M/S. GVG
ELECTRICAL AND
POWER SANGLI

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Ref. No: GVG/2023-22

Date:16/05/2023

Certificate of Energy Audit

This is to certify that **Shahid Virpatni Laxmi Mahavidyalaya, Titave Tal. – Radhanagari, Dist.- Kolhapur,** successfully underwent an **Energy Audit on 16 May 2023** and assessed the electrical energy conservation, energy saving measures, and sustainability in compliance with the applicable regulations, policies, and standards in the campus were found to be **excellent.**

Place- Atpadi

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Mr.R.S.Pukale

M/s. GVG Electrical and Power, Sangli

ENERGY AUDIT REPORT

Client Name	**Shahid Virpatni Laxmi Mahavidyalaya, Titave** **Tal. – Radhanagari, Dist.- Kolhapur** **Pin – 416208**
Project Name	**Shahid Virpatni Laxmi Mahavidyalaya, Titave** **Tal – Radhanagari, Dist- Kolhapur** **Pin – 416208**
Date	**Year 2022-23**
Submitted by	**M/s. GVG Electrical and Power, Sangli** **Tal.- Atpadi, Dist.-Sangli (Maharashtra state)**

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ACKNOWLEDGEMENT

We appreciate the interest and participation of the Honorable Management and Principal and Faculty in carrying out the energy audit at **Shahid Virpatni Laxmi Mahavidyalaya, Titave Tal.- Radhanagari, Dist.- Kolhapur.** Our special thanks to the Technicians and Staff involved in the college who have extended their cooperation and courtesy to the energy audit team during the audit.

THE ENERGY AUDIT TEAM

Team Member	**Dr. H.T. Jadhav** Certified Energy Auditor Bureau of Energy Efficiency Reg. No-EA-3023 **Mr. R.S. Pukale** B.E (Electrical), M-Tech (Power System) M/s. GVG Electrical and Power, Sangli

INDEX

1. EXECUTIVE SUMMARY (Lighting Load):

Recommendations	Monthly present expenditure in Rs.	Investment for the saving of expenditure in Rs.	Savings per month in Rs.	Payback period in years.
1) Principal cabin Replace the 40W tube set with the 20W LED tube set. Quantity -02 No. Replace the 80W old fan with an energy-efficient fan. Quantity -01 No.	362.88	4400	192.78	1.90 Yrs.
2) Office Replace the 40W tube set with the 20W LED tube set. Quantity -04 No. Replace the 80W old fan with an energy-efficient fan. Quantity -06 No.	1451.52	22800	793.8	2.39 Yrs.
3) Staff Room Replace the 80W old fan with an energy-efficient fan. Quantity -03 No.	544.32	10500	306.18	2.86 Yrs.
4) Store Room	Nil	Nil	Nil	Nil
5) Computer Lab Replace the 40W tube set with the 20W LED tube set. Quantity -01 No. Replace the 80W old fan with an energy-efficient fan. Quantity -05 No.	997.92	17950	555.66	2.69 Yrs.
6) Class Room 1 Replace the 40W tube set with the 20W LED tube set. Quantity -01 No. Replace the 80W old fan with an energy-efficient fan. Quantity -01 No.	272.16	3950	147.42	2.23 Yrs.
7) Class Room 2 Replace the 40W tube set with the 20W LED tube set. Quantity -02 No. Replace the 80W old fan with an energy-efficient fan.	907.2	14900	498.96	2.49 Yrs.

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Quantity -04 No.				
8) Class Room 3 Replace the 80W old fan with an energy-efficient fan. Quantity -02 No.	362.88	7000	204.12	2.86 Yrs.
9) Class Room 4 Replace the 80W old fan with an energy-efficient fan. Quantity -01 No.	181.44	3500	102.06	2.86 Yrs.
10) Class Room 5 Replace the 80W old fan with an energy-efficient fan. Quantity -01 No.	181.44	3500	102.06	2.86 Yrs.
11) Class Room 6 Replace the 80W old fan with an energy-efficient fan. Quantity -02 No.	362.88	7000	204.12	2.86 Yrs.
12) Class Room 7 Replace the 40W tube set with the 20W LED tube set. Quantity -02 No. Replace the 80W old fan with an energy-efficient fan. Quantity -02 No.	544.32	7900	294.84	2.23 Yrs.
13) Hall No 1 Replace the 80W old fan with an energy-efficient fan. Quantity -06 No.	1088.64	21000	612.36	2.86 Yrs.
14) Corridor	Nil	Nil	Nil	Nil
15) Gents Staff Wash Room	Nil	Nil	Nil	Nil
16) Ladies Staff Wash Room	Nil	Nil	Nil	Nil

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2. SUMMARY OF SAVINGS POTENTIAL OF CLASSROOM

		No. of Tube	No. of Fan	Projector	No of Compute r	LED Bulb	T. V	Printer	Xerox machine	C.C.T.V.
1	Principal cabin	2	1		1	1	1	1		1
2	office	4	6		7			3	1	2
3	staff room		3		2				1	
4	Store Room					1				
5	Computer Lab	1	5	1	56	7				3
6	Class Room 1	1	1			1				
7	Class Room 2	2	4							1
8	Class Room 3		2		1	1				
9	Class Room 4		1		1	1				
10	Class Room 5		1		1	2				
11	Class Room 6		2		1	1				
12	Class Room 7	2	2			1				
13	Hall No 1		6	1	1	6				1
14	Canteen		2			3	1			1
15	Corridor					11				8
16	Gents Staff Wash Room					1				
17	Ladies Staff Wash Room					2				
	Information of Solar PV plants or windmill if already fixed	5 KW Grid Connected solar system and 10KVA inverter								

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1) **Principal cabin**

Sr.no	Particulars	Wattage	Quantity	Run Time (Hr/Day)	Total wattage	Watt Hours/Day	Energy consumed per day kWh/day	Recommendation
1	Tube light	40	2	6	80	480	0.48	Replace the 40W tube set with the 20W LED tube set.
2	Fan	80	1	6	80	480	0.48	Replace the 80W old fan with an energy-efficient fan.
3	Projector	300	0	6	0	0	0	Nil
4	Computer system	250	1	6	250	1500	1.5	Nil
5	LED light	20	1	6	20	120	0.12	Nil
6	TV	50	1	6	50	300	0.3	Nil
7	Printer	300	1	6	300	1800	1.8	Nil
8	Xerox machine	1500	0	2	0	0	0	Nil
				Total	**780**	**4680**	**4.68**	

2) **office**

Sr.no	Particulars	Wattage	Quantity	Run Time (Hr/Day)	Total wattage	Watt Hours/Day	Energy consumed per day kWh/day	Recommendation
1	Tube light	40	4	6	160	960	0.96	Replace the 40W tube set with the 20W LED tube set.
2	Fan	80	6	6	480	2880	2.88	Replace the 80W old fan with an energy-efficient fan.
3	Computer system	250	7	6	1750	10500	10.5	Nil
4	Printer	300	3	6	900	5400	5.4	Nil
5	Xerox machine	1500	1	2	1500	3000	3	Nil
				Total	**4790**	**22740**	**22.74**	

3) Staff room

Sr.no	Particulars	Wattage	Quantity	Run Time (Hr/Day)	Total wattage	Watt Hours/Day	Energy consumed per day kWh/day	Recommendation
1	Fan	80	3	6	240	1440	1.44	Replace the 80W old fan with an energy-efficient fan.
2	Computer system	250	2	6	500	3000	3	Nil
3	Xerox machine	1500	1	2	1500	3000	3	Nil
				Total	**2240**	**7440**	**7.44**	

4) Store Room

Sr.no	Particulars	Wattage	Quantity	Run Time (Hr/Day)	Total wattage	Watt Hours/Day	Energy consumed per day kWh/day	Recommendation
1	LED light	20	1	6	20	120	0.12	Nil
				Total	**20**	**120**	**0.12**	

5) Computer Lab

Sr.no	Particulars	Wattage	Quantity	Run Time (Hr/Day)	Total wattage	Watt Hours/Day	Energy consumed per day kWh/day	Recommendation
1	Tube light	40	1	6	40	240	0.24	Replace the 40W tube set with the 20W LED tube set.
2	Fan	80	5	6	400	2400	2.4	Replace the 80W old fan with an energy-efficient fan.
3	Projector	300	1	6	300	1800	1.8	Nil
4	Computer system	250	56	6	14000	84000	84	Nil
5	LED light	20	7	6	140	840	0.84	Nil
				Total	**14880**	**89280**	**89.28**	

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6) Class Room 1

Sr.no	Particulars	Wattage	Quantity	Run Time (Hr/Day)	Total wattage	Watt Hours/Day	Energy consumed per day kWh/day	Recommendation
1	Tube light	40	1	6	40	240	0.24	Replace the 40W tube set with the 20W LED tube set.
2	Fan	80	1	6	80	480	0.48	Replace the 80W old fan with an energy-efficient fan.
5	LED light	20	1	6	20	120	0.12	Nil
				Total	**140**	**840**	**0.84**	

7) Class Room 2

Sr.no	Particulars	Wattage	Quantity	Run Time (Hr/Day)	Total wattage	Watt Hours/Day	Energy consumed per day kWh/day	Recommendation
1	Tube light	40	2	6	80	480	0.48	Replace the 40W tube set with the 20W LED tube set.
2	Fan	80	4	6	320	1920	1.92	Replace the 80W old fan with an energy-efficient fan.
				Total	**400**	**2400**	**2.4**	

8) Class Room 3

Sr.no	Particulars	Wattage	Quantity	Run Time (Hr/Day)	Total wattage	Watt Hours/Day	Energy consumed per day kWh/day	Recommendation
2	Fan	80	2	6	160	960	0.96	Replace the 80W old fan with an energy-efficient fan.
4	Computer system	250	1	6	250	1500	1.5	Nil

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5	LED light	20	1	6	20	120	0.12	Nil
				Total	**430**	**2580**	**2.58**	

9) Class Room 4

Sr.no	Particulars	Wattage	Quantity	Run Time (Hr/Day)	Total wattage	Watt Hours/Day	Energy consumed per day kWh/day	Recommendation
2	Fan	80	1	6	80	480	0.48	Replace the 80W old fan with an energy-efficient fan.
4	Computer system	250	1	6	250	1500	1.5	Nil
5	LED light	20	1	6	20	120	0.12	Nil
				Total	**350**	**2100**	**2.1**	

10) Class Room 5

Sr.no	Particulars	Wattage	Quantity	Run Time (Hr/Day)	Total wattage	Watt Hours/Day	Energy consumed per day kWh/day	Recommendation
2	Fan	80	1	6	80	480	0.48	Replace the 80W old fan with an energy-efficient fan.
4	Computer system	250	1	6	250	1500	1.5	Nil
5	LED light	20	2	6	40	240	0.24	Nil
				Total	**370**	**2220**	**2.22**	

11) Class Room 6

Sr.no	Particulars	Wattage	Quantity	Run Time (Hr/Day)	Total wattage	Watt Hours/Day	Energy consumed per day kWh/day	Recommendation
2	Fan	80	2	6	160	960	0.96	Replace the 80W old fan with an energy-efficient fan.

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4	Computer system	250	1	6	250	1500	1.5	Nil
5	LED light	20	1	6	20	120	0.12	Nil
				Total	**430**	**2580**	**2.58**	

12) Class Room 7

Sr.no	Particulars	Wattage	Quantity	Run Time (Hr/Day)	Total wattage	Watt Hours/Day	Energy consumed per day kWh/day	Recommendation
1	Tube light	40	2	6	80	480	0.48	Replace the 40W tube set with the 20W LED tube set.
2	Fan	80	2	6	160	960	0.96	Replace the 80W old fan with an energy-efficient fan.
3	LED light	20	1	6	20	120	0.12	Nil
				Total	**260**	**1560**	**1.56**	

13) Hall No 1

Sr.no	Particulars	Wattage	Quantity	Run Time (Hr/Day)	Total wattage	Watt Hours/Day	Energy consumed per day kWh/day	Recommendation
1	Fan	80	6	6	480	2880	2.88	Replace the 80W old fan with an energy-efficient fan.
2	Projector	300	1	6	300	1800	1.8	Nil
3	Computer system	250	1	6	250	1500	1.5	Nil
4	LED light	20	6	6	120	720	0.72	Nil
				Total	**1150**	**6900**	**6.9**	

14) Canteen

Sr.no	Particulars	Wattage	Quantity	Run Time (Hr/Day)	Total wattage	Watt Hours/Day	Energy consumed per day kWh/day	Recommendation

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2	Fan	80	2	6	160	960	0.96	Replace the 80W old fan with an energy-efficient fan.
4	Computer system	250	1	6	250	1500	1.5	Nil
5	LED light	20	3	6	60	360	0.36	Nil
				Total	**470**	**2820**	**2.82**	

15) Corridor

Sr.no	Particulars	Wattage	Quantity	Run Time (Hr/Day)	Total wattage	Watt Hours/Day	Energy consumed per day kWh/day	Recommendation
1	LED light	20	11	6	220	1320	1.32	Nil
				Total	**220**	**1320**	**1.32**	

16) Gents Staff Wash Room

Sr.no	Particulars	Wattage	Quantity	Run Time (Hr/Day)	Total wattage	Watt Hours/Day	Energy consumed per day kWh/day	Recommendation
1	LED light	20	1	6	20	120	0.12	Nil
				Total	**20**	**120**	**0.12**	

17) Ladies Staff Wash Room

Sr.no	Particulars	Wattage	Quantity	Run Time (Hr/Day)	Total wattage	Watt Hours/Day	Energy consumed per day kWh/day	Recommendation
1	LED light	20	2	6	40	240	0.24	Nil
				Total	**40**	**240**	**0.24**	

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3. SUMMARY ANALYSIS OF CURRENT SCENARIO:
3.1 ANALYSIS ENERGY METER.

As per MSEDCL tariff LT-I Residential Tariff

052 LT II Comm 3Ph < 20KW

Connected Load (KW):	**10.00 KW**

Consumption Slab (kWh)	**Fixed/ Demand Charge=456**	**Wheeling Charge (Rs/kWh):1.17**	**Energy Charge (Rs/kWh):5.94**

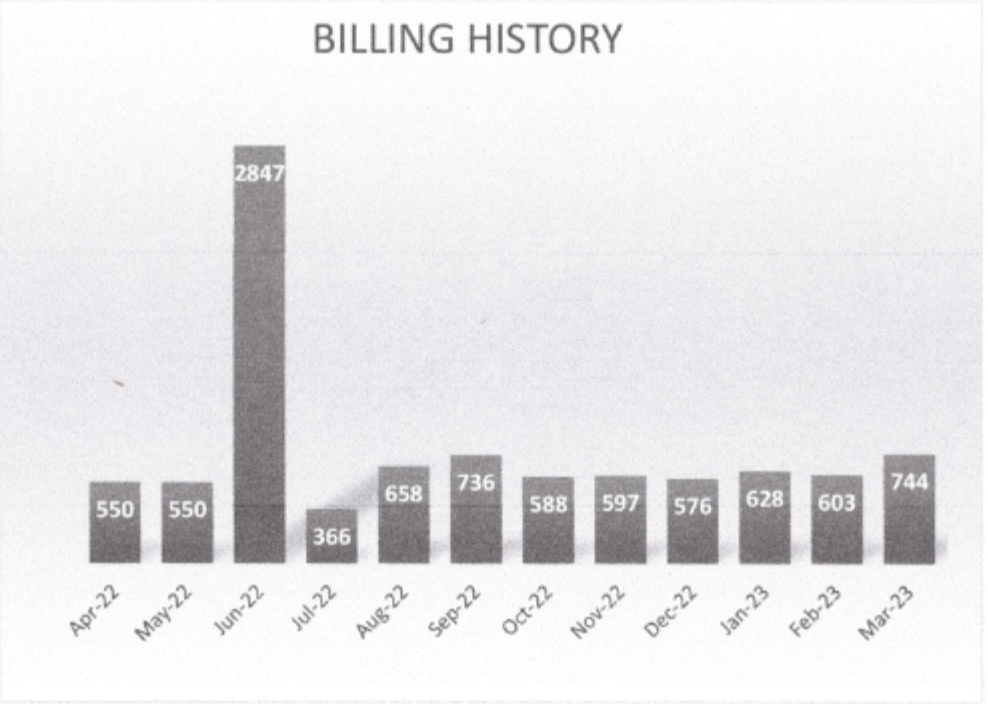
TOD Zone	Rate	Units	Demand	Charges Rs.
2200 Hrs-0600 Hrs	0	0	0	0
0600 Hrs-0900 Hrs & 1200 Hrs-1800 Hrs	0	0	0	0
0900 Hrs-1200 Hrs	0	0	0	0
1800 Hrs-2200 Hrs	0	0	0	0

1) Main College building

Approx. Unit charges including taxes: - Rs.12.60/- Unit

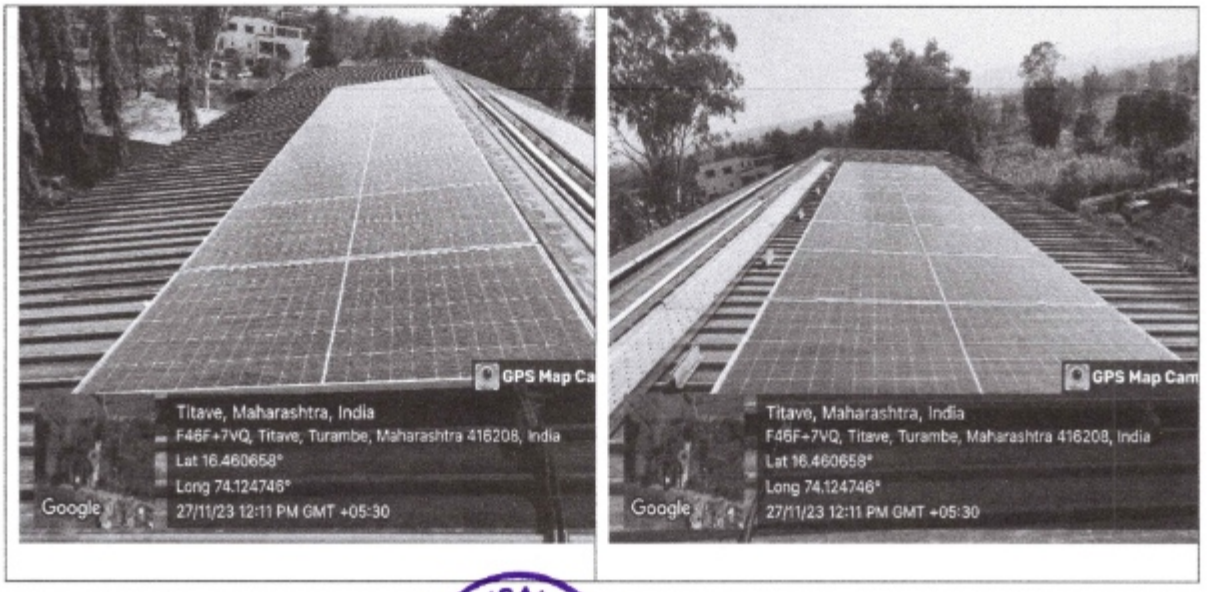
Maximum Consumption in year 2022-23 = Jun-22 (2847 units)

265292654361				
Sr.No	**Month**	**Unit Consumed in KWh**	**Bill Demand (KVA)**	**Bill Amount, Rs.**
1	Mar-23	744	0	9490.95
2	Feb-23	603	0	7790.18
3	Jan-23	628	0	8091.73
4	Dec-22	576	0	7464.5
5	Nov-22	597	0	7717.8
6	Oct-22	588	0	7609.24
7	Sep-22	736	0	9394.45
8	Aug-22	658	0	8453.6
9	Jul-22	366	0	4941.28
10	Jun-22	2847	0	35273.67
11	May-22	550	0	6397.71
12	Apr-22	550	0	6393.88
	Total	9,443	0	1,19,019
	Maximum	2847	0	35273.67
	Minimum	366	0	4941.28
	Average	787	0	9,918



3.2 RENEWABLE ENERGY GENERATION:

To promote green energy and energy conservation, the Shahid Virpatni Laxmi Mahavidhyalay, Titavetal Radhanagari, Dist- Kolhapur, is all set to generate 5 Kw electricity by installing Solar PV system on the roof of its RCC buildings.



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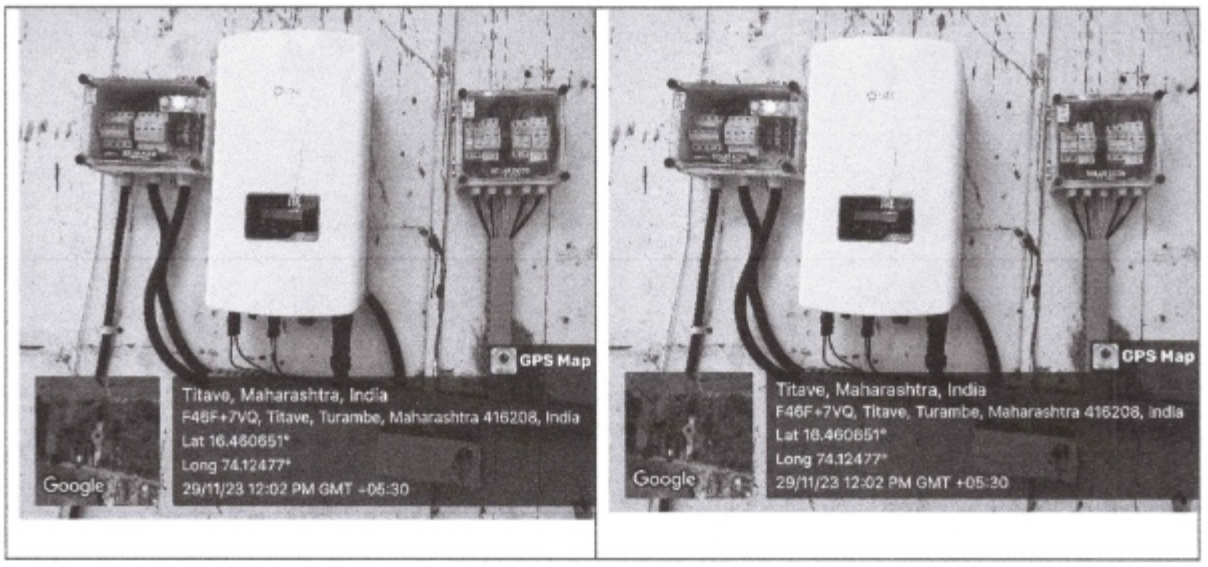

3.2. INSTITUTE IN PROCESS TOWARDS ENERGY CONSERVATION:

- Step by step replace the 40-watt i.e. T12 Fluorescent Tube Lights in the classrooms and Laboratory rooms and use 12W LED which gives almost the same luminous flux.
- Replacing the 80W ceiling fan in classrooms and laboratories with energy-efficient fans of 35 w is very helpful in saving energy.

4.0 SCOPE OF WORK:

1. Detailed examination of the existing energy uses of the facility.

2. Measurement and analysis of demand and power factor, energy meter to reduce the energy bill.

3. Detailed examination of the lighting system and other electrical equipment in the laboratory and classrooms.

4. Survey report of the lighting system in the overall institute.

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5. METHODOLOGY:

5.1 MEASURED LUX LEVELS:

Sr.no.	Location/ Area/ Room	Measured Lux	Recommended Lux Level
01	Principal cabin	150	300-500
02	office	135	300
03	staff room	130	100
04	Store Room	100	300
05	Computer Lab	95	100
06	Class Room 1	91	300
07	Class Room 2	60	300
08	Class Room 3	90	300
09	Class Room 4	62	300
10	Class Room 5	92	300
11	Class Room 6	112	300
12	Class Room 7	150	300
13	Hall No 1	95	300
14	Canteen	150	300-500
15	Gents Staff Wash Room	84	300-500
16	Ladies Staff Wash Room	84	300-500

5.2 SAVING POTENTIAL CALCULATION IN EACH CLASSROOM AND LABORATORY:

Assumptions: - Working hours of classroom, laboratory, and office = Approx.6hrs
Unit for institute energy bill = Approx. Rs.12.60 / kWh

Office

Sr.no	Particulars	Wattage	Quantity	Run Time (Hr/Day)	Total wattage	Watt Hours/Day	Energy consumed per day kWh/day	Recommendation
1	Tube light	40	4	6	160	960	0.96	Replace the 40W tube set with the 20W LED tube set.
2	Fan	80	6	6	480	2880	2.88	Replace the 80W old fan with an energy-efficient fan.
3	Computer system	250	7	6	1750	10500	10.5	Nil
4	Printer	300	3	6	900	5400	5.4	Nil
5	Xerox machine	1500	1	2	1500	3000	3	Nil
				Total	**4790**	**22740**	**22.74**	

Specimen calculation for tube set:- Energy consumption of conventional tube light set:- 40Watt capacity tube set used for 6 hrs per day so unit consumed by tube is 40Watt x 6hr 1000 = 0.24kwh per day and monthly unit consumed by tube set = 0.24x30 days = 7.2kwh / month. Energy consumption of one tube in terms of rupees = 7.2kwh x Rs.12.60= Rs.90.72.

The office has one tube light set. So the monthly expenditure due to fans is Rs.90.72.

If the tub set is replaced by a 20W LED tube set energy efficient (BEE star rating) it will consume energy Rs. 45.36 for one month.

Office: Replace the 40W tube set with the 20W LED tube set.	Cost of energy Rs.90.72/-	Investment for 20W LED tube set – Rs.450.	Cost of energy Rs.45.36/- Saving=Rs.90.72 -Rs. 45.36 = Rs.45.36/-	Payback period 0.83 yrs.

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Specimen calculation for Fan:- An old fan capacity is 80W and used for 6 hrs. per day so the unit consumed by the fan is 80Watt x 6hr 1000 = 0.48 kWh per day and the monthly unit consumed by the fan = 0.48x30 days = 14.4 kWh / month. Energy consumption of fan in terms of Rs. = 14.4 kWh x Rs.12.60 = Rs.181.44.

The office has one old ceiling fan. So the monthly expenditure due to fans is Rs.181.44.

If the old fan is replaced by a new energy efficient (BEE star rating) it will consume energy Rs. 79.38 for one month.

Office:- Replace the 80W old fan with an energy-efficient fan.)	Cost of energy Rs.181.44/-	Investment for BEE star-rated Fan – Rs.3500	Cost of energy Rs.79.38/- Saving=Rs.181.44 -Rs. 79.38 = Rs.102.6/-	Payback period 2.86 yrs.

Tube set type	**Cost Rs.**	**Payback**	**Life**	**Efficacy**
T-8 LED tube light1.00 inch	1600-2000	3-4 Yrs	10-15 Yrs.	@100-120Lumens / watt
T-5 LED tube light 0.625 inch	500	6 month-1yr.	3-4 yrs.	110 lumens /watt

Evolution of BEE 5-star rated Fan

Speed	1	2	3	4	5
Wattage	13 W	24 W	30 W	40W	55W

Cost: - Rs. 1700 -2000 and Life: - 10-15 yrs.

Evolution of regular-rated Fan

Speed	1	2	3	4	5
Wattage	14 W	26 W	39 W	48 W	76 W

Cost: - Rs. 1000 -1500 and Life: - 5-10 yrs.

A typical desktop computer uses about up to 250 watts and 20-40 watts for an LCD monitor and don't forget related devices like cable modem uses 7 watts, D-Link DI-604 router uses 4.5 watts,

To calculate your costs, use this formula:

$$\frac{\text{Watts} \times \text{Hours Used}}{1000} \times \text{Cost per kilowatt-hour} = \text{Total Cost}$$

One LCD computer consumes 1.5Kwh (Unit) per day i.e. 9Rs. Per day (300 W x 5 hrs.)

Old version computer consumes 2.5kwh(unit) per day i.e.15Rs. per day (500 W x5hrs)

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6.0 CONCLUSIONS AND GENERAL RECOMMENDATION OF THE AUDIT

a) Replace conventional tube light fittings of 40W with T-5 LED Tube light for 400 – 500 lumens light efficacy. Replace 80 W old fan with energy-efficient fans.

b) Replace old version computer systems with energy-efficient LCD monitors and new generation energy-efficient computer systems.

c) Ensure maximum natural daylight and natural ventilation in classrooms, Labs, and staff rooms i.e. when it's bright outside in the daytime, turn off the light and open blinds of windows.

d) Try to turn on lights in our cabin, and labs only after the sun sets. Do your reading and writing near a window or natural illumination.

e) Installing occupancy sensors to turn ON-OFF lighting and fan can save considerable energy.

f) Overhead projectors, computers, and UPS all use electricity for power. Be sure to unplug these types of items when they're not in use can achieve energy saving considerably.

g) Use the power "saving option" (hibernate mode) for the computer and possibly switch off when not in use.

h) Consider planting trees and shrubs in strategic locations to help reduce the temperature and airflow in the Laboratory, classroom, etc. Trees planted on the west and south sides of buildings help to keep the buildings shaded during hotter weather.

i) To promote Green Energy and Energy Conservation a roof-top Solar PV plant can be useful.

j) Suggested to protect all Transformers, Generators, and UPS with fencing and keep the awareness boards and safety signs on 'Dangers' and 'Warnings, etc.

k) Advised to cover Electrical wires, switch boxes, inverters, and stabilizers so as not to cause any problems to the staff and student members.

l) Advised to replace old generation computers and TVs with LED monitors and old incandescent (tungsten) bulbs with LED lights and install automatic street solar lights.

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