Dayanand Girls' PG College
Kanpur

Energy Audit Report

2021-22 & 2022-23

Prepared by

Society for Academic facilitation and Extension (Regd.)

Disclaimer

This report is intended solely for the use of Dayanand Girls' PG College, Kanpur, and is provided for informational purposes only. While every effort has been made to ensure the accuracy and completeness of the information contained herein, SAFE and its team members accept no liability for any errors. The recommendations are based on current standards and practices and are intended to support the college in enhancing its environmental and energy management practices. The findings and recommendations presented in this report are based on data collected and observations made during the audit period. Any changes in the conditions or operations of Dayanand Girls' PG College, Kanpur, after the audit period are beyond the scope of this report, and SAFE is not responsible for any implications arising from such changes.

By accepting and utilizing this report, the readers acknowledge and agree to the terms and limitations set forth in this disclaimer. The goal of this report is to provide insights and guidance to support Dayanand Girls' PG College, Kanpur, in achieving its sustainability and energy efficiency objectives, and it should be used as a tool for continual improvement. The recommended measures can be implemented either in phases or as a comprehensive whole, contingent upon the decisions made by the Hon'ble Management and College. It is expressly stated that no warranty or undertaking, whether expressed or implied, is provided. The Audit Team accepts no responsibility for any direct or consequential loss arising from the use of the information, statements, or forecasts contained in this report.

This audit constitutes a thorough study based on the inspection and investigation of data collected over a specified timeframe. It is explicitly not intended for legal action. This document is the exclusive property of the Society for Academic Facilitation and Extension (SAFE), a registered entity, and may not be copied or reproduced in any form without prior consent. The report has been prepared by the team at SAFE, with Dr. Ramesh Chandra serving as the Project Head and Secretary General of SAFE, who has conducted audits for numerous institutes to date. SAFE, as an organization, holds ISO 14001:2015 and ISO 50001:2018 certifications. This study has been conducted in the capacity of an Accredited and Certified Green Professional with extensive experience in the field.

Acknowledgement

We extend our sincere appreciation and gratitude to the esteemed members of the Managing Committee of Dayanand Girls' PG College, Kanpur, for their invaluable contributions and unwavering support in the completion of the Green Audit report. The dedication and collaborative efforts of the following individuals have been instrumental in the successful execution of this project:

Managing Committee:

1.	Shri. Manvendra Swarup	Chairman
2.	Smt. Kumkum Swarup	Vice-Chairman
3.	Shri. Gauravendra Swarup	Secretary
4.	Shri. Ranjit Singh	Joint-Secretary
5.	Smt. Ananta Swarup	Member
6.	Dr. Virendra Kumar Srivastava	Member
7.	Dr. Geeta Mathur	Member
8.	Smt.Madhu Srivastava	Member
9.	Dr. Meeta Jamal	Member
10.	Dr. Prem Narayan Nigam	Member
11.	Dr. Ashwani Kumar Asthana	Member
12.	Prof.Archana Verma	Principal

College Officials:

1.	Prof. Archana Varma (Principal)	Chairperson
2.	Prof. Vandana Nigam	Coordinator
3.	Dr. Nivedita Tandon	Teacher Member
4.	Prof. Sugandha Tiwari	Teacher Member
5.	Prof. Alka Srivastava	Teacher Member
6.	Prof. Suman Singh	Teacher Member
7.	Dr. Archana Dixit	Teacher Member
8.	Dr. Eshita Pandey	Teacher Member
9.	Mrs. Sanchita Laxmi	Teacher Member
10.	Mr. Krishnendra Kumar	Acting Office Superintendent

We are grateful for the cooperation and assistance provided by the entire college community, whose commitment to sustainability and environmental stewardship has greatly contributed to the success of this audit.

Sincerely,

SAFE (Society for Academic Facilitation and Extension)

SAFE
SOCIETY FOR ACADEMIC FACILITATION & EXTENSION

About the Institution

Introduction

Established in 1959, Dayanand Girls' PG College in Uttar Pradesh holds the distinction of being the first post-graduate college for women in Kanpur, affiliated with C.S.J.M. University, Kanpur. Under the mentorship of the late Dr. Nagendra Swarup Ji, the institution has set a significant educational benchmark. Dayanand Girls' PG College offers a comprehensive range of programs, including 13 undergraduate and 12 postgraduate courses, all available in full-time mode. These courses are designed to equip students with essential skills and knowledge in their chosen fields. Students can pursue various degrees such as M.Sc., M.A., B.A., B.Ed., and B.Sc. in streams like Science, Humanities & Social Sciences, and Teaching & Education.

The college brings together students from diverse cultural and religious backgrounds, providing a rich and varied academic and vocational experience. It aims to develop each student into a strong, integrated woman, inspiring them to be responsible, committed to serving others and society, and to receive a holistic education.

Over time, Dayanand Girls' PG College has offered students the opportunity to gain expertise and proficiency through its trained and experienced faculty. The college also boasts excellent facilities and infrastructure, including a cafeteria, labs, library, and sports complex

Statements of the Institution

- **Vision:** The College has envisioned “Dayanand Girls P.G. College is the first Post - Graduate College for women in Kanpur, University affiliated to the Chhatrapati Shahu Ji Maharaj University, Kanpur. We bring together students from different cultural and religious backgrounds and offers rich and varied academic and vocational programmes”.
- **Mission:** The College has a mission “The institution strives to develop each student into a strong, responsible citizen, committed to the service of others and society and at the same time receive a holistic education**.**
- **Motto: “***Asto Ma Sadgamaya Tamso Ma Jyotirgamaye*”
- **Objective: “**The college has been a paragon and a source of inspiration in the field of arts and science. It has maintained its conspicuous presence in academia and has always been steadfast in its mission to promote in the various fields of learning. Moreover, free pursuit of knowledge is encouraged here, within an environment that is respectful and congenial to all members”.
- **Aim of the College:** A Dayanand Girls College student should develop a broad knowledge base in her discipline , critical thinking, independent decision making and creative problem solving ,the ability to work individually and collaboratively, An understanding of spiritual and ethical values including an awareness of the Vedic perspective, The ability to be sensitive to the cultural and environmental issues contributing to their sustenance**.**

The Natural Environs of Dayanand Girls' College, Kanpur

Dayanand Girls' College in Kanpur is situated in a setting that harmoniously blends urban convenience with a touch of natural tranquility. Located in one of Uttar Pradesh's prominent industrial and educational hubs, the college campus serves as a serene oasis amidst the bustling cityscape of Kanpur. The campus itself is adorned with lush greenery, featuring well-maintained gardens and tree-lined pathways that provide a refreshing environment for both students and faculty. These green spaces are not only aesthetically pleasing but also offer a peaceful retreat from the rigorous academic activities, promoting mental well-being and focus.

In addition to the manicured lawns and flower beds, the campus is home to several age-old trees, which stand as silent witnesses to the institution's long history and tradition. These trees not only add to the scenic beauty but also provide ample shade, making the outdoor spaces more comfortable for various activities and gatherings.

The college's location also offers easy access to the city's numerous parks and recreational areas, allowing students to explore and enjoy nature beyond the campus boundaries. The proximity to the Ganges River further enriches the natural setting, with the riverbanks providing a picturesque locale for reflection and relaxation. Moreover, the institution's commitment to sustainability and environmental awareness is evident in its initiatives to maintain a green campus. Efforts such as rainwater harvesting, waste recycling programs, and energy-efficient practices highlight the college's dedication to preserving its natural surroundings.

In summary, Dayanand Girls' College, Kanpur, is characterized by a harmonious blend of urban accessibility and natural beauty. The verdant campus, coupled with the institution's eco-friendly initiatives, creates an enriching environment conducive to learning, growth, and personal development.

Assessment of the College

- **Affiliation:** The College has all its courses approved and affiliated to **The Chhatrapati Shahu Ji Maharaj University, Kanpur.**

Certification-

- **AISHE:** The College has the AISHE Code C-12428
- **Recognition:** The College is recognised by University Grant Commission (UGC) under section 2(f) and 12 (b) of the UGC Act, 1956 vide by University Grants Commission, New Delhi

Institution overview

- **Populace analysis for Academic year 2022-23**

- **Students' data**

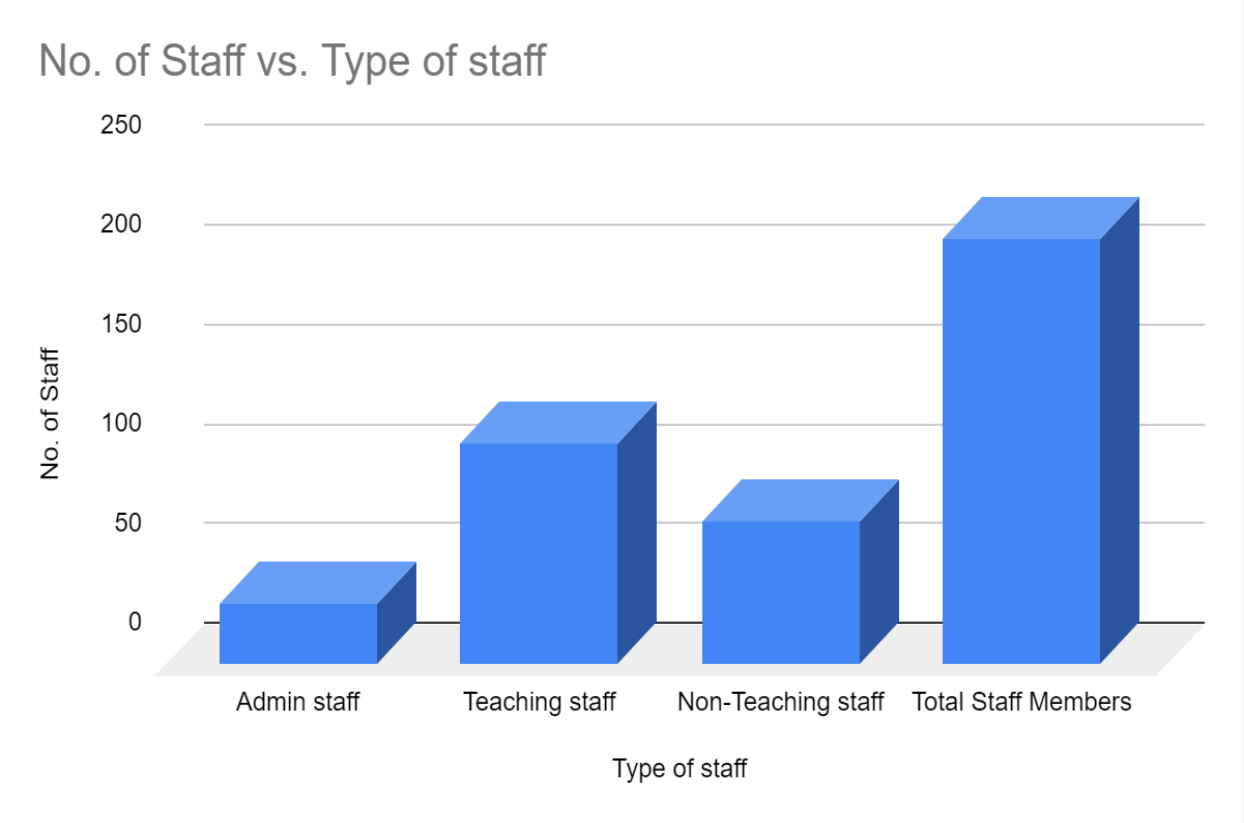
The data provided by the College indicates that there were a **total of 2973** students on the premises.

❖ **Staff data**

Type of Staff	No. of Staff
Admin staff	31
Teaching staff	111
Non-Teaching staff	72
Total Staff Members	**214**

Table 1: Staff data of the Institution for 2022-2023

The staff data shows the premises had a total of **214** Staff Members.



➢ **Populace analysis for Academic year 2021-22**

❖ **Students' data**

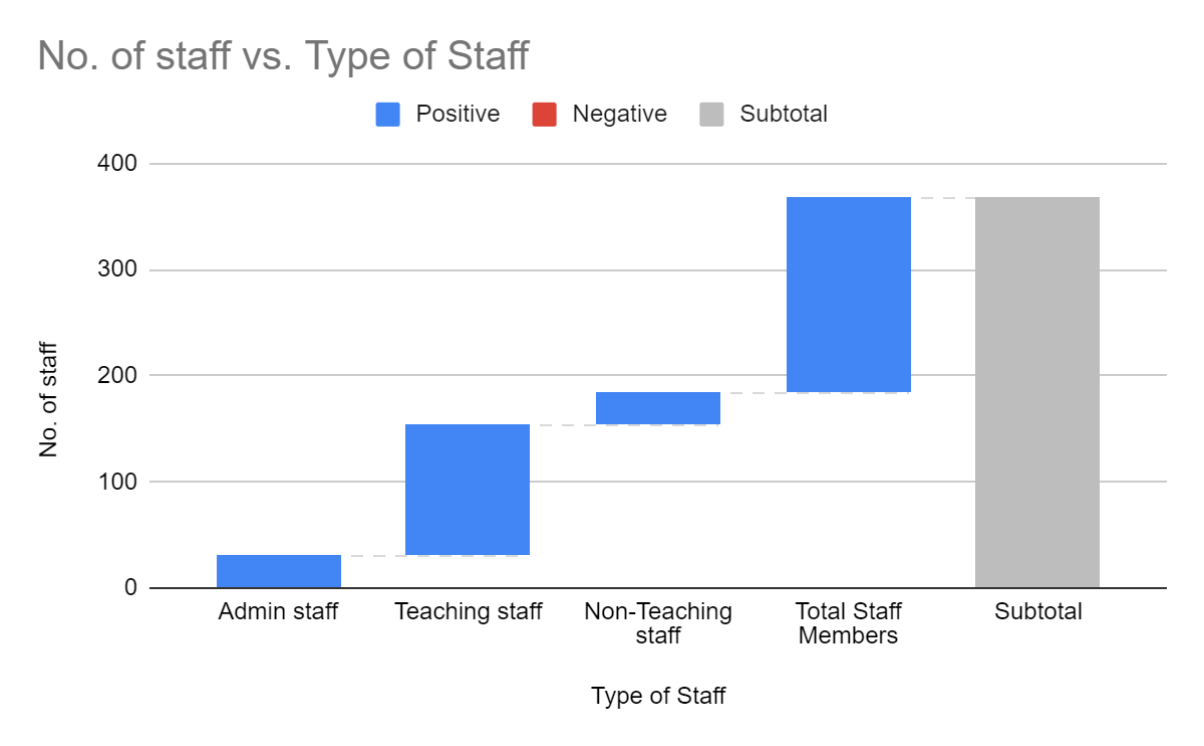
The data provided by the College indicates that there was a **total of 3371** students on the premises.

❖ **Staff data**

Type of Staff	No. of staff
Admin staff	31
Teaching staff	124
Non-Teaching staff	29
Total Staff Members	**184**

Table 2: Staff data of the Institution for 2021-2022

The staff data shows the premises had a total of **184** Staff Members.



College Infrastructure

Establishment: The College was established in 1959. The building is a Reinforced Cement Concrete (RCC) framework building. Overall, the Infrastructure of the Building is excellent in terms of the Architecture Design and Green Building Design. The Premises covers quite a few of the requirements for a Green Habitat. The infrastructure of a college refers to the physical facilities and resources that support the educational and administrative functions of the institution. It encompasses various elements such as buildings, classrooms, libraries, laboratories, administrative offices, recreational areas, and other facilities.

Spatial Organisation: The overall ambience of the College is warm and inviting. The classrooms and other spaces benefit from ample natural ventilation through clear glass windows that allow fresh air to flow in. The building's architecture is well-designed, featuring a color palette that not only makes the structure stand out but also gives it an institutional feel. This design harmonizes with the local architecture and the natural landscape, which includes large trees surrounding the area. The emphasis on design creates a calm environment, seamlessly blending the built form with the serene surroundings. The floor-to-ceiling height exceeds 11 feet. While there are no lifts in the premises, amenities include CCTV, fire extinguishers, a library, and a first aid box.

SAFE Study Audit

- **About the SAFE Study Audit**

It is a systematic study of the factors that make the institution a sustainable and healthy environment for its inhabitants.

- **Analysis for the SAFE Study Audit**

The procedure included detailed verification for the following:

Energy Audit

- Analysis of the Lights, Fans, AC, Equipment
- Renewable energy
- Scope for reducing the current energy bills if any
- Improvement in the thermal comfort of the premises

Green Audit

- Green initiatives
- Hygiene audit
- Water Audit - Analysis of the current water consumption of premises; Scope to include Rain water harvesting and Waste water treatment in premises
- Waste Audit - Current waste produced, its segregation and usage; Strategies to be adopted for waste management and awareness

Environmental Audit

- Analysis of the current landscape + hardscape of campus
- Analysis of the flora and fauna of campus
- Strategies adopted at present to enhance vegetation
- Measures that can be adopted for ecological improvement of the premises.

➢ **Strategy Adopted for SAFE Study Audit**

The strategy included data collection from the administrative department, actual inventory inspection, investigation of operation and maintenance procedures, analysis of the collected data, and preparation of the report.

Timeline of the Activities for Green Building Study Audit

- 10 May 2024 – Allotment and Initiation by the College
- 10 May 2024 – Induction meeting
- 14 May 2024 – Survey of the Student and staff submitted.
- 04-05 June 2024 - Site visit at the Institute
- 06 June 2024 – Submission of the report

Energy Audit

An energy audit at Dayanand Girls College, Kanpur, is a crucial step towards enhancing energy efficiency and sustainability on campus. This comprehensive assessment involves a detailed examination of the college's energy consumption patterns, identifying areas where energy is being wasted, and recommending practical measures to optimize usage.

The audit process begins with collecting data on electricity, gas, and water usage over a significant period. It includes inspecting lighting systems, HVAC (heating, ventilation, and air conditioning) units, laboratory equipment, and other electrical appliances. Special attention is given to the building's insulation, windows, and overall structural efficiency, as these significantly impact heating and cooling needs.

Energy auditors utilize advanced tools and techniques, such as infrared thermography and power quality analyzers, to detect inefficiencies. The audit aims to identify potential upgrades, like installing LED lighting, energy-efficient appliances, and improving insulation. It also explores renewable energy options, such as solar panels, to reduce reliance on non-renewable sources.

Sources of Energy consumption

The premise uses following sources of energy consumption.

Primary sources

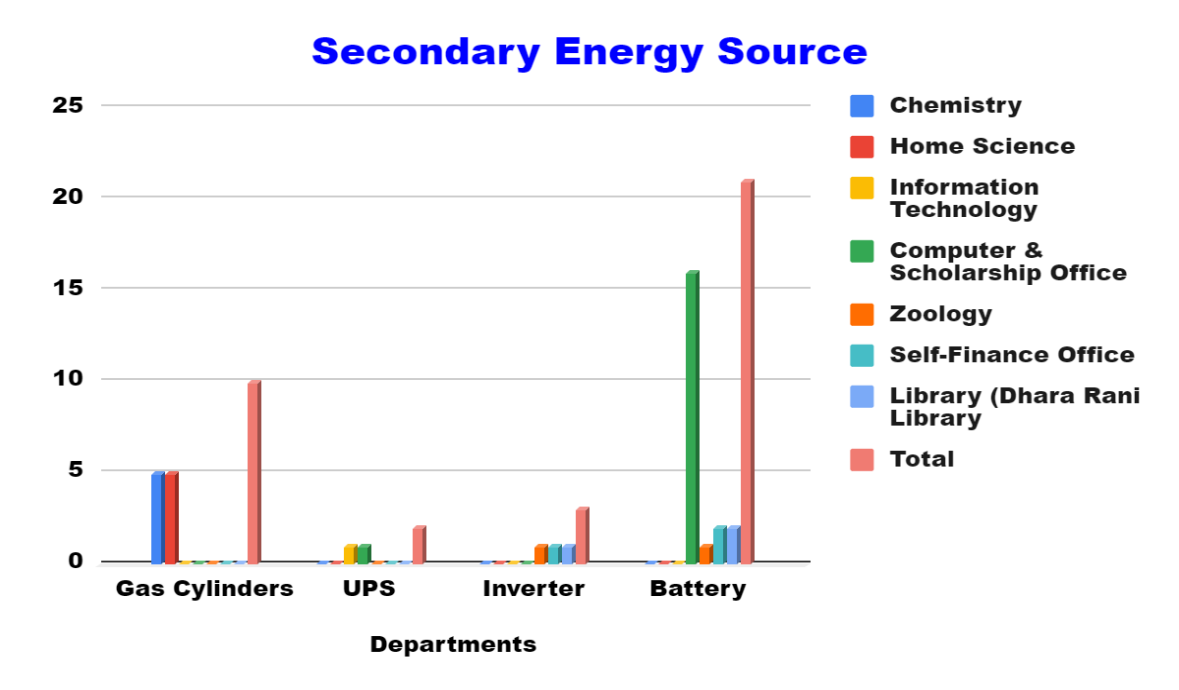
❖ **Electrical (Metered) –** Light, Fans, Equipment's, Pumps comprise these sources.

❖ **Renewable energy** – There are sources of renewable energy available.

Secondary sources

The sources are listed below (Department and location wise)

S. No	Department	Gas Cylinders	UPS	Inverter	Battery
1	Chemistry	5	0	0	0
2	Home Science	5	0	0	0
3	Information Technology	0	1	0	0
4	Computer & Scholarship Office	0	1	0	16
5	Zoology	0	0	1	1
6	Self-Finance Office	0	0	1	2
7	Library (Dhara Rani Library)	0	0	1	2
Total		**10**	**2**	**3**	**21**



Investigation Analysis

The site investigation at Dayanand Girls College, Kanpur, included observations and interviews with the maintenance staff and the Electrical Department in charge. The findings are summarized below:

- **Switch-off Drills:** Currently, the maintenance staff and lab attendants diligently practice switch-off drills. They ensure that all equipment is regularly turned off when not in use.

- **Computer Usage:** All computers are shut down after use and are also set to power-saving mode to conserve energy.
- **Energy Conservation Awareness:** Display boards encouraging both staff and students to save energy are prominently placed in classrooms and laboratories.

These practices highlight the college's commitment to energy conservation and safety standards.

Actual Electrical Consumption as per Bills

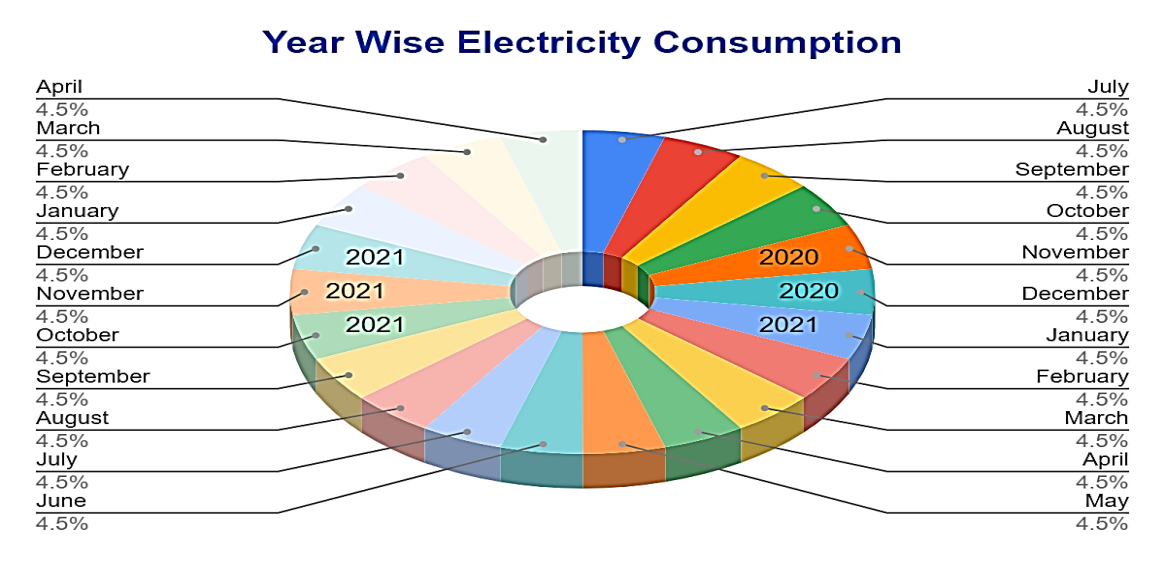
The admin department had shared the bills for Meter which is connected to the building and is the main source of energy supply. The details of unit consumption meter wise stated there were around 320787 units consumed for Rs. 43,77878/-

Electricity Consumption Year Wise According to Bills				
S.No.	**Month**	**Year**	**Unit Consumed**	**Amount**
1	July	2020		
2	August	2020	16464	359590.00
3	September	2020		
4	October	2020	13674	189241.00
5	November	2020	4900	72311.00
6	December	2020	6480	86875.00
7	January	2021	7180	93513.00
8	February	2021	9022	97505.00
9	March	2021	5497	77710.00
10	April	2021		
11	May	2021	6962	208532.00
12	June	2021		
13	July	2021	7086	150656.00
14	August	2021		
15	September	2021	8142	96135.00
16	October	2021	11400	174864.00
17	November	2021		
18	December	2021		
19	January	2022	13944	282158.00
20	February	2022		
21	March	2022	4600	64455.00
22	April	2022	16802	194849.00
23	May	2022	10856	87726.00

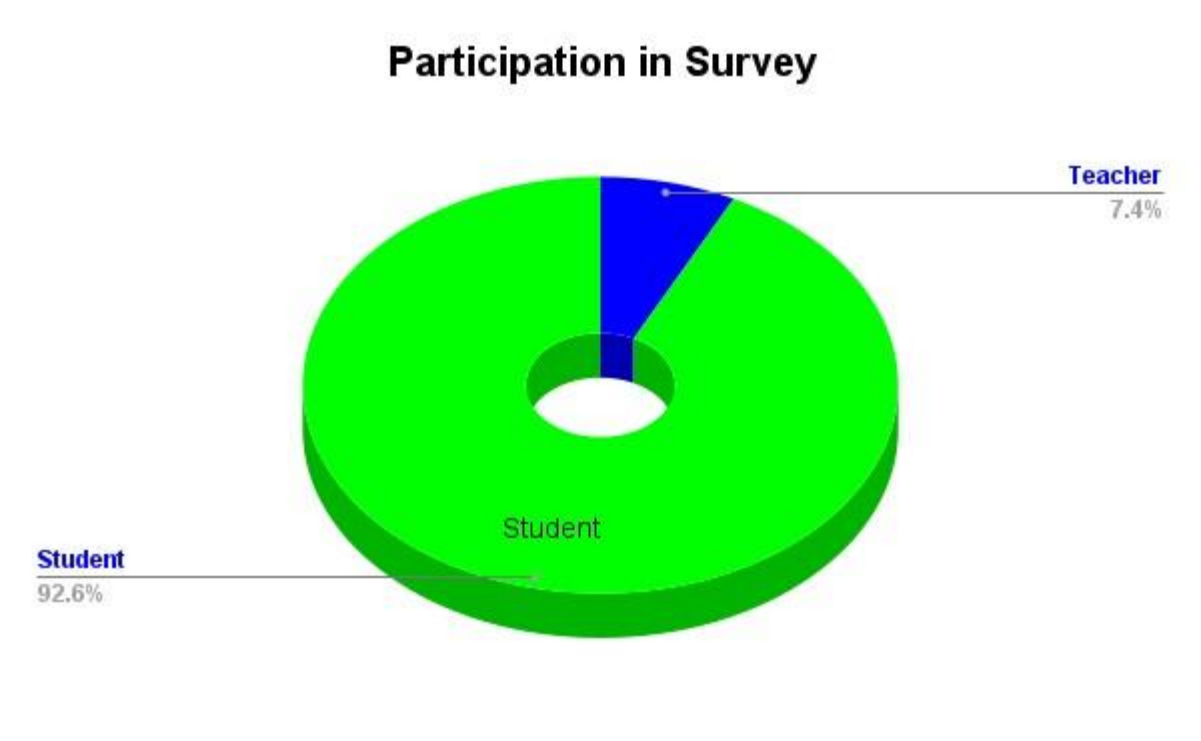
24	June	2022	10854	113822.00
25	July	2022	12788	138733.00
26	August	2022		
27	September	2022	16456	173869.00
28	October	2022		
29	November	2022	10992	117829.00
30	December	2022	15156	191577.00
31	January	2023	4324	60498.00
32	February	2023		
33	March	2023	13267	165228.00
34	April	2023		
35	May	2023	15124	182870.00
36	June	2023	10706	114226.00
37	July	2023	8644	83662.00
38	August	2023	10956	11103.00
39	September	2023	5518	68614.00
40	October	2023		
41	November	2023	21578	221087.00
42	December	2023	5863	180159.00
43	January	2024		
44	February	2024	15552	172991.00
45	March	2024		
46	April	2024		145490.00
47	May	2024		

Details of the electrical consumption

The summary of the above study shows the average consumption varies for each month.



Survey Results

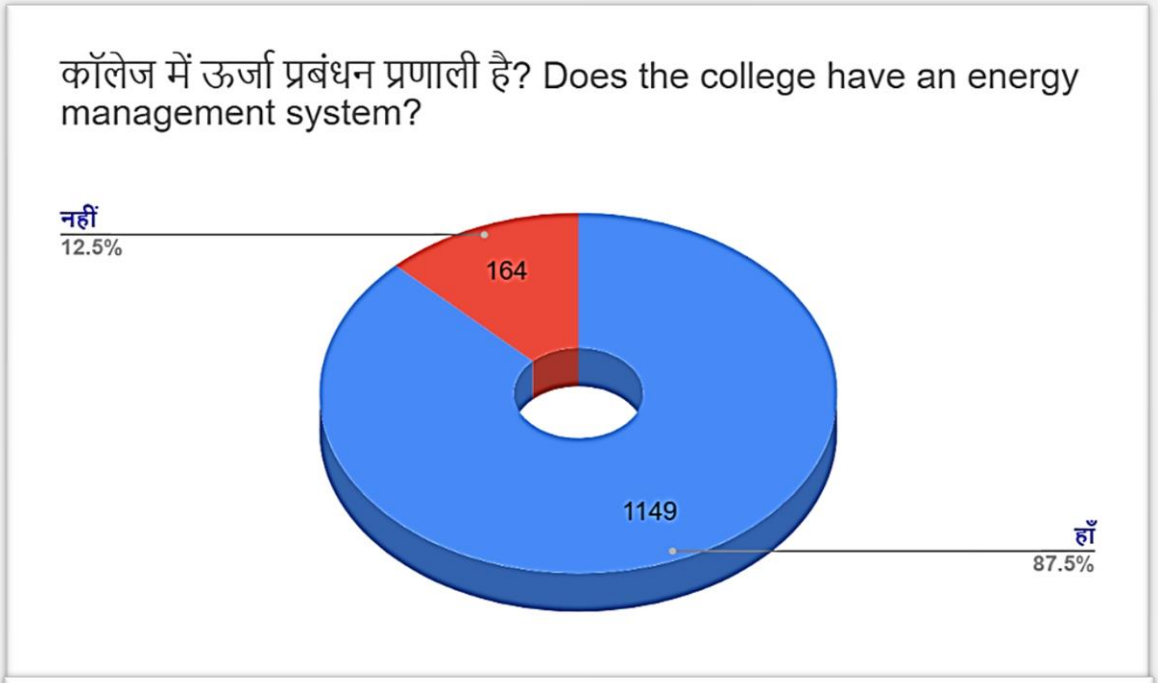


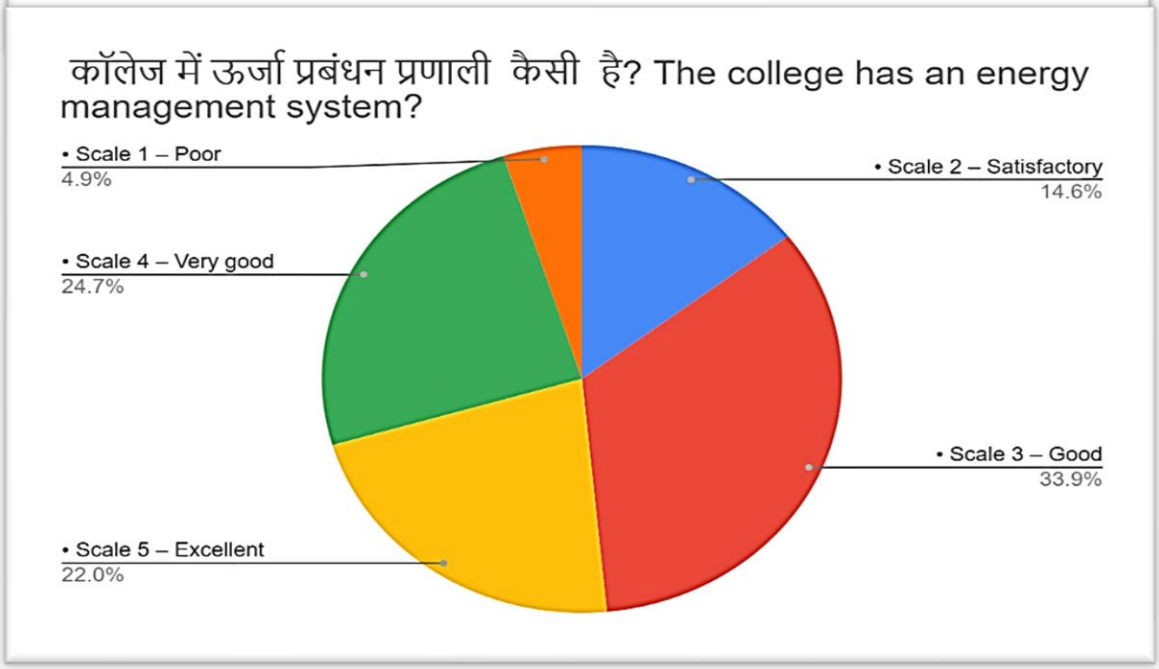
A total of **1,313 responses** were received out of which 92.6% were students.

Review of the Energy management practices in the premises

Note: The Participants were asked to review the practice on a scale of 1-5 with scale components as follows:

- Scale 1 – Poor
- Scale 2 – Satisfactory
- Scale 3 – Good
- Scale 4 – Very good
- Scale 5 – Excellent

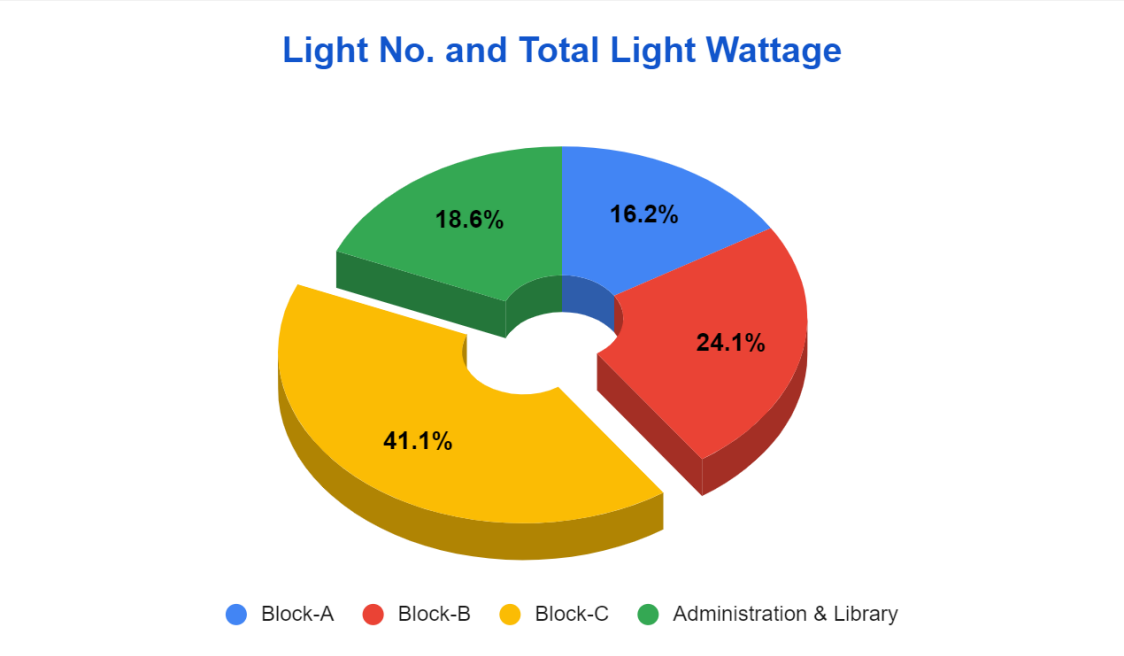




The students, staff (almost 22 %) of the responses found the practices to be excellent (rating 5) and 24.7% of the responses found practices to be very good (rating 4) and 33% of the responses were Good (rating 3).

Block Wise Analysis of the Energy Consumption

The energy consumption of Lights is **34,232 KWh** of energy; the following graph shows the building wise consumption



1. **Highest Light Density:**
    - Block-C has the highest number of lights (276) and the highest total light wattage (13120 watts). This suggests Block-C is the most illuminated building, which could indicate it has the largest area or requires more lighting due to its usage patterns.
2. **Energy Efficiency:**
    - The average wattage per light varies among the buildings, with Block-A having the highest average wattage per light at approximately 62.94 watts. This indicates that Block-A might be using higher wattage bulbs compared to other blocks, potentially offering areas for energy-saving improvements.
3. **Administration & Library:**
    - With 125 lights and a total wattage of 6332 watts, the Administration & Library building has a moderate number of lights and total wattage. Its average wattage

per light is 50.66 watts, which is lower than Block-A but higher than Blocks B and C.

Recommendations for Energy Conservation:

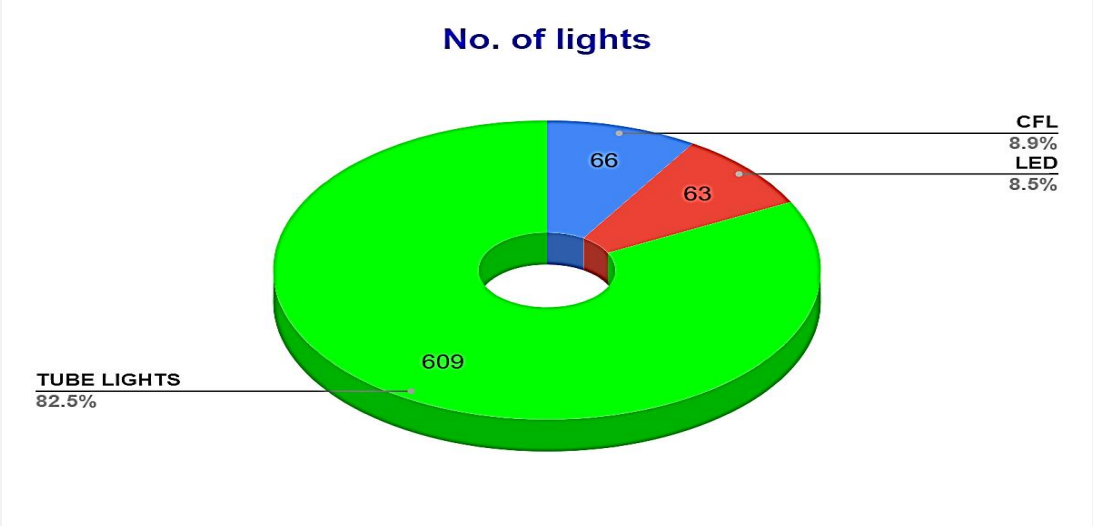
1. **Upgrade Lighting Fixtures:**
    - Consider replacing higher wattage lights, especially in Block-A, with more energy-efficient LED lighting. LEDs can provide the same or better illumination with significantly lower energy consumption.
2. **Implement Smart Lighting Systems:**
    - Introduce automated lighting controls such as motion sensors and timers, particularly in areas with sporadic use, to ensure lights are only on when needed.
3. **Regular Energy Audits:**
    - Conduct regular energy audits to identify other potential areas for reducing energy consumption. Monitoring and adjusting the lighting usage based on actual need can contribute to significant energy savings.
4. **Enhance Awareness Programs:**
    - Strengthen the existing energy conservation awareness programs with more detailed guidelines and regular updates. Encourage both staff and students to participate actively in energy-saving initiatives.

Lights

Types of lights based on the numbers

There are a total of **738 lights in the premises;** the following table shows the various types of lights in the premises.

S. No.	Type	Nos.
1	CFL	66
2	LED	63
3	TUBE LIGHTS	609
	TOTAL	738



Summary of the types of lights in the premise

Site investigation observations

- ❖ All lights are in working conditions
- ❖ Daily monitoring and check are done by the maintenance staff.
- ❖ There was no fuse defect observed.

Fans

Types of fans based on the numbers

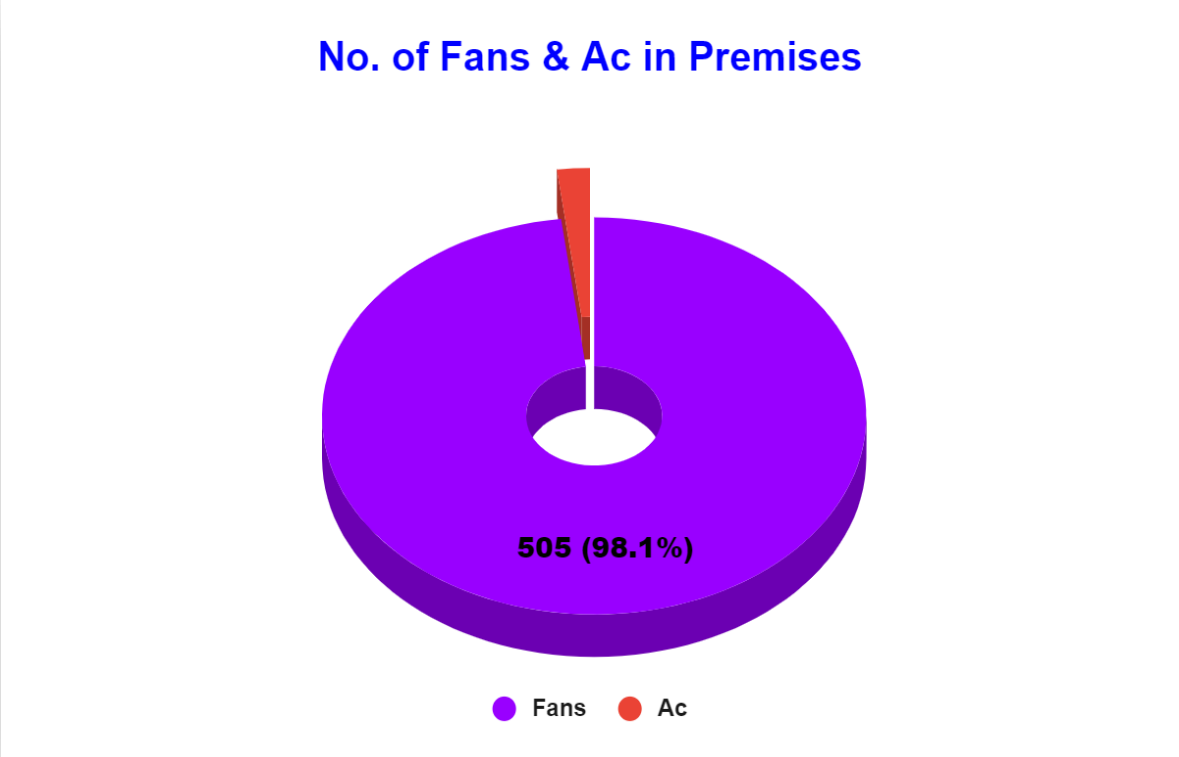
There are a total of **505 fans like Ceiling, Exhaust, Pedestal, Table and Wall mounted fan** in the premises.

Air conditioners

There are 10 air conditioners on the entire premises. Assuming the average power consumption of a standard air conditioner is approximately 1,000 to 1,500 watts per hour:

- If all 10 air conditioners are used simultaneously, they could consume between 10,000 to 15,000 watts per hour.

- Given the college's total power consumption of 13,300 watts, it is likely that not all ACs are running at full capacity simultaneously, or they are used intermittently and efficiently managed.



Site Investigation Observations

Daily Monitoring and Maintenance

The maintenance staff at Dayanand Girls College, Kanpur, conducts daily monitoring and checks with great skill. Their diligent efforts ensure that all outdoor units are thoroughly cleaned and maintained, with no issues related to dust accumulation.

Air Conditioner Replacement Considerations

The current air conditioners are in good condition and well-maintained, indicating no immediate need for replacement. However, during any future redevelopment projects at the College, it is advisable to consider upgrading to energy-efficient air conditioners. These newer models would reduce power consumption, aligning with sustainable practices and potentially lowering operational costs.

Recommendations for a Sustainable Habitat

Over time, energy-efficient appliances have proven to be a boon, not only in terms of energy conservation but also in fostering eco-friendly habits. Educational institutions like schools and colleges are ideal platforms for implementing these initiatives. They help raise awareness among students from a young age and serve as symbols of energy-efficient premises. Based on our analysis, here are some recommendations that can be implemented at Dayanand Girls' PG College, Kanpur, to significantly reduce electrical consumption.

Section 1: Building Management Systems

Dayanand Girls' PG College has immense potential to become a 100% energy-efficient campus. In addition to upgrading the electromechanical systems, several measures can be introduced to enhance the building management systems. These initiatives can be applied to educational area of the college.

- **Set the BMS Time-of-Day Schedules**: Adjust the building management system (BMS) schedules to match the minimum occupancy periods of different areas. Implementing an optimum start-stop routine, including a night purge cycle and adjusting for session and holiday schedules, can greatly enhance efficiency.
- **Space Temperature Setback**: Utilize a temperature setback strategy to save on utility costs by reducing the frequency of heating or cooling system operations. This approach is a simple yet effective way to cut down energy usage.
- **Timer Control for Air Conditioners**: Install timer controls on air conditioning units to ensure they operate only when necessary.
- **Timer Control for Personal Heaters**: In residential areas, introduce push-button timer controls for personal heaters to prevent unnecessary usage.

By implementing these measures, Dayanand Girls PG College can move towards a more sustainable and energy-efficient future, setting an example for other institutions to follow

Energy Efficiency Improvement Recommendations

Section 2 - Electromechanical Systems - Electrical and Lighting

Sub-Section 1 - Lighting

Current Lighting Systems

Our analysis of the current lighting systems at Dayanand Girls' PG College reveals the presence of non-LED lights, CFLs, Halogen, and Mercury lights. These types of lighting are significantly less energy-efficient compared to modern alternatives.

Recommendation

Replacing all Non-LED, CFL, Halogen, and Mercury lights with energy-efficient LED lights can result in an average energy consumption reduction of 50%. This upgrade should be considered during any upcoming renovations to enhance overall energy efficiency.

Sub-Section 2 - Fans

Current Fan Systems

The ceiling fans in the college are in good working condition and are well-maintained. However, these fans typically consume at least 45W each when in use.

Recommendation

Replacing existing ceiling fans with energy-efficient models that consume only 14W can lead to an average reduction of 69% in energy consumption. While immediate replacement is ideal, the college may also consider replacing fans as they become damaged or non-functional.

Sub-Section 3 - Equipment

Current Computer Systems

Desktop computers, which consume approximately 250W, are widely used in the college. In contrast, laptops consume only 40W and have the added benefit of battery backup, lasting up to 4 hours.

Recommendation

Switching from desktops to laptops can lead to an 84% reduction in energy consumption. However, this transition should take into account the following factors:

- Senior staff may find desktops more convenient, and switching to laptops could disrupt their work patterns and productivity.
- Laptops are more susceptible to damage from drops, which could lead to data loss.
- For students, laptops offer greater flexibility, though desktops might still be preferable in monitored common areas.
- Irregular use due to pandemic situations might affect device functionality.

Given these considerations, the college should develop a strategy for phased replacement, ideally when devices become damaged or non-functional. Additionally, e-waste management should be integrated into this strategy.

On site visit photo

Dr. Ramesh Chandra
Chairman

Dr. Shaleen Kumar Singh
Coordinator

Dr. Deepak Singh
Co-coordinator

SAFE
SOCIETY FOR ACADEMIC FACILITATION & EXTENSION