PowerTech Energy Solutions
Conserve to Consume

Energy & Green Audit Report
of
Arts, Commerce and Science College, Satral, Tal- Rahuri

Submitted By

PowerTech Energy Solutions

Our Certificates

BEE Certified Energy Auditor Certificate

Regn. No. EA-20121 Certificate No. 8299

National Productivity Council

(National Certifying Agency)

PROVISIONAL CERTIFICATE

This is to certify that Mr. / Mrs./ Ms. Swapnil Sanjay Gaikwad

son / daughter of Mr. Sanjay J. Gaikwad

has passed the National Certification Examination for Energy Auditors held in August - 2014, conducted on behalf of the Bureau of Energy Efficiency, Ministry of Power, Government of India.

He / She is qualified as Certified Energy Manager as well as Certified Energy Auditor.

He / She shall be entitled to practice as Energy Auditor under the Energy Conservation Act 2001, subject to the fulfillment of qualifications for the Accredited Energy Auditor and issue of certificate of Accreditation by the Bureau of Energy Efficiency under the said Act.

This certificate is valid till the issuance of an official certificate by the Bureau of Energy Efficiency.

Place : Chennai, India

Date : 9th January, 2015

Controller of Examination

Lead Auditor Certificate – ISO 50001: Energy Management System

TÜV NORD

PR366: ISO 50001:2018 Lead Auditor (Energy Management System) Training Course

Certificate of Achievement

Atul Kakad

has successfully completed the above mentioned course and examination.

26th - 30th November 2019

PUNE, INDIA

Certificate No. 35258395 07

Delegate No. 222777

for TÜV NORD CERT GmbH

Essen, 2020-01-08

The course is certified by CQI and IRCA (Certification No. 2088). The learner meets the training requirements for those seeking certification under the IRCA EnMS Auditor certification scheme.

TÜV NORD CERT GmbH Langemarckstraße 20 45141 Essen www.tuev-nord-cert.com

CQI | IRCA

CERTIFIED COURSE

MEDA Registration Certificate

MAHARASHTRA ENERGY DEVELOPMENT AGENCY

Maharashtra Energy Development Agency

(A Government of Maharashtra undertaking)
Aundh Road, Opposite Spicer College,
Near Commissionerate of Animal Husbandry, Aundh, Pune – 411 067
Ph No: 020-26614393/266144403
Email: eee@mahaurja.com, Web: www.mahaurja.com

ECN/2022-23/CR-44/3803

4th October, 2022

CERTIFICATE OF REGISTRATION
FOR CLASS 'A'

We hereby certify that, the firm having following particulars is registered with ***MAHARASHTRA ENERGY DEVELOPMENT AGENCY (MEDA)*** under given category as "Energy Planner & Energy Auditor" in Maharashtra for Energy Conservation Programme of MEDA.

Name and Address of the firm	:	M/s PowerTech Energy Solutions Office No. 10, B-wing, 3rd floor, Phuge Prima, Bhosari Dighi Road Bhosari, Pimpri Chinchwad- 411 039.
Registration Category	:	*Empanelled Consultant for Energy Conservation Programme for Class 'A'*
Registration Number	:	***MEDA/ECN/2022-23/Class - A/EA-31***

- Energy Conservation Programme intends to identify areas where wasteful use of energy occurs and to evaluate the scope for Energy Conservation and take concrete steps to achieve the evaluated energy savings.
- MEDA reserves the right to visit at any time without giving prior information to verify quarterly activities performed by the firm and canceling the registration, if the information is found incorrect.
- This empanelment is valid till **3rd October, 2024** from the date of registration, to carry out energy audits under the Energy Conservation Programme
- The Director General, MEDA reserves the right to cancel the registration at any time without assigning any reasons thereof.

General Manager (EC)

1 Executive Summary – Energy Audit

Sr No	Area	Observations	Proposed Action	Estimated Monthly Energy Savings	Estimated Monthly CO2 Emission Reduction	Estimated Monthly Monetary Savings	Estimated Investment	Payback Period
				kWh	Tones	Rs. Lakh	Rs. Lakh	Months
1	Ceiling Fan	At present, conventional ceiling fans of 75W are installed in Class Room, Tutorial Room, Staff Room, Examination Dept, VLC Room, 3rd floor Library Physics, Labs.	It is recommended to replace existing 75 W ceiling fans with new energy efficient 40W BLDC fan	407	0.3	0.04	2.9	71
SUM				**407**	**0.3**	**0.04**	**3**	**71**

2 Executive Summary – Green Audit

Sr.No	Area	Observations	Remark
1	**Tree Plantation**	College has planted 125 trees and medicine trees in last year and also plan to plant more no. of trees in coming years	Good initiative taken by college toward green campus
2	**Solid Waste Management**	College has vermicomposting plant where solid waste has been used as a raw material. Vermic plant is producing approx. 2.5 Tons of compost in a period of 2 months	Good initiative taken by college towards solid waste management
3	**Rain Water Harvesting**	Rain water harvesting system is installed in college to use the rain water for gardening purpose. Capacity of the storage tank is 500 lit.	Good initiative taken by college to use rain water
4	**Solar Energy**	College has implemented solar PV system of 15.36 kW which is generating almost 11000 units annual which helps to reduce 8.7 tones	Good initiative taken to by college toward use of renewable energy
5	**E waste Management**	At present, E -waste generated by college is sent to their Head office	College shall ensure that e-waste generated by them is channelised through collection center or dealer of authorized producer or dismantler or recycler

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3 Acknowledgement

PowerTech Energy Solutions extends gratitude to Arts, Commerce and Science College, Satral for extending us the opportunity to conduct the Energy & Green Audit.

We are thankful to the professors & supporting staff of the college for their transparency & consistent support in sharing relevant information and for providing data about policies and projects along with their other valuable information. This report would have not been possible without their support.

The study team would like to acknowledge the following distinguished personnel's of Arts, Commerce and Science College, Satral in person for the diligent involvement and cooperation.

Prof. (Dr) P. M. Dongre	Principal
Prof. D. N. Gholap	Department of Botany
Dr. R.S. Tambe	Department of Zoology

4 About College

Arts, Commerce and Science College, Satral was established in August 1998 under the mentorship of Pravara Rural Education Society, Pravaranagar and with great vision of Balasaheb Vikhe Patil, Padmabhushan Awardee.

It stands with a specific objective of elevation of rural masses through quality, need based and appropriate education by achieving academic excellence among rural youth with relevance to employability and rural development right from grass root level.

The College is situated on the bank of sacred PRAVARA River in Satral village. Satral is located in the core of Panchkroshi, (cluster of five Villages).

At present the college has its 12.5acres of expansive premises dotted with beautiful lush green surroundings, large class rooms, well equipped laboratories, exclusive library and spacious playgrounds congenial to academic growth and all round development of learners.

The College is permanently affiliated to Savitribai Phule University, Pune & is approved under Section 2 (f) & Section 12 (b) of the UGC act. The college also received 'A' grade with CGPA 3.15 by NAAC in 2012**.**

4.1 Vision:

To provide higher educational avenues to develop overall personality of the students in rural and economically weaker classes.

4.2 Mission:

To inculcate moral values and the spirit of fair competition, which make students academically sound and socially conscience to become responsible.

4.3 Goals:

- To achieve academic excellence of higher education.
- To bring higher educational opportunities within the reach of the under privileged section of society and girls.
- To inculcate value based education to empower the youth for development of the nation.
- To develop an overall personality of the students by giving ample exposure in co-curricular and extracurricular activities.
- To develop nexus between educational institution and society for mutual benefits by socio-Economics and culture transformation through higher education.

5 Energy Audit

An energy audit is an inspection, survey and analysis of energy flows, for energy conservation in a building, process or system to reduce the amount of energy input into the system without negatively affecting the output(s). In commercial and industrial real estate, an energy audit is the first step in identifying opportunities to reduce energy expense and carbon footprints.

5.1 Electricity Bill Analysis

There is three numbers of energy meters being power supplied by MSEDCL. Two meters used for college and another one is agriculture college Monthly electricity bill is served by MSEDCL against electricity used & is paid by college. A cost of power is worked out by summing up total KWH of all connections & their amount over the year 2023-2024. By dividing total amount by total KWH works out average cost of power per KWH.

Consumer	**Shri Principal Arts,Comm & Science**
Consumer No.	850660027495
Tariff	80/LT IV

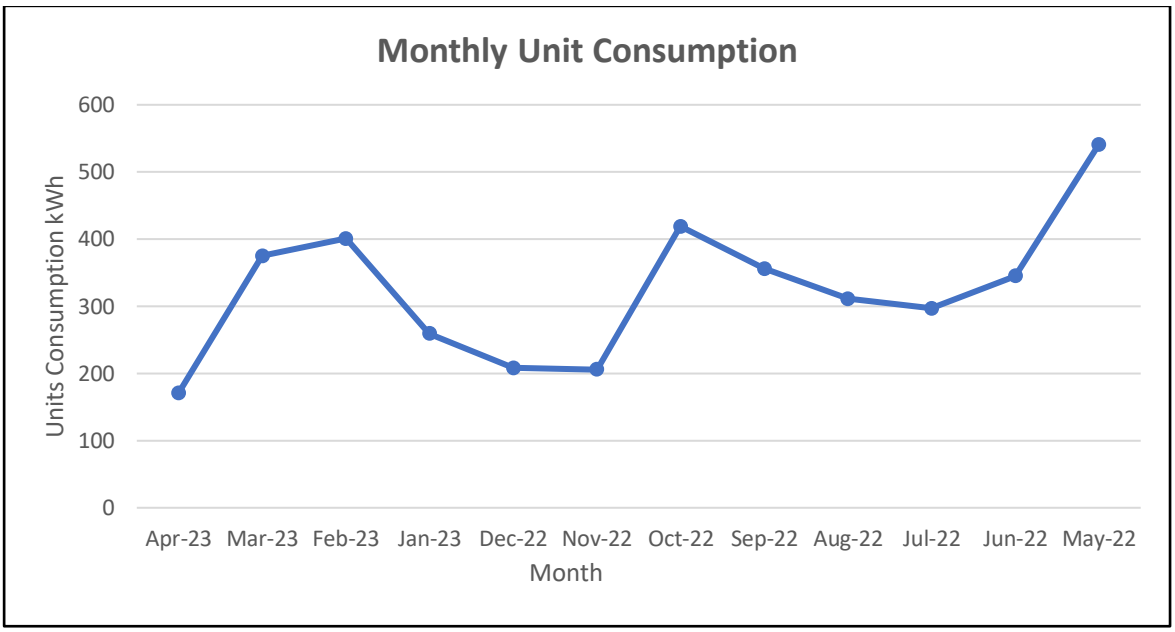
Consumer	**Pri Arts,Comm & Science Satral**
Consumer No.	850660009217
Tariff	73/LT -XB I

Consumer	**Pracharya Arts,Comm & Science College**
Consumer No.	850660009535
Tariff	73/LT V-II BI

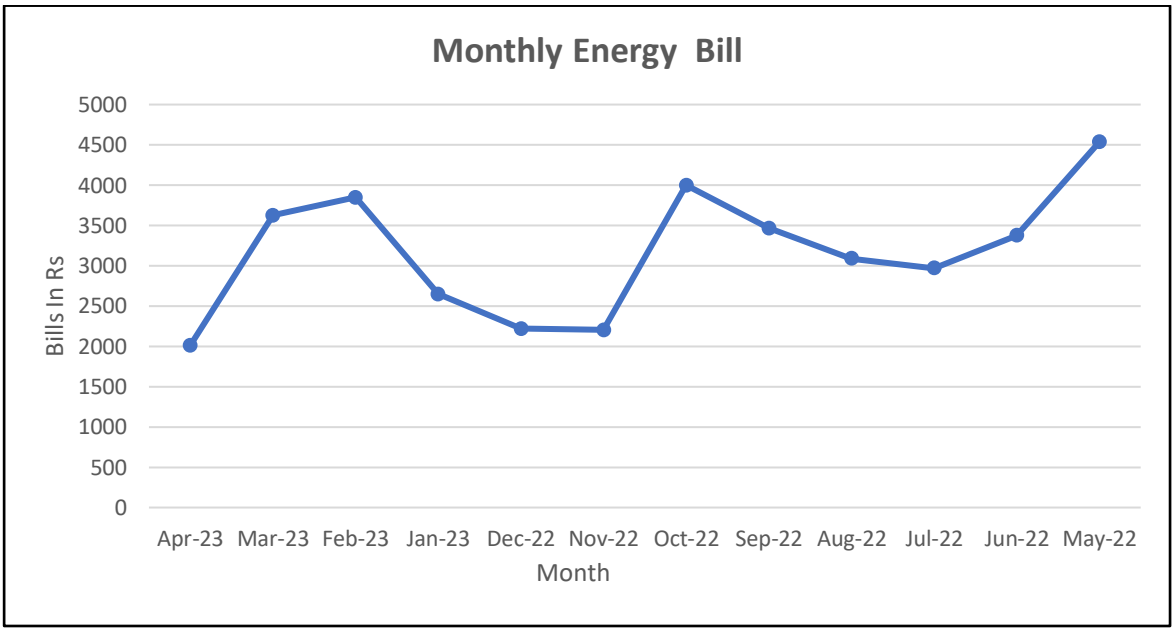
Below table shows the monthly energy consumption.

Month	**Unit Consumption (kWh)**	**Bill Amount (Rs)**	**Average Unit Rate (Rs/kWh)**
Apr-23	171	2013	12
Mar-23	375	3624	10
Feb-23	401	3846	10
Jan-23	259	2649	10
Dec-22	208	2219	11
Nov-22	206	2202	11
Oct-22	419	3998	10
Sep-22	356	3467	10
Aug-22	311	3088	10
Jul-22	297	2969	10
Jun-22	345	3374	10
May-22	541	4536	8
Avg	**324**	**3165**	**10**

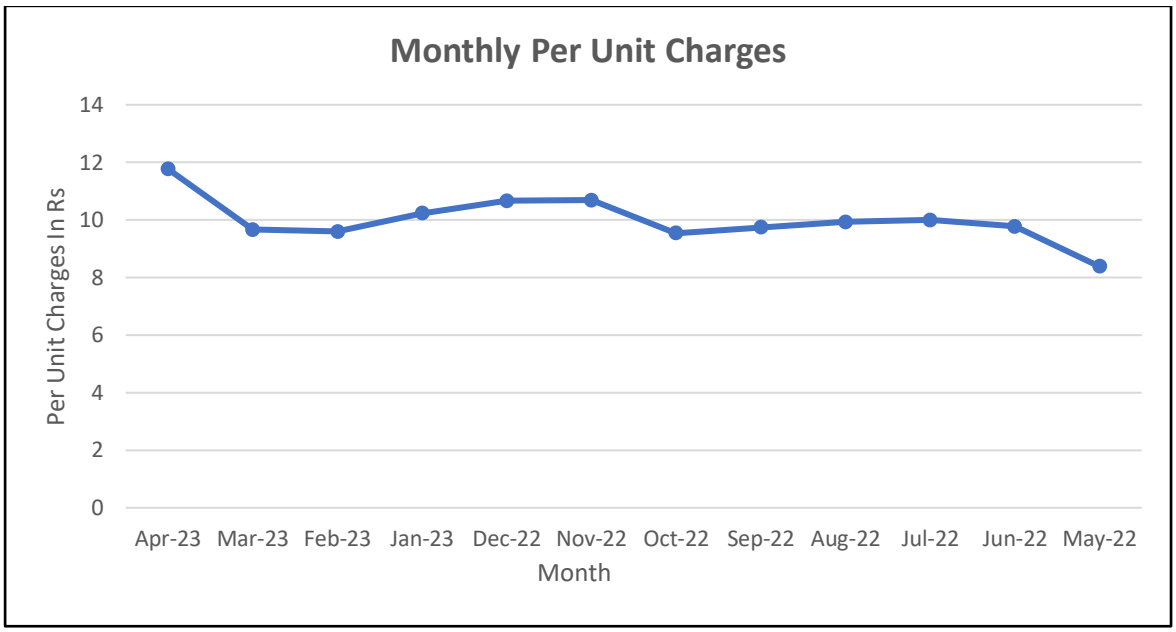
Below graph shows the monthly energy consumption.



Below graph shows the monthly energy bill Rs.



Below graph shows the monthly per unit charges.



5.2 Observations & Remark

Sr.No.	Parameter	Observation	Remark
1	Contract Demand	Contract demand of the college is 15 kVA	No action required
2	Connected Load	Connected load of college is 18.40 kW	No action required
3	Unit consumption	Minimum unit consumption recorded is 171 kWh in month of April-23	No action required
		Avg. unit consumption recorded is 324 kWh	No action required
		Maximum unit consumption recorded is 541 kWh in month of May-22	No action required

5.3 Connected Load

Name of the Space	Type of Load	Total Qty	Used Qty	Wattage	Load in kW
Gymkhana	LED TL	6	6	18	0.11
Gymkhana	Ceiling Fan	1	1	75	0.08
Canteen	LED TL	2	2	18	0.04
Library	LED TL	6	6	18	0.11
Library	Fan	5	5	75	0.38
Seminar Hall	LED TL	9	9	18	0.16
Seminar Hall	Fan	12	12	75	0.90
Research Lab	LED	6	6	18	0.11
Ladies Toilet	LED TL	1	1	18	0.02
Gents Toilet	LED TL	2	2	18	0.04
Passage near gym	LED TL	5	5	18	0.09
Chemistry Lab 2 & 3	LED TL	4	4	18	0.07
Chemistry Lab 2 & 3	Fan	5	5	75	0.38
Chemistry Lab 2 & 3	Exhaust fan	3	3	50	0.15
Chemistry Lab 1	LED TL	4	4	18	0.07
Chemistry Lab 1	Exhaust fan	1	1	150	0.15
Chemistry Lab 1	Exhaust fan	3	3	65	0.20
Principal cabin	LED TL	3	3	18	0.05
Principal cabin	Fan	2	2	75	0.15
Office Area	LED TL	3	3	18	0.05
Office Area	Fan	3	3	75	0.23
Examination Dept	LED TL	2	2	18	0.04
Examination Dept	Fan	2	2	75	0.15
Ground floor passage	LED TL	8	8	18	0.14
Ground floor passage	LED Bulb	1	1	7	0.01
1st floor BSR	LED TL	2	2	18	0.04
1st floor BSR	Fan	1	1	75	0.08
Geology Lab	LED TL	2	2	18	0.04
Geology Lab	Fan	2	2	75	0.15
Principal cabin	AC 1.5 Ton	1	1		0.00
Botany Lab	LED TL	3	3	18	0.05
Botany Lab	Fan	2	2	75	0.15
Ladies Room	LED TL	4	4	18	0.07
Ladies Room	Fan	3	3	75	0.23
VLC Room	LED TL	5	5	18	0.09
VLC Room	Fan	3	3	75	0.23
Exam Room	LED TL	2	2	18	0.04
Exam Room	Fan	3	3	75	0.23
Physical Lab	LED TL	3	3	18	0.05
Physical Lab	Fan	3	3	75	0.23
1st floor passage	LED TL	6	6	18	0.11
2nd floor class - 1	LED TL	2	2	18	0.04
2nd floor class - 1	Fan	2	2	75	0.15
2nd floor class - 2 & 3	LED TL	4	4	18	0.07
2nd floor class - 2 & 3	Fan	4	4	75	0.30
English Lab	LED TL	3	3	18	0.05
English Lab	Fan	4	4	75	0.30
HOD	LED TL	1	1	18	0.02
HOD	Fan	3	3	75	0.23
2nd floor passage	LED TL	3	3	18	0.05

Name of the Space	Type of Load	Total Qty	Used Qty	Wattage	Load in kW
3rd floor Library	LED TL	5	5	18	0.09
3rd floor Library	Fan	3	3	75	0.23
3rd floor class room	LED TL	1	1	18	0.02
3rd floor class room	Fan	2	2	75	0.15
Staff room	LED TL	2	2	18	0.04
Staff room	Fan	2	2	75	0.15
Class room block 1	LED TL	2	2	18	0.04
Class room block 1	Fan	2	2	75	0.15
Class room block 2	LED TL	2	2	18	0.04
Class room block 2	Fan	2	2	75	0.15
NSS	LED TL	1	1	18	0.02
NSS	Fan	2	2	75	0.15
Geography Dept	LED TL	3	3	18	0.05
Geography Dept	Fan	3	3	75	0.23
3rd floor passage	LED TL	3	3	18	0.05
Stair case	LED TL	3	3	18	0.05
Street light	LED SL	8	8	35	0.28
Street light	LED SL	10	10	35	0.35
Total					**9**

5.4 Performance Assessment of Lighting System

Lighting system analysis is taking the data from college building areas. Most of the system is in energy efficient LED system. There are total 494 lights installed in the college building at different location and for different purposes. Out of 494 lights, 482 lights are of LED type. Remaining lights are conventional types of light fittings.

Name of the Space	Type of Load	Total Qty	Used Qty	Wattage	Load in kW	Daily kWh	Monthly kWh
Gymkhana	LED TL	6	6	18	0.11	0.5	13.5
Canteen	LED TL	2	2	18	0.04	0.2	4.5
Library	LED TL	6	6	18	0.11	0.9	21.6
Seminar Hall	LED TL	9	9	18	0.16	0	1.9
Research Lab	LED	6	6	18	0.11	0.3	9.9
Ladies Toilet	LED TL	1	1	18	0.02	0.2	6.6
Gents Toilet	LED TL	2	2	18	0.04	0	0
Passage near gym	LED TL	5	5	18	0.09	1.1	32.9
Chemistry Lab 2 & 3	LED TL	4	4	18	0.07	0.6	17.6
Chemistry Lab 1	LED TL	4	4	18	0.07	0.6	17.6
Principal cabin	LED TL	3	3	18	0.05	0.4	13.2
Office Area	LED TL	3	3	18	0.05	0.4	13.2
Examination Dept	LED TL	2	2	18	0.04	0.3	8.8
Ground floor passage	LED TL	8	8	18	0.14	1.7	52.7
Ground floor passage	LED Bulb	1	1	7	0.01	0.1	2.6
1st floor BSR	LED TL	2	2	18	0.04	0.1	4.4
Geology Lab	LED TL	2	2	18	0.04	0.3	8.8
Botany Lab	LED TL	3	3	18	0.05	0.4	13.2
Ladies Room	LED TL	4	4	18	0.07	0.5	15.4
VLC Room	LED TL	5	5	18	0.09	0.6	19.2
Exam Room	LED TL	2	2	18	0.04	0.1	4.4
Physical Lab	LED TL	3	3	18	0.05	0.2	6.6
1st floor passage	LED TL	6	6	18	0.11	0.9	26.4
2nd floor class - 1	LED TL	2	2	18	0.04	0.2	6.6
2nd floor class - 2 & 3	LED TL	4	4	18	0.07	0.4	13.2
English Lab	LED TL	3	3	18	0.05	0.4	11.5
HOD	LED TL	1	1	18	0.02	0.1	1.6
2nd floor passage	LED TL	3	3	18	0.05	0	0
3rd floor Library	LED TL	5	5	18	0.09	0.5	16.5

Name of the Space	Type of Load	Total Qty	Used Qty	Wattage	Load in kW	Daily kWh	Monthly kWh
3rd floor class room	LED TL	1	1	18	0.02	0.1	3.3
Staff room	LED TL	2	2	18	0.04	0.2	6.6
Class room block 1	LED TL	2	2	18	0.04	0.2	6.6
Class room block 2	LED TL	2	2	18	0.04	0.2	6.6
NSS	LED TL	1	1	18	0.02	0.1	3.3
Geography Dept	LED TL	3	3	18	0.05	0.3	9.9
3rd floor passage	LED TL	3	3	18	0.05	0	0
Stair case	LED TL	3	3	18	0.05	0	0
Street light	LED SL	8	8	35	0.28	3.4	102.5
Street light	LED SL	10	10	35	0.35	4.2	128.1
Total		**142**	**142**		**2.86**	**20.7**	

5.5 Observation & Remark

Sr. No.	Area	Observation	Remark
1	Arts, Commerce and Science College, Satral, Tal-Rahuri	Some of the street lights in the college areas are on for 12 to 13 hours every day	Recommendation to replacing the existing street lights in the college areas with energy-efficient 30W dimming motion sensor lights. This upgrade will not only conserve energy but also enhance security by automatically adjusting the lighting intensity based on motion, ensuring optimal illumination when needed.

5.6 ECM-1 Replacement of conventional ceiling fans with energy efficient ceiling fans

It has been observed that conventional ceilings fans are used at different areas in college building offices, Class Room, Tutorial Room, Staff Room, Examination Dept, VLC Room, 3rd floor Library Physics, Labs etc. It is recommended to replace existing 75W ceiling fans with 40W energy efficient fans. Below table shows the estimated energy and monetary saving along with payback period.

Location	Fan	Qty	Load in Kw	Hours of Usage	Daily Consumption (kWh)	Monthly Consumption (kWh)	New Wattage	New kW	New Monthly kWh	Energy Saving in kWh	Monetary saving in Rs	Investment	Payback period
Gymkhana	Ceiling fan-75w	1	0.08	5	0.4	9.6	40	0.04	5	4.5	45	3500	78
Library	Ceiling fan-75w	5	0.38	8	3.0	76.5	40	0.20	41	35.7	357	17500	49
Seminar Hall	Ceiling fan-75w	12	0.90	0	0.0	0.0	40	0.48	0	0.0	0	42000	0
Chemistry Lab 2 & 3	Ceiling fan-75w	5	0.38	8	3.0	76.5	40	0.20	41	35.7	357	17500	49
Chemistry Lab 2 & 3	Ceiling fan-75w	3	0.23	4	0.9	23.0	40	0.12	12	10.7	107	10500	98
Chemistry Lab 1	Ceiling fan-75w	1	0.08	7	0.5	13.4	40	0.04	7	6.2	62	3500	56
Chemistry Lab 1	Ceiling fan-75w	3	0.23	7	1.6	40.2	40	0.12	21	18.7	187	10500	56
Principal cabin	Ceiling fan-75w	2	0.15	11	1.7	42.1	40	0.08	22	19.6	196	7000	36
Office Area	Ceiling fan-75w	3	0.23	8	1.8	45.9	40	0.12	24	21.4	214	10500	49
Examination Dept	Ceiling fan-75w	2	0.15	8	1.2	30.6	40	0.08	16	14.3	143	7000	49
1st floor BSR	Ceiling fan-75w	1	0.08	4	0.3	7.7	40	0.04	4	3.6	36	3500	98
Geology Lab	Ceiling fan-75w	2	0.15	8	1.2	30.6	40	0.08	16	14.3	143	7000	49
Botany Lab	Table Fan-75w	2	0.15	8	1.2	30.6	40	0.08	16	14.3	143	7000	49
Ladies Room	Ceiling fan-75w	3	0.23	7	1.6	40.2	40	0.12	21	18.7	187	10500	56
VLC Room	Table Fan-75w	3	0.23	7	1.6	40.2	40	0.12	21	18.7	187	10500	56
Exam Room	Ceiling fan-75w	3	0.23	4	0.9	23.0	40	0.12	12	10.7	107	10500	98
Physical Lab	Ceiling fan-75w	3	0.23	4	0.9	23.0	40	0.12	12	10.7	107	10500	98
2nd floor class - 1	Ceiling fan-75w	2	0.15	6	0.9	23.0	40	0.08	12	10.7	107	7000	65
2nd floor class 2&3	Ceiling fan-75w	4	0.30	6	1.8	45.9	40	0.16	24	21.4	214	14000	65
English Lab	Ceiling fan-75w	4	0.30	7	2.1	53.6	40	0.16	29	25.0	250	14000	56
HOD	Ceiling fan-75w	3	0.23	3	0.7	17.2	40	0.12	9	8.0	80	10500	131
3rd floor Library	Ceiling fan-75w	3	0.23	6	1.4	34.4	40	0.12	18	16.1	161	10500	65
3rd floor class room	Ceiling fan-75w	2	0.15	6	0.9	23.0	40	0.08	12	10.7	107	7000	65
Staff room	Ceiling fan-75w	2	0.15	6	0.9	23.0	40	0.08	12	10.7	107	3500	33
Class room block 1	Ceiling fan-75w	2	0.15	6	0.9	23.0	40	0.08	12	10.7	107	7000	65
Class room block 2	Ceiling fan-75w	2	0.15	6	0.9	23.0	40	0.08	12	10.7	107	7000	65
NSS	Ceiling fan-75w	2	0.15	6	0.9	23.0	40	0.08	12	10.7	107	7000	65
Geography Dept	Ceiling fan-75w	3	0.23	6	1.4	34.4	40	0.12	18	16.1	161	10500	65
		83	**6**		**34**	**876**	**1120**	**3**	**467**	**409**	**4087**	**287000**	**70**

Fan Recommendation

Replace existing 75-watt conventional ceiling fans with 40-watt energy efficient fans

Parameter	Unit	Value
Present fan type		Conventional ceiling fan
Present wattage of ceiling fans	watt	75
Total no.of fans installed	Nos.	82
Present load of ceiling fans	kW	6
Present monthly energy consumption of ceiling fans	kWh	876
Recommended fan type		Energy Efficient BLDC fan
New Estimated wattage of fan	watt	40
Estimated load of ceiling fan	kW	3
Power saving	kW	3
% Savings	%	47%
New Estimated monthly energy consumption	kWh	467
Estimated monthly energy savings	kWh	409
Estimated monthly carbon emission reduction	Tons	0.3
Estimated monthly monetary savings	Rs	4,087
Estimated investment for 1 fan	Rs	3500
Estimated total investment	Rs	287,000
Payback period	Months	70

5.7 Observation & Remark

Sr.No	Area	Observation	Remark
1	Arts, Commerce and Science College, Satral, Tal-Rahuri	At present, conventional ceiling fans of 75W are installed in Class Room, Tutorial Room, Staff Room, Examination Dept, VLC Room, 3rd floor Library Physics, Labs. There are total 82 no. of ceilings fans installed Total ceiling fan load is 6 kW	New energy efficient fans are available in the market which deliver same air volume at less power consumption It is recommended to replace existing 60 W ceiling fans with new energy efficient 40W BLDC fan Estimated new load of fan is 3 kW Estimated monthly energy saving is 467units Estimated monthly carbon emission reduction is 0.3 Tones Estimated monthly monetary saving is Rs.0.04 Lakh Estimated investment is Rs.2.87 Lakh Payback period is 70 months

6 Requirements of NAAC

6.1 Alternative Energy Initiative

Percentage of power requirement met by renewable energy sources

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

= (7618/11451) X 100

= 150 % (Energy generated from Solar PV system is more than energy required for college campus)

6.2 Percentage of lighting power requirement met through LED bulbs

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

= (2.86 / 2.86)

= 100 %

7 Green Audit

Green audit was initiated with the beginning of 1970s with the motive of inspecting the work conducted within the organizations whose exercises can cause risk to the health of inhabitants and the environment. It exposes the authenticity of the proclamations made by multinational companies, armies and national governments with the concern of health issues as the consequences of environmental pollution. It is the duty of organizations to carry out the Green Audits of their ongoing processes for various reasons such as; to make sure whether they are performing in accordance with relevant rules and regulations, to improve the procedures and ability of materials, to analyze the potential duties and to determine a way which can lower the cost and add to the revenue. Through Green Audit, one gets a direction as how to improve the condition of environment and there are various factors that have determined the growth of carrying out Green Audit. Some of the incidents like Bhopal Gas Tragedy (Bhopal; 1984), Chernobyl Catastrophe (Ukraine; 1986) and Exxon-Valdez Oil Spill (Alaska; 1989) have cautioned the industries that setting corporate strategies for environmental security elements have no meaning until they are implemented.

Green Audit is assigned to the Criteria 7 of NAAC, National Assessment and Accreditation Council which is a self-governing organization of India that declares the institutions as Grade a, Grade B or Grade C according to the scores assigned at the time of accreditation.

The intention of organizing Green Audit is to upgrade the environment condition in and around the institutes, colleges, companies and other organizations. It is carried out with the aid of performing tasks like waste management, energy saving and others to turn into a better environmentally friendly institute.

7.1 Goals of Green Audit

- The objective of carrying out Green Audit is securing the environment and cut down the threats posed to human health.
- To make sure that rules and regulations are taken care of
- To avoid the interruptions in environment that are more difficult to handle and their correction requires high cost.
- To suggest the best protocols for adding to sustainable development

7.2 Benefits of Green Audit

- It would help to shield the environment
- Recognize the cost saving methods through waste minimizing and managing
- Point out the prevailing and forthcoming complications
- Authenticate conformity with the implemented laws
- Empower the organizations to frame a better environmental performance
- It portrays a good image of a company which helps building better relationships with the group of stakeholders
- Enhance the alertness for environmental guidelines and duties

8 Initiatives by College towards Sustainable Environment

8.1 Dripping System and New Tree Plantation

Complete Campus has been under dripping system, which helps college to minimize the water uses and spread awareness of water management and water distribution in the students.

The college has independent plant nursery to nurture the various types of plants which helps to control greenhouse gases and temperature. The student of the plant spread awareness in nearby villages about plantation and greenhouse gases emissions. The college and students also donated lakhs of plants to the villagers.

8.2 Vermicomposting Plant

Vermicomposting (or vermi-compost) is the product of the composting process using various species of worms, usually red wigglers, white worms, and other earthworms, to create a mixture of decomposing vegetable or food waste, bedding materials, and vermicast.

Vermicast (also called worm castings, worm humus, worm manure, or worm feces) is the end-product of the breakdown of organic matter by earthworms. These castings have been shown to contain reduced levels of contaminants and a higher saturation of nutrients than the organic materials before vermicomposting.

Vermicomposting contains water-soluble nutrients and is an excellent, nutrient-rich organic fertilizer and soil conditioner. It is used in farming and small scale sustainable, organic farming.

Vermicomposting can also be applied for treatment of sewage sludge. Furthermore, a variation of the process is vermifiltration (or vermidigestion) which is used to remove organic matter, pathogens and oxygen demand from wastewater or directly from blackwater of flush toilets

College has vermicompost plant with following specifications

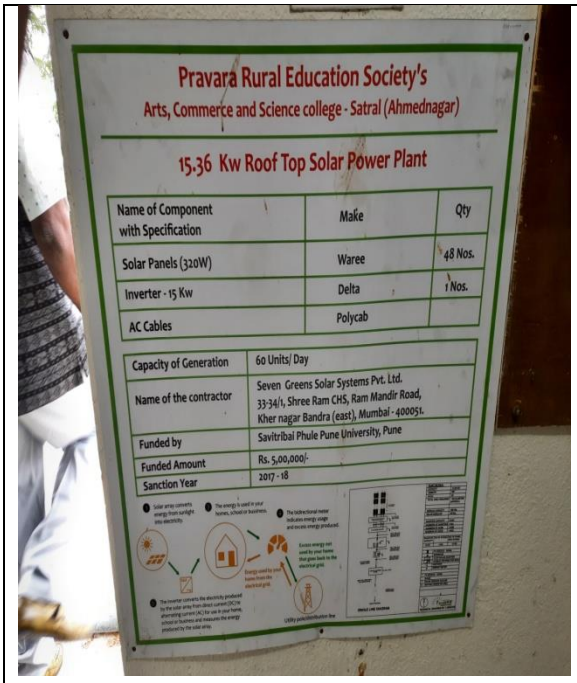
- Pit Size = 8’ X 4’ X 3’
- Total Area = 576 Sq.ft

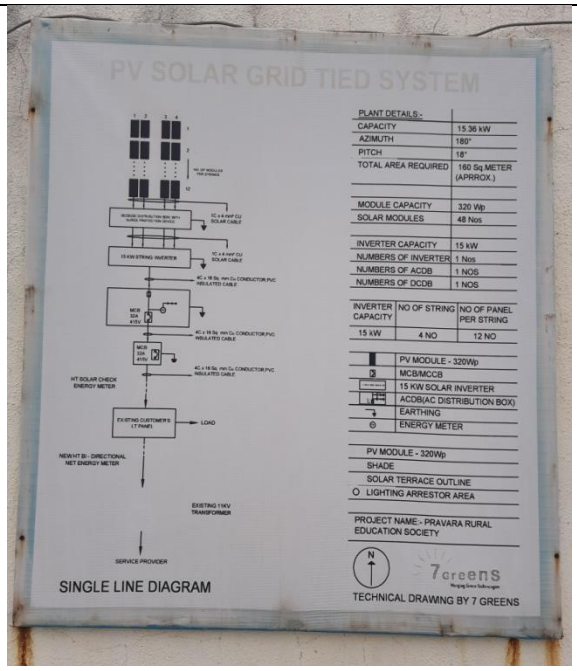
Green waste such as dung, grass, etc. has been used for this plant. Period of approximate 2 months is required for generation of vermicompost. Around 2.5 Tons of vermicompost is generated from this plant

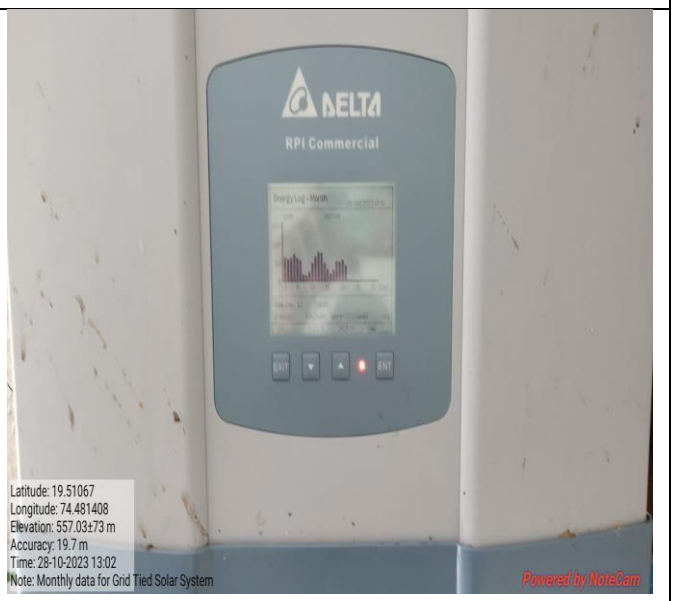
Following are the some actual images of vermicomposting plant

8.3 Solar PV System

The college had installed 15.36 kW Rooftop Solar PV System in July 2018. Per month unit generation has been listed below.







8.4 Rain Water Harvesting

The College successfully installed and run the “Rain Water Harvesting System”. Currently the have total 3 tanks to store the rain water. One is installed near the chemistry lab which used this water in their laboratory. Other two tanks are installed near to Main Building having capacities of 1500 liters each, overflow of water then transferred to nearby well by 4 inch underground pipeline to refilling ground-water

8.5 Awareness of Renewable Energy

College has been taking efforts to create the awareness of solar energy among the students and in nearby villages. Department of Physics organized seminars, workshops, rallies to promote the benefits of solar energy. A department has some own solar equipment's such as solar cooker, solar lamp, etc. for practical purpose.

Following are some images showing initiative taken by college to create the awareness of renewable energy such as solar, biogas, etc.

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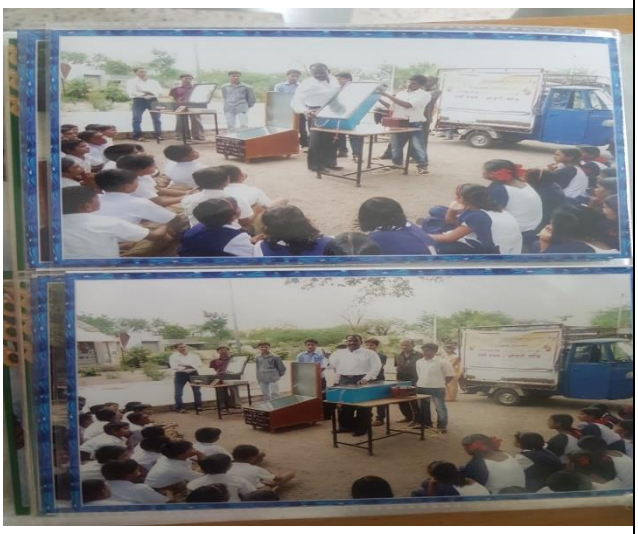
<td>  </td>
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8.6 LED Lighting System

The college has 100 % LED Lighting in the campus. This is good initiative by college towards conservation of energy

9 Scope for Improvement

9.1 Liquid Waste Management

The proper disposal of liquid waste is a must in order to maintain a good human and animal health. Because liquid waste has a high amount of dangerous compounds such as salts and metals, it is important for companies to get rid of it in a timely manner. Industrial wastes, including dangerous and hazardous liquids, can be disposed of by using a wide variety of techniques and methods.

Present Condition

There is an improvement opportunity for college. Sewage treatment facility can be provided to re-use the waste water for applications other than drinking. It is recommended that to make standard operating procedure (SOP) for disposal of chemicals which has been used in laboratories for practical purpose
Following details are given for guidance to dispose the laboratory chemical waste

Solution

Disposal Procedures for Laboratory Chemicals

It is the clear responsibility of all research workers to ensure the safe and correct disposal of all wastes produced in the course of their work. Improper and irresponsible disposal of chemical wastes down drains, to the Local Authority refuse collection, or into the atmosphere is forbidden by law.

Wash down drains with excess water

- Concentrated and dilute acids and alkalis
- Harmless soluble inorganic salts (including all drying agents such as CaCl2, MgSO4, Na2SO4, P2O5)
- Alcohols containing salts (e.g. from destroying sodium)
- Hypochlorite solutions from destroying cyanids, phosphines, etc.
- Fine (tlc grade) silica and alumina

It should be noted in particular that no material on the "Red List" should ever be washed down a drain. This list is as follows:

- compounds of the following elements:- antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, tellurium, thallium, tin, titanium, uranium, vanadium and zinc.
- organ halogen, organophosphorus or organonitrogen pesticides, triazine herbicides, any other biocides.
- cyanides
- mineral oils and hydrocarbons
- poisonous organosilicon compounds, metal phosphides and phosphorus element
- fluorides and nitrites

Incineration (Solvent Waste collection)

- all organic solvents including water miscible ones
- soluble organic waste including most organic solids
- paraffin and mineral oil (from oil baths and pumps)

Laboratory waste bins and controlled waste

All waste suitable for the Local Authority refuse collection, except recyclable paper and glass, is termed 'controlled waste'. Items in this category which includes dirty paper, plastic, rubber and wood, should generally be placed in the waste bins available in each laboratory and will be collected by the cleaners. However, each laboratory must also have a container for certain items which are not allowed to be put in the normal waste bins. In this special controlled waste container should be put:- all broken laboratory glassware, any sharp objects of metal or glass, all fine powders (preferably inside a bottle or jar) and dirty sample tubes or other items lightly contaminated with chemicals (but not any syringes or needles). Laboratory controlled waste containers must be emptied regularly and never allowed to overflow. Under no circumstances must any item of glass, sharp metal or fine powder ever be put in a normal laboratory waste bin. The tops must be removed from all bottles put out for disposal and there should be no detectable smell of chemicals from any bottle put for disposal.

For more information, please visit

https://www.standrews.ac.uk/staff/policy/healthandsafety/publications/waste/waste-disposaloflaboratorywastesguidance/

9.2 E Waste Management

Electronic waste or e-waste describes discarded electrical or electronic devices. Used electronics which are destined for reuse, resale, salvage, recycling, or disposal are also considered e-waste. Informal processing of e-waste in developing countries can lead to adverse human health effects and environmental pollution.

Electronic scrap components, such as CPUs, contain potentially harmful components such as lead, cadmium, beryllium, or brominated flame retardants. Recycling and disposal of e-waste may involve significant risk to health of workers and communities in developed countries and great care must be taken to avoid unsafe exposure in recycling operations and leaking of materials such as heavy metals from landfills and incinerator ashes.

College need to have E-waste management policy and all the E-waste disposals generated in the college campus should be disposed/ reuse as per standard procedures/norms

The environmental impact of the processing of different electronic waste components

E-Waste Component	Process Used	Potential Environmental Hazard
Cathode ray tubes (used in TVs, computer monitors, ATM, video cameras, and more)	Breaking and removal of yoke, then dumping	Lead, barium and other heavy metals leaching into the ground water and release of toxic phosphor
Printed circuit board (image behind table – a thin plate on which chips and other electronic components are placed)	De-soldering and removal of computer chips; open burning and acid baths to remove metals after chips are removed.	Air emissions and discharge into rivers of glass dust, tin, lead, brominated dioxin, beryllium cadmium, and mercury
Chips and other gold plated components	Chemical stripping using nitric and hydrochloric acid and burning of chips	PAHs, heavy metals, brominated flame retardants discharged directly into rivers acidifying fish and flora. Tin and lead contamination of surface and groundwater. Air emissions of brominated dioxins, heavy metals, and PAHs
Plastics from printers, keyboards, monitors, etc.	Shredding and low temp melting to be reused	Emissions of brominated dioxins, heavy metals, and hydrocarbons
Computer wires	Open burning and stripping to remove copper	PAHs released into air, water, and soil.