

July 2022- June 2023  
Report on Energy Audit  
of  
Sarat Centenary College  
Dhaniakhali, Hooghly, WB



Prepared For  
Sarat Centenary College  
Dhaniakhali, Hooghly, PIN-712302, West Bengal

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Associate Professor  
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Ref. No. ....

Dated.....

## ENERGY AUDIT CERTIFICATE

This is to certify that "**Sarat Centenary College**", Dhaniakhali, Hooghly, West Bengal, Pin-712302 has successfully undergone 'Energy Audit' on 14<sup>th</sup> July 2023 for the session July 2022 to June 2023.

The activities and measures carried out by the institution has been verified and found to be acceptable.

The Energy Management team of the institution have identified some energy conservation activities and have taken steps towards their implementation. The audit team has also suggested some energy conservation and carbon reduction measures and it was acceptable by the institute. The positive approach of the institute towards energy consumption and sustainable development is highly commendable.

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BEE CERTIFIED ENERGY AUDITOR  
REG NO. EA-34982/23

Place: Sarat Centenary College, Dhaniakhali, Hooghly  
Date: 7<sup>th</sup> June 2024



## Executive Summary – Energy Audit

### **I. Project Details**

Project	Energy Audit
Client	Sarat Centenary College, Dhaniakhali, Hooghly
Site	Tarakeswar - Dhaniakhali Road, Dist Hooghly, Dhaniakhali, West Bengal 712302
Segment	Academic and Administrative Blocks
Consultants	Dr. Arindam Kumar Sil, Associate Professor, Electrical Engineering Department, Jadavpur University  Mr. Ayandeep Ganguly, BEE certified energy auditor
Project Reference	
Notes	<b>The suggestions / alternatives in the audit report are based on the present operating conditions of equipment's/systems and to the best of our knowledge.</b> <b><i>It is recommended to obtain vendor quotations before implementation.</i></b>

## II. Summary of Energy Saving Proposals

### Short Term Measures

Sr. No.	Area	Proposed Action	Expected Result	Monthly Energy Savings in kWh	Annual Reduction in CO <sub>2</sub> emission in Tons	Monthly Cost Savings in Rs	Investment in Rs	Payback Period in Months
ESM1	Lighting Recommendation	Replace the existing 40 W FTL tube lights into 20W LED Tubes	<ul style="list-style-type: none"> <li>Total No of light fittings = 176</li> <li>Total No of light fittings to be replaced = 72</li> <li>Present Energy Consumption = 463.68 kWh</li> <li>Expected Energy Consumption = 231.84 kWh</li> <li>Total Energy saved per month = 231.84 kWh</li> <li>Monetary Savings = Rs 1527.8</li> <li>Investment = Rs 13680</li> <li>Simple Payback Period = 9 months</li> </ul>	231.84	2.25	1527.8	13680	9
ESM2	Fan Recommendation	Replace existing 80 watts conventional ceiling fans with 35 watts energy efficient fans	<ul style="list-style-type: none"> <li>Total No of fans present = 128</li> <li>Total no of fans to be replaced = 128</li> <li>Present energy consumption = 1648.64 kWh</li> <li>Expected energy consumption = 721.28 kWh</li> <li>Total energy saved per month = 927.36 kWh</li> <li>Monetary Savings = Rs 6111.3</li> <li>Investment = Rs 320000</li> <li>Simple Payback Period = 52 months</li> </ul>	927.36	8.95	6111.3	320000	52
	Total			1159.2	11.2	7639	333680	

### Long Term Measures

Particulars	Unit	Details
Annual energy consumption	kWh/year	31134
System size required	kW	29
System size required after considering losses	kW	35
Solar panel peak energy produced	Wp	250
Number of 250 Wp solar modules	Nos.	139
Area Requirement @ 3 m <sup>2</sup> / module including maintenance place	sq. m.	417
Area Requirement in square foot	sq. ft.	4489
Expected Savings	kWh/year	31134
Expected monetary savings	Rs/year	208530
Simple payback period	Months	90



### III. Energy Scenario

Particulars	Details		
Year	2022-2023		UNIT
Supply Utility	WBSEDCL		
Consumer No.	162069814	16211929	
Meter No.	ST708262	SF702611	
Tariff Code	A(CM-R)	A(CM-I)	
Contract Demand	0.12	5.41	kVA
Connected Load	67.873		kW
Demand Charges	30	25	Rs/kVA/Month
Avg. Energy Charges	8.84	5	Rs. Per kWh
Energy Consumption of the Institution for the year from WBSEDCL	13362	90092	kWh
Diesel Consumption of the institute for the year from DG generation	310.92		Ltr.
Energy Generated by DG set	979		kWh
Total Energy Consumed by the institute	104433		kWh
Cost of Energy received from WBSEDCL	208208		Rs
Average Cost of Diesel during the year	87.65		Rs/Ltr.
Cost of Diesel Energy used by the Institute	27252		Rs
Total Cost of Energy used by the Institute	235460		Rs
Total built up area	2152		Sq. Metres
Specific Energy Consumption for the year	48.52		kWh/sq. mtr/annum

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## **Acknowledgement**

We extend our gratitude to Sarat Centenary College, Dhaniakhali, Hooghly for extending us the opportunity to conduct the Energy Audit.

We are thankful to the professors & supporting staff of the college for their transparency & consistent support in sharing relevant information and for providing data about policies and projects along with their other valuable information. This report would not have been possible without their support.

The study team would like to acknowledge the following distinguished personnel of Sarat Centenary College in person for the diligent involvement and cooperation.

Dr. Sandip Kumar Basak

Principal

Dr. Ramanuj Konar

Assistant Professor, Department of English



## 1. About College



It was the ardent zeal for advancement of higher education that the people of Dhaniakhali to establish Sarat Centenary College, named after one of the greatest Bengali novelists, Sarat Chandra Chattopadhyay, in 1976 as a Junior College with the Higher Secondary Course which was later upgraded into a Degree College in 1978 with all the three streams Arts, Science and Commerce being affiliated under the University of Burdwan. The college stands at the heart of Dhaniakhali. It is under grants-in-aid Scheme of the Government of West Bengal. The College campus extends over an area of 03 acres.

The college provides **Honours in Bengali, Sanskrit, English, Political Science, Philosophy, History, Geography, Mathematics, Physics, Chemistry, Botany, Zoology and Accountancy**. General courses offered by the college are **Bengali, Sanskrit, Santali, English, Political Science, Philosophy, Education, History, Geography, Physical Education, Mathematics, Physics, Chemistry, Botany, Zoology and Commerce**. Some vocational courses like Communicative English, Computer Basics, Tailoring-Knitting etc. have been introduced from the session 2015-2016. Moreover, a Women Study Centre is functioning with the task of awareness about Gender Biases.

Presently, a sufficient number of Associate Professors, Assistant professors, Government Approved Part-Time Teachers and Guest Lecturers are catering academic needs of all the three streams. Moreover, one teacher is working on Government-Approved Whole-Time Teacher. The standard of education and academic results are good and encouraging. The students evaluate the teaching standard of the departments as per the university norms. A good number of teachers have national and international linkage through their academic activities. A sufficient number of academic support staff of the college, including part-time and contractual staff, are rendering their service.

The college regularly organizes seminars, inter-departmental talks, debates, quizzes and other academic ventures. The college has started remedial courses for the benefit of the -students both socially and academically backwards. The Principal and the Governing Body monitor all the developmental works.

Besides the main building, the college has a separate library building (Netaji Bhawan), which has about 21337 books and various journals. The Jagadish Chandra Bose Bhawan, Vidyasagar Bhawan, U.G.C. Building, have provided more classrooms to meet the growing demands. A new building for Students' Union, Cheap Canteen and Boys' Common Room is at the point of completion. The main building encompasses a good garden along with Ayurvedic Plants. The laboratories are relatively well-equipped. Microphone systems are available in Classrooms where it is necessary. Smart classroom infrastructure has been constructed with financial support from the Government of West Bengal. Construction under MPLADS has added extra classrooms to this college.

The college has a spacious playground and a pond surrounded by the shady green trees. The NSS adds much to the progress in the academic atmosphere of the college. It is worth mentioning that the NSS has already



imprinted its valuable marks for the total development of the college. The Gymnasium has been opened up for the college students. A Yoga Center is also operative. More land is yet to be purchased. Moreover, the college has already approached the high authorities for introducing job-oriented new courses. Apart from academic development, the college is keen on the all-round development of the students. Regular counselling by the teachers is offered to the students for guidance towards an exact route for their establishment in multifarious segments of life. The college has already left its mark of success in different spheres. The 2nd cycle accreditation by NAAC has been completed in 2016.

## **2. Mission & Vision**

Dhaniakhali assembly constituency, reserved for SC category, is comprised of population mostly from economically weaker section of the society, specifically SC, ST, OBC, and Minority communities. As the only institute of higher learning in the undergraduate level in the Dhaniakhali Development Block, there is a need to develop a network and strong covalent linkage with the society. The college encourages and spreads knowledge and value-based education amongst the young mind and thereby enlighten them to build the career in personal and professional life with an emphasis of all-round development in respect to the global scenario. The vision, mission and objectives of this college are as stated below:

**Vision:** Imparting quality education at the undergraduate level to the students of the locality with a focus on the underprivileged section.

**Mission:** To make our students (i) Academically confident (ii) Mentally tolerant (iii) Morally upright (iv) Environmentally conscious.

### **Objectives:**

- Minimizing the gap between privileged and underprivileged sections of the society regarding attaining higher education.
- Ensuring holistic development of the students.
- Encouraging the students for co-curricular activities.
- Making students socially responsible.
- Creating more space for interaction with local people through NSS and cultural programme.

### 3. Energy Audit

An energy audit is an inspection, survey and analysis of energy flows, for energy conservation in a building, process or system to reduce the amount of energy input into the system without negatively affecting the output(s). In commercial and industrial real estate, an energy audit is the first step in identifying opportunities to reduce energy expense and carbon footprints.

The energy audit will help for the following points.

- Energy cost reduction.
- Preventive maintenance and quality control programmes which are vital for production and utility activities.
- Keep focus on variations which occur in the energy costs, availability and reliability of supply of energy, decide on an appropriate energy mix, identify energy conservation technologies, retrofit for energy conservation equipment etc.

The primary objective of Energy Audit is to determine ways to reduce energy consumption per unit of product output or to lower operating costs. The present report shows the energy audit of Sarat Centenary College, Dhaniakhali, Hooghly campus in terms of pre-audit phase, audit phase and post audit phase.

There are three phases of Energy Audit

1. Pre-audit phase
2. Audit phase
3. Post audit phase

Above phase include following stages:

1. Data Collection – In the primary stage of collection of exhaustive data was mainly implemented using measures such as observation, survey communicating with responsible persons and measurements.

Following steps were taken for data collection:

- A squad went to the respective Departments, Central Library, Admin Block, pump operating stations, canteens, DG unit blocks etc.
- Data was acquired from the responsible persons through general information observation and interview.
- In some of the cases average values were considered in case of power consumption of different appliances.

2. Data Analysis – Analysis of data collected include:

- calculation of energy consumption,
- analysis of latest electricity bill of the campus,
- Understanding the tariff plan provided by the West Bengal State Electricity Board.

3. Recommendation – Based on the results of the data analysis and observations presented, some recommendations are put forward which will help to reduce power and water consumption. Waste water treatment and as well as utilization of rain water were also suggested for betterment. The above target areas particular to the college was evaluated through questionnaire circulated among the staff for data collection. Some the major points which is included in the questionnaire is given below.



### 3.1. Pre- Audit Phase

#### 3.1.1. Questionnaire for data collection-survey

1. Different ways through which energy is consumed at your college. (Electricity, electric stove, kettle, microwave, LPG, Petrol, diesel and others).
2. Amount of Electricity bill paid for the last five year
3. Amount paid for LPG cylinders for last five year
4. Amount of fuel consumed for DG for the last five years
5. Energy saving methods employed in your college? If yes, please specify. If no, suggest Some.
6. What is the total number of CFL installed in your college? Mention use (Hours used/day for how many days in a month)
7. Energy used by each bulb per month? (for example- 40-watt bulb x 6 hours x number of bulbs = kwh).
8. How many LED bulbs are used in your college? Mention the use (Hours used/day for how many days in a month)
9. Energy used by each bulb per month? (Kwh).
10. How many incandescent (tungsten) bulbs have your college installed? mentions use (Hours used/day for how many days in a month)
11. Energy used by each bulb per month? (Kwh).
12. How many fans are installed in your college? Mention use (Hours used/day for how many days in a month)
13. Energy used by each fan per month? (kwh)
14. How many air conditioners are installed in your college? Mention use (Hours used/day, for how many days in a month)
15. Energy used by each air conditioner per month? (Kwh).
16. How many electrical equipments including weighing balance are installed your college? Mention the use (Hours used/day for how many days in a month)
17. Energy used by each electrical equipment per month? (Kwh).
18. How many computers are there in your college? Mention the use (Hours used/day for how many days in a month)
19. Energy used by each computer per month? (kwh)
20. How many photocopiers are installed by your college? Mention use (Hours used/day for how many days in a month).
21. How many cooling apparatuses are in installed in your college? Mention use (Hours used/day for how many days in a month)
22. Energy used by each cooling apparatus per month? (kwh)Mention use (Hours used/day for how many days in a month)
23. Energy used by each inverter per month? (kwh)
24. How many electrical equipment are used in different labs of your college? Mention the use (Hours used/day for how many days in a month)
25. How many heaters are used in the canteen of your college? Mention the use (Hours used / day for how many days in a month)
26. Energy used by each heater per month? (kwh)
27. No of street lights in your college?
28. Energy used by each street light per month? (kwh)
29. No of TV in your college and hostels?
30. Energy used by each TV per month? (kwh)
31. Any other item that uses energy (Please write the energy used per month) Mention the use (Hours used/day for how many days in a month)
32. Do you run switch off drills at college?
33. Are your computers and other equipment put on power-saving mode?
34. Does your machinery (TV, AC, Computer, weighing balance, printers, etc.) run on standby mode most of the time? If yes, how many hours?



35. What are the energy conservation methods adapted by your college?
36. How many boards displayed for saving energy awareness?
37. How much ash is collected after burning fire wood per day in the canteen?
38. Write a note on the methods/practices/adaptations by which you can reduce the energy use in your college campus in future.

### 3.2. Audit Phase

Energy auditing was done at Sarat Centenary College, with the help of a team of teaching staff. To begin with the audit, teachers' team went through different departments of the college, sorting out the different types of energy consuming equipment and utilities (fan, lights, taps, toilets, heater, pumps, water purifiers, fridges, etc.) and as well as consumption of power by reading the rating plate of the items (voltage, current, watts etc.). They were also engaged in identifying the consumption pattern (how long and how often it is used). The details of the power consumption of the items were noted through rigorous discussion and information exchange among the team and the respective teaching staff of the department. Teaching staffs along with the audit team also visited the admin blocks to identify and monitor the power consuming equipment. Enough checking was done in the calculation portion by the team to maintain the accuracy of the calculation as far as possible.

#### 3.2.1. Data Collection

Energy consumption data was collected and recorded for calculation from college records and sectors where energy is consumed. The documents were verified repeatedly and examined through survey and discussion to maintain the clarity of the data collected. The whole energy audit process was completed from June 2022 to July 2023, and the previous energy pattern was also observed to identify any anomaly present in the report.

#### 3.2.2. Review of Documents and Records

Documents such as electricity bills, registers of electricity, fuel consumption were collected and reviewed.

#### 3.2.3. Site Inspection

To gather information and exact data for energy audit the team visited the institute and its premises several times. Total number of grounds, gardens, canteens, library, office rooms and etc. were visited a number of times to accumulate the data. The vehicle used by the stakeholders were also taken into account to note down the fuel consumption of each. Total number of LPG cylinders used in canteens, hostel kitchen, and mechanical labs were also taken into account for calculation and data as reference. During the site inspection leakage of any water pumps, taps were immediately reported to the college authority.

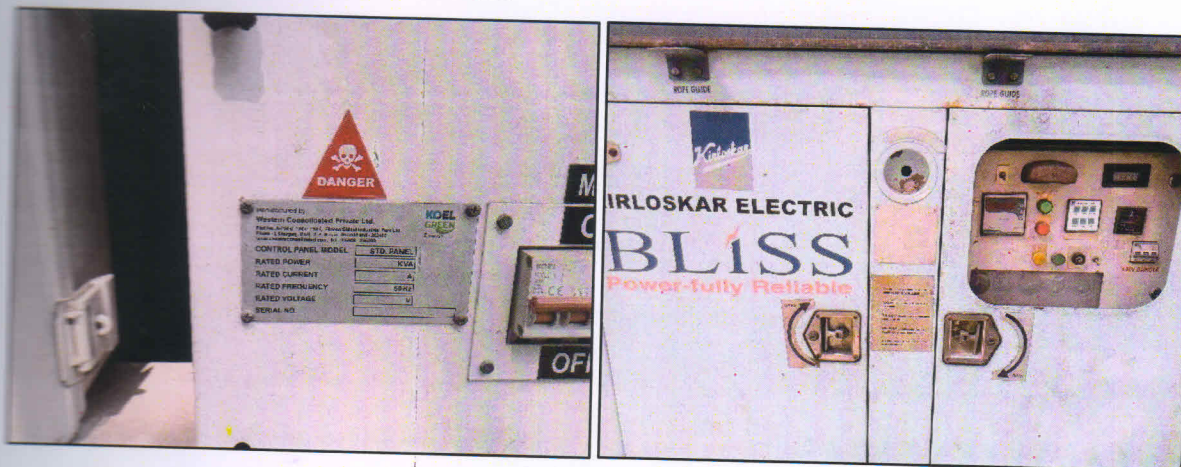
#### Total Campus Area & College Building Spread Area:

Location	Rural
Campus Area in sq. Mts	3.34 Acres (13516.5 Sq. Metres)
Built up area in sq. Mts	2152 Sq. Metres



### 3.2.4. Backup Power Source

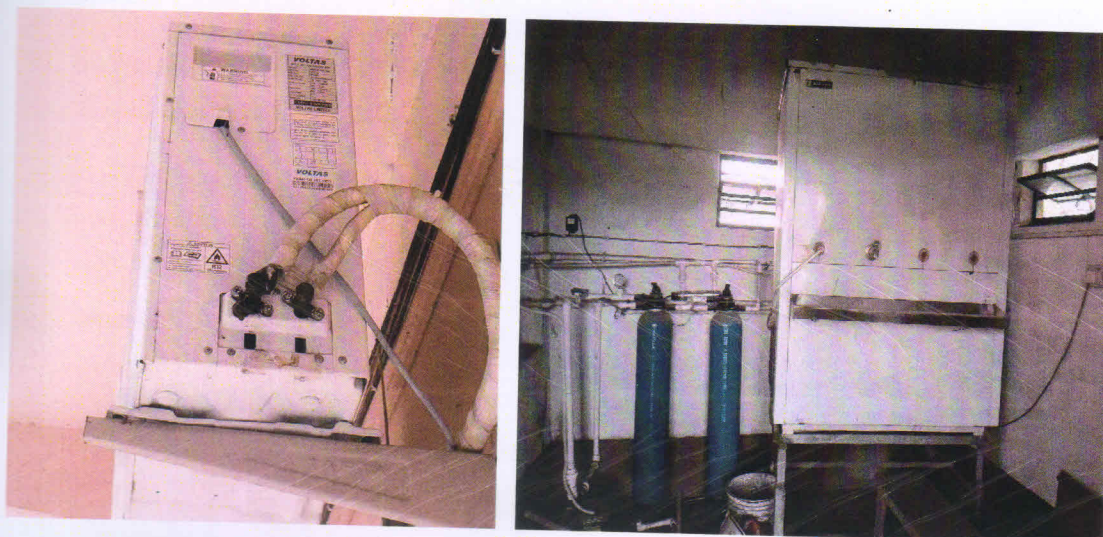
When power cut occurs, Sarat Centenary College supply power to fulfil demands with help of generator which runs on diesel as fuel.



Diesel Generator details:

DG	1	2
Make Location	Kirloskar	Kirloskar
Eng. Sr.No.	XENS112-004	18G12249-H
Rated kva	20	25
Rated Load current	27.8	108.7
Rated voltage Current	415	230
Rated frequency	50Hz	50 Hz
Rated RPM	1500	1500
EXC. Amp	1.6	1.6
EXC. Voltage	35	35

### 3.2.5. Energy Users





**a. AC Capacity and Location**

Location	AC	Type	Number	Star Rating	Rating	Wattage	Total (Watts)
Vidyasagar Bhavan							
Ground Floor	1	Split	1	2- non-inverter	1.5 ton	1500	1500
First Floor	3	Split	3	2, EER-3	2 ton	2033	6099
Swamiji Bhavan (Student's Union)							
First Floor	2	Split	2	2-non-inverter	1.5 ton	1500	3000
Jagadish Chandra Bhavan							
Second Floor	1	Split	1	2-non-inverter, EER-2.58	2 ton	2500	2500
	1	Split	1	non-inverter	2 ton	2033	2033
Netaji Bhavan							
Ground Floor	1	Split	1		2 Ton	2033	2033
Rabindra Bhavan							
Ground Floor	2	split	1	3-inverter	1.5 T	1500	1500
Main Building							
Ground Floor	7	Split	7	3-Inv, EER-3.80	1.5T	1500	10500
First Floor	1	Window	1	non-inverter	2 T	2200	2200
Total AC Connected Load			18				31365

**Total Installed AC Load 31.365 kW**

**b. Connected Load without AC and Pump**

Location	Type	Qty	Wattage	Load in KW	Daily Op. Hr(Avg)	Monthly Op.Hr	Daily kWh	Monthly kWh
Nibedita Bhavan(NSOU)	Led Tubes	11	20	0.22	7	161	1.54	35.42
	Small LED Tubes	5	10	0.05	7	161	0.35	8.05
	LED Bulbs	4	9	0.036	7	161	0.252	5.796
	Normal Tubes	15	40	0.6	7	161	4.2	96.6
	Fan	19	80	1.52	7	161	10.64	244.72
	Water Pump	1	1119	1.119	7	161	7.833	180.159



	Exhaust fan	2	70	0.14	7	161	0.98	22.54
	PA system	1	200	0.2	7	161	1.4	32.2
Vidyasagar Bhavan								
Ground Floor	Exhaust Fan	2	70	0.14	7	161	0.98	22.54
	LED Bulbs	2	9	0.018	7	161	0.126	2.898
	Aquaguard	1	50	0.05	7	161	0.35	8.05
	Led Tubes	3	20	0.06	7	161	0.42	9.66
	Ceiling Fan	2	80	0.16	7	161	1.12	25.76
First Floor	Wall Mounted Fan	5	80	0.4	7	161	2.8	64.4
	Projector	1	280	0.28	7	161	1.96	45.08
	PA System	1	200	0.2	7	161	1.4	32.2
	LED Tube	2	20	0.04	7	161	0.28	6.44
	LED Bulb	2	9	0.018	7	161	0.126	2.898
	Ceiling Fan	3	80	0.24	7	161	1.68	38.64
	Tube	1	40	0.04	7	161	0.28	6.44
	Exhaust Fan	1	70	0.07	7	161	0.49	11.27
Swamiji Bhavan (Student's Union)								
First Floor	Ceiling Fan	5	80	0.4	7	161	2.8	64.4
	Tubes	10	40	0.4	7	161	2.8	64.4
Jagadish Chandra Bhavan								
Ground Floor	Water Pump	1	1119	1.119	7	161	7.833	180.159
	Exhaust Fan	2	70	0.14	7	161	0.98	22.54
	Tubes	2	40	0.08	7	161	0.56	12.88
	LED Tubes	4	20	0.08	7	161	0.56	12.88
	Tubes	2	40	0.08	7	161	0.56	12.88
	Ceiling Fan	8	80	0.64	7	161	4.48	103.04
First Floor	Exhaust fan	1	70	0.07	7	161	0.49	11.27
	Tube	7	40	0.28	7	161	1.96	45.08
	Led Tube	8	20	0.16	7	161	1.12	25.76
	Aquaguard	1	50	0.05	7	161	0.35	8.05

Second Floor	Projector	1	280	0.28	7	161	1.96	45.08
	PA System	1	200	0.2	7	161	1.4	32.2
	Ceiling Fan	9	80	0.72	7	161	5.04	115.92
	LED Tubes	2	20	0.04	7	161	0.28	6.44
	Tubes	4	40	0.16	7	161	1.12	25.76
	LED Bulb	1	9	0.009	7	161	0.063	1.449
				0	7	161		
Third Floor	Tube	2	40	0.08	7	161	0.56	12.88
	Ceiling Fan	2	80	0.16	7	161	1.12	25.76
Netaji Bhavan								
Ground Floor	Ceiling Fan	4	80	0.32	7	161	2.24	51.52
	LED Tubes	6	20	0.12	7	161	0.84	19.32
First Floor	Tubes	3	40	0.12	7	161	0.84	19.32
	LED Tubes	3	20	0.06	7	161	0.42	9.66
	Ceiling Fan	2	80	0.16	7	161	1.12	25.76
Rabindra Bhavan								
Ground Floor	PC	4	400	1.6	7	161	11.2	257.6
	Ceiling Fan	10	80	0.8	7	161	5.6	128.8
	Wall Fan	2	70	0.14	7	161	0.98	22.54
	CFL	3	30	0.09	7	161	0.63	14.49
	Led Tube	7	20	0.14	7	161	0.98	22.54
	Led Bulb	5	9	0.045	7	161	0.315	7.245
	Tube	3	40	0.12	7	161	0.84	19.32
	Copier	1	1200	1.2	7	161	8.4	193.2
First Floor	Tubes	6	40	0.24	7	161	1.68	38.64
	LED Tubes	6	20	0.12	7	161	0.84	19.32
	Ceiling Fan	12	80	0.96	7	161	6.72	154.56
Second Floor	Tubes	6	40	0.24	7	161	1.68	38.64
	LED Tubes	6	20	0.12	7	161	0.84	19.32
	Ceiling Fan	12	80	0.96	7	161	6.72	154.56
Main Building								
Ground Floor	Ceiling Fan	9	80	0.72	7	161	5.04	115.92
	Led Bulb	4	9	0.036	7	161	0.252	5.796
	Led Tube	15	20	0.3	7	161	2.1	48.3
	PC	11	400	4.4	7	161	30.8	708.4
	Printer	6	360	2.16	7	161	15.12	347.76
	Copier	2	800	1.6	7	161	11.2	257.6
	Water Cooler	1	1000	1	7	161	7	161
	Aquaguard	1	50	0.05	7	161	0.35	8.05
	CFL	5	30	0.15	7	161	1.05	24.15
	Tube	3	40	0.12	7	161	0.84	19.32
	Exhaust Fan	3	70	0.21	7	161	1.47	33.81
	Fridge	1	300	0.3	7	161	2.1	48.3



	Hot Air Oven	1	2000	2	7	161	14	322
First Floor	Ceiling Fan	10	80	0.8	7	161	5.6	128.8
	Led Tubes	8	20	0.16	7	161	1.12	25.76
	Tubes	7	40	0.28	7	161	1.96	45.08
Second Floor	Ceiling Fan	14	80	1.12	7	161	7.84	180.32
	Tube	4	40	0.16	7	161	1.12	25.76
	Led Tube	10	20	0.2	7	161	1.4	32.2
	PA	1	200	0.2	7	161	1.4	32.2
Total				34.27			239.89	5517.47

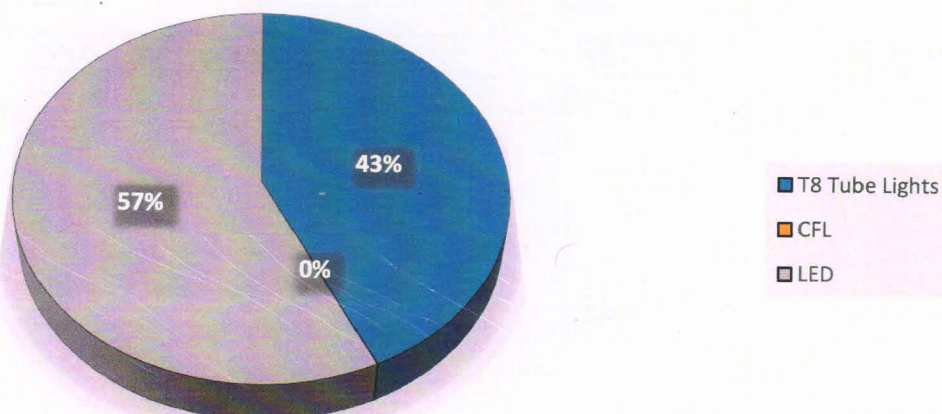
**c. Installed submerged pump load**

Location	Equipment	Number	Rating (in Watts)	Rating (in HP)
Nibedita Bhavan (NSOU)	Water Pump	1	1119	1.5
Jagadish Chandra Bhavan				
Ground Floor	Water Pump	1	1119	1.5
Total		2	2238	3

**d. Type wise lighting distribution in the institution**

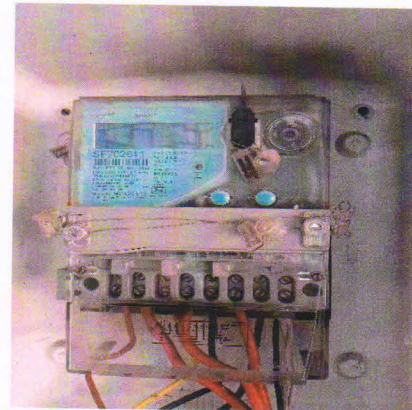
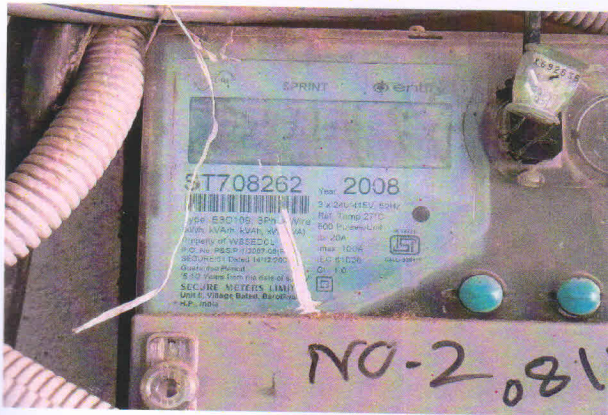
Type	Qty	kW
T8 Tube Lights	72	2.88
CFL	8	0.096
LED	96	1.672

**Type Wise Lighting Distribution**



### 3.2.6. Electricity Bill Analysis

At present, two electricity meters are there for all campus



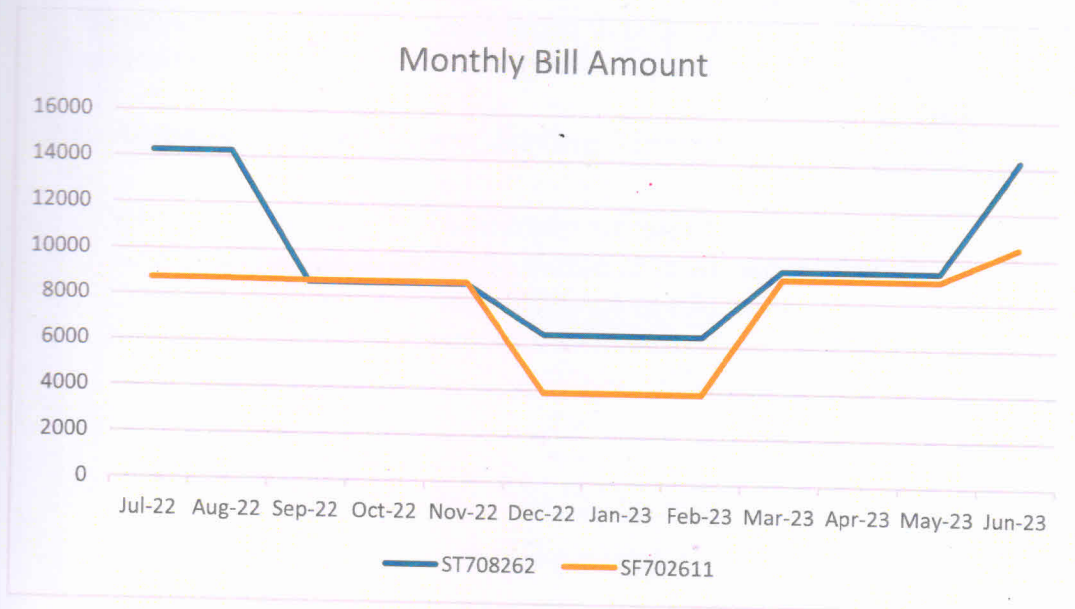
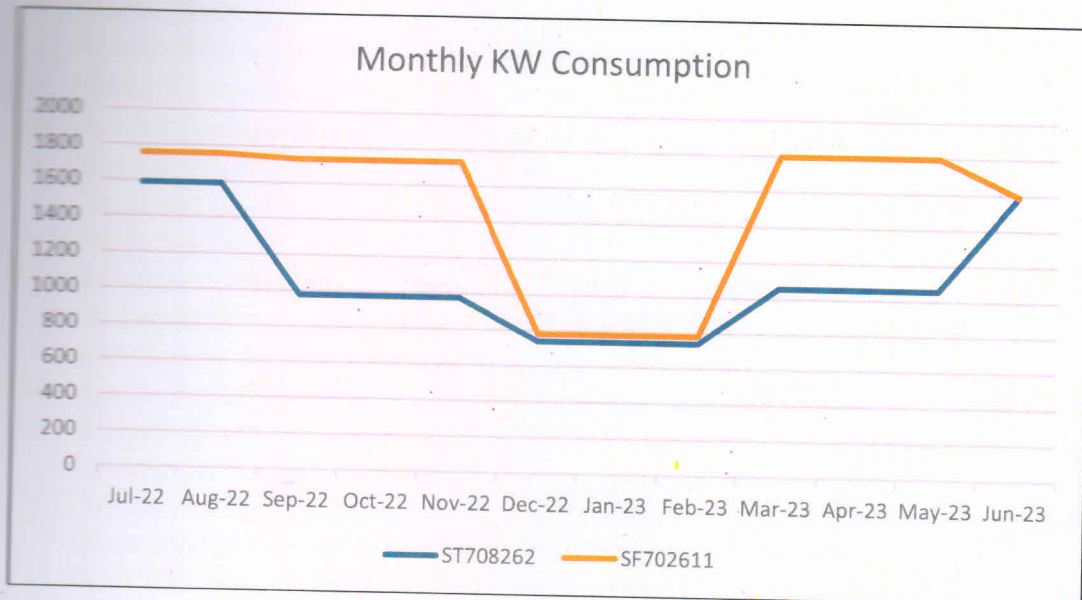
Sl No.	Meter No.	Consumer ID
1	ST708262	162069814
2	SF702611	162111929

Bill Analysis is shown below:

Metre No	ST708262			SF702611		
Period	Units Consumed	Energy Charges	Demand Charges	Units Consumed	Energy Charges	Demand Charges
Jul 2022-Aug 2022	2376	20856	60	3511	17413	270.5
Sept 2022-Nov 2022	4777	42760	90	5230	26009	405.75
Dec 2022 - Feb 2023	2932	25841	90	5199	25995	405.75
Mar 2023 - May 2023	2217	19284	90	2339	11695	405.75
Jun-23	1060	9375	30	1796	8980	135.25
	13362	118116	360	18075	90092	1623



### 3.2.6.1. Graphical Representation of bill analysis



### 3.2.7. Observations

- Monthly average power consumption is 1092.17 kWh for meter number ST708262.
- Monthly average power consumption is 1502.25 kWh for meter number SF702611.
- Monthly average electricity bill is Rs 9667.67 for meter number ST708262.
- Monthly average electricity bill is Rs 7710.1 for meter number SF702611.
- Average unit rate is 6.69 Rs/kWh.
- Connected Load is high compared to contract demand. Increase in contract demand is recommended.
- The entire connected load should be divided into essential and non-essential loads and connection should be done in such a way so that only the essential loads are catered to by the diesel generators during power cuts.
- Most of the ACs are non-inverter type and have low BEE star rating. Efforts should be made to replace the existing ACs by 5 star rated units to reduce the energy consumption of the institution.
- The specific energy consumption can be further reduced by implementation of the recommended short term and long-term energy saving measures.
- The effort of the institute towards reducing their energy consumption through best practices of operating electrical loads is commendable.
- The institute has already replaced more than 50% of their lighting load by LED lamps which shows their commitment towards reducing their energy bill.
- Alternate energy source implementation through installation of solar panels in the campus can further reduce the energy consumption from the utility.

### 3.2.8. Already Existing Power Saving Measures

- When not in use electrical equipment are turned OFF.
- Electronics regulators are in use instead of resistance regulators.
- CFLs and FTLs are being replaced by more efficient LEDs
- Electronic equipment operators are instructed to operate at power saving mode.



### 3.3. Energy Saving Measures Recommendation

#### 3.3.1. Short Term Measures

##### Lighting Recommendation:

- Total No of light fittings = 176
- Total No of light fittings to be replaced = 72
- Present Energy Consumption = 463.68 kWh
- Expected Energy Consumption = 231.84 kWh
- Total Energy saved per month = 231.84 kWh
- Monetary Savings = Rs 1527.8
- Investment = Rs 13680
- Simple Payback Period = 9 months

##### Fan Recommendation:

- Total No of fans present = 128
- Total no of fans to be replaced by BLDC fans = 128
- Present energy consumption = 1648.64 kWh
- Expected energy consumption = 721.28 kWh
- Total energy saved per month = 927.36 kWh
- Monetary Savings = Rs 6111.3
- Investment @2500 per fan = Rs 320000
- Simple Payback Period = 52 months

#### 3.3.2. Long Term Measures

Particulars	Unit	Details
Annual energy consumption	kWh/year	31134
System size required	kW	29
System size required after considering losses	kW	35
Solar panel peak energy produced	Wp	250
Number of 250 Wp solar modules	Nos.	139
Area Requirement @ 3 m <sup>2</sup> / module including maintenance place	sq. m.	417
Area Requirement in square foot	sq. ft.	4489
Expected Savings	kWh/year	31134
Expected monetary savings	Rs/year	208530
Simple payback period	Months	90

#### **4. Requirement of NAAC**

##### **Percentage of lighting power requirement met through LED bulbs**

Percentage of lighting power requirement met through LED bulbs  
= (Lighting power requirement met through LED bulbs / Total lighting power requirement) X 100

$$= (96 / 176)$$

$$= 54.54 \%$$

#### **5. Post Audit Phase**

##### ***Monitoring and Follow up action***

The primary objective of Energy Audit is to determine ways to reduce energy consumption per unit of product output or to lower operating costs. Energy Audit provides a "bench-mark" for managing energy in the organization and also provides the basis for planning a more effective use of energy throughout the organization. Hence, energy audit is an ongoing process. Effective initiative must be taken to design and upgrade the implementation every year in the college campus to make the environment sustainable.