Vidya Vikas Mandal's

Yashwantrao Chavan Mahavidyalaya Karmala

Karmala-413203, Dist-Solapur, Maharashtra(India)

AFFILIATED TO Solapur University

NAAC REACCREDITED 'B+' GRADE

ENERGY AUDIT REPORT

2020-21 & 2021-22

Of

The Principal,

YASHVANTRAO CHAVAN MAHAVIDYALAYA

BY

BIO-GEO CONSULTANCY

About Institute:

Yashvantrao Chavan College, Karmala, Tal Karmala, Dist Solapur had two faculties viz. Arts and Commerce since beginning. Later on the science wing was started in the academic year 2017-18 as a special case due to ever growing demand from the students in the rural region. The college is affiliated to Punyashlok Ahilyadevi Holkar Solapur University. The college offersundergraduate courses namely, B.A., B.Com, and B. Sc. in both Marathi and English medium along with certificate courses.

Goal

Yashwantrao Chavan Mahavidyalaya, Karmala, aspire to establish itself as an institution of excellence thriving on the tri-pillars of inclusiveness, integrity and innovation. Equipped with advanced infrastructure and empowered with ingenuous minds it shall seek to design customized curricula to meet the growing challenges in higher education. In doing so, the college will offer diverse communities with rich academic experience and open the gates of knowledge and research for all, through successful global partnerships.

Objectives

- To cater education to the students from different socio-economic strata irrespective of caste, creed and class.
- To contribute significantly for overall personality development of students through academic, sports, cultural and extension activities.
- To impart a perfect blend of traditional and modern education
- To inculcate moral values and nurture a compassionate and progressive attitude.
- To sensitize the students for environmental issues and preservation of natural resources so as to contribute to economic growth of the nation in a sustainable manner.

Mission

"Our mission is to create and develop "Modern" youth as responsible citizen with multi-dimensional personalities by inculcating among students a blending of cultural awareness, compassionate and progressive attitude, scientific insights and time-tested traditional values".

Preface

Energy Audit is the effort made to reduce the consumption of energy by using energy efficient devices and services along with behavioral aspect. It has also inquired about convenience of the concerned persons for achieving energy competence of the campus. The undergraduate students Department of Geography under the guidance faculty have completed the necessary survey work for energy audit. The data regarding requirement of energy devices and their duration in each classroom, laboratory, room and the open spaces have been collected. The work was carried out by observing number of tubes, fans, refrigerators, A.C.s, electronic instruments, etc. in each room. Thus, component wise and area specific consumption of electricity have been quantified. This was the basis for designing strategic plan to reduce electricity consumption.

We really appreciate the effort put by management for creating awareness of energy usage among the staff and students, willingness for investing for renewable energy such as solar energy and making good framework of rules energy saving. We appreciate enthusiasm exhibited by the management of the college during the process of energy audit. The vision of the institution, 'Green campus and save our green nature' is being followed in true sense of the term. We really appreciate to develop in house good quality weather station in the college.

Acknowledgements:

We are very much thankful to Principal Dr. Laxman Patil and IQAC coordinator, NAAC think tank team for motivating us and giving us the opportunity for energy audit. We would like to express our sincere thanks to Dr. Abhimanyu Mane, Head Department of English, faculty members of English and all respected staff, faculty members and students those who have taken part in this audit survey for each department, labs, offices etc. of Yashvantrao Chavan Arts, Science and Commerce College, Karmala. We tried our best to present this energy report as per requirements of college and our expertise work.

Bio-Geo Consultancy

Contents

CHAPTER NO – 1

Introduction

1.1 Introduction:

Energy crisis is one of major problem in exiting world where demand of energy is increasing rapidly. Energy is prime focus due to rapid growth and development of technology. Proper utilization of Energy is one of the major aspects of any developing country. Today the need of energy has increased greatly in order to meet the demand of ever increasing consumption of it. This energy crisis problem will be solved through Energy conservation and use of energy efficient equipment.

1.2 Objective of Energy Audit

The Energy Audit provides the vital information base for overall energy conservation program covering essentially energy utilization analysis and evaluation of energy conservation measures. It aims at:

- Identifying the quality and cost of various energy inputs.
- Assessing present pattern of energy consumption in different cost centers of operations.
- Relating energy inputs and production output.
- Identifying potential areas of thermal and electrical energy economy.
- Highlighting wastage's in major areas.
- Fixing of energy saving potential targets for individual cost centers.
- Implementation of measures for energy conservation & realization of savings.
- Identifying the quality and cost of various energy inputs.
- Assessing present pattern of energy consumption in different cost centers of operations.
- Relating energy inputs and production output.
- Identifying potential areas of thermal and electrical energy economy.
- Highlighting wastage's in major areas.
- Fixing of energy saving potential targets for individual cost centers.
- Implementation of measures for energy conservation & realization of savings.

The energy audit provides the vital information base for overall energy conservation Programme covering essentially energy utilization analysis and evaluation of energy conservation measures.

1.3 **Need for Energy Audit**

- The primary objective of Energy Audit is to determine ways to reduce energy consumption per unit of product output or to lower operating costs.
- To minimize the cost of energy
- To minimize the operational cost
- To minimize the cost for repair & reconstruction
- To increase the quality of environment that contribute to increased work productivity
- Preventive measure for energy wastage
- Maintenance and quality control programmes
- Helps to understand more about the ways energy and fuel are used in any industry.
- Help in identifying the areas where waste can occur & where scope for improvement exists.
- Positive orientation to cost reduction.
- Preventive maintenance & quality control programs
- Check the variation of energy cost.
- Reliability of energy supply
- Identify energy conservation techniques.
- Finding the feasible solution for energy wastage
- Energy auditing provide 'benchmark' for managing energy in the organization

1.4 **Present Scenario of College campus**

The college has three storied building on a piece of 26 acres of land. There is a beautiful garden in the front area. The college has 20 classrooms and 5 well equipped science laboratories and Geography research lab. The college has computer labs for science. In addition to this Gymkhana hall, Girls common room, Boys common room, Auditorium for various function, well-furnished office, Principal's Room, Library with reading room, YCMOU center. Every head of department have separate cabin.

1.5 **General Information:**

Bio-Geo Consultancy conducted the energy audit at Vidya Vikas Manda's Yashvantrao Chavan Arts, commerce & Science College Karmala, Tal Karmala, Dist – Solapur 413203 in December 2022. The purpose of the energy audit was to address the status of the Electrical systems, Energy uses, performance assessment of various facilities like A.C. system, Fans, lighting system, Printers, Pumps etc.

General Information about the Yashvantrao Chavan Arts, commerce & Science College		
Sr. No.	**Items**	**Details**
1	Location	Yashvantrao Chavan College, Karmal, Tal Karmala, Dist Solapur. 413203
2	Establishment Year	1966
3	Campus Size	26Acre
4	Affiliation	Punyashlok Ahilyadevi Holkar Solapur University
5	Departments	11
6	Faculties	16
7	No. of Courses	255
8	Mode of Education	Co-Education
9	Official Website	http://www.ycmkarmala.org/

Bio-Geo Consultancy has observed certain shortcomings in energy systems and their uses. Some of the techno-commercially implementable solutions to improve system efficiency, performance of different equipment and safety level are purposed in this report.

CHAPTER NO - 2

Energy Audit Methodology and Scope

2.1 What is Energy Audit?

Energy today has become a key factor in deciding the product cost at micro level as well as in dictating the inflation and the debt burden at the macro level. Energy cost is a significant factor in economic activity at par with factors of production like capital, land and labor. Same is the case for educational institutes. More importantly, colleges and schools in the rural areas face the challenges of power cut and frequently interrupted power supply causing lack of internet facilities in turn putting obstacles in on-line classes, disturbing prompt communication with university and schedule of laboratory work. At times even smooth conduct of exams becomes trouble some. Any educational institute cannot be held responsible for the issues of shortage of power in the country, particularly, in rural areas. However, it becomes the responsibility of a good institute to find the ways and means to address these externalities. The college has decided to do so and hence the present audit is meaningful for strategizing conservation of electricity on one hand and improving the share of green energy on the other. Energy conservation measures essentially mean using less energy for the same level of activity. Energy Audit attempts to balance the total energy inputs with its use and serves to identify all the energy streams in the systems and quantifies energy consumption according to its discrete function. Energy Audit helps in energy cost optimization, pollution control and safety. It also suggests the appropriate methods to improve the operating & maintenance practices of the system. It is instrumental in coping with the situation of variation in energy cost, availability, reliability of energy supply, decision on appropriate energy mix, decision for using improved energy efficient equipment, instrumentations and technology.

2.2 Energy Audit Methodologies

A. Data Collection

Data collection is very important step in energy audit. Data collection includes,

1. Relevant data like electricity bills for the year 2020-21 & 2021-22.
2. List of lighting load, fan, computer and air conditioner for each department.
3. Voltage, Current and Power are measured at each feeder.

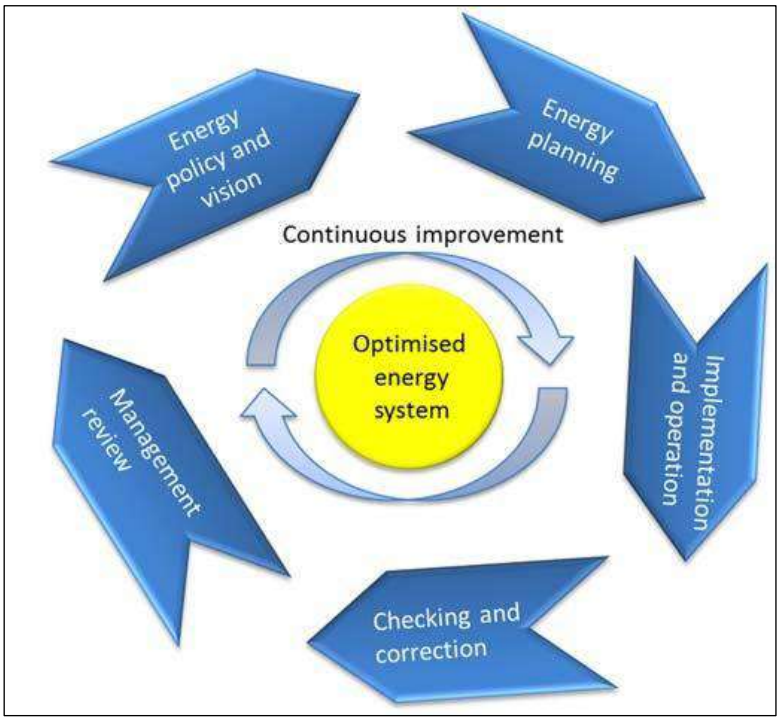
B. Data Analysis

Data analysis is next important step after data collection. The areas for implementation and energy conservation opportunities are identified.

C. Action Taken

Action taken report must be critically examined. It involves implementation of strategies based on measurement of actual energy consumption. In this methodology different areas of energy consumption are identified.

2.3 Energy Management Cycle Diagram:



2.4 Methodology

Board guidelines indicating the methodology for such an energy audit is given below. Possible stages for interaction/conference are also indicated.

Phase-I

1. Collections of data on operational parameters, energy consumption both normal and electrical, coal and power quality etc., through a questionnaire.

2. Study the existing plant capacities and their performance to assess plant operations.

3. Study of the specific energy consumption (both thermal and electrical) department-wise and plant as a whole.

4. Study of the power sources, distribution system and drive controls, load factor and efficiency of large motors (above 10 kW), process automations, plant illuminations etc.

5. Collection of requisite data and analysis and identification of specific areas with potential for conservation of thermal and electrical energy.

6. Field measurements of operational parameters and carrying out heat and mass balance.

7. Study of limitations, if any, in the optimal use of thermal and electrical energy.

8. Formulation of specific recommendations along with broad system concept for conservation of thermal and electrical energy.

9. Preparation of capital cost estimates and establishing techno-economic feasibility for recommended measures.

10. No investment and/or marginal investment for system improvements and optimization of operations.

11. Major investment due to incorporation of modern energy efficient equipment and up gradation of existing equipment.

12. Formulating tentative time schedule for implementation of the recommendation.

13. Undertaking broad cost benefit analysis in terms of savings in energy consumption per unit of production and pay-back period.

Phase-II

Follow-up with the industry on periodic basis to ascertain the level of implementation of recommendation and assist, if requiredd, in implementation of the measures to achieve energy efficiency.

2.5 Types of Energy Audit

A. Preliminary Energy Audit

The Preliminary Energy Audit focuses on the major energy suppliers and demands usually accounting for approximately 70% of total energy. It is essentially a preliminary data gathering and analysis effort. It uses only available data and is completed with limited diagnostic instruments. The PEA is conducted in a very short time frame i.e. 1-3 days during which the energy auditor relies on his experience together with all the relevant written, oral visual information that can lead to a quick diagnosis of the plant energy situation. The PEA focuses on the identification of obvious sources of energy wastage's. The typical out put of a PEA is a set of recommendations and immediate low cost action that can be taken up by the department head.

B. Detailed Energy Audit

The detailed audit goes beyond quantitative estimates of costs and savings. It includes engineering recommendations and well-defined project, giving due priorities. Approximately 95% of all energy is accounted for during the detailed audit. The detailed energy audit is conducted after the preliminary energy audit. Sophisticated instrumentation including flow meter, flue gas analyzer and scanner are use of compute energy efficiency.

1. Review of Electricity Bills, Contract Demand and Power Factor: For the last one year, in which possibility will be explored for further reduction of contract demand and improvement of power factor

2. Electrical System Network: It would include detailed study of all the Transformer operations of various Ratings / Capacities, their operational pattern, Loading, No Load Losses, Power Factor Measurement on the Main Power Distribution Boards and scope for improvement if any. The study would also cover possible improvements in energy metering systems for better control and monitoring.

3. Study of Motors and Pumps Loading: Study of motors (above 10 kW) in terms of measurement of voltage (V), Current (I), Power (kW) and power factor and thereby suggesting measures for energy saving like reduction in size of motors or installation of energy saving device in the existing motors. Study of Pumps and their flow, thereby suggesting measures for energy saving like reduction in size of Motors and Pumps or installation of energy saving device in the existing motors / optimization of pumps.

4. Study of Air conditioning plant: w.r.t measurement of Specific Energy consumption i.e kW/TR of refrigeration, study of Refrigerant Compressors, Chilling Units, etc. Further, various measures would be suggested to improve its performance.

5. Cooling Tower: This would include detailed study of the operational performance of the cooling towers through measurements of temperature differential, air/water flow rate, to enable evaluate specific performance parameters like approach, effectiveness etc.

6. Performance Evaluation of Boilers: This includes detailed study of boiler efficiency, Thermal insulation survey and flue gas analysis.

7. Performance Evaluation of Turbines: This includes detailed study of Turbine efficiency, Waste heat recovery.

8. Performance Evaluation of Air Compressor: This includes detailed study of Air compressor system for finding its performance and specific energy consumption

9. Evaluation of Condenser performance: This includes detailed study of condenser performance and opportunities for waste heat recovery.

10. Performance Evaluation of Burners: This includes detailed study on performance of Furnace / Burner, thermal insulation survey for finding its efficiency

11. Windows / Split Air Conditioners: Performance shall be evaluated as regards, their input power vis-a-vis TR capacity and performance will be compared to improve to the best in the category

12. Illumination: Study of the illumination system, LUX level in various areas, area lighting etc. and suggest measures for improvements and energy conservation opportunity wherever feasible.

13. DG Set: Study the operations of DG sets to evaluate their average cost of Power Generation, Specific Energy Generation and subsequently identify areas wherein energy savings could be achieved after analysing the operational practices etc. of the DG sets.

14. The entire recommendations would be backed up with techno-economic calculations including the estimated investments required for implementation of the suggested measures and simple payback period. Measurement would be made using appropriate instrumentation support for time lapse and continuous recording of the operational parameters.

15. Completion Period: We usually start the field data collection at site with in one and half months' time, from the date of receipt of work order and the draft energy audit report is submitted thereafter in 1 month time. Finalization of energy audit report is normally completed within 3 months. (After completion of the audit study, the findings and recommendations are discussed with the technical head and the final report with recommendations is submitted.

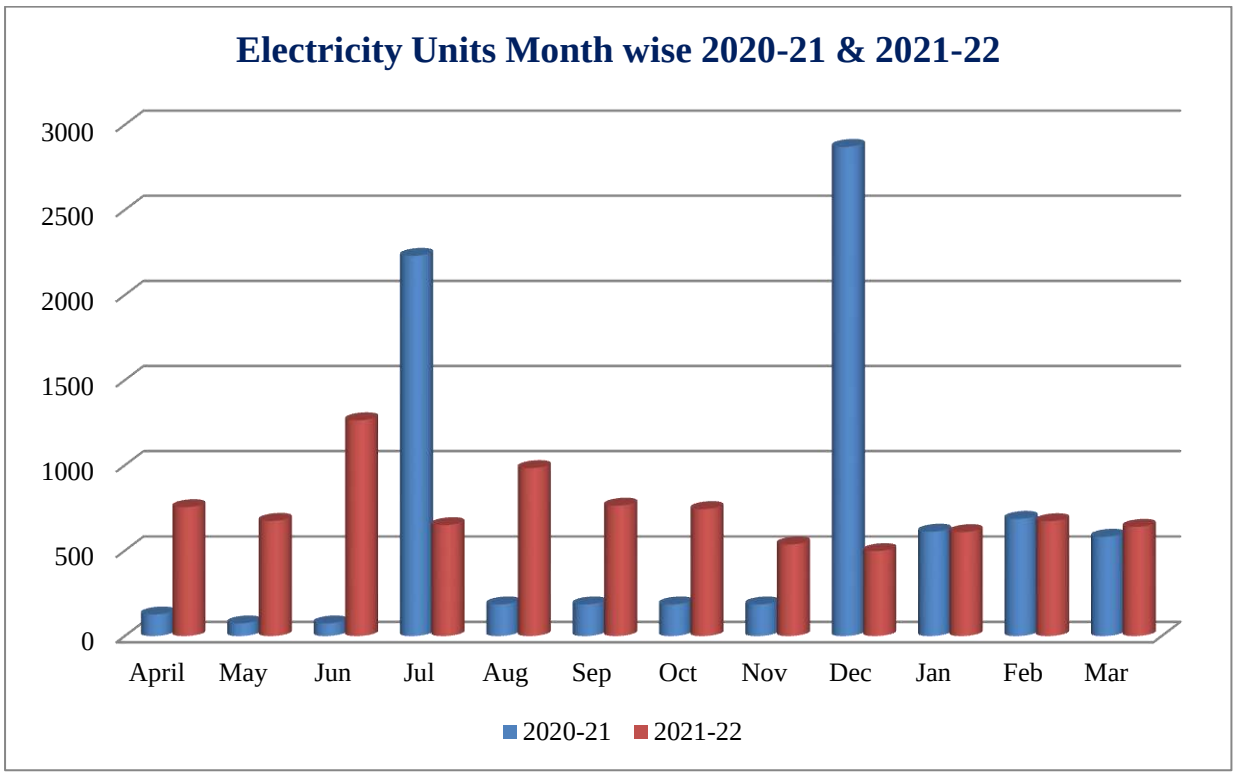
2.6 List of Energy Audit Instruments

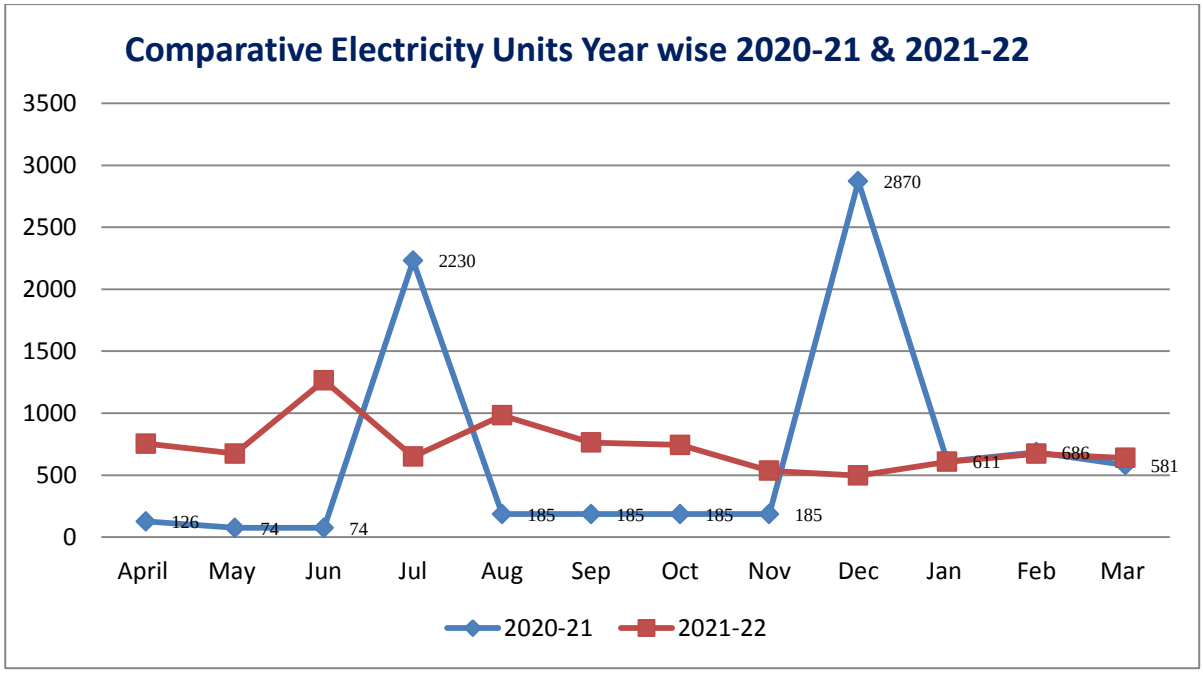
Sr. No	Name of the Instrument	Intended Use
1	Three Phase & Single Phase Power Analyser	Used to measure, record real time Power Consumption, analysis of electrical load, demand control, harmonics and transient. It is done without interrupting the connections.
2	Luxmeter	Used for measurement of illumination level
3	Digital Multimeter	Used for measurement of voltage. Current and resistance.
4	Non-Contact Tachometer	Used for measurement of speed of rotation equipment.
5	Thermo-hygrometer	Used for measurement of air velocity & humidification, ventilation, Air-conditioning and refrigeration systems etc. Also used for calculation of dew point to find out the heat being carried away by outgoing gases in industries. Where product drying requires hot air.
6	Anemometer	Used for measuring the flow and speed of Air in air conditioning
7	Digital Temperature & Humidity monitor	Used for measurement and monitoring of temperature and humidity
8	Digital Manometer	Used for measurement of differential pressure.

Chapter No. 3
Energy Use Profile

3.1 Electricity Units Month wise 2020-21 & 2021-22

Month	2020-21 Bill Units	2020-21 Bill Amount in Rs.	2021-22 Bill Units	2021-22 Bill Amount in Rs.
April	126	1345	754	8515
May	74	796	674	7544
Jun	74	796	1264	14211
Jul	2230	20925	649	7283
Aug	185	2476	983	10773
Sep	185	2476	763	8474
Oct	185	2476	743	8265
Nov	185	2476	536	7555
Dec	2870	31342	497	5695
Jan	611	7056	608	6855
Feb	686	7862	672	8086
Mar	581	6734	639	7615
Total	**7992**	**86761**	**8782**	**100870**
Average	**666**	**7230**	**732**	**8406**





3.2 Executive Summary:

The objective of the audit was to study the energy consumption pattern of the facility, identify the areas where potential for energy/cost saving exists and prepare proposals for energy/cost saving along with investment and payback periods.

The salient observations and recommendations are given below.

1. Yashvantrao Chavan College, Karmal, Tal Karmala, Dist Solapur uses energy in the following forms:

a. From MSEDCL

b. Electricity SOLAR Grid connected solar plant (15.3kw)

c. High Speed Diesel Generator (HSDG)

Electrical energy is used for various applications, like: Computers, Lighting, Air-Conditioning, Fans Other Laboratory Equipment, Printers, Refrigerators, Xerox machines, CCTV, UPS, LCD Projector, Router system, Flood light, and Pumping motor etc.

2. The average cost of energy is around Rs. 666 & 732/- in 2020-21 & 2021-22 respectively.

3. The Specific Energy Consumption **(SEC)** is the ratio of energy required per square meter.

In this case the SEC is evaluated as electrical units consumed per square meter of area. It is calculated as under for (Electricity): **0.21504 kWh/Sq.m.**

4. After the measurement and analysis, we propose herewith following Energy Efficiency Improvement measures.

Apart from the above suggestions, as a renewable energy and sustainability initiative, it is recommended to install 3kW roof top solar PV power plant which can save the 25% of annual electricity consumption of the college. Also, following suggestions are made for energy saving purpose: All computers have to be set for power save mode for switching off screen if not used for 05 minutes and hibernate if not used for morethan 60 minute. Students may be educated towards saving of electricity by displayingmessages in the classroom and common public area for switching off lights, fans and computers when not required. Fans should be used only in the hot summer climate and has to be replaced by 5 STAR rated energy efficient fans to reduce consumption

3.3 Past Electricity Bills Analysis:

Electricity Consumption (2020-21 & 2021-22)

Monthly electricity consumption analysis

- The College has one single Phase connection. Following table givesthe detail of bills:
- Load Allowed:15KW
- Meter No. E 05316655341

Sr. No.	Meter No.	Load Allowed	Single/Three Phase
1	E 05316655341	15KW	Three Phase

- The average Electrical Energy Consumption per day in Academic year 2020-21 & 2021-22 is **21.90 & 24.06 KWH Units** respectively.
- Highest Electrical Energy consumption 2230 units in Jul 2020 & 2870 units in Dec 2020 units were recorded due to **Covid 19 Quarantine Centre**.

- The average Electrical Energy Consumption per day **cost works out to be *Rs. 238/- & 276/-*** *in the year of 2020-21 & 2021-22 respectively.*
- Monthly average consumption is **666 & 732** kWH amounting to Rs7230 & 8406/- *in the year of 2020-21 & 2021-22 respectively.*
- The yearly average electricity Units consumption is 7992 & 8728 kWH amounting to ***Rs. 86761*/- & Rs. 100870** year 2020-21 & 2021-22 respectively.
- The consumption pattern is shown above.

3.4 Summary Details:

From the above mentioned Electrical Energy Consumption Analysis, some options of energy saving or low energy consuming devices may be suggested. The college has accepted the suggestions made by the experts. Comparative analysis has proved that this initiative has saved power consumption.

3.5 Specific Energy Consumption:

Specific Energy Consumption (SEC) is defined as energy usage per unit production in any sector like agriculture, manufacturing, service, etc. Here, it is calculated as the ratio of total electricity consumption in kWh to total number of students of the college. The average yearly consumption of electricity is **666 kW & 732 KW** for the year 2020-21 & 2021-22 respectively. The student strength in the almost same year is 2021-22. Thus, SEC for the college is **6.38 kW** & 6.92 kw per student in 2020-21 & 2021-22 respectively. Also per student cost is Rs. 69.30 in 2020-21 & Rs. 79.50 in the year of 2021-22. This is certainly not so high as compared with other educational institutes under the Solapur University. By calculating SEC, we can crudely identify the factors of energy efficiency or inefficiency. The present report has identified the areas having further scope to reduce the consumption.

Chapter No. 4

Conclusion and Action Plan

4.1 Conclusion:

The Power Factor is the ratio of electrical power consumed by various components used by the college to the same supplied by AC grid. If there is good efficient transportation and use of power through pumps, tubes, laboratory equipment, computers, backup systems, etc. PF would be 100%. However, any activity cannot be 100% efficient. By and large it ranges from 70 to 80%. It is useful calculation to understand whether loss of power is beyond the limit and immediate measures are warranted. Most utility bills are influenced by KVAR usage. A good Power Factor provides a better voltage, reducing the pressure on electrical distribution network, reducing cable heating, cable over loading and cable losses, reducing over loadings of control gears and switch-gears etc.

Whenever the average power factor over a billing cycle or a month, whichever is lower, of a High Tension consumer is below 90%, Penal charges shall be levied to the consumer at the rate of 2% (two %) of the amount of monthly energy bill (excluding of Demand Charges, FOCA, Electricity Duty and Regulatory Liability Charge etc.) For power factor of 0.99, the effective incentive will amount to 5% (five percent) reduction in the energy bill and for unity power factor the effective incentive will amount to 7% (seven percent) reduction in the energy bill. Here in case of the college under scrutiny PF is good enough and no penal charges have been levied in the year 2021-22. This is plus point observed in the audit process.

4.2 Energy Conservation Action Plan:

Following are the energy conservation action plan is possible as per the detailed energy audit. These energy conservation opportunities are of the type of minimum cost investment.

- Water management system must be in place. Reduction in water consumption by addressing leakages of taps and other miscellaneous utilities. Installation of flow meters which will help in reduction of water consumption.
- As per the survey of connected load in the campus approved electrical demand is too large. It is suggested to reduce maximum demand, if possible.
- Rainwater harvesting can be implemented for reducing pumping hours and ultimately for saves in electrical energy.
- Replacement of simple tubes & bulbs monitors with LED.

- Display Sign boards at different eminent locations in the building to create awareness amongst staff and students
- Install solar street lights in the institute, mess and hostel campus.
- Replace old electric fans by energy efficient fans
- Small wind mills can be placed on institute and surrounding as institute location is away from population and sufficient wind velocity available.
- Electric distribution must be renovated and all safety features are required to consider. It is suggested to have firefighting system to be installed in the distribution room.

4.3 Department wise load consumption:

1) Principal Office/Cabin:

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption/day (Watt)
A	**B**	**C**	**D**	**E = C X D**	**F**	**G = E X F**
1	FTL	40	04	160	03	480
2	Fan	60	03	180	06	1080
3	PC	12	01	12	01	12
4	LED	33	01	33	05	165
5	Printer	200	01	200	01	200
6	CCTV	5	01	05	24	120
7	AC	55	No	00	00	00
8	Refrigerator	250	01	250	00	250
9	Inverter	10	01	10	24	240
10	Xerox	80	No	00	00	00

2) Administration Office

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption/day (Watt)
A	**B**	**C**	**D**	**E = C X D**	**F**	**G = E X F**
1	FTL	40	05	200	06	1200
2	Fan	60	05	300	06	1800
3	PC	12	07	84	06	504
4	LED	33	No	00	00	00
5	Printer	200	05	1000	04	4000
6	CCTV	5	02	10	24	240
7	AC	55	No	00	00	00
8	Refrigerator	250	No	00	00	00
9	Inverter	10	01	10	24	240
10	Xerox	80	01	80	02	160

3. IQAC

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption/day (Watt)
A	**B**	**C**	**D**	**E = C X D**	**F**	**G = E X F**
1	FTL	40	02	80	02	160
2	Fan	60	01	60	02	120
3	PC	12	01	12	02	24
4	LED	33	00	00	00	00
5	Printer	200	01	200	½	100
6	CCTV	5	01	05	24	120
7	AC	55	00	00	00	00
8	Refrigerator	250	00	00	00	00
9	Inverter	10	00	00	00	00
10	Xerox	80	00	00	00	00

4. Passage

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption/day (Watt)
A	**B**	**C**	**D**	**E = C X D**	**F**	**G = E X F**
1	FTL	40	06	240	05	1200
2	Fan	60	01	60	03	180
3	PC	12	No	00	00	00
4	LED	33	No	00	00	00
5	Printer	200	00	00	00	00
6	CCTV	5	03	15	24	36
7	AC	55	No	00	00	00
8	Refrigerator	250	00	00	00	00
9	Inverter	10	00	00	00	00
10	Submersible Pump	3728.5	01	3728.5	01	3728.5

5. Gym

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption/day (Watt)
A	**B**	**C**	**D**	**E = C X D**	**F**	**G = E X F**
1	FTL	40	03	120	03	360
2	Fan	60	03	180	03	540
3	PC	12	01	12	½	06
4	LED	33	01	00	00	00
5	Printer	200	01	200	½	100
6	CCTV	5	00	00	00	00
7	AC	55	00	00	00	00
8	Refrigerator	250	00	00	00	00
9	Inverter	10	00	00	00	00
10	Xerox	80	00	00	00	00

6. Department of Marathi

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption/day (Watt)
A	**B**	**C**	**D**	**E = C X D**	**F**	**G = E X F**
1	FTL	40	01	40	02	80
2	Fan	60	01	60	02	120
3	PC	12	01	12	½	06
4	LED	33	00	00	00	00
5	Printer	200	00	00	00	00
6	CCTV	5	00	00	00	00
7	AC	55	00	00	00	00
8	Refrigerator	250	00	00	00	00
9	Inverter	10	00	00	00	00
10	Xerox	80	00	00	00	00

7. **Department of English**

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption/day (Watt)
A	**B**	**C**	**D**	**E = C X D**	**F**	**G = E X F**
1	FTL	40	01	40	02	80
2	Fan	60	01	60	02	120
3	PC	12	01	12	½	06
4	LED	33	00	00	00	00
5	Printer	200	01	200	½	100
6	CCTV	5	00	00	00	00
7	AC	55	00	00	00	00
8	Refrigerator	250	00	00	00	00
9	Inverter	10	00	00	00	00
10	Xerox	80	00	00	00	00

8. **Department of Hindi**

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption/day (Watt)
A	**B**	**C**	**D**	**E = C X D**	**F**	**G = E X F**
1	FTL	40	01	40	02	80
2	Fan	60	01	60	02	120
3	PC	12	01	12	½	06
4	LED	33	00	00	00	00
5	Printer	200	01	200	½	100
6	CCTV	5	00	00	00	00
7	AC	55	00	00	00	00
8	Refrigerator	250	00	00	00	00
9	Inverter	10	00	00	00	00
10	Xerox	80	00	00	00	00

9. **Department of Economics**

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption/day (Watt)
A	**B**	**C**	**D**	**E = C X D**	**F**	**G = E X F**
1	FTL	40	01	40	02	80
2	Fan	60	01	60	02	120
3	PC	12	01	12	½	06
4	LED	33	00	00	00	00
5	Printer	200	01	200	½	100
6	CCTV	5	00	00	00	00
7	AC	55	00	00	00	00
8	Refrigerator	250	00	00	00	00
9	Inverter	10	00	00	00	00
10	Xerox	80	00	00	00	00

10. **Department of Geography**

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption/day (Watt)
A	**B**	**C**	**D**	**E = C X D**	**F**	**G = E X F**
1	FTL	40	06	240	02	480
2	Fan	60	02	120	02	240
3	PC	12	01	12	½	06
4	LED	33	00	00	00	00
5	Printer	200	01	200	½	100
6	CCTV	5	00	00	00	00
7	AC	55	00	00	00	00
8	Refrigerator	250	00	00	00	00
9	Inverter	10	00	00	00	00
10	Xerox	80	00	00	00	00

11. **Department of History**

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption/day (Watt)
A	**B**	**C**	**D**	**E = C X D**	**F**	**G = E X F**
1	FTL	40	01	40	02	80
2	Fan	60	01	60	02	120
3	PC	12	01	12	½	06
4	LED	33	00	00	00	00
5	Printer	200	01	200	½	100
6	CCTV	5	00	00	00	00
7	AC	55	00	00	00	00
8	Refrigerator	250	00	00	00	00
9	Inverter	10	00	00	00	00
10	Xerox	80	00	00	00	00

12. **Department of Chemistry**

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption/day (Watt)
A	**B**	**C**	**D**	**E = C X D**	**F**	**G = E X F**
1	FTL	40	05	200	02	400
2	Fan	60	04	240	02	480
3	PC	12	00	00	00	00
4	LED	33	00	00	00	00
5	Printer	200	00	00	00	00
6	CCTV	5	00	00	00	00
7	AC	55	00	00	00	00
8	Refrigerator	250	00	00	00	00
9	Inverter	10	00	00	00	00
10	Xerox	80	00	00	00	00

13. **Department of Physics**

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption/day (Watt)
A	**B**	**C**	**D**	**E = C X D**	**F**	**G = E X F**
1	FTL	40	05	200	02	400
2	Fan	60	04	240	02	480
3	PC	12	00	00	00	00
4	LED	33	00	00	00	00
5	Printer	200	00	00	00	00
6	CCTV	5	00	00	00	00
7	AC	55	00	00	00	00
8	Refrigerator	250	00	00	00	00
9	Inverter	10	00	00	00	00
10	Xerox	80	00	00	00	00

14. **Department of Mathematics**

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption/day (Watt)
A	**B**	**C**	**D**	**E = C X D**	**F**	**G = E X F**
1	FTL	40	00	00	00	00
2	Fan	60	00	00	00	00
3	PC	12	00	00	00	00
4	LED	33	00	00	00	00
5	Printer	200	00	00	00	00
6	CCTV	5	00	00	00	00
7	AC	55	00	00	00	00
8	Refrigerator	250	00	00	00	00
9	Inverter	10	00	00	00	00
10	Xerox	80	00	00	00	00

15. **Department of Botany**

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption/day (Watt)
A	**B**	**C**	**D**	**E = C X D**	**F**	**G = E X F**
1	FTL	40	05	200	02	400
2	Fan	60	03	180	02	360
3	PC	12	00	00	00	00
4	LED	33	00	00	00	00
5	Printer	200	00	00	00	00
6	CCTV	5	00	00	00	00
7	AC	55	00	00	00	00
8	Refrigerator	250	00	00	00	00
9	Inverter	10	00	00	00	00
10	Xerox	80	00	00	00	00

16. **Department of Zoology**

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption/day (Watt)
A	**B**	**C**	**D**	**E = C X D**	**F**	**G = E X F**
1	FTL	40	05	200	02	400
2	Fan	60	03	180	02	360
3	PC	12	00	00	00	00
4	LED	33	00	00	00	00
5	Printer	200	00	00	00	00
6	CCTV	5	00	00	00	00
7	AC	55	00	00	00	00
8	Refrigerator	250	00	00	00	00
9	Inverter	10	00	00	00	00
10	Xerox	80	00	00	00	00

17. **Department of …….**

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption/day (Watt)
A	**B**	**C**	**D**	**E = C X D**	**F**	**G = E X F**
1	FTL	40	02	80	02	160
2	Fan	60	02	120	02	240
3	PC	12	01	12	½	06
4	LED	33	00	00	00	00
5	Printer	200	01	200	½	100
6	CCTV	5	00	00	00	00
7	AC	55	00	00	00	00
8	Refrigerator	250	00	00	00	00
9	Inverter	10	00	00	00	00
10	Xerox	80	00	00	00	00

4.4 Abbreviations:

AVR	: Automatic Voltage Regulator (electricity)
CFL	: Compact Fluorescent Lamp
FTL	: Fluorescent Tube Lamp
kVA	: kilo Volt Ampere
kVAr	: kilo Volt Ampere reactive
kW	: kilo Watt
kWp	:kilo Watt peak
kWh	: kilo Watt hour (Unit of Electricity)
LED	: Light Emitting Diode
LT	: Low Tension
PF	: Power Factor
MEDA	: Maharashtra Energy Development Agency
MSEDCL	: Maharashtra State Electricity Distribution Company Limited
Solar PV	: Solar Photo Voltaic

BIO-GEO CONSULTANCY

School, Colleges, Company Green, Carbon Credit Audit etc.
Neelkanth Society, Bombay Sappers Colony, Wadgaonsheri, Pune. 14
Email ID jyotirammore@gmail.com Mobile Number : 8983349170

This is to certify that

Energy Audit

of

Vidya Vikas Mandal's

Yashvantrao Chavan Mahavidyalaya,

Karmala, Dist. Solapur, Maharashtra, India,

Has been carried out successfully for the year 2020-21 & 2021-22

by

BIO-GEO CONSULTANCY, PUNE

It is further certified that the college exhibits good commitment from the top management to the staff and students, for energy saving, use of renewable energy, energy efficiency, etc. mainly to internalise climate change externalities.

Place : Karmala

Date : 25/01/2023

(Dr. Praveen G. Saptarshi)
Auditor

(Dr. Jyotiram More)
Coordinator