

ANEKANT EDUCATION SOCIETY'S  
**TULJARAM CHATURCHAND COLLEGE**  
of Arts, Science, And Commerce, Baramati  
(Autonomous Status)  
DIST. PUNE 413102

# **ENERGY AUDIT REPORT 2021-2022**



Dr Vitthal B. Nale  
Chairman, Green Audit Committee,  
Tuljaram Chaturchand College of  
Arts, Science & Commerce, Baramati,  
Dist. Pune. (Autonomous Institute)  
Date – 20<sup>th</sup> Dec.2022

To,  
The Principal,  
Tuljaram Chaturchand College of Arts, Science & Commerce,  
Baramati, Dist. Pune. (Autonomous Institute)

Subject: - Submission of Energy Audit Report 2021-22

Respected sir,

On behalf of all the members of committee, I am happy to submit the report of Energy Audit for Academic year 2021-22. I am thankful to you for giving me this opportunity.

Thanking you,



Yours' Sincerely,

Dr. Vitthal B. Nale

Received

22/12/21

तु.च.कॉलेज, बारामती  
आवक नंबर: SL-249  
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## ADVISORY COMMITTEE

| Sr. No. | Name                        | Designation                       |
|---------|-----------------------------|-----------------------------------|
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| 2       | Dr. Avinash Jagtap          | Vice Principal                    |
| 3       | Dr. Yogini Mulaye           | IQAC Coordinator & Vice Principal |
| 4       | Dr. Ramchandra Sapkal       | Vice Principal                    |
| 5       | Dr. Seema Naik              | Vice Principal                    |
| 5       | Mr. Abhinandan B. Shah      | Registrar                         |

## ENERGY AUDIT COMMITTEE

| Sr. No. | Name                   | Designation                        |
|---------|------------------------|------------------------------------|
| 1       | Dr. Ashok E. Kalange   | Chairman,<br>Department of Physics |
| 2       | Dr. Sachin B. kulkarni | Dept of Physics                    |
| 3       | Mr. Bapu P. Shinde     | Laboratory Attendant               |



## **Executive Summary of Savings**

The preliminary energy analysis was entrusted at T.C. College campus for the year 2021-2022 following are the major energy-saving potential, identified during the study.

### **1. Lighting and cooling fans system**

There are different types of departments and buildings where lighting points and fans are provided. Depending upon the category of load, monthly billing is done by MSEDCL as per the applicable tariff. The assessments of the monthly bill are done in a two-part tariff in which fixed charges depend on the sanctioned load and variable charges as per consumption. For higher consumption, rates are more in various slabs. It is always advisable to limit the consumption at a lower billing slab and utilize the optimum sanction load. For commercial category connections, the unit rate is the highest. We need to focus on such connections, viz, Admin building, Auditorium, Canteen, Society, etc.

### **2. Water Pumping System**

There are 10 No. of water pump connections at various locations. Existing water pumps are high-speed Monoblock and their condition is normal. While the billing for the water pump is done at Rs. 6 to 8 per kWh. There is a capacitor bank of 2KVAR provided for a 5HP water pump at the boy's hostel and the power factor is 0.95.

### **3. Girls Hostels**

The billing is done at the residential rate. All 40-watt florescent tubes (Total No. 410) were replaced by LED tubes (20w) which reduces the load from 16.4 kWh to 8.2 kWh.

### **4. College Library**

There are 26 no. of 23w and 218 no. of 15w with a load at 4.78kw which was reduced to 3.924 kW. 18w by replacing 66 no. of 22w LED.



## 5. Summary of Energy Saving

| Sr. No. | Description                                                                          | Monthly Saving Potential |             |          | Capital Investment Rupees | Investment Recovery Period |
|---------|--------------------------------------------------------------------------------------|--------------------------|-------------|----------|---------------------------|----------------------------|
|         |                                                                                      | Nos                      | kWh Saved   | Amt. Rs. |                           |                            |
| 1       | Replacement of CFLs                                                                  | 530                      | 6360        | 14840/-  | 159000/-                  | Ten Months                 |
| 2       | Reduction of Load in Connection for Adm. Bldg.                                       | 2                        | 55 to 40 kW | 6600     | -                         | Immediate                  |
| 3       | Restricting the use of fans in boys' and girls' hostels during college working hours | 200                      | 2400        | 27700    | -                         | Immediate                  |
|         |                                                                                      |                          |             |          |                           |                            |

By optimizing the locating pattern and operational times of hostels substantial energy consumption can be reduced. Also replacing the traditional lamps with low consumption LED lamps, effective energy saving and thereby reducing the energy bills strongly recommended.

## 6. Preamble

The Govt. of India is its organization have decided to bring down energy consumption by 30% over 5 years by conducting comprehensive energy audit studies on their premises and by 20% on private premises followed by implementation of suggestions / Recommendations arising out of the study.

## 7. Introduction

Tuljaram Chaturchand college is the oldest college in the region and was established on a big campus with different faculties, admin building, Auditorium, Library building, Boy's and girl's hostels, Mess arrangements, Water wells, and Pumping systems, Canting, Banking, Student waiting fora house, Printing press, Gymkhana, etc. The internal roads are provided with street lighting and area lighting arrangements. Adequate plantation and gardening at open loads are provided buildings are constructed in such a way that ample ventilation and sunlight are easily accessible hence the power requirement in classrooms and offices during day hours is reduced.



## **8. Energy Source and Distribution**

The energy demands for different faculty and activities are met through various single-phase and three-phase electrical connections. Monthly bills are charged by MSEDCL authorities and are regularly paid by concerned depts. The bills for construction activities are paid by the civil contractor and the canteen meter bills are by the canteen manager. There are 29 no. of electrical connections on the college campus. Separate distribution boards are provided for each connection.

## **9. Study Results**

The existing billing tariff reveals that the power consumption of commercial units is charged at a higher rate as compared with other categories of power consumption, however, for higher consumption in all categories, the rate per unit increases. Hence it is advisable to restrict the consumption at the lower slab. In the existing scenario, wherever the rate of the unit is more than Ten Rupees, immediate action is needed to reduce the consumption by way of replacing the high-power lamps with LEDs and restricting the use of power by proper operational measures. Such locations are identified and mentioned in the energy saving calculation sheet.

Adequate and proper lighting contributes both directly and indirectly towards productivity safety and towards providing an improved work atmosphere. In fact, all these are interrelated and complementary to each other. To study, analyze and identify energy conservation options in lighting, a study of lighting loads of all buildings and areas was conducted. The purpose of the study was to determine the lighting load and its distribution in various sections of buildings, determine the quality of illumination provided, and recommend measures to improve illumination and reduce electricity consumption. To determine the total lighting load, a physical count of the number of light fixtures provided in different floors of different buildings was carried out.

## **10. Options for Improvements in lighting systems:**

Based on the measurements and observations made during the energy audit, the following option has been evolved for producing energy consumption as well as improvement in lux levels in lighting system



- a. The tube lights and CFLs energized at other windows may be put off when sufficient daylight is available.
- b. Although a smaller number of fluorescent tube lights are provided, while chock-type CFLs are provided in some places. (e.g. Bathroom etc.) These tubes and CFLs can be replaced with high-lumen LEDs to minimize lighting consumption and reduce the number of monthly bills. The net effect in various locations is shown in the energy saving calculation sheet with net savings in monthly bills.

### **11. Grid-tied solar- the best option for reducing the existing energy bills.**

The ministry for new and renewable energy (MNRE) of Govt. of India has launched the scheme of a rooftop solar grid-connected system' for the common man to generate his own power for self-use without storage and with thought waste of energy. In this scheme, any consumer of MSEDCL can apply for a grid-connected solar system as per the sanctioned load and monthly requirement units in the prescribed format along with relevant documents and can get installed solar plant on the rooftop of his building such that the AC output of solar plant can be connected to grid through the net meter. The unutilized or balance power of the solar plant is exported to the grid during day hours. The units exported to the grid are recorded in net meter every day and during night hours the power is taken or imported from the grid. This imported power is also recorded in net meter. At the end of every month, the energy bill is generated considering export/import power during the month. If the export is more than the import the excess units are carried forward for the next month. If the import is more than the export the difference unit will be charged as per the appropriate tariff. The final account of export/import units is closed at the end of the year. The benefits of this scheme are (i) We can utilize the full capacity of the solar plant and (ii) There is no need to store the power in batteries. (iii) Cost of storage devices and routing maintenance is saved (iv) When there is no local load for consumption of power the total power is sent to grid and the units exported remains to the credit for future use. The main fetcher of the system is that the solar plant works only when grid power is available. In absence of grid power, the solar plant immediately shuts down, so as to avoid back feed on the grid and mishap power grid of 10kwh was installed.



## 12. Conclusion

During the Energy Audit Study of the college campus, the following points are noted for immediate action in phases.

1. The First action will be taken to reduce the excess section load of a particular connection so as to save the excess payment against fixed charges of excess demand.
2. The Second action shall be taken to monitor the undue use of light and fans. Especially in boys' and girls' hostels, the power cut can be implemented during college working hours. The use of fans for soaking clothes should be watched. Every person on campus should take care to switch off the light, fans, computers, A/c, etc wherever not needed.
3. Where the rate of the unit in the bill is high at such identified location the replacement should be done in the first phase and likewise depending upon the availability of funds.

### Meters abstract of proposed load reduction by replacing fluorescent. Tubes and high-wattage CFLs by LED Annexure-1

| Sr. No. | Connection   | Location               | Equivalent LEDs              |                         | Billing Rate<br>Per Unit<br>Rs/Kwh |
|---------|--------------|------------------------|------------------------------|-------------------------|------------------------------------|
|         |              |                        | Nos                          | Wattage<br>(Kw)         |                                    |
| 1       | 186840038463 | Physics Lab            | 36                           | 0.05                    | 12.00                              |
| 2       | 186840010461 | Chemistry Lab.         | 61                           | 0.73                    | 6.79                               |
| 3       | 186840010666 | Adm. Office Bld.       | 28                           | 0.33                    | 6.79                               |
| 4       | 186840041987 | College Library        | 218 18w<br>66 22 w<br>69 36w | 3.924<br>1.452<br>2.284 | 6.79                               |
| 5       | 186840042151 | Ladies Hostel-1        | 129                          | 1.55                    | 9.20                               |
| 6       | 186840011468 | Ladies Hostel-2        | 7                            | 0.08                    | 9.20                               |
| 7       | 186840011476 | Ladies Hostel-3        | 4                            | 0.05                    | 9.20                               |
| 8       | 186840046466 | Office Store           | 14                           | 0.16                    | 9.20                               |
| 9       | 186840048264 | Principal Residence    | 6                            | 0.07                    | 11.50                              |
| 10      | 186840048639 | Student Rest Room      | 10                           | 0.12                    | 6.79                               |
| 11      | 186840048647 | Assembly Hall (Jivraj) | 1                            | 0.01                    | 6.79                               |
| 12      | 186840022524 | Sci. Workshop          | 20                           | 0.24                    | 9.20                               |
| 13      | 186840014874 | Gymkhana Build.        | 4                            | 0.05                    | 6.79                               |

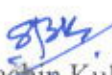


|    |              |                       |      |      |       |
|----|--------------|-----------------------|------|------|-------|
| 14 | 186840015293 | P.G. Build.           | 4    | 0.05 | 6.79  |
| 15 | 186840065215 | Boys Hostel           | 250  | 0.54 | 11.50 |
| 16 | 186840066904 | Ladies Rest Room      | 9    | 0.1  | 11.50 |
| 17 | 186841208125 | Working Women Host.   | 81   | 0.97 | 11.50 |
| 18 | 186841210804 | Microbiology          | 12   | 0.14 | 6.79  |
| 19 | 186840022915 | Print. Press          | 4    | 0.05 | 9.20  |
| 20 | 186841218635 | Comp.Sci.             | 45   | 0.54 | 6.79  |
| 21 | 186841396126 | New Comp. Lab         | 32   | 0.38 | 11.60 |
| 22 | 186841396088 | New Micro. Lab        | 14   | 0.17 | 11.60 |
| 23 | 186841396070 | New Elect. Lab        | 23   | 0.27 | 9.20  |
| 24 | 186841396100 | New Chem. Lab         | 13   | 0.15 | 9.20  |
| 25 | 186841396134 | New Ladies Host.      | 24   | 0.29 | 11.50 |
| 26 | 186841469557 | Prerna Building (20W) | 250  | 5kW  | 12    |
|    |              | Total                 | 1425 |      |       |

**Suggestions:** Considering daily 12 Hours consumption and present billing rate following suggestions are made for savings in monthly energy bills

1. In order to improve the power factor, the capacitors to be provided as mentioned above this will reduce the consumption.
2. In order to improve the power factor, the capacitors to be provided as mentioned above this will reduce the consumption
3. The bills charged at commercial rates should be considered for the reduction of load on priority.
4. The A.C. should be operated in a temperature range of 20 to 24-degree centigrade for low power consumption.

  
Mr. Bapu Shinde

  
Dr. Sachin Kulkarni

  
Dr. Ashok Kalange



  
Principal  
Tuljaram Chaturchand College  
Baramati