



DETAILED ENERGY AUDIT REPORT

Year 2024-2025



GOVT. P.G COLLEGE, KHARGONE

Dist.-Khargone, (M.P.) Pin code 451001

CONDUCTED BY:

SABS ENERGY ENVIRO PVT. LTD.

WE BUILD A SOLID FOUNDATION FOR SAVING ENERGY

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Project Title:	Detailed Energy Audit
Organization:	SABS ENERGY ENVIRO PVT. LTD.
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Acknowledgement

SABS ENERGY ENVIRO PVT. LTD. expresses sincere thanks to the management of for inviting SABS ENERGY ENVIRO PVT. LTD. conducts Detailed Energy Audit 2024-2025 of their Premises at Govt. P.G College, Khargone. The field study of this audit was carried out on 13-June-2025.

The officials of Govt. P.G. College, Khargone have coordinated and helped to the audit team during the field study and measurement. SABS ENERGY ENVIRO PVT. LTD. express special thanks to the following persons of Govt. P.G College, Khargone.

Internal Audit Team		
1	Principal	Dr. G.S. Chouhan
2	IQAC & NACC Coordinator	Dr. Vandana Barve

We are also thankful to all other Teachers and staffs for the keen interest shown in this study and the courtesies 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)



ENERGY AUDIT Certificate



This is to certify that **Govt. P.G College, Khargone.** has conducted, Energy audit in the academic year 2024 - 2025 to assess the environmental initiative planning, efforts, activities, implemented in the college campus like Light ,Fan, pump, electrical load ,Conservation of Energy, Energy Management and various Environmental Awareness activities. **SABS ENERGY ENVIRO PVT. LTD.** has verified campus data of **Govt. P.G College, Khargone.** This Energy Audit are also aimed to assess impact of Energy saving initiatives for maintenance of the campus eco-friendly.

Mr. Sanjay Singh

A P: Indian Green Building council Green Building Consultant

EA 1462 Bureau of Energy efficiency

Ministry of Power Govt. of India

Save Energy save Nation





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ABBREVIATION

O&M	Operation and maintenance
kW	Kilo Watt
P.F	Power Factor
kVA	kilo Volt Ampere
kWh	kilowatt Hour
kVAh	kilovolt Amperes Hour
kVAr	kilovolt Amperes Reactive
ACs	Air Conditioners
FTL	Fluorescent Tube Light Lamp
TR	Ton of Refrigeration
SPC	Specific Power Consumption
CMH	Cubic Meter per Hour
STL	Single Tube Light
DTL	Double Tube Light
Amp	Ampere
Volt	Voltage
BLDC	Brushless Direct current
Nos	Numbers
Hrs	Hours
MPPKVVCL	Madhya Pradesh Paschim Kshetra Vidyut Vitaran Company Ltd.



EXECUTIVE SUMMARY

❖ College Details:

Particulars	Units	Details
Name of the College	-	Govt. P.G College, Khargone
Location	-	Khargone (M.P), India
Owner	-	Government
Contact Person	-	Dr. S. Rathor
No. of Shifts	Nos.	1
Daily Operating Hours	Hrs./day	8
Annual Working Days	Days/yr.	300
Source of Electricity	-	MPPKVCL
Total connected maximum Load	kW	63.2 kW
Total Sanctioned Load	(kW)	76.5 kW
Average Energy Charge in per unit	Rs. /kWh	117.3



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

The major equipment's installed in Govt. P.G College, Khargone. Lighting fixtures, Fans and Other appliances

Table 1. Connected Load (kW)

S.N.	Types of Load	Load in kW	Percentage %
1	Lighting System	14.2	22
2	Fan System	12.6	20
3	Pump System	6.7	11
4	AC System	2.94	5
5	Other load	26.80	42
Total Power in kW		63.2	100

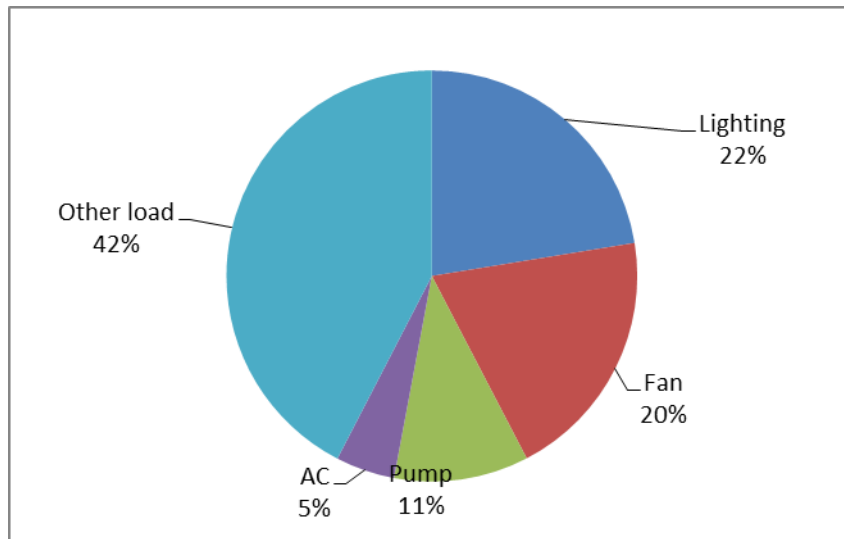


Figure 1. Connected Load details of campus in different zone.

- As per electricity bills observation and analysis, **Total Sanction load is 76.5 kW with 6 Nos. of connection** in College premises. **But 4 Connection With Major Load are Shown in the report.**
- As per electricity bills observation and analysis from **electricity unit (kWh) consume 13531 kWh for** electricity bill in college premises.
- As per electricity bills observation and analysis **Total 12-month bill Paid is Rs. 137656.00**
- As per electricity bills observation and analysis, **electricity bill Power Factor varies from 0.98.**

Note -Please maintain electricity bill logbook properly in record for monitoring and analysis of electricity bill.



b) Proposed Energy Saving Technologies with Cost Economics.

❖ Lighting Load Analysis

- We **appreciate to use LED Lighting luminaries** at some location as per site visit.
- We observed during visit, few Lights were T5/FTL consuming high electricity
- We **are suggesting to purchase 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.
- We will get energy saving approximately **5491 kWh** per year and also will get amount saving approximately **Rs. 45577**.
- As per year by replacing conventional FTL/T5 Tube light with new energy efficient LED Tube light .
- As per data collection and site visit, Total Connected lighting load at College Campus is **14.18 kW**.
- As per data collection and observation, **Total no. of lighting fixture is 549**.

❖ Ceiling Fan Load Analysis

- We observed, most of the Fan was conventional.
- We are recommended to **replace 371 no. of 70 W Ceiling 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 purchase 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 **conducting regular Cleaning and maintenance** of Fan at least in every 6 months to increase performance of Fan.
- We are also suggesting improving their Air delivery of Fan by Replacing New energy efficient BLDC Fan as per 5 stars leveling of Bureau of energy efficiency.
- We will get energy saving approximately **37397 kWh** per year and also will get amount saving approximately **Rs. 654444**.
- per year by replacing conventional Fan with new energy efficient BLDC fan. It observed ,The total load for Ceiling Fan is **12.6 kW** and Total No. of Fan fixtures are **371**.

❖ Pumping System

- It observed during Energy Audit and site visit, **there were water supply pumps**.



❖ 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 regularly.

Saving Highlights

Table 2. Saving Highlights.

Total Amount of savings (kWh)	46147	kWh/Year
Total Amount of savings Rs	8.07	Rs. In Lacs
Total Amount of investments	14.15	Rs. In Lacs
Pay Back Period	21	Months

Summary of Energy Conservation Measures

Table 3. Summary of Energy Conservation Measures

S.No.	Energy Conservation Measures	Annual Savings		Investment	Payback
		kWh	Rs.	Rs.	Months
LED TUBE LIGHT					
1.	Replace 104 no of Existing 40 W FTL / 28 W T5 Tube light with Energy efficient 18 W LED Tube light.	8750	153132	265000	21
CEILING FAN					
2.	Replace 371 no of Existing 70 W Ceiling Fan with Energy efficient Energy Efficient 28 W BLDC Ceiling Fan.	37397	654444	1150100	21
	Total	46,147	807,576	14,15,100	21



CHAPTER-1

INTRODUCTION

1.1 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 programmes 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.

Govt. P.G College, Khargone. has engaged **SABS ENERGY ENVIRO PVT. LTD.** for conducting detailed energy audit in their premises for the year of 2024-25.

1.2 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 Govt. PG College Khargone **(M.P.)** 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 schedule and equipment breakdown, 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.

1.3 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 KUSAMMECO)
- Digital Hygrometer HD-304HTC
- Digital Lux Meter (LX-101A HTCTM)
- Digital Anemometer (AVM -07HTC)
- IR Thermometers for temperature measurement HTC TM (IR -50 to 15500C)
- Digital distance meter
- Measuring Tap meter



CHAPTER-2

SITE VISIT AND INSPECTION

2.1 College Details

Established in **1956 Government Post Graduate College, Khargone**, a renowned institution of higher learning is located in Khargone, Madhya Pradesh. Government Post Graduate College, Khargone offers 14 diverse courses for Degree in Full Time mode. Government Post Graduate College, Khargone offers a range of 3 UG courses. These courses are aimed to provide students with the necessary skills and knowledge in their field of interest. Government Post Graduate College, Khargone has been accredited with **Grade B++** by NAAC. Its a public institute. Candidate can pursue in multiple range of courses like MSW, M.Sc., M.A., M.Com, B.Com, B.A., B.Sc. with the stream of Humanities & Social Sciences, Science and Accounting & Commerce. From introductory courses to more advanced topics, there are a variety of courses to choose from. Institute provides opportunity to students to gain proficiency & expertise in the specialization of Zoology, Botany, Physics, Chemistry, Mathematics. Most importantly, these courses with 1120 seats are imparted at affordable fees, which increase accessibility and allow students to gain knowledge and skills in their chosen field. For students institute has facilities & infrastructure like Auditorium, Boys Hostel, Cafeteria, Girls Hostel, Gym, Hospital / Medical Facilities, Hostel, Labs, Library, Sports Complex, Wi-Fi Campus. The Institute has 2 hostel facilities with capacity of 20 students Institute provides 8 labs facilities for the students

Vision:

The vision of the college is to impart value based quality education that makes the students intellectually fit and socially committed in every realm of life. the student will be encouraged identifying their talents and in developing their talents for the betterment of the self and the society at large.

Mission:

We try to bring up a centre of academic excellence imparting a new spirit of development oriented education suited to the social needs. We ensure quality education through curricular, Co-curricular and extra-curricular activities assuring a peaceful learner, friendly, progressive and democratic ambience. We strive in linking what is learned in classroom to the world at large enabling students to take right attitude and spirit.

2.2 Site visit and site inspection

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

2.3 Power Measurement

Power measurement was done in the campus by the audit team. Power is measured at the meter section.

Power is also measured at the Panels.



CHAPTER-3

ELECTRICITY BILL ANALYSIS

Govt. P.G College, Khargone receives power from, Madhya Pradesh Paschim Kshetra Vidyut Vitran Company Limited.

3.1 Month Wise Energy Consumption

The maximum demand, energy consumption, fixed charges, energy charges and total bill in Rs.40,998 for the academic year 2024-2025 are showing 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. College Installed 25kWp Solar PV Roof Top System which generated approximately 55508 kWh annually.

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-1 Govt. College, Khargone - IVRS- N3746046133

Monthly Electricity bill detail Govt. PG College Khargone-Apr 2024 to Mar-2025 IVRS-N3746046133									
Months	Sanctioned Load (kW)	MDI	kWh	Fixed charges (Rs)	Energy Charges (Rs)	Power Factor	Total bill (Rs)	Average Per unit Charges Rs/kWh	Solar generation
Apr-24	52	12.96	341.22	12925	6760	0.82	19682	57.7	4979.34
May-24	52	0.72	88.98	12925	6760	0.55	19699	221.4	9372.06
Jun-24	52	10.44	173	12925	6760	0.83	18446	106.6	
Jul-24	52	4.68	67.2	12925	6760	0.71	16426	244.4	6318.42
Aug-24	52	8.52	144.12	12925	6760	0.65	16649	115.5	6190.38
Sep-24	52	9	169.86	12925	6760	0.79	16431	96.7	5722.86
Oct-24	52	9.36	273	12925	6760	0.77	19685	72.1	5349.12
Nov-24	52	7.44	247.08	12925	6760	0.80	19522	79.0	3923.88
Dec-24	52	5.16	128.04	12925	6760	0.72	18181	142.0	3450.12
Jan-25	52	7.56	196.62	12925	6760	0.75	18376	93.5	2706.12
Feb-25	52	7.08	217.62	12925	6760	0.83	18574	85.4	2986.98
Mar-25	52	7.2	247.86	12925	6760	0.82	19685	79.4	4508.70

Figure 2. Per Unit Charges of IVRS- N3746046133

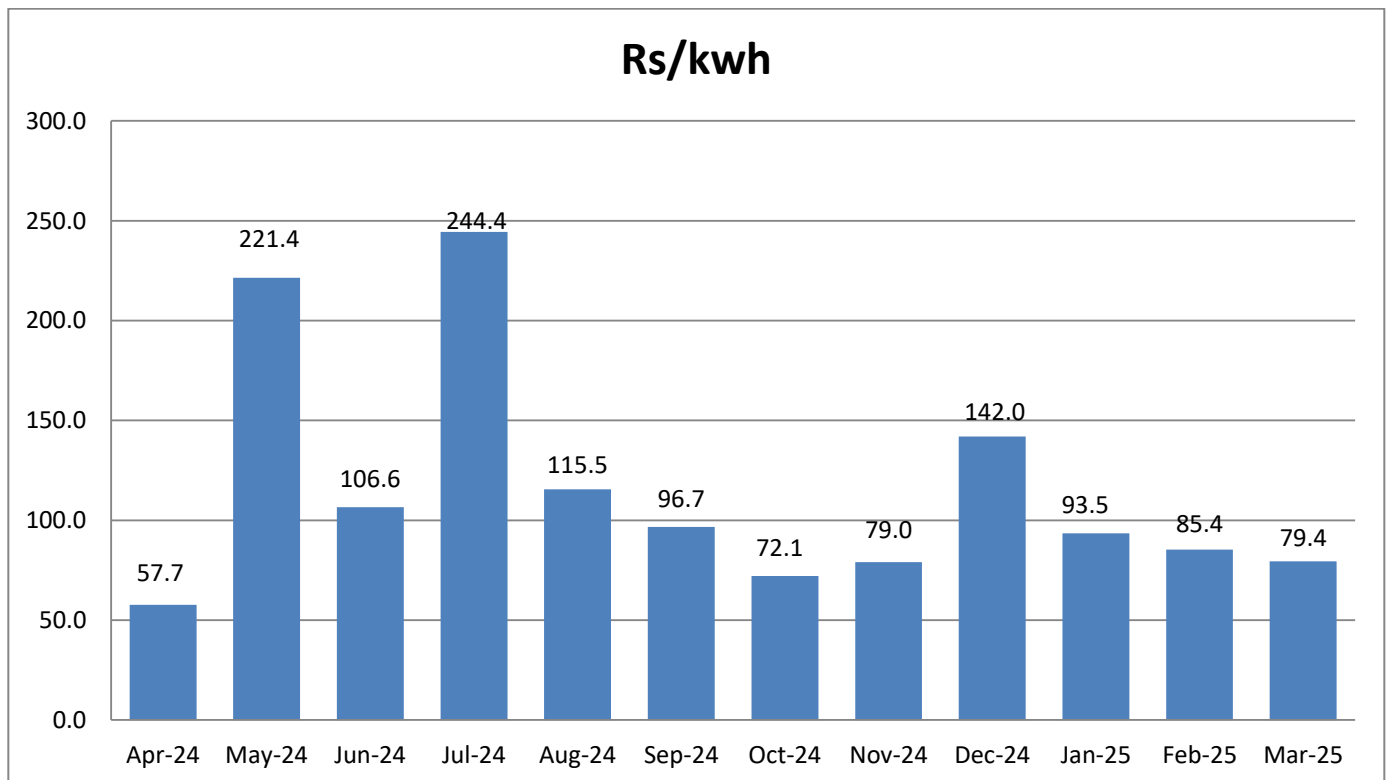




Table 5. Electricity Bill-2 Govt. College, Khargone - IVRS- N3746046168: Zero Electricity bill

Figure 3. Per Unit Charges of IVRS- N3746046168

Table 6. Electricity Bill-3 Govt. College, Khargone - IVRS- N3746047382

Monthly Electricity bill detail Govt. PG College Khargone-Apr 2024 to Mar-2025 IVRS-N3746047382									
Months	Sanctioned Load (kW)	MDI	kWH	Fixed charges (Rs)	Energy Charges (Rs)	Power Factor	Total bill (Rs)	Average Per unit Charges Rs/kWh	Solar Generation
Apr-24	10	10	694.664	1380	5418.38	0.90	6552	9.4	0.00
May-24	10	10.2	857.32	1380	6687.1	0.89	8241	9.6	0.00
Jun-24	10	10.28	676.406	1380	5275.97	0.89	6710	9.9	0.00
Jul-24	10	9.78	709.41	1380	5533.4	0.88	5148	7.3	0.00
Aug-24	10	13.08	637.344	1835.4	4971.28	0.88	5084	8.0	0.00
Sep-24	10	12.16	962.496	1656	7507.47	0.93	7219	7.5	0.00
Oct-24	10	13.2	766.41	1835.4	5973	0.92	7600	9.9	0.00
Nov-24	10	8.02	666.664	1380	5199.98	0.92	6112	9.2	0.00
Dec-24	10	0	639	0	0	0.00	0	0.0	0.00
Jan-25	10	11.8	749.344	1656	5844.88	0.90	7413	9.9	0.00
Feb-25	10	12.46	643.47	1656	5019.07	0.89	6487	10.1	0.00
Mar-25	10	12.68	913.646	1835.4	7126.44	0.92	8720	9.5	0.00
							75286		

Figure 4 Per Unit Charges of IVRS- N3746047382

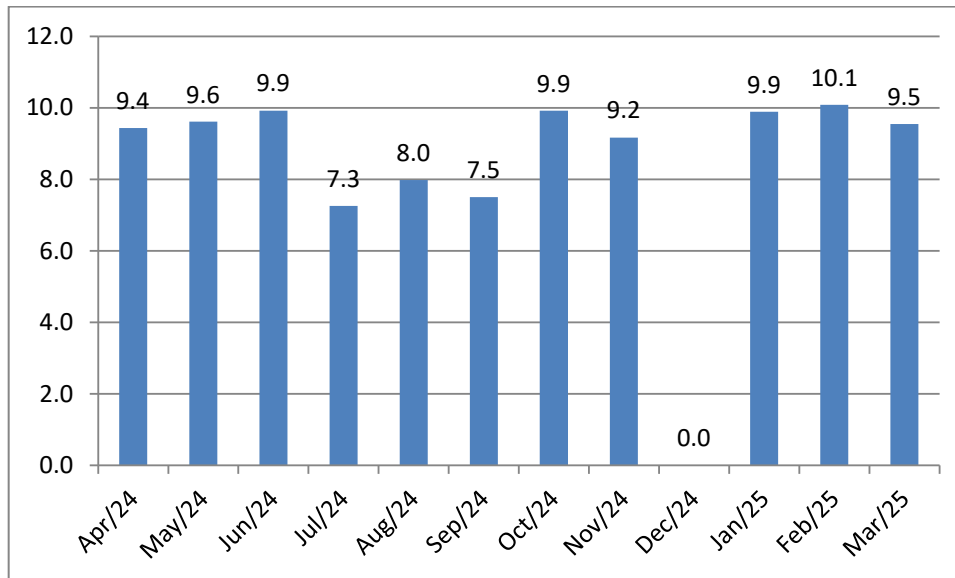




Table 7. Electricity Bill-4 Govt. College, Khargone - IVRS- N3746046180

Monthly Electricity bill detail Kul Sachiv Krantisurya Khargone-Apr 2024 to Mar-2025 IVRS-N3746046180									
Months	Sanctioned Load (KW)	MDI	KWH	Fixed charges (Rs)	Energy Charges (Rs)	Power Factor	Total bill (Rs)	Average Per unit Charges Rs/KWh	Solar Consumption
Apr-24	6.5	2.98	162	1092	1053	0.99	2086	12.9	
May-24	6.5	2.68	151	1092	987	0.98	3461	0	
Jun-24	6.5	2.24	199	1092	1293	0.97	2345	11.8	
Jul-24	6.5	2.28	209	1092	1363	0.97	2384	11.4	
Aug-24	6.5	2.86	219	1092	1429	0.98	2462	11.2	
Sep-24	6.5	2.64	188	1092	1225	0.98	2285	12.2	
Oct-24	6.5	2.18	223	1092	1453	0.99	2462	11	
Nov-24	6.5	2.04	200	1092	1301	0.98	2306	11.5	
Dec-24	6.5	2.44	186	1092	1209	0.98	2222	11.9	
Jan-25	6.5	2.32	209	1092	1362	0.98	2331	0	
Feb-25	6.5	2.38	182	1092	1186	0.98	2154	11.8	
Mar-25	6.5	2.38	193	1092	1256	0.99	2204	11.4	

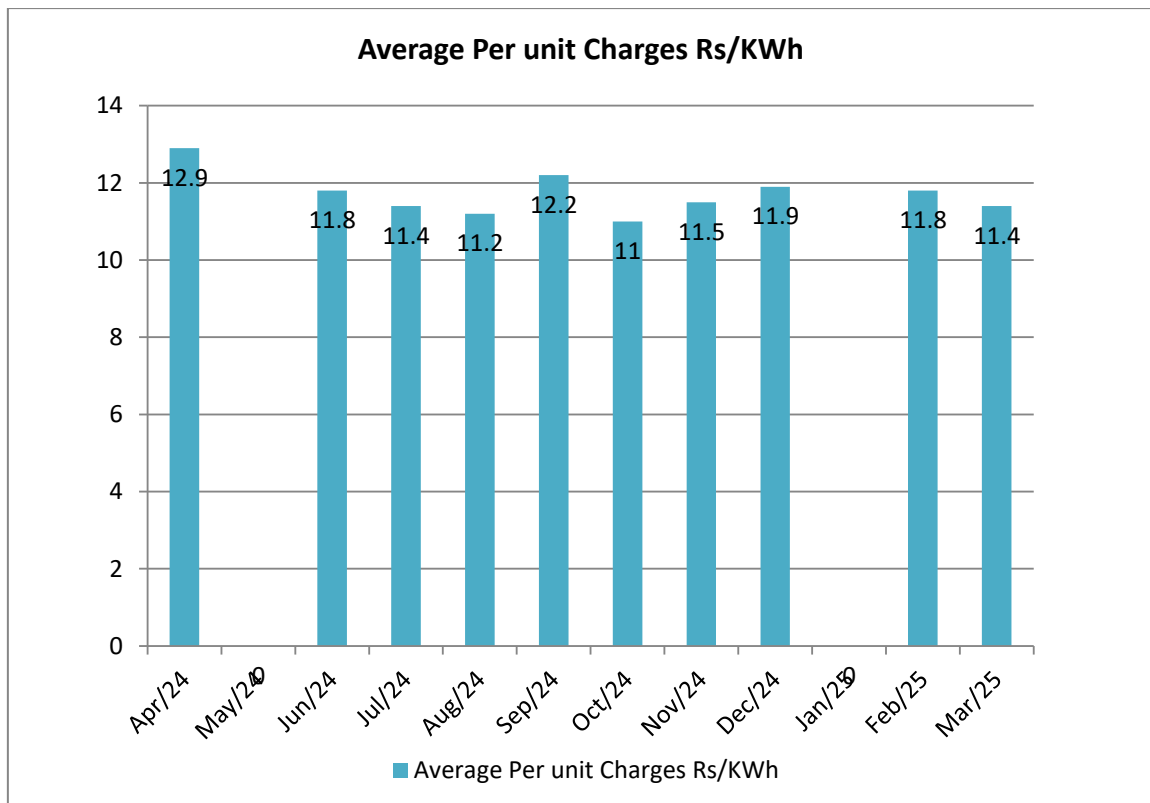


Figure 5 Per Unit Charges of IVRS- N3746047382



3.2 Observations & Comments:

- As per electricity bills observation and analysis, **Total Sanction load is 76.5 kW with 6 Nos. of connection** in College premises. **But 4 Connection With Major Load are Shown in the report.**
- As per electricity bills observation and analysis from **electricity unit (kWh) consume 13531 kWh for** electricity bill in college premises.
- AS per Electricity bill **55508 kwh unit generated through Solar Photovoltaic power system.**
- As per electricity bills observation and analysis **Total 12-month bill Paid is Rs. 137656.00**
- As per electricity bills observation and analysis, **electricity bill Power Factor varies from 0.98.**



Figure 6 Solar PV Roof Top System



Figure 7 Solar PV Roof Top System



CHAPTER - 4

LIGHTING LOAD ANALYSIS

4.1 Details of Lighting Load analysis

The Govt. College, Khargone. 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 8. Different type of lighting fixture

Sr. No.	Location	Location of Fixtures	Types of Lighting	No. of Lighting fixture	Power (W)	Total Power (W)	Lux Level
1	Front Building Ground Floor						
		Room No 1	FTL	8	40	320	80-120
		Room No 2	FTL	4	40	160	690-730
		Room No 3 , LAB1,LAB2	FTL	4	40	160	130-150
		Room No 4	FTL	5	40	200	83-123
		Room No 5	FTL	3	40	120	225-300
		Room No 6	T5	8	28	224	392-432
		Room No 7	T5	21	28	588	120-180
		Dark Room	T5	8	28	224	150-200
		Room No 10	FTL	7	40	280	150-200
		Room No 11	FTL	2	40	80	150-200
		Room No 12 & 13	FTL	11	40	440	150-200
		Room No 18	FTL	16	40	640	150-200
		Room No 21	T5	9	28	252	150-200
		Room No 20	T5	9	28	252	150-200
		Room No 24	6*6	12	15	180	118-148
		Room No 2	LED TL	3	20	60	690-730
		Room No 3	LED TL	13	20	260	150-200
		Store Room	LED TL	4	28	112	83-123
		Room No 5	LED TL	1	20	20	150-200
		Room No 6	LED TL	16	20	320	392-432
		Room No 7	LED	4	20	80	150-200
		Corridor	LED	7	20	140	150-200
		Room No 11	LED BULB	1	9	9	150-200
		Room No 12 & 13	LED	2	20	40	150-200
		Room No 15	LED TL	2	20	40	150-200
		Room No 15	LED BULB	2	9	18	150-200
Room No 18	LED	11	20	220	150-200		



Sr. No.	Location	Location of Fixtures	Types of Lighting	No. of Lighting fixture	Power (W)	Total Power (W)	Lux Level
		Room No 21	LED	1	20	20	150-200
		Room No 25	LED	12	20	240	150-200
		Room No 26	T5	6	28	168	150-200
		Room No 26	LED	2	20	40	150-200
		English Dept.	FTL	9	40	360	116-146
		English Dept.	LED	7	20	140	116-146
		HALL	2*2	22	36	792	150-200
		HALL	Flood Light	2	50	100	150-200
		HALL	FTL	7	40	280	150-200
		HALL	LED	3	20	60	150-200
		1 st Floor	FTL	2	40	80	150-200
		1 st Floor	LED	4	20	80	150-200
		Room No 27	T5	18	28	504	150-200
		Room No 29	T5	12	28	336	150-200
		Room No 30	T5	11	28	308	150-200
		Room No 31	T5	11	28	308	150-200
		Room No 32	T5	14	28	392	150-200
		Room No 33	T5	19	28	532	150-200
		Room No 34	T5	17	28	476	150-200
		Room No 35	D LIGHT	15	15	225	150-200
		Room No 35	LED TL	2	20	40	150-200
		Room No 36	DL	19	15	285	145-185
		Corridor	DL	17	15	255	150-200
		Corridor	LED	5	20	100	150-200
		Room No 37	T5	3	28	84	150-200
		Room No 37	LED	3	20	60	150-200
		Room No 38	T5	6	28	168	150-200
		Room No 38	LED	2	20	40	150-200
		Room No 39	LED	8	20	160	150-200
		Room No 40	LED	8	20	160	150-200
		Room No 46	T5	3	28	84	150-200
		Room No 46	LED	3	20	60	150-200
		Room No 45	T5	4	28	112	150-200
		Room No 45	LED	2	20	40	150-200
		Corridor	LED	4	20	80	150-200
		Room No 47	LED	3	20	60	150-200
		Room No 47	T5	3	28	84	150-200
		Room No 48	LED	4	20	80	150-200



Sr. No.	Location	Location of Fixtures	Types of Lighting	No. of Lighting fixture	Power (W)	Total Power (W)	Lux Level
		Room No 48	TL	3	40	120	150-200
		Room No 49	TL	3	40	120	150-200
		Room No 50	FTL	4	40	160	150-200
		Room No 51	FTL	1	40	40	150-200
		Corridor	LED	4	20	80	150-200
		Computer Dept.	LED	4	20	80	150-200
		U.G LAB	6*6	12	15	180	150-200
		P.G LAB	6*6	15	15	225	150-200
		Vivekand yuva	LED	12	20	240	150-200
		Corridor	LED	5	20	100	150-200
Total Power Consumption in kW			14.177				
Total no. of Lighting Fixture			549				



Figure 8 Lux Measurement at Site.

4.2 Observations & Comments :

- We appreciate to use **LED Lighting luminaries** at some location as per site visit.
- We observed during visit, few Lights were T5/FTL consuming high electricity
- We are suggesting to purchase 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.
- We will get energy saving approximately **5491 kWh** per year and also will get amount saving approximately **Rs. 45577**.
- As per year by replacing conventional FTL/T5 Tube light with new energy efficient LED Tube light .
- As per data collection and site visit, Total Connected lighting load at College Campus is **14.18 kW**.
- As per data collection and observation, **Total no. of lighting fixture is 549**.



LED TUBE LIGHT PROPOSAL

Proposal 1

Quotation for replacement of 182 Nos. existing 28 W T5 tube light with Energy efficient Energy Efficient 18 W LED Tube light in College.

Energy Saving	
Total no of Approximate 28 W T5	182
Replacement of 28 Watt T5 with capacity of 18 Watt LED	18
Average daily running time for 20 Watt T5 in hour	8
Total Energy Consumed by 28 W T5	28
Total Energy Consumed by 182 no. of 28 Watt T5 kWh per day	40.8
Annual Energy Consumed by 28 Watt T5 (300 working Days) kWh	12230.4
Annual Energy Consumed by 182 no. of 18 Watt LED in kWh	7862
Prospective Annual Energy Savings in kWh	4368
Annual Savings in Rupees (taking Average Rs.117.5 Per unit charge for 300 day a year)	76440
Initial investment required for 182 no. of 18 Watt LED (Price for @ 1000 per 18 Watt)	182000
Payback Period in months only	29
Life of the project years	15
Depreciation Cost Rs	12133.3
ROI {(Net annual savings - Depreciation cost)/ Investment} x 100%	35

Proposal 2

Quotation for replacement of 83 Nos. existing 40 W FTL tube light with Energy efficient Energy Efficient 18 W LED Tube light in College.

Energy Saving	
Total no of Approximate 40 W FTL	83
Replacement of 40 Watt FTL with capacity of 18 Watt LED	18
Average daily running time for 40 Watt FTL in hour	8
Total Energy Consumed by 40 W FTL	40
Total Energy Consumed by 83 no. of 40 Watt FTL kWh per day	26.6
Annual Energy Consumed by 40 Watt FTL (300 working Days) kWh	7968
Annual Energy Consumed by 83 no. of 18 Watt LED in kWh	3586
Prospective Annual Energy Savings in kWh	4382
Annual Savings in Rupees (taking Average Rs.117.5 Per unit charge for 300 day a year)	76692
Initial investment required for 83 no. of 18 Watt LED (Price for @ 1000 per 18 Watt)	83000
Payback Period in months only	13
Life of the project years	15
Depreciation Cost Rs	5533.3
ROI {(Net annual savings - Depreciation cost)/ Investment} x 100%	86



CHAPTER-5 FAN LOAD ANALYSIS

The various ceiling fan installed at various location in the Govt. P.G College, Khargone. and they also contribute very high electricity consumption. All of the fans are conventional and hence high energy consuming.

5.1 Details of Different type off Fans :

The detail of the fans is given in the below table:

Table 9. Different type of Fan

Sr. No.	Location	Location of Fan	Types of Fan	No.of Fan	Power (W)	Total Power (W)
1	Front Building Ground Floor	Room No 1	Fan	6	70	420
		Room No 1	Pedestal Fan	1	450	450
		Room No 1	Cooler	1	NA	
		Room No 2	Ceiling Fan	4	70	280
		Room No 2	Ext. Fan	1	55	55
		Room No 3	Ceiling Fan	13	70	910
		Room No 3	Ext. Fan	3	55	165
		Room No 4	Ext. Fan	6	55	330
		Room No 4	Ceiling Fan	18	70	1260
		Store	Ceiling Fan	3	70	210
		Store	Ext. Fan	3	55	165
		Room No 5	Ceiling Fan	3	70	210
		Room No 5	Exhaust fan	2	55	110
		Room No 6	Ceiling Fan	16	70	1120
		Room No 6	Ext. Fan	2	55	110
		Room No 6	Pedestal Fan	1	450	450
		Dark Room	Ceiling Fan	4	70	280
		Room No 7	Ceiling Fan	16	70	1120
		Room No 7	Ext. Fan	2	55	110
		Corridor	Ceiling Fan	4	70	280
		Room No 10	Ext. Fan	1	55	55
		Room No 11	Ceiling Fan	2	70	140
		Room No 12 & 13	Ceiling Fan	2	70	140
		Room No 14	Ceiling Fan	4	70	280
		Room No 15	Ceiling Fan	1	75	75
		Room No 15	Ceiling Fan	2	60	120
		Room No 18	Ceiling Fan	29	70	2030
Room No 21	Ceiling Fan	6	70	420		
Room No 20	Ceiling Fan	6	70	420		



Sr. No.	Location	Location of Fan	Types of Fan	No.of Fan	Power (W)	Total Power (W)
		Room No 24	Ceiling Fan	6	70	420
		Room No 25	Ceiling Fan	5	70	350
		English Dept.	Ceiling Fan	7	70	490
		Hall	Wall Fan	17	180	3060
		Hall	Ceiling Fan	12	70	840
		1st Floor	Ceiling Fan	3	70	210
		Room No 27	Ceiling Fan	9	70	630
		Room No 29	Ceiling Fan	9	70	630
		Room No 30	Ceiling Fan	9	70	630
		Room No 31	Ceiling Fan	9	70	630
		Room No 32	Ceiling Fan	4	70	280
		Room No 33	Ceiling Fan	18	70	1260
		Room No 34	Ceiling Fan	14	70	980
		Room No 36	Ceiling Fan	6	70	420
		Corridor	Ceiling Fan	3	70	210
		Room No 37	Ceiling Fan	4	70	280
		Room No 38	Ceiling Fan	4	70	280
		Room No 39	Ceiling Fan	4	70	280
		Room No 40	Ceiling Fan	4	70	280
		Room No 46	Ceiling Fan	6	70	420
		Room No 45	Ceiling Fan	6	70	420
		Room No 47	Ceiling Fan	4	70	280
		Room No 48	Ceiling Fan	4	70	280
		Room No 49	Ceiling Fan	4	70	280
		Room No 50	Ceiling Fan	2	70	140
		Room No 51	Ceiling Fan	1	70	70
		Computer Dept.	Ceiling Fan	2	70	140
		P.G Lab	Ceiling Fan	15	70	1050
		Vivekand Yuva	Ceiling Fan	18	70	1260
Total Power Consumption in kW			12.6			
Total no. of Fan Fixture			371			

5.2 Observations & Comments



- We observed, most of the Fan was conventional.
- We are recommended to **replace 371 no. of 70 W Ceiling 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 **conducting regular Cleaning and maintenance** of Fan at least in every 6 months to increase performance of Fan.
- We are also suggesting improving their Air delivery of Fan by Replacing New energy efficient BLDC Fan as per 5 stars leveling of Bureau of energy efficiency.
- We will get energy saving approximately **37397 kWh** per year and also will get amount saving approximately **Rs. 654444**.
- per year by replacing conventional Fan with new energy efficient BLDC fan. It observed ,The total load for Ceiling Fan is **12.6 kW** and Total No. of Fan fixtures are **371**.

CEILING FAN PROPOSAL

Energy Saving	
Total no of Approximate 70 W Ceiling Fan	371
Replacement of 70 Watt Ceiling Fan with capacity of 28 Watt BLDC Fan	28
Average daily running time for 70 Watt Ceiling Fan in hour	8
Total Energy Consumed by 70 W Ceiling Fan	70
Total Energy Consumed by 371 no. of 70 Watt Ceiling Fan kWh per day	207.76
Annual Energy Consumed by 70 Watt Ceiling Fan (300 working Days) kWh	62328
Annual Energy Consumed by 371 no. of 28 Watt Ceiling Fan in kWh	24931
Prospective Annual Energy Savings in kWh	37397
Annual Savings in Rupees (taking Average Rs. 117.5 Per unit charge for 300 day a year)	654444
Initial investment required for 371 no. of 28 Watt Ceiling Fan(Price for BLDC Fan @ 3100 per 28 Watt)	1150100
Payback Period in months only	21
Life of the project years	15
Depreciation Cost Rs	76673
ROI {(Net annual savings – Depreciation cost)/ Investment} x 100%	50



CHAPTER - 6

OTHER EQUIPMENTS LOAD

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

6.1 Different Type Other Equipment's

Table 10. Different type of equipment system

Other Equipments Govt. College Khargone					
Sr. No.	Location	Type of Product	Number of Product	Power (Watts)	Total Power (Watts)
1		PC	174	100	17400
2		Printer	8	650	5200
3		Fridge	4	350	1400
4		Water cooler	2	575	1150
5		Projector	3	200	600
6		Digital Board	1	500	500
7		Photocopy Machine	1	550	550
Total Load in kW					26.8

6.2 Observations &Comments

- It observed ,Total Other Connected load 26.8 kW.
- 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.



CHAPTER -7

PUMPING LOAD ANALYSIS

7.1 Pumping Load Analysis

There were 3 install water supply pumps .

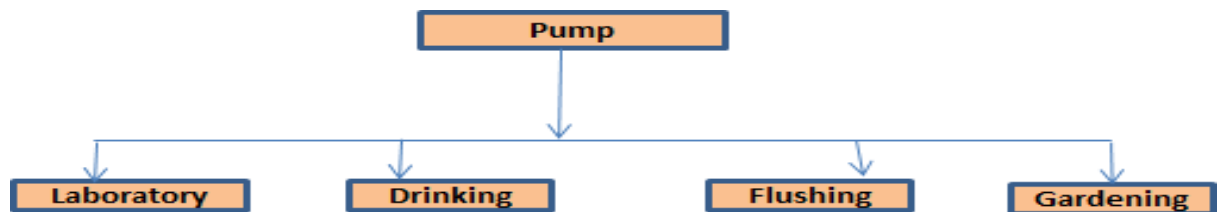


Table 11. Major usage area of pump

Pumps Details:

Pump Details Govt. College, Khargone						
Sr. No.	Location	Location of Pump	Types of Pumps	No. of Pump	Power (HP)	Total Power (KW)
1	College Campus	Back side	Submersible Pump	03	3	6.7
Total Power in kW						6.7

Observation and Comments:

- We observed during Energy Audit and site visit, **3 Pumps, of Capacity 3 HP within** College campus for drinking water, Flushing and gardening purpose.
- Power consumption of 3 HP pump was 6.7 as per site visit and measurement.
- We are suggesting purchasing **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 installing Solar Pumping system and** will get huge amount of saving



CHAPTER-8

ANNEXURES

9.1 Annexure – 1 General Tips For Energy Conservation In Different Utilities Systems

Electricity:

- Schedule your operations to maintain a high load factor
- Minimize maximum demand by tripping loads through a demand controller
- Use standby electric generation equipment for on-peak high load periods.
- Correct power factor to at least 0.99 under rated loads conditions.
- Set transformer taps to optimum settings.
- Shut off unnecessary computers, printers, and copiers at night.

Motors:

- Properly size to the load for optimum efficiency.
- (High efficiency motors offer of 4 - 5% higher efficiency than standard motors)
- Check alignment.
- Provide proper ventilation
- (Forevery10°C increase in motor operating temperature over recommended peak, the motor life is estimated to be halved)
- Check for under-voltage and over-voltage conditions.
- Balance the three-phase power supply.
- (An Imbalanced voltage can reduce 3 - 5% in motor input power)
- Demand efficiency restoration after motor rewinding.

Fans:

- Use smooth, well-rounded air inlet cones for fan air intakes.
- Avoid poor flow distribution at the fan inlet.
- Minimize fan inlet and outlet obstructions.
- Clean screens, filters, and fan blades regularly.
- Use aero foil-shaped fan blades.
- Minimize fan speed.
- Use variable speed drives for large variable fan loads.



Pumps:

- ❑ Operate pumping near best efficiency point.
- ❑ Modify pumping to minimize throttling.
- ❑ Adept to wide load variation with variable speed drives or sequenced control of smaller units.
- ❑ Stop running both pumps -- add an auto-start for an on-line spare or add a booster pump in the problem area.
- ❑ Use booster pumps for small loads requiring higher pressures.
- ❑ Increase fluid temperature differentials to reduce pumping rates.
- ❑ Repair seals and packing to minimize water waste.
- ❑ Balance the system to minimize flows and reduce pump power requirements.
- ❑ Use siphon effect to advantage: don't waste pumping head with a free-fall (gravity) return.

Lighting:

- ❑ Reduce excessive illumination levels to standard levels using switching; decamping, etc. (Know the electrical effects before doing decamping.)
- ❑ Aggressively control lighting with clock timers, delay timers, photocells, and/or occupancy sensors.
- ❑ Install efficient alternatives to incandescent lighting, mercury vapor lighting, etc. Efficiency (lumens/watt) of various technologies range from best to worst approximately as follows: low pressure sodium, high-pressure sodium, metal halide, fluorescent, mercury vapor, incandescent.
- ❑ Select ballasts and lamps carefully with high power factor and long-term efficiency in mind.
- ❑ Upgrade obsolete fluorescent systems to Compact fluorescents and electronic ballasts
- ❑ Consider lowering the fixtures to enable using less of them.
- ❑ Consider day lighting, skylights, etc.
- ❑ Consider painting the walls a lighter color and using less lighting fixtures or lower wattages.
- ❑ Use task lighting and reduce background illumination.
- ❑ Re-evaluate exterior lighting strategy, type, and control. Control it aggressively.
- ❑ Change exit signs from incandescent to LED.



DG Sets:

- Optimize loading
- Use waste heat to generate steam/hot water /power an absorption chiller or preheat process or utility feeds.
- Clean air filters regularly
- Insulate exhaust pipes to reduce DG set room temperatures
- Use cheaper heavy fuel oil for capacities more than 1MW

Buildings:

- Seal exterior cracks/openings/gaps with caulk, gasketing, weather stripping, etc.
- Consider new thermal doors, thermal windows, roofing insulation, etc.
- Install windbreaks near exterior doors.
- Replace single-pane glass with insulating glass.
- Consider covering some window and skylight areas with insulated wall panels inside the building.
- If visibility is not required but light is required, consider replacing exterior windows with insulated glass block.
- Consider tinted glass, reflective glass, coatings, awnings, overhangs, draperies, blinds, and shades for sunlit exterior windows.
- Use landscaping to advantage.
- Add vestibules or revolving doors to primary exterior personnel doors.
- Use intermediate doors in stairways and vertical passages to minimize building stack effect.
- Use dock seals at shipping and receiving doors.
- Bring cleaning personnel in during the working day or as soon after as possible to minimize lighting and HVAC costs.

Waste & Waste water:


- Recycle water, particularly for uses with less-critical quality requirements.
- Recycle water, especially if sewer costs are based on water consumption.
- Balance closed systems to minimize flows and reduce pump power requirements.
- Eliminate once-through cooling with water.
- Use the least expensive type of water that will satisfy the requirement.
- Fix water leaks.
- Test for underground water leaks. (It's easy to do over a holiday shutdown.)
- Check water overflow pipes for proper operating level.




9.2 Annexure – 2 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

9.3 Annexure – 1 Energy saver for air conditioning system



PATENT PUBLISHED

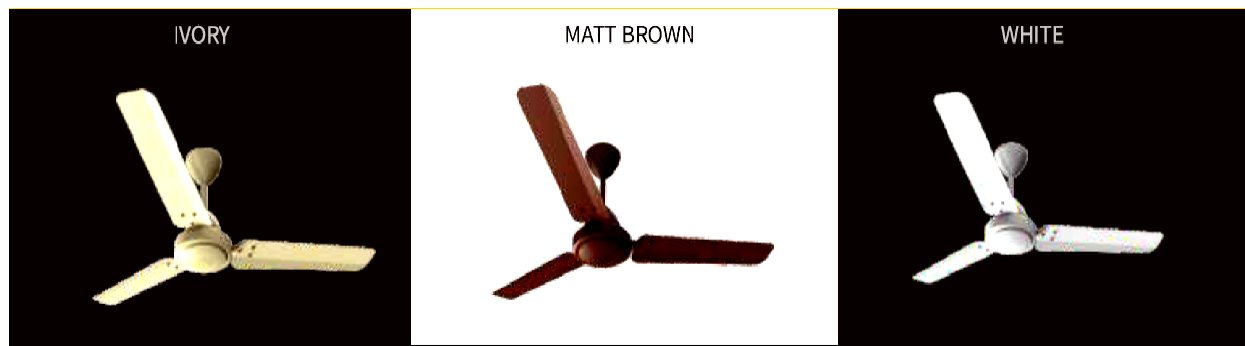


Airtron is the World's First & Only Programmable, Dual-Sensor Driven Microprocessor which saves up to 35% Electricity on all Air Conditioners with Precision Control of Set Temperature and a payback of barely 4-6 months.

IMPORTANT VALIDATIONS				
N.B. The Set Temp. was the Same WITH / WITHOUT the Airtron.				
SL. NO.	NAME OF THE COMPANY	COUNTRY	AC TYPE	SAVINGS
1	ENERGY EFFICIENCY SERVICES LTD . (EESL GOVT. OF INDIA)	INDIA	SPLIT	44.00%
2	L.G. ELECTRONICS INDIA LTD.	INDIA	SPLIT (INVERTER)	26.00%
3	VIDEOCON TELECOM	INDIA	SPLIT	20.00%
4	TATA COMMUNICATION LTD.	INDIA	SPLIT	28.30%
5	LARSEN & TOUBRO LTD.	INDIA	SPLIT	25.80%
6	TATATELE SERVICES LTD.	INDIA	SPLIT	33.00%
7	TATA POWER LTD.	INDIA	SPLIT	37.50%
8	ASHOK LEYLAND LTD.	INDIA	WINDOW	29.40
9	ZENITH ENERGY (BEE, ACCREDITED ENERGY AUDITOR)	INDIA	SPLIT	37.00%
10	ACCENTURE SERVICES PVT. LTD.	INDIA	SPLIT	37.00%
11	M/S. UNIC MAGNATE	INDIA	SPLIT	58.00%
12	SATURN PYRO (UTIM REGISTRATION OFFICE)	MALAYSIA	CEILING-SPLIT	36.00%
13	SATURN PYRO (AT MALAYSIA POLICE H.Q.)	MALAYSIA	WALL -SPLIT	34.00%
14	CPE ENERGY SDN BHD	MALAYSIA	SPLIT	57.00%

9.4 Annexure – 1 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 (Remotecontrolled)
Input Voltage	230	230	140-285V
Warranty	1-2 year	1-2 year	3 years
MRP	1300-1600	1800-2500	3690





