2021

ENERGY AUDIT REPORT OF INDIRA GANDHI GOVERNMENT POST-GRADUATION COLLEGE, VAISHALI NAGAR, BHILAI (C.G.)

Greenserve Energy
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Endless in Optimization

Greenserve Energy Management Solutions
Vijay nagar, Near shrinathkunj, Durg-491001

Acknowledgement

We are thankful to the Management and the Principal of the Indira Gandhi Govt. Post-Graduation College, Vaishali Nagar, Bhilai for entrusting processes of Energy auditing with us. We thank all the participants of the auditing team especially students, faculty and non-teaching staff who took pain along with us to gather data through survey. We also thank the office staff who helped us during the document verification.

Audit Team Members

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List of Abbreviations

Word	Meaning
ECM	Energy Conservation Measure
EE	Energy Efficiency
kVA	Kilo Volt Ampere
kVAh	Kilo Volt Ampere hour
kVAr	Kilo Volt Ampere reactive
kW	Kilo Watt
kWh	Kilo Watt hour
PF	Power Factor
RH	Relative Humidity
THD	Total Harmonic Distortion
TR	Tons of Refrigerant
INR	Indian Rupees
kV	Kilo Volt
V	Volt
A	Ampere
EB	Electricity Board
m/s	Meter per seconds
m2	Meter Square
CFL	Compact Fluorescent Lamp
FTL	Fluorescent Tube Light
LED	Light Emitting Diodes
FY	Financial Year
HP	Horse Power

Section 1: Executive Summary

1. Executive Summary

Sno	Energy saving measures	Investment (Lakh Rs.)	Energy Saving Electricity (kWh/Year)	Annual Energy Cost savings (Lakh Rs.)	Payback Period (Months)
1	Replacement of Existing Light to LED Lights in Old Building	0.554	7340	0.572	12
2	Replacement of Existing Ceiling Fan to Energy Efficient Fan in Old Building	5.040	12546	0.979	62
	Total	**5.594**	**19886**	**1.551**	**43**

The Annual electrical energy savings (in kWh) are calculated and mentioned in the below table:

Total annual Energy savings, kWh	19886
Total Investment, Rs Lakh	5.59
Total Monetary savings, Rs Lakh	**1.551**
Simple Payback Period, Months	**43**

Section 2: Introduction

2. Introduction

2.1 About *Indira Gandhi* Govt. Post-Graduation *College*

Indira Gandhi Govt. Post-Graduation College, located in Vaishali Nagar, Bhilai Municipality in the Tehsil & District of Durg State Chhattisgarh, Established on 12th July 1989, it was soon to possess a building of its own. With a campus spread across 10.61 acres, the college has a fine infrastructure. herbal and botanical gardens, a Big ground and other sports and games facilities.

At present, the work of teaching studies at the undergraduate level in all the four faculties of Arts, Commerce, Science and Home Science is going on smoothly in a self-constructed building on about 11 acres of land. A total of about one thousand students are studying in the college and making their dreams of higher education come true. This college is affiliated to Hemchand Yadav University, Durg.

VISION AND MISSION

Institutional Vision

"TO STRIVE TOWARDS EXCELLENCE IN EVERY SPHERE BY THOUGHTS, EXPRESSION AND ACTION."

Mission

- Creating an academic environment which gives scientific and technological orientation to the students.
- To create and promote environment which are value based, enhances moral characteristics and nurtures a love for human beings, animals and develops a social commitment.
- To ensure that the students develop an affinity for environment, nature and in totality, and concern for the biodiversity.
- To inculcate admiration, respect and love for the nation and also to ensure the empathy for Chhattisgarh and its culture in the mosaic of Indian culture.
- To promote skills so as to meet the needs of successful career & employability.
- To give a platform for academic intelligence, creativity and physically energize them through sports so as to strive towards total physical development.

The installed capacity of each load is given as follows:

Connected Load Breakup	
Lighting Load	9.5
Fans, Coolers & AC Load	15.3
Computers, Projectors & Photo Copier Load	10.6
Freeze, Incubator & Others Load	9.2

Table 1: Connected Load Break up

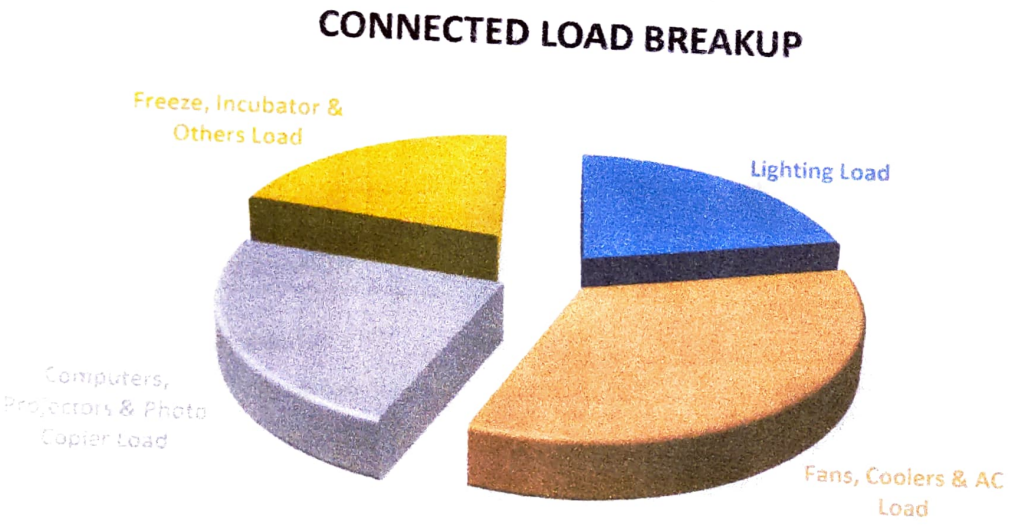

Figure 1: Connected Load Breakup

2.2 Methodology

The methodology adopted for energy audit study is given below:

- Kick off meeting
- Analysis of past performance data
- Measurements of required electrical parameters
- Conduct of efficiency and performance improvement trials (if required)
- Discussion of the findings and recommendations with Electrical Team.
- Detailed techno-economic analysis
- Report submission

2.3 Instruments used for study

The following Instruments were used during energy audit study:

S. No	Name of the Instrument	Make of the instrument	Details
1.	Portable power quality analyser	Hioki	Range: 5A-5000Amps Accuracy: Uncertainty in measurement is ±0.77% Voltage & ±0.7% (current), ±0.31% (watts)
2.	Thermal Imaging camera	Fluke TS10	Temperature Range: -10 to 350 °C (14 to 662 °F)
4.	RH meter	TESTO	Temperature range: 0°C to 50°C. with 100% RH
5.	Lux meter	Ten mars (NEDA 1604)	Range:0-2000, 0-20000 & 0-50000 Lux (3 Ranges)
6.	Digital Pressure Meter	Metravi	Range : 0 to 2.131 PSI
7.	Anemometer	Lutron (AM 4201)	Range of Velocity: 0-30 m/s
8.	Ultrasonic flow meter	ADOPT Fluid Dynamics, pune	Range: 0-2500 m^3/hr Resolution: 0.01m^3/hr

Table 2: Instruments used for the study

Climatic condition

The average high temperature and low temperature profile of Bhilai is given as follows:

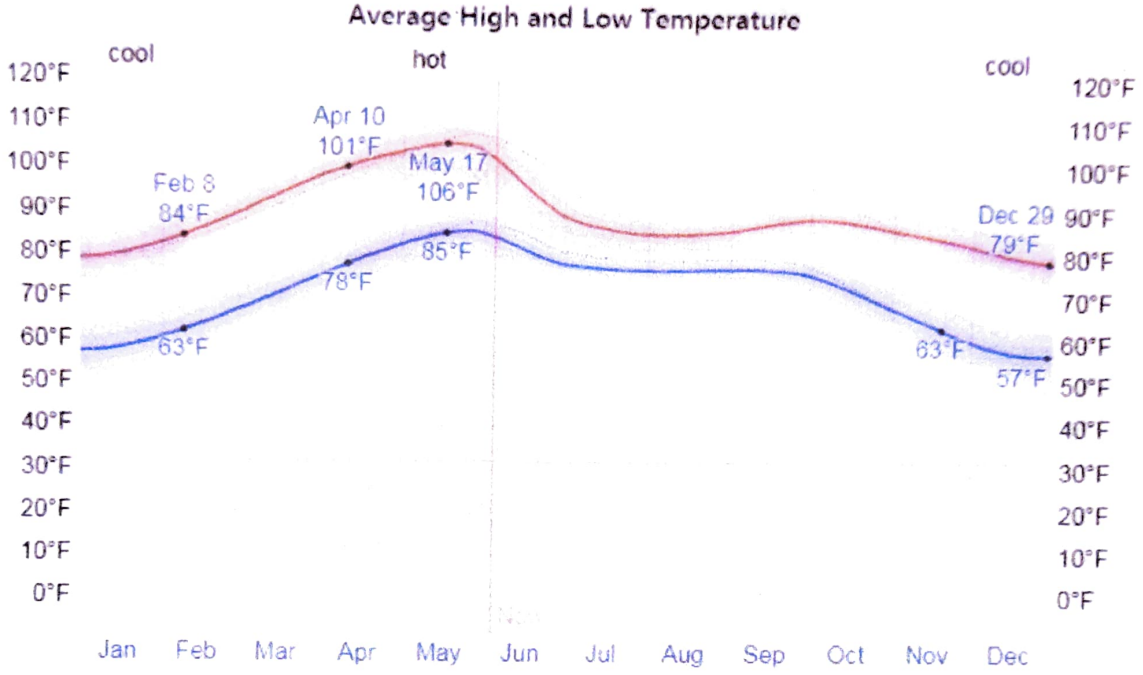

Figure 2: Climatic condition of Bhilai

The hot season lasts for 1.9 months, from April 10 to June 8, with an average daily high temperature above 101°F (38°C). The hottest day of the year is May 17, with an average high of 106°F (41°C) and low of 85°F (29°C).

The cool season lasts for 2.6 months, from November 19 to February 8, with an average daily high temperature below 84°F(29°C). The coldest day of the year is December 29, with an average low of 57°F(14°C) and high of 79°F(26°C).

2.4 Present Energy Scenario at Indira Gandhi Govt. Post-Graduation College

2.4.1 Source of Electricity

Electricity is sourced from Chhattisgarh State Power Distribution Company Limited (CSPDCL).The sanctioned demand of the facility is 31 kW.

Section3: Performance Assessment

3. Performance Assessment

The Indira Gandhi Govt. Post-Graduation College, has One Energy Meter. The facility has AC's, Fans, lighting and Computers as the major energy consuming utilities.

3.1 Load Analysis

The power logging monitoring has been done for main incomer feeder.

Main Incomer reading

Sr No.	Name of Feeder	Voltage (Volt)					Current (Amp)					Power Factor (PF)	Power	
		RY	YB	BR	Avg.	% Imbalance	R	Y	B	Avg.	% Imbalance		(kW)	(KVA)
1	Main Incomer	401	399	398	399	0.42	24.0	26.0	29.0	26.3	10.13	0.85	15.5	18

Voltage profile

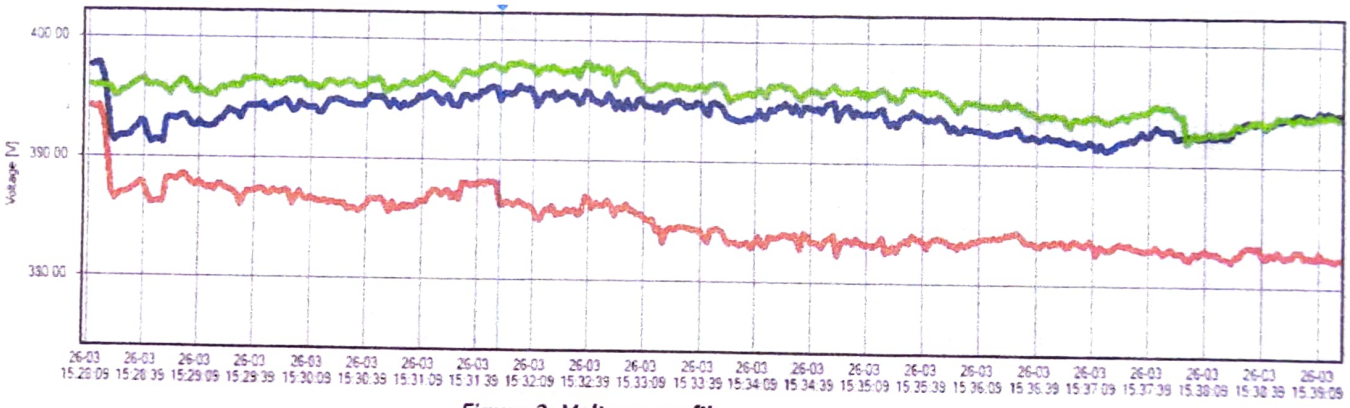

*Figure 3: **Voltage profile-***

Current profile

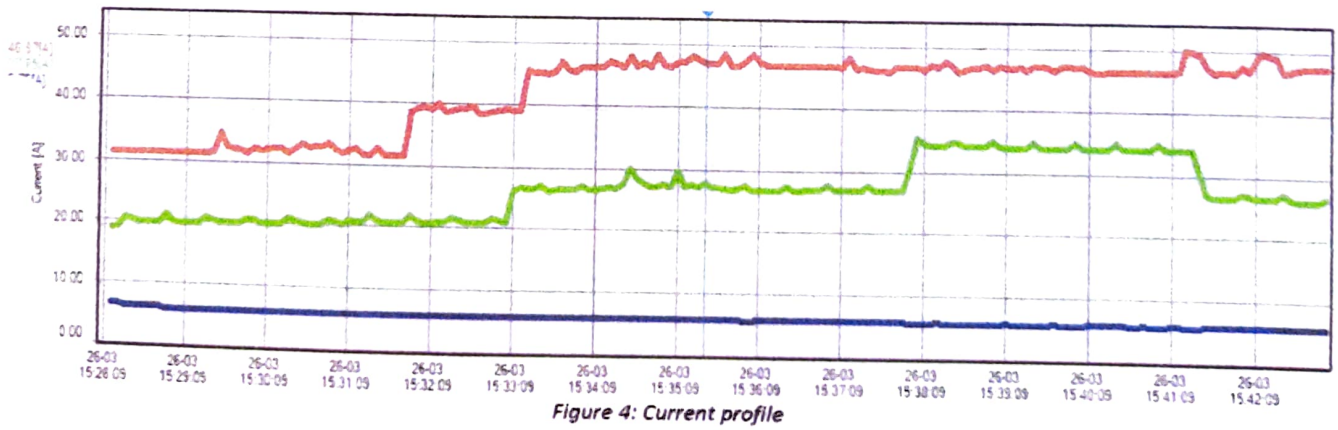

Figure 4: Current profile

3.2 Illumination Survey

Sl. No.	Location / Room No.	Lux
	COLLEGE BUILDING	
1	Principal Chamber	290
2	Room No.-02	180
3	English Department	160
4	Mathematics Department	165
5	Room No.-05	140
6	Home Science	150
7	Room No.-07	160
8	Sports Room	120
9	Room No-09	148
10	Girls Common Room	136
11	Office	230
12	Room No-19	150
13	Room No-20	142
14	Room No-10(Physics Department)	165
15	Room No-14(Conference Hall)	260
16	Smart Class	250
17	Old NCC Room	130
18	Geography Room	147
19	Staff Room	190
20	Room No-18(Economics)	170
21	Computer Department	210
22	Class Room 1st Floor	150
23	1st Floor Passage	180
24	Commerce Depatment-01	130
25	Commerce Depatment-02	138
26	Store Room	90
27	Hall	190
28	Library	160
29	Ground Floor Passage	144
30	Play Ground	130
31	Chemistry Department(Room No-13)	162
32	Room No-12	167
33	Industrial Microbiology Department(Room No-11)	152
34	Room No-21	168
35	Room No-22	160
36	Room No-23(Zoology Department)	172
37	Room No-24	181
38	Wash Room Boys	88
39	Wash Room Girls	96

3.3Connected Load

Sr.No.	Type of Fitting	Qty.	Watts	Total KW
	COLLEGE BUILDING			
1	FTL- 40 W	41	40	1.6
2	FTL- 36 W	145	36	5.2
3	CFL-11 W	6	40	0.2
4	CFL-60 W	7	60	0.4
5	LED-18W	74	18	1.3
6	LED-09	5	9	0.05
7	LED-11	2	11	0.02
8	Bulb 100W	2	100	0.2
9	Fluorescent bulb-60W	6	60	0.4
10	Ceiling fan 70W	163	70	11.4
11	Ceiling fan 120W	5	120	0.6
12	Wall Fan(40)	1	40	0.04
13	Exhaust Fan(40W)	9	40	0.4
16	Room Cooler(100)	12	100	1.2
17	Water Cooler(100)	2	100	0.2
14	AC-1500W	1	1500	1.5
15	Computer(200W)	33	200	6.6
18	Projector-300W	7	300	2.1
19	Photo Copier(930W)	2	930	1.9
20	Freeze(300W)	4	250	1.0
21	Television(LED)-300W	1	300	0.3
22	Printer(200W)	7	200	1.4
23	Hot Air	1	500	0.5
24	Incubator (instrument)	6	1000	6.0
	Total Load			**44.5**

Section4: Energy Conservation Measures (ECM)

4. Energy Conservation Measures

ECM 1: Replacement of Existing Light to LED Lights in College Building.

Existing condition

Sr. No.	Location	Existing Fittings (100, 40, 36 Watt FTL & 100 Watt Incandescent Lamp & 11, 100 Watt CFL)				Proposed Fittings to be Replaced with LED				
		Type of Fitting	Watt	Qty.	Total Watt	Watt	Qty.	Total Watt	Approx. Each Price in Rs.	Amount in Rs.
1	College Building	FTL	40	41	1640	18	41	738	250	10250
2		FTL	36	145	5220	18	145	2610	250	36250
3		Incandescent Lamp	100	2	200	18	2	36	250	500
		CFL	60	7	420	30	7	210	600	4200
4		FTL Bulb	60	6	360	30	6	180	600	3600
5		CFL Bulb	11	6	66	9	6	54	100	600
	Total				7906			3828		55400

Recommendation

Replacement of Existing Light to LED Lights

Savings Analysis

Energy saving potential for illumination

1	Existing Fitting energy consumption	Watt	7906
2	Proposed Fitting energy consumption	Watt	3828
3	After replacement energy saving	Watt	4078
4	Energy Saving in Percentage	%	51.58
5	Operating hour per day	hours/day	6
6	Operating days per years	days/Year	300
7	Energy Saving After Replacement	Watt Hour	24468
		kWh/year	7340
		Lakh kWh/year	0.073
8	Energy Cost	Rs./kWh	7.80
9	Saving in Terms of Amount	Lakh Rs. /year	0.573
10	Estimator Investment of LED Fitting	Lakh Rs.	0.554
11	Simple Payback Period	Year	0.97
		Month	11.61
		Say Month	12

ECM 2: Replacement of Existing Ceiling Fan to Energy Efficient Fan in College Building.

Existing condition

Sr.No.	Location	Existing Ceiling Fan Fittings (70&120 Watt)			Proposed Fan to be Replaced with Energy Efficient ceiling Fan (1200 mm) 30 Watt				
		Watt	Qty.	Total Watt	Watt	Qty.	Total Watt	Approx. Each Price in Rs.	Amount in Rs.
1	College Building	70	163	11410	30	163	4890	3000	489000
		120	5	600	30	5	150	3000	15000
	Total			12010			5040		504000

Recommendation

Replacement of existing Ceiling Fan to Energy Efficient fan in Old Building

Savings Analysis

1	**Existing Fitting energy consumption**	**Watt**	**12010**
2	**Proposed Fitting energy consumption**	**Watt**	**5040**
3	**After replacement energy saving**	**Watt**	**6970**
4	**Energy Saving in Percentage**	**%**	**58.03**
5	**Operating hour per day**	**hours/day**	**6**
6	**Operating days per years**	**days/Year**	**300**
7	**Energy Saving After Replacement**	**Watt Hour**	**41820**
		kWh/year	**12546**
		Lakh kWh/year	**0.125**
8	**Energy Cost**	**Rs./kWh**	**7.80**
9	**Saving in Terms of Amount**	**Lakh Rs. /year**	**0.979**
10	**Estimated Investment for Energy Efficient ceiling fan**	**Lakh Rs.**	**5.040**
11	**Simple Payback Period**	**Year**	**5.15**
		Month	**61.80**
		Say Month	**62**

CERTIFICATION

This Part shall indicate certification by Certified Energy Auditor stating that: -

I. The data collection has been carried out diligently and truthfully.
II. All data monitoring devices are in good working condition and have been calibrated or certified by approved agencies authorized and no tampering of such device has occurred.
III. All reasonable professional skill, care and diligence had been taken in preparing the Energy Audit Report and the contents thereof are a true representation of the facts.
IV. Adequate training provided to personnel involved in daily operation after implementation of recommendation.
V. The Energy Audit has been carried out in accordance with the Bureau of Energy Efficiency (Manner and intervals of time for the conduct of Energy Audit) Regulation, 2010.

Signature:

Certified Energy Auditor
EA-20984
BEE
Rahul Agrawal

Name of the Certified Energy Auditor: Mr. Rahul Agrawal
Certification Detail: EA-20984

Principal
Indira Gandhi Govt. P.G. College
Vaishali Nagar, Bhilai