ENERGY AUDIT REPORT

YEAR-2021-22

CHANDRA SHEKHAR AZAD GOVERNMENT P.G. LEAD COLLEGE SEHORE (M.P.)

CONDUCTED BY:

SABS ENERGY ENVIRO PVT.LTD

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THE ENERGY AUDIT DOCUMENT VERIFICATION TEAM

External Audit Team		
Sr. No.	**Name**	**Position**
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Acknowledgement

SABS ENERGY ENVIRO PVT LTD is thankful to the CHANDRA SHEKHAR AZAD GOVERNMENT P.G. LEAD COLLEGE SEHORE (M.P.) **for** their positive support in undertaking this intricate task of energy Audit. The field studies would not have been completed on time without their interaction and timely support. We are grateful for their co-operation during field studies and provision of data for the study. The field study of this audit was carried out on October 2022.

The officials of CHANDRA SHEKHAR AZAD GOVERNMENT P.G. LEAD COLLEGE SEHORE (M.P.) coordinated and helped to the audit team during the field study and measurement. SABS ENERGY ENVIRO PVT LTD expresses special thanks to the following persons of CHANDRA SHEKHAR AZAD GOVERNMENT P.G. LEAD COLLEGE

1	Principal	**DR URMILA SALUJA**
2	Asst. Professor of Physics	**Mr. DEVENDRA WARWADE**
3	Asst. Professor Chemistry	**Mr. PUSHPENDRA PARSENDIYA**
4	Laboratory Attendant	**Mr. HARIKISHAN KEER**

And all other officers, technicians and staffs for the keen interest shown in this study and the courtesy extended.
We are thankful to the management for giving us the opportunity to be involved in this very interesting and challenging project.

We would be happy to provide any further clarifications, if required, to facilitate implementation of the recommendations.

SABS ENERGY ENVIRO PVT LTD
Indore

MR. SANJAY SINGH
EA-1462
Certified Energy Auditor
M. Tech (Energy Management)

SABS ENERGY ENVIRO PVT. LTD.

Sr. No. SABS/EA/21-22/201 Dated 10/10/2022

Certificate

This is to certify that Chandra Shekhar Azad Government P.G. LEAD College Sehore (M.P.) has conducted, Energy Audit in the academic year 2021 - 2022 to assess the energy initiative planning, efforts, activities, implemented in the college campus like Light, Fan, AC etc. Conservation of Energy, Energy Management and various Awareness activities. SABS Energy Enviro Pvt Ltd has verified campus data of Chandra Shekhar Azad government P.G. lead college Sehore (M.P.) This Energy Audit, is also aimed to assess impact of energy initiatives for maintenance of the campus eco-friendly.

SABS ENERGY ENVIRO PVT. LIMITED

Mr. Sanjay Singh

EA-1462
CERTIFIED ENERGY AUDITOR, BEE
Bureau of Energy efficiency
Ministry of Power Govt. of India

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EXECUTIVE SUMMARY

College Details:

Particulars	Units	Details
Name of the College	-	**CHANDRA SHEKHAR AZAD GOVERNMENT P. G. LEAD College Sehore**
Location	-	Sehore (M.P), India
Owner	-	Government
Contact Person	-	Mr. Devendra Singh
No. of Shifts	Nos.	1
Daily Operating Hours	Hrs./day	8
Annual Working Days	Days/yr.	300
Source of Electricity	-	MPMKVVCL
Total connected maximum Load	kW	89
Total Sanctioned Load	(kW)	42.78
Average Energy Charge in per unit	Rs. /kWh	7.4
Solar Power Generation System	KW	15

a) Existing Major Energy Consuming Technology and Electricity billing analysis:

The major equipment's installed in **Chandra Shekhar Azad Government P. G. LEAD College Sehore** like Lighting fixtures, Fans and Other appliances.

Table 1: Connected Load (kW)

S.N.	Types of Loads	Load in kW	Percentage %
1	Lighting System	13.0	15
2	Fan System	22.58	25
3	Pump System	12.75	14
4	Air conditioning System	2.94	3
5	Other load	37.66	42
Total Power in kW		**89.0**	**100**

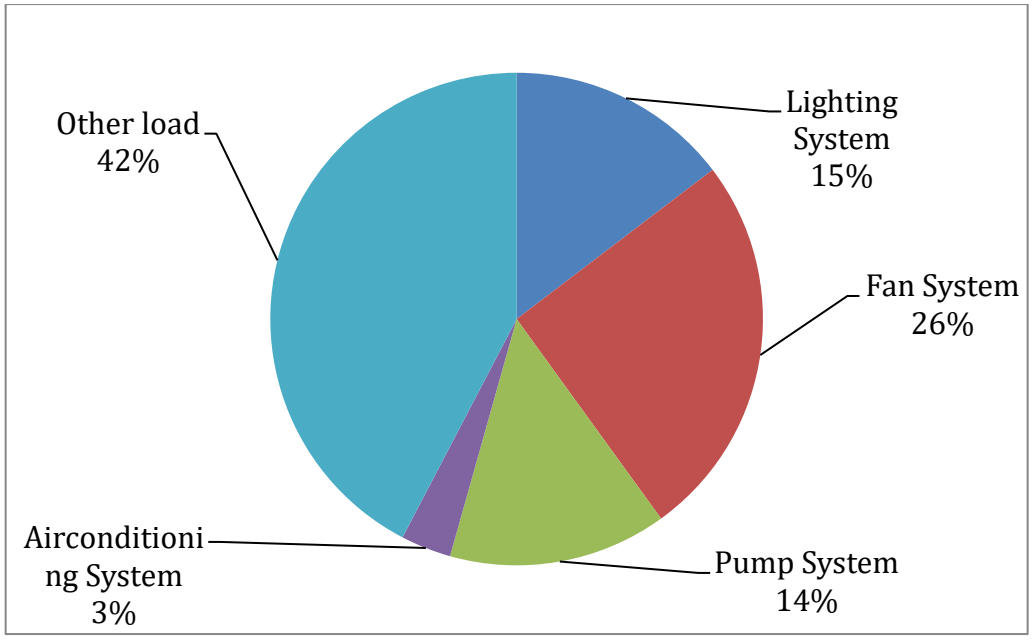

Figure 1: Electricity Connected Load details of campus in different zone

- As per electricity bills observation and analysis, **Total Sanction load is 42.78 KW** in College premises.
- As per electricity bills observation and analysis, **electricity bill Power Factor varies from 0.8-0.98.**
- As per electricity bills observation and analysis, we observed there were 7 number different capacity energy meters installed and all had different contract demand.

b) Proposed Energy Saving Technologies with Cost Economics

❖ Lighting System

- We appreciate to use LED Lighting luminaries at some location as per site visit.
- We **are suggesting to purchases all electrical** equipment as per star leveling program by Bureau of energy. efficiency, and will get huge amount of electricity saving.
- We are suggesting to conduct regular **Cleaning and maintenance of lighting fixtures** in every 5-6 months. to increase performance of Lighting and also improve their Lux level.
- As per data collection and site visit, Total Connected lighting load at College Campus is **13 KW.**
- As per data collection and observation, **Total no. of lighting fixture is 684.**

❖ Ceiling Fan System

- We observed that most of the Fans installed in campus were 50 W, star rated ceiling fan.
- We observed and analyze, the total load for Ceiling Fan is **22.58 kW**.
- We observed and analyze, Total No. of Fan fixtures are **452**.
- We are recommended to replace 421 no. of 50 W Ceiling fan, 23 no. of 45 W exhaust fan and 8 no. of 55 W wall fan with New Super energy efficient 5 star rated BLDC ceiling fan and will get electricity saving as per Star leveling program by Bureau of Energy Efficiency.
- We are **suggesting to purchases new energy efficient BLDC fan as per Star leveling program by Bureau of Energy Efficiency, and will get** huge amount of electricity saving.

❖ Pumping System

- We observed during Energy Audit and site visit**, 3 Pumps, of Capacity 3 HP were installed** within college campus for drinking water, Flushing and gardening purpose.
- Power consumption of **3 HP** pump was **2.25 KW as** per site visit and measurement.
- We are suggesting to **purchase 5 star rated pumps and will get huge** amount of saving as per Star leveling program by Bureau of Energy Efficiency 2020.
- We are **suggesting to install Solar Pumping system and** will get huge amount of savings.

❖ Air Conditioning System

- Total Connected load of Air Conditioning System is **2.9 KW.**
- Total No. of AC installed in the campus is **2.**
- We are **suggesting to purchases New AC as 5 star rated Air Conditioning** system as per Star leveling program by Bureau of Energy Efficiency 2020, and will get huge amount of electricity saving.
- We are suggesting to maintain air conditioning set temperature above **24 Degree Celsius** as per Bureau of Energy Efficiency.
- We are **suggesting conducting regular air condition maintenance** in every 3 months to increase performance of air conditioning.

❖ Other Different Type of Connected Load:

There are different types of other equipment's like Computer, Printer, Xerox machine, Water Cooler, Refrigerator and other lab equipment's are installed at various location and they also contribute electricity consumption

- We suggest to **purchase equipment's as per Star leveling program** by Bureau of Energy Efficiency 2020, and will get huge amount of electricity saving.
- Maintenance of all the equipment's should be done regularl

1 CHAPTER 01
INTRODUCTION COLLEGE

1.1 Introduction

Chandra Shekhar Azad Government P.G. Lead College, Sehore established in 1956 with a vision to impart quality education to students coming from all the sections of the society. The college therefore focuses on acquiring and sharpening appropriate learning skills, knowledge and conception. The college in visions an atmosphere which produces a pool of intellectuals, responsible, cultured and Enlighted citizen who are valuable assets to the nation and by special care to channelize the energy of the youth in learning, exploring and integrating human values so that they find an outlet for their creative spirit and knowledge. We also strive hard to infuse scientific fervor among students and motivate the teachers to explore new horizons in scientific research.

The college has shoulder immense responsibility and strives hard to invite what is inscribed in its emblem.

Vision

To develop this institution into a Centre of learning for rural students where a participative and comprehensive approach to education is made available to them.

Mission

- Accessibility to and equity in aspiring learners in education from every stratum of society.
- Providing a strong background in fundamentals.
- Imparting learning skills and shaping conscientious minds for service to society and nation.
- Increasing skills and hands –on experience for jobs and entrepreneurship.
- Encouraging originality and creativity of students and helping them realize their talents and capacities through various activates like live-projects, seminars, co-curricular and extra-curricular activities.
- Creating awareness for social and ENVIROal issues.
- Providing employment opportunities through regular career fairs.

Providing opportunities for physics and mental growth and development

2 CHAPTER-02
SITE VISIT AND INSPECTION

2.1 Site visit and site inspection

Energy audit team visited at college campus premises and also had completed of electrical measurement and appliances data collection.

Figure 2: Chandra Shekhar Azad Government P.G. Lead College, Sehore

Figure 3: Chandra Shekhar Azad Government P.G. Lead College, Sehore inside the classroom

Figure 4: Chandra Shekhar Azad Government P.G. Lead College, Sehore Projector room

3. CHAPTER -03
ENERGY AUDIT

3.1 Introduction of Energy Audit

Energy Audit is an effective means of establishment present efficiency levels and identifying Potential areas of improvement in energy consumption.

Energy audit of utility systems largely helps, which are given below:

Reducing the energy consumption with resultant reduction in electricity bills.

Audit involves data collection, data verification and detailed analysis of the data.
The analysis leads to recommendations, which are short term (with minimum investment), medium term (with moderate investment) and long term (with capital expenditure).
The cost benefit analysis of various energy conservation proposals enables managements to take decisions regarding implementation schedules.

Energy conservation is a worldwide objective to save the human being from possible disaster. Under the mandate of The Energy Conservation Act 2001, the Bureau of Energy Efficiency and Government of India are implementing various programmers to provide momentum of the energy conservation movement in the country. Energy Auditing is most vital part of the conservation of energy. In order to improve the efficiency of the Energy consuming system, energy auditing is the first necessary action to be taken by the concerned firm. Through the energy auditing actual parameters can be detected at each step, which can be compared with the standard achievable parameters. For proper Energy auditing and energy accounting, parameters need to be monitored on regular.

3.2 Methodology & Approach

The audit involved basic design data collection for various electrical & thermal utilities, kick of meeting with concern departmental engineers & managers, carrying out various field measurements, performance analysis and loss analysis covering all major energy consuming sections of **Chandra Shekhar Azad Government P. G. LEAD College Sehore** to realistically assess losses mainly in energy consuming utility areas and potential for energy savings. The major areas of study include:

- Building energy bills analysis.
- Electrical supply and distribution system analysis
- Lighting system analysis.
- Water pumping system analysis.
- Buildings envelop analysis.
- Specific Energy Consumption.

During study several interactions was made to the office personnel and technicians to share the actual operational features of equipment, equipment's maintenance of equipment break down, down time of machineries, safety measures etc. At the same time required data was collected from the various departments and review the same with the operational actual data.

The study focused on improving energy use efficiency and identifying energy saving opportunities at various equipment's. The analyses included simple payback period and life cycle cost calculations where investments are required to be made to implement recommendations, to establish their economic viability.

3.3 Instrument used in Energy Audit

We have a wide array of latest, sophisticated, portable, diagnostic and measuring instruments to support our energy audit investigations and analyses. The audit study made use of various portable instruments along with plant online instrumentations, for carrying out various measurements and analyses. The specialized instruments that were used during the energy audit include:

- Power Analyzer.
- Ultra-Sonic Flow Meter.
- Digital power clamp meter & multi-meter (2745 KUSAM MECO)
- Digital Hygrometer HD-304 HTC
- Digital Lux Meter (LX-101A HTC TM)
- Digital Anemometer (AVM -07 HTC)
- IR Thermometers for temperature measurement HTC TM (IR -50 to 1550 0C)
- Digital distance meter
- Measuring Tap meter

4. CHAPTER-04

ELECTRICITY BILL ANALYSIS

4.1 Month Wise Energy Consumption

Chandra Shekhar Azad Government P. G. LEAD College Sehore. receives power from, Madhya Pradesh Madhya Kshetra Vidyut Vitran Company Limited Bhopal.

The maximum demand, energy consumption, fixed charges, energy charges and total bill in Rs. for the financial year 2021-2022 are shown in below tables as per the details from the College bill. All the one year's data has been represented by the various graphs. This indicator addresses energy consumption, energy sources, energy monitoring, and electricity consumption.

Tariff Schedule LV - 2

NON-DOMESTIC:
LV 2.1

Applicability:
This tariff is applicable for light, fan and power to Schools / Educational Institutions including workshops and laboratories of Engineering Colleges / Polytechnics/ITIs (which are registered with /affiliated/ recognized by the relevant Govt. body or university), Hostels for students or working women or sports persons.

Tariff:
Tariff shall be as given in the following table:

Sub category	Energy Charge (paise/unit) Urban/ Rural areas	Monthly Fixed Charge (Rs.)	
		Urban areas	Rural areas
Sanctioned load-based tariff (only for connected load up to 10 kW)	630	150 per kW	120 per kW
Demand based tariff **Mandatory** for Connected load above 10 kW	630	270 per kW or 216 per kVA of billing demand	230 per kW or 184 per kVA of billing demand

Table 4: Electricity bill analysis 01

CHANDRA SHEKHAR AZAD GOVERNMENT P.G. LEAD COLLEGE SEHORE M.P. IVRS-N 2154031854								
Months	**Sanctioned Load (KW)**	**MDI**	**KWH**	**Fixed charges (Rs)**	**Energy Charges (Rs)**	**Power Factor**	**Total bill (Rs)**	**Average Per unit Charges Rs/KWh**
Jan-22	10	3.97	201	1380	1560	0.8	2989	14.87
Feb-22	10	3.97	200	1380	1560	0.8	3013	15.07
Mar-22	10	3.74	200	1380	1560	0.92	2837	14.19
Apr-21	10	0	260	1380	2028	0.8	3454	13.28
May-21	10	10	140	1380	1092	0.1	2512	17.94
Jun-21	10	0	200	1380	1560	0.8	2918	14.59
Jul-21	10	10	200	1380	1560	0.8	2609	13.05
Aug-21	10	5	200	1380	1560	0.8	2607	13.04
Sep-21	10	0.84	200	1380	1550	0.95	2576	12.88
Oct-21	10	1.38	200	1380	1560	0.95	2891	14.46
Nov-21	10	1.36	200	1380	1560	0.95	2909	14.55
Dec-21	10	4.4	200	1380	1560	0.9	2923	14.62

Table 5: Electricity bill analysis 02

CHANDRA SHEKHAR AZAD GOVERNMENT P.G. LEAD COLLEGE SEHORE M.P. IVRS-N 2154031642								
Months	**Sanctioned Load (KW)**	**MDI**	**KWH**	**Fixed charges (Rs)**	**Energy Charges (Rs)**	**Power Factor**	**Total bill (Rs)**	**Average Per unit Charges Rs/KWh**
Jan-22	17.9	9.3	510	4400	2304	0.96	6967	13.66
Feb-22	17.9	3	231.7	4400	2304	0.97	6843	29.53
Mar-22	17.9	12.3	364	4400	2304	0.81	6751	18.55
Apr-21	17.9	2.72	356	4400	2311	0.96	6546	18.39
May-21	17.9	3	386	4400	2456	0.96	6755	17.50
Jun-21	17.9	11.2	560	4400	2360	0.9	6790	12.13
Jul-21	17.9	3.52	360	4400	2304	0.97	6494	18.04
Aug-21	17.9	19	349	5775	2234	0.82	7962	22.81
Sep-21	17.9	1.44	396.4	4400	2225	0.79	6601	16.65
Oct-21	17.9	3.44	244.9	4400	2304	0.96	6592	26.92
Nov-21	17.9	12	298.1	4400	2304	0.82	6736	22.60
Dec-21	17.9	10.2	1445	4400	2304	0.82	6743	4.67

Table 6: Electricity bill analysis 03

CHANDRA SHEKHAR AZAD GOVERNMENT P.G. LEAD COLLEGE SEHORE M.P. IVRS-N 2154026530								
Months	**Sanctioned Load (KW)**	**MDI**	**KWH**	**Fixed charges (Rs)**	**Energy Charges (Rs)**	**Power Factor**	**Total bill (Rs)**	**Average Per unit Charges Rs/KWh**
Jan-22	2	0	40	306	256	0.8	568	14.20
Feb-22	2	0	40	306	256	0.8	569	14.23
Mar-22	2	0	40	306	256	0.8	563	14.08
Apr-21	2	0	40	306	256	0	566	14.15
May-21	2	0	40	306	256	0.8	555	13.88
Jun-21	2	0	40	306	256	0.8	553	13.83
Jul-21	2	0	40	306	256	0.8	79	1.98
Aug-21	2	0	40	306	256	0.8	79	1.98
Sep-21	2	0	40	306	256	0.8	546	13.65
Oct-21	2	0	40	306	256	0.8	562	14.05
Nov-21	2	0	40	306	256	0.8	562	14.05
Dec-21	2	0	40	306	256	0.8	563	14.08

Table 7: Electricity bill analysis 04

CHANDRA SHEKHAR AZAD GOVERNMENT P.G. LEAD COLLEGE SEHORE M.P. IVRS-N 2154032032								
Months	**Sanctioned Load (KW)**	**MDI**	**KWH**	**Fixed charges (Rs)**	**Energy Charges (Rs)**	**Power Factor**	**Total bill (Rs)**	**Average Per unit Charges Rs/KWh**
Jan-22	4 HP	5	360	576	1750	0.89	2123	5.90
Feb-22	2.98	0	60	414	468	0.8	896	14.93
Mar-22	2.98	0	60	414	458	0.8	469	7.82
Apr-21	4 HP	0	437.8	228	2213	0.8	431	0.98
May-21	2.98	0	437.8	228	2204	0.8	405	0.93
Jun-21	4 HP	2	6113	248	36222	0.98	4029	0.66
Jul-21	HP	0	60	414	470	0.92	897	14.95
Aug-21	4 HP	0	20	212	502	0.8	1473	73.65
Sep-21	4 HP	3	120	240	562	0.96	1506	12.55
Oct-21	4 HP	9	643	1344	3359	0.96	1563	2.43
Nov-21	4 HP	5	360	576	1750	0.89	2098	5.83
Dec-21	4 HP	5	360	576	1750	0.89	2097	5.83

Table 8 : Electricity bill analysis 05

CHANDRA SHEKHAR AZAD GOVERNMENT P.G. LEAD COLLEGE SEHORE M.P. IVRS-N 2154010737								
Months	**Sanctioned Load (KW)**	**MDI**	**KWH**	**Fixed charges (Rs)**	**Energy Charges (Rs)**	**Power Factor**	**Total bill (Rs)**	**Average Per unit Charges Rs/KWh**
Jan-22	1.00	0	20	153	128	0.8	284	14.20
Feb-22	1.00	0	20	153	128	0.8	284	14.20
Mar-22	1.00	0	20	153	128	0.8	283	14.15
Apr-21	1.00	0	20	153	128	0.8	286	14.30
May-21	1.00	0	20	153	128	0.8	279	13.95
Jun-21	1.00	0	20	153	128	0.8	277	13.85
Jul-21	1.00	0	20	153	128	0.8	218	10.90
Aug-22	1.00	0	20	153	128	0.8	217	10.85
Sep-21	1.00	0	20	153	128	0.8	276	13.80
Oct-21	1.00	0	20	153	128	0.8	280	14.00
Nov-21	1.00	0	20	153	128	0.8	283	14.15
Dec-21	1.00	0	20	153	128	0.8	280	14.00

Table 9 : Electricity bill analysis 06

CHANDRA SHEKHAR AZAD GOVERNMENT P.G. LEAD COLLEGE SEHORE M.P. IVRS-N 2154015482								
Months	**Sanctioned Load (KW)**	**MDI**	**KWH**	**Fixed charges (Rs)**	**Energy Charges (Rs)**	**Power Factor**	**Total bill (Rs)**	**Average Per unit Charges Rs/KWh**
Jan-22	1.9	3	255	612	1612	0.93	2171	8.51
Feb-22	1.9	2	340	306	2176	0.93	2431	7.15
Mar-22	1.9	2	279	306	1785	0.89	2062	7.39
Apr-21	1.9	1	1121	306	7198	0.8	7105	6.34
May-21	1.9	4	63	918	404	0.8	1445	22.94
Jun-21	1.9	5	1849	1224	11852	0.9	5104	2.76
Jul-21	1.9	5	855	1224	5352	0.98	4946	5.78
Aug-21	1.9	2	362	306	2244	0.84	1410	3.90
Sep-21	1.9	2	340	306	2176	0.9	2490	7.32
Oct-21	1.9	3	435	512	2784	0.9	3270	7.52
Nov-21	1.9	3	435	612	2784	0.91	3268	7.51
Dec-21	1.9	2	120	306	768	0.93	1022	8.52

Table 10: Electricity bill analysis 07

CHANDRA SHEKHAR AZAD GOVERNMENT P.G. LEAD COLLEGE SEHORE M.P. IVRS-N 2154026022								
Months	**Sanctioned Load (KW)**	**MDI**	**KWH**	**Fixed charges (Rs)**	**Energy Charges (Rs)**	**Power Factor**	**Total bill (Rs)**	**Average Per unit Charges Rs/KWh**
Jan-22	7.0	2	810	1071	5184	0.85	6339	7.83
Feb-22	7.0	2	684	1071	4377	0.95	5386	7.87
Mar-22	7.0	1	686	1071	4390	0.88	5470	7.97
Apr-21	7.0	2	1201	1071	7737	0.8	8838	7.36
May-21	7.0	1	733	1071	4706	0.8	5839	7.97
Jun-21	7.0	3	794	1071	5089	0.96	5702	7.18
Jul-21	7.0	6	921	1071	5765	0.96	5427	5.89
Aug-21	7.0	3	875	1071	5425	0.84	5429	6.20
Sep-21	7.0	3	810	1071	5184	0.84	6339	7.83
Oct-21	7.0	3	1150	1071	7360	0.91	8061	7.01
Nov-21	7.0	3	952	1071	5092	0.91	6939	7.29
Dec-21	7.0	3	723	1071	4627	0.91	5536	7.66

OBSERVATIONS & COMMENTS:

- As per electricity bills observation and analysis, **Total Sanction load is 42.78 KW** in College premises.
- As per electricity bills observation and analysis, **electricity bill Power Factor varies from 0.8 - 0.98.**

5. CHAPTER 05

LIGHTING SYSTEM

5.1 Details of Lighting System

The Chandra Shekhar Azad Government P. G. LEAD College Sehore has high lighting load and various type of indoor and outdoor lighting fixture are installed in college campus. The lux measurement was also done at the time of audit. All the parameters are given in the below table:

Table: 11 Lighting details

Chandra Shekhar Azad Government P.G. LEAD College Sehore (M.P.)						
Sr. No.	**Location**	**Location of Fixtures**	**Types of Lighting**	**No. of Lighting fixture**	**Power (W)**	**Total Power (W)**
1	Room No. 1	Wall	Tube Light	1	20	20
			Lamp	2	100	200
2	Room No. 2	Wall	Tube Light	2	20	40
3	Room No. 3	Wall	Tube Light	14	20	280
4	Room No. 4	Wall	Tube Light	1	20	20
			LED	1	9	9
5	Room No. 5	Wall	Tube Light	1	20	20
			LED	1	9	9
6	Room No. 6	Wall	Tube Light	12	20	240
			LED	2	9	18
7	Room No. 7	Wall	Tube Light	17	20	340
8	Room No. 8	Wall	Tube Light	3	20	60
			LED	1	9	9
9	Room No. 9	Wall	Tube Light	4	20	80
10	Room No. 10	Wall	Tube Light	4	20	80
11	Room No. 11	Wall	Tube Light	4	20	80
12	Room No. 12	Wall	Tube Light	2	20	40
			LED	2	20	40
13	Room No. 13	Wall	Tube Light	2	20	40
14	Room No. 14	Wall	Tube Light	1	20	20
			LED	1	9	9
15	Room No. 15 to 18 Library	Wall	Tube Light	19	20	380
			LED	2	9	18
16	Room No. 19	Wall		0	0	0
17	Room No. 20	Ceiling	Tube Light	5	20	100
18	Room No. 21	Wall	Tube Light	5	20	100
19	Room No. 22	Wall	Tube Light	73	20	1460
20	Room No. 23	Ceiling	Tube Light	32	20	640
		Ceiling	LED	40	9	360
21	Room No. 24	Wall	Tube Light	6	20	120
22	Room No. 25	Wall	Tube Light	4	20	80

Chandra Shekhar Azad Government P.G. LEAD College Sehore (M.P.)						
Sr. No.	**Location**	**Location of Fixtures**	**Types of Lighting**	**No. of Lighting fixture**	**Power (W)**	**Total Power (W)**
23	Room No. 26	Wall	Tube Light	2	20	40
24	Room No. 27	Wall	Tube Light	4	20	80
25	Room No. 28	Wall	Tube Light	3	20	60
26	Room No. 29	Wall	Tube Light	6	20	120
			LED	6	9	54
27	Room No. 30	Wall	Tube Light	4	20	80
28	Room No. 31	Wall	Tube Light	4	20	80
29	Room No. 32	Wall	Tube Light	4	20	80
30	Room No. 33	Wall	Tube Light	4	20	80
31	Room No. 30 to 33 Corridor	Ceiling	Tube Light	4	20	80
32	Room No. 34 Hall	Wall	Halogen Light	8	200	1600
33	Room No. 35	Wall	CFL	8	15	120
34	Room No. 36	Wall	Tube Light	3	20	60
35	Room No. 37	Wall	Tube Light	4	20	80
36	Room No. 38	Wall	Tube Light	6	20	120
37	Room No. 39	Wall	Tube Light	2	20	40
38	Room No. 40	Wall	Tube Light	2	20	40
39	Room No. 41	Wall	Tube Light	4	20	80
40	Room No. 42	Wall	Tube Light	4	20	80
41	Room No. 43	Wall	Tube Light	8	20	160
42	Room No. 44	Wall	Tube Light	4	20	80
43	Room No. 45	Wall	Tube Light	3	20	60
44	Room No. 46	Wall	Tube Light	2	20	40
45	Room No. 47	Wall	Tube Light	8	20	160
46	Room No. 48 to 52 Botony	Wall	Tube Light	20	20	400
47	Room No. 53	Wall	Tube Light	7	20	140
48	Room No. 54	Wall	Tube Light	4	20	80
49	Room No. 55	Wall	Tube Light	3	20	60
50	Room No. 56	Wall	Tube Light	11	20	220
51	Room No. 57	Wall	Tube Light	4	20	80
52	Room No. 58	Wall	Tube Light	4	20	80
53	Room No. 59	Wall	Tube Light	9	20	180
54	Room No. 60	Wall	Tube Light	8	20	160
55	Room No. 61	Wall	Tube Light	8	20	160
56	Computer Corridor	Ceiling	Tube Light	6	20	120
57	Room No. 62	Ceiling	LED	15	9	135
58	Room No. 63	Ceiling	LED	15	9	135
59	Room No. 64	Ceiling	LED	15	9	135
60	Room No. 65	Ceiling	LED	10	9	90
61	Room No. 66	Ceiling	LED	20	9	180

Chandra Shekhar Azad Government P.G. LEAD College Sehore (M.P.)						
Sr. No.	**Location**	**Location of Fixtures**	**Types of Lighting**	**No. of Lighting fixture**	**Power (W)**	**Total Power (W)**
62	Room No. 67	Ceiling	LED	15	9	135
63	Room No. 68	Ceiling	LED	15	9	135
64	Room No. 69	Ceiling	LED	15	9	135
65	Computer Room	Ceiling	LED	18	9	162
66	Computer Lab	Ceiling	LED	18	9	162
67	M/W Toilet	Wall	Tube Light	25	20	500
68	Computer Corridor	Ceiling	Tube Light	48	22	1056
Total Power Consumption in kW			**13.0**			
Total no. of Lighting Fixture			**684**			

Different type of Out Door Lighting System						
S. N.	**Location**	**Location of Fixtures**	**Types of Lighting**	**No. of Lighting fixture**	**Power (W)**	**Total Power (W)**
1	**New Chemistry Lab**	**Outside of Building**	**Lamp**	**8**	**120**	**960**
			LED	**1**	**20**	**20**
2	**College Campus**	**Stand Pole**	**LED**	**16**	**20**	**320**
3	**College Campus**	**Wall**	**Halogen**	**18**	**200**	**3600**
	Total Power Consumption in kW			***4.9***		
	Total no. of Lighting Fixture			***43***		

OBSERVATIONS & COMMENTS

- We **appreciate to use LED Lighting luminaries** at some location as per site visit.
- We **are suggesting to purchases all electrical** equipment as per star leveling program by Bureau of energy efficiency, and will get huge amount of electricity saving.
- We are suggesting to conduct regular **Cleaning and maintenance of lighting fixtures** in every 5-6 months to increase performance of Lighting and also improve their Lux level.
- As per data collection and site visit, Total Connected lighting load at College Campus is **13.0 KW indoor and 4.9 KW outdoor.**
- As per data collection and observation, **Total no. of lighting fixture is 684**.

6. CHAPTER 06

FAN SYSTEM

6.1 FAN SYSTEM

There is various ceiling fan installed at various location in the Chandra Shekhar Azad Government P. G. LEAD College Sehore and they also contribute very high electricity consumption. All of the fans are conventional and hence high energy consuming.

Table: 12 details of Fan

Chandra Shekhar Azad Government P.G. LEAD College Sehore (M.P.)						
Sr. No.	**Location**	**Location of Fan**	**Types of Fans**	**No. of Fan**	**Power (W)**	**Total Power (W)**
1	Room No.1	Roof	Ceiling Fan	1	50	50
2	Room No.2	Roof	Ceiling Fan	1	50	50
3	Room No.3	Roof	Ceiling Fan	8	50	400
4	Room No.4	Roof	Ceiling Fan	1	50	50
5	Room No.5	Roof	Ceiling Fan	1	50	50
6	Room No.6	Roof	Ceiling Fan	8	50	400
7	Room No.7	Roof	Ceiling Fan	15	50	750
8	Room No.8	Roof	Ceiling Fan	2	50	100
9	Room No.9	Roof	Ceiling Fan	4	50	200
10	Room No.10	Roof	Ceiling Fan	4	50	200
11	Room No.11	Roof	Ceiling Fan	4	50	200
			Exhaust fan	1	45	45
12	Room No.12	Roof	Exhaust fan	1	45	100
			Ceiling Fan	2	50	100
13	Room No.13	Roof				
14	Room No.14	Roof	Ceiling Fan	2	50	100
15	Room No.15 to 18	Roof	Ceiling Fan	16	50	800
16	Room No.19					0
17	Room No.20					0
18	Room No.21	Roof	Ceiling Fan	2	50	100
19	Room No.22	Roof	Ceiling Fan	46	50	2300
		Wall	Exhaust fan	11	45	495
20	Room No.23	Roof	Ceiling Fan	26	50	1300
21	Room No.24	Roof	Ceiling Fan	4	50	200
22	Room No.25	Roof	Ceiling Fan	4	50	200
23	Room No.26	Roof	Ceiling Fan	4	50	200
24	Room No.27	Roof	Ceiling Fan	4	50	200
25	Room No.28	Roof	Ceiling Fan	5	50	250

Chandra Shekhar Azad Government P.G. LEAD College Sehore (M.P.)						
Sr. No.	**Location**	**Location of Fan**	**Types of Fans**	**No. of Fan**	**Power (W)**	**Total Power (W)**
26	Room No.29	Roof	Ceiling Fan	6	50	300
27	Room No.30	Roof	Ceiling Fan	5	50	250
28	Room No.31	Roof	Ceiling Fan	5	50	250
29	Room No.32	Roof	Ceiling Fan	5	50	250
30	Room No. 30 to 33 Corridor	Roof	Ceiling Fan	5	50	250
31	Room No.34 Hall	Roof	Ceiling Fan	8	50	400
		Wall	Wall Fan	8	55	440
		Wall	Exhaust fan	4	45	180
32	Room No.35	Roof	Ceiling Fan	11	50	550
33	Room No.36	Roof	Ceiling Fan	5	50	250
34	Room No.37	Roof	Ceiling Fan	4	50	200
35	Room No.38	Roof	Ceiling Fan	4	50	200
36	Room No.39	Roof	Ceiling Fan	5	50	250
37	Room No.40	Roof	Ceiling Fan	1	50	50
38	Room No.41	Roof	Ceiling Fan	1	50	50
39	Room No.42	Roof	Ceiling Fan	2	50	100
40	Room No.43	Roof	Ceiling Fan	2	50	100
41	Room No.44	Roof	Ceiling Fan	4	50	200
42	Room No.45	Roof	Ceiling Fan	2	50	100
43	Room No.46	Roof	Ceiling Fan	2	50	100
44	Room No.47	Roof	Ceiling Fan	1	50	50
45	Room No.48 to 52	Roof	Ceiling Fan	4	50	200
46	Room No.53	Roof	Ceiling Fan	12	50	600
47	Room No.54	Roof	Ceiling Fan	3	50	150
48	Room No.55	Roof	Ceiling Fan	2	50	100
49	Room No.56	Roof	Ceiling Fan	1	50	50
50	Room No.57	Roof	Ceiling Fan	8	50	400
51	Room No.58	Roof	Ceiling Fan	4	50	200
52	Room No.59	Roof	Ceiling Fan	6	50	300
53	Room No.60	Roof	Ceiling Fan	6	50	300
54	Room No.61	Roof	Ceiling Fan	8	50	400
55	Room No.62	Roof	Ceiling Fan	8	50	400
56	Room No.63	Roof	Ceiling Fan	10	50	500
57	Room No.64	Roof	Ceiling Fan	10	50	500
58	Room No.65	Roof	Ceiling Fan	10	50	500
59	Room No.66	Roof	Ceiling Fan	8	50	400
60	Room No.67	Roof	Ceiling Fan	16	50	800
61	Room No.68	Roof	Ceiling Fan	10	50	500

Chandra Shekhar Azad Government P.G. LEAD College Sehore (M.P.)						
Sr. No.	**Location**	**Location of Fan**	**Types of Fans**	**No. of Fan**	**Power (W)**	**Total Power (W)**
62	Room No.69	Roof	Ceiling Fan	10	50	500
63	New Computer Lab Class Room	Roof	Ceiling Fan	10	50	500
64	New Computer Lab	Roof	Ceiling Fan	12	50	600
65	M/W Toilet	Roof	Ceiling Fan	16	50	800
		Wall	Exhaust fan	6	45	270
66	Computer Corridor	Roof	Ceiling Fan	5	50	250
Total Power Consumption in W				**22580**		
Total Power Consumption in KW				**22.58**		
Total no. of Fan Fixture				**452**		

OBSERVATIONS & COMMENTS

- We are recommended to **replace 421 no. of 50 W Ceiling fan, 23 no. of 45 W exhaust fan and 8 no. of 55 W wall fan with New Super energy efficient 5 star rated BLDC ceiling fan** and will get huge amount of electricity saving as per Star leveling program by Bureau of Energy Efficiency.
- We are **suggesting to purchases new energy efficient BLDC fan as per Star leveling program by Bureau of Energy Efficiency, and will get** huge amount of electricity saving.
- Energy Saving calculation **and recommendation for the existing Conventional** Ceiling fans with BLDC super energy efficient fan has been given in this report.

- We are suggesting **to conduct regular Cleaning and maintenance** of Fan at least in every 6 months to increase performance of Fan.
- We are also suggesting to improve their Air delivery of Fan by Replacing New energy efficient BLDC Fan as per 5 stars leveling of Bureau of energy efficiency.
- The total load for Ceiling Fan is **22.58 kW**.
- Total No. of Fan fixtures are **452**

7. CHAPTER -07
AIR CONDITIONING SYSTEM

7.1 Air Conditioning System

Air Conditioning load is also present in Chandra Shekhar Azad Government P. G. LEAD College Sehore campus although it quite less comparatively. Details of the air conditioners are given below.

Table 13 : Air conditioning system details

CHANDRA SHEKHAR AZAD GOV. P. G. LEAD COLLEGE SEHORE M.P.									
Sr. No	**Location**	**No. of AC**	**Air Conditioning**				**Power Consumption**		**Specific Power Consumption**
			Type	**Star**	**Make**	**Ton**	**In W**	**Total Power (Tone)**	**kW/TR**
1	Room no 35	2	Split			1.5	1430	3	1.01
Total no. of AC		**2**	**TOTAL POWER CONSUMPTION in (Tons)**					**3**	
			TOTAL POWER CONSUMPTION in (kW)					**2.9**	

OBSERVATIONS & COMMENTS:

- Total Connected load of Air Conditioning System is **2.9 KW**.
- Total No. of AC installed in the campus is **2 number.**
- We are **suggesting to purchases New AC as 5 star rated Air Conditioning** system as per Star leveling program by Bureau of Energy Efficiency 2020, and will get huge amount of electricity saving.
- We are suggesting to maintain air conditioning set temperature above **24 Degree Celsius** as per Bureau of Energy Efficiency.
- We are **suggesting conducting regular air condition maintenance** in every 3 months to increase performance of air conditioning.

8.CHAPTER-08

OTHER EQUIPMENTS LOAD

8.1 Different Type Other Equipment's

There are different types of other equipment's like Printer, PC, Water Cooler, Refrigerator and other lab equipment's are installed at various location in the College, Indore and they also contribute electricity consumption.

Table 14: Different type of equipment system

Chandra Shekhar Azad Gov. P. G. LEAD College Sehore M.P.						
Sr. No.	**Location**	**Location of Product**	**Type of Product**	**Number of Product**	**Power (Watts)**	**Total Power (Watts)**
1	Room No. 2	Inside the room	Cooler	1	500	500
2	Room No. 6	Inside the room	Computer	3	200	600
			Cooler	1	500	500
			Freeze	1	120	120
			TV	2	300	600
3	Room No. 7	Inside the room	Computer	6	200	1200
			Printer	2	40	80
			Photo copy Machine	2	560	1120
4	Room No. 9	Inside the room	Computer	1	200	200
			Printer	1	40	40
			Photo copy Machine	1	560	560
5	Room No. 11	Inside the room	LCD Projector	1	450	450
6	Room No. 17	Inside the room	Projector	1	350	350
			Computer	1	200	200
			Printer	1	40	40
7	Room No. 22	Inside the room	Computer	4	200	800
			Printer	1	40	40
			Distillation	1	10	10
			Projector	1	60	60
			freeze	1	70	70
			Incubator	2	80	160
			Oven	2	3000	6000

Chandra Shekhar Azad Gov. P. G. LEAD College Sehore M.P.						
Sr. No.	**Location**	**Location of Product**	**Type of Product**	**Number of Product**	**Power (Watts)**	**Total Power (Watts)**
			Micro wave Oven	1	2500	2500
8	Room No. 25	Inside the room	Projector	1	60	60
9	Room No. 29	Inside the room	Computer	1	200	200
10	Room No. 32	Inside the room	Computer	1	200	200
11	Room No. 35	Inside the room	Computer	5	200	1000
			Projector	1	60	60
			Photo copy Machine	1	560	560
12	Room No. 36	Inside the room	Cooler	1	500	500
			Computer	1	200	200
13	Room No. 37	Inside the room	Projector	1	60	60
14	Room No. 52	In the Lab	Projector	1	60	60
			Computer	1	200	200
			Printer	1	40	40
			Freeze	1	120	120
15	Room No. 53	In the Bio tech Lab	Cooler	1	500	500
			freeze	1	120	120
			Water bath	1	80	80
			Incubator	1	80	80
16	Room No. 54	In the room	Cooler	1	560	560
			Refrigerator	1	120	120
17	Room No. 55	In the room	Computer	1	200	200
			Printer	1	40	40
18	Room No. 56	In the room	Projector	1	60	60
19	Room No. 57	In the room	Computer	1	200	200
20	Room No. 60	In the room	Computer	25	200	5000
			Cooler	1	560	560
			Printer	1	40	40
21	Room No. 61	In the room	Computer	25	200	5000
			Cooler	1	560	560
			Printer	1	40	40
22	Near Library	Library	Watercooler	1	750	750
23	Near Women toilet	Near Women toilet	Watercooler	1	750	750
24	Office	Office	Watercooler	2	750	1500

Chandra Shekhar Azad Gov. P. G. LEAD College Sehore M.P.						
Sr. No.	**Location**	**Location of Product**	**Type of Product**	**Number of Product**	**Power (Watts)**	**Total Power (Watts)**
25	New computer lab	New computer lab	Watercooler	2	750	1500
26	Old college building	Corridor	CCTV Camera	38	10	380
27	New computer lab	Rooms & corridor	CCTV Camera	16	10	160
Total Power in KW				**37.7**		
Total Product				**179**		

OBSERVATION AND COMMENTS

- Total Connected load **37.7 KW** and Total 179 no. equipment installed.
- We suggest to **purchase equipment's as per Star leveling program** by Bureau of Energy Efficiency 2020, and will get huge amount of electricity saving.
- Maintenance of all the equipment's should be done regularly.

9. CHAPTER 09

PUMPING SYSTEM

9.1 Details of Pumps

There are 5 no. of 3 HP and 2 no. of 1 HP capacity of submersible pump installed within college campus for drinking water, Flushing and gardening purpose.

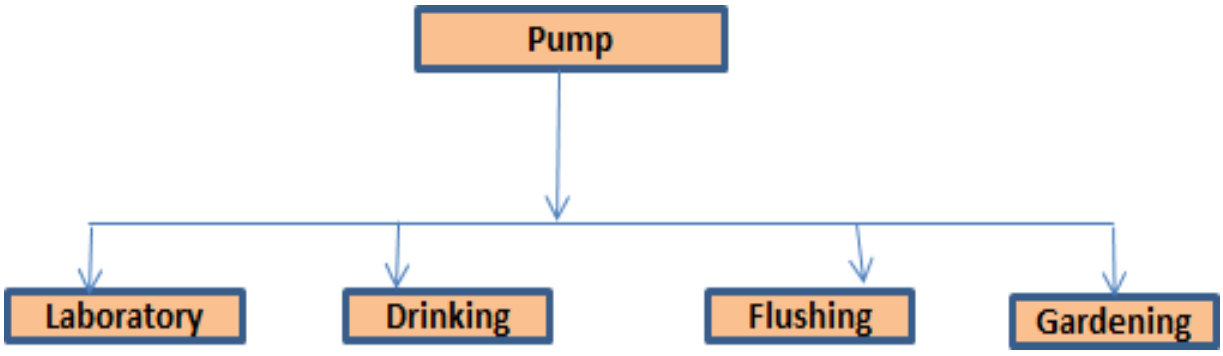

Table 15: Details of Pumping system

CHANDRA SHEKHAR AZAD GOV. P. G. LEAD COLLEGE SEHORE M.P.						
Sr. No.	**Location**	**Location of Pump**	**Types of Pumps**	**No. of Pump**	**Power (HP)**	**Total Power (KW)**
1	College Campus Boring	Back side	Tube Well	5	3	11.25
2	Pump	Chem. Department & Office	Pump	2	1	1.5
Total Power in KW						12.75

Observation and Comments

- We observed during Energy Audit and site visit, **5 Pumps, of Capacity 3 HP within** College campus for drinking water, Flushing and gardening purpose.
- Power consumption of 3 HP pump was **2.25 KW as** per site visit and measurement.
- We are suggesting to **purchase 5 star rated pumps and will get huge** amount of saving as per Star leveling program by Bureau of Energy Efficiency 2020.
- We are **suggesting to install Solar Pumping system and** will get huge amount of savings.

10. CHAPTER -10

SOLAR SYSTEM

10.1 Details of Solar Power Plant:

There are installed 15 KW solar power system in campus for Green energy generation.

Figure 5: Chandra Shekhar Azad Government P.G. Lead College, Sehore Solar system

ANNEXURE – I

Standard Lux Level

Activity	Illumination *(lux, lumen/m^2)*
Public areas with dark surroundings	20 - 50
Simple orientation for short visits	50 - 100
Working areas where visual tasks are only occasionally performed	100 - 150
Warehouses, Homes, Theaters, Archives	150
Easy Office Work, Classes	250
Normal Office Work, PC Work, Study Library, Groceries, Show Rooms, Laboratories	500
Supermarkets, Mechanical Workshops, Office Landscapes	750
Normal Drawing Work, Detailed Mechanical Workshops, Operation Theatres	1,000
Detailed Drawing Work, Very Detailed Mechanical Works	1500 - 2000
Performance of visual tasks of low contrast and very small size for prolonged periods of time	2000 - 5000
Performance of very prolonged and exacting visual tasks	5000 - 10000
Performance of very special visual tasks of extremely low contrast and small size	10000 - 20000

ANNEXURE – II

Super Energy efficient BLDC Ceiling Fan

	900 mm	1050 mm	1200 mm	1400 mm
Warranty (Years)	3 Years	3 Years	3 Years	3 Years
Blade Span (mm/inch)	900/36	1050/42	1200/48	1400/56
RPM	450	430	350	270
Service Value	7.1	6.6	7.8	7.7
Input Voltage (V)	140-285	140-285	140-285	140-285
Power Consumption (W)	28	32	28	35
Frequency (Hz)	48-52	48-52	48-52	48-52
Air Delivery (CMM)	200	210	220	270
Power Factor	>0.98	>0.98	>0.98	>0.99
No. of Blades	3	3	3	3
Bearing (Double)	Deep Groove Double Sided Steel Shielding			
Remote Control (12 Keys)	Speed Control, Boost Mode, Timer and Sleep Mode			

Comparison Between Ordinary,5 Star Rated and Super-Efficient Fans

Parameters	Ordinary Fan	5 Star Rated Fan	Super-Efficient Fan
Wattage	75	50	28
RPM (speed)	380	**330**	360-380
CMM (air delivery)	230	**210**	220-230
Power factor	>0.9	>0.95	>0.99
Regulator	Yes	Yes	Not Required (Remote controlled)
Input Voltage	230	230	140-285V
Warranty	1-2 year	1-2 year	3 years
MRP	1300-1600	1800-2500	3690