

# ENERGY AUDIT REPORT

YEAR 2022-23



**VIJYARAJE GOVT. GIRLS COLLEGE MORAR, DISTT.  
GWALIOR (M.P.)**

**CONDUCTED BY:**



**SABS ENERGY ENVIRO PVT.LTD**

(Empaneled with Madhya Pradesh Urja Vikas Nigam Ltd. – A Govt. Undertaking)

**WE BUILD A SOLID FOUNDATION FOR SAVING ENERGY**

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## ACKNOWLEDGEMENT

**SABS ENERGY ENVIRO PVT. LTD.** is thankful to 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 30 January 2023.

The officials of **VIJYARAJE GOVT. GIRLS COLLEGE MORAR, GWALIOR (M.P.)** coordinated and helped the audit team during the field study and assessment. **SABS ENERGY ENVIRO PVT. LTD.** expresses special thanks to the following persons of **VIJYARAJE GOVT. GIRLS COLLEGE MORAR, GWALIOR (M.P.)**

1	Principal	<b>Dr. Sushila Mahor</b>
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6	Prof. – Physics	<b>Mr. R.K. Dandoliya</b>

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**

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**Certified Energy Auditor**

**M. Tech (Energy Management)**



**SABS ENERGY ENVIRO PVT. LTD.**

Sr. No. SABS/EA/23-24/501

Dated 14/05/2023

## Certificate



This is to certify that **VIJYARAJE GOVT. GIRLS COLLEGE MORAR, GWALIOR (M.P.)** has conducted, Energy Audit in the academic year 2022 - 2023 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 **VIJYARAJE GOVT. GIRLS COLLEGE MORAR, GWALIOR (M.P.)** This Energy Audit also aims to assess impact of energy initiatives for maintenance of eco-friendly campus.

Mr. Sanjay Singh

**EA-1462**

**CERTIFIED ENERGY AUDITOR, BEE**

Bureau of Energy Efficiency

Ministry of Power Govt. of India



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*Figure 1: Electricity Connected Load details of campus in different Zone*

*Figure 2: Vijayaraje Govt. Girls College Morar, Gwalior,*

*Figure 3: Vijayaraje Govt. Girls College Morar, Gwalior, Lux Measurement*

*Figure 4: Vijayaraje Govt. Girls College Morar, Gwalior, PV Solar System*

## EXECUTIVE SUMMARY

### College Details:

Particulars	Units	Details
Name of the College	-	<b>VIJYARAJE GOVT. GIRLS COLLEGE MORAR, GWALIOR (M.P.),</b>
Location	-	Morar, Distt. Gwalior (M.P), India
Owner	-	Government
Contact Person	-	Dr. S.K. Shrivastava
No. of Shifts	Nos.	1
Daily Operating Hours	Hrs./day	8
Annual Working Days	Days/yr.	300
Source of Electricity	-	MPPKVVCL
Total connected maximum Load	kW	98
Total Sanctioned Load	(kW)	110
Average Energy Charge in perunit	Rs./kWh	10.17

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

The major equipment installed **VIJYARAJE GOVT. GIRLS COLLEGE MORAR, GWALIOR (M.P.)**, like Lighting fixtures, Fans and other appliances.

1. **Table 1: Connected Load (kW)**

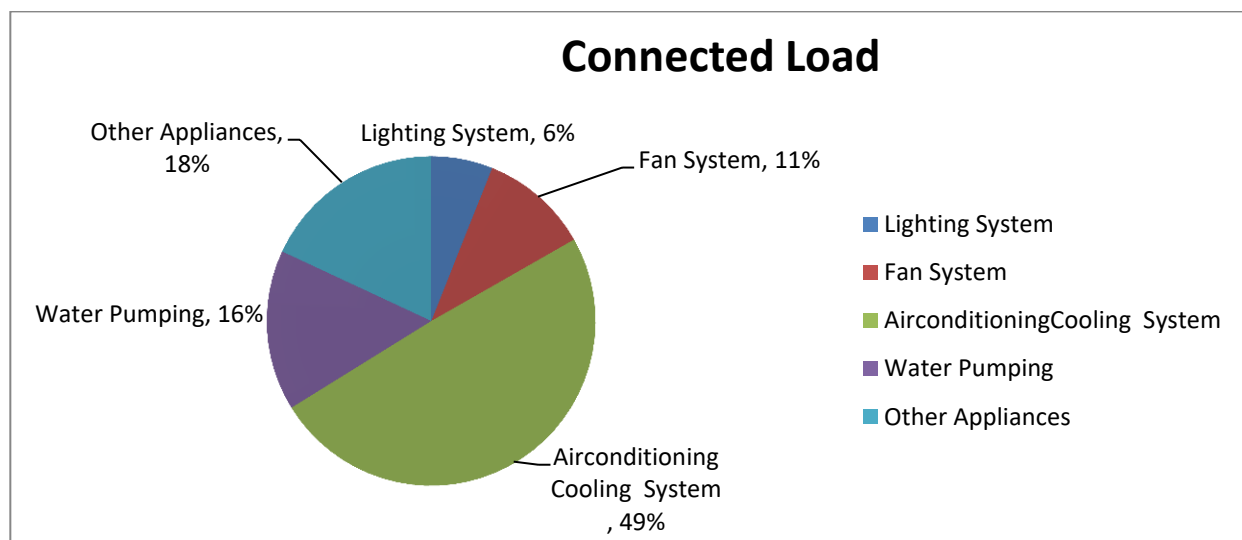


Figure 1: Electricity Connected Load details of campus in different zone

- As per electricity bills observation and analysis, Total Sanction load is 110 kW in College premises.
- As per electricity bills observation and analysis, **electricity bill Power Factor various 0.96 to 0.99.**
- We observed that maximum load of Air Condition & Exhaust fan etc.
- College using day light in very efficiently.

### b) Proposed Energy Saving Technologies with Cost Economics

#### ❖ Lighting System

- We **suggest using LED Lighting luminaries** at some location as per site visit.
- We **are suggesting to purchase all electrical** equipment as per star leveling program by Bureau of energy efficiency, which will get huge amount of electricity saving.

- We are suggesting conducting 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 **5.12 kW**.
- As per data collection and observation, **Total no. of lighting fixture is 175**.

#### ❖ *Ceiling and Exhaust Fan System*

- We are **suggesting to purchase new energy efficient BLDC fan as per Star leveling program by Bureau of Energy Efficiency, which 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 Fans at least in every 6 months to increase performance of Fan.
- We are also suggesting improving the Air delivery of Fans by replacing the existing ones with new energy efficient BLDC Fans as per 5 stars leveling of Bureau of energy efficiency.
- The total load for Ceiling and exhaust Fan is **10.50 kW**.
- Total No. of Fan fixtures are **167**.

#### ❖ *Pumping System*

- We observed during Energy Audit and site visit, **2 Pump of Capacity 5 & 3 HP within** College campus for drinking water, Flushing and gardening purpose.
- Power consumption of both pump was **15.44 kW as** per site visit and measurement.
- We are suggesting purchasing **5 star rated pumps which will get huge** amount of savings as per Star leveling program by Bureau of Energy Efficiency 2020.
- We are **suggesting installing Solar Pumping system which** will get huge amount of savings.



❖ *Other Different Type of Connected Load:*

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

- Total Connected load **97.97 kW** and Total **412 no.** equipment installed.
- Light load **5.92 kW and 175 no.** of lighting fixtures.
- Fan load **10.53 kW and 167 no.** of fixtures.
- We suggest to **purchase equipment as per Star leveling program** by Bureau of EnergyEfficiency 2020 which will get huge amount of electricity saving.
- Maintenance of all the equipment should be done regularly.

# CHAPTER-01

## INTRODUCTION OF THE COLLEGE

### 1.1 Introduction

**Vijayaraje Govt. Girls Post Graduate College, Morar**, is situated in Gwalior Madhya Pradesh of College is established in the year of 1963, it is a multi-faculty College having Arts and Humanities, Science, Home Science and Commerce faculties. It has also started B.Sc Computer science and B.Com. with Computer Applications, B.Sc. (Chemistry), M.Com. and M.A. (English) under self-financing scheme. The College has on its rolls 5,169 students. No. of Surviving Teaching Faculty are 50. The College is affiliated to JIWAJI UNIVERSITY, Gwalior registered under 2(f) and 12(b) with the UGC.

The Vision and Mission of **Vijayaraje Govt. Girls Post Graduate College, Morar**, Gwalior (M.P.) are as under:

#### VISION:

- To empower women with excellent education, inclusiveness, empathy, self-reliance and respect for Indian culture.

#### MISSION:

- To provide quality education with traditional values for the holistic development of women especially from weaker section of society.
- To nature human skills and augment national consciousness.
- To prepare them to face the challenges of modern, technological and globalizing world.
- To sensitize them with social and environmental issues.

## CHAPTER-02

### SITE VISIT AND INSPECTION

#### 2.1 Site visit and site inspection

Energy audit team visited **Vijayaraje Govt. Girls Post Graduate College, Morar**, premises and completed electrical measurement and appliances data collection.



*Figure 2: Vijayaraje Govt. Girls College Morar, Gwalior, Site Visit*





*Figure 3: Vijayaraje Govt. Girls College Morar, Gwalior, Lux Measurement*

## 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 in the areas 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 human beings from possible disaster. Under the mandate of The Energy Conservation Act 2001, the Bureau of Energy Efficiency and Government of India is implementing various programmes to provide momentum to 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 basis.

#### 3.2 Methodology & Approach

The audit involved basic design data collection for various electrical & thermal utilities, meetings with concerned departmental engineers & managers carrying out various field measurements, performance analysis and loss analysis covering all major energy consuming sections of **Vijayaraje Govt. Girls Post Graduate College, Morar, Gwalior** to realistically assess losses mainly in energy consuming utility areas and potential for energy savings. The major areas of study include:

- Building electricity 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 were made with the office personnel and technicians to share the actual operational features of equipment, maintenance of equipment breakdown, time of machineries, safety measures etc. At the same time required data was collected from various departments and reviewed the same with the operational actual data.

The study focused on improving energy use efficiency and identifying energy saving opportunities for various equipment. 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 Instruments 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

## CHAPTER-04

### ELECTRICITY BILL ANALYSIS

#### 4.1 Month Wise Energy Consumption

**Vijayaraje Govt. Girls Post Graduate College, Morar,** Receives power from, Madhya Pradesh Paschim Kshetra Vidyut Vitran Company Limited Indore.

The maximum demand, energy consumption, fixed charges, energy charges and total bill in Rs. 85737/- for the financial year 2022-2023 are shown in below tables as per the details from the College bill. One year's data have been represented by various graphs. These indicators address 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.

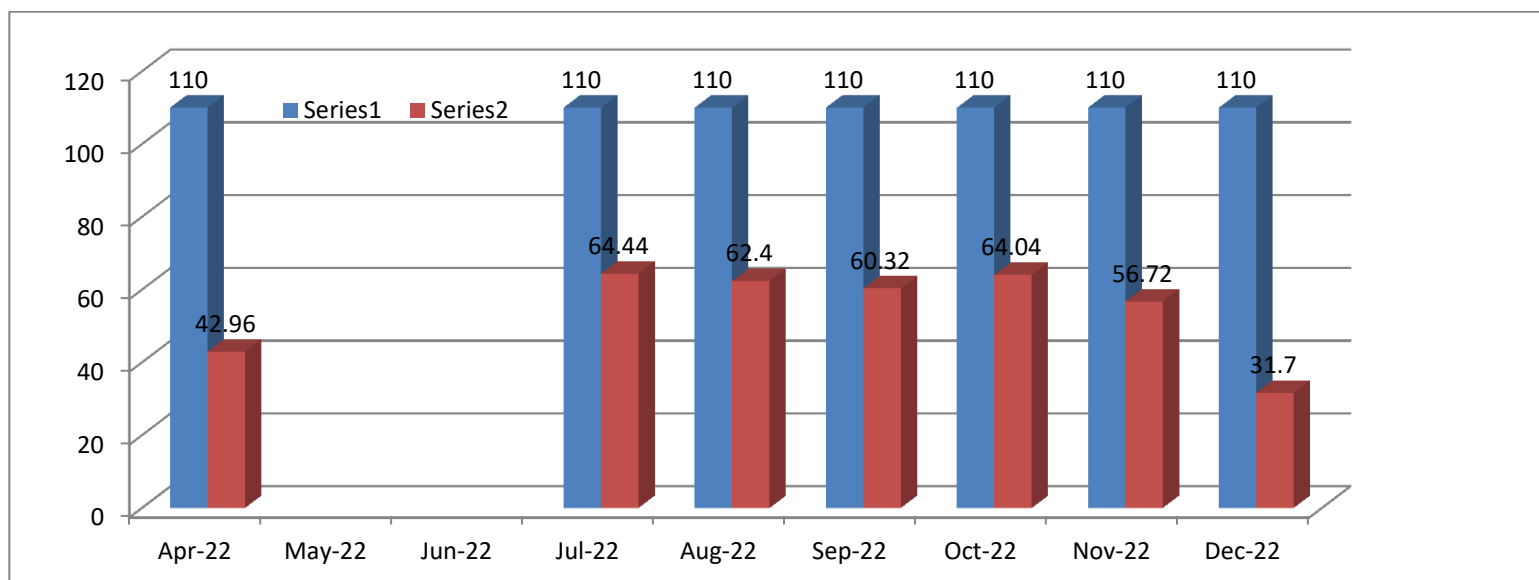
##### **Tariff:**

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 <b>Mandatory</b> 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 2: Electricity bill analysis

Monthly Electrical bill detail in Vijayaraje Govt. Girls College Morar								
IVRS No. N3131021738, Address Garam Sadak								
Months	Sanctioned Load (KW)	MDI	kWh	Fixed charges (Rs)	Energy Charges (Rs)	Power Factor	Total bill (Rs)	Average Per unit Charges Rs/KWh
Apr-22	110	42.96	8263	14850	53458	0.93	278282	33.68
Jul-22	110	64.44	12839	17600	84244	0.96	96652	7.53
Aug-22	110	62.4	13009	17050	85862	0.96	97435	7.49
Sep-22	110	60.32	11439	16500	75498	0.96	88118	7.70
Oct-22	110	64.04	12190	17600	80495	0.97	91231	7.48
Nov-22	110	56.72	9880	15675	66193	0.98	77252	7.82
Dec-22	110	31.7	8240	14850	55210	0.98	66133	8.03
			75860	Total Bill			795103	10.48





### **OBSERVATIONS & COMMENTS:**

- As per electricity bills observation and analysis, **Total Sanction load is 110 kW** in 2022 College premises.
- As per electricity bills observation and analysis, **electricity bill Power Factor varies from 0.96 to 0.99**
- It is observed that maximum demand varies **0 to 110 kVA**.
- It is observed that Average Per unit Charges **10.48 Rs/kW**.

## CHAPTER-05

### LIGHTING SYSTEM

#### 5.1 Details of Lighting System

**Vijayaraje Govt. Girls Post Graduate College, Morar**, Has high lighting load and various type of indoor and outdoor lighting fixtures are installed in college campus. Lux measurement was also done at the time of audit. All the parameters are given in the below table:

*Table: 4 Indoor Lighting details*

Sr. No.	Location	Types of Lighting	No.of Lighting fixture	Power (W)	Total Power (W)	Lux Level
	Chemistry Lab.	LED T.L.	2	28	56	198-232
		T.L	2	40	80	40-80
	Room	LED T.L.	3	40	120	110-160
	Room	LED T.L.	5	28	140	55-95
	Room Botany	LED T.L.	2	40	80	116-156
	Room	LED T.L.	2	20	40	50-80
	Micro Biology Lab.	T5	3	28	84	35-55
		T5	4	28	112	15-40
		T5	3	20	60	35
	Room No. 21	LED. T.L.	4	40	160	110-125
	Room No. 22	LED T.L.	4	40	160	110-125
	Room No. 23	LED T.L.	4	40	160	110-125
	Room No. 24	LED T.L.	4	40	160	210-240
	Biotech Room Lab -2	LED T.L.	4	40	160	140-160
		T5	1	28	28	40-60
	Home Science	LED T.L.	7	28	196	70-95
	Textile	LED	1	20	20	170-200
	Nutrituion Lab.	LED	7	28	196	120-150
	Biotech Lab -2	LED	4	40	160	60-80
	Library	LED	1	20	20	60-80
		LED	2	40	80	60-85
		LED	3	20	60	60-85
		LED	3	28	84	150-175
		LED	3	20	60	180-200
	English	LED	3	28	84	80-120
	Sociology	LED	2	28	56	25-40

Sr. No.	Location	Types of Lighting	No.of Lighting fixture	Power (W)	Total Power (W)	Lux Level
		LED	2	20	40	180-250
	E-Llibrary	LED	6	28	168	160-280
	Semester Cell	LED	3	28	84	60-190
	Room No. 11	LED	4	28	112	150-200
	Room No. 12	LED	4	28	112	130-150
	Room No. 13	LED	4	28	112	130-160
First Floor	Room No .15	LED	4	40	160	170
	Room No. 16	LED	4	40	160	180
	Room No. 17	LED	4	40	160	190
	Community Hall	LED	16	40	640	190
	Double Story Building	LED	6	40	240	150
	Remaining Building	LED	5	40	200	70-95
		LED	5	40	200	55-85
		LED	4	40	160	100-115
		LED	2	28	56	90-115
		LED	4	40	160	140-180
	Office	LED	3	28	84	150-180
		LED	6	40	240	120-140
		LED	2	28	56	110-150
		LED	4	40	160	100-130
<b>Total Power Consumption in kW</b>					5920	
<b>Total no. of Lighting Fixture</b>			<b>175</b>			

## Outdoor lighting:

Table: 5 Outdoor Lighting details

VIJAYARAJE GOVT. GIRLS COLLEGE MORAR, GWALIOR (M.P.)						
	Location	Location of Fixtures	Types of light	No.of Lighting fixture	Power (Watts)	Total Power (Watts)
1	Out Door Lighting	Street Light	LED	6	50	300
			LED	8	50	400
			LED	12	50	600
Total Power Consumption in kW			1.3			
Total no. of Lighting Fixture			14			

## OBSERVATIONS & COMMENTS

- We are appreciating that your replaced FTL with Energy Efficient LED Tube light.
- We recommend **using LED Lighting luminaries at some locations as per site visit.**
- We **are suggesting to purchase all electrical** equipment as per star leveling program by Bureau of energy efficiency, which will get huge amount of electricity saving.
- We are suggesting conducting 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 **indoor lighting load** at College Campus is **5.92 kW.**
- As per data collection and site visit, Total Connected **outdoor lighting load** at College Campus is **0.13 kW.**
- As per data collection and observation, **Total no. of Indoor lighting fixture is 175.**
- As per data collection and observation, **Total no. of Outdoor lighting fixture is 14.**

## CHAPTER-06

### FAN SYSTEM

There are various ceiling fans installed at various locations in **VIJAYARAJE GOVT. GIRLS COLLEGE MORAR, GWALIOR (M.P.)**. And they also contribute to very high electricity consumption. All of the fans are conventional and hence are high energy consuming.

*Table: 6 Details of Fan*

Sr. No.	Location	Types of Fan	No.of Fan	Power (W)	Total Power (W)
1 Ground Floor	Chem Lab.	Ceiling Fan	4	68	272
	Chem Room	Ceiling Fan	2	68	136
	Lab	Ceiling Fan	5	68	340
	Zoo Lab.	Ceiling Fan	2	68	136
	Micro Bio	Ceiling Fan	6	68	408
	Room No. 21	Ceiling Fan	12	68	816
	Room No. 22	Ceiling Fan	12	68	816
	Room No. 23	Ceiling Fan	12	68	816
	Room No. 24	Ceiling Fan	12	68	816
	Office	Ceiling Fan	3	55	165
First Floor	Home Sc.	Ceiling Fan	5	68	340
	Textile	Ceiling Fan	6	68	408
	Nutrition Lab.	Ceiling Fan	4	68	272
	Biotech	Ceiling Fan	10	68	680
	Comp. Lab.	Ceiling Fan	6	68	408
	Library	Ceiling Fan	8	68	544
	Art Block English	Ceiling Fan	3	68	204
	Sociology	Ceiling Fan	5	68	340
	E-Library	Ceiling Fan	6	68	408
	Semester Cell	Ceiling Fan	3	68	204
	Room No. 11	Ceiling Fan	4	55	220
	Room No. 12	Ceiling Fan	4	55	220
	Room No. 13	Ceiling Fan	4	55	220
	Room No. 15	Ceiling Fan	4	55	220
	Room No. 16	Ceiling Fan	4	55	220

Sr. No.	Location	Types of Fan	No.of Fan	Power (W)	Total Power (W)
	Room No. 17	Ceiling Fan	4	55	220
	Commerce Hall	Ceiling Fan	6	55	330
	Double Story Building	Ceiling Fan	6	55	330
		Ceiling Fan	5	40	200
<b>Total no. of Fixture</b>			<b>167</b>		<b>10.509</b>

## OBSERVATIONS & COMMENTS

- We recommend **to purchases new energy efficient BLDC fans as per Star leveling programby Bureau of Energy Efficiency, which will get** huge amount of electricity saving.
- Energy Saving calculation **and recommendation for the existing Conventional** Ceiling fans with BLDC super energy efficient fan have been given in this report.
- We are suggesting **conducting regular Cleaning and maintenance** of Fan at least in every 6months to increase performance of Fan.
- We are also suggesting improving the Air delivery of Fans by Replacing them with New energy efficient BLDCFan as per 5 stars leveling of Bureau of energy efficiency.
- The total load for Ceiling and exhaust Fan is **10.50 kW**
- Total No. of Fan fixtures are **167**.

## CHAPTER-07

### OTHER EQUIPMENTS LOAD

#### 7.1 Different Type Other Equipment

There are different types of other equipment like Printer, PC, Water Cooler, Refrigerator and other lab equipment installed at various locations in **VIJAYARAJE GOVT. GIRLS COLLEGE MORAR, GWALIOR (M.P.)**. and they also contribute to electricity consumption.

*Table 7: Different type of equipment system*

Other equipment location wise						
Sr. No.	Location	Location of Product	Type of Product	Number of Product	Power (Watts)	Total Power (Watts)
			PC	6	100	600
			Printer	6	650	3900
			Photocopier	4	1800	7200
			Projector	2	100	200
			Water Cooler	4	650	2600
			Microwave	1	900	900
		Control Room	Fridge	5	300	1500
			Washing Machine	2	400	800
Total Connected Load in kW			17.7			
Total no. of Connected Electrical Appliances			30			

#### OBSERVATION AND COMMENTS

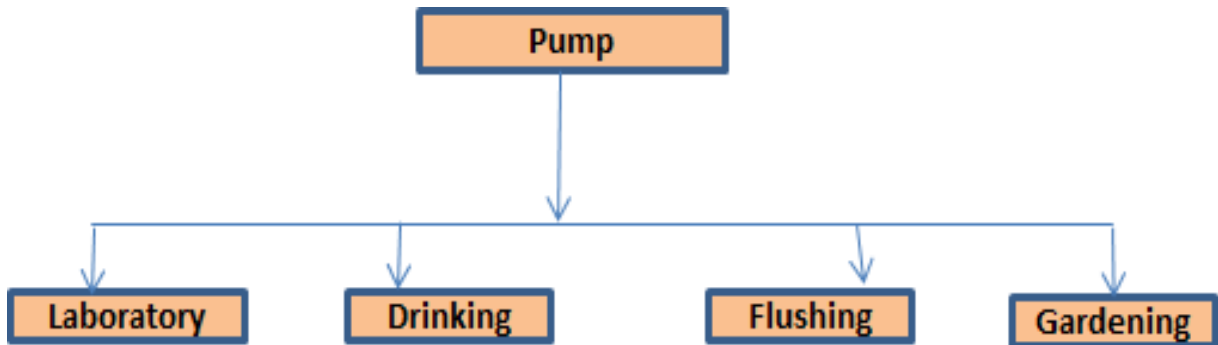
- Total Connected load **17.7 kW** and Total **30 no.** equipment installed.
- We suggest to **purchase equipment as per Star leveling program recommended** by Bureau of Energy Efficiency 2020, which will result in huge amount of electricity saving.
- Maintenance of all the equipment should be done regularly.

## CHAPTER-08

### PUMPING SYSTEM

#### 8.1 Details of Pumps

There is 2 no. of 3 hp & 5hp capacity of submersible pump installed within college campus for drinking water, Flushing and gardening purpose.



*Table 8: Details of pumping system*

JANNAYAK TANTYA MAMA GOVT. COLLEGE BHIKANGAON , KHARGAON (M.P.)					
Sr. No.	Location of Pump	Types of Pumps	No. of Pump	Power (HP)	Total Power (kW)
1	Outside & Near Ground	Submersible	2	7.5	15.45
<b>Total Power in kW</b>					15.45

#### OBSERVATION AND COMMENTS

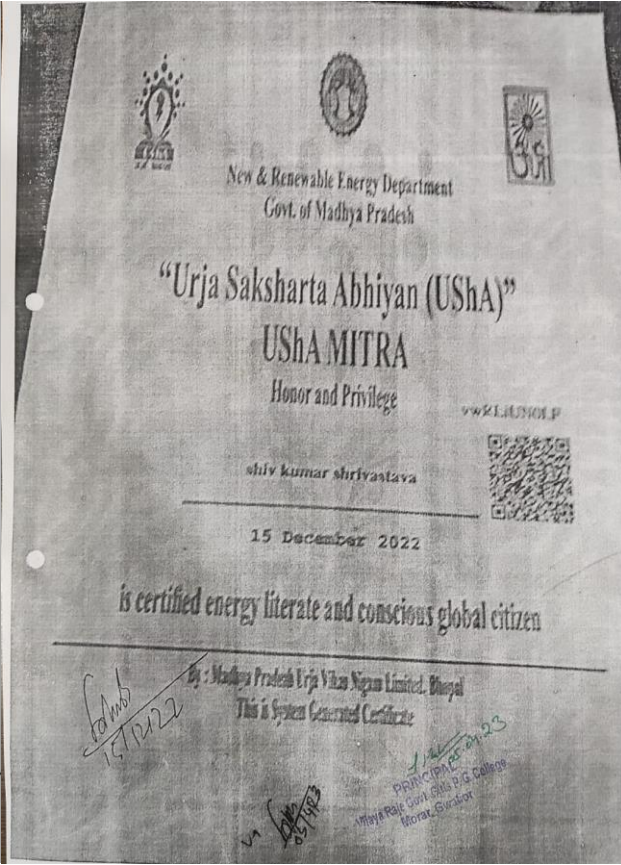
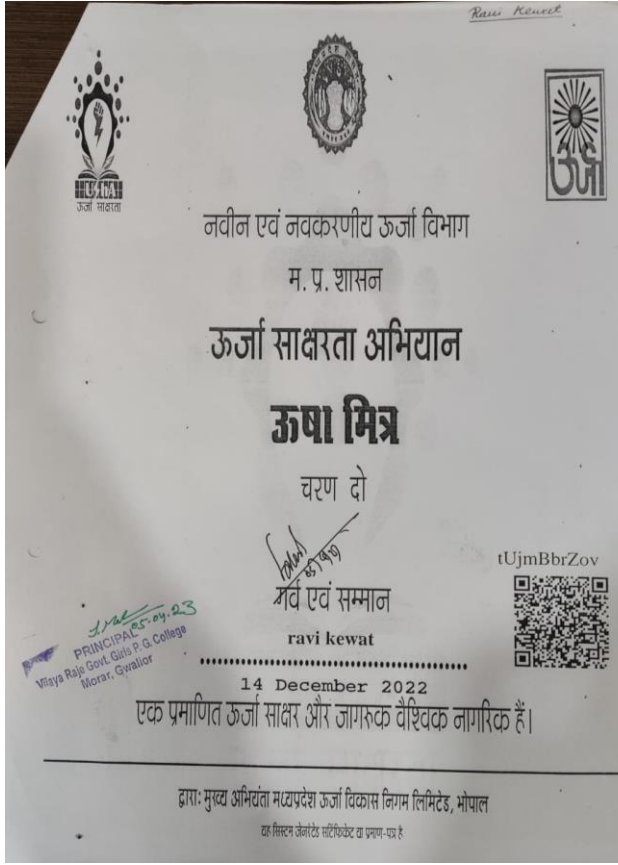
- We observed during Energy Audit and site visit, **2 Pump of Capacity 7.5 hp within** Collegecampus for drinking water, Flushing and gardening purpose.
- Power consumption of 2 Nos. pumps was **15.45 kW as** per site visit and measurement.
- We are suggesting purchasing **5 star rated pumps which will result in huge** amount of saving as per Star leveling program of Bureau of Energy Efficiency 2020.
- We are **suggesting installing Solar Pumping system which** will result in huge amount of savings.

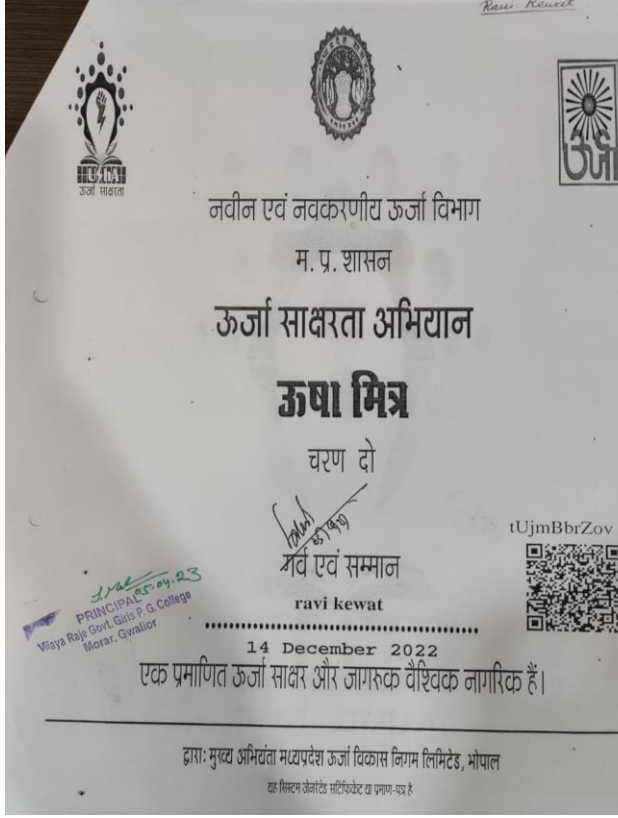


## Energy Saving Activities Conducted by the College



## Energy Saving Posters in Classrooms





## Conclusion

Vijayaraje Govt. Girls College Morar, is college serving for Higher Education for about thirty Five years. The electrical equipment is therefore quite old and since the bulk replacement of these involves PWD, Indore the institute has not actively engaged in the process of replacement. The activities involving students for energy conservation, signboards for energy conservation and participation of the students and teachers in the Energy Literacy Campaign of Govt. of Madhya Pradesh and receiving Usha Mitra Certificates are some of the genuine efforts on the part of the college for Energy conscious conservation measures. Their initiative of conducting an Energy Audit for attaining professional assessment and recommendations for energy saving is also commendable.

The fulfillment of recommendations of this Audit partially or fully will surely move the institute a forward in the direction of energy conservation significantly.

**It is advisable to use electrical equipment with:**

- 1) We appreciate of use LED Lightings in new buildings & we also recommend replacing all FTL with Energy efficient LED lightings.**
- 2) We Strongly recommended to use of Solar Roof top On-grid Solar PV system in college premises to increase the use of green energy.**
- 3) We appreciate the campus having good natural day light in class room & good air ventilation also at upper floors in the buildings.**
- 4) We strongly recommended installing Solar Street light for Outdoor Light**
- 5) Recommended to use Energy Efficient BLDC Ceiling Fan for 50% energy saving.**
- 6) We appreciate the efforts of faculty & student; during the energy audit we found no wastage of energy in the campus.**
- 7) We also recommend using all 5 star rated Energy Efficient Products Lights, Fan, Pump, etc.**
- 8) We also recommended using solar pumping system for irrigation & water management in campus to reduce electrical bills.**
- 9) We recommend using install motion sensor based lighting in area of less activity / motion / movement.**
- 10) We also recommend using sign board of switch-off the electrical loads when not in use.**
- 11) We also recommend using air condition temperature setting to 24°C.**

## ANNEXURE – I

Activity	Illumination (lux, lumen/m <sup>2</sup> )
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
<b>Warranty (Years)</b>	3 Years	3 Years	3 Years	3 Years
<b>Blade Span (mm/inch)</b>	900/36	1050/42	1200/48	1400/56
<b>RPM</b>	450	430	350	270
<b>Service Value</b>	7.1	6.6	7.8	7.7
<b>Input Voltage (V)</b>	140-285	140-285	140-285	140-285
<b>Power Consumption (W)</b>	28	32	28	35
<b>Frequency (Hz)</b>	48-52	48-52	48-52	48-52
<b>Air Delivery (CMM)</b>	200	210	220	270
<b>Power Factor</b>	>0.98	>0.98	>0.98	>0.99
<b>No. of Blades</b>	3	3	3	3
<b>Bearing (Double)</b>	Deep Groove Double Sided Steel Shielding			
<b>Remote Control (12 Keys)</b>	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	<b>330</b>	360-380
CMM (air delivery)	230	<b>210</b>	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