ENVIRONEMENT AUDIT REPORT

Auditing conducted on <u>15-11-2024</u>

PKM Educational Trust®

R. R. College of Pharmacy

Affiliated to RGUHS and Approved by AICTE, New Delhi ,Recognised by Govt. of Karnataka

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ENVIRONEMENT AUDIT REPORT

C O N T E N T S

1. ACKNOWLEDGEMENT

Green Audit Team thanks the management of R R College of Pharmacy for assigning this important work of Green Audit (Environmental Audit). We appreciate the co-operation to our team for completion of study. Our special thanks are due to: ♣ Principal of the college – Dr V B Narayanaswamy ♣–Dr. S D Vachala QAC Director ♣ Green Audit coordinator, Teaching & Supporting Staff of RRCP For giving us necessary inputs to carry out this very vital exercise of Green Audit (Environment Audit). We are also thankful to other staff members who were actively involved while collecting the data and conducting field measurements.

Audit Participants

From Institution- Green Club members	
Name	Position / Department
Dr. Narayanaswamy V B	Principal, RRCP
Mr. Siddarth. B	Administrator, RRCP
Dr. Vachala S D	Director- Quality Assurance Cell
Mrs. Poornima A N	Assistant Professor, Department of Pharma chemistry, RRCP
Ms. Nayana P Kunderi	Assistant Professor, Department of Pharmacy Practice, RRCP

Auditor

Name	Details
Mr. Ranganathan B A	Lead Auditor EMS and OSHA

2. DISCLAIMER

Green Audit/Environment Audit Team has prepared this report for R R College of pharmacy based on input data submitted by the representatives of College complemented with the best judgment capacity of the expert team. It is further informed that the conclusions are arrived following best estimates and no representation, warranty or undertaking, express or implied is made and no responsibility is accepted by Audit Team in this report or for any direct or consequential loss arising from any use of the information, statements or forecasts in the report. If you wish to distribute copies of this report external to your organisation, then all pages must be include, its staff and agents shall keep confidential all information relating to your organisation and shall not disclose any such information to any third party, except that in the public domain or required by law or relevant accreditation bodies.

Report by: (B.A.Ranganathan)

Lead Auditor

Ranganathan B A
EMS Auditor/Lead Auditor
Reg. No: EA/92/IN/5004

3. CONTEXT

We are committed as a component of Corporate Social Responsibility of the Higher Edifying Institutions to ascertain that they contribute towards the minimization of ecumenical warming through Carbon Footprint abbreviation measures. R R College of Pharmacy decided to conduct an external Green Evaluation by a competent Green Auditor along with a Green Audit Assessment Team headed by Dr. Narayanaswamy V B, Principal, R R College of Pharmacy , Bengalure. Green Audit or Environment Audit focuses on the Green Campus, Waste Management, Water Management, Air Pollution and etc. being implemented by the College Management. The concept, structure, objectives, methodology, tools of analysis, objectives of the audit are mentioned below

4. CONCEPT

The term 'Environmental audit' or 'Green audit' means differently to different people. Terms like 'assessment', 'survey' and 'review' are also used to describe similar activities. Furthermore, some organizations/Institutions believe that an 'environmental audit' addresses only environmental matters, whereas others use the term to mean an audit of health, safety and environment-related matters. Although there is no universal definition of Green Audit, many leading companies/institutions follow the basic philosophy and approach summarized by the broad definition adopted by the International Chambers of Commerce (ICC) in its publication of Environmental Auditing (1989). The ICC defines Environmental Auditing as: "A management tool comprising a systematic, documented, periodic and objective evaluation of how well environmental organization, management and equipment are performing with the aim of safeguarding the environment and natural resources in its operations/projects." The outcome of Green Audit should be established with concrete evidence that the measures undertaken and facilities in the institution under green auditing.

5. INTRODUCTION

A Nation's growth starts from its educational institutions, where the ecology is thought as a prime factor of development associated with environment. Educational institutions now days are becoming more sensitive to environmental factors and more concepts are being introduced to

make them eco-friendly. To preserve the environment within the campus, various viewpoints are applied by the several educational institutes to solve their environmental problems such as promotion of the energy savings, recycle of waste, water reduction, water harvesting etc. The activities pursued by colleges can also create a variety of adverse environmental impacts. Green audit is defined as an official examination of the effects a college has on the environment. As a part of such practice, internal environmental audit (Green Audit) is conducted to evaluate the actual scenario at the campus. Green 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. Green auditing and the implementation of mitigation measures is a win-win situation for all the college, the learners and the planet. It can also create health consciousness and promote environmental awareness, values and ethics. It provides staff and students better understanding of Green impact on campus. Green auditing promote financial savings through reduction of resource use. It gives an opportunity for the development of ownership, personal and social responsibility for the students and teachers. 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. A clean and healthy environment aids effective learning and provides a conducive learning environment. There are various efforts around the world to address environmental education issues.

Environmental Management Systems (EMS) is very popular in the industrial sector, but the general belief is that EMS is something pertaining to industries only. Other parts of the world have started adopting compatible environmental management systems either voluntarily or for promoting standards by external certification. International environmental standards do not suit the existing Indian educational system. Hence, a compatible system by developing locally-applicable techniques. A very simple indigenized system has been devised to monitor the environmental performance of educational institutions. It comes with a series of questions to be answered on a regular basis. Environmental conditions may be monitored from angles that are relevant to Indian requirements, without stress on legal issues or compliance. This innovative scheme is user-friendly and totally voluntary. The environmental monitoring system helps the

institution to set environmental examples for the community and to educate young learners. It can be adapted to urban and / or rural situations.

6. ENVIRONMENTAL AUDIT

A clean and healthy environment aids effective learning and provides a conducive learning environment. There are various efforts around the world to address environmental education issues.

Environmental Management Systems are very popular in the 'Industrial sector', but the general opinion is that EMS is 'something pertaining to industries'. In other parts of the world, they have started adopting compatible environmental management systems either voluntarily or for promoting standards by external certification.

R R College of Pharmacy Environmental Education Centre has devised a very simple and indigenous system for monitoring the environmental performance of college. It comes with a series of questions to be answered. Environmental conditions may be monitored from many angles that are very close to Indian requirements, without stress on legal issues or compliance. This innovative scheme for college is user friendly and totally voluntary. The environmental monitoring system helps the college to set environmental examples for the community and to educate young learners. This is the Green College Initiative (GCI).

7. ABOUT R.R. COLLEGE OF PHARMACY

R R College of Pharmacy, was established with a mission of imparting education to all sections of the society, was established in the year 2005 to render highest standards of academic achievement with moral and social commitments. Converting the idea of providing high quality education combined with excellent infrastructure into a reality in Indian context. R R college of pharmacy have proved the capability of placing students after completing their course in prestigious organizations and industries across the country and abroad. Generating a synergistic relationship with the industry with a long term view where the college and the industry could have a mutual beneficial relationship, it aims a rigorous, relevant and rewarding education with a special emphasis on practical and technical inputs

8. BENEFITS OF THE ENVIRONMENT -AUDITING SYSTEM:

- Environmental Education through systematic environmental management approach
- Improving environmental standards of institute
- Benchmarking for environmental protection / initiatives
- Reduction in resource use
- Financial savings through a reduction in resource use
- Curriculum enrichment through practical experiences
- Development of ownership; personal and social responsibilities for the school and its environment
- Involvement with other projects
- Enhancement of school profile
- Encouraging sharing of ideas and knowledge between schools
- Promoting links and support to other schemes

9. THE AREAS OF EMS AUDITING TO BE FOLLOWED.

- Waste Minimisation and Recycling
- Green Cover / Plants
- Energy Conservation
- Water Conservation

10. ENVIRONMENTAL AUDIT - QUESTIONARE

1. What is the total permanent population of the Institute?

   60 Staffs and 750 students- Approximately

2. Where is the campus located?

   Chikkabanavara, Bengaluru

3. Which of the following are available in your institute**?**

Garden area	Available
Playground	Available
Kitchen	Available (in hostels)
Toilets	Available
Garbage or Waste Store Yard	Available
Laboratory	Available

Canteen	Available
Hostel Facility (numbers)	300
Guest House	Not Available

4. Which of the following are found near your institute?

Municipal dump yard	Not in vicinity of institute
Garbage heap	Not in vicinity of institute
Public convenience	Yes
Sewer line	Yes
Stagnant water	No
Open drainage	Yes
College – (Mention the type)	Pharmacy/ Health sciences
Bus / Railway station	Close to college
Public halls	1KM

11. WASTE MINIMIZATION AND RECYCLING

Does your institute generate any waste? If so, what are they?	Yes, Solid waste, Canteen waste, paper waste, plastic waste, toiletry waste, Horticulture Waste, etc.
What is the approximate amount of waste generated per day? (in Kilograms/month) (approx.)	Bio –Degradable --- 20Kg Non-Biodegradable – 1Kg
Do you use both side of the paper in institute?	yes
Do you use reused paper in institute?	yes
How would you spread the message of recycling to others in the community	Awareness program by NSS

12. GREENING THE CAMPUS

Is there a garden in your institute?	Yes
Total number of Plants in Campus	Approximately 200 numbers
Suggest plants for your campus. (Trees, Vegetables, herbs, etc.)	Amla, Silver Oak, Tulsi, Neem, Sankupushpi, Pudina, Henna, spinach,

	Turmeric, Insulin plant, etc.
Number of Staff working for garden	02
Plant Ownership Program	NO

13. ENERGY CONSERVATION

List few 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 is saved by use of LED bulbs for Illumination Main source of energy i.e. Solar Panel Installed
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 Messages will be displayed at various locations to give awareness to the People about Energy Savings. Use of Natural Lights and Natural Ventilation are promoted
How many CFL/LED bulbs has your institute Installed?	**85** % of Total Conventional bulbs are replaced by LED Lights.
Are your computers and other equipment's put on power-saving mode?	Yes, In Practice
Does your machinery (TV, AC, Computer, weighing balance, printers, etc.) run on standby modes most of the time? If yes, how many hours?	2 hours

14. WATER CONSERVATION

List uses of water in your institute	Basic usages of water in campus are. Drinking, Gardening, Toilets and Others. And total consumption is 90 KL/month
How does your institute store water? Are there any water saving techniques followed. in your institute?	Underground Water tank installed for storage of water. To avoid overflow of water-controlled valves are provided in water supply system
If there is water wastage, specify why and How can the wastage be prevented /? stopped?	No
Write down few ways that could reduce the amount of water used in your institute	By Following ways: 1. RWH, Close the taps after usage. 2. Push cock are used in all common bathroom.

	3. Maintenance and monitoring of valves in supply system to avoid. overflow, leakage and spillage 4. Water Conservation awareness for new students
Does your institute harvest rainwater?	Yes
Does your institute use recycled water	Yes

15. CLEAN AIR

Are the Rooms in Campus are well Ventilated**?**	Yes
Window Floor ratio of the Rooms	25%
Provide details of College l- owned. motorized vehicles?	Buses --2 Cars -2 Total -4

16. ENVIRONMENTAL LEGISLATIVE COMPLIANCE

Are you aware of any environmental Laws, pertaining to different aspects of environmental management?	yes
Does your institute have any rules to protect the environment?	yes
Does Environmental Ambient Air Quality Monitoring conducted by the Institute?	No
Does Water and Wastewater Quality monitoring conducted by the Institute?	No
Does any Hazardous waste generated by the Institute?	No
Does any Bio medical waste generated by the Institute? If yes explain its category and disposal method	No

17. GENERAL PRACTICES

Are you aware of any environmental Laws, pertaining to different aspects of environmental management?	Yes
Does housekeeping schedule in your campus?	Yes
Does Important Days Like World	Yes

Environment Day, Earth Day, and Ozone Day etc. eminent in Campus?	
Does Institute has any Recognition/ certification for environment friendliness?	No
Does Institute use renewable energy?	Yes
Does Institution conduct a Green / environmental audit of its campus?	Yes
Has the institution been audited / accredited? by any other agency such as NABL, NABET, TQPM, NAAC etc.?	No

18. BEST PRACTICES FOR ENVIRONMENT

A	Renewable Energy Solar panel installed at RR college of pharmacy. A clean source of energy is utilized at campus. Efforts towards Carbon Neutrality The capacity of 300 KW Solar plant on building roofs is commissioned and will be operational in a month that will supply approx. 70% of total power in campus	 ROOF TOP SOLAR SYSTEM 300 KW
B	Biodiversity Conservation Flora and fauna conservation	RRCP have lush green campus which provides habitat to various specie of bird like Indian peafowl, paraqueets, Sunbird, black kite, house crow, , wood pecker, honey bee, common tailor bird, , Green bee eater, brown headed green barbet, Brahmini Starling, Paro cistatus, Indian Robin.
C	Tree Plantation Drives Drives Annually as well as Every Guest is honored by Tree Plantation at Campus	Yes, periodically the plantation drives by students and staff of campus
D	Ground Water Recharge	By Rain Water Harvesting System
E	e-Waste Management	e-waste is sent to the authorized recyclers for adequate disposal
F	Solid Waste Management	Lifting of garbage from campus on

		alternate day
G	Adoption of Village/society	No

19. RECOMMENDATION:

*Environmental Audit of Institution may be conducted in every two years

*Reduction in use of paper work by go digital system

20. CO N C L U S IO N

This audit involved extensive consultation with all the campus team, interactions with key personnel on wide range of issues related to Environmental aspects. The R R College of pharmacy has Environmental Committee for sustainable use of resources. Overall 60% of college campus is for landscaping. The audit team opines that the overall site is maintained well from environmental perspective. There are no major observations.

Auditor's signature

Ranganathan B A
EMS Auditor/Lead Auditor
Reg. No: EA/02/IN/5004

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 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

♣ Internal Records of the Campus

22. KEY ACTIVITIES OF THE NATIONAL SERVICE SCHEME

1. Plantation by Principal
2. Tree Plantation- 05/06/2024

23. PHOTOGRAPHS OF THE NATIONAL SERVICE SCHEME

VAGMINE POWER

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ENERGY AUDIT

REPORT FOR ACADEMIC YEAR 2023-24

Auditing conducted on 20-11-2024

Audit conducted by T.S MOHAN KUMAR

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ACKNOWLEDGEMENT

An energy audit is a study of a plant or facility to determine how and where energy is used. It plays a critical role in knowing the present efficiency level of various systems and components, by establishing the areas of shortfall for improvements and identifies the potential for energy savings.
This report is just one step, a mere mile marker towards our destination of achieving energy efficiency and we would like to emphasise that an energy audit is a continuous process. We have compiled a list of possible actions to conserve and efficiently utilize our scarce resources and identified their savings potential. The next step would be to prioritize their implementation. We look forward with optimism that the institute authorities, staff and students shall ensure the maximum execution of the recommendations and the success of this work. Any suggestions to further enhance the quality of this work are always welcome.

We are very much thankful to the Hon. Principal Dr.NARAYANASWAMY V.B. of R.R College of Pharmacy for having given us an opportunity to conduct Energy Audit of various facilities inside the college campus. We are also thankful to Respected HOD's, Lecturers & Office staff and Prof B.A Ranganathan HOD Civil Dept RRIT. and others who had provided valuable contribution by supporting us during campus round for data collection , network study and physical measurements of Electrical parameters for accomplishing successful Audit.

This report is made with sincere effort that gives the details of reluctant data collected during the audit study, observation, analysis and recommendations made pertaining to different facilities in the campus. The measures to save energy and Energy cost having been identified in course of study, when implemented are expected to give long term benefits in both energy and cost savings to the management.

We are pleased to submit this detailed Energy audit report to Hon. Principal Dr. Narayanaswamy V.B. representing the management of R.R college of Pharmacy. We wish him success for implementation of identified Energy conservation measures and recommendations after sincere study and observation.

M/s Vagmine Powers express its willingness to extend all the required technical supports to the management in implementing proposals to achieve the benefits.

For VAGMINE POWERS

(MOHAN KUMAR T.S)
ENERGY AUDITOR
Reg. No. - 3962

1. INTRODUCTION

Energy is a Prime mover of Economic growth and is vital to the sustenance of modern economy. The Energy efficiency has assumed a critical role in our pursuit of sustainable development. The furfure economic growth crucially depends on long term availability of energy from the source's that are affordable. The Energy efficiency and its conservation is one of the most cost- effec t i ve measures' to bridge the gap between Demand and Supply.One unit of energy saved is equivalent to two units of energy generated. Hence it is vital importance to conserve the energy by identifying and implementing with improved energy efficient measures.

The energy audit helps in identifying the areas where energy conservation can be made without affecting the comfort and quality levels. It also helps in achieving cost optimization, Pollution control, and safety aspects. It suggests methods to improve the operating and maintenance practices and efficiency of the system.

The Govt of India has enacted energy conservation Act 2001 to provide legal frame work and institutional arrangements for enhancing the energy efficiency. The act empowers Central and State Govt. to facilitate and enforce Energy and its conservation, notify the Energy intensive Industries, Establishments and Commercial buildings as designated consumers and prescribe Energy consumption norms and standards for designated consumers.

2. PREFACE

The objective of this Energy audit is to compile a list of possible actions to conserve and efficiently utilize the resources and identify the savings potential. The further step is to priorities the implementation of the recommendations based on its investment and payback period of the recommendations and approval of the project by the management.

3. OBJECTIVE OF ENERGY AUDIT.

- To acquire and analyze Data and finding the energy consumption pattern of the Facilities.
- Documentation of results & generating vital information through the activities.
- To calculate the wastage pattern based on the results of the first objective.
- Estimation of implementation costs and pay back periods for each recommendation.
- To recommend and implement the measures that is acceptable and feasible
- Identification of possible use of, renewable energy resources like Solar Power.

3.1. Electrical System Facility Description

The Campus of R.R. College of Pharmacy is Located in Chikkabanavara at Bangalore, consists of majorly 7 Blocks. It has installed capacities of the Electrical Installation with 200 KVA from the Grid and 160 KWp from Roof Top Solar power system to feed the Power for all the Blocks. The contingency plan for the power system and the Server is through the stand by D.G set and UPS system. Therefore it is very important to survey the campus at the first step of Energy auditing. The authenticity of observation and recommendations made in this Energy audit depends on correctness of the information gathered through the Survey.

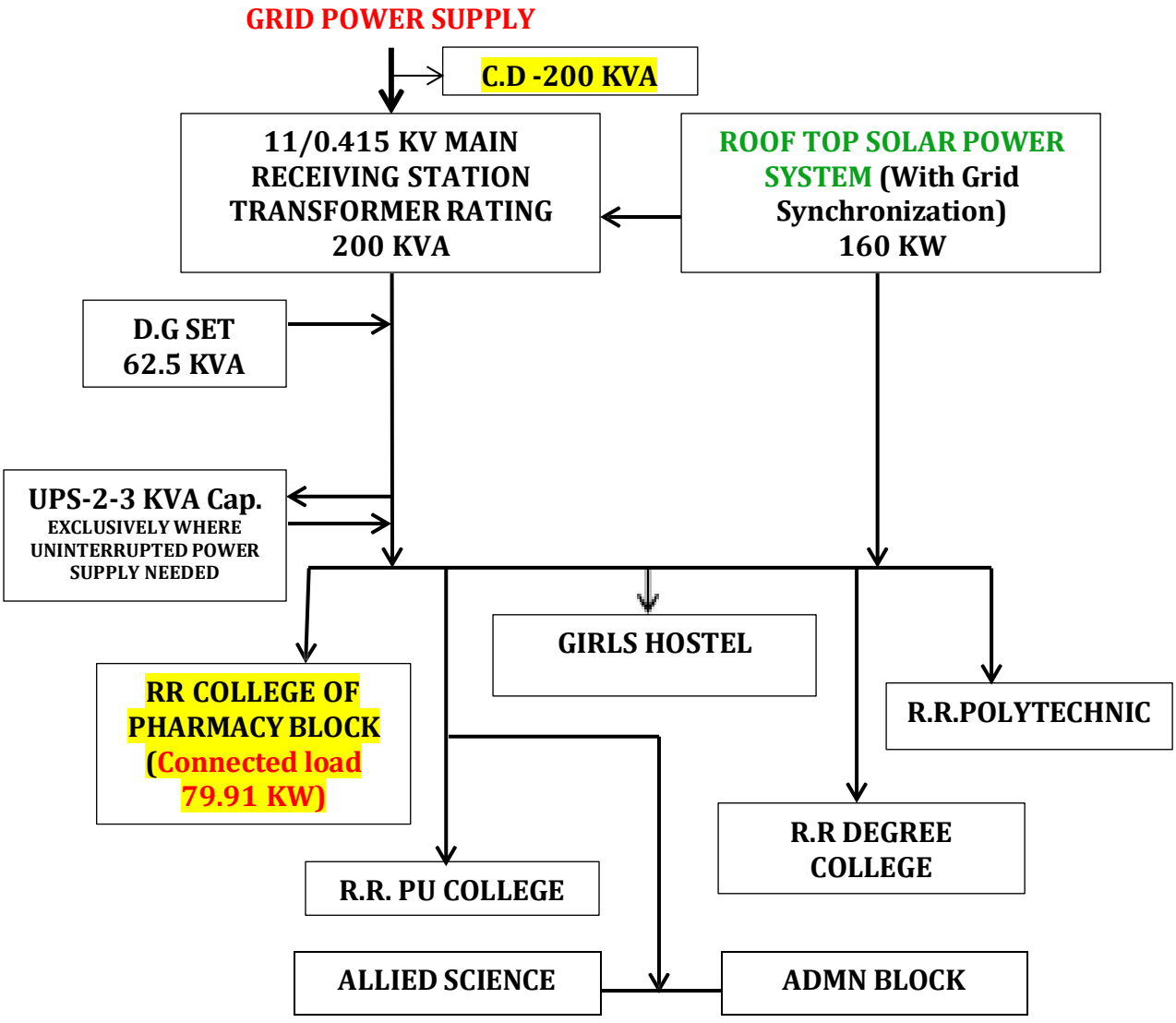
TRANSFORMER RATING 200 KVA

ROOF TOP SOLAR SYSTEM 160 KWp

D.G SET 62.5 KVA

UPS SYSTEM

3.2. Block Diagram of Power Distribution R.R College of Pharmacy



4. ENERGY AUDIT

4.1 Need for an Energy Audit

The implementation of Energy Efficiency measures in an Institution like RR College of Pharmacy may result to benefits at three distinct levels: -

- **Financial benefits:** contribute to a Reduction in operating costs of the institution. These must be assessed against the cost of implementation of the Energy saving measures
- **Operational benefits**
- This assists the management of the institution to improve the safety, comfort, and Productivity of the staff orotherwise, improve its general operation
- **Environmental benefits**; these concern mainly the reduction of CO2 or and "greenhouse gasses" emissions, reduction of Energy demand and the conservation of natural resources to the next Generation.

Each of the said benefits is likely to be realised progressively and to have a cumulative effect. The principal benefits may become available immediately from no-cost measures, or could involve small investment with some period before a return on investment is achieved. Others may only be realised with long-term plans.

We can also say that, the energy audit is the translation of conservation ideas into reality, by lending technically feasible solutions with economic and other organizational considerations within a specified time frame. The primary objective of the energy audit is to determine the ways to reduce energy consumption per unit of product output or to lower operating costs. The audit provides a benchmark, or reference point, for managing and accessing energy use across the organisation and provides the basis for ensuring more effective use of energy.

4.2 Energy sources

The Energy Resources in the campus of R.R College of Pharmacy is distributed mainly to 7 Buildings that presently consists of Lighting, Fans, A/c Units, heating loads, computer Labs, machines labs, Drinking water & Sewerage water Treatment Pump sets etc. The power supply to the campus is drawn from BESCOM with the supply voltage source at 11 KV level and in house Roof Top Solar Power Generation system. The contingency plan for the above is Diesel Generator and small UPS systems.

LABORATORY FACILITY

LIBRARY READING ROOM

PHARMACY LIBRARY

4.3 Energy audit methodology

The methodology adopted for this audit was

- Use Visual inspection and data collection
- Observations on the general condition of the facility and equipment and Quantification.
- Identification / verification of energy consumption and other parameters by measurements.
- Detailed calculations, analyses and assumptions
- Validation
- Potential Energy saving Opportunities
- Implementation.

5. Quantification by End Use.

The loads were segregated based on the end use as Lighting, fans, Computers, Printer, Lab Equipment's, water pumping etc. The Quantification, types and necessary measurements were carried out. The details are given below.

5.1 Important Points While Collecting the Load Data

a) Usage

- The usage of the equipment's is calculated in terms of No of hours / day, No days /year that is collected from the Institution staff.
- It is important to ensure the accuracy of this data because much of the potential for energy savings lies on wise allocation of the equipment's operating hours.

b) Actual power consumed - Actual power consumption is measured from the Voltmeter, Ammeter and wattmeter & Watt-hour instruments.

c) Supplementary Information - Some other supplementary information are also collected such as state of insulation in case of AC's or availability of natural light etc.

d) Identification of Target Areas

Opportunities for energy savings can range from zero investments to medium and high investments i.e creating awareness to switch off lights during the day time, to the measure such as solar water heater plants etc. After the preliminary identification of opportunities, more time should be spent on those which have shorter payback periods.

e) Cost Benefit Analysis

The Identified Energy Conservation opportunities should be analysed in terms of costs of implementing the project versus benefits that can be gained.

f) Action Plan to Set Implementation Priority

After completing the approval procedures form the management, an action plan should be developed to ensure that the opportunities identified are implemented.

The action plan should include all the major steps for implementing the measures to train the people responsible. Furthermore, there should be a plan for monitor the results.

5.2 Power Consumption Profile from January to October - 2024

5.3

Month wise Electricity Consumption of the Institution was studied from the energy bills collected for the past Ten months. It gives the trend of several important parameters like Contract demand, Maximum demand recorded, Power factor, Energy consumption on Grid power and Roof top solar power (through Import and Export of Energy) and Self Generation through DG set, consumed by the institution for the period in particular months. The analysis and the summary of the same are displayed in the table. The Graphical charts were shown for better understanding of

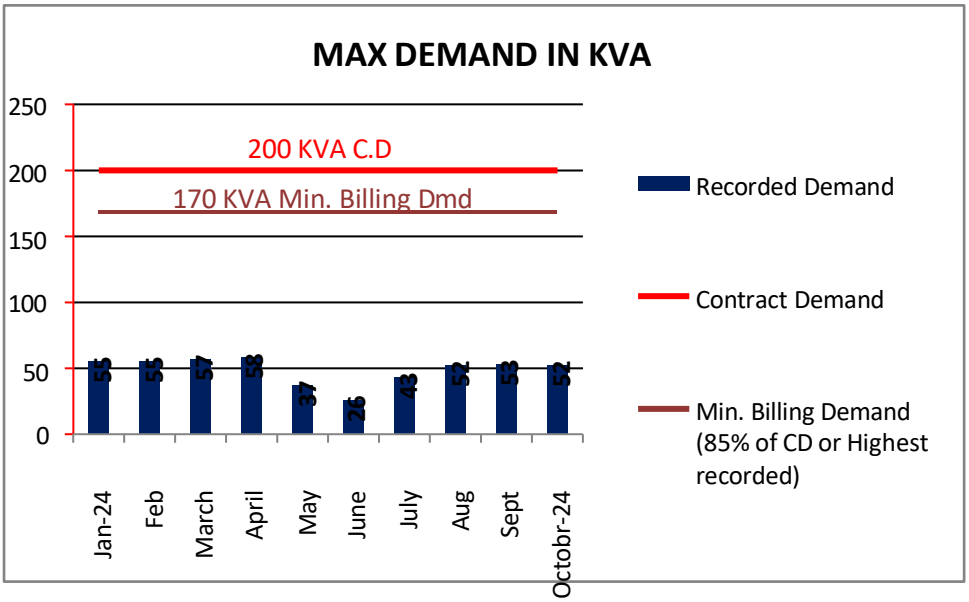
the recorded values.

5.4 GRID POWER

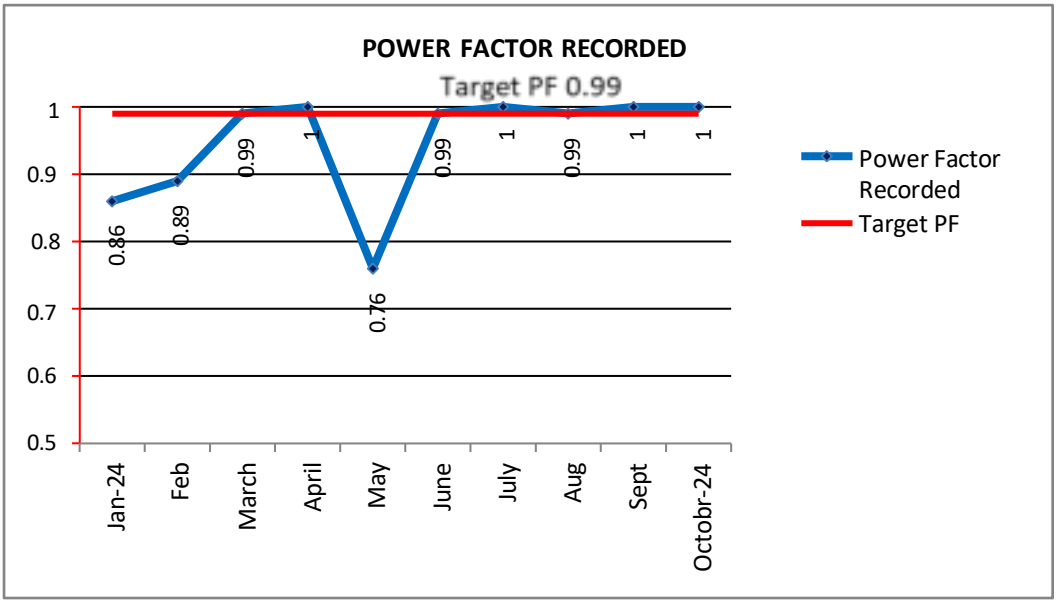
a) Maxm. Demand & Power Factor Details (from Energy Bills) JAN - OCT-24

RECORDED MAXM. DEMAND (in KVA) & POWER FACTOR				
Billing month	Contract Demand	Min. Billing Demand (85% of CD or Highest recorded)	Recorded Demand	Power Factor Recorded(lag)
Jan-24	200	170	55	0.86
Feb	200	170	55	0.89
March	200	170	57	0.99
April	200	170	58	1
May	200	170	37	0.76
June	200	170	26	0.99
July	200	170	43	1
Aug	200	170	52	0.99
Sept	200	170	53	1
Octobr-24	200	170	52	1

b) Graph -Contract Demand vs Actual Demand Recorded JAN - OCT-24



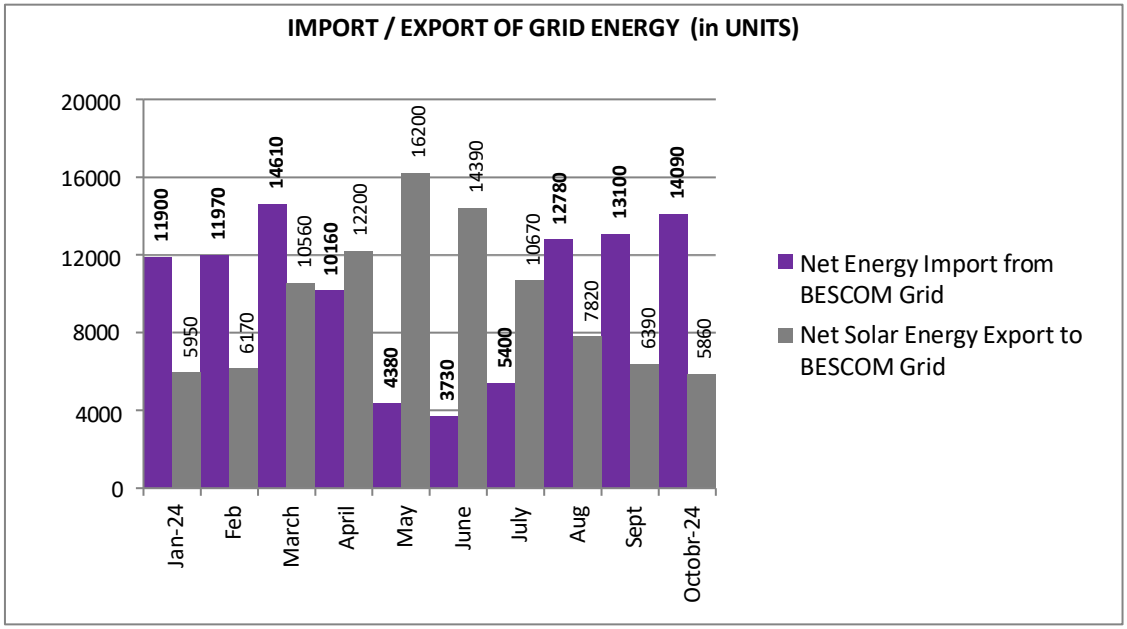
c) Graph – Target Vs Recorded Power Factor JAN – OCT-24



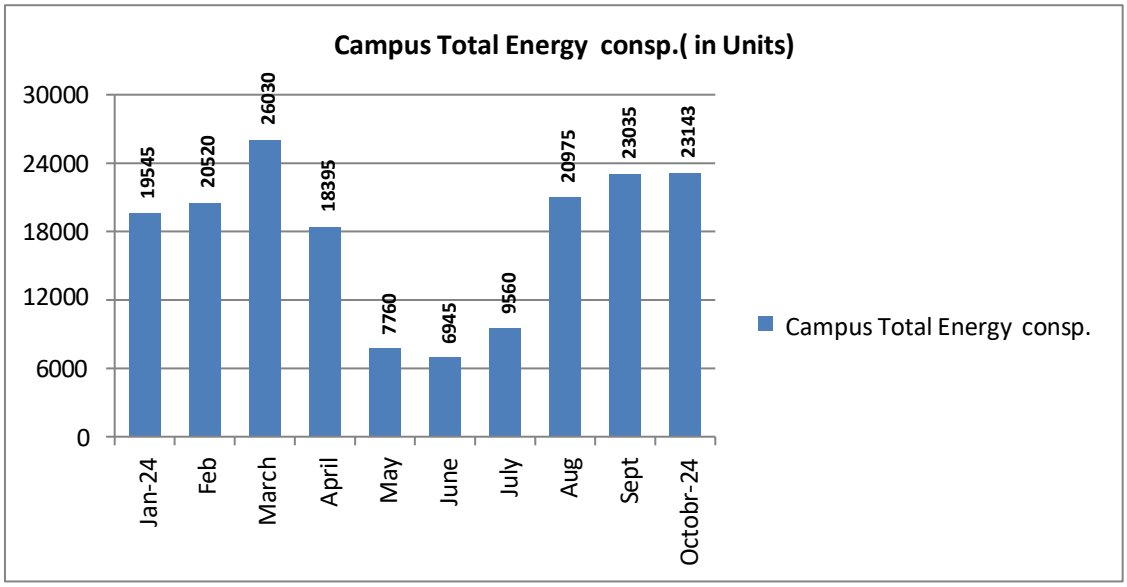
d) Month wise Energy Consumption (Energy Bills) JAN - OCT-24

GRID & SOLAR POWER – IMPORT & EXPORT OF ENERGY (in UNITS)						
Billing month	**Energy Import from BESCOM Grid**	**Solar Energy Export to BESCOM Grid**	**Net Billing Energy Consp. on BESCOM Grid**	**Tot. Solar Power Generation**	**Solar Direct Utilisation (by Instn.)**	**Campus Total Energy consp.**
Jan-24	11900	5950	5950	13595	7645	19545
Feb	11970	6170	5800	14720	8550	20520
March	14610	10560	4050	21980	11420	26030
April	10160	12200	0	20435	8235	18395
May	4380	16200	0	19580	3380	7760
June	3730	14390	0	17605	3215	6945
July	5400	10670	0	14830	4160	9560
Aug	12780	7820	4960	16015	8195	20975
Sept	13100	6390	6710	16325	9935	23035
Oct-24	14090	5860	8230	14913	9053	23143

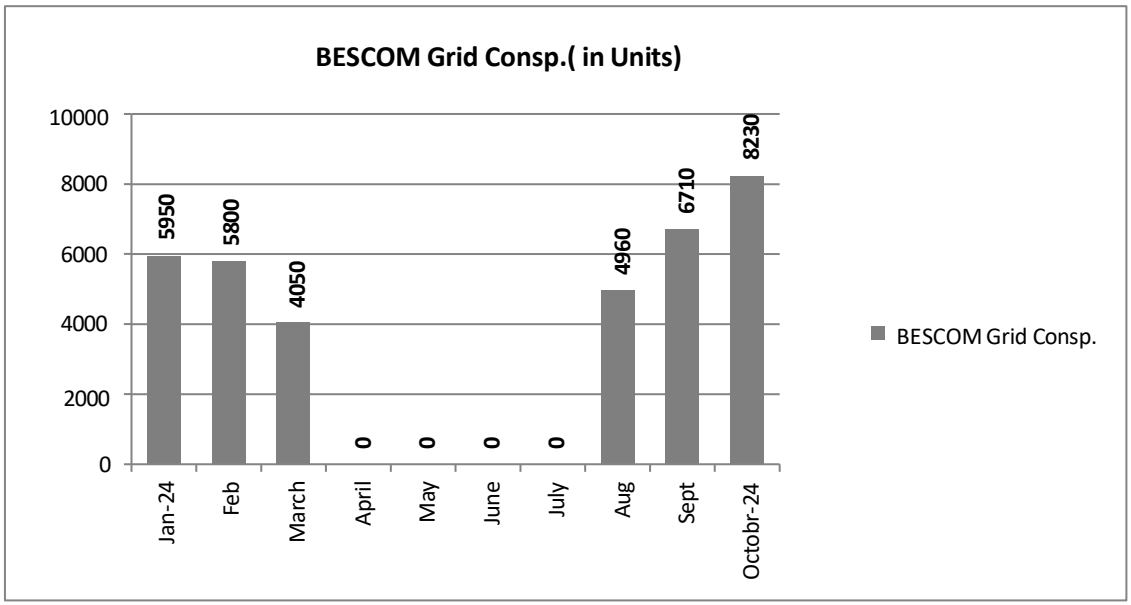
e) Graph – Month wise Import / Export of Grid Energy JAN - OCT-24



f) Graph- Month wise Total Campus Energy Consp. Jan- oct 24



g) . Graph - Grid Energy consumption Jan to Oct-24



Highest Recordings during Jan to Oct 24:

Maximum demand recorded: - 58 KVA – January 2024
Maximum Energy Recorded: - 26030 Units – March 2024

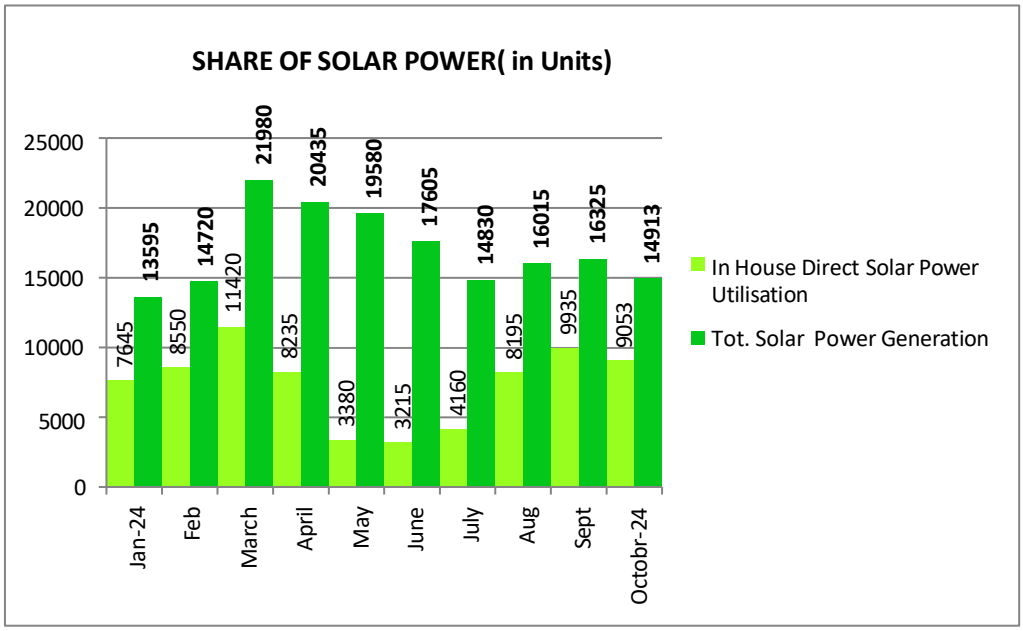
Best and Lowest P.F. Recorded
Best PF: - 1.0 – April, July, Sept, Oct-24
Lowest PF- 0.76 Lag - during May 24

5.5 SOLAR POWER

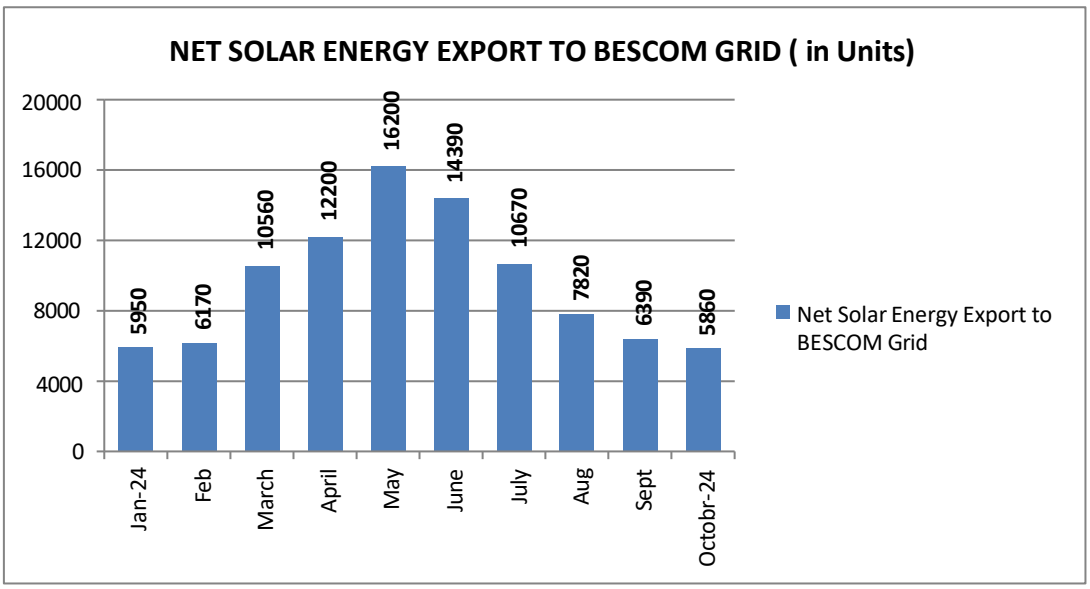
a) Share of Solar Power Jan- Oct -24

Month	In House Direct Utilisation of Solar Power	Tot. Solar Power Generation
Jan-24	7645	13595
Feb	8550	14720
March	11420	21980
April	8235	20435
May	3380	19580
June	3215	17605
July	4160	14830
Aug	8195	16015
Sept	9935	16325
Octobr-24	9053	14913

b) Graph - Share of Solar Power Jan- Oct -24



c) **Graph – Solar Power Export to Grid Jan- Oct -24**



Highest & Lowest Solar Energy Generation January to October 24:

❖ **Best Generation**

Highest Generation- 21980 Units – March 2024

❖ **Lowest Generation**

Lowes Generation- 13595 Units – January 2024

5.6 D.G. POWER

Installed Capacity of Diesel Generating Set – 62.5KVA

Generator Operation during January to October 24:-

No of Hrs Run - Nil	Units Generated - Nil	HSD consumption - Nil

Note:-The D.G Generator is provided as a Stand by source to feed the Power supply during Mains Source supply failure. It is provided supply the power only to Critical equipment's. Hence the Installed capacity of the DG Source do not meet the Total installed capacity of the Grid load.

IMPORTANT POINTS TO BE NOTE.

- The energy tariff applicable to the Installation is 1HT2C2. The Sanctioned Contract Demand from the Utility i.e. B.E.S.C.O.M is 200 KVA presently. In case of exceeding this CD it attracts Penalty for the exceeding demand consumed by the installation in that particular month.
- Operating the system below the recommended Power Factor of 0.90 Lag. Will attract

the penalty clause.

- The Billing demand chargeable for the Maxm Demand is 85% of the contract demand or the Maxm Demand recorded whichever is the highest. **Therefore it is always benefited if the Maxm Demand recorded is in between the 85% of the CD and Contract Demand.** However incase if it do not cross the 85% of the CD, It is always beneficial to surrender the Contract demand until the demand reaches the said qty.

6. DATA COLLECTION

Load Survey

R.R College of Pharmacy

The connected load of the campus can be generally classified in to following

- Lighting Loads
- Fans
- Computers
- Printers
- Lab Equipment's
- Air conditioners
- Heating Equipment
- Xerox M/cs
- Servers

6.1 Pharmacy Connected Load Details

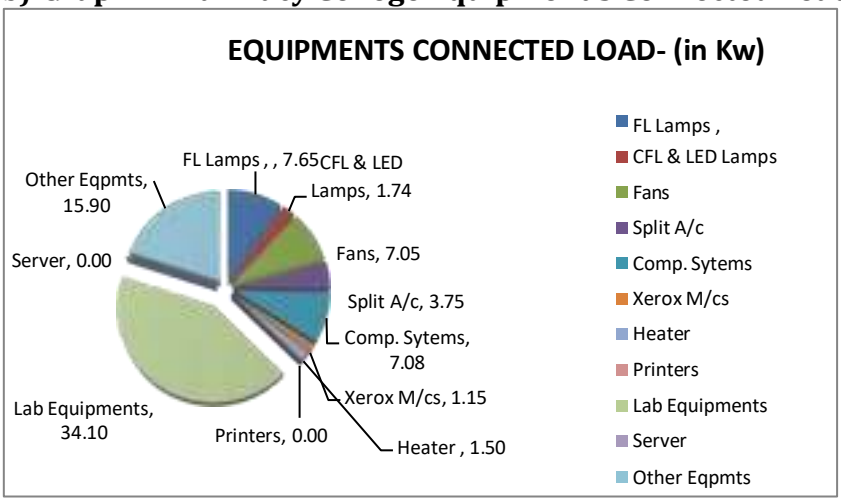
Sl No	Load	Ground Floor		First Floor		Second Floor		Third Floor	
		Nos.	Load (Watts)	Nos.	Load (Watts)	Nos.	Load (Watts)	Nos.	Load (Watts)
1	FL Lamps	57	2850	55	2750	27	1350	12	600
2	L.E.D. Fixs.	21	420	18	360	9	180	39	780
3	CFL Lamps	28	2100	24	1800	20	1500	22	1650
4	Fans	1	2250	0	0	1	1500	0	0
5	Split A/c	5	600	26	3120	23	2760	5	600
6	Comp. systems	1	1150	0	0	0	0	0	0
7	Xerox M/c	0	0	1	1500	0	0	0	0
8	Heater	0	0	0	0	0	0	0	0
9	Printers	26	19735	11	6600	10	7765	0	0
1	Lab equipment's	0	0	0	0	0	0	0	0
1	Servers	3	800	2	900	0	0	0	0
1	Other Eqmts.	57	2850	55	2750	27	1350	12	600
	TOTAL (Kw)		**7.65**		**17.03**		**15.05**		**3.63**
	Sewerage Plant Treatment Load = 14.30 Kw								
	GRAND TOTAL =65.61+14.30 = 79.91 KW								

6.2 Break up Details of Pharmacy College Connected Load

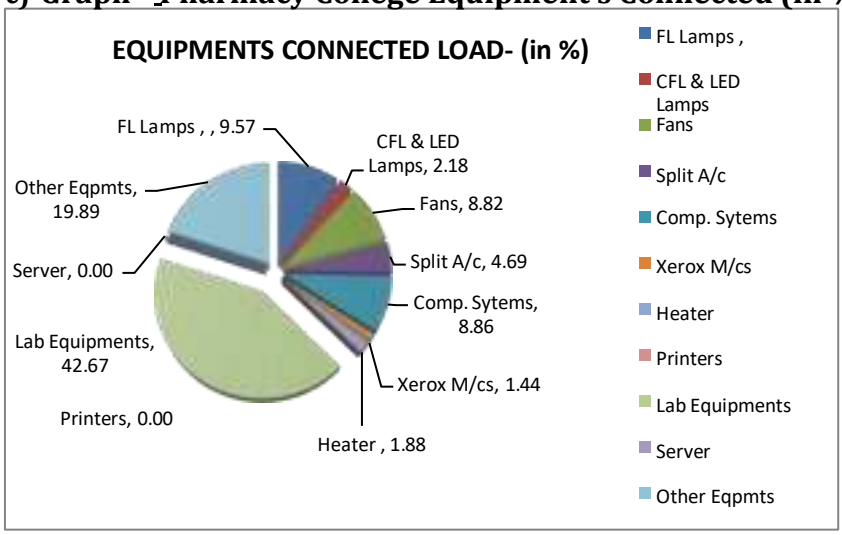
a) Equipment's load Details

Sl No	Connected Load in KW	
1	FL Lamps	7.65
2	LED &CFL LampsS	1.74
3	Fans	7.05
4	Split A/c	3.75
5	Computer Systems	7.08
6	Xerox M/cs	1.15
7	Heater	1.50
8	Printers	0.00
9	Lab equipment's	34.10
10	Server	0.00
11	Other equipment's	15.90
	Grand Total in KW	**79.92**

b) Graph – Pharmacy College Equipment's Connected Load (in KW)



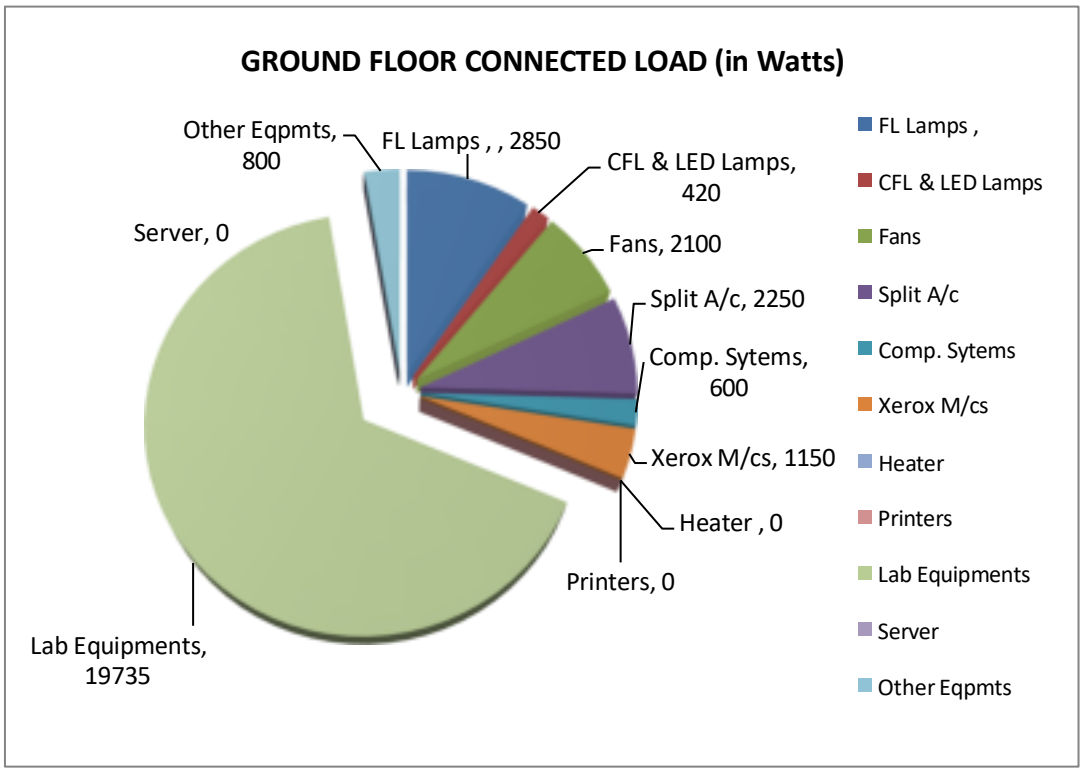
c) Graph – Pharmacy College Equipment's Connected (in %)



d) Ground Floor- Connected Load

Sl No	Ground Floor- Connected Load in Watts	
1	FL Lamps	2850
2	CFL Lamps	420
3	Fans	2100
4	Split A/c	2250
5	Comp. system's	600
6	Xerox M/cs	1150
7	Heater	0
8	Printers	0
9	Lab equipment's	19735
10	Server	0
11	Other equipment's	800
	Grand Total in KW	**29.905**

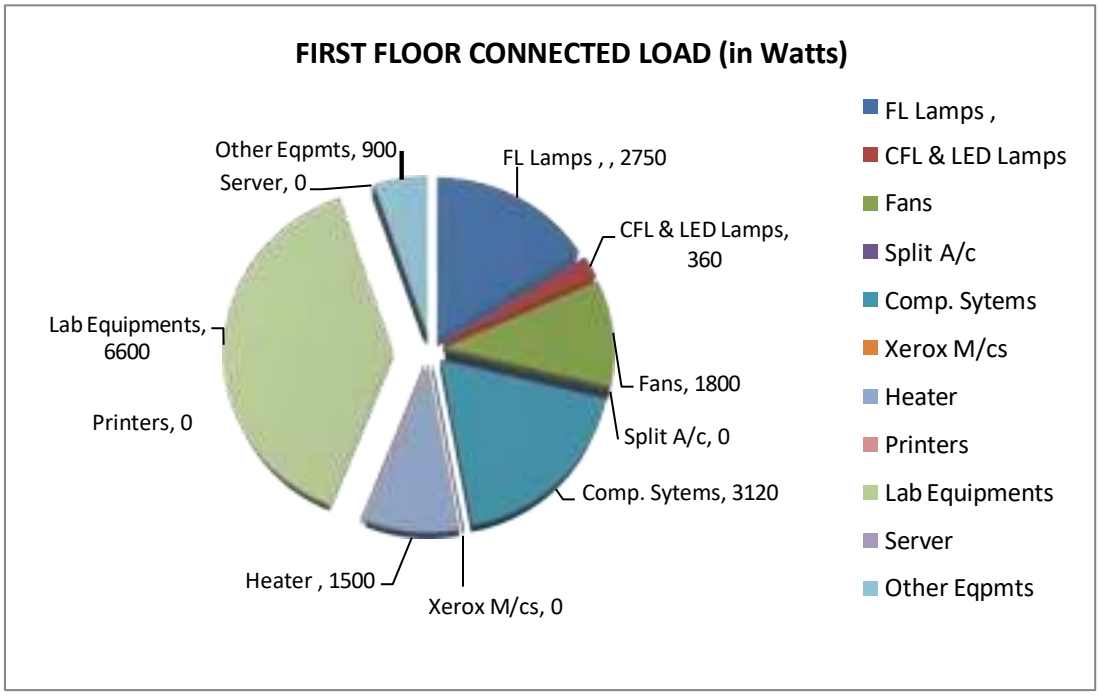
e) Graph - Ground Floor- Connected Load



f) First Floor- Connected Load

Sl No	First Floor- Connected Load in Watts	
1	FL Lamps	2750
2	CFL Lamps	360
3	Fans	1800
4	Split A/c	0
5	Comp. system's	3120
6	Xerox M/cs	0
7	Heater	1500
8	Printers	0
9	Lab equipment's	6600
10	Server	0
11	Other equipment's	900
	Grand Total in KW	**17.03**

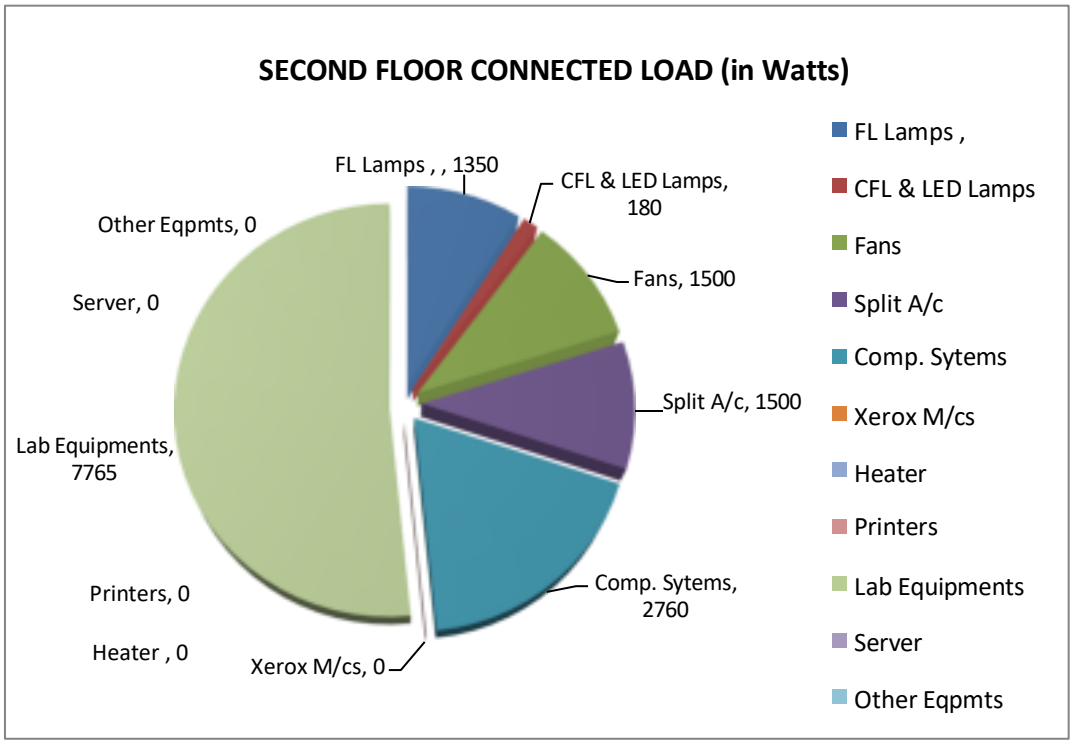
g) Graph - First Floor- Connected Load



h) Second Floor- Connected Load

Sl No	Second Floor- Connected Load in Watts	
1	FL Lamps	1350
2	CFL Lamps	180
3	Fans	1500
4	Split A/c	1500
5	Comp. system's	2760
6	Xerox M/cs	0
7	Heater	0
8	Printers	0
9	Lab equipment's	7765
10	Server	0
11	Other equipment's	0
	Grand Total in KW	**15.05**

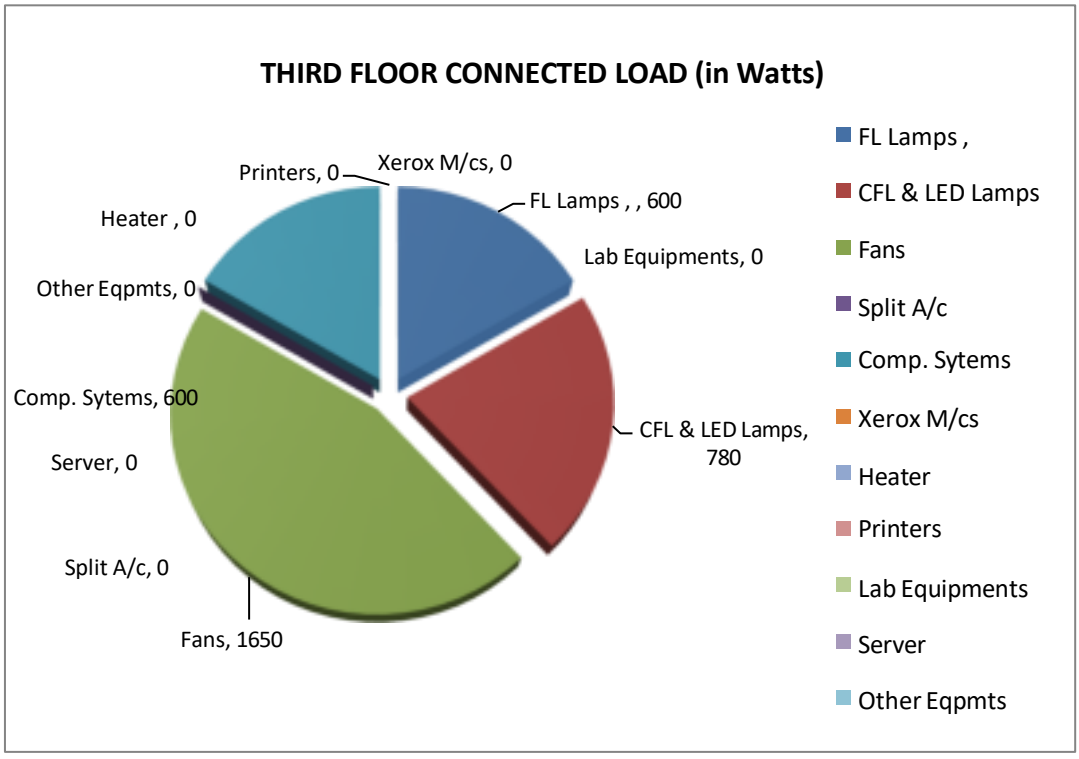
i) Graph – Second Floor- Connected Load



j) Third Floor- Connected Load

Sl No	Third Floor- Connected Load in Watts	
1	FL Lamps	600
2	CFL Lamps	780
3	Fans	1650
4	Split A/c	0
5	Comp. system's	600
6	Xerox M/cs	0
7	Heater	0
8	Printers	0
9	Lab equipment's	0
10	Server	0
11	Other equipment's	0
	Grand Total in KW	**36.30**

k) Graph - Third Floor Connected Load

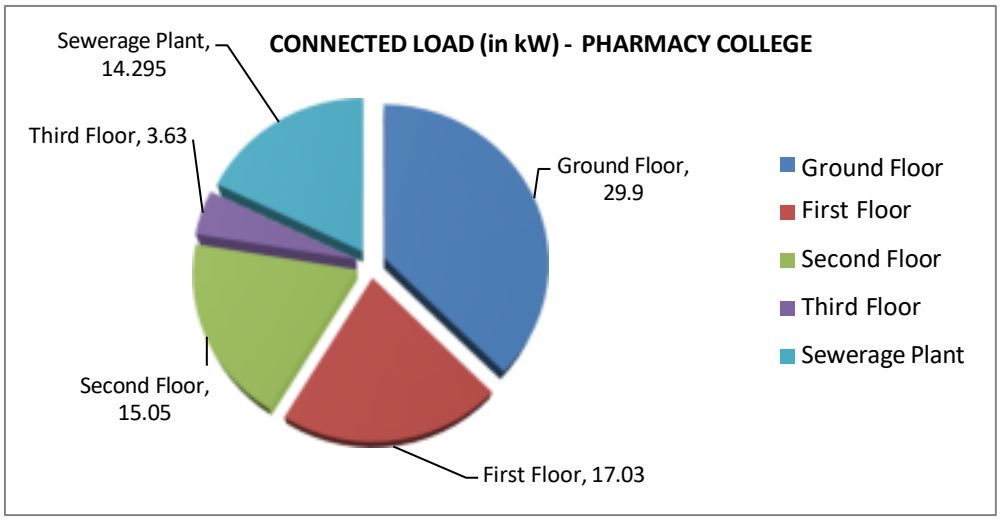


6.2 Floor wise Share of Connected Load

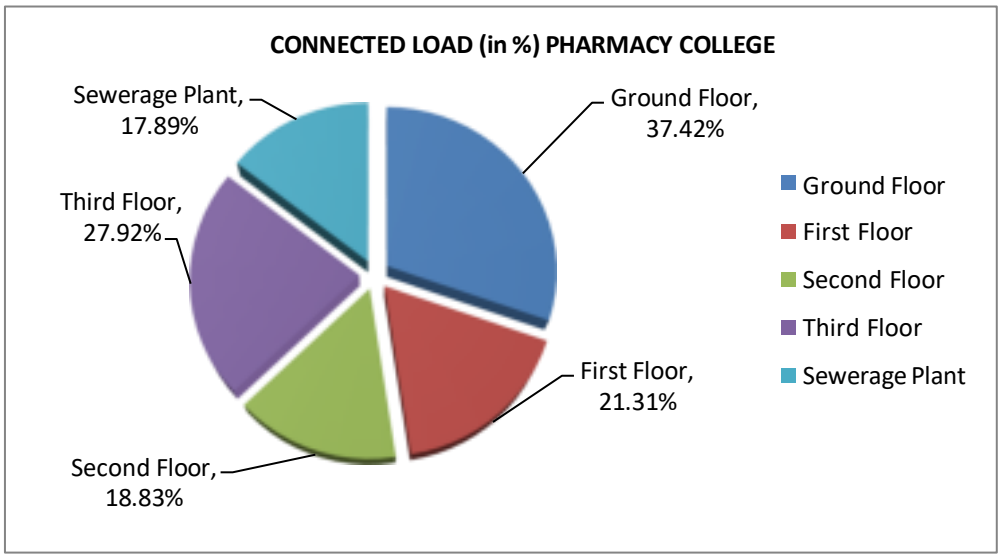
a) Floor wise Connected load

	CONNECTED LOAD IN KW & % - PHARMACY COLLEGE		
Sl No	**Description**	**Load**	**% of load**
	Ground Floor	29.9	37.42
	First Floor	17.03	21.31
	Second Floor	15.05	18.83
	Third Floor	3.63	27.92
	Sewerage Plant	14.295	17.89
	Total Load	**79.905**	

b) Graph – Floor wise Share of connected load (in kw)



c) Graph – Floor wise Share of connected load (in %)

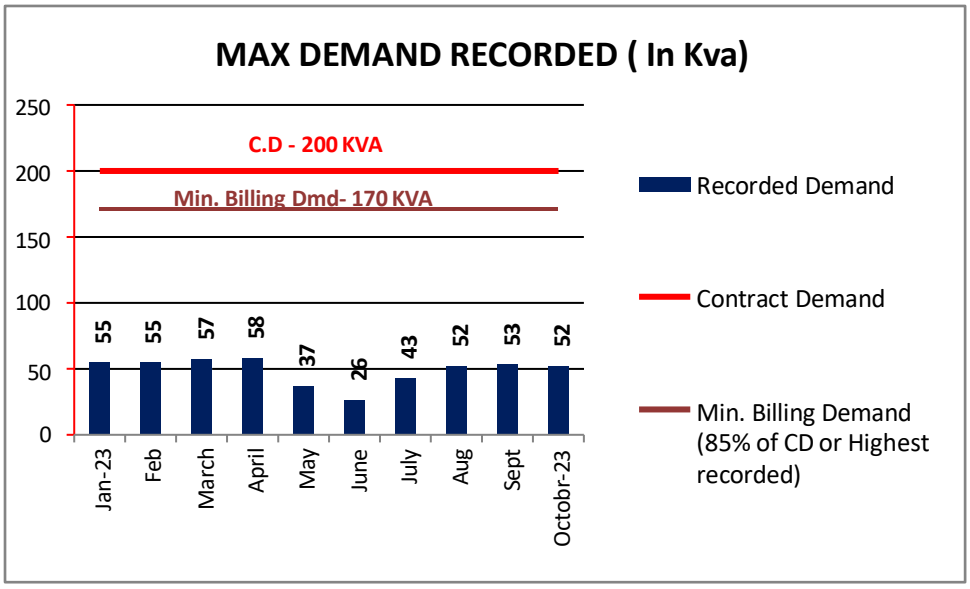


7. ANALYSIS OF DATA

Analysis of Energy Bills

From the above collected data, the following are the analyses are carried out on Max Demand, Power factor recorded.

7. 1 ANALYSIS OF MAXM DEMAND



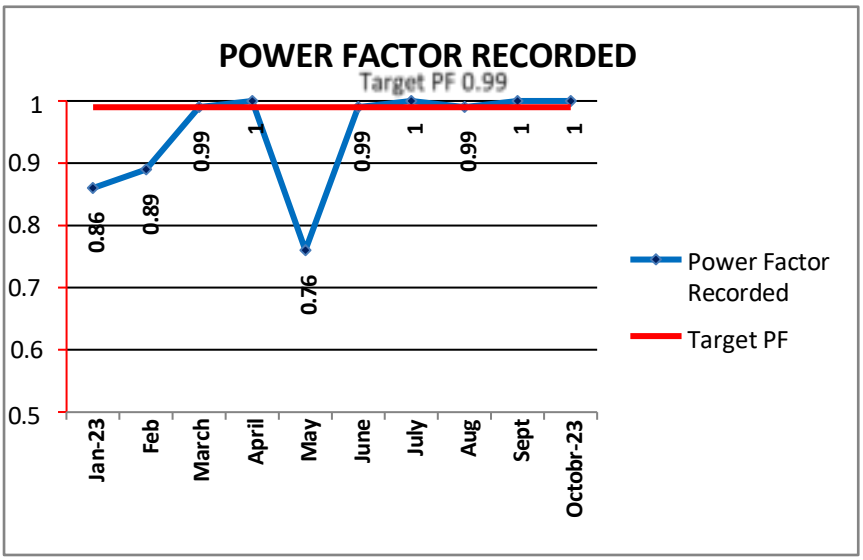
From the above Maxm. Demand Trend Chart, it is clear that the Average Maxm Demand recorded during the period shown is in between 26 – 58 KVA. Since the Minimum billing demand is 85% of the contract demand, i.e. 170 KVA.

7. 1 SURRENDERING OF MAXM DEMAND

Surrendering of Maxm. Demand of about 80 KVA will help in reduction of Monthly power Bill.

Cost saving :- Rs/-211,200 /-Annum (80KVAx Rs 220/KVA x12 Months)

7.3 TREND OF POWER FACTOR.



From the Power Factor Trend Chart it is clear that the Lowest Power factor recorded between Dec-20 and Jan 24 is 0.917 lag. Therefore there is a scope to reduce the Maxm Demand by improving the power factor from 0.917 to 0.99 Lag.

Avoid Penalty clauses by improving factor : It is observed that the PF is below .09 lag during Jan, Feb & May 2024 and hence attracted Penalty clause for these period. it is advised to maintain Ideal PF of 0.98 to .099 Lag every Month to avoid any penalty , also to achieve reduction in Max demand recorded.

8. RECOMMENDATIONS OF ENERGY CONS. MEASURES

8.1 Lighting System

Use of LED Tube lights in place of Conventional Fluorescent lamps and Chokes.

From the experiment it is found that a 40W rated tube light fixture with conventional choke has consumed 50 W for 36W rated tube light, whereas the LED Tube light consumes only 20W.

Energy saving by using L.E.D Tube lights in place Conventional Fluorescent fittings

Comparison of LED vs Conventional Lighting fixture	
Conventional Choke & Fluorescent Lamp	50Watts
L.E.D Tube lights	20 Watts
Savings/ Fixture	30 Watts
No of Conventional Fixtures in the Campus	153 Nos
Savings by using L.E.D Tube light Fixture.	75 x 30 watts **=2250 Watts /2.25KW** (Considering utilization of only 75 Nos. from Total of 153 Fixtures at any point of Time)
Energy savings / Annum	2.25 KW x0.8* LF x 6hrs/day x 270 working days = **2916 Kwh/ Annum** *L.F-Load Factor
Cost Savings	= 2916 Kwh x Rs. 8.10 = 2**3619/- Rupees / Annum**
Investment for L.E.D Fixtures	= Rs300x 153 Nos = **Rs- 45,900/ -**
ROI	= 45900 / 23619 = 1**year 11 months**
Note: It may also be possible to restrict the fixture replacements to the areas where lighting is needed continuously during the working Hrs. Under the circumstances Investment may be minimized and the ROI will be faster	

Other Recommendations to consider in lighting systems

- **Display of Energy conservation posters and boards:** - in every areas of the campus to switch off the lights and equipment's when not in use.
- **Periodical Maintenance** by cleaning of lighting fixtures.
- **Use of Mirror Optics** Reflectors for Fluorescent Fixtures.
- **Use of Reduced Voltage Transformers** for Lighting Circuits to save the Energy between 8- 10 %.

8.2 Solar water heater

Use of Solar Water Heater for Hot water Requirements

Parameters are calculated that will be associated with this recommendation for the Analysis solar water heating systems.

Sample calculation for 300 Lts /day solar water system:-

For a qty of 300 Lts / day of Hot Water requirement for any needs like Bath or cloth washing etc.	300 Lts /Day
Average area of flat plate collector for producing 150Lts of hot water/ day.	2 m A 2
Thus total collector area for 300 Lts Required	= 4 mA2
Investment /cost of solar water heater@ 10,000 Rs/m"Z	Rs.10000x4 mA2 = Rs40000/-Rupees
Power consp. For 2 Nos of 2.3 kW Electrical geysers for heating the same qty of water with 18 hrs operation	= 2Nosx3KWx3hrs = 18 kWh/ Day i.e 18Kwhx 270 days **= 4860 Kwh /Annum**
Electrical power cost Of the. Geyser / Heater	4860x8.10 = **Rs 39366 /-**
Payback Period	40000/39366 = **I Year 1 Month**

Recommendation: - This is a comfortable payback period and it is advisable to have solar Water heaters installed for hot water facility.

8.3 Efficient D.G.Plant Operation

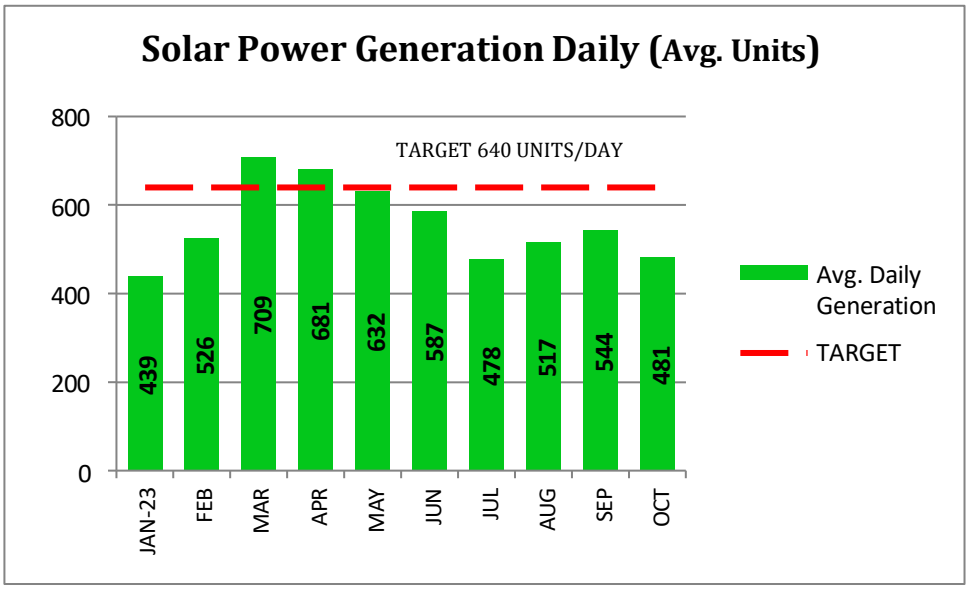
Power Gen. through DG sets

There is only one Diesel Generating set for total Pharmacy College Campus. The Generation details with their yields is mentioned in Tabular columns calculated from the previous available data.

D.G. capacity	Month	Units Generated	Diesel (HSD) Consumed	Yield	Generation Cost/ Unit @ Rs 85/Lt HSD
62.5 KVA	Jan –Oct 2024	NIL	No records	----	Rs-30/Unit With an expected Yield of 2.80 Units/ Lt of HSD

Note: The above D.G Set study indicates that it is not economical to operate the Diesel generating sets except during the power interruptions and emergencies. It can only be operated as a standby power source, since the operating cost is over Eight times the utility Power tariff of 8.10 / unit

8.4 Optimizing Solar Power Generation



8.5 Solar Energy Grid Export - Target vs Actuals

The Graphs displayed from the Data collected through Energy bills for the shown period Indicates, the Energy production from the Roof top solar panels is very much below Target Levels. It is also observed that the Energy production level is varying for each invertor unit, affecting the export Power to Grid and Revenue from the ESCOM. Therefore the system needs study & investigation of performance for complete unit and regular maintenance to improve the efficiency & achieve the target levels.

Benefits of achieving Target level of Solar Generation	
Installed capacity	**160 KW**
Present Generation Level	**439 – 709 Units / Day**
Target level	**640 Units / Day** (@ 4 Units / Day / KW x 200 KW)
Present Avg Generation (Jan –Oct23)	**466 Units / Day**
Additional Generation (Min 250Units/ day)	174 Units / Day x 365 Days **= 63,510 Units**
Additional revenue from ESCOM	63510 Units x 3.07 Rs / Unit **= 1,93,070 Rs/ Annum**
Expenditure	Minimum since the Solar unit will be under the warranty Period
Note: - Immediate attention may be given to this recommendation. A small effort will provide a good result in saving of power cost to institution through its monthly Energy Bills	

8.6 Summary of Energy Savings Measures & Potentials

Sl No	Particulars	Energy Savings (Units / Annum)	Cost Savings / Benefits (In Rs / Annum)	Investment (In Rs).	Payback Time
1	Surrender of Maxm. Demand to BESCOM	80 KVA	2,11,200	0	NA
2	Maintaining Power Factor above .09 lag to avoid Penalty	>0.90 Lag	Maintaining <0.90 avoids Penalty charges, levied on every units consumed on the Grid for that month.		N A
3	LED Tube lights in place of conventional fluorescent lamps	2916	23619	45,900	1 Year 11 Months
6	Solar Water heater with a capacity of 300 Lts/ day (OPTIONAL)	4860*	39366*	40000*	1 Year 1 Month
7	Optimizing Solar Power Generation	63,510	1,93,070	Minimum	N A
	Grand Total (*Not considered)		**4,27,889**	**45900**	

Summary of Proposed Energy Conservation Measures

Typically, the energy audit will cover the facility modification, requiring the detailed economic analysis and minor operation modifications, offering simple and quick pay backs. A list of major Energy Conservation Measures was developed for major energy consuming systems like HVAC, lighting, heating equipment's etc. Based on the final review of all information and data gathered about the facility and reaction obtained from the facility personnel at the conclusion field survey review, a finalized list of measures were developed and will be reviewed with the facility management In charge.

The results of our findings and recommendation are summarized in the report. The report includes the description of the facilities and their operation description of all major energy consuming systems, description of recommended ECMs with their specific energy impact; implementation costs benefits and pay back. The report incorporates a summary of all activities and efforts performed through the project with specific conclusions and recommendations. The recommendations that are presented in the report will be discussed with facility owners in order to help them in making a decision in which ECMs are to be implemented.

The Detailed recommendations and actual energy savings that can be achieved by implementing the recommendation are as following.

a) Replacement of conventional Tube light with L.E.D tube lights: - There are about 153 conventional Tube light fixtures out of 240 Lighting fixtures fitted in the Pharmacy College (The remaining fixtures are fitted with CFL and LED Fixtures). The total connected load of these fixtures is 7.65 KW. It is suggested to replace these existing fixtures with 20 W L.E.D Tube light fixtures that give higher luminous efficiency and excellent color index.

b) Providing energy savers in Air conditioners :-It is suggested to provide energy savers for all the air conditioners. The AC's are used continuously during summer season. Considerable energy could be saved by the use of energy savers. It is recommended to use ECO-SMART energy savers with each AC's which could save energy up to 15% of present level energy consumption.

Note: - It is advised to procure 5 star A/c Units for all new procurements and also while replacing the existing units**.**

c) Solar water heater for Canteen Utility :- It is recommended to provide Solar water heating facility for college ,Hostel and other Hot water requirements in the Pharmacy college campus . Installation of Solar water heater avoids Electric Heaters used for the said application. This Hot water from solar heater can be used for all the Hot water requirements used for Bath, utensil cleaning and cloth washing etc.in hostel or any applications inside campus.

9. CONCLUSION

Energy audit is a very much useful method in understanding the opportunities for energy conservations and measures to minimize the expenses on energy consumption. Following are the conclusions from the energy audit carried out in R.R College of Pharmacy,

- The energy audit at R.R College of Pharmacy, recommends looking into the methods of energy usage and for the opportunities to make the entire campus as energy efficient.
- The energy audit carried out suggests to adopt the measures in order to minimize the expenses incurred on the energy consumption
- The audit also suggested to continuously looking for energy conservation opportunities.
- The entire process gives an idea to understand the load pattern of the campus.
- In present scenario, the energy audit is must, as it not only provides measures to minimize the operating cost, but it also gives information to effective minimization of energy usage.
- Energy saved is equal to energy generated.

10. REFERENCES

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[2JGuide to Energy Management, Cape hart, Tuner and Kennedy

[3J Clive Beggs Energy Management, supply and conservation

[4JTechnolgy Menu on Energy Efficiency (NPC)

[5JEnergy Audit Reports NPC, Lighting Hand Book

[6J ASHRAE Hand Book, ECBC Guide Book