ENERGY AUDIT

(2020-21)

VIDYASAGAR UNIVERSITY, MIDNAPORE, WEST BENGAL

CONSULTRAIN MANAGEMENT SERVICES,
LAKE ROAD, KOLKATA

TROPICAL INSTITUTE OF EARTH& ENVIRONMENTAL RESEARCH (TIEER),
MIDNAPORE

CONSULTRAIN MANAGEMENT SERVICES
LAKE ROAD, KOLKATA

TROPICAL INSTITUTE OF EARTH AND ENVIRONMENTAL RESEARCH (TIEER)
Reg. No.S/1L/42578 of 2006-07
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Energy Audit Certificate

Academic Year: 2020 -2021

This is to certify that Vidyasagar University, Midnapore, West Bengal has good and healthy eco-friendly environment created for saving Earth and Nature. Tropical Institute of Earth and Environmental Research associated with Consultrain Management Service are satisfied after successful completion of green and environmental audit with moral support of Honorable Vice Chancellor, IQAC Team, Staff and Students for academic year 2020-2021. This efforts taken by Faculty and Students towards environment and sustainable are highly appreciable and commendable.

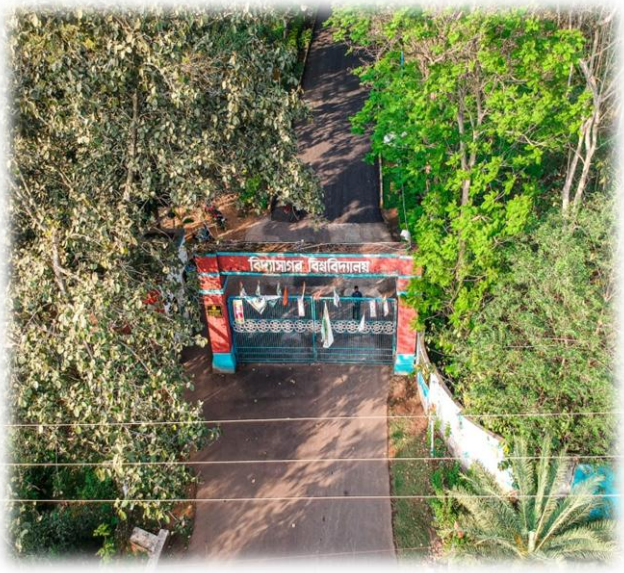
(Dr. Binoy Chanda)	(Dr. Pranab Sahoo)	(Mrs. Sanchita Bhattachariya)	(Mr. Ananda Kr. Das)
President, TIEER	Secretary, TIEER	Chief Executive Officer, CMS	Expert & Member, TIEER

Date:- 18/03/2021

LIST OF EXPERTS AND SCIENTISTS

SL.No.	NAME	DESIGNATION	AREA IN INTEREST
1.	Dr. Binoy Kr. Chanda	President, TIEER & Former IC, VU	Environment Science & Climatology
2.	Dr. PranabSahoo	Secretary, TIEER & Assistant Professor and HOD, Dept of Geography, S.B. Mahavidyalaya, Kapgari	Climate Change and Environment Management and Biogeography
3.	Mrs. Sanchita Bhattachariya	Chief executive officer, Consultrain Management services, Kolkata	Environment management
4.	Dr. SK MafizulHaque	Assistant Professor in Geography, CU	Climate Change and Environment Management and RS-GIS Techniques
5.	Prof. Koushik Chatterjee	Assistant Professor , Dept of Commerce & Management , Sent Xavier's College, Kol	Management service
6.	Sri Amal Sasmal	Consultant, EIA and EMS	Environmental management
7.	Dr. Chandan Karan	Faculty, Dept. of Geography, S.B. Mahavidyalaya, Kapgari	Land use Survey, Technician for Lab test. and Map Designer
8.	Dr. Suvendu Ghosh	Assistant Teacher in Geography	Soil Management and Environment Management
9.	Sri Ananda Das	Assistant Teacher in Physics	Solid state Physics and Mechanical & Electrical low cost model
10.	Sri Achiransu Sengupta	Electrical Engineer	Machine & Power system
11.	Sarat Chatterjee	Surveyor	Air quality and carbon footprint measurement

Arial view of the Vidyasagar University campus



Meeting between member of IQAC Cell, VU and Auditing Authority

CONTENTS :

CHAPTER-1

1.0 INTRODUCTION

Energy Audit is a process of systematic, documented, periodic and objective evaluation of components of Energy sources with the aim of safeguarding the environment and natural resources in its operations. The process starts with systematic identification, quantification, recording, reporting and analysis of components ofEnergy sources inthe university. Energy auditing is a means of assessing environmental performance (Welford, 2002). It is assystematic, documented, periodic, and objective review by regulated entities of facility operations and practices related to meeting environmental requirements (EPA, 2003).

1.2 Objectives of energy auditing:

The objectives of Energy Auditing are to assess a resource and fossil fuel utilization aids effective learning and provides a learning Resource management.

- To study of interrelationship between beneficiary and environment in the University campus
- To Establish to provide basis for improved sustainability
- To Recognize the cost saving methods through energy minimizing and managing
- To Financial savings through a reduction in resource use
- To Develop of ownership, personal and social responsibility for the University and its environment and resource

1.3 Advantages of Energy Audit:

- To develop to more efficient resource management
- To provide basis for improved sustainability
- To create a GHG free campus

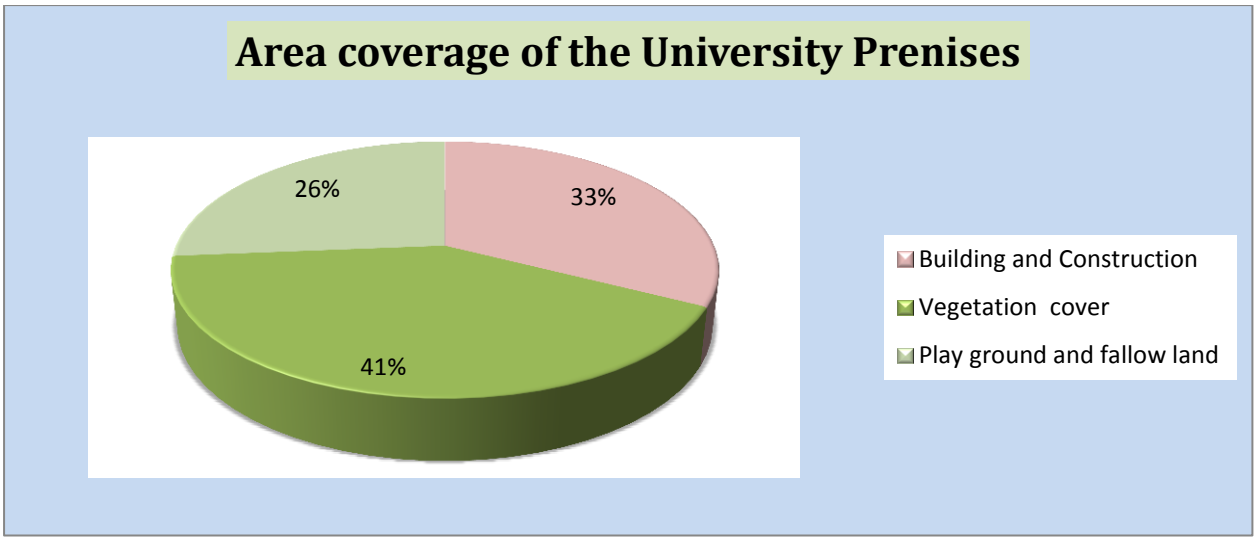
Campus Area and Infrastructure

Total area of the university campus – 138.78 acres,
Main campus – 103.74 acres,
Residential campus - 35.04 acres.

MAIN CAMPUS CONSISTING	RESIDENTIAL CAMPUSCONSISTING
Administrative building	Vice Chancellor Bungalow
DDE Building with Guest House	V.I.P Guest House
Science building	Student Amenities Center
Humanities Building	P.G Girls Hostel (2 Blocks)
Silver Jubilee Building	Teacher & Officers Hostel (2 Blocks)
Central Library	Teacher Quarter (2 Blocks)
P.G Boys Hostel(2- Blocks)	Non Teaching Staff Quarter (2 Blocks)
Non-teaching Staff hostel (2 Blocks)	
Women Infrastructure	
Sports complex with Pavilion	
Tribal cultural Building	
Electrical Sub Station	
Over Head Water Reservoir with deep tube well (4 Nos) & Pump House	

Table 1. Area Coverage of the University Campus:

Area Coverage of University Premises:	Area in Percentage
Building and Construction	32.5
Vegetation Cover	41.2
Playground and fallow land	26.3



Academic Department and Research Centre

Academic Departments		Research Centre
Bengali	**Anthropology**	**Centre for Environmental Studies (CES**
Business Administration	**Applied Mathematics with Oceanology and Computer Programming**	**Centre for Life Sciences**
Commerce with Farm Management	**Aquaculture management & Technology**	**Gandhian Studies Centre**
Economics with Rural Development	**Bio-Medical Laboratory Science & Management**	**Women's Studies Centre**
English	**Botany and Forestry**	**Centre for Adivasi Studies and Museum**
Hindi	**Chemistry& Chemical Technology**	
History	**Computer Science**	
Library and Information Science	**Electronics**	
Philosophy& Life world	**Geography& Environment Management**	
Political Science with Rural Administration	**Human Physiology with Community Health**	
Sanskrit	**Microbiology**	
Santali	**Physics &Technophysics**	
Sociology	**Remote Sensing and GIS**	
	Zoology	

Meeting with IQAC Team

CHAPTER – 2

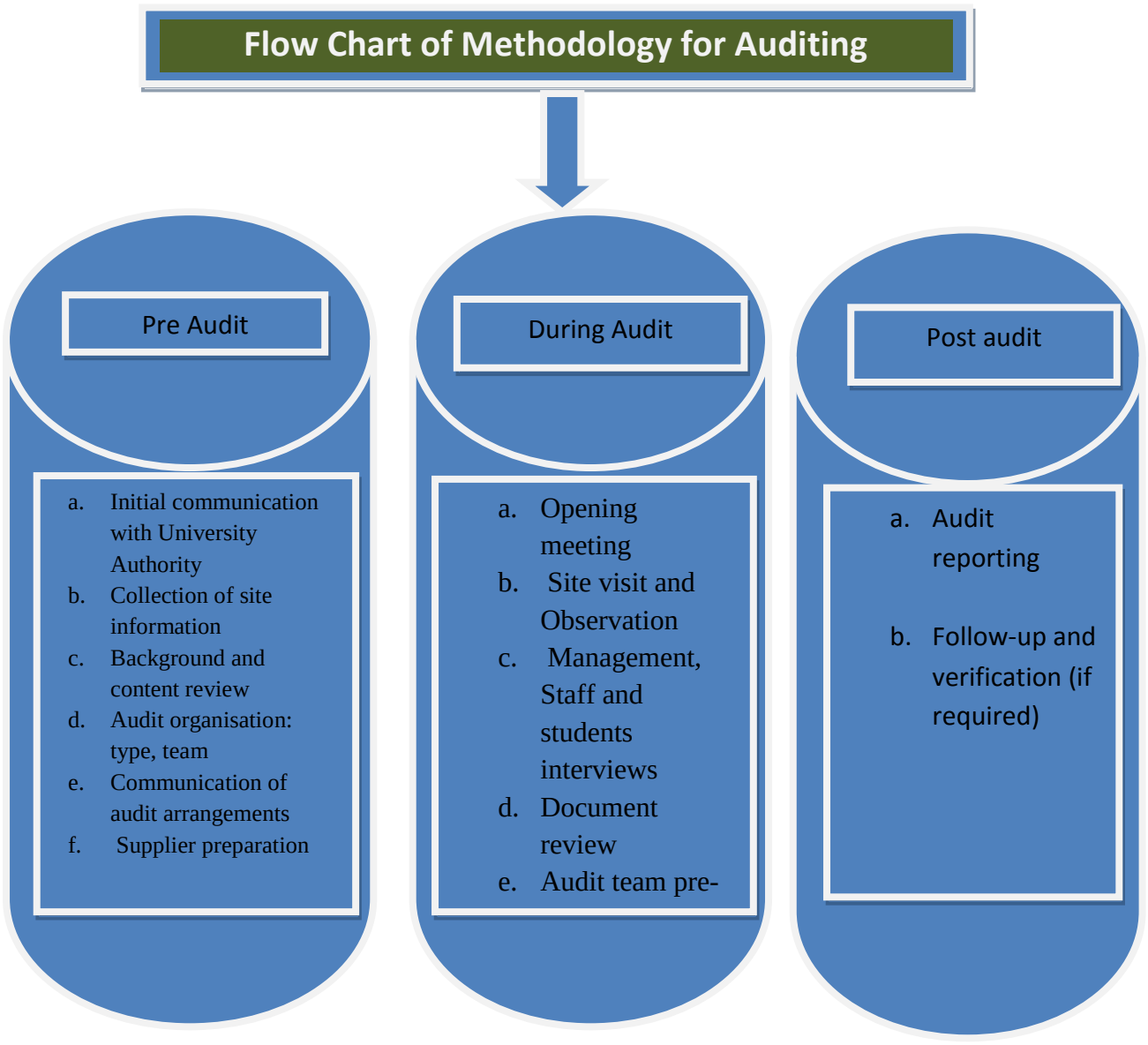
Source of NCE Energy

Collection of Various Electrical Data

Observation of Conventional Electric panel

Methodology and Survey Schedules

The methodology is adopted for this Assessment by collecting the information by Onsite visit, group discussion, Campus survey, Enquiry, Observation, Perception study and opinion also included in the Auditing Report.



The Audit team started the audit at the University Campus on 16th Sep, 2020

SL.NO	PURPOSE	DATE	REMARKS
1.	Communication with university authority	24th August,2020	Discuss about term and condition
2.	Opening Meeting	6th Sep,2020	Submitted the survey schedule
3.	Collection information about the University	16th Sep,2020	Introduced to Administrative Officer
4.	Campus visit and observation	27th Sep,2020	Outdoor observation with Drown camera& Photo camera
5.	Campus enquiry	19th Nov, 2020	Physically enquiry with expert
6.	Departments visit and enquiry	23th Nov.,2020	Laboratory enquiry
7.	Interview with other stake holder	3rd Dec.,2020	Meet with others stake holder
8.	Interview with staff	13th Dec..2020	Collected different information
9.	Review data and Assessment	16th Dec. 2020 -15th January. 2021	Data generate and drown figures
10	Pre Closing meeting	7th February, 2021	Meeting with IQAC
11.	Closing Meeting	25th February, 2021	Pre-submission of the Report
12.	Submit audit report	18th March,2021	Submit of the Report

Site Visit :

a. University and its premises were visited and analyzed by the audit-team.
b. All Departments, office rooms, Hostels, DDE Building, Guest House, Staff Quarter and parking grounds were also visited to collect data.
c. Number and type of vehicles used by the stakeholders were counted and fuel consumption for each vehicle was verified with the user.
d. Number of LPG cylinders used in labs, canteen and hostel kitchen were also counted.

Interview with staff and other stakeholder (Canteen manager)

Observation in Chemistry Lab.

Survey Form for data collection

1. List ways that you use energy in your university. (Electricity, electric stove, kettle, microwave, LPG, firewood, Petrol, diesel and others).
2. Electricity bill amount for the last three year
3. Amount paid for LPG cylinders for last one year
4. Also mention the amount spent for petrol/diesel/ others for generators?
5. Are there any energy saving methods employed in your university? If yes, please specify. If no, suggest some.
6. How much money does your university spend on energy such as electricity, gas, etc. in a month.
7. How many CFL bulbs has your university installed? Mention use (Hours used/day for how many days in a month)
8. Energy used by each bulb per month? (for example- 60 watt bulb x 4 hours x number of bulbs = kwh).
9. How many LED bulbs are used in your university ? Mention the use (Hours used/day for how many days in a month)
10. Energy used by each bulb per month? (kwh).
11. How many incandescent (tungsten) bulbs have your university installed?
12. Mentions use (Hours used/day for how many days in a month)
13. Energy used by each bulb per month? (kwh).
14. How many fans are installed in your university ? Mention use (Hours used/day for how many days in a month)
15. Energy used by each fan per month? (kwh)
16. How many air conditioners are installed in your university? Mention use (Hours used/day, for how many day in a month)
17. Energy used by each air conditioner per month? (kwh).
18. How much electrical equipment including weighing balance are installed your university?
19. Mention the use (Hours used/day for how many days in a month)
20. Energy used by each electrical equipment per month? (kwh).

21. How many computers are there in your university? Mention the use (Hours used/day for how many days in a month)
22. Energy used by each computer per month? (kwh)
23. How many photocopiers are installed by your university? Mention use (Hours used/day for how many days in a month).
24. How many cooling apparatuses are in installed in your university? Mention use(Hours used day for how many days in a month)
25. Energy used by each cooling apparatus per month? (kwh)Mention use (Hours used/day for how many days in a month)
26. Energy used by each photocopier per month? (kwh) Mention the use(l¯lours used/day for how many days in a rnonth)how many inverters your university installed? Mentions use (Hours used/day for how many days in a month)
27. Energy used by each inverter per month? (kwh)
28. How many electrical equipment are used in different labs of your university? Mention the use (Hours used/day for how many days in a month)
29. Energy used by each equipment per month? (kwh)
30. How many heaters are used in the canteen of your university? Mention the use (hours used per day for how many days in a month)
31. Energy used by each TV per month? (kwh)
32. Any other item that uses energy (Please write the energy used per month) Mention the use (Hours used per day for how many days in a month)
33. Are any alternative energy sources/nonconventional energy sources employed / installed in your university? (photovoltaic cells for solar energy, windmill, energy efficient stoves, etc.,) Specify.
34. Do you run ¯switch off drills at university?
35. Are your computers and other equipment put on power-saving mode?
36. Does your machinery (TV, AC, Computer, weighing balance, printers, etc.)run on standby mode most of the time? If yes, how many hours?
37. What are the energy conservation methods adapted by your university?
38. How many boards displayed for saving energy awareness?

Chapter 3.0 : AUDIT STAGE

3.1 Campus Survey and Enquiry

The Audit covered the following major areas:

1. Sources of Energy
2. Consumption of Energy
3. Cost of Energy
4. Measurement of Emission of GHG_S
5. Energy Efficiency and Energy Management

3.2 Grouping and Strategy

The following groups were formed with specific target areas and end users assigned.
Group 1: Lighting and fans in Main building, Library and staff canteen
Group 2: Lighting and fans in Departments (all departments, offices, class rooms and labs)
Group 3: Lighting common area – Covering Street lights, corridors, grounds
Group 4: Lighting and fans in boys Hostels
Group 5: Lighting and fans in Girls Hostels and Staff Quarters
Group 6: Total energy audit of DDE Building and Guest house
Group 7: Energy use in Dulung Canteen and Guest canteen
Group 8: Total room air conditioners in Administrative building, departments and labs.
Group 9: Total Energy audit of Central library and Computer Lab.
Group 10: Enquiry of total energy cost from Power Office
Group 11: Water Pumps in the entire campus
Group 12: Benchmarking of electricity consumption

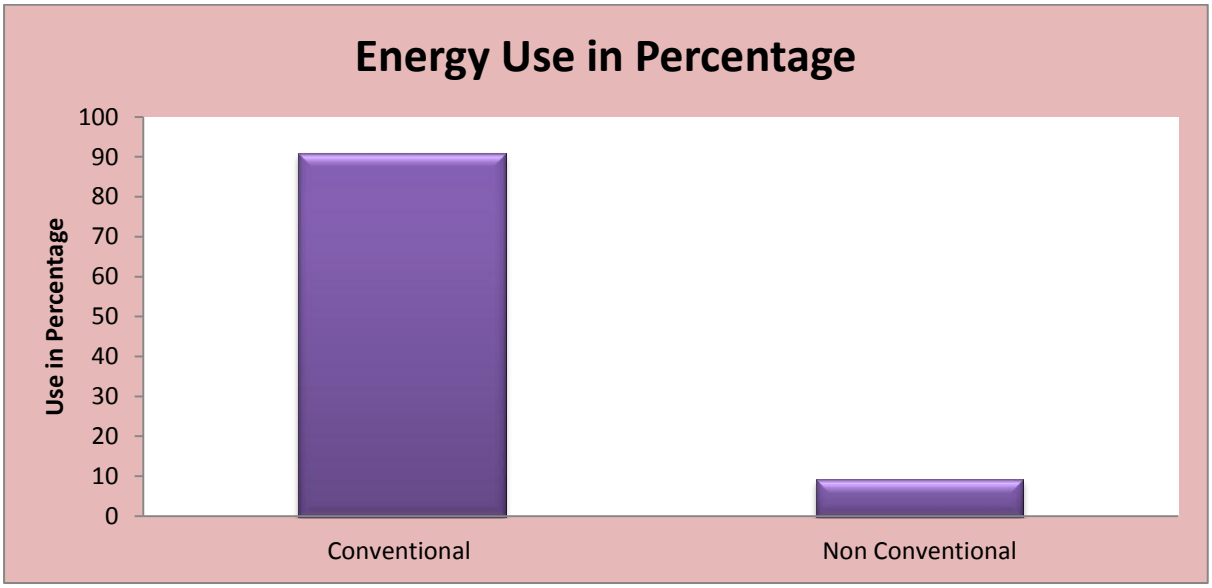
3.3 Source of Energy:

By the enquiry, that the useable energy is Conventional and Non-Conventional energy. The uses energy is 1185930 Unit, Rs.-11562817/- Per Year, Conventional energy-1080705Unit
Nonconventional energy-105225 Unit Less-Rs.1025944/ /. Only 9.2% uses Energy is Non-conventional energy which is Solar Power. About 2500sq ft area is cover by the solar plate. The Maximum energy is consumption to Light & Fan purpose which amount about 55.0 % from total consumption.

Use of Non- Conventional energy

Table2. Source of Energy in Percentage:

Source of energy	In Percentage
Conventional	90.8
Non -Conventional	9.2



3.4	Energy Consumption

POWER CONSUMPTION (kWh) OF PARTICULARS:

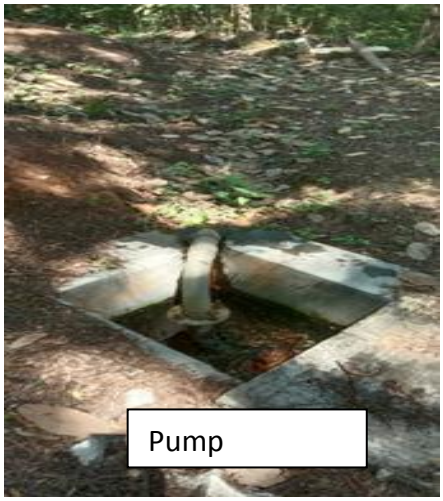
Sl.no	Particulars	Power consumption per hour
1.	Air Conditionar	1.5kw
2.	Computer	300w
3.	Xerox Machine/Network printer	500w
4.	Inkjet printer	50w
5.	Dot matrix printer	50w
6.	Tube light	40w +20w
7.	Fans	50w
8.	LCD Projector	500w
9.	Water Coolar	200w
10	Chimni for cooking	850w
11	Spot light(CFL)	25w
12	Electric ketle	850w
13	Refregerator	500w
14	Water pump	1kw

Table 3. **Energy Consumption of different items (Kwh/day)**

Electrical Items	Numbers	Use of energy(Kwh/day)
Computers	820	246
Printers	160	13
Fans	2010	80.4
Exhaust fans	30	1.2
Tubes(Fluorescent)	3500	112
Tubes(LED)	3000	48.0
LCD Projectors	85	85
Refrigerators	38	152
Water Cooler	55	55
Xerox Machines	16	24
AC	370	166.5
Electric Kettle	60	25.5
Sodium Vapor Lamp	02	3.6
CC TVs	32	38.4
Pumps	07	14
LED Bulbs(Streetlight)	1400	8.40
Streetlight-Sodium Vapor	1600	2880

3.5Energy Cost:

- Electricity Consumption -1185930 Unit, Rs.-11562817/- Per Year
  a) Conventional energy-1080705Unit
  b) Nonconventional energy-105225 Unit Less-Rs.1025944/ .Rs. for Paid-Rs.-10536873/
- Fossil fuel consumption this Year:
  a. Number of Gas cylinders used for cooking purpose(Hostels& Canteen) – 420PC
  b. Number of Gas cylinders used in Chemistry Laboratory - 2PC
  c. Diesel used for green Generater-1250 liter



Pump

Source of Others energy

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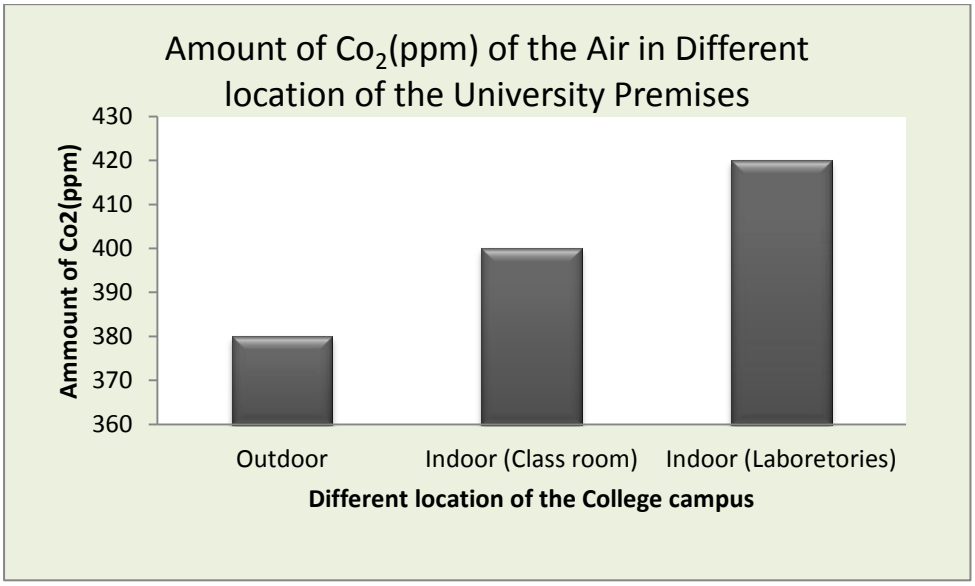
3.6 Emission of GHGs:

Table .3 Amount of CO_2 (ppm) in different places :

Amount of CO_2 (ppm) in the Air in Different places of the University Premises	Amount of CO_2 (ppm)
Outdoor	380
Indoor (Class room)	400
Indoor (Laboratories)	420



CHAPTER : 4.0 POST AUDIT STAGE

4.1 Data analysis and Assessment

Sl. No.	Object and Parameter	Observation and Finding
1	Source of energy (conventional)	90.8%
2	Source of energy (Non-conventional)	Solar-9.2%
3	Total consumption of Electric Power	1185930 unit
4	The maximum use of Electric Power	Conventional - 92%
5	Maximum energy consumption in the purpose	Light and fans - 516462 unit AC- 193673 unit
6	Energy Consumption in Computer & Lab.	387347 unit
7	No. of LPG Gas cylinder for coking purpose	420
8	No. of LPG Gas cylinder used in Laboratories	2
9	Amount of diesel used for green generator	1250 liter
10	No. of Computers and use of energy	820 (246 Kwh/Day)
11	No. of AC and use of energy	370(166.5 Kwh/Day)
12	No. of Street sodium vapor light	1600(2880Kwh/Day)

4.2 Results and Findings

Power Consumption in different sectors:

Sl.no	Sectors and purpose	Power consumption(kWh /day)	Power consumption(%)/day
1.	Science Department	177.89 kWh	15%
2.	Humanities Department	71.16 kWh	6%
3.	Computer laboratory and library sc	106.73 kWh	9%
4.	Administrative sector	533.4kWh	45%
5.	DDE Sector	47.43 kWh	4%

6.	Commerce and management Department	35.57 kWh	3%
7.	Hostel and Quarters	83.01kWh	7%
8.	Guest House and Canteen	23.71 kWh	2%
9.	Pump and water lifting	11.85kWh	1%
10.	Others	94.87 kWh	8%

4.3. Energy Cost:

❖Electricity Consumption -1185930 Unit, Rs.-11562817/- Per Year

c) Conventional energy-1080705Unit

d) Nonconventional energy-105225 Unit Less-Rs.1025944/ .Rs. for Paid-Rs.-10536873/

❖ Fossil fuel consumption per Year:

d. Number of Gas cylinders used for cooking purpose(Hostels& Canteen) – 420PC

e. Number of Gas cylinders used in Chemistry Laboratory - 2PC

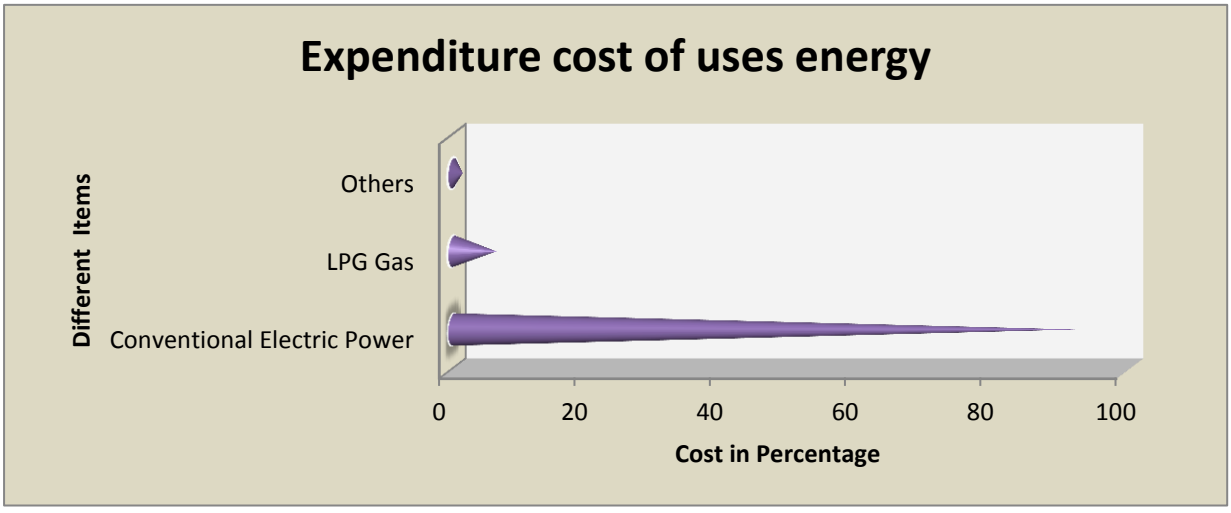
f. Diesel used for green Generater-1250 liter

❖Number of Green Generators - 4

❖Cost of generator fuel – Rs.11500 /month

Table 6. Expenditure cost of uses energy

Expenditure cost of uses energy	Cost in Percentage
Conventional Electric Power	92
LPG Gas	6.5
Others	1.5



Energy consumption in different purpose , 2020-21		
1	Lights & Fans	516462 unit

2	Air Condition	193673 unit
3	Lifting of water(HP pump)	62558unit
4	Computer & Dept. Lab	387347 unit
5	Others(CCTV,TV, water cooler & others)	129116unit

Routine of Energy save Practices

- Non Air Condition Day in a week (Wednesday),
- Non Motor vehicles Day- (Thursday),
- World Environment Day – June 5,
- Ozone Day – September 16
- Awareness seminars are organized on various environmental problems.

Major Audit Observations		
Sl. No	**Sectors/Indicators**	weightage
1	Applied of NCE	L
2	Step to LED and CFL Bulb use	M
3	Reduce of AC User	H
4	Awareness	M
5	Management of GHG_S	H

* H denote- Taken management policy level above 25%

** M denote- Taken management policy level 15%-25%

*** L denote-Taken management policy level below 15%

4.5 Energy Conservation Proposals :

Providing Energy Saver Circuit to the Air Conditioners: The energy saver circuits for the air conditioners, intelligently reduces the operating hours of the compressors either by timing or temperature difference logic without affecting the human comfort. This can save around 15% to 30% of the electricity depending on the weather conditions and temperature settings. There are total 7 split type air conditioners. It is Recommended that the old air conditioners are being replaced with new energy efficient BEE STAR labeled (3 Star and above) air conditioners in a phased manner. Considering the average compressor ON Time = 5 h/day

5. Conclusion and Recommendations

General Recommendations:

- .
- Most of the time, all the tube lights in a class room are kept **on,** even though, there is sufficient light level near the window opening.
- In such cases, the light row near the window may be kept **off**.
- All projectors to be kept OFF or in idle mode if there will be no presentation slides.
- All computers to have power saving settings to turn off monitors and hard discs, say after10 minutes/30 minutes.
- All Class Rooms and labs to have Display Messages regarding optimum use of electrical appliances in the room like lights, fans, computers and projectors.

Criteria Wise Recommendations

Energy

- ✓ Installation of more solar panels and other renewable energy sources.
- ✓ Conduct more save energy awareness programs for students and staff.
- ✓ Replace old computers and TVs with LED monitors.
- ✓ More energy efficient fans, tubes and bulb should be replaced.
- ✓ Observe a power saving day every year.
- ✓ Automatic power switch off systems may be introduced.

Acknowledgements:-

TIEER and CMS are thankful to the Honorable Vice Chancellor & Administration and the Director, IQAC of the Vidyasagar University for entrusting processes of Green and Environmental auditing with us. We thank all the participants of the auditing team especially, Administrative Officers, Assistant Engineer, HOD, faculty and non-teaching staff , students, Research Scholars also others stakeholders who took pain along with us to gather data through survey. We also thank the office staff who helped us during the document verification.