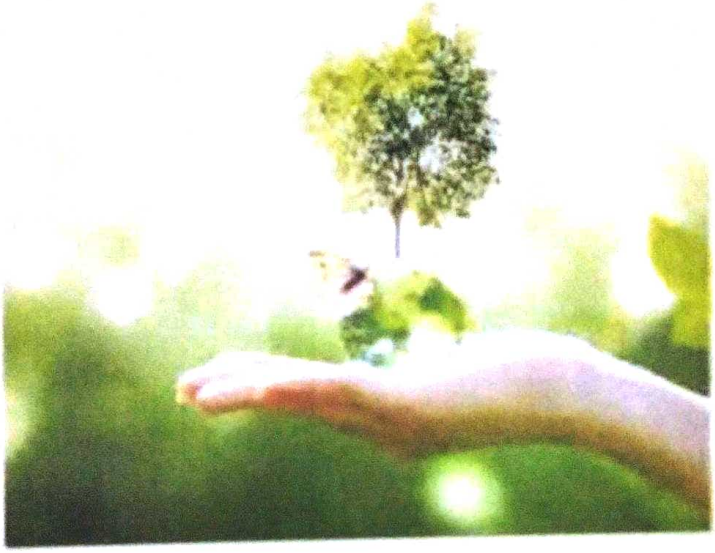
Bidhan Chandra College
Asansol

Energy Audit
2020 - 2021



Prepared by Eco club Coordinators

Department of Environmental Studies

Contents

1. Introduction

Energy conservation is a techno-commercial as well as a techno legal activity which is directly and strongly connected to the life of human beings as well as other lives on earth. India faces the most serious energy shortage since 1973. A fundamental imbalance between supplies and demand defies our nation's energy crisis. For energy security, the energy policy objectives should have three E-goals viz:

1. Economic Efficiency 2. Environmental Protection 3. Energy security

To achieve this goals, we should encourage alternative energy resources or clean energy resources. To save energy for our people, the lifelines are:

a) Availability of reliable and affordable environment friendly energy for all
b) Maximisation for renewable and other non-conventional energy resource utilisation
c) Introduction of environment friendly technologies
d) Development of long term energy options
e) Formulation of balanced energy policies with environmental and ecological sustainability

2. About the College

Internationally renowned scholar and the then Vice President of India, Dr Sarvapally Radhakrishnan laid the founding stone of Bidhan Chandra College in Asansol and the College was established in 1961 to serve the growing demands of the Asansol Burnpur industrial region. An initiative of the Asansol Educational Development Committee, Bidhan Chandra College also known as B.C. College named after one of the founding figures of West Bengal Dr. Bidhan Chandra Roy is government sponsored public university situated in Asansol (23°40'36.91"N 86°57'09.67"E). Sri Sasthi Narayan Gorai donated the sum of Rs.1,11,111 to support their noble cause in the establishment of the college. Bidhan Chandra College is currently affiliated to Kazi Nazrul University whilst previously affiliated to the University of Burdwan.

Bidhan Chandra College (Government Sponsored), Asansol, District Paschim Burdwan, West Bengal is a co-educational institution established in the year 1961. The members of the Asansol Educational Development Committee, a Relief and Welfare Society took initiative in founding this college and Sri Sasthi Narayan Gorai donated the sum of Rs.1,11,111 to support their noble cause. The institution owes its name to Dr. Bidhan Chandra Roy – an illustrious son of Bengal and one of the early Chief Ministers, and its foundation stone was laid by Dr. Sarvapally Radhakrishnan, an internationally acclaimed scholar of Indian Philosophy and the then Vice President of India. Since then, we have been one of the major higher-educational institutions of West Bengal affiliated with Kazi Nazrul University and approved by the University Grants Commission.

Currently headed by Dr Falguni Mukhopadhyay, our College believes in its primary stakeholders being the students. All aspects of education focuses on the core values of contribution to national development while fostering global competencies among students. The College admits students from all social milieus and empowers them through intensive mentoring and counselling them to face the challenges of life and become responsible and sensitized citizens of the country.

The most valuable investment any educational institution can make is "Nurturing Future Leaders". With the continuous rise in expectation of essential leadership standards, Bidhan Chandra College have taken a responsibility for this investment to nurture the Next Generation leaders with a vision to bridge the existing skill gap. With a firm step forward to attain an academic excellence, several Centers of Excellence, computer labs have been setup at the Bidhan Chandra College in association with the top leaders.

The Bidhan Chandra College imparts education to Undergraduates in the following departments:

- Department of English
- Department of Hindi
- Department of Bengali
- Department of Urdu
- Department of History
- Department of Mathematics
- Department of Chemistry
- Department of Physics

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- Department of Zoology
- Department of Botany
- Department of Geography
- Department of Political Science
- Department of Economics
- Department of Commerce
- Department of BBA and BCA
- Department of Philosophy

3. About the Area where the College is situated

Located at the heart of the metropolitan area of Asansol, Bidhan Chandra College serves a population of almost a million inhabitants. Asansol is a burstling metropolis with a sprawling suburban area located at the western end of West Bengal near the border of Jharkhand. With an urban population of almost 3 million, Asansol is the second largest city of West Bengal just after Kolkata. Perhaps most well-known for its heavy industries based on Iron and Steel, it also serves as a major hub of transportation and commerce. Asansol is the divisional as well as district headquarters of Paschim Burdwan district & situated in the south west corner of West Bengal. Paschim Burdwan district is sort of an extension of the Choto Nagpur plateau. It is located around 200 km from the State Capital, Kolkata. Asansol lies between 23°68'N Latitude and 86°99'E Longitude.

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4. Global Energy Scenario

i. Global Population Increase

The global population has increased day by day and to survive, each and every life requires air, food and water. The more population on earth - more burden and more requirements of the above mentioned necessities.

ii. Energy resource reduction

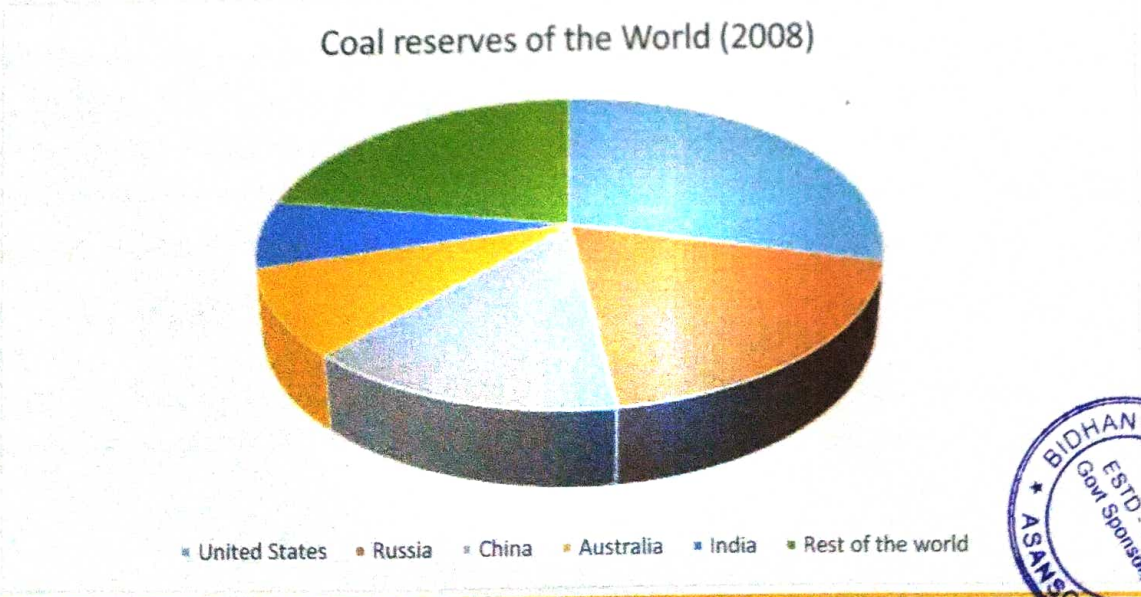
Energy resources of the earth is widely used by mankind for the fulfilment of their specific needs and necessities. Nowadays, the life of mankind is very much comfortable to fulfil the basic requirement because science and technological innovation. As energy resources have increased from all the way as compared to production of the same, it drastically decreases which can be a potential threat to our everyday life.

iii. Rise of energy consumption

The comfort level of humans is increased by the use of energy at different stage of human activates and the energy consumption for this activity for human being in the earth is rapidly increasing. Nowadays, human being is dependent on machines and auto-machines in which energy is consumed. More activities being performed causes more consumption of energy.

a) Coal

Coal is the most abundant fossil fuel which exist as anthracite,



bituminous, sub-bituminous, lignite and peat. It has been estimated that there are over 8-6 billion tonnes of coal reserves present worldwide. There is enough coal to last 122 years (source: Bp statistical review of world energy of June 2009)

b)Oil

Conventional crude oil reserves were estimated to be 1258 billion barrels in the year 2009. 60% of that can be found in the middle east. Saudi Arabia has the largest share with 21%. If production continues at today's rate, many of the present top ranking producers such as Russia, Mexico, China, Brazil will have their oil fields largely depleted.

c)Natural Gas

Natural Gas is a gaseous fuel primarily of methane but also includes but also includes small quantities of ethane, butane, propane and pentane. Before natural gas can be used as a fuel, it undergoes extensive processing for the removal of all constituent except for methane. This petroleum refining process releases large amount of toxicants in the atmosphere and is highly harmful. The global proven gas reserves were estimated to be 185 trillion metre^3

5. India's Energy Scenario

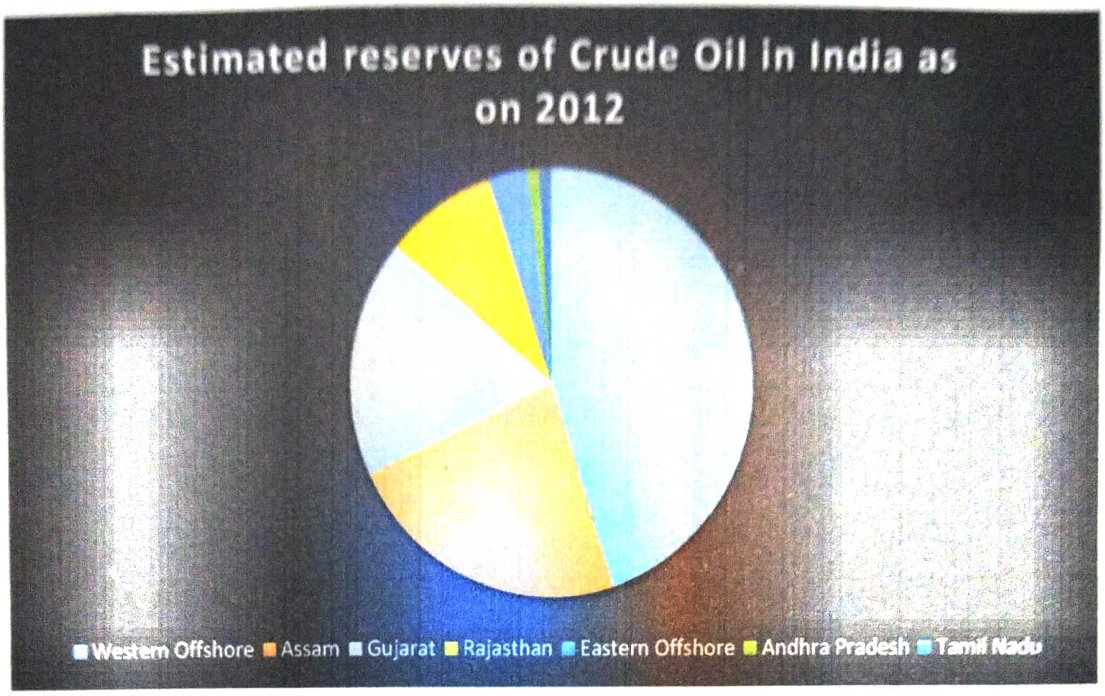
At the time of independence, India's total energy consumption was made by the non-commercial sources of supplies like firewood, dung cake, agricultural waste.

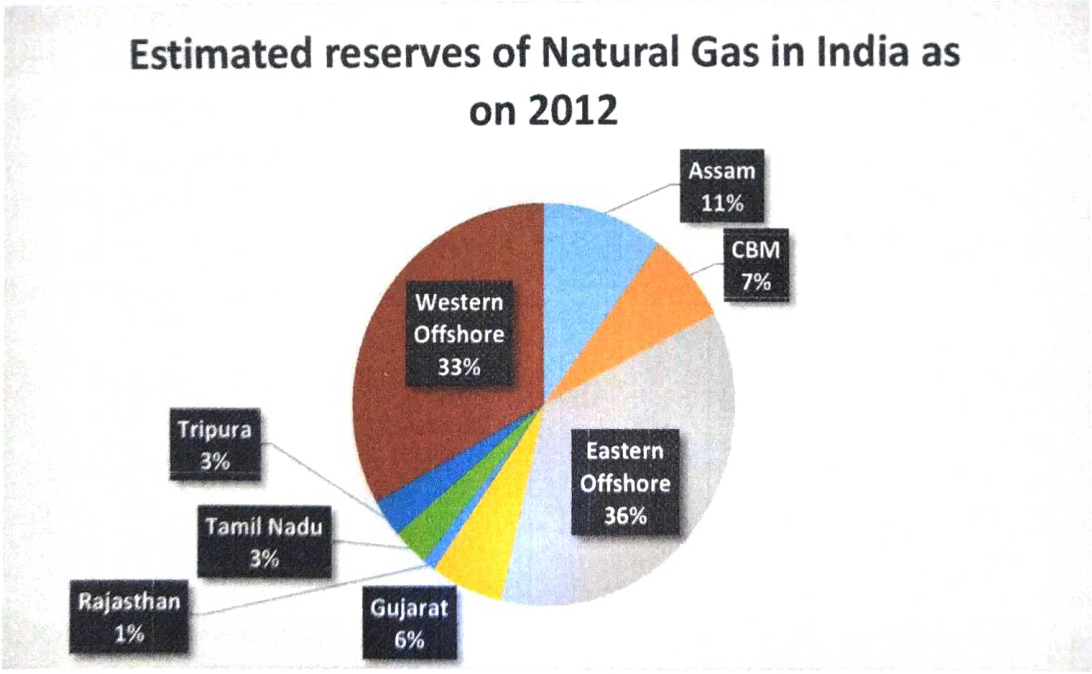
a)Coal

Coal deposits are mainly confined to eastern and south central part of the country. The states of Jharkhand, Odisha, West Bengal, Chhattisgarh, Andhra Pradesh, Maharashtra and Madhya Pradesh accounts for more than 99% of the total coal reserves of India. Total coal reserves were estimated around 294 billion tonnes in the year 2013.

b) Petroleum & Natural Gas

The estimated reserves of crude oil in India is 759.59 million tonnes. The estimated reserves of Natural gas in India is 1330.26 billion metre^3.





6. Energy Conservation Act - 2001

The government of India enacted the energy conservation act on 29th of September, 2001 put light into energy saving and reduce energy consumption. Some of its salient features are:

i. Energy Audit has been forced into compulsion for their respective consumers
ii. Laying down the energy conservation standards and the scheme for compulsory labelling on practical equipment
iii. Establishment of energy conservation at central and state level
iv. Energy conservation is mandatory for all buildings with a label greater than 500 kilowatts

7. Electricity Act – 2003

As per the ministry of Law & Justice, The Electricity Act to consolidate the laws relating to generation, transmission, distribution, trading and use of electricity and generally for taking measures conducive to development of electricity industry, promoting competition therein, protecting interest of consumers and supply of electricity to all areas, rationalization of electricity tariff, ensuring transparent policies regarding subsidies, promotion of efficient and environmentally benign policies, constitution of Central Electricity Authority, Regulatory Commissions and establishment of Appellate Tribunal and for matters connected therewith or incidental thereto.

8. Process of Energy Conservation of Electrical Appliances

i. Regulated consumption of Light

The energy efficient lamps are coming up and are being used, still energy is wasted in several ways. Studies show that, in general people turn on the lights when they use it, but later forget to turn it off even when they are no more required. The controlling can be done manually or by using electronic devices to sense the lighting and automatically switch the light on and off. By proper planning of controlling the light sources, as much as 70% of the energy can be saved.

ii. Room temperature controller

These are among the heaviest consumer of energy in domestic appliances. Proper setting of thermostat and using a fan along with an air conditioner and heater can reduce the energy consumption considerably. There are certain intelligent control devices which act by sensing the presence of a person in the room. A proper choice of air conditioner itself reduces the energy consumption. A low power rating machine is preferred for the same.

iii. Fan

Old fans can still be observed in many places which consume more power than modern fans due to the materials used in its construction. Replacement of old fans with low power new fans results in the saving of energy to a large extent. Exhaust fans can be automated so that it runs only when required. The power consumption of fans varies from 60 watts to 90 watts depending on its quality. Fans are a necessity in India due to its tropical environment but we should manage its usage by energy conservation. Conventional regulators should be replaced by electronic regulators.

iv. Refrigerators

Refrigerator is another common household appliance among the middle and upper classes in India. Single doors refrigerators take a share of more than 80% and almost all are right hinged. These are available in a variety of capacities and models but the most popular among them is the single door one 65 litres capacity. Refrigerators in India are mostly used for preservation of food items and for cold water. If two separate compartments are provided, then there can be good energy savings since the loss of cooling due to door opening is confined to the particular compartments only. Defrosting is done only when the deep freezer is completely choked with ice which hampers the effectiveness thus making the refrigerator inefficient. We should introduce no frost model and double door system which are very efficient and consume less power than the normal model.

v. Water and Solar Heaters

Storage geysers, running water geyser, emersion heaters are available in India. Emersion water heaters are economical and hence widely used despite the fatal risk involved just because of its cost. Solar water heaters are not available in many places because of their high initial investment. These are used only in luxury hotels, guest houses and cottages among others. Augmenting the geyser with solar heaters greatly reduces the power consumption as much as 80%.

vi. Water Pumps

Many houses are fitted with a 350 watts (*0.7 hp*) or 750 (*1 hp*) watts water pumps. 1 hp motor depending on the overhead tank capacity. Most of the motors are controlled manually and the average usage is about 2 hours a day. Overflowing of the tank is a common phenomenon in India since the use of automatic water level controllers are not yet generalized among the masses. Automatic water level controller is available for around 500-800. The savings of electricity can be increased with the increase of the rating of the motor and the time of overflow. This also increases the comfort level and conserve the water resources

vii. Automation

Intelligent devices offer a solution for optimising the energy to some extent. The energy conservation with the use of a personal computer which acts as a central controller that takes input from various transducer and takes a decision to switch on or off and electrical gadgets. The use of automated electrical control system with the aid of sensing devices (transducers) such as Photo sensor, occupancy sensor and Temperature sensors.

a) Photo Sensors

There are two types of photo sensors viz: used for switching and those used for deeming. A photo sensor used for switching sense a binary signal to the direct digital control network when the amount of light detects reach at the threshold limit. The building automation system can then turn off or set them to lower levels.

A photo sensor used for deeming sends a continuously variable signals indicating how much light is detected. This information can be used t

gradually deem or brighten lamps as daylight increase or decrease respectively.

b) Occupancy Sensor

When people are unlikely to remember to turn off electrical devices like but not limited to light, air conditioners, fan. An occupancy sensor comes in handy to save energy. It is designed for sensing the presence of any occupant in a room where this sensor is placed so that it effectively generates a control signal when any person enters or leaves the room. 20% to 40% energy savings can be performed with the use of occupancy sensors

c) Temperature Sensor

The main purpose for designing the temperature sensor is to optimise the performance of air conditioners so as to save energy in more convincing ways. Conventional thermostat can be used in electrical appliances. We should place the sensors at appropriate locations for utilising its maximum efficiency.

viii. Appliances maintenance

Normally it has been the tendency to "fit and forget" the lamps and replacement is done only when it fails. Dirt on the surface of lamps cam reduce the lighting by around 20% and causes overheating, thus deteriorating the light of the lamp. A proper maintenance schedule improves the lighting and extend the life of a lamp drastically. It is advisable to replace the appliances when they run out of their life expectancy to reduce their energy consumption.

9. Energy Audit of our College

Energy Audit is the systematic approach for decision making in the sphere of energy management. It estimates total energy utilisation in the campus for lighting, Air conditioning, running of laboratories and their appliances, water heating, water pumping and cooking among others.

Fossil Fuel and electricity are major expenses in major organizations today. Efficient energy consumption is crucial for the economic success of all organization. Few ways that we use to conserve in our institution are:

- Electricity is saved by the usage of LED Blub
- LPG is saved by the usage of pressure cookers for cooking food
- We always try to run our computers at power saving mod
- We never use our Air conditioners, computers, weighing balance, printers, etc. in standby mode
- When these are not in use we completely shut them down or switch those off.
- We switch off our electrical appliances immediately after the dispersal of classes and when these are not in use.
- All Streetlights are in sensor based LED energy efficient module.

10. DATA REPRESENTATION

QUARTER WISE ELLECTRIC BILL (2020-2021)				
FIELDS	1ST	2ND	3RD	4TH
PRINCIPAL QUARTER	DNA	5790	8390	250
COLLEGE MAIN CAMPUS	DNA	84270	176860	70580
GIRL'S HOSTEL	DNA	19125	6346	27300
COLLEGE CANTEEN	DNA	6564	DNA	10580

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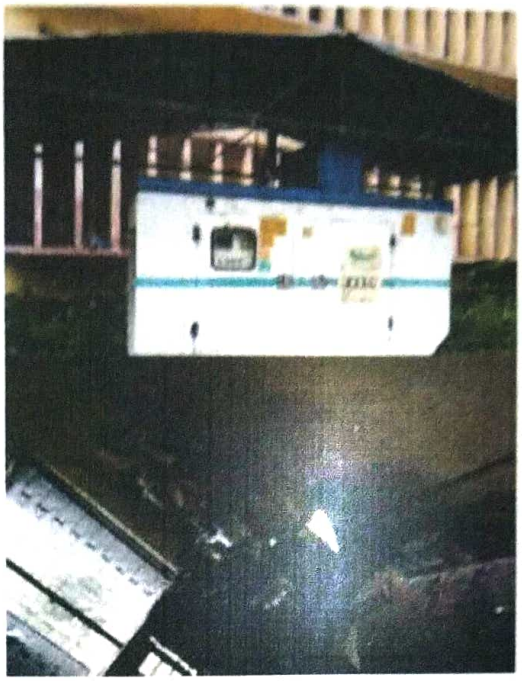
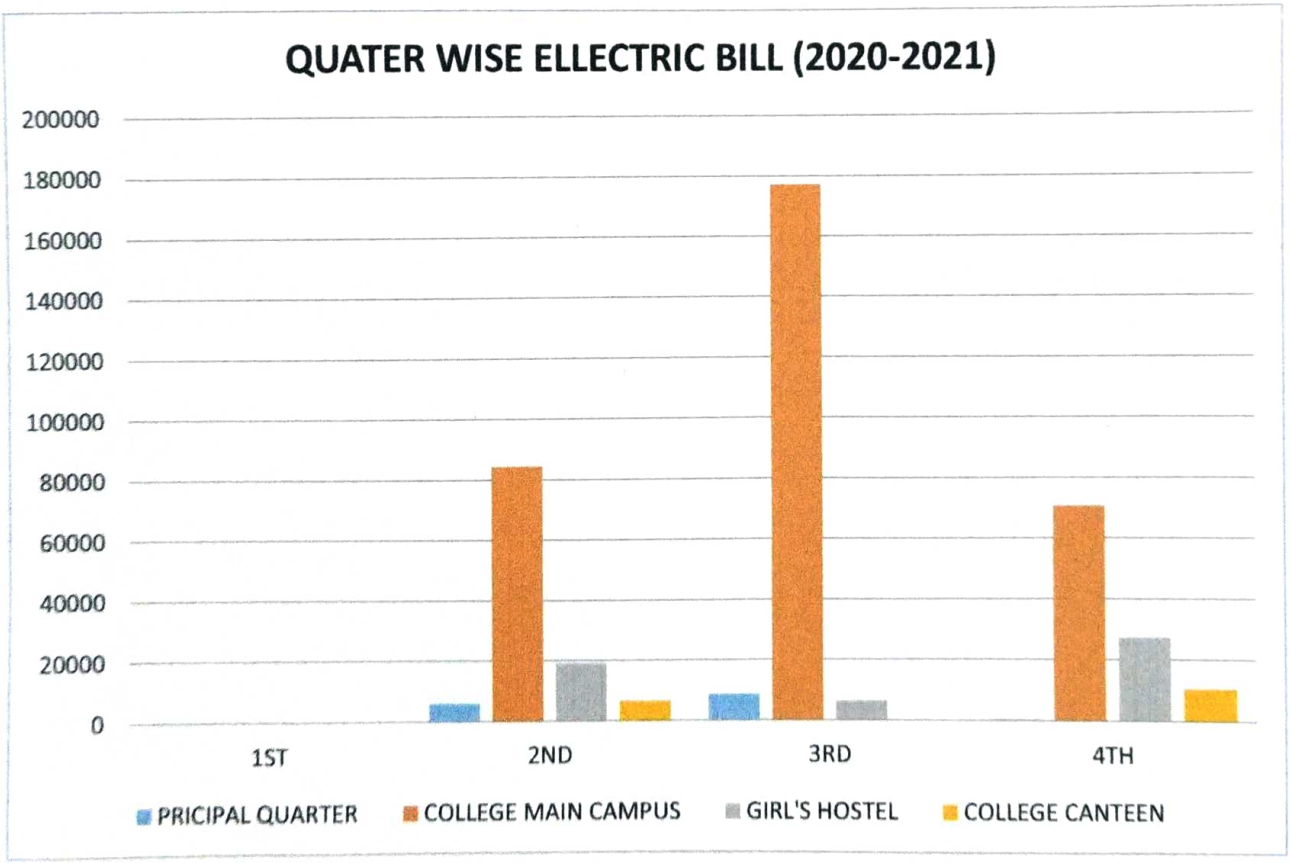
QUATERWISE TOTAL ELECTRIC BILL (2020-2021)	
QUATER OF MONTHS	TOTAL ELLECTRIC BILL
FISRT	DNA
SECOND	115759
THIRD	191596
FOURTH	83718



Two generator at our college



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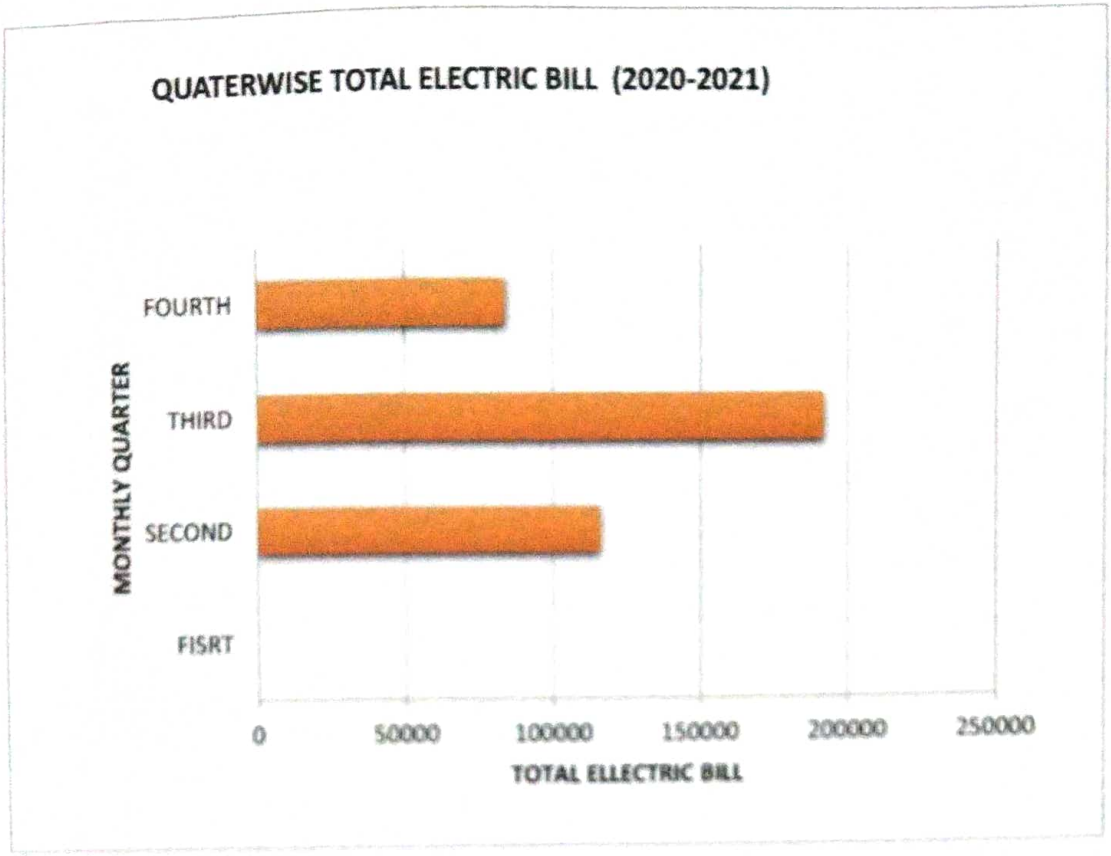

ROOM NO	ROOM NAME	SEATING CAPACITY	TUBELIGHT/BULB/LED	FAN
307	SEMINAR ROOM	90	23	18
301	Commerce Programme Classroom	>72	7	07
314	Arts Classroom	>72	11	11
208	Physics Office	-	04	04
209	Physics Lab	-	16	05
302	Commerce Honours Classroom	48	07	07

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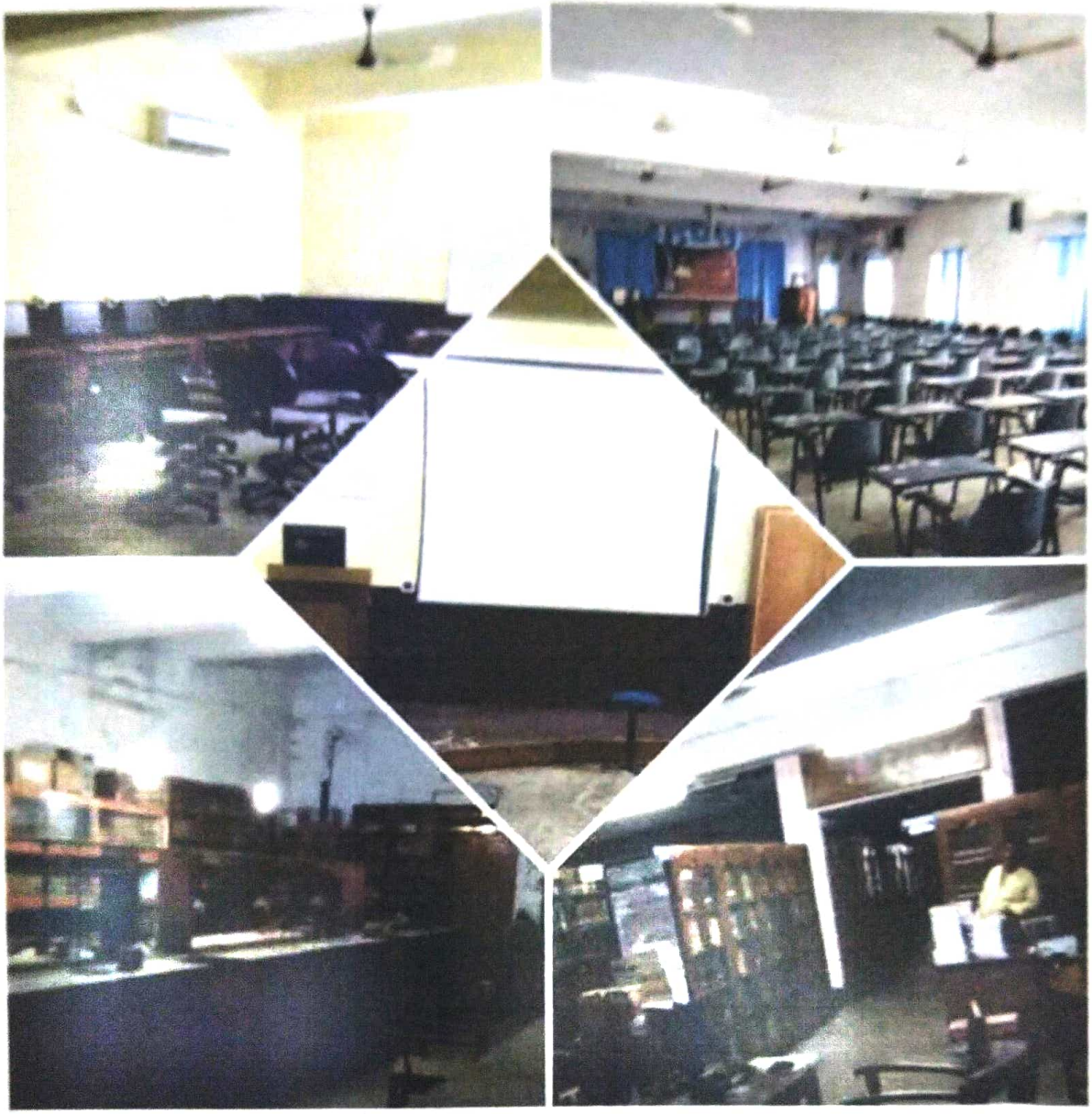
ROOM NO	ROOM PURPOSE	SEATING CAPACITY	WINDOWS	DOORS
208	Physics Office	-	2	1
209	Physics lab	-	6	4
210	Physics Dark Room	-	2	2
301	Commerce Programme Classroom	>72	6	4
302	Commerce Honours Classroom	48	4	4
307	Seminar Room	90	7	4
314	Arts Classroom	>72	6	6

Room Number	Ceiling Fan	Tube	LED Bulb	Wall Fan	A/C	Exhaust Fan
101	6	10	1	3	-	2
102	2	3	1		-	
Cash Room	3	7	1	1		1
104	2	2	3	-	-	-
105	2	3	-	-	-	-
106	2	3	-	-	-	-
107	2	4	1	-	-	-
108	4	5	2	-	-	-
109	2	3	1	-	1	-
110	4	5	-	1	1	-
111	4	8	-	1	-	-
112	4	4	-	-	-	-
113	4	4	-	-	-	-
114	5	4	-	-	-	-
115	5	4	-	-	-	-
116	4	6	1	-	1	-
117	-	-	1	-		-

118	3	3		-	-	1
119		21		-	-	4
120	4		1	-	-	-
121		13	6	-	-	1
122	5	5	-	-	-	2
123	5	5				-
124	-	4	-	-	-	-
125	4	5	1	-	-	-
126	4	5	1	-	-	-
127	5	5	-	-	-	1
128	5	5	-	-	-	-
129	5	5	-	-	-	-
210	2	1	2	-	-	-
211	9	5	6	-	-	-
212	-	-	-	-	-	-
213	4	8	-	-	2	-
214	4	4	-	-	-	-
215	4	4	-		-	-
216	4	4	-	-	-	-
217	4	4	-	-	-	-
218	4	5	-	-	-	-
219	4	4	-	-	-	-
220	2	1	1	1	1	-
221	1	2	-	-	1	-
222	4	4	-	-		-
223	4	4	-	-	1	-
224	4	4	-	-	-	-
225	-	-	-	-	-	-
226	-	-	-	-	-	-
227	-	-	-	-	-	-
228	4	4	-	-	-	-
301	7	1	6	-	-	-
302	7	1	6	-	-	-
303	6	1	4	-	-	-
304	6	5	4	-	-	-
305	-	-	-	-	-	-
306	6		8	-	-	-
307	18	14	8	-	6	-
308	5	5	1	-	-	-
309	5	5	-	-	-	
310	5	5	-	-	-	-
322	4	4	4	1	1	-



Clockwise from top left: Room no 212: Computer Lab, Room No 307: Seminar Room, Room No 206: Library, Room No 119: Chemistry Lab

Room No: 213 at the centre

11. Recommendation

The Energy Audit team has made short term and long-term suggestions for energy conservation. Some recommendations to towards energy management are as follows:

1. Sensor based energy conservation should be encouraged more.
2. Replacement of conventional ceiling fans with efficient ceiling fans.
3. Replacement of conventional classroom tube lights with LED tube light.
4. Solar energy panels should be installed as alternative energy resources. The public lights within the campus may be run with solar panels.
5. Uses of bicycles should be promoted.
6. Increase environmental promotional activities for spreading awareness among students in the campus.
7. The star rating of an electrical appliance is quantified in the form of energy efficiency ratio (EER). A three-star Air Conditioner has an EER that ranges between 2.9 to 3.09 and 5-star Air conditioner has an EER of 3.3 or above but sometimes 1.5 tones three split air conditioner may be more energy efficient than a regular 4 or 5-star model because it works on a variable speed compressor. The compressor runs continuously but depending on the heat load, adjust speed and power consumption to achieve the desired thermostat temperature.
8. Exhaust fans can be automated so that it runs only when required. Conventional regulators should be replaced by electronic regulators.
9. We should introduce no frost model and double door system which are very efficient and consume less power than the normal model. Two separate compartments should be provided, so there can be good energy savings since the loss of cooling due to door opening is confined to the particular compartments only.
10. Augmenting the geyser with solar heaters greatly reduces the power consumption as much as 80% so solar geysers should be introduced among the masses.
11. Automatic water level controllers should be adopted. The savings of electricity can be increased with the increase of the

rating of the motor and the time of overflow. This also increases the comfort level and conserve the water resources.

12. The energy conservation with the use of a personal computer which acts as a central controller that takes input from various transducer and takes a decision to switch on or off and electrical gadgets. The use of automated electrical control system with the aid of sensing devices (transducers) such as Photo sensor, occupancy sensor and Temperature sensors.

13. Occupancy Sensor is designed for sensing the presence of any occupant in a room where this sensor is placed so that it effectively generates a control signal when any person enters or leaves the room. 20% to 40% energy savings can be performed with the use of occupancy sensors.

14. A photo sensor used for switching sense a binary signal to the direct digital control network when the amount of light detects reach at the threshold limit. The building automation system can then turn off or set them to lower levels thus saving energy when necessary.

15. Conventional thermostat should be used in electrical appliances. We should place the sensors at appropriate locations for utilising its maximum efficiency.

16. A proper maintenance schedule improves the lighting and extend the life of a lamp drastically. It is advisable to replace the appliances when they run out of their life expectancy to reduce their energy consumption.

12. Reference

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