Arya College of Engineering (ACE)
KUKAS, JAIPUR
A·C·E

ARYA COLLEGE OF ENGINEERING

ENERGY AUDIT REPORT

2023-2024

PREPARED BY
EHS ALLIANCE SERVICES

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CERTIFICATE

EHS alliance

CERTIFICATE

PRESENTED TO

ARYA COLLEGE OF ENGINEERING

SP-40, RIICO Industrial Area, Kukas, Delhi Road, Jaipur-302028, Rajasthan

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 - 2024

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 appreciated and noteworthy.

EHS ALLIANCE SERVICES GURGAON

SIGNATURE

02.03.2024
DATE OF AUDIT

EHS ALLIANCE SERVICES, PLOT A-72, SURYA VIHAR, GURUGRAM, 122001
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ACKNOWLEDGEMENT

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

First of all, we would like to thank **Dr. Arvind Agarwal - President** for giving us an opportunity to evaluate the environmental performance of the campus.

We would also like to thank **Dr. Pramod Sharma - Audit Coordinator** for his 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. Puja Agarwal, *Vice- President*

Dr. Himanshu Arora, *Principal*

Mr. Kshitiz Agarwal, *Registrar*

DISCLAIMER

EHS Alliance Services Energy Audit Team has prepared this Energy Audit Report for Arya College of Engineering based on input data submitted by the representatives of college complemented with the best judgment capacity of the expert team.

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

It is further informed that the 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

Arya College of Engineering (ACE) is amongst the foremost of Top Colleges in Rajasthan for Engineering in Higher Technical Education & Research. Established in the year 2005, in the State of Rajasthan, Arya College of Engineering has evolved into the most prominent College in the state as well as the Best Engineering Colleges in Jaipur. Spread over 5 acres of land, its highly skilled faculties are imparting education and guidance to thousands of students in a multi-faceted environment comprising of various Teaching Departments on its Campus. Since its establishment, the College has played a vital role in providing the best technical manpower and know-how to the country.

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MISSION, VISION & VALUES

MISSION

- ✓ To create a Progressive Academic Environment by nurturing the Creativity, Ideas, Innovation and Skills in Students in order to achieve Qualitative Techno-Managerial Skills.
- ✓ To provide Excellent Ambience to enhance the Teaching-Learning processes amongst Students and Faculty members by building a determined team who are committed to the ideas of Integrity, Positive Thinking and Social Development to meet industry expectations and requirements.
- ✓ To make Students Globally Competitive by providing suitable Training, Value Added Certification Courses and Beyond Syllabus Academics in order to generate capacity to face competitions and placements and become imaginative mastermind and inventive issue solver while providing them safe and challenging environment.

VISION

To emerge as the best educational college and Work for Excellence in imparting quality education to the students to nurture their inherent talent as Innovative Professional in technical and managerial field there by making them competitive to meet all the future challenge of global economy.

VALUES

Create an environment that instils professionalism, integrity, and the highest professional commitment to the students.

Facilities in the campus

Amenities at Arya College of Engineering (ACE) 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, ACE offers the following:

GREEN CAMPUS: The College has an impressive and pollution-free campus with panoramic green surroundings, elegant landscaping and beautiful flowerbeds.

TRANSPORT: The college runs its own fleet of buses and Cabs for the convenience of the students and the staff members to help them commute from Jaipur and surrounding areas. The students

intending to avail the transport facility need to inform the transport officer at the time of admission.

SPORTS ACTIVITIES: Spending quality time is never a problem in the College. Sports facilities are provided for Lawn tennis, Table tennis, Carom, Billiards Table, Cricket, Football, Badminton, Basketball, and Volleyball. Evenings find students enjoying the pleasure of these sports as players and audience.

MESS: The college has its huge mess, which serves healthy and nutritious cuisines to its students.

CANTEEN: The college has its own canteen, which serves healthy and nutritious food to its students at subsidized rates. The menu varies from spicy samosas, wafers to full-meals. The students also have a wide range of chocolates and soft drinks to choose from.

WATER & ELECTRICITY: The college has complete arrangements to deliver uninterrupted water and electricity supply for the students, round the clock. Sufficient water coolers with filtered water are available throughout the campus to provide clean drinking water to the students. In case of power failures, high power generators are also available. Constant monitoring is carried out to ensure that cleanliness is given utmost importance.

HEALTH: Health is wealth. Keeping this in mind regular health checkup Camps are organized in the campus to examine the health of students and staff members. Acquisition of health-related knowledge, attitudes, skills and practices empower students to pursue a healthy life. The

energetic students take full advantage of every opportunity to learn and thus achieve higher - academic excellence & tend to maximize social relationships and interactions, thus improving their chances of balanced progress.

MEDICAL: Each hostel is provided with necessary first aid facilities. The College provides free first aid to the students in college campus during working hours. Qualified physicians are available in the close proximity of the college & hostels for consultancy.

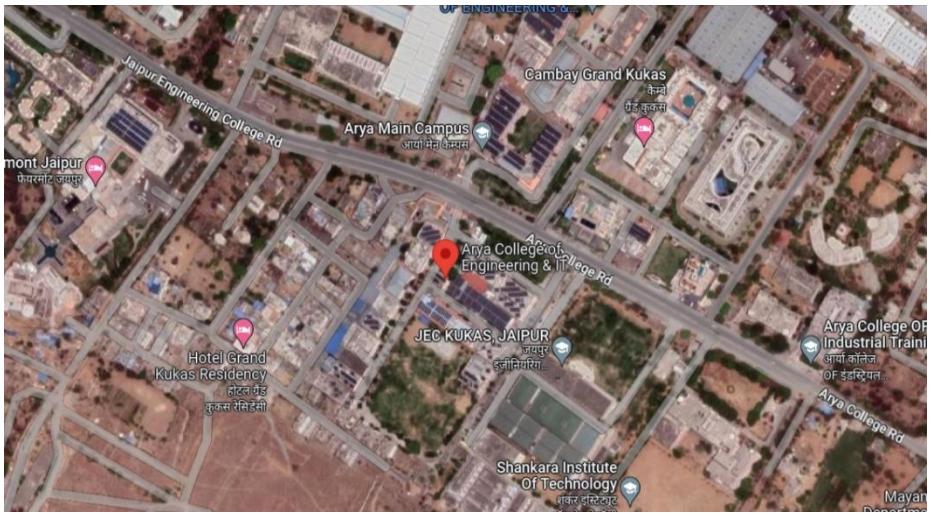
CAFETERIA

AUDITORIUM

WELL EQUIPED GYMS

HOSTEL

Geo Location
Geo Coordinates from Google maps:
27.0299119, 75.8913942



AUDIT PARTICIPANTS

On behalf of the college

Name	Designation
Dr. Arvind Agarwal	*President*
Dr. Puja Agarwal	*Vice- President*
Dr. Himanshu Arora	*Principal*
Mr. Kshitiz Agarwal	*Registrar*
Dr. Pramod Sharma	*Audit Coordinator*

On behalf of EHS Alliance Services

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

EXECUTIVE SUMMARY

The purpose of this Energy Audit was to seek opportunities to improve the energy efficiency of the Arya College of Engineering. 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 Arya College of Engineering. 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 Arya College of Engineering.

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 Apr 2023 to March 2024.

The details of **"Meter Connection"** at **"Arya College of Engineering"** are as follows-

Name - ALL INDIA ARYA SAMAJI SOCIETY FOR HIGHER TECH EDUCATION

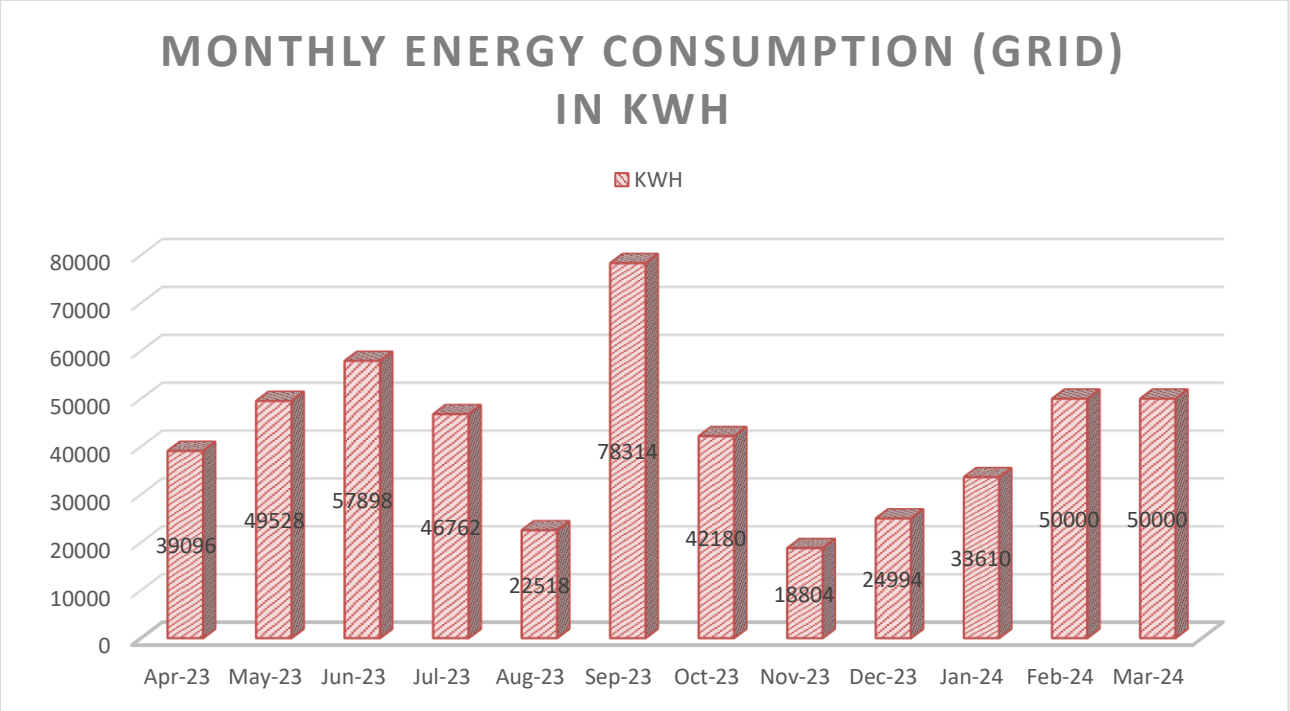
CA No. - 210524027388

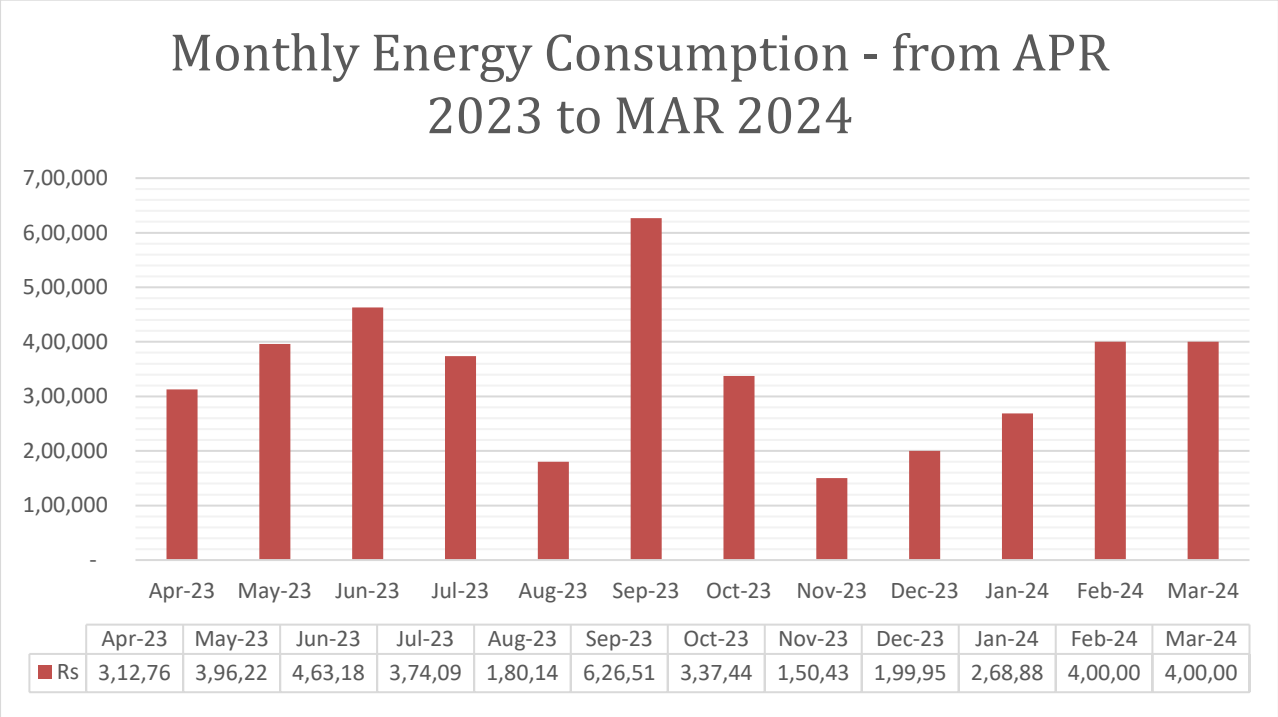
1.1 SUMMARY OF MONTHLY ELECTRICITY CONSUMPTION AND BILL AMOUNT

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 Apr 2023 to Mar 2024

Month	Grid Units	Amount	Solar Units	Export kWh	Total	Amount
Apr-23	26516	8.00	48780	36200	39096	312768
May-23	32218	8.00	46126	28816	49528	396224
Jun-23	32938	8.00	43008	18048	57898	463184
Jul-23	26994	8.00	38948	19180	46762	374096
Aug-23	22518	8.00	14580	14580	22518	180144
Sep-23	32402	8.00	60900	14988	78314	626512
Oct-23	27492	8.00	42716	28028	42180	337440
Nov-23	16722	8.00	27734	25652	18804	150432
Dec-23	20720	8.00	28602	24328	24994	199952
Jan-24	24486	8.00	29140	20016	33610	268880
Feb-24*	24000	8.00	54000	28000	50000	400000
Mar-24*	24000	8.00	54000	28000	50000	400000
SUM	**311006**		**488534.00**	**285836.00**	**513704**	**4109632**

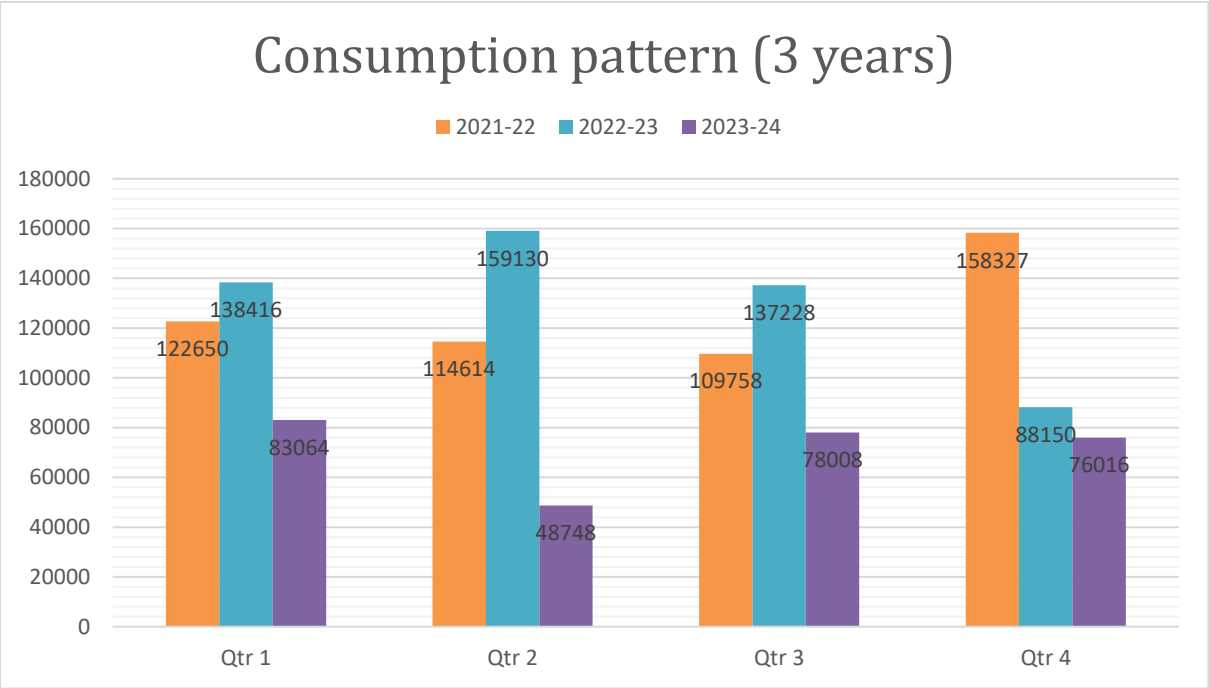
**February and March month data are taken as average data for computing the energy consumption*





	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
Rs	3,12,76	3,96,22	4,63,18	3,74,09	1,80,14	6,26,51	3,37,44	1,50,43	1,99,95	2,68,88	4,00,00	4,00,00

Analysis of electricity consumption for the last 3 years is shown below

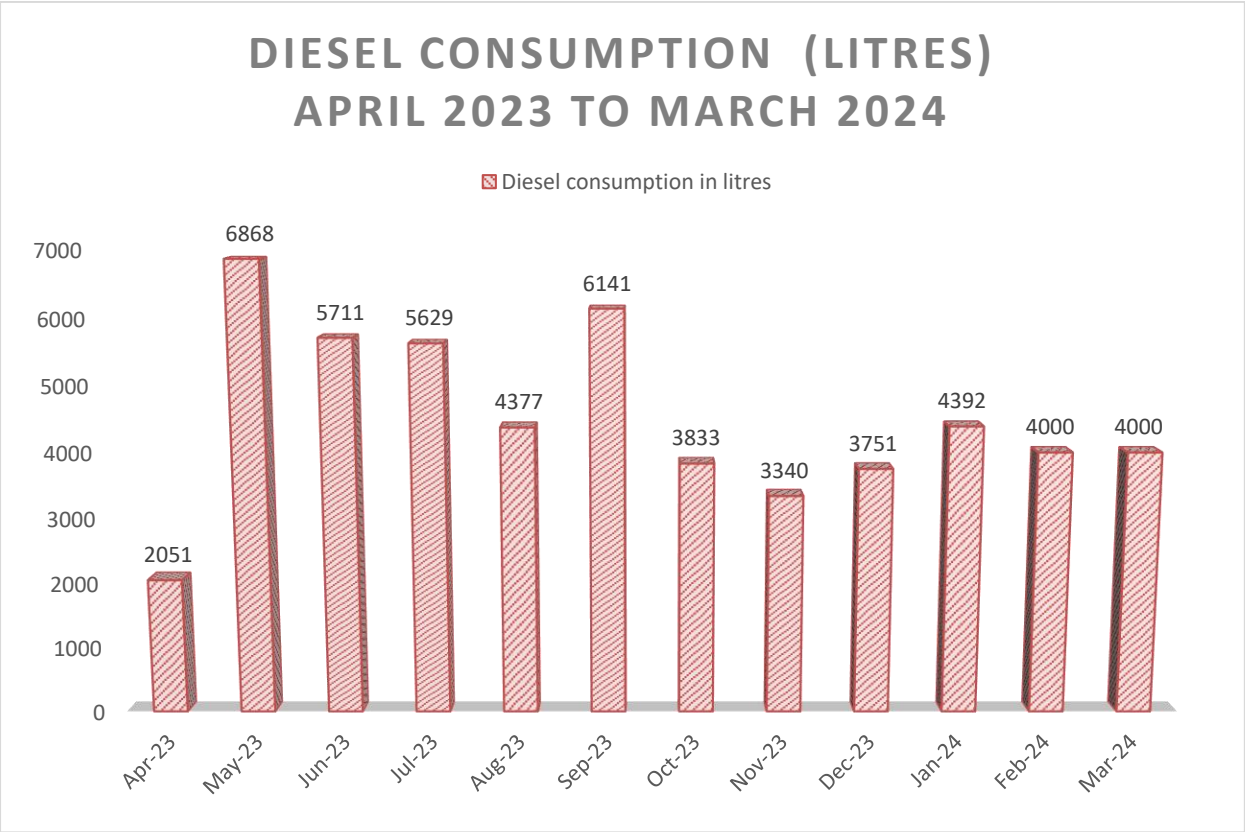


2. DIESEL CONSUMPTION

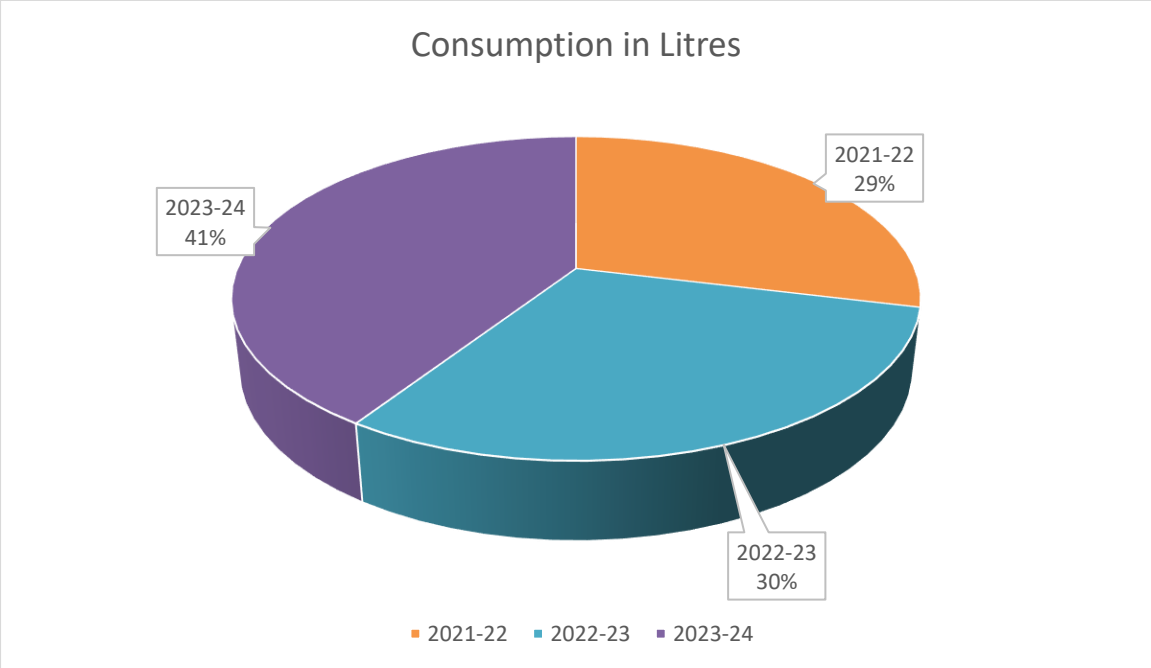
Below is the diesel consumption details in litres from April 2023 to March 2024.

Month	Diesel (Ltrs)
Apr-23	2051
May-23	6868
Jun-23	5711
Jul-23	5629
Aug-23	4377
Sep-23	6141
Oct-23	3833
Nov-23	3340
Dec-23	3751
Jan-24	4392
Feb-24	4000
Mar-24	4000
Total	**54093**

**February and March month data are taken as average data for computing the energy consumption*



Three-year usage pattern is shown below



3. ANALYSIS OF DG SETS

In the campus, there is only one Diesel Generator (DG) set for its electrical power needs in case of Grid power failure. DG sets capacity is 250 kVA.

DG Set Design Details		
Description	***Unit***	***DG at Station 1***
Rated capacity	kVA	250 KVA
Hz		50
Sl No.		3306081004174
Make		Greaves
Volts	Volts	415
PF		0.8
Phase		3
RPM		1500
Amps	Amps	448
Mfg.		2006

DG Set Operation details		
Operating hours during testing	Hours	0.50
% Loading	%	62.65
Energy Generation	kWh	34.98
Load	kVA	90.75
Fuel consumption during testing	Litre	10
Specific energy generation	kWh/litre	3.14

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 62.65% which is ok and specific energy consumption of DG Sets 3.14 kWh/Litre 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 Split ACs installed in Arya College of Engineering in various areas of various capacity which detail is given below: -

Sl No.	Location/Identification	Type (Window/ Split)	Quantity	TR (Tons)	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	Ground Floor	S	10	1.5	23	12	22	53	0.03	2.3	24	42	0.43	0.71	1.63	2.15
2	Ground Floor	S	1	2.0	23	12	22	52	0.03	2.3	24	43	0.46	0.76	1.67	2.11
3	Ground Floor	W	13	1.5	24	11	20	52	0.03	2.2	22	38	0.37	0.66	1.79	1.97
4	First Floor	W	7	1.5	24	11	20	52	0.03	2.3	22	38	0.38	0.68	1.77	1.98
5	First Floor	W	8	1.5	23	12	22	53	0.03	2.3	24	42	0.43	0.71	1.63	2.15
6	Second Floor	S	2	1.5	23	12	22	52	0.03	2.3	24	43	0.46	0.76	1.67	2.11
7	Second Floor	W	10	1.5	24	11	20	52	0.03	2.2	22	38	0.37	0.66	1.79	1.97
8	Third Floor	S	4	1.5	24	11	20	52	0.03	2.3	22	38	0.38	0.68	1.77	1.98
9	Third Floor	S	2	2.0	23	12	22	53	0.03	2.2	24	42	0.41	0.72	1.75	2.00
10	Third Floor	W	12	1.5	23	12	20	53	0.03	2.6	25	38	0.35	0.67	1.9	1.85
11	Robo lab	W	2	1.5	24	11	20	52	0.03	2.3	22	38	0.38	0.63	1.65	2.14
12	Library	W	1	1.5	24	12	20	53	0.03	2.3	24	39	0.36	0.64	1.79	1.96

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 invertor-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 Arya College of Engineering 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 Arya College of Engineering, there are 1229 Ceiling Fans (60W) are installed. The observations and suggestions are given below.

Fan Wattage	Fan Count
70 Watt	1229
120 Watt	2

Sl No.	Location/Identification	Ceiling Fan-60W	Pedestal Fan
1	Basement Lab 1	6	
2	Basement Lab 2	6	
3	Basement Lab-3	6	
4	Basement Lab -4	6	
5	Basement Lab -5 GSS	6	
6	Basement Lab 6 (PE)	6	
7	Basement Drive Lab	6	
8	Basement Lab -CSE	4	
9	Basement - Project Lab	6	
10	Basement HVE Lab	6	
11	Ground Floor	120	2
12	First Floor	99	
13	Second Floor	120	
14	Third Floor	141	
15	NBH	253	
16	Tej Hostel	178	
17	Robolab	9	
18	Library	40	
20	H. Hostel	150	
21	ME Dept	60	
22	Temple	1	
	TOTAL	**1229**	**2**

Observation and Suggestions: -

In the college, most of the ceiling fans are of 60 W but BEE 5 Star Rated of 30W Ceiling Fans are present in the market. We recommend considering BEE 5 Star rated 30W fans for all future purchases.

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 has been done.

6.2 INVENTORY OF LIGHTING

Sl. No.	Location/ Identification	200W-LED High Mast	10W LED	18W LED Light	12 W LED Round	36W LED	18W LED Flood	36W LED Flood	20W LED
1	Basement	0	0	25	0	60	0	0	0
2	Ground Floor	0	0	32	0	48	40	0	13
3	First Floor	0	0	35	0	40	0	0	25
4	Second Floor	0	0	30	0	47	0	0	10
5	Third Floor	0	0	80	0	25	0	0	0
6	Main Gate	2		5	0		7	0	0
7	NBH Hostel	4	131	200	0	194	0	0	0
8	Tez Hostel	2	69	150	0	50	0	0	0
9	Robo lab	0	0	0	0	13	0	0	0
10	Library	0	0	24	96	2	0	0	0
11	ME Dept			30				45	
12	H Hostel	2	180	50				105	
	TOTAL	**10**	**380**	**661**	**96**	**479**	**47**	**150**	**48**

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 initiated an LED-based lighting solution, but still, there are 479 (36W) tube lights. LEDs save energy, the life span is much greater, and emit virtually no heat. We recommend replacing the tube lights with LEDs.

We also recommend increasing solar lights.

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

Sl No.	Location/Identification	Desktop	Laptop	Printers	Scanners	Other
1	Registrar Office	6	2	2	1	-
2	Account Office	6	-	2	-	-
3	Robotic Lab 1	6	1	1	-	-
4	Robotic Lab 2	2	-	-	-	-
5	T&P Office	4	1	3	-	-
6	Exam Cell	7	1	2	-	Photocopy -1
7	Admission Cell	1	-	-	-	-
8	Board Room1	1	-	1	-	2 TVs
9	Board Room2	2	-	1	-	1 TV
10	TV Studio	2	-	-	-	1 TV
11	Principal Office	3	1	1	-	-
12	Director Room	5	1	2	-	1 Photocopy Machine
13	Estate Room	1	-	1	-	-
14	CSE Dept	10	-	2	-	-
15	CSE Staff Room	7	-	-	-	-
16	SDC Cell	4	-	1	-	-
17	MBA Dept	4	-	1	-	-
18	R&D Lab	1	-	-	-	-
19	LT-11	1	-	-	-	-
20	Civil Dept	3	-	1	-	-

21	3rd Floor	1	-	-	-	-
22	EE Dept	4	-	1	-	-
23	ME Dept	2	-	1	-	-
24	CL12	31	-	-	-	-
25	CL13	60	-	-	-	-
26	CL-14-A	31	-	-	-	-
27	CL-14 B	30	-	-	-	-
28	CL-15	30				
29	CL-16	30				
30	CL-17	30				
31	CL-18	30				
32	CL-19	30				
33	CL-20	30				
34	TEZ Lab	30				
35	EE CL	24				
36	ME CL	30				
37	CL-26	40	-	-	-	-
38	CL-27	40	-	-	-	-
39	CL-28	40	-	-	-	-
40	CL-29	40	-	-	-	-
41	CL-30	40	-	-	-	-
42	CL-31	30	-	-	-	-
43	CL-32	50	-	-	-	-

44	CL-33	30	-	-	-	-
45	CL-34	50	-	-	-	-
46	CL-35	50	-	-	-	-
47	Mechatronics Lab	5	1	4	-	-
48	Library	14	-	2	-	-
49	President Office	3	1	2	-	-
50	Vice President	2	-	2	-	-
51	NBH Hostel	3				
	TOTAL	**936**	**9**	**33**	**1**	**-**

7.2 WATER PUMP DETAILS

Description	Rated Power of Motor (KW)	Motor Eff. (%)	Discharge Head (m)	Suction Head (m)	Pump Type
Pump No.-1	7.3x2	80%	151		Submersible
Pump No.-2	2.2	80%	36	10	Monoblock
Pump No.-3	2.2	80%	50	10	Monoblock
Pump No.-4	2.2	80%	5	3	Monoblock
Pump No.-5	1.5	80%	4	3	Monoblock
Pump No.-6	1.5	80%	4	34	Monoblock

7.3 OTHER LOADS

Sl No.	Location/Identification	60W Exhaust Fan	160W Exhaust Fan
1	Third Floor -Staff Toilet	1	
2	Third Floor CSE Lab	1	
3	Third Floor CSE Lab17	2	
4	Third Floor CSE -18	2	
5	Third Floor CSE-19	1	
6	Third Floor- Dark Room	2	
7	Third Floor Physics Lab	2	
8	Third Floor Chemistry Lab	1	

9	Third Floor Boy's Toilet	1	
10	Girls Toilet	1	
11	LT-41	1	
12	LT-42	2	
13	LT-43	1	
14	LT-45	1	
15	LT-46	1	
16	LT-47	2	
17	Second Floor	13	2
18	First Floor	10	1
19	Ground + Basement	7	8
20	ME Dept.	2	4
	TOTAL	54	15

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	Main Gate	1 KVAR-1
2		2 KVAR-1
3		5 KVAR-1
4		10 KVAR-2
5		15 KVAR-4
5		20 KVAR-2

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