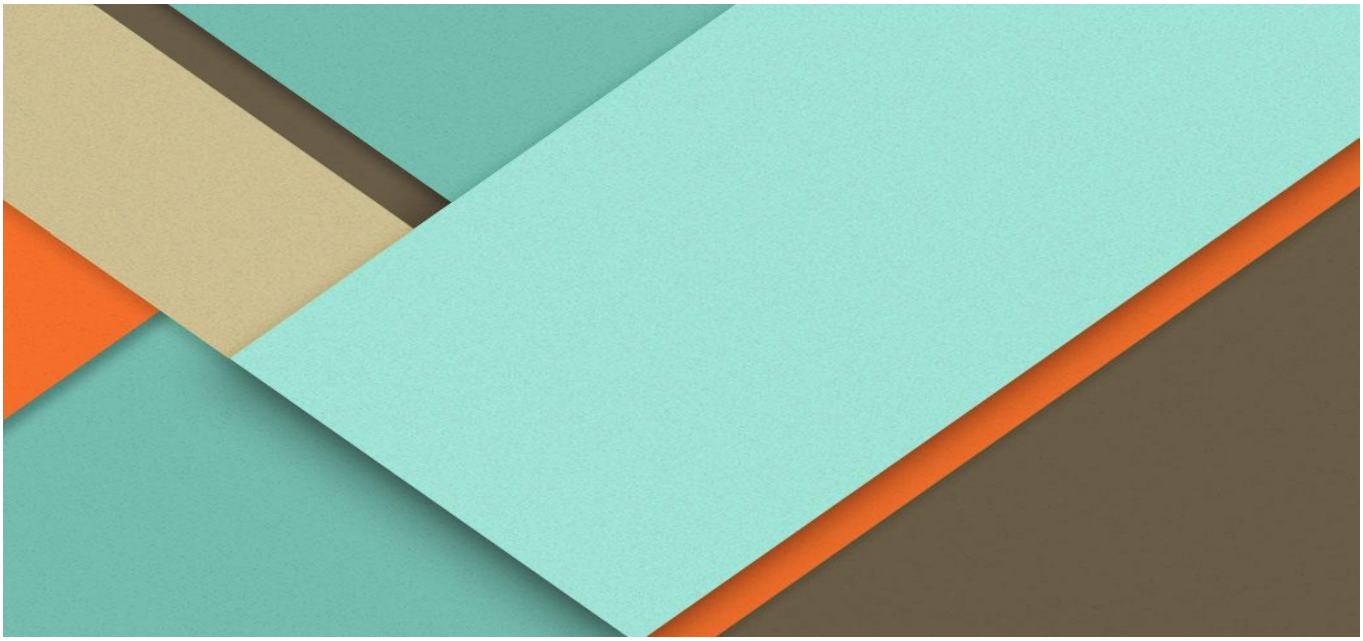


ENERGY AUDIT REPORT

2024-25

PADMABHUSHAN DR. VASANTRAODADA PATIL MAHAVIDYALAYA, TASGAON

—

DS ENERGY CONSULTANCY AND SERVICES
Mrs. D. S. Patil (BEE Certified energy auditor and manager)
Vishrambag, Sangli

ACKNOWLEDAGEMENT

Energy Audit Assessment Team thanks the management of Shri Swami Vivekanand Shikshan Sanstha Kolhapur Sanchalit, Padmabhushan Dr. Vasantraodada Patil Mahavidyalaya, Tasgaon for assigning this important work of Green Audit to DS Energy Consultancy and services, Sangli. We appreciate the cooperation to our Team for completion of study.

Our special thanks are to Principle of college Dr. Milind Hujare, IQAC coordinator Dr. J.S. Ghodake, all heads of the departments, teaching and non- teaching staff for giving us necessary inputs to carry out this vital exercise of Energy Audit.

We are also thankful to other staff and office members who were actively involved while collecting the data and conducting field measurements.

Mrs. D.S. Patil (EA-31840)
BE(Mech) MTech(Energy)
Bureau of Energy Efficiency (BEE)
Certified Energy Auditor and Manager

DISCLAIMER

Energy Audit Team has prepared this report for Shri Swami Vivekanand Shikshan Sanstha Kolhapur Sanchalit, Padmabhushan Dr. Vasantraodada Patil Mahavidyalaya, Tasgaon based on input data submitted by the representatives of College complemented with the best judgment capacity of the expert team.

While all reasonable care has been taken in its preparation, details contained in this report have been compiled in good faith based on information gathered.

It is further informed that the calculations are arrived at by best estimates and no representation, warranty or undertaking, express or implied, is made and no responsibility is accepted by the 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.

Mrs. D.S. Patil (EA-31840)
BE(Mech) MTech(Energy)
Bureau of Energy Efficiency (BEE)
Certified Energy Auditor and Manager

TABLE OF CONTENT

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. Padmabhushan Dr. Vasantraodada Patil Mahavidyalaya, Tasgaon uses energy in the following forms:

a) Electricity from MSEDCL

b) High Speed Diesel (HSD)

c) Solar wind Hybrid Energy Source

2. Electrical energy is used for various applications, like Computers, Lighting, Air-Conditioning, Fans, Other Lab Equipment

The average energy consumption is around 3913 kWh/Month.

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: 2.348 kWh/Sq m

4. It has found that there is wide scope for energy saving and pollution free campus development. Recommendations with cost benefit analysis have been given in detail in the report.

5. Total potential for energy saving within all campuses is approximately **Rs. 0.80+**Lakh per annum.

ABBREVIATION

AHU	- Air handling unit
APFC	- Automatic Power Factor Controller
DG	-Diesel generator
ECP	-Energy Conservation Proposal
GCV	-Gross Calorific Value
HVAC	- Heating, Ventilation and Air conditioning
HSD	-High speed diesel
kCal	-Kilo-calories
FO	-Furnace oil
PF	-Power Factor
SEC	- Specific Energy Consumption
TR	-Tons of Refrigeration
UOM	- Unit of Measurement
MAHADISCO	-Maharashtra State Electricity Distribution Company

INTRODUCTION OF ENERGY AUDIT

An energy audit is a process to study a building or industry to know the energy consumption of the building and identify methods to reduce the energy consumption for energy savings. In Commercial Building, the present electrical consumption is about 8-10 percent of the total electricity. To meet the international level of comfort and facilities the electrical demand is increasingly by 11-12 % annually. This is a challenge for every industry to ensure that energy growth in commercial buildings does not become unmanageable but also gives and presents an opportunity to influence and identify energy management issues in various commercial buildings and facilities. As the natural resources are limited and energy uses are increasingly very sharply so it is very necessary to save natural resources by reducing energy consumption which can be achieved by using energy efficient equipments and also by awareness of peoples about energy conservation .Energy audit in industrial and commercial, is the process to identifying opportunities to reduce carbon footprints and energy conservation.

GENERAL

Padmabhushan Dr. Vasantraodada Patil Mahavidyakaya, Tasgaon entrusted the work of conducting a Detailed Energy Audit of campus at Tasgaon with the main objectives as below:

- To study the present pattern of energy consumption
- To identify potential areas for energy optimization
- To recommend energy conservation proposals with cost benefit analysis.

Case Study in Campus:

We are taking this opportunity to express our heartily gratitude to Padmabhushan Dr. Vasantraodada Patil Mahavidyakaya, Tasgaon for giving opportunity for carrying Energy Audit in campus We once again put up our appreciation for full cooperation & valuable guidance for perfect auditing of the Campus to technical as well as commercial persons for providing all the required information & data as well as for provide cooperation with all the departments & extend

his best help in our work. We have tried our level best for the work of Energy Audit up to their satisfaction.

The major activities carried out during the audit are as follow:

- Collection of College's records regarding Electricity Power Bills, Power Distribution Diagram, Specifications of major power handling equipment – such as Fans, lighting and pumps.
- Analysis of above calculations, isolating the areas vulnerable to energy consumption not related to production.
- Recommendation of various methods of rectification
- Making a case study of projected saving by following our recommendations; and estimating potential investment &payback period.

Steps in Energy Auditing The energy audit may range from a simple walk - through survey at one extreme to one that may span several phases: -

1) The first step is to identify the areas where energy is wasted and reduced energy without affecting the outputs of various functions.

2) The second step is to implement energy efficient appliances in place of normal appliances which reduce energy use by proper operations and maintenance. For this reason, it is necessary to reduce the number of operating machines and operating hours according to the demands of the load, and fully optimize equipment operations.

Energy audit depends on following factors:

- Building equipment operation
- Lighting systems.
- Power systems
- Building envelope
- Air-conditioning and ventilation equipment systems.
- Miscellaneous services.

The first two steps can be implemented without changing buildings and existing appliances.

3) The third step would require investment for remodeling, rebuilding, or introducing further control upgrades to the building.

4) The fourth step is to carry out large-scale energy reducing measures when existing facilities have passed their useful life, or require extensive repairs or replacement because of obsolescence. In this case higher energy savings may be achieved. For these last two stages, the audit may be more extensive in order to identify more ECOs for evaluation, but at an increased need for heavier capital expenditure to realize these opportunities.

INTRODUCTION OF COLLEGE

Sr No.	Particulars	Details
1	Name of the Institutes	Shri Swami Vivekanad Shikshan Sanstha Kolhapur Sanchit, Padmabhushan Dr. Vasantraodada Patil Mahavidyalaya, Tasgaon
2	Address	Sangli- Tasgaon Road, Tasgaon PIN CODE-416312 Contact No.02346250665 San_pdvpm.tas@gmail.com
3	Year of Establishment	June 1962
4	Courses offered	a) Bachelor of Science b) Bachelor of commerce c) Bachelor of Arts d) Masters in Science e) Masters in commerce f) Masters in Arts g) Bachelor of Computer Application
5	Affiliation	NAAC (B++ Grade ,2.76) UGC-approved and recognized college affiliated by the Shivaji University

Energy Audit assessment team	**Designation**
Prof.Mrs. D.S.Patil	Certified Energy Auditor
Dr. Milind Hujare	Principal
Dr. J. S.Ghodake	IQAC coordinator

Physical Structure

Total college campus area	11 acre
Build up area	40000 sq ft or 3716 Sq.m
Projected area	16000 sq ft or 1486 Sq.m

SCOPE OF WORK AND APPROACH

Scope:

Scope of work and methodology were as per the proposal. While undertaking data collection, field trials and their analysis, due care was always taken to avoid abnormal situations so as to generate a normal/representative pattern of energy consumption at the facility.

Approach:

1. We focused our attention on energy management and optimization of energy efficiency of the systems, sub systems and equipment. The key to such performance evaluation lies in the sound knowledge of performance of equipment and system as a whole. The objective of Energy Audit is to balance the total energy inputs with its use and to identify the energy conservation opportunities in the stream.

2. Energy Audit also gives focused attention to energy cost and cost involved in achieving higher performance with technical and financial analysis. The best alternative is selected on a financial analysis basis.

ENERGY AUDIT METHODOLOGY:

A] Historical data Analysis:

The historical data analysis involves establishment of energy consumption pattern to establish base line data on energy consumption and its variation with change in production volumes.

B] Actual measurements and data Analysis:

This step involves actual site measurement and field trials using various portable measurement instruments. It also involves input to output analysis to establish actual operating equipment efficiency and finding out losses in the system.

C] Identification and evaluation of energy conservation opportunities:

This step involves evaluation of energy conservation opportunities identified during the energy audit. It gives potential energy saving and investment required to implement the proposed modifications with payback period. All recommendations for reducing losses in the system are backed with its cost benefit analysis.

Preliminary Audit:

In this Preliminary survey, the auditor may need to know the building envelope and its energy consumption. The data of a building can be obtained from: -

- Building Architectural blueprints.
- Building Air-conditioning blueprints.
- Building Electrical lighting and power drawings.
- Electrical bills and operation logs for the year preceding the audit.
- Air-conditioning manuals and system data.
- ECOs for evaluation, but at an increased need for heavier capital expenditure to realize these opportunities.

The walk-through process can be started after familiarization with the building, if the building blueprints and other electrical appliance information available describes the building and its operation accurately. In the walk-through audit, the building envelope can be studied by a walk around the building. In the model analysis, the building must be divided into zones for analysis. The building survey would include that the air-conditioning system is as indicated on plans. In the building envelope, the type and condition of the windows, effectiveness of window seals will be noted. In the building, typical lighting and power requirements, occupancy and space usage are also noted. This information regarding building could be compared against the recommendations in the relevant Codes of Practices. The survey of mechanical rooms and plant rooms can give system and plant data. Name plate information could be compared against those in the building's documents, and pumps and chiller rooms can be visited for estimating the load on the system.

Operator's Input The auditor may discuss with the building maintenance staff further on the operating schedules and seek clarification on any unusual pattern in the trend of the utility bills. Unusual patterns such as sudden increase or decrease in utility bills could be caused by changes in occupancy in the building, or change in use by existing tenants. It is not uncommon for tenants to expand their computing operations that may increase the energy use significantly

A] HISTORICAL DATA ANALYSIS:

Record of monthly energy consumption of individual meter in Kwh (units) and respective Energy bill in Rupees is given below

		Consumer No. 281510073737		**Consumer No. 281510073729**		**Consumer No. 281510562495**		**Consumer No.281510323903**			
		Meter No 41103997870		**Meter No. 09849981633**		**Meter No. 06507146699**		**Meter No. 09849981633**			
Sr. No	**Month**	**Energy consumption units kWh**	**Bill in Rs**	**Energy consumption units kWh**	**Bill in Rs**	**Energy consumption units kWh**	**Bill in Rs**	**Energy consumption units kWh**	**Bill in Rs**	**Total Energy consumption**	**Total Bill in**
1	25-Mar	183	11046	1235	12597	1675	17085	511	5212	3604	45940
2	25-Feb	806	8221	925	9435	1205	12291	403	4110	3339	34057
3	25-Jan	842	8588	998	10179	1367	13943	393	4008	3600	36718
4	24-Dec	746	7609	1047	10679	1108	11301	431	4396	3332	33985
5	24-Nov	894	9118	1220	12444	1077	10985	405	4131	3596	36678
6	24-Oct	678	6915	1210	12342	1032	10526	543	5538	3463	35321

7	24-Sep	1045	10750	1167	11903	1621	16560	556	7890	4389	47103
8	24-Aug	1219	12433	1140	11628	1616	16483	561	5722	4536	46266
9	24-Jul	673	6864	1529	15595	1252	12770	539	5497	3993	40726
10	24-Jun	513	5232	1355	13821	988	10077	513	5232	3369	34362
11	24-May	745	7599	1584	16157	1494	15239	731	7456	4554	46451
12	24-Apr	1272	12974	1472	15014	1857	18941	578	5896	5179	52825

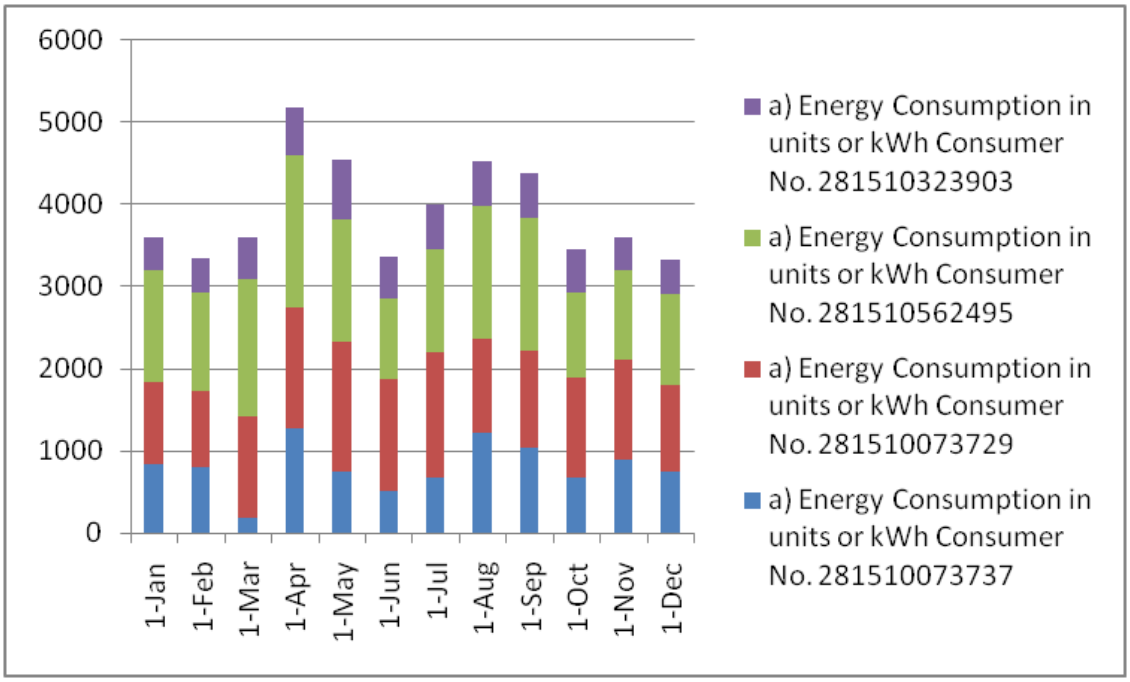
a) Energy Consumption in units or kWh

MONTHS	Consumer No. 281510073737	Consumer No. 281510073729	Consumer No. 281510562495	Consumer No. 281510323903
25-Mar	183	1235	1675	511
25-Feb	806	925	1205	403
25-Jan	842	998	1367	393
24-Dec	746	1047	1108	431
24-Nov	894	1220	1077	405
24-Oct	678	1210	1032	543
24-Sep	1045	1167	1621	556
24-Aug	1219	1140	1616	561
24-Jul	673	1529	1252	539
24-Jun	513	1355	988	513
24-May	745	1584	1494	731
24-Apr	1272	1472	1857	578

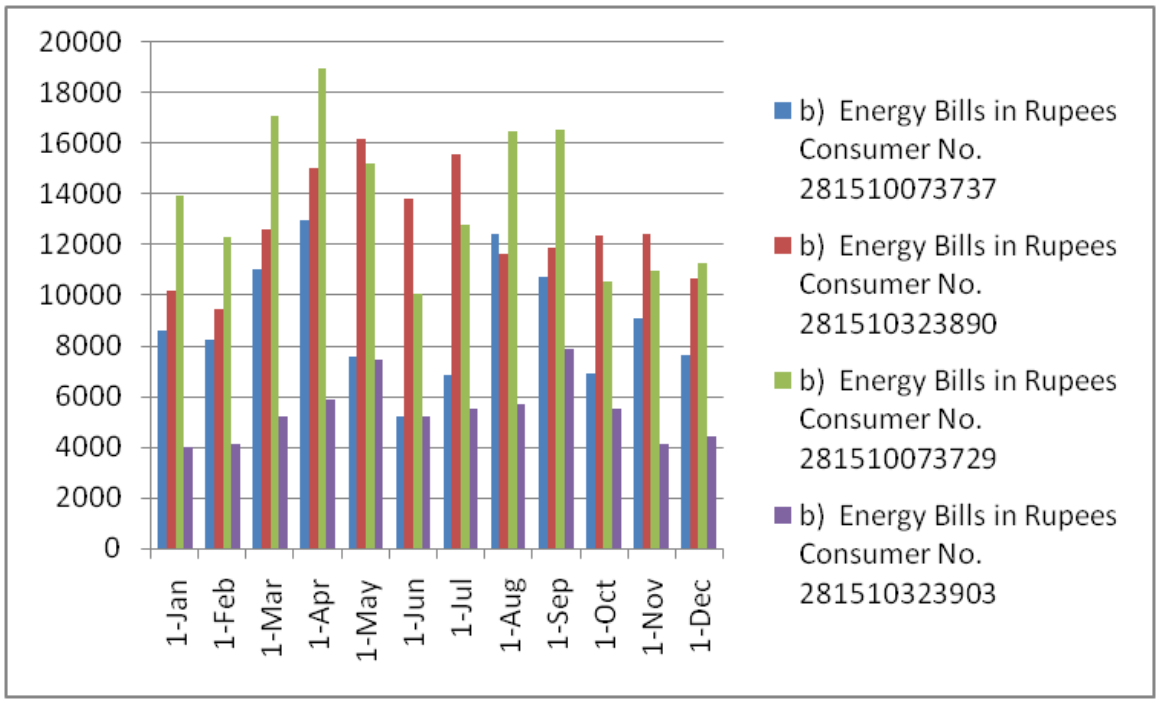
b) Energy Bills in Rupees

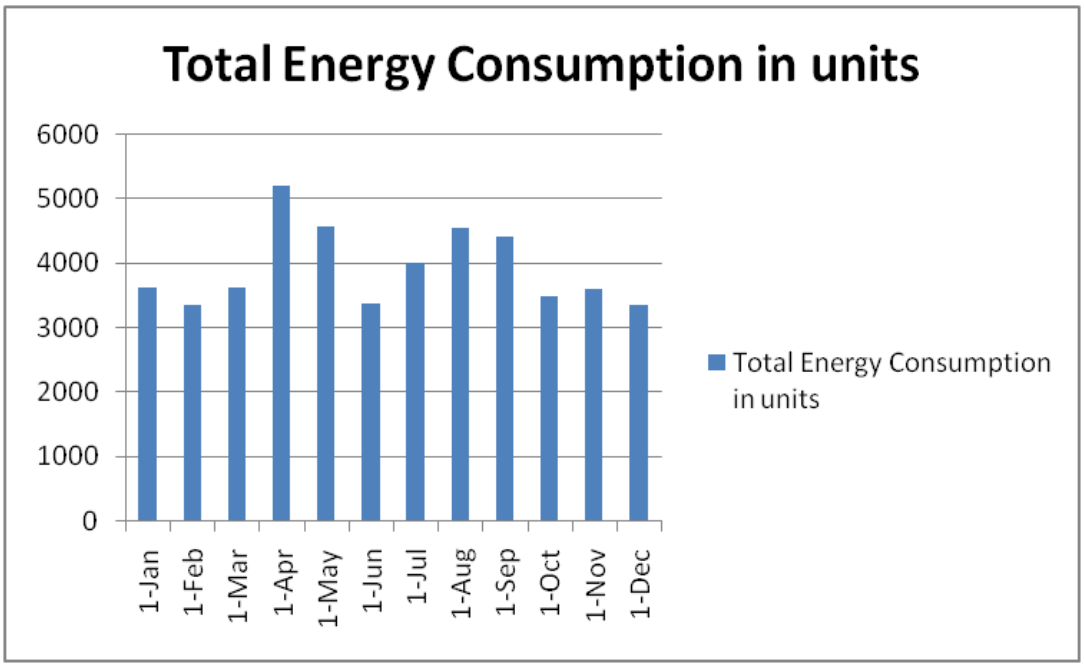
MONTHS	Consumer No. 281510073737	Consumer No. 281510323890	Consumer No. 281510073729	Consumer No. 281510323903
25-Mar	11046	12597	17085	5212
25-Feb	8221	9435	12291	4110
25-Jan	8588	10179	13943	4008
24-Dec	7609	10679	11301	4396
24-Nov	9118	12444	10985	4131
24-Oct	6915	12342	10526	5538
24-Sep	10750	11903	16560	7890
24-Aug	12433	11628	16483	5722
24-Jul	6864	15595	12770	5497
24-Jun	5232	13821	10077	5232
24-May	7599	16157	15239	7456
24-Apr	12974	15014	18941	5896

a) Energy Consumption in units or kWh



b) Energy Bills in Rupees





Total Energy Consumption in Units

MONTH	Total Energy Consumption in units
25-Mar	3604
25-Feb	3339
25-Jan	3600
24-Dec	3332
24-Nov	3596
24-Oct	3463
24-Sep	4389
24-Aug	4536
24-Jul	3993
24-Jun	3369
24-May	4554
24-Apr	5179

Source of Energy:

Padmabhushan Dr. Vasantraodada Patil Mahavidyakaya, Tasgaon uses Energy in following forms:

A] Electricity from MSEDCL

Padmabhushan Dr.Vasantraodada PatilMahavidyakaya, Tasgaon receives Electricity from MSEBE

B] High Speed Diesel (HSD)

HSD is used as a fuel for Diesel Generator which is run whenever power supply from MSEDCL is not available.

The following are the major consumers of electricity in the facility

- Computers
- Lighting
- Air-Conditioning
- Fans
- Other Lab Equipment

C] Hybrid (Solar with wind miles) energy generation device

The hybrid energy generation devices contain a solar panel and wind turbine. The hybrid energy generation device has rated power 2 KW.

SPECIFIC ENERGY CONSUMPTION:

Specific Energy Consumption (SEC) is defined as energy usage per Square meter of area. It is calculated total electrical kWh/total area of the campus. By calculating SEC, we can crudely target the factors of energy efficiency or inefficiency. SEC for the last twelve months was calculated and is as shown in the chart below.

Total College campus Area	11 acre
Build up Area	40000 Sq.ft or 3716 Sq.m
Projected Area	16000 Sq.ft or 1486 Sq.m
Specific Energy Consumption	0.6 Units/Sq.m

MONTH	Specific Energy Consumption
25-Mar	2162.4
25-Feb	2003.4
25-Jan	2160
24-Dec	1999.2
24-Nov	2157.6
24-Oct	2077.8
24-Sep	2633.4
24-Aug	2721.6
24-Jul	2395.8
24-Jun	2021.4
24-May	2732.4
24-Apr	3107.4

B] STUDY OF ACTUAL MEASUREMENT AND ITS ANALYSIS

I) Actual measurement of existing equipments

All required data is collected by the Energy Audit Team. In this data, different classifications are one and made surveys of the college. In this survey, in every room, how much fans, tubes, fans, computer, instrument AC, etc. will be measured. According to survey following data is collected

All Electricity consuming equipment and respective energy consumption in kW

	Equipment	Quantity	Actual load in Watt	Total consumption in Watt
Department of Mathematics	Fan	2	78	156
	Tube light	2	40	80
	computers	16	520	8320
	printer	2	200	400
	LED	1	10	10
Department of Computer Science	Fans	4	78	312
	Tube light	3	40	120
	Air conditioners (1.5 Tonne)	1	5500	5500
	LED	1	10	10
	computers	58	520	19760
	Printer	1	200	200
Department	Fans	9	78	702
	Tube light	6	40	240
	LED	2	20	40

of Physics	**computers**	4	520	2080
	Printer	2	200	400
	LED Projector	1	200	200
Department of Botany	**Fans**	7	78	546
	tube light	3	40	120
	LED	1	10	10
	wall Fan	1	100	100
	Refrigerator	1	180	180
	computers	1	520	520
	printer	1	200	200
Zoology Department	**Fan**	9	78	702
	Tube light	5	40	200
	LED	3	10	30
	wall Fan	1	100	100
	Projector	1	200	200
	Oven I	2	1000	2000
	Oven II	1	2000	2000
	outdoor light	2	40	80
	computers	2	520	1040
	Printer	1	200	200
	Fan	12	78	936
	Tube light	5	40	200
	LED	3	10	30

Statastics Department	**wall Fan**	3	100	300
	outdoor light LED	2	10	20
	computers	39	520	20280
	Air conditioners (2 Tonne)	1	7050	7050
chemistry Department	**Fan**	15	78	1170
	Tube light	15	40	600
	LED	6	10	60
	computers	12	520	6240
	wall Fan	1	100	100
	TV LED	1	100	100
	oven	2	1500	3000
	Refrigerator (253 units per year saving	1	180	180
	Air conditioners(1.5 Tonne)	1	5275	5275
Class rooms (No.22)	**Fans**	1	78	78
	Tube light	1	40	40
Library	**Fan**	18	78	1404
	18 tube light	1	18	18
	Tube light	20	40	800
	CFL (18W)	1	18	18

	outdoor light	2	40	80
	Printer	1	200	200
	computers	7	520	3640
Staff room for Arts and Commerce	**Fan**	4	78	312
	Tube light	4	40	160
	computers	1	520	520
Office	**Fan**	8	78	624
	Tube light	5	40	200
	LED	4	10	40
	wall Fan	1	100	100
	Xerox machine	1	500	500
	computers	7	200	1400
	Printer	6	200	1200
Principle Office	**Fan**	5	78	390
	Tube light	1	40	40
	LED light	17	10	170
	CFL (18W)	1	18	18
	Air conditioners	2	7050	14100
	LED TV	2	100	200
	computers	1	520	520
	Printer	1	200	200
	Fan	21	78	1638
	Tube light	15	40	600

Hostel	**Bulb**	8	15	120
	LED	5	10	50
	Motor	1	746	746
	Water purifier	1	100	100
Jimkhana	**Fan**	2	78	156
	Tube light	8	40	320
	street light	2	25	50
	bulb CFL (18 W)	1	18	18
	Total	120012		

Electricity consumption Equipments purchased in 2024-25 year:

This college has purchased all the equipment by taking into account the findings and recommendations of the previous energy audit report 2023-24 to ensure energy efficiency and long term cost savings. Procurement decisions are aligned with energy audit recommendations to support college's sustainability goals and reduce operational energy costs.

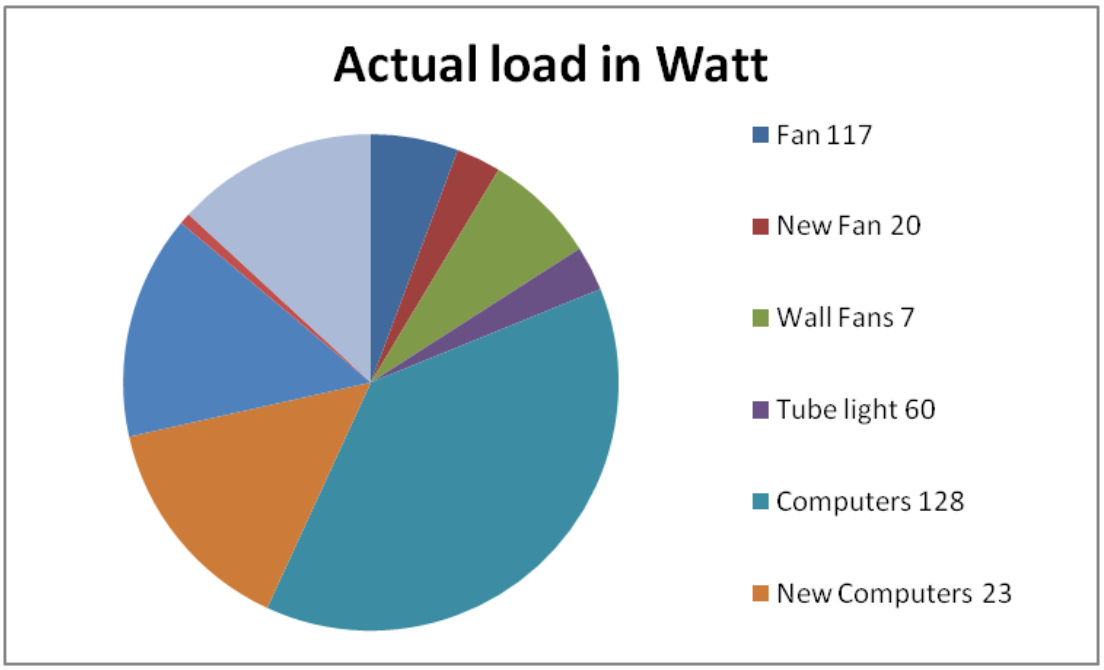
Sr.No	Electrical Equipments	Quantity	Energy consumption in watt	Total Energy Consumption in Watt
1	Computers	23	200 W	4600
2	Smart Boards	3	150	450
3	Fans	20	40	800
4	LED/Tube light	20	20	400
5	Inverter 7.5KV(6kW)	**2**	6000	12000
6	Inverter 10 KV (8kW)	**1**	8000	8000
7	Inverter 6 KV(4.8kW)	**1**	4800	4800
8	Printer	**5**	340	1700
TOTAL				**32750 Watt**

Total Energy Consumption in watts: 120012 + 32750 = 152762 Watt

A] Major electricity consuming equipment and respective total load

Equipments	Quantity	Actual load in Watt	Total Load in Watt
Fan	117	78	9126
New Fan	20	40	800
Wall Fans	7	100	700
Tube light	60	40	2400
Computers	128	520	66560
New Computers	23	200	4600

Printers	15	200	3000
LED	46	10	460
Air conditioners	2 (1.5 T)+ 3(2 T)		26650
Inverter	4		24800
Refrigerator	2	180	360
Oven	2(1kW) + 1 (2kW)		4000
others			6956
Total	**152762 Watt**		



II) Renewable Energy Sources

Hybrid (Solar with wind miles) energy generation system is available in college campus. The device has rated power 2KW.

Assuming total working hours -4 hours

Total kWh or units energy obtained from renewable source is 8 kWh Equipment working on renewable energy

Sr. No	Equipment	Quantity	Actual consumption by equipment	Total Energy consumption in kWh or units
1.	Computer	1	520 W	520W x 4 = 2080Wh 2.08kWh
2.	Printer	1	200 W	200W x 4 = 800Wh 0.8 kWh
3.	Tube light	2	40 W	80W x 4 = 320Wh 0.32 kWh
4.	Fan	2	78 W	156W x 4 = 624Wh 0.624 kWh
Total				5.736 kWh

Total daily energy consumption by Renewable Energy source = 3.824 kWh
Therefore monthly energy consumption by Renewable Energy source = 21.92 kWh
Monthly Average energy consumption by Electricity board = 2224.25 kWh

III) Carbon dioxide Emission

For consumption of 1 Unit (1 kWh) of Electricity, the CO2 emitted is 0.8 Kg. OR the Emission is 0.8 Kg/kWh. In the following Table we present the total units consumed and CO2 emitted as under:

Sr.No	Month	Energy Consumption (kWh)	CO_2 emitted in kg
1	25-Mar	3604	2883.2
2	25-Feb	3339	2671.2
3	25-Jan	3600	2880
4	24-Dec	3332	2665.6
5	24-Nov	3596	2876.8
6	24-Oct	3463	2770.4
7	24-Sep	4389	3511.2
8	24-Aug	4536	3628.8
9	24-Jul	3993	3194.4
10	24-Jun	3369	2695.2
11	24-May	4554	3643.2
12	24-Apr	5179	4143.2
	Avg	3913	3130.26

III] Requirement of NAAC:

a) Alternative Energy Initiative

Percentage of power requirement met by renewable energy sources

= (Power requirement met by renewable energy sources / Total power requirement) X 100

We have,

Power requirement met by renewable energy sources -21.92 kWh

Monthly Average energy consumption by Electricity board – 2500 kWh

Total Power requirement: 21.92 + 2224.75 = 2246.67 kWh

Therefore,

= (21.92/2500) X 100

= 0.8%

b) **Percentage of lighting power requirement met through LED bulbs**

Percentage of lighting power requirement met through LED bulbs

= (Lighting power requirement met through LED bulbs / Total lighting power requirement) X 100

= (260/650) X 100

= 40.06%

C] IDENTIFICATION AND EVALUATION OF DATA

The electrical devices which are connected in college campuses are not energy saving devices. These devices can be changed by electrical efficient appliances. The appliances are of high watt equipment so the electrical consumption is high in Tasgaon college campus. Nowadays low wattage appliances are used in buildings. They are helpful in

; saving electricity.

Table Energy Efficient Electrical Equipment

Sr.No	Equipment	Make	Rating	Specification	Cost INR
1	20 W LED Tube light	Wipro	18 W	LED	300*
\2	Fan (1200 mm)	Usha	50 W	BEE 4 star	1255*
3\\\\	Fan (700mm)	Usha	43 W	BEE 4 star	1135*
4\	Exhaust fan	Usha	50 W	BEE 4 star 486 m3/min	1650*
5	Tube light	Philips	36 W	Lumen	250*

*Price is based on market rates

1) Tubes and CFL are replaced by LEDs.

2) Replacing the CRT Monitors with LCD Monitors:

3) Replacing regular fans by BEE 4 star fan

Energy saving calculations

1) Cost Analysis of LED light with Conventional tube light.

total No. of conventional Tubelights in campus	130
Conventional tubelight average power	40 W
LED Average Power	10 W
Difference in power saved per tube light	(40-10)= 30 W
% saving After replacement	75%
Average use of Tube light per year	1935kWh
Energy saved per year	75% of 1935= 1451.25
Electricity bill saving per year	1451*8=Rs. 11610
LED Average cost	Rs. 300
Total LED used	26
Total cost of replacement of tube light	Rs.7800

Current status:

Conventional light: 60 tubes instead of 131 quantities

LED: 26 with cost of replacing Rs. 7800.

Recommendation:

Replace all 60 Tube lights by LED

2) Replacing the CRT Monitors with LCD Monitors:

In the college campus computers with CRT monitors are 128 numbers and the power consumption of CRT monitors is 520 W which is very large. The power consumption of LCD monitor is 250 Watts so the difference between CRT monitors and LCD monitor is large but the

LCD monitor are costlier than CRT monitors. This saving of 270W per monitor is very large. LCD monitor cost analysis with CRT monitors.

total No. of computers with CRT Monitor in campus	128
Conventional CRT Monitor average power	520 W
LED monitor Average Power	250W
Difference in power saved per new computer	(520-250)= 270 W
% saving After replacement	52%
Average use of computer per year	24573kWh
Energy saved per year	52% of 24573= 12778kWh
Electricity bill saving per year	12778*8=Rs. 102224
LED monitor Average cost	Rs. 4500
Total LED monitor used	128
Total cost of replacement of CRT monitor	Rs.576000

2) Replacing regular fans by BEE 4 star fans

total No. of conventional Fans in campus	117
Conventional Fan average power	78 W
BEE 4 star Average Power	50W
Difference in power saved per new Fan	(78-50)= 28 W
% saving After replacement	36%
Average use of Fan per year	3370kWh

Energy saved per year	36% of 3370= 1213kWh
Electricity bill saving per year	1213*8=Rs. 9704
BEE 4 star rated fan-Average cost	Rs. 4500
Total Fans used	117
Total cost of replacement of CRT monitor	Rs.146835
Payback period	15 years

. Hence, the payback time for replacing all conventional fans of the campus with BEE 4 star rated fan is around 15 yrs year.

*Payback period is more than average life of equipment so not recommended

AUDIT OBSERVATION AND RECOMMENDATIONS:

Good daylight Design & Ventilation:

The college has a structure with broad door opening, high windows, and a rectangular building so that sunlight can reach all areas. Classrooms are provided with enough illumination from natural light. They are providing light colored fabric curtains or binds for window covering. Windows are in good operable condition. The structure has a high ceiling, wide corridors. Exhaust fans are used wherever necessary.

It is advised to use double or triple glazing on windows/ Sun protecting film on windows.

All Class Rooms and labs have Display Messages regarding optimum use of electrical appliances in the room like lights, fans, computers and projectors.

Indoor Air Quality:

As the building has open ventilation, there is no need for HVAC system

It is recommended to install smoke detectors from safety point of view. Indoor quality monitoring should be carried out periodically. The college can arrange indoor Air Quality (IAQ) awareness programs.

Temperature and Acoustic Control:

The college has been using daylight design as the building is constructed in such a way that diffused sunlight allows light but not heat.It is advised to use special walls for temperature control and noise barrier. Use an Earth air tunnel which will cool in summer and heat in winter. Roofs with reflective glass can be helpful for temperature control. Using cool roofing material during new construction(mineral wool, rock wool, vermiculite, foams, expanded polystyrene etc). using water bodies like fountain, ponds are good for temperature control.

INSTALLATION OF SOLAR PV PANEL

A 10kW solar system is the best fit to meet your average daily consumption of 40 kWh and offset your heavy electricity bills. With higher efficiency and power potential, this system's capacity is the largest residential solar energy system you can go for.

Small businesses and commercial properties can also benefit from a 10kW solar panel system. Its significant power generation capacity can replace the traditional energy sources you use and help you become self-sufficient.The Working of a 10kW Solar System and Its Benefits:

Simply put, solar panels work by capturing sunlight (not heat) and converting this energy into usable electricity. This is called the photovoltaic (or PV) effect which takes place at the individual solar cells arranged together in the panels.

The DC power generated by solar panels is converted to AC electricity when it flows through a solar inverter, an important component in your 10kW solar system cost. An inverter has an in-build transformer to also control the voltage of DC and AC currents.

Being a renewable, sustainable, and plentiful energy source, solar energy has many advantages to offer:

· Lower Electricity Bill:

The biggest incentive for switching to solar is the opportunity to cut down your annual electricity expenses. Your bills drop as you start meeting your energy needs with your on-site 10kW solar system. Your savings depend on how much of your power demand is covered by your solar system in comparison to the upfront price of your 10,000-watt solar panel system in India. It's safe to conclude that the upfront cost of a 10kW solar power plant is an investment toward securing a much lower long-term energy cost for your home.

· Earn Solar Credits:

In addition to savings on utility bills, there is a possibility to sell and monetize the surplus solar energy that you don't use at home. A grid-tied 10kW solar panel system is designed to export

unused solar energy to the grid for solar credits. Households can use these credits to buy grid electricity when required or receive a payment on their credit balance at the year end.

· Environmental Gains:

For each kilowatt-hour (kWh) of solar electricity that you use at home, you give up a similar quantity of grid electricity. This lowers your property's environmental footprint. Since solar panels use sunlight to generate power, there is no emission during the process, making solar good for the environment.

10 Kilowatt Solar Panel Price List & Specifications

Solar photovoltaic technology has become more efficient and feasible for both residential and commercial applications. Also, the prices of 10kW solar systems in India have reduced sharply over the decade with the market becoming more competitive. Selecting the right type and size of solar system is important to ensure maximum returns on your investment. Here is a representation of estimated 10kW solar system prices for different system types.

Model	10kW Solar Price
10kW On-grid solar system	Rs. 7,11,000 Onwards*
10kW Off-grid solar system	Rs. 6,00,000
10kW Hybrid solar system	Rs. 8,00,000

Key specifications of a 10kW solar system:

Key components	Solar panels (at least 75% performance efficiency), solar mounting structure, solar inverter, solar batteries (optional), the balance of system (cables, fuses, MCBs, and Distribution boxes) **For residential applications, all components should be in compliance with MNRE guidelines and ALMM standards to be eligible under the subsidy scheme.*
Energy output	– 40 kWh of electricity per day – 1,200 kWh of electricity per month – 14,400 kWh of electricity per year
Area required	To install a 10kW solar system, you need a shade-free space of 1,000 square feet.

Different Types of 10kW Home Solar Systems:

The price of a 10kW solar panel system varies across the different installation options available. Each type of system has a unique combination of solar components to fit a variety of commercial and residential applications. Knowing each system type is important to determine the best way to meet your energy needs.

- On-grid 10kW solar system (with the flexibility and benefits of net metering)

- Off-grid 10kW solar system (with solar batteries)
- Hybrid 10kW solar system (with solar battery storage and grid connection)

A] 10kW On-grid Solar System Specifications:

In a grid-tied solar energy system, electricity flows both to and from the local grid. Aside from solar panels and an inverter, your system is paired with a net meter. The surplus electricity that you don't use is fed to the grid. Through the net metering regulations, you receive solar credits for the electricity exported on your subsequent energy bill. This makes the overall cost of energy for your home even cheaper.

A grid-tied solar system also allows you to draw grid power to meet additional electricity demand beyond what your solar panels are supplying. Solar credits can be used to purchase additional grid power units.

If you are looking for the most affordable option to go solar, a 10kW on-grid solar system price in India with subsidy is worth considering. Since this type of system doesn't include solar batteries, the upfront cost is less than other types of solar installation frameworks. Also, you can avail a fixed subsidy of Rs. 94,822/- on an on-grid solar system.

B] 10kW Off-grid Solar System Specifications:

Many communities that are located far away from power sources (the government grid) have to pay higher electricity tariff rates for grid connection. At the same time, they depend on expensive diesel-fired power generation to fulfil additional electricity needs. For such households and commercial establishments, an off-grid 10kW solar plant cost proves to be more feasible and affordable than traditional energy sources.

An off-grid framework uses solar panels, an inverter and a battery bank to ensure a 24-hour power supply. 10kW solar panels can generate enough power to run your home or office and still give a surplus to charge batteries and create an energy reserve. Your property uses the battery reserve during the night hours or on days when solar panels don't produce enough power.

C] 10kW Hybrid Solar System Specifications

The biggest motivation for choosing the hybrid solar framework is to minimize and even eliminate grid dependence and avoid power outages. The price of a 10kW solar system in India installed in a hybrid framework is higher than an on-grid system. And It's reasonably so if you consider the additional advantages.

A hybrid framework offers the flexibility of net metering combined with the reliability of solar batteries. You not only earn solar credits by selling off surplus solar energy to the grid but also maintain an on-site power reserve to prevent sudden outages and ensure a dependable power supply.

CONCLUSION:

The energy audit conducted on the college campus has revealed several opportunities to improve energy efficiency, reduce operational costs and promote environmental sustainability. By analyzing energy consumption patterns across various facilities, the audit has identified key areas where upgrades, behavioural changes and policy improvements can lead to significant savings. Continued monitoring, Periodic reevaluation, and culture of energy awareness among students and staff are essential to sustaining the benefits of the audit. With a proactive approach, the college can serve as a model for energy- conscious academic institutions.

Mrs. D.S. Patil (EA-31840)
BE(Mech) MTech(Energy)
Bureau of Energy Efficiency (BEE)
Certified Energy Auditor and Manager

DS Energy Consultancy and Services

Certificate of Completion

Energy Audit

This certifies that

A detailed Energy Audit for **Padmabhushan Dr. Vasantraodada Patil Mahavidyalaya, Tasgaon** has been conducted for the year **2024-25** to assess the green initiative planning, efforts, activities implemented in the campus like economical usage of electricity, water and paper resources ,Swach Bharat Abhiyan, plantation Segregation of waste etc.

The activities and measures carried out by the institute have been verified and found to be satisfactory, some recommendations are given in the report. The efforts taken by the institute, faculty and students are highly commendable.

D.S. ENERGY CONSULTANCY AND SERVICES SANGLI BEE Certified Energy Auditor EA-31840

Dhanashri Patil
Certified Energy Auditor and
Manager (EA 31840)
Bureau of Energy Efficiency

Date
JULY 14,2025

Certification & Inspection

Certificate of Compliance

This is to certify that the

Conformity Assessment Certification

of

DS ENERGY CONSULTANCY AND SERVICES

at

5/29, 'PRASHANT', ZP COLONY, NEAR WARNALI, VISHRAMBAG, SANGLI, MAHARASHTRA PIN 416415, INDIA

has been independently assessed and is compliant with the requirements of:

ISO/IEC 17020:2012

For the following scope of activities:

THIRD PARTY INSPECTION SERVICES FOR WALKTHROUGH AND DETAILED ENERGY AUDIT, GREEN AUDIT AND ENVIRONMENTAL AUDIT FOR COMMERCIAL BUILDINGS, INDUSTRIES , EDUCATIONAL INSTITUTES LIKE COLLEGES AND UNIVERSITIES , POWER QUANTITY AUDIT AND HARMONIC STUDIES , ENERGY AND LOAD MONITORING SERVICES , THERMOGRAPHY, ENERGY MANAGEMENT SYSTEM , AIR QUALITY TESTING , DATA WARE HOUSING , WATER AUDIT, RENEWABLE ENERGY ADVISORY, HEALTH CHECK UP OF PLANT EQUIPMENTS.

Certificate Number: UQ - 2024011219

Validity of this certificate can be verified at www.ukcertifications.org.uk

Date of Certification	12th January 20
1st Surveillance Audit Due	11th January 2025
2nd Surveillance Audit Due	11th January 2026
Certificate Expiry	11th January 2027

Authorised Signatory

UKAF

UK Certification & Inspection Ltd.