



MIRANDA HOUSE

UNIVERSITY OF DELHI

ENERGY AUDIT REPORT

2023-2024



Prepared by
EHS ALLIANCE

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CERTIFICATE



CERTIFICATE

PRESENTED TO

MIRANDA HOUSE **UNIVERSITY OF DELHI**

GC Narang Road, University Enclave, New Delhi, 110007

That has been assessed by EHS Alliance Services for the comprehensive study of Energy Audit on institutional working framework to fulfill the requirement of

ENERGY AUDIT **ACADEMIC YEAR 2023-24**

The energy-saving initiatives carried out by the institution have been verified in the report submitted and were found to be satisfactory.

The efforts taken by management and faculty towards all types of energy used in the institution and sustainability are highly appreciable and noteworthy.


SIGNATURE



23.08.2024
DATE OF AUDIT

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ACKNOWLEDGEMENT

EHS Alliance Services would like to thank the management of Miranda House for assigning this important work of Energy Audit. We appreciate the co-operation of the teams for completion of assessment.

First of all, we would like to thank **Prof. Bijayalaxmi Nanda - Principal** for giving us an opportunity to evaluate the environmental performance of the campus.

We would also like to thank **Prof. Saloni Bahri, Audit Coordinator and Convenor IQAC, Miranda House** for her continuous support and guidance, without which the completion of the project would not have been possible. We are also thankful to other staff members who were actively involved while collecting the data and conducting field measurements.

We are also thankful to

Dr Nisha Vashistha

Prof. Rekha Kumari

Dr E. Geetanjali

Coordinator, UBA

Convenor, MH Vatavaran

Convenor, Garden Committee



DISCLAIMER

EHS Alliance Services Energy Audit Team has prepared this Energy Audit Report for Miranda House based on input data submitted by the representatives of the 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 conclusions are arrived following best estimates and no representation, warranty or undertaking, express or implied is made and no responsibility is accepted by 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.

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Vijay Singh
Lead Auditor EMS & Energy



Dr. Uday Pratap
Co-Auditor EMS & Energy

ABBREVIATION

A	Amps
AC	Air Conditioner
AC	Alternating Current
AMET	Academy of Maritime Education and Training
CFL	Compact Fluorescent Lamp
CIP	Comprehensive Inspection Program
DC	Direct Current
HSD	High Speed Diesel
Hz	Hertz
kg	Kilogram
kVA	Kilo-Volt-Ampere
kW	kilo Watts
kWh	Kilowatt Hour
kWp	Kilowatt Peak
LED	Light Emitting Diode
LPG	Liquefied Petroleum Gas
MMS	Module Mounting Structure
MPPT	Maximum Power Point Tracker
NAAC	The National Assessment and Accreditation Council
SEC	Specific Energy Consumption
SPV	Solar Photovoltaic
STC	Standard Test Condition
TV	Television
V	Volts
W	Watts
W/m²	Watt Per Square Meter

OVERVIEW OF THE COLLEGE

Miranda House, college for women, located in the University of Delhi campus, is a premier women's institution. It was established in 1948 by the then Vice Chancellor, Sir Maurice Gwyer. Lady Edwina Mountbatten laid its foundation stone on March 7 in the same year. Originally designed by renowned architect Walter George, Miranda House is built in warm red brick with cool and spacious corridors. The College shares an architectural affinity with other colonial educational institutions of the country. In the past six decades, as the College has grown, several other buildings have been added in consonance with its original design. Special efforts are on to preserve the heritage of its pristine architectural glory.

Miranda House offers liberal education in social sciences, humanities and basic sciences to more than 3500 students. The faculty, renowned for its meritorious basis profile and versatile talent, is dedicated to the cause of liberal education. Through their three years at Miranda, the students develop a sense of social responsibility, intellectual rigour, and practical knowledge. They learn communication, analytical and problem-solving skills, and a demonstrated ability to apply their education to the complex and diverse world. The College has always maintained high academic standards.



The College has always maintained high academic standards. More significantly, it has provided students an enabling and creative environment to freely develop and express views

that help them respond to changes in society. Being on the University campus, its proximity to other colleges facilitates the participation of Miranda students in several inter-college events, both academic and cultural. Those who will make the College hostel their home for the next three years has the privilege of residing in one of the most beautiful residential buildings on the University campus The institution's philosophy is guided by a pedagogy that encourages the students to explore new domains, to critically examine the world around them and to question stereotypes.

The Legacy... traditions and institutional values

MH has a rich legacy. Established at dawn of independence it provided a unique opportunity to young women for quality higher education. They set for themselves high goals and ideals. They worked for a new society in which women would enjoy equal opportunity with men in professional and public fields. In this, they were abetted by the founding faculty who were independent minded, and belonged to the select group of highly educated women in independent India with a deep concern for quality of education they imparted. They were also charged with a spirit of adventure, steeped in idealism, and committed to women empowerment and the task of building a nation. Proud of their mission as early pioneers, they worked with single-minded devotion in setting the Miranda traditions. These attributes of total dedication have contributed in a large measure to the position of distinction occupied by the college. Over near seven decades of its existence, the college has grown from strength to strength, continuing to provide an atmosphere of high academic excellence and rich cultural activities to its students. The college has established a niche for itself amongst the globally recognized premiere institutions of higher learning.



Being a college established and maintained by the University; Miranda House has a special place among the women's colleges of the University of Delhi. Its location in the heart of the University Campus, and its close interaction with the various Departments of the University and other campus colleges gives it a unique advantage. Although a women's college, it is not a cloister. It welcomes interaction with other colleges and educational organizations across

the country, actively engaging both men and women in all its extramural activities, competing with the best on equal terms.

The extremely distinguished list of alumnae imparts a sense of confidence and immense pride in students. They view themselves as torchbearers of great traditions. All this propels them to often explore uncharted territory, think unfettered, and bend traditions in a bid to create a better world, especially for women.

Mission

The stated mission of the college is to provide

- a stimulating active learning environment attracting young women with exceptional desire to make a difference to the world
- highest quality liberal arts and basic science education through distinctive academic programmes that instill rigour in the pursuit of knowledge
- culturally sensitive inclusive environment upholding core values of respect for diversity
- enriching co-curricular activities linking education to the world of work and communities
- dedicated and responsive faculty of scholars to assist each student fulfill aspirations and reach milestones
- competencies for new domains of knowledge and the future of work in a globally connected world
- early mentoring for leadership instilling capacity to explore new ideas, take intellectual risk, and usher paradigm change

Vision

The Upanishadic maxim in the college logo “Swadhyayann pramaditavyam” enshrines Miranda House’s understanding of what education must accomplish and steers students towards introspection and self-learning. Miranda House envisions a world where women have their rightful place and are given due recognition as leaders to reach top positions in all sectors of human endeavour. To give shape to this vision, Miranda House continually reaffirms and embraces its responsibility to build on its historic legacy of leadership in the education of women. It remains strongly committed to addressing issues of gender in all their complexity and preparing young women to: lead professionally successful lives enriched by the love of learning build personally fulfilling lives radiating integrity and strength of character sustain purposeful engagement with the world with an open mind and balanced perspective develop an understanding of their duty to nation and nation-building meet with confidence the challenges they will encounter in their lives flourish in a different cultural milieu in an increasingly interconnected world uphold the core institutional values of respect for diversity, inclusiveness, and humanism to emerge as leaders charged with new ideas and the capacity to make a difference.

Facilities in the campus

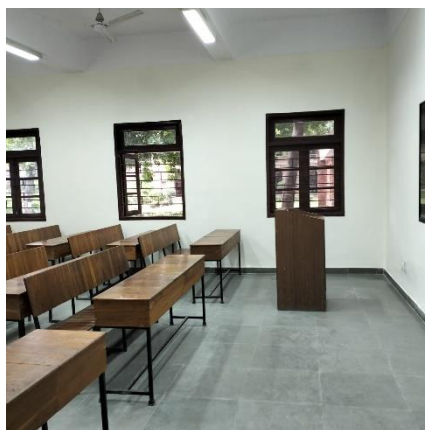
Amenities at Miranda provide far more than academic and administrative facilities on campus. It is dedicated to provide students with an exceptional infrastructure for learning as well as facilities for simplifying the procurement of fundamental skills. To accomplish the goal, Miranda House offers the following:

LIBRARY: The Miranda House Library was established on 7th March 1948 and the first book was accessioned on 22nd July 1948. The foundation stone of the present building was laid by Smt. Indira Gandhi, then Prime Minister of India on 7th March 1973. The Miranda House Library preserves and provides access to a rich and enduring source of knowledge to inform, inspire and engage its users in their intellectual and creative endeavors by the well-known motto "Right Document to the Right Reader at the Right Time". It takes pride in fulfilling this inherent mission to the hilt. MH has common Digital Resource Centres with a cluster of 80 computers on LAN.

SMART CLASSROOMS: The total of 110 formal lecture spaces provide comfortable seating for 2200 students in regular classes with the potential for easily accommodating another 10% at any time. Nearly all lecture venues have neatly arranged custom designed, comfortable desks and benches with shelves for bags; teacher table and chair. Green Ceramic Board for use with dust-free chalk or White Board for use with marker pens. Roof mounted Projector, and a pull-down white display screen for multimedia projection. Custom-designed Lecterns facility to link laptop to multimedia projector. Extra power outlets on front wall for flexible usage of the room. Air-conditioning was considered essential.



Library



Smart Class room



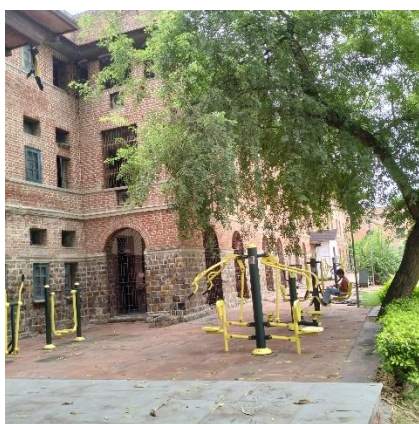
Auditorium

AUDITORIUM: Miranda House has an Auditorium with seating capacity of 450 in the Main Hall. As one of the oldest constructions in the college, it is part of the college building that was designed by Walter George. The architecture is unique. The Miranda House Auditorium and its stage bring alive nostalgic memories and are of historic importance.

MINI-AUDITORIUM: There are 170 seats in Miranda House's mini auditorium, which is arranged in steps so that everyone can see each other. The theatre has large windows that provide a lovely view of the surrounding greenery. is utilized to hold training programs, seminars, conferences, workshops, lectures, and certificate courses.

SEMINAR HALL: The Seminar Hall has a seating capacity of 125. It has a high-quality sound system, wall-mounted speakers, conference table mikes, roving mikes, lapel microphone, provision for recording; Roof-mounted high luminosity projection system. MH hosts several cultural events in its outdoor spaces like the open-air theatre, 2 arcades, cafeteria lawns, front lawns, sports ground, hostel lawns, etc. The bank foyer is periodically used for exhibitions and help desks for events. The Heritage Hall and the Student Activity Center are exquisite learning studios used extensively for organizing indoor music concerts, dance, theatre, workshops, exhibitions of photographs, paintings, art installations, prestigious public lectures, and panel discussions. They are innovatively used for baithak style gatherings.

SPORTS FACILITY: Miranda House has a Sports Ground. Facilities exist for a wide range of indoor as well as outdoor sports. The college has 14 Sport Teams and competitively participates in Archery, Athletics, Ball Badminton, Basketball, Chess, Cross-country, Netball, Power Lifting, Table Tennis, Taekwondo, Tennis, Weight Lifting, Volleyball and Yoga.



Fitness Centre



Sports ground



Cafeteria

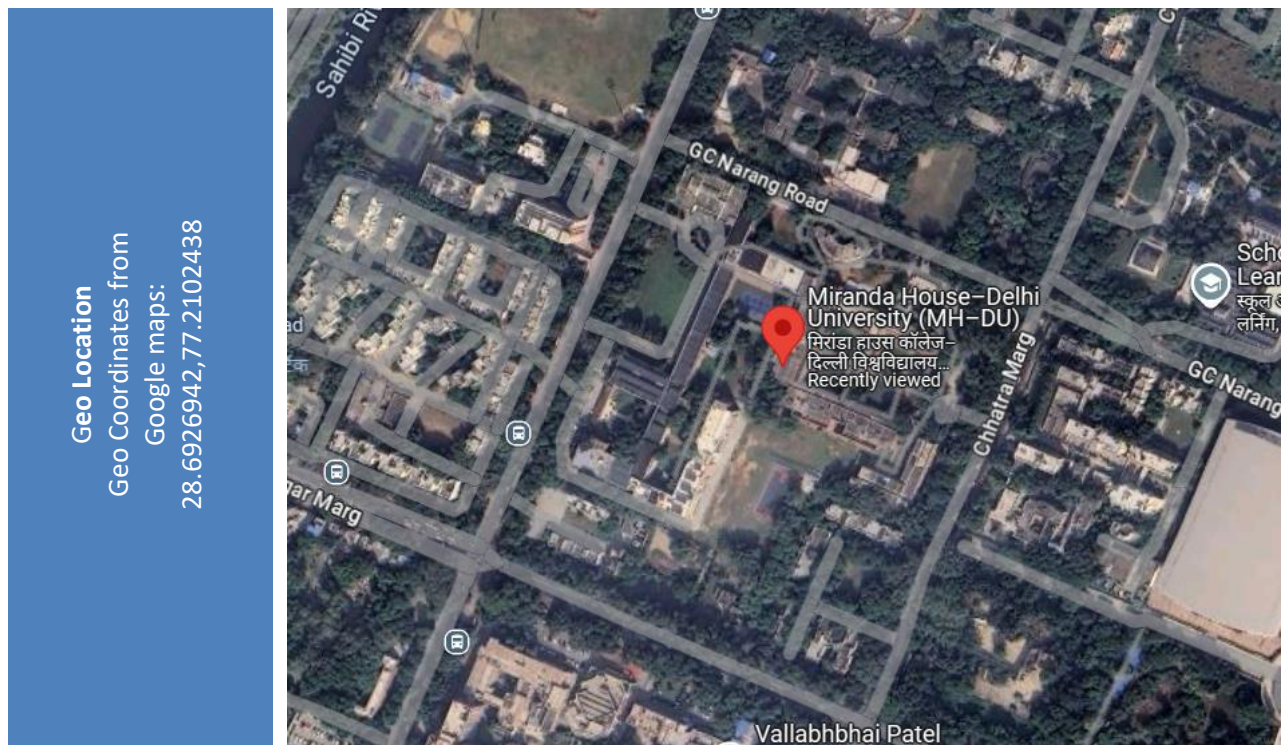
FITNESS CENTRE: MH has an active Physical Education Department that inspires the college community to work on a fitness regime and organizes several intra-college sports events, morning sessions on aerobics, yoga, recreational games, an annual sports festival, and freshers' cross-country race.

The college has an air-conditioned multigym with free weight and cardio training equipment like treadmills, cross-training gears, and bicycles. It also has 2 open gyms.

CAFETERIA: The cafeteria has been aesthetically renovated and is furnished with custom designed furniture. It includes a well-ventilated open kitchen for the preparation of certain

food items, with chimney hoods above burner stoves. Utmost hygiene is maintained at the food counters, dedicated storage spaces for grocery, cookware crockery and cutlery and dishwashing area. An additional large room adjoining the main hostel kitchen and opening into the cafeteria complex is used for preparation work and most of the heavy-duty cooking. Water supply for cooking and drinking purposes is from the Hostel Reverse Osmosis Water Purification Plant.

HOSTEL: The hostel designed by the renowned architect Walter George, with the foundation stone laid by Lady Edwina Mountbatten, lends to the college a historical charm and a sense of legacy. It is laid out in an aesthetically designed quadrangle enclosing well-kept gardens paced out by a majestic bottle palm-lined pathway. The long corridors, the dining hall with a high arched ceiling, and stonework balconies add to its charm.



AUDIT PARTICIPANTS

On behalf of the college

Name	Designation
Prof. Bijayalaxmi Nanda	<i>Principal</i>
Prof. Saloni Bahri	<i>Coordinator, IQAC</i>
Dr Nisha Vashistha	<i>Coordinator, UBA</i>
Prof. Pushpa Singh	<i>Member, IQAC</i>
Dr. E. Geetanjali	<i>Convener, Garden Committee</i>
Prof. Hena Oak	<i>Member, IQAC</i>
Dr Simran Jit	<i>Member, IQAC</i>
Dr Neeru Yadav	<i>Member, IQAC</i>
Dr Sujata Sengupta	<i>Member, IQAC</i>
Ms. Manavi Jain	<i>Member, IQAC</i>
Mr. Veer Singh	<i>AO, Admin</i>
Mr. Sudhir Aggarwal	<i>AO, Admin</i>
Mr. Joyti Prakash	<i>Section Officer, Admin.</i>
Mr. Shiv Kumar	<i>Site Engineer</i>
Ms. Neelam Thukral	<i>Sr. Assistant</i>
Mr. Deepak Bharti	<i>Jr. Assistant</i>
Mr. Mukesh Kumar	<i>Accounts Team</i>

On behalf of EHS Alliance Services

Name	Position	Qualifications
Mr. Vijay Singh	<i>Lead Auditor</i>	<i>M.Sc. M. Tech (Environment Science & Engineering), Energy Auditor, Post Diploma in Industrial Safety Management</i>
Dr. Uday Pratap	<i>Co-Auditor</i>	<i>Ph.D., EMS: Lead Auditor ISO14001:2015, QCI-WASH</i>

EXECUTIVE SUMMARY

The purpose of this Energy Audit was to seek opportunities to improve the energy efficiency of the Miranda House. Reducing the energy consumption despite improving the human comfort, health and safety were of primary concern.

Beyond just identifying the energy consumption pattern, this audit sought to detect and categorize the most energy efficient appliances. Additionally, some daily practices relating common appliances have been shared which may help reducing the energy consumption. Data collection for energy audit of the campus was carried out by the EHS Alliance Team. The Energy Audit Report accounts for the energy consumption patterns of the institution on actual survey and detailed analysis during the audit.

The work comprehends the area wise consumption traced using suitable equipment. The analysis was carried out by our team with the support of the staff members from Miranda House. The report provides a list of possible actions to preserve and efficiently access the available source, resources and their saving potential was also identified. We look forward towards optimization that the authorities, students and staff members would follow the recommendations in the best possible way. The report is based on certain generalizations including the approximations wherever necessary. The views conveyed may not reveal the general opinion. They merely represent the opinion of the team guided by the interviews of clients. We are happy to submit this Energy audit report to the Miranda House.

ENERGY AUDIT - ANALYSIS

1. ENERGY CONSUMPTION

To understand the Energy Consumption trends and to analyze the average monthly consumption we have collected electricity energy bills from July 2023 to June 2024.

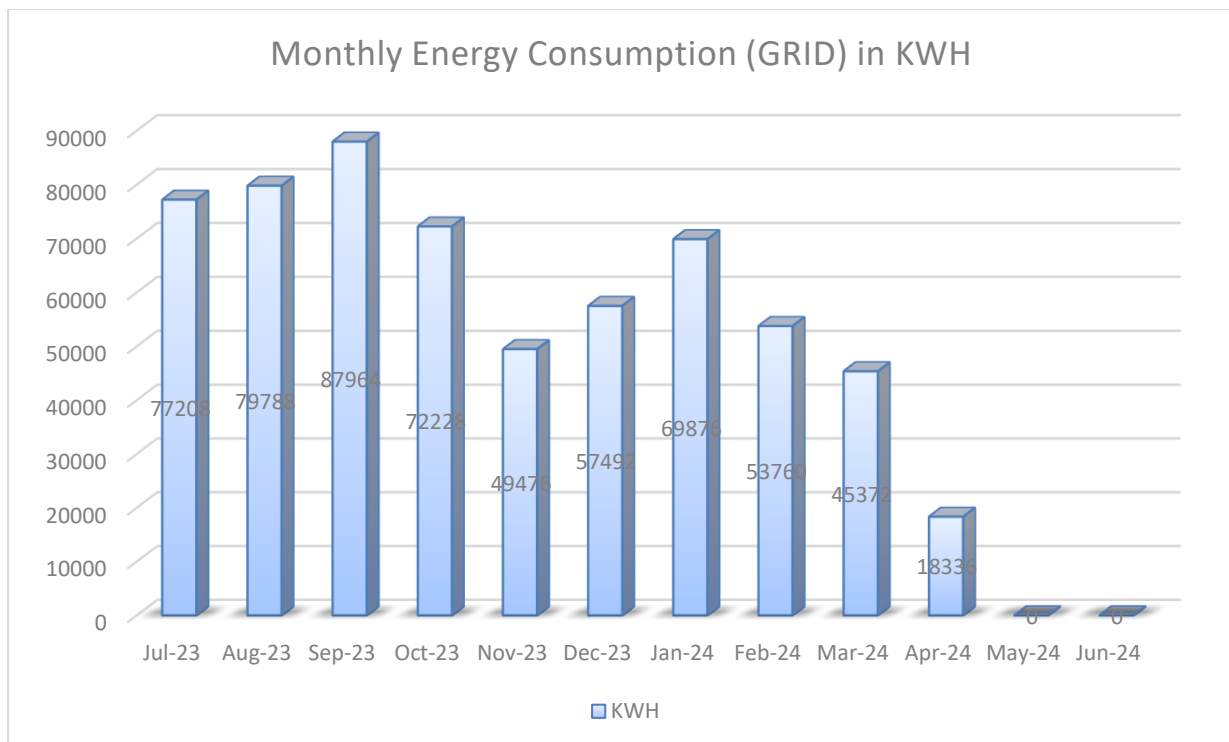
The details of “**Meter Connection**” at “**Miranda House**” are as follows-

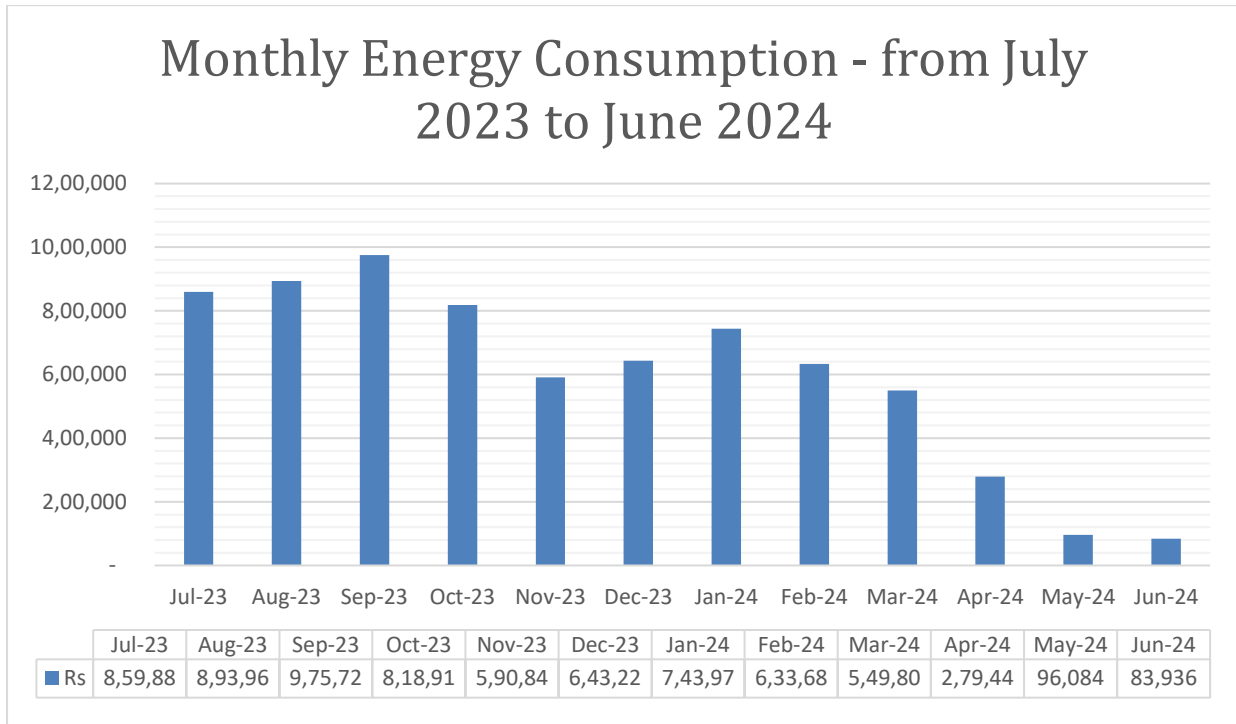
Name	-	The Principal
CA No.	-	60000002711

1.1 SUMMARY OF MONTHLY ELECTRICITY CONSUMPTION AND TOTAL BILL AMOUNT

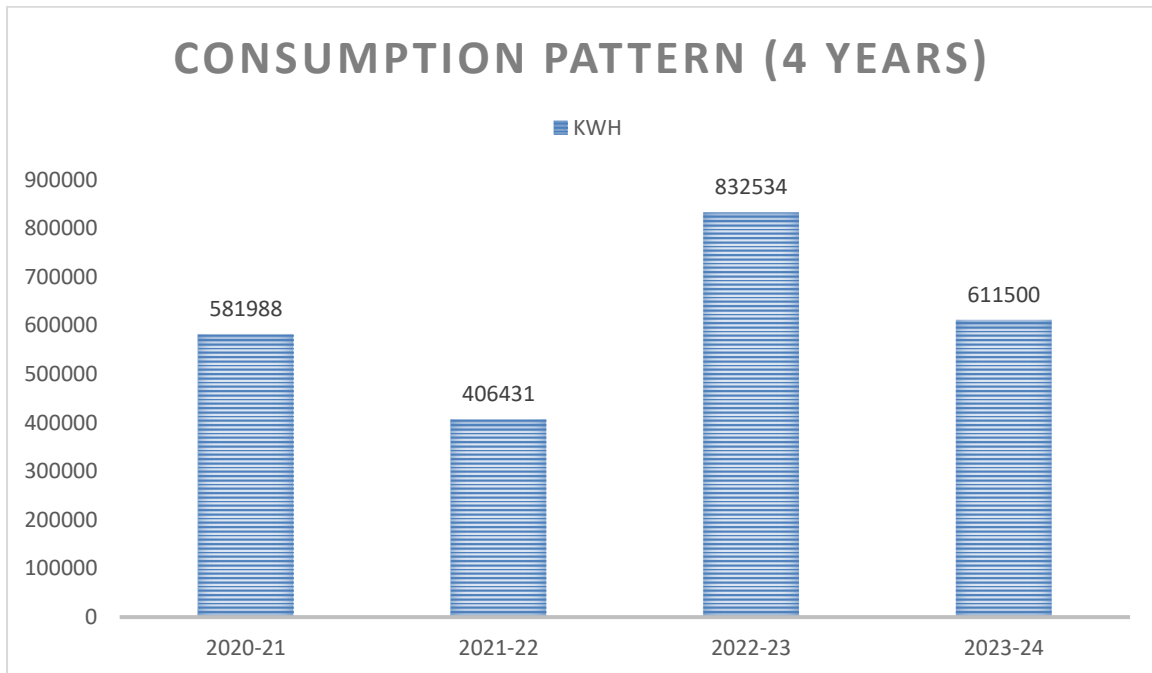
To understand the Energy consumption trend and for developing the baseline parameter we have collected monthly energy bill for the 12 months i.e. from July 2023 to June 2024

Month	Grid Billing	Solar PV	Total	Rate INR	Amount in INR
Jul-23	77208	17216	94,424	10.00	859,882
Aug-23	79788	18840	98,628	10.00	893,964
Sep-23	87964	18840	106,804	10.00	975,724
Oct-23	72228	18948	91,176	10.00	818,915
Nov-23	49476	18840	68,316	10.00	590,844
Dec-23	57492	13394	70,886	10.00	643,229
Jan-24	69876	8866	78,742	10.00	743,977
Feb-24	53760	18840	72,600	10.00	633,684
Mar-24	45372	18840	64,212	10.00	549,804
Apr-24	18336	18840	37,176	10.00	279,444
May-24	0	18840	18,840	10.00	96,084
Jun-24	0	16458	16,458	10.00	83,936
SUM	611,500	206,762	818,262		7,169,486



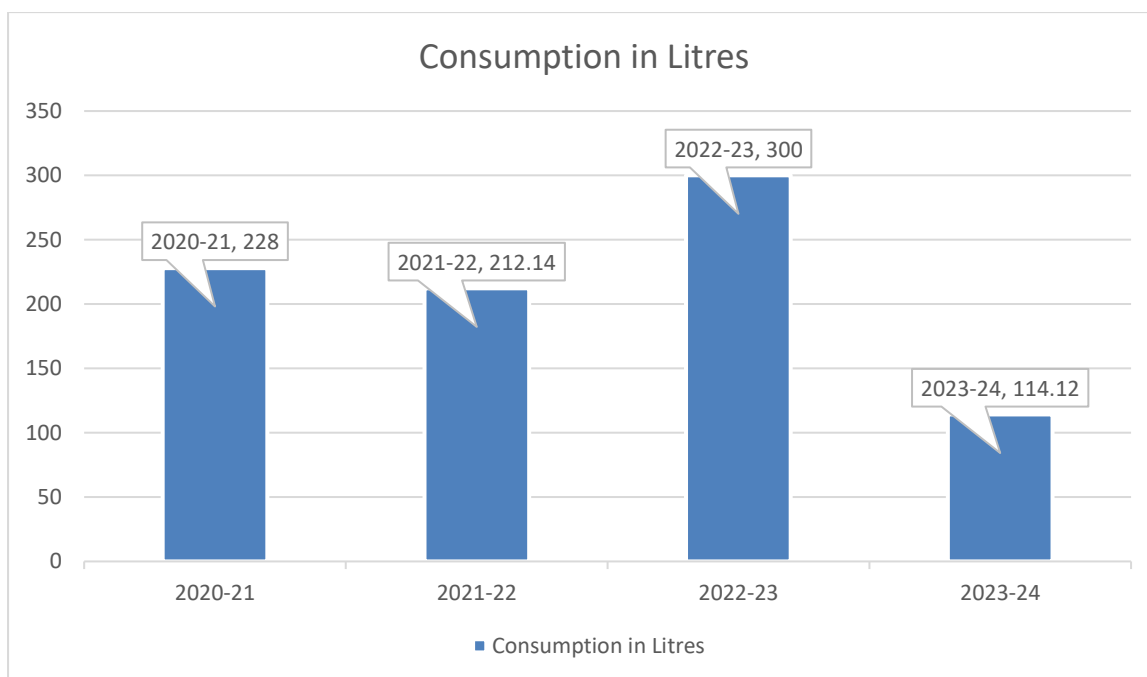


Analysis of electricity consumption for the last 4 years is shown below:



2. DIESEL CONSUMPTION

From July 2023 to June 2024, Miranda House has consumed 114.12 liters of fuel. Four-year usage pattern is shown below:



3. ANALYSIS OF DG SETS

In the campus, there is one Diesel Generator (DG) set for its electrical power needs in case of Grid power failure. DG sets capacity is 320 kVA.

DG Set Design Details		
<i>Description</i>	<i>Unit</i>	<i>DG at Station 1</i>
Rated capacity	kVA	320
Hz		50
Sl No.		
Make		Sudhir
Volts	Volts	400 Volts
PF		0.8
Phase		3 Phase
RPM		1200
Amps	Amps	445.2
Mfg.		2011

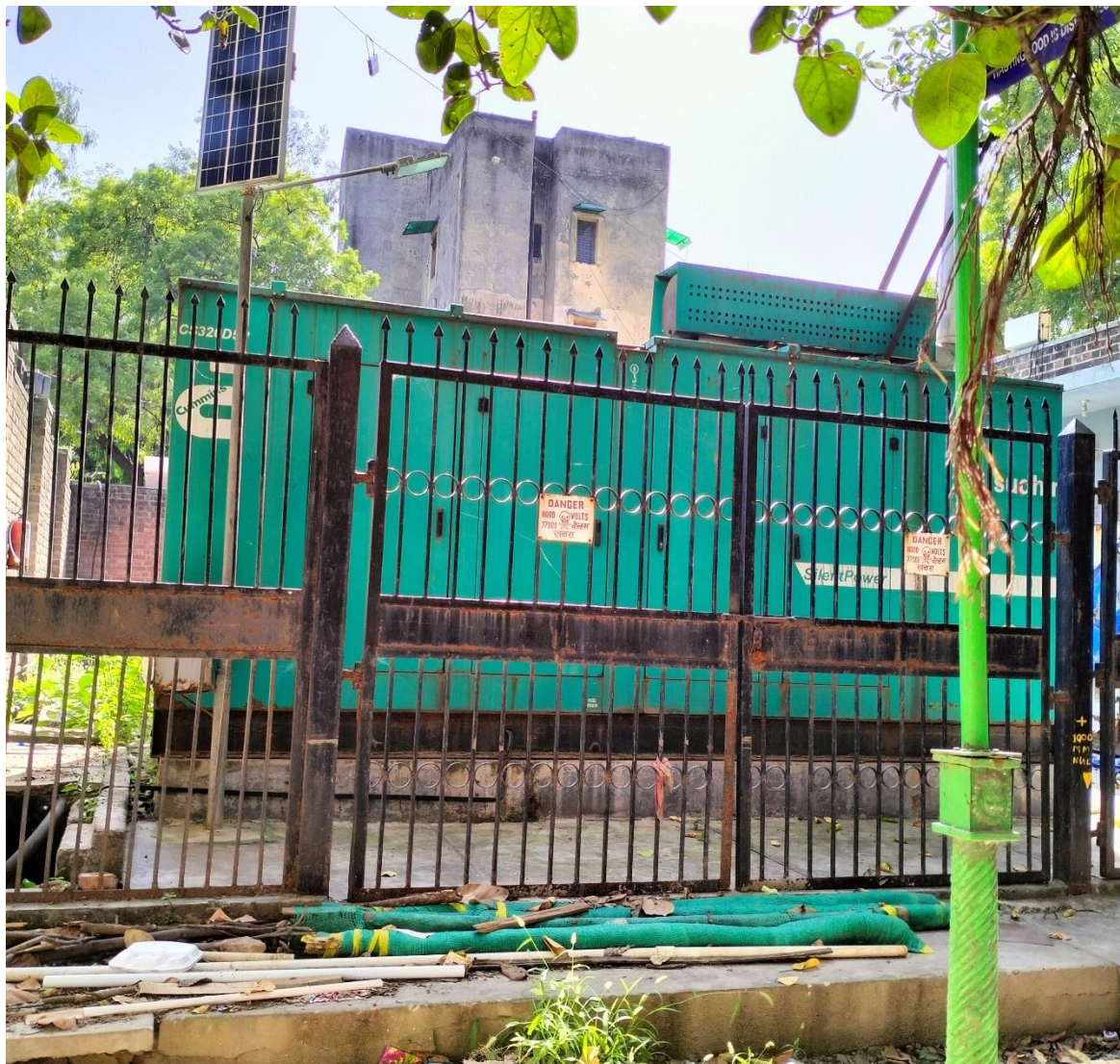
DG Set Operation details		
Operating hours during testing	Hours	0.50
% Loading	%	62.76
Energy Generation	kWh	36.95
Load	kVA	92.54
Fuel consumption during testing	Litre	9
Specific energy generation	kWh/litre	3.11

Observation and Suggestions: -

Soundproof silent generators are an efficient tool to keep both noise and vibration at low levels. For the power backup of the institution, the soundproof model is installed in the institution.

As per the trial taken during the energy audit the percentage loading of DG set is 61.76% which is ok and specific energy consumption of DG Sets 3.11 kWh/Liter which is satisfactory because as per manufacturer recommendation, best practices for SEC in DG sets range from 3.0 to 3.5 kWh/Litre and above.

We recommend college to initiate stack monitoring of DG set through authorized lab.



4. AC SYSTEM

Energy Efficiency Ratio (EER): The performance of smaller chillers and rooftop units is frequently measured in EER rather than kW/ton. EER is calculated by dividing a chiller's cooling capacity (in Btu/h) by its power input (in watts) at full-load conditions. The higher the EER, the More efficient the unit. The cooling effect produced is quantified as tons of refrigeration (TR). The above TR is also called as air-conditioning tonnage.

There are 121 ACs installed in Miranda House in various areas of various type and capacity, details are given below: -

S.No	Location/ Identification	AC Type	Qty.	T R.	Room Temp. (°C)	AC-Tout (°C)	AC-Tin (°C)	Room-RH (%)	Area (m2)	Air velocity (m/s)	Enthalpy Hout	Enthalpy Hin	Heat Load in TR	KW supplied	(Eff.)Power per Ton (KW/TON)	EER
1	Principal Room	s	2	1.5	23	11	21	53	0.03	2.50	24	40	0.42	0.74	1.77	1.99
2	P.A. ROOM	s	1	1.5	22	12	20	52	0.03	2.60	25	38	0.35	0.71	2.02	1.74
3	Committee Room	s	2	1.5	24	11	20	52	0.03	2.20	22	38	0.39	0.63	1.61	2.18
4	Lobby	s	1	1.5	24	12	20	52	0.03	2.20	25	38	0.32	0.55	1.72	2.04
5	Bursar Room	s	1	1.5	24	11	19	52	0.03	2.60	24	37	0.38	0.57	1.52	2.31
6	Vice Principal Room	s	1	1.5	24	12	21	52	0.03	2.20	24	39	0.34	0.66	1.92	1.83
7	Administration Office	w	4	1.5	23	12	20	52	0.03	2.30	25	38	0.33	0.55	1.67	2.11
8	Administration Office	w	2	2.0	23	11	19	52	0.03	2.00	22	37	0.33	0.58	1.74	2.02
9	Accounts Branch	s	3	1.5	23	13	20	52	0.03	2.30	26	38	0.31	0.53	1.74	2.02
10	Web Lab.	s	1	1.5	23	12	20	52	0.03	2.20	25	38	0.32	0.55	1.74	2.03
11	Near Web Lab.	s	1	1.5	23	11	21	53	0.03	2.50	24	40	0.42	0.74	1.77	1.99
12	Room No. 116	s	1	1.5	22	12	20	52	0.03	2.60	25	38	0.35	0.71	2.02	1.74
13	Room No. 117	s	1	1.5	24	11	20	52	0.03	2.20	22	38	0.39	0.63	1.61	2.18
14	Room No. 118	s	1	1.5	24	12	20	52	0.03	2.20	25	38	0.32	0.55	1.72	2.04

15	Seminar Hall R.No. 102	s	6	2.0	24	11	19	52	0.03	2.60	24	37	0.38	0.57	1.52	2.31
16	Room No. 108 DRC Lab.	s	2	1.5	24	12	21	52	0.03	2.20	24	39	0.34	0.66	1.92	1.83
17	Room No. 107 DRC Lab.	s	3	1.5	23	12	20	52	0.03	2.30	25	38	0.33	0.55	1.67	2.11
18	Room No. 109 DRC Lab. Server Room	s	4	1.5	23	11	21	53	0.03	2.50	24	40	0.42	0.74	1.77	1.99
19	Library Ground Floor	s	3	1.5	22	12	20	52	0.03	2.60	25	38	0.35	0.71	2.02	1.74
20	Amba Dalmia Resource Centre	s	2	1.5	24	11	20	52	0.03	2.20	22	38	0.39	0.63	1.61	2.18
21	Digital Rresource Centre	s	5	1.5	24	12	20	52	0.03	2.20	25	38	0.32	0.55	1.72	2.04
22	Teaching Study Room (Library)	s	4	1.5	24	11	19	52	0.03	2.60	24	37	0.38	0.57	1.52	2.31
23	Porta Cabin-I	s	2	1.5	24	12	21	52	0.03	2.20	24	39	0.34	0.66	1.92	1.83
24	Porta Cabin-II	s	2	1.5	23	12	20	52	0.03	2.30	25	38	0.33	0.55	1.67	2.11
25	Porta Cabin-III	s	2	1.5	23	11	19	52	0.03	2.00	22	37	0.33	0.58	1.74	2.02
26	Porta Cabin-IV	s	2	1.5	23	11	21	53	0.03	2.50	24	40	0.42	0.74	1.77	1.99
27	Room No. 215 (Phil)	s	1	1.5	22	12	20	52	0.03	2.60	25	38	0.35	0.71	2.02	1.74
28	Room No. 214 Staff Lounge	s	6	1.5	24	11	20	52	0.03	2.20	22	38	0.39	0.63	1.61	2.18
29	Room No. 213 History	s	1	1.5	24	12	20	52	0.03	2.20	25	38	0.32	0.55	1.72	2.04
30	Room No. 212, Hindi	s	1	1.5	24	11	19	52	0.03	2.60	24	37	0.38	0.57	1.52	2.31
31	Room No. 211, Economics	s	1	1.5	24	12	21	52	0.03	2.20	24	39	0.34	0.66	1.92	1.83
32	English Department	s	1	1.5	23	11	21	53	0.03	2.50	24	40	0.42	0.74	1.77	1.99
33	Zoology Department	s	5	2.0	22	12	20	52	0.03	2.60	25	38	0.35	0.71	2.02	1.74
34	Room No. 203, Geography	s	1	1.5	24	11	20	52	0.03	2.20	22	38	0.39	0.63	1.61	2.18
35	Room No. 204, Political Science	s	1	1.5	24	12	20	52	0.03	2.20	25	38	0.32	0.55	1.72	2.04
36	Room No. 205, Sociology	s	1	1.5	24	11	19	52	0.03	2.60	24	37	0.38	0.57	1.52	2.31
37	Room No. 206, Bengali	s	1	1.5	24	12	21	52	0.03	2.20	24	39	0.34	0.66	1.92	1.83
38	Room No. 220, Sanskrit	s	1	1.5	23	12	20	52	0.03	2.30	25	38	0.33	0.55	1.67	2.11
39	Room No. 222, Mathematics	s	1	1.5	23	11	21	53	0.03	2.50	24	40	0.42	0.74	1.77	1.99

40	Room No.235, Biotechnology Lab.	w	3	1.5	22	12	20	52	0.03	2.60	25	38	0.35	0.71	2.02	1.74
41	Room No. 250, Project Lab. DSKC	s	2	1.5	24	11	20	52	0.03	2.20	22	38	0.39	0.63	1.61	2.18
42	Physics Computer Lab.	s	2	1.5	24	12	20	52	0.03	2.20	25	38	0.32	0.55	1.72	2.04
43	Physics Teacher's Room	w	7	1.5	24	11	19	52	0.03	2.60	24	37	0.38	0.57	1.52	2.31
44	DSKC Physics II Floor	s	2	1.5	24	12	21	52	0.03	2.20	24	39	0.34	0.66	1.92	1.83
45	Physics Porta Cabin	s	2	1.5	23	12	20	52	0.03	2.30	25	38	0.33	0.55	1.67	2.11
46	Room No. 245	s	2	1.5	23	11	19	52	0.03	2.00	22	37	0.33	0.58	1.74	2.02
47	Room No. 236, Computer Science	s	3	1.5	23	13	20	52	0.03	2.30	26	38	0.31	0.53	1.74	2.02
48	Room No. 145, CLT	s	3	1.5	23	11	21	53	0.03	2.50	24	40	0.42	0.74	1.77	1.99
49	Room No. 150 (DSKC Lab.	s	2	1.5	22	12	20	52	0.03	2.60	25	38	0.35	0.71	2.02	1.74
50	Room No.146	w	2	1.5	24	11	20	52	0.03	2.20	22	38	0.39	0.63	1.61	2.18
51	Room No.146	s	1	1.5	24	12	20	52	0.03	2.20	25	38	0.32	0.55	1.72	2.04
52	Room No. 265	s	1	1.5	24	11	19	52	0.03	2.60	24	37	0.38	0.57	1.52	2.31
53	Room No. 308	s	3	1.5	24	12	21	52	0.03	2.20	24	39	0.34	0.66	1.92	1.83
54	Room No. 310	s	1	1.5	23	12	20	52	0.03	2.30	25	38	0.33	0.55	1.67	2.11
55	Room No. 311	s	1	1.5	23	11	19	52	0.03	2.00	22	37	0.33	0.58	1.74	2.02
56	Room No. 312	s	1	1.5	23	13	20	52	0.03	2.30	26	38	0.31	0.53	1.74	2.02
57	Room No. 315	s	2	1.5	23	12	20	52	0.03	2.20	25	38	0.32	0.55	1.74	2.03
58	Auditorium	T	4	3	24	12	21	52	0.03	2.20	24	39	0.34	0.66	1.92	1.83

Remarks: - We have checked the Energy Efficiency Ratio of AC's and the EER of AC's is fairly OK. But in the future, you should purchase 5-Star rated inverter-based split AC's because the power consumption of inverter-based BEE 5-Star rated AC's is less than non-star rated AC's.

Also, we recommend Miranda House to organize a periodic maintenance schedule and take corrective actions for insulating of AC's refrigerant lines to protect against energy losses.



5. FANS ANALYSIS

In the Miranda House, there are 945 Fans installed, out of which 887 fans are of 70W, and 58 120W fans. The observations and suggestions are given below:

Sl No.	Location/Identification	Ceiling Fan-70W	Ceiling Fan-120W
1	Room no. 120	6	-
2	Room No.119	6	-
3	Room No.118	6	-
4	Room No.117	4	-
5	Room No.116	4	-
6	Room NO.115	2	-
7	Room No.114	4	-
8	Room No. 113	1	-
9	Room No. 112	1	-
10	Room No. 101	3	-
11	Room No. 102	10	-
12	Bank Area	5	-
13	Room No. 104	3	-
14	Auditorium	22	-
15	Wash Room Auditorium	2	-
16	Room No. 105	3	-
17	Room No.111	1	-
18	Room No. 106	2	-
19	Room No. 107	4	-

20	Rom No. 108	8	-
21	Rom No. 109	2	-
22	Room No. 110	2	-
23	Server Room	1	-
24	Principal Office Area	14	-
25	Adm Office	16	-
26	Room No. 128	-	5
27	Room no. 129	4	-
28	Room No. 130	-	5
29	Room No. 131	1	1
30	Room No. 132	1	1
31	Room No. 133	1	-
32	Room No. 134	1	-
33	Room No. 135	1	-
34	Room No. 136	8	-
35	Room No. 137	3	-
36	Room No. 138	2	2
37	Room No. 139	2	2
38	Room No. 140	6	-
39	Room No. 141	2	-
40	Room No. 142	2	-
41	Room No. 143	10	-
42	Room No. 144	2	-
43	Room No. 145	-	7
44	Room NO. 146	3	-
45	Room No. 148	2	-
46	Room No. 149	4	-
47	Room No. 150	-	9
48	Room No. 151	4	-
49	Room No. 152	18	-
50	Room No. 153	2	-
51	Room No. 154	2	-
52	Room No. 155	4	-
53	Room No. 156	18	-
54	Room No. 157	16	-
55	Room No. 158	6	-
56	Room No. 201	1	-
57	Room No. 202	6	-
58	Room No. 203	1	-
59	Room No. 204	1	-

60	Room No. 205	1	-
61	Room No. 206	1	-
62	Room No. 207	6	-
63	Room NO. 208	6	-
64	Room No. 209	6	-
65	Room No. 210	6	-
66	Room NO. 211	4	-
67	Room No. 212	4	-
68	Room No. 213	2	-
69	Room No. 214	5	-
70	Room No. 215	2	-
71	Room No. 216	4	-
72	Room No. 217	3	-
73	Room No.218	3	-
74	Room No.219	6	-
75	Room No. 220	2	-
76	Room No. 221	10	-
77	Room No. 222	2	-
78	Room No.223	2	-
79	Room No. 224	2	-
80	Room No. 225	4	-
81	Room No. 226	4	-
82	Room No. 227	4	-
83	Room No.228	6	-
84	Room No. 229	6	-
85	Room No. 230	6	-
86	Room No. 231	4	-
87	Room No. 232	1	-
88	Room No. 233	2	-
89	Room No. 234	3	-
90	Room No. 235	8	-
91	Roomn No. 236	9	-
92	Roomn no.237	2	-
93	Room No. 238	4	-
94	Room No.239	8	-
95	Room No. 240	1	-
96	Room No.241	8	-
97	Room No.242	1	1
98	Room No. 243	1	1
99	Room No. 244	1	1

100	Room No. 245	1	-
101	Room No. 246	4	-
102	Room No. 247	8	-
103	Room No. 248	6	-
104	Room No. 249	3	-
105	Room No. 250	6	-
106	Room no.251	14	2
107	Room No. 252	2	-
108	Room No. 253	10	-
109	Room No. 254	4	-
110	Room No. 255	2	-
111	Room No. 256	1	-
112	Room No. 257	1	1
113	Room No. 258	1	1
114	Room No. 259	1	1
115	Room No. 260	-	9
116	Room No. 261	22	-
117	Room No. 262	3	-
118	Room No. 263	4	-
119	Room No. 264	8	-
120	Room No. 265	21	-
121	Room No. 266	4	-
122	Room No. 267	6	-
123	Room No. 268	6	-
124	Room No. 301	8	-
125	Room No. 302	6	-
126	Room No. 303	4	-
127	Room No. 304	10	-
128	Room No. 305	10	-
129	Room No. 306	3	-
130	Room No. 307	-	9
131	Room No. 308	20	-
132	Room No. 309	1	-
133	Room No. 310	1	-
134	Room No. 311	1	-
135	Room No. 312	-	-
136	Room No. 313	8	-
137	Room No. 314	8	-
138	Room No. 315	4	-
139	Room No. 316	4	-

140	Room No. 317	2	-
141	Room No. 318	9	-
142	Room No. 319	5	-
143	Room No. 320	6	-
144	Room No. 321	4	-
145	Room No. 322	6	-
146	Room No. 323	6	-
147	College Library Building	164	-
148	College Canteen	20	-
149	Student Activity Room	10	-
150	Nescafe Kiosk	1	-
151	Pizza AND more	1	-
152	DRC Server Room	1	-
	TOTAL	887	58

<i>Total no of Ceiling Fans (70W)</i>	<i>Nos.</i>	<i>887</i>
<i>Total no of Ceiling Fans (120W)</i>	<i>Nos.</i>	<i>58</i>
<i>Total wattage of 50W Ceiling Fans</i>	<i>Watt</i>	<i>62090</i>
<i>Total wattage of 60W Ceiling Fans</i>	<i>Watt</i>	<i>6960</i>
<i>Total wattage of BEE 5 Star rated Fans (30W)</i>	<i>Watt</i>	<i>28350</i>
<i>Total saving in Wattage after replacement</i>	<i>Watt</i>	<i>40700</i>
<i>Operating hours per day</i>	<i>Hours</i>	<i>8</i>
<i>Operating days per annum</i>	<i>Days</i>	<i>180</i>
<i>Energy charges per unit in Rs.</i>	<i>INR</i>	<i>10</i>
<i>Saving in Rs. /Annum</i>	<i>INR</i>	<i>586080</i>
<i>Investment INR</i>	<i>INR</i>	<i>2362500</i>
<i>Payback period: -</i>	<i>YEARS</i>	<i>4.03</i>

Observation and Suggestions: -

In the college, most of the ceiling fans are of 220 W but BEE 5 Star Rated of 30W Ceiling Fans are present in the market. We recommend replacing existing fans with BEE 5 Star rated 30W fans.

Note: - Energy savings will increase or decrease if the operating hours of the machine /equipment are increased or decreased and the payback period will also increase or decrease if the cost of investment (Cost of machine/equipment/accessories of the machine) will increase or decrease because cost of investment is taken on a tentative basis.

6. ANALYSIS OF LIGHTING SYSTEM

6.1 BRIEF DESCRIPTION OF EXISTING SYSTEM

For assessing the energy efficiency of the lighting system, an Inventory of the Lighting System has been noted/collected, with the aid of a lux meter, measurement and documentation of the lux levels at various locations at the working level have been done.

6.2 INVENTORY OF LIGHTING

Light Wattage	Count
36W Normal Light	1433
36 W 2X2 LED	5
32W LED	278
150W LED	8
20W LED	814
20W LED-FOB Aly Side	102
10W LED Glow Shine	44
36W Normal Light	1433
Total	2684

6.3 LUX MEASUREMENT

Description	Lux	Remark
Class Rooms	120 to 235	Acceptable
Offices	130 to 240	Acceptable
Corridors	35 to 90	Acceptable
Washrooms	45 to 76	Acceptable
Outdoor	36 to 95	Acceptable
Computer Lab	150 to 289	Acceptable
Parking area	45 to 94	Acceptable
Canteen	69 to 185	Acceptable

Observation

The college has opted LED-based lighting solution, LEDs save energy, the life span is much greater, and emit virtually no heat. We recommend replacing the tube lights with LEDs.

Additionally, we recommend increasing motion sensor-based lights in common areas such as libraries, washrooms, corridors, etc.

Table - Luminous Performance Characteristics of Commonly Used Luminaries

Type of Lamp	Lumens/Watt		Colour Rendering Index	Typical Application	Typical Life
	Range	Avg.			
Incandescent	8-18	14	Excellent (100)	Homes, restaurants, general lighting emergency lighting	1000
Fluorescent lamps	46-60	50	Good w.r.t coating (67-77)	Offices, shops, hospitals, homes	5000
Compact fluorescent Lamps (CFL)	40-70	60	Very Good (85)	Hotels, shops, homes, offices	8000-10000
High-pressure mercury (HPMV)	44-57	50	Fair (45)	General lighting in factories, garages, and car parking. floodlighting	5000
Halogen lamps	18-24	22	Excellent (100)	Display, flood lightening, stadium exhibition grounds, construction areas	2000 - 4000
High-pressure sodium (HPSV) SON	67-121	90	Fair (22)	General lighting in warehouses, factories, street lighting	6000 - 12000
Low-pressure sodium (LPSV) SOX	101-175	150	Poor (10)	Roadways, tunnels, canals, street lighting	6000 - 12000
Metal halide lamps	75-125	100	Good (70)	Industrial bays, spotlighting, floodlighting, retail stores	8000
LED Lamps	30-50	40	Good (70)	Reading lights, desk lamps, night lights, spotlights, security lights, signage lights, etc.	40000 - 100000

7. OTHER POWER CONSUMPTION

7.1 INVENTORY OF IT INFRASTRUCTURE

SI No.	Location/ Identification	Laptops	Desktops	Notebook	Tablets	Printers/ Scanners	UPS
1	Botany Lab. 129	-	-	-	-	-	-
2	Botany Lab. 130	-	-	-	-	-	-
3	Room No. 141	-	-	-	-	-	-
4	Room No. 142	-	-	-	-	-	-
5	Room No. 143	-	-	-	-	-	-

6	Room No. 152	-	-	-	-	-	-
7	Room No. 153	-	-	-	-	-	-
8	Room No. 240	-	-	-	-	-	-
9	Room No. 251	-	-	-	-	-	-
10	Ground Floor Main Gate	-	-	-	-	-	-
11	Ground Floor New Building	-	-	-	-	-	-
12	College Library	-	-	-	-	-	-
13	Auditorium	-	-	-	-	-	-
14	Canteen	-	-	-	-	-	-
15	First Floor New Building Physics Lab.	1040	386	116	3	47	15
16	First Floor Old Building Physics Lab.	-	-	-	-	-	-
17	First Floor Accounts Branch	-	-	-	-	-	-
18	Common water cooler	-	-	-	-	-	-
19	First Floor Geography Deptt.	-	-	-	-	-	-
	TOTAL	1040	386	116	3	47	15

7.2 WATER PUMP DETAILS

Water Pump Location	Pump Power	Type of Pump
Main Gate	7.5	Submersible Pump
Main Gate	1.0	Monoblock Pump
New Building Mono Booster Pump	5.0	Submersible Pump
Teacher's Flats	7.5	Submersible Pump
Teacher's Flats	5.0	Submersible Pump
Teacher's Flats	1.0	Monoblock Pump
Non-Teaching Flats	7.5	Submersible Pump
Non-Teaching Flats	7.5	Submersible Pump
Non-Teaching Flats	1.0	Monoblock Pump
College RO Plant	5.0	Submersible Pump
College RO Plant	5.0	Submersible Pump
College RO Plant	1.0	Monoblock Pump
College RO Plant	1.0	Monoblock Pump
Hostel R.O.Plant	5.0	Submersible Pump
Hostel R.O.Plant	5.0	Submersible Pump
Hostel R.O.Plant	3.0	Monoblock Pump
Hostel R.O.Plant	1.0	Monoblock Pump
Hostel R.O.Plant	1.0	Monoblock Pump

7.3 OTHER LOADS

Sl No.	Location/Identification	160W Exhaust Fan	Water Cooler-200W
1	Botany Lab. 129	2	-
2	Botany Lab. 130	2	-

3	Room No. 141	1	-
4	Room No. 142	1	-
5	Room No. 143	1	-
6	Room No. 152	4	-
7	Room No. 153	1	-
8	Room No. 240	1	-
9	Room No. 251	4	-
10	Ground Floor Main Gate	-	1
11	Ground Floor New Building	-	1
12	College Library	-	1
13	Auditorium	-	1
14	Canteen	-	1
15	First Floor New Building Physics Lab.	-	1
16	First Floor Old Building Physics Lab.	-	1
17	First Floor Accounts Branch	-	1
18	Common water cooler	-	2
19	First Floor Geography Deptt.		1
	TOTAL	17	11

ANALYSIS

There should be a regular maintenance schedule of equipment like pumps, exhaust fans, and IT equipment. Electronics such as computers, printers, scanners, etc. more than 3 years or 5 years old (as per their life) should be replaced with new computers/laptops. Ideal temperature should be maintained for all electronic appliances.

8. CAPACITOR BANK

Sl. No.	Location/ Identification	Capacity in KVAR
1	Sub Station- I	500 KVA
2	Sub Station - II	500 KVA

***** **END OF THE REPORT** *****