



ଦୁତିକା ସାହୁ ମହାବିଦ୍ୟାଳୟ, ଲାଇଡା, ସମ୍ବଲପୁର, ଓଡ଼ିଶା
D.S COLLEGE, LAIDA, SAMBALPUR, ODISHA



DUTIKA SAHU COLLEGE
LAIDA - SAMBALPUR

ENERGY AUDIT REPORT

2022-2023

PREPARED BY
EHS ALLIANCE SERVICES

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CERTIFICATE



AUDIT CERTIFICATE

PRESENTED TO

DUTIKA SAHU COLLEGE

Laida, Sambalpur, Odisha, 768214

Has been assessed by EHS Alliance Services for the comprehensive study of environmental impacts on institutional working framework to fulfill the requirement of

ENERGY AUDIT

The energy-saving initiatives carried out by the College 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 College and sustainability are highly appreciated and noteworthy.

A handwritten signature in blue ink, appearing to read 'H. Das', written over a horizontal line.

AUDITOR SIGNATURE



11.10.2023

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 Dutika Sahu College for assigning this important work of Energy Audit. We appreciate the co-operation to the teams for completion of assessment.

We would also like to thank ***Ms. Gayatri Patel – Audit Coordinator and Member Green campus monitoring committee (GCMC)***, 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. Nibedita Nath ***Member Green campus monitoring committee (GCMC)***

Mr. S.K. Sirajul Haque ***Member Green campus monitoring committee (GCMC)***

Ms. Namrata Pradhan ***Member Green campus monitoring committee (GCMC)***

Ms. Chandini Pujari ***Member Green campus monitoring committee (GCMC)***

Last but not the least, we would like to thank ***Dr. Basanta Kumar Naik - Principal***, for giving us an opportunity to evaluate the environmental performance of the campus.

DISCLAIMER

EHS Alliance Services Energy Audit Team has prepared this Energy Audit Report for Dutika Sahu College 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 Programme
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 metre

OVERVIEW OF THE COLLEGE

D.S College, Laida is situated in the District of Sambalpur, Odisha which has been registered under Govt of Odisha Education and youth Services Department, Oder No. IVE/C.226/90. 45466/EYS.Dt. 16/10/1990 for three year Degree Courses in Arts in Dutika Sahu College, Laida in the Dist. of Sambalpur and permanent affiliated with Sambalpur University, Order No. 9563/ASW, Dt-04/06/1992 and registered under the Societies Act XXI OF 1860, Regd No-16907/1741 of 1979-1980.



Due to poverty and lack of guidance many pass outs from matriculation had no access to be admitted in G.M College, Sambalpur. With the Leadership of Combrade, Iswar Chandra Naik and financial help from Smt. Dutika Sahu, the child of the Soil, and with the co-operation of villagers this college has been established in 1979 and named as Dutika Sahu College, Laida.

The college Started with Arts wings. In the year 1979 and +3 Arts +3 Science (started in 2019-20 session with all Honours program in Botany, Chemistry, Mathematica, Physics, and Zoology) in the year 1981 with Political Science, History, Odia, Education and Economics. +2 Science was added as an extremism using from the year 1993. Now the College has a student strength of 968. The College is running properly with the said subjects.

MISSION, VISION & VALUES

MISSION

The Mission of Dutika Sahu College, Laida, a rural based college is to enhance inventive educational atmosphere and facilitate to enable students to develop personality and acquiring jobs and to become a good citizen of the nation.

VISION

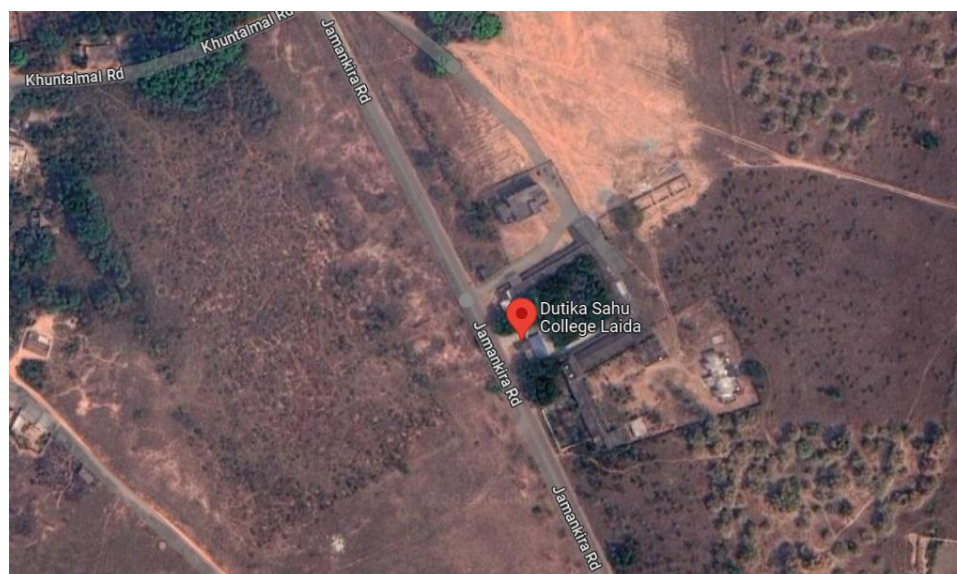
The culture of Excellence The Culture of Innovation The Culture of Quality The Culture of Flexibility and Dynamism The Culture of Sustainability Vision We envision a College that leads the campus and the capital region as the center for cross-disciplinary exchange and programming, and ranks as an acknowledged innovator in research and teaching in the Arts and Humanities

VALUES

Dutika Sahu College, Laida will facilitate best education that would be responsible for the necessity of the society and enable them to face with their social, economical and national problems. The college would draw out the best of the students' body, mind and soul.

Geo Location

Geo Coordinates from Google maps:
21.7249869, 84.2347336



AUDIT PARTICIPANTS

On behalf of the college

Name	Designation
Dr. Basanta Kumar Naik	<i>Principal</i>
Ms. Gayatri Patel	<i>Audit Coordinator and Member, Green campus monitoring committee (GMGC)</i>
Dr. Nibedita Nath	<i>Member, Green campus monitoring committee (GMGC)</i>
Ms. Namrata Pradhan	<i>Member, Green campus monitoring committee (GMGC)</i>
Mr. Bhabani Shanker Singh	<i>Member, Green campus monitoring committee (GMGC)</i>
Ms. Chandini Pujari	<i>Member, Green campus monitoring committee (GMGC)</i>

On behalf of EHS Alliance Services

Name	Position	Qualifications
Mr. Vijay Singh	Lead Auditor	<i>M.Sc. M. Tech (Environment Science & Engineering), Energy Auditor, Post Diploma in Industrial Safety Management</i>
Dr. Uday Pratap	Co-Auditor	<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 Dutika Sahu College. 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 Dutika Sahu College. 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 Dutika Sahu College.

ENERGY AUDIT - ANALYSIS

1. ENERGY CONSUMPTION

To understand the Energy Consumption trends and for analyzing the average monthly consumption we have collected electricity energy bills from July 2021 to June 2022

The details of “**Meter Connection**” at “**Dutika Sahu College**” are as follows-

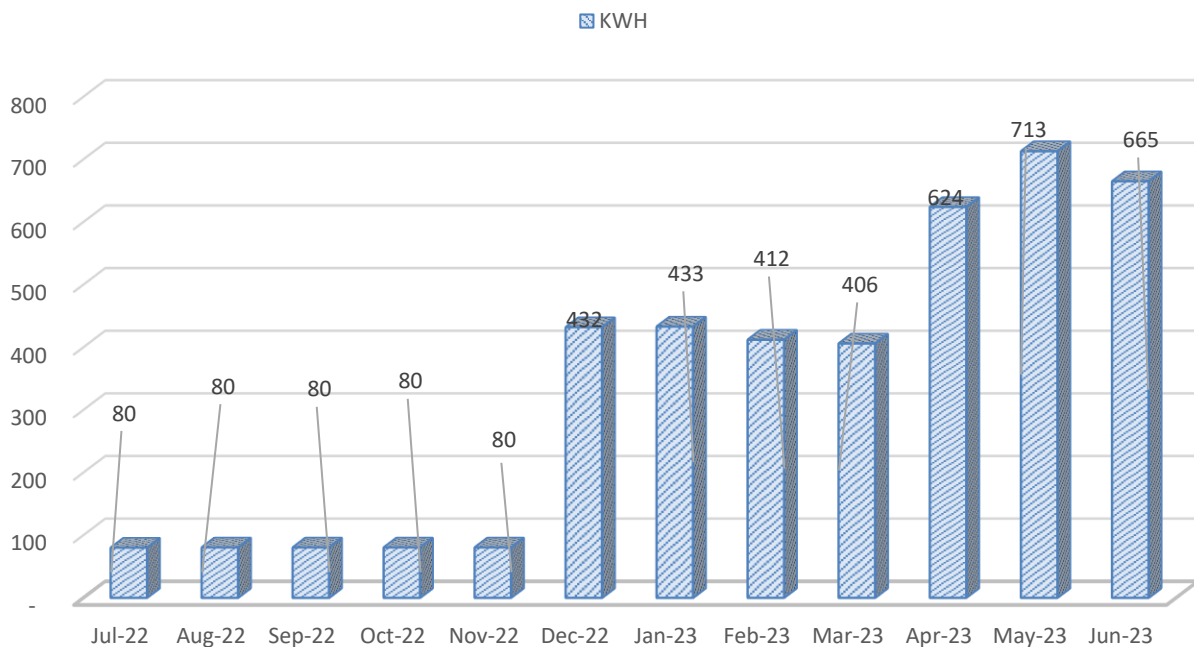
Name	-	Principal cum Secy., D.S.
CA No.	-	416001120114

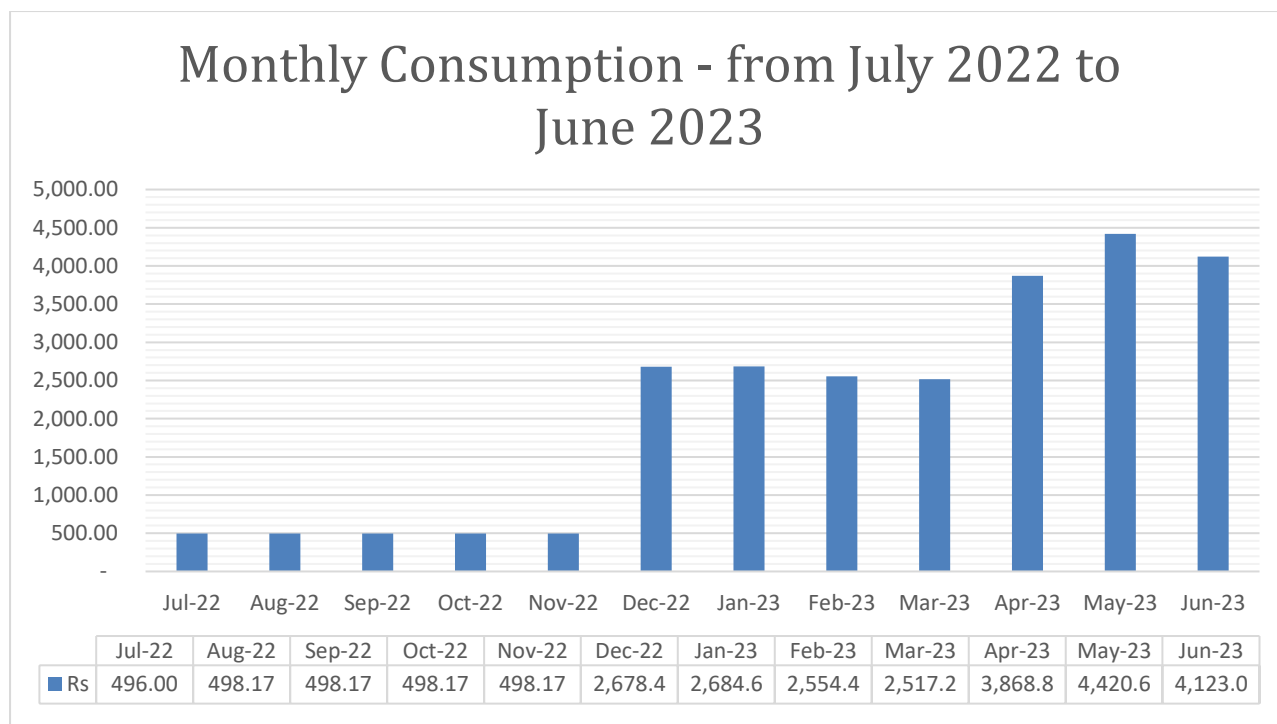
1.1 Summary of Monthly Electricity Consumption and Total Bill Amount

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 2022 to June 2023

Month	Grid Billing	Solar PV	Total Readings	Rate INR	Amount in INR
Jul-22	80	-	29508	6.20	496.00
Aug-22	80	-	34398	6.20	498.17
Sep-22	80	-	58744	6.20	498.17
Oct-22	80	-	47854	6.20	498.17
Nov-22	80	-	34041	6.20	498.17
Dec-22	432	-	32719	6.20	2,678.40
Jan-23	433	-	36544	6.20	2,684.60
Feb-23	412	-	31738	6.20	2,554.40
Mar-23	406	-	41476	6.20	2,517.20
Apr-23	624	-	44772	6.20	3,868.80
May-23	713	-	52168	6.20	4,420.60
Jun-23	665	-	61387	6.20	4,123.00
SUM	4086.40	-	505349		25,335.68

MONTHLY ENERGY CONSUMPTION IN KWH

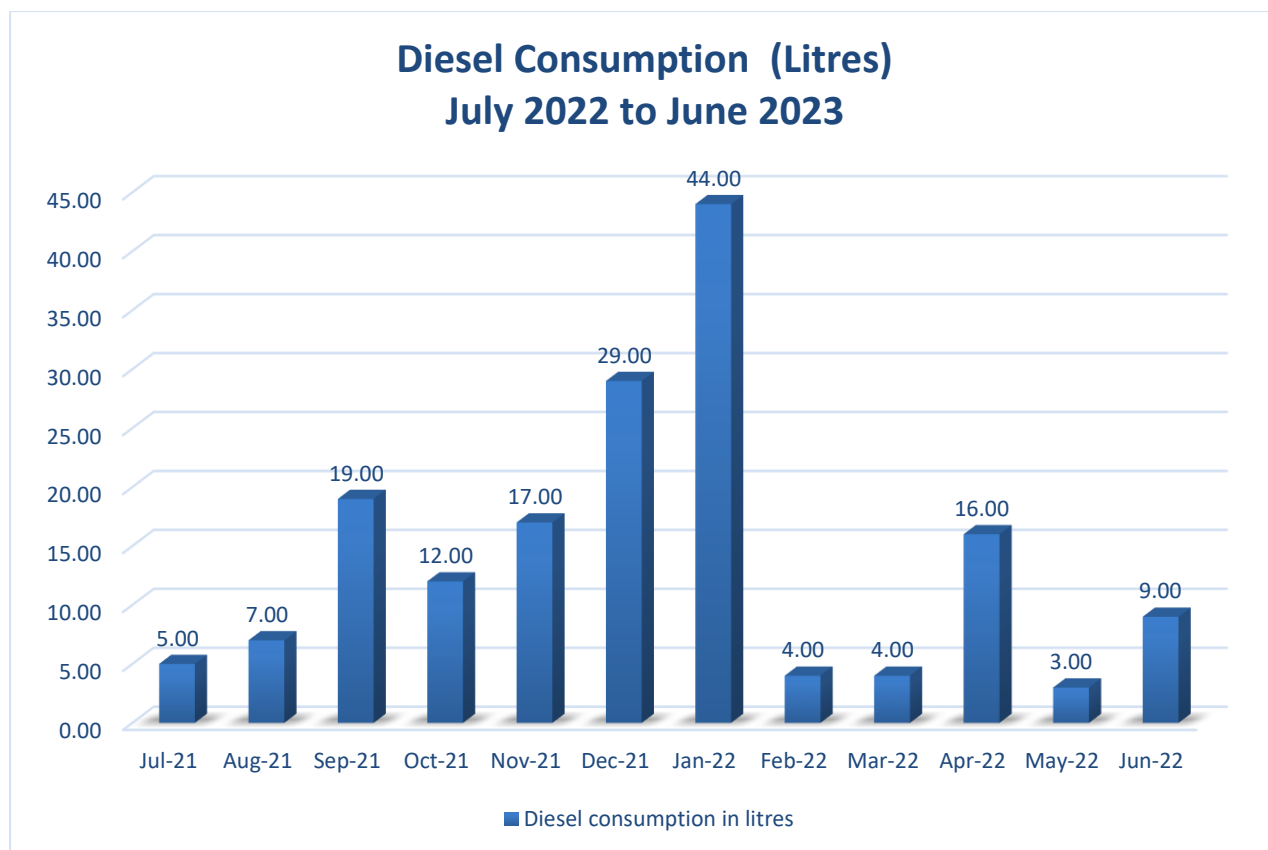




2. DIESEL CONSUMPTION

Below is the diesel consumption details in litres from from July 2022 to June 2023.

Period	Diesel consumption (in litres)
Jul-21	5.00
Aug-21	7.00
Sep-21	19.00
Oct-21	12.00
Nov-21	17.00
Dec-21	29.00
Jan-22	44.00
Feb-22	4.00
Mar-22	4.00
Apr-22	16.00
May-22	3.00
Jun-22	9.00
Total	169.00



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		
<i>Description</i>	<i>Unit</i>	<i>DG at Station 1</i>
Design Details	kVA	15K-2KFWN105
Rated capacity	kVA	15
Hz		50
Sl No.		YKF1A0015RR03A-016
Make		Kirloskar
Volts	Volts	240
PF		0.8
Phase		1
RPM		1500
Amps	Amps	62.5
Mfg.		kirloskar electric

DG Set Operation details		
Operating hours during testing	Hours	0.50
% Loading	%	62.78
Energy Generation	kWh	39.21
Load	kVA	85.73
Fuel consumption during testing	Litre	10
Specific energy generation	kWh/litre	3.08

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 near herbal garden of the institution.

As per the trial taken during the energy audit the percentage loading of DG set is 62.78% which is ok and specific energy consumption of DG Sets 3.08 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 periodic maintenance schedule and stack monitoring of DG set through authorized lab.



4. AC SYSTEM

Energy Efficiency Ratio (EER): 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 Dutika Sahu College in various areas of various capacity which detail is given below:-

SI No.	Location/Identification	Type(Window/Split)	Quantity	TR Rating	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)
1	Principal Office	S	1	1.5	24.0	10.0	18.0	52.0	0.0	2.4	24.0	37.0	0.4	0.5	1.5
2	Staff Common Room	S	1	1.5	24.0	11.0	19.0	52.0	0.0	2.0	22.0	37.0	0.3	0.6	1.7
3	UGC Hostel	S	1	2.0	24.0	11.0	19.0	52.0	0.0	2.6	24.0	37.0	0.4	0.6	1.5



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

Also, we recommend Dutika Sahu College to organize periodic maintenance schedule and take corrective actions for insulating of AC's refrigerant lines in order to protect energy losses.

5. FANS ANALYSIS

In the Dutika Sahu College, there are 1018 fans installed, all ceiling fans are of 60W. The observation and suggestion are given below.

Sl No.	Location/ Identification	Ceiling Fan-70W	Bracket Fan 45W
1	Room No-2	2	
2	Room No-3	1	
3	Room No-4	1	
4	Room No-5	2	
5	Room No-6	2	
6	Room No-7	2	
7	Room No-8	2	
8	Room No-11	6	
9	Room No-12	6	
10	Room No-13	6	
11	Room No-14	6	2
12	Room No-15	6	
13	Room No-16	5	
14	Girls Common Room	2	
15	Staff Common Room		3
16	Principal Office		2
17	Account Office	1	2
18	Office	2	
19	Main Hall	10	
20	Women Cell	1	
21	RTI office	1	
22	Library	2	
23	+3 Science Bot Lab	6	
24	+3 Science Chem Lab	6	
25	+3 Science Phy Lab	6	
26	+3 Science Math Lab	6	
27	+3 Science Zoology Lab	6	
	TOTAL	96	

Observation and Suggestions: -

In the college, the ceiling fans are of 70 W but BEE 5 Star Rated of 30W Ceiling Fans are present in the market. We recommend to buy BEE 5 Star rated 30W fans for all future purchases.

Note:- Energy saving 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 energy efficiency of lighting system, 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 working level has been done.

6.2 Inventory of Lighting

Sl. No.	Location/ Identification	9W LED	18W LED Light	18W LED Flood	20W LED
1	Room No-2	2			
2	Room No-3	1			
3	Room No-4	2			
4	Room No-5	2			
5	Room No-6	2			
6	Room No-7	2			
7	Room No-8	2			
8	Room No-11	2			
9	Room No-12	2			
10	Room No-13	2			
11	Room No-14	2			
12	Room No-15	2			
13	Room No-16	2			
14	Main Hall	10			
15	Principal Room	2	2		2
16	Staff Common Room	4			
17	Account Office	2			
18	Office	3			
19	Girls Common Room	4			
20	Boys Common	2			

	Room				
21	Women Cell	1			
22	Library	8			
23	+3 Science Bot Lab	2			
24	+3 Science Chem Lab	4			
25	+3 Science Phy Lab				
26	+3 Science Math Lab				
27	+3 Science Zool Lab	5			
28	RTI OFFICE	1			
29	TRW Hostel Gate	4		2	
30	College Gate	6		3	
	Total	83	2	5	2

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

College has initiated LED-based lighting solutions, but there are very few traditional tube lights left to replace with LED tube lights. 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 installing motion sensor-based lights in common areas such as library, washrooms, corridors, etc.

We also recommend using solar lights for open areas like parking, ground, street lights, etc. The table below shows the performance characteristics comparison of all luminaries.

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
CFL - Compact fluorescent Lamps	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, car parking. flood lighting	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, street lighting, factories	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, spot lighting, flood lighting, 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
1	office	3	3	5
2	science lab		6	1
3	library		1	1

7.2 Water pump details

Sr. No.	Description	Unit	Pump No.-1
1	Rated Power of Motor	KW	0.746
2	Motor Eff.	%	0.8
3	Discharge Head	m	10
4	Suction Head	m	15
5	Pump Type		Submersible

7.3 Exhaust fan details

Sl No.	Location/Identification	60W Exhaust Fan	Water Cooler-200W
1	Chemistry Lab	2	
2	College Campus		6

ANALYSIS

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

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