KVAH CONSUMPTION	DEMAND CHARGES (INR)	ENERGY CHARGES (INR)	PF	CONTRACT DEMAND (KW)	BILL DEMAND (KW)	BILL AMOUNT (INR)
Dec-19	7815	8096	45150	69375	0.965	140	48	122014
Nov-19	7269	7578	45150	64878	0.959	140	54	118280
Oct-19	12410	13963	46766	111624	0.889	140	108	170281
Sep-19	22222	22825	70526	193957	0.974	140	167	307201
Aug-19	19162	19779	71808	162303	0.969	140	179	281417
Jul-19	15916	16900	48256	138551	0.942	140	120	200818
Jun-19	11398	12737	42000	104208	0.895	140	76	157184
May-19	23674	24709	47440	202975	0.958	140	118	267907
Apr-19	20461	21353	54560	175290	0.958	140	136	245698
Mar-19	10468	11876	42000	97105	0.881	140	76	149538
Feb-19	9414	10624	42000	86779	0.886	140	39	139347
Jan-19	10726	11898	42000	97283	0.901	140	39	149729

It is observed that average bill demand is 66 KVA but Pashchimanchal Vidyut Vitran Nigam Limited charge minimum 80% of sanction demand. If we reduce the contract demand from 140 KVA to 70 KVA by installing MDI controller than the saving calculation is given below:

Parameters	Units	Value
Existing contract demand	KVA	140
Proposed contract demand	KVA	70
Demand Saved	KVA	70
Demand Charges	Rs./KVA	430
Savings as per reduced	Rs./Month	30100
Savings per year after reducing demand	Rs./Year	361200

Building is getting the power supply from Pashchimanchal Vidyut Vitran Nigam Limited through 11kV line which directly feeds into the transformer that is of 250 KVA, which steps down voltage from 11kV to 433V. Details of transformers are given below.

Transformer name plate		
Make & Model No.	Capacity (kVA)	No Load Voltage (kV)
TR (on loading)	250	HV-11/LV-0.433

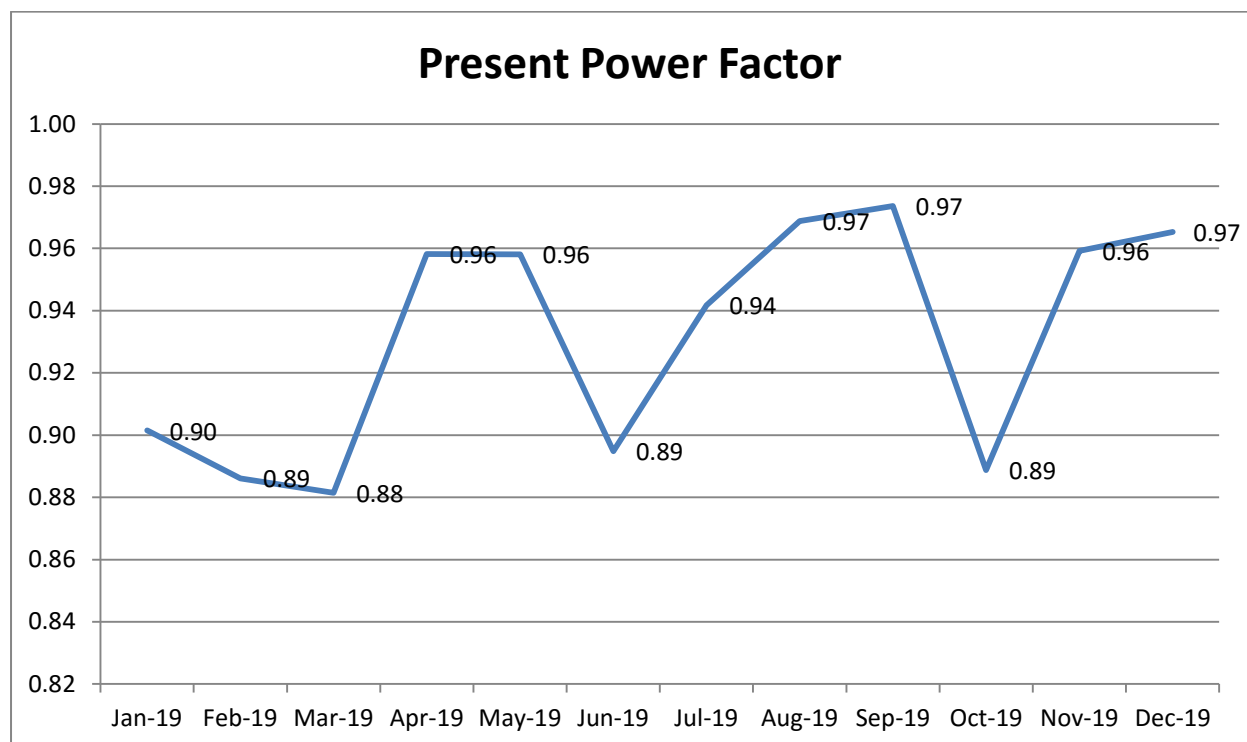
Pashchimanchal Vidyut Vitran Nigam charge as per tariff HV is as under

Description	Avg. Unit Price (Rs./KVAh)
Unit charge	Rs 8.68 per KVAh
Fix Charge	Rs 430 per KVA per month

Per unit charge for the building is Rs 14.15/KWh

Months	Avg. Unit Price (Rs./KWh)
Jan 2020 – Dec 2021	14.96

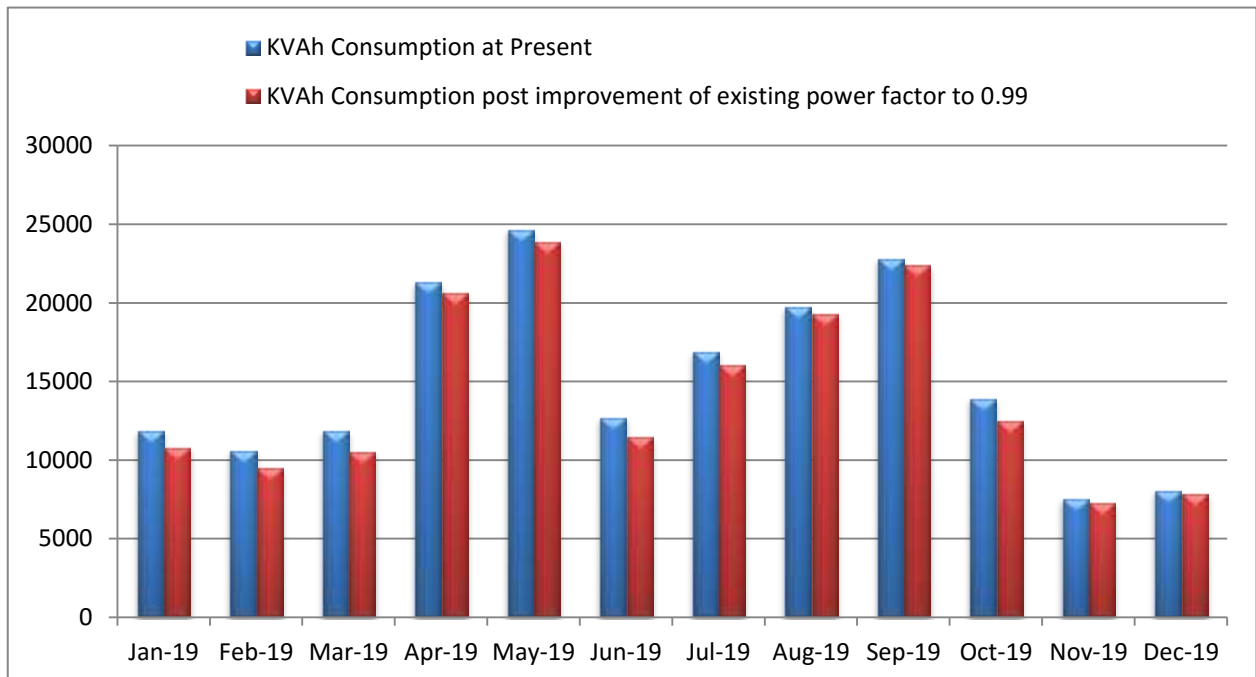
Billing is done on KVAh basis so recommended to maintain the power factor unity. Present Power Factor graphical representation is shown below:



Saving calculation shown below by maintain power from current level to 0.99 (By considering power cost Rs 8.68 per KVA)

Bill Period	KVAh Consumption at Present	Present Power Factor	KVAh Consumption post improvement of existing power factor to 0.99	Net Reduction in KVAh Consumption	Corresponding reduction in Energy Charges (Rs)	Total Monetary Benefit (Rs)
Dec-19	8096	0.97	7894	202	1754	1754
Nov-19	7578	0.96	7342	236	2045	2045
Oct-19	13963	0.89	12535	1428	12392	12392
Sep-19	22825	0.97	22446	379	3286	3286
Aug-19	19779	0.97	19356	423	3675	3675
Jul-19	16900	0.94	16077	823	7146	7146
Jun-19	12737	0.89	11513	1224	10623	10623
May-19	24709	0.96	23913	796	6908	6908
Apr-19	21353	0.96	20668	685	5949	5949
Mar-19	11876	0.88	10574	1302	11304	11304
Feb-19	10624	0.89	9509	1115	9677	9677
Jan-19	11898	0.90	10834	1064	9233	9233
Total	182338		172662			83991

Graphical representation of reduction in KVAh after maintaining the power factor 0.99



Note: Total contribution of law acidity is 33% in total electricity consumption. Saving & investment is also divided in same manner.

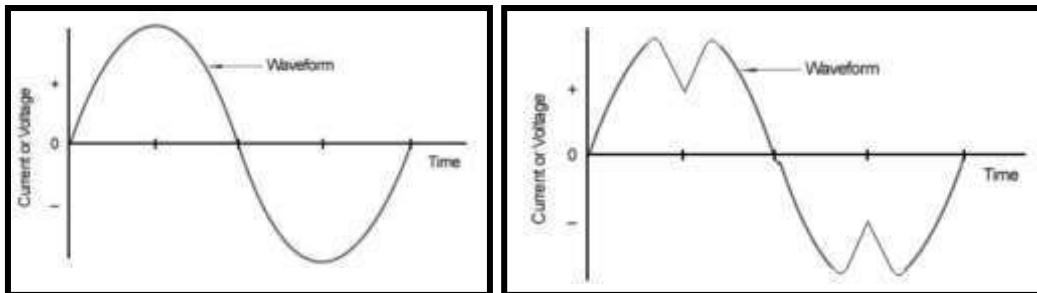
4. Electrical Load Measurement

4 ELECTRICAL LOAD MEASUREMENT

List of equipment installed at IPEM LAW ACADEMY as below tabulated:

INTRODUCTION

Total harmonic distortion (THD) is an important figure of merit used to quantify the level of harmonics in voltage or current waveforms. Power sources act as non-linear loads, drawing a distorted waveform that contains harmonics. These harmonics can cause problems ranging from telephone transmission interference to degradation of conductors and insulating material in motors and transformers. Therefore it is important to gauge the total effect of these harmonics. The summation of all harmonics in a system is known as total harmonic distortion (THD).



Major devices which cause Harmonics are:-

- Computers, UPS
- Transformers operating at saturation levels
- Motors
- TV Sets, Air Conditioners, Washing Machines, Microwave Ovens
- Fax Machines, photocopiers, printers

Voltage Distortion Limits

Bus Voltage at PCC	Individual Voltage Distortion (%)	Total Voltage Distortion THD (%)
69 kV and below	3.0	5.0
69.001 kV through 161 kV	1.5	2.5
161.001 kV and above	1.0	1.5

NOTE: High-voltage systems can have up to 2.0% THD where the cause is an HVDC terminal that will attenuate by the time it is tapped for a user.

**Current Distortion Limits for General Distribution Systems
(120 V Through 69000 V)**

Maximum Harmonic Current Distortion in Percent of I_L						
Individual Harmonic Order (Odd Harmonics)						
I_{sc}/I_L	<11	$11 \leq h < 17$	$17 \leq h < 23$	$23 \leq h < 35$	$35 \leq h$	TDD
<20*	4.0	2.0	1.5	0.6	0.3	5.0
20<50	7.0	3.5	2.5	1.0	0.5	8.0
50<100	10.0	4.5	4.0	1.5	0.7	12.0
100<1000	12.0	5.5	5.0	2.0	1.0	15.0
>1000	15.0	7.0	6.0	2.5	1.4	20.0

Even harmonics are limited to 25% of the odd harmonic limits above.

Current distortions that result in a dc offset, e.g. half-wave converters, are not allowed.

* All power generation equipment is limited to these values of current distortion, regardless of actual I_{sc}/I_L .

Where

- I_{sc} = maximum short-circuit current at PCC.
- I_L = maximum demand load current (fundamental frequency component) at PCC.
- TDD = Total demand distortion (RSS), harmonic current distortion in % of maximum demand load current (15 or 30 min demand).
- PCC = Point of common coupling.

The limits on voltage harmonics are thus set at 5% for THD and 3% for any single harmonic. It is important to note that the suggestions and values given in the IEEE Std. 519 standard are purely voluntary. However, keeping low THD values on a system will further ensure proper operation of equipment and a longer equipment life span.

MAIN INCOMER

During the audit phase we had installed one power analyzer on the main incoMER of IPEM LAW ACADEMY on transformer 630 KVA during on load, for monitoring the loading pattern of the building and collected all the parameters like power, current, voltage, power factor and harmonics. We had collected all the parameters at 0.44kV (LT) Level.

250 KVA TRANSFORMERS:

Parameters	Avg.	Min.	Max.
Frequency	50.04	50.02	50.06
Ampere- R phase	68.35	55.50	87.00
Ampere- Y phase	55.13	45.00	67.00
Ampere- B phase	86.56	72.00	104.0
Ampere- Neutral	27.42	15.30	40.70
Voltage- R phase	411.4	407.0	416.1
Voltage- Y phase	406.8	401.3	411.8
Voltage- B phase	410.9	403.6	416.2
P.F. Total	0.991	0.988	0.993
KW- Total	49.19	44.97	52.18
V THD % R phase	2.351	2.200	2.500
V THD % Y phase	2.604	2.400	2.800
V THD % B phase	2.776	2.600	2.900
I THD % R phase	4.397	3.600	5.400
I THD %Y phase	5.674	4.700	7.400
I THD % B phase	7.728	6.000	9.200
Voltage Unbalance %	0.706	0.600	0.800
Current Unbalance %	24.69	14.00	36.50

Observation:

During power quality analysis it is found that current harmonics is height. It may be due to under load operation of system. It is recommended to monitor the current harmonics on regular basis.

During audit current unbalance also found and recommended to balance the current on each phase.

5. Sound decibel Monitoring

5 Sound db Monitoring

Sound db monitored at IPEM LAW ACADEMY site and details as under.

S NO	Location Name	Sound
1	G Floor Director Room	55
2	Office	54
3	Girls Common Room	52
4	Faculty Room	54
5	Principal Room/General Office	52
6	Class Room -2106	50
7	Class Room -2107	53
8	Class Room -2108	54
9	Low Canteen	55
10	Low Staff Canteen	52
11	1St Floor Class Room - 2201	55
12	1St Floor Class Room - 2202	58
13	1St Floor Class Room - 2203	53
14	1St Floor Class Room - 2204	50
15	1St Floor Class Room - 2205	53
16	1St Floor Class Room - 2206	52
17	1St Floor Class Room - 2207	53
18	1St Floor Class Room - 2208	52
19	Moot Room	53
20	Faculty Room	54
21	2nd Floor Library	55
22	2nd Floor Class Room - 2301	50
23	2nd Floor Class Room - 2302	54
24	2nd Floor Class Room - 2303	51
25	2nd Floor Class Room - 2304	55
26	2nd Floor Class Room - 2305	53
27	2nd Floor Class Room - 2306	52
28	2nd Floor Class Room - 2307	55
29	2nd Floor Class Room -	50

	2308	
30	Faculty Room	54

Recommended sound level as set in CPCB-Environmental Standards- Noise (ambient standards) dB (A)

SCHEDULE

(see rule 3(1) and 4(1))

Ambient Air Quality Standards in respect of Noise

Area Code	Category of Area / Zone	Limits in dB(A) Leq*	
		Day Time	Night Time
(A)	Industrial area	75	70
(B)	Commercial area	65	55
(C)	Residential area	55	45
(D)	Silence Zone	50	40

- Note:-
1. Day time shall mean from 6.00 a.m. to 10.00 p.m.
 2. Night time shall mean from 10.00 p.m. to 6.00 a.m.
 3. Silence zone is an area comprising not less than 100 metres around hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority
 4. Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.

* dB(A) Leq denotes the time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.

6. Lighting/Illumination system

6 LIGHTING SYSTEM

LUMINARY DETAILS

The building management had already changed all the old high energy consuming light with the energy efficient LED lights.

Asset List of Light

Location	UOM	Tube light Qty.	Tube light Capacity (W)	Lamp LED Qty.	Lamp LED Capacity (w)	Ceiling LED Qty.	Ceiling LED Capacity (W)
Ground Floor Director Office	Nos	4	40				
Ground Floor Office	Nos	4	40				
Ground Girls Common Room	Nos	12	40				
Ground Floor Faculty room	Nos	4	40				
Ground Floor Principal Room/General Office	Nos	4	40				
Ground Floor Faculty Room	Nos	4	40				
Ground Floor Class Room 2101	Nos	8	40				
Ground Floor Class Room 2102	Nos	8	40				
Ground Floor Class Room 2103	Nos	8	40				
Ground Floor Class Room 2104	Nos	8	40				
Ground Floor Class Room 2105	Nos	8	40				
Ground Floor Class Room 2106	Nos	8	40				
Ground Floor Class Room 2107	Nos	8	40				
Ground Floor Class Room 2108	Nos	8	40				
Ground Floor Low Canteen	Nos	8	40				
Ground Floor Staff Toilet	Nos	2	40	6	18		
Ground Floor Common Canteen	Nos	4	40	17	9		
1st Floor Class Room 2201	Nos	8	40				
1st Floor Class Room 2202	Nos	8	40				
1st Floor Class Room 2203	Nos	8	40				
1st Floor Class Room 2204	Nos	8	40				
1st Floor Class Room 2205	Nos	8	40				
1st Floor Class Room 2206	Nos	8	40				
1st Floor Class Room 2207	Nos	8	40				
1st Floor Class Room 2208	Nos	8	40				
1st Floor Faculty Room	Nos	9	60				

1st Floor Moot Court	Nos			32	8	10	24
2nd Floor Class Room 2301	Nos	4	40				
2nd Floor Class Room 2302	Nos	4	40				
2nd Floor Class Room 2303	Nos	4	40				
2nd Floor Class Room 2304	Nos	4	40				
2nd Floor Class Room 2305	Nos	4	40				
2nd Floor Class Room 2306	Nos	4	40				
2nd Floor Class Room 2307	Nos	4	40				
2nd Floor Class Room 2308	Nos	4	40				
2nd Floor Library	Nos	11	40				
2nd Floor Faculty Room	Nos	9	40				

We have measured lux area wise for the sample basis.

AREA WISE LUX LEVEL

S NO	Location Name	Lux
1	G Floor Director Room	56
2	Office	248
3	Girls Common Room	50
4	Faculty Room	65
5	Principal Room/General Office	76
6	Class Room -2106	85
7	Class Room -2107	95
8	Class Room -2108	95
9	Low Canteen	120
10	Low Staff Canteen	130
11	1St Floor Class Room - 2201	120
12	1St Floor Class Room - 2202	110
13	1St Floor Class Room - 2203	114
14	1St Floor Class Room - 2204	120
15	1St Floor Class Room - 2205	110
16	1St Floor Class Room - 2206	150
17	1St Floor Class Room - 2207	190
18	1St Floor Class Room - 2208	120
19	Moot Room	130
20	Faculty Room	125
21	2nd Floor Library	125

22	2nd Floor Class Room - 2301	118
23	2nd Floor Class Room - 2302	110
24	2nd Floor Class Room - 2303	115
25	2nd Floor Class Room - 2304	118
26	2nd Floor Class Room - 2305	130
27	2nd Floor Class Room - 2306	118
28	2nd Floor Class Room - 2307	115
29	2nd Floor Class Room - 2308	120
30	Faculty Room	124

OBSERVATIONS

It was observed that the building has opted the Energy efficient lighting system that is LED which was good option to save energy and we personally felt good to observe it and checked whether the lux level we are getting is sufficient or not and was observed that the lux level was good.

It was observed that the lux level in building is within limits.

RECOMMENDATION

LED lights are highly recommended as they are the best in technology available in the illumination market and will provide good amount of energy and monetary savings since major lighting includes halogens which are the most inefficient light in the market. So please go for the Led lights for the areas where it is still remaining to go for 100% LED lightings.

LED's also help in heat load reduction since the heat dissipated by the halogens is much higher than the heat dissipated by LED lights thus intangible savings by reduction in cooling can be easily be achieved. Also we recommend to not using GLS Bulbs as they are inefficient lights and also dissipates heat increase HVAC load.

It is recommended to install photo sensor for all the outdoor light and also in working floor near to the glasses envelope in the building.

It is recommended to install occupancy sensor in Stores/office cabins and toilets to save energy.

It is recommended to install the day light sensor on the outdoor lights for automation and control of the lights and this will also help us reduce the unwanted running hours of the lights.

7. Air Conditioning

7 Air Conditioning

The Building is having the Ceiling fans for air circulation and Air coolers to get comfort and also having window and split AC's for air conditioning.

List of Fan:

Location	UOM	Ceiling Fan (60W) Qty.
Ground Floor Director Office	Nos	2
Ground Floor Office	Nos	3
Ground Girls Common Room	Nos	9
Ground Floor Faculty room	Nos	3
Ground Floor Principal Room/General Office	Nos	2
Ground Floor Faculty Room	Nos	3
Ground Floor Class Room 2101	Nos	8
Ground Floor Class Room 2102	Nos	8
Ground Floor Class Room 2103	Nos	8
Ground Floor Class Room 2104	Nos	8
Ground Floor Class Room 2105	Nos	8
Ground Floor Class Room 2106	Nos	8
Ground Floor Class Room 2107	Nos	8
Ground Floor Class Room 2108	Nos	8
Ground Floor Low Canteen	Nos	6
Ground Floor Common Canteen	Nos	3
1st Floor Class Room 2201	Nos	6
1st Floor Class Room 2202	Nos	6
1st Floor Class Room 2203	Nos	6
1st Floor Class Room 2204	Nos	6
1st Floor Class Room 2205	Nos	6
1st Floor Class Room 2206	Nos	6
1st Floor Class Room 2207	Nos	6
1st Floor Class Room 2208	Nos	6
1st Floor Faculty Room	Nos	6
1st Floor Moot Court	Nos	13
2nd Floor Class Room 2301	Nos	6
2nd Floor Class Room 2302	Nos	6
2nd Floor Class Room 2303	Nos	6
2nd Floor Class Room 2304	Nos	6
2nd Floor Class Room 2305	Nos	6
2nd Floor Class Room 2306	Nos	6

2nd Floor Class Room 2307	Nos	6
2nd Floor Class Room 2308	Nos	6
2nd Floor Library	Nos	10
2nd Floor Faculty Room	Nos	6

List of AC:

Location	UOM	A.C Qty.	A.C. Capacity (TR)	Total Cooling Capacity (TR)
Ground Floor Director Office	Nos	1	1	1
Ground Floor Office	Nos	1	1	1
1st Floor Faculty Room	Nos	1	1.5	1.5
1st Floor Moot Court	Nos	4	1.5	6
2nd Floor Library	Nos	2	1.5	3

We can replace the existing ceiling fans with the energy efficient BLDC fans: Savings should be taken as when the fan is needed to be changed as when they get faulty.

Parameters	Units	Value
Average power consumption of the ceiling fan at present	Watt	60
Average power consumption of energy efficient star rated (BLDC) Fans	Watt	28
Equivalent Power saving per fan	Watt	32
Numbers of fans to be replaced	Nos	226
Working Hours Per annum	Hr	3000
Overall electric Power Cost	Rs/KW H	14.15
Annual Energy Saving	KWH	21696
Monetary saving	Rs/Yea r	30699 8
Investment	Rs	54240 0
Payback	Month	21.20

It is recommended to replace the girls and boys hostel fan with BLDC fan immediately and plan to replace the all fan with BLDC fan.

Note: For future expansion we can use VRF's in place of different Split and window. IEPM can plan to replace ac with VRF with phase manner. A.C's doing so will help us to save energy up to 50% of total consumption with AC.

Variable refrigerant flow

Variable refrigerant flow (VRF), also known as variable refrigerant volume (VRV), is an HVAC technology invented by Daikin Industries, Ltd. in 1982. Like ductless minisplits, VRFs

use refrigerant as the cooling and heating medium. This refrigerant is conditioned by a single outdoor condensing unit, and is circulated within the building to multiple indoor units.

VRFs are typically installed with an Air conditioner inverter which adds a DC inverter to the compressor in order to support variable motor speed and thus variable refrigerant flow rather than simply perform on/off operation. By operating at varying speeds, VRF units work only at the needed

rate allowing for substantial energy savings at load conditions. Heat recovery VRF technology allows individual indoor units to heat or cool as required, while the compressor load benefits from the internal heat recovery. Energy savings of up to 55% are predicted over comparable unitary equipment. This also results in greater control of the building's interior temperature by the building's occupants.

VRFs come in two system formats, two pipe and three pipe systems. In a heat pump two pipe system all of the zones must either be all in cooling or all in heating. Heat Recovery (HR) systems have the ability to simultaneously heat certain zones while cooling others; this is usually done through a three pipe design, with the exception of Mitsubishi and Carrier, whose systems are able to do this with a two pipe system using a branch circuit (BC) controller to the individual indoor evaporator zones. In this case the heat extracted from zones requiring cooling is put to use in the zones requiring heating. This is made possible because the heating unit is functioning as a condenser, providing sub-cooled liquid back into the line that is being used for cooling. While the heat recovery system has a greater initial cost, it allows for better zoned thermal control of a building and overall greater efficiencies. In heat recovery VRF systems, some of the indoor units may be in cooling mode while others are in heating mode, reducing energy consumption. If the coefficient of performance in cooling mode of a system is 3, and the coefficient of performance in heating mode is 4, then heat recovery performance can reach more than 7. While it is unlikely that this balance of cooling and heating demand will happen often throughout the year, energy efficiency can be greatly improved when the scenario occurs.

8 TRANSFORMER & Distribution LOSSES

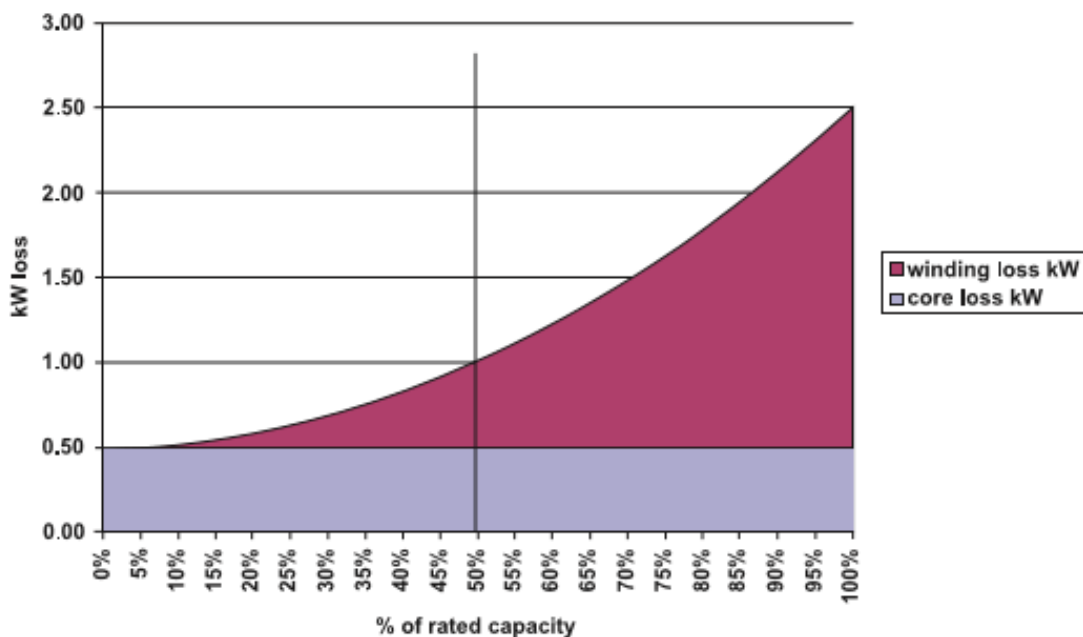
Observation: It is observed that 250 KVA transformer is working at 6 KW load. Average power factor at transformer is 0.69

Recommendation:

Operate the transformer on 50-55% loading to minimize the transformer losses. Replace the 250 KVA transformers with the capacity of 100 KVA.

Saving by Replacement 250 KVA transformer to 100 KVA		
Rated load	KVA	250
Recommended load	KVA	100
Transformer load reduction	KVA	150
No load losses reduction standard	% of rated KVA	0.5
Running Hour	Hr	24
No. of operating days	Days	365
Unit price	Rs.	6.75
NO load Loss reduction	0.5% of rating (KW)	0.75
Annual Energy reduction	KVAH/Yr	6570
Monetary Savings	Rs/year	57027
Investment	Rs	100000
Payback	Month	21

Standard loss in transformer shown in graphical form:



9 AREA OF IMPROVEMENT

Energy Management has become crucial to the competitors of the facility. Rising fuel costs coupled with increased global competition is forcing industries/buildings and other facilities to slash energy costs. It was aimed at obtaining a detailed idea about the various end use energy consumption activities and identifying, enumerating and evaluating the possible energy savings opportunities. However, Energy conservation is a continuous process and there is always scope for further improvements. With this objective the Energy Audit team with the active involvement of office we have identified the following Energy Conservation Opportunities (ECO's). Implementation of the ECO's can further help improve the energy consumption


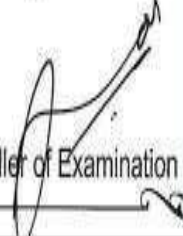
The following energy saving/conservation measures were identified for the plant. Table: List of Energy saving / conservation recommendations

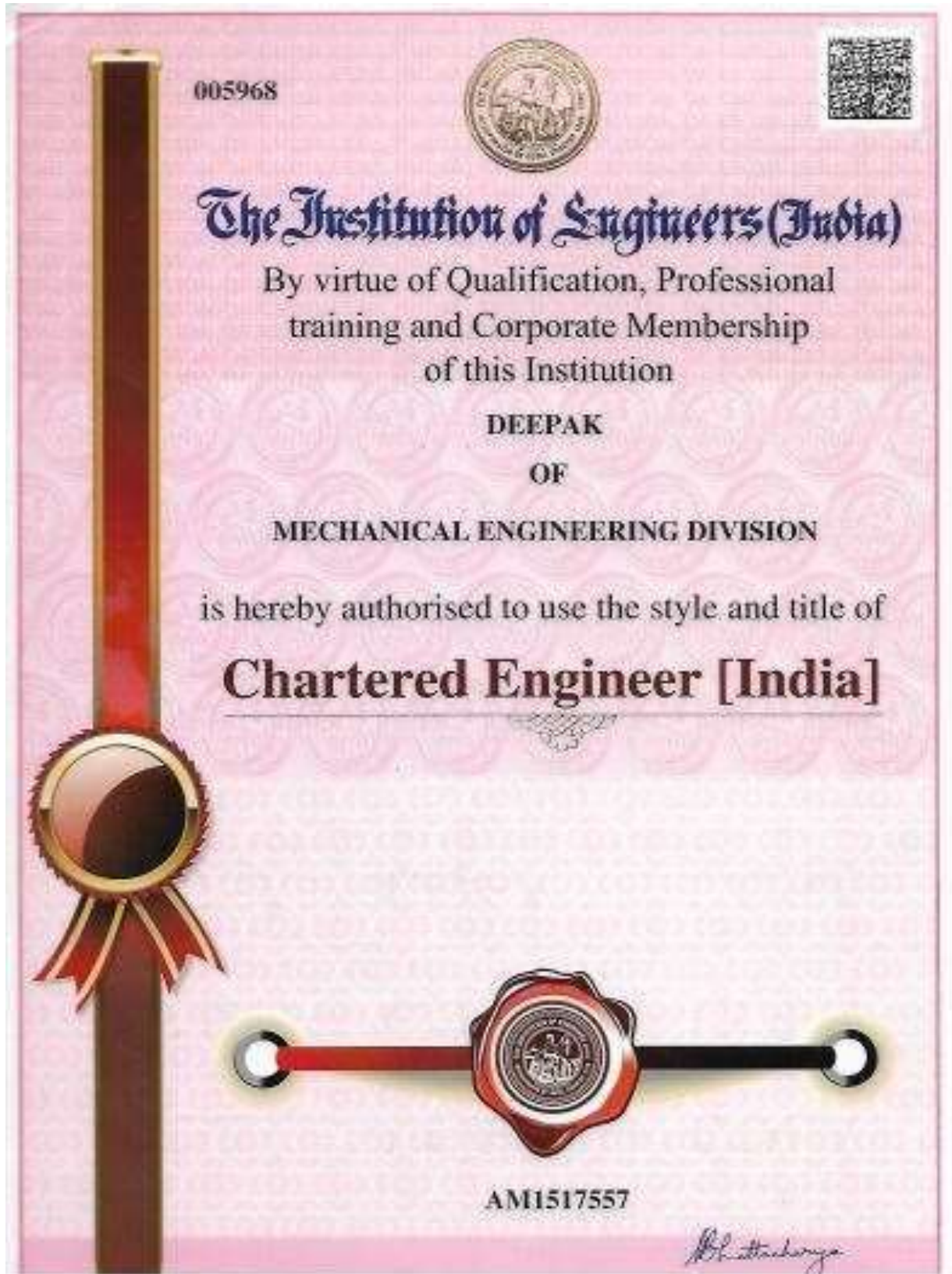
Sr. No.	Recommended Measure
1	Replace the ceiling fan with BLDC fan
2	Maintain the power factor near unity (0.99) to reduce billing KVAh
3	Reduce the contract demand from 140KVA to 70 KVA
4	Replace the transformer from 250KVA to 100 KVA
5	Replace the AC with VRV technology
6	It is recommended to install occupancy sensor in office cabins and toilets to save energy
7	It is recommended to install the day light sensor on the outdoor lights for automation and control of the lights and this will also help us reduce the unwanted running hours of the lights
	Current is found unbalanced at site, it require to balance and maintain to within 10%
	Current harmonics is above as per industrial average it required to install the harmonics filter

Some Energy Saving measure already taken by Institute as listed below:

- The institute has a very clear environmental vision and trying to reduce the energy
- The institute has planted a lot of trees and has maintained very good greenery.
- The institute generates more than 48 percent of energy through solar power plant for its domestic needs.
- The solar power plant is on grid which supplies the excess electricity generated in the grid during no or less load condition.
- It was observed that the building has opted the Energy efficient lighting system that is LED which was good option to save energy and we personally felt good to observe it.
- Most of the building have sufficient day light which saves the energy in the institutes.

10 Energy Auditor Certificates

Regn No. EA-19771	 National Productivity Council	Certificate No. 8890
National Productivity Council (National Certifying Agency) <u>PROVISIONAL CERTIFICATE</u>		
<p><i>This is to certify that Mr./Mrs./Ms.Deepak.....</i></p> <p><i>son / daughter of Mr.Vineet Kumar.....</i></p> <p><i>has passed the National certification Examination for Energy Auditors held in September - 2016, conducted on behalf of the Bureau of Energy Efficiency, Ministry of Power, Government of India.</i></p> <p><i>He / She is qualified as Certified Energy Manager as well as Certified Energy Auditor.</i></p> <p><i>He / She shall be entitled to practice as Energy Auditor under the Energy Conservation Act 2001, subject to the fulfillment of qualifications for the Accredited Energy Auditor and issue of certificate of Accreditation by the Bureau of Energy Efficiency under the said Act.</i></p> <p><i>This certificate is valid till the issuance of an official certificate by the Bureau of Energy Efficiency.</i></p>		
Place : Chennai, India		
Date : 10 th March, 2017		Controller of Examination



THANKS

