ENERGY AUDIT OF MALE AND FEMALE CAMPUS INTERNATIONAL ISLAMIC UNIVERSITY, ISLAMABAD

Researcher

Iram Shahzadi & Anam shafqat

Supervisor

Ms Anjuman Shaheen

Department of Environmental Sciences

Faculty of Basic & Applied Sciences

INTERNATIONAL ISLAMIC UNIVERSITY ISLAMABAD

MS
696
IRE

1-Energy auditing

ENERGY AUDIT OF MALE AND FEMALE CAMPUS INTERNATIONAL ISLAMIC UNIVERSITY, ISLAMABAD

Iram shahzadi (Redg# 148-FBAS/MSCES/FO8)

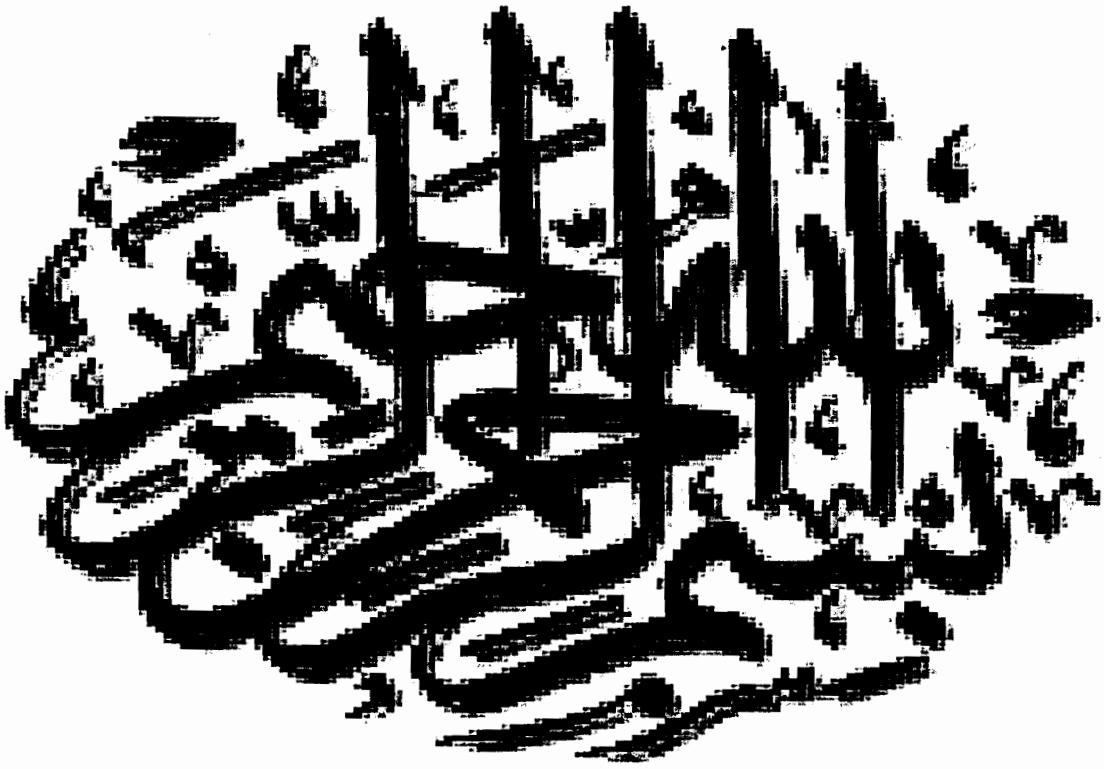
Anam Shafqat (Redg# 173-FBAS/MSCES/FO8)

A thesis submitted to International Islamic University Islamabad in partial fulfillment of the requirement of degree of Master of Science in subject of Environmental Science

Supervisor

Ms Anjuman Shaheen

August, 2010



With the Name of Allah who Is More Beneficent and Merciful

(Acceptance by the Viva Voce Committee)

Title of project Energy Auditing of Male and Female Campus International Islamic University Islamabad

Name of Student Iram Shahzadi (Redg# 148-FBAS/MSCES/FO8)

&

Anam Shafqat (Redg# 173-FBAS/MSCES/FO8)

Accepted by the FBAS/ Department of Environmental Science. International Islamic University Islamabad, in partial fulfillment of the requirement for the MSc degree in Environmental Science.

Viva Voce Committee

Chairman

In charge

Supervisor

Dr. Maliha Asma

Internal Examiner

Dated _____

DEDICATION

THESIS IS DEDICETED TO OUR PARENTS WHO HAVE TAKEN GREAT PAINS TO SEE US PROSPER IN OUR LIVES

ACKNOWLEDGEMENT

"I humbly thank Allah Almighty, the Merciful and the Beneficent, who gave me health, thoughts and co-operative people to enable me to achieve this goal."

It is difficult to overstate my gratitude to my supervisor, Ms Anjuman Shaheen, with her enthusiasm, her inspiration and her great efforts to explain things clearly and simply throughout my thesis-writing period, she provided encouragement, sound advice, good teaching, good company and lots of good ideas. I would have been lost without her.

We also pay thanks to all those who gave possibility to complete this project, especially to our ever loving parents who made all this possible for us by expanding their resources and supporting us morally to complete our education.

We also acknowledge this work to Mr. Abdul Qayyum and Mr. Israr Ahmed whose continuous support and encouragement throughout the research enabled to step up the levels of achievements.

We also pay special thanks to Engr. Muhammad Abdul Basir who helped us to accomplish the project and to Mr. Shafique-ur-Rehman and Mr. Amir Ishtiaq who facilitate us to get the required data.

Iram Shahzadi & Anam Shafqat

ABSTRACT

A simple energy audit was conducted at male and female campus of International Islamic university Islamabad. Both campuses have four blocks and 210 rooms in each at an area of 280,000 feet and work for 10 to 12 hours daily.

The data was collected through "walk through survey" and behavior towards energy conservation has been assessed through questionnaire survey. Total electricity consumption was determined by calculating the watts of existing electrical appliances in the campus and then calculating saving potential by replacing three parameters computers, large tube lights and air conditions by energy efficient appliances. The results shows that by replacing current electrical appliances installed in the building and simply changing behaviors about 25 % to 28% of energy would be saved in each campus. The university is still under construction it is suggested that in new building energy efficient appliance should be installed.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

List of Acronyms

S No.	Abbreviations	
1	ECPA	Energy Conservation and Promotion Act
2	O & M	operation and maintenance
3	MTOE	Million ton oil equivalent
4	IEA	International Energy Agency
5	GHG	Green house gasses
6	USEPA	United States Environmental Protection Agency
7	LCD	Liquid crystal display
8	CRT	Cathode ray tube
9	HVAC	Heating, Ventilating, and Air conditioning

LIST OF ANNEXURES

INTRODUCTION

CHAPTER 1

INTRODUCTION

Natural resources are an important source of national wealth around the world because they provide the base on which the development of a nation is dependent. They play an important role in the development of a nation. A country that tends to have more natural resources and has a way to a better and stable economy, where as a country with fewer amounts of resources might find themselves in economic troubles. The solution of this problem lies in the balance of three characteristics of a resource i.e. utility, quantity (often in terms of availability) and consumption. If this balance is disturbed, the resource goes in stress and then gradually towards depletion and then some conservation measures are taken to maintain a balance between availability and consumption.

Energy which is also an important natural resource and everything we do is connected to energy in one form or another. Energy is "The ability to do work". Energy is a property or characteristic of matter that makes things happen or in the case of stored or potential energy, it has the potential to make things happen. (Dave Watson).

Energy has a number of different forms. All forms of energy fall under two categories i.e. **kinetic energy** (Radiant energy, Thermal energy, motion, sound, Electrical energy). **Potential energy** (Chemical energy, Nuclear energy, stored mechanical energy, Gravitational energy).

Chapter 1
Introduction

Undoubtedly, in the new millennium, the importance of energy sector for the development of a country is undeniable. Rapidly increasing knowledge along with speedy technological modernization has resulted in the provision of large amount of facilities. This has made the human beings, patrons or producers, much demanding for energy sources that are used to run mechanical processes. There are various sources of energy which include oil, electricity, gas, coal and nuclear. Countries differ in the usage of alternative energy sources. In Pakistan the major energy source is gas which is 41% of the total energy supplied. The other energy supply sources are as follow: oil (29%), hydro (12.70%), coal (12%) and nuclear (1%). (Pakistan Development Review, winter, 2008)

Electrical energy is most widely used form and a secondary source of energy, which is obtained through the conversion of primary forms of energy i.e. coal, nuclear energy, natural gas or oil etc. . Electricity is largely produced by power stations burning fossil fuels.

In Pakistan electricity is the most important source of energy. It has become a necessity in the present in commercial sector. The major domestic users of electricity in Pakistan along with their respective shares of consumption are house hold with 45.6%, commercial sector 7.4%, industrial sector 28.4%, agriculture sector 11.8%, street lights 0.6% and other government sectors with 6.2% share in total energy consumption. The residential consumption of electricity has the highest share. (Source: Pakistan Economic Survey, 2007-08)

When utility, quantity and consumption of this important natural resource is observed in developing nations like in Pakistan a severe imbalance among these is seen.

There is an increased consumption and less availability so a short fall has occurred and the country is categorized as energy deficient nation.

Pakistan with limited resources of fossil fuels and rain dependent hydroelectric generation witnessing long hour of power shut downs, reflects very well on prevailing energy crises. The situation is alarming and frustrating power availability position in the country. This is high time to think of alternative such as savings, need to identify and put them to practice. Energy wastage in the building sector is one of the large possibilities where saving opportunities can be definitely sought.

Because of the limited amount of nonrenewable energy sources it is important to conserve current supply or to use renewable sources so that natural resources will be available for future generations.

Energy conservation does more than just save money. It reduces environmental and social costs as well. Energy conservation mitigates the numerous adverse environmental and social impacts associated with energy production and consumption. These include air pollution, acid rain and global warming, oil spills and water pollution, loss of wilderness areas, construction of new power plants, foreign energy dependence and the risk of international conflict over energy supplies.

In every country there is lot of opportunities for conservation of energy to achieve more efficient energy management of the government own facilities and operation. Conservation of energy will help in improving efficiency at all levels of government and help in lowering the energy cost of public agencies, reduced demand on capacity constrained electricity system, increased energy reliability and reduced emissions of green house gases and minimizing local air pollution. The government sector buying power and

visible leadership offers powerful non regulatory means to simulate market demand for energy efficient products and services. Increased buyer demand for these products and services can have positive response for domestic supplier, encouraging them to introduce more energy efficient products at competitive price once the public sector has helped to establish a reliable market.

Despite these benefits to government sector leadership in energy efficiency, many countries particularly developing and transition economies have only recently begun to focus on energy efficiency policies in this sector. Institutional barriers that historically have constrained public sector energy efficiency effort include a lack of awareness and technical expertise, bias toward buying lowest first cost products, budget constraints and disincentives, periodic changes of leadership, and competing policy priorities.

Educational institutes and universities buildings are organizations which are functioning for building the nation and consume energy in different forms and ways at large scale. Uninterrupted power supply is the fore most need in education sector.

International Islamic University Islamabad which occupies a quarter part of H-10 sector Islamabad. It is established in 1995 with a single campus in the Faisal Mosque, now running successfully with an old and new campuses, library, café etc. the area of each campus is 280,000 feet having 4 blocks as A, B, C and D. Mainly the male and the female campus have the most work load and hence most energy consuming areas occupying departments, class rooms, laboratories, auditorium, stationary and photo state shops etc. Both campuses have three floors and total 210 rooms. Assessment of energy consumption in male and female campus of International Islamic University Islamabad is a step towards an effort of energy conservation. So that a continuously supply of energy is ensured in

educational institutes which are playing an important role in nation's building and progress.

1.1 Justification of study

Electricity shortage is one of the major issue Pakistan facing today. The problem becomes more severe in the summer when there is a power outage of 12-18 hours. However this winter is no different in which there was a power outage of 3-4 hours during the peak crisis. This condition affected all the sectors badly but the focus of this study is the educational sector which is most important for the progress of a nation. A continuous power supply is needed in the educational institutes to support the educational activities. This study will help to improve the energy efficiency system of the university by reducing the energy consumption and in saving energy bills to solve the problem of power outage in study hours.

1.2 Objectives of the study

The objectives of this study are:

- To carry out the energy audit of male and female campus of International Islamic university Islamabad
- To suggest the improvements in energy system of International Islamic university Islamabad making it more energy efficient to conserve the energy.
- To help the university administration in saving energy bills.

1.3 Methodology

The study area was Male and female campus at international Islamic university Islamabad. It was a simple audit and carried out by walk through survey and inspection. Checklist procedure was adopted to get the data of electrical and gas equipments. Questionnaire was developed to check the behavior of students and facility personnel towards energy conservation. Auto cad and Microsoft excel was used for data analysis.

LITERATURE REVIEW

Chapter 2

LITERATURE REVIEW

From the literature review it is revealed that all progress and development in the modern society is energy dependent. Energy is one of the basic need/requirement of human being after food and shelter to maintain all the varied form of life on the earth.

There are number of sources which used for production of energy. Among these fossil fuel, hydroelectric and solar etc are common source. Fossil fuel is one of the major sources in world currently to obtain maximum of it commercial energy. These deposits are not for ever also causing green house gases effect and global warning. These deposits are limited and depleted at high pace and world is facing a challenge in the field of energy because of high cost, and consumed almost half of the total estimated oil reserve globally. it is thought that within a few year use will reach the peak of global oil production after which time conventional oil production will decline.

Pakistan is developing country of 170 million people facing serious crises of energy. The economy of Pakistan is growing and higher energy consumption results in great pressure. Presently there is no light about 12 to 18 hours in different parts of Pakistan.

Energy supply was 56 Million ton oil equal (MTOE) in 2005 and predictable energy demand for next 20 year will increased by 3.5 time from current level of 56 MTOE

to 198 MTOE. (P-20 FUELING THE FUTURE, Meeting Pakistan Energy Needs In the 21st Century)

The power over view of Pakistan is as: -

- Installed capacity 19000 MW
- Production 9000 – 11000 MW
- Actual demand 12000 – 15000 MW
- Gap 1000 - 4000 MW
- Annual growth in demand 14 – 15%
- Energy consumed by bldg 2700 – 3300 MW (30%)
- Saving potential in bldg 36 – 40% (1000 MW)

(P-12, ENERCON workshop outcome report on (Building Energy Code .BEC) dated 11 Feb 2009 Islamabad Pakistan)

To meet this short fall Government of Pakistan is striving hard to find out solution to energy shortage. National Energy Conservation Center (ENERCON) has been tasked to pursue the goals of energy conservation through identifying various sector based on energy consumption. National Energy Conservation Policy - 2005 had been developed by the ENERCON. The salient features of policy regarding the building sector are as;

- Encourage and facilitate introduction of energy audits in buildings.
- Encourage adoption of energy efficient consideration in the house hold.

- Evaluate building and insulation materials for the energy efficient characteristics with report to different climatic zone and promote their adoption nationwide.
- Encourage use of energy efficient equipment, fixture and institute measures for its compliance.
- Develop/update a building energy code for the country and institute measures to its compliance.
- Promote use energy efficient HVAC and lighting practices in buildings.
- Promote through relevant authorities, energy efficient building design.

(P-6 National Energy Conservation Policy) It has been estimated by ENERCON that building sector consumes over 30% of country energy supply. Suitable building design, orientation, features and use of energy efficient materials, Technologies and equipment can easily be save up to 35 – 45% of energy. Four major elements of building i.e. Building envelope, HVAC, water heating and lighting are therefore desired to have energy efficient design, materials and standards. (P-3, ENERCON workshop outcome report on (Building Energy Code .BEC) dated 11 Feb 2009 Islamabad Pakistan

- J. Nouri ,*et all* (2005) conduct an energy audit of faculty of Humanities and science and research campus at Islamic Azad University and concluded that by implementing the energy management system in the implied building system are finally made to propose managerial solution towards reducing energy consumption in the building. By providing energy management system procedures presented for optimizing energy consumption and saving in the building, by employing procedures 1,73000 kilo watts hour of power as well as 323642 cubic meter of natural gas can be saved per year.

- Rod Janseen in 2004, consultant energy efficiency in UK discussed that building represents the largest share of energy consumption, there is high cost effective for energy saving in buildings. The council Resolution of Dec 1998 on energy efficiency stated that meeting the indicative target of 1% improvement in energy intensity result in avoiding energy consumption of 55 MTOE (Million Tons of Oil Equal) in buildings and 20% of Kyoto protocol target.
- Ecogeneration in 2009, Reported that The International Energy Agency (IEA) has estimated that in many countries, up to 40% of energy use can be accounted for by buildings, residential as well as commercial.
- City Switch, office in 2009, stated that demand side energy management and energy efficiency practices can greatly lessen both costs and energy consumption. The reduction in consumption leads to a decrease in GHG emissions, which reduces the impacts of global warming.
- USEPA (2007) reported that in addition to these benefits, energy efficiency is also moving into the mainstream because it reduces air pollutants, reduces reliance on fossil fuels, increases electrical grid dependability and reduces the need for capital investment in new power plants.
- McLennan Magasanik Associates Pty Ltd, 2008 In the current world and Australian contexts, reduction in GHG emissions is an important factor for all levels of government, including local councils. According to a 2008 Climate Institute report, the Australian commercial sector has the opportunity to make energy savings of up to 70%.

- Department of the Environment, Water, Heritage and the Arts in 2009, on a much larger scale, Centrelink has an environmental policy to conduct operations in an environmentally accountable manner. This extends to all of its amenities across Australia. The energy efficiency of Centrelink's buildings was improved over the two years to 2006, with an overall reduction in energy consumption of 7%, or 37,000 Gigajoules. The GHG emissions were also reduced by 7% during that time, through both building and fleet efficiency. Specific measures that Centrelink implemented comprise the use of energy audits on over 200 offices and implementation of some of the recommendations; the introduction of "Lights Off" campaigns encouraging staff to switch off and the widespread purchasing of appliances that have Energy Star ratings, including desktop computers and screens, multifunction devices and kitchen appliances. Centrelink acknowledges that staff commitment is a significant part of the success of its programs. Staffs are involved in many ways, including through training, web-based learning modules and a network of volunteer environmental champions to act as role models.
- R.Kannan, 2003 conduct study on energy management in the bakery, results shows that there is a reduction of 6.5% on total energy consumption was expected. Though the bakery had some energy conservation programmed, this 6.5% energy saving is to be achieved without much investment. It indicates that there could be a significant potential to save energy in other bakeries where no energy conservation campaign/saving measures have been taken.

MATERIALS AND METHODS

Chapter 3

MATERIALS AND METHODS

3.1 Description of the study Area

The area of study was International Islamic University, H-10 sector Islamabad. It occupies 704 acres (2.85 km^2) of land. The foundation of the University was laid on the November 11,1980.It has two campuses; old campus and new campus. The university's Old Campus is located around the Faisal Mosque and the new campus in in H-10 sector. At present three academic blocks while two under construction and Eleven hostel blocks (Seven for male and Four for female) have been completed 'and all University faculties are now functioning in new buildings with effect from January, 2002. In addition one academic block and two hostel blocks have also been completed and became functional for the Women Campus of the University. The area of each study campus is 280,000 feet having 4 blocks as A, B, C and D. There are 210 rooms in each campus. The buildings work for 12 hours a day. The university consists of the following faculties:

- Faculty of Basic and Applied Sciences
- Faculty of Engineering and Technology (PEC recognized)
- Faculty of Arabic Language and Islamic Civilization
- Faculty of Languages, Literature and Humanities
- Graduate School of Management
- Faculty of Shariah and Law
- Faculty of Social Science

- Faculty of Islamic Studies (Usuluddin)
- CMC (Center of Media and Communication)

In the Master Plan of the new campus, the University will be completed in phases of which Stage-I of Phase-I has reached culmination while stage-II is nearing completion. When constructed in its entirety, the University will accommodate 30,000 students (20,000 male and 10,000 female) in 22-25 faculties. In addition, there will be 57 hostel blocks for male students and 28 for female and partial accommodation for teaching/research and administrative staff.

3.2 Methodology

Energy audit has been used as tool to assess the energy consumption. It is commonly used to describe a broad spectrum of energy studies ranging from quick walk though of a facility to identify major problem areas to a comprehensive analysis of the implications of alternative energy efficiency measures sufficient to satisfy the financial criteria.

3.2.1 Data collection

(a) Primary data collection

Primary data has been collected through Walk through survey and by designing questionnaire.

- **Walk through survey**

A walk through survey method was developed for the inspection of building and to observe building structure, electrical and gas points, room lightning assessment and behavior of students is observed either they turn on lights in the presence of sufficient light or not and turn off light while leave rooms after attending any class.

- **Questionnaire:**

A structured questionnaire was developed to assess the behavior of students towards energy consumption, awareness about the importance of energy, their attitude towards the use of electrical appliances and how energy crises can be overcome by the changing the behavior of user or by revision of government policies. The pretesting of questionnaire has been done and then pre tested questionnaires were distributed.(Annex-v)

- **Sample size**

A sample size of 150 questionnaires is used. 75 questionnaires are filled by female students and 75 from male students of different faculties.

(b) Tools

Checklist and Microsoft excels were used for the collection and analysis of data.

- **Checklist**

A checklist was developed to note detailed building's information as number of windows and ventilators in each room, detail information of electrical appliance such as fans

, exhaust fans , tube lights , bulbs , air conditioners , computers , multimedia, printers ,photo copiers, electrical cooler , fridge , ovens and electrical kettles and also the information of gas appliances as heaters and geysers. (Annex -II,III)

- **Microsoft Excel**

The data analysis has been done through Microsoft excel. All the data of building, electrical and gas appliances has entered in the excel sheet and analyzed the data and then graphs has been developed.

- **Auto cad**

Auto cad software has been use to study map and to calculate areas of rooms.

3.3 Secondary data collection

Secondary data has been collected from internet different energy audit reports, research papers and articles.

RESULTS AND DISCUSSION

Chapter 4

Results and Discussion

Pakistan is facing many problems recently, among which energy problem is the most important and hot issue .With the decrease of electricity the whole economy is disturbing.

Due to this problem life of Pakistani peoples have effected on large scale. In the summer season as the demand of electricity increases its short fall gradually increases. Also per unit cost increases. Many industries have been closed due to the lack of electricity, while others are running producing the things in expensive cost.

Energy conservation can be achieved through increased efficient energy use, in conjunction with decreased energy consumption or reduced consumption from conventional energy sources. Energy consumption can be reduced by changing behavior, by implementing energy save policies and by installing less energy consuming appliances.

(A) Simple Energy Audit of Female campus

This energy audit is a simple audit. In this study power consumed by the electrical appliances is determined by collecting the detailed information about these appliances and then saving potential for energy is determined by considering the three parameters. Total power consumed by all the electrical appliances i.e. fans, exhaust fans, air conditions, computers, bulbs, tube lights, multimedia, ovens, refrigerator, electric kettles, printer, geysers and electric cooler is 10,14,426 watts.

Most of these appliances work for 10 to 12 hours and the study is based on the saving potential of these three parameters i.e.

- The type of computers used in labs and departments
- Type of bulbs and tube lights used in the campus
- The AC wattage (either it is appropriate to the area where it is operating or not)

4.1.1 Computers

There are two types of computers used in the labs and for the department work on the basis of the type of monitor.

- LCD monitor
- CRT monitor

An LCD monitor consumes 100 watts and CRT consumes 180 watts of electricity and by replacing one CRT by LCD 80 watts of the electrical power can be saved (ABS Alaskan). Data shows that in the female campus most of the computers are CRT. Total number of CRT computers in female campus is 343 and consume total power of 84,600 watts, if these computers are replaced by LCDs power consumption will be reduced to 37,600watts, total saved power is 47000 watts. There is potential of saving 44% of current power usage by the PCs.

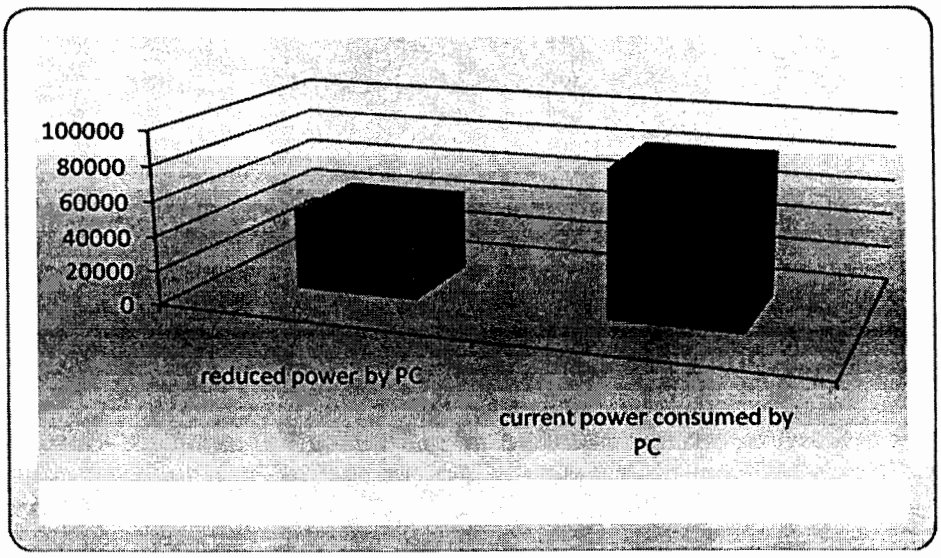


Fig 4.1 power reduced by computers

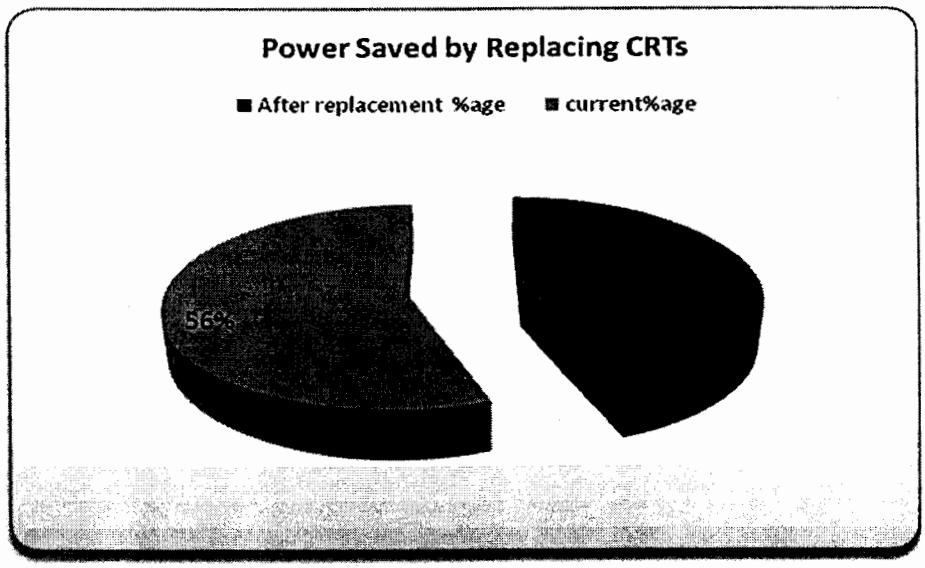


Fig 4.2 % age of power saved by replacing LCD computers

4.1.2 Tube lights

In female campus mostly small tube lights are working for the enlightenment of campus. But at some places large tube lights are also installed. Power consumption by small tube lights is 30 watts and by large tube lights is 50

watts. If a large tube light is replaced by a smaller one 20 watts of power can be saved. Data shows that total large tube lights are 258 and consume 12,900 watts. By replacing them with smaller tube lights power consumption is reduced to 7,740 watts. In percentage it is shown that 40% of the current power usage by tube lights can be saved.

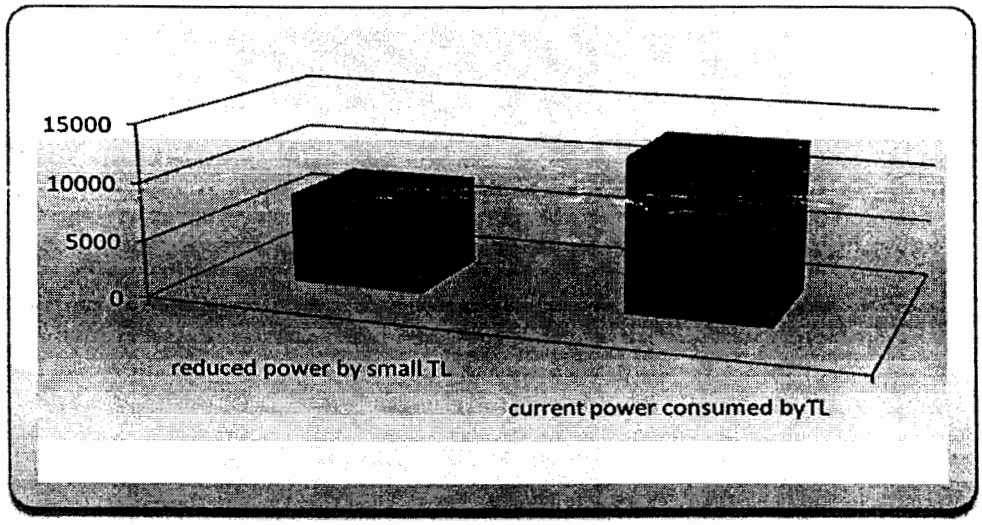


Fig 4.3 power reduced by tube lights after replacement

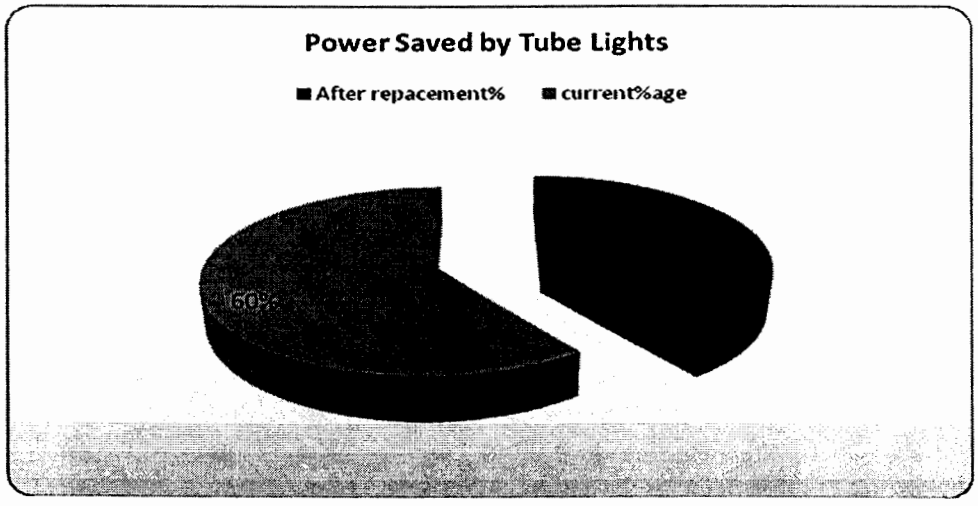


Fig 4.4 %age of power saved by tube lights after replacement

4.1.3 Air Conditions

For energy saving air conditioning, it is necessary that the air conditions selected should be in accordance with the area of room. to air condition a room that is 15 feet wide and 20 feet long, you would calculate: 15 x 20 x 20(Btu) = 6,000. Thus, an air conditioner with a 6,000 Btu capacity would be required that is of 0.5 ton. Required AC can be determined by the following formula

$$\text{AC required (tons)} = \frac{\text{Area of room} \times 20(\text{btu})}{12000}$$ (EcoMall™ ©1994-2010)

Data shows that if the ACs are installed according to the area calculated by formula power consumption is reduced to 49,214.26 watts while current usage is 1,18,667 watts.58.5 % can be saved of the current power usage.

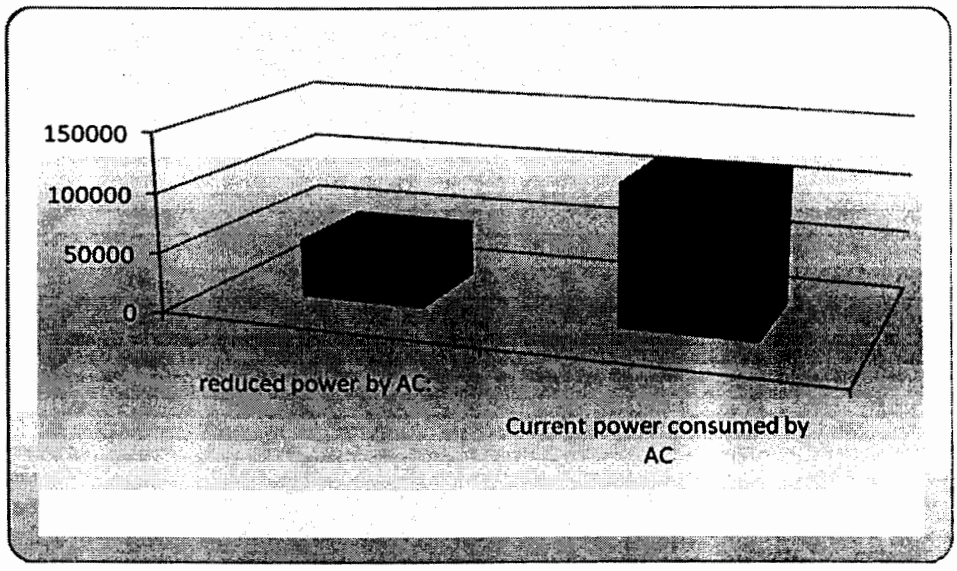


Fig 4.5 power reduced by ACs installed according to area

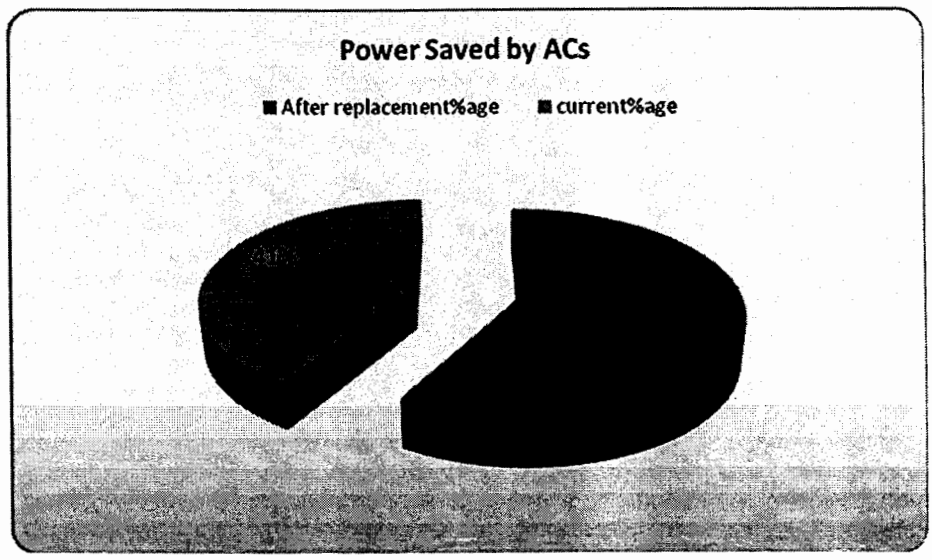


Fig 4.6 %age of power saved by ACs after replacement

4.1.4 Total power saved in female campus

Calculations of Data shows that by replacing large tube lights by small tube lights, CRT monitors by LCDs and by installing air condition calculated according to area about 25% of the total power consumed by campus would be saved.

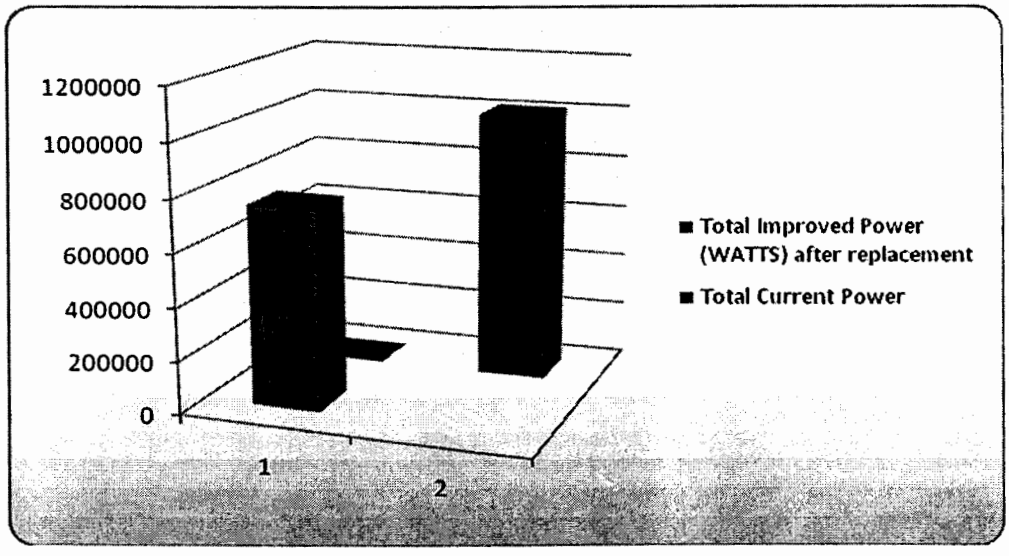


Fig 4.7 total power saved in campus after replacement

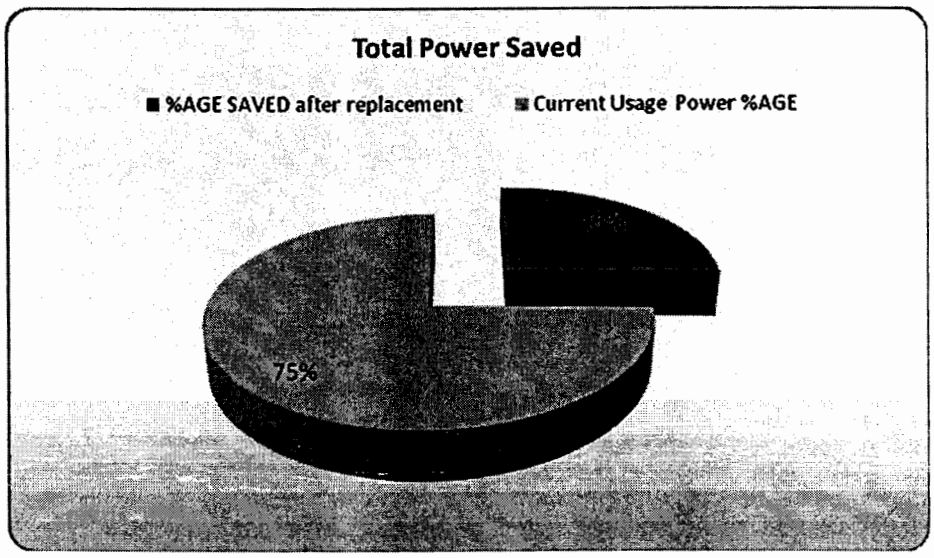


Fig 4.8 %age of power saved in female campus

(B) Simple Energy Audit of Male campus

Total power consumed in male campus by all the electrical appliances i.e. fans, exhaust fans, ACs, computers, bulbs, tube lights, multimedia, ovens, refrigerator, electric kettles, printer, geysers and electric cooler is 9,22,645 watts. Most of these appliances work for 10 to 12 hours and the study is based on the saving potential of these three parameters i.e.

- The type of computers used in labs and department work
- Type of bulbs and tube lights used in the campus
- The AC wattage (either it is appropriate to the area where it is operating or not)

4.2.1 Computers

In male campus there are two types of computers used in the labs and for the department work on the basis of the type of monitor.

- LCD monitor
- CRT monitor

Data shows that in the Male campus most of the computers are CRT. Total number of CRT computers in Male campus is 212 and consume total power of 38,160 watts, if these computers are replaced by LCDs power consumption will be reduced to 16,960 watts. Total saved power is 21,200 watts. There is potential of saving 44% of Current power usage by the PCs.

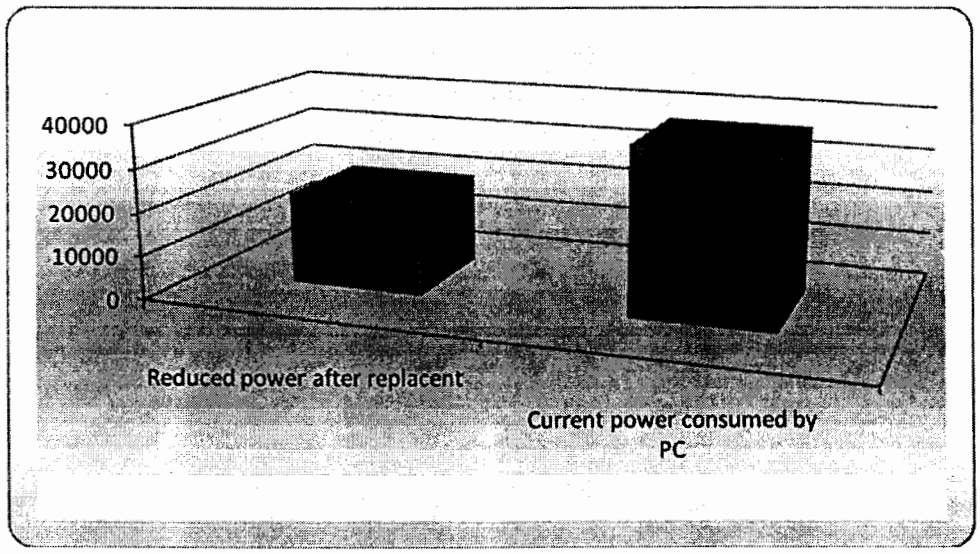


Fig 4.9 power reduced by computers

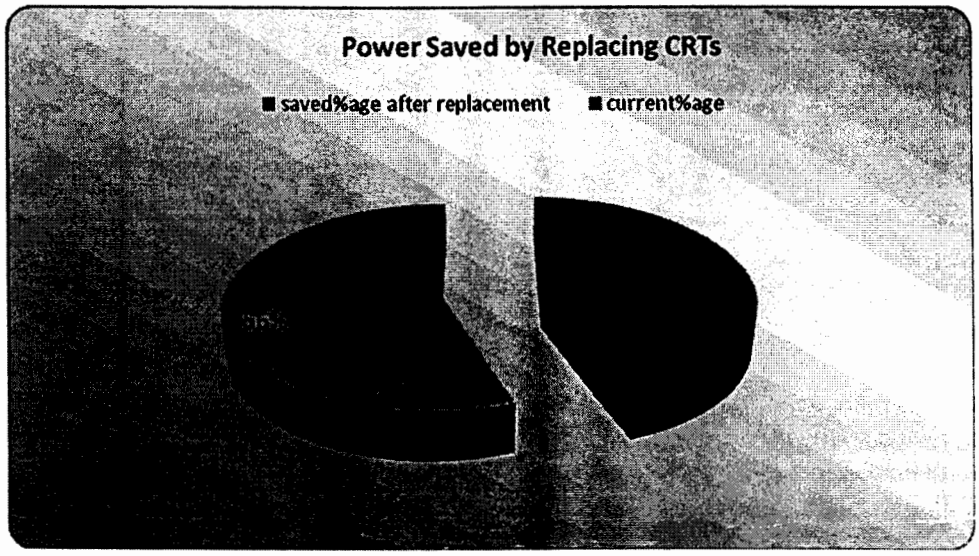


Fig 4.10 % age of power saved by replacing LCD computers

4.2.2 Tube lights

In Male campus mostly small tube lights are working for the enlightenment of campus. But at some places large tube lights are also installed. Data shows that total large tube lights are 272 and consume 13,600 watts. By replacing them with smaller tube lights power consumption is reduced to 8,160 watts. In percentage it is shown that 40% of the current power usage by tube lights would be reduced.

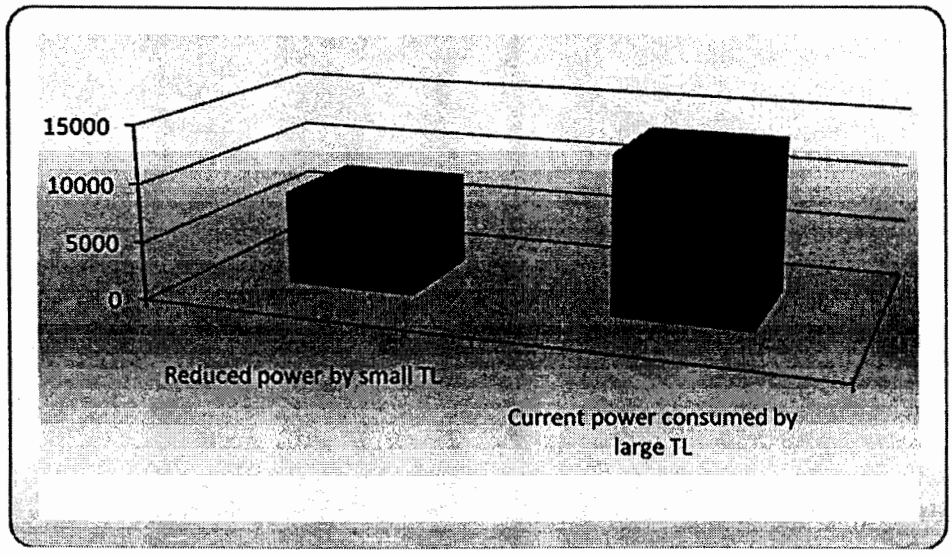


Fig 4.11 power reduced by small tube light

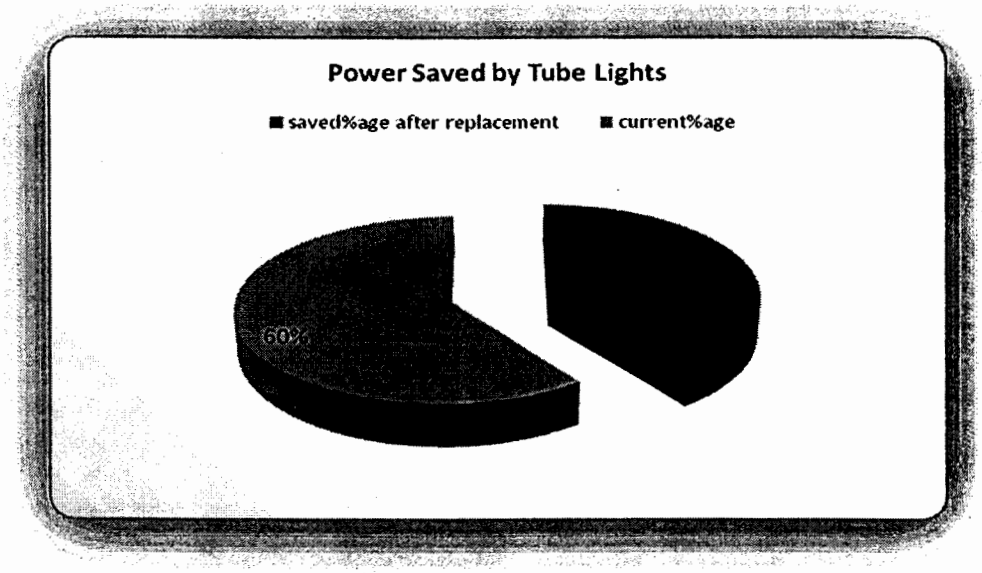


Fig 4.12 %age of power saved by tube lights after replacement

4.2.3 Air Conditions

For energy saving air conditioning, it is necessary that the air conditions selected should be in accordance with the area of room. to air condition a room that

is 15 feet wide and 20 feet long, you would calculate: 15 x 20 x 20(Btu) = 6,000. Thus, an air conditioner with a 6,000 Btu capacity would be required that is of 0.5 ton. Required AC can be determined by the following formula

$$\text{AC required (tons)} = \frac{\text{Area of room} \times 20(\text{btu})}{12000}$$

Data shows that if the ACs is installed according to the area calculated by formula power consumption is reduced to 51,495.26697 Watts while current usage is 1, 37,126 watts.58.5 % can be saved of the current power usage.

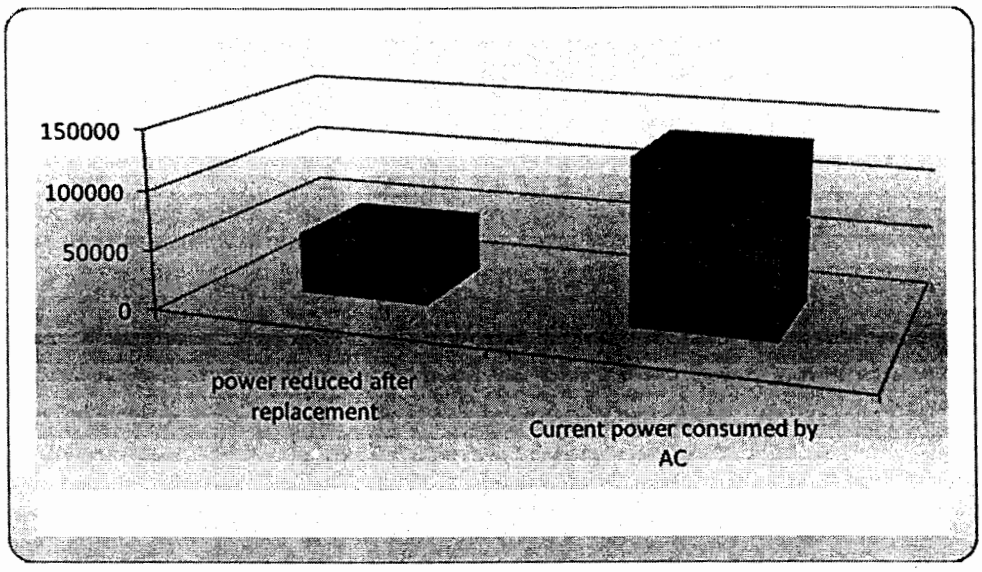


Fig 4.13 power reduced by ACs

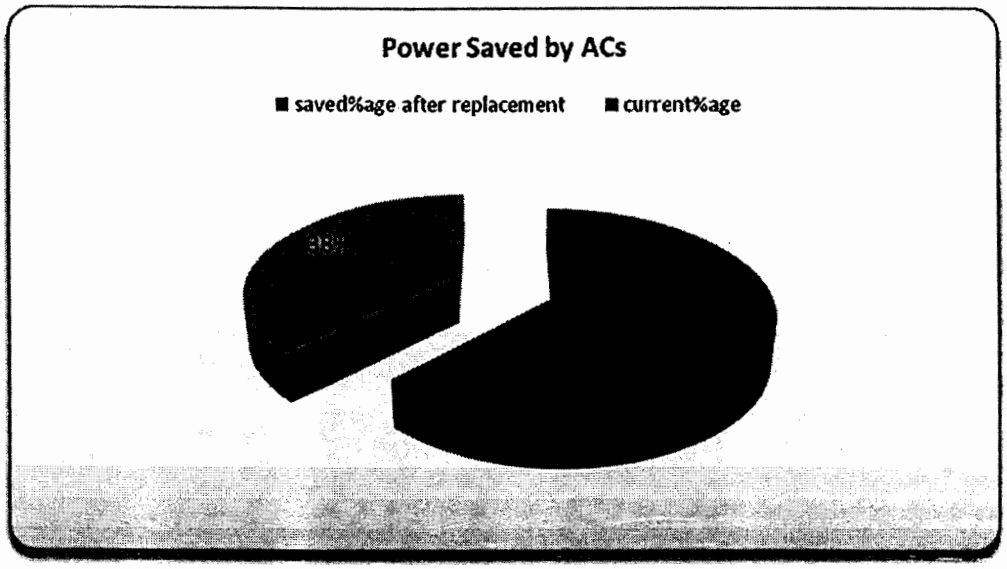


Fig 4.14 %age of power saved by ACs after replacement

4.2.4 Total power saved in male campus

Calculations of data shows that by replacing large tube lights by small tube lights, CRT monitors by LCDs and by installing air condition calculated according to area about 28% of the total power consumed by campus can be saved.

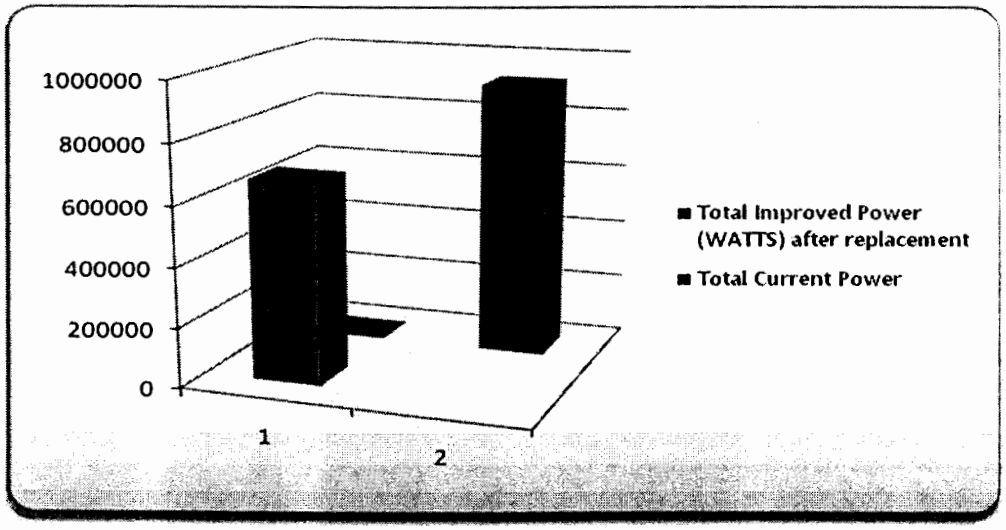


Fig 4.15 total power saved in campus

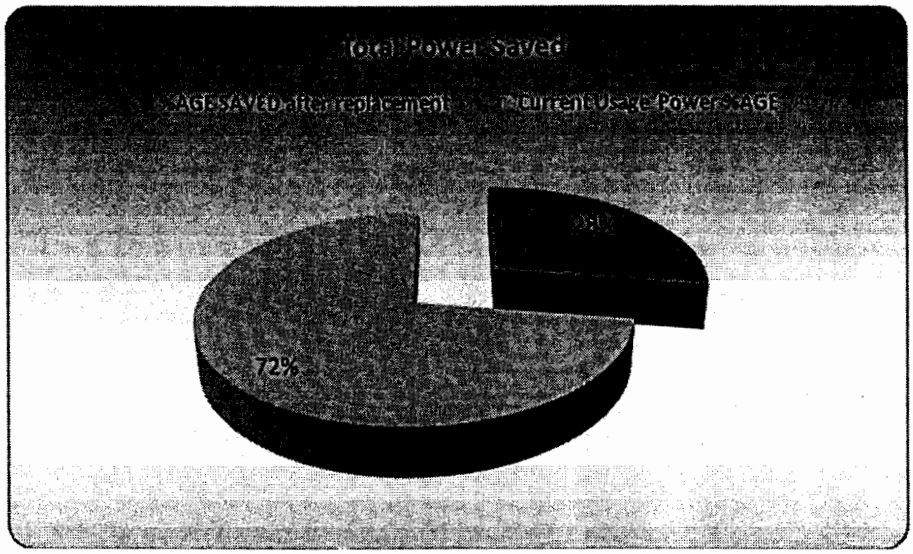


Fig 4.16 %age of power saved in male campus

4.3 Awareness and Behavior of students towards energy conservation

A questionnaire survey was conducted to check the behavior, awareness level and attitude of students towards energy consumption. Data shows the following results

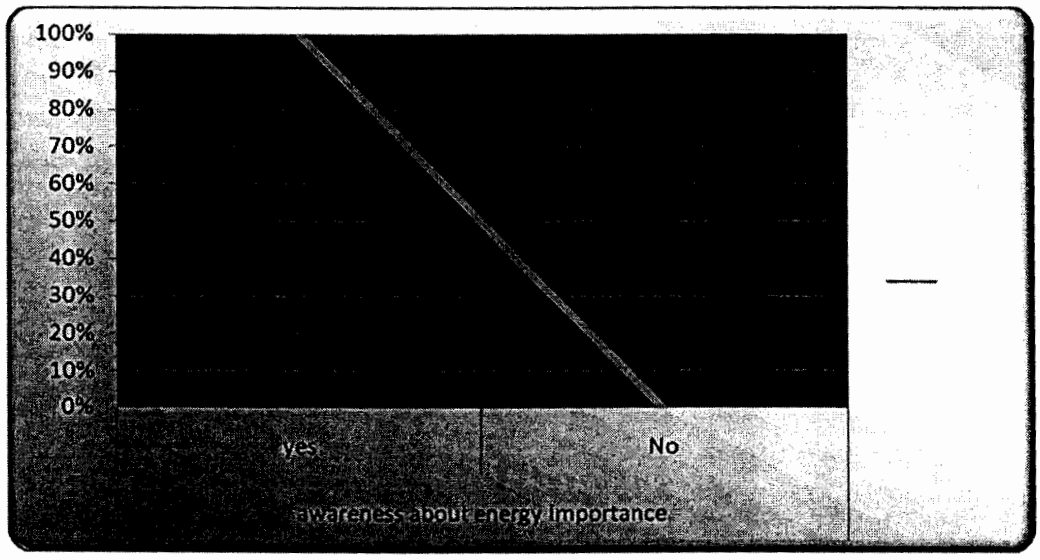


Fig 4.17 Awareness about Importance of energy

The data is collected from students all the respondents are educated people so they all know the importance of energy conservation. So the results were 100% positive.

Thomas E. Curry *et al* (2005) conducted a survey of public attitude towards energy and environment in Great Britain. They concluded that the environment is not a pressing concern for the mainstream of the public, the majority of the people believe that action should be taken to tackle global warming. Over 70 % of respondents believe that action needs to be taken to address global warming; over 40 % thinks that urgent action is necessary. Over 50 %of respondents chose the environment. 11% said the environment should be given main concern over the environment even if it hurts the economy. An enormous percentage of people responded that that they would pay an additional £5 to £20 on each month's electric bill, willingness to pay dropped off quickly above £20.

Energy short fall affect almost all the sectors badly educational, industrial, residential and marketing sector as well.

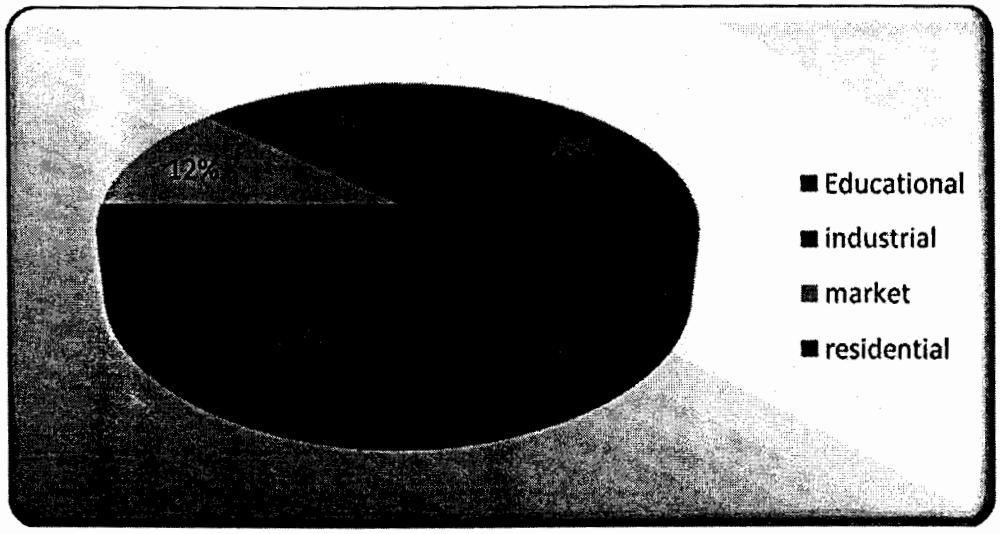


Fig 4.18% age of sectors affected due to energy shortfall

Data shows that the industrial and the educational sectors are the most affected sectors due to energy short fall. 40% people consider industrial sector and 35 % people consider educational sector as most affected sector, 12% and 13 % people opinion that market and residential sectors respectively are more affected sectors due to energy short fall.

Electricity short fall in developing countries like Pakistan is due to many reasons it is necessary for the conservation of energy that people may know the actual reasons of energy short fall.

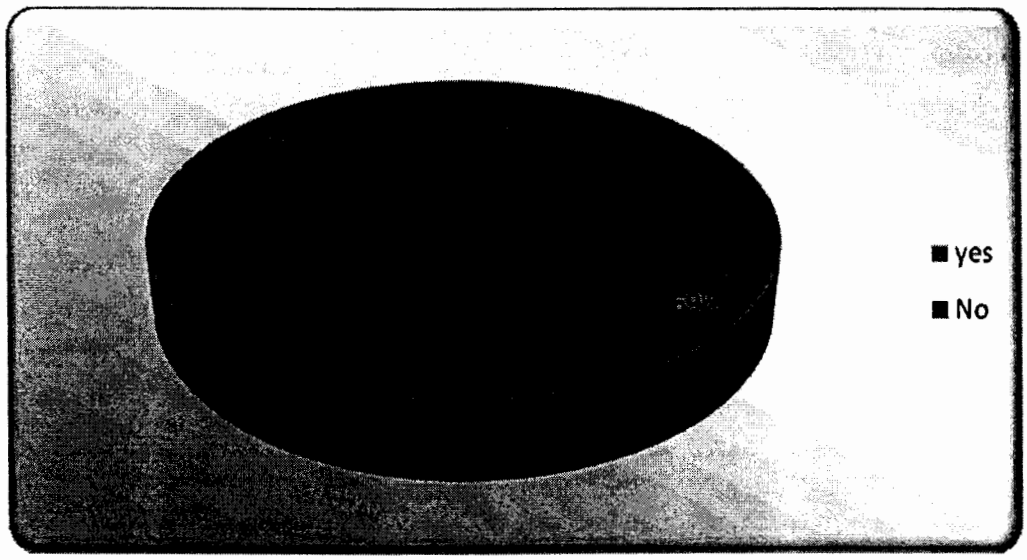


Fig 4.19 Reasons for electricity short fall

The data is collected from educated people so most of the people know the reasons of electricity short fall and they have different opinions about the reasons of electricity shortfall. About 69% of the respondents know the reasons of electricity shortage and 31% answered negatively.

People considered different reasons for electricity short fall, for example irresponsible behavior or Government policies which do not implemented properly.

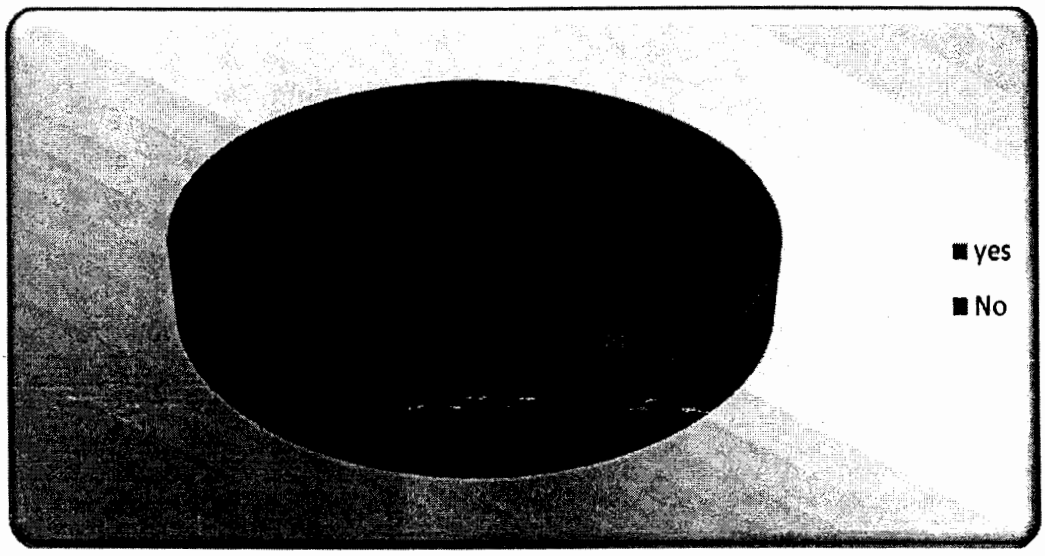


Fig 4.20 Energy short fall due to Irresponsible behavior

Data shows that about 83% people consider behavior a reason for electricity short fall and only 13 % respond negatively.

Mari Martiskainen, (2007) in his research on Affecting consumer, behavior on energy demand concluded that behavior is a mixture of emotions, morals, habits, social and normative factors and altering any of these components could not be easy. Majority of energy consuming behaviors are based on habits and routine. Habits require to be breaking down and altering by introducing new behaviors, building understanding can help. Actions such as feedback displays, better billing and micro-generation can help making people more aware in energy consumption and as a result manipulate their behavior .Research has revealed that feedback on energy consumption can convince households to save energy, by an average of 5-15% depending on the measure.

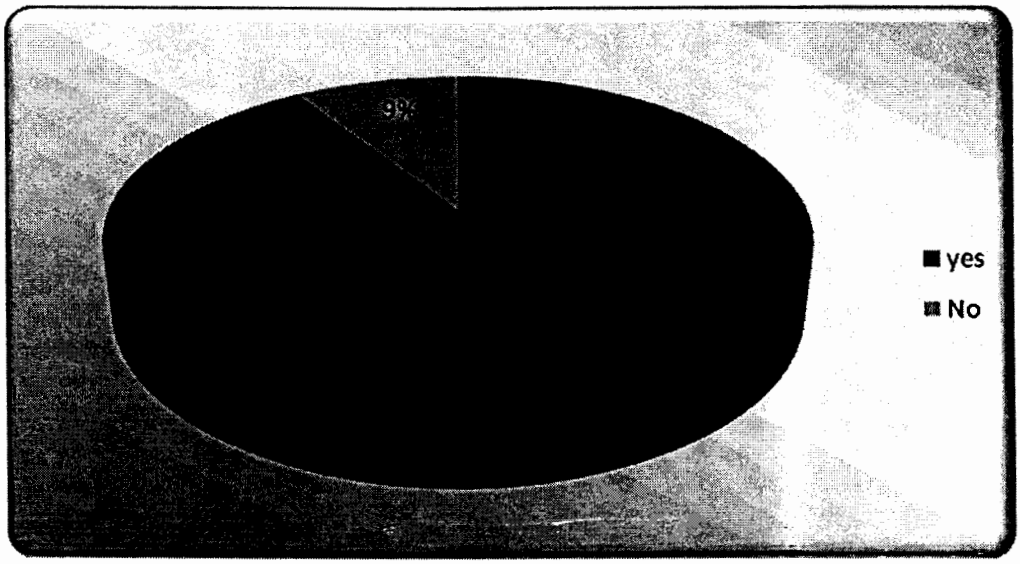


Fig 4.21 energy Crises due to lack of implementation of Govt policies

Wrong government policies are one of the great reasons of electrical shortages as there is no proper implementation of government policies. Data shows that almost 91% people consider government policies a immense reason of electrical shortage and only 9% respond negatively.

In the 1980's many countries have approved legislations to enhance the efficiency in energy use. In Thailand the Energy Conservation and Promotion Act (ECPA) was passed in April 1992. Thai–German Energy Efficiency plan sponsored by Federal Government of Germany provided support in its accomplishment. Two German consultants had reported the improvement to be slow on account of (i) low perception of energy conservation benefits and (ii) scarce qualification of all key players.

Load shedding affect the lives of people badly especially for students Light is very important to accomplish their educational tasks properly. Load shedding affect students study routine. And it becomes very difficult for students to

complete and fulfill important tasks of their studies in time. Daily routine also disturbed.

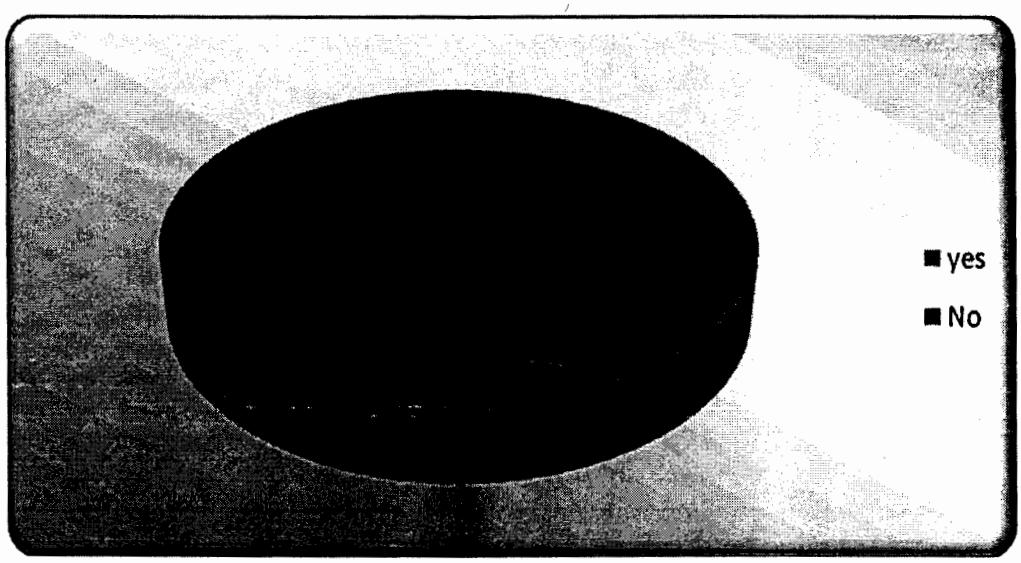


Fig4.22 Affect of load shedding on studies

Data shows that about 91% of the respondents consider load shedding a disturbance in their studies only 9% of the respondents answer negatively.

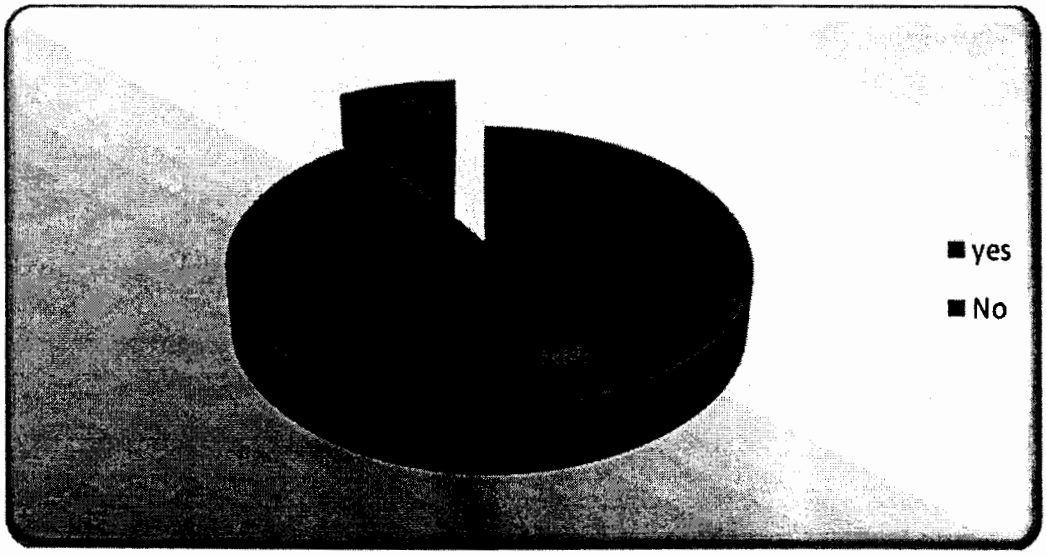


Fig 4.23 .Disturbance of daily routine due to load shedding

Light is essential to carry out all kind of tasks either at home, university or office. Data shows that mostly people about 91% feel disturbance in their daily routine due to load shedding only 9% response was negative.

Majority of the people show negative behavior toward the use of electrical appliances, they leave the appliances turn on even when not in use in this way a lot of energy is wasted.

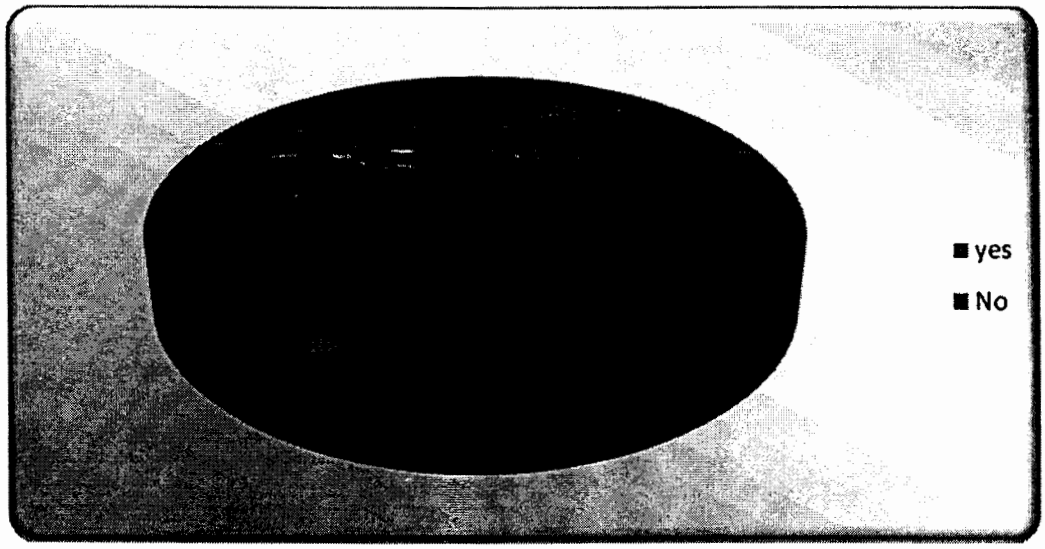


Fig 4.24 %age of people who Turn off lights when leave room

Through inspection it is seen that students leave rooms after attending their class. Data results show that 86% student don't turn off lights and only 14% answer positively.

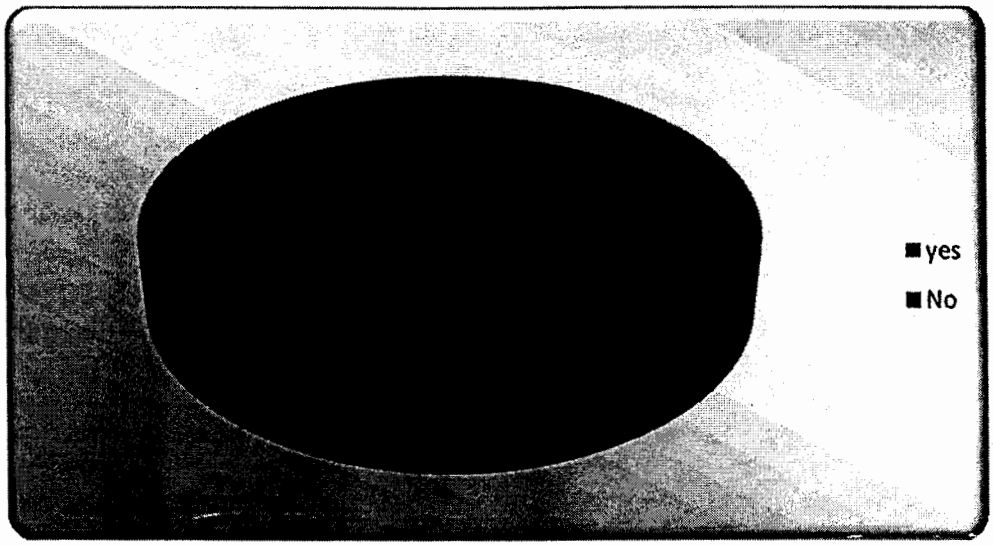


Fig 4.25 %age of people who turn off TV/Computer when not in use

Data shows that students leave computers and Television turn on when not in use and a lot of energy is lost in this way. About 83% respondents do not turn off computer or TV when not use only 17 % answers positively.

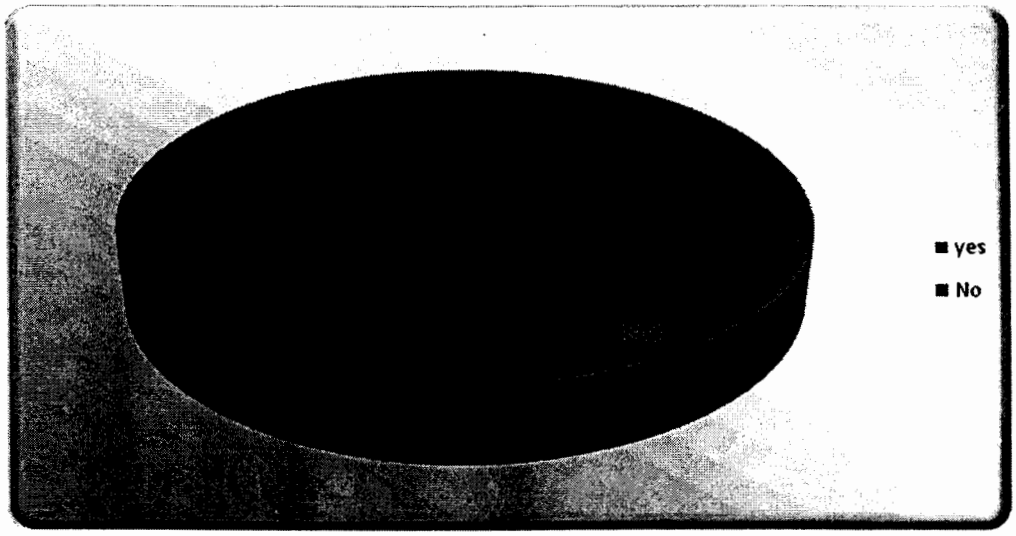


Fig 4.26 use of electric light in presence of enough sun light

People are habitual to use electrical light and they use it even in the day when there is sufficient sunlight. Data results also show only very little percentage of

people who do not use electrical light when enough sunlight is available. Only 17% people do not use electrical light in the presence of sunlight while 83% people use electrical light in presence of sunlight.

According to the United States Department of Energy, the use of timers and automatic switching in commercial lighting can both decrease the amount of energy used and improve occupant ease and efficiency. In association with the use of day-lighting, lighting controls offer one of the best ways to lessen lighting energy consumption (US Dept of Energy, checklist, 2009).

For energy conservation it is necessary that people show positive behavior, aware people convince and motivate others to reduce the energy use and make possible the maximum use of sun light.

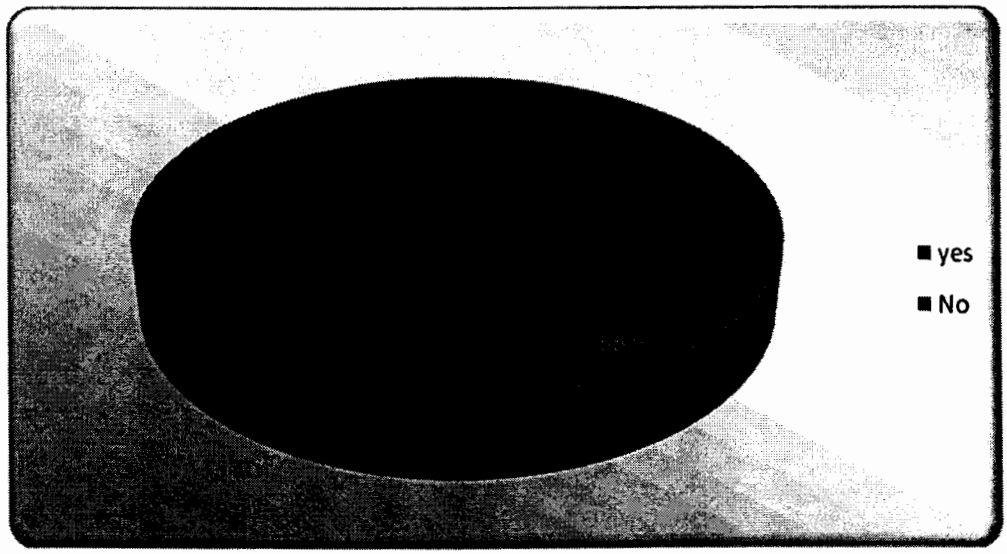


Fig 4.27 Reduction in Energy consumption by checking behavior

Data shows that about 83% of the people think that by changing behavior the energy consumption can be reduced only 17% people response was negative.

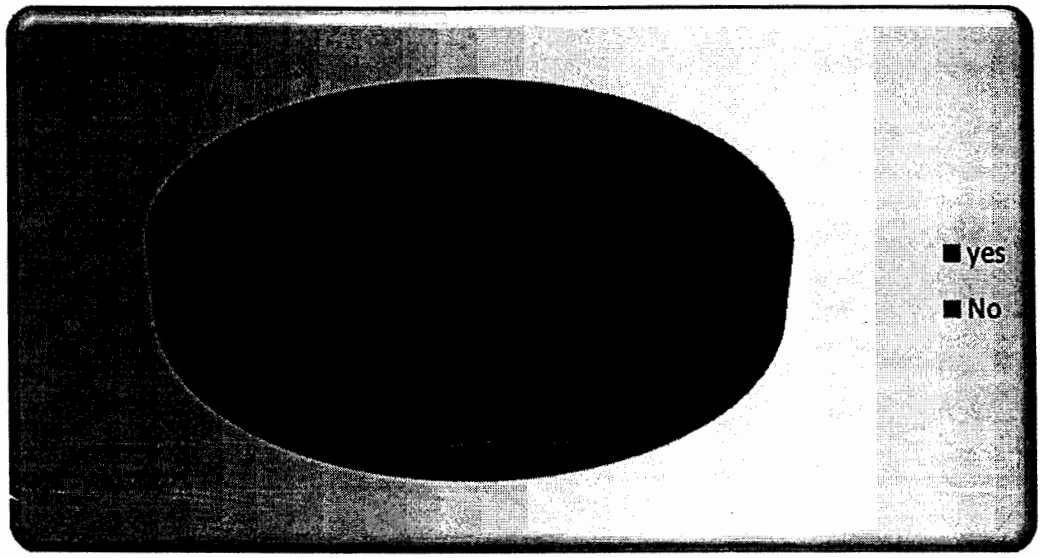


Fig 4.28 %age of people who convince others for energy conservation

People themselves show irresponsible behavior towards energy consumption so they do not convince others for energy conservation. Data shows that 93 % people response negative and only 7% positive.

City Switch, home (2009) Energy efficiency can also be easily achieved in commercial buildings by educating staff members. Education and contribution by all users of a building are significant aspects of any flourishing energy management program. Efficient energy consumption is achieved in a variety of ways depending on the end use. Commercial building services can be separated into five main sections, each providing efficiency opportunities beyond education and O&M (operation and maintenance) practices.

CONCLUSION AND RECOMMENDATIONS

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

Energy has everlastingly been an essential resource in the progress of any nation. Energy shortfall is one of the hot issues facing by the world today particularly in developing countries i.e. Pakistan. It is the need of time to conserve energy by using different strategies like energy management, energy auditing and behavioral changes etc. This study is a step towards energy conservation at educational institutions by conducting a simple energy audit of female and male campus of International Islamic University Islamabad. It is concluded that a lot of energy can be saved by replacing the current appliances by energy efficient appliances. This study is primarily focused on considering three parameters i.e. Computers, tube lights and air conditions. If these electrical appliances are replaced by energy efficient appliances, about 40% of the energy would be saved by the current consumption of each campus, and overall about 25% to 28% of energy would be saved in each campus. The behavior checking survey results show that about 85% people have negative behavior towards energy conservation so by changing behavior energy saving potential would be increased.

The following recommendations are hereby made on the basis of the study:

- CRT monitors should be replaced by LCD monitors

LCD monitor has more initial/ purchasing cost than CRT however, LCDs have longer life span and low power consumption so these are cheaper in long run.

- Air condition should be installed according to the area calculated by the formula

$$\text{AC required (tons)} = \frac{\text{Area of room} \times 20(\text{ btu})}{12000}$$

- Energy savors should be installed.

- Campaign and seminars should be arranged for the awareness about importance of energy and to motivate people to show positive behavior towards energy conservation.

- Make sure the maximum utilization of sunlight.

REFERENCES

REFERENCES

1.Manczyk, H., (2000) " Energy Accounting Audit for Commercial Office Building"

2.Janssen, R.,(2004) " Towards Energy Efficient Buildings in Europe" Euroace: the European Alliance of Companies for Energy Efficiency in Buildings.

3.Nouri, J., Karbasi, A., R, Borgheipour and Taheri, A (2006) " Energy Management System Audit and Implementation in Educational Buildings" American Journal of Applied Sciences

4. Martiskainen,M.,(2007) "Affecting Consumer Behaviour on Energy Demand" Sussex Energy Group SPRU - Science and Technology Policy Research;

5. Thomas E. Curry., David M. Reiner., Mark A. de Figueiredo & Howard J. Herzog; (2005)
"A Survey of Public Attitudes towards Energy & Environment" Great Britain

Laboratory for energy and the ernvironment.

6.Damodaran, c., Thirumoorthy,n and Parthasarathy,P "Energy audit in sugar industry " Engineering and consultants pvt. ltd.

7.Mata, J.,(2003)."Energy auditing as a first step for efficient energy management"A focus on Buildings.

8.Ecogeneration.,(2009) *"Australian Clean Energy Directory"* Great Southern Press, Melbourne.

9 US Department of Energy.,(2009) "Economics of Energy Effective Lighting for Offices" Energy Efficiency and Renewable Energy.

10 New Jersey Department of Environmental Protection., (2006) *"How to Conduct an Energy Audit" A Short Guide for Local Governments and Communities.*

11. Magasanik, M (2008) *"Defining a National Energy Efficiency Strategy "*The Climate Institute, Sydney.

12 Ecogeneration*(2009-10)" Australian Clean Energy Directory"* Great Southern Press Melbourne.

13. US Environmental Protection Agency,(2007") *Report to Congress on Data Center Energy Efficiency Public Law "* USEPA, Washington DC.

14 CitySwitch Green Office Program,(2009) "Office Energy Efficiency." City of sydney

ANNEXURE

Annex-1

S No.	PARAMETER	RESPONDENT	
		Yes %age	No %age
1	Awareness about Importance of energy	100	0
2	Affect of load shedding on studies	91	9
3	Disturbance of daily routine due to load shedding	91	9
4	Awareness about reasons of electricity short fall	69	31
5	Irresponsible behavior is one reason for energy short fall	83	17
6	Turning off lights when leave room	14	86
7	Turn off TV/Computer when not in use	17	83
8	use of electric light in presence of enough sun light	83	17
9	Energy consumption can reduce by checking behavior	83	17
10	convince others for energy conservation	7	93
12	Government policies	91	9

Table 1. Awareness and attitude of students towards energy conservation

PARAMETER	Educational % age	Industrial % age	Market % age	Residential %age
Sectors affected due to energy shortfall	35	40	12	13

Table 2. %age of affected sectors due to energy short fall

ANNEX-II

Faculty Block -1 Female Campus

				W	V	F	E.F	Ac	LT	ST	B	R	M	PC	H	P	O	G	E.k	Sug Ac power
Room no.	Function	Area(sq.feet)	Dimensions(x'y")	4	8	2	0	0		12	0	0	0	3	1	1	0	0	0	
1	dpt	336	24'3" x 14'	0	0	1	0	0		0	1	0	0	0	0	0	0	0	0	
2	e room	252	14' x 18'																	
3		280		2	0	2	0	0	4	0	0	0	0	4	0	1	0	0	0	
4	dpt			2	2	1	0	0		4	0	0	0	2	1	1	0	0	0	
5	dpt	191.36	13'10" x 13'10"	4	9	3	0	1		16	0	0	0	2	1	1	1	0	0	0.61
6	dpt	366	14' x 24'	1	5	2	0	0		8	0	0	0	3	1	1	0	0	0	
7	dpt	294	14' x 21'	4	10	2	0	1		10	1	0	3	1	2	0	1	1	0	0.49
8	dpt	294	14' x 21'	3	12	3	0	1		12	0	0	0	1	1	0	0	0	0	0.56
9	staff room	336	14' x 24'	1	10	2	0	1	16	0	0	0	0	0	1	0	0	0	0	1.1861
10	class room	711.66	50'10" x 14'	1	10	2	0	1		16	0	0	0	0	1	0	0	0	0	1.5
11	class room			3	7	2	0	0		8	0	0	0	0	1	0	0	0	0	0
12	class room	158.12	11'6" x 13'9"	4	10	2	0	1		14	0	0	0	0	1	0	0	0	0	0.346666667
13	class room	208	14'9" x 14'208	2	5	1	0	1		4	0	0	0	2	1	1	0	0	0	0.473666667
14	dpt	284.2	20'3" x 14'	1	5	2	0	0		8	0	0	0	0	1	0	0	0	0	
15	class room	247.5	18' x 13'9"	2	5	1	0	0		4	0	0	0	2	1	0	0	0	1	
16	dpt	52.5	8'9" x 6'	1	0	0	0	0		1	0	0	0	0	0	0	0	0	0	
17	e room	168	14' x 11'9"	2	5	1	0	0		4	0	0	0	2	1	2	0	0	1	
18	dpt	432	24'3" x 18'	4	8	2	1	1		16	1	0	0	1	1	0	0	1	0	0.49
19	staff room	294	14' x 21'	3	8	2	0	1		16	0	0	0	4	1	1	0	0	0	0.49
20	dpt	294	14' x 21'	3	8	2	0	1		16	0	0	0	1	1	1	0	0	0	0.473333333
21	dpt	284	20'3" x 14'	3	5	2	0	1		16	0	0	0	2	1	0	0	0	0	1.5
22	library			0	2	0	2	0		2	2	0	0	0	0	0	0	0	0	
23	wash room	284	20'3" x 14'	1	8	2	0	1		8	0	0	0	2	1	0	0	0	0	0.275
24	m lab	165	11'9" x 14'	2	5	1	0	0		4	0	0	0	1	1	1	0	0	1	
25	dpt	208	14'9" x 14'	2	5	1	0	0		4	0	0	0	1	1	0	0	0	1	
26	dpt	208	11'9" x 14'																	
27		208	11'9" x 14'	2	5	1	0	0		4	0	0	0	1	1	1	0	0	1	
28	dpt	140	11'9" x 11'	2	5	1	0	1		4	0	0	0	2	1	1	0	0	1	0.346666667
29	dpt	208	11'9" x 14'	2	5	1	0	0		4	0	0	0	3	1	0	0	0	1	
30	dpt	284	20'3" x 14'	1	5	1	0	0		4	0	0	0	5	1	0	0	0	1	

31	dpt	196	14' x 14'	0	2	0	2	0		0	2	0	0	0	0	0	0	0	0	
32	wash room			2	3	1	0	0	2	0	0	0	0	0	0	0	0	0	0	
33	ablusion room			3	8	2	0	0		8	0	0	0	0	1	0	0	0	0	
34	class room	280	14' x 20'3"	2	9	2	0	0	8	0	0	0	0	0	0	0	0	0	0	
35	prayer hall	310.5	23' x 13'6"	0	4	1	0	0		2	0	0	0	0	0	0	0	0	0	
36	admin	134.75	11' x 12'3"	3	11	3	0	1		24	0	0	0	0	1	0	0	0	0	0.816666667
37	class room	490	35' x 14'	0	25	0	0	4		144	24	0	1	1	( )	0	0	0	0	4.94
38	auditorium	2964	78' x 38'	5	14	4	0	1		16	0	0	0	7	1	2	0	0	1	0.8078
39	dpt	484.68	35'3" x 13'9"	3	12	3	0	1		12	1	0	0	0	1	0	0	1	0	0.803333333
40	staff room	482	14' x 30'6"	5	9	3	1	1		16	1	0	0	7	2	1	0	1	1	0.567
41	dpt	340.2	24'3" x 14'	2	2	1	0	0		4	0	0	0	3	1	0	0	0	0	
42	dpt	196	14' x 14'	5	0	3	1	1		12	2	0	0	1	1	1	0	1	0	0.636666667
43	dpt	382	27'3" x 14"	2	0	2	0	1		4	0	1	0	3	1	1	2	0	0	0.641766667
44	dpt	385.06	25'3" x 15'3"	1	0	0	0	0		1	0	0	0	0	0	0	0	0	0	
45	e room			1	6	2	0	0		8	0	1	0	1	1	1	2	0	1	
46	director off	284	20'3" x 14'	3	7	2	0	0		8	0	0	0	2	1	2	0	0	0	
47	admin	340	24'3" x 14"	2	4	1	0	0		4	0	0	0	2	1	0	0	0	1	
48	dpt	166	11'9" x 14"	3	14	3	0	1		24	0	0	0	0	1	0	0	0	0	1.633333333
49	class room	490	14' x 35'	2	8	3	0	1		16	0	0	0	0	1	0	0	0	0	0.5561
50	class room	333.66	14' x 23'10"	0	4	0	0	0		0	0	0	0	0	0	0	0	0	0	
51	store	154.68	11'3" x 13'9"	3	8	2	0	0		8	0	0	0	0	1	0	0	0	0	
52	class room	271.56	13'9" x 19'9"	2	3	1	1	0	2	0	0	0	0	0	1	0	0	0	0	0
53	kitchen	189.06	13'9" x 13'9"	0	2	0	2	0		2	2	0	0	0	0	0	0	0	0	
54	wash room			1	5	1	0	0		4	0	0	0	0	1	0	0	0	0	
55	class room	283.5	20'3" x 14'	2	3	1	0	0		4	0	0	0	0	1	0	0	0	0	
56	class room	196	14' x 14'	2	5	1	0	0		4	0	0	0	2	1	1	1	0	1	
57	dpt	164.5	11'9" x 14'	2	5	1	0	0		4	0	0	0	0	1	0	0	0	0	
58	class room	206.5	14'9" x 14'	2	5	1	0	0		4	0	0	0	2	1	1	0	0	0	
59	dpt	164.5	11'9" x 14'	2	5	1	0	0		4	0	0	0	2	1	1	0	0	0	
60	dpt	164.5	11'9" x 14'	2	5	1	0	0		4	0	0	0	2	1	1	0	0	0	
61	dpt	164.5	11'9" x 14'	2	5	1	0	1		4	0	0	0	2	1	1	0	0	0	0.344166667
62	dpt	206.5	14'9" x 14'	0	3	1	0	2		4	0	0	0	2	1	1	0	0	0	0.4725
63	dpt	283.5	20'3" x 14'	3	8	2	0	0		8	0	0	0	0	1	0	0	0	0	
64	library	276.75	20'6" x 13'6"	0	2	1	0	0		1	0	0	0	1	0	1	0	0	0	

65	e room	145.12	10'9" x 13'6"	5	8	3	1	1		1	1	0	0	3	1	1	0	1	1	0.565
66	dpt	339	14' x 24'3"	2	5	1	0	1		4	0	0	0	1	1	0	0	0	1	0.274166667
67	dpt	164.5	14 x 11'9"	3	8	2	0	0		8	0	0	0	0	1	0	0	0	0	
68	class room	294	21' x 14'	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
69	e room	51	8'6" x 6'	2	5	1	0	1		4	0	0	0	1	1	0	0	0	1	0.426666667
70	dpt	256	18'4 x 14'	5	8	3	1	1		1	1	0	0	3	1	1	0	1	1	0.274166667
71	dpt	164.5	11'9" x 14'	1	8	2	0	0		8	0	0	0	0	1	0	0	0	0	
72	class room	285	20'4 x 14'	2	5	1	0	0		4	0	0	0	1	1	1	0	0	1	
73	dpt	206.5	14'9" x 14'	5	20	4	0	0		32	0	0	0		2	0	0	0	0	
74	class room	685.12	50'9" x 13'6"	3	8	2	0	0		8	0	0	0	4	1	0	0	0	0	
75	dpt	276.5	19'9" x 14'	1	4	1	0	0		4	0	0	0	4	1	0	0	0	1	
76	dpt	159	14' x 11'4'	3	3	3	0	0		12	0	0	0	0	1	0	0	0	0	
77	class room	490	14' x 35"	2	5	1	0	1		4	0	0	0	1	1	0	0	0	1	0.273333333
78	dpt	164	14' x 11'9"	5	8	3	1	1		1	1	0	0	3	1	1	0	1	1	0.273333333
79	dpt	164	14' x 11'9"	3	8	2	0	0		8	0	0	0	0	1	0	0	0	0	
80	class room	294	21' x 14'	2	4	1	0	0		4	0	0	0		1	0	0	0	1	
81	dpt	164.5	14' x 11'9"	2	3	1	0	0		4	0	0	0	3	1	1		0	1	
82	dpt	196	14' x 14'	0	3	0	0	0		1	0	0	0	0	0	0	0	0	0	
83	e room			0	2	0	2	0		2	2	0	0	0	0	0	0	0	0	
84	wash room			2	3	1	0	0		4	0	1	0	2	1	1	1	0	1	
85	dpt	196	14' x 14'	1	5	1	0	1		4	0	0	0	2	1	1	0	0	1	0.356666667
86	dpt	214	14'6" x 14'	2	5	1	0	1		4	0	0	0	2	1	2	0	0	0	0.356666667
87	dpt	214	14'6" x 14'	2	5	1	0	0		4	0	0	0	2	1	0	0	0	1	
88	dpt	164.5	11'9' x 14'	2	5	1	0	0		4	0	0	0	2	1	0	0	0	1	
89	dpt	164.5	11'9' x 14'	2	5	1	0	0		4	0	0	0	3	1	0	0	0	0	
90	dpt	164.5	11'9' x 14'	2	5	1	0	1		4	0	0	0	1	1	0	1	0	1	0.274166667
91	dpt	164.5	11'9' x 14'	2	5	1	0	1		4	0	0	0	3	1	1	0	0	1	0.338333333
92	dpt	203	14'6 x 14'	2	5	1	0	1		4	0	0	0	2	1	2	0	0	0	0.4725
93	dpt	283.5	20'3" x 14'	0	2		2	0		2	2	0	0	0	0	0	0	0	0	
94	wash room			3	5	2	0	0		8	0	0	0	0	1	0	0	0	0	
95	class room	283.5	14' x 20'3"	5	8	3	0	1		17	1	0	0	2	1	1		1	1	0.565833333
96	dpt	339.5	14' x 24'3"	3	11	3	0	1		12	0	0	0	0	1	0	0	0	0	0.49
97	library	294	21' x 14'	2	5	1	0	0		4	0	0	0	3	1	0	0	0	0	
98	dpt	294	14' x 21'	3	8	2	0	0		8	0	0	0	0	1	0	0	0	0	

99	class room	294	21' x 14'	1	0	0	0	0		1	0	0	0	0	0	0	0	0	0	
100	e room	54.68	8'9" x 6'3"	3	3	1	0	0		6	0	0	0	3	1	0	0	0	1	
101	dpt	247.5	18' x 13'9"	1	5	2	0	1		8	0	0	0	1	1	0	0	0	0	0.4725
102	dpt	283.5	20'3" x 14'	2	5	1	0	0		4	0	0	0	3	1	0	0	0	1	
103	dpt	155.25	11'6" x 13'6"	2	5	1	0	1		4	0	1	0	2	1	1	1	0	1	0.25875
104	dpt	206.5	14'9" x 14'	1	8	2	0	1		8	0	0	0	2	1	0	0	0	0	0.9
105	lab	540	40' x 13'6"	2	5	1	0	1		4	0	1	0	2	1	1	1	0	1	0.460833333

	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
2								ANNEX-IIA												
3				Faculty Block -1 Female Campus																
4							1st floor plan													
5																				
6	Function	Area(sq.feet)	Dimensions(x'y'')	W	V	F	Ex F	Acs	LT	ST	B	R	M	PC	P	O	G	E.K	Req Acs	
7	Class	286	11'10'' x 24'3''	2	9	3	0	1	0	20	0	0	0	0	0	0	0	0	0.476667	
8	Class	364.25	23'6'' x 15'6''	4	5	2	0	0	0	16	0	0	0	0	0	0	0	0		
9	Washroom			2	0	0	2	0	0	2	4	0	0	0	0	0	0	0		
10	Class	909.5	24'9'' x 36'9''	6	15	4	0	2	0	20	0	0	0	0	0	0	0	0	1.515833	
11	Class	1219	24'9'' x 49'3''	5	20	8	0	3	0	64	0	0	0	0	0	0	0	0	2.031667	
12	Class	287	11'10'' x 24'3''	2	9	3	0	1	0	20	0	0	0	0	0	0	0	0	0.478333	
13	Class	377	23'10'' x 15'10''	4	5	2	0	1	0	16	0	0	0	0	0	0	0	0	0.628333	
14	Washroom			2	0	0	2	0	2		4	0	0	0	0	0	0	0		
15	Class	858	24' x 35'9''	6	15	6	0	3	0	36	0	0	0	0	0	0	0	0	1.43	
16	Class	1182	24' x 49'3''	5	20	8	0	3	28	0	0	0	0	0	0	0	0	0	1.97	
17	Lab	2786.75	78'6'' x 35'6''	6	30	11	0	2	0	12	0	0	1	33	2	0	0	0	4.644583	
18	Class	296.125	11'6' x 25'9''	0	10	2	0	1	4	0	0	0	0	0	0	0	0	0	0.493542	
19	Class	888	24'0'' x 37''	2	11	6	0	2	20	0	0	0	0	0	0	0	0	0	1.48	
20	Class	816	24'0'' x 34''	6	4	6	0	2	0	24	0	0	0	1	0	0	0	0	1.36	
21	Class	732	24' x 30'6''	5	11	5	0	2	20	0	0	0	0	0	0	0	0	0	1.22	
22	Class	732	24' x 30'6''	5	12	5	0	2	0	20	0	0	0	0	0	0	0	0	1.22	
23	Washroom			2	2		2		3	0	5	0	0	0	0	0	0	0		
24	Dpt	138.75	15' x 9'3''	4	9	3	0	1	0	16	0	0	0	2	1	1	0	0	0.23125	
25	Class	732	24' x 30'6''	5	12	5	0	2	20	0	0	0	0	0	0	0	0	0	1.22	
26	Class	732	24' x 30'6''	5	12	5	0	2	20	0	0	0	0	0	0	0	0	0	1.22	
27	Class	820	24' x 34'2''	0	10	5	0	2	0	20	0	0	0	0	0	0	0	0	1.366667	
28	Class	1156	24' x 48'	6	18	8	0	4	0	32	0	0	0	0	0	0	0	0	1.926667	
29	Class			6	18	8	0	4	0	32	0	0	0	0	0	0	0	0	6	
30	Ablusion	244.37	11'6 x 25'9''	0	10	2	0	0	3	0	0	0	0	0	0	0	0	0		
31	PrayerHall	876	24' x 36'6''	2	11	6	0	0	0	24	0	0	0	0	0	0	0	0		
32	Class	244.37	11'6'' x 21'3''	4	0	2	0	1	3	0	0	0	0	0	0	0	0	0	0.407283	
33	Washroom			2	0	0	2	0	0	3	5	0	0	0	0	0	0	0		

	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
34	Class	732	30'6" x 24'	5	12	5	0	2	0	20	0	0	0	0	0	0	0	0	1.22	
35	Class	732	30'6" x 24'	4	10	5	0	2	20	0	0	0	0	0	0	0	0	0	1.22	
36	Lab			3	13	4	0	2	20	0	0	0	0	30	0	0	0	0	0	
37	Class	1182	24' x 49'3"	3	7	2	0	1	12	0	0	0	0	0	0	0	0	0		
38	Lab	820	34'2 x 24'	6	10	0	0	2	0	0	6	0	1	1	0	0	0	0	1.366667	
39	Class	1152	48' x 24'	7	19	8	0	4	32	0	0	0	0	0	0	0	0	0	1.92	
40	Class			0	10	2	0	1	8	0	0	0	0	0	0	0	0	0	0	
41	Class	1134	47'3" x 24'	7	20	8	0	4	0	32	0	0	0	0	0	0	0	0	1.89	
42	Class	740	34'2 x 21'8"	6	4	6	0	2	0	24	0	0	0	0	0	0	0	0	1.233333	
43	Class	732	30'6" x 24'	5	9	5	0	2	0	20	0	0	0	0	0	0	0	0	1.22	
44	Class	732	30'6" x 24'	5	12	5	0	2	0	20	0	0	0	0	0	0	0	0	1.22	
45	Washroom			2	2	0	2	0	0	3	5	0	0	0	0	0	0	0		
46	Dpt	364.37	13'9" x 26'6"	2	0	1	0	0	2	0	0	0	0	3	1	0	0	1		
47	Class	732	24' x 30'6"	5	12	5	0	2	0	20	0	0	0	0	0	0	0	0	1.22	
48	Class	732	24' x 30'6"	5	12	2	0	2	2	0	0	0	0	0	0	0	0	0	1.22	
49	Class	820	34'2" x 24'	6	10	6	0	2	0	24	0	0	0	0	0	0	0	0	1.366667	
50	Class	1170	48'9" x 24'	7	19	8	0	4	0	32	0	0	0	0	0	0	0	0	1.95	
51																				

ANNEX-IIB

Faculty Block -1 Female Campus

2nd Floor Plan

Room no.	Function	Area	Dimensions(x'y'')	W	V	F	Ex F	Acs	LT	SL	B	R	M	PC	P	O	G	E.K
1(45)	Class			2	9	3	0	1	0	20	0	0	0	0	0	0	0	0
2(46)	Dpt	377	23'10'' x 15'10''	4	5	2	0	1	0	16	0	0	0	3	0	0	0	1
3(47)	WashRoom			2	0	0	2	0	2	0	4	0	0	0	0	0	0	0
4(48)	Lab	882	24' x 36'9''	6	15	6	0	2	0	36	0	0	0	25	0	0	0	0
5(49)	Class	212	24' x 8'10''	4	10	4	0	2	0	16	0	0	0	0	0	0	0	0
6(50)	Lab	992	24' x 41'4''	4	10	4	0	2	0	16	0	0	0	27	0	0	0	0
7(51)	Class			5	0	4	0	1	0	6	0	0	0	0	0	0	0	0
8(52)	Lab	312	12' x 26''	6	0	3	0	2	0	20	3	0	0	17	0	0	0	0
9(53)	Class	644	23' x 28'	0	10	4	0	1	0	40	0	0	0	0	0	0	0	0
10(54)	Dpt	1715	49' x 35'	9	10	12	0	2	2	64	0	0	0	15	2	0	0	2
11(55)	Lab			8	20	8	0	2		64	0	0	0	7	1	0	0	0
12(56)	Lab																	0
13(57)	WashRoom			2	0	0	2	0	2	0	4	0	0	0	0	0	0	0
14(58)	Dpt			4	5	2	0	1	0	16	0	0	0	3	2	0	0	0
15(59)	Lab			2	9	3	0	1	0	20	0	0	0	30	0	0	0	0
16(60)	Lab								6					127				

ANNEX-IIIA

Faculty Block -1 MALE Campus

Room no.	Function	Area(sq.feet)	Dimensions(x'y")	w	V	F	EX	Ac	LT	ST	B	R	M	PC	H	P	O	G	EK	AC power
1	dpt	336	24'3" x 14'	4	8	2	0	0		12	0	0	0	0	1	0	0	0	0	
2	e room	252	14' x 18'	0	0	1	0	0		0	1	0	0	0	0	0	0	0	0	
3		280																		
4	dpt			2	0	2	0	0	4	0	0	0	0	0	0	0	0	0	0	
5	dpt	191.36	13'10" x 13'10"	2	2	1	0	0		4	0	0	0	0	1	0	0	0	0	
6	dpt	366	14' x 24'	4	9	3	0	1		16	0	0	0	0	1	0	1	0	0	0.61
7	dpt	294	14' x 21'	1	5	2	0	0		8	0	0	0	0	1	0	0	0	0	
8	dpt	294	14' x 21'	4	10	2	0	1		10	1	0	0	0	2	0	1	1	0	0.49
9	staff room	336	14' x 24'	3	12	3	0	1		12	0	0	0	0	1	0	0	0	0	0.56
10	class room	711.66	50'10" x 14'	1	10	2	0	1	16	0	0	0	0	0	1	0	0	0	0	1.1861
11	class room			1	10	2	0	1	12	16	0	0	0	0	1	0	0	0	0	1.5
12	class room	158.12	11'6" x 13'9"	3	7	2	0	0		8	0	0	0	0	1	0	0	0	0	0
13	class room	208	14'9" x 14'208	4	10	2	0	1		14	0	0	0	0	1	0	0	0	0	0.346667
14	dpt	284.2	20'3" x 14'	2	5	1	0	1		4	0	0	0	0	1	0	0	0	0	0.473667
15	class room	247.5	18' x 13'9"	1	5	2	0	0		8	0	0	0	0	1	0	0	0	0	
16	dpt	52.5	8'9" x 6'	2	5	1	0	0	2	4	0	0	0	0	1	0	0	0	1	
17	e room	168	14' x 11'9"	1	0	0	0	0		1	0	0	0	0	0	0	0	0	0	
18	dpt	432	24'3" x 18'	2	5	1	0	0		4	0	0	0	0	1	0	0	0	1	
19	staff room	294	14' x 21'	4	8	2	1	1		16	1	0	0	0	1	0	0	1	0	0.49
20	dpt	294	14' x 21'	3	8	2	0	1		16	0	0	0	0	1	0	0	0	0	0.49
21	dpt	284	20'3" x 14'	3	8	2	0	1		16	0	0	0	0	1	0	0	0	0	0.473333
22	library			3	5	2	0	1		16	0	0	0	0	1	0	0	0	0	1.5
23	wash room	284	20'3" x 14'	0	2	0	2	0		2	2	0	0	0	0	0	0	0	0	
24	m lab	165	11'9" x 14'	1	8	2	0	1		8	0	0	0	0	1	0	0	0	0	0.275
25	dpt	208	14'9" x 14'	2	5	1	0	0		4	0	0	0	0	1	0	0	0	1	
26	dpt	208	11'9" x 14'	2	5	1	0	0		4	0	0	0	0	1	0	0	0	1	
27		208	11'9" x 14'					3									0			0.346667
28	dpt	140	11'9" x 11'	2	5	1	0	0		4	0	0	0	0	1	0	0	0	1	

29	dpt	208	11'9" x 14'	2	5	1	0	1		4	0	0	0	0	1	0	0	0	1	0.346667
30	dpt	284	20'3" x 14'	2	5	1	0	0		4	0	0	0	0	1	0	0	0	1	
31	dpt	196	14' x 14'	1	5	1	0	0		4	0	0	0	0	1	0	0	0	1	
32	wash room			0	2	0	2	0		0	2	0	0	0	0	0	0	0	0	
33	ablusion room			2	3	1	0	0	2	0	0	0	0	0	0	0	0	0	0	
34	class room	280	14' x 20'3"	3	8	2	0	0		8	0	0	0	0	1	0	0	0	0	
35	prayer hall	310.5	23' x 13'6"	2	9	2	0	0	8	0	0	0	0	0	0	0	0	0	0	
36	admin	134.75	11' x 12'3"	0	4	1	0	0		2	0	0	0	0	0	0	0	0	0	
37	class room	490	35' x 14'	3	11	3	0	1		24	0	0	0	0	1	0	0	0	0	0.816667
38	auditorium	2964	78' x 38'	0	25	0	0	4		144	24	0	0	0	0	0	0	0	0	4.94
39	dpt	484.68	35'3" x 13'9"	5	14	4	0	1		16	0	0	0	0	1	0	0	0	1	0.8078
40	staff room	482	14' x 30'6"	3	12	3	0	1		12	1	0	0	0	1	0	0	1	0	0.803333
41	dpt	340.2	24'3" x 14'	5	9	3	1	1		16	1	0	0	0	2	0	0	1	1	0.567
42	dpt	196	14' x 14'	2	2	1	0	0		4	0	0	0	0	1	0	0	0	0	
43	dpt	382	27'3" x 14"	5	0	3	1	1		12	2	0	0	0	1	0	0	1	0	0.636667
44	dpt	385.06	25'3" x 15'3"	2	0	2	0	1		4	0	0	0	0	1	0	2	0	0	0.641767
45	e room			1	0	0	0	0		1	0	0	0	0	0	0	0	0	0	
46	director offic	284	20'3" x 14'	1	6	2	0	0		8	0	0	0	0	1	0	2	0	1	
47	admin	340	24'3" x 14"	3	7	2	0	0		8	0	0	0	0	1	0	0	0	0	
48	dpt	166	11'9" x 14"	2	4	1	0	0		4	0	0	0	0	1	0	0	0	1	
49	class room	490	14' x 35'	3	14	3	0	1		24	0	0	0	0	1	0	0	0	0	1.633333
50	class room	333.66	14' x 23'10"	2	8	3	0	1		16	0	0	0	0	1	0	0	0	0	0.5561
51	store	154.68	11'3" x 13'9"	0	4	0	0	0		0	0	0	0	0	0	0	0	0	0	
52	class room	271.56	13'9" x 19'9"	3	8	2	0	0		8	0	0	0	0	1	0	0	0	0	
53	kitchen	189.06	13'9" x 13'9"	2	3	1	1	0	2	0	0	0	0	0	1	0	0	0	0	0
54	wash room			0	2	0	2	0		2	2	0	0	0	0	0	0	0	0	
55	class room	283.5	20'3" x 14'	1	5	1	0	0		4	0	0	0	0	1	0	0	0	0	
56	class room	196	14' x 14'	2	3	1	0	0		4	0	0	0	0	1	0	0	0	0	
57	dpt	164.5	11'9" x 14'	2	5	1	0	0		4	0	0	0	0	1	0	1	0	1	
58	class room	206.5	14'9" x 14'	2	5	1	0	0		4	0	0	0	0	1	0	0	0	0	
59	dpt	164.5	11'9" x 14'	2	5	1	0	0		4	0	0	0	0	1	0	0	0	0	
60	dpt	164.5	11'9" x 14'	2	5	1	0	0		4	0	0	0	0	1	0	0	0	0	
61	dpt	164.5	11'9" x 14'	2	5	1	0	0		4	0	0	0	0	1	0	0	0	0	
62	dpt	206.5	14'9" x 14'	2	5	1	0	1		4	0	0	0	0	1	0	0	0	0	0.344167

63	dpt	283.5	20'3" x 14'	0	3	1	0	2		4	0	0	0	0	1	0	0	0	0	0.4725
64	library	276.75	20'6" x 13'6"	3	8	2	0	0		8	0	0	0	0	1	0	0	0	0	
65	e room	145.12	10'9" x 13'6"	0	2	1	0	0		1	0	0	0	0	0	0	0	0	0	
66	dpt	339	14' x 24'3"	5	8	3	1	1		1	1	0	0	0	1	0	0	1	1	0.565
67	dpt	164.5	14 x 11'9"	2	5	1	0	1		4	0	0	0	0	1	0	0	0	1	0.274167
68	class room	294	21' x 14'	3	8	2	0	0		8	0	0	0	0	1	0	0	0	0	
69	e room	51	8'6" x 6'	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
70	dpt	256	18'4 x 14'	2	5	1	0	1		4	0	0	0	0	1	0	0	0	1	0.426667
71	dpt	164.5	11'9" x 14'	5	8	3	1	1		1	1	0	0	0	1	0	0	1	1	0.274167
72	class room	285	20'4 x 14'	1	8	2	0	0		8	0	0	0	0	1	0	0	0	0	
73	dpt	206.5	14'9" x 14'	2	5	1	0	0		4	0	0	0	0	1	0	0	0	1	
74	class room	685.12	50'9" x 13'6"	5	20	4	0	0		32	0	0	0	0	2	0	0	0	0	
75	dpt	276.5	19'9" x 14'	3	8	2	0	2		8	0	0	0	0	1	0	0	0	0	0.460833
76	dpt	159	14' x 11'4'	1	4	1	0	0		4	0	0	0	0	1	0	0	0	1	
77	class room	490	14' x 35"	3	3	3	0	0		12	0	0	0	0	1	0	0	0	0	
78	dpt	164	14' x 11'9"	2	5	1	0	1		4	0	0	0	0	1	0	0	0	1	0.273333
79	dpt	164	14' x 11'9"	5	8	3	1	1		1	1	0	0	0	1	0	0	1	1	0.273333
80	class room	294	21' x 14'	3	8	2	0	0		8	0	0	0	0	1	0	0	0	0	
81	dpt	164.5	14' x 11'9"	2	4	1	0	0		4	0	0	0	0	1	0	0	0	1	
82	dpt	196	14' x 14'	2	3	1	0	0		4	0	0	0	0	1	0		0	1	
83	e room			0	3	0	0	0		1	0	0	0	0	0	0	0	0	0	
84	wash room			0	2	0	2	0		2	2	0	0	0	0	0	0	0	0	
85	dpt	196	14' x 14'	2	3	1	0	0		4	0	0	0	0	1	0	0	0	1	
86	dpt	214	14'6" x 14'	1	5	1	0	1		4	0	0	0	0	1	0	0	0	1	0.356667
87	dpt	214	14'6" x 14'	2	5	1	0	1		4	0	0	0	0	1	0	0	0	0	0.356667
88	dpt	164.5	11'9' x 14'	2	5	1	0	0		4	0	0	0	0	1	0	0	0	1	
89	dpt	164.5	11'9' x 14'	2	5	1	0	0		4	0	0	0	0	1	0	0	0	1	
90	dpt	164.5	11'9' x 14'	2	5	1	0	0		4	0	0	0	0	1	0	0	0	0	
91	dpt	164.5	11'9' x 14'	2	5	1	0	1		4	0	0	0	0	1	0	0	0	1	0.274167
92	dpt	203	14'6 x 14'	2	5	1	0	1		4	0	0	0	0	1	0	0	0	1	0.338333
93	dpt	283.5	20'3" x 14'	2	5	1	0	1		4	0	0	0	0	1	0	0	0	0	0.4725
94	wash room			0	2		2	0		2	2	0	0	0	0	0	0	0	0	
95	class room	283.5	14' x 20'3"	3	5	2	0	0		8	0	0	0	0	1	0	0	0	0	
96	dpt	339.5	14' x 24'3"	5	8	3	0	1		17	1	0	0	0	1	0		1	1	0.565833

97	library	294	21' x 14'	3	11	3	0	1		12	0	0	0	0	1	0	0	0	0	0.49
98	dpt	294	14' x 21'	2	5	1	0	0		4	0	0	0	0	1	0	0	0	0	
99	class room	294	21' x 14'	3	8	2	0	2		8	0	0	0	0	1	0	0	0	0	0.49
100	e room	54.68	8'9" x 6'3"	1	0	0	0	0		1	0	0	0	0	0	0	0	0	0	
101	dpt	247.5	18' x 13'9"	3	3	1	0	0		6	0	0	0	0	1	0	0	0	1	
102	dpt	283.5	20'3" x 14'	1	5	2	0	1		8	0	0	0	0	1	0	0	0	0	0.4725
103	dpt	155.25	11'6" x 13'6"	2	5	1	0	0		4	0	0	0	0	1	0	0	0	1	
104	dpt	206.5	14'9" x 14'	2	5	1	0	1		4	0	0	0	0	1	0	0	0	1	0.25875
105	lab	540	40' x 13'6"	1	8	2	0	1		8	0	9	6	115	1	10	0	0	0	0.9
106	dpt	276.5	19'9" x 14'	2	5	1	0	1		4	0	6	3	80	1	12	0	0	1	0.460833

ANNEX-IIIB

Faculty Block -1 MALE Campus

1st floor plan

Room no.	Function	Area(sq.feet)	Dimensions(x'y'')	W	V	F	Ex F	Acs	LT	ST	B	R	M	PC	P	O	G	E.K
1	Class	286	11'10" x 24'3"	2	9	3	0	1	0	20	0	0	0	0	0	0	0	0
2	Class	364.25	23'6" x 15'6"	4	5	2	0	0	0	16	0	0	0	0	0	0	0	0
3	Washroom			2	0	0	2	0	0	2	4	0	0	0	0	0	0	0
4	Class	909.5	24'9" x 36'9"	6	15	4	0	2	0	20	0	0	0	0	0	1	0	0
5	Class	1219	24'9" x 49'3"	5	20	8	0	3	0	64	0	0	0	0	0	0	0	0
6	Class	287	11'10" x 24'3"	2	9	3	0	1	0	20	0	0	0	0	0	0	0	0
7	Class	377	23'10" x 15'10"	4	5	2	0	1	0	16	0	0	0	0	0	0	0	0
8	Washroom			2	0	0	2	0	2		4	0	0	0	0	0	0	0
9	Class	858	24' x 35'9"	6	15	6	0	3	0	36	0	0	0	0	0	0	0	0
10	Class	1182	24' x 49'3"	5	20	8	0	3	28	0	0	0	0	0	0	0	0	0
11	Lab	2786.75	78'6" x 35'6"	6	30	11	0	2	0	12	0	0	0	0	0	0	0	0
12	Class	296.125	11'6' x 25'9"	0	10	2	0	1	4	0	0	0	0	0	0	0	0	0
13	Class	888	24'0" x 37"	2	11	6	0	2	20	0	0	0	0	0	0	0	0	0
14	Class	816	24'0" x 34"	6	4	6	0	2	0	24	0	0	0	3	0	0	0	0
15	Class	732	24' x 30'6"	5	11	5	0	2	20	0	0	0	0	0	0	0	0	0
16	Class	732	24' x 30'6"	5	12	5	0	2	0	20	0	0	0	0	0	0	0	0
17	Washroom			2	2		2		3	0	5	0	0	0	0	0	0	0
18	Dpt	138.75	15' x 9'3"	4	9	3	0	1	0	16	0	0	0	2	0	1	0	0
19	Class	732	24' x 30'6"	5	12	5	0	2	20	0	0	0	0	0	0	0	0	0
20	Class	732	24' x 30'6"	5	12	5	0	2	20	0	0	0	0	0	0	0	0	0
21	Class	820	24' x 34'2"	0	10	5	0	2	0	20	0	0	0	0	0	0	0	0
22	Class	1156	24' x 48'	6	18	8	0	4	0	32	0	0	0	0	0	0	0	0
23	Class			6	18	8	0	4	0	32	0	0	0	0	0	0	0	0
24	Ablusion	244.37	11'6 x 25'9"	0	10	2	0	0	3	0	0	0	0	0	0	0	0	0
25	PrayerHall	876	24' x 36'6"	2	11	6	0	0	0	24	0	0	0	0	0	0	0	0
26	Class	244.37	11'6" x 21'3"	4	0	2	0	1	3	0	0	0	0	0	0	0	0	0
27	Washroom			2	0	0	2	0	0	3	5	0	0	0	0	0	0	0
28	Class	732	30'6" x 24'	5	12	5	0	2	0	20	0	0	0	0	0	0	0	0

29	Class	732	30'6" x 24'	4	10	5	0	2	20	0	0	0	0	0	0	0	0	0
30	Lab			3	13	4	0	2	20	0	0	0	0	0	0	0	0	0
31	Class	1182	24' x 49'3"	3	7	2	0	1	12	0	0	0	0	0	0	0	0	0
32	Lab	820	34'2 x 24'	6	10	0	0	2	0	0	6	0	0	3	0	1	0	0
33	Class	1152	48' x 24'	7	19	8	0	4	32	0	0	0	0	0	0	0	0	0
34	Class			0	10	2	0	1	8	0	0	0	0	0	0	0	0	0
35	Class	1134	47'3" x 24'	7	20	8	0	4	0	32	0	0	0	0	0	0	0	0
36	Class	740	34'2 x 21'8"	6	4	6	0	2	0	24	0	0	0	0	0	0	0	0
37	Class	732	30'6" x 24'	5	9	5	0	2	0	20	0	0	0	0	0	0	0	0
38	Class	732	30'6" x 24'	5	12	5	0	2	0	20	0	0	0	0	0	0	0	0
39	Washroom			2	2	0	2	0	0	3	5	0	0	0	0	0	0	0
40	Dpt	364.37	13'9" x 26'6"	2	0	1	0	0	2	0	0	0	0	3	0	0	0	0
41	Class	732	24' x 30'6"	5	12	5	0	2	0	20	0	0	0	0	0	0	0	0
42	Class	732	24' x 30'6"	5	12	2	0	2	2	0	0	0	0	0	0	0	0	0
43	Class	820	34'2" x 24'	6	10	6	0	2	0	24	0	0	0	0	0	0	0	0
44	Class	1170	48'9" x 24'	7	19	8	0	4	0	32	0	0	0	0	0	0	0	0

ANNEX-IIIC

Faculty Block -1 MALE Campus

2nd Floor Plan

Room no.	Function	Area	Dimensions(x'y'')	W	V	F	Ex F	Acs	LT	ST	B	R	M	PC	P	O	G	EK	
1(45)	Class			2	9	3	0	1	0	20	0	0	0	0	0	0	0	0	0
2(46)	Dpt	377	23'10'' x 15'10''	4	5	2	0	1	0	16	0	0	0	3	0	0	0	0	0.628333
3(47)	WashRoom			2	0	0	2	0	2	0	4	0	0	0	0	0	0	0	
4(48)	Lab	882	24' x 36'9''	6	15	6	0	2	0	36	0	0	0	0	0	0	0	0	1.47
5(49)	Class	212	24' x 8'10''	4	10	4	0	2	0	16	0	0	0	0	0	0	0	0	0.353333
6(50)	Lab	992	24' x 41'4''	4	10	4	0	2	0	16	0	0	0	0	0	0	0	0	1.653333
7(51)	Class			5	0	4	0	1	0	6	0	0	0	0	0	1	0	0	1
8(52)	Lab	312	12' x 26''	6	0	3	0	2	0	20	3	0	0	0	0	0	0	0	0.52
9(53)	Class	644	23' x 28'	0	10	4	0	1	0	40	0	0	0	0	0	0	0	0	1.073333
10(54)	Dpt	1715	49' x 35'	9	10	12	0	2	2	64	0	0	0	0	0	0	0	0	2.858333
11(55)	Lab			8	20	8	0	2		64	0	0	0	0	0	0	0	0	2
12(56)	Lab																	0	
13(57)	WashRoom			2	0	0	2	0	2	0	4	0	0	0	0	0	0	0	
14(58)	Dpt			4	5	2	0	1	0	16	0	0	0	3	0	0	0	0	1
15(59)	Lab			2	9	3	0	1	0	20	0	0	0	0	0	0	0	0	1

ANNEX-IV

RESUTS IN FEMALE CAMPUS

Total Female Campus Power (WATTS)	1014726
Total Improved Power (WATTS) after replacement	757225.57
Total Saved Power (WATTS)	257500.43
%AGE SAVED after replacement	25.3763
Current Usage Power %AGE	74.6236

COMPUTERS	
reduced power by PC	47000
current PC	84600
[illegible]	44.44
current%age	55.56

TUBE LIGHTS	
reduced power by small TL	9270
currentTL	13200
[illegible]	40
current%age	60

AIR CONDITIONS	
reduced power by AC	49214.26
Current AC	118667
[illegible]	58.52742
current%age	41.4725

RESULTS IN MALE CAMPUS

Total Male Campus Power (WATTS)	922645
Total Improved Power (WATTS) after replacement	668715.83
Total Saved Power (WATTS)	253929.17
[illegible]	27.5218
[illegible]	72.4781

COMPUTERS	
Reduced power after replacent	21200
Current PC	38160
[illegible]	44.44
current%age	55.56

TUBE LIGHT	
Reduced power by small TL	8160
Current TL	13600
[illegible]	40
current%age	60

AIR CONDITIONS	
power reduced after replacement	
	51495.267
Current AC	137126
[illegible]	ent
	62.446
[illegible]	37.553

ANNEX-V

Behavior of students towards energy conservation

Name: ---------- **Role: Student/ others**----------

Faculty: ---------- **Subject:** ----------

Gender: **(Male/ female)**

1. Do you know the importance of energy?

A) Yes B) No

2. In your opinion which sector is more affected due to energy short fall?

A) Educational B) industrial

C) Market D) residential

3. Do you think load shedding effects your studies?

A) Yes B) No

4. Do you feel disturbance in your daily routine work due to load shedding?

A) Yes B) No

5. Do you know the reasons of electricity short fall?

A) Yes B) No

6. Do you think that irresponsible behavior is one of the reasons for energy crisis in our country?

A) Yes B) No

7. Do you think that wrong government policies are one of the reasons for energy crisis in our country?

A) Yes B) No

8. What do you think is it possible to reduce the energy consumption by checking your behavior?

A) Yes B) No

9. Do you turn off the lights while leaving the rooms?

A) Yes B) No

10. Do you turn off TV/ computer while not using it?

A) Yes B) No

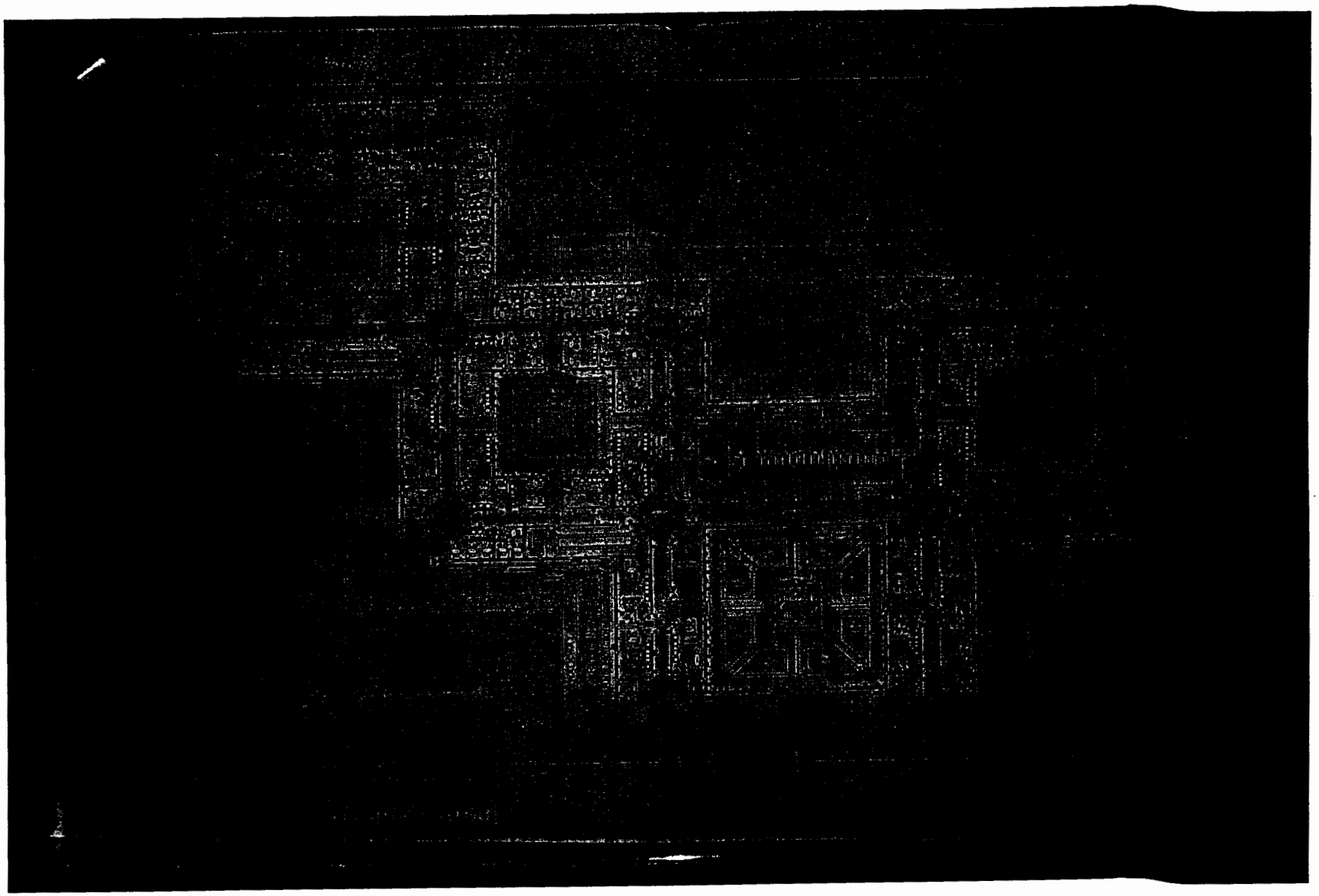
11. Do you use electric lights when enough sunlight is available?

A) Yes B) No

12. Do you convince others to take steps for the conservation of energy?

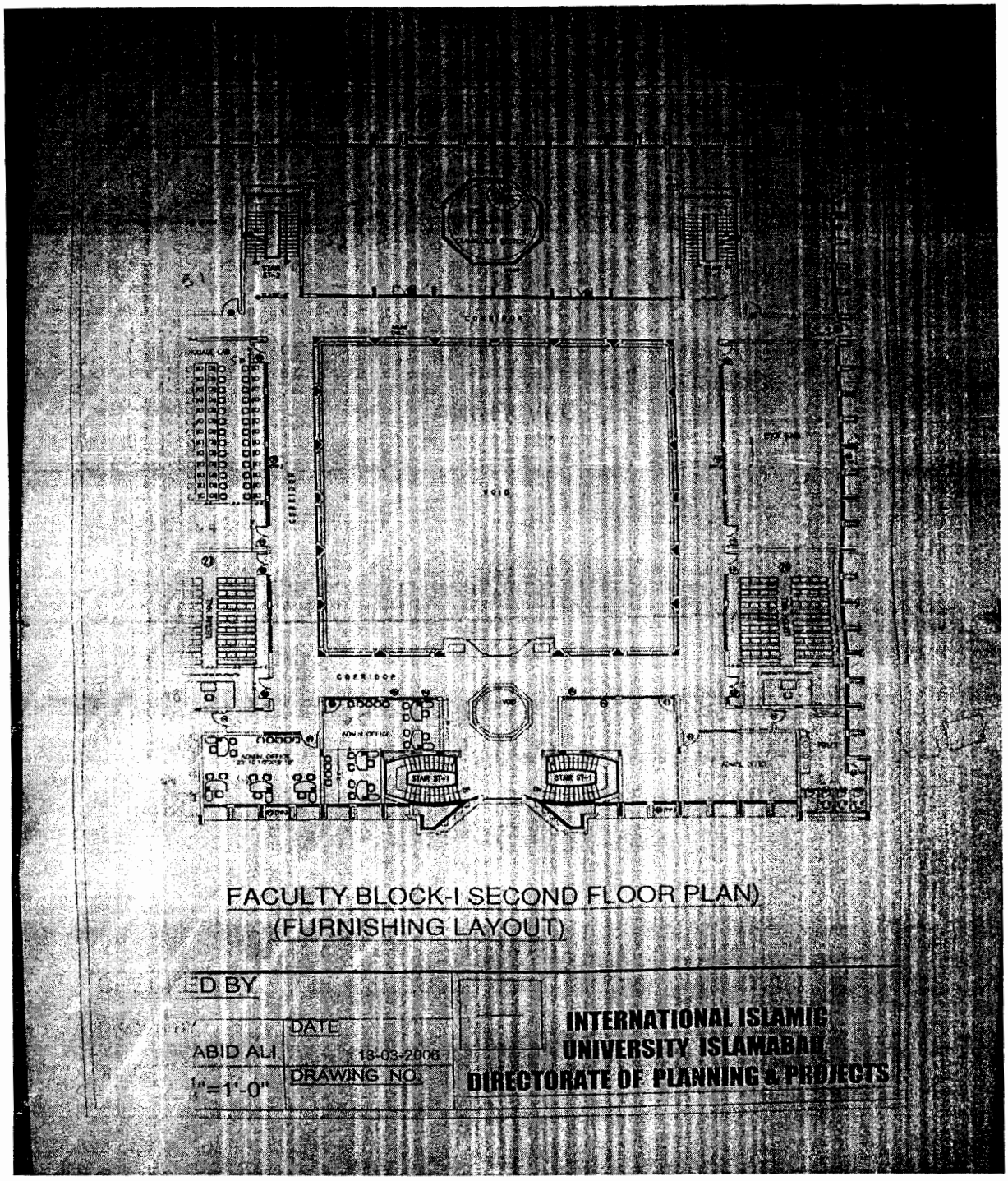
A) Yes B) No

ANNEX-VI (A)



FURNISHING LAY OUT OF MALE AND FEMALE CAMPUS (GROUND FLOOR PLAN)

ANNEX VI-C



FURNISHING LAYOUT OF MALE AND FEMALE CAMPUS (2ND FLOOR)