MP Urja Vikas Nigam Ltd.
(M.P. Govt. Undertaking)

Madhya Pradesh Urja Vikas Nigam Limited (MPUVNL)
Government of Madhya Pradesh

ENERGY AUDIT REPORT

M/s. Govt. College, Bichhua, Chinwara

PPS Energy Solutions™
THE POWER OF ENERGY

ENERGY AUDIT REPORT

M/S. Govt. College, Bichhua, Chinwara

MARCH 2023

Conducted By

PPS Energy Solutions Pvt. Ltd.
Plot No-18, Girish Housing Society
Warje, Pune – 411058, Maharashtra, India

For MPUVNL

For PPS Energy Solutions Pvt. Ltd, Pune

Dr. Ravi G. Deshmukh
Accredited Energy Auditor, AEA-0243

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MPUVNL EMAPANELMENT CERTIFICATE

Madhya Pradesh Urja Vikas Nigam Limited
(MP Govt. Undertaking)

Ref. No. MPUVN/ EA- Empanelment /2017/ /65/ **Date: 21.07.2017**

To,

The Director,
M/s. PPS Energy Solutions,
B-403, Bharti Vihar,
S. No. 78, Bharti Vidyapith Campus, Kartaj,
Pune-411046. (M.H.)

Sub: Your Empanelment as Energy auditor with MPUVN.

Ref: Our letter no. MPUVN/EA-EA/2013/5754, dated 15.02.2013.

With reference to above matter, it is to inform you that we are considering your empanelment as Energy Auditor with MPUVN till new empanelment process is completed.

You are requested to kindly acknowledge the same and submit the status of work done in M.P to MPUVN.

Thanking You,

(Bhuvnesh Kumar Patel)
Chief Engineer

Urja Bhawan, Link Road No. 2, Shivaji Nagar, Bhopal - 462016 (M.P.)
E-mail– cmpuvn@bsnl.in Web-www.mprenewable.nic.in
Phone: 0755– 2553595, 2556246 Fax: 0755–2553122

ABBREVIATIONS

Table 1 Abbrevations:

Abbreviations	Full Form
°C	Degree Centigrade
A	Ampere
AC	Alternating Current
Avg.	Average
CFM	Cubic Feet per Minute
cm.	Centimeter
CMH	Cubic Meter per Hour
DB	Distribution Board
DC	Direct Current
DG	Diesel Generator
Dia.	Diameter
Effn.	Efficiency
FAD	Free Air Delivery
Ft. or ft	Feet
hr.	Hour
A	Current
kCal	Kilo Calories
kg.	Kilogram
kV	Kilo Volt
kVA	Kilo Volt Ampere
kVAr	Kilo Volt Ampere Reactive
kW	Kilo Watts
kWh	Kilo Watt Hour
lit	Liters
Lt	Liters
Ltd.	Limited
M	Meter
Max.	Maximum
m/c	Machine
m^3/hr	Cubic Meter per hour
MD	Maximum Demand
Min.	Minimum
Mm	Millimeter
MTs	Metric Tons
MT	Micro Turners
MW	Mega Watts
No.	Number
p.a.	Per Annum

Abbreviations	Full Form
PF	Power Factor
Sec.	Second
SEC	Specific Energy Consumption
SHW	Solar Hot Water
THD	Total Harmonics Distortion
TPA	Tons per Annum
TPD	Tons per day
Temp.	Temperature
V	Voltage
VFD	Variable Frequency Drive
Wt.	Weight
yr.	Year

ACKNOWLEDGEMENT

We at PPS Energy Solutions Pvt. Ltd, Pune wish to express our sincere gratitude to the management of M/s. Govt. College, Bichhua, Chinwara for assigning the work of Energy Audit of electrical and utility systems to us.

We appreciate the co-operation and support extended to our team members during the entire tenure of field study.

We express our thanks to

M/s. Govt. College, Bichhua, Chinwara

1. Mr. Yadav

MPUVNL

1. Mr. Sunil Gahukhedkar District Renewable Energy Officer

& all other staff members who helped us during the Measurements at the field and for giving us the necessary inputs to carry out this vital exercise of Energy Audit.

EXECUTIVE SUMMARY

A Detailed Energy Audit exercise of M/s. Govt. College, Bichhua, Chinwara was entrusted to PPS Energy Solutions Pvt. Ltd, Pune.

In short, Energy Audit was conducted to study the energy consumption pattern of the facility, identify the areas where potential for energy/cost saving exists and prepare proposals for energy/cost saving along with investment and payback periods.

The salient observations and recommendations are given below.

1. M/s. Govt. College, Bichhua, Chinwara uses energy in the following forms:

Table 2 Sources of Energy:

Particulars	Units	Per Unit Cost	Monthly Cost
Electricity (kWh)	15305.52	6.70	102546.98
TOTAL			**102546.98**

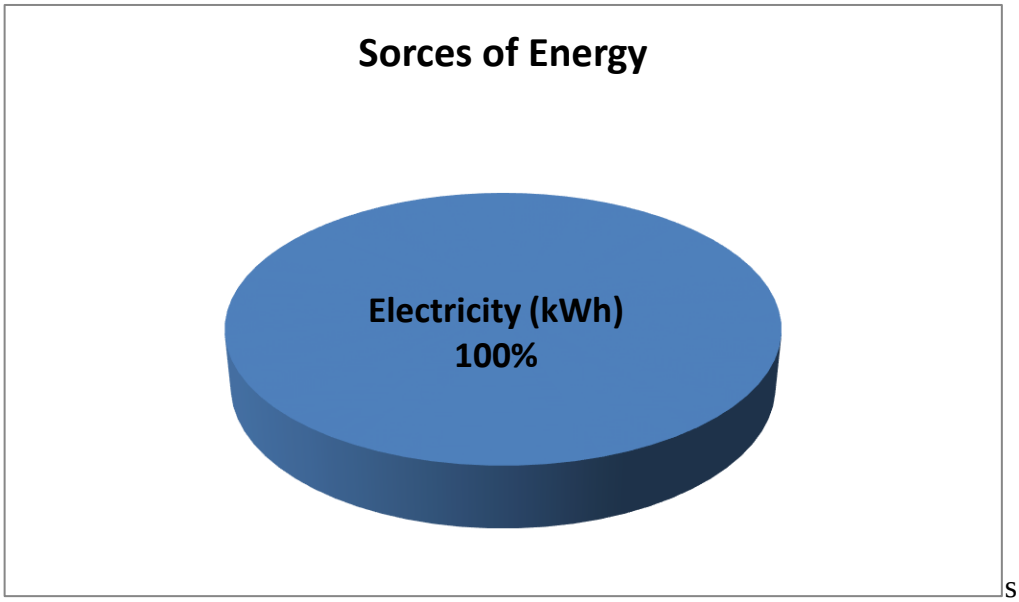

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Figure 1 Sources of Energy

2. Electrical energy is used for various applications, like:
   - Air Conditioners
   - Lighting
   - Other electrical appliances
3. The Total annual cost of energy is **Rs. 1,02,547/-**
4. Average monthly kWh units consumed are **1276 kWh** equivalent to **Rs. 8,546**/-
5. Average electricity charges works out to be Rs. **6.70**/-.
6. Total **Connected** Load = **45.93 kW, Quantity of Equipment = 339**
7. After the measurement and analysis, we propose here with following Energy Efficiency Improvement measures.

RECOMMENDATIONS AND ACTION PLAN

Summary of Recommendations:

Table 3 Summary of Recommendations:

Sr No	Criteria	Estimated Investment (Rs.In Lacs /Year)	Estimated energy saving (KWH)	Estimated saving in tCO2e	Estimated savings (Rs.In Lacs /Year)
1	Zero Investment	0.000	75.600	0.068	0.005
2	Payback 36 months and above	2.681	3662.400	3.113	0.245
	Total	**2.681**	**3662.400**	**3.113**	**0.245**

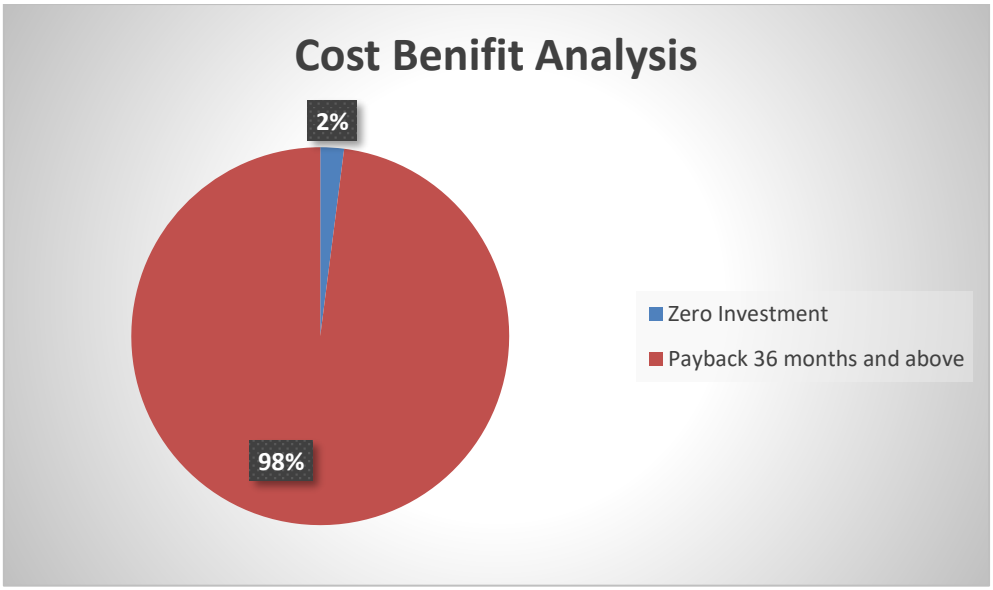


Figure 2 Cost Benefit Analysis

Recommendations:

Table 4 Summary of Recommendations:

Sr.No.	Equipment Name	ECM Details	Investment (Rs. In Lacs)	Savings (kWh/year)	Carbon credit (Tons of Co2)	Saving (Rs.In Lacs /Year)	Payback (Years)	Payback (Months)
1	AC	Optimize the temperature setting to 23-25 degree celsius	0.00	75.60	0.07	0.01	0.00	0.00
2	Lights	Replacement of conventional lights with suitable LEDs	0.46	302.40	0.26	0.02	20.11	241.32
3	Fans	Replacement of existing fans with energy efficient Super fans	2.22	3360.00	2.86	0.23	9.88	118.57
Total			**2.68**	**3662.40**	**3.11**	**0.25**	**10.92**	131.09

During the Energy Audit,

- **Total Estimated Investment of Rs. 2,68,000/-**
- **Total Estimated Savings of Rs. 25,000/-**
- **Total Energy Cost of Rs. 1,02,547-**
- **Total Estimated Savings is 24 % of the Total cost of Energy**
- **Overall payback period of 10.92 Months**

Action Plan:

Sr No	Recommendations	Action Required
1	Optimization of Set Temperature of ACs	Optimise the temperature setting to 23-25 degree Celsius
2	Optimisation of Lighting	Replacement of conventional lights with suitable LEDs
3	Replacement of existing fans with energy efficient Super fans	Install/energy efficient super fans (BLDC Fans)

1. INTRODUCTION

1.1 Background

The management of M/s. Govt. College, Bichhua, Chinwara entrusted the work of conducting a Detailed Energy Audit exercise of their premises attached to PPS Energy Solutions Pvt. Ltd, Pune.

1.2. About Facility

General Details of M/s. Govt. College, Bichhua, Chinwara

Table 5 About M/s. Govt. College, Bichhua, Chinwara

Sr. No.	Particulars	Details
1	Name of the Facility	M/s. Govt. College, Bichhua, Chinwara
2	Address	Chinwara
3	Business Activity	College premises
4	Name of Concern Person and Designation	Mr. Yadav
5	Contact Number of Concern Person	9425425968
6	E-Mail ID of Concern Person	hegcbicchh@mp.gov.in

1.3. Energy Audit Methodology

Energy Audit Study is divided into following steps

- Historical Set Data Analysis

  The historical data analysis involves establishment of energy consumption pattern to establish base line data on energy consumption and its variation with change in production volumes.

- Actual measurement and data analysis

  This step involves actual site measurement and field trials using various portable measurement instruments. It also involves input to output analysis to establish actual operating equipment efficiency and finding out losses in the system.

- Identification and evaluation of Energy Conservation Opportunities

  This step involves evaluation of energy conservation opportunities identified during the energy audit. It gives potential of energy saving and investment required to implement the proposed modifications with payback period. All recommendations for reducing losses in the system are backed with its cost benefit analysis.

1.4. Instruments Used for conducting Energy Audit

The following instruments were used during the study for measurements.

Table 6 List of Instruments:

Sr. No.	Name of instrument	Make	Purpose
1	Tong Tester	MECO	Instantaneous measurements for Voltage and current
2	Lux Meter	MECO	Measurement of light intensity
3	IR Gun	HTC	Non-contact type measurement of temperatures

1.5. Energy Audit Team:

PPS Energy Solutions Pvt. Ltd. deputed following Team of experts to conduct the study and worked in close association with unit personnel.

Table 7 Energy Audit Team:

Name	Role	Academics and Expertise
Dr. Ravi Deshmukh	ECM verification, Report verification and presentation	Accredited Energy Auditor, PhD, M tech, MBA (Power), Graduate E&TC Engineer with over 18 years of experience in Energy Management, Management of Power System, street light projects, Power Exchange Operations, Power Trading and Analysis, Electrical Automation. Has worked as Expert in Iron & Steel sector and Energy
Mr .Nilesh Saraf	Co-ordination with officers, project status review.	Expert in Energy sector with 16 years of experience in Energy efficiency assessment, Industrial engineering sector & Renewable Energy.
Mr. Vinayak Apte	Energy Audit Expert	Graduate Electrical Engineer with more than 10 years of experience in various sectors. He handled Energy Audits, Energy Conservation and Energy Efficiency projects in Industries, Commercial and Residential Buildings, Pump House
Mr. Ritesh Pali	Field study, data tabulation and analysis, report preparation	Graduate Electrical Engineer with 5 years of experience in energy efficiency assessment

2. ENERGY PROFILE

2.1. Sources of Energy

M/s. Govt. College, Bichhua, Chinwara uses Energy following forms:

- Electricity from MPPKVVCL: M/s. Govt. College, Bichhua, Chinwara receives Electricity through LT line. Further, it is distributed to various electrical panels in the facility.

Table 8 Sources of Energy:

Particulars	Units	Per Unit Cost	Monthly Cost
Electricity (kWh)	15305.52	6.70	102546.98
TOTAL			**102546.98**

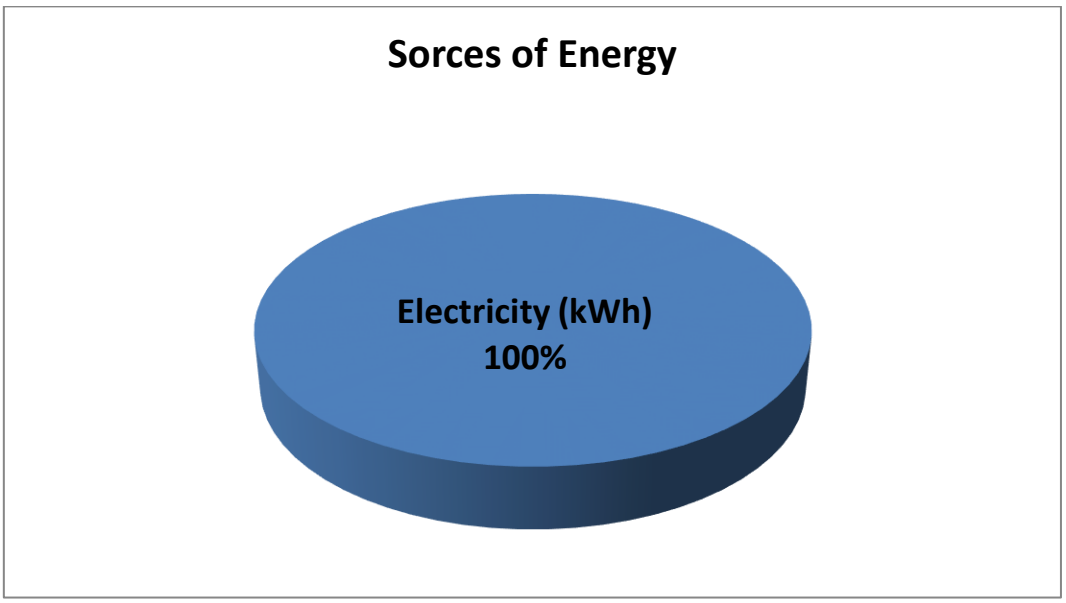


Figure 3 Sources of Energy

2.2. Appliances

I. Electrical Energy is used for various appliances like:
   i. Air Conditioners
   ii. Lighting
   iii. Other electrical appliances

II. The Total annual cost of energy is **Rs. 1,02,547/-**

III. Average monthly kWh units consumed are **1276 kWh** equivalent to **Rs. 8,546**/-

IV. Average electricity charges works out to be **Rs. 6.70**/-

3. INPUT ENERGY ANALYSIS

3.1. Bill Analysis

3.1.1. Electricity Bill Analysis

Table 9 Details of Consumer:

Parameter	Details
Name of Customer	PRINCIPAL GOVT. COLLEGE
Address	BICHHUA
Location Code	1344602
Load Sanctioned (kW)	13
Contract Demand(KVA)	13 KVA
Tariff	LV2

Table 10 Study of Electricity Consumption:

Month	Current Reading		Previous Reading		Meter Consumption (kWh)		Net Units Consumptin (kWh)	Final Units Consumed (kWh)	Billing Units (kWh)	PF
	Import	Export	Import	Export	Import	Export				
Feb-23	14795.07		15665.40				870.33	0.00	870.33	1.000
Jan-23	13744.21		14795.07				1050.86	0.00	1050.86	0.990
Dec-22	12565.11		13744.21				1179.10	0.00	1179.10	1.000
Nov-22	11553.51		12565.11				1011.60	1011.60	1011.60	0.997
Oct-22	10328.24		11553.51				1225.27	1225.27	1225.27	0.997
Sep-22	8906.10		10328.24				1422.14	1422.14	1422.14	0.998
Aug-22	7539.26		8906.10				1366.84	1366.84	1366.84	0.997
Jul-22	6271.63		7539.26				1267.63	1267.63	1267.63	0.995
Jun-22	4693.62		6271.63				1578.01	1578.01	1578.01	0.996
May-22	3040.71		4693.62				1652.91	1652.91	1652.91	0.997
Apr-22	1368.29		3040.71				1672.42	1672.42	1672.42	0.998
Mar-22	359.88		1368.29				1008.41	1008.41	1008.41	0.996
Avg	**7930.47**		**9205.93**				**1275.46**	**1017.10**	**1275.46**	**0.997**
Max	**14795.07**	**0.00**	**15665.40**	**0.00**	**0.00**	**0.00**	**1672.42**	**1672.42**	**1672.42**	**1.000**
Min	**359.88**	**0.00**	**1368.29**	**0.00**	**0.00**	**0.00**	**870.33**	**0.00**	**870.33**	**0.990**
Sum	**95165.63**	**0.00**	**110471.15**	**0.00**	**0.00**	**0.00**	**15305.52**	**12205.23**	**15305.52**	

Month	Energy Charges (Rs)	Energy FCA Charges (Rs.)	Fixed Charges (Rs)	Government Electricity Duty (Rs)	Government Metering Charges (R.)	ASD Instsalment (Rs.)	Other Charges Welding/PF Surcharge/PF Incentive (Rs.)	Other Charges Penel Charges (Rs.)	Other Charges (Rs)	Current month's bill amountt (Rs)	Total Unit Rate (Rs)
Feb-23	5657.15	174.07								5831.21	6.70
Jan-23	6830.59	210.17								7040.76	6.70
Dec-22	7664.15	235.82								7899.97	6.70
Nov-22	6575.40	202.32								6777.72	6.70
Oct-22	7964.26	245.05								8209.31	6.70
Sep-22	9243.91	284.43								9528.34	6.70
Aug-22	8884.46	273.37								9157.83	6.70
Jul-22	8239.60	253.53								8493.12	6.70
Jun-22	10257.07	315.60								10572.67	6.70
May-22	10743.92	330.58								11074.50	6.70
Apr-22	10870.73	334.48								11205.21	6.70
Mar-22	6554.67	201.68								6756.35	6.70
Avg	**8290.49**	**255.09**								**8545.58**	**6.70**
Max	**10870.73**	**334.48**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**11205.21**	**6.70**
Min	**5657.15**	**174.07**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**5831.21**	**6.70**
Sum	**99485.88**	**3061.10**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**102546.98**	**6.70**

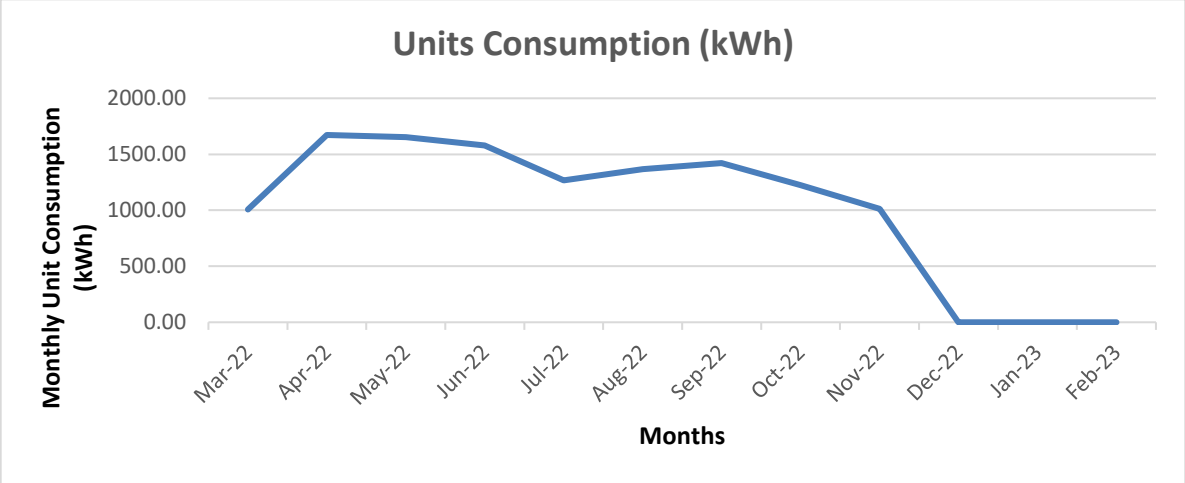


Figure 4 Monthly Unit Consumption (kWh) Variation

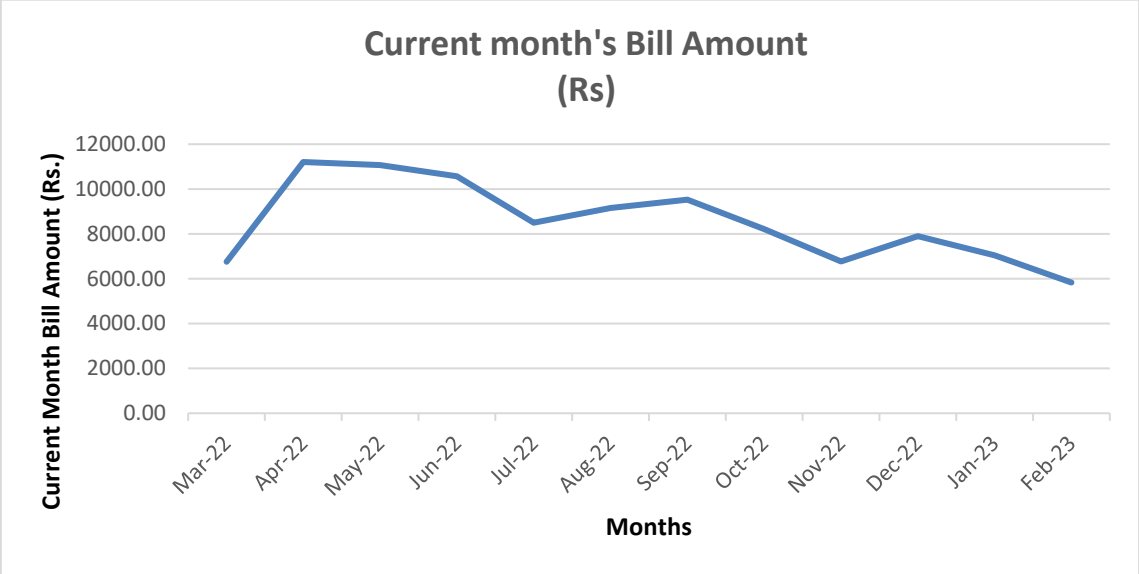


Figure 5 Monthly Electricity Bill Variation

Comments:

1. Average monthly kWh units consumed are **1,276 kWh** equivalent to **Rs. 8,546/-**
2. Average electricity charges works out to be **Rs./kWh** = **6.70**/-

3.1.2. Power Factor and PF Penalty

M/s. Govt. College, Bichhua, Chinwara found to be maintaining PF of **average 0.997 lag**.

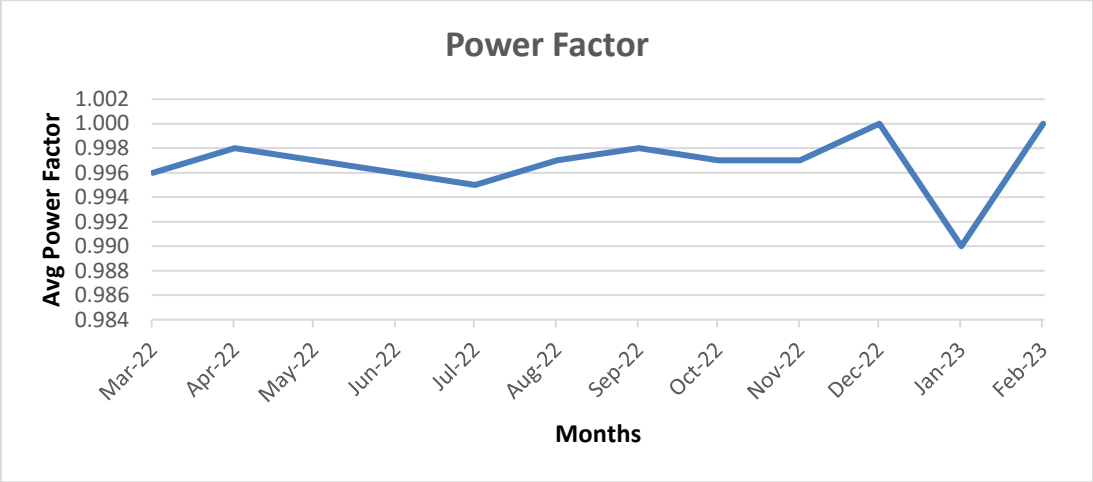


Figure 6 Monthly Power Factor Variation

3.1.3. Electrical Supply Details:

The electrical supply to M/s. Govt. College, Bichhua, Chinwara comes from MPPKVVCL

Study of Main Incomer:

The Tong Tester was used to measure Voltage, Current, variations.at main incoming panel and data is tabulated below

Table 11 Study of Main Incomer:

Parameter		R-Phase	Y-Phase	B-Phase
Voltage (V)	Avg	400.2	400.2	400.3
Current (A)	Avg	7.2	2.1	1.2

Comments:

1. Average voltage values for all the Phases is within the limit of +/- 6% of 400 V.
2. The balance voltage is observed between the Phases.
3. The balance current is observed between the Phases.

4. LOAD ANALYSIS

4.1. Study of Connected Loads:

Table 12 List of Connected Electrical Load:

Machines / Equipments / Devices	Wattage	Total Qty	Total Load in kW
Ceilling Fan	75	100	7.50
T-8 Tubelight	40	10	0.40
LED Tube Light	18	83	1.49
PC	150	26	3.90
Printer	60	8	0.48
Projector	150	8	1.20
Exhause Fan	60	5	0.30
LED Screen	150	3	0.45
Wall Fan	55	2	0.11
LED Bulb	15	63	0.95
CFL Bulb	12	4	0.05
RO Water cooler	600	2	1.20
Xerox M/C	800	2	1.60
A.C.	1500	5	7.50
Oven	1000	9	9.00
Refrigerator	900	2	1.80
Air Cooler	1500	3	4.50
Sound System	1000	3	3.00
Sanetary Pad Machine	500	1	0.50
Total	**8585**	**339**	**45.93**

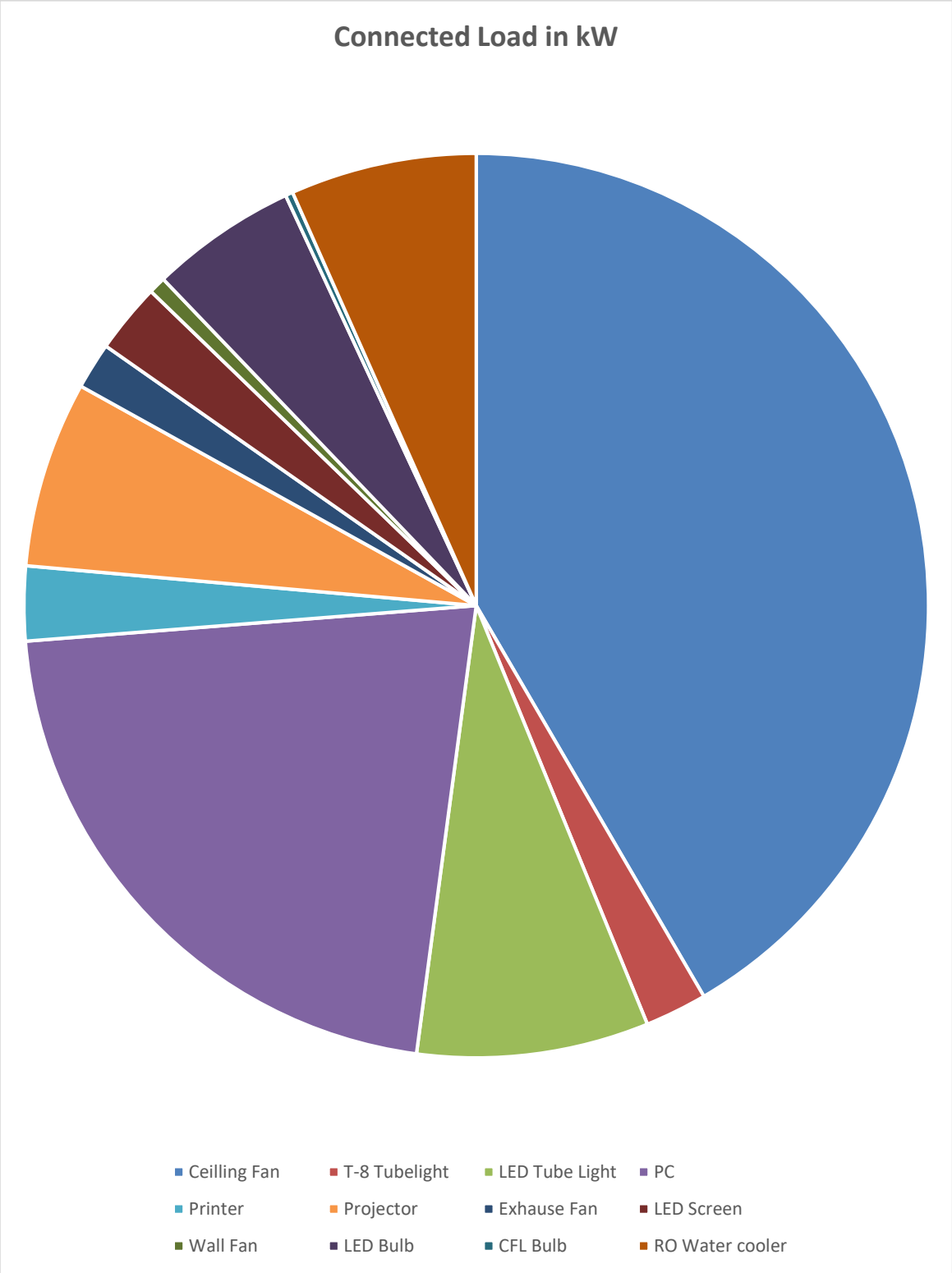


Figure 7 Connected Load in kW

1.3. Study of Lighting System:

Following is the lighting load in the premises

Machines / Equipments / Devices	Wattage	Total Qty	Total Load in kW
T-8 Tubelight	40	10	0.40
LED Tube Light	18	83	1.49
LED Bulb	15	63	0.95
CFL Bulb	12	4	0.05
Total	**85**	**160**	**2.89**

We have measured lux level at various location in their premises. We are giving details as under –

Lux Measurement	
Location	**Lux**
Point 1	120
Point 2	106
Point 3	125
Point 4	126
Point 5	100
Point 6	125
Point 7	123
Point 8	120
Point 9	80
Avg Value of Lux	**158**

5. ENERGY CONSERVATION MEASURES

5.1. ECM 6: Optimization of Set Temperature of ACs

Name	Optimization of Set Temperature of ACs
Location	Entire premises
Estimated Annual Savings	75.60 kWh/year, Rs. 0.07 Lakh/year
Estimated investment Cost	Nil
Estimated Payback	Nil
Environmental Benefits.	Reduced CO_2 emissions from less electricity used @ 0.01 tCO_2e per year
Next Steps	It is recommended to maintain AC temperature from 23 to 25 degree Celsius

Observations:

Facility has installed Window AC of 1 Ton 0* in their premises

Recommendations:

During assessment, it is observed that Window AC of 1 Ton 0* set point was 22^0 C. Hence, it is recommended to increase set temperature setting to 1^0 C as well as improve maintenance of AC frequency.

It is known that a 1°C raise in temperature can help to save almost 3% on power consumption (this can also be verified in BEE guideline: Chapter 4. HVAC and Refrigeration System).

The TR capacity of the same HVAC systems will also increase with the increase in evaporator temperature (Refrigerator set points), as given in Table below:

Effect of variation in Evaporator Temperature on Compressor Power Consumption			
Evaporator temperature(^{0} C)	**Refrigeration Capacity* (tons)**	**Specific Power Consumption**	**Increase in kW/ton (%)**
5	67.58	0.81	-
0	56.07	0.94	16
-5	45.98	1.08	33
-10	37.2	1.25	54
-20	23.12	1.67	106

** Condenser temperature 40°C*

Recommendations:

It was recommended to increase the set point for all indoor units by 1^0C to achieve energy gain of 3% as per guideline of BEE.

Facility will further study the overall effect on the facility and may further tune the temperature settings.

Based on the recommended change of AC temperature settings, calculation for energy saving was given below

Energy Saving Calculations:

Particular	Unit	Value
Estimated Annual Consumption of ACs	kWh/hr	2520
Estimated Saving	%	3%
Operating Hrs per day	hrs/day	2
Operating days per year	Days/year	240
Estimated Saving	kWh/year	76
Unit Rate	Rs/kWh	6.7
Annual Saving	Rs Lakh/year	0.01

Sr No	Type	Ton	Qty	Annual Consumption
1	Window A/C (1 Ton) (0*)	1	1	2520
Total			**1**	**2520**

	Model	Star Rating	W
Split AC	1.0 Ton	5 Star	984
	1.5 Ton		1490
	2 Ton		1732
	0.8 Ton	3 Star	812
	1.0 Ton		1092
	1.5 Ton		1566
	2.0 Ton		1938
	1.0 Ton	2 Star	1154
	1.5 Ton		1709
	2.0 Ton		2210
	1.0 Ton	No star	1600
	1.5 Ton		2500
	2.0 Ton		3000
Window AC	1.0 Ton	3 Star	1157
	1.5 Ton		1676
	2.0 Ton		2266
	1.0 Ton	2 Star	1250
	1.5 Ton		1745
	2.0 Ton		2396
	1.0 Ton	No star	1600
	1.5 Ton		2500
	2.0 Ton		3280

5.2. ECM 2: Replacement of conventional lights with suitable LEDs

Name	Replacement of conventional lights with suitable LEDs
Location	Overall campus
Estimated Annual Savings	302.40 kWh/year, Rs. 0.26 Lakhs/year
Estimated investment Cost	Rs. 0.46 Lakhs
Estimated Payback	20.11 Years
Environmental Benefits	Reduced CO_2 emissions from less electricity used @ 0.02 tCO_2e per year
Next Steps	Change conventional tube lights with LED

Figure 8 Conventional Lights

Observations:

Facility has installed Tube of 40 W and CFL of 12 W in their premises

Recommendations:

During energy audit, it is observed that facility has installed Tube of 40 W and CFL of 12 W at some of the places in the facility Also energy team at facility has already replaced some of

the CFLs with LEDs. The operating hours for these lightings are around 6 hours. Tube of 40 W and CFL of 12 W with equivalent LED fixture thereby achieving significant reduction in energy consumption. The LEDs could be replaced in such a manner that it has same fixture so there will not be retrofitting cost attached to the replacement. The replacement could be done in a phased manner. LED lights have better efficacy as well as better lifetime than conventional lights

Energy Saving Calculations:

Particular	Unit	Value
Energy Saving Calculation		
Power consumption of existing lights	KW	0.45
Power consumption of suitable LED light	KW	0.28
Average power saving after replacement with LED light	KW	0.17
Replacement of conventional lights with suitable LEDs	Nos	14
Average working hour per day	Hrs	6
No. of working days in a year	Days	300
Cost Benefit Calculation		
Annual Energy Saving potential	kWh	302
Electricity tariff	Rs/unit	6.7
Annual Cost Saving	Rs. Lakh	0.02
Total investment cost	Rs. Lakh	0.41
Annual Saving	Rs. Lakh	0.02
Simple Payback Period	Years	20.11

Investment Details

Type of Exisitng Fitting	Wattage	Qty	Proposed LED W	CSR NO	Price - Rs/Unit	Dismantling cost	TOTAL COST	Existing KW	Proposed KW	Saved kW	Investment Rs Lakh	GST 12%	Total Investment
Tube Light	40	10	20	2-1-23	926	15	0.23	0.40	0.20	0.20	0.23		
CFL	12	4	20	2-1-23	926	15	0.18	0.05	0.08	-0.03	0.18		
TOTAL		**14**			**1852**	**30.00**	**0.41**	**0.45**	**0.28**	**0.17**	**0.41**	**0.05**	**0.46**

CSR no	Description	Material	Labour	Total	Dismantling cost	Quantity	Total Cost
2-1-23	Supplying & erecting LED 20W tube light fitting (4 feet) with aluminium housing, heat sink, integrated HF electronic driver complete.	881	45	926	15	10	23150
2-1-23	Supplying & erecting LED 20W tube light fitting (4 feet) with aluminium housing, heat sink, integrated HF electronic driver complete.	881	45	926	15	4	17594
	Total						**0.41**
	12% GST on total Investment cost						**0.05**
	Total cost						**0.46**

5.3. ECM 3: Replacement of existing fans with energy efficient Super fans:

Name	Replacement of existing fans with energy efficient Super fans
Location	Entire premises
Estimated Annual Savings	3360 kWh/year, Rs. 0.23 Lakhs/year
Estimated investment Cost	Rs. 2.22 Lakhs
Estimated Payback	9.88 Years
Environmental Benefits	Reduced CO_2 emissions from less electricity used @ 2.86 tCO_2e per year
Next Steps	Install/use energy efficient super fans

Figure 9 Ceiling Fans

Observations:

During energy audit, it is observed that facility has old 75 W fan and its energy consumption is on higher side.

Recommendations:

During energy audit, it is observed that facility has installed non star rated fan of 75 Wso we recommend to replace energy consuming fan with energy efficient super fan

Energy Saving Calculations:

Particular	Unit	value
Existing energy consumption of Fan	kWh/year	9000
Wattage of Energy Efficient Super Fan	Watt	35
Energy consumption after replacing with Energy Efficient Super Fan	kWh/year	4200
Operating hrs/day	Hrs/day	4
No. of working days in a year	Days	300
Diversity factor	%	70%
Annual Saving	kWh/year	3360
Unit rate	Rs/kWh	6.7
Annual Saving	Rs. In Lacs	0.23

Name of Equipment	Nos	Estimated Running kW
Ceiling Fan 75 W	100	7.50
Total	**100**	**7.50**

Investment Details

CSR No	Description	Material	Labour	Total	Quantity	Total Cost
2-14-4	Dismantling the existing ceiling fan /exhaust fan / cabin fan / bracket fan complete with accessories, G.I. down rod, frame etc. and making the site clear.	0	37	37	100	3700
2-12-21.	Supplying and erecting five star rated energy saving Ceiling fan 230 V A.C. 50 cycles 1200 mm complete erected in position as per specification no. FG-FN/CF	1858	91	1949	100	194900
	Total					**1.99**
	12% GST on total Investment cost					**0.24**
	Total cost					**2.22**

6. RECOMMENDATIONS AND ACTION PLAN

6.1. Recommendations:

Summary of Recommendations:

Table 13 Summary of Recommendations:

Sr No	Criteria	Estimated Investment (Rs.In Lacs /Year)	Estimated energy saving (KWH)	Estimated saving in tCO2e	Estimated savings (Rs.In Lacs /Year)
1	Zero Investment	0.000	75.600	0.068	0.005
2	Payback 36 months and above	2.681	3662.400	3.113	0.245
	Total	**2.681**	**3662.400**	**3.113**	**0.245**

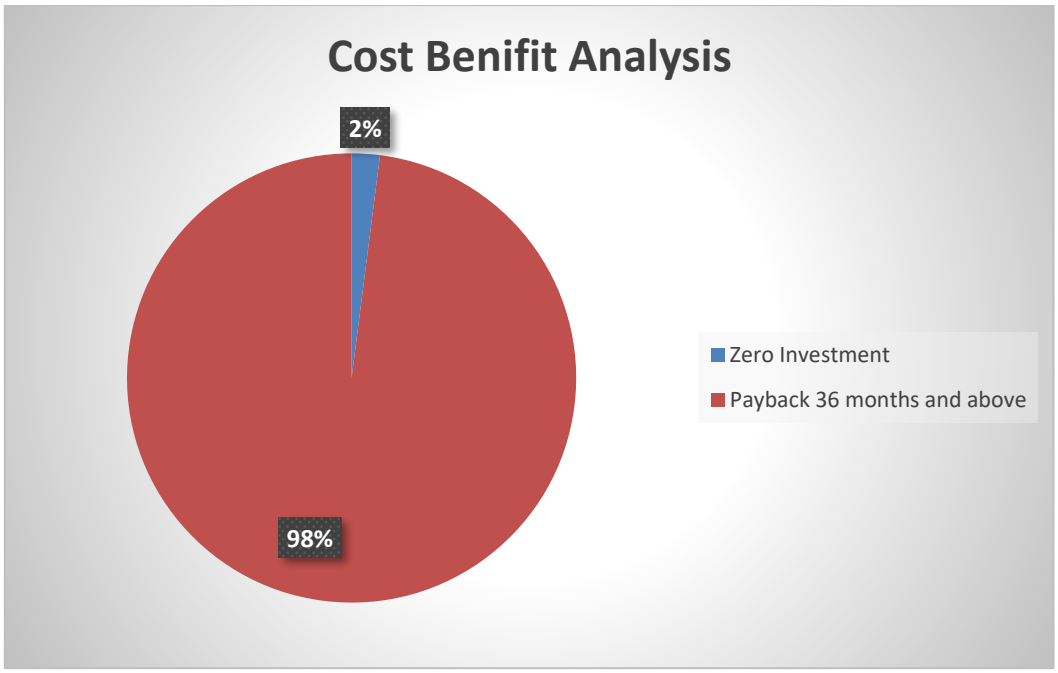


Figure 10 Cost Benefit Analysis

Recommendations:

Table 14 Recommendations:

Sr.No.	Equipment Name	ECM Details	Investment (Rs. In Lacs)	Savings (kWh/year)	Carbon credit (Tons of Co2)	Saving (Rs.In Lacs /Year)	Payback (Years)	Payback (Months)
1	AC	Optimize the temperature setting to 23-25 degree celsius	0.00	75.60	0.07	0.01	0.00	0.00
2	Lights	Replacement of conventional lights with suitable LEDs	0.46	302.40	0.26	0.02	20.11	241.32
3	Fans	Replacement of existing fans with energy efficient Super fans	2.22	3360.00	2.86	0.23	9.88	118.57
Total			**2.68**	**3662.40**	**3.11**	**0.25**	**10.92**	**131.09**

During the Energy Audit,

- **Total Estimated Investment of Rs. 2,68,000/-**
- **Total Estimated Savings of Rs. 25,000/-**
- **Total Energy Cost of Rs. 1,02,547/-**
- **Total Estimated Savings is 24 % of the Total cost of Energy**
- **Overall payback period of 10.92 Years**

Action Plan:

Sr No	Recommendations	Action Required
1	Optimization of Set Temperature of ACs	Optimise the temperature setting to 23-25 degree Celsius
2	Optimisation of Lighting	Replacement of conventional lights with suitable LEDs
3	Replacement of existing fans with energy efficient Super fans	Install/energy efficient super fans (BLDC Fans)

7. LIST OF INSTRUMENTS

DIGITAL CLAMP METER

Picture 1 MECO 3150 DIGITAL CLAMP METER

Power Clamp meter is a Portable Digital multi-functional measuring instrument. Designed for Measuring selected power network parameters, AC/DC Voltage, AC/DC current, Resistance, Continuity, Diode and Frequency.

TECHNICAL SPECIFICATIONS

DC VOLTAGE (Auto Ranging)	
Ranges	4V, 40V, 400V, 1000V
Overload Protection	1200V DC/800V AC
AC VOLTAGE (Auto Ranging) 40-500Hz	
Range	4V, 40V, 400V, 750V
Overload Protection	1200V DC/800V AC
RESISTANCE (Auto Ranging)	
Range	400Ω, 4KΩ, 40KΩ, 400KΩ, 4MΩ, 40MΩ
Test Current	0.7mA on 400Ω, 0.1mA on 4KΩ
Diode Test	
Measurement Current	1.0 ± 0.6 mA Approx
Open Circuit Voltage	0.4V Approx
Overload Protection	500V DC / AC
Frequency (Auto Ranging)	
Range	10.00Hz, 50.00Hz, 500.0Hz, 5.000kHz,
	50.00kHz, 500.0kHz
Sensitivity	3V
Overvoltage Protection	200V DC or AC peak
Thermal Sensitivity/NETD	<150 mK
Display	2.0 in TFT LCD

INFRARED THERMOMETER

Picture 2 HTC IRX 64 Infrared thermometer

HTC IRX 64 infrared thermometer is useful instrument to measure the surface temperature. Infrared thermometers are ideal for taking temperatures need to be tested from a distance. They provide accurate temperatures without ever having to touch the object you're measuring (and even if your subject is in motion).

TECHNICAL SPECIFICATIONS

Specification	Range
IR	-50°C~1050 °C
Contact	-50°C~1370 °C
IR Temp. Resolution	0.1°C
Basic Accuracy	+/- 1.5% of reading
Emissivity	Adjustable 0.10 ~ 1.0
Optical resolution	30 : 1

LUX METER

Picture 3 Nishant NE 1010 Lux meter

Nishant NE 1010 Lux meter is used to measure the lux levels.

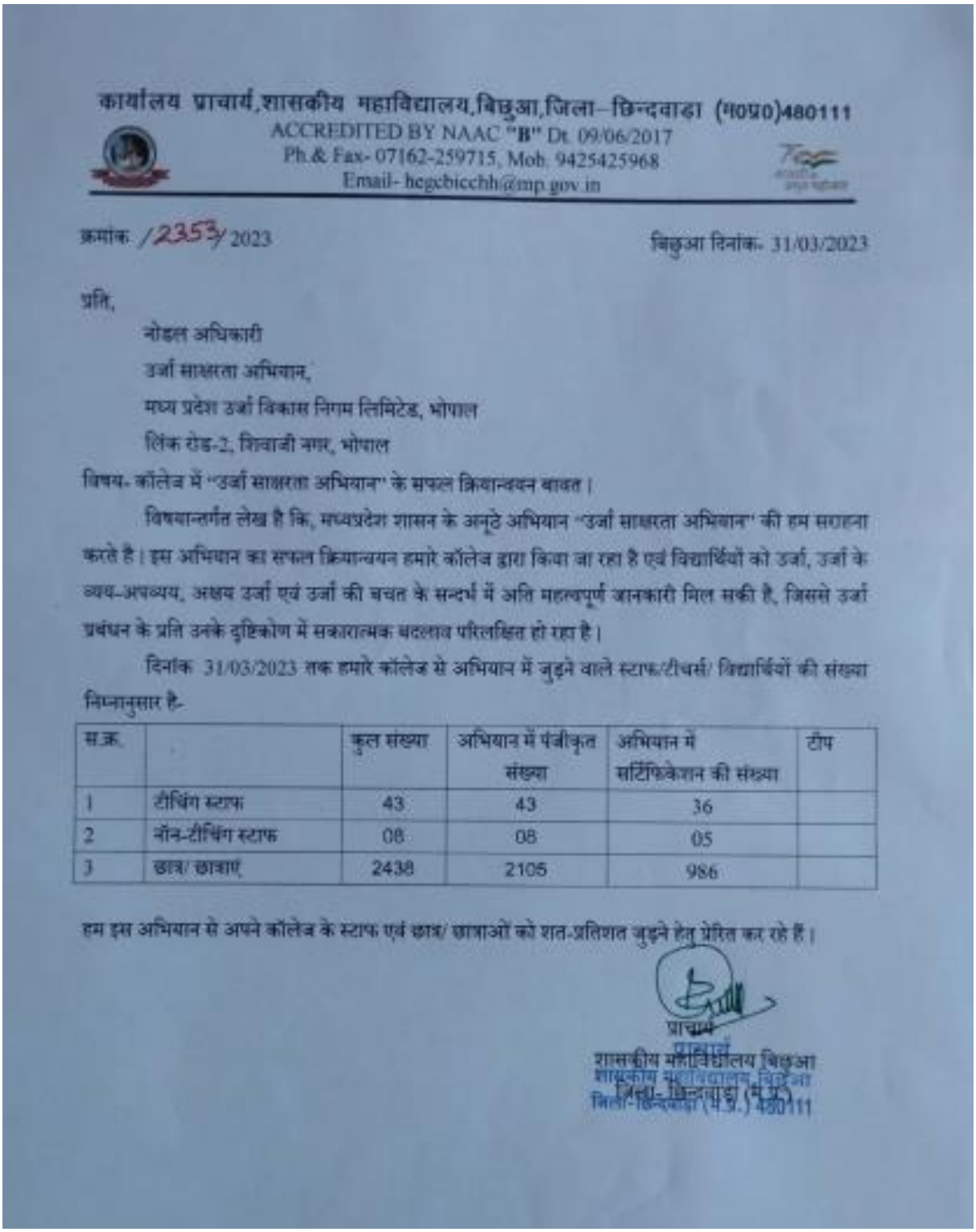
TECHNICAL SPECIFICATIONS

Measuring range	0 Lux ~200, 000 Lux/0 Fc~185, 806 Fc
Accuracy	± 3% rdg ± 0.5% f.s.(<10,000 Lux)
	± 4% rdg ± 10% f.s.(>10,000 Lux)
Digital Updates	2 times/s
Photometric sensor	Silicon diode
Battery life	18 hours (continuous operation)
Operating temperature and humidity	0°C ~ 40°C, 10% RH ~ 90% RH
Storage temperature and humidity	-20°C ~ 50°C, 10% RH ~ 90% RH
Power	9V battery
Unit Size	52.5 x 52.5 x 166 mm
Auto power off	After 5 minutes

8. ANNEXURES

8.1. Annexure 1: Site Photographs

8.2. Annexure 2: Urja Saksharta



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ACCREDITED BY NAAC "B" Dt. 09/06/2017
Ph.& Fax- 07162-259715, Mob. 9425425968
Email- hegcbicchh@mp.gov.in

क्रमांक /2353/ 2023 बिछुआ दिनांक- 31/03/2023

प्रति,

नोडल अधिकारी
उर्जा साक्षरता अभियान,
मध्य प्रदेश उर्जा विकास निगम लिमिटेड, भोपाल
लिंक रोड-2, शिवाजी नगर, भोपाल

विषय- कॉलेज में "उर्जा साक्षरता अभियान" के सफल क्रियान्वयन बाबत।

विषयान्तर्गत लेख है कि, मध्यप्रदेश शासन के अनूठे अभियान "उर्जा साक्षरता अभियान" की हम सराहना करते है। इस अभियान का सफल क्रियान्वयन हमारे कॉलेज द्वारा किया जा रहा है एवं विद्यार्थियों को उर्जा, उर्जा के व्यय-अपव्यय, अक्षय उर्जा एवं उर्जा की बचत के सन्दर्भ में अति महत्वपूर्ण जानकारी मिल सकी है, जिससे उर्जा प्रबंधन के प्रति उनके दृष्टिकोण में सकारात्मक बदलाव परिलक्षित हो रहा है।

दिनांक 31/03/2023 तक हमारे कॉलेज से अभियान में जुड़ने वाले स्टाफ/टीचर्स/ विद्यार्थियों की संख्या निम्नानुसार है-

क्र.क्र.		कुल संख्या	अभियान में पंजीकृत संख्या	अभियान में सर्टिफिकेशन की संख्या	टीप
1	टीचिंग स्टाफ	43	43	36	
2	नॉन-टीचिंग स्टाफ	08	08	05	
3	छात्र/ छात्राएं	2438	2105	986	

हम इस अभियान से अपने कॉलेज के स्टाफ एवं छात्र/ छात्राओं को शत-प्रतिशत जुड़ने हेतु प्रेरित कर रहे हैं।

प्राचार्य
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जिला- छिन्दवाड़ा (म.प्र.) 480111