Raiganj Surendranath Mahavidyalaya

Sudarshanpur, Raiganj, Uttar Dinajpur
(Affiliated to University of Gour Banga)
Recognized by UGC U/S 2(f) & 12(B)
NAAC accredited College with "B+" Grade

INTERNAL ENERGY AUDIT 2022 - 23

RAIGANJ SURENDRANATH MAHAVIDYALAYA
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SURENDRANATH MAHAVIDYALAYA ESTD-1986 P.O. RAIGANJ DIST. U/D.

MANAGEMENT SYSTEM CONSULTANCY

Service Provided: Legal, Safety, Fire, Environment, Energy Audit and ISO, Information Security, Automotive, NABL, NABH, CER, Food, Medical Certification and Training services

Energy Audit Certificate

This Certificate is awarded to

RAIGANJ SURENDRANATH MAHAVIDYALAYA

As part of the Institution's Initiatives for a Healthy & Sustainable College the audit was conducted.

We appreciate the immense efforts taken by Staff and Students towards the Energy Management and Conservation.

Issued on April, 2022 valid till March, 2023

Amalesh Kr. Mandal

MANAGEMENT SYSTEM CONSULTANCY

Authorization:

- **ISO 14001:2015 (Environment) (CQI-IRCA Delegate ID: 173839, Certificate No. 46957)Lead Auditor Certificate**
- **ISO 9001:2015 (Quality) (NABET Accredited, Certificate No. IRCLASS/QMS/2016/02/03/01 of 07) Lead Auditor Certificate**
- **ISO 45001:2018 (OHSAS) (CQI-IRCA Delegate ID: 111285, Certificate No. 44532) Lead Auditor Certificate.**
- **Certified PGDiploma in Environment and Sustainable Development (En Roll No-BU/13/706432) from Bundelkhand University.**
- **Certified PG Diploma in Fire and Safety Management from Jawaharlal Nehru Technological University Hyderabad (Cert. No. 15359120506)**

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ABOUT THE INSTITUTION

Raiganj Surendranath Mahavidyalaya was established in 1986 with the intention of meeting the educational needs of rural and suburban youth in the surrounding area. The land of the College was donated by Mr. Shailendra Narayan Sen in loving memory of his father Surendranath Sen and hence the College was named as Raiganj Surendranath Mahavidyalaya. Although initially planned as a Women's College, it later evolved into a coeducational undergraduate degree college affiliated under the University of North Bengal. In 2008, the college became affiliated with the University of Gour Banga. It is currently the largest college in the district, with a student population exceeding 5000. In 2016, the college received accreditation from NAAC at the B+ level. The college now offers four-year Bachelor of Arts (B.A.) and Bachelor of Science (B.Sc.) programs under the New Education Policy of 2000. Situated in the northern part of Raiganj town, the campus features a modern three-storied building with top-notch facilities, including five air-conditioned science laboratories, a library with e-resources, and two air-conditioned auditoriums, one AC Teachers' Common Room, office equipped with network, two AC Guest Room, music room, Computer Training Centres, Boys' Common Room & Girls' Common Room, two Canteen with one Dining Room, one Cheap Stores, Selfie Zone, Study Centres of two Open Universities (Rabindra Bharati University & Netaji Subhas Open University) etc. The college has shown a significant dedication to promoting academic excellence in Raiganj and its surrounding areas. It is currently enhancing opportunities in important undergraduate programs. The College offers Certificate Courses in Photography and Journalism & Mass Communication as well as Add-on courses such as Early Childhood Development, Folk Culture, Communicative English and Karate Excellence. In recent years, the college has seen substantial growth in various activities, creating new opportunities in multiple areas.

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MEMBERS OF INTERNAL ENERGY AUDIT COMMITTEE

1. **Dr. Chandan Roy**
   Principal, Raiganj Surendranath Mahavidyalaya
2. **Dr. Rakhee Das Biswas**
   Associate Professor & H. o. D., Botany
3. **Dr. Priyanjalee Banerjee**
   Assistant Professor & H. o. D., Zoology
4. **Dr. Abdus Sabur**
   Assistant Professor of Botany
5. **Mr. Tarik Anwar**
   SACT in Department of Geography
6. **Md. Azmalul Alam**
   SACT in Department of Botany

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CONTENT

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1. INTRODUCTION

Energy auditing is a crucial process that helps organizations understand how energy is used within their facilities. By identifying areas where energy waste occurs and opportunities for improvement, energy audits can significantly enhance overall energy efficiency. This process involves evaluating energy management practices and implementing measures to conserve energy, ultimately leading to cost savings and better resource utilization.

Objectives of Energy Auditing:

1. Identify Energy Inputs and Costs: Assess the quality and cost of various energy sources.
2. Analyze Consumption Patterns: Evaluate how energy is consumed across different operations.
3. Relate Inputs to Outputs: Understand the relationship between energy inputs and production outputs.
4. Highlight Wastage: Identify major areas of energy wastage.
5. Set Conservation Targets: Establish energy-saving goals for different cost centres.
6. Implement Conservation Measures: Apply strategies to conserve energy and realize savings.

Methodology

The energy audit was conducted using a comprehensive approach that included:

1. Site Inspections: On-site visits to assess the condition and efficiency of existing systems, equipment, and building envelope.
2. Discussions: Engaging with concerned officials to identify major areas of focus and related systems.
3. Measurements and Monitoring: Electrical loads of the instruments and appliances were recorded by visual observations to identify energy usage patterns and losses.
4. Trend Analysis: Analyzing costs and consumption trends.
5. Computation: Graphical presentations and electrical load calculations were done to draw inferences.

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2. PRESENT ENERGY SCENARIO

Raiganj Surendranath Mahavidyalaya (RSM) uses energy in the form of electricity purchased from West Bengal State Electricity Distribution Company Limited (WBSEDCL) under tariff category **Type A (CM-PU) (MUN)** for public utility/ specific Institution Public Bodies. The College has sanctioned load of **49.64 KVA**. The total billing amount has been found to be about INR **2,39,264/-** for four quarter analysis period of 2022 – 2023. The overall average energy charges stand at INR **9.65/-** per unit.

2.1. POWER SUPPLY SYSTEM

The power supply system for the college is from WBSEDCL with the help of 400/230 volts three phase feeder under tariff category Type A (CM-PU) (MUN) for public utility/ specific Institution Public Bodies with sanctioned load of 49.64 KVA.

Phase	Red	Yellow	Green
Voltage (V)	240	240	240

2.2. DG set

There are two DG set in the college premise. Of the two DG sets, one is currently in broken down condition. The technical specification of the functional DG set is given in Table 1.

Table 1: **Technical specification of DG set-**

Properties	Technical specification
Manufacturer	Kirloskar Oil Engines Limited
Model	KG10AS1
Capacity	10 KVA
Rated Voltage	415 V
Frequency	50 Hz
Power factor	0.8
Phase	3
Governing Class	G2
Noise level	<75 dBA at 1m
Electrical Battery starting Voltage	12V-DC
Rated Output	16 Hp
Max. Voltage dip	<20%

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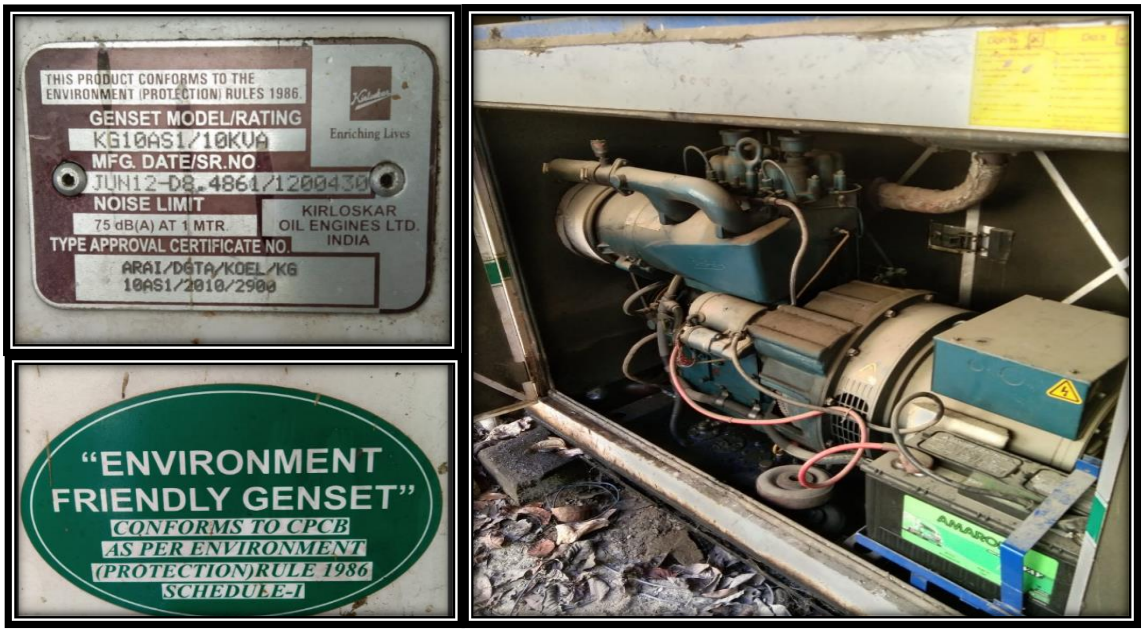

Figure 1: DG set installed in front of the college building

Figure 2: Main power supply to the college from WBSEDCL

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2.3. Solar Panel

Several initiatives have been undertaken to utilize solar energy on the college campus. Since 2022, RSM has been actively and steadily generating solar energy. Currently, the college has a total of 15 solar panels with a capacity of 5 KW, installed on the roof and connected to the grid using RUSA funds. The college has applied twice in the last 3-4 years to the West Bengal State Electricity Distribution Company Limited (WBSEDCL), Raiganj, for a separate meter for the solar system, but the process is still ongoing.

Figure 3: Solar power panels installed at the rooftop of the college building, solar power connection and wheeling to the grid present at the staircase.

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3. OBSERVATION

3.1. ELECTRICITY BILL ANALYSIS

The energy audit team has analyzed last four quarter electricity bill of the college. Detailed of the unit consumption, annual payable amount, and annual per unit charges are determined as follow:

Quarterly electrical energy consumption (2022 – 2023)

The quarterly electrical energy consumption for the college is given in Table 2

Table 2: The quarterly electrical energy consumption for the college for 2022 – 2023

Serial number	Month and year (Mar 22 – Feb 23)	Total consumed unit (KWH)	Electricity Bill (INR)
1	Q1 (Mar – May)	3279	26825/-
2	Q2 (June – Aug)	6322	93957/-
3	Q3 (Sep – Nov)	9519	74112/-
4	Q4 (Dec – Feb)	5675	44370/-
Total		**24795**	**239264/-**

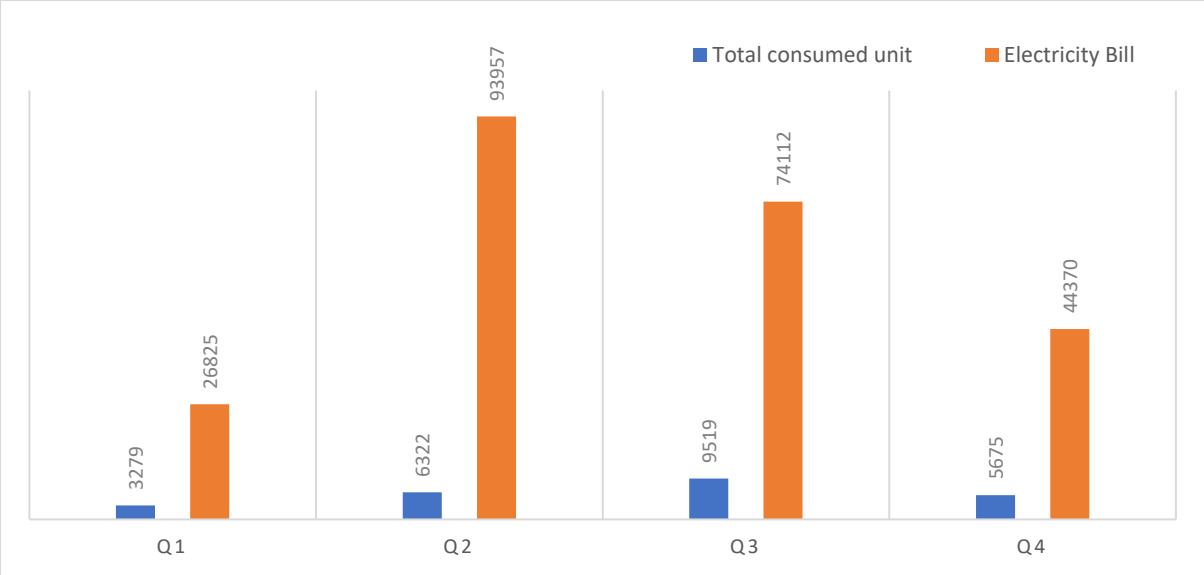

Figure 4: Graphical representation of electrical energy consumed and bill paid in all the four quarter of 2022 – 2023

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Table 3: Over-all unit charges in 2022 -2023

Serial number	Quarter of the year	Unit charges (Rs/ KWH)
1	Q1	8.18
2	Q2	14.86
3	Q3	7.78
4	Q4	7.82
Average unit charge		**INR 9.65/-**

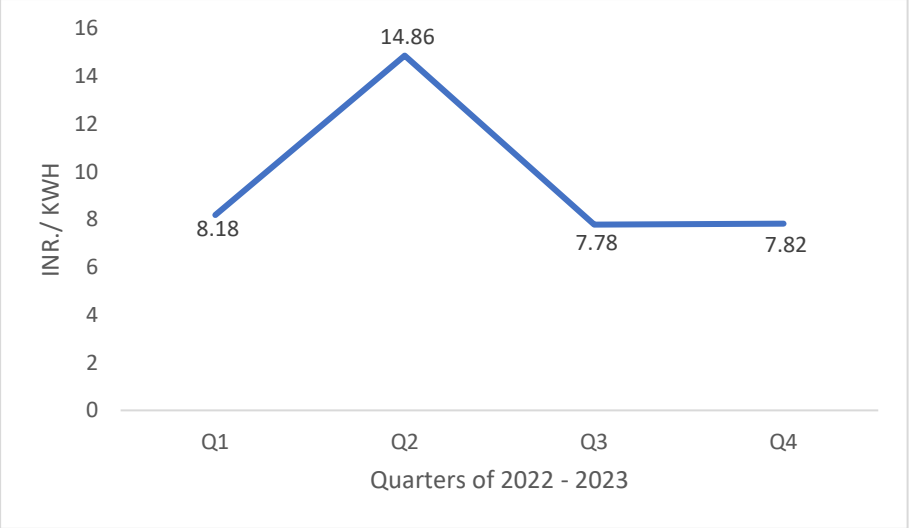

Figure 5: Graphical presentation of actual unit charges throughout the year 2022 -2023

3.2. CONNECTED LOAD OF THE COLLEGE

Details of connected load (maximum) are given in Table 4

Table 4: Connected load

Location/Department	Fixtures	Watt	Qty	Total load (W)
Department of Economics	Fan	50	3	150
	LED Tube	10	4	40
Department of History	Fan	50	6	300
	LED Tube	10	2	20
	Projector	50	1	50
	CFL Bulb	11	3	33
Department of Education	Fan	50	8	400
	LED Tube	10	4	40
	Projector	50	1	50
Department of Bengali	Fan	50	7	350
	LED Tube	10	5	50
	Projector	50	1	50

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Department of philosophy & Sanskrit	Fan	50	1	50
	LED Tube	10	1	10
Department of Political Science	Fan	50	7	350
	LED Tube	10	3	30
Department of Sociology	Fan	50	8	400
	LED Tube	10	5	50
Department of English (including G-17)	Fan	50	19	950
	LED Tube	10	17	170
Department of Urdu	Fan	50	11	550
	LED Tube	10	5	50
	CFL bulb	11	6	66
Department of Zoology	Fan	50	10	500
	LED Tube	10	18	180
	Computer	60	3	180
	AC	1000	2	2000
	Refrigerator	100	2	200
	CFL bulb	11	2	22
	Exhaust Fan	10	1	10
	Incubator	40	2	80
	Printer	20	1	20
	Autoclave	20	1	20
	Laminar Cabinet	40	1	40
	Centrifuge	138	1	138
	Spectrophotometer	20	1	20
	Magnetic stirrer	10	1	10
	Dry Bath	550	1	550
Department of Chemistry	Fan	50	3	150
	LED Tube	10	32	320
	CFL bulb	11	6	66
	Computer	60	3	180
	AC	1000	1	1000
	Exhaust Fan	10	6	60
	Hot air Oven	500	1	500
	Heating mantle	200	2	400
	Centrifuge	138	3	414
	Shaker	15	4	60
	Distillation plant	750	1	750
	Magnetic stirrer	10	4	40
	Printer	20	1	20
	Refrigerator	100	1	100
	UV chamber	66	1	66
	Vacuum rotary	400	1	400
	Water bath	500	2	1000
	Dry Bath	550	3	1650
	Colorimeter	20	2	40
	Digital melting point bath	100	1	100
	Projector	50	1	50

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Department of Mathematics	Fan	50	13	650
	LED Tube	10	9	90
	AC	1000	1	1000
	Computer	60	8	480
Department of Botany	AC	1000	1	1000
	Fan	50	13	650
	LED Tube	10	15	150
	Computer	60	2	120
	Refrigerator	100	1	100
	BOD	60	1	60
	Laminar Cabinet	60	1	60
	Colorimeter	20	1	20
	Spectrophotometer	20	1	20
	Hot plate	750	1	750
	Centrifuge	138	1	138
	Water bath	500	1	500
Department of Geography	Fan	50	7	350
	LED Tube	10	5	50
	Computer	60	1	60
	CFL bulb	11	3	33
Department of Physics	AC	1000	3	3000
	Fan	50	13	650
	LED Tube	10	22	220
	Spectrophotometer	20	1	20
	Voltameter	1000	1	1000
	Miscellaneous	100	1	100
Department of Physical Education	Fan	50	4	200
	LED Tube	10	4	40
Library	AC	1000	1	1000
	Fan	50	15	750
	LED Tube	10	30	300
	Computer	60	18	1080
Computer Lab	Fan	50	3	150
	LED bulb	11	2	22
	Computer	60	10	600
Language Lab	Fan	50	4	200
	LED Tube	10	2	20
RBU DDE	Fan	50	2	100
	LED Tube	10	1	10
	LED bulb	11	2	22
	Computer	60	1	60
NSOU	Fan	50	2	100
	LED Tube	10	4	40
Galleries and Halls (8)	AC	1000	10	10000
	Fan	50	86	4300
	LED Tube	10	52	520
	LED bulb	11	36	396
	Projector	50	3	150

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Principal's Chamber	AC	1000	3	3000
	Fan	50	8	400
	LED Tube	10	6	60
	LED bulb	11	10	110
	Computer	60	2	120
IQAC, Women Cell & NSS	AC	1000	2	2000
	Fan	50	6	300
	LED Tube	10	7	70
	Computer	60	3	180
Office	AC	1000	1	1000
	Fan	50	18	900
	LED Tube	10	21	210
	Computer	60	8	480
	Photocopier	55	2	110
Boys' Common room	Fan	50	1	50
	LED Tube	10	1	10
Boys' toilet (2)	LED bulb	11	2	22
Girls' Common room	Fan	50	4	200
	LED Tube	10	2	20
Girls' toilets (2)	CFL bulb	11	2	22
	LED bulb	11	1	11
Teachers' common room	Fan	50	8	400
	LED Tube	10	4	40
	AC	1000	2	2000
	Projector	50	1	50
	CFL bulb	11	9	99
Teaching & non-teaching staff's toilets (4)	LED bulb	11	5	55
	CFL bulb	11	2	22
	LED Tube	10	1	10
	Exhaust fan	10	4	40
Kitchen, canteens and dining room	Fan	50	8	400
	LED Tube	10	4	40
	CFL bulb	11	1	11
	Water purifier	30	1	30
Cheap store	Fan	50	1	50
	LED Tube	10	1	10
	Photocopier	55	1	55
Sick room	Fan	50	1	50
	LED Tube	10	1	10
Guest room	AC	1000	1	1000
	Air cooler	100	2	200
	LED Tube	10	1	10
Student Union	Fan	50	1	50
	LED Tube	10	2	20
Staircase	CFL bulb	11	2	22
Outdoor facilities	Fan	50	22	1100
	LED Tube	10	3	30
	Metal	35	8	280ReR

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	Spot Light	11	15	165
	Water purifier	30	2	60
	Water cooler	75	2	150

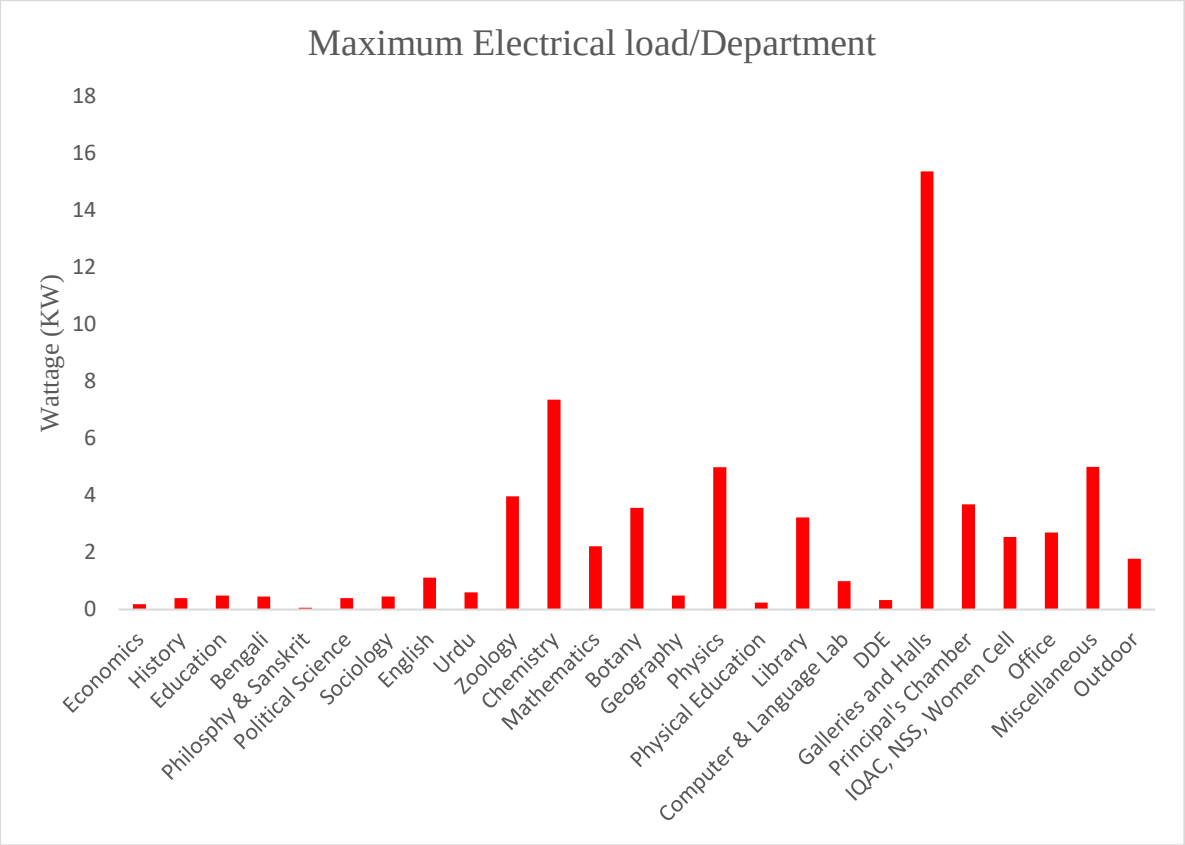

Figure 6: Load distribution/Department (KW)

Table 5: Connected load in %Wattage

Serial Number	Fixtures	Percentage of Wattage
1	AC	43.09
2	Fan & Exhaust fan	25.79
3	LED Tube, LED bulb and CFL bulb	5.88
4	Computer	5.94
5	Projector	0.72
6	Printer & Photocopier	0.33
7	Refrigerator	0.64
8	Water purifier, water and Air Cooler	0.7
9	Laboratory equipments	16.91
Total		**100**

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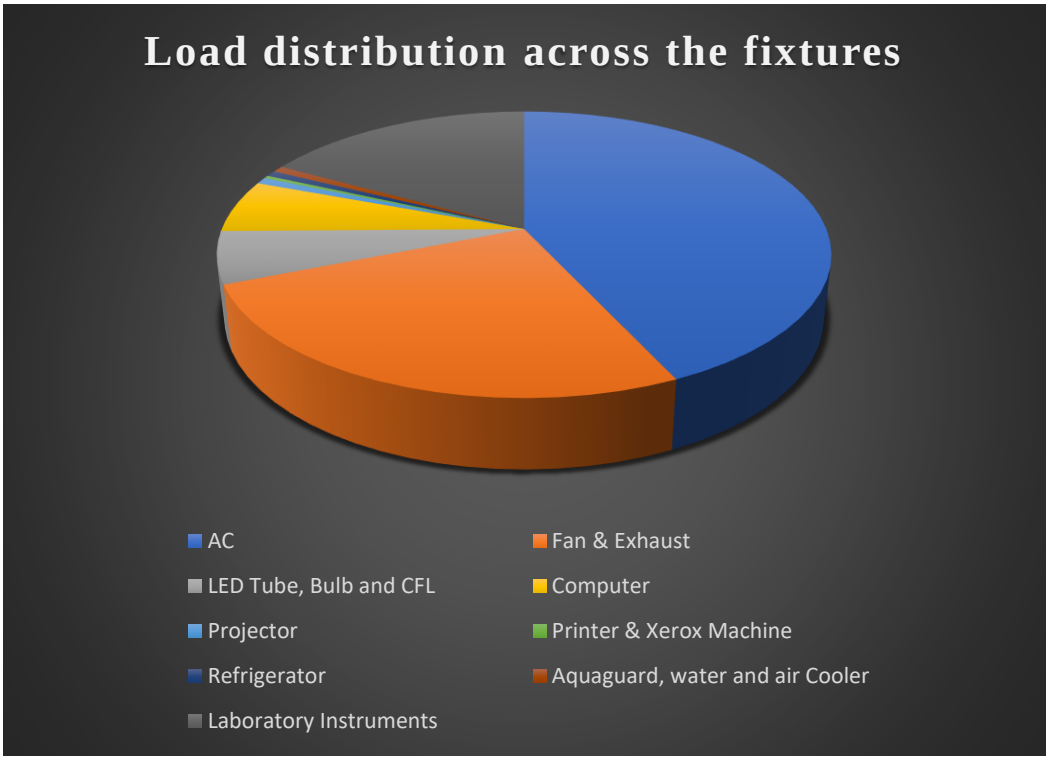

Figure 7: Load distribution across the various fixtures

Photograph of hazardous area

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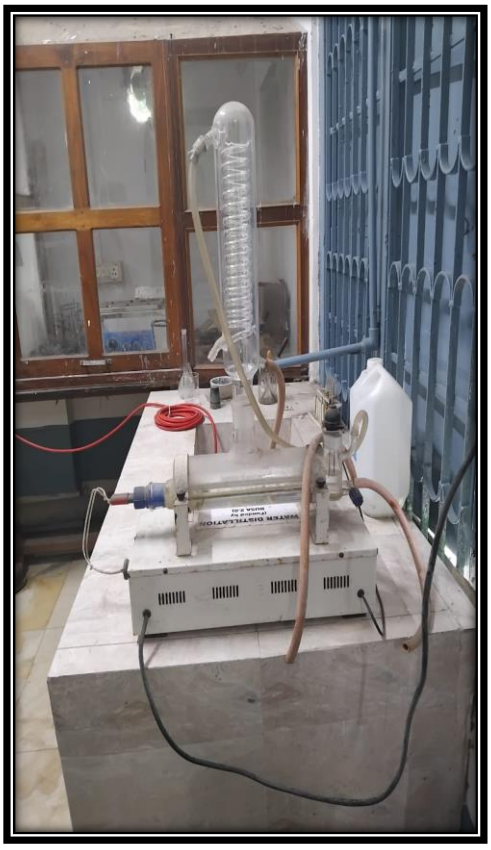
Sample photographs of Laboratory equipment connected



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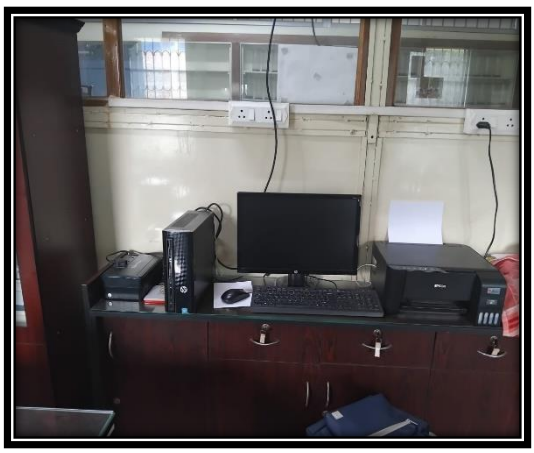
Sample photographs of electrical appliances connected



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4. FINDINGS

4.1. Energy Consumption Analysis

The energy consumption analysis indicates the following:

- Among the Departments from Humanities, Department of English consumes the maximum electrical energy accounting for 1.79% of total consumption.
- Among the Departments from Science, Department of Chemistry uses the maximum electrical energy accounting for 11.75% of total electrical load.
- The maximum electrical load (24.52%) is distributed to eight galleries and halls used mainly for organizing lectures on multidisciplinary studies and courses common to all, or for seminars/ workshop.
- Among the Departments from Humanities, Department of Philosophy & Sanskrit consumes the least electrical load (~0.1%).
- Among the Departments from Science, Department of Geography () consumes least electrical load (~0.8%).
- The maximum electrical load (74.76%) of the college is distributed to the Air conditioners, fan (including exhausts) and LED tubes, LED bulbs and CFL bulbs installed in different locations.
- Water purifiers and coolers consume the least electrical load accounting for 0.7%.
- Computers, projectors, printers and photocopiers uses 6.99% of the total electrical load.
- Refrigerators and laboratory equipment accounts for 17.61% of the electrical load.

4.2. Building Envelop

- Certain areas of the buildings have inadequate insulation, causing significant heat loss in winter and increased cooling demands in summer.
- Drafts around windows, doors, and other openings lead to energy wastage and reduced comfort.

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4.3. Lighting

- Many buildings have old, inefficient lighting fixtures.
- Absence of occupancy sensors and daylight harvesting controls.
- About 10.4% lighting is CFL. Although, the college is less reliant on CFL bulbs for lighting, complete shifting to LED will save more electrical energy.

4.4 Fans

- Many fans are old and consume more power. Replacing them with energy-efficient models is advised.
- Old regulators should be replaced with electronic ones to reduce power loss.

5. RECOMMENDATION

Based on the energy audit following recommendations are proposed to improve energy efficiency and reduce electricity bills-

- Installation of at least one more DG set is highly recommended so as to supply electricity to the entire college premise during power cut.
- The contracted electrical load can be further extended. Apply for separate meter for solar system.
- Improve building insulation and address drafts around windows, doors, and other openings to reduce energy wastage and improve comfort. Consider upgrading windows to improve thermal performance and reduce HVAC demands.
- Develop awareness camps to educate students, faculty, and staff about energy-saving practices.
- Encourage the community to adopt habits like turning off lights and equipment when not in use.

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- Install energy sensors and daylight harvesting controls.
- Replace old electrical appliances and wiring.

6. CONCLUSION

This energy audit report identifies several opportunities for Raiganj Surendranath Mahavidyalaya to enhance energy efficiency, reduce consumption, and achieve cost savings. Implementing the recommended measures will not only support environmental sustainability but also provide long-term financial benefits. We encourage Raiganj Surendranath Mahavidyalaya to prioritize these initiatives and develop an action plan based on the recommendations.

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