ENERGY AUDIT REPORT OF

DON BOSCO COLLEGE OF ARTS AND SCIENCE

A CHRISTIAN MINORITY, CO-EDUCATIONAL, SELF-FINANCING COLLEGE | AFFILIATED TO MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI.

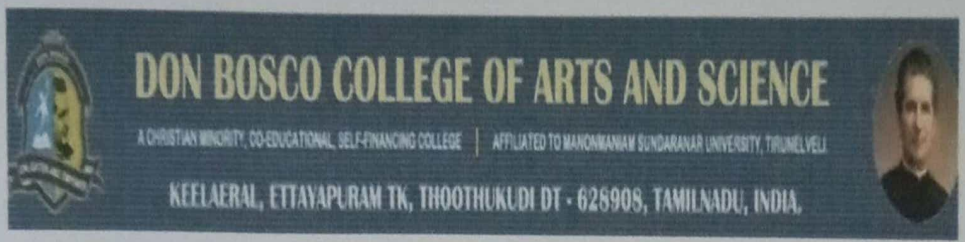
KEELAERAL, ETTAYAPURAM TK, THOOTHUKUDI DT - 628908, TAMILNADU, INDIA.

2019

Report Prepared By

Department of Mechanical Engineering,
National Engineering College(Autonomous),
K.R Nagar, Kovilpatti
Thoothukudi-628503.

ENERGY AUDIT REPORT OF



2019

Report Prepared By

Department of Mechanical Engineering,
National Engineering College(Autonomous),
K.R Nagar, Kovilpatti
Thoothukudi-628503.

NATIONAL ENGINEERING COLLEGE

(An Autonomous Institution Affiliated to Anna University, Chennai)

K.R.Nagar, Kovilpatti - 628 503, Thoothukudi Dist., Tamilnadu.

K. KALIDASA MURUGAVEL M.E.,Ph.D.,
Principal

Phone : +91 9385976684, 04632 - 222502,
Email : principal@nec.edu.in,
Fax : 04632 - 232749
Web: www.nec.edu.in

TO WHOM SO EVER IT MAY CONCERN

This is to certify that the Department of Mechanical Engineering of our institution, below mentioned faculty member of our institution, conducted energy audit at Don Bosco College of Arts & Science, KeelaEral, Thoothukudi during the month of April 2020 and the recommendations to conserve energy is given in the report. I thank the management of Don Bosco College of Arts & Science, KeelaEral for providing the opportunity and I also appreciate the efforts made by the energy audit team.

Mr. K. Sudalaiyandi M.E.,
Energy Manager, EA - 34488

Principal

National Engg. College
Kovilpatti
628 503
K.R. Nagar

CONTENTS

GIST

1. Average power consumption of Don Bosco College of Arts & Science is Rs.38000/- per month in 2019.
2. Major power consumption of connected load is Fans, which is 27% of the overall connected load.
3. Out of all blocks in Don Bosco College of Arts & Science for connected load Block A consumes 65% followed by Block C, Hostel block.
4. As an easy picking, by replacing older electric choke tube light with LED tube light, savings per year is about Rs. 1,01,616/- with return on investment of 4 months.
5. As a low hang fruit, by replacing older fan with super fan, savings per year is about Rs. 1,47,168/- with return on investment of 34 months.

aculty Members Involved in Energy Audit:

1. Mr. K. Sudalaiyandi,
   Assistant Professor / Mechanical Engineering
2. Mr. R. Jaya Venkatesh,
   Assistant Professor / Mechanical Engineering

pecial Thanks:

Our Special thanks to **M. Sivasankari,** Assistant Professor, department of Computer pplication, Don Bosco College of Arts & Science, Keela Eral, Thoothukudi for her valuable pport in this audit.

1.0 INTRODUCTION

1.1 About NATIONAL ENGINEERING COLLEGE, Kovilpatti

National Engineering College, Kovilpatti, Tamil Nadu offers a wide variety of high-quality education and training opportunities for every student, awarding qualifications through highly reputed Anna University. The college offers six undergraduate and six postgraduate programs in a wide range of disciplines and is approved by AICTE and accredited by NBA & NAAC. NEC is sprawled in a lush green campus, with an alluring backdrop of an enchanting hillock, in NH44 between Madurai and Tirunelveli. The institute provides an excellent locale for academic pursuits in south Tamil Nadu.

1.2 About Don Bosco College of Arts & Science

Don Bosco College of Arts & Science, Keela Eral, Thoothukudi, Tamil Nadu offers high-quality education to the youth, particularly the under privileged of Thoothukudi awarding qualifications through Manonmaniam Sundaranar University, Tirunelveli. The college offers 7 courses altogether: 6 undergraduate courses and 1 postgraduate course. DBCAS aims to provide an environment in which all students feel safe and happy and are able to develop to their full potential. The college atmosphere caters for the needs of all students through a curriculum that is responsive to individual student needs. Our curriculum is engaging and challenging, aimed at developing a holistic personality and is delivered by competent and caring teachers, supported by sympathetic structures and policies.

1.3 ABOUT ENERGY AUDIT

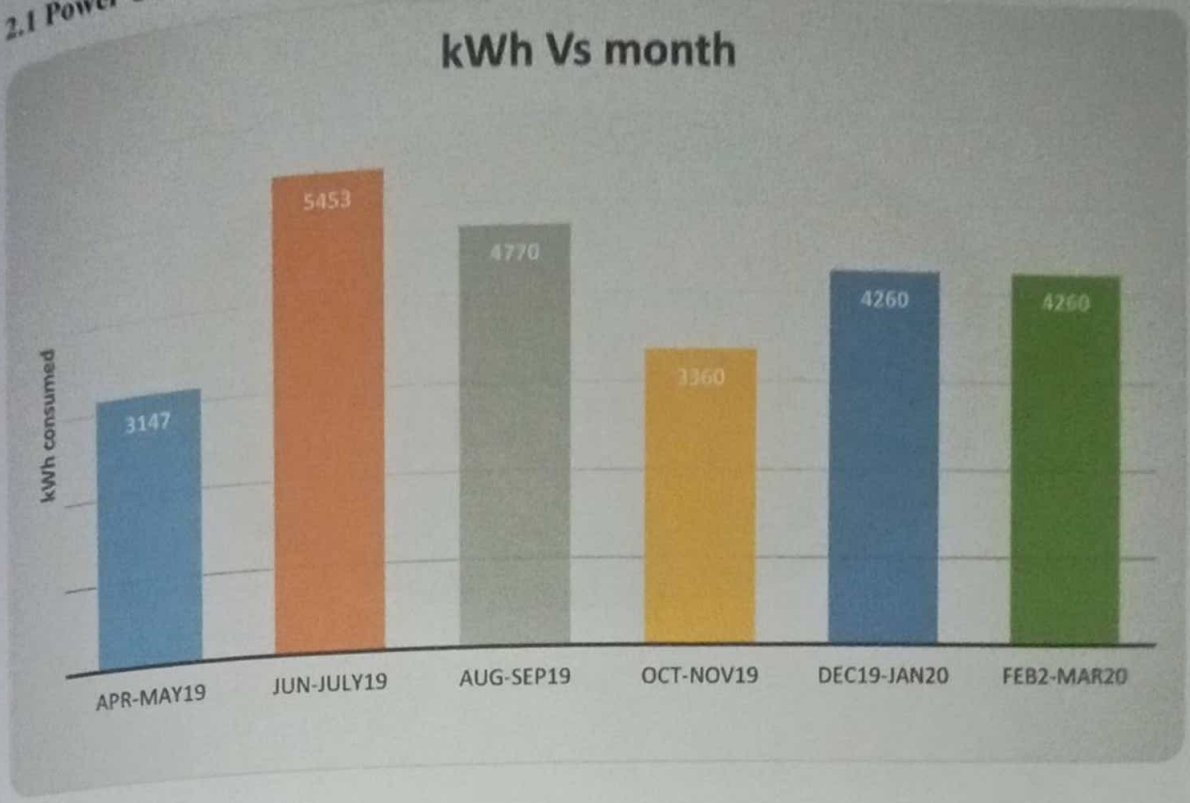
The building sector has gained prominence over the past few decades as the largest consumers of energy. 45% of total global energy is used in heating, cooling and lighting of buildings. Energy consumption patterns could be substantially altered by adopting energy conserving measures, particularly during the phase of building design. Hence energy requirement to the building is need of the hour for the institutions, this might be the first step in achieving the green audit to the campus.

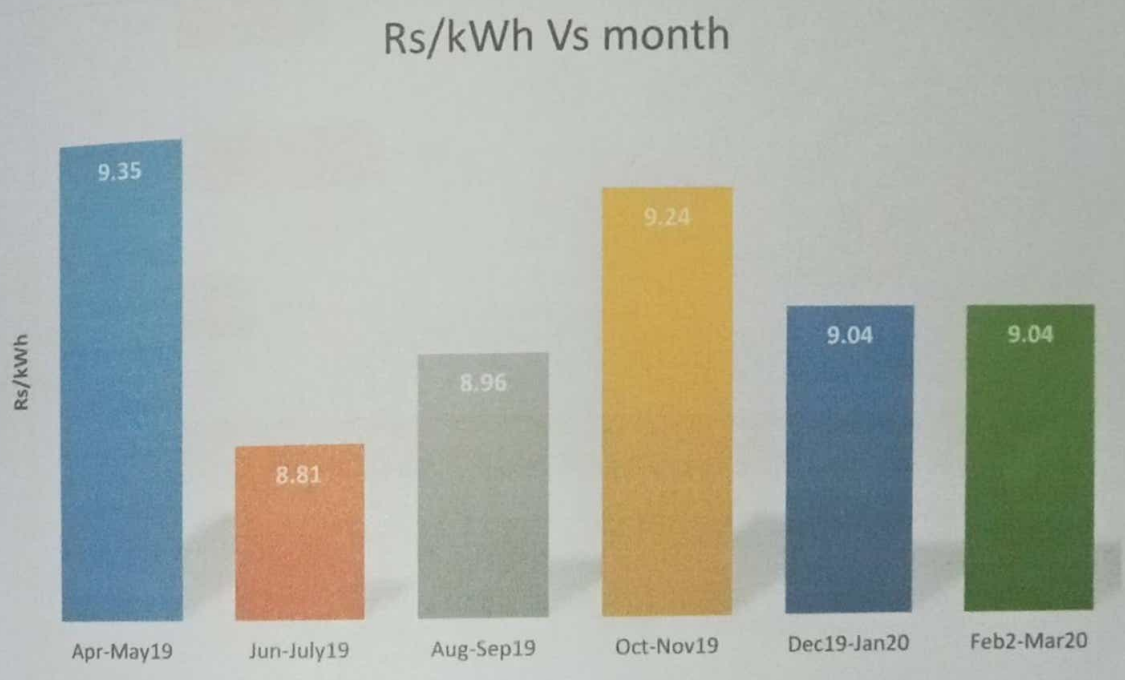
2.0: ENERGY AUDIT

The area of the energy audit includes

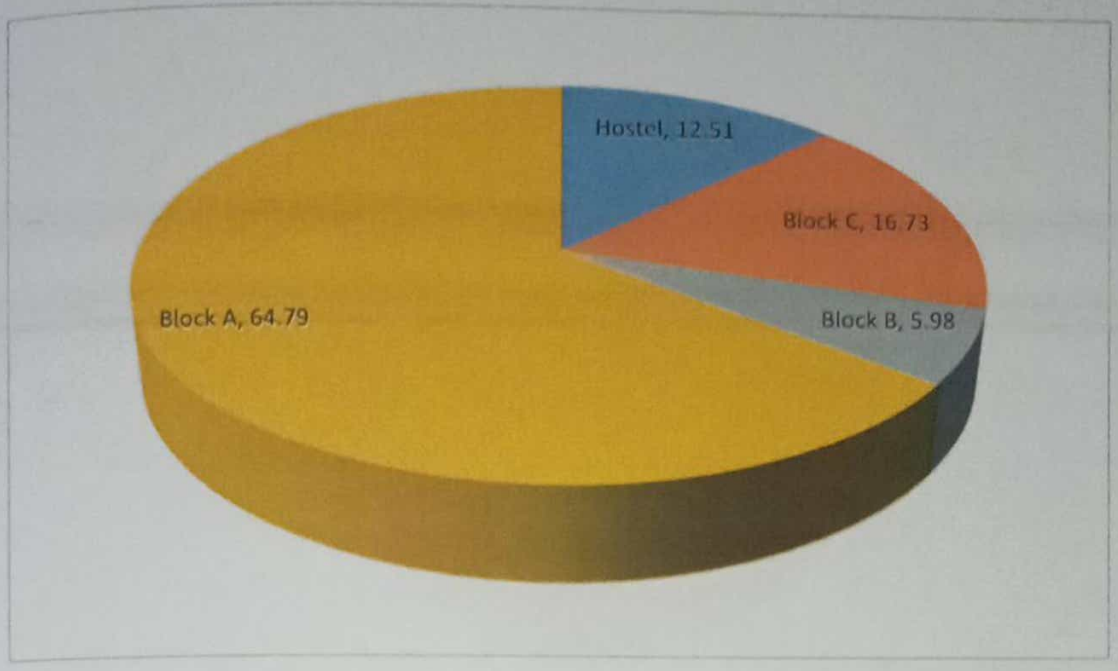
- Class Rooms
- Faculty Room
- Laboratories
- Office Rooms
- Seminar Halls
- Hostel
- Canteen
- others

2.1 Power Consumption Pattern for the year 2019

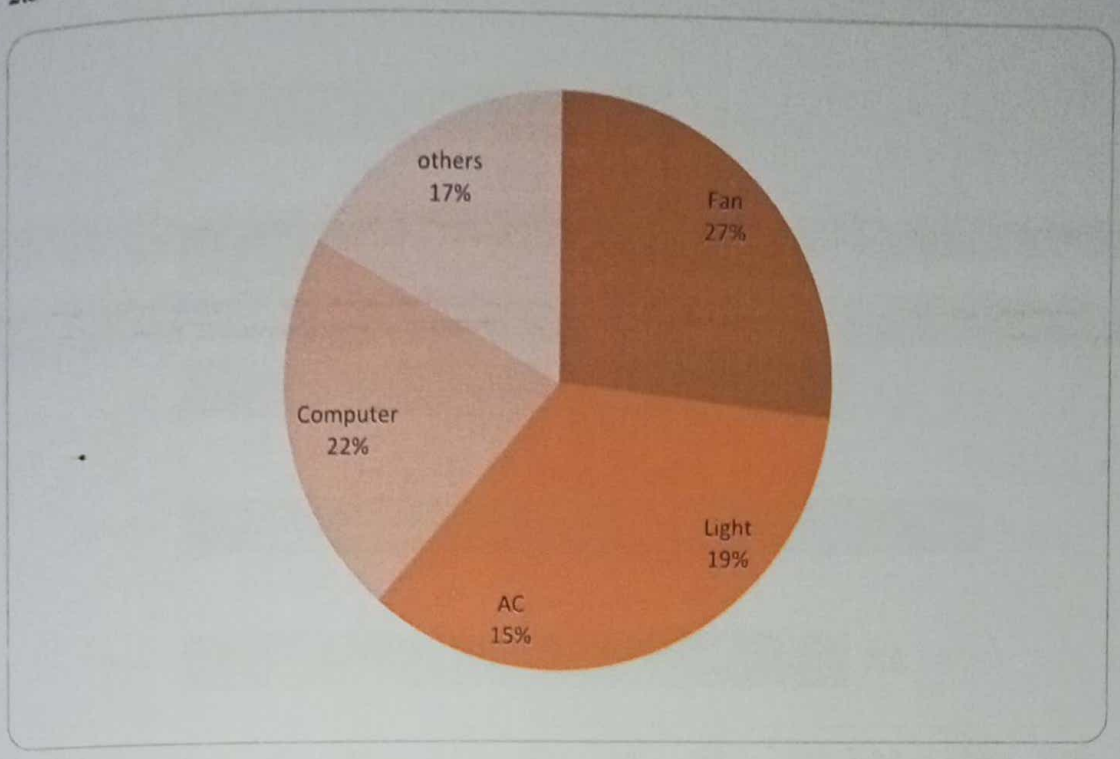


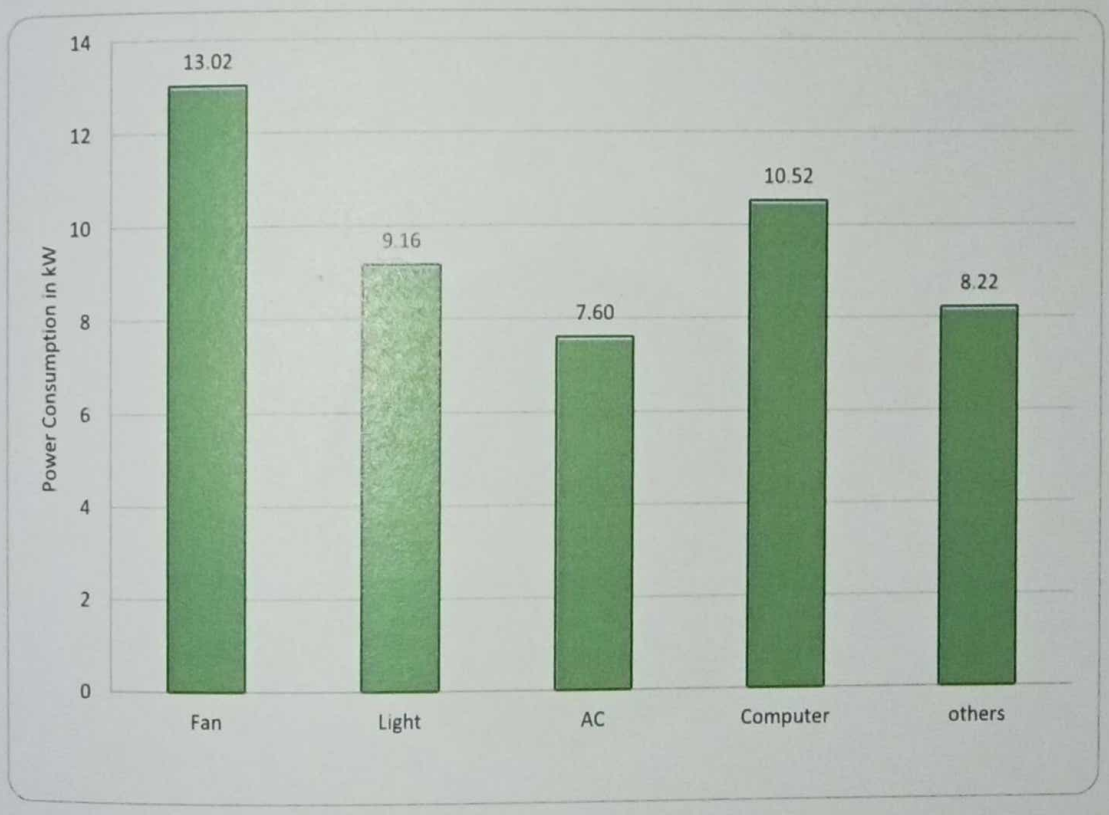


2.2 Connected load distribution

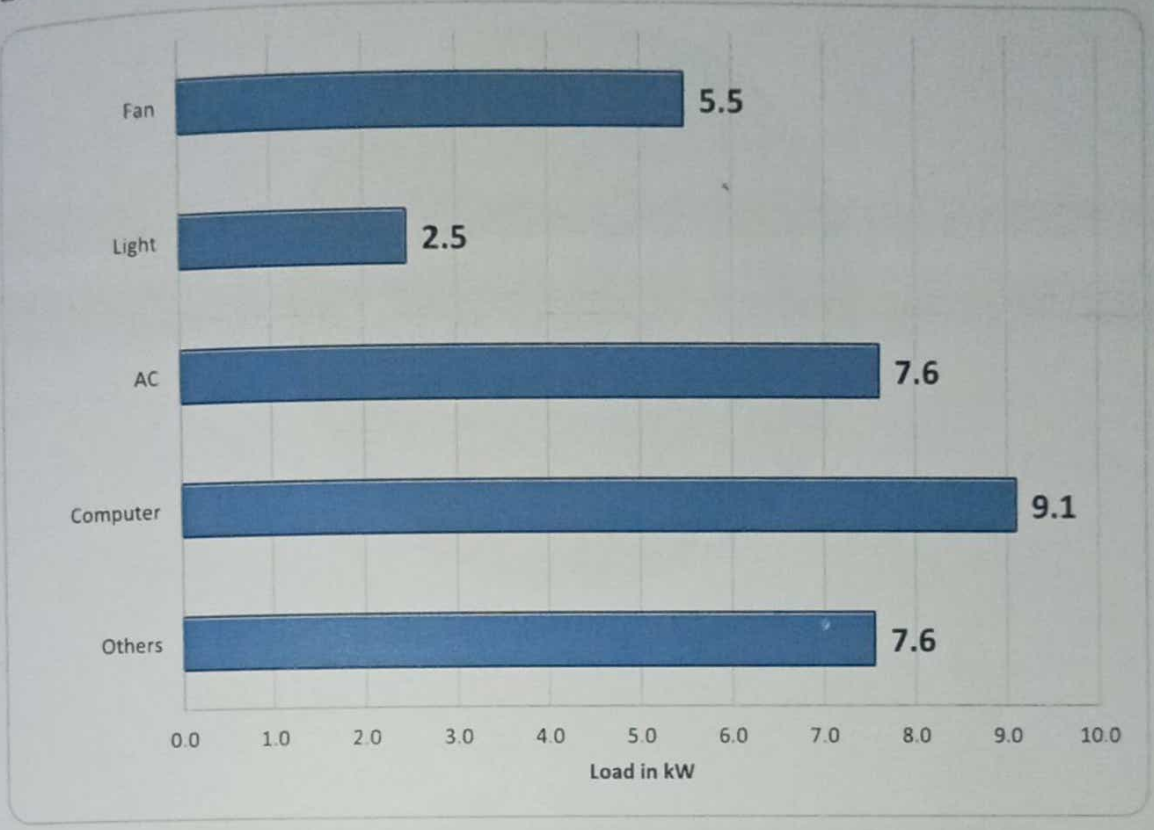


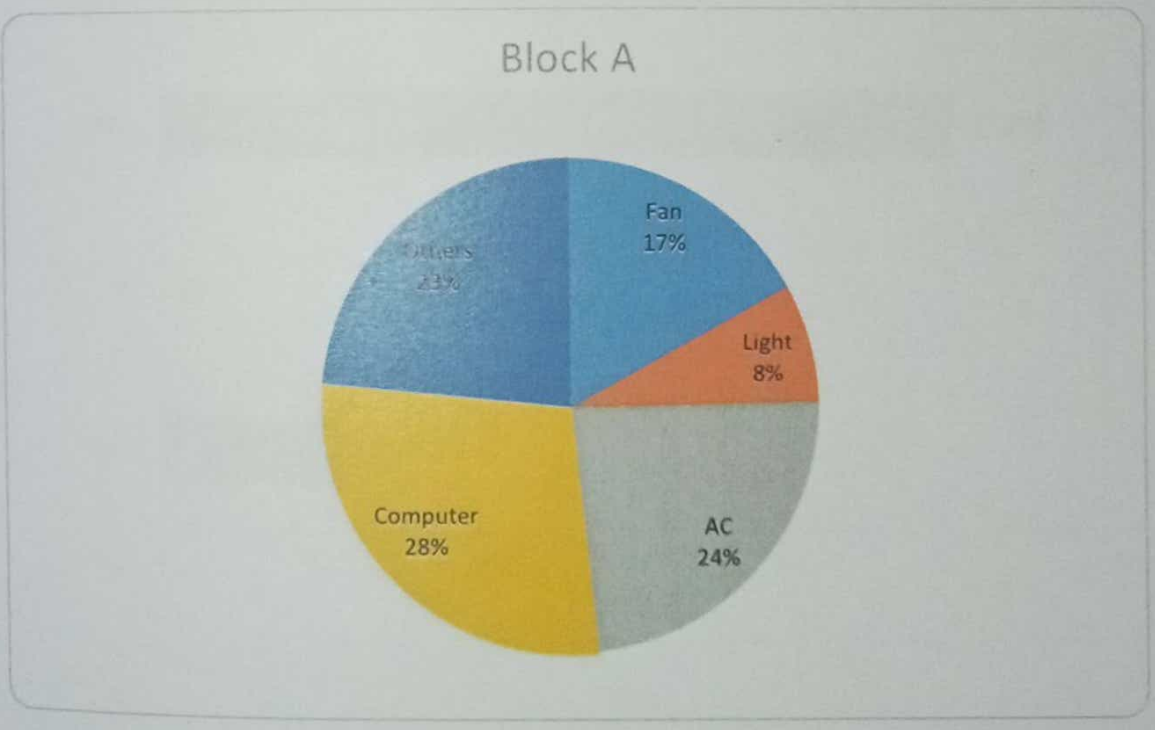
2.3 Connected load distribution - category wise



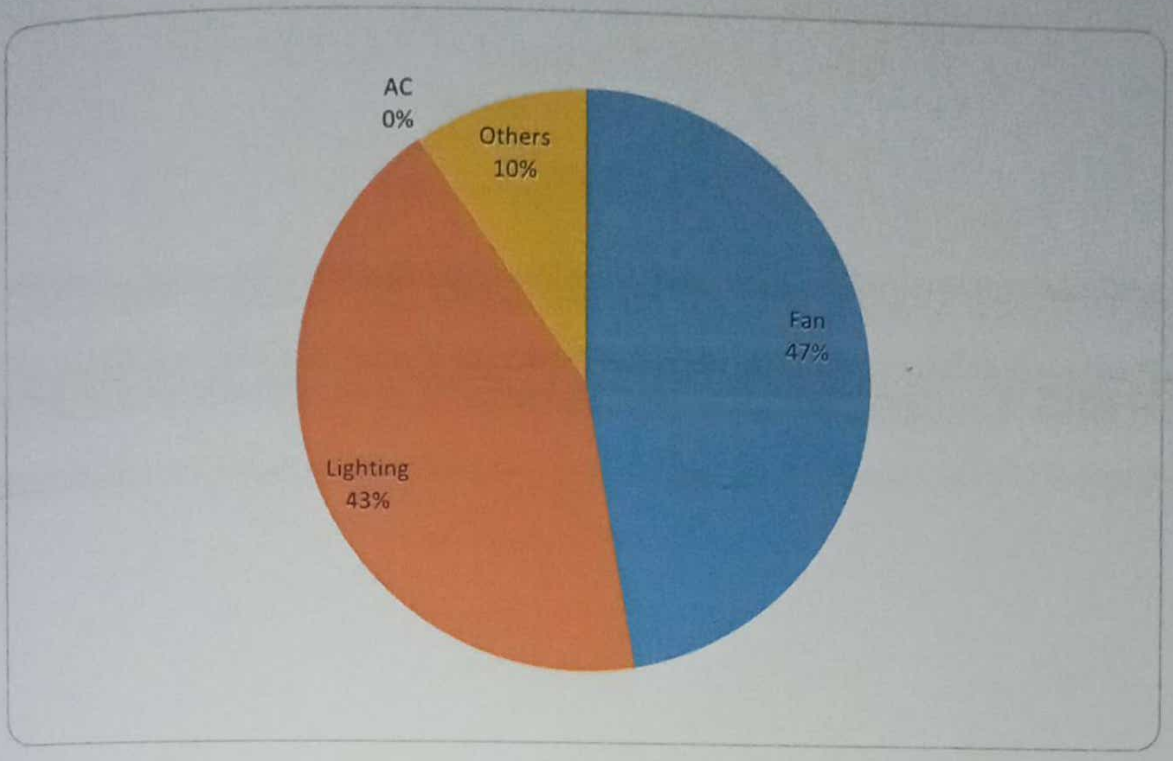


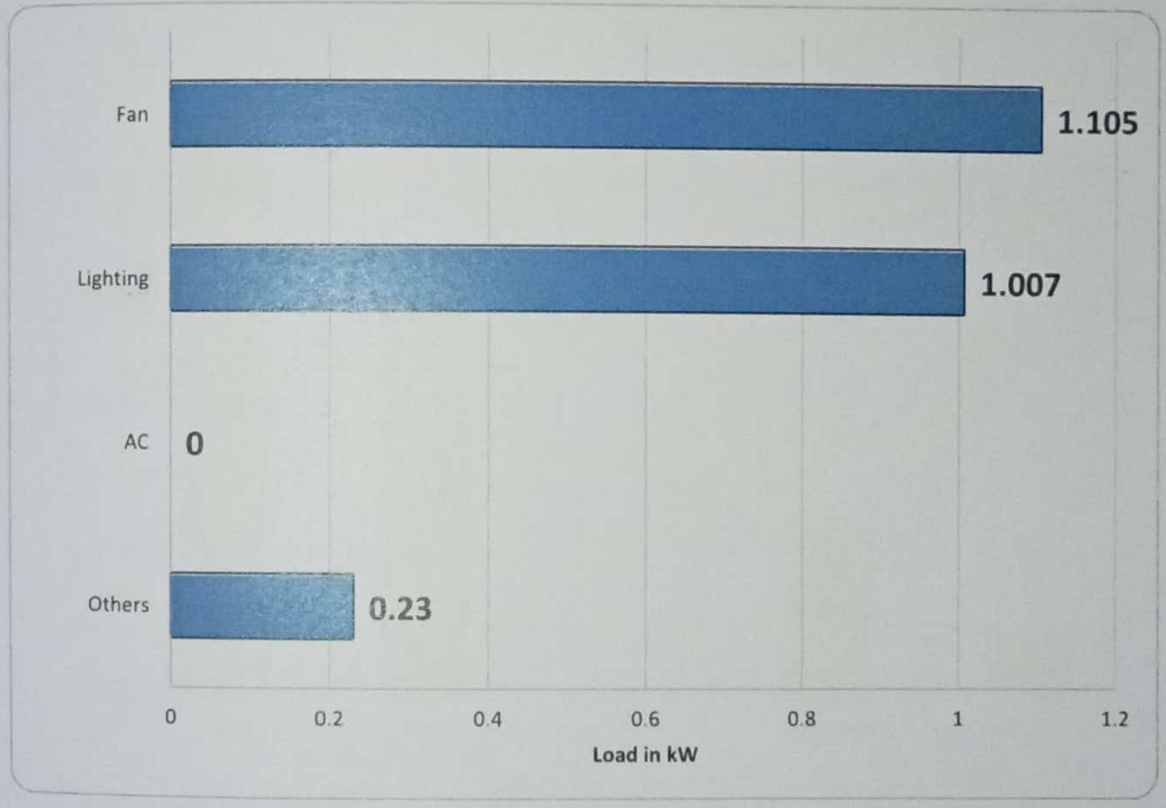
2.4 Connected load distribution for Block A



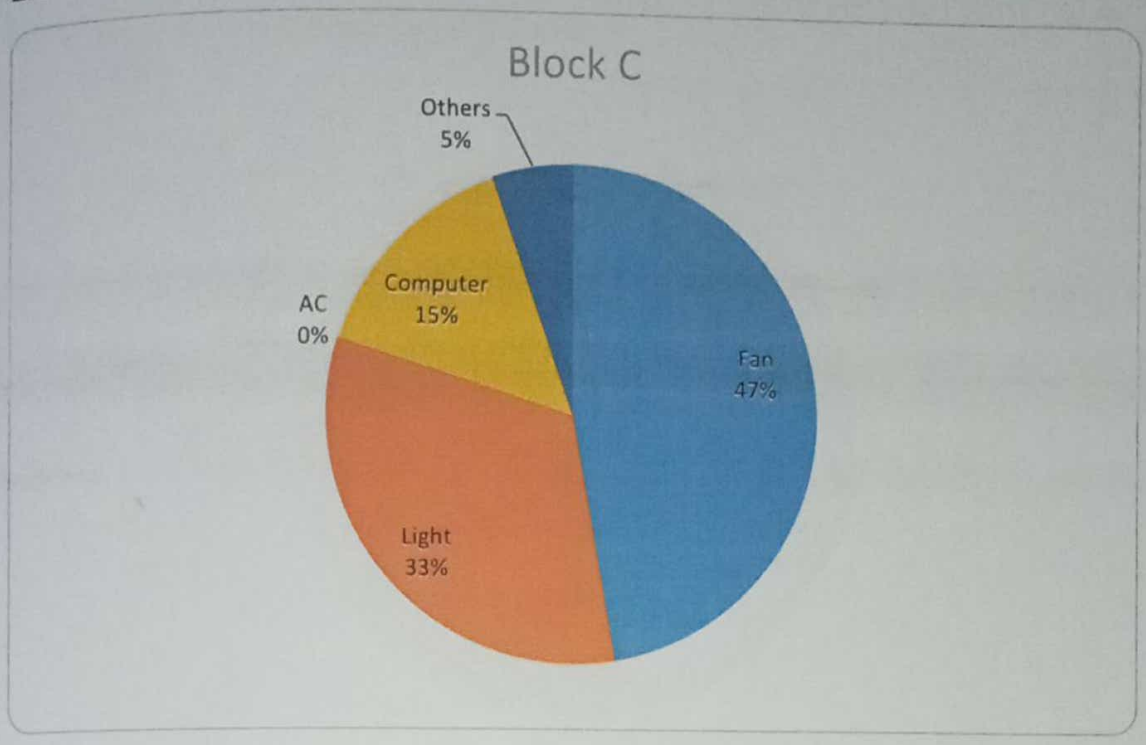


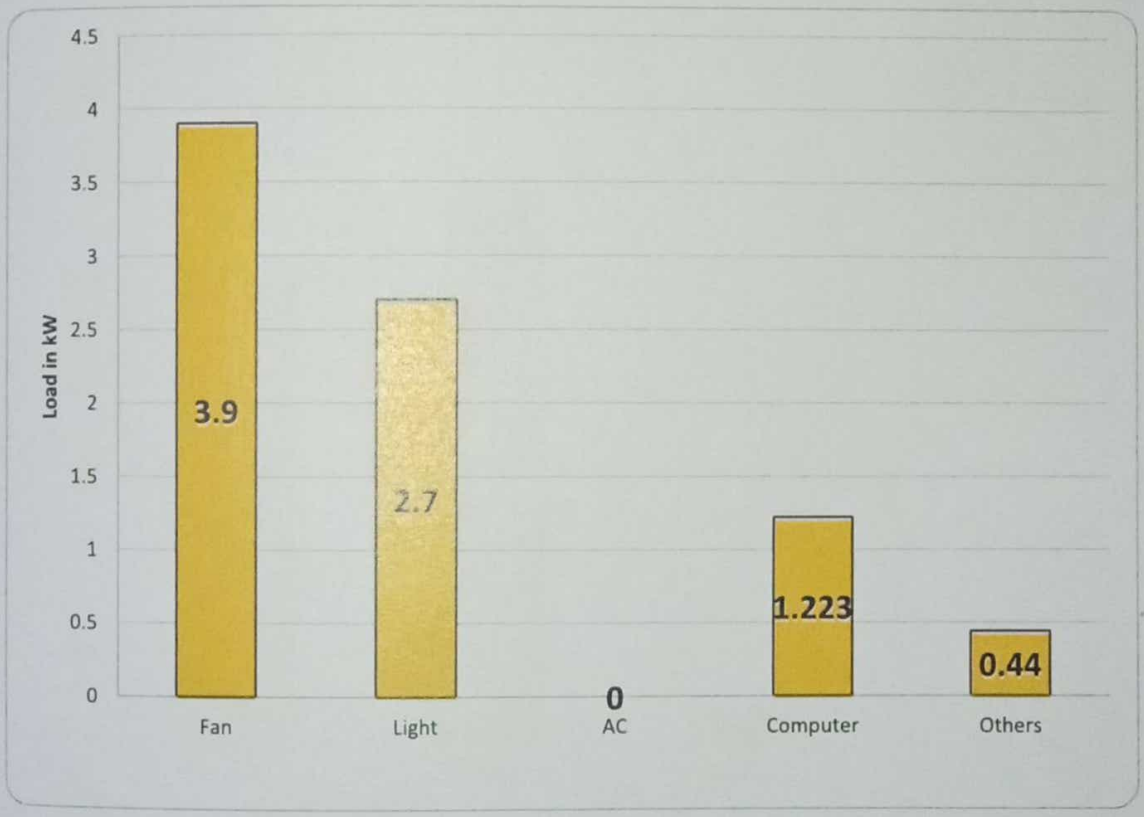
2.5 Connected load distribution for Block B



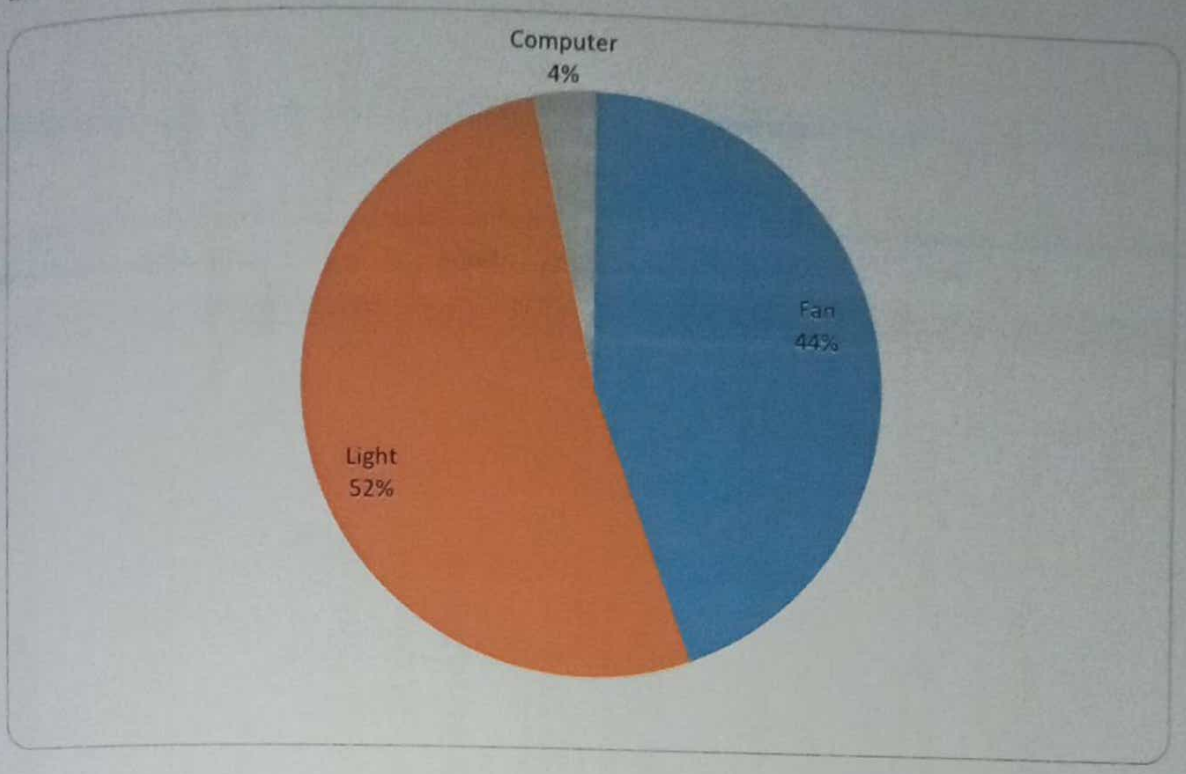


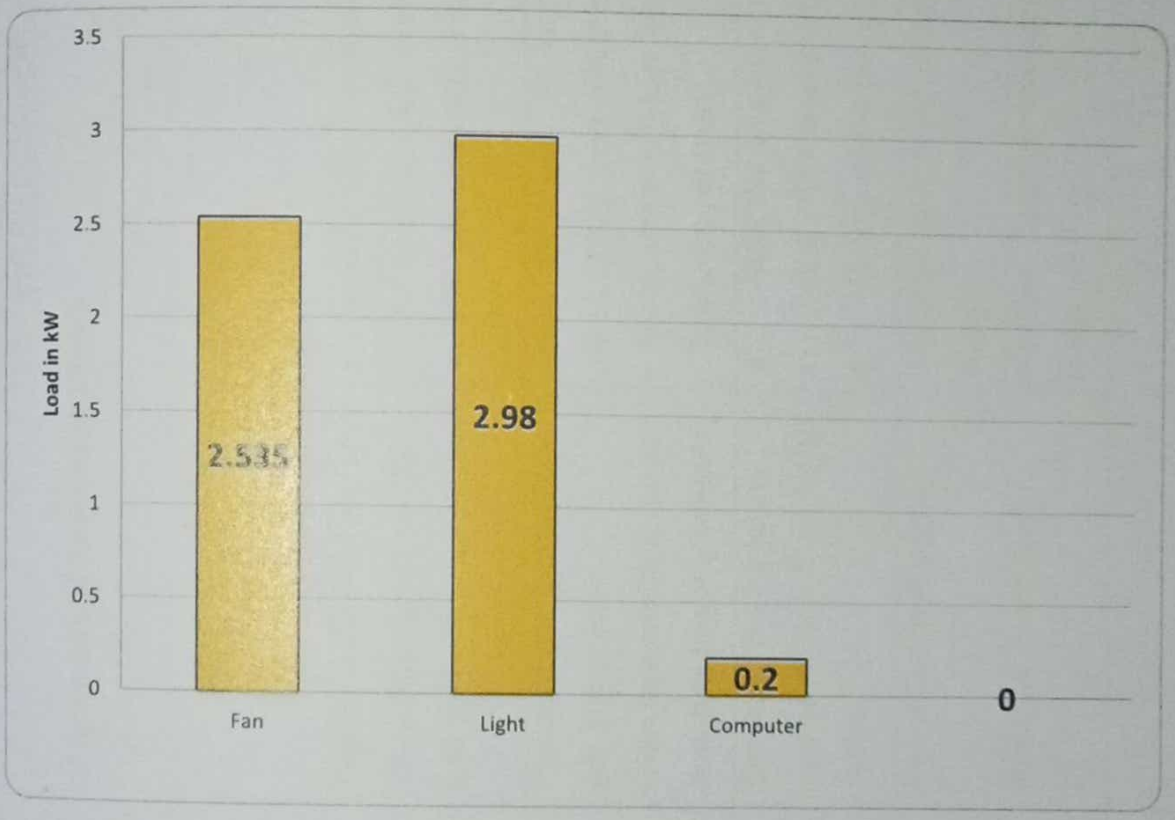
2.6 Connected load distribution for Block C





2.7 Connected load distribution for Hostel Block





3.0 ENERGY CONSERVATION RECOMMENDATIONS

3.1 Summary of Recommendations

Sl. No.	Topic	Descriptions	Investment(Rs.)	Return on Investment	Page No.
1.	Replacing the older electrical choke tube lights to a LED tube lights	• Replacement of Single Electrical Choke tube lights with LED Tube light (Savings= 34.8 Units per Day) • LED tube lights are up to 60% more efficient	31320/-	4 months	13
2.	Replacement of older fans with Super Fans Older fans can be given as **donation to govt. schools**.	There are around 168 fans in the campus. BLDC fans are up to 50% more efficient • Replacement of older fans with super fan (Savings= 50.4 Units per Day)	420000	34 Months	13
3.	Replacing the 1.5 ton window AC to 1.5 ton 5 star split AC	• Older Window AC consumes 29% of total AC load • Split ACs are up to 50% more efficient • Energy saving per day 4 units	70000/-	72 Months	14
4.	Power Quality Analysis	Proposed to conduct detailed audit with power quality analyzer.			
5.	Indoor air quality audit	Measure Room temperature, LUx level, RH and CO_2 levels.			

4.0 ENERGY CONSERVATION PROPOSALS

The following table describes the total number of electrical components used in the Don Bosco Arts and Science College campus, Keela Eral.

Descriptions	Rated power (W)	Quantity	Power Consumption (kW)
Fan	65	168	10.92
T8	30	35	1.05
FL	40	174	6.96
Pattern Type LED	20	19	0.38
LED	20	42	0.84
CFL	30	61	1.83
Window AC	2600	2	5.2
Split AC	2400	1	2.4
Computer	100	82	8.2
Others	100	38	3.8

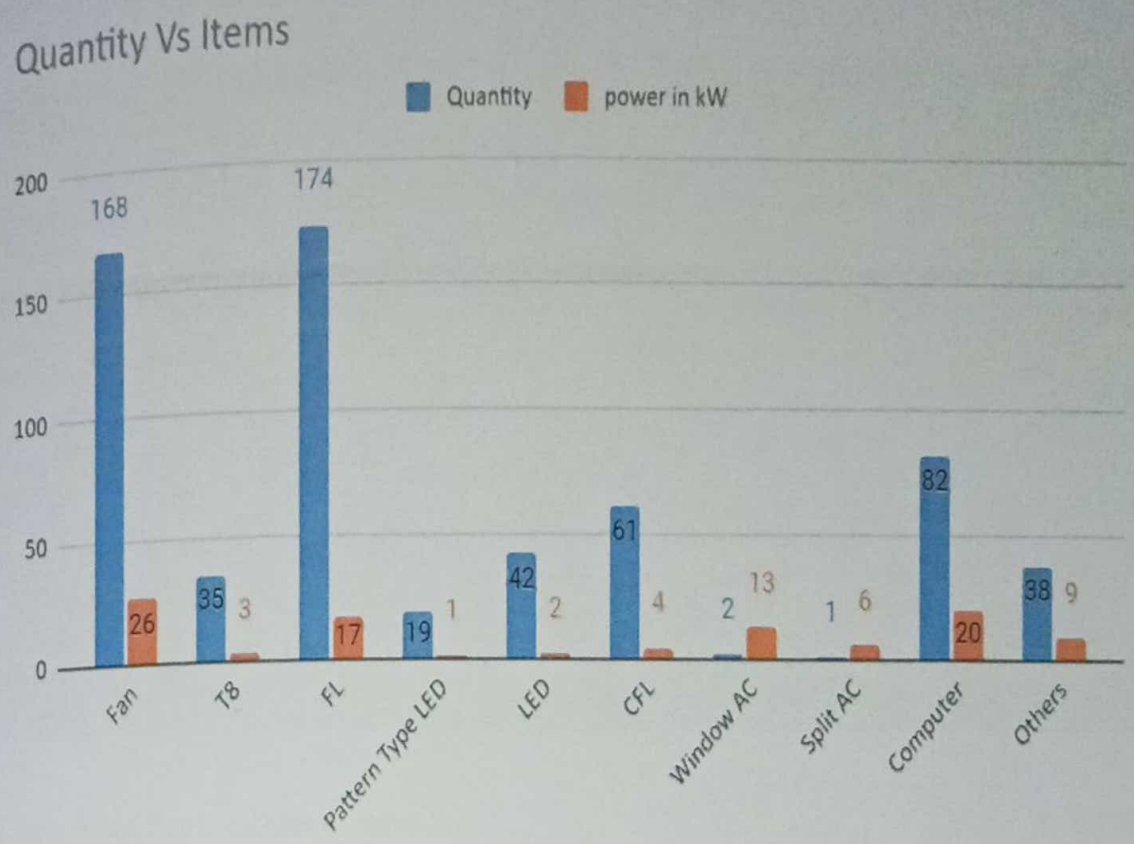


Figure: Number of Components in Don Bosco Arts and Science College.

From the above figure, it is found that the tube light is more in number (174 nos.) followed by the CFL (61 nos.), LED (42 nos.), and T8 lamp (35 nos.). A LED light consumes a 20 W whereas a tube light consumes 40 W. Which means that the tube light consumes around twice the power of the LED light.

Hence it is recommended to replace all the available tube lights with the LEDs in a phase schedule or a single replacement.

ECM 1 – Replace Older Tube lights to Energy efficient LED lights

Present Scenario		Proposed Scenario	
Total Number Tube Lights	174	Total Number of LED	174
Wattage	40W	Wattage	20W
Total hours of operation	10hrs	Total hours of operation	10hrs
Total Units consumed	69.6	Total Units consumed	34.8
Total Unit savings per day		34.8	
Electricity Cost		Rs.8/Unit	
Annual Cost savings		Rs.101616/-	
Initial Investment(Rs.180/LED lamp)		Rs.31320/-	
Payback period		**3.69 months**	

ECM 2- Replace Older fans to Super fan

Present Scenario		Proposed Scenario	
Total Number Fans	168	Total Number of Super Fans	168
Wattage	70W	Wattage	40W
Total hours of operation	10hrs	Total hours of operation	10hrs
Total Units consumed	117.6	Total Units consumed	67.2
Total Unit savings per day		50.4	
Electricity Cost		Rs.8/Unit	
Annual Cost savings		Rs.147168/-	
Initial Investment(Rs.2500/Super Fan)		Rs.420000/-	
Payback period		**34 months**	

ECM 3- Replace Window AC to Split AC

Present Scenario		Proposed Scenario	
Total Number Window AC	2	Total Number of Split AC	2
Wattage	2600W	Wattage	2400W
Total hours of operation	10hrs	Total hours of operation	10hrs
Total Units consumed	52	Total Units consumed	48
Total Unit savings per day		4	
Electricity Cost		Rs.8/Unit	
Annual Cost savings		Rs.11680/-	
Initial Investment(Rs.35000/AC)		Rs.70000/-	
Payback period		**72 months**	

ENERGY AUDIT REPORT OF

DON BOSCO COLLEGE OF ARTS AND SCIENCE

A CHRISTIAN MINORITY, CO-EDUCATIONAL, SELF-FINANCING COLLEGE | AFFILIATED TO MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI.

KEELAERAL, ETTAYAPURAM TK, THOOTHUKUDI DT - 628908, TAMILNADU, INDIA.

Report Prepared By

Department of Mechanical Engineering,
National Engineering College(Autonomous),
K.R Nagar, Kovilpatti
Thoothukudi-628503.

2022

ENERGY AUDIT REPORT OF

DON BOSCO COLLEGE OF ARTS AND SCIENCE

A CHRISTIAN MINORITY, CO-EDUCATIONAL, SELF-FINANCING COLLEGE | AFFILIATED TO MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI

KEELAERAL, ETTAYAPURAM TK, THOOTHUKUDI DT - 628908, TAMILNADU, INDIA.

Report Prepared By

Department of Mechanical Engineering,
National Engineering College(Autonomous),
K.R Nagar, Kovilpatti
Thoothukudi-628503.

2022

NATIONAL ENGINEERING COLLEGE

(An Autonomous Institution Affiliated to Anna University, Chennai)

K.R.Nagar, Kovilpatti - 628 503, Thoothukudi Dist., Tamilnadu.

Dr. K. KALIDASA MURUGAVEL M.E.,Ph.D.,
Principal

Phone : +91 9385976684, 04632 - 222502,
Email : principal@nec.edu.in,
Fax : 04632 - 232749
Web: www.nec.edu.in

TO WHOM SO EVER IT MAY CONCERN

This is to certify that the Department of Mechanical Engineering of our institution, below mentioned faculty members of our institution, conducted energy audit at Don Bosco College of Arts & Science, KeelaEral, Thoothukudi during the month of April 2023 and the recommendations to conserve energy is given in the report. I thank the management of Don Bosco College of Arts & Science, KeelaEral for providing the opportunity and I also appreciate the efforts made by the energy audit team.

Mr. K. Sudalaiyandi M.E., (Ph.D)
Energy Auditor, EA –34488/22

Mr. K. Sudalaiyandi M.E., (Ph.D.).,
BEE Certified Energy Auditor
EA 34488/22.

Mr. R. Jaya VenkateshM.E., (Ph.D)
Energy Auditor, EA – 34505/22

Mr. R. Jaya Venkatesh M.E., (Ph.D.).,
BEE Certified Energy Auditor
EA 34505/22.

Principal

GIST

1. Average power consumption of Don Bosco College of Arts & Science is Rs.37000/- per month in 2022.
2. Major power consumption of connected load is Fans, which is 22% of the overall connected load.
3. Out of all blocks in Don Bosco College of Arts & Science for connected load Block A consumes 65% followed by Block C, Hostel block.
4. As an easy picking, by replacing older electric choke tube light with LED tube light, savings per year is about Rs. 84,753/- with return on investment of 3 months.
5. As a low hang fruit, by replacing older fan with super fan, savings per year is about Rs. 1,74,762/- with return on investment of 26 months.

CONTENTS

Faculty Members Involved in Energy Audit:

1. Mr. K. Sudalaiyandi, BEE Certified Energy Auditor, EA-34488
   Assistant Professor / Mechanical Engineering
2. Mr. R. Jaya Venkatesh, BEE Certified Energy Auditor, EA-34505
   Assistant Professor / Mechanical Engineering

Special Thanks:

Our Special thanks to **Dr. M. Sivasankari,** Assistant Professor, department of Computer Application and **Mr. S. Enigo**, Assistant Professor, department of English, Don Bosco College of Arts & Science, KeelaEral, Thoothukudi for their valuable support in this audit.

1.0 INTRODUCTION

1.1 About NATIONAL ENGINEERING COLLEGE, Kovilpatti

National Engineering College, Kovilpatti, Tamil Nadu offers a wide variety of high-quality education and training opportunities for every student, awarding qualifications through highly reputed Anna University. The college offers six undergraduate and six postgraduate programs in a wide range of disciplines and is approved by AICTE and accredited by NBA & NAAC. NEC is sprawled in a lush green campus, with an alluring backdrop of an enchanting hillock, in NH44 between Madurai and Tirunelveli. The institute provides an excellent locale for academic pursuits in south Tamil Nadu.

1.2 About Don Bosco College of Arts & Science

Don Bosco College of Arts & Science, Keela Eral, Thoothukudi, Tamil Nadu offers high-quality education to the youth, particularly the under privileged of Thoothukudi awarding qualifications through Manonmaniam Sundaranar University, Tirunelveli. The college offers 7 courses altogether: 6 undergraduate courses and 1 postgraduate course. DBCAS aims to provide an environment in which all students feel safe and happy and are able to develop to their full potential. The college atmosphere caters for the needs of all students through a curriculum that is responsive to individual student needs. Our curriculum is engaging and challenging, aimed at developing a holistic personality and is delivered by competent and caring teachers, supported by sympathetic structures and policies.

1.3 ABOUT ENERGY AUDIT

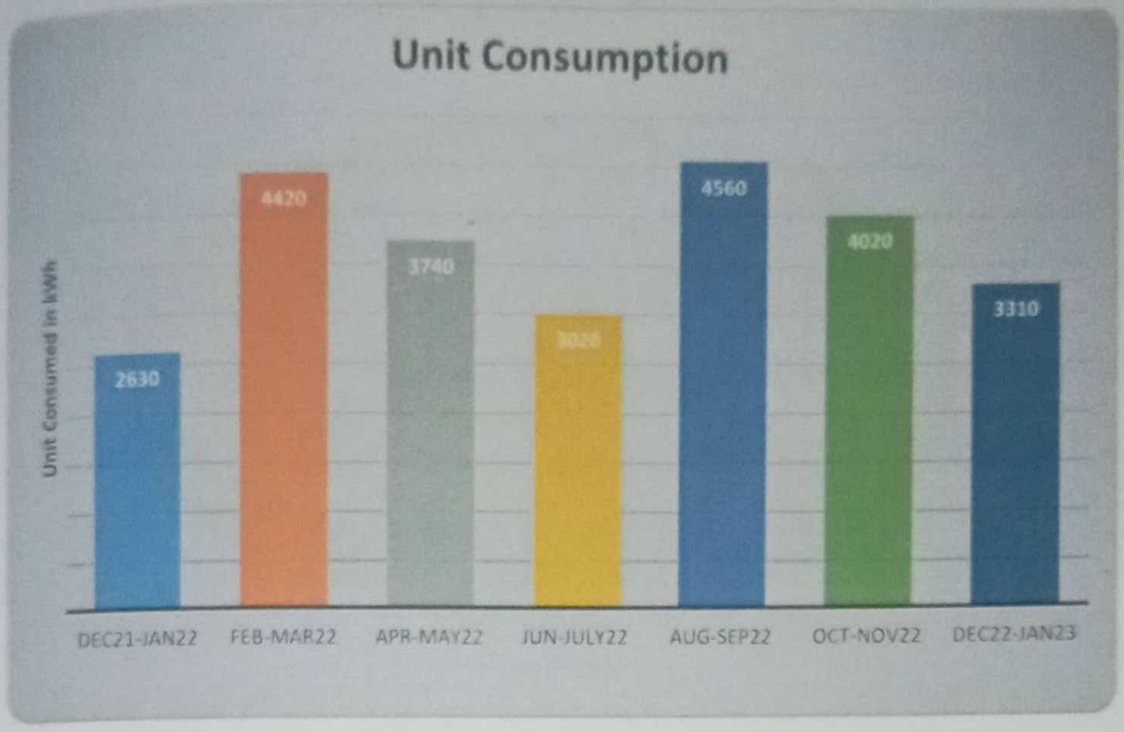
The building sector has gained prominence over the past few decades as the largest consumers of energy. 45% of total global energy is used in heating, cooling and lighting of buildings. Energy consumption patterns could be substantially altered by adopting energy conserving measures, particularly during the phase of building design. Hence energy requirement to the building is need of the hour for the institutions, this might be the first step in achieving the green audit to the campus.

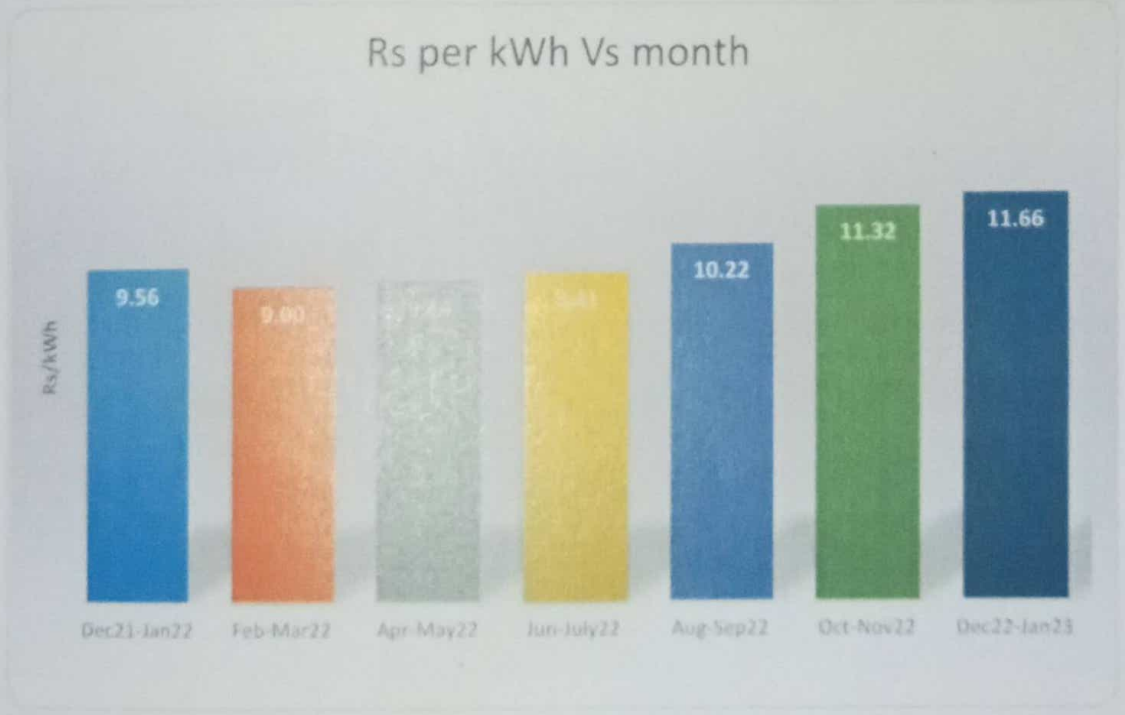
2.0 ENERGY AUDIT

The area of the energy audit includes

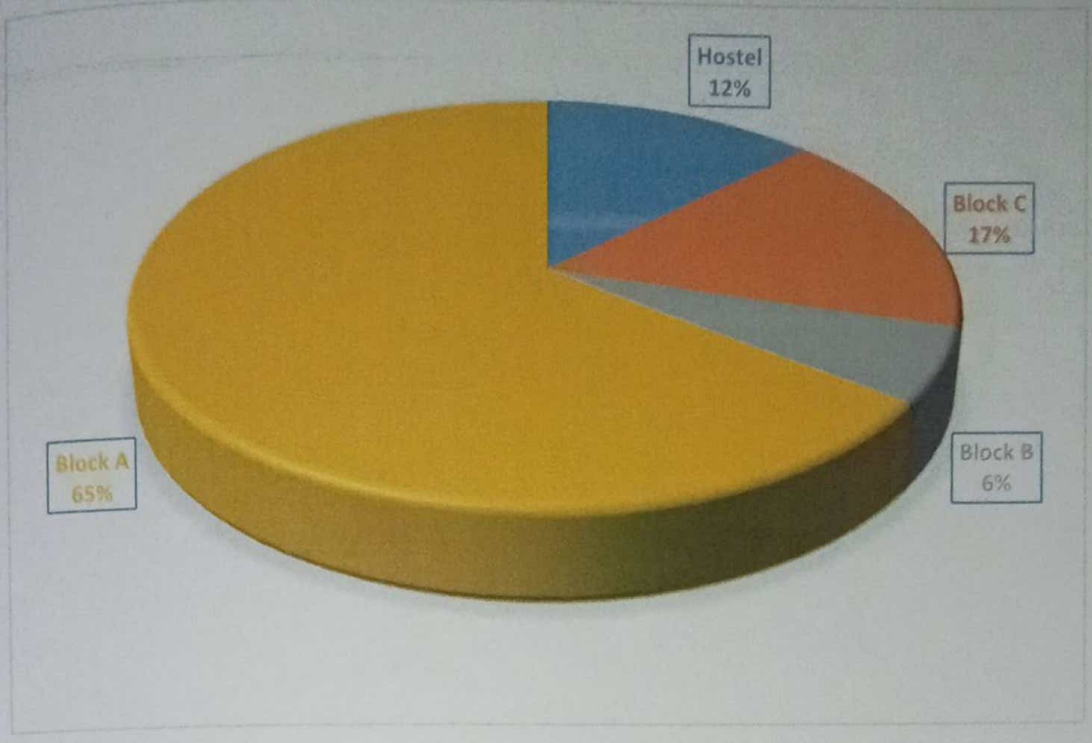
- Class Rooms
- Faculty Room
- Laboratories
- Office Rooms
- Seminar Halls
- Hostel
- Canteen
- others

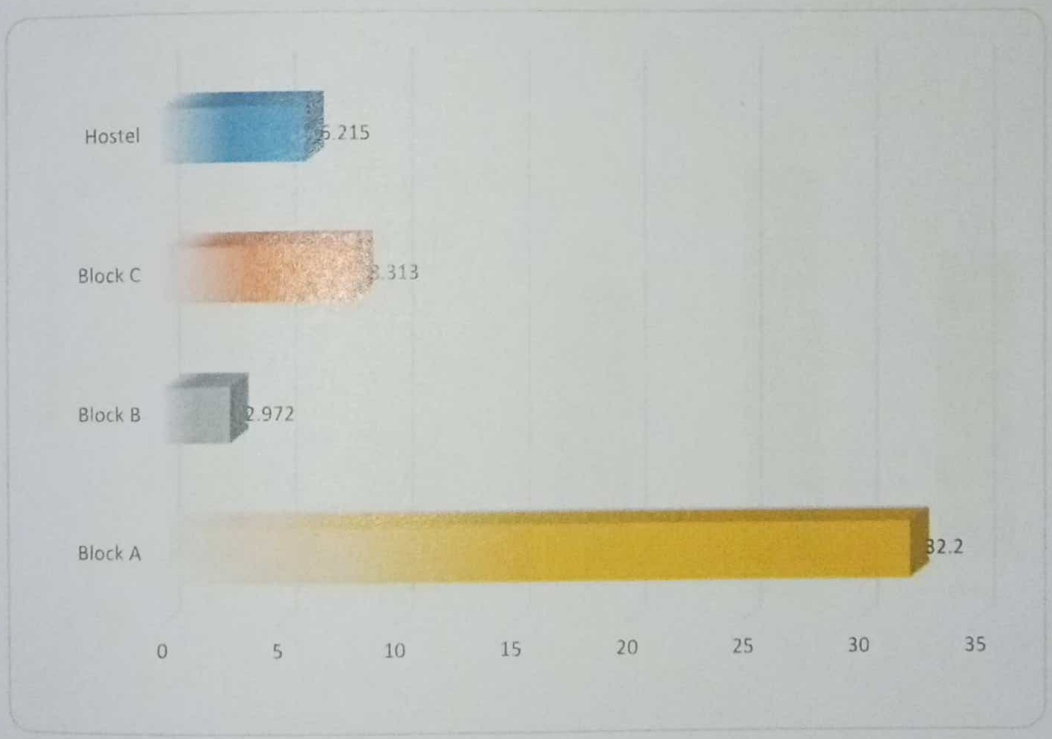
2.1 Power Consumption Pattern for the year 2022



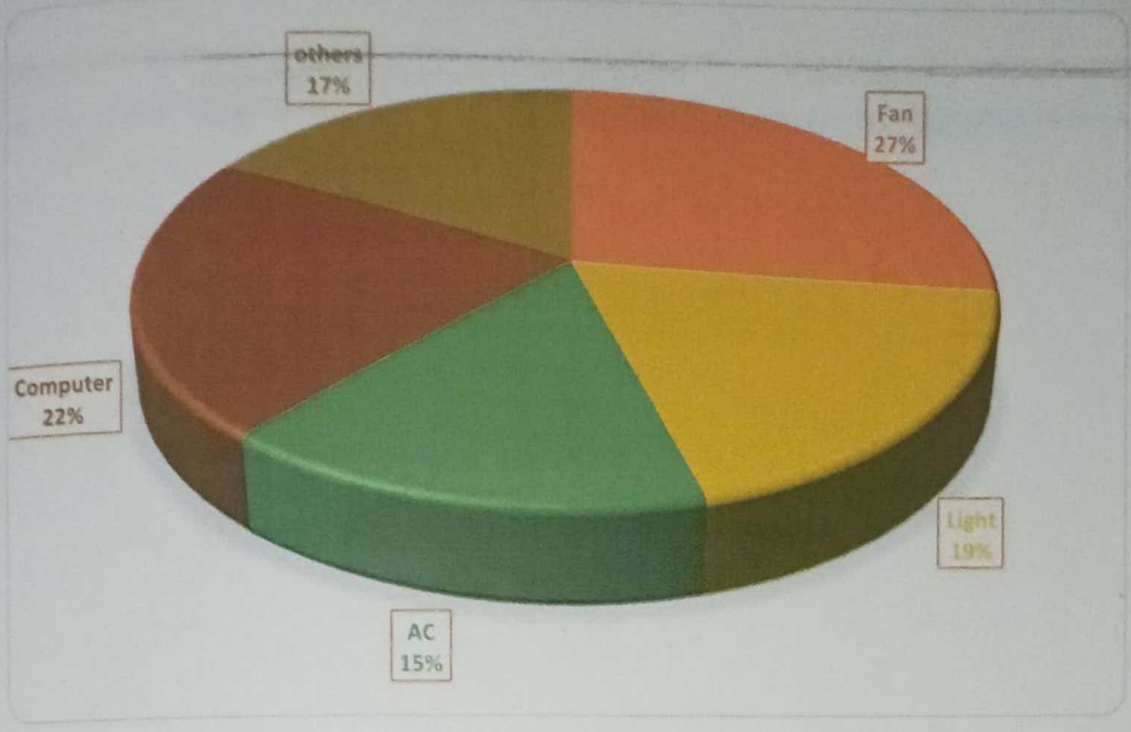


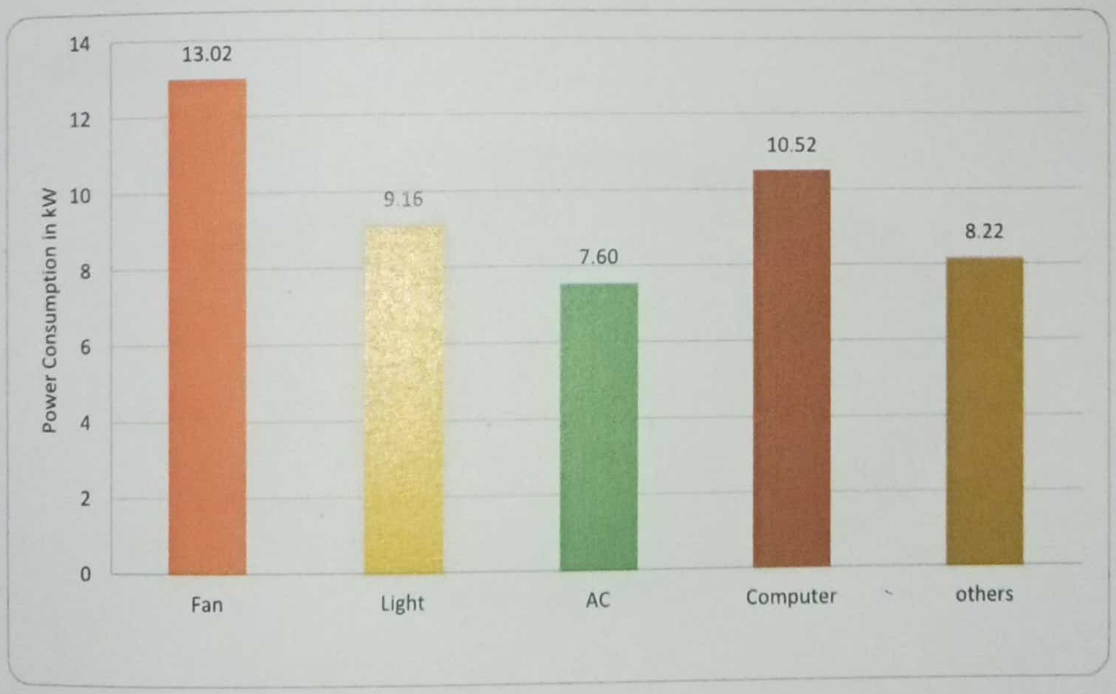
2.2 Connected load distribution



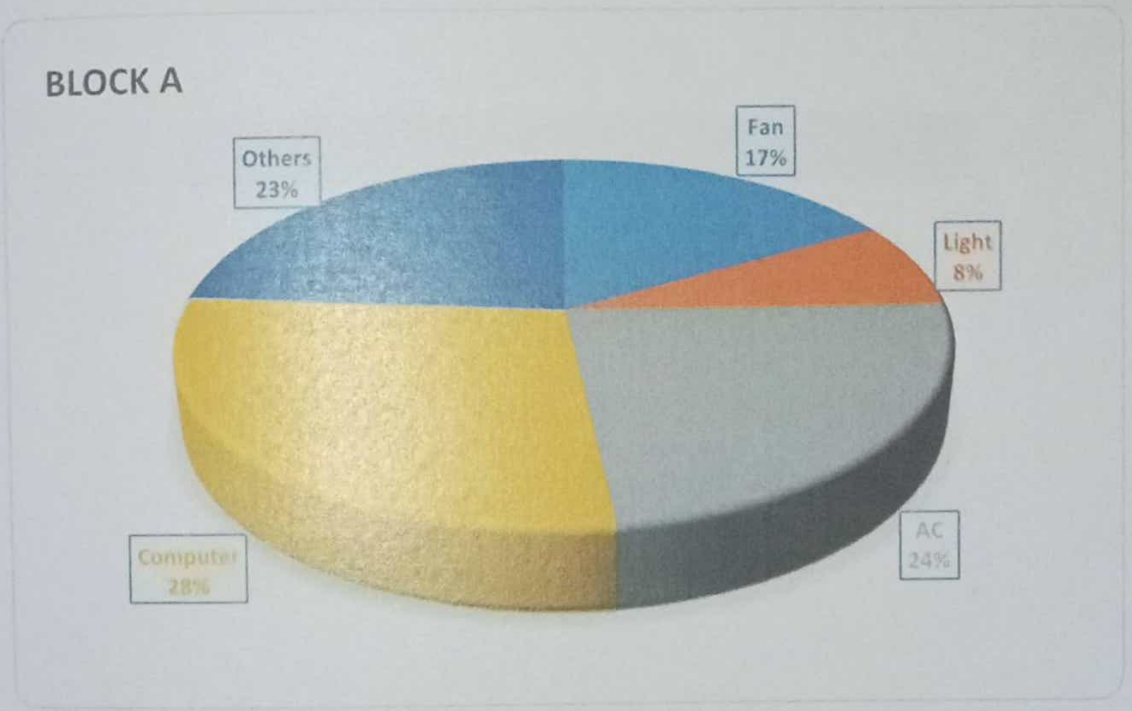


2.3 Connected load distribution - category wise



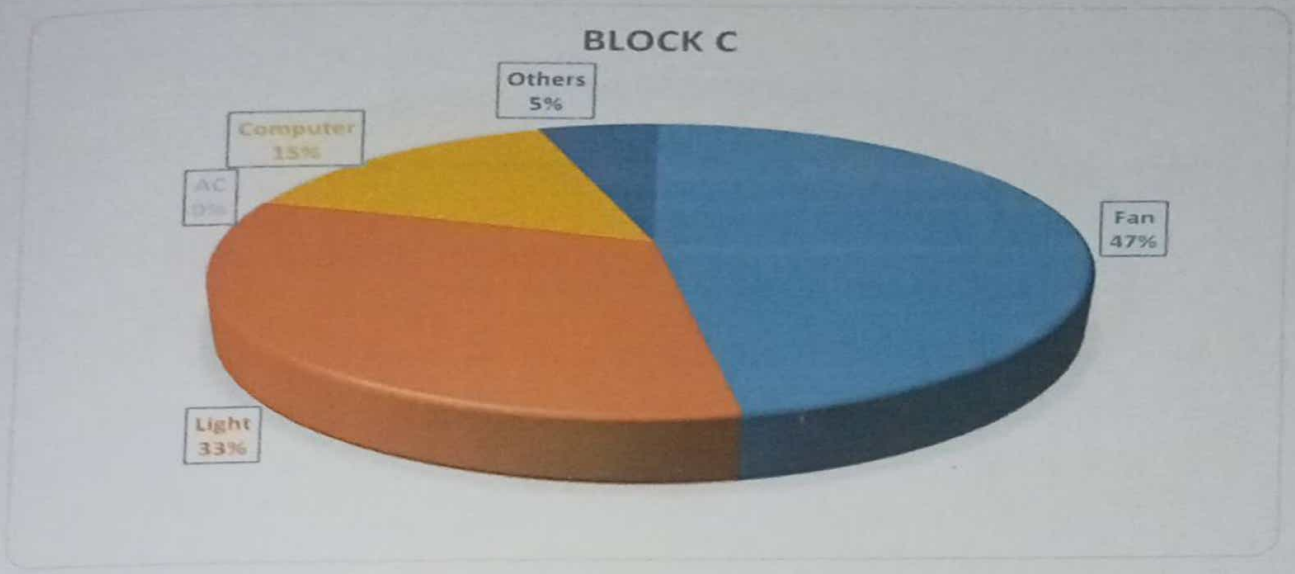


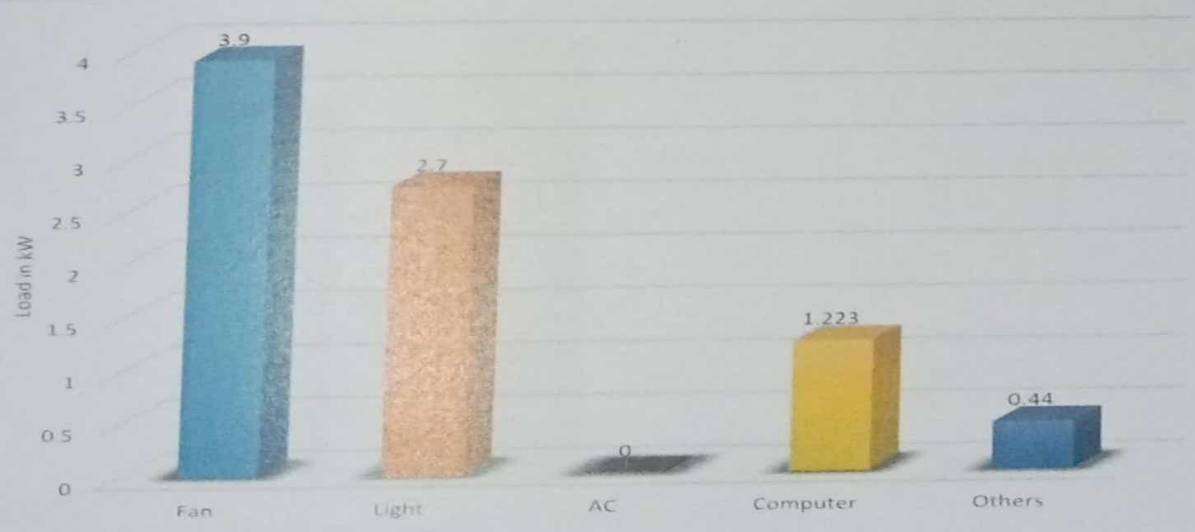
2.4 Connected load distribution for Block A



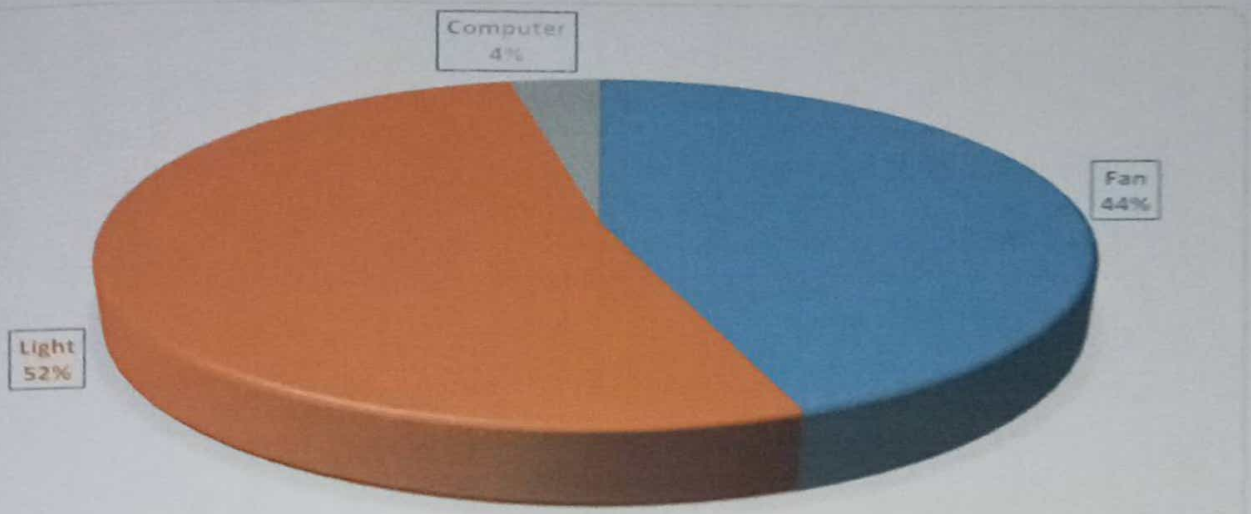
2.5 Connected load distribution for Block B

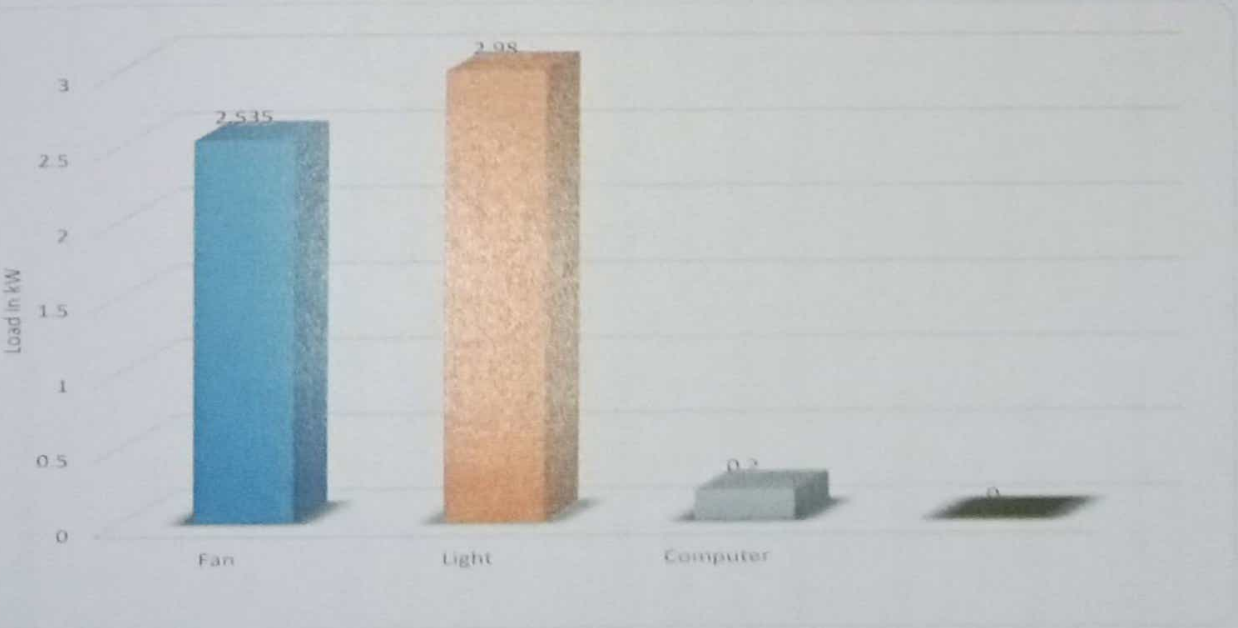
2.6 Connected load distribution for Block C





2.7 Connected load distribution for Hostel Block





3.0 ENERGY CONSERVATION RECOMMENDATIONS

3.1 Summary of Recommendations

Sl. No.	Topic	Descriptions	Investment(Rs.)	Return on Investment	Page No.
1.	Replacing the older electrical choke tube lights to a LED tube lights	• Replacement of Single Electrical Choke tube lights with LED Tube light (Savings= 25.8 Units per Day) • LED tube lights are up to 60% more efficient	19350/-	3 months	13
2.	Replacement of older fans with BLDC Older fans can be given as **donation to govt. schools**.	There are around 168 fans in the campus. BLDC fans are up to 50% more efficient • Replacement of older fans with super fan (Savings= 59.85 Units per Day)	378000/-	26 Months	14
3.	Power Quality Analysis	Proposed to conduct detailed audit with power quality analyzer.			
4.	Indoor air quality audit	Measure Room temperature, LUx level, RH and CO_2 levels.			
5.	Install solar water heaters	Proposed to install solar water heaters.			

4.0 ENERGY CONSERVATION PROPOSALS

The following table describes the total number of electrical components used in the Don Bosco Arts and Science College campus, Keela Eral.

Descriptions	Rated power (W)	Quantity	Power Consumption (kW)
Fan	65	168	10.92
T8	30	35	1.05
FL	40	129	5.16
Pattern Type LED	20	30	0.6
LED	20	95	1.9
CFL	30	35	1.05
Split AC	2400	3	7.2
Computer	100	82	8.2
Others	100	38	3.8

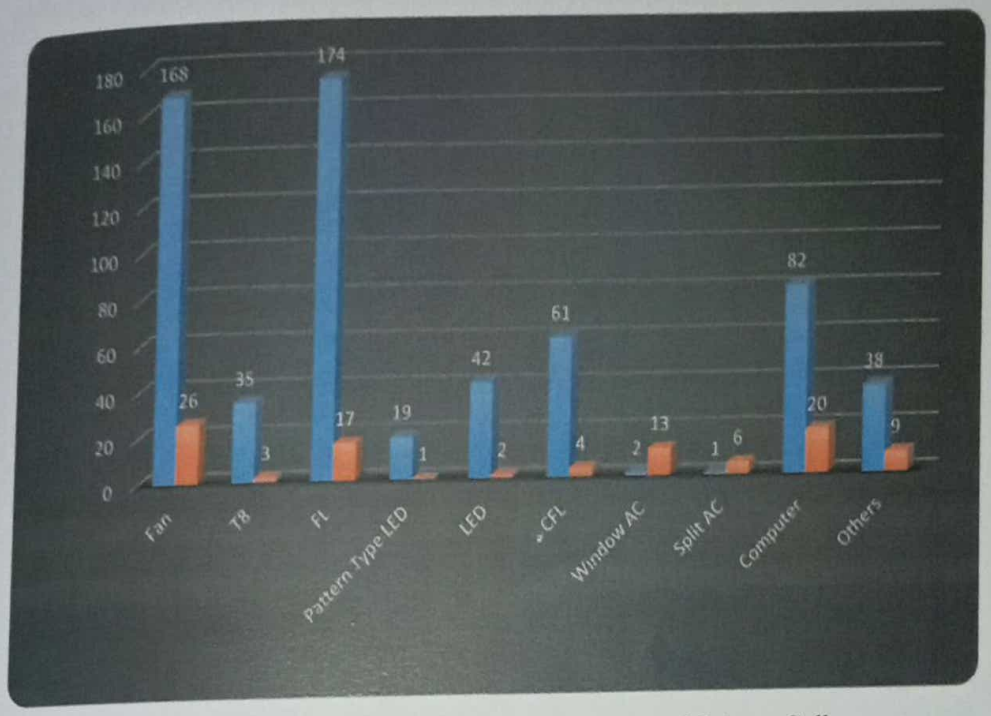


Figure: Number of Components in Don Bosco Arts and Science College.

From the above figure, it is found that the tube light is more in number (129 nos.) followed by the LED (95 nos.), CFL (35 nos.), and T8 lamp (35 nos.). A LED light consumes a 20 W whereas a tube light consumes 40 W. Which means that the tube light consumes around twice the power of the LED light.

Hence it is recommended to replace all the available tube lights with the LEDs in a phase schedule or a single replacement.

ECM 1 – Replace Older Tube lights to Energy efficient LED lights

Present Scenario		Proposed Scenario	
Total Number Tube Lights	129	Total Number of LED	129
Wattage	40W	Wattage	20W
Total hours of operation	10hrs	Total hours of operation	10hrs
Total Units consumed	51.6	Total Units consumed	25.8
Total Unit savings per day		25.8	
Electricity Cost		Rs.9/Unit	
Annual Cost savings		Rs.84753/-	
Initial Investment (Rs.150/LED lamp)		Rs.19350/-	
Payback period		**3 months**	

ECM 2- Replace Older fans to BLDC

Present Scenario		**Proposed Scenario**	
Total Number Fans	168	Total Number of Super Fans	168
Wattage	70W	Wattage	35W
Total hours of operation	10hrs	Total hours of operation	10hrs
Total Units consumed	117.6	Total Units consumed	57.75
Total Unit savings per day		59.85	
Electricity Cost		Rs.9/Unit	
Annual Cost savings		Rs.174762/-	
Initial Investment(Rs.2250/Super Fan)		Rs.378000/-	
Payback period		**26 months**	

Don Bosco College of Arts and Science
A Christian Minority, Self-financing College, Affiliated to Manonmaniam Sundaranar University, Tirunelveli
Keela Eral, Ettayapuram TK, Thoothukudi DT, Tamilnadu - 628 908
04632-290768 97904 02888 principal@dbcas.edu.in https://dbcas.edu.in

Declaration

I hereby declare that the details and information given above are complete and true to the best of my knowledge and conviction.

PRINCIPAL
DON BOSCO COLLEGE OF ARTS & SCIENCE
KEELA ERAL, Thoothukudi Dist.
Tamilnadu, India-628 908.

Don Bosco College of Arts & Science
Keela Eral
Tuticorin Dist.