

ENERGY AUDIT REPORT



KARIMGANJ COLLEGE, KARIMGANJ, ASSAM

SESSION- 2020-21, 2021-22 & 2022-23



PREPARED BY

ENERGY AUDIT COMMITTEE

KARIMGANJ COLLEGE, KARIMGANJ, ASSAM

ENERGY AUDIT COMMITTEE

Energy Audit Committee of Karimganj College was constituted as follows:

Chairman: Dr. Pradip Kumar Nath, Associate Professor

Convenor: Sri Pinak Dey, Assistant Professor

Members:

1. Dr. Sujit Tewari, Co-ordinator, IQAC (Ex-officio member)
2. Dr. Sushmita Paul, Assistant Professor
3. Dr. Arijita Paul, Assistant Professor
4. Dr. Paban Dhar, Assistant Professor
5. Dr. Subrata Das, Assistant Professor
6. Dr. Malabika Bhattacharjee, Assistant Professor


Principal
Karimganj College

DECLARATION

The energy audit of Karimganj College has been conducted by the 'Energy Audit Committee' of the college for the sessions 2020-21, 2021-22 and 2022-23 in order to study the level of energy consumption and to assess the energy efficiency of the electrical appliances as well as the laboratory equipments being used in the college. We have studied the various measures that can be taken for more efficient energy consumption in the college campus.

Date: 07.07.23

Place: Karimganj

Pradip Kumar Nath

Dr. Pradip Kumar Nath
Associate Professor
Chairman, Energy Audit Committee

Pinak Dey

Sri Pinak Dey
Assistant Professor
Convenor, Energy Audit Committee

CERTIFICATE

This is to certify that the energy audit of Karimganj College has been conducted by the 'Energy Audit Committee' of Karimganj College for the sessions 2020-21, 2021-22 and 2022-23 in order to study the level of energy consumption and to assess the energy efficiency of the electrical appliances as well as the laboratory equipments being used in the college. I have gone through this energy audit report and found that the audit is complete and satisfactory.

Date: 07/05/24
Place: Karimganj

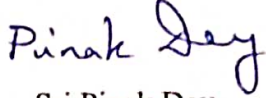


Sub-Divisional Engineer
Karimganj Electrical Sub-Division
APDC, EAP, Karimganj
Signature of External Auditor

ACKNOWLEDGEMENT

The 'Energy Audit Committee' of Karimganj College is thankful to the Principal, Karimganj College for providing us the opportunity and necessary support for conducting the energy audit. The committee extends thanks to the Heads of all the Departments of the college for providing the departmental data for energy consumption. The committee is thankful to Sri Nayanendu Das and Sri Shibdas Dutta for providing all the necessary records related to energy audit. The committee is also thankful to Sri Rajesh Bhattacharjee for his help throughout the survey work.

Date: 07.07.23
Place: Karimganj

For Energy Audit Committee

Sri Pinak Dey
Assistant Professor
Convenor, Energy Audit Committee

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INTRODUCTION:

Energy audit in an institution is an important approach for proper energy management. According to Energy Conservation Act, 2011, "Energy audit" means the verification, monitoring and analysis of use of energy including submission of technical report containing recommendations for improving energy efficiency with cost benefit analysis and an action plan to reduce energy consumption".

SCOPE OF THE WORK:

- To review the consumption of electricity in the entire college campus.
- To review the expenditure incurred on electricity by the college.
- To review the consumption of other sources of energy apart from electricity.
- To review the expenditure incurred on other sources of energy apart from electricity.
- To estimate the department wise/ room wise electrical load in the entire college.

METHODOLOGY:

- **Step 1:** Identifying the types of energy consumed in the college campus.
- **Step 2:** Physical verification of number of lights, fans, Air conditioners, heaters, laboratory equipment etc. that consume electrical or any other energy.
- **Step 3:** Calculating the energy load in the entire college campus.
- **Step 4:** Analysing the cost incurred on energy consumption by the college.

TYPES OF ENERGY USAGE IN COLLEGE:

- **Electricity:** The electricity supply for Karimganj College is provided by Assam Power Distribution Company Limited (APDCL). The energy consumed by Karimganj College falls under the category of HT IV BULK SUPPLY (GOVERNMENT EDUCATION). The Contracted Demand is 71 KVA and the connected load is 60 KW.
- **Diesel:** The College has one Diesel Generator set having capacity of 62.5 kW.

ELECTRICITY EXPENDITURE:

Records of electricity bills for the session 2020-21:

<i>Month</i>	<i>Units Consumed</i>	<i>Electricity Bill (INR)</i>
July, 2020	3957	37986
August, 2020	4206	39727
September, 2020	4260	31688
October, 2020	4422	40922
November, 2020	3894	38090
December, 2020	3459	34734
January, 2021	4203	39691
February, 2021	4326	39556
March, 2021	4962	45361
April, 2021	4963	45362
May, 2021	4882	44618
June, 2021	3297	32498
Total	50831	470233
Average per month	4236	39186

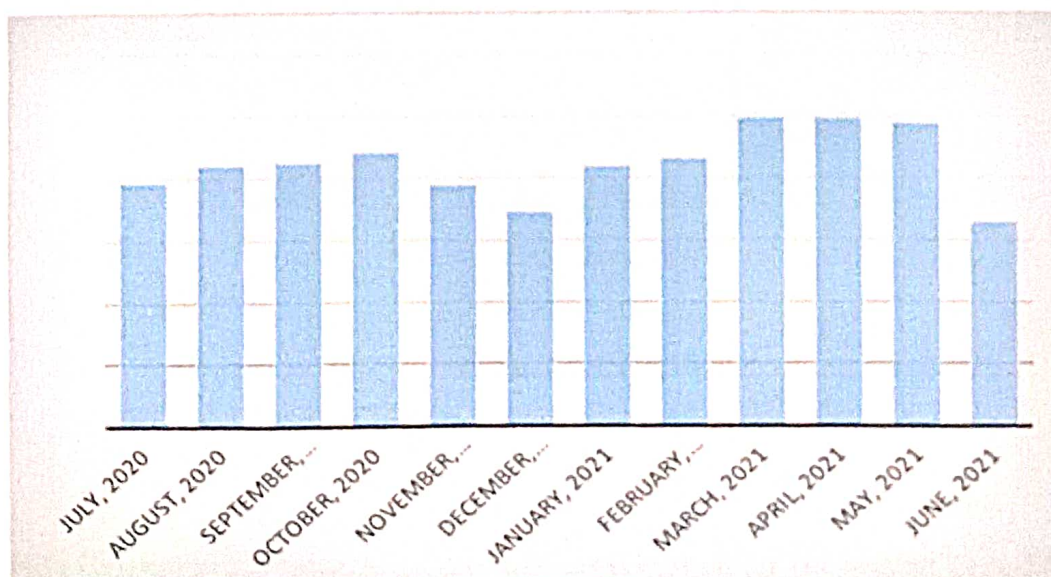


Fig.: Comparison of monthly electricity consumption for the session 2020-21

Records of electricity bills for the session 2021-22:

<i>Month</i>	<i>Units Consumed</i>	<i>Electricity Bill (INR)</i>
July, 2021	3726	35762
August, 2021	4278	39536
September, 2021	4140	39431
October, 2021	6555	55102
November, 2021	4539	41305
December, 2021	4125	38778
January, 2022	3858	36934
February, 2022	3789	27861
March, 2022	6528	54917
April, 2022	5892	52846
May, 2022	7245	61991
June, 2022	7578	63976
Total	62253	548439
Average per month	5188	45703

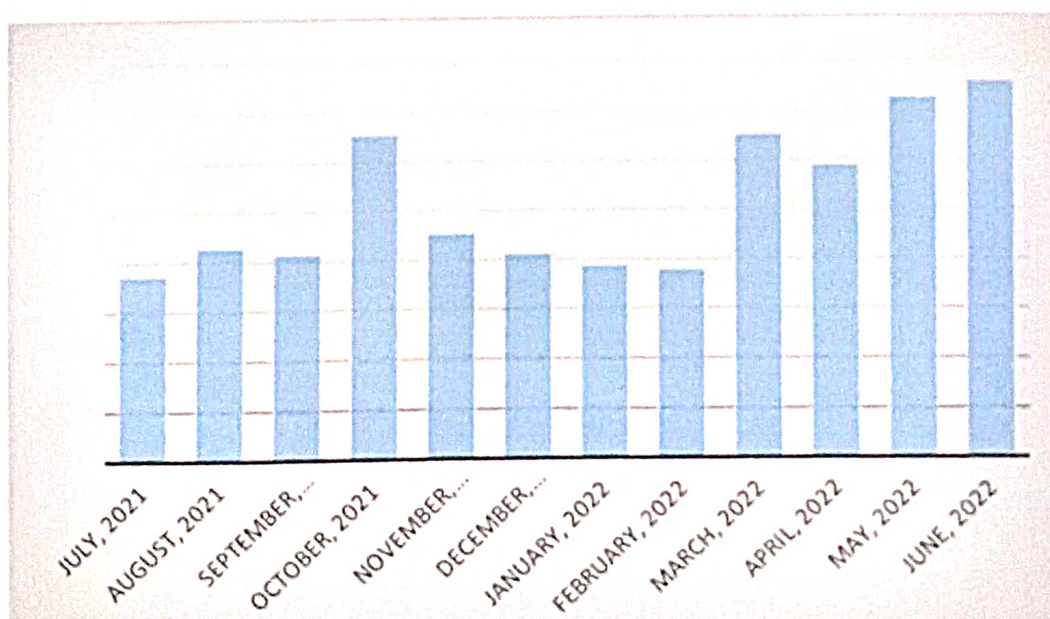


Fig.: Comparison of monthly electricity consumption for the session 2021-22

Records of electricity bills for the session 2022-23:

<i>Month</i>	<i>Units Consumed</i>	<i>Electricity Bill (INR)</i>
July, 2022	5007	46619
August, 2022	10416	88629
September, 2022	7947	70559
October, 2022	4890	48197
November, 2022	7251	64213
December, 2022	5493	45111
January, 2023	4368	44846
February, 2023	4254	42562
March, 2023	5499	52737
April, 2023	7590	68360
May, 2023	8223	79240
June, 2023	8025	77235
Total	78963	728308
Average per month	6580	60692

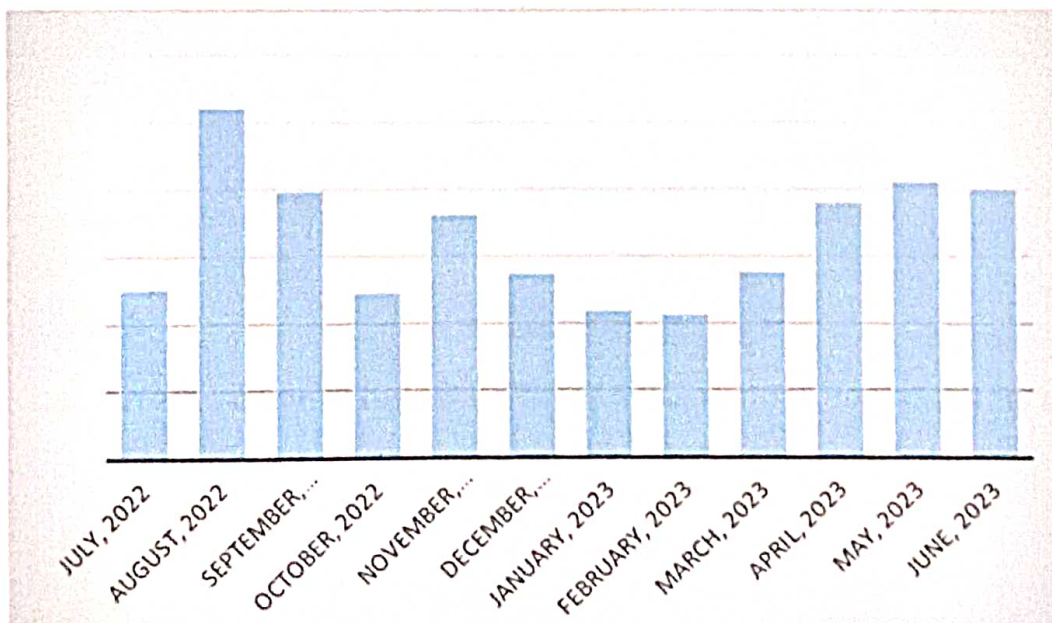


Fig.: Comparison of monthly electricity consumption for the session 2022-23

Comparison of electricity expenditure for the sessions 2020-21, 2021-22 and 2022-23:

<i>Session</i>	<i>Units Consumed</i>	<i>Electricity Bill (INR)</i>
2020-21	50831	470233
2021-22	62253	548439
2022-23	78963	728308

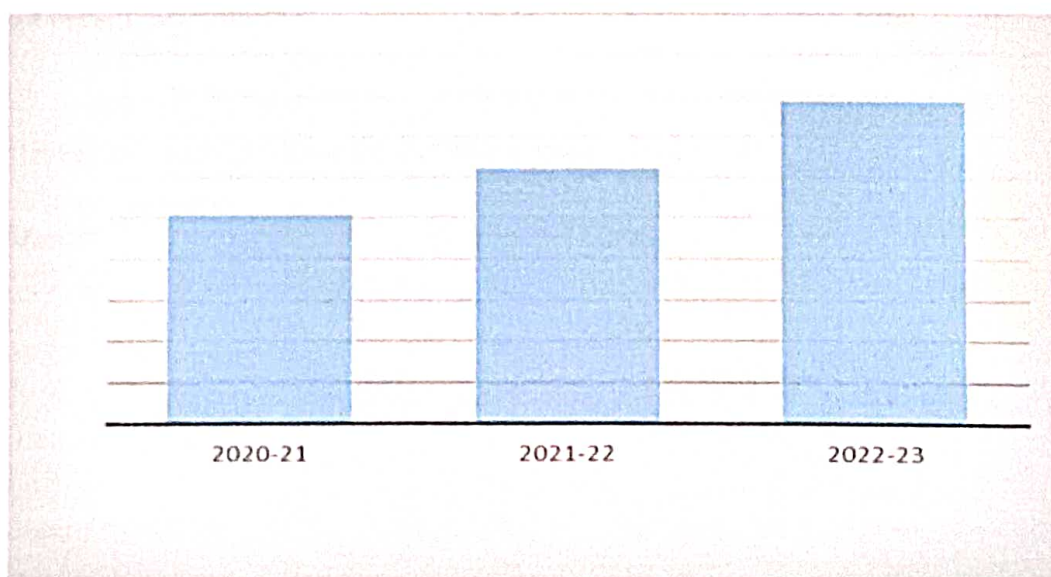


Fig.: Comparison of electricity expenditure for the sessions 2020-21, 2021-22 and 2022-23

DIESEL EXPENDITURE:

Diesel purchase records for the session 2020-21:

<i>Month</i>	<i>Quantity (Litres)</i>	<i>Diesel Bill (INR)</i>
July, 2020	148	11900
August, 2020	147	11900
September, 2020	NIL	NIL
October, 2020	76	5950
November, 2020	76	5950
December, 2020	147	11900
January, 2021	72	5950
February, 2021	142	11900
March, 2021	72	5950
April, 2021	NIL	NIL
May, 2021	NIL	NIL
June, 2021	NIL	NIL
Total	881	71400
Average per month	73	5950

Diesel purchase records for the session 2021-22:

<i>Month</i>	<i>Quantity (Litres)</i>	<i>Diesel Bill (INR)</i>
July, 2021	NIL	NIL
August, 2021	NIL	NIL
September, 2021	145	12900
October, 2021	NIL	NIL
November, 2021	NIL	NIL
December, 2021	NIL	NIL
January, 2022	NIL	NIL
February, 2022	85	6950
March, 2022	85	6950
April, 2022	NIL	NIL
May, 2022	157	13900
June, 2022	163	13900
Total	634	54600
Average per month	53	4550

Diesel purchase records for the session 2022-23:

<i>Month</i>	<i>Quantity (Litres)</i>	<i>Diesel Bill (INR)</i>
July, 2022	128	9900
August, 2022	81	6950
September, 2022	NIL	NIL
October, 2022	NIL	NIL
November, 2022	79	6950
December, 2022	NIL	NIL
January, 2023	NIL	NIL
February, 2023	78	6950
March, 2023	NIL	NIL
April, 2023	73	6550
May, 2023	77	6950
June, 2023	77	6950
Total	593	51200
Average per month	49	4267

Comparison of diesel expenditure for the sessions 2020-21, 2021-22 and 2022-23:

<i>Session</i>	<i>Quantity (Litres)</i>	<i>Diesel Bill (INR)</i>
2020-21	881	71400
2021-22	634	54600
2022-23	593	51200

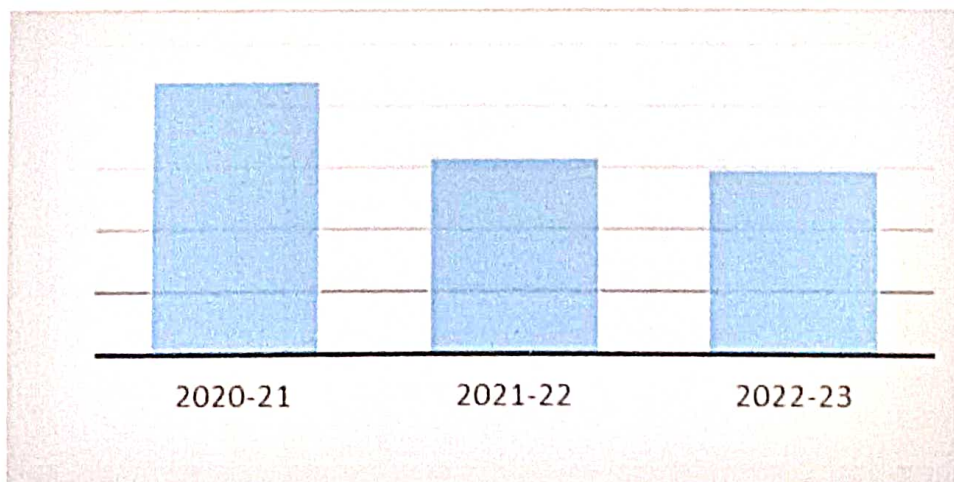


Fig: Comparison of diesel expenditure for the sessions 2020-21, 2021-22 and 2022-23

LIST OF COMMON ELECTRICAL APPLIANCES IN DIFFERENT DEPARTMENTS/ ROOMS:

Department/ Room	Bulb (Normal power)	Bulb (High Power)	Non LED Tube	Led tube	Fan	AC	Inverter 1kv	Inverter 2kv	Online UPS	Refrigerator	Computers	Printers	Photocopier	Lamination machine	Projector	TV	Smart Board	Electric kettle	Water pump	Bell	CCTV Camera	CCTV Monitor	Water purifier
Office Block	3	-	-	13	21	-	2	1	-	-	8	8	1	-	-	-	-	-	-	-	32	2	-
Botany and Biotech	-	-	13	5	15	-	-	1	-	5	6	1	-	-	1	-	-	1	-	-	-	-	-
Biotech Hub	-	-	2	3	6	1	-	1	-	-	5	2	-	-	1	-	-	-	-	-	-	-	-
Chemistry	7	-	34	17	56	1	1	-	1	3	4	2	-	-	-	-	-	-	1	-	-	-	-
Mathematics	11	-	4	4	12	-	-	-	-	-	1	1	-	-	-	-	-	-	1	-	-	-	-
Physics	14	-	16	14	45	1	1	-	-	1	10	2	-	-	2	-	-	1	-	-	-	-	-
Statistics	2	-	7	-	7	-	1	-	-	-	7	1	-	-	-	-	-	1	-	-	-	-	-
Zoology	3	-	8	4	12	-	1	-	-	2	2	-	1	-	1	-	-	-	-	-	1	1	1
Computer Science and Application	9	-	3	11	17	2	1	-	6	-	2	3	-	-	1	2	-	-	-	-	-	-	-

Boys Common room	Girls Common room	Teachers Common room	IQAC	Library	New Arts Block	Commerce	Ecology and Environmental Science	Department/ Room
-	4	2	-	6	6	1	1	Bulb (Normal power)
-	-	-	-	-	-	-	-	Bulb (High Power)
-	-	6	2	22	12	3	1	Non LED Tube
5	3	2	3	22	12	5	-	Led tube
8	9	8	7	12	28	7	1	Fan
-	-	-	1	-	-	-	-	AC
-	-	-	1	1	-	-	-	Inverter 1kv
-	-	-	-	-	1	-	-	Inverter 2kv
-	-	-	-	-	-	-	-	Online UPS
-	-	-	-	-	-	-	-	Refrigerator
-	-	-	2	4	9	1	-	Computers
-	-	-	2	1	8	1	-	Printers
-	-	-	-	-	-	-	-	Photocopier
-	-	-	-	-	-	-	-	Lamination machine
-	-	-	-	-	-	1	-	Projector
-	-	-	1	-	-	-	-	TV
-	-	1	-	-	1	-	-	Smart Board
-	-	-	-	-	-	1	-	Electric kettle
-	-	-	-	-	-	-	-	Water pump
-	-	-	-	-	-	-	-	Bell
-	-	-	-	-	-	1	-	CCTV Camera
-	-	-	-	-	-	1	-	CCTV Monitor
-	-	-	-	-	-	-	-	Water purifier

Room No. 10	Room No. 9	Room No. 8	Room No. 6c	Room No. 6	Room No. 5	Room No. 4	Room No. 3	Room No. 2	Room No. 1	Cooperative	IGNOU	NRC	Department/ Room
.	1	.	1	Bulb (Normal power)
.	.	1	.	.	.	.	1	1	1	.	.	.	Bulb (High Power)
.	.	1	2		1	1	.	.	.	3	2	2	Non LED Tube
2	2	3	.	2	1	1	2	2	2	2	2	.	Led tube
.	4	1	Fan
.	AC
.	1	Inverter 1kv
.	Inverter 2kv
.	Online UPS
.	Refrigerator
.	5	Computers
.	3	Printers
.	1	Photocopier
.	1	Lamination machine
.	Projector
.	TV
.	Smart Board
.	Electric kettle
.	Water pump
.	Bell
.	CCTV Camera
.	CCTV Monitor
.	Water purifier

Room No.	Room No. 24	Room No. 23	Room No. 22	Room No. 21	Room No. 20	Room No. 19	Room No. 18	Room No. 17	Room No. 16	Room No. 15	Room No. 14	Room No. 13	Room No. 12	Room No. 11	Department/Room
.	Bulb (Normal power)
.	Bulb (High Power)
2	.	.	.	1	.	.	1	.	.	.	.	.	.	.	Non LED Tube
.	2	2	2	2	2	2	.	.	3	1	1	2	2	1	Led tube
.	Fan
.	AC
.	Inverter 1kv
.	Inverter 2kv
.	Online UPS
.	Refrigerator
.	Computers
.	Printers
.	Photocopier
.	Lamination machine
.	Projector
.	TV
.	Smart Board
.	Electric kettle
.	Water pump
.	Bell
.	CCTV Camera
.	CCTV Monitor
.	Water purifier

TOTAL	Staff Quarter	Boys Hostel	Girls Hostel	Balcony and Campus	Canteen 2	Canteen 1	Room No. 30	Room No. 28	Room No. 27	Room No. 26	Room No. 25	Department/ Room
224	50	28	54	20	-	1	-	-	-	-	-	Bulb (Normal power)
4	-	-	-	-	-	-	-	-	-	-	-	Bulb (High Power)
188	7	17	3	-	1	-	4	2	-	2	2	Non LED Tube
231	11	6	23	25	-	1	-	1	1	-	-	Led tube
387	26	46	38	-	-	1	-	-	-	-	-	Fan
7	1	-	-	-	-	-	-	-	-	-	-	AC
18	5	1	2	-	-	-	-	-	-	-	-	Inverter 1kv
4	-	-	-	-	-	-	-	-	-	-	-	Inverter 2kv
7	-	-	-	-	-	-	-	-	-	-	-	Online UPS
19	5	-	1	-	1	1	-	-	-	-	-	Refrigerator
66	-	-	-	-	-	-	-	-	-	-	-	Computers
35	-	-	-	-	-	-	-	-	-	-	-	Printers
3	-	-	-	-	-	-	-	-	-	-	-	Photocopier
1	-	-	-	-	-	-	-	-	-	-	-	Lamination machine
7	-	-	-	-	-	-	-	-	-	-	-	Projector
12	8	-	1	-	-	-	-	-	-	-	-	TV
2	-	-	-	-	-	-	-	-	-	-	-	Smart Board
4	-	-	-	-	-	-	-	-	-	-	-	Electric kettle
4	-	1	1	-	-	-	-	-	-	-	-	Water pump
0	-	-	-	-	-	-	-	-	-	-	-	Bell
38	-	2	2	-	-	-	-	-	-	-	-	CCTV Camera
6	-	1	1	-	-	-	-	-	-	-	-	CCTV Monitor
1	-	-	-	-	-	-	-	-	-	-	-	Water purifier

ELECTRICAL ENERGY CONSUMPTION IN COLLEGE BY COMMON ELECTRICAL APPLIANCES:

Sl. No.	Appliance	Average Power of each Appliance (Watt)	No. of Appliance	Average Usage (Hours/day)	Average Usage (Days/month)	Total Energy consumed per day (kWh) [(Power in watts x Duration x Number) /1000]	Total Energy consumed per month (kWh) [{"Power x Duration x Number} /1000] x No. of days]
1.	Bulb (Normal power)	10	224	9	25	20.16	504.00
2.	Bulb (High Power)	40	4	9	25	1.44	36.00
3.	Non LED Tube	40	188	9	25	67.68	1692.00
4.	Led tube	20	231	9	25	41.58	1039.50
5.	Fan	40	387	6	25	92.88	2322.00
6.	AC	1000	7	4	10	28.00	280.00
7.	Inverter 1kv	900	18	2	25	32.40	810.00
8.	Inverter 2kv	1600	4	2	25	12.80	320.00
9.	Online UPS	2400	7	5	25	84.00	2100.00
10.	Refrigerator	400	19	24	30	182.40	5472.00
11.	Computers	100	66	5	25	33.00	825.00
12.	Printers	300	35	1	10	10.50	105.00
13.	Photocopier	600	3	2	15	3.60	54.00
14.	Lamination machine	600	1	1	5	0.60	3.00
15.	Projector	150	7	2	5	2.10	10.50
16.	TV	50	12	2	5	1.20	6.00
17.	Smart Board	150	2	2	15	0.60	9.00

Sl. No.	Appliance	Average Power of each Appliance (Watt)	No. of Appliance	Average Usage (Hours/day)	Average Usage (Days/month)	Total Energy consumed per day (kWh) [(Power in watts x Duration x Number) /1000]	Total Energy consumed per month (kWh) [((Power x Duration x Number) /1000) x No. of days]
18.	Electric kettle	1000	4	1	25	4.00	100.00
19.	Water pump	1000	4	1	25	4.00	100.00
20.	Bell	20	0	1	25	0.00	0.00
21.	CCTV Camera	3	38	24	30	2.74	82.08
22.	CCTV Monitor	15	6	24	30	2.16	64.80
23.	Water purifier	25	1	5	25	0.13	3.13
24.	TOTAL						15938.01

ELECTRICAL ENERGY CONSUMPTION IN COLLEGE BY ELECTRICITY OPERATED LABORATORY EQUIPMENT:

Department	Appliance /Device/ Equipment name	Power of each Appliance /Device/ Equipment (Watt)	No. of Appliance / Device/ Equipment	Usage (Hours /day)	Usage (Days/ month)	Total Energy consumed per day (kWh) [(Power in watts x Duration x Number) /1000]	Total Energy consumed per month (kWh) [{"(Power x Duration x Number) /1000} x No. of days]
Botany and Biotechnology	Weighing balance	100	1	1	4	0.10	0.40
	Light microscope	50	3	1	15	0.15	2.25
	Laminar air flow	150	1	2	4	0.30	1.20
	Hot air oven	2500	1	5	10	12.50	125.00
	Autoclave	1000	1	2	4	2.00	8.00
	Microwave oven	1200	1	1	4	1.20	4.80
	pH meter	5	1	1	5	0.01	0.03
	Spectrophotometer	80	1	1	3	0.08	0.24
	Incubator	120	1	12	2	1.44	2.88
	Water bath	250	1	1	3	0.25	0.75
Biotech Hub	Autoclave	1000	1	2	4	2.00	8.00
	Laminar air flow	150	1	2	4	0.30	1.20
	Distillation unit	1500	1	6	10	9.00	90.00
	High speed centrifuge	120	2	1	4	0.24	0.96
	Anaerobic incubator	600	1	12	2	7.20	14.40
	Anaerobic work station	250	1	5	2	1.25	2.50
	-20° Refrigerator	500	2	24	30	24.00	720.00

	PCR	1500	1	2	4	3.00	12.00
	Gel Doc system	300	1	1	4	0.30	1.20
	Water bath incubator	250	1	12	5	3.00	15.00
	Hot air oven	2500	1	2	5	5.00	25.00
	Light Microscope	50	1	3	10	0.15	1.50
	UV-Spectrophotometer	100	1	1	5	0.10	0.50
	Lyophiliser	800	1	1	5	0.80	4.00
Ecology and Environmental Science	Binocular Microscope	20	1	2	5	0.04	0.20
	Water analyser	50	1	2	5	0.10	0.50
	Rotary Shaker	220	1	2	5	0.44	2.20
Chemistry	Oven	1100	2	1	5	2.20	11.00
	UV-Vis Spectrophotometer	100	1	1	2	0.10	0.20
	Microscope	30	1	2	5	0.06	0.30
Physics	Heater	1000	3	2	6	6.00	36.00
	Weighing balance	100	1	2	6	0.20	1.20
	CRO	5	1	2	6	0.01	0.06
	Logic gate	5	10	2	6	0.10	0.60
	Transistor	5	3	2	6	0.03	0.18
	Diode ckt	5	2	2	6	0.02	0.12
	Timer ckt	5	1	2	6	0.01	0.06
	Battery eliminator	150	10	2	6	3.00	18.00
	Newton's ring apparatus	50	1	2	6	0.10	0.60
	Sodium lamp	55	2	2	6	0.22	1.32

Zoology	Centrifuge	120	1	1	5	0.12	0.60
	pH meter	5	2	1	5	0.01	0.05
	Incubator	120	1	12	2	1.44	2.88
	SDS PAGE	50	2	2	2	0.20	0.40
	Electric blade	100	2	1	2	0.20	0.40
	Electric microscope	50	3	2	10	0.30	3.00
	Slide projector	150	1	2	5	0.30	1.50
	Analyser	100	1	1	2	0.10	0.20
	Colorimeter	10	1	1	2	0.01	0.02
	Spectrophotometer	80	1	1	2	0.08	0.16
Computer Science and Application	Computers	30	68	3	26	6.12	159.12
Commerce	Computers	30	28	4	20	3.36	67.20
TOTAL							1349.88

SUMMARY OF ELECTRICITY CONSUMPTION IN THE COLLEGE:

<i>Category</i>	<i>Energy consumed per month (kWh)</i>	<i>Average energy consumed per day (kWh)</i>
Common electrical appliances	15938.01	531.27
Laboratory equipment	1349.88	44.99
TOTAL	17287.89	576.26

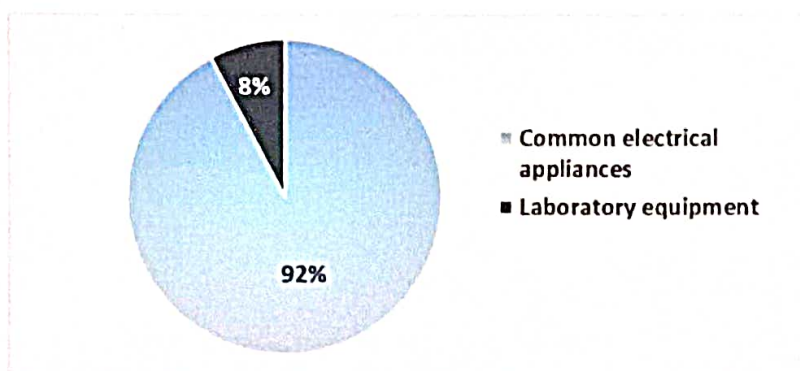


Fig.: Summary of electricity consumption in the college

ENERGY SAVING METHODS EMPLOYED IN COLLEGE:

- Switching off lights, fans and other electrical appliances whenever they are not in use.
- Optimising usage of lights during daytime.
- Boards/ stickers displayed throughout the college campus to create awareness on aware energy saving.

RECOMMENDATIONS FOR IMPROVING ENERGY EFFICIENCY:

- Installation of Solar power plant as alternative energy source.
- Installation of Biogas plant.
- Installation of submeter in all the buildings for energy monitoring so that energy load required and energy consumption in each building can be taken into account.
- Procurement of energy efficient equipment during any replacement process.
- Installation of automatic switches with occupancy sensors in common areas.