BJS
Bharatiya Jain Sanghatana

Bharatiya Jain Sanghatana's
Arts, Science & Commerce College

Bakori Phata, Pune-Nagar Highway, Wagholi, Pune - 412207

***Run by Jain Minority Institute, Affiliated to SPPU, Pune.,* ID No. PU/PN/ASC/113/1995**

NAAC Re-Accredited 'B' Grade

ENERGY AUDIT REPORT
Year-2020-21

BJS Bharatiya Jain Sanghatana's Arts, Science and Commerce College,Wagholi

Certificate

This is to certify that **Bharatiya Jain Sanghatana's Arts, Science and Commerce College, Wagholi, Pune** has conducted **"Energy Audit"** in the Year-**2020-21** to identify present profile of electrical energy consumption, energy conservation and saving opportunity for environment protection. This energy audit is also aimed to assess impact of installed various renewable energy applications.

Place: Pune

Date: 15.01.2022

Mr. Vipul S. Ghemud
Internal Auditor

B.J.S. Arts, Science & Commerce College, Wagholi, Pune-412207. ID No. PU/PN ASC/113/1995

Mr. Shivaji M. Sonawane
Chairman, Energy Audit

Dr. K S Desarda
IQAC Coordinator

Major Dr.Ashok V. Giri
PRINCIPAL
Bharatiya Jain Sanghatana's
Art, Science & Commerce College
Wagholi, Pune-412207

IQAC Coordinator
Bharatiya Jain Sanghatana's
Arts Science and Commerce College Wagholi

CONTENT

Particulars **Page No.**

Chapter V : Recommendation, Suggestions and Action Plan

Chapter VI : Result and Conclusion

Preface

An energy audit is an inspection, survey and analysis of energy flows for energy conservation in a building, process or system to reduce the amount of energy input into the system without negatively affecting the output. When the object of study is an occupied building then reducing energy consumption while maintaining or improving human comfort, health and safety are of primary concern. Beyond simply identifying the sources of energy use, an energy audit seeks to prioritize the energy uses according to the greatest to least cost effective opportunities for energy savings. Energy Audit is the key to a systematic approach for decision-making in the area of energy management. It attempts to balance the total energy inputs with its use, and serves to identify all the energy streams in a facility. It quantifies energy usage according to its discrete functions. Energy audit is an effective tool in defining and pursuing comprehensive energy management is to achieve and maintain optimum energy procurement and utilization, throughout the organization. Through this project we can prioritize the energy uses according to the greatest to least cost effective opportunities for energy savings in our college campus.

Acknowledgements

I take this opportunity to express our gratitude towards Hon. Founder President, Shri. Shantilalji Muttha, **Bharatiya Jain Sanghatana**, Pune and Chairman of College Development Committee,Hon. Mr. Arun Nahar and all Hon. Members of the College Development Committee of the college for their valuable guidance, continuous encouragement, generous gift of time with constructive critism & suggestion during entire 'Energy Audit Report-2020-21.'

I also express our deep sense of gratitude towards Hon.Mr. Suresh Salunke, WERC, Project Administrator, Principal Major Dr. Ashok Giri and IQAC Coordinator & Vice-Principal, Dr. Kishor Desarda who inspired and encouraged us throughout the work. We gratefully acknowledge the help provided by them on several occasions.

It is right time to acknowledge the support given by IQAC member Dr. S. V. Gaikwad, Dr. R. A. Gulalkari, Dr. B. Landge, Dr.Monika Jain & Mr. S. G. Shelake, who provided continuous help, inspiring resoluteness and sensible suggestion without any reservation whenever we approached throughout investigation.

I am thankful to Mr.Vipul Ghemud (Internal Auditor) for his valuable assistance in preparation of "Energy Audit Report-2020-21".

I am equally thankful to all our colleagues for their guidance during the Audit. I convey my sincere thanks to *Dr. Monika Jain* for proof reading and valuable suggestions.

Acknowledgements would be incomplete without mentioning the office superintend, Mr. S. V. Keskar and All non-teaching staff who helped in data collection.

Place: Wagholi
Date: 15.01.2022

Mr. Shivaji M. Sonawane
Chairman

CHAPTER NO-1

INTRODUCTION

1.1 Introduction

Energy crisis is one of major problem in exiting world where demand of energy is increasing rapidly. Energy is prime focus due to rapid growth and development of technology. Proper utilization of Energy is one of the major aspects of any developing country. Today the need of energy has increased greatly in order to meet the demand of ever increasing consumption of it. This energy crisis problem will be solved through Energy conservation and use of energy efficient equipment.

1.2 ABOUT INSTITUTE

BJS was established in the year 1985 since then Bharatiya Jain Sanghatana (BJS) has been in the forefront for addressing national concerns in the areas of Disaster Response, Social Development and Educational Initiatives. Having its head office in Pune, BJS is a non-political, non-profit, professionally managed Non-Governmental Organization (NGO) with a nationwide footprint working towards the benefit of all.

Over the years of its existence, BJS has practiced and perfected its approach and processes in the chosen areas of its work. It has rich and multi-dimensional experience of working at the grassroots as well as contributing to policy-level thought processes and decision making. BJS has worked with Central and many State governments and NGOs to implement many of its projects.

BJS works in progressional steps to achieve optimum and lasting impact - identifying issues, researching the needs, developing solutions based on practical experiences, implementing them sizable pilot projects to validate scalability, after analyzing the pilot results, and taking the modules countrywide roll-out and implementation.

The foundation of Bharatiya Jain Sanghatana is the Volunteers' Network that is built very meticulously since day one. BJS has a nation-wide network of volunteers actively carrying out BJS responsibilities with relentless commitment. This volunteers' network is the real strength of the organization. Having such a committed network till grass-root level serving for the social cause, BJS demonstrated the power of executing projects or many seemingly uphill tasks with speed and scale.

BJS has active volunteers' network in Maharashtra, Chhattisgarh, Madhya Pradesh, Tamil Nadu, Karnataka, Uttar Pradesh, Andhra Pradesh, Gujarat, Rajasthan, Punjab, and Haryana. At many locations across all these 11 states and at few dispersed locations in other parts of India, BJS implements Social Development programs through its specially trained volunteers.

BJS has participated in Disaster Response activities in all major disasters since 1993 major earthquake of Latur - Osmanabad in Maharashtra. There onwards, BJS worked in Jabalpur (Madhya Pradesh) earthquake – 1996, Gujarat earthquake – 2001, Akola (Maharashtra) floods – 2002, Andaman & Nicobar tsunami – 2005, Jammu & Kashmir earthquake – 2005, Bihar floods – 2008, and Maharashtra drought – 2013 & 2016.

BJS has been focused on educational rehabilitation of disaster affected children since 1993 earthquake. From Latur & Osmanabad, BJS rehabilitated 1200 students and took complete responsibility of their education from standard 5th till their graduation. BJS established a permanent facility - Wagholi Educational Rehabilitation Center (WERC) near Pune in 1997. WERC has been hosting tribal students from Melghat (Amravati) and Kosbad (Thane) of Maharashtra since 1996. Since November 2015, BJS took responsibility of rehabilitating children from suicide affected farmers' families of Maharashtra. In the academic year 2016-17, 287 tribal boys and 653 boys and girls of farmers' families were hosted at WERC for their education where all facility for their co-curricular development, sports and especially physical and mental health are provided with utmost care.

About BJS College

The BJS's College for Arts, Science and Commerce was established in 1995. B.J.S. College is a constituent Degree College affiliated to the University of Pune. It provides for the teaching of courses leading to B.A., B.Sc., B.Com., B.B.A.(CA)., B.C.A.(Sci.), M.Com. and M.Sc. degree from Savitribai Phule Pune University, Pune to give admission preferably to the students from earth quake affected area. No doubt, at present the college has 2371 students and 5000 sq. meter, four storied, airy, well equipped and well furnished, attractive building to carve the pillars of nation through higher education by inculcating basic values and making students of all-round personality.

Our Vision

"Exploring Youth Capabilities For Social Service"

Our Mission

"Persuation of Studies in Arts, Science & Commerce with vocational training based on the concept of earn-as- you learn principles and plethora of extracurricular activities to ensure all round growth"

- To provide a safe, friendly, accessible environment where all students can optimize their academic career cultural experience.
- To foster a comprehensive and enriching program of extracurricular activities required for developing global perspective
- To conduct community education programs that encourages learning at every stage of life.
- To participate in the social, cultural, environment and economic development of the communities served by the college.
- To provide Holistic education for self – reliance.
- To generate social consciousness by igniting young minds.

1.3 Objective of Energy Audit

The Energy Audit provides the vital information base for overall energy conservation program covering essentially energy utilization analysis and evaluation of energy conservation measures. It aims at:

1. Identifying the quality and cost of various energy inputs.
2. Assessing present pattern of energy consumption in different cost centers of operations.
3. Relating energy inputs and production output.
4. Identifying potential areas of thermal and electrical energy economy.
5. Highlighting wastage's in major areas.
6. Fixing of energy saving potential targets for individual cost centers.
7. Implementation of measures for energy conservation & realization of savings.
8. Identifying the quality and cost of various energy inputs.
9. Assessing present pattern of energy consumption in different cost centers of operations.
10. Relating energy inputs and production output.
11. Identifying potential areas of thermal and electrical energy economy.
12. Highlighting wastage's in major areas.
13. Fixing of energy saving potential targets for individual cost centers.
14. Implementation of measures for energy conservation & realization of savings.

The energy audit provides the vital information base for overall energy conser-vation programme covering essentially energy utilization analysis and evalua-tion of energy conservation measures.

- Energy Audit is the key to a systematic approach for decision making in the area of energy management.
- It enables breaking down the total energy consumption into all its components and helps in identifying the area where maximum savings can be achieved. It also establishes the base from which the extent of those savings can be measured.
- The primary objective of energy audit is to determine ways to reduce energy consumption per unit of product output or to lower operating costs

1.4 Need for Energy Audit

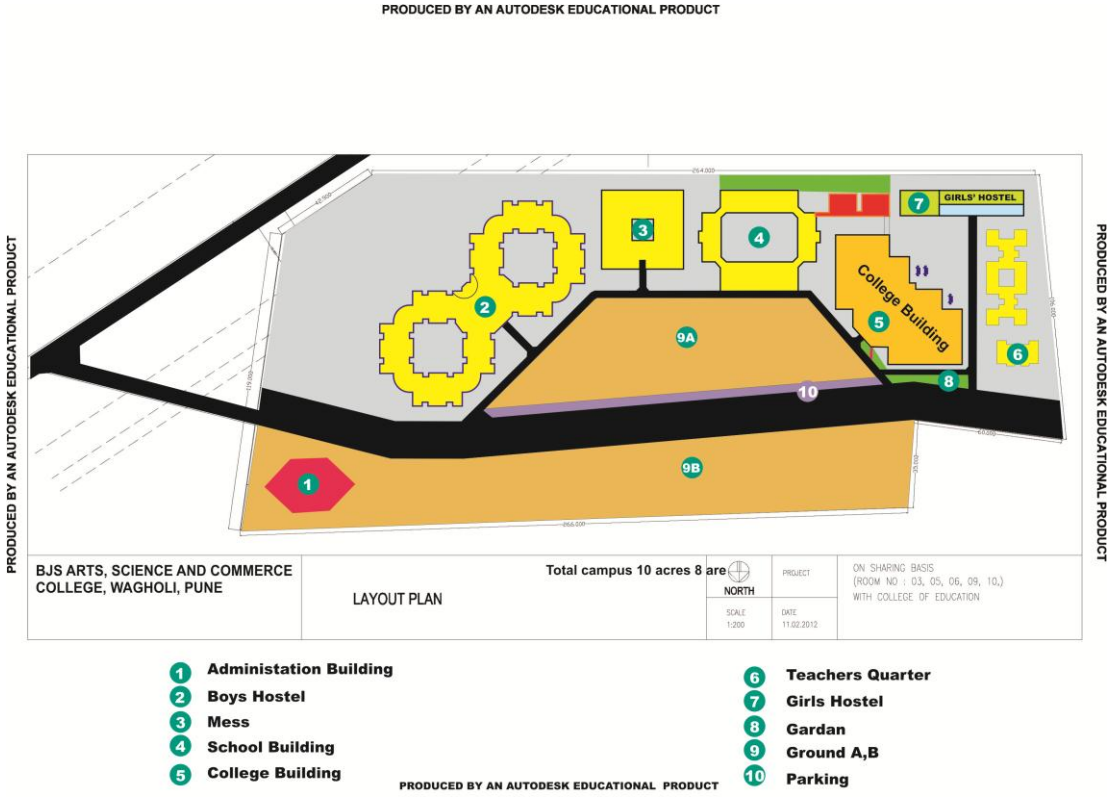
- The primary objective of Energy Audit is to determine ways to reduce energy consumption per unit of product output or to lower operating costs.
- To minimize the cost of energy
- To minimize the operational cost
- To minimize the cost for repair & reconstruction
- To increase the quality of environment that contribute to increased work productivity
- Preventive measure for energy wastage
- Maintenance and quality control programmes
- Helps to understand more about the ways energy and fuel are used in any industry.
- Help in identifying the areas where waste can occur & where scope for improvement exists.
- Positive orientation to cost reduction.
- Preventive maintenance & quality control programs
- Check the variation of energy cost.
- Reliability of energy supply
- Identify energy conservation techniques.
- Finding the feasible solution for energy wastage
- Energy auditing provide 'benchmark' for managing energy in the organization

1.5 Present Scenario of College campus

The college has three storied building on a piece of 10 acres of land. There is a beautiful garden in the front area. The college has 20 classrooms and 15 well equipped science laboratories and commerce

research lab. The college has two computer labs for BBA.CA & B. C. A. science. In addition to this Women's hostel, Gymkhana hall, Girls common room, Boys common room, BJS Gallery (Auditorium) for various function, well-furnished office, Principal's Room, Library with reading room, YCMOU center. Every head of department have separate cabin. The college has botanical garden and vermicomposting beds.

Campus map



College Physical Infrastructure Detail

Sr. No.	Particular	Dimensions	Sq.m.	No.	Total Sq.m.
	Ground Floor				
01	Principal Office	7.6 × 6.6	50.16	01	50.16
	IQAC Office	7.6 × 3.3	25.08	01	25.08
02	College Office	7.6 × 10.6	80.56	01	75.24
03	Student Facility Centre / YCMOU	7.6 × 6.6	50.16	01	50.16
04	Development Officer	7.6 × 3.3	25.08	01	25.08
05	Examination / Research Centre	7.6 × 6.6	50.16	01	50.16

	Toilet	7.6 × 3.3	25.08	01	**25.08**
06	Ladies Common Room	7.6 × 6.6	50.16	01	**50.16**
07	Library	9.07 × 7.6	96.04	01	**96.04**
08	Students Reading Room	7.6 × 6.6	81.56	05	**405.00**
09	Computer Lab	7.6 × 13.7	104.01	01	**104.00**
10	BJS Gallery	7.6 × 29.2	222	01	**122.00**
	First Floor				
11 to 15	Classrooms	7.6 × 10.6	81.00	05	**405.00**
16	Classroom	9.8 × 9.8	96.00	01	**96.00**
17	Computer Laboratory	7.6 × 10.6	81.00	01	**81.00**
18	Dark Room	7.6 × 10.6	81.00	01	**81.00**
19	English Department	7.6 × 3.3	25.08	01	**25.08**
20	Physics Laboratory	7.6 × 10.6	81.00	01	**81.00**
21	Marathi Department	7.6 × 3.3	25.08	01	**25.08**
22	Mathematics Department	7.6 × 6.6	25.08	01	**25.08**
23	Zoology Laboratory	7.6 × 14.1	107.00	01	**107.00**
	Second Floor				
24 to 28	Class Rooms	7.6 × 10.6	81.00	05	**405.00**
29	Classroom	9.8 × 9.8	96.00	01	**96.00**
30	Chemistry Laboratory 5	7.6 × 10.6	81.00	01	**81.00**
31	Hindi Department	7.6 × 3.3	25.08	01	**25.08**
32	Geography Department	7.6 × 3.3	25.08	01	**25.08**
33	Chemistry Laboratory 6	7.6 × 14-1	107.00	01	**107.00**
34	History Department	7.6 × 3.3	25.08	01	**25.08**
35	NSS/ Economics Department	7.6 × 3.3	25.08	01	**25.08**
36	Botany Laboratory	7.6 × 14.1	107.00	01	**107.00**
	Third Floor				
37 to 41	Class Rooms	7.6 × 10.6	81.00	05	**405.00**
42	Class Room	9.8 × 9.8	96.00	01	**96.00**
43	Chemistry Research Laboratory 1	7.6 × 10.6	81.00	01	**81.00**
44	Chemistry Laboratory 2	7.6 × 7.6	50.00	01	**50.00**
45	Chemistry Laboratory 3	7.6 × 14.1	107.00	01	**107.00**
46	Separation room Chemistry	7.6 × 3.3	25.08	01	**25.08**
47	Chemistry Store	7.6 × 3.3	25.08	01	**25.08**
48	Chemistry Laboratory 4	7.6 × 14.1	107.00	01	**107.00**
49	Physical Education	9.25X	38.08	01	**38.08**
50A	NSS	7.6 × 7.6	50.00	01	**50.00**
50B	NCC	7.6 × 7.6	50.00	01	**50.00**
51	Indoor Hall	19.6X12.3	241.08	01	**241.08**

CHAPTER NO-2

Energy Audit Methodology and Scope

2.1 What is Energy Audit?

Energy today has become a key factor in deciding the product cost at micro level as well as in dictating the inflation and the debt burden at the macro level. Energy cost is a significant factor in economic activity at par with factors of production like capital, land and labor. The imperatives of an energy shortage situation calls for energy conservation measure, which essentially mean using less energy for the same level of activity. Energy Audit attempts to balance the total energy inputs with its use and serves to identify all the energy streams in the systems and quantifies energy usage's according to its discrete function. Energy Audit helps in energy cost optimization, pollution control, safety aspects and suggests the methods to improve the operating & maintenance practices of the system. It is instrumental in coping with the situation of variation in energy cost availability, reliability of energy supply, decision on appropriate energy mix, decision on using improved energy conservation equipment's. Instrumentation's and technology.

2.2 Energy Audit Methodologies

A. Data Collection

Data collection is very important step in energy audit. Data collection includes,

1. Relevant data like electricity bills for the year 2014-15.

2. List of lighting load, fan, computer and air conditioner for each department.

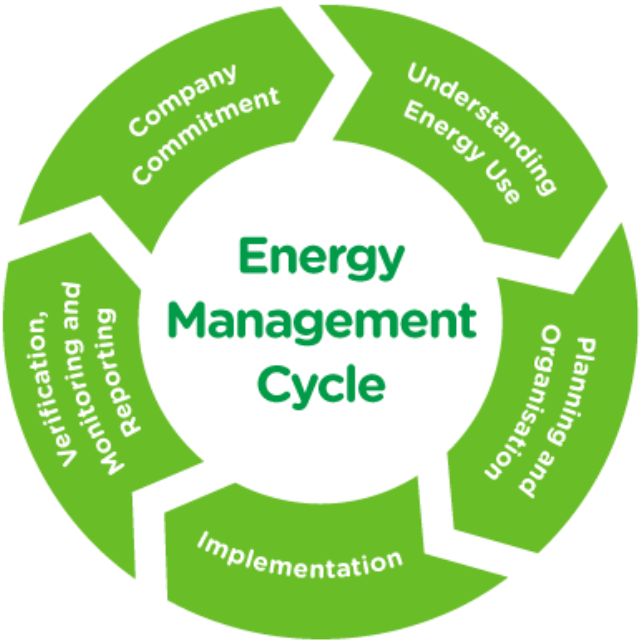
3. Voltage, Current and Power are measured at each feeder.

B. Data Analysis

Data analysis is next important step after data collection. The areas for implementation and energy conservation opportunities are identified.

C. Action Taken

Action taken involved the implementation strategies based on measurement of actual energy consumption. In this methodology different areas of energy consumption are identified.



Methodology

Board guidelines indicating the methodology for such an energy audit is given below. Possible stages for interaction/conference are also indicated.

Phase-I

1. Collections of data on operational parameters, energy consumption both normal and electrical, coal and power quality etc., through a questionnaire.
2. Study the existing plant capacities and their performance to assess plant operations.
3. Study of the specific energy consumption (both thermal and electrical) department-wise and plant as a whole.
4. Study of the power sources, distribution system and drive controls, load factor and efficiency of large motors (above 10 kW), process automations, plant illuminations etc.
5. Collection of requisite data and analysis and identification of specific areas with potential for conservation of thermal and electrical energy.
6. Field measurements of operational parameters and carrying out heat and mass balance.
7. Study of limitations, if any, in the optimal use of thermal and electrical energy.
8. Formulation of specific recommendations along with broad system concept for conservation of thermal and electrical energy.
9. Preparation of capital cost estimates and establishing techno-economic feasibility for recommended measures.

10. No investment and/or marginal investment by doing system improvements and optimization of operations.
11. Major investment due to incorporation of modern energy intensive equipment and upgradation of existing equipment.
12. Formulating tentative time schedule for implementation of the recommendation.
13. Undertaking broad cost benefit analysis in terms of savings in energy consumption per unit of production and pay-back period.

Phase-II

Follow-up with the industry on periodic basis to ascertain the level of implementation of recommendation and assist, if require, in implementation of the measures to achieve energy user efficiency.

2.3 Types of Energy Audit

A. Preliminary Energy Audit

The Preliminary Energy Audit focuses on the major energy suppliers and demands usually accounting for approximately 70% of total energy. It is essentially a preliminary data gathering and analysis effort. It uses only available data and is completed with limited diagnostic instruments. The PEA is conducted in a very short time frame i.e. 1-3 days during which the energy auditor relies on his experience together with all the relevant written, oral visual information that can lead to a quick diagnosis of the plant energy situation. The PEA focuses on the identification of obvious sources of energy wastage's. The typical out put of a PEA is a set of recommendations and immediate low cost action that can be taken up by the department head.

B. Detailed Energy Audit

The detailed audit goes beyond quantitative estimates of costs and savings. It includes engineering recommendations and well-defined project, giving due priorities. Approximately 95% of all energy is accounted for during the detailed audit. The detailed energy audit is conducted after the preliminary energy audit. Sophisticated instrumentation including flow meter, flue gas analyzer and scanner are use of compute energy efficiency.

Scope of work for detailed Energy Audit

1. Review of Electricity Bills, Contract Demand and Power Factor: For the last one year, in which possibility will be explored for further reduction of contract demand and improvement of power factor
2. Electrical System Network : Which would include detailed study of all the Transformer operations of various Ratings / Capacities, their operational pattern, Loading, No Load Losses, Power Factor Measurement on the Main Power Distribution Boards and scope for improvement if any. The study would also cover possible improvements in energy metering systems for better control and monitoring.
3. Study of Motors and Pumps Loading : Study of motors (above 10 kW) in terms of measurement of voltage (V), Current (I), Power (kW) and power factor and thereby suggesting measures for energy saving like reduction in size of motors or installation of energy saving device in the existing motors. Study of Pumps and their flow, thereby suggesting measures for energy saving like reduction in size of Motors and Pumps or installation of energy saving device in the existing motors / optimization of pumps.
4. Study of Air conditioning plant : w.r.t measurement of Specific Energy consumption i.e kW/TR of refrigeration, study of Refrigerant Compressors, Chilling Units, etc. Further, various measures would be suggested to improve its performance.
5. Cooling Tower: This would include detailed study of the operational performance of the cooling towers through measurements of temperature differential, air/water flow rate, to enable evaluate specific performance parameters like approach, effectiveness etc.
6. Performance Evaluation of Boilers: This includes detailed study of boiler efficiency, Thermal insulation survey and flue gas analysis./li>
7. Performance Evaluation of Turbines: This includes detailed study of Turbine efficiency, Waste heat recovery.
8. Performance Evaluation of Air Compressor: This includes detailed study of Air compressor system for finding its performance and specific energy consumption
9. Evaluation of Condenser performance: This includes detailed study of condenser performance and opportunities for waste heat recovery/li>
10. Performance Evaluation of Burners / Furnace : This includes detailed study on performance of Furnace / Burner, thermal insulation survey for finding its efficiency
11. Windows / Split Air Conditioners: Performance shall be evaluated as regards, their input power vis-a-vis TR capacity and performance will be compared to improve to the best in the category

12. Illumination: Study of the illumination system, LUX level in various areas, area lighting etc. and suggest measures for improvements and energy conservation opportunity wherever feasible.
13. DG Set: Study the operations of DG sets to evaluate their average cost of Power Generation, Specific Energy Generation and subsequently identify areas wherein energy savings could be achieved after analysing the operational practices etc. of the DG sets.
14. The entire recommendations would be backed up with techno-economic calculations including the estimated investments required for implementation of the suggested measures and simple payback period. Measurement would be made using appropriate instrumentation support for time lapse and continuous recording of the operational parameters.
15. Completion Period: We usually start the field data collection at site with in one and half months' time, from the date of receipt of work order and the draft energy audit report is submitted thereafter in 1 month time. Finalization of energy audit report is normally completed within 3 months. (After completion of the audit study, the findings and recommendations are discussed with the technical head and the final report with recommendations is submitted.

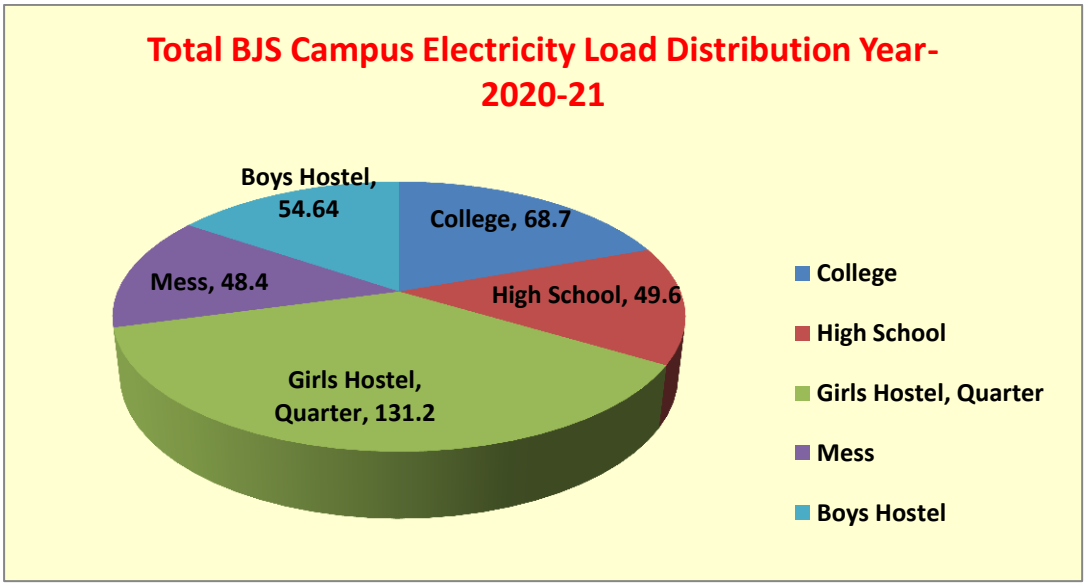
2.3 Energy Audit Instrument:

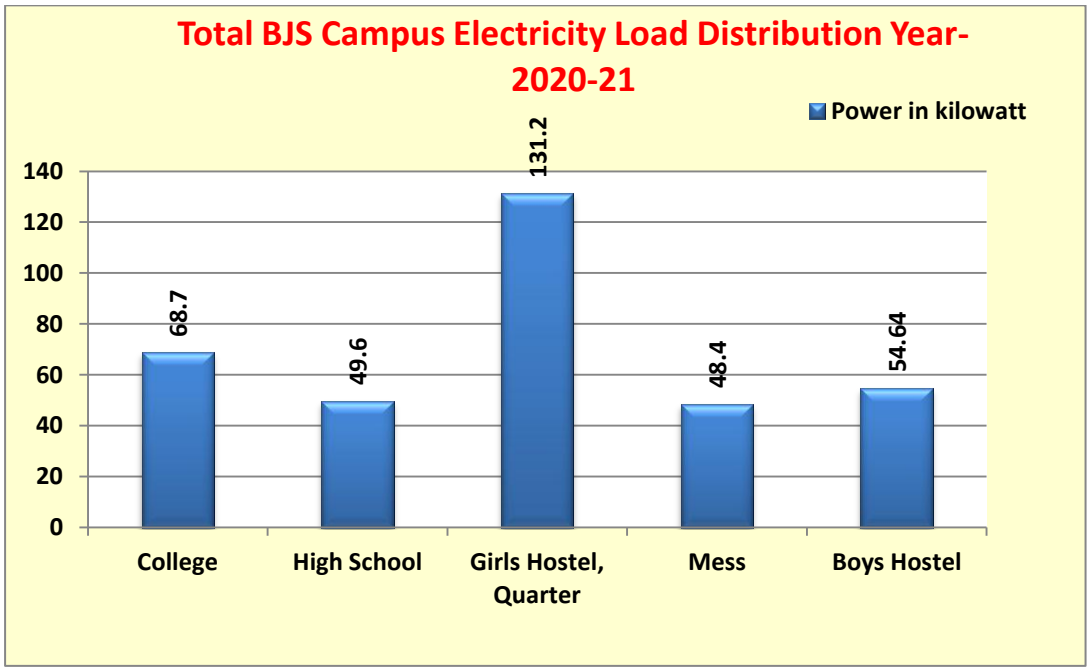
No.	Name of the Instrument	Intended Use
1	Digital Multimeter	Used for measurement of voltage. Current and resistance
2	Luxmeter	Used for measurement of illumination level.
3	Luxmeter	Used for measurement of illumination level.
4	pH meter	Used for on the spot analysis of effective acidity or alkalinity of a solution/water. Acidity /alkalinity water.
5	Temperature Indicators	Used for measuring temperatures of gases/air, liquids, slurries, semi solids, powders etc. Using different types of probes.
6	Infrared Thermometers	Used for measuring temperatures from a distance using infrared technology.

Chapter No-3

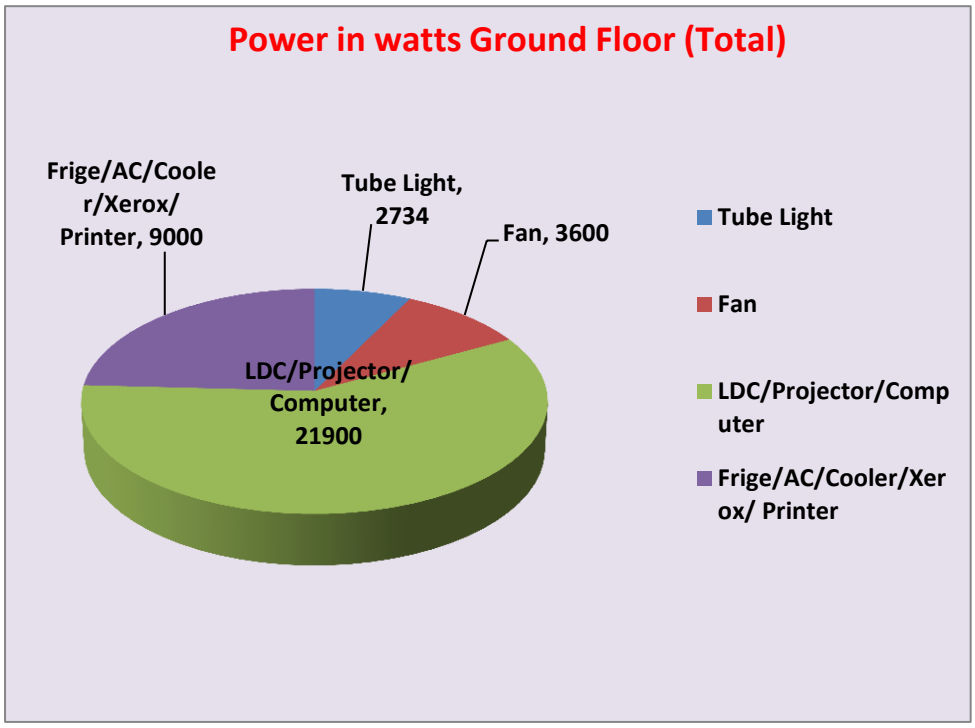
Energy Use Profile

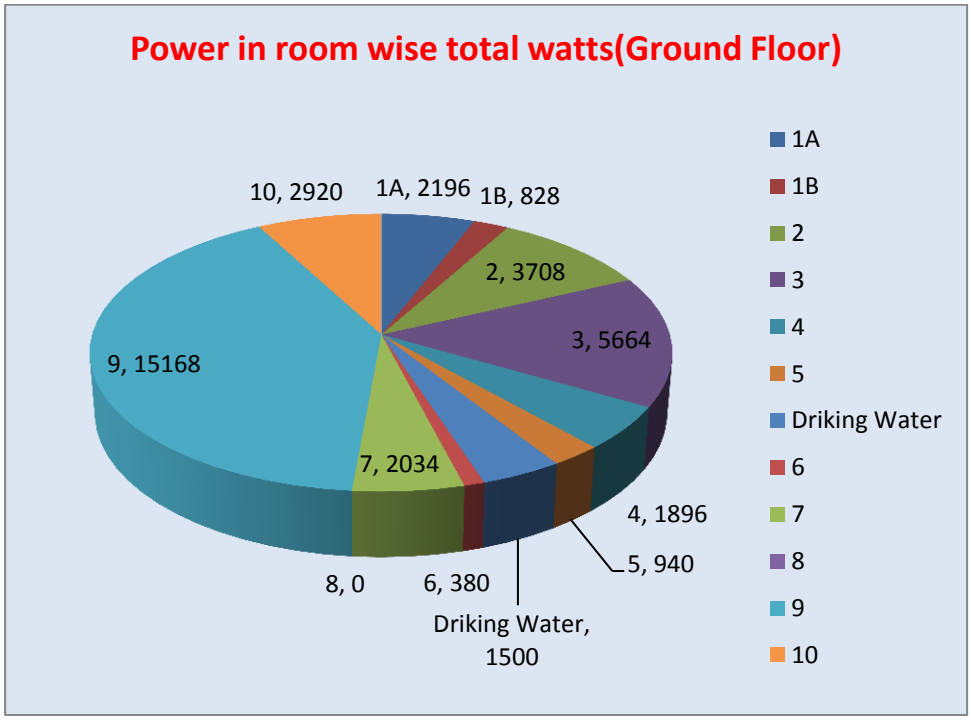
BJS ASC College Building Energy Load and Consumption Details Year-2020-21



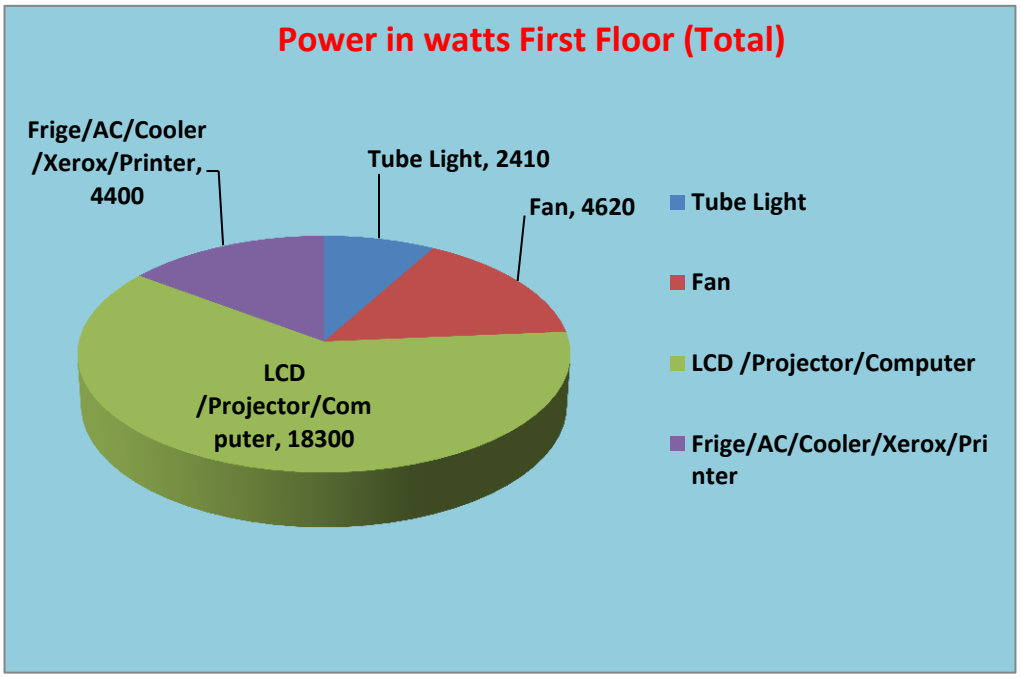


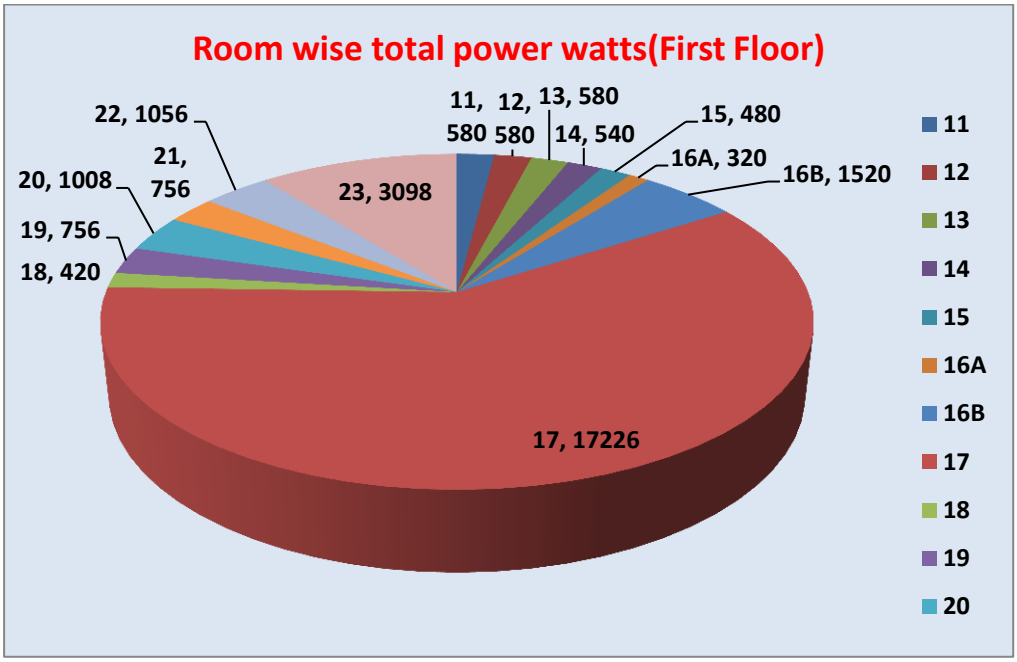
BJS ASC College Energy Audit of Building 2020-2021 (Ground floor)									
Room No.	**Total Tube Light**	**Power Watts**	**Total Fan**	**Power in Watts**	**Total LCD /Projector/Computer**	**Power in Watts**	**Other Frige/AC/Cooler/Xerox/ Printer Electrical Instruments**	**Others**	**Total Power (Watts)**
1A	6 X 36	216	3 x 60	180	2Lx 300	300	1 x 1500	1500	**2196**
1B	3 x 36	108	2 x 60	120	1L x 300, 1C x 300	600			**828**
2	6 x 18	108	10 x 60	600	8C x 300	2400	2 X 300	600	**3708**
3	8 x 18	144	2 x 60	120	8C X 300	2400	2x X 1500	3000	**5664**
4	2 X 18	36	1 X60	60	1C X 300	300	1A x 1500	1500	**1896**
5	4 X 40	160	3 x 60	180	1C X 300	300	1P X300	300	**940**
Driking Water							1 Cool X 1500	1500	**1500**
6	5 X 40	200	3 X 60	180					**380**
7	13 X 18	234	10 x 60	600	1L x 300, 3C x 300	1200			**2034**
8									**0**
9	16 X 18	288	8 X60	480	1P X300, 45C X300	13800	2 P X 300	600	**15168**
10	31 X 18	1240	18 X 60	1080	1P X 300, 1C x300	600			**2920**


Power in watts Ground Floor (Total)
Frige/AC/Cooler/Xerox/ Printer, 9000
Tube Light, 2734
Fan, 3600
LDC/Projector/ Computer, 21900
Tube Light
Fan
LDC/Projector/Computer
Frige/AC/Cooler/Xerox/ Printer

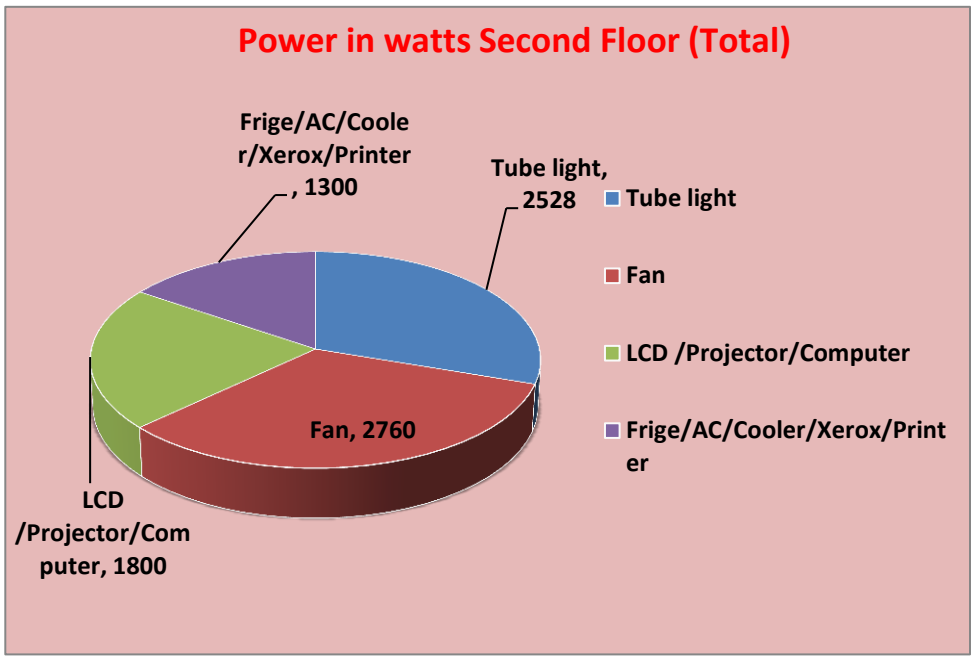

Power in room wise total watts(Ground Floor)
10, 2920
1A, 2196
1B, 828
2, 3708
3, 5664
9, 15168
7, 2034
4, 1896
5, 940
8, 0
6, 380
Driking Water, 1500
1A
1B
2
3
4
5
Driking Water
6
7
8
9
10

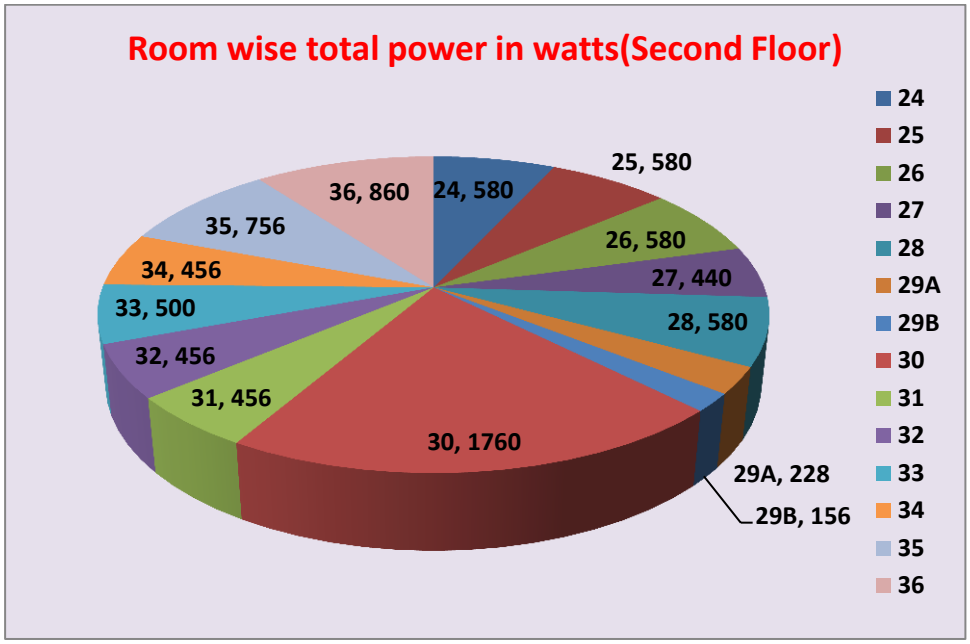
BJS ASC College Energy Audit of Building 2020-2021 (First floor)									
Room No.	**Total Tube Light**	**Power Watts**	**Total Fan**	**Power in Watts**	**Total LCD /Projector/Computer**	**Power in Watts**	**Other Frige/AC/Cooler/Xerox/Printer Electrical Instruments**	**Others**	**Total Power (Watts)**
11	7 x 40	280	5 X 60	300					**580**
12	7 x 40	280	5 X 60	300					**580**
13	7 x 40	280	5 X 60	300					**580**
14	6 x 40	240	5 X 60	300					**540**
15	6 x 40	240	4 X 60	240					**480**
16A	5 X 40	200	2 x 60	120					**320**
16B	5 X 40	200	2 x 60	120	2C x 300	600	2p x300	600	**1520**
17	7 X 18	126	6 x 300	1800	1P X 300, 49C X 300	15,000	1P X300	300	**17226**
18	6 X 40	240	3 X 60	180					**420**
19	2 X18	36	2 X 60	120	1C X 300	300	IP X 300	300	**756**
20	6X 18	108	5 X 60	300	1C X 300	300	IP X 300	300	**1008**
21	2X18	36	2 X 60	120	1C X 300	300	IP X 300	300	**756**
22	2 X 18	36	2 X 60	120	2C x 300	600	IP X 300	300	**1056**
23	8 X 18	108	5 X60	300	1P X 300, 3C X 300	1200	1FRIGE X 1	2300	**3908**


Power in watts First Floor (Total)
Frige/AC/Cooler /Xerox/Printer, 4400
Tube Light, 2410
Fan, 4620
LCD /Projector/Computer, 18300
Tube Light
Fan
LCD /Projector/Computer
Frige/AC/Cooler/Xerox/Printer


Room wise total power watts(First Floor)
11, 580
12, 580
13, 580
14, 540
15, 480
16A, 320
16B, 1520
17, 17226
18, 420
19, 756
20, 1008
21, 756
22, 1056
23, 3098
11
12
13
14
15
16A
16B
17
18
19
20

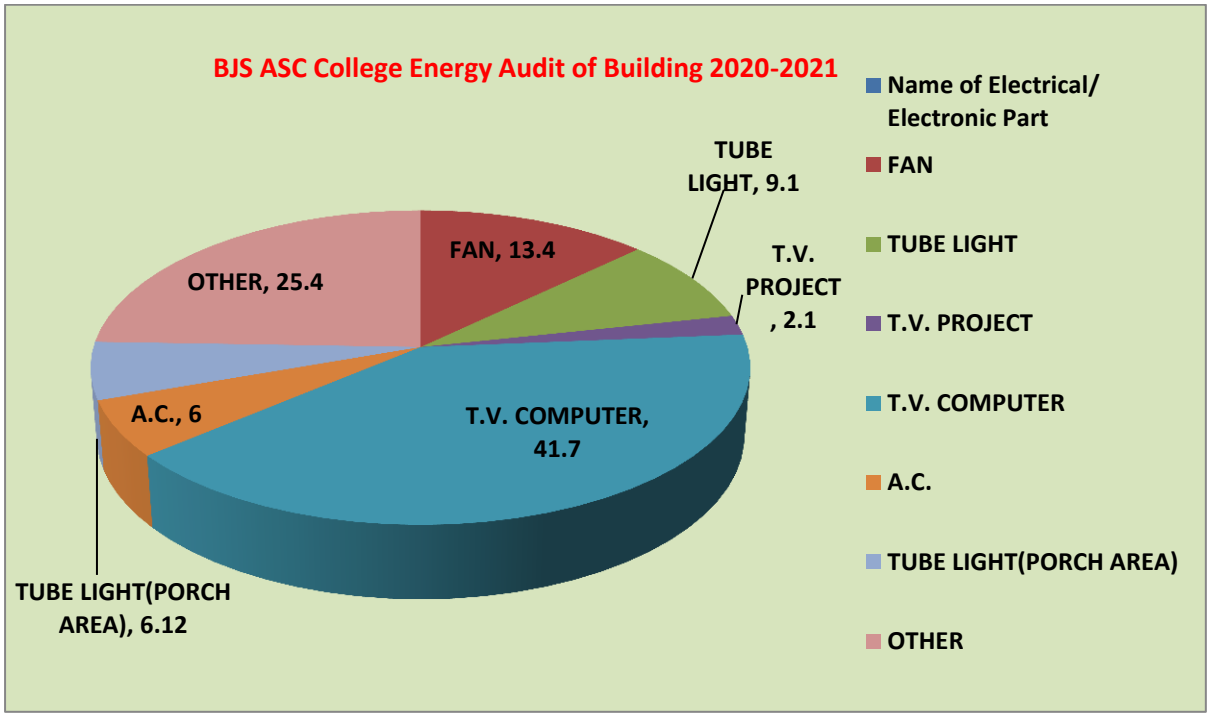
BJS ASC College Energy Audit of Building 2020-2021 (Second floor)									
Room No.	**Total Tube Light**	**Power Watts**	**Total Fan**	**Power in Watts**	**Total LCD /Projector/Computer**	**Power in Watts**	**Other Frige/AC/Cooler/Xerox/Printer Electrical Instruments**	**Others**	**Total Power (Watts)**
24	7 X 40	280	5 x 60	300					**580**
25	7 x 40	280	5 x 60	300					**580**
26	7 x 40	280	5 x 60	300					**580**
27	5 X 40	200	4 x 60	240					**440**
28	7 X 40	280	5 X 60	300					**580**
29A	6 X 18	108	2 X 60	120					**228**
29B	2 X 18	36	2 x 60	120					**156**
30	7 X 40	280	3 X 60	180	1C X 300	300	2 Oven x 500	1000	**1760**
31	2 X18	36	2 X 60	120	1C X 300	300			**456**
32	2 X18	36	2 X 60	120	1C X 300	300			**456**
33	8 X 40	320	3 X 60	180					**500**
34	2 X 18	36	2 X 60	120	1C X 300	300			**456**
35	2 X 18	36	2 X 60	120	1C X 300	300	1P X300	300	**756**
36	8 X 40	320	4 x 60	240	1C X 300	300			**860**


Power in watts Second Floor (Total)
Frige/AC/Cooler/Xerox/Printer, 1300
Tube light, 2528
Fan, 2760
LCD /Projector/Computer, 1800
Tube light
Fan
LCD /Projector/Computer
Frige/AC/Cooler/Xerox/Printer


Room wise total power in watts(Second Floor)
24, 580
25, 580
26, 580
27, 440
28, 580
29A, 228
29B, 156
30, 1760
31, 456
32, 456
33, 500
34, 456
35, 756
36, 860
24
25
26
27
28
29A
29B
30
31
32
33
34
35
36

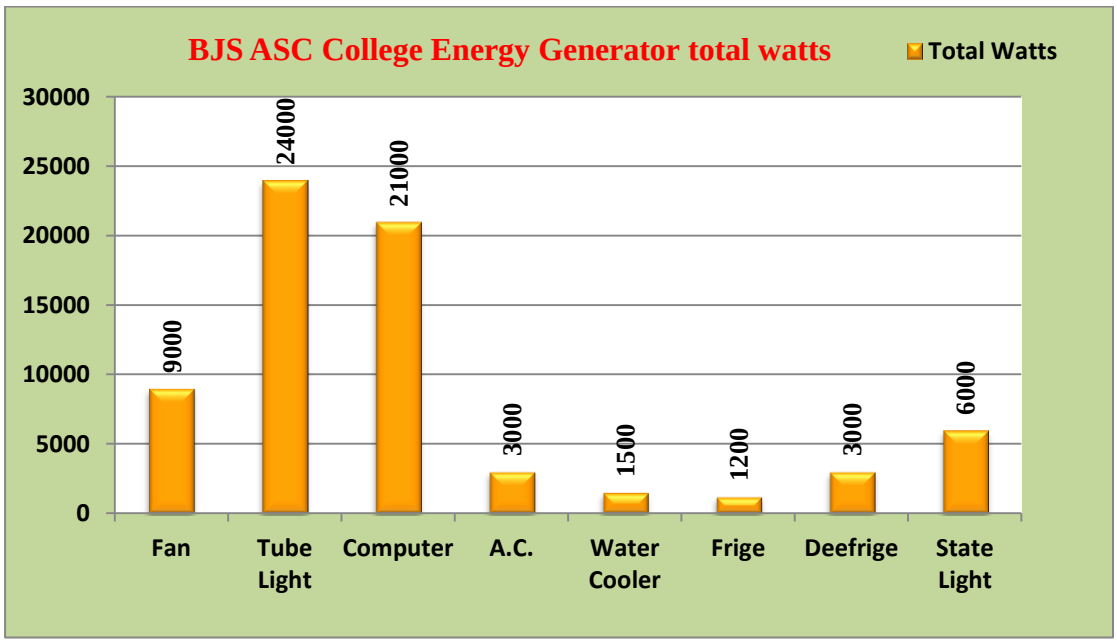
BJS ASC College Energy Audit of Building 2020-2021 (Third floor)									
Room No.	**Total Tube Light**	**Power Watts**	**Total Fan**	**Power in Watts**	**Total LCD /Projector/ Computer**	**Power in Watts**	**Other Frige/AC/Cooler/Xerox/Printer Electrical Instruments**	**Others**	**Total Power (Watts)**
37	7 X 18	126	5 x 60	300					**426**
38	7 x 40	280	5 x 60	300					**580**
39	7 x 40	280	5 x 60	300					**580**
40	7 X 18	126	4 x 60	240					**366**
41	5 X 18	90	5 X 60	300					**390**
42A	7 X 18	126	2 X 60	120					**246**
42B	3 X 18	54	2 x 60	120					**174**
43	7 X 18	126	3 X 60	180	5C X 300	1500	5 Oven x 1000, 3 Frige x500	6500	**8306**
44	6 X 40	240	2 X 60	120					**360**
45	8 X 18	144	4 X 60	240					**384**
46	2 X 18	36	2 x 60	120	1C X 300	300			**456**
47	3 X18	54	2 X60	120					**174**
48	8 X 40	240	8 X 60	240	1C X 300	300			**780**
49 OG	4 X18	72	4 X 60	240					**312**
50 NG	9 X100	900	10 X 60	600	1C X 300	300			**1800**
51 A-NSS	4 X 18	72	2 X 60	120					**192**
51 B-NCC	4 X 18	72	2 X 60	120					**192**
52 Boxing Ring	4 X 450	1800							**1800**

Sr. No.	Name of Electric/Electronic part	Total Number	Total Power Watts	Total Power (KW)
1	FAN	224	13440	13.4
2	TUBE LIGHT	325	9150	9.1
3	T.V. PROJECT	7	2100	2.1
4	T.V. COMPUTER	139	41700	41.7
5	A.C.	4	6000	6
6	TUBE LIGHT (PORCH AREA)	153	6120	61.2
7	**OTHER**			25.4
	1)FIRGE	6	9000	
	2)OVEN	8	8000	
	3) PRINTER	13	3900	
	4) XEROX	2	3000	
	5) COOLER	1	1500	
			25400	

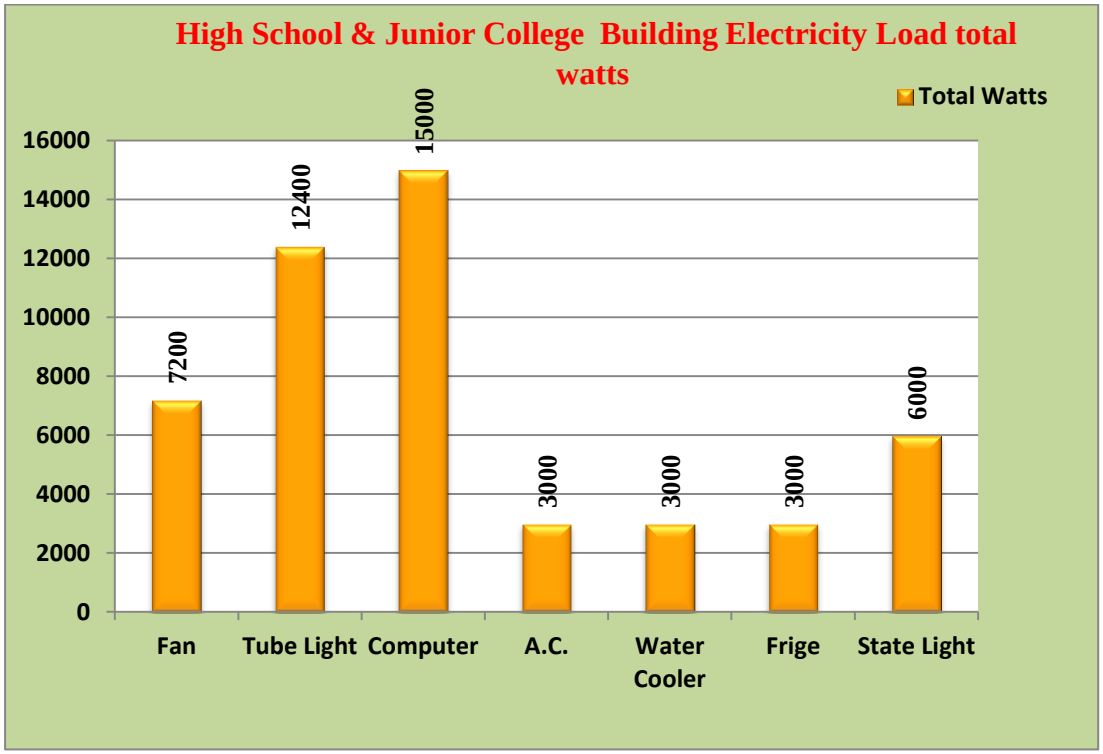


Building wise Electricity Load Details

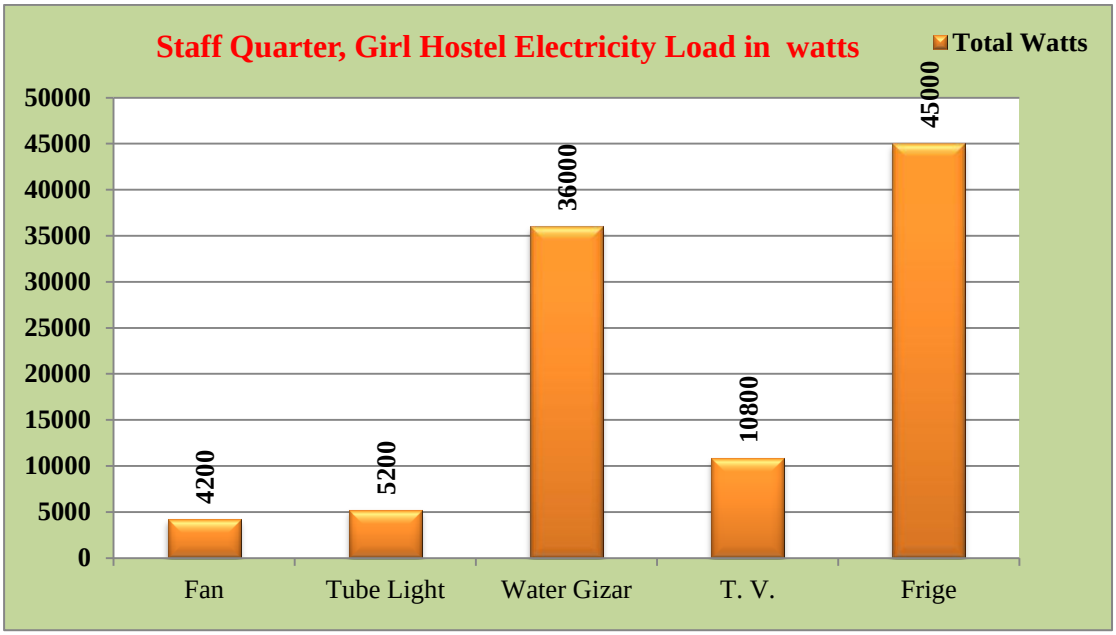
BJS ASC College Building Total Electricity Load Distribution Year-2020-2021			
Sr. No.	**Name of Electrical Instruments**	**Use of Power**	**Total Watts**
1	Fan	150 x 60	9000
2	Tube Light	600 x 40	24000
3	Computer	70 x 300	21000
4	A.C.	2 x 1500	3000
5	Water Cooler	5 x 300	1500
6	Frige	4 x 300	1200
7	Deefrige	1 x 3000	3000
8	State Light		6000
Total			**68700**
Total Kilowatts		**68700/1000**	**68.70 (kilowatts)**



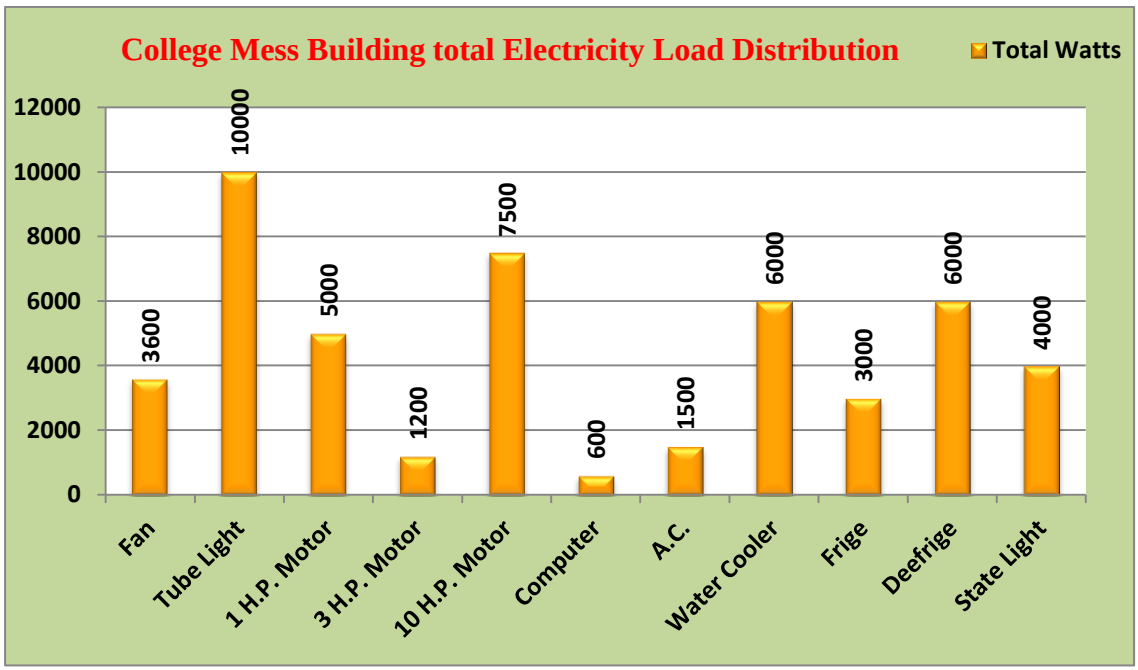
High School & Junior College Building Total Electricity Load Distribution Year- 2020-2021			
Sr. No.	**Name of Electrical Instruments**	**Use of Power**	**Total Watts**
1	Fan	120 x 60	7200
2	Tube Light	310 x 40	12400
3	Computer	50 x 300	15000
4	A.C.	2 x 1500	3000
5	Water Cooler	2 x 1500	3000
6	Frige	2 x 1500	3000
8	State Light		6000
Total			**49600**
Total Kilowatts		**49600/1000**	**49.60 (kilowatts)**



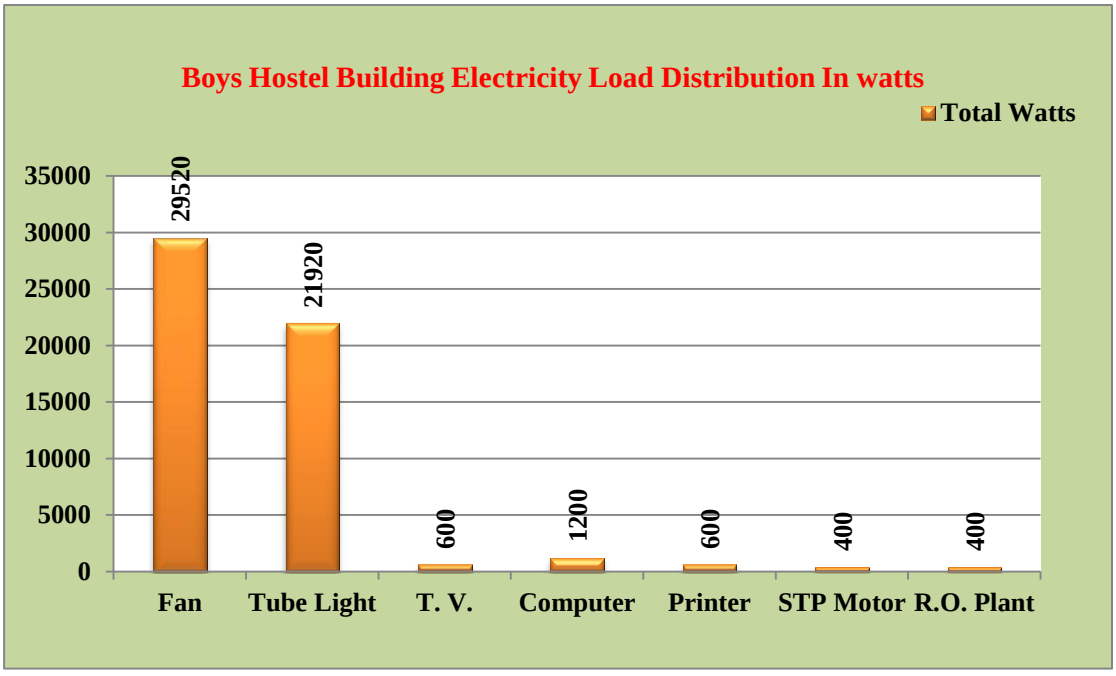
Staff Quarter, Girl Hostel Building Total Electricity Load Distribution Year- 2020-21			
Sr. No.	**Name of Electrical Instruments**	**Use of Power**	**Total Watts**
1	Fan	70 x 60	4200
2	Tube Light	130 x 40	5200
3	Water Gizar	36 x 1000	36000
4	T. V.	36 x 300	10800
6	Frige	36 x 300	45000
Total			**101200**
Total Kilowatts		**101200/1000**	**101.20 (kilowatts)**
	Girls Hostel		**30 (KiloWatts)**
	Total		**131.20 (Kilowatts)**



College Mess Building Total Electricity Load Distribution Year-2020-21			
Sr. No.	**Name of Electrical Instruments**	**Use of Power**	**Total Watts**
1	Fan	60 x 60	3600
2	Tube Light	250 x 40	10000
3	1 H.P. Motor	05 x 1000	5000
4	3 H.P. Motor	3 x 400	1200
5	10 H.P. Motor	01 x 7500	7500
6	Computer	02 x 300	600
7	A.C.	1 x 1500	1500
8	Water Cooler	4 x 1500	6000
9	Frige	2 x 1500	3000
10	Deefrige	2 x 3000	6000
11	State Light		4000
Total			**48400**
Total Kilowatts		**48400/1000**	**48.4 (Kilowatts)**



College Boys Hostel Building Total Electricity Load Distribution Year- 2020-21			
Sr. No.	**Name of Electrical Instruments**	**Use of Power**	**Total Watts**
1	Fan	492 x 60	29520
2	Tube Light	548 x 40	21920
3	T. V.	02 x 300	600
4	Computer	04 x 300	1200
5	Printer	02 x 300	600
6	STP Motor	01 x 400	400
7	R.O. Plant	01 x 400	400
Total			**54640**
Total Kilowatts		**48400/1000**	**54.64 (Kilowatts)**



Chapter No-4

Installation of Solar Power Plant

Bharatiya Jain Sanghatana Educational Rehabilition Center, Wagholi Pune has installed **119.68 KWP** Solar Rooftop power generation systems on **19.12.2017** from Kalapa Power Pvt.Ltd.

Effect of Solar Power plant is shown in following table-

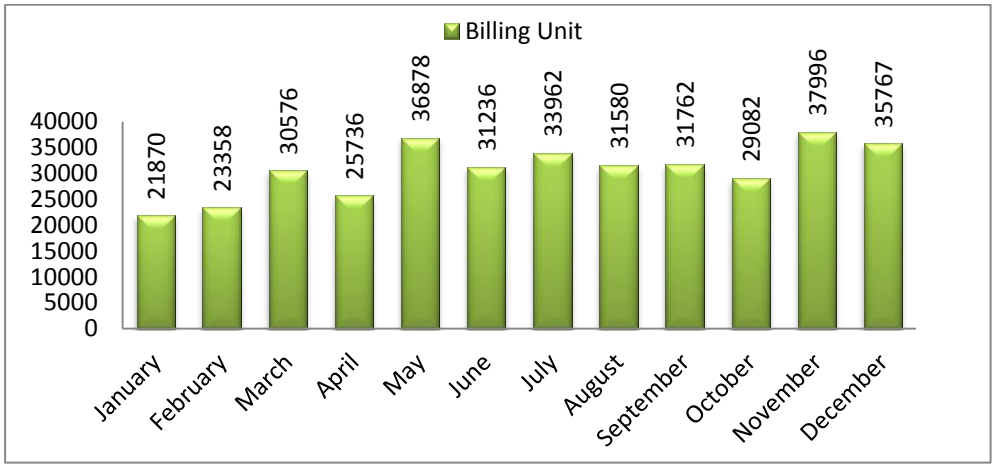
Sr.No.	Month	Year-2016	Year-2017	Year-2018	Year-2019	Year-2020	Year-2021
1	January	39,652	44,294	24,693	21,870	22,552	2,592
2	February	41,614	46,398	31,785	23,358	20,439	2,190
3	March	48,860	55,666	39,846	30,576	20,439	2,732
4	April	42,216	42,156	33,459	25,736	2,974	4,818
5	May	46,218	45,940	41,595	36,878	2,970	5,286
6	June	41,582	36,330	30,735	31,236	2,289	4,916
7	July	48,678	41,344	33,681	33,962	3,140	3,203
8	August	49,934	45,182	32,607	31,580	3,701	2,035
9	September	46,956	45,524	31,662	31,762	3,453	1,968
10	October	47,058	31,014	42,690	29,082	4,829	2,224
11	November	36,988	35,552	22,494	24,500	2,940	2,080
12	December	44,808	44,294	26,838	24,500	2,664	2,369
	Total	**5,34,564**	**5,13,694**	**3,92,085**	**3,45,040**	**92,390**	**36,413**

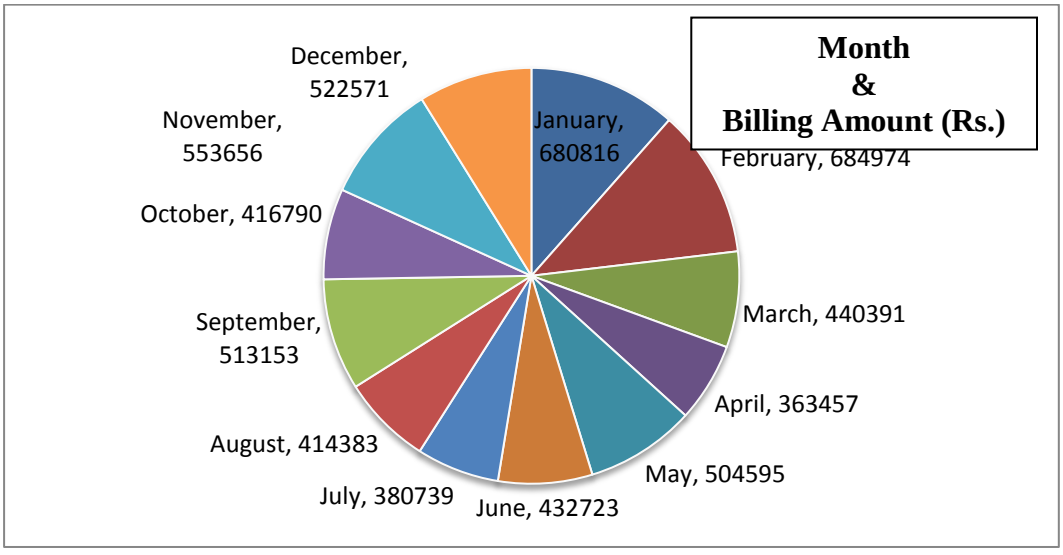
Conclusion-

1. The above data analysis concludes that average **30%** total energy save due to solar power plant.
2. Due to installed **119.68 KWP** Solar Rooftop power generation systems on 19.12.2017 every years nearly **20 lakh** save by institute.
3. As per Maharashtra State Electricity Distribution Statement total demand power Bharatiya Jain Sanghatana Educational Rehabilitation Center is **122 KW.**
4. In the year 2017-18 Sewage Treatment Plants (One lakh liter capacity), Bore well, Reverse Osmosis Plant (2000LPH capacity), two computer laboratory (School & College-90 Computer) and Waste recycling machine newly installed in campus.
5. From data table in the month of May and October of every year use of energy is maximum.

Year 2019

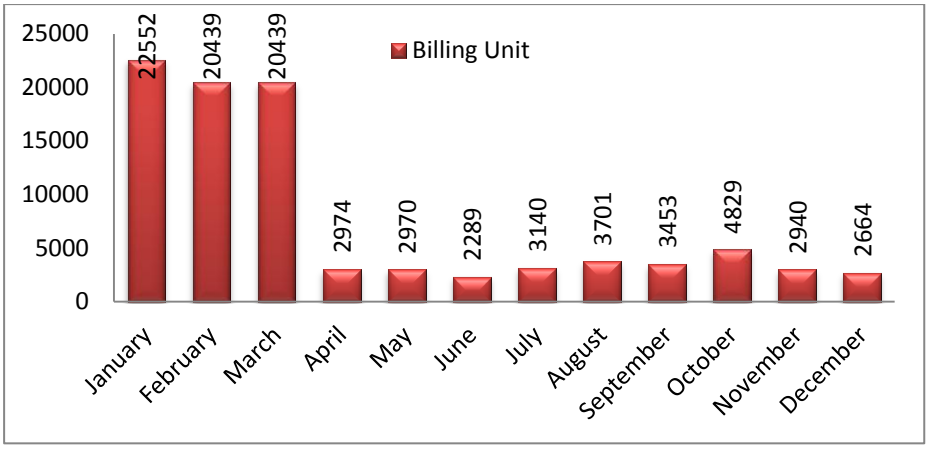
Sr. No.	Month	Units	Bill Demand (KVA)	Light Bill (Rs.)
1	January	21870	122	6,80,816
2	February	23358	122	6,84,974
3	March	30576	122	4,40,391
4	April	25736	92	3,63,457
5	May	36878	93	5,04,595
6	June	31236	92	4,32,723
7	July	33962	92	3,80,739
8	August	31580	92	4,14,383
9	September	31762	92	5,13,153
10	October	29082	100	4,16,790
11	November	37996	102	5,53,656
12	December	35767	86	5,22,571

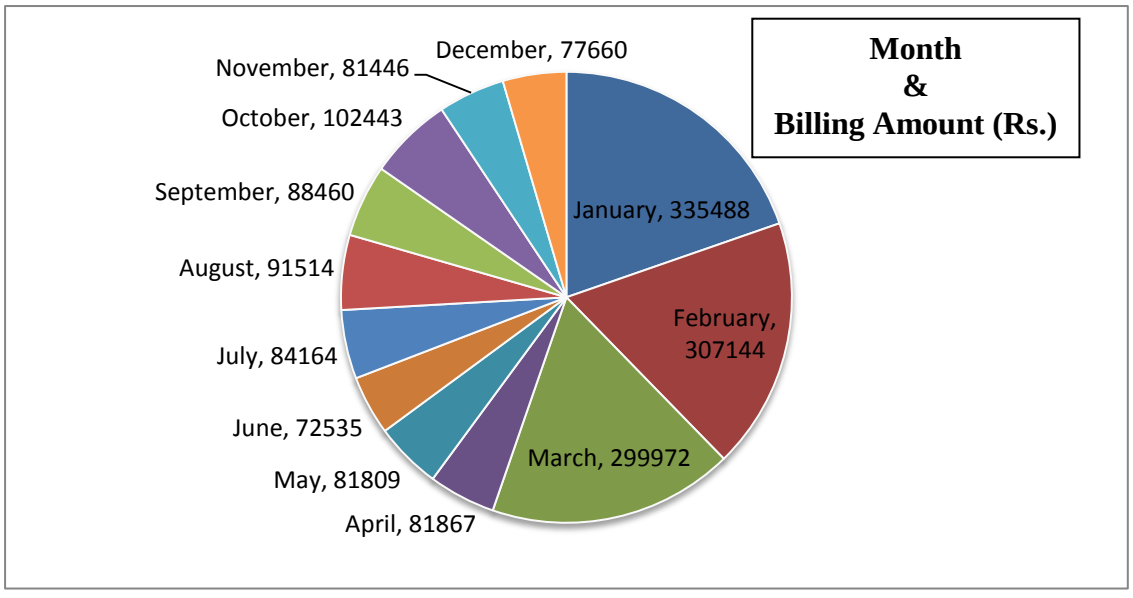




Year 2020

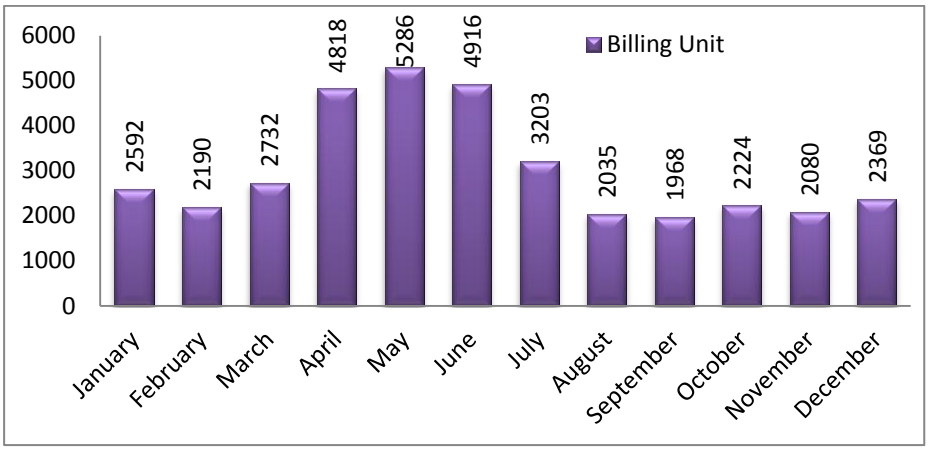
Sr. No.	Month	Units	Bill Demand (KVA)	Light Bill (Rs.)
1	January	22552	81	335488
2	February	20439	75	307144
3	March	20439	75	299972
4	April	2974	83	81867
5	May	2970	83	81809
6	June	2289	83	72535
7	July	3140	83	84164
8	August	3701	83	91514
9	September	3453	83	88460
10	October	4829	83	102443
11	November	2940	83	81446
12	December	2664	83	77660

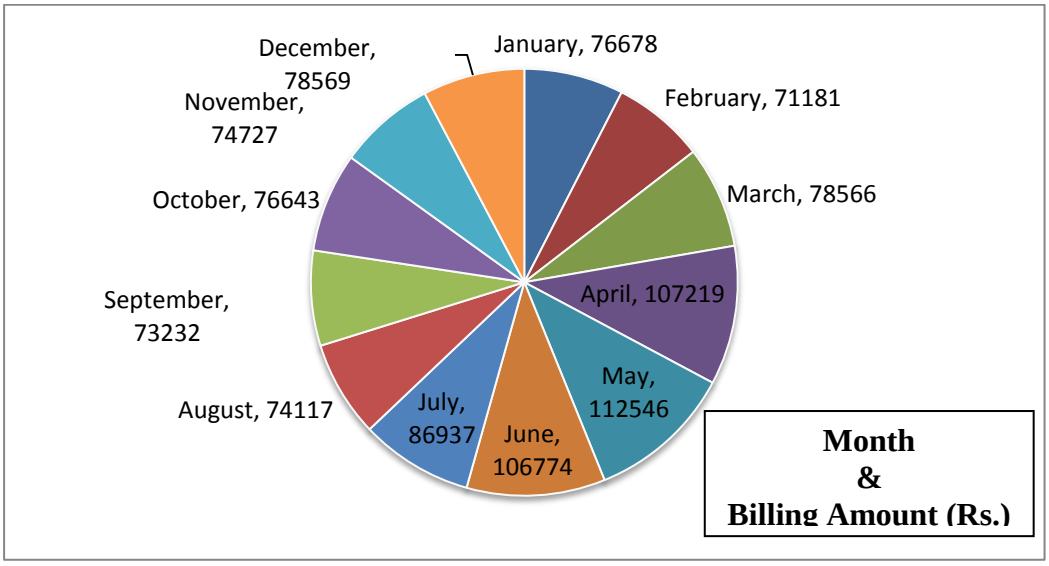




Year 2021

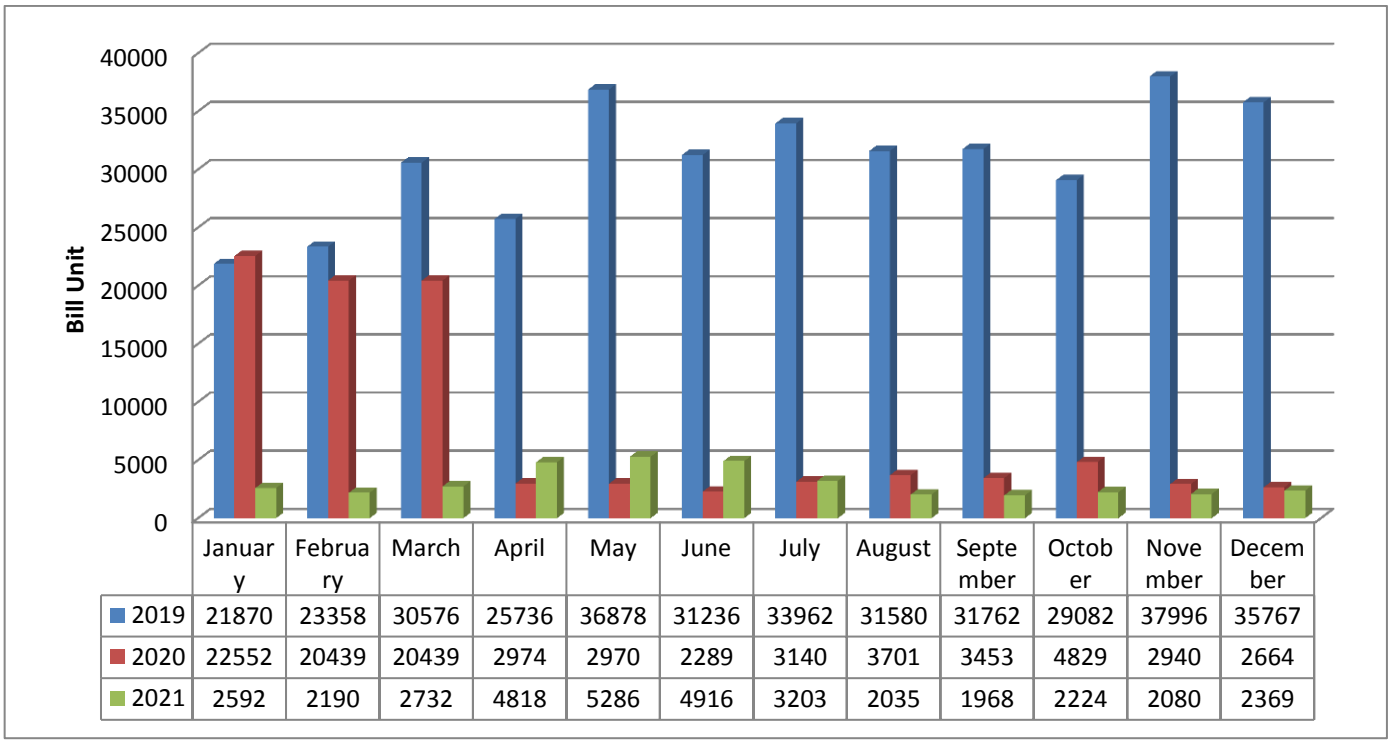
Sr. No.	Month	Units	Bill Demand (KVA)	Light Bill (Rs.)
1	January	2592	83	76678
2	February	2190	83	71181
3	March	2732	83	78566
4	April	4818	90	107219
5	May	5286	90	112546
6	June	4916	90	106774
7	July	3203	90	86937
8	August	2035	90	74117
9	September	1968	90	73232
10	October	2224	90	76643
11	November	2080	90	74727
12	December	2369	90	78569





Summary

Sr. No.	Month	Units			Light Bill (Rs.)		
		2019	2020	2021	2019	2020	2021
1	January	21870	22552	2592	680816	335488	76678
2	February	23358	20439	2190	684974	307144	71181
3	March	30576	20439	2732	440391	299972	78566
4	April	25736	2974	4818	363457	81867	107219
5	May	36878	2970	5286	504595	81809	112546
6	June	31236	2289	4916	432723	72535	106774
7	July	33962	3140	3203	380739	84164	86937
8	August	31580	3701	2035	414383	91514	74117
9	September	31762	3453	1968	513153	88460	73232
10	October	29082	4829	2224	416790	102443	76643
11	November	37996	2940	2080	553656	81446	74727
12	December	35767	2664	2369	522571	77660	78569
	Total	**369803**	**92390**	**36413**	**5908248**	**1704502**	**1017189**



Chapter No-5

Recommendations and Action Plans

Conservation Tips

LIGHTING SYSTEM

1. Use of CFL lamp in place of GLS lamp can save energy up to 70%.
2. Clean the lamps & fixtures regularly. Illumination levels fall by 20-30% due to collection of dust.
3. Use of 18W LED instead of 40 W tubes light saves electricity by 40 to 50%.
4. Use of sodium vapour lamps for area lighting in place of Mercury vapour lamps saves electricity up to 40%.
5. Use of electronic ballast in place of conventional choke saves energy upto 20%.
6. One of the best energy-saving devices is the light switch. Turn off lights when not required.
7. Many automatic devices can help in saving energy used in lighting. Consider employing infrared sensors, motion sensors, automatic timers, dimmers and solar cells wherever applicable, to switch on/off lighting circuits.
8. As for as possible use task lighting, which focuses light where it's needed. A reading lamp, for example, lights only reading material rather than the whole room.
9. Dirty tube lights and bulbs reflect less light and can absorb 50 percent of the light; dust your tube lights and lamps regularly.
10. Fluorescent tube lights and CFLs convert electricity to visible light up to 5 times more efficiently than ordinary bulbs and thus save about 70% of electricity for the same lighting levels.
11. Ninety percent of the energy consumed by an ordinary bulb (incandescent lamp) is given off as heat rather than visible light.
12. Replace your electricity-guzzling ordinary bulbs (incandescent lamps) with more efficient types. Compact fluorescent lamps (CFLs) use up to 75 percent less electricity than incandescent lamps.
13. A 18-watt compact fluorescent bulb produces the same amount of light as a 60-watt incandescent bulb.

ROOM AIR CONDITIONERS

14. Use ceiling or table fan as first line of defense against summer heat. Ceiling fans, for instance, cost about 30 paise an hour to operate - much less than air conditioners (Rs.10.00 per hour).
15. Refrigerator motors and compressors generate heat, so allow enough space for continuous airflow around refrigerator. If the heat can't escape, the refrigerator's cooling system will work harder and use more energy.
16. A full refrigerator is a fine thing, but be sure to allow adequate air circulation inside.
17. Think about what you need before opening refrigerator door. You'll reduce the amount of time the door remains open.
18. Allow hot and warm foods to cool and cover them well before putting them in refrigerator. Refrigerator will use less energy and condensation will reduced.
19. Make sure that refrigerator's rubber door seals are clean and tight. They should hold a slip of paper snugly. If paper slips out easily, replace the door seals.
20. When dust builds up on refrigerator's condenser coils, the motor works harder and uses more electricity. Clean the coils regularly to make sure that air can circulate freely.

COMPUTERS

21. Turn off your home office equipment when not in use. A computer that runs 24 hours a day, for instance, uses - more power than an energy-efficient refrigerator.
22. If your computer must be left on, turn off the monitor; this device alone uses more than half the system's energy.
23. Setting computers, monitors, and copiers to use sleep-mode when not in use helps cut energy costs by approximately 40%.
24. Battery chargers, such as those for laptops, cell phones and digital cameras, draw power whenever they are plugged in and are very inefficient. Pull the plug and save.
25. Screen savers save computer screens, not energy. Start-ups and shutdowns do not use any extra energy, nor are they hard on your computer components. In fact, shutting computers down when you are finished using them actually reduces system wear - and saves energy.

FANS

26. Use smooth, well-rounded air inlet cones for fan air intakes. • Avoid poor flow distribution at the fan inlet.
27. Minimize fan inlet and outlet obstructions.
28. Clean screens, filters, and fan blades regularly.
29. Use aerofoil-shaped fan blades.
30. Minimize fan speed.
31. Use low-slip or flat belts.
32. Check belt tension regularly.
33. Eliminate variable pitch pulleys.
34. Use variable speed drives for large variable fan loads.

SCOPE

Energy audit includes following actions, steps and processes:

1. Actual energy consumption.
2. Calculated energy consumption taking into account rated efficiency and power losses in all energy utilizing equipment and power transmission system i.e. Conductor, cable, panels etc.
3. Identifying the equipment, operational aspects and characteristic of power supply causing inefficient functioning, wastage of energy, increase in hydraulic or power losses etc. and evaluating increase in energy cost or wastage of energy.
4. Identifying solutions and actions necessary to correct the shortcomings and lacunas in (iv) and evaluating cost of the solutions.
5. Carrying out economic analysis of costs involved in (iv) and (v) above and drawing conclusions whether rectification is economical or otherwise.
6. Checking whether operating point is near best efficiency point and whether any improvement is possible.
7. Verification of penalties if any, levied by power supply authorities e.g. penalty for poor power factor, penalty for exceeding contract demand.

Broad review of following points for future guidance or long term measure:

1. All Interior walls should be painted using Enameled paint which would reflect light.
2. Good light ventilation and Air ventilation to classrooms may solve the problem of Energy Consumption.
3. Energy saving by replacing LCD desktop with LAPTOP illustrate the benefits in terms of portability, space saving, maintenance cost of desktop computers and additional cost of peripherals. Also cost of damage and other electrical problems. Critical space management and cost involved can be removed. Wiring for LAN and labour cost can also be prevented.
4. Unnecessary power consumption by negligence of user and system administrator for not switching off while leaving the office will have more vulnerability for damage due to short circuit and heavy voltage due to lightning.
5. It is recommended to replace fluorescent lamps by CFL and LED"S which are handy by construction and possibility of breakage is less. Installation is easy and the labour charge required for replacement of burnt tubes and defected choke lamps is a costly affair. Disposal of burnt tubes will disturb the habitat place of both human being and animals. The release of krypton and argon gases is more dangerous, it may lead to ecological imbalance if it in mass destruction.
6. Switch off the photocopier machine at the main outlet itself when not in use or in other words machine should not be kept in stand by and sleep mode which consumes power.
7. Use good lighting system will reduce the power burden as a whole.
8. Energy recycling, when Equipment is operating or motor is running is the research area where young generations have to address.
9. Fans running without capacitor or under rated capacitor will draw more current therefore use of correct rated capacitor will reduce the power consumption.
10. Recommended to use solar water cooler in place of conventional one.
11. Reschedule the time table to reduce the maximum demand.
12. Outside lightening of the campus should be placed bit higher.
13. Use pumps on the off peak time so that we can reduce the consumption cost. If the securities are available. Fill the tank by pumping once.
14. Recommended to replace the old refrigerator, freezers, grinders and mixers with the new energy efficient ones i.e. five stars rated equipments.

Chapter No-6

Result and Conclusions

Energy audit is an effective tool in identifying problems associated with energy management program. A careful audit in any organization will lead to manage energy system in organization at minimum energy cost. In development process to cope with increasing energy demands, energy conservation and energy audit are two parallel paths.

The energy audit which deals with inspection, survey and analysis of energy flows for energy conservation in a building, process or system to reduce the energy consumption by the system without negatively affecting the output .We showed where the power consumption is more in the given system. It also included the reduction losses and improvement of power quality .we suggested the new models in place of old existing models and found the cost benefits for new installed application over the old application. **This report is only according to data analysis and observation. It is necessary to do energy audit from authentic bodies.**

REFERENCES

1. http://www.pcra.org
2. M.Bala Raghav, M.Sravya Srijaa, G.Srinivasa Rao, K.Naga Bhavya, Y.Suchitra ,International Journal of Advanced Research in Electrical,Electronics and Instrumentation Engineering, Vol. 2, Issue 10, October 2013
3. Akshashila Bhandari,A.G.Thosar, M.R.Bachawad, Pankaj Bhakre, International Journal of Industrial Electronics and Electrical Engineering, Volume-4, Issue-11, Nov.-2016
4. https://powermin.nic.in/
5. http://indiaenergy.gov.in/
6. https://www.energy.gov/
7. https://mnre.gov.in/
8. https://www.mahaurja.com/meda/
9. http://seci.co.in/

Certificate

This is to certify that **Bharatiya Jain Sanghatana's Arts, Science and Commerce College, Wagholi, Pune** has conducted **"Energy Audit"** in the Year-**2020-21** to identify present profile of electrical energy consumption, energy conservation and saving opportunity for environment protection. This energy audit is also aimed to assess impact of installed various renewable energy applications.

Place: Pune

Date: 15.01.2022

Mr. Vipul S. Ghemud
Internal Auditor

B.J.S. Wagholi, Pune-412207. ID No. PU/PN ASC/113/1995 Arts, Science & Commerce College

Mr. Shivaji M. Sonawane
Chairman, Energy Audit

Dr. K S Desarda
IQAC Coordinator

Major Dr.Ashok V. Giri
PRINCIPAL
Bharatiya Jain Sanghatana's
Art, Science & Commerce College
Wagholi, Pune-412207

IQAC Coordinator
Bharatiya Jain Sanghatana's
Arts Science and Commerce College Wagholi