CRITERION-VII

EVIDENCE(S), AS PER SOP

METRIC No. 7.1.6	Quality audits on environment and energy are regularly undertaken by the institution
	The institutional environment and energy initiatives are confirmed through the following: 1. Green audit 2. Energy audit 3. Environment audit 4. Clean and green campus recognitions/awards 5. Beyond the campus environmental promotional activities
• Reports on Green audit, Energy audit, and Environment audit • Quality audits certificate on environment and energy	

GREEN AUDIT

2019-20 & 2020-21

AUDIT REPORT

Studied for

Pt. Ravishankar Shukla University

Amanaka G.E.Road, Raipur,
Chhattisgarh (India) - 492010

Analysed by

Greenvio Solutions

23 March 2022

Letter and Certificate of Consent

GREEN AUDIT

This is to certify that the Green Audit for 2019-20 and 2020-21
has been conducted for

Pt. Ravishankar Shukla University

Amanaka G. E. Road, Raipur, Chhattisgarh (India) - 492010

The Study observed the following:

The Institution undertakes multiple Green Practices as part of its activities.

The Buildings in the premises are well designed as per requirements of Green Buildings.

Regular and prompt action is by the team towards Building maintenance and improvement.

The Institution actively participates & conducts awareness programs related to Green Practices.

Overall the study concludes:

The Green Audit practices managed and implemented by the Institution are excellent.

Study and Audit done by:

Ar. Nahida Shaikh
Project Head and Green Building Consultant

Sustainable Academe – Greenvio Solutions
Sustainability Department of Greenvio Solutions, Naigaon
An environment Design and Consultancy developing Healthy and Sustainable Environments
sustainableacademe@gmail.com I **greenviosolutions@gmail.com**

About the Project Head - Ar. Nahida Shaikh has completed audits of multiple Institutes including Technical, State University, Private University and Single Faculty Colleges for a total of more than **50 lakhs+ sq. ft. of Built-up area audited till date** Pan India as an Accredited Green Building Professional-Architect.

She has **authored over 6 books** for Colleges in India titled *Towards a Healthy & Sustainable Institute, An Ecologically Sound Institution, Education amidst the nature, Micro efforts towards a Green Institution leading to Macro Results, An Eco-friendly Developed Institutions* f these are published with ISBN Number as Paperback and the book titled *An Urban Green Habitat* published with ISSN Number.

She is a Registered Licensed **Architect** with the Council of Architecture, India an **Indian Green Building Council Accredited Professional** (IGBC AP), an **Assocham GEM Certified Professional** (Regn. No. GEM CP 22/718) and she has completed her Lead Auditor Course on Environment Management System, Green Campus Audit, Energy Audit and Hygiene Audit to Educational Institutions and Industries.

Green Building consultancy is her forte and she is one of the most sought after names when it comes to providing e[illegible] services within the stipulated time frame.

GREENVIO SOLUTIONS SUSTAINABLE ACADEME

(Valid till March 2023)

Disclaimer

The Audit Team has prepared this report for the **Pt. Ravishankar Shukla University** located at *Amanaka G.E.Road, Raipur, Chhattisgarh (India) - 492010* based on input data submitted by the University analysed by the team to the best of their abilities.

The details have been consolidated and thoroughly studied as per the various guidelines for Green Buildings available in National and International Standards; the report has been generated based on comparative analysis of the existing facilities and the prerequisites formulated by various standards. The inputs derived are a result of the inspection and research. These will further enhance and develop a Healthy and Sustainable Institution.

These can be implemented phase wise or as a whole depending on the decision taken by the Hon'ble Management and University. The warranty or undertaking, expressed or implied is made and no responsibility is accepted by Audit Team in this report or for any direct or consequential loss arising from any use of the information, statements or forecasts in the report.

The audit is a thorough study based on the inspection and investigation of data collected over a period of time and should not be used for any legal action. This is the property of Greenvio Solutions and should not be copied or regenerated in any form.

The Report is prepared by the Team of Greenvio Solutions under their brand and department – Sustainable Academe as Consultancy firm with the Project Head - Ar. Nahida Shaikh who has completed audits of multiple Institutes including Technical, State University, Private University and Single Faculty Universities of more than 50 lakhs+ sq. ft. of Built-up area audited till date Pan India as an Accredited and Certified Green Building Professional-Architect. Green Building consultancy is her forte and she is one of the most sought after names when it comes to providing excellent quality services within the stipulated time frame.

The Study is conducted in capacity of Accredited & Certified Green Building Professional with extensive experience.

Greenvio Solutions

Developing Healthy and Sustainable Environments

We are an Environmental and Architectural Design Consultancy firm

Sustainable Academe is our department for conducting Audits

Palghar District, Maharashtra- 401208

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Acknowledgement

The Audit Assessment Team thanks the **Pt. Ravishankar Shukla University, Raipur, Chhattisgarh** for assigning this important work of Environment Audit. We appreciate the cooperation extended to our team during the entire process.

Our special thanks are due to Hon'ble **Prof. Keshari Lal Verma Sir, Vice Chancellor** and **everyone from the University.**

Our heartfelt thanks to Chairpersons of the entire process **Prof. Girish Kant Pandey Sir,** Registrar for the valuable inputs.

The kind gesture for the inventory and data collection of **and Mr. Kuldeep Bhupendra,** Incharge - Engineering Section is quite commendable.

We are also thankful to **University's Task force the faculty members - Audit Coordinators** who have collaborated to collect data required **Dr. Sanjay Tiwari,** Professor, Coordinator: M.Tech. in Optoelectronics & Laser Technology, Coordinator: Institute of Renewable Energy Technology & Management, S.O.S. in Electronics & Photonics; **Prof. Arti Parganiha,** Professor of Bioscience.

We highly appreciate the assistance of the **entire Teaching, Non-teaching and Admin staff** for their support while collecting the data.

Sustainable Academe

Brand of Greenvio Solutions, Palghar District, Maharashtra- 401208

Contents

Greenvio Solutions

Hereby presents

An Environment & Ecological friendly premise

Established as a State Private University at Raipur

vide Chhattisgarh Act of 1973

The prestigious

Pt. Ravishankar Shukla University

Amanaka G.E.Road, Raipur, Chhattisgarh (India) - 492010

1. Introduction

1.1 About Pt. Ravishankar Shukla University

An educational institute is beyond than being just a building. It helps one in acquiring knowledge which is a gateway to being successful and a good human.

"A good education is the best gift you can give yourself or anyone else"

- Mahtab Narsimhan

Pt. Ravishankar Shukla University is Chhattisgarh's largest and oldest institution of higher education, founded in 1964, and named after the first chief minister of erstwhile Madhya Pradesh. The University has a sprawling campus in the western part of the capital of Chhattisgarh, Raipur. The campus of University is spread in 300.17 acres of land. There are Twenty-Nine teaching departments in the University. Out of which six departments buildings have been constructed recently. A variety of self-financed courses have been initiated in some departments. The total number of employees is 700, who provide the administrative support at different levels.

Attracted by the opportunity to study and conduct advanced research with renowned professors and fellow scholars in one of the Chhattisgarh's most dynamic cities, students also come from the neighbouring States. There are 5000 students enrolled for variety of courses offered by the departments who are steered under the guidance of more than 100 faculty members. Jurisdiction of RSU covers entire central and southern part of Chhattisgarh. There are 180 educational institutions affiliated to the University. In the academic year 2005-06, about 1,25,000 students were enrolled, both for undergraduate and postgraduate courses. The University plays a major role in the educational, cultural and economic life of the region.

"There is no school equal to a decent home and no teacher equal to a virtuous parent."

- Mahatma Gandhi

It is one of the premier State Educational University providing quality education with best state of the art facility & Infrastructure to the students.

1.2 Statement, Section of University

1.2.1 Vision towards the future

- To **make quality higher education accessible to all sections of society,** including the tribal population of Chhattisgarh.
- To **provide quality education in the disciplines** of arts, humanities, social sciences, natural sciences and other disciplines of learning.
- To **develop human resource with world class competence and skills** in the respective disciplines.

1.2.2 Mission for achieving benchmarks

- To develop the university as a centre of excellence for higher education and knowledge resource
- To promote understanding the value of self-learning, creativity and competence building:
  - By providing world-class education through university-teaching departments and schools.
  - By promoting quality research in university schools and affiliated colleges.

1.2.3 About the Engineering section

Engineering section is an important component of the administrative infrastructure of Pt. Ravishankar Shukla University. The section mainly works on all matters subject to the control of the Building Committee.

The Building committee advises the Executive Council on all matters related to construction of buildings, repairs, alteration, additions to existing buildings, select and recommend site or acquisition, accord technical sanction to the plans and estimates, and expenditure.

The composition of the Building Committee is such that the members are nominated for the period of two years, as per additional Statute 3 of the University Act

1.2.4 About the Development section

The Development section is an important component of the administrative structure of the University. It periodically performs work related to all type of purchase proposals i.e. inviting quotations, preparation and floating tenders for the purpose of purchase, organizes the meeting of Central Purchase Committee duly constituted as per provisions of the University Act, preparation and floating the expression of interest, disposal of waste material such as used answer books etc.

The section also supervises works related to the printing of various documents, proforma, Degree & preparation of gold medal etc.

1.3 Institutions in the premises

The aim of the University is to continuously enhance the teaching methods in order to provide students with an opportunity for their all-round development. In order to manage the programme offerings in a much better way, Pt. Ravishankar Shukla University has **structured its offerings under 29 Major Sections** as follows:

1. **School of Studies in Ancient Indian History Culture & Tourism & Hotel Management**
2. **School of Studies in Anthropology**
3. **School of Studies in Biotechnology**
4. **School of Studies in Chemistry**
5. **Swami Vivekanand Memorial School of Studies in Comparative Religion , Philosophy and Yoga**
6. **School of Studies in Computer Science & IT**
7. **School of Studies in Economics**
8. **School of Studies in Electronics and Photonics**
9. **School of Studies in Environmental Science**
10. **School of Studies in Geography**
11. **School of Studies in Geology and Water Resource Management**
12. **School of Studies in History**

13. **School of Studies in Law**
14. **School of Studies in Library and Information Science**
15. **School of Studies in Life Science**
16. **School of Studies in Literature and Languages**
17. **Institute of Management**
18. **School of Studies in Mathematics**
19. **University Institute of Pharmacy**
20. **School of Studies in Physical Education**
21. **School of Studies in Physics and Astrophysics**
22. **School of Studies in Psychology**
23. **School of Regional Studies and Research**
24. **School of Studies in Sociology & Social Work**
25. **School of Studies in Statistics**
26. **Institute of Teachers Education**
27. **Centre for Women's Studies**
28. **Renewable Energy Technology & Management**
29. **Center for Basic Sciences (CBS)**

Each of these Schools is headed by highly experienced and competent Director/Deans along with H.O.Ds checking on the right academic progress of each faculty/department in the University.

The University strives for excellence in academics and makes an effort to induce passion for learning along with the inspiration for decisive thinking and assessment, thereby helping them to become the best professionals in their chosen careers.

1.4 Programs offered by the University

The University a wide range of courses for the students to upgrade their educational qualification. The details of each of these courses as per the School are as follows.

- **Post-Doctoral** – It offers the following courses.

1. Doctor of Science Chemistry
2. Doctor of Science/ Doctor of Literature Anthropology
3. Doctor of Literature Sociology
4. Doctor of Literature Linguistics
5. Doctor of Science/ Doctor of Literature Geography
6. Doctor of Literature Psychology
7. Doctor of Literature Economics
8. Doctor of Science Physics
9. Doctor of Literature History
10. Doctor of Science Zoology
11. Doctor of Science Botany
12. Doctor of Science Bioscience
13. Doctor of Science Statistics
14. Doctor of Law
15. Doctor of Literature Philosophy
16. Doctor of Science Geology
17. Doctor of Literature Physical Education
18. Doctor of Literature Library & Information Sciences
19. Doctor of Science Mathematics
20. Doctor of Science Microbiology
21. Doctor of Science Electronics
22. Doctor of Literature Hindi
23. Doctor of Science Computer Science

24. Doctor of Literature Ancient Indian History
25. Doctor of Literature English
26. Doctor of Science Pharmacy
27. Doctor of Literature Management
28. Doctor of Science Biochemistry
29. Doctor of Science Biotechnology

- **Doctoral** – It offers the following courses.
    1. Doctor of Philosophy - Chemistry
    2. Doctor of Philosophy - Anthropology
    3. Doctor of Philosophy - Sociology
    4. Doctor of Philosophy - Linguistics
    5. Doctor of Philosophy - Geography
    6. Doctor of Philosophy - Psychology
    7. Doctor of Philosophy - Economics
    8. Doctor of Philosophy - Physics
    9. Doctor of Philosophy - History
    10. Doctor of Philosophy - Zoology
    11. Doctor of Philosophy - Botany
    12. Doctor of Philosophy - Bioscience
    13. Doctor of Philosophy - Statistics
    14. Doctor of Philosophy - Law
    15. Doctor of Philosophy - Comparative Religion and Philosophy
    16. Doctor of Philosophy - Geology
    17. Doctor of Philosophy - Physical Education
    18. Doctor of Philosophy - Library Science
    19. Doctor of Philosophy - Mathematics
    20. Doctor of Philosophy - Microbiology

21. Doctor of Philosophy - Regional Studies
22. Doctor of Philosophy - Electronics
23. Doctor of Philosophy - Hindi
24. Doctor of Philosophy - Computer Science & IT
25. Doctor of Philosophy - Ancient Indian History, Culture & Archaeology
26. Doctor of Philosophy - English
27. Doctor of Philosophy - Pharmacy
28. Doctor of Philosophy - Management
29. Doctor of Philosophy - Biochemistry
30. Doctor of Philosophy - Biotechnology
31. Doctor of Philosophy Environmental Science

- **Post Graduate -** It offers the following courses

1. Master of Science - Chemistry
2. Master of Arts - Sociology
3. Master of Arts - Psychology
4. Master of Arts - Linguistics
5. Master of Arts/Master of Science - Geography
6. Master of Arts/ Master of Science - Anthropology
7. Master of Arts - History
8. Master of Arts – Economics
9. Master of Science – Physics
10. Master of Arts/Master of Science - Statistics
11. Master of Science - Bioscience
12. Master of Law - Constitutional and Administrative Law, Crime and Torts
13. Master of Science - Geology
14. Master of Library Science - Library and Information Science
15. Master of Science/Master of Arts - Mathematics

16. Master of Science - Microbiology
17. Master of Physical Education
18. Master of Business Administration
19. Master of Arts - English
20. Master of Science - Electronics
21. Master of Arts - Hindi
22. Master of Computer Applications
23. Master of Arts - Ancient Indian History, Culture & Archaeology
24. Master of Science - Information Technology
25. Master of Science - Biochemistry
26. Master of Science - Biotechnology
27. Master of Education
28. Master of Science - Pharmacy Pharmaceutics
29. Master of Arts - Applied Philosophy & Yoga
30. Master of Technology - Optoelectronics & Laser Technology
31. Master of Social Work
32. Master of Science - Environmental Science
33. Master of Arts - Rural Development Master of Arts - Chhattisgarhi
34. Master of Science Integrated [Physics/ Mathematics/ Chemistry/Biology]

- **Under Graduate** – It offers the following courses.

1. Bachelor of Library Science Library and Information Science
2. Bachelor of Physical Education
3. Bachelor of Pharmacy
4. Bachelor of Arts - Bachelor of Legislative Law
5. Bachelor of Education
6. Bachelor of Vocation in Renewable Energy Technology and Management

- **Post-Graduation diploma** – It offers the following courses.

1. P.G. Diploma in Guidance and Counselling
2. P.G. Diploma in Yoga Education & Philosophy
3. P.G. Diploma in Tourism & Hotel Management
4. P.G. Diploma in Regional Planning & Development
5. P.G. Diploma in Forensic Science
6. P.G. Diploma in Rehabilitation Psychology
7. P.G. Diploma in Applied Hydrogeology
8. P.G. Diploma in Remote Sensing & GIS

- **Diploma Programs -** It offers the following courses
    1. Diploma in European and Asian Languages English
    2. Diploma in European and Asian Languages French
    3. Diploma in National Language Sindhi

1.5 Assessment of the University

1.5.1 Establishment

Pt. Ravishankar Shukla University, has been established as a State University at Raipur, vide Chhattisgarh Act of 1973.

1.5.2 Recognition

The University is recognised by **University Grant Commission (UGC)** under section 2 (f) and 12 (b) of the UGC Act, 1956 vide by University Grants Commission, New Delhi.

1.5.3 Accreditation

NAAC - The following are details of the reaccreditation of the University.

Cycle	First	Second	Third
CGPA	75.1	2.62	3.02
Grade	B+	B	A
Year	2003	2011	2016

Table 1: NAAC Accreditation details of the Institute

The University is due to enter its Fourth cycle of NAAC soon.

1.5.4 Approval

The University has received the following significant approvals for the various courses.

S. No.	Course	Approval
1	B. Pharm and M. Pharm	**Pharmacy Council of India (P.C.I)** A statutory body of government of India constituted under the Pharmacy Act, 1948, responsible for regulation of pharmacy education and practice of profession in the country for registration as a pharmacist.
2	BA LLB (Five Years)	**Bar Council of India (B.C.I)** A statutory body established under the section 4 of Advocates Act 1961 that regulates the legal practice and legal education in India.

3	Teacher courses (B. Ed)	**National Council for Teacher Education (N.C.T.E)** A statutory body in pursuance of the National Council for Teacher Education Act, 1993
4	Diploma in rehabilitation psychology	**Rehabilitation Council of India (RCI)** The apex government body, set up under an Act of Parliament, to regulate training programmes and courses targeted at disabled, disadvantaged, and special education requirement communities.
5	Technical courses	**All India Council for Technical Education (AICTE)** A national-level Apex Advisory Body to conduct a survey on the facilities available for technical education and to promote development in the country in a coordinated and integrated manner.

Table 2: Details of the various Approvals of the Institute

1.5.5 Certification

The institute has received the following Certifications

- **The National Institutional Ranking Framework (NIRF)** - Ranked between 150 and 200 in the latest rankings.
- **All India Survey of Higher Education (AISHE)** – As per latest documents the reference number is U-0093-2019 for 2019-20

1.6 Affiliated colleges

The PRSU is one of the premier centers of higher education & learning in Chhattisgarh, India. It caters to the needs of the youths of Chhattisgarh and adjoining States, namely Madhya Pradesh, Maharashtra, Odisha, Jharkhand, Andhra Pradesh, as well as from West Bengal and Andaman & Nicobar Islands in the realm of higher education and research.

Chhattisgarh was carved out of Madhya Pradesh on the 1st November, 2000 as a new political entity. Pt. Ravishankar Shukla University, being the oldest university, is leaving no stone unturned to cater to the needs of the society. **The university has grown enormously over the last 57 years** in terms of number of students or disciplines, viz., humanities, natural science, law, education, pharmacy, management, physical education, library science and computer science & IT etc.

In 29 Schools of Studies (SoS) and 149 affiliated colleges spread over five districts of the Chhattisgarh State.

2. Institution overview

2.1 Populace analysis for Academic year 2019-20

2.1.1 Students data

The student data (shared by the University) shows there were a total of **16,500 Boys and 10,092 Girls** students thus **a total of 26,592 students** in the premises.

2.1.2 Staff data

Type	Total
Admin Staff	**4**
Teaching Staff	**120**
Non-Teaching Staff	**302**
Total Staff Members	**426**

Table 3: Staff data of the Institution for 2019-20

The staff data shows the premises had a total of **426** Staff Members.

2.2 Populace analysis for Academic year 2020-21

2.2.1 Students data

The student data (shared by the University) shows there were a total of **17,113 Boys and 11,091 Girls** students thus **a total of 28,204 students** in the premises.

2.2.2 Staff data

Type	Total
Admin Staff	**4**
Teaching Staff	**115**
Non-Teaching Staff	**288**
Total Staff Members	**407**

Table 4: Staff data of the Institution for 2020-21

The staff data shows the premises had a total of **407** Staff Members.

2.3 Total University Area & Building Spread Area

The **total site area is 300.17 Acres** and the **total Built-up area of University is 2,87,751 sq. ft.** for **a total of 28,611 footfalls.**

2.4 University Infrastructure

The Buildings are made of Reinforced Cement Concrete (RCC) framework. These are equipped with modern amenities. It facilitates the students with a good environment for studies and stays true to its aim of providing Holistic development. The Residential and Academic buildings amalgamate smoothly with the open space in order to stand out as one of the most premier Institutes in the country.

Overall the Infrastructure of the Building is excellent in terms of the Architecture Design and Green Building Design. The Premises covers most of the requirements for a Green Habitat. It continues to upgrade itself in terms of the facilities and makes sure that there is no compromise on the quality of services towards Building requirements. The cooperative teamwork and the leadership of the Hon'ble dignitaries are one of the main reasons for achieving success in providing quality education with an advanced and up-to date premises.

2.4.1 Spatial Organisation

2.4.1.1 Architectural Design

The overall ambience of the University is warm and inviting. The courtyards, educational spaces, learning spaces, residential spaces and recreational spaces have ample natural ventilation in the form of clear glass windows with fresh air ventilation. The architecture of the buildings are quite well designed. The colour palette not just helps the buildings to stand out as per respective typology of the Building be it Educational or Residential but also provides an Institutional arena. There are provisions for lifts, CCTV, Fire extinguishers, first aid box and much more.

2.4.1.2 Landscape design

The built-form balances with the local architecture and amalgamates very well with the natural landscapes in form of open ground, designed landscape spaces, streetscape

elements such grounds, designed gardens, greenhouse, botanical gardens and huge trees all around. There are provisions for ramps, open ground, courtyards, designated landscape areas, signages, Utility Boxes, Parking, Sidewalk Furniture and Utility Poles.

2.4.2 Building and Block wise details

The Building & Block wise details on the Pt. Ravishankar Shukla University premises are mentioned below:

S. No.	Branch name	Floor
1	Admin Building	G+2
2	Arts Building	G+3
3	Library Building	G+3
4	Electronic Building.	G+1
5	Science Block	G+1
6	B.ED Building	G+1
7	USIC	G
8	M.B.A. Building	G+1
9	New NCNR Building	G+1
10	HRDC Building	G+1
11	Computer Science Building	G+1
12	Biotechnology Building	G+1
13	Physical Education	G+1
14	Student Recreation	G
15	Pharmacy Building	G+1
16	Law Building	G+1
17	Maths/ Statistics Building	G+1
18	Geology Building	G+1
19	Bio Science Building	G+1
20	Regional study/ IQAC	G+1

21	CBS Building	G+2
22	Auditorium Building	G+1
23	Guest House Building	G+1
24	Teacher Hostel Building	G+1
25	Geography Building	G+1
26	Anthropology Building	G+1
27	Physics Dom Building	G+1
28	Health Center	G
29	Utility Center	G+1
30	old NCNR Building	G
31	Press Building	G+1
32	Community hall	G+1
33	Gym Building	G+1
34	Power gird Hostel	G+2
35	Gandhi Hostel	G+1
36	Azad Hostel	G+1
37	Boys Research Hostel	G
38	Navin Kanya Hostel	G+1
39	Professional Girls Hostel	G+1
40	Research Girls Hostel	G+1
41	PG Girls Hostel	G+1

Table 5: Block and department wise details of the University premises

2.4.3 Salient features

The University had the best State of the art Infrastructure in the Country. Some of the best features available are as follows:

1. *ERP System for monitoring administration /academics*
2. *Wi-Fi enabled premises*

3. *Modern infrastructure with well-equipped laboratories*
4. *Guest Lectures by Eminent Scholars*
5. *Ragging free environment*
6. *Hostels for Girls and Boys*
7. *24 x 7 Power and RO water supply*
8. *State of art Library*
9. *Canteen Facility*
10. *Medical Facility (Health Centre)*
11. *Auditorium with all ultra-modern facilities.*
12. *Multipurpose Hall*
13. *Landscaped Gardens*
14. *On premises Residential Facilities for faculties and employees.*
15. *Community development programs*
16. *Arrangement for physically Challenged persons/students.*

The University endeavours at training young women to be competent, committed and compassionate and lead in all walks of life.

2.4.5 Operation and Maintenance of the premises

The interview session with the staff regarding the operation and working hours is summarized in the table. The Institutions are open Monday to Friday for full day. Saturday, Sunday is an off for all. Below mentioned in the table are the average working hours. The detail wise timing for each is mentioned below the table.

S. No.	Section	Spaces	Time	Hours / day	Days in a year
1	Main Institutional University	Student areas and Teaching faculty	10:00 a.m. to 5:30 p.m.	7.5	280
2	General areas	Admin areas and library, Passage, staircase, toilet	09:30 a.m. to 5:30 p.m.	8	300

Table 6: Schedule of the timings of the premises


INDIAN
HOUSE

3. Green Building Audit Study

3.1 About the Green Building Study Audit

It is a systematic study of the aspects which make the Institution a sustainable and healthy premises for its inhabitants.

3.2 Analysis for the Green Building Study Audit

The procedure included detailed verification for the following:

Energy Audit

- Analysis of the Lights, Fans, AC, Equipment
- Renewable energy
- Scope for reducing the current energy bills if any
- Improvement in the thermal comfort of the premises

Green Audit

- Green initiatives
- Hygiene audit
- Water Audit - Analysis of the current water consumption of premises; Scope to include Rain water harvesting and Waste water treatment in premises
- Waste Audit - Current waste produced, its segregation and usage; Strategies to be adopted for waste management and awareness

Environmental Audit

- Analysis of the current landscape + hardscape of premises
- Analysis of the flora and fauna of campus
- Strategies adopted at present to enhance vegetation
- Measures that can be adopted for ecological improvement of the premises.

3.3 Strategy adopted for Green Building Study Audit

The strategies included data collection from admin department, actual inventory, investigation to check the operation and maintenance, analysis of the data collected and preparation of the Report.

3.4 Timeline of the activities for Green Building Study Audit

- 01 January 2022 – Discussion with the University
- 13 January 2022 – Allotment and Initiation by the University
- 12 February 2022 – Survey of the Student and staff submitted
- 24 February 2022 – Discussion for review of data collection
- 08 March 2022 – Site visit
- 10-21 March 2022 – Data submitted by University
- 23 March 2022 – Submission of the Report

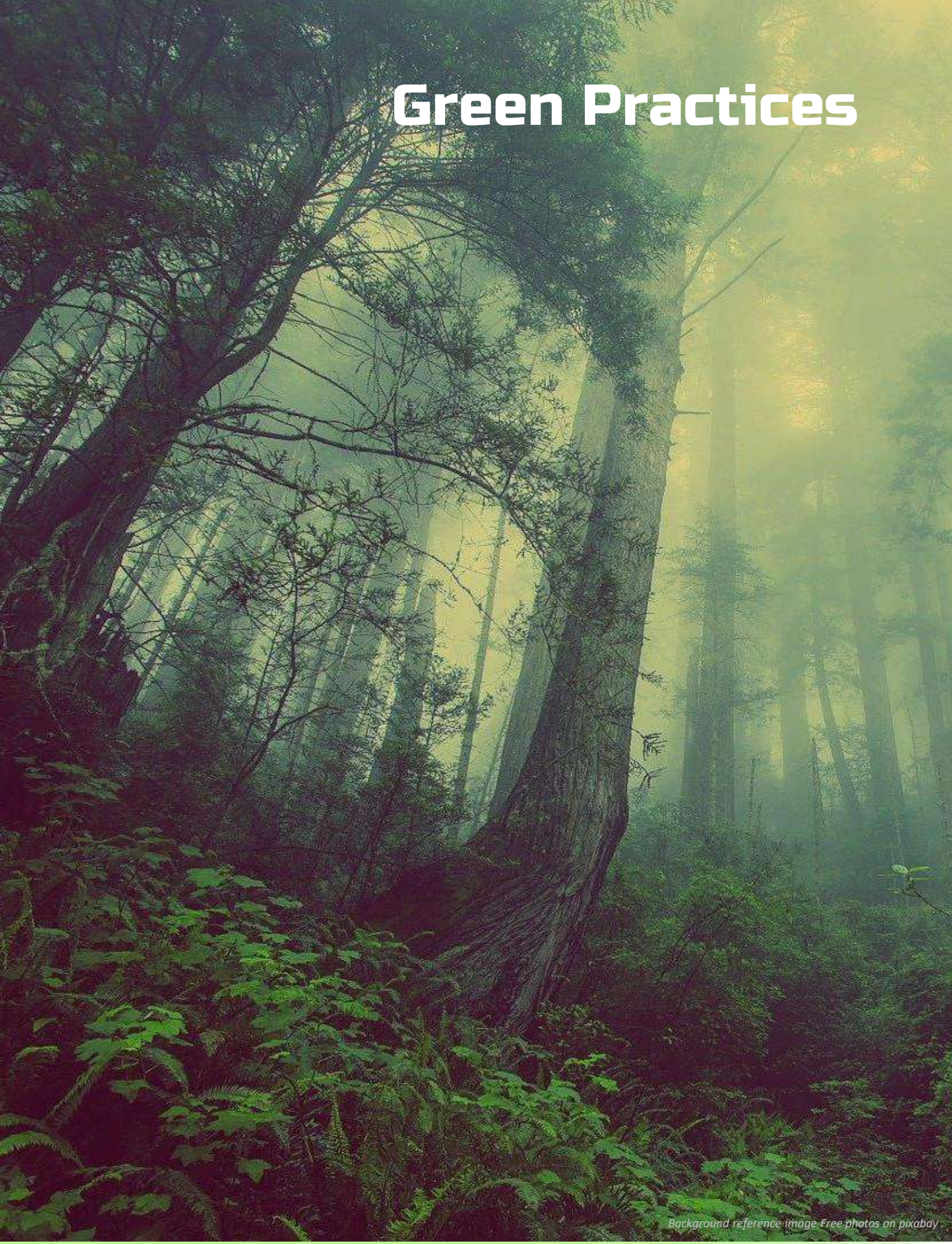
Meeting with Vice Chancellor Sir during the Audit visit

Discussion meeting with Prof. Girish Kant Pandey Sir, Registrar

Induction meeting with Mr. Kuldeep Bhupendra, Incharge Engineering section

On-site External Team with the University representatives

Green Practices



Background reference image Free photos on pixabay

Greenvio Solutions

4. Green Practices Audit

The increasing global warming and climate change have made us realise that apart from the enormous strategies the individual small efforts need to be taken by individuals and Educational Institutes as the younger generations are the future of the world and once they are taught about these practices only then can we assume a better future.

4.1 Green practices

We observed the following points during the Site investigation:

- There is **availability of open space in the premises in addition to the provision of the multiple varieties of flora.**
- **The ample vegetation benefit the users by providing shade.**
- **Self-sustaining premises has provision for organic composting and waste water contain organic nutrients which do not require additional nutritioning. These are utilised in the gardens of the premises.**
- There is **organic composting process carried out for decomposition of organic matter of plants and it is used as an organic fertilizer and increase ecology, this is done through Vermiculture.**
- The Students, University authorities **jointly conduct initiatives for upgrading of the premises from environmental view.**
- **The trees are well planned and organised this makes the ambience very refreshing.**
- **We would like to specially mention about the staff, though the University's provision for staff, personal housekeeping their co-operation and dedication towards maintaining the premises has lead to it being one of the most clean premises in the city of Raipur.**
- **The Teaching staff too is very cautious about eco-friendly initiatives and have ample knowledge about systems which is commendable.**

4.2 Survey results

An online survey was conducted to analyse the student and staff views about the premises, following are some of the reviews. (Note - Responses have been rounded off keeping in the population study)

4.2.1 Participation

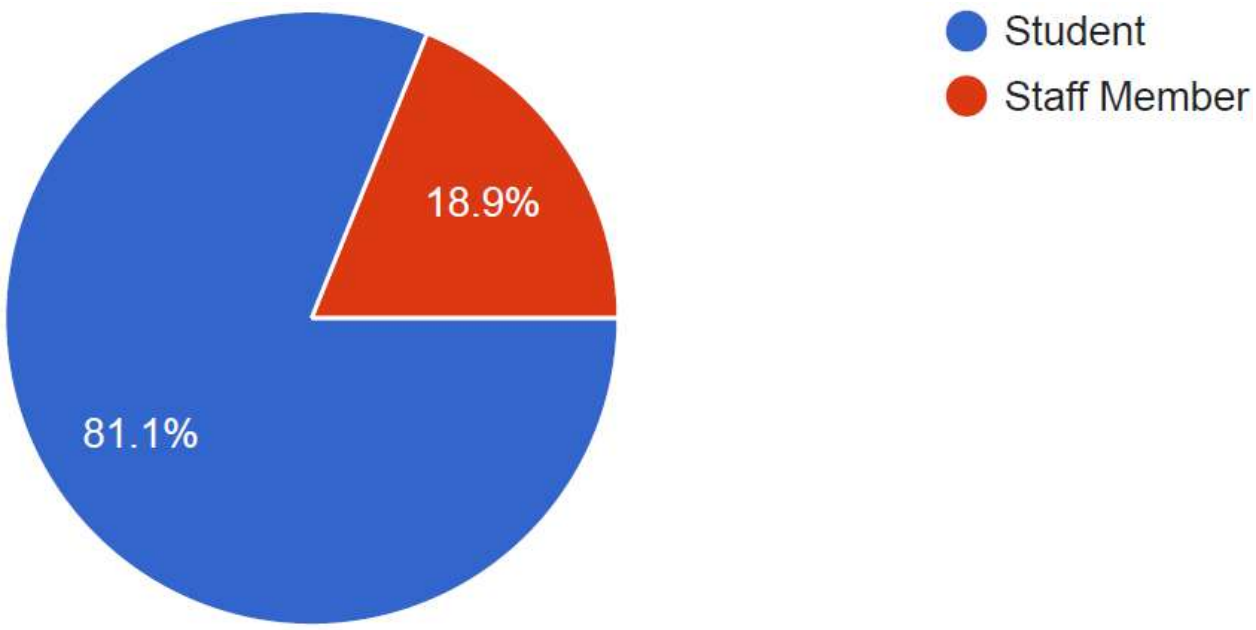


Figure 1: Participation analysis in the survey

A total of **122 responses** were received out of which 81% were students.

4.2.2 Schools (Dept./ Faculty)

The Students and staff from almost all the schools and departments had participated in the survey.

The enthusiastic participation and the coordination of the University towards encouraging the students to participate in the same are quite commendable.

4.3 Survey Ratings

Note about the review-rating survey

The Participants were asked to review (Though an online mode) the practice on a scale of 1-5 with scale components as follows:

- Scale 1 – Poor
- Scale 2 – Satisfactory
- Scale 3 – Good
- Scale 4 – Very good
- Scale 5 – Excellent

The figures in each of the columns of graph depict the Number of participants responses in numerical (Percentage of the participant response) – For example 101 responses (44.5%)

Rate the Green awareness practices in University

An online survey was conducted to analyse the student and staff views

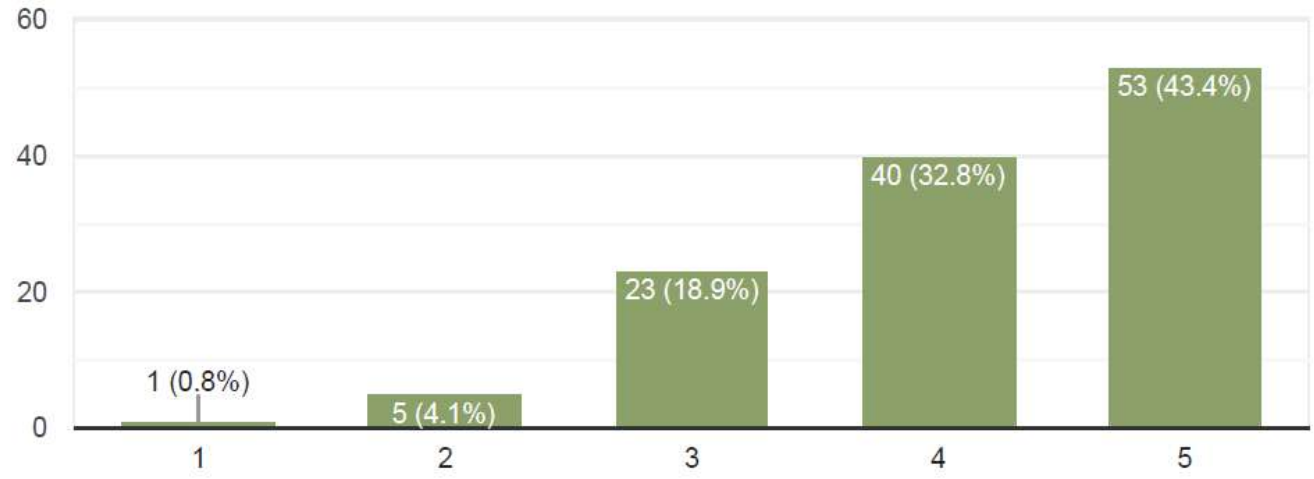


Figure 2: Participation analysis in the survey

There were mixed responses received the equal also the highest was for **rating 5 (Excellent) at 43% (which is a very good point to be noted) and rating 4 (Very good) at 33%** followed by **19% for rating 3 (Good).**

4.4 Community Development

4.4.1 About the initiative and concept

The various community development programs conducted include Tree Plantation, Life Learning, Employability Skill program introduced for the youth, Blood Donation Camp, Food Kit Distribution Program to the neighbourhood community, Relief fund programs. **The most special part is the Unnat Bharat Abhiyan initiative which are conducted by the University for generating awareness. A lot of efforts get involved right from planning to execution. The main motive behind these is social welfare. This kind of a though process is highly admirable. We respect and congratulate the University for the same.**

4.4.1.1 Unnat Bharat Abhiyan

The conceptualization of UBA started with the initiative of a group of dedicated faculty members of Indian Institute of Technology (IIT) Delhi working for long in the area of rural development and appropriate technology. The concept was nurtured through wide consultation with the representatives of a number of technical Universitys, Rural Technology Action Group (RuTAG) coordinators, voluntary organizations and government agencies, actively involved in rural development work, during a National workshop held at IIT Delhi in September, 2014. The workshop was sponsored by Council for Advancement of People's Action and Rural Technology (CAPART), Ministry of Rural Development, Govt. of India. The program was formally launched by the Ministry of Education (MoE) (formerly Ministry Human Resource Development (MHRD)) in presence of The President of India on 11 November, 2014.

Pt. Ravishankar Shukla University, Raipur, Chhattisgarh became a participating institute of UBA with AISHE CODE: 0093. As a part of Unnat Bharat Abhiyan, Pt. Ravishankar Shukla University, Raipur, Chhattisgarh is acting as representative of UBA in their area for promoting & facilitating UBA network. The University is responsible for conducting cluster activities in their own adopted village under UBA. The University is consistently work on the overall development of adopted villages through various innovative ideas and trying to identify the problems and need of the village peoples. The institute will also responsible to solve the problems and helps them to raise the standard of living of villagers.

To full fill the requirement of the adopted villages related to their socioeconomic development and to conduct the activities, disseminate the new technologies the UBA team of our institution is actively involved and is trying to improve the quality of rural life through innovative and affordable technological interventions.

4.4.1.2 Villages adopted

There are a total of five villages adopted by the Pt. Ravishankar Shukla University, Raipur, Chhattisgarh in this context. The details of the same are as follows.

- **Telnisatti gram – Zilla Dhamtari**
- **Baronda gram – Zilla Mahasamund**
- **Mund gram – Zilla Baloda Bazar- Bhatapara**
- **Gomchi gram – Zilla Raipur**
- **Supebeda gram – Zilla Gariaband**

4.4.2 Survey reviews

An online survey was conducted to analyse the student and staff views about **the Rural community programs undertaken by the Institute?**

Some of the key responses are noted below as a result of Online survey.

- Excellent
- NSS and few other departments are doing good activities.
- **University is continually working for uplifting the education standards and facilities in nearby government schools.**
- Impressive but need to be updated time to time
- Very good initiative by Pt.S.R.U. NSS team to take a camp in rural areas to awareness about swachh Bharat Abhiyan and also aware from Covid-19, to protect him or her self planting trees.
- They organize seminars to awre us about rural problems and their solution
- **The Program is very good and helpful for the rural community nearby University.**

4.5 Eco-friendly initiatives undertaken

The University has undertaken the following initiatives through **excellent efforts** towards save environment measures and conduct various activities like tree plantation, nature cleanliness, visits to nearby flora and fauna, rural development initiatives.

4.5.1 Environment initiatives

There are National Service Scheme units in the College. The N.S.S Programme Officers of the College have been working as a team with dedication for the following activities.

- Cleaning campaign in the society.
- Afforestation through tree plantation.
- Creating awareness of such issues as social problems, education and cleanliness.
- Awareness Rallies about environment, cleanliness
- Organization of health camps, Street plays.
- Fund raising for the Armed forces.

4.5.2 Survey results

4.5.2.1 Does your University conduct environment awareness programs/ webinars/ plantations/ cleanliness or similar programs?

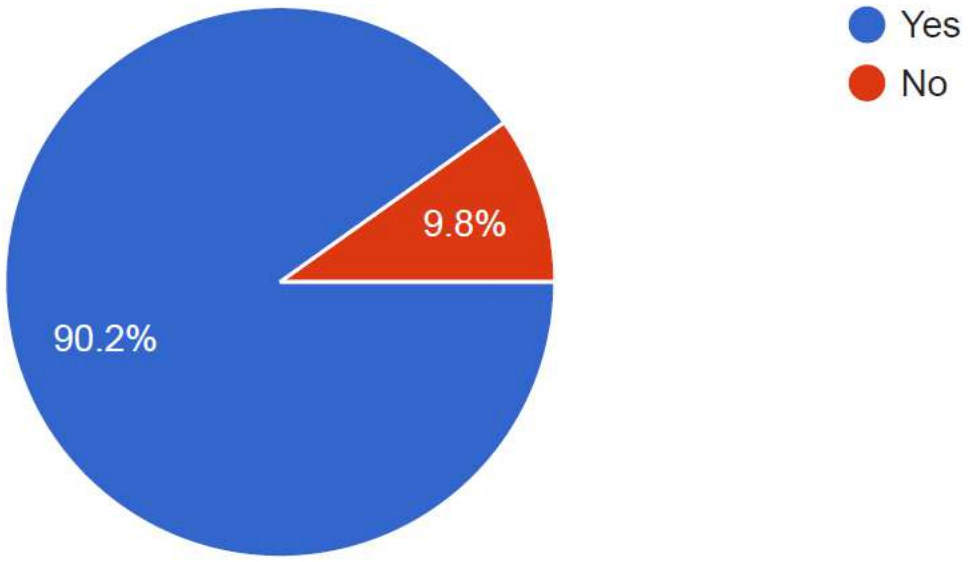


Figure 3: Green awareness practices in University

The students, staff **(almost 90%)** of responses confirmed activities are conducted which is very excellent.

4.5.2.2 Do you participate is such events?

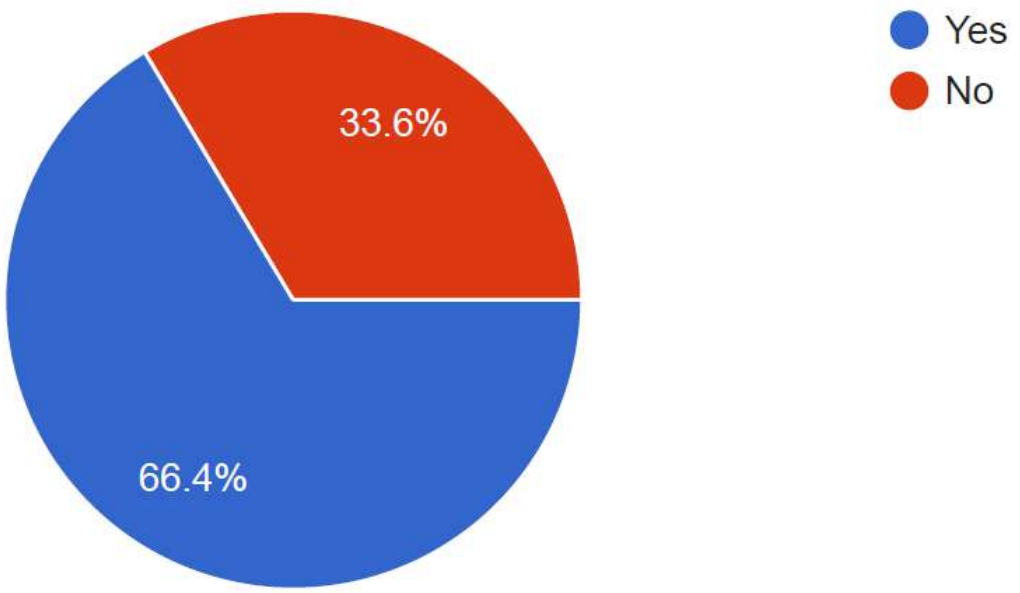


Figure 4: Green awareness practices in University

The students, staff **(almost 66%)** of the responses confirmed their participation, **this is a good number however it can be increased in future.**

4.5.3 Survey review

4.5.3.1 If yes, what has been your experience about the program?

We have listed some of the key responses below.

- It's very good and informative.
- Pleasant experience
- **It was really very nice experience and to experience and I also aware people in the society regarding same.**
- It tries to educate the people regarding issues of environment.
- Very valuable and knowledgeable to maintain our environment clean and green.
- **It was great, we came to know about many species of plants and their uses.**
- Informative and good step towards our future.
- Good as it creates awareness and social interaction.
- Good and qualitative information collected.

- Programs were well organized and impactful.
- Under the University Green Program Awareness, we got to know about our ecological balance and control of environmental balance.
- **Traffic rule awareness, overall the experience is good, learned about the importance of following traffic rule as it not only safe our life's but also prevent others life too.**
- It is nice to experience of doing such work for our environment.

4.6 Recommendations for a Sustainable Habitat

We have found that the current practices are very excellent and thus there are only minimal recommendation with respect to this section.

a) Beautification of the plantations in the premise

There can be provision for more plantations in the premise may be even Kitchen garden facility, the existing plantations and open unsused areas such as backyards require upgradation through proper landscape architecture interventions. Though, duing the site visit we observed this activity has begun to be implemented there is scope for improvement.

b) Plant as a gift

As a kind gesture the guests visiting the premise can be asked to plant a small plant in the premise itself and they can be even given plants/ bouquet from the flowers of the plants in the premise as a gift.

c) Environmental awareness

There can be various artworks on compound wall giving message of saving environment through the joint efforts of the students and staff thereby making the student socially and environmentally responsible citizen.

d) Tree adoption scheme

The college can adopt One Faculty – One tree adoption scheme which is one of its kind practice, this can be very beneficial especially during the summer season.

e) No vehicle day

Once in a while a No vehicle day can be adopted by students and staff to promote the use of eco-friendly vehicles in the premise.

f) Signages on the plants mentioning scientific names

The practice of having the names of each plant and tree will provide awareness among the staff and students.

राष्ट्रीय सेवा योजना

स्थापना दिवस एवं सम्मान समारोह

23 एवं 24 सितम्बर 2018

प्रशस्ति-पत्र

प्रमाणित किया जाता है कि श्री एल. एस. गजपाल, पं. रविशंकर शुक्ल विश्वविद्यालय अध्ययन

शाला, रायपुर (छ.ग.) ने सत्र 2017- 2018 में राज्य स्तरीय राष्ट्रीय सेवा योजना के श्रेष्ठ कार्यक्रम अधिकारी

के रूप में सम्मानित किया जाता है।

इन्हें उज्जवल भविष्य की कामना करते है।

कार्यक्रम समन्वयक (रासेयो)
पं. रविशंकर शुक्ल विश्वविद्यालय
रायपुर (छ.ग.)

राज्य एन. एस. एस. अधिकारी
राष्ट्रीय सेवा योजना छ.ग. शासन
रायपुर (छ.ग.)

कुलपति
पं. रविशंकर शुक्ल विश्वविद्यालय
रायपुर (छ.ग.)

राष्ट्रीय सेवा योजना

स्वर्ण जयंती वर्ष 1969-2019

राज्य स्तरीय स्थापना दिवस एवं सम्मान समारोह

23 एवं 24 सितम्बर 2019

प्रशस्ति पत्र

प्रमाणित किया जाता है कि श्री कौशल गजेन्द्र

महाविद्यालय समाजशास्त्र एवं समाजकार्य, अध्ययनशाला, पं. रविशंकर शुक्ल विश्वविद्यालय, रायपुर (छ.ग.)

को सत्र 2018-19 में राष्ट्रीय सेवा योजना के श्रेष्ठ स्वयं सेवक के रूप में सम्मानित किया जाता है।

डॉ. नीना बाजपेयी
कार्यक्रम समन्वयक (रासेयो)
पं. रविशंकर शुक्ल विश्वविद्यालय
रायपुर (छ.ग.)

डॉ. समरेन्द्र सिंह
राज्य एन. एस. एस. अधिकारी, पदेन उपसचिव
राष्ट्रीय सेवा योजना छ.ग. शासन
रायपुर (छ.ग.)

प्रो. केशरी लाल वर्मा
कुलपति
पं. रविशंकर शुक्ल विश्वविद्यालय
रायपुर (छ.ग.)

नेहरू युवा केन्द्र, रायपुर

NEHRU YUVA KENDRA, RAIPUR

नेहरू युवा केन्द्र संगठन
विश्व का सबसे बड़ा युवा नेटवर्क
कोड-7206

स्वायत्तशासी संस्था
युवा कार्यक्रम एवं खेल मंत्रालय
भारत सरकार

an autonomous Body under the Ministry of Youth Affairs & Sports Government of India

साथ साथ
चलने की ओर...

क्र: NYK/Rpr/SBSI-2/2019 / 2020-21/ 158

06.01.2021

कार्यक्रम अधिकारी (NSS)
पं रवि शंकर विश्वविद्यालय
रायपुर छ.ग

विषय- स्वच्छ भारत समर इंटर्नशिप 2019 प्रतियोगिता के पुरस्कार राशि बाबत ।

महोदय ,

नेहरू युवा केंद्र , रायपुर छ.ग अत्यंत हर्ष के साथ आपको सूचित करना चाहता है की स्वच्छ भारत समर इंटर्नशिप 2019 में NSS ईकाई , पं रवि शंकर विश्वविद्यालय, रायपुर छ.ग को जिला स्तर पर द्वितीय पुरस्कार मिला है।

इस पुरस्कार की राशि ₹ 20,000 माह हमें नई दिल्ली मुख्यालय से प्राप्त हो चुकी है। अतः आपसे निवेदन है कि उक्त पुरस्कार राशि का भुगतान करने हेतु आपके पं रवि शंकर विश्वविद्यालय के NSS ईकाई का बैंक खाता क्रमांक, पासबुक की छायाप्रति एवं मैंडेट फॉर्म (Mandate Form) भरकर 07.01.2021 तक देने का कष्ट करें जिससे उक्त पुरस्कार राशि आपके खाते में भेजी जा सके।

धन्यवाद।

भवदीय
06.01.2021
अंकित तिवारी
जिला युवा अधिकारी
नेहरू युवा केंद्र रायपुर
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एवं
रा.से.यो. राज्य स्तरीय सम्मान समारोह

दिनांक : 12 जनवरी 2021

{ प्रशस्ति पत्र }

प्रमाणित किया जाता है कि श्री / कु. / डॉ. / श्रीमती अध्ययन शाला इकाई

संस्था पं. रविशंकर शुक्ल विश्वविद्यालय, विश्वविद्यालय पं. रविशंकर शुक्ल विश्वविद्यालय, रायपुर

को राष्ट्रीय सेवा योजना के श्रेष्ठ 'संस्था कार्यक्रम इकाई' के रुप में सम्मानित किया जता है।

हम इनके उज्जवल भविष्य की कामना करते है।

डॉ. समरेन्द्र सिंह
राज्य एन. एस. एस. अधिकारी, पदेन उपसचिव
राष्ट्रीय सेवा योजना छ.ग. शासन

धनंजय देवांगन (IAS)
सचिव
उच्च शिक्षा विभाग

Waste Audit

Background reference image Polina Tankilevitch on pexels

Greenvio Solutions

5. Waste Audit

Waste is an inevitable part of our lives. Over the years as the awareness about waste management techniques has given a rise to rethink how the waste can be avoided form being sent to the landfills. The audit provides an approximation of the types of waste generated, location of waste collections, disposal techniques used, waste segregation methodologies adopted, waste management strategies that are and implemented in addition to the newer ways the can be adopted aiming to make the premises clean and sustainable. Here sustainable refers to a broader aspect to analyse whether the current techniques are having positive or negative effect on the stakeholders of the premises.

5.1 Waste produced

5.1.1 Types and disposal of waste in Premises

The types of waste collected in the premises are as follows, these are separated before processing.

S. No.	Type of waste	Source and quantity	Current Disposal method	Can be treated/ recycled?	Methodology
1	Solid waste	Toilets–Biodegradable waste of 100-200 kg per week	Led in to storm water drain	Yes	Biogas plant/ Sewage treatment plant
2	Paper waste	Newspaper and other paper	Given to vendor	Yes	CONTINUE - with the current practice
3	E-waste	Computers - Non-biodegradable waste as per the annual year usage	Given to vendor	Yes	CONTINUE - with the current practice
4	Dry waste in form of leaves	Open space & plantations, papers - Non biodegradable waste of 500-1,000 kg per week	Partial compost and partial handed over to municipality	Yes	Large size dedicated compost pit can be constructed.
5	Liquid waste	Toilets, washbasins – Around 100 – 120 litres per week during general times and 50 litres at present	Led in to storm water drain	Yes	Water treatment plant
6	Organic regular waste	Dust, dirt usually dry waste from Canteen and all sources – approx. 3 to 5 kg	Partial compost and partial handed over to municipality	Yes	Large size dedicated compost pit can be constructed.

Table 7: Summary of the types of waste produced in the premises

5.1.2 Bins summary

As per our analysis we found that there are 379 dusbins in the entire premise. the only defect is that all of these are made up of plastic, in future the Univerity may adopt dustbins made of eco-friendly materials.

5.2 Waste handling

Quantification wise as per Interview and survey it was found that the Solid, Dry leaves collected is approximately 500 kg per week. The liquid and hazardous waste (septic tanks) is approximately 1,00,000 litres per week. The waste produced on the premises is segregated. The staffs are very well trained and do an excellent job. **Further the Team has shared the following strategy which is adopted for waste management.**

Presently solid waste and waste from trees is being dealt by making pits at one place. Leaves and waste of tree is dumped in pits for making compost manure. Similarly, solid waste is collected from residences, hostels, offices and departments.

The same is segregated and accordingly solid waste is lifted by municipality and garbage is dumped in the pits for preparing compost manure. Further proposal for installation of solid waste treatment and waste water treatment plant is underway.

During on interaction with the Team we observed the concern and dedication the entire Team shows towards the University management aspect. We highly appreciate these efforts and way of working.

5.3 Waste management

The University reuses the papers. It was informed newspapers were given in bulk to Vendor who shreds and converts it into new paper, thereby not sending it to Municipal Corporation **and not adding to landfill site.** Ample measures are taken to maintain hygiene. **No smell problem or health related issues were observed.**

There are adequate numbers of bins present in all parts of building. **The waste does not pollute the ground or surface water.** The wastes from toilets are discharged to main drains through underground covered channels (Safety Tanks) thus avoiding any incident. **There is no problem of air, dust pollution from waste.**

5.4 Survey Ratings

Note about the review-rating survey

The Participants were asked to review (Though an online mode) the practice on a scale of 1-5 with scale components as follows:

- Scale 1 – Poor
- Scale 2 – Satisfactory
- Scale 3 – Good
- Scale 4 – Very good
- Scale 5 – Excellent

The figures in each of the columns of graph depict the Number of participants responses in numerical (Percentage of the participant response) – For example 101 responses (44.5%)

Rate - Usage of waste saving practices adopted in Institute premises

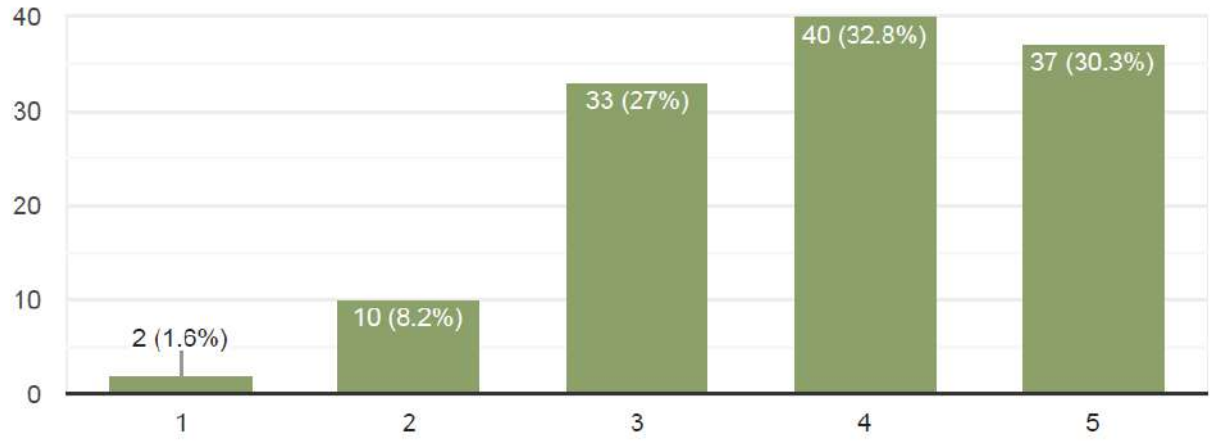

Figure 5: Waste management practices in University

There were mixed responses received the highest was for **rating 4 (Very good) at 33%** followed by **30% for rating 5 (Excellent).**

5.5 Survey Results

Is there any Waste pollution in the premises?

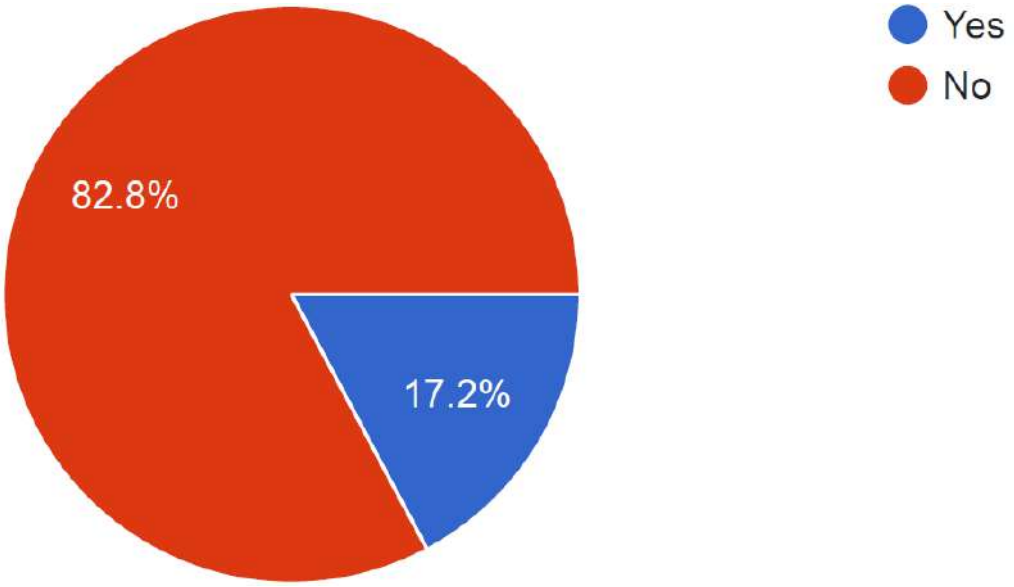

Figure 6: Participants response in survey

The students, staff **(almost 83%)** of responses confirmed there is no waste pollution

5.6 Survey review

According to your observation what are the simple steps adopted by the Institute towards waste conservation?

Some of the key responses are noted below as a result of Online survey.

- Dustbins for the bio and non biodegradable waste
- **Moving towards becoming paperless.**
- **Dustbins are installed in nearly every corridor.**
- Encouraging students for minimising use of plastic bottles and plastics
- They have put dustbins everywhere and have good workers for the cleaning work
- For the sanitary pads disposal, the pads burning machines have been provided to the girls hostel. But the same machine provided to different dipartments do not work properly which is very disappointing. There are dustbins everywhere inside the campus, but the same dustbins are used for dry waste and wet waste.

5.7 Recommendations for a Sustainable Habitat

As per our verification for this audit the efforts of the University are highly appreciable as they are very well maintained hence additional recommendations are excluded for this section.

a) Zero Waste practice adoption

The college can undertake a zero organic waste protocol. The following practices can be adopted as part of the same.

- The food waste generated by the students and staffs are taken by them to their own home, so that, minimum waste is generated inside the premises.
- The organic waste generated in the canteen is used as feed for a biogas plant and the biogas is used as fuel in college canteen.
- Vegetable waste and other leaf litters can be used to fed in the vermi-compost pit and the resulting vermin-cast is used as manure in the garden.
- The chemicals from the laboratories be disposed in a sealed tank along with water, so that the chemicals undergo neutralization with the water.

As part of the above there will be a requirement for a Biogas plant, vermin-compost pit, awareness signages, sealed tank for waste water from chemical laboratory.

b) Signages

Message about avoiding wastage should be placed at appropriate locations.

c) Compost pit

There can be provision for a compost pit

d) Dustbins at every 100m

There should be dustbin at every 50-100 in the open spaces

e) Material of the dustbin

The current plastic dustbins should be replaced with an eco-friendly material.

f) Sanitary vending machine and incinerators

There should be increased provsiisons for vending and incinerator machines in every building.


KLEENO
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नहीं मिलेगा जीवन दोबारा,
प्रदुषण मुक्त हो पर्यावरण हमारा.
Green Campus, Clean Campus
Pt. Ravishankar Shukla University, Raipur

Water Audit

Background reference image Vlad Chetan on pexels

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6. Water Audit

Water is one of the basic needs. Pure drinking water is a resource which needs to be preserved efficiently. Water audit helps to identify the sources of water consumption, the water requirement by the campus met by these sources. The points and effective usage of without any wastage. Understanding the techniques which are best suited to the site to increase water conservation in terms of awareness and practice.

6.1 Water availability and consumption

6.1.1 Sources of Primary water supply

The Borewell is the main source of water in the premises. The are 31 wells and borewells locatd at multiple places in the premises.

6.1.2 Source of Secondary water supply

The University requires water from the Local Municipality for drinking purpose. The total water consumption through the tanks on site at multiple locations is 1,11,000 litres.

As per the investigation and data collection shared we found that there are total of 5 tanks in the premises. There is no issue with respect to cleanliness and hygiene. The areas are kept clean. There is periodic maintenance carried out.

6.1.3 Sources of Tertiary water supply

Natural Rainwater harvesting – It is done through the ground water recharging and upgrading the water quantity for bore well recharging. The water gets recharged and water table is maintained well naturally. The areas of gardens, tracks do not hav any kind of flooding and water is percolated on its own. Though, there can be provision of water tanks to store the water in future. At present the requirements are met within the limits.

Rain water harvesting has been done to recharge the rain water of roof and parking in the premises. **During the time of induction meeting with Mr. Bhupendra on site we were informed that every building has pit for rain water harvesting.** The rain water of roof and parking is directly recharged through these bore wells.

6.2 Water requirement

The main areas of water requirement and type of usage is as follows

- **Drinking water –** Consumption of around 70,000 litres of water through Water cooler, stabilizer, starter & Aquaguard with filter is available in premises.
- **Toilet blocks**– General usage by occupants in toilets, urinals, bathrooms, wash basins using approx. 80,000 - 1,00,000 litres of water daily
- **Cleaning of the premises –** The entire University is very well maintained with respect to hygiene and cleaning is one of the major uses of water requirement. **The toilet areas are cleaned twice on a daily basis.**
- **Garden and surrounding open space**
    - Cleaning, watering the plants requires approximately more than good amount of water.
    - Keeping in mind the scale of the open spaces there is supply system connected directly and the plants, trees are hardly watered regularly.
    - Though, they are watered on alternate days in winter season and about 2-3 times a day in summer season.
    - On a regular climate day it is watered 3 days a week and in rainy season it is dependent on the monsoon showers.

6.3 Areas of water usage

Based on the inventory done - data shared by the staff it was found that the premises has the following facilities.

- No. of Urinals - 341
- No. of Toilets - 548
- No. of Wash Basins - 726
- No. of Taps in Indoors - 1,015
- No. of Taps in the Outdoors - 84

As per on site observation, it was noted that there is no water wastage of water in the form of Cleanliness of toilets.

6.4 Site investigation about water management.

The University has an excellent management system which is very appreciable. We have observed the following points.

- There was **no water leakage in the entire premises.** The **pipes are well maintained with adequate hygiene.**
- **The premises has an efficient water management in terms of operations and maintenance.** The toilets were kept very tidy and are cleaned every day.
- The **waste water does not mix with ground water and gets directed to storm water drains.**
- **The University has natural rainwater harvesting system which is very useful.** There are **sufficient number of taps** in the premises.

6.5 Survey Ratings

Note about the review-rating survey

The Participants were asked to review (Though an online mode) the practice on a scale of 1-5 with scale components as follows:

- Scale 1 – Poor
- Scale 2 – Satisfactory
- Scale 3 – Good
- Scale 4 – Very good
- Scale 5 – Excellent

The figures in each of the columns of graph depict the Number of participants responses in numerical (Percentage of the participant response) – For example 101 responses (44.5%)

Rate - Usage of water saving practices adopted in Institute premises

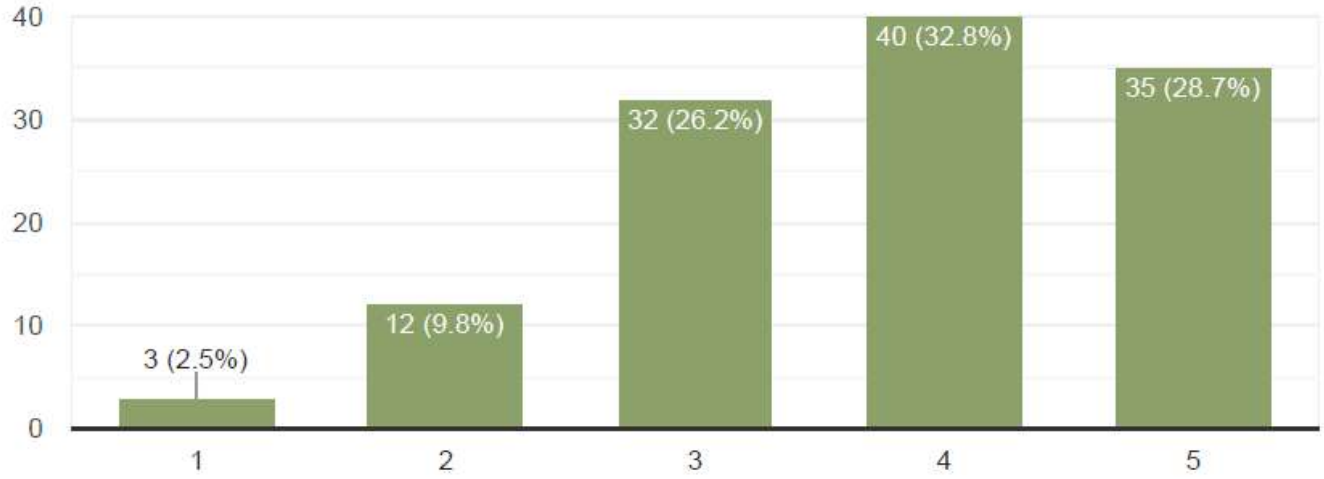

Figure 7: Water management practices in University

There were mixed responses received the highest was for **rating 4 (Very good) at 33%** followed by **29% for rating 5 (Excellent).**

6.6 Survey Results

Is there any Water pollution in the premises?

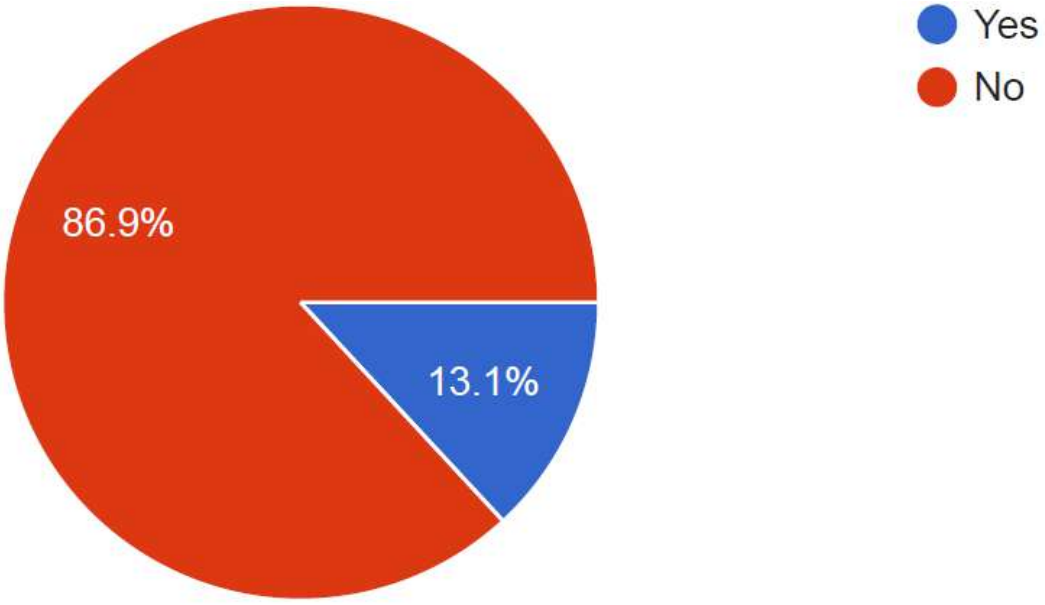

Figure 8: Participants response in survey

The students, staff **(almost 87%)** of responses confirmed there is no water pollution

6.7 Survey review

According to your observation what are the simple steps adopted by the Institute towards water conservation?

Some of the key responses are noted below as a result of Online survey.

- **Rainwater harvesting, maintenance of water bodies, minimize water wastage.**
- The water supply are monitored and overflow are taken care.
- There should be proper maintenance of plumbing system, waste water should be used for irritation purpose, it will decrease the usage of potable water.
- Soak peats, construction of reservoirs.
- **There's no overflowing of water. The waster which is of no use is discarded in the garden so it isn't wasted.**
- They never waste water as they use water very carefully.
- **They don't waste water and all water supply pipes work properly so no leakage is there so it helps to conserve water.**
- **University has been conducting awareness programs and they are encourage more on rain water harvesting at homes.**

6.8 Recommendations for a Sustainable Habitat

Below mentioned are few suggestions for better water management practices in the premises.

a) Universal Toilet

At least 1 toilet should be made for specially abled as per universal design norms in every building

b) Waste water from toilets

This should be collected and a waste water treatment plant can be installed in the open space wherein this water can be treated and reused for gardening and toilet flushing.

c) Signages

Message about avoiding water wastage should be placed at appropriate locations.

d) Waterless urinals

There can be provision of waterless urinals as a Green Building initiative in the premise, either the existing ones can be replace with such a facility of new toilets can be constructed in this manner.


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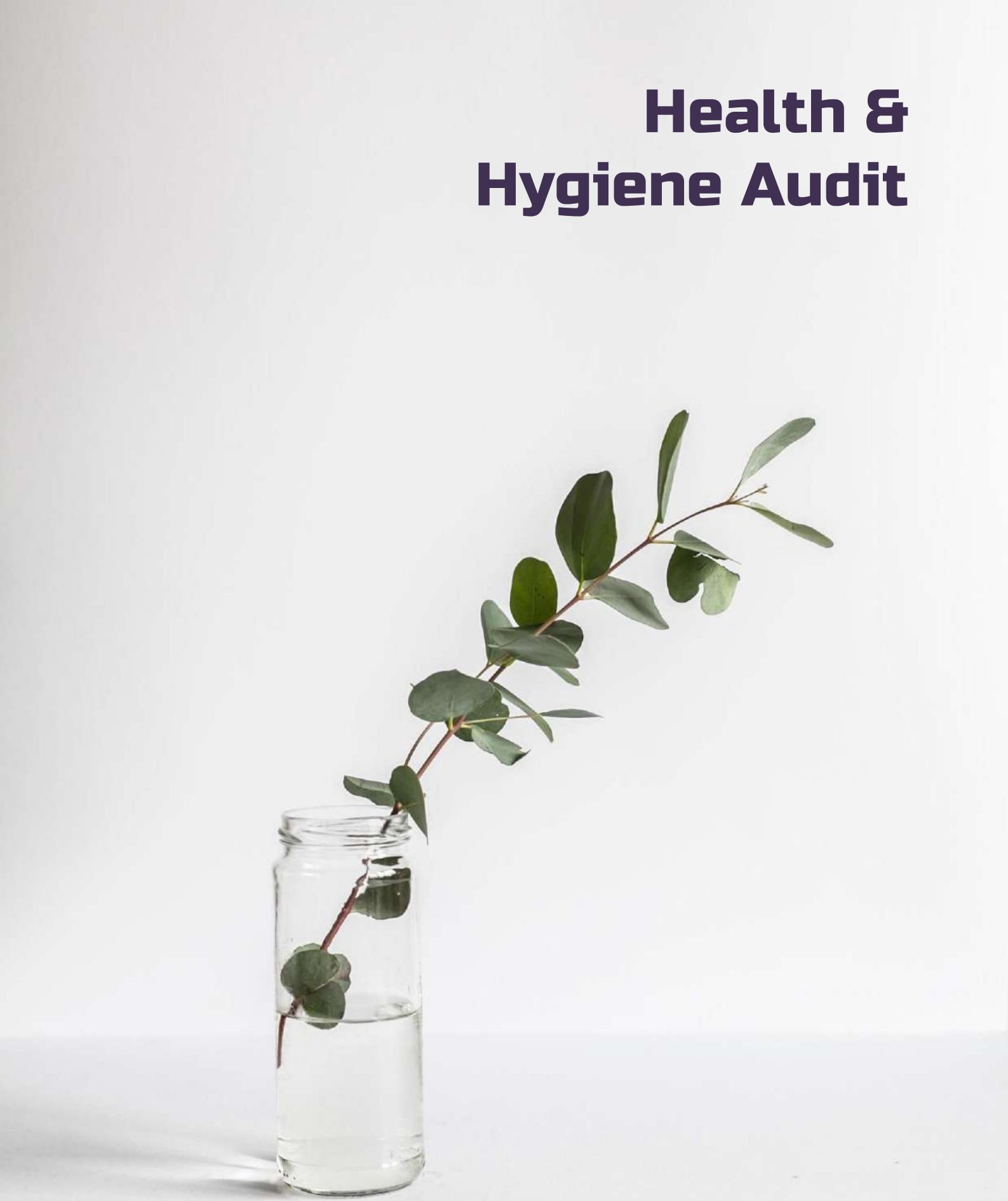
Health & Hygiene Audit



Background reference image Curology on unsplash

Greenvio Solutions

7. Health and Hygiene Audit

The hygiene is a part and parcel of our daily life. It is extremely essential to keep the surroundings clean in the same manner as we would want our houses to be. Educational Institutes have a bigger role to play in order to affect the young minds in the positive manner through better hygienic practices.

7.1 Facilities available

The University has the following facilities as part of the premises.

- Washroom facility in each of the Building.
- Hand wash facility
- Drinking water facility in the form of Water coolers and taps
- Ample number of dustbins in the premises

7.2 Smoke Exposure

As per the Site visit the following analysis **has a positive impact on premises.**

- The University has No Smoking messages as part of the awareness.
- Canteen uses Gas cylinders for cooking, there is no utilisation of fire wood. Thus **there is no smoke from burning of fire wood and any health issues related to the same.**
- The **garbage in premises is not burnt and there is no air pollution because of it**.
- The University is a tobacco and smoke free premises which helps in adapting to a Healthy University
- There is parking provision inside the premises there is slight issue of dust owing to the same but it is **balanced with the good vegetation in the premises.**

7.3 Hygiene

As per our analysis the following points **has a positive impact on premises.**

- For overall hygiene of the students and staff there are facilities such as Washroom

facility on ground floor, hand wash. The hygiene of toilet areas is well maintained. **The entire premises is cleaned twice on a daily basis. It is very appreciating that there are sufficient numbers of Maintenance staff who strive their best to take care of the entire premises in the most excellent way possible.**

- There staff keep a regular check about the operation and maintenance of the equipments each floor.
- Water management initiative with appropriate hygiene is undertaken. The areas of water tanks in site on ground floor are clean and no mosquito breeding spots are there.
- There are pest controls program practiced with appropriate sanitation facilities and Annual Maintenance Contract for pest control is done once a year by professional Pest control units
- The food premises and equipments are cleaned as per schedule with special care taken to avoid any water stagnation. The food waste and other refuse are removed periodically from food handling areas to avoid accumulation.
- As part of Tree Plantation programme the initiative of **Swachh Bharat Abhiyan of Govt. of India** is undertaken during various occasions.
- There are appropriate storage areas which are well maintained.

7.4 Site investigation

During the physical verification of the site, the following points were noted.

- All the facilities are cleaned on a daily basis.
- The Maintenance staffs are allotted the responsibility of the washroom hygiene and they do a very commendable and excellent job to maintain hygiene of the premises.

7.5 Recommendations for a sustainable habitat

As per out physical site verification for this audit the efforts of the University are highly appreciable as they are very well maintained and no new recommendation with respect to this aspect is required.

7.6 Survey ratings

Note about the review-rating survey

The Participants were asked to review (Though an online mode) the practice on a scale of 1-5 with scale components as follows:

- Scale 1 – Poor
- Scale 2 – Satisfactory
- Scale 3 – Good
- Scale 4 – Very good
- Scale 5 – Excellent

The figures in each of the columns of graph depict the Number of participants responses in numerical (Percentage of the participant response) – For example 101 responses (44.5%)

An online survey was conducted to analyse the student and staff views about **Rate - Hygiene practices in Institute premises**

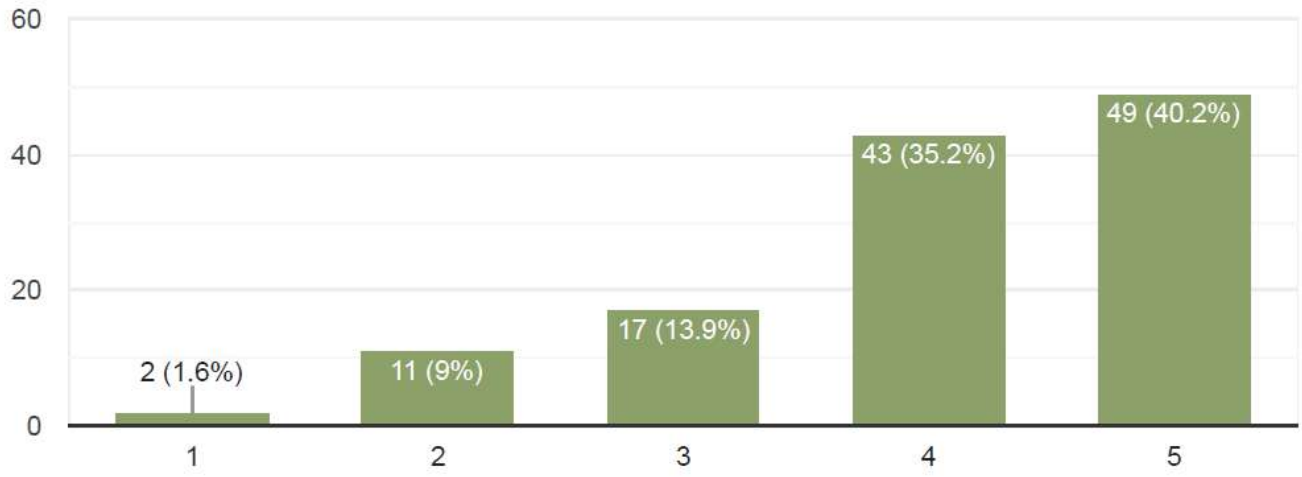


Figure 9: Participation analysis in the survey

There were mixed responses received the equal also the highest was for **rating 5 (Excellent) at 40% and rating 4 (Very good) at 35%** followed by **14% for rating 3 (Good).**

7.7 Survey review

Some of the key responses are noted below as a result of Online survey.

7.7.1 According to your observation what are the simple steps adopted by the Institute towards cleanliness of the premises?

- Sometimes department organise those swaach bharat abhiyaan programs.
- Proper waste disposal. No plastic usage. Dustbins at all points.
- Regular dusting and cleaning of the building along with provision of hand sanitizers.
- Regular cutting of overgrown grass and proper maintenance of waste.
- **Floors and classrooms are cleaned on regular basis. Dustbins are emptied everyday. Proper cleaning of washrooms are done time to time.**
- **Cleanliness of different dipartments on the daily basis, hostel floor are cleaned by the workers everyday, dustbins inside the campus wherever needed, this all contribute to the University's steps toward the cleanliness of the campus.**
- Engineering section of the university take care about the cleanliness.
- University have lots of cleaning workers who work very hard to keep premise clean.

8. Survey review of Positive steps

What according to you are the positive steps taken by the Institute towards Green Building/ Good maintenance?

We have listed some of the key responses below.

- **Solar projects and installation of solar at rooftop for green power supply.**
- **To plant more or more trees and maintain the ecosystem.**
- **Minimal waste generation and maintenance of the green campus by good upkeep. There is a restriction on the entry of the automobiles in the campus during the morning hours, since the campus attracts a large number of morning walkers and joggers due to its greenery.**
- **Initiative of creating awareness about Green Energy and Green Building. Induction of Renewable Energy based courses.**
- **Managing our playground properly and also making new courts for other games.**
- **Fertilizers are provided to the plants from time to time, and green houses have also been made for the maintenance of plants in our departmental schools.**
- **All the plants that have been planted are taken care on regular basis.**

9. Towards a Healthy & Sustainable University

9.1 Inputs by Greenvio Solutions

Based on the analysis of the study of premises in addition to the recommendations provided in each section of Ecological, Water, Waste and Energy Audit the University can adopt the following strategies towards a Healthy and Sustainable Institution practices.

a) **Cutlery in the Canteen –** The regular plastic and steel plates, spoons used in Canteen can be replaced with eco-friendly and organic leaves, paper straw, disposable plates, edible spoons and tables made out of sugarcane waste or bamboo. This will be first of its kind initiative to be adopted and practiced thus also inculcating the healthy practices in students.

b) **Waste vio –** Stepping up a little further an initiative can be undertaken wherein University can tie up with an organisation and students can be encouraged to collect dry waste and electronic waste such as newspapers, old computers and others and hand over to organisation on a weekly or monthly basis thereby making a waste reduction approach in the community. This has benefits such as awareness, eco-friendly habits in becoming a responsible citizen.

c) **Signages –** In addition to the signages being in regular language there can be additional signages in braille language for the specially abled students.

d) **Environment Certificate Courses –** The University could begin courses such as Bachelor's, Diploma or Certificate courses with National and International Collaboration related to Environment as part of the courses provided. Though, this is not a requisite or compulsion.

9.2 Survey Results

An online survey was conducted to analyse the student and staff views about what changes according to you can be undertaken for Green audit improvement in University premises and activity, some of the key responses are listed below.

Some of the suggestions by the Students and staff are listed below:

- Cleanliness should be given first, plantation of need full plants to make the environment more eco-friendly. And renewable project for the power supply systems
- Parking sheds could be replaced by solar modules
- Proper recognition for Green belt and yearly audit should be there.
- Proper maintenance of all the present facilities with positive monitoring system in each 3 months.

However, it should be noted that the University has taken up multiple initiatives and because of Pandemic the students have not practically visited the campus so many of these points are not mandatory at the moment.

10. References

- Uniform Plumbing Code – India, 2008
- IGBC Green Existing Buildings – Operation & Maintenance (O&M) Rating system, Pilot version, Abridged Reference Guide, April 2013
- IGBC Green Landscape Rating system, March 2013
- BOMA Canada Waste Auditing Guide, Best Environmental Standards, BOMA BEST – Canada
- Climate data https://www.indianclimate.com/show-data.php?request=FDCRNM6Z6Y
- Used only for understanding Universal design - Universal accessibility Guidelines for Pedestrian, Non-motorizes vehicle and Public Transport Infrastructure – Report guidelines by Samarthyam (National centre for Accessible Environments) – an initiative supported by Shakti Sustainable Energy Foundation.
- City of Cheyenne, Streetscape/ Urban Design elements - Wyoming Planning Association, Gillette, Wyoming, United States


स्वर्ण जयंती वर्ष २०१३-१४
पं. रविशंकर शुक्ल विश्वविद्यालय, रायपुर

ENERGY AUDIT

2019-20 & 2020-21

AUDIT REPORT

Studied for

Pt. Ravishankar Shukla University

Amanaka G.E.Road, Raipur,
Chhattisgarh (India) - 492010

Analysed by

Greenvio Solutions

23 March 2022

Background reference image Janko Ferlic on pexels

Letter and Certificate of Consent

ENERGY AUDIT

This is to certify that the Green Audit for 2019-20 and 2020-21
has been conducted for

Pt. Ravishankar Shukla University

Amanaka G. E. Road, Raipur, Chhattisgarh (India) - 492010

The Study observed the following:

The Premises is an energy efficient Institution.

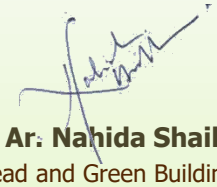
It has facilities such as renewable energy which were observed during investigation.

The Architectural design of the Buildings reduces the load of artificial energy consumption to a great extent.

Overall the study concludes:

The Energy Audit & its management practices undertaken by the Institution are excellent.

Study and Audit done by:



Ar. Nahida Shaikh
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Sustainable Academe – Greenvio Solutions
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sustainableacademe@gmail.com I **greenviosolutions@gmail.com**

About the Project Head - Ar. Nahida Shaikh has completed audits of multiple Institutes including Technical, State University, Private University and Single Faculty Colleges for a total of more than **50 lakhs+ sq. ft. of Built-up area audited till date** Pan India as an Accredited Green Building Professional-Architect.

She has **authored over 6 books** for Colleges in India titled *Towards a Healthy & Sustainable Institute, An Ecologically Sound Institution, Education amidst the nature, Micro efforts towards a Green Institution leading to Macro Results, An Eco-friendly Developed Institutions* f these are published with ISBN Number as Paperback and the book titled *An Urban Green Habitat* published with ISSN Number.

She is a Registered Licensed **Architect** with the Council of Architecture, India an **Indian Green Building Council Accredited Professional** (IGBC AP), an **Assocham GEM Certified Professional** (Regn. No. GEM CP 22/718) and she has completed her Lead Auditor Course on Environment Management System, Green Campus Audit, Energy Audit and Hygiene Audit to Educational Institutions and Industries.

Green Building consultancy is her forte and she is one of the most sought after names when it comes to providing e[illegible] services within the stipulated time frame.

GREENVIO SOLUTIONS SUSTAINABLE ACADEME

(Valid till March 2023)

Disclaimer

The Audit Team has prepared this report for the **Pt. Ravishankar Shukla University** located at *Amanaka G.E.Road, Raipur, Chhattisgarh (India) - 492010* based on input data submitted by the University analysed by the team to the best of their abilities.

The details have been consolidated and thoroughly studied as per the various guidelines for Green Buildings available in National and International Standards; the report has been generated based on comparative analysis of the existing facilities and the prerequisites formulated by various standards. The inputs derived are a result of the inspection and research. These will further enhance and develop a Healthy and Sustainable Institution.

These can be implemented phase wise or as a whole depending on the decision taken by the Hon'ble Management and University. The warranty or undertaking, expressed or implied is made and no responsibility is accepted by Audit Team in this report or for any direct or consequential loss arising from any use of the information, statements or forecasts in the report.

The audit is a thorough study based on the inspection and investigation of data collected over a period of time and should not be used for any legal action. This is the property of Greenvio Solutions and should not be copied or regenerated in any form.

The Report is prepared by the Team of Greenvio Solutions under their brand and department – Sustainable Academe as Consultancy firm with the Project Head - Ar. Nahida Shaikh who has completed audits of multiple Institutes including Technical, State University, Private University and Single Faculty Universities of more than 50 lakhs+ sq. ft. of Built-up area audited till date Pan India as an Accredited and Certified Green Building Professional-Architect. Green Building consultancy is her forte and she is one of the most sought after names when it comes to providing excellent quality services within the stipulated time frame.

The Study is conducted in capacity of Accredited & Certified Green Building Professional with extensive experience.

Greenvio Solutions

Developing Healthy and Sustainable Environments

We are an Environmental and Architectural Design Consultancy firm

Sustainable Academe is our department for conducting Audits

Palghar District, Maharashtra- 401208

sustainableacademe@gmail.com

Acknowledgement

The Audit Assessment Team thanks the **Pt. Ravishankar Shukla University, Raipur, Chhattisgarh** for assigning this important work of Environment Audit. We appreciate the cooperation extended to our team during the entire process.

Our special thanks are due to Hon'ble **Prof. Keshari Lal Verma Sir, Vice Chancellor** and **everyone from the University.**

Our heartfelt thanks to Chairpersons of the entire process **Prof. Girish Kant Pandey Sir,** Registrar for the valuable inputs.

The kind gesture for the inventory and data collection of **and Mr. Kuldeep Bhupendra,** Incharge - Engineering Section is quite commendable.

We are also thankful to **University's Task force the faculty members - Audit Coordinators** who have collaborated to collect data required **Dr. Sanjay Tiwari,** Professor, Coordinator: M.Tech. in Optoelectronics & Laser Technology, Coordinator: Institute of Renewable Energy Technology & Management, S.O.S. in Electronics & Photonics; **Prof. Arti Parganiha,** Professor of Bioscience.

We highly appreciate the assistance of the **entire Teaching, Non-teaching and Admin staff** for their support while collecting the data.

Sustainable Academe

Brand of Greenvio Solutions, Palghar District, Maharashtra- 401208

Contents

Greenvio Solutions

Hereby presents

An Environment & Ecological friendly premise

Established as a State Private University at Raipur

vide Chhattisgarh Act of 1973

The prestigious

Pt. Ravishankar Shukla University

Amanaka G.E.Road, Raipur, Chhattisgarh (India) - 492010

1. Introduction

1.1 About Pt. Ravishankar Shukla University

An educational institute is beyond than being just a building. It helps one in acquiring knowledge which is a gateway to being successful and a good human.

"A good education is the best gift you can give yourself or anyone else"

- Mahtab Narsimhan

Pt. Ravishankar Shukla University is Chhattisgarh's largest and oldest institution of higher education, founded in 1964, and named after the first chief minister of erstwhile Madhya Pradesh. The University has a sprawling campus in the western part of the capital of Chhattisgarh, Raipur. The campus of University is spread in 300.17 acres of land. There are Twenty-Nine teaching departments in the University. Out of which six departments buildings have been constructed recently. A variety of self-financed courses have been initiated in some departments. The total number of employees is 700, who provide the administrative support at different levels.

Attracted by the opportunity to study and conduct advanced research with renowned professors and fellow scholars in one of the Chhattisgarh's most dynamic cities, students also come from the neighbouring States. There are 5000 students enrolled for variety of courses offered by the departments who are steered under the guidance of more than 100 faculty members. Jurisdiction of RSU covers entire central and southern part of Chhattisgarh. There are 180 educational institutions affiliated to the University. In the academic year 2005-06, about 1,25,000 students were enrolled, both for undergraduate and postgraduate courses. The University plays a major role in the educational, cultural and economic life of the region.

"There is no school equal to a decent home and no teacher equal to a virtuous parent."

- Mahatma Gandhi

It is one of the premier State Educational University providing quality education with best state of the art facility & Infrastructure to the students.

1.2 Statement, Section of University

1.2.1 Vision towards the future

- To **make quality higher education accessible to all sections of society,** including the tribal population of Chhattisgarh.
- To **provide quality education in the disciplines** of arts, humanities, social sciences, natural sciences and other disciplines of learning.
- To **develop human resource with world class competence and skills** in the respective disciplines.

1.2.2 Mission for achieving benchmarks

- To develop the university as a centre of excellence for higher education and knowledge resource
- To promote understanding the value of self-learning, creativity and competence building:
  - By providing world-class education through university-teaching departments and schools.
  - By promoting quality research in university schools and affiliated colleges.

1.2.3 About the Engineering section

Engineering section is an important component of the administrative infrastructure of Pt. Ravishankar Shukla University. The section mainly works on all matters subject to the control of the Building Committee.

The Building committee advises the Executive Council on all matters related to construction of buildings, repairs, alteration, additions to existing buildings, select and recommend site or acquisition, accord technical sanction to the plans and estimates, and expenditure.

The composition of the Building Committee is such that the members are nominated for the period of two years, as per additional Statute 3 of the University Act

1.2.4 About the Development section

The Development section is an important component of the administrative structure of the University. It periodically performs work related to all type of purchase proposals i.e. inviting quotations, preparation and floating tenders for the purpose of purchase, organizes the meeting of Central Purchase Committee duly constituted as per provisions of the University Act, preparation and floating the expression of interest, disposal of waste material such as used answer books etc.

The section also supervises works related to the printing of various documents, proforma, Degree & preparation of gold medal etc.

1.3 Institutions in the premises

The aim of the University is to continuously enhance the teaching methods in order to provide students with an opportunity for their all-round development. In order to manage the programme offerings in a much better way, Pt. Ravishankar Shukla University has **structured its offerings under 29 Major Sections** as follows:

1. **School of Studies in Ancient Indian History Culture & Tourism & Hotel Management**
2. **School of Studies in Anthropology**
3. **School of Studies in Biotechnology**
4. **School of Studies in Chemistry**
5. **Swami Vivekanand Memorial School of Studies in Comparative Religion , Philosophy and Yoga**
6. **School of Studies in Computer Science & IT**
7. **School of Studies in Economics**
8. **School of Studies in Electronics and Photonics**
9. **School of Studies in Environmental Science**
10. **School of Studies in Geography**
11. **School of Studies in Geology and Water Resource Management**
12. **School of Studies in History**

13. **School of Studies in Law**
14. **School of Studies in Library and Information Science**
15. **School of Studies in Life Science**
16. **School of Studies in Literature and Languages**
17. **Institute of Management**
18. **School of Studies in Mathematics**
19. **University Institute of Pharmacy**
20. **School of Studies in Physical Education**
21. **School of Studies in Physics and Astrophysics**
22. **School of Studies in Psychology**
23. **School of Regional Studies and Research**
24. **School of Studies in Sociology & Social Work**
25. **School of Studies in Statistics**
26. **Institute of Teachers Education**
27. **Centre for Women's Studies**
28. **Renewable Energy Technology & Management**
29. **Center for Basic Sciences (CBS)**

Each of these Schools is headed by highly experienced and competent Director/Deans along with H.O.Ds checking on the right academic progress of each faculty/department in the University.

The University strives for excellence in academics and makes an effort to induce passion for learning along with the inspiration for decisive thinking and assessment, thereby helping them to become the best professionals in their chosen careers.

1.4 Programs offered by the University

The University a wide range of courses for the students to upgrade their educational qualification. The details of each of these courses as per the School are as follows.

- **Post-Doctoral** – It offers the following courses.

1. Doctor of Science Chemistry
2. Doctor of Science/ Doctor of Literature Anthropology
3. Doctor of Literature Sociology
4. Doctor of Literature Linguistics
5. Doctor of Science/ Doctor of Literature Geography
6. Doctor of Literature Psychology
7. Doctor of Literature Economics
8. Doctor of Science Physics
9. Doctor of Literature History
10. Doctor of Science Zoology
11. Doctor of Science Botany
12. Doctor of Science Bioscience
13. Doctor of Science Statistics
14. Doctor of Law
15. Doctor of Literature Philosophy
16. Doctor of Science Geology
17. Doctor of Literature Physical Education
18. Doctor of Literature Library & Information Sciences
19. Doctor of Science Mathematics
20. Doctor of Science Microbiology
21. Doctor of Science Electronics
22. Doctor of Literature Hindi
23. Doctor of Science Computer Science

24. Doctor of Literature Ancient Indian History
25. Doctor of Literature English
26. Doctor of Science Pharmacy
27. Doctor of Literature Management
28. Doctor of Science Biochemistry
29. Doctor of Science Biotechnology

- **Doctoral** – It offers the following courses.
    1. Doctor of Philosophy - Chemistry
    2. Doctor of Philosophy - Anthropology
    3. Doctor of Philosophy - Sociology
    4. Doctor of Philosophy - Linguistics
    5. Doctor of Philosophy - Geography
    6. Doctor of Philosophy - Psychology
    7. Doctor of Philosophy - Economics
    8. Doctor of Philosophy - Physics
    9. Doctor of Philosophy - History
    10. Doctor of Philosophy - Zoology
    11. Doctor of Philosophy - Botany
    12. Doctor of Philosophy - Bioscience
    13. Doctor of Philosophy - Statistics
    14. Doctor of Philosophy - Law
    15. Doctor of Philosophy - Comparative Religion and Philosophy
    16. Doctor of Philosophy - Geology
    17. Doctor of Philosophy - Physical Education
    18. Doctor of Philosophy - Library Science
    19. Doctor of Philosophy - Mathematics
    20. Doctor of Philosophy - Microbiology

21. Doctor of Philosophy - Regional Studies
22. Doctor of Philosophy - Electronics
23. Doctor of Philosophy - Hindi
24. Doctor of Philosophy - Computer Science & IT
25. Doctor of Philosophy - Ancient Indian History, Culture & Archaeology
26. Doctor of Philosophy - English
27. Doctor of Philosophy - Pharmacy
28. Doctor of Philosophy - Management
29. Doctor of Philosophy - Biochemistry
30. Doctor of Philosophy - Biotechnology
31. Doctor of Philosophy Environmental Science

- **Post Graduate -** It offers the following courses

1. Master of Science - Chemistry
2. Master of Arts - Sociology
3. Master of Arts - Psychology
4. Master of Arts - Linguistics
5. Master of Arts/Master of Science - Geography
6. Master of Arts/ Master of Science - Anthropology
7. Master of Arts - History
8. Master of Arts – Economics
9. Master of Science – Physics
10. Master of Arts/Master of Science - Statistics
11. Master of Science - Bioscience
12. Master of Law - Constitutional and Administrative Law, Crime and Torts
13. Master of Science - Geology
14. Master of Library Science - Library and Information Science
15. Master of Science/Master of Arts - Mathematics

16. Master of Science - Microbiology
17. Master of Physical Education
18. Master of Business Administration
19. Master of Arts - English
20. Master of Science - Electronics
21. Master of Arts - Hindi
22. Master of Computer Applications
23. Master of Arts - Ancient Indian History, Culture & Archaeology
24. Master of Science - Information Technology
25. Master of Science - Biochemistry
26. Master of Science - Biotechnology
27. Master of Education
28. Master of Science - Pharmacy Pharmaceutics
29. Master of Arts - Applied Philosophy & Yoga
30. Master of Technology - Optoelectronics & Laser Technology
31. Master of Social Work
32. Master of Science - Environmental Science
33. Master of Arts - Rural Development Master of Arts - Chhattisgarhi
34. Master of Science Integrated [Physics/ Mathematics/ Chemistry/Biology]

- **Under Graduate** – It offers the following courses.

1. Bachelor of Library Science Library and Information Science
2. Bachelor of Physical Education
3. Bachelor of Pharmacy
4. Bachelor of Arts - Bachelor of Legislative Law
5. Bachelor of Education
6. Bachelor of Vocation in Renewable Energy Technology and Management

- **Post-Graduation diploma** – It offers the following courses.

1. P.G. Diploma in Guidance and Counselling
2. P.G. Diploma in Yoga Education & Philosophy
3. P.G. Diploma in Tourism & Hotel Management
4. P.G. Diploma in Regional Planning & Development
5. P.G. Diploma in Forensic Science
6. P.G. Diploma in Rehabilitation Psychology
7. P.G. Diploma in Applied Hydrogeology
8. P.G. Diploma in Remote Sensing & GIS

- **Diploma Programs -** It offers the following courses
    1. Diploma in European and Asian Languages English
    2. Diploma in European and Asian Languages French
    3. Diploma in National Language Sindhi

1.5 Assessment of the University

1.5.1 Establishment

Pt. Ravishankar Shukla University, has been established as a State University at Raipur, vide Chhattisgarh Act of 1973.

1.5.2 Recognition

The University is recognised by **University Grant Commission (UGC)** under section 2 (f) and 12 (b) of the UGC Act, 1956 vide by University Grants Commission, New Delhi.

1.5.3 Accreditation

NAAC - The following are details of the reaccreditation of the University.

Cycle	First	Second	Third
CGPA	75.1	2.62	3.02
Grade	B+	B	A
Year	2003	2011	2016

Table 1: NAAC Accreditation details of the Institute

The University is due to enter its Fourth cycle of NAAC soon.

1.5.4 Approval

The University has received the following significant approvals for the various courses.

S. No.	Course	Approval
1	B. Pharm and M. Pharm	**Pharmacy Council of India (P.C.I)** A statutory body of government of India constituted under the Pharmacy Act, 1948, responsible for regulation of pharmacy education and practice of profession in the country for registration as a pharmacist.
2	BA LLB (Five Years)	**Bar Council of India (B.C.I)** A statutory body established under the section 4 of Advocates Act 1961 that regulates the legal practice and legal education in India.

3	Teacher courses (B. Ed)	**National Council for Teacher Education (N.C.T.E)** A statutory body in pursuance of the National Council for Teacher Education Act, 1993
4	Diploma in rehabilitation psychology	**Rehabilitation Council of India (RCI)** The apex government body, set up under an Act of Parliament, to regulate training programmes and courses targeted at disabled, disadvantaged, and special education requirement communities.
5	Technical courses	**All India Council for Technical Education (AICTE)** A national-level Apex Advisory Body to conduct a survey on the facilities available for technical education and to promote development in the country in a coordinated and integrated manner.

Table 2: Details of the various Approvals of the Institute

1.5.5 Certification

The institute has received the following Certifications

- **The National Institutional Ranking Framework (NIRF)** - Ranked between 150 and 200 in the latest rankings.
- **All India Survey of Higher Education (AISHE)** – As per latest documents the reference number is U-0093-2019 for 2019-20

1.6 Affiliated colleges

The PRSU is one of the premier centers of higher education & learning in Chhattisgarh, India. It caters to the needs of the youths of Chhattisgarh and adjoining States, namely Madhya Pradesh, Maharashtra, Odisha, Jharkhand, Andhra Pradesh, as well as from West Bengal and Andaman & Nicobar Islands in the realm of higher education and research.

Chhattisgarh was carved out of Madhya Pradesh on the 1st November, 2000 as a new political entity. Pt. Ravishankar Shukla University, being the oldest university, is leaving no stone unturned to cater to the needs of the society. **The university has grown enormously over the last 57 years** in terms of number of students or disciplines, viz., humanities, natural science, law, education, pharmacy, management, physical education, library science and computer science & IT etc.

In 29 Schools of Studies (SoS) and 149 affiliated colleges spread over five districts of the Chhattisgarh State.

2. Institution overview

2.1 Populace analysis for Academic year 2019-20

2.1.1 Students data

The student data (shared by the University) shows there were a total of **16,500 Boys and 10,092 Girls** students thus **a total of 26,592 students** in the premises.

2.1.2 Staff data

Type	Total
Admin Staff	**4**
Teaching Staff	**120**
Non-Teaching Staff	**302**
Total Staff Members	**426**

Table 3: Staff data of the Institution for 2019-20

The staff data shows the premises had a total of **426** Staff Members.

2.2 Populace analysis for Academic year 2020-21

2.2.1 Students data

The student data (shared by the University) shows there were a total of **17,113 Boys and 11,091 Girls** students thus **a total of 28,204 students** in the premises.

2.2.2 Staff data

Type	Total
Admin Staff	**4**
Teaching Staff	**115**
Non-Teaching Staff	**288**
Total Staff Members	**407**

Table 4: Staff data of the Institution for 2020-21

The staff data shows the premises had a total of **407** Staff Members.

2.3 Total University Area & Building Spread Area

The **total site area is 300.17 Acres** and the **total Built-up area of University is 2,87,751 sq. ft.** for **a total of 28,611 footfalls.**

2.4 University Infrastructure

The Buildings are made of Reinforced Cement Concrete (RCC) framework. These are equipped with modern amenities. It facilitates the students with a good environment for studies and stays true to its aim of providing Holistic development. The Residential and Academic buildings amalgamate smoothly with the open space in order to stand out as one of the most premier Institutes in the country.

Overall the Infrastructure of the Building is excellent in terms of the Architecture Design and Green Building Design. The Premises covers most of the requirements for a Green Habitat. It continues to upgrade itself in terms of the facilities and makes sure that there is no compromise on the quality of services towards Building requirements. The cooperative teamwork and the leadership of the Hon'ble dignitaries are one of the main reasons for achieving success in providing quality education with an advanced and up-to date premises.

2.4.1 Spatial Organisation

2.4.1.1 Architectural Design

The overall ambience of the University is warm and inviting. The courtyards, educational spaces, learning spaces, residential spaces and recreational spaces have ample natural ventilation in the form of clear glass windows with fresh air ventilation. The architecture of the buildings are quite well designed. The colour palette not just helps the buildings to stand out as per respective typology of the Building be it Educational or Residential but also provides an Institutional arena. There are provisions for lifts, CCTV, Fire extinguishers, first aid box and much more.

2.4.1.2 Landscape design

The built-form balances with the local architecture and amalgamates very well with the natural landscapes in form of open ground, designed landscape spaces, streetscape

elements such grounds, designed gardens, greenhouse, botanical gardens and huge trees all around. There are provisions for ramps, open ground, courtyards, designated landscape areas, signages, Utility Boxes, Parking, Sidewalk Furniture and Utility Poles.

2.4.2 Building and Block wise details

The Building & Block wise details on the Pt. Ravishankar Shukla University premises are mentioned below:

S. No.	Branch name	Floor
1	Admin Building	G+2
2	Arts Building	G+3
3	Library Building	G+3
4	Electronic Building.	G+1
5	Science Block	G+1
6	B.ED Building	G+1
7	USIC	G
8	M.B.A. Building	G+1
9	New NCNR Building	G+1
10	HRDC Building	G+1
11	Computer Science Building	G+1
12	Biotechnology Building	G+1
13	Physical Education	G+1
14	Student Recreation	G
15	Pharmacy Building	G+1
16	Law Building	G+1
17	Maths/ Statistics Building	G+1
18	Geology Building	G+1
19	Bio Science Building	G+1
20	Regional study/ IQAC	G+1

21	CBS Building	G+2
22	Auditorium Building	G+1
23	Guest House Building	G+1
24	Teacher Hostel Building	G+1
25	Geography Building	G+1
26	Anthropology Building	G+1
27	Physics Dom Building	G+1
28	Health Center	G
29	Utility Center	G+1
30	old NCNR Building	G
31	Press Building	G+1
32	Community hall	G+1
33	Gym Building	G+1
34	Power gird Hostel	G+2
35	Gandhi Hostel	G+1
36	Azad Hostel	G+1
37	Boys Research Hostel	G
38	Navin Kanya Hostel	G+1
39	Professional Girls Hostel	G+1
40	Research Girls Hostel	G+1
41	PG Girls Hostel	G+1

Table 5: Block and department wise details of the University premises

2.4.3 Salient features

The University had the best State of the art Infrastructure in the Country. Some of the best features available are as follows:

1. *ERP System for monitoring administration /academics*
2. *Wi-Fi enabled premises*

3. *Modern infrastructure with well-equipped laboratories*
4. *Guest Lectures by Eminent Scholars*
5. *Ragging free environment*
6. *Hostels for Girls and Boys*
7. *24 x 7 Power and RO water supply*
8. *State of art Library*
9. *Canteen Facility*
10. *Medical Facility (Health Centre)*
11. *Auditorium with all ultra-modern facilities.*
12. *Multipurpose Hall*
13. *Landscaped Gardens*
14. *On premises Residential Facilities for faculties and employees.*
15. *Community development programs*
16. *Arrangement for physically Challenged persons/students.*

The University endeavours at training young women to be competent, committed and compassionate and lead in all walks of life.

2.4.5 Operation and Maintenance of the premises

The interview session with the staff regarding the operation and working hours is summarized in the table. The Institutions are open Monday to Friday for full day. Saturday, Sunday is an off for all. Below mentioned in the table are the average working hours. The detail wise timing for each is mentioned below the table.

S. No.	Section	Spaces	Time	Hours / day	Days in a year
1	Main Institutional University	Student areas and Teaching faculty	10:00 a.m. to 5:30 p.m.	7.5	280
2	General areas	Admin areas and library, Passage, staircase, toilet	09:30 a.m. to 5:30 p.m.	8	300

Table 6: Schedule of the timings of the premises


INDIAN
HOUSE

3. Green Building Audit Study

3.1 About the Green Building Study Audit

It is a systematic study of the aspects which make the Institution a sustainable and healthy premises for its inhabitants.

3.2 Analysis for the Green Building Study Audit

The procedure included detailed verification for the following:

Energy Audit

- Analysis of the Lights, Fans, AC, Equipment
- Renewable energy
- Scope for reducing the current energy bills if any
- Improvement in the thermal comfort of the premises

Green Audit

- Green initiatives
- Hygiene audit
- Water Audit - Analysis of the current water consumption of premises; Scope to include Rain water harvesting and Waste water treatment in premises
- Waste Audit - Current waste produced, its segregation and usage; Strategies to be adopted for waste management and awareness

Environmental Audit

- Analysis of the current landscape + hardscape of premises
- Analysis of the flora and fauna of campus
- Strategies adopted at present to enhance vegetation
- Measures that can be adopted for ecological improvement of the premises.

3.3 Strategy adopted for Green Building Study Audit

The strategies included data collection from admin department, actual inventory, investigation to check the operation and maintenance, analysis of the data collected and preparation of the Report.

3.4 Timeline of the activities for Green Building Study Audit

- 01 January 2022 – Discussion with the University
- 13 January 2022 – Allotment and Initiation by the University
- 12 February 2022 – Survey of the Student and staff submitted
- 24 February 2022 – Discussion for review of data collection
- 08 March 2022 – Site visit
- 10-21 March 2022 – Data submitted by University
- 23 March 2022 – Submission of the Report

Meeting with Vice Chancellor Sir during the Audit visit

Discussion meeting with Prof. Girish Kant Pandey Sir, Registrar

Induction meeting with Mr. Kuldeep Bhupendra, Incharge Engineering section

On-site External Team with the University representatives

4. Energy Audit

4.1 Sources of Energy consumption

The premise uses following sources of energy consumption.

4.1.1 Primary sources

1. **Electrical (Metered) –** Light, Fans, air conditioners, Equipments, Pumps consume approximately 1,39,138 units per month for Rs. 9,05,778/- per month (average).
2. **Renewable energy –** There are 99 kW Solar panels, 38 Solar Hot water heaters (In all the residential areas), 36 Solar lamps, 3,864 Energy efficient fans and 462 Energy efficient air conditioners, solar cooking system available in premise.

4.1.2 Secondary sources

There are UPS, gas cylinders generators, inverters and batteries in the premises.

4.2 Site investigation analysis

The Site investigation observations and interviews with the Maintenance staff, Electrical department in charge are summarised below:

- The **switch-off drills are practised at present,** the maintenance staff and Lab Attendants put off switches of all equipments regularly.
- All the **computers are shut-off after use** and also put on power saving mode.
- There are **display boards encouraging staff and students to save energy are put up in the classrooms and laboratories**.
- There are **no Ultra-violet lights and any other harmful lights used** in the premise.

4.3 Actual Electrical Consumption as per Bills

The admin department had shared the bills for Meter which is connected to all Buildings and is main source of energy supply. The supplier is Chhattisgarh State Power Distribution Company Limited. The analysis of actual electrical energy consumption is summarised below. The solar panels were installed in recently post which the cost of electricity has been reduced. The details of unit consumption meter wise is as follows.

S. No.	Month	Year	Meter 1		Meter 2	
			University		Education Society	
			Units	Amount	Units	Amount
1	June	2019	84,206	12,22,375	78,192	6,22,375
2	July	2019	80,100	5,93,485	75,200	5,87,485
3	August	2019	75,200	4,32,395	71,250	4,26,395
4	September	2019	76,001	6,93,590	70,250	6,37,590
5	October	2019	70,010	5,49,230	65,002	5,43,230
6	November	2019	68,250	6,53,130	63,300	6,47,130
7	December	2019	67,200	4,71,680	61,200	4,65,680
8	January	2020	65,150	4,81,005	60,250	4,75,005
9	February	2020	60,250	5,31,840	56,300	5,25,840
10	March	2020				
11	April	2020	95,250	4,64,500	85,320	4,58,500
12	May	2020	98,300	5,08,510	90,690	5,02,510
13	June	2020	85,150	4,10,440	76,200	4,04,440
14	July	2020	79,200	3,45,865	74,250	3,39,865
15	August	2020	76,150	3,95,475	72,600	3,89,470
16	September	2020	75,020	5,52,030	69,250	5,46,030
17	October	2020	73,200	3,77,485	65,250	3,71,480
18	November	2020	69,150	3,40,550	63,140	3,34,520
19	December	2020	65,250	3,58,810	61,230	3,52,815
20	January	2021	64,150	4,17,750	59,321	4,11,740
21	February	2021	60,351	3,80,730	58,230	3,74,370
22	March	2021	62,300	1,04,795	59,630	98,790
23	April	2021	84,012	7,06,510	82,000	7,00,520
24	May	2021	96,150	2,68,361	91,250	2,62,350

Table 7: Study of the electricity consumption of the meters in premise

The summary of the above study shows the average consumption varies for each month.

4.4 Survey

4.4.1 Results

An online survey was conducted to analyse the student and staff views about the Energy management practices adopted in University, following is the result received.

Participation

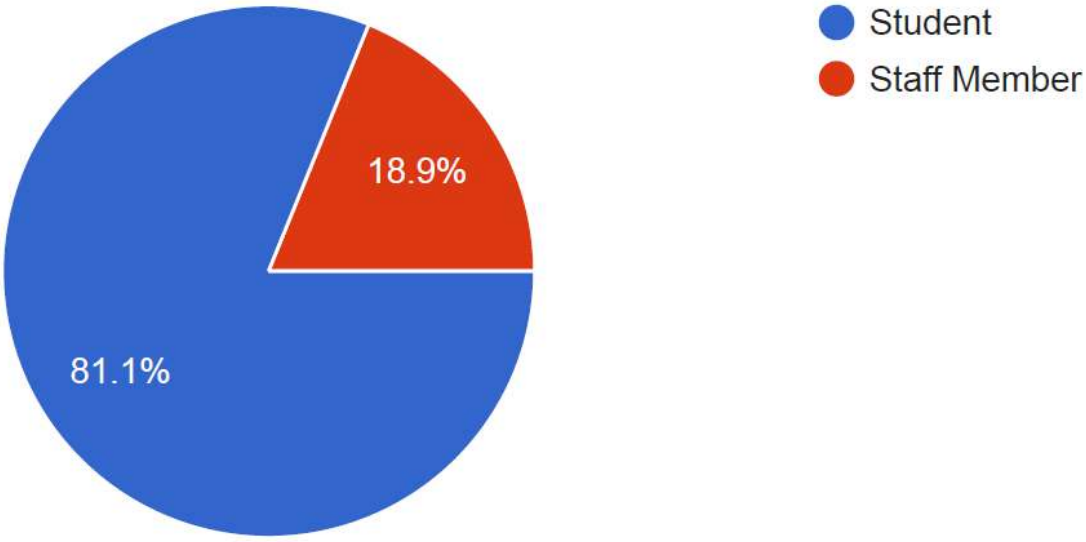


Figure 1: Participation analysis in the survey

A total of **122 responses** were received out of which 81% were students.

4.42 Survey ratings

Review of the Energy management practices in the premises

Note: The Participants were asked to review the practice on a scale of 1-5 with scale components as follows:

- Scale 1 – Poor
- Scale 2 – Satisfactory
- Scale 3 – Good
- Scale 4 – Very good
- Scale 5 – Excellent

The figures in each of the columns of graph depict the Number of participants responses in numerical (Percentage of the participant response) – For example 101 responses (44.5%)

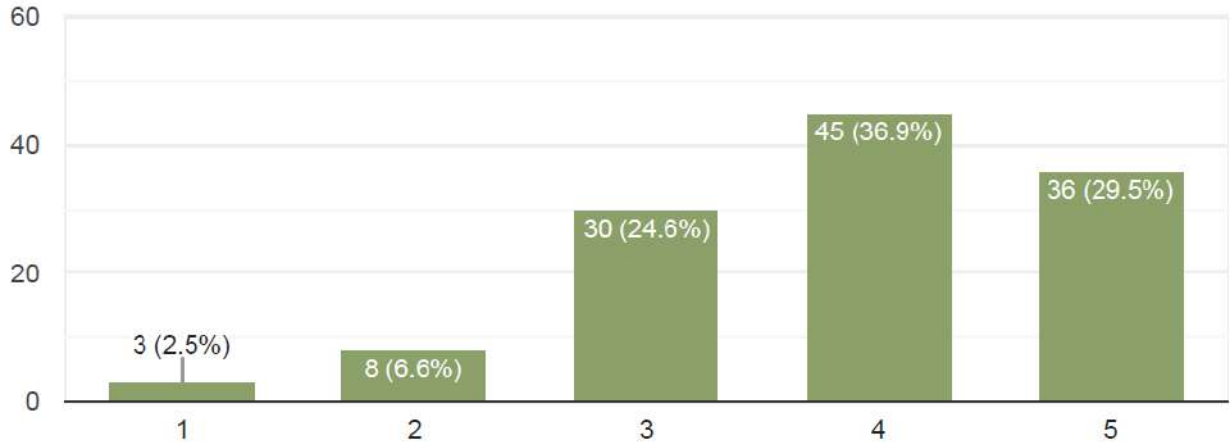


Figure 2: Energy Management practices in University

The students, staff **(almost 37%)** of the responses found the practices to be very good.

4.4.3 Survey review

Some of the key responses are noted below as a result of Online survey.

What is the best environmental feature you find about the Institute site?

1. Awareness program for save the energy
2. Usage of Solar energy. Solar panels on roof top of building. LED lights.
3. Renewable energy department doing a great job in that field
4. Automatic relay system for power management, solar system installation.

4.5 Calculated Electrical Consumption as per inventory

4.5.1 Main study

The electricity bills provide actual consumption data. The following is the calculated consumption. It is done to understand the percentage of energy usage in the premises by various applications. It is based on the inventory collected and interviews with the staff. The additional data such as wattage is taken from market research. In terms of electrical consumption, the main sources are lights, fans, air conditioners, equipment. The inventory and data collection for sources of energy consumed in the premise in summarised in the following sections. Note: The following analysis is combined for entire premise taking into considerations the duration before pandemic to understand the consumption pattern as post pandemic the premise is used only for a few hours.

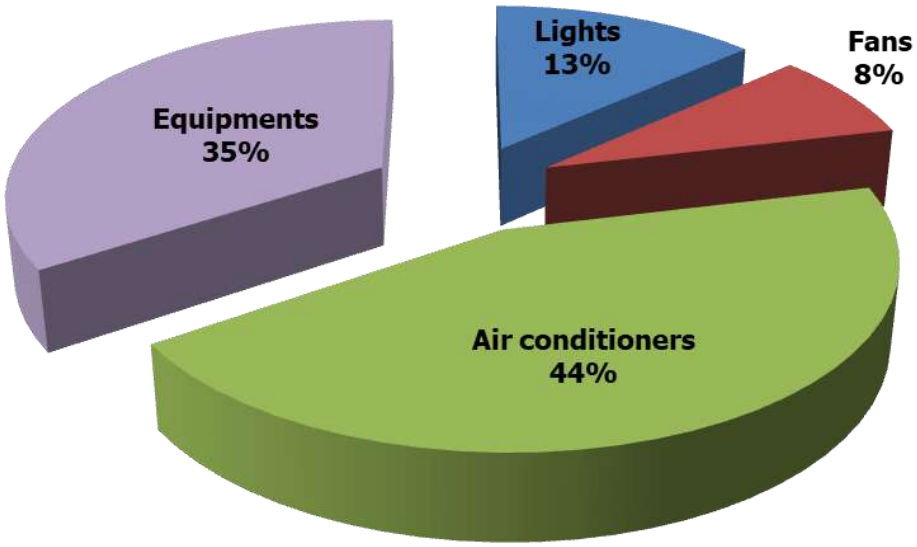


Figure 3: Summary of the Calculated Electrical Consumption as per data

The above graph shows that air conditioners consume 44% followed by equipment at 35% the lights at 13% and the fans at 8% of the total calculated electrical energy.

4.5.2 Sectors study

For study purpose of lights, fans and air conditioners, the premises was divided into following blocks:

- Administrative – Considered for the admin section.
- Educational - Considered for all the buildings of various schools.
- Recreational - Considered for the Health section.
- Residential - Considered for the hostels and guest house.

4.6 Lights

4.6.1 Types of lights

There are a total of **9,293 lights in the premises;** the following table shows the various types of lights in the premises.

S. No.	Type	Nos.
1	CFL	882
2	LED	5,042
3	Non-LED	3,347
3	Solar lamp	22
Total		**9,293**

Table 8: Summary of the types of lights in premise

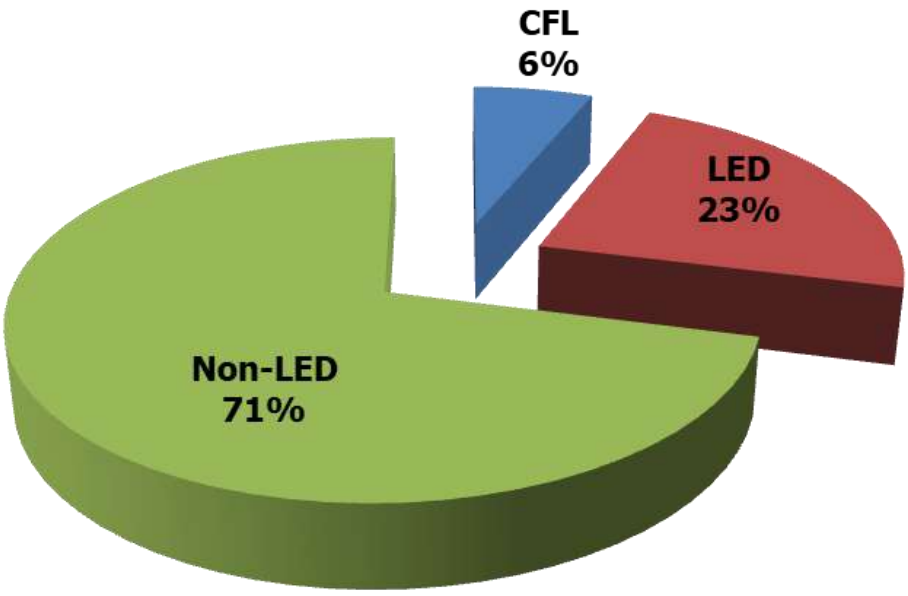


Figure 4: Energy consumed by types of lights in the premise based on the usage study

The analysis of the types of Lights in premises shows **Non-LED lights 71%** followed by **LED lights consuming 23%** and **CFL lights consume 6%** (The solar lights are connected to the system and hence excluded for this artificial lights calculation)

4.6.2 Block-wise consumption analysis

The energy consumption of Lights is **4,18,918 kWh** of energy; the following graph shows the block wise consumption.

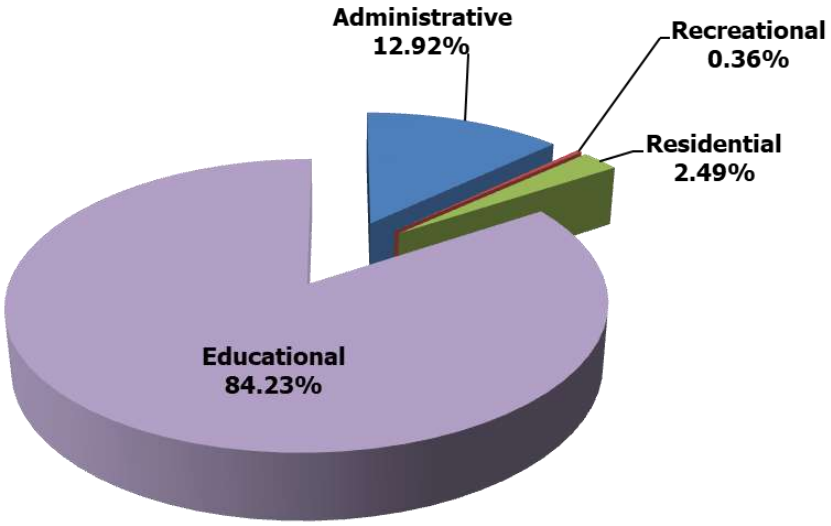


Figure 5: Energy consumed by lights block wise

The above analysis shows the lights in the **Educational blocks consume 84.23% the Administrative blocks consume 12.92%, the Residential blocks consume 2.49% and the Recreational blocks consume 0.36%**

4.6.3 Requirement of NAAC

4.6.3.1 Alternative Energy Initiative

Percentage of power requirement met by renewable energy sources – 100% of the energy produced is utilised in the premises which 300 kW, since the requirement of the premises is 1 megawatt, thus *30% of the power requirement is met and utilized in the premises. External agency in*

4.6.3.2 Percentage of lighting power requirement met through LED bulbs

The premise has LED Lights contribute to 54% in terms of number and **23% of the power requirement** is met through the same. As per our study we could conclude that both of these are highest contributions among all the types of lights.

4.6.4 Site investigation observations

Some of the points noticed are as follows:

1. All lights are in working conditions
2. Daily monitoring and check is done by the maintenance staff.
3. There was no fuse defect observed.

4.7 Fans

4.7.1 Types of fans

There are a total of **4,212 fans** in the premises. The following table shows the various types of fans in the premises.

S. No.	Type	Nos.
1	Wall mounted fans	5
2	Room Cooler	280
3	Exhaust fans	148
4	Ceiling fans	3,779
Total		**4,212**

Table 9: Summary of the types of fans in premise

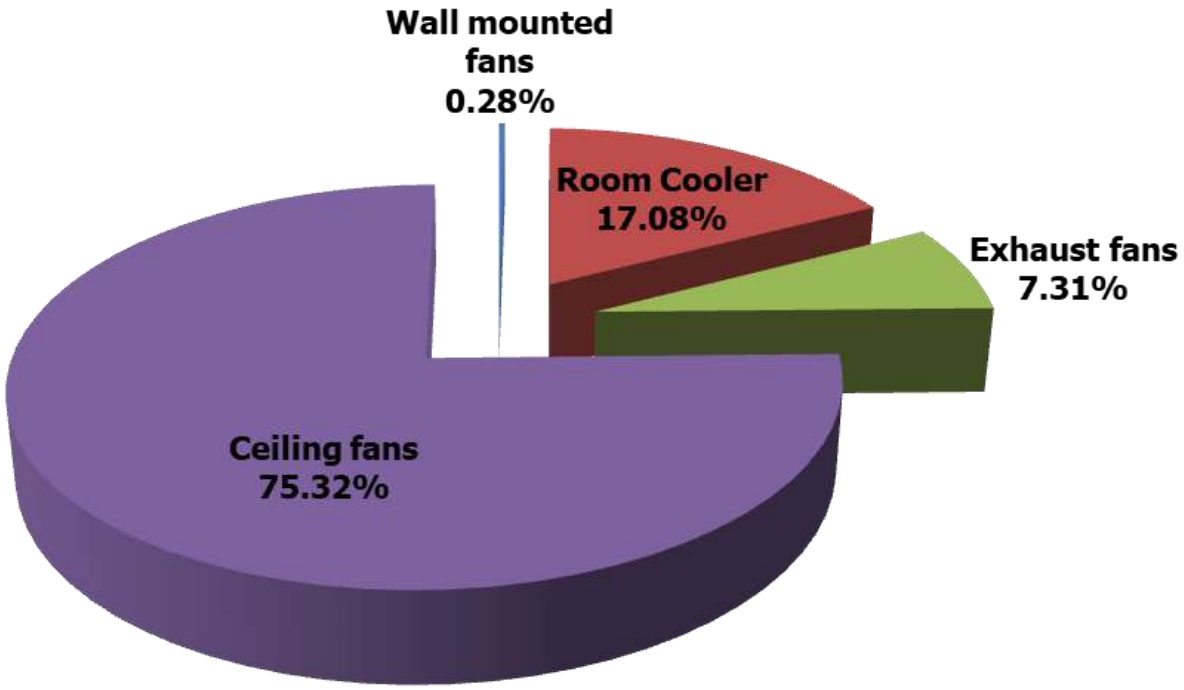


Figure 6: Energy consumed by types of fans in the premise based on the usage study

The analysis of the types of fans in premises shows **Ceiling fans consume 75.32%** the **Room coolers consume 17.08%** the **Exhaust fans consume 7.31% and the Wall mounted fans consume 0.28%**

4.7.2 Block-wise consumption analysis

The energy consumption of fans is **2,49,288 kWh** of energy; the following graph shows the block wise consumption.

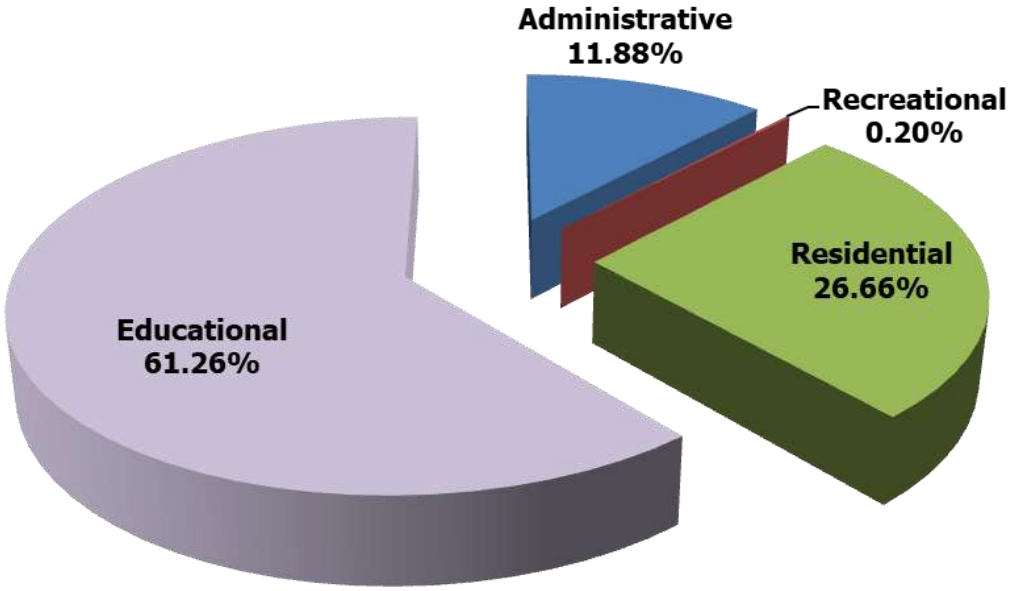


Figure 7: Energy consumed by fans block wise

The above analysis shows the fans in the **Educational blocks consume 61.26% the Residential blocks consume 26.66%, the Administrative blocks consume 11.88% and the Recreational blocks consume 0.20%**

4.7.3 Site investigation observations

Some of the points noticed are as follows:

1. All fans are in working conditions
2. Daily monitoring and check is done by the maintenance staff and admin staff in an excellent manner.
3. **87% of the fans in the premises are energy efficient fans consuming almost 47% less energy as compared to regular fans.**

4.8 Air conditioners

4.8.1 Types of air conditioners

There are **39 air conditioners** in the entire premise. The details mentioned as follows.

Sr. No	Room Name	Nos
1	DWS Counter	1
2	Finance Deptt	2
3	Gereral Deptt	1
4	DCDC	2
5	Registar office	3
6	E.C. Meeting Hall	4
7	Kulpati Eatrance Barmdada	2
8	VC office	4
9	VC Chamber	3
10	Acadmic section	1
11	DATA Center	5
12	Confidential Room	1
13	Confidential section office No-1	2
14	Confi. Room Strong room hall	4
15	Confi. Computer Centre Corrido.	3
16	Development sec. Hall+ Corri.	1

Table 10: Details of the air-conditioner in premise

The architectural design of the University is such that most of the buildings do not require artificial ventilation in the form of air conditioner. Thus, there are very less spaces where the air conditioners are required in the premises.

4.8.2 Block-wise consumption analysis

The energy consumption of air conditioners is **1,23,728 kWh** of energy; the following graph shows the block wise consumption.

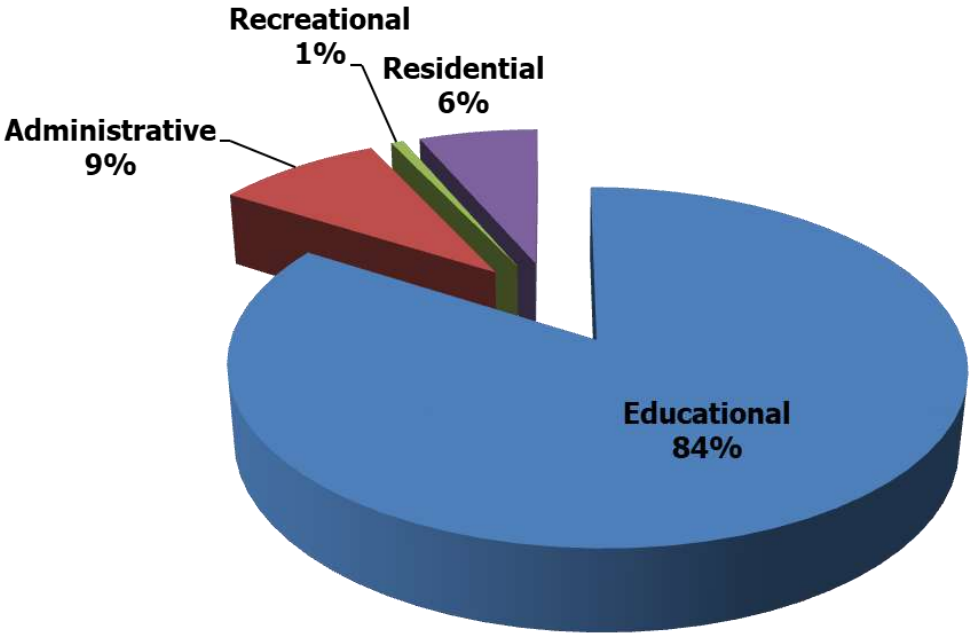


Figure 8: Energy consumed by air conditioners block wise

The above analysis shows the equipment in the **Educational blocks consume 84% the Administrative blocks consume 9%, the Residential blocks consume 6% and the Recreational blocks consume 1%**

4.8.3 Site investigation observations

Some of the points noticed are as follows:

1. Daily monitoring and check is done by the maintenance staff and admin staff in an excellent manner.
2. The Outdoor Unit is properly cleaned and maintained well.
3. The Outdoor Unit does not have any dust collection problem.

4.8.4 About the replacement of Current AC

The current air conditioners are well maintained, through there is not an immediate requirement for replacement however, whenever the University undergoes redevelopment or a new block is constructed there can be provisions for replacement with energy efficient appliances or new air conditioners that require less power consumption. **The University has already begun the replacement along with many other measures and is heading towards becoming a 100% energy efficient premises soon.**

4.9 Equipment

4.9.1 Sector wise allocation study

There are **more than 1,326 equipment considered for study** in the entire premises. For study purpose the entire premises was divided in **2 sectors – Residential and Educational.**

4.9.2 Residential Sector study

The equipment comprises of Mixer Grinder, TV, Wifi Router, Chimney, Desktop Computer, Aatamixer, CCTV, Water Plant with 2 Motors, Geysers, water pumps, Refrigerator and Water Cooler.

4.9.3 Educational Sector study

The educational sector was briefly subdivided into for major subsectors depending on their usage these are listed as follows along with the type of equipment which fall under this category.

- **Infrastructure mandatory usage** – Water pumps, submersible pumps, motors.
- **Scientific usage** – All the equipment used in various laboratories.
- **Administrative and regular usage** - Scanner, Bio Metric, Telephone, Wifi Router, Water Dispensers, Laptop, DVR, Water Purifier, Xerox Machine, Water Cooler, Intercom, Internet Hub, PA Systems, Refrigerator, CCTV, Desktop Computer, Printer
- **Occasional usage -** Amplifier, LED TV, Computer Home Theatre, Washing Machine, TV, Heater, Projector, Microwave Ovens, Mixer Grinder, Tread Mills, NVR

4.9.4 Equipment and usage consumption

The energy consumption of air conditioners is **10,78,356 kWh** of energy.

4.9.5 Site investigation observations

Some of the points noticed are as follows:

1. All equipments are in working conditions and daily monitoring and check is done by the maintenance staff and admin staff in an excellent manner.
2. No defect was found in any equipment of electrical consumption.

4.10 Positive aspect of Energy Efficiency Management

(Based on the Green Building system requirements for Electro mechanical Systems)

Electromechanical systems are related to Energy, waster and waste.

A. Electrical & lighting - Solarisation of the premises

- Availability of Solar hot heaters in Residential sections (Hostels)
- Provision of a solar plant, solar lamps in the Residential and Educational sections.
- Facilities to the make the premises automated and smart premises.
- Institute of Renewable Energy Technology & Management (IRETM) in the premises, the activities carried out by the Institute are as follows:
    - Training for solar based LED lamps.
    - Training for Home energy audit by Chattisgarh Govt. and Bureau of energy efficiency (BEE), Govt. of India.

B. Water management

Suitable ground water recharge through rainwater harvesting

C. Waste management

- Sustainable integrated waste management practices through anaerobic process.

D. Future proposals

- The University will go for 100% solar panels in the entire premise.
- Planning is underway to make the prmeises a carbon net zero energy premises.

4.11 Recommendations for a Sustainable Habitat

Over the time energy efficient appliances have been a boon not only to the energy saving parameters they adhere to but also the eco-friendly habits it helps to inculcate. The Institution such as Schools and Universitys are the best way to implement these initiatives. It creates awareness among the students at a young age. The Institutions also act as a symbol and representative of being an energy efficient premise. Following the analysis we found are some of the suggestions which can be implemented for an energy efficient Institution. This would help in reduction of the current electrical consumption by a major percentage. **As per our analysis the premises has a lot of posistive aspects as far as Energy audit is concerned, hence the number of recommendations are extremely less in this aspect.**

Electromechanical systems - Electrical and Lighting

Section 1 - Lights

Non-LED and CFL Lights

The current light analysis shows that Non-LED tube lights consume anywhere between 24W, 36W and 40W when in use; similarly the CFL lights consume more than 25 to 28W when is use; these should be replaced with LED lights which consume on an average 16-20W when in use. Our technical analysis shows that there would be a reduction of an average of **79% reduction** in energy consumption through lights specifically as a part of the electro -mechanical system if all **Non-LED and CFL lights on all floors and blocks** are replaced with an energy efficient appliance whenever the University undergoes renovation. The University has already begun the replacement.

Section 2 - Fans

Ceiling fans

87% of the fans in the premises are energy efficient fans consuming almost 47% less energy as compared to regular fans. The remaining fans can be replaced with energy efficient fans. The current Fans are in proper working conditions and maintained well. This will result in a reduction of average of **47% reduction** in energy consumption if replaced with energy efficient appliance. It will be suggested to either replace these now if University can have certain plans else the replacement can be done when fans get damaged or are not in working condition.

Section 3 – Equipment

Desktop computers to laptops

Among all equipment it suggested to replace the desktop computers with laptops as this would be energy efficient. A normal desktop computer consumes on an average 250W and it is to be connected all time when it has to be used. On the contrary a laptop consumes 40W and has a battery backup which lasts up to 4 hours.

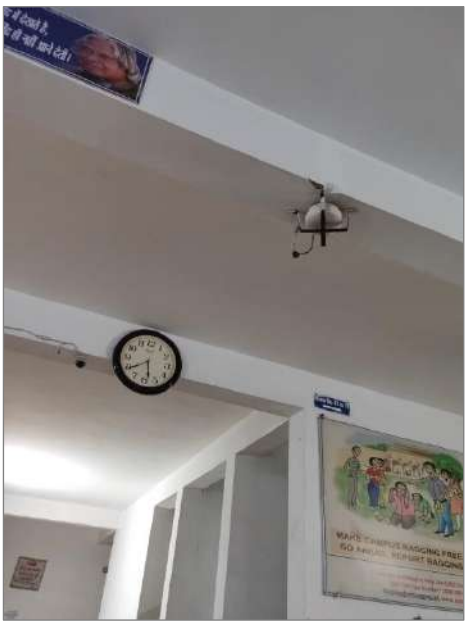
There is **an average 84% reduction** in energy consumption if replaced with energy efficient appliance which is a laptop in all the areas of Educational and Residential areas.

This replacement is however is dependent on a variety of factors as follows.

- Some of the senior staff members may be more convenient with computers, replacement with laptop might result in a change of the working patterns and hours which may affect the productivity.
- Laptops – in case are not handled with care such as if dropped unintentionally might result in data imbalance.
- Students who are not day scholars can use laptop as per their own convenience, whereas in common areas there can a monitoring about the usage hours hence computers may be a preferable option then laptop in certain spaces.
- Similarly depending on the pandemic situation in case it might be possible due to irregular usage the device might have issues while functioning.

Thus the University should analyse the above points and then devise a strategy about the replacement, essentially when the devices get damaged or are not in working condition they can surely be replaced.

As well as once they are not in working condition the proposed strategy should be linked towards e-waste management as well.




GreenSol

5. Towards a Healthy & Sustainable University

5.1 Inputs by Greenvio Solutions

Based on the analysis of the study of premises in addition to the recommendations provided in each section of Ecological, Water, Waste and Energy Audit the University can adopt the following strategies towards a Healthy and Sustainable Institution practices.

a) **Cutlery in the Canteen –** The regular plastic and steel plates, spoons used in Canteen can be replaced with eco-friendly and organic leaves, paper straw, disposable plates, edible spoons and tables made out of sugarcane waste or bamboo. This will be first of its kind initiative to be adopted and practiced thus also inculcating the healthy practices in students.

b) **Waste vio –** Stepping up a little further an initiative can be undertaken wherein University can tie up with an organisation and students can be encouraged to collect dry waste and electronic waste such as newspapers, old computers and others and hand over to organisation on a weekly or monthly basis thereby making a waste reduction approach in the community. This has benefits such as awareness, eco-friendly habits in becoming a responsible citizen.

c) **Signages –** In addition to the signages being in regular language there can be additional signages in braille language for the specially abled students.

d) **Environment Certificate Courses –** The University could begin courses such as Bachelor's, Diploma or Certificate courses with National and International Collaboration related to Environment as part of the courses provided. Though, this is not a requisite or compulsion.

5.2 Survey Results

An online survey was conducted to analyse the student and staff views about what changes according to you can be undertaken for Green audit improvement in University premises and activity, some of the key responses are listed below.

Some of the suggestions by the Students and staff are listed below:

- Cleanliness should be given first, plantation of need full plants to make the environment more eco-friendly. And renewable project for the power supply systems
- Parking sheds could be replaced by solar modules
- Proper recognition for Green belt and yearly audit should be there.
- Proper maintenance of all the present facilities with positive monitoring system in each 3 months.

However, it should be noted that the University has taken up multiple initiatives and because of Pandemic the students have not practically visited the campus so many of these points are not mandatory at the moment.

6. References

- Uniform Plumbing Code – India, 2008
- IGBC Green Existing Buildings – Operation & Maintenance (O&M) Rating system, Pilot version, Abridged Reference Guide, April 2013
- IGBC Green Landscape Rating system, March 2013
- BOMA Canada Waste Auditing Guide, Best Environmental Standards, BOMA BEST – Canada
- Climate data https://www.indianclimate.com/show-data.php?request=FDCRNM6Z6Y
- Used only for understanding Universal design - Universal accessibility Guidelines for Pedestrian, Non-motorizes vehicle and Public Transport Infrastructure – Report guidelines by Samarthyam (National centre for Accessible Environments) – an initiative supported by Shakti Sustainable Energy Foundation.
- City of Cheyenne, Streetscape/ Urban Design elements - Wyoming Planning Association, Gillette, Wyoming, United States


स्वर्ण जयंती वर्ष २०१३-१४
पं. रविशंकर शुक्ल विश्वविद्यालय, रायपुर

CREDA
CHHATTISGARH STATE RENEWABLE ENERGY DEVELOPMENT AGENCY
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V.I.P. Road (Airport Road), Near Energy Education Park, RAIPUR (C.G.)
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क्रः 3184 /क्रेडा/GRID/2016-17 दिनांक 30/03/2017

प्रति,

कुलसचिव
पंडित रविशंकर शुक्ल विश्वविद्यालय
रायपुर, (छ.ग.)

विषयः–पंडित रविशंकर शुक्ल विश्वविद्यालय परिसर में ग्रिड कनेक्टेड सौर संयंत्रों की स्थापना किए जाने के संबंध में।

संदर्भः–दिनांक 22.03.17 को विश्वविद्यालय परिसर में हुई समीक्षा बैठक में हुई चर्चानुसार।

महोदय,

विषयांतर्गत विश्वविद्यालय परिसर मे ग्रिड कनेक्टेड सौर संयंत्रों की स्थापना के संबंध में क्रेडा द्वारा किए गए सर्वेक्षण के आधार पर परिसर के विभिन्न भवनों की छतों पर निम्नानुसार संयंत्र स्थापना किया जाना प्रस्तावित हैः–

स क्र.	प्रस्तावित स्थल	प्रस्तावित क्षमता कि.वॉ. में
01	प्रशासनिक भवन	70 कि.वॉ.
02	विज्ञान भवन	50 कि.वॉ.
03	कम्प्यूटर प्रयोगशाला	50 कि.वॉ.
04	पुस्तकालय	50 कि.वॉ.
05	एकेडमिक स्टॉफ कॉलेज	10 कि.वॉ.
06	कुलपति भवन	15 कि.वॉ.
	कुल क्षमता	**245 कि.वॉ.**

- उपरोक्त क्षमता का निर्धारण भवन पर उपलब्ध छत एवं भवन में स्थापित विद्युत मीटरों की खपत के अनुरूप किया गया है।
- कुछ भवनों पर छत उपलब्ध है, किंतु भवन में स्थापित विद्युत मीटर के अनुसार खपत कम है।
- वर्तमान में छ.ग. राज्य विद्युत नियामक आयोग द्वारा 50 कि.वॉ. से कम क्षमता के ग्रिड कनेक्टेड सौर संयंत्रों की कनेक्टिविटी की अनुमति नही दी जा रही है। अतः सरल क्र. 01,02,03 एवं 04 में ही प्रस्तुत स्थलों पर संयंत्र स्थापना की जा सकती है। तद्नुसार प्रस्ताव प्रपत्र-अ पर संलग्न है।
- यह भी अवगत होना चाहेगें कि इन संयंत्रों में बैटरी बैकअप नही होता है एवं संयंत्र के संचालन हेतु विद्युत की अपूर्ति होना आवश्यक है। परंपरागत विद्युत अपूर्ति ना होने की दशा में सौर संयंत्र से विद्युत अपूर्ति बाधित रहेगी।

निरंतर.....

पूर्व पृष्ठ से निरंतर.....

- ग्रिड कनेक्टेड सौर संयंत्रों के समुचित Captive Consumption हेतु उचित होगा कि परिसर में स्थापित विविध एनर्जी मीटर के स्थान पर एकल बाईडायरेक्शनल एनर्जी मीटर की स्थापना की जावे। एकल मीटर ना होने की दशा में विश्वविद्यालय की विद्युत खपत में कमी नही आ पाएगी। यदि पूरे परिसर हेतु एक एनर्जी मीटर स्थापित नहीं हो पाता है तो कम से कम एक ही भवन में स्थापित एक से अधिक एनर्जी मीटरों को एक बाईडायरेक्शनल एनर्जी मीटर में बदलवाया जाना आवश्यक होगा।

संलग्नः- उपरोक्तानुसार।

30/8/17

(राजीव ज्ञानी)
कार्यपालन अभियंता

स.क्र.	संयंत्र क्षमता	छायामुक्त स्थल की आवश्यकता (वर्ग मीटर में)	अनुमानित औसत विद्युत खपत (दिन के समय युनिट में)	संयंत्र प्रदाय एवं स्थापना लागत (रू. में)	05 वर्षीय एएमसी लागत (रू.में.)	कुल परियोजना लागत * (3+4) (रू.में.)	केंद्र अनुदान (रू. 18750 प्रति कि.वा. या कुल परियोजना लागत का 30 प्रतिशत जो भी कम हो) (यदि उपलब्ध हो तो राशि रू. में)	प्रचलित दर के मान से हितग्राही अंशदान राशि रू. में (यदि अनुदान उपलब्ध है)
1	2	3		4	5	6	7	
1	10 KW	120	1200	615000.00	55000.00	670000.00	187500.00	**482500.00**
2	20 KW	240	2400	1240000.00	90000.00	1330000.00	375000.00	**955000.00**
3	25 KW	300	3000	1540000.00	122500.00	1662500.00	468750.00	**1193750.00**
4	30 KW	360	3600	1850000.00	145000.00	1995000.00	562500.00	**1432500.00**
5	50 KW	600	6000	3050000.00	225000.00	3275000.00	937500.00	**2337500.00**
6	100 KW	1200	12000	6100000.00	450000.00	6550000.00	1875000.00	**4675000.00**
7	500 KW	6000	60000	30100000.00	1400000.00	31500000.00	9375000.00	**22125000.00**

बाईडायरेक्शनल मीटर न होने की दशा में मीटर प्रदाय की लागत पृथक से देय होगी। छ.ग. राज्य विद्युत वितरण कंपनी/स्टेट लोड डिस्पेच सेंटर को 100 कि.वा. क्षमता तक के सौर संयंत्र की कनेक्टिविटी हेतु देय प्रोसेसिंग फीस रू. 11000.00 (दस हजार + एक हजार), एवं 101 से 500 कि.वा. क्षमता के सौर संयंत्रों हेतु रू. 21000.00 (बीस हजार +एक हजार)भी हितग्राही संस्थान को व्यय करना होगी। यह परियोजना लागत में सम्मिलित नहीं है। संबंधित भवन में यदि एक से अधिक एनर्जी मीटरों की स्थापना है तो उक्त भवन में विभिन्न मीटरों को विस्थापित कर सिर्फ एक बाईडायरेक्शनल मीटर में स्थापना आवश्यक होगी। उपरोक्त लेखनुसार हितग्राही अंशदान क्रेडा में जमा करने के पश्चात् क्रेडा द्वारा स्थलवार निविदा जारी की जावेगी निविदा के माध्यम से अनुमोदित दरों पर कार्य सम्पादित किया जावेगा।

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क्रमांक- 17029 /टी-1/क्रेडा/एसएमडी/16-17

रायपुर,दिनांक: 07.10.2016

प्रति,

कुलसचिव
पंडित रविशंकर शुक्ल विश्वविद्यालय
रायपुर (छ.ग.)

विषयः- पंडित रविशंकर शुक्ल विश्वविद्यालय परिसर, रायपुर में स्थित छात्रावासों में खाना बनाने हेतु स्टीम कुकिंग संयंत्र की स्थापना बाबत्।

विषयांतर्गत् लेख है कि, पंडित रविशंकर शुक्ल विश्वविद्यालय परिसर, रायपुर में स्थित छात्रावासों में खाना बनाने हेतु बड़ी मात्रा में एलपीजी/लकड़ी का उपयोग किया जाता है, जिससे न सिर्फ विश्वविद्यालय का वित्तीय भार बढ़ता है अपितु पर्यावरण भी प्रदूषित होता है। अतः मान्य हो तो पंडित रविशंकर शुक्ल विश्वविद्यालय परिसर, रायपुर में स्थित छात्रावासों में खाना ,बनाने हेतु स्टीम कुकिंग संयंत्र की स्थापना किया जाना प्रस्तावित है।

इस संयंत्र की स्थापना पर कुल लागत ₹27,50,000/-आती है जिसमें से ₹5,18,400/-केन्द्रीय मंत्रालय (एमएनआरई) एवं ₹3,45,600/-यूएनडीपी द्वारा अनुदान के रूप में देय होगा अर्थात परियोजना पर पंडित रविशंकर शुक्ल विश्वविद्यालय, रायपुर को हितग्राही अंश के रूप में ₹18,86,000/-देय होगा। उल्लेखनीय है, कि इस परियोजना पर यूएनडीपी द्वारा निर्धारित अनुदान केवल जनवरी 2017 से पहले स्वीकृत संयंत्रों पर ही देय होगा।

उक्त प्रस्ताव आपके सुलभ सन्दर्भ हेतु प्रेषित किया जा रहा है। कृपया प्रस्ताव पर विचार कर स्वीकृति प्रदान करते हुए संलग्न प्राक्कलन के अनुसार परियोजना के क्रियान्वयन हेतु कुल हितग्राही अंश ₹18,86,000/- इस कार्यालय को क्रेडा, रायपुर के नामे चेक अथवा डिमाण्ड ड्राफ्ट के माध्यम से उपलब्ध कराने का कष्ट करेंगे।

संलग्नः- उपरोक्तानुसार।

7/10/16.
(एस.एम.देशपांडे)
मुख्य अभियंता,क्रेडा

Solar Steam Cooking System

Cooking / Session	Space in Sq. Mt.	Dish Area	Total no. of Parabolas	Parabolas size	R.C. Price	MNRE Subsidy	UNDP Support	Net cost to Client	LPG Cyl. Saved	Savings per day	Savings 300 days	Payback in years	Depreciation	Inv. With Dep.	Payback with Dep.
100 - 200	105	48	3	16	1,475,000.00	259,200.00	172,800.00	1,043,000.00	1.00	1,230.00	369,000.00	2.83	303,950.00	739,050.00	2.00
201 - 350	140	64	4	16	1,945,000.00	345,600.00	230,400.00	1,369,000.00	1.50	1,845.00	553,500.00	2.47	399,850.00	969,150.00	1.75
351 - 500	210	96	6	16	2,750,000.00	518,400.00	345,600.00	1,886,000.00	2.00	2,460.00	738,000.00	2.56	557,900.00	1,328,100.00	1.80
700 - 800	280	128	8	16	3,610,000.00	691,200.00	460,800.00	2,458,000.00	2.80	3,444.00	1,033,200.00	2.38	729,700.00	1,728,300.00	1.67
1,000	350	160	10	16	4,352,000.00	864,000.00	576,000.00	2,912,000.00	4.00	4,920.00	1,476,000.00	1.97	872,000.00	2,040,000.00	1.38
1,500	490	224	14	16	6,010,000.00	1,209,600.00	806,400.00	3,994,000.00	6.00	7,380.00	2,214,000.00	1.80	1,200,100.00	2,793,900.00	1.26
2,000	630	288	18	16	7,725,000.00	1,555,200.00	1,036,800.00	5,133,000.00	8.00	9,840.00	2,952,000.00	1.74	1,542,450.00	3,590,550.00	1.22
2,500	770	352	22	16	8,890,000.00	1,900,800.00	1,267,200.00	5,722,000.00	10.00	12,300.00	3,690,000.00	1.55	1,747,300.00	3,974,700.00	1.08
3,000	910	416	26	16	9,850,000.00	2,246,400.00	1,497,600.00	6,106,000.00	12.00	14,760.00	4,428,000.00	1.38	1,900,900.00	4,205,100.00	0.95
5,000	1,470	672	42	16	17,200,000.00	3,628,800.00	2,419,200.00	11,152,000.00	20.00	24,600.00	7,380,000.00	1.51	3,392,800.00	7,759,200.00	1.05
10,000	2,730	1,248	78	16	32,555,500.00	6,739,200.00	4,492,800.00	21,323,500.00	40.00	49,200.00	14,760,000.00	1.44	6,454,075.00	14,869,425.00	1.01
15,000	3,780	1,728	108	16	44,820,000.00	9,331,200.00	6,220,800.00	29,268,000.00	60.00	73,800.00	22,140,000.00	1.32	8,872,200.00	20,395,800.00	0.92
20,000	4,900	2,240	140	16	56,700,000.00	12,096,000.00	8,064,000.00	36,540,000.00	80.00	98,400.00	29,520,000.00	1.24	11,151,000.00	25,389,000.00	0.86

Solar Termic Fluid Heated Cooking System

Cooking / Session	Space in Sq. Mt.	Dish Area	Total no. of Parabolas	Parabolas size	R.C. Price	MNRE Subsidy	UNDP Support	Net cost to Client	LPG Cyl. Saved	Savings per day	Savings 300 days	Payback in years	Depreciation	Inv. With Dep.	Payback with Dep.
100-200	100	64	2	32	2,625,000.00	345,600.00	230,400.00	2,049,000.00	1.33	1,640.00	492,000.00	4.16	569,850.00	1,479,150.00	3.01
201-350	200	128	4	32	3,810,000.00	691,200.00	460,800.00	2,658,000.00	2.33	2,870.00	861,000.00	3.09	779,700.00	1,878,300.00	2.18
301-500	300	192	6	32	5,090,000.00	1,036,800.00	691,200.00	3,362,000.00	2.86	3,514.29	1,054,285.71	3.19	1,013,300.00	2,348,700.00	2.23
501 - 700	400	256	8	32	6,810,000.00	1,382,400.00	921,600.00	4,506,000.00	4.00	4,920.00	1,476,000.00	3.05	1,356,900.00	3,149,100.00	2.13
701 - 900	500	320	10	32	8,295,000.00	1,728,000.00	1,152,000.00	5,415,000.00	5.14	6,325.71	1,897,714.29	2.85	1,641,750.00	3,773,250.00	1.99
901 - 1000	600	384	12	32	9,550,000.00	2,073,600.00	1,382,400.00	6,094,000.00	5.71	7,028.57	2,108,571.43	2.89	1,869,100.00	4,224,900.00	2.00
1,001 - 1,200	700	448	14	32	11,100,000.00	2,419,200.00	1,612,800.00	7,068,000.00	6.86	8,434.29	2,530,285.71	2.79	2,170,200.00	4,897,800.00	1.94
1,201 - 1,500	800	512	16	32	12,450,000.00	2,764,800.00	1,843,200.00	7,842,000.00	8.57	10,542.86	3,162,857.14	2.48	2,421,300.00	5,420,700.00	1.71
1,501 - 1,700	900	576	18	32	14,120,000.00	3,110,400.00	2,073,600.00	8,936,000.00	9.71	11,948.57	3,584,571.43	2.49	2,752,400.00	6,183,600.00	1.73
1,701 - 2,000	1,000	640	20	32	15,100,000.00	3,456,000.00	2,304,000.00	9,340,000.00	11.43	14,057.14	4,217,142.86	2.21	2,911,000.00	6,429,000.00	1.52

Note: The Subsidy and UNDP incentives may change with any change in Govt. policy

The above cost includes Tax, Cooking Vessels (3 Nos.) of suitable sizes, on site erection & commissioning charges, Transportation and trial runs of the system. Not included in the above price are any Back-up system, Hot Water storage tanks, special material handling equipments like crane etc., operational spares, dish cleaning pipe line and AMC.

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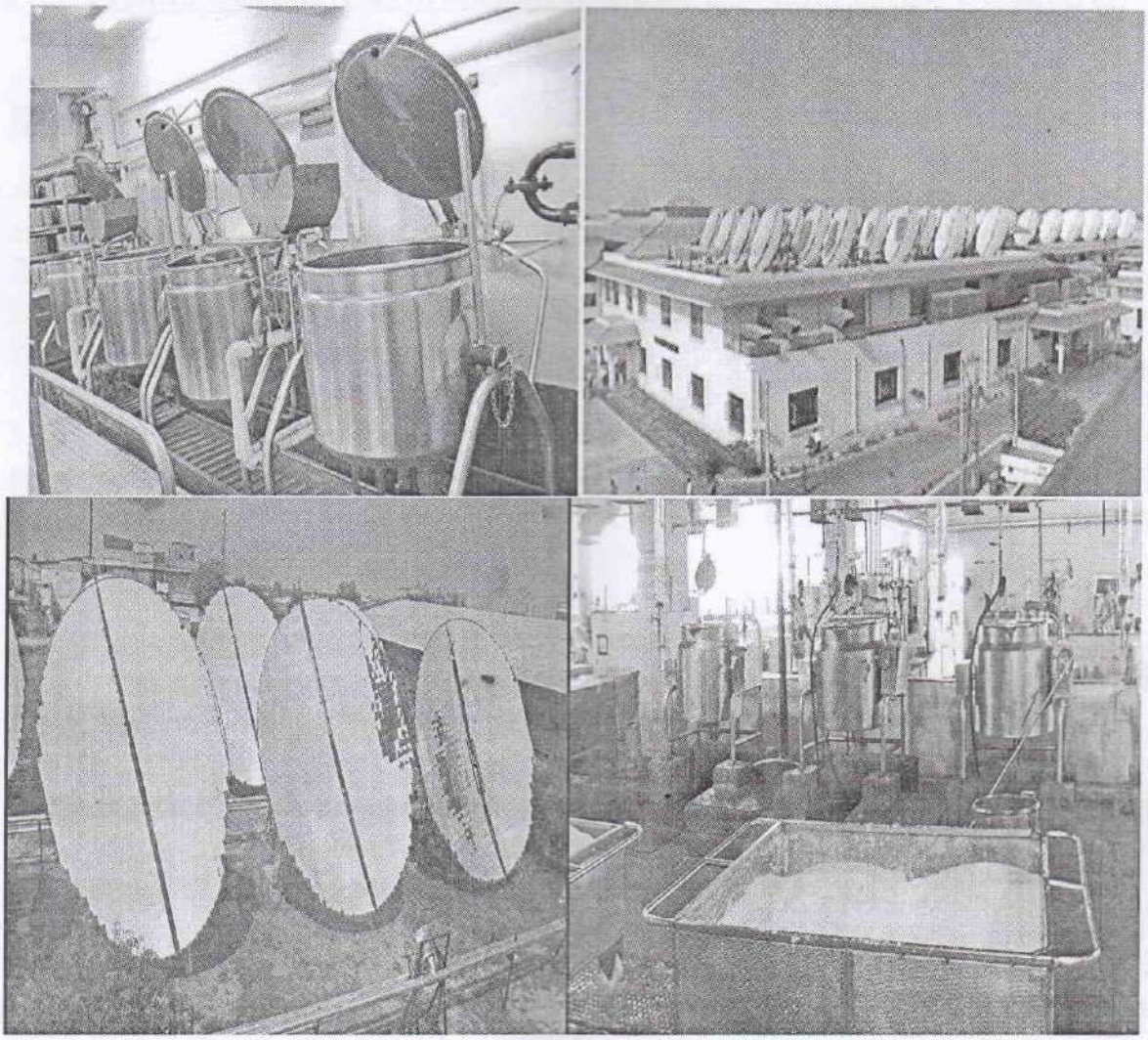
Techno-Commercial Proposal



Steam Cooking System
at Pt. Ravi Shankar shukla University
Cooking purpose of 500 children

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Techno-Commercial proposal for Steam Cooking, Direct Cooking & Dish Cooker

Executive Summary

Among various renewable energy resources, India possesses a very large solar energy resource which is seen as having the highest potential for the future. The first, recently announced, Jawaharlal Nehru National Solar Mission with a target of 20,000 MW grid solar power, and 20 million sq.m. Solar thermal collector area by 2022 is under implementation.

Ministry is also launching a new initiative for household cook stoves. Meanwhile, large Solar cooking systems for institutions and have plans to install at least 1000 large solar cooking systems by 2022 and solar dish cookers are also being encouraged.

Renewable energy is experiencing new enthusiasm and vibrancy all across, and the foundation of a new economy is being laid that is inclusive, sustainable and aspires for de-carbonization of energy in a definite time frame.

Solar cooking is an area which has been getting attention but perhaps requires more focus. India has been a pioneer in using solar concentrating technologies for the purpose of steam generation for various applications.

Ministry would like to cover at least all institutions including large institutions like Jails, Hostels, Hospitals/Medical colleges, Military/Para-Military Establishments, Industrial Organizations, wherever large number of meals is cooked, are the targets. Essentially, these will reduce the consumption of cooking gas to great extent.

MNRE gives a subsidy of 30% to promote Solar Cooking system and also State nodal agency provides additional subsidy.

In various Ashrams, Schools, Hostels of India maximum daily expenses is of cooking food for the Guests and Devotes, This can be reduced by more than 60 to 70% by installing Solar Steam Cooking and Direct Cooking Systems in India. *The Paybacks of all Solar cooking systems of are very attractive.*

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Introduction:

We, **Chhattisgarh Renewable Energy Development Agency (CREDA)** is State Nodal Agency for implementing Renewable Energy Projects. The team of CREDA is having experience and knowledge of various Solar Steam Generating systems for various applications, solar direct and indirect cooking /heating systems etc. for more than 10 years.

The advantage of using solar energy instead of fossil base sources is the prevention of CO_2 emission and in medium / long term cost savings compared to rapidly rising cost for conventional energy-fuels.

Solar cooking is an area which has been getting attention but perhaps requires more focus. India has been a pioneer in using solar concentrating technologies for the purpose of steam generation, direct cooking and dish cookers for various applications.

Ministry would like to cover at least all institutions including large institutions like Educational Institutes and Universities, Residential Schools & Colleges, MDM Schemes, State and District Jails, Hostels, Hotels, Canteens, Hospitals/Medical Colleges, Military/Para-Military Establishments, Industrial Organizations, Religious organizations and all other wherever large number of meals is cooked. Essentially, these will reduce the consumption of cooking gas or fire wood, subsidy burden on Government to great extent.

At CREDA, we offer various applications:-

- Dish Cooker of 1 m^2 , 1.4m^2 and 4m^2
- Direct Cooking of 10m^2 and 16m^2
- Steam Cooking for 100 to Thousands of People
- Solar Crematorium
- Solar Thermal Air-Conditioning
- Process Heat / Pressurized Hot water for Industrial Applications
- Space Heating and Hot air application
- Solar Power Plant
- Waste Water Evaporation/Solar Desalination
- Pasteurization of Water/Milk or any other Liquid

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Solution to Current Challenges

We are responsible for all type of Pollutions and health related problems, which are on the rise and are becoming unstoppable and controllable. The main cause of all these is fossil fuel which generates CO_2 emissions. The way we are using all our natural resources, it is clear that our Next Generation will have huge problems. For fighting the global warming and to save fuel for future, Solar Thermal Parabolic Concentrating Technology is one of the fastest growing and widely accepted technologies and promoted in big way by MNRE.

The amount of energy falling on earth surface is 1373 w/m^2 which is sufficient to boil whole water on earth. In many regions of the world one square kilometer of land is enough to as much as 100 to 120 Giga Watt hours (GWH) of electricity per year using solar thermal technology. This is equivalent to the annual production of a 50 MW conventional coal or gas fired mid load power plant. As India fortunately has large potential of solar energy, the purpose of this proposal is to introduce the utility of Solar Thermal Energy for all types of community and family cooking.

Working Principle of Solar Concentrator:

Solar dish concentrator concentrates radiations of Sun on receiver through all the day from 9 a.m. to 6 p.m. It tracks the radiations of Sun through automated tracking device, which rotates the parabolic dish along axis of rotation of Sun.

Parabolic dish consists of set of large Aluminum mirrors of rectangular shape or high reflective Aluminum sheet. Normally, parabolic dish has an area of 16m^2 of elliptical shape. It can be of 8 M^2, 9m^2, 10m^2 or 32 m^2 also depending on the application and customer's requirement.

Technology – Parabolic Concentrators:

Each parabolic concentrator of the system has a reflector frame fitted with reflecting Aluminum mirrors, rotating support and a stand. The concentrators are installed in such a way that they focus the Sunlight on to the receivers while in operation which will be attached to a steam header/ tank. The concentrators are tracked automatically with the help of suitable tracking arrangement. The concentrators are installed in series and parallel combination connected to different

steam headers/ tanks depending on the size of the system. Each unit of concentrators is connected in series and has its own tracking arrangement. The stands of the concentrators are properly grouted. The tracking arrangement is such that once adjusted in the morning with the help of drive motor, the concentrators will automatically track the Sun at least in one direction i.e. in E-W, thereby focusing all the Sun light exactly on the receivers connected to the header.

Solar Steam Cooking System:

Steam Header Assembly and Instrumentation:

Each steam header assembly is connected to a group of concentrators that consists of a steam header/ tank connected to receiver (circular in shape), pressure reducing station, steam and feed water pipelines and necessary valves. The designs of the receivers are such that they work on thermo- siphon principle and the water stored in the header is slowly converted into steam when the system is put into operation. It has a drain arrangement for cleaning against scale formation. The pressure reducing station is so designed that it reduces the pressure of steam generated in the header from 10 Kg/cm2 to 1-2 Kg/cm 2 so as to ensure safety of the user while using the steam. The system pipelines, receivers and steam header are insulated with glass wool/ rock wool covered by aluminum cladding to minimize heat losses. The system is hydro tested for any leaks before insulating its various components. Feed water tank of suitable capacity, instrumentation e.g. pressure gauze and water level and temperature indicators, level controller, safety valves, steam separators are installed with the system for safety and measuring different parameters.

Support Structure and Civil Work:

Necessary steel structures are provided to support steam header/ tank, stands for Concentrators, steam and feed water pipelines, pressure reducing valves, feed water tank etc.

Technical Specifications of Steam Cooking System:

Concentrators:	
Shape & make of each Concentrator	Of parabolic shape made of reflecting mirror(s) fixed to a supporting frame / structure
Aperture area	16 sq. m. or 32 Sq.m (for Scheffler dishes, it will be $\pi/4$ x lengths of major & minor axes of the ellipse).

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Reflecting Mirrors:	
i) Material	**i)** Bright Solar grade Aluminum mirrors* especially developed for outdoor use is used with reflectivity of over 90%.
ii) Reflectivity	**ii)** 90% minimum with a maximum degradation of 10% over its life span.
iii) Mirror fixing	**iii)** With positive locking or sticking by good quality adhesives. Due protection of mirror coatings is taken while fixing the mirrors.

* The benefit from this breakthrough is that the glass becomes the part of the anodic surface and has reflectivity equal to conventional specular anodized finishes; the final product has a glass-like surface, and is resistant to ultraviolet light. It has

- Outstanding reflectance (Solar reflectance 90% minimum as per ASTM E1331-96 and E 903-96)
- Superior corrosion resistance
- Drains moisture and dries faster than conventional reflector surfaces
- Available in patented composite panels that are easy to fabricate and install
- Reflectance and Corrosion-Resistance warranties up to 30 years based on application and location.
- It functions like glass, but without the weight and without the brittleness
- It functions like glass, but without the weight and without the brittleness

Though there may be increase in the cost of the Parabola but looking to the above advantages it makes an ideal choice for our solar parabolic concentrators. The price increase is justified as the life of the reflectors are more than three times compared to mirrors, there are no breakages and saves replacement cost which is more than the price increase.

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Concentration Ratio:
More than 80%
Tracking Arrangement:
• The system has reliable D.C automatic tracking mechanism. It is made of standard components and is protected from rain, dust & outside environment.
Heat receivers, Headers/ Drums and Piping:
• Tested steam pressure: 1.5 times of designed pressure (15-20 kg / cm^2) • Receivers : of boiler quality material to sustain required temperature and pressure • Header material and piping: Designed & manufactured as per IBR/ standard industry quality.
Insulation:
• All hot water and steam piping, interconnecting piping from header to receivers, are insulated with minimum thickness of 50 mm of PUF or rock wool as per requirement and weather conditions. Headers or water-steam tank should have minimum insulation of 75 mm. • All insulated components will have Al sheet or powder coated steel sheet cladding as per industrial practices so as not to allow rain water to sip in the insulation
Frame and Supporting Structure:
• Is strong enough to avoid any deformation of the reflector dish during manhandling / tracking/under wind pressure of 200 km per hour. • Of mild steel and Aluminum bars which are strong enough and painted with epoxy/anti-rust coating.
Instrumentation & Controls:
• Complete system comes with all instrumentation such as pressure gauge, temperature indicator, fluid level indicators, safety valves etc. • All parts/components are weather resistant. The complete system is designed to withstand natural weathering outdoors under local climatic conditions, for a minimum period of 25 years.

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Warranty: The system carries a performance warranty of 5 years.

- Necessary spares for smooth operation are provided on request, so that the users do not face any problems at least during the warranty period.
- The complete steel structures provided to support various components of the system are fabricated in such a way that they are capable to take load (both wind load and static dead load) of the whole system.
- The personnel of the buyer/user institution are trained by CREDA in the operation and maintenance of the system and its back-up system. Proper manuals are prepared and handed over to the user.

The other important features of system are:

i) It will be designed to have easy access to the user and proper walkway and platforms will be supplied for easy operation and maintenance of the system wherever necessary.

ii) Safety features such as safety valves etc. will be incorporated in the system.

iii) Proper instrumentation as mentioned above will be provided so that user could see the status of system and take precautions /corrective steps if the system does not behave as expected.

CREDA reserves the rights for any improvements in the above specifications, which can lead to higher efficiency and cost reduction of the system.

Applications:

Solar Steam Cooking	From 200 to more than 50,000 meals / day	Boiling of rice, dal, vegetables , milk etc.	In the comfort of the kitchen.	Residential schools, mid-day meal program, defense teams deployed in remote and urban areas, hotels, Jails, institutions, industries providing canteen facilities to employees, temples and many more catering to more than 200 to thousands persons daily

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Components in the System:

1. Parabolic Concentrators
2. Receivers
3. Central Automatic Tracking System
4. Steam Header
5. Steam Pipe Line (branch) & feed water pipe line
6. Back-up system for whole year operation – Option available at extra cost.

Silent features of Steam Cooking System:

- Complete system designed as per MNRE specifications and guide lines.
- Specialized Al. mirrors with 90% reflectivity with a life of more than 30 years.
- The system can sustain wind velocity of 200 Km./Hr.
- We provide AMC for the system after warrantee period.

Price of the systems and Related information for 351-500 Persons:

Sr. No	Description	Details
1	Solar Steam Cooking System / Session	351 – 500 persons
2	Total Space Required for Installation	210 Sq. M
3	Total Reflective Area required	96 Sq M
4	Total Parabolas to be installed	6 Nos
5	Size of Parabola	16 M^2
6	Subsidy from MNRE (in ₹)	518400.00
7	UNDP Support (in ₹)	345600.00
8	Proposed Cost of System (in ₹)	2750000.00
9	Net cost to Client after MNRE and UNDP support(in ₹)	1886000.00
10	LPG Cylinders saved per day(in Nos.)	2.00
11	Cost of one Cylinder (14.2 Kg) in (in ₹)	1230.00
12	Savings per day in (in ₹)	2460.00
13	Savings in 300 days (in ₹)	738000.00

The above cost includes Tax, Cooking Vessels (3 Nos.) of suitable sizes, on site erection & commissioning charges, Transportation and trial runs of the system.

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Not included in the above price are any Back-up system, Hot Water storage tanks, **special** material handling equipments like crane etc., operational spares, dish **cleaning** pipe line and AMC.

Pay-back on Investment Steam Cooking:

With MNRE subsidy and UNDP-GEF support the return on investment are less than three years in any of Solar Steam Cooking System.

General Terms of Payment:

After deduction of MNRE & UNDP-GEF .Support, the cost of system borne by beneficiary organization is to be deposited in CREDA in form of Demand Draft, address to The Director, CREDA payable at Raipur.

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Environment Audit

2019-20 & 2020-21

AUDIT REPORT

Studied for

Pt. Ravishankar Shukla University

Amanaka G.E.Road, Raipur,
Chhattisgarh (India) - 492010

Analysed by

Greenvio Solutions

23 March 2022

Background reference image Nic Y C Gua on unsplash

Letter and Certificate of Consent

ENVIRONMENT AUDIT

This is to certify that the Environment Audit for 2019-20 and 2020-21 has been conducted for

Pt. Ravishankar Shukla University

Amanaka G. E. Road, Raipur, Chhattisgarh (India) - 492010

The Study observed the following:

The Premises is an eco-friendly Institution which is pollution free and has a fresh ambience.

There are ample of vegetation and tree covers in and around each Building of the premises.

Adequate facilities are provided for user benefit for all stakeholders.

The Institutions efforts of having facilities for Universal Design are appreciable.

Overall the study concludes:

The Environmental Audit & its management practices undertaken by the Institution are excellent.

Study and Audit done by:

Ar. Nahida Shaikh

Project Head and Green Building Consultant

Sustainable Academe – Greenvio Solutions

Sustainability Department of Greenvio Solutions, Naigaon

An environment Design and Consultancy developing Healthy and Sustainable Environments

sustainableacademe@gmail.com I greenviosolutions@gmail.com

About the Project Head - Ar. Nahida Shaikh has completed audits of multiple Institutes including Technical, State University, Private University and Single Faculty Colleges for a total of more than **50 lakhs+ sq. ft. of Built-up area audited till date** Pan India as an Accredited Green Building Professional-Architect.

She has **authored over 6 books** for Colleges in India titled *Towards a Healthy & Sustainable Institute, An Ecologically Sound Institution, Education amidst the nature, Micro efforts towards a Green Institution leading to Macro Results, An Eco-friendly Developed Institutions* f these are published with ISBN Number as Paperback and the book titled *An Urban Green Habitat* published with ISSN Number.

She is a Registered Licensed **Architect** with the Council of Architecture, India an **Indian Green Building Council Accredited Professional** (IGBC AP), an **Assocham GEM Certified Professional** (Regn. No. GEM CP 22/718) and she has completed her Lead Auditor Course on Environment Management System, Green Campus Audit, Energy Audit and Hygiene Audit to Educational Institutions and Industries.

Green Building consultancy is her forte and she is one of the most sought after names when it comes to providing excellent quality services within the stipulated time frame.

(Valid till March 2023)

Disclaimer

The Audit Team has prepared this report for the **Pt. Ravishankar Shukla University** located at *Amanaka G.E.Road, Raipur, Chhattisgarh (India) - 492010* based on input data submitted by the University analysed by the team to the best of their abilities.

The details have been consolidated and thoroughly studied as per the various guidelines for Green Buildings available in National and International Standards; the report has been generated based on comparative analysis of the existing facilities and the prerequisites formulated by various standards. The inputs derived are a result of the inspection and research. These will further enhance and develop a Healthy and Sustainable Institution.

These can be implemented phase wise or as a whole depending on the decision taken by the Hon'ble Management and University. The warranty or undertaking, expressed or implied is made and no responsibility is accepted by Audit Team in this report or for any direct or consequential loss arising from any use of the information, statements or forecasts in the report.

The audit is a thorough study based on the inspection and investigation of data collected over a period of time and should not be used for any legal action. This is the property of Greenvio Solutions and should not be copied or regenerated in any form.

The Report is prepared by the Team of Greenvio Solutions under their brand and department – Sustainable Academe as Consultancy firm with the Project Head - Ar. Nahida Shaikh who has completed audits of multiple Institutes including Technical, State University, Private University and Single Faculty Universities of more than 50 lakhs+ sq. ft. of Built-up area audited till date Pan India as an Accredited and Certified Green Building Professional-Architect. Green Building consultancy is her forte and she is one of the most sought after names when it comes to providing excellent quality services within the stipulated time frame.

The Study is conducted in capacity of Accredited & Certified Green Building Professional with extensive experience.

Greenvio Solutions

Developing Healthy and Sustainable Environments

We are an Environmental and Architectural Design Consultancy firm

Sustainable Academe is our department for conducting Audits

Palghar District, Maharashtra- 401208

sustainableacademe@gmail.com

Acknowledgement

The Audit Assessment Team thanks the **Pt. Ravishankar Shukla University, Raipur, Chhattisgarh** for assigning this important work of Environment Audit. We appreciate the cooperation extended to our team during the entire process.

Our special thanks are due to Hon'ble **Prof. Keshari Lal Verma Sir, Vice Chancellor** and **everyone from the University.**

Our heartfelt thanks to Chairpersons of the entire process **Prof. Girish Kant Pandey Sir,** Registrar for the valuable inputs.

The kind gesture for the inventory and data collection of **and Mr. Kuldeep Bhupendra,** Incharge - Engineering Section is quite commendable.

We are also thankful to **University's Task force the faculty members - Audit Coordinators** who have collaborated to collect data required **Dr. Sanjay Tiwari,** Professor, Coordinator: M.Tech. in Optoelectronics & Laser Technology, Coordinator: Institute of Renewable Energy Technology & Management, S.O.S. in Electronics & Photonics; **Prof. Arti Parganiha,** Professor of Bioscience.

We highly appreciate the assistance of the **entire Teaching, Non-teaching and Admin staff** for their support while collecting the data.

Sustainable Academe

Brand of Greenvio Solutions, Palghar District, Maharashtra- 401208

Contents

Greenvio Solutions

Hereby presents

An Environment & Ecological friendly premise

Established as a State Private University at Raipur

vide Chhattisgarh Act of 1973

The prestigious

Pt. Ravishankar Shukla University

Amanaka G.E.Road, Raipur, Chhattisgarh (India) - 492010

1. Introduction

1.1 About Pt. Ravishankar Shukla University

An educational institute is beyond than being just a building. It helps one in acquiring knowledge which is a gateway to being successful and a good human.

"A good education is the best gift you can give yourself or anyone else"

- Mahtab Narsimhan

Pt. Ravishankar Shukla University is Chhattisgarh's largest and oldest institution of higher education, founded in 1964, and named after the first chief minister of erstwhile Madhya Pradesh. The University has a sprawling campus in the western part of the capital of Chhattisgarh, Raipur. The campus of University is spread in 300.17 acres of land. There are Twenty-Nine teaching departments in the University. Out of which six departments buildings have been constructed recently. A variety of self-financed courses have been initiated in some departments. The total number of employees is 700, who provide the administrative support at different levels.

Attracted by the opportunity to study and conduct advanced research with renowned professors and fellow scholars in one of the Chhattisgarh's most dynamic cities, students also come from the neighbouring States. There are 5000 students enrolled for variety of courses offered by the departments who are steered under the guidance of more than 100 faculty members. Jurisdiction of RSU covers entire central and southern part of Chhattisgarh. There are 180 educational institutions affiliated to the University. In the academic year 2005-06, about 1,25,000 students were enrolled, both for undergraduate and postgraduate courses. The University plays a major role in the educational, cultural and economic life of the region.

"There is no school equal to a decent home and no teacher equal to a virtuous parent."

- Mahatma Gandhi

It is one of the premier State Educational University providing quality education with best state of the art facility & Infrastructure to the students.

1.2 Statement, Section of University

1.2.1 Vision towards the future

- To **make quality higher education accessible to all sections of society,** including the tribal population of Chhattisgarh.
- To **provide quality education in the disciplines** of arts, humanities, social sciences, natural sciences and other disciplines of learning.
- To **develop human resource with world class competence and skills** in the respective disciplines.

1.2.2 Mission for achieving benchmarks

- To develop the university as a centre of excellence for higher education and knowledge resource
- To promote understanding the value of self-learning, creativity and competence building:
  - By providing world-class education through university-teaching departments and schools.
  - By promoting quality research in university schools and affiliated colleges.

1.2.3 About the Engineering section

Engineering section is an important component of the administrative infrastructure of Pt. Ravishankar Shukla University. The section mainly works on all matters subject to the control of the Building Committee.

The Building committee advises the Executive Council on all matters related to construction of buildings, repairs, alteration, additions to existing buildings, select and recommend site or acquisition, accord technical sanction to the plans and estimates, and expenditure.

The composition of the Building Committee is such that the members are nominated for the period of two years, as per additional Statute 3 of the University Act

1.2.4 About the Development section

The Development section is an important component of the administrative structure of the University. It periodically performs work related to all type of purchase proposals i.e. inviting quotations, preparation and floating tenders for the purpose of purchase, organizes the meeting of Central Purchase Committee duly constituted as per provisions of the University Act, preparation and floating the expression of interest, disposal of waste material such as used answer books etc.

The section also supervises works related to the printing of various documents, proforma, Degree & preparation of gold medal etc.

1.3 Institutions in the premises

The aim of the University is to continuously enhance the teaching methods in order to provide students with an opportunity for their all-round development. In order to manage the programme offerings in a much better way, Pt. Ravishankar Shukla University has **structured its offerings under 29 Major Sections** as follows:

1. **School of Studies in Ancient Indian History Culture & Tourism & Hotel Management**
2. **School of Studies in Anthropology**
3. **School of Studies in Biotechnology**
4. **School of Studies in Chemistry**
5. **Swami Vivekanand Memorial School of Studies in Comparative Religion , Philosophy and Yoga**
6. **School of Studies in Computer Science & IT**
7. **School of Studies in Economics**
8. **School of Studies in Electronics and Photonics**
9. **School of Studies in Environmental Science**
10. **School of Studies in Geography**
11. **School of Studies in Geology and Water Resource Management**
12. **School of Studies in History**

13. **School of Studies in Law**
14. **School of Studies in Library and Information Science**
15. **School of Studies in Life Science**
16. **School of Studies in Literature and Languages**
17. **Institute of Management**
18. **School of Studies in Mathematics**
19. **University Institute of Pharmacy**
20. **School of Studies in Physical Education**
21. **School of Studies in Physics and Astrophysics**
22. **School of Studies in Psychology**
23. **School of Regional Studies and Research**
24. **School of Studies in Sociology & Social Work**
25. **School of Studies in Statistics**
26. **Institute of Teachers Education**
27. **Centre for Women's Studies**
28. **Renewable Energy Technology & Management**
29. **Center for Basic Sciences (CBS)**

Each of these Schools is headed by highly experienced and competent Director/Deans along with H.O.Ds checking on the right academic progress of each faculty/department in the University.

The University strives for excellence in academics and makes an effort to induce passion for learning along with the inspiration for decisive thinking and assessment, thereby helping them to become the best professionals in their chosen careers.

1.4 Programs offered by the University

The University a wide range of courses for the students to upgrade their educational qualification. The details of each of these courses as per the School are as follows.

- **Post-Doctoral** – It offers the following courses.

1. Doctor of Science Chemistry
2. Doctor of Science/ Doctor of Literature Anthropology
3. Doctor of Literature Sociology
4. Doctor of Literature Linguistics
5. Doctor of Science/ Doctor of Literature Geography
6. Doctor of Literature Psychology
7. Doctor of Literature Economics
8. Doctor of Science Physics
9. Doctor of Literature History
10. Doctor of Science Zoology
11. Doctor of Science Botany
12. Doctor of Science Bioscience
13. Doctor of Science Statistics
14. Doctor of Law
15. Doctor of Literature Philosophy
16. Doctor of Science Geology
17. Doctor of Literature Physical Education
18. Doctor of Literature Library & Information Sciences
19. Doctor of Science Mathematics
20. Doctor of Science Microbiology
21. Doctor of Science Electronics
22. Doctor of Literature Hindi
23. Doctor of Science Computer Science

24. Doctor of Literature Ancient Indian History
25. Doctor of Literature English
26. Doctor of Science Pharmacy
27. Doctor of Literature Management
28. Doctor of Science Biochemistry
29. Doctor of Science Biotechnology

- **Doctoral** – It offers the following courses.
    1. Doctor of Philosophy - Chemistry
    2. Doctor of Philosophy - Anthropology
    3. Doctor of Philosophy - Sociology
    4. Doctor of Philosophy - Linguistics
    5. Doctor of Philosophy - Geography
    6. Doctor of Philosophy - Psychology
    7. Doctor of Philosophy - Economics
    8. Doctor of Philosophy - Physics
    9. Doctor of Philosophy - History
    10. Doctor of Philosophy - Zoology
    11. Doctor of Philosophy - Botany
    12. Doctor of Philosophy - Bioscience
    13. Doctor of Philosophy - Statistics
    14. Doctor of Philosophy - Law
    15. Doctor of Philosophy - Comparative Religion and Philosophy
    16. Doctor of Philosophy - Geology
    17. Doctor of Philosophy - Physical Education
    18. Doctor of Philosophy - Library Science
    19. Doctor of Philosophy - Mathematics
    20. Doctor of Philosophy - Microbiology

21. Doctor of Philosophy - Regional Studies
22. Doctor of Philosophy - Electronics
23. Doctor of Philosophy - Hindi
24. Doctor of Philosophy - Computer Science & IT
25. Doctor of Philosophy - Ancient Indian History, Culture & Archaeology
26. Doctor of Philosophy - English
27. Doctor of Philosophy - Pharmacy
28. Doctor of Philosophy - Management
29. Doctor of Philosophy - Biochemistry
30. Doctor of Philosophy - Biotechnology
31. Doctor of Philosophy Environmental Science

- **Post Graduate -** It offers the following courses

1. Master of Science - Chemistry
2. Master of Arts - Sociology
3. Master of Arts - Psychology
4. Master of Arts - Linguistics
5. Master of Arts/Master of Science - Geography
6. Master of Arts/ Master of Science - Anthropology
7. Master of Arts - History
8. Master of Arts – Economics
9. Master of Science – Physics
10. Master of Arts/Master of Science - Statistics
11. Master of Science - Bioscience
12. Master of Law - Constitutional and Administrative Law, Crime and Torts
13. Master of Science - Geology
14. Master of Library Science - Library and Information Science
15. Master of Science/Master of Arts - Mathematics

16. Master of Science - Microbiology
17. Master of Physical Education
18. Master of Business Administration
19. Master of Arts - English
20. Master of Science - Electronics
21. Master of Arts - Hindi
22. Master of Computer Applications
23. Master of Arts - Ancient Indian History, Culture & Archaeology
24. Master of Science - Information Technology
25. Master of Science - Biochemistry
26. Master of Science - Biotechnology
27. Master of Education
28. Master of Science - Pharmacy Pharmaceutics
29. Master of Arts - Applied Philosophy & Yoga
30. Master of Technology - Optoelectronics & Laser Technology
31. Master of Social Work
32. Master of Science - Environmental Science
33. Master of Arts - Rural Development Master of Arts - Chhattisgarhi
34. Master of Science Integrated [Physics/ Mathematics/ Chemistry/Biology]

- **Under Graduate** – It offers the following courses.

1. Bachelor of Library Science Library and Information Science
2. Bachelor of Physical Education
3. Bachelor of Pharmacy
4. Bachelor of Arts - Bachelor of Legislative Law
5. Bachelor of Education
6. Bachelor of Vocation in Renewable Energy Technology and

Management

- **Post-Graduation diploma** – It offers the following courses.
    1. P.G. Diploma in Guidance and Counselling
    2. P.G. Diploma in Yoga Education & Philosophy
    3. P.G. Diploma in Tourism & Hotel Management
    4. P.G. Diploma in Regional Planning & Development
    5. P.G. Diploma in Forensic Science
    6. P.G. Diploma in Rehabilitation Psychology
    7. P.G. Diploma in Applied Hydrogeology
    8. P.G. Diploma in Remote Sensing & GIS
- **Diploma Programs -** It offers the following courses
    1. Diploma in European and Asian Languages English
    2. Diploma in European and Asian Languages French
    3. Diploma in National Language Sindhi

1.5 Assessment of the University

1.5.1 Establishment

Pt. Ravishankar Shukla University, has been established as a State University at Raipur, vide Chhattisgarh Act of 1973.

1.5.2 Recognition

The University is recognised by **University Grant Commission (UGC)** under section 2 (f) and 12 (b) of the UGC Act, 1956 vide by University Grants Commission, New Delhi.

1.5.3 Accreditation

NAAC - The following are details of the reaccreditation of the University.

Cycle	First	Second	Third
CGPA	75.1	2.62	3.02
Grade	B+	B	A
Year	2003	2011	2016

Table 1: NAAC Accreditation details of the Institute

The University is due to enter its Fourth cycle of NAAC soon.

1.5.4 Approval

The University has received the following significant approvals for the various courses.

S. No.	Course	Approval
1	B. Pharm and M. Pharm	**Pharmacy Council of India (P.C.I)** A statutory body of government of India constituted under the Pharmacy Act, 1948, responsible for regulation of pharmacy education and practice of profession in the country for registration as a pharmacist.
2	BA LLB (Five Years)	**Bar Council of India (B.C.I)** A statutory body established under the section 4 of Advocates Act 1961

		that regulates the legal practice and legal education in India.
3	Teacher courses (B. Ed)	**National Council for Teacher Education (N.C.T.E)** A statutory body in pursuance of the National Council for Teacher Education Act, 1993
4	Diploma in rehabilitation psychology	**Rehabilitation Council of India (RCI)** The apex government body, set up under an Act of Parliament, to regulate training programmes and courses targeted at disabled, disadvantaged, and special education requirement communities.
5	Technical courses	**All India Council for Technical Education (AICTE)** A national-level Apex Advisory Body to conduct a survey on the facilities available for technical education and to promote development in the country in a coordinated and integrated manner.

Table 2: Details of the various Approvals of the Institute

1.5.5 Certification

The institute has received the following Certifications

- **The National Institutional Ranking Framework (NIRF)** - Ranked between 150 and 200 in the latest rankings.
- **All India Survey of Higher Education (AISHE)** – As per latest documents the reference number is U-0093-2019 for 2019-20

1.6 Affiliated colleges

The PRSU is one of the premier centers of higher education & learning in Chhattisgarh, India. It caters to the needs of the youths of Chhattisgarh and adjoining States, namely Madhya Pradesh, Maharashtra, Odisha, Jharkhand, Andhra Pradesh, as well as from West Bengal and Andaman & Nicobar Islands in the realm of higher education and research.

Chhattisgarh was carved out of Madhya Pradesh on the 1st November, 2000 as a new political entity. Pt. Ravishankar Shukla University, being the oldest university, is leaving no stone unturned to cater to the needs of the society. **The university has grown enormously over the last 57 years** in terms of number of students or disciplines, viz., humanities, natural science, law, education, pharmacy, management, physical education, library science and computer science & IT etc.

In 29 Schools of Studies (SoS) and 149 affiliated colleges spread over five districts of the Chhattisgarh State.

2. Institution overview

2.1 Populace analysis for Academic year 2019-20

2.1.1 Students data

The student data (shared by the University) shows there were a total of **16,500 Boys and 10,092 Girls** students thus **a total of 26,592 students** in the premises.

2.1.2 Staff data

Type	Total
Admin Staff	**4**
Teaching Staff	**120**
Non-Teaching Staff	**302**
Total Staff Members	**426**

Table 3: Staff data of the Institution for 2019-20

The staff data shows the premises had a total of **426** Staff Members.

2.2 Populace analysis for Academic year 2020-21

2.2.1 Students data

The student data (shared by the University) shows there were a total of **17,113 Boys and 11,091 Girls** students thus **a total of 28,204 students** in the premises.

2.2.2 Staff data

Type	Total
Admin Staff	**4**
Teaching Staff	**115**
Non-Teaching Staff	**288**
Total Staff Members	**407**

Table 4: Staff data of the Institution for 2020-21

The staff data shows the premises had a total of **407** Staff Members.

2.3 Total University Area & Building Spread Area

The **total site area is 300.17 Acres** and the **total Built-up area of University is 2,87,751 sq. ft.** for **a total of 28,611 footfalls.**

2.4 University Infrastructure

The Buildings are made of Reinforced Cement Concrete (RCC) framework. These are equipped with modern amenities. It facilitates the students with a good environment for studies and stays true to its aim of providing Holistic development. The Residential and Academic buildings amalgamate smoothly with the open space in order to stand out as one of the most premier Institutes in the country.

Overall the Infrastructure of the Building is excellent in terms of the Architecture Design and Green Building Design. The Premises covers most of the requirements for a Green Habitat. It continues to upgrade itself in terms of the facilities and makes sure that there is no compromise on the quality of services towards Building requirements. The cooperative teamwork and the leadership of the Hon'ble dignitaries are one of the main reasons for achieving success in providing quality education with an advanced and up-to date premises.

2.4.1 Spatial Organisation

2.4.1.1 Architectural Design

The overall ambience of the University is warm and inviting. The courtyards, educational spaces, learning spaces, residential spaces and recreational spaces have ample natural ventilation in the form of clear glass windows with fresh air ventilation. The architecture of the buildings are quite well designed. The colour palette not just helps the buildings to stand out as per respective typology of the Building be it Educational or Residential but also provides an Institutional arena. There are provisions for lifts, CCTV, Fire extinguishers, first aid box and much more.

2.4.1.2 Landscape design

The built-form balances with the local architecture and amalgamates very well with the natural landscapes in form of open ground, designed landscape spaces, streetscape

elements such grounds, designed gardens, greenhouse, botanical gardens and huge trees all around. There are provisions for ramps, open ground, courtyards, designated landscape areas, signages, Utility Boxes, Parking, Sidewalk Furniture and Utility Poles.

2.4.2 Building and Block wise details

The Building & Block wise details on the Pt. Ravishankar Shukla University premises are mentioned below:

S. No.	Branch name	Floor
1	Admin Building	G+2
2	Arts Building	G+3
3	Library Building	G+3
4	Electronic Building.	G+1
5	Science Block	G+1
6	B.ED Building	G+1
7	USIC	G
8	M.B.A. Building	G+1
9	New NCNR Building	G+1
10	HRDC Building	G+1
11	Computer Science Building	G+1
12	Biotechnology Building	G+1
13	Physical Education	G+1
14	Student Recreation	G
15	Pharmacy Building	G+1
16	Law Building	G+1
17	Maths/ Statistics Building	G+1
18	Geology Building	G+1
19	Bio Science Building	G+1
20	Regional study/ IQAC	G+1

21	CBS Building	G+2
22	Auditorium Building	G+1
23	Guest House Building	G+1
24	Teacher Hostel Building	G+1
25	Geography Building	G+1
26	Anthropology Building	G+1
27	Physics Dom Building	G+1
28	Health Center	G
29	Utility Center	G+1
30	old NCNR Building	G
31	Press Building	G+1
32	Community hall	G+1
33	Gym Building	G+1
34	Power gird Hostel	G+2
35	Gandhi Hostel	G+1
36	Azad Hostel	G+1
37	Boys Research Hostel	G
38	Navin Kanya Hostel	G+1
39	Professional Girls Hostel	G+1
40	Research Girls Hostel	G+1
41	PG Girls Hostel	G+1

Table 5: Block and department wise details of the University premises

2.4.3 Salient features

The University had the best State of the art Infrastructure in the Country. Some of the best features available are as follows:

1. *ERP System for monitoring administration /academics*
2. *Wi-Fi enabled premises*

3. *Modern infrastructure with well-equipped laboratories*
4. *Guest Lectures by Eminent Scholars*
5. *Ragging free environment*
6. *Hostels for Girls and Boys*
7. *24 x 7 Power and RO water supply*
8. *State of art Library*
9. *Canteen Facility*
10. *Medical Facility (Health Centre)*
11. *Auditorium with all ultra-modern facilities.*
12. *Multipurpose Hall*
13. *Landscaped Gardens*
14. *On premises Residential Facilities for faculties and employees.*
15. *Community development programs*
16. *Arrangement for physically Challenged persons/students.*

The University endeavours at training young women to be competent, committed and compassionate and lead in all walks of life.

2.4.5 Operation and Maintenance of the premises

The interview session with the staff regarding the operation and working hours is summarized in the table. The Institutions are open Monday to Friday for full day. Saturday, Sunday is an off for all. Below mentioned in the table are the average working hours. The detail wise timing for each is mentioned below the table.

S. No.	Section	Spaces	Time	Hours / day	Days in a year
1	Main Institutional University	Student areas and Teaching faculty	10:00 a.m. to 5:30 p.m.	7.5	280
2	General areas	Admin areas and library, Passage, staircase, toilet	09:30 a.m. to 5:30 p.m.	8	300

Table 6: Schedule of the timings of the premises


पं.रविशंकर शुक्ल प्रेक्षागृह


भूगोल अध्ययन शाला


आजाद हास्टल
AZAD HOSTEL


INDIAN
HOUSE

3. Green Building Audit Study

3.1 About the Green Building Study Audit

It is a systematic study of the aspects which make the Institution a sustainable and healthy premises for its inhabitants.

3.2 Analysis for the Green Building Study Audit

The procedure included detailed verification for the following:

Energy Audit

- Analysis of the Lights, Fans, AC, Equipment
- Renewable energy
- Scope for reducing the current energy bills if any
- Improvement in the thermal comfort of the premises

Green Audit

- Green initiatives
- Hygiene audit
- Water Audit - Analysis of the current water consumption of premises; Scope to include Rain water harvesting and Waste water treatment in premises
- Waste Audit - Current waste produced, its segregation and usage; Strategies to be adopted for waste management and awareness

Environmental Audit

- Analysis of the current landscape + hardscape of premises
- Analysis of the flora and fauna of campus
- Strategies adopted at present to enhance vegetation
- Measures that can be adopted for ecological improvement of the premises.

3.3 Strategy adopted for Green Building Study Audit

The strategies included data collection from admin department, actual inventory, investigation to check the operation and maintenance, analysis of the data collected and preparation of the Report.

3.4 Timeline of the activities for Green Building Study Audit

- 01 January 2022 – Discussion with the University
- 13 January 2022 – Allotment and Initiation by the University
- 12 February 2022 – Survey of the Student and staff submitted
- 24 February 2022 – Discussion for review of data collection
- 08 March 2022 – Site visit
- 10-21 March 2022 – Data submitted by University
- 23 March 2022 – Submission of the Report

Meeting with Vice Chancellor Sir during the Audit visit

Discussion meeting with Prof. Girish Kant Pandey Sir, Registrar

Induction meeting with Mr. Kuldeep Bhupendra, Incharge Engineering section

On-site External Team with the University representatives

4. Site Study

4.1 On-site observations study

The following listed are some of the positive site elements which are beneficial to the University in terms of tangible and intangible benefits.

- **Location -** The Pt. Ravishankar Shukla University is located at Amanaka G.E.Road, Raipur - 492010 and falls under *the Raipur Municipal Corporation (Raipur Nagar Nigam) in the capital city of Chhattisgarh state in central India.*
- **Neighbourhood context -** The premises is surrounding by open spaces and Residential, Educational, Recreational spaces on the immediate surroundings of the site, there are educational institutes and the site is adjacent to the Great eastern road, it is situated in the Raipur city which is famous for *vibrant steel plants, over 200 steel mills and a slew of coal and aluminium industries.*
- **Natural physical features –** The premises includes a rich biodiversity and huge number of plants in the open space. The site does not have major different in the land levels (contours). The rainwater is diverted through pipes into ground and it has helped ground water recharge for the well water over the years and treated waste water is used as a source of organic fertilizer in the premises.
- **Manmade features –** The premises is situated in an urban area amidst residential areas and open spaces with appropriate proximity to necessary amenities. There is sufficient appreciation space for entrance. The materials used for construction are RCC and the landscaping includes in potted plants.
- **Circulation –** There is a smooth transition of pedestrian traffic inside the premises due to the large entrance gate and the huge open space where vehicles of students and staff is parked.
- **Climate –** The average wind speed in Raipur is 2.6 m/s with the maximum wind speed of around 8 m/s. The average ambient temperature remains 26.4°C, varies from 9.5°C to 42.4°C. The average reletive humidity remains around 62%, varies from 16.8% to 99.9%. The station pressure varies from 972 hPa to 959 hPa, averaged around 985 hPa. Windrose of Raipur shows that predominantly wind blow from the WSW - about 15.65% of all wind directions.

(Source: https://www.indianclimate.com/show-data.php?request=FDCRNM6Z6Y)

4.2 Survey results

An online survey was conducted to analyse the student and staff views about the premises, following are some of the reviews. (Note - Responses have been rounded off keeping in the population study)

4.2.1 Participation

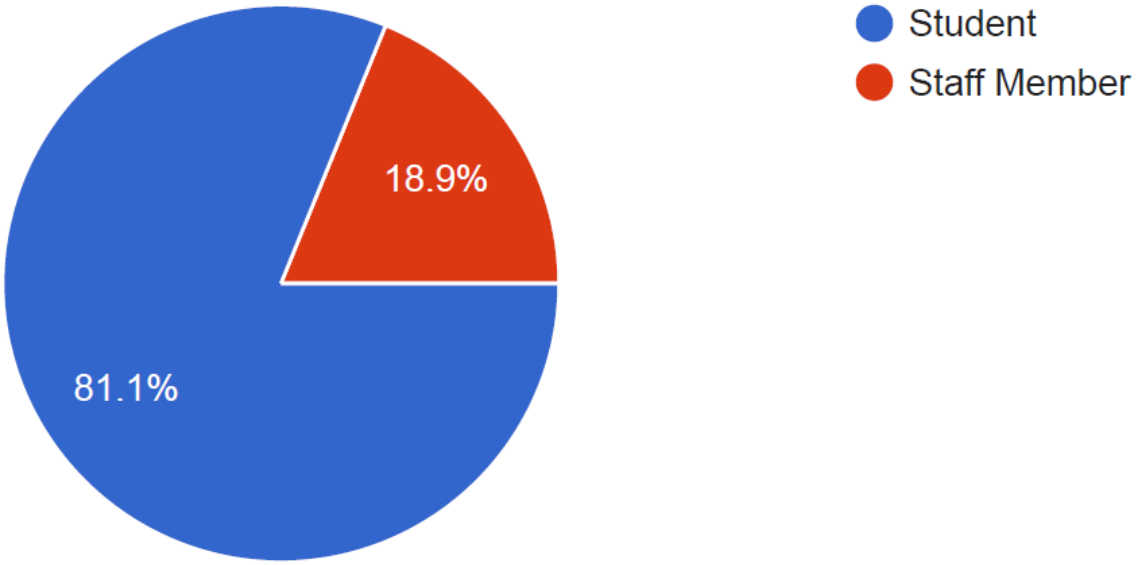


Figure 1: Participation analysis in the survey

A total of **122 responses** were received out of which 81% were students.

4.2.2 Schools (Dept./ Faculty)

The Students and staff from almost all the schools and departments had participated in the survey.

The enthusiastic participation and the coordination of the University towards encouraging the students to participate in the same are quite commendable.

4.2.3 Is there any Dust pollution in the premises?

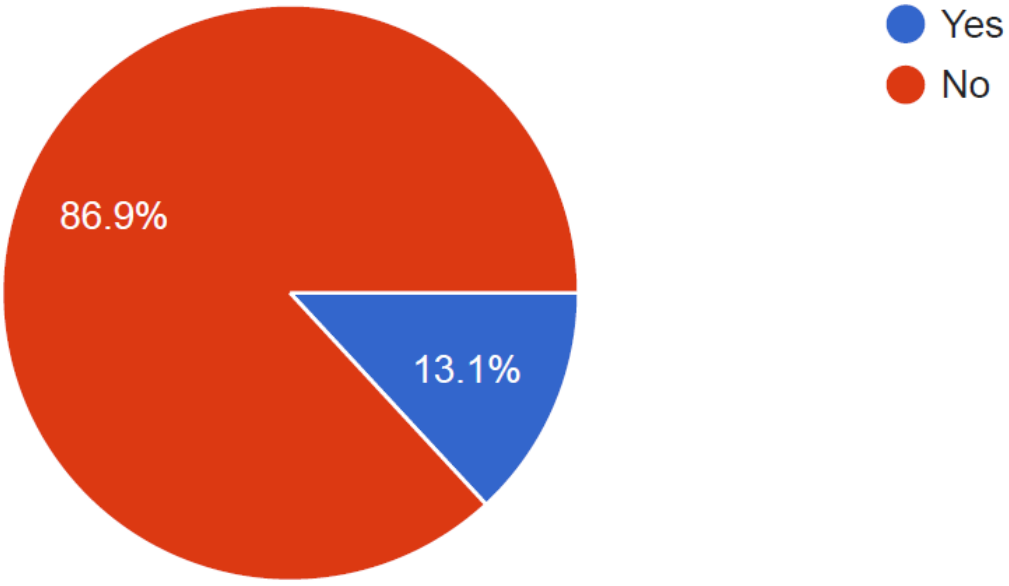


Figure 2: Participation analysis in the survey

The students, staff **(almost 87%)** of responses confirmed that there is no dust pollution. **This justifies the fresh environment in the premises.**

4.2.4 Is there any Air pollution in the premises?

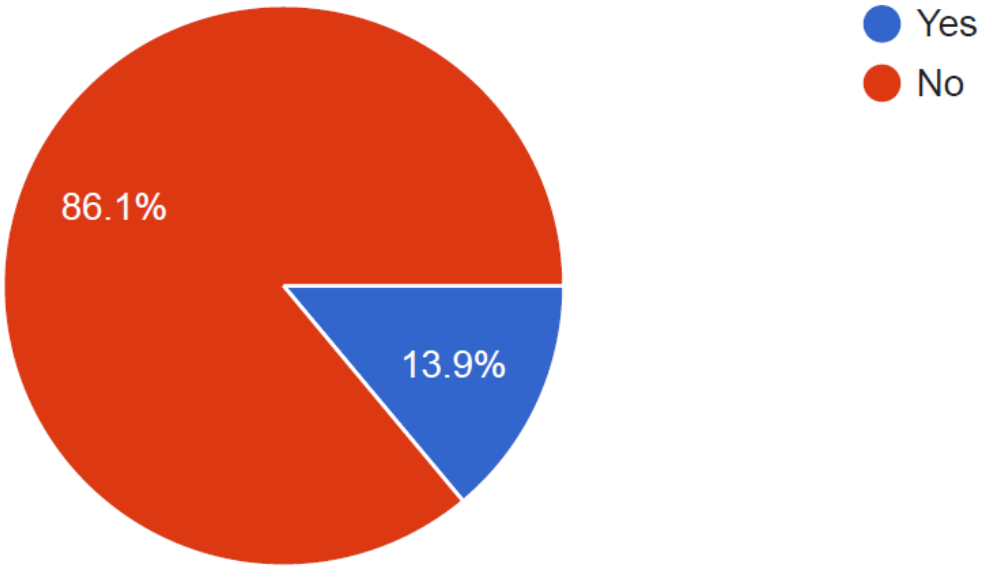


Figure 3: Participation analysis in the survey

The students, staff **(almost 87%)** of responses confirmed that there is no air pollution. **This justifies the appropriate measure adopted by the engineering and planning department to ensure movability of vehicles within the premises to ensure fresh environment.**

4.3 Survey ratings

Note about the review-rating survey

The Participants were asked to review (Though an online mode) the practice on a scale of 1-5 with scale components as follows:

- Scale 1 – Poor
- Scale 2 – Satisfactory
- Scale 3 – Good
- Scale 4 – Very good
- Scale 5 – Excellent

The figures in each of the columns of graph depict the Number of participants responses in numerical (Percentage of the participant response) – For example 101 responses (44.5%)

4.3.1 Rate - Location of the Institute premises with respect to surrounding context

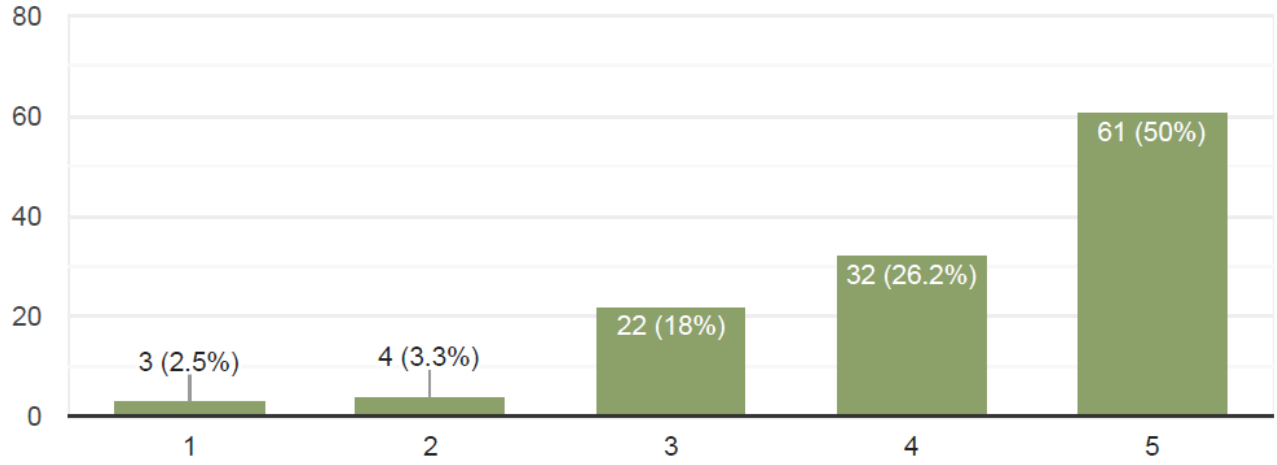


Figure 4: Participation analysis in the survey

There were mixed responses received the equal also the highest was for **rating 5 (Excellent) at 50% and rating 4 (Very good) at 26%**

This study positively highlights the Sustainable Site Planning strategies adopted by the Institute.

4.3.2 Rate - Circulation of students and staff within the Institute premises with respect to mobility (Travel)

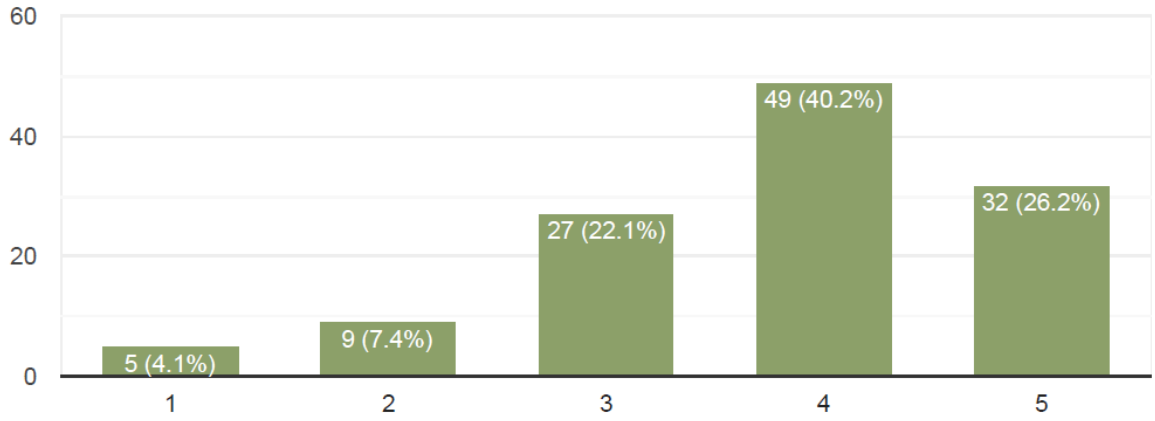


Figure 5: Participation analysis in the survey

There were mixed responses received the equal also the highest was for **rating 4 (Very Good) at 40% and rating 5 (Excellent) at 26%**

Though the Sustainable Site Planning strategies have been adopted by the Institute, during the interview session with the Mr. Kuldeep Bhupendra, Incharge - Engineering Section we understood the progressive steps adopted by the University towards reworking the master plan in order to incorporate the subsequent internal traffic management to ensure smooth circulation and control in mobility traffic for user benefit.

4.4 Survey review

Some of the key responses are noted below as a result of Online survey.

What is the best environmental feature you find about the Institute site?

- That all the department students gathers at their own department to celebrate plant and tree plantation day.
- **It is a green belt full of trees, shrubs and herbs with lot of bird variety. It has a natural forest in some area.**
- There's no air and noise pollution. Peaceful environment
- **Still un-used place contains lots of old plants make us feel like this university is situated in mid of forest.**

4.4 Sampling results

The external audit team had done physical verification of the data shared by the Team. An on-site investigation of the various parameters related to the site using scientific instruments was carried out at various times of the day. Some detail sampling was undertaken at key locations in the premises. The results of these are summarised below:

S. No.	Location	Zone	Indoor Temp.	Comfort	Noise (db.) Min	Noise (db.) Max
1.	Admin block	Administrative	28.6	47%	46.3	70.6
2.	B. Ed block	Administrative	31.2	31%	37.1	75.0
3.	CBS Block	Educational	32.5	32%	70.9	52.6
4.	Biotechnology block	Educational	32.5	32%	36.2	56.9
5.	Pharmacy block	Educational	33.2	30%	7.7	72.5
6.	Power grid hostel	Residential	32.5	27%	44.8	75.0
7.	Gandhi hostel	Residential	31.5	32%	45.3	39.0

Table 7: Details of the sampling using Scientific Instruments at Pt. Ravishankar Shukla University, Raipur

As per our study and observations we found the sampling results to be positive.

Ecological (Environment) Audit

Background reference image Yugal Shrivastava on pexels

Greenvio Solutions

5. Ecological (Environmental) Audit

Environment is an essential part for human survival. We co-exist with the environment and it cannot be termed as a separate entity. The Ecological audit helps to understand the flora, fauna that exists and steps that can be taken to improve the same. To denote if there are problems related to sound in and around the surrounding. In terms of the carbon footprint it helps in keeping a tab on the eco-friendly habits incorporated by the inhabitants of the premises. Health today is the topmost priority, a general understanding of the initiatives undertaken along with sufficient hygiene practices adopted. Universal design is applicable to all built and unbuilt spaces.

As part of our study we could state that the University has developed eco-friendly practices and sustainable solutions which are well reflected in the rich biodiversity of the Premises. Being situated near the city the appreciation space towards the main entrance provides a welcoming approach to the University.

The University has huge open space used by all. The students use it for as a leisure place for study and University ground is used for sports activities. There are ample resting spaces as part of building design which provide a resting and warm welcoming approach in the premises.

5.1 Open Spaces

There is a beautiful balance of natural and open spaces in the premises and the open/ vegetation spaces are balanced overall. The Ground is used by students at present for sports as it has outdoor sports facility in the premises. **There are provisions for natural plantations which have enhanced the beauty of the space.**

There are sufficient numbers of Maintenance staff allotted for the open spaces and they have done an excellence job in terms of the duty allotted. The infrastructure committee too is involved in this process. The traditional tap and pipe facility is adopted for watering and the University has taken special provisions for the same. The spaces are watered daily in summer. T**he efforts to maintain the existing space are commendable.**

5.2 Flora and Fauna Audit

Note about the review-rating survey

The Participants were asked to review (Though an online mode) the practice on a scale of 1-5 with scale components as follows:

- Scale 1 – Poor
- Scale 2 – Satisfactory
- Scale 3 – Good
- Scale 4 – Very good
- Scale 5 – Excellent

The figures in each of the columns of graph depict the Number of participants responses in numerical (Percentage of the participant response) – For example 101 responses (44.5%)

5.2.1 Survey Ratings

An online survey was conducted to analyse the student and staff views about **Rate - The existing flora and fauna and efforts taken by the Institute towards it preservation?**

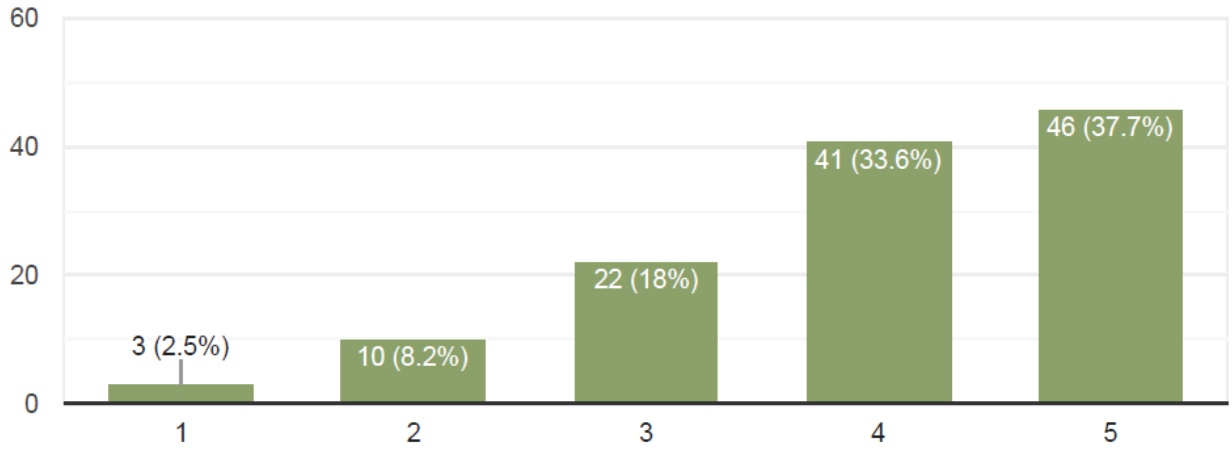


Figure 6: Participation analysis in the survey

There highest response was for **rating 5 (Excellent) at 38%; rating 4 (Very good) at 34%** and **18% for rating 3 (Good).**

The on-site visit was held on Tuesday, 8 March 2022. During this visit a physical verification was undertaken by the Team, we found out the

University along with the Engineering section and State Horticulture department has implemented excellent architecturally designed landscape gardens. These include multiple types of botanical and flower gardens and have thus upgraded the local ecological footprint to a great extent in a positive manner.

5.2.2 Flora Audit

A flora survey was carried out to identify the plantations. The premises have huge open areas. The University officials undertake various plantation and beautification projects to enhance the landscape. **There are more than 10,000+ plantations in the premises.** There are provisions for landscaped gardens, floral gardens, botanical gardens in the premises. These have been meticulously planned with native species of plantations and have been well maintained on a regular basis. All of these species are either planted by students and staffs on multiple occasions or have grown naturally.

5.2.3 Fauna Audit

It is a beautiful site to have the birds chirping around the University premises. It highlights the ecological co-existence concept in the most beautiful way. The University being located in the East-central part of the country has multiple varieties of fauna which enhance the ecological footprint of the premises in a positive manner.

5.2.4 Survey reviews

Some of the key responses are noted below as a result of Online survey.

5.2.4.1 Name some of the Flora (Plants) and Fauna (Birds) you have observed in the premises

- Sparrows and Mango tree
- Sahib, sal, flowering plants, Gauraiya,Myna
- Azadirecta Indica, Catharanthus Roseus, Embelica Officinalis, Mangifera Indica, Acacia, Aegle Marmelos, Mimosa Pudica, Ocimum Sanctum
- Neem, Peepal, Mango, Bargad, Sal, Teak, Crow, Sparrow, Eagle, Maina, Parrot

- Rose, Marigold, Parrots, Nightingale
- Shorea Robusta, Bengalensis Indica, Neem, Bee eater, crow,
- Neem, Ashok, Gulmohar, Parrot, Neelkanth
- Guava, Neem, Karanj, Aam, Bel, Mayna, Koyal,
- Flora: Neem, Arjuna, Karanj, Mango, Khamar, Seesham; Fauna: Sparrow, Crow, Kingfisher, Sparrow Hawk, Crane
- Guava, banana, neem, tulsi and small woodpeckers, parrots etc.
- Cestrum nocturnum (Night blooming Jasmine) and House sparrow
- Shorea robusta, Tictona grandis, Ruffled tightarse (Birds)
- Tulsi Aloevera tomatao, Sparrows
- **Neem and we have some medicinal herbs in our department.**
- Banana tree, Banyan tree,Mango, guava tree, papaya plant, aleovera
- **A rich collection of biodiversity exists ranging from forest trees to medicinal plants. Presence of tall sal, Arjuna,teak trees ,wild brown rabbits large variety of snakes and water body with egrets within the premises.**

5.2.4.2 Name some of the trees you would like to plant in the premises in future.

- Medicinal plants
- Fruit bearing trees mango, guava, Chikoo.
- Neem, Mango, Banyan, Pipal
- Mango, Palm and maybe some small shrubs.
- Palm trees, Almond trees and Kadam's tree .
- Fruit and flower plants
- Teak, Gulmohar

5.3 Noise Audit

5.3.1 Macro level

On a macro level there are open grounds in the site. The approach road too has very minimal traffic. As the University is oriented amidst the residential areas with immense vegetation the noise levels do not affect the students and staff in their day to day functioning. The approach road too is pretty away. **Overall the noise level in terms of bad effect is low and there are positive outcomes as per our analysis on macro level.**

5.3.2 Micro level

The University has an adequate open space covered with huge trees prevailing naturally in the premises. There are bare minimum parking provisions provided in the premises which causes bare minimum noise as they are situated near the entrance which is a bit away. The University has Substation facility but there is no inconvenience or sound problem caused due to the same. There are no particular equipments which cause any noise effect. **Overall the noise levels inside the premises are low which is a good approach.**

5.3.3 Survey Result

An online survey was conducted to analyse the student and staff views about **any Noise pollution in the premises?**

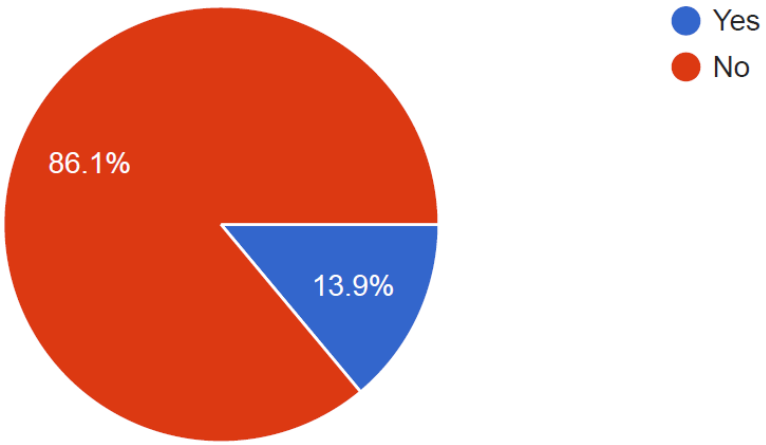


Figure 7: Participation analysis in the survey

The students, staff **(almost 86%)** of responses confirmed that there is no Noise pollution. **During the visit, samplings were undertaken, the noise levels were found to be very low thus making it suitable for educational premises.**

5.4 Carbon Footprint Audit

5.4.1 Eco-friendly Commuting Practices

Based on data collection and discussion with staff the following points were noted:

- **Ease of commuting –** Owing to close proximity to public transport the access is very feasible and walk able.
- **Area** – Sufficient area is designated for overall parking including the ones for 250+ residences in the premises.
- **Vehicles details** – The provision provided by University for Educational facilities includes Parking facilities for 200+ cars, 200+ cycles, 800+ bikes, 3 electric vehicles. In the residential areas there are additional provisions for parking.
- **Visitors vehicle** – There are adequate number of visitors parking for 100 cars in the premises.
- **Commute details** – The students and staff commute from quite a lot of places. However, the premise has a Hostel facility for around 600+ students thus the external commute is comprehensively low. The internal roads and wide enough.

Being situated in Raipur (Urban) City area the load-frequency on travelling by private vehicles by students and staff is however very less thus there is less or negligible air pollution caused within and around the premises.

5.4.2 Heat Island Reduction

The University has **adopted the following practices which are yielding positive results** in terms of Urban Heat Island Effect which refers to increase in temperature of the surrounding because of ineffective strategies.

5.4.1 Exposed roof areas

The terrace is flat roof covered with solar panels. The current practices are clean and well maintained.

5.4.2 Exposed non-roof hardscape areas

The following were the main observations:

- There are 6-8 feet wide pathways on all sides of the premises. These include some natural and potted plantations. There are huge numbers of trees planted on both sides of the roads. These provide immense shade to the sun-exposed

roads. Moreover sitting areas are provided at multiple locations in the premise.

- The University has multiple types of open spaces in the form of lush green carpet; gardens available. The overall temperature in these areas is cool.

There are adequate measures adopted in the premises to reduce heat island effect of Building roofs and in site.

5.4.3 Outdoor Light Pollution Study

5.4.3.1 Investigation observation

The University compound lights are not upward looking thus, these do not cause light pollution. The flood lights are facing towards specific boards but not causing and environmental degradation.

5.4.3.2 Survey results

An online survey was conducted to analyse the student and staff views about **Is there any Light pollution in the premises?**

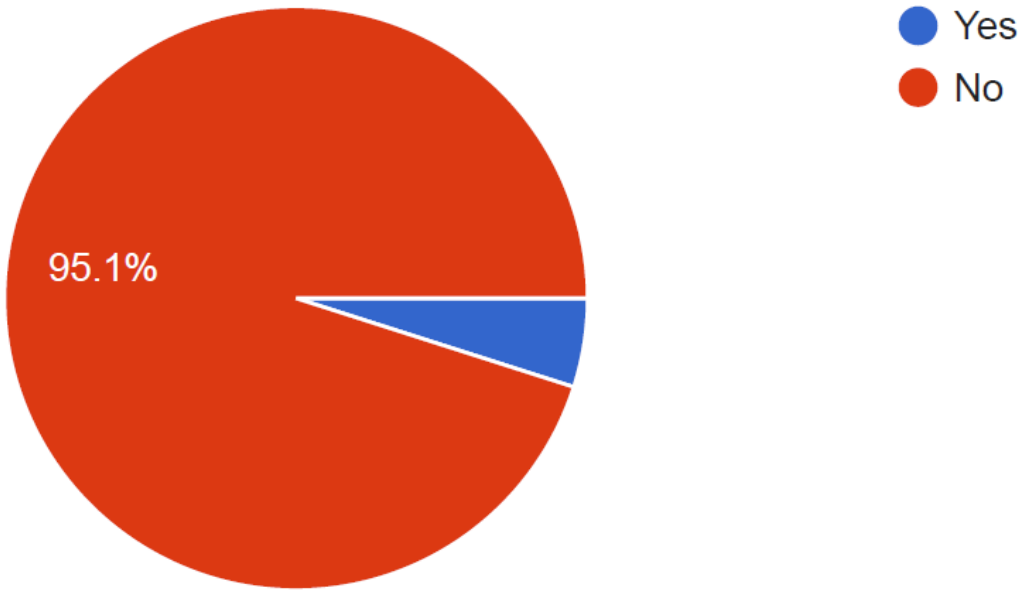


Figure 8: Participation analysis in the survey

The students, staff **(almost 95%)** of responses confirmed that there is no light pollution. **This states the necessary practices adopted by the University towards Energy Optimization.**

5.5 Universally accessible premises

5.5.1 On-site observations

As per World Report on Disability, 2011 there are 180 million approx. Persons with Disabilities that makes it 15% of total population of India.

There are Handrails along staircase, ramps, lifts, Universal toilets, low height risers in the Staircases as part of universally accessible premises initiatives. The design of the premises is appropriate for access with passages and corridors being wide enough in size and naturally ventilated. The doubly and singly loaded corridors are safe from fire safety aspect. The University has resting places (seating areas) in the outdoor along the trees thereby making it user friendly for the specially abled students.

5.5.1.1 Features for user benefit

The below mentioned are details of the Universal Design and Additional features for user benefit in the premise.

- Ramp
- Staircase
- Wheelchair
- Sanitary vending machine
- Lift

The existing facilities are very well maintained was the on-site observation and at present there is not much requirement to increase these numbers. However, post the site visit and interaction with the University officials during Induction and exit meeting we would suggest the University to have provisions for 100% lifts, wheelchairs and sanitary vending as well as incinerator machines in all the buildings.

5.5.2 Survey results

An online survey was conducted to analyse the student and staff views about **Do you find the facilities for the Physically challenged people sufficient in the premises?**

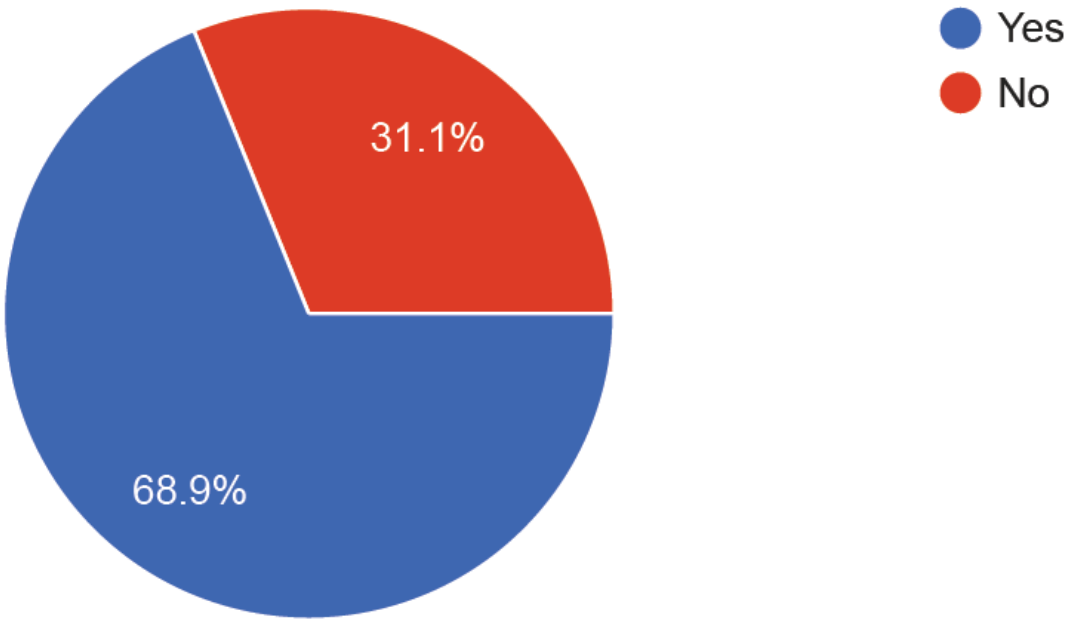


Figure 9: Participation analysis in the survey

The students, staff **(almost 65%)** of responses confirmed activities conducted are sufficient. **However, our analysis states that there is scope for improvement.**

5.6 Fire Safety

The University has taken care for adequate fire safety measures to be adopted. Each floor has an open staircase without any barriers for fire safety measures & is free of any kind of storage or combustible material. The University has adopted additional fire safety practices such as signages, Fire hydrant cabinets. The current facilities are quite well maintained.

At present as per Fire norms there are equal number of extinguishers present in all the buildings. However, there can be additional provisions of sand buckets and increased number of extinguishers. Also, there should be at least 1 fire extinguisher in every space which has an air conditioner.

5.7 Survey review for the Site features study

Some of the key responses are noted below as a result of an online survey is summarised as follows:

What can be additional features you would want in terms of Institute premises in terms of accessibility, open spaces, site features and neighbourhood?

- Add more landscape elements, flower gardens/beds and establish more theme gardens
- Internship programme for students, helpdesk or student zone, special classes and programme for physical challenged for students and more equipment for students.
- There should be No Motor Vehicle Zone and electric cycle should be available to move with university. The whole tree side area should be planted with grass instead of wild grass.
- There should be transportation facilities inside the premises for students. WiFi in Teachers Colony.
- Play ground is required; beautification of the university premise is required. Proper lighting to ensure safe premises. Good canteen accessible only to university staff and students. Bookstore and essential commodities must be within premises. A safe and dignified neighbourhood. The university entrance must have a police post

5.8 Positive site features as per our study

a) Cool rooftops

The University has the Terrace roofs painted with white cover it helps reduce the temperature of the spaces.

b) User friendly movability in premises

There are provisions of Kerb Ramp in the Building premises, also low height hand rail for ease of access in all the buildings of the premises.

c) Avoid using plastic in premises

There are provisions for ban on the use of plastic bags or products in the Premises for office purpose as well eco-friendly materials area used.

d) OPAC system

The system in the library is beneficial for the students.

e) Cleanliness and regular maintenance

There are ample provisions to maintain the site, cleanliness of the premises, regular maintenance and infrastructure up gradation.

f) Vehicle usage

There are restrictions on the speed limit of vehicles in the premises limited to 10 km per hour in addition to facilities for not horning on the premises.

g) Community gardening.

There are provisions for community gardening in addition to allowing the general public to use the parks in the premises for walk and jogging.

h) Paperless technologies and digitalisation

The University has adopted technology friendly practices and has been observing paperless measures in the functioning to a certain extent.

5.9 Recommendations for a Sustainable Habitat by Greenvio Solutions

Site beautification

a) Low VOC Paints and Adhesives

Whenever the University undergoes repairs or renovations there should be use of materials with low emissions so as to reduce the adverse health impacts on workmen and the students occupying the space thereafter.

b) Additional facilities for birds

There can be provision for drinking water and food facility in multiple locations for birds visiting in the University premise.

c) Nutrition pits

Certain pits can be demarcated as 'Nutrition pits' where the organic food from kitchen and Canteen fruit peels and fruits or vegetables can be degraded for making nutrition rich soil

Heat island reduction

a) Grass pavers in the setback areas

The college can have grass pavers for in replacement to existing paving for further heat island reduction on exposed non-roof areas

Universally accessible premises

a) Universal Toilet

There should be minimum 1 toilet for the specially abled people as per guidelines prescribed by National Building Code 2016 in every building.

b) Provision of wheelchair

There should be provision of wheelchair in every building for specially abled, senior citizens it is very beneficial facility.

Pollution Control

Although the pollution is extremely less and equivalent to nil however, the following can be additional provisions which can be undertaken.

a) Bicycles as a gift

As an appreciation gesture may be the students toppers/ staff best performers can be awarded with a bicycle occasionally.

b) Electric charging points

The University can introduce electric vehicles and have provision for charging points in future.

c) Pollution Meter

There can be a provision of Pollution Meter to check the Air Quality Index in the premises, the results of which can be sent to Government, this can be installed after permission from the local Government.

a) Avoid burning of waste

The waste produced in premises (Hostel areas as observed during the visit) should not be burned as it is dangerous towards health of students and staff

Smart and responsible environment systems

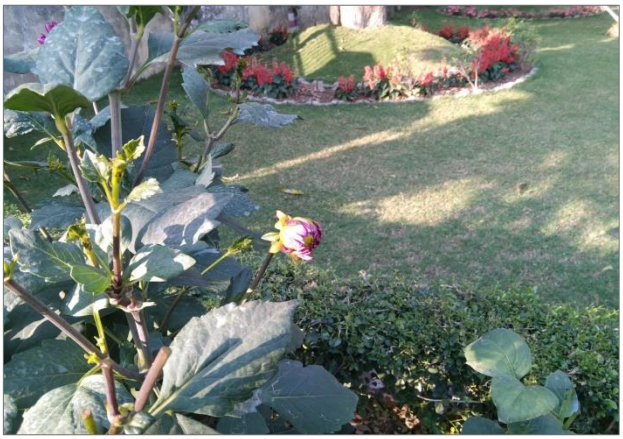
a) Smart Gardening System

The College can undertake Smart Gardening system using IoT Technology such as an automated watering system. This will result in saving time by scheduling time for watering; Saving money and water as smart irrigation systems have automated water schedules in addition to tracking dampness of soil which helps the irrigation system know when and how much the garden needs. It also helps in healthier plants as with the help of apps, smart irrigation systems, or even smart growing containers, these tasks can be provided evenly and allow the plants to be healthier and more productive. More information on this system can be checked here https://www.happysprout.com/inspiration/what-is-smart-gardening/

Additional Facilities

As the premises is a mixed use Institution (Residential + Educational use), the following facilities can be adopted for user benefit

- Route maps for all places in the premises.
- Land can be properly utilized to grow different flowering plants.
- Walking tracks (Beautification projects can be taken up)
- Post Office
- Small fountains



6. Towards a Healthy & Sustainable Institution

6.1 Inputs by Greenvio Solutions

Based on the analysis of the study of premises in addition to the recommendations provided in each section of Ecological, Water, Waste and Energy Audit the University can adopt the following strategies towards a Healthy and Sustainable Institution practices.

a) **Cutlery in the Canteen –** The regular plastic and steel plates, spoons used in Canteen can be replaced with eco-friendly and organic leaves, paper straw, disposable plates, edible spoons and tables made out of sugarcane waste or bamboo. This will be first of its kind initiative to be adopted and practiced thus also inculcating the healthy practices in students.

b) **Waste vio –** Stepping up a little further an initiative can be undertaken wherein University can tie up with an organisation and students can be encouraged to collect dry waste and electronic waste such as newspapers, old computers and others and hand over to organisation on a weekly or monthly basis thereby making a waste reduction approach in the community. This has benefits such as awareness, eco-friendly habits in becoming a responsible citizen.

c) **Signages –** In addition to the signages being in regular language there can be additional signages in braille language for the specially abled students.

d) **Environment Certificate Courses –** The University could begin courses such as Bachelor's, Diploma or Certificate courses with National and International Collaboration related to Environment as part of the courses provided. Though, this is not a requisite or compulsion.

6.2 Survey Results

An online survey was conducted to analyse the student and staff views about what changes according to you can be undertaken for Green audit improvement in University premises and activity, some of the key responses are listed below.

Some of the suggestions by the Students and staff are listed below:

- Cleanliness should be given first, plantation of need full plants to make the environment more eco-friendly. And renewable project for the power supply systems
- Parking sheds could be replaced by solar modules
- Proper recognition for Green belt and yearly audit should be there.
- Proper maintenance of all the present facilities with positive monitoring system in each 3 months.

However, it should be noted that the University has taken up multiple initiatives and because of Pandemic the students have not practically visited the campus so many of these points are not mandatory at the moment.

7. References

- Uniform Plumbing Code – India, 2008
- IGBC Green Existing Buildings – Operation & Maintenance (O&M) Rating system, Pilot version, Abridged Reference Guide, April 2013
- IGBC Green Landscape Rating system, March 2013
- BOMA Canada Waste Auditing Guide, Best Environmental Standards, BOMA BEST – Canada
- Climate data https://www.indianclimate.com/show-data.php?request=FDCRNM6Z6Y
- Used only for understanding Universal design - Universal accessibility Guidelines for Pedestrian, Non-motorizes vehicle and Public Transport Infrastructure – Report guidelines by Samarthyam (National centre for Accessible Environments) – an initiative supported by Shakti Sustainable Energy Foundation.
- City of Cheyenne, Streetscape/ Urban Design elements - Wyoming Planning Association, Gillette, Wyoming, United States


स्वर्ण जयंती वर्ष २०१३-१४
पं. रविशंकर शुक्ल विश्वविद्यालय, रायपुर

Energy Audit Report of Pandit Ravi Shankar Shukla University (PRSU) Campus, Raipur, Chhattisgarh

Conducted by

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SUBMITTED BY

TQ Services
A Division of TATA PROJCTS Ltd.,
Hyderabad

W.O. Number : - CREDA/EC/F-11N/11533, Date-13/11/15
Report No :-BHI15EA925/12122015/1KVS

Audit Team :

Mr. K V S N Rao
Mr. Santhosh A
Mr. Azim
Mr. Ashok K M P

Abbreviations Used

AC	:	Alternating Current
AC Units	:	Air Conditioner Units
AMC	:	Annual Maintenance Contract
BEE	:	Bureau of energy efficiency
CSPDCL	:	Chhattisgarh State Power Distribution Company Limited
CTPT Unit	:	Current Transformer Potential Transformer Unit
DB	:	Distribution Board
DG Set	:	Diesel Generator Set
DVRF	:	Digital Variable Refrigeration Flow System
ECBC	:	Energy Conservation Building code
ELCB	:	Earth Leakage Circuit Breaker
EPM	:	Electrical Preventive Maintenance Program
GI Pipe	:	Galvanized Iron Pipe
HT	:	High Tension
IE	:	Indian Electricity
IS	:	Indian Standard
KVA	:	Kilo Volt Ampere
KW	:	Kilo Watt
KWH	:	Kilo Watt Hour/ units
LPD	:	Lighting Power density
MSB	:	Main switch board
MTC	:	Material Test Certificate
NOC	:	No Objection Certificate
PF	:	Power factor
PM	:	Preventive Maintenance
SFU	:	Switch Fuse Unit
SOP	:	Standard Operating Procedure
SLD	:	Single Line Diagram
T/F	:	Transformer
THD	:	Total harmonic distortion
UPS	:	Un-interrupted Power Supply
WI	:	Work Instruction

INDEX

Acknowledgements

We are extremely thankful to the Officers and employees of PRSU for extending their whole hearted cooperation in successfully completing our Energy Audit. We have visited PRSU, for conducting Preliminary studies and subsequently conducted detailed Energy Audit from 24th Nov 2015 to 30th Nov-2015. We are also thankful to CREDA-Chhattisgarh, for their participation and also for giving us the opportunity to serve Chhattisgarh state. Since we are unable to list out all the names that have extended their unstinted support to us, we are thankful to all of them including the following officers.

No	Name	Designation
1	Mr Shiv Kumar Pandey	Vice chancellor- PRSU
2	Mr K K Chandraker	Registrar- PRSU
3	Dr. Sanjay Tiwari	HOD-Electronics & Photonics- PRSU
4	Mr Johan Thakur	Sub Engineer (Elect)- PRSU
5	Mr B C Biswas	Finance Controller- PRSU

No	Name	Designation
1	Mr Sanjeev Jain	CE - CREDA
2	Mr Rajiv Gyani	EE- CREDA
3	Mr Kamran Shaikh	AE- CREDA
4	Mr Dhir Singh	PC - CREDA

EXECUTIVE SUMMARY

Energy Audit options at a glance &recommendations to University

Annual energy savings	=	179100kWh
Annual financial savings	=	Rs. 22, 62,240
Total investment	=	Rs. 19, 72,500

ENERGY CONSERVATION OPTIONS AND RECOMMENDATION

Energy conservation options & recommendation (As per investment)

LOW INVESTMENT (< 1 LAKH):

Sl.No	PARTICULARS	ANNUAL ENERGY SAVINGS (kWh)	ANNUAL FINANCIAL SAVINGS (Rs)	INVESTMENT (Rs)	SIMPLE PAY BACK PERIOD(Months)
1	Replacing 400 Nos.T12(40 W) Fluorescent Lamps (fitted with Copper Chokes) with electronic choke and T-8 Tubes	14400	1,15,200	62500	07
2	Replacing 500 Nos.T12(40 W) Fluorescent Lamps (fitted with Electronic Chokes) with 28 W T-5 Fitting:	11520	92160	85000	13
3	Replacing 300 Nos. Of Ordinary resistance type regulators with electronic regulators	7200	57600	1,00,000	20

MEDIUM INVESTMENT: (1 lakhs > x < 10 lakhs):

4	Replacement of existing CRT computer screens with LCD screen	7500	60,000	2,50,000	50

5	Replacing 250 Nos.T12(40 W) Fluorescent Lamps with LED Lights	24000	1,92,000	3,00,000	19
6	Replacement of300 existing ceiling fans with BLDC fans	54000	432000	9,00,000	25
HIGH INVESTMENT: (>10 LAKHS):					
7	Replacement of old 1.5TR window a/c with 4 star Split A/c	60480	483840	12,60,000	32

Distribution of power

	Potential area for energy savings and safety issues	Present system	Proposed Recommendations
8	No isolation switches for building or rooms	Prevention of Short circuit and energy saving by single isolation	MCB/ELCB or master switch for isolation of electricity supply.
9	Selection of cables	Due to harmonics and unbalance current neutral wire can burn	Avoid unbalance and provide 4 core wiring
10	Over voltage in transformers	Over voltage increase energy consumption, safety and maintenance issues for luminaries and equipment's	Take up issue with CSPDCL for lowering the tap setting in the corresponding transformer
11	Connected loads	Connected Load is more than sanctioned Load which will invite penalty from CDPDCL	Increase the connected load from CSPDCL and change it in the next bills
12	Low Power factor	Power factor found lower than 0.85 which invites penalty from CSPDCL	Increase the power factor by installing LV capacitors with loads.
13	Cable joint and termination burning	For safety cable termination and fuses found red hot	Proper crimping and terminal joints and useof proper fuses instead of wires as fuses.

Lighting

	Potential area for energy savings and safety issues	Present system	Proposed Recommendations
14	Street Light, garden lights	Operated by security persons	Provision for timers for operation
15	Common lights in toilets , corridor steps	Found burnt in normal time	Energy team to be formed among students and responsibility to be given, stickers and posters to be provided in the lighting switch boards, Lights to be changed in first phase of changing
16	For New buildings under construction	T-12 tubes are being used	Change into LED tubes and Luminaries. Order to be issued
17	Cleaning of luminaries	Most of the tubes and Luminaries are dusty	Energy team to be made among students in collaboration with NSS volunteers for scheduled cleaning.

	Potential area for energy savings and safety issues	Identified issue	Recommendations
20	Engineering practice	Lengthy copper tube from compressor to condenser, installation of air conditioner evaporator and condenser locations against its installation manual	Minimum gap between top ceiling and top of evaporator should be 1 feet, and for condenser side and back gaps are to be 1feet for proper circulation of air, avoid the blockage of air in front of condenser fan.
21	Cleaning	Condenser fins and evaporator suction filter not cleaned	Cleaning schedule to be incorporated, AMC for repairing and cleaning, along with checking of power consumption periodically and recording of the same.
22	Ingress of heat into the room	The windows are plain glass and gaps found in doors and old windows	The old metal frame of windows to be changed, proper sealing of doors and windows to be done, Cool film installation on windows

23	Set temperature	Set temperature in ACs found between 16 to 20 ^{o}C in many areas	Set temperature to be changed and kept between 23^{0}C to 26^{0}C as per ASHRAE standard for HVAC

Ceiling Fans

	Potential area for energy savings and safety issues	Present system	Proposed Recommendations
18	Cleaning	Old fans not cleaned and corrosion in side of blades found. Improper lubrication of bearings increases power consumption	Change to BLDC fans which consumes 35 W Energy. Team to be made among students in collaboration with NSS volunteers foe scheduled cleaning,
19	Cross ventilation	New buildings window positions	Design the new building as per ECBC norms. On cross ventilation.

Diesel generators:

SL No	Potential area for energy savings and safety issues	Identified issue	Recommendations
25	AMF installed in many DG sets	AMF is not working and CSPDCL supply restored DG working continuously without the knowledge of people.	AMF to be repaired with Supplier. Indication with lights and alarm for failure and restoration of CSPDCL supply to be incorporated
26	Log book	No log book maintained regarding type diesel consumption, running hours, energy generation and maintenance checkups and sevices.	Log book to be maintained (health card of the DG).

PUMPS

SL no	Potential area for energy savings and safety issues	Identified issue	Recommendations
27	No record of rewound motors and repaired pumps	Most of the pumps are bore well pumps, its motors are rewinded many times ,	Monitoring of repairing will be required for alternate pumping solutions, and reason for replacement to be recorded
28	Peak time running	Peak time charges are more and we observed pumps are running during peak hours,	Peak time pumping to be shifted and pumping should be at off peak time ,
29	Capacitors in pumping installations	LV Capacitors installed in pumps are not working	Change the LV capacitors for better operation and improving power factor.

GOOD OBSERVATIONS:

1. Renovation in all the major buildings has been done in the electrical side and also the building as a whole.
2. Good knowledge about the energy conservation and its purpose among the staffs and students that we interacted.
3. Waste management in the campus was found to be well organised.

Specific Electricity Consumption of University Building:-

SL No:	Particulars	Connected Load (kW)	Average Energy consumption (kWh)	Area (m^2)	Specific electricity consumption (Avg) (kWh/m^2)	Specific electricity consumption (Max) (kWh/m^2)	Specific electricity consumption (Min) (kWh/m^2)	Remarks
1	Guest house (page no-29)	51.86	2373.41	967.98	2.45	7.24(June)	1.14(Apr)	High SEC in June due to building renovation
2	Gandhi hostel (page no-34)	9.96	2293.33	1589.46	1.4425	5.78(Sep)	0.63(Aug)	High SEC in June due to building renovation
3	PG girls hostel (page no-38)	3.7	1378.41	1339.52	1.03	2.26(Apr)	0.47(Jul)	
4	Teachers hostel(page no-42)	3.7	5342.5	1163.4	0.45	1.04(Sep)	0.14(Jun)	
5	Azad hostel(page no-46)	2.1	1149	1484	1.33	1.54(Mar)	0.8(June)	Meter not working from June onwards
6	Research Hostel for Girls (page no-50)	2.25	2135.6	744	2.87	5.94(Apr)	2.1(Dec-14)	Variation in SEC due to the variation in accommodation
7	Professional girls hostel (page no-54)	7.3	2483.66	1172.4	2.12	6.76 (Apr.)	1.19(Jan)	Variation in SEC due to the variation in accommodation

SL No:	Particulars	Connected Load (kW)	Average Energy consumption (kWh)	Area (m^2)	Specific electricity consumption (Avg) (kWh/m^2)	Specific electricity consumption (Max) (kWh/m^2)	Specific electricity consumption (Min) (kWh/m^2)	Remarks
8	Research boys hostel (page no-58)	3.94	345.5	656	0.52	1.43(Sep.)	0.2(Mar)	
9	Girls hostel pump house (page no-62)	3.73	983.5	--	--			
10	Street light (page no-63)	23.76	4756	---	---			
11	SOS in electronics and photonics**(page no-66)**	34.3	1150.09	1409.44	0.9	2, 09(Jun)	0.285(Jan)	May and June no bill
12	SOS in computer science and IT**(page no-71)**	20	1335.5	3171.36	1.71	2.59(Mar)	1.25(Apr)	
13	Institute of Management **(page no-82)**	51.7	1833.33	2514.02	0.745	1.095(Mar)	0.87(May)	
14	National Centre for Natural Resources**(page no-87)**	30.6	1351	3754.4	0.36	0.742(Sep)	0.134(Apr)	
15	Sos Physics and Chemistry**(page no-92)**	69.8	6995.05	3616.04	1.52	2.3(Sep)	1.215(Jan)	
16	USIC**(page no-100)**	9	3504.54	308.83	1.183	2.73(Mar)	0.17(Apr)	
17	SOS geology and water resource management **(page no-104)**	22.5	2773.41	1294.34	2.14	3.25(Mar)	0.5(Oct)	
18	SOS in life Science-1**(page no-109)**	10.444	2651.25	2441.28	1.02	3.25(Jun)	0.16(Jan)	Separate area for each

19	SOS in life Science-2	9.04	2061					section is not available in the Universit y.
20	Bio science Lab	4	1749.75					
21	Tissue culture	9	660					
22	SOS in Pharmacy**(p age no-119)**	74.99	2940.33	6558.98	0.446	0.695(Sep)	0.075(Dec. 14)	
23	SOS in statistics &mathematic **(page no-124)**	12	1721	1223.24	1.40	1.84(May)	1.09 (Oct)	
24	University press**(page no-129)**	0.9	517.16	----	----			
25	SOS in regional study and research:	2.25	710	560.54	1.27	2.11(May)	0.41(Jan)	
26	SOS in Physical education**(pa ge no-135)**	--	1459.4	2905.06		0.62(Sep)	0.4(Oct)	
27	SOS in Law**(page no-140)**	---	1209	1625.42		8.05(May)	09.24(Feb)	No meter reading from June onwards
28	Auditorium**(p age no-145)**:	13.965	927	1315.98	0.703	1.75(Mar)	0.3(Apr)	No bill on May
29	Community hall	8	183.33	744.18	0.244	1.38(Mar)	0.067(Oct)	No bills on May, Aug, Sep-15
30	Engineering department:(**page no-152)**	3.36	470.33	164.67	2.85	5.28(Apr)	1.5(Feb)	
31	SOS in Geography**(p age no-156)**	33.08	1170	1751.3	6.48	10.82(May)	2.44(Apr)	
32	Library**(page no-161)**	65	4224.83	4950	0.85	2.17(May)	0.52(Nov-14)	
33	Animal house**(page no-165)**	3.36	373	17	21.94	26.71(Jun)	15.29(Nov)	No bills from July onwards
34	Pump and block**(page**	-	677.54	----	----			

	no-169)							
35	Botanical garden pump**(page no-170)**	3.75	510.25	----	----			
36	Pump near library**(page no-171)**	2.238	1041.6	----	----			
37	Arts bhavan ground floor**(page no-172)**	65	4141.83	2433.48	1.7	6.23(May)	0.47(Sep)	High SEC due to building renovation
38	Arts Dept In first Floor**(page no-177)**	32	576	2433.48	0.278	0.34(Aug)	0.05(Oct)	No bill for March, Apr, May
39	Arts bhavan second floor**(page no-182)**	32.14	672.5	2433.48	0.438	0.61(Sep)	0.19(Oct)	No bill first 6 months
40	Health centre**(page no-186)**	4.95	317.83	960	0.33	0.57(Jun)	0.2(Jan)	No bill on Jan and June
41	Administrative building**(page no-196)**	66.725	10868	3916.35	2.773	3.69 (May-15)	1.82 (Nov-14)	
42	VC bungalow**(page no-200)**	4.768	1031.6	470.13	5.124	9.66(Jul)	1.66(May)	No bill on power meter
43	VC Bungalow Street light**(page no-205)**	0.36	317.83					
44	Registrars bungalow**(page no-209)**	2.28	240.03	285.51	0.84	12.1(Jun)	0.3(Jan)	High SEC in June as accommodation provided for guests in university programs.

Lighting Loads of University

Particulars	T-12	T-8	Bulb	CFL-15W	CFL-36W	SVL
Guest house	50		02	36		
Gandhi hostel	79			05		
PG girls hostel	112					02
Teachers hostel	52	04				
Azad hostel	76					02
Research Hostel for Girls	45	09				02
Professional girls hostel	72		02	91		02
Research boys hostel	34		02	01		
Street light		30				60
SOS in electronics and photonics	35			93		
SOS in computer science and IT	125	05		02		
Human Resource centre	90	06				
Institute of Management	126			07	08	
National Centre for Natural Resources	12	15		08		
SOS Physics and Chemistry	235			48		
USIC	16	02		01		
SOS geology and water resource management	76			02	01	
SOS in life Science-1	320	44		88		
Particulars	**T-12**	**T-8**	**Bulb**	**CFL-15W**	**CFL-36W**	**SVL**
SOS in Pharmacy				32	26	
SOS in statistics & mathematics	32			30		01
University press	40					01

Auditorium:	25			15		01
Community hall	24					
Engineering department:	08					
SOS in Geography	125		01			
Library:	132		126			
Animal house	06			04		
Arts bhavan ground floor	143			07		
Arts Dept In first Floor	108			5		
Arts bhavan second floor	87			2		
Health centre	10		01	01		
Administrative building First Floor	157	26	110	28		
Administrative building second Floor	257	16	15	52		
VC bungalow	42					03
Registrars bungalow	08				02	01
Total Nos	**2759**	**157**	**259**	**558**	**37**	**75**

Fan loads of university:

Particulars	Ceiling fan (New)	Ceiling fan (Old)	Exhaust fans
Guest house		36	02
Gandhi hostel		56	04
Pg girls hostel		66	01
Teachers hostel		25	02
Azad hostel		48	02
Research Hostel for Girls		26	02
Professional girls hostel		39	03
Research boys hostel		25	02
SOS in electronics and photonics	05	13	01
SOS in computer science and IT	33	50	3
Human Resource centre	57		03
Institute of Management		81	01
National Centre for Natural Resources	08		
SOS Physics and Chemistry	18	99	21
Music		07	
SOS geology and water resource management		42	02
SOS in life Science-1		138	04
SOS in Pharmacy		106	06
SOS in statistics &mathematics		38	
Auditorium:		26	
SOS in Geography		92	02
Library:	60	16	
Arts bhavan ground floor		78	
Particulars	**Ceiling fan (New)**	**Ceiling fan (Old)**	**Exhaust fans**
Arts Dept In first Floor		58	02

Arts bhavan second floor		48	02
Health centre	05	02	
Administrative building First Floor	38	59	10
Administrative building second Floor	107	56	28
VC bungalow	04	10	03
Registrars bungalow	08		01
Total nos	**343**	**1340**	**107**

Air conditioners loads:

Particulars	**Window**	**Split A/C-1TR**	**Split A/C-1.5 TR**	**Split A/C-2TR**
Guest House	09		04	
SOS in electronics and photonics			09	04
SOS in computer science and IT			21	02, 12 TR not working
Human Resource centre			17	
Institute of Management			02	05 (Not Working)
National Centre for Natural Resources			08	04
SOS Physics and Chemistry	10		16	01
SOS geology and water resource management			03	
SOS in life Science-1	07 and 01 1TR		17	05
SOS in Pharmacy	04		12	02
SOS in statistics & mathematics	02 and 1No: 1TR		01	02
Particulars	**Window**	**Split A/C-1TR**	**Split A/C-1.5 TR**	**Split A/C-2TR**
SOS in Geography			05	01
Library:			01	05
Animal House			06	01
Health center	02	01		

Administrative building	02		22	03
Total Nos	**36**	**1**	**144**	**35**

COMPUTERS AND OTHER EQUIPMENTS

Particulars	Computer LCD	Computer CRT	Lap top	Laser Printer	3 Phase Printer	Scanner	Xerox M/c
Guest House	02						
Gandhi Hostel			05				
PG Girls Hostel	06		05				
Teachers Hostel			05				
Azad Hostel		06	05				
Research Hostel for Girls		05	10				
Professional Girls Hostel			5				
Research Boys Hostel			05				
SOS in electronics and photonics	13	16			02	01	01
SOS in computer science and IT	67		02	03		01	01
Particulars	**Computer LCD**	**Computer CRT**	**Lap top**	**Laser Printer**	**3 Phase Printer**	**Scanner**	**Xerox M/c**
Human Resource centre	10			04	01	01	01
Institute of Management	09	20	04	02	01	01	01
National Centre for Natural Resources	05				01	01	02
SOS Physics and Chemistry	63	06	04	26	02	04	02
SOS geology and water resource management	15	01		02	01		

SOS in life Science-1	28	05	04	11	03	02	01
SOS in Pharmacy	25		02	05	01		
SOS in statistics & mathematics	05	15	5	1	1		
SOS in Geography	38	04	01	09	01	01	
Library:	12				01	03	01
Animal House							
Arts Bhavan Ground Floor		25		07	01	01	
Arts Dept In first Floor		28	03	04	02	01	
Arts Bhavan Second Floor		08		06		02	
Health centre	02						
Administrative building	75	03		32	15	07	10
VC Bungalow	03				01		
Total	**378**	**142**	**65**	**112**	**34**	**26**	**20**

TOTAL CONNECTED LOAD IN EACH METER:

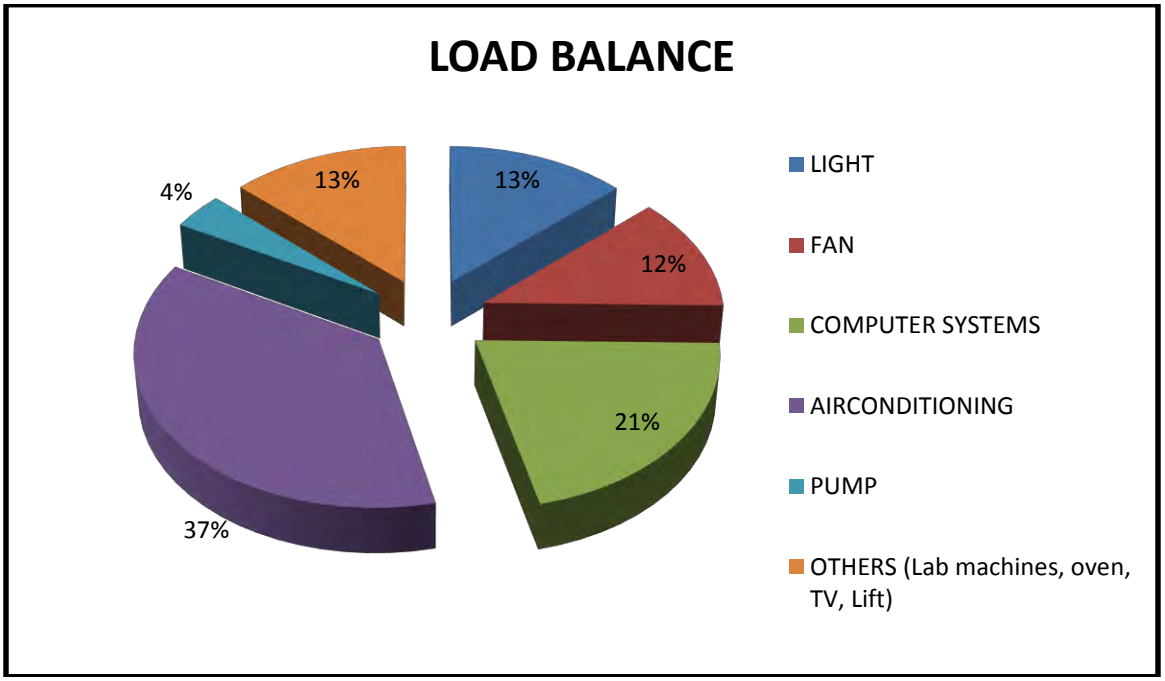
SL NO	PARTICULARS	Service No/Consumer no	SANCTIONED LOAD (kW)	CONNECTED LOAD (kW)	REMARKS
1	Guest house	405439	51.86	35.652	
2	Gandhi hostel	403267	9.96	9.015	
3	Pg girls hostel	403268	3.7	12.68	Greater than the Sanctioned load
4	Teachers hostel	403288	3.7	5.09	Greater than the Sanctioned load
5	Azad hostel	404408	2.1	9.52	Greater than the Sanctioned load
6	Research Hostel for Girls	771284	2.25	7.33	Greater than the Sanctioned load
7	Professional girls hostel	774229	7.3	7.65	Greater than the Sanctioned load
8	Research boys hostel	606167	3.94	4.34	Greater than the Sanctioned load
9	Girls hostel pump house	406131	3.73	3.5	
10	Street light	1000145454	23.76	19.08	

11	SOS in electronics and photonics	771282	34.3	38.52	Greater than the Sanctioned load
12	SOS in computer science and IT	773349	20	26.41	Greater than the Sanctioned load
13	New Computer building	406284	40	36.25	
14	Computer server room	406285	10	9	
15	HRDC	1005795195	40	41	Greater than the Sanctioned load
16	Institute of Manageme nt	773578	51.7	38.9	
17	National Centre for Natural Resources	1005248369	30.6	23.16	
18	SOS Physics and Chemistry	404300	69.8	62.52	
SL NO	**PARTICULARS**	**Service No/Consumer no**	**SANCTIONED LOAD (kW)**	**CONNECTED LOAD (KW)**	**REMARKS**
19	SOS Physics and Chemistry	406134	71.9	65.2	
20	USIC	406148	9	11.5	Greater than the Sanctioned load
21	SOS geology and water resource manageme nt	406195	22.5	23.12	Greater than the Sanctioned load
22	SOS in life Science-1	406147	10.444	21.2	Greater than the Sanctioned load
23	SOS in life Science-2	404446	9.04	18.5	Greater than the Sanctioned load
24	Bio science Lab	771215	4	8.5	Greater than the Sanctioned load
25	Tissue culture	406200	9	16.2	Greater than the Sanctioned load
26	SOS in Pharmacy	773533	74.99	72.5	
27	SOS in statistics &	774228	12	25.194	Greater than the Sanctioned load

	mathematics				
28	University press	403232	0.9	8.15	Greater than the Sanctioned load
29	SOS in regional study and research:	771283	2.25	8.765	Greater than the Sanctioned load
30	SOS in Physical education	606210		27.07	
31	SOS in Law	405438	8.72	17.2	Greater than the Sanctioned load
32	Auditorium:	405914	13.965	12.27	
33	Community hall	406296	8	5.75	
34	Engineering department:	405708	3.36	2.21	
35	SOS in Geography	606211	33.38	37.58	Greater than the Sanctioned load
36	Library	402164	65	28.5	
37	Animal house	405706	3.36	13.05	
38	Pump and block	406185	-	3.5	
SL NO	**PARTICULARS**	**Service No/Consumer no**	**SANCTIONED LOAD (kW)**	**CONNECTED LOAD (KW)**	**REMARKS**
39	Botanical garden pump	406203	3.75	3.65	
40	Pump near library	406126	2.238	3.62	Greater than the Sanctioned load
41	Arts bhavan ground floor	402163	65	29.435	Maintenance work was going on during the period of audit.
42	Arts Dept In first Floor	406354	32	19.3	Maintenance work was going on during the period of audit.
43	Arts bhavan second floor	406355	32.14	9.27	Maintenance work was going on during the period of audit.
44	Health centre	402158	4.95	8.25	
45	Administrative building	406135	63.35	67.25	Greater than the Sanctioned load
46	Administrati	404298	69.95	66.56	

	ve building				
47	Pareekshab havan	406267	----	13.55	
48	VC chamber	406184	3.375	3.35	
49	VC bungalow	403290	2.25	4.25	Greater than the Sanctioned load
50	VC Bungalow Street light	402168	0.36	0.4	
51	Registrars bungalow	775464	--	6.25	
52	Bio technology	1005623708	67	63.2	
	TOTAL KW		**1116.87**	**1113.91**	

LOAD BALANCE:



- As one can see, Max load has been taken by the Air conditioning units in the university.

1.0 INTRODUCTION

Pt. Ravishankar Shukla University is Chhattisgarh's largest and oldest institution of higher education, founded in 1964, and named after the first chief minister of erstwhile Madhya Pradesh. The University has a campus in the western part of the capital of Chhattisgarh, Raipur. Land. The University is about 5 km from the Raipur Railway Station and about 15 km from the Raipur airport. There are Twenty-Nine teaching departments in the University. Out of which six departments buildings have been constructed recently. The total number of employees is 700, who provide the administrative support at different levels.

There are 5000 students enrolled for variety of courses offered by the departments who are steered under the guidance of more than 100 faculty members. Jurisdiction of PRSU covers entire central and southern part of Chhattisgarh. There are 180 educational institutions affiliated to the University.

1.1 Scope of work:

(A) Electricity Supply and Distribution Network

(B) Lighting System

(C) Diesel Generators (DG) Sets

(D) Water Pumping System

(E) Motor Load Survey

(F) Energy Monitoring and Accounting System

2.0 Energy Audit Team

1. **K V S N Rao**, **B-Tech Electrical**
   Registered Energy Auditor of Bureau of Energy Efficiency (BEE – Govt of India)
   Energy Auditor No – EA 9064
2. **Santhosh A, B-Tech, DEE, PGDENM.**
   Registered Energy Auditor of Bureau of Energy Efficiency (BEE – Govt of India)
   Energy Auditor No – EA 7597
3. **AZEEM K , M-TECH**
   Registered Energy Auditor of Bureau of Energy Efficiency (BEE – Govt of India)
   Energy Auditor No – EA 3375
4. **Ashok K M P,**Sr project Engineer
5. **Ranjith M-** Project engineer
6. **Maqbool M -** Project engineer

3.0. ANALYSIS OF EACH DEPARTMENT:

In this section, auditors have analysed each department or building according to the metre number. This section contains base line data of each department electricity bill, Electrical load analysis using logged data by the power quality analyser, Light, Fan, Computer loads consumption pattern and its connected load, Light intensity (LUX) of each sections, Air conditioning loads and its efficiency and Specific electricity consumption of each building. The Auditors have tried to separate measurements by each loads vies departments and Electricity board metre, however there found difficulties in doing so in most of the buildings as the one department itself contains more than one metre.

Present system of Electricity supply

At present most of the buildings in the Raipur University have separate LT connection with an energy metre provided by the CSPDCL. Whenever any expansion occurs in the building, University applies for another connection in the same and the CSPDCL provided it. Thus in most of the departments or buildings more than one EB metre is common. Diesel generator is provided as back up supply for almost all the buildings individually.

4.0 TARIFF STRUCTURE OF CSPDCL FOR YEAR 2015-16:

1. LV1 DOMESTIC GENERAL:

The tariff for all consumption slabs of LV-1 category has been revised. In LV-1 domestic category, the Commission has split the consumption slab of 0-200 units by introducing two new consumption slabs, i.e., 0-40 units per month and 41-200 units per month, as under:
Slab 1: 0-40 units;
Slab 2: 41-200 units;
Slab 3: 201-600 units; and
Slab 4: more than 600 units.

A. APPLICABILITY:

This tariff is applicable to domestic light and fan and power used for all domestic appliances, student hostels; working women's hostels; schools

B. TARIFF:

Category of Consumers	Units Slab	Fixed Charge (Rupees per kWh)	Energy Charge (Rs. per kWh)	Minimum Fixed Charge
LV-1: Domestic				
Domestic including BPL Consumers	0 -40 units	2.00	1.00	Single Phase Rs. 40/- p.m.
	41-200 units	2.10	1.00	
	201 - 600 units	2.80	1.60	Three phase Rs. 120/- pm
	601 and above units	4.30	2.20	

2. LV2 NON DOMESTIC

A. APPLICABILITY:

This tariff is applicable to light and fan and power to shops, showrooms, business houses, offices, educational institutions (except those included in LV-1 and LV-5), public buildings, town halls, clubs, gymnasium and health clubs, meeting halls, places of public entertainment, circus, hotels, cinemas, public libraries and reading rooms.

B. Tariff:

Category of Consumers	Units Slab	Fixed Charge (Rs per kWh of Contracted load/Demand)	Energy Charge (Rs. per kWh)
LV-2.1:Non-Domestic (Normal Tariff)	0 – 100 units	Rs. 60 per kW per month up to 3 kW and Rs. 120 per kW per month above 3 kW	4.40
	101 - 500 units		4.90
	501 and above units		6.20
LV-2.2: Non-Domestic Demand Based Tariff (for Contract demand of 15 to 75 kW)		Demand Charges- Rs 200/kW/month on billing demand	5.60

3. LV6 PUBLIC UTILITY

A. APPLICABILITY

This tariff is applicable to public utilities such as water supply schemes, sewage treatment plants, street lights, streets including public parks and archaeological and other monuments when requisition for supply is made by Public Health Engineering Department, local bodies, Gram Panchayats or any organization made responsible by the Government to maintain these services.

B. Tariff:

Category of Consumers	Fixed Charge	Energy Charge (Rs. per kWh)
LV-6: Public utilities Public street light and water works	Rs. 100/HP/month or Rs. 135/kW/month	4.00

4. Terms & conditions:

For the purpose of Demand Based Tariff (LV-2.2. LV-4.2 and LV-5.3)

a. **Determination of Maximum Demand**- The maximum demand of the consumer in each month shall be twice the largest amount of kilo Watt hours delivered at the point of supply of the consumer, during any consecutive thirty minutes, in that month.

b. **Billing Demand**– The billing demand for the month shall be the actual maximum kW demand of the consumer recorded during the month or 75% of the contract demand or 15 kW, whichever is higher. The billing demand shall be rounded off to the next whole number.

c. **Minimum Charge** – The demand charge on contract demand (CD) is a monthly minimum charge whether any energy is consumed during the month or not.

d. There shall be no restriction on connected load for applicability of demand based tariff.

Power Factor Incentive and Surcharge:

a. All the agriculture **pump connections of above 3HP** shall provide with capacitor of specified rating and **maintain average monthly power factor of 0.85 or above** failing which they shall be required to pay power factor surcharge @ 35 paisa per kWh on the entire consumption of the month.

b. All **LT non-domestic consumers** with contracted load/connected load of 15 kW or above shall arrange to install suitable low tension capacitors of appropriate capacity at their cost. The consumer shall ensure that the capacitors installed by him properly match with the actual requirement of the load so as **to ensure**

average monthly power factor of 0.85 or above. A consumer who fails to do so will be liable to pay power factor surcharge @ 35 paisa per kWh on the entire consumption of the month.

Provisions of billing in case of Excess Supply

I. For Normal Tariff consumers

a) In case the **connected load of any LT consumer, except the domestic (LV-1) consumers, is found at any time in excess of contracted load,** the consumer shall have to pay charges at tariff (fixed and energy charge) corresponding to the excess load at the rate of one and half times the normal tariff for the excess load to the extent of 20% of contracted load and at the rate of two times of the normal tariff if the excess load is found beyond 20% of contracted load for actual period of enhancement of load or 6 months whichever is less, including the month in which the existence of excess load is detected and shall be continued to be billed till excess load is removed or contract load is enhanced.

b) Where the recording facility of demand is available, the billing on account of excess supply shall be restricted to the recorded month only.

Favourable points for the University:

- No capacitors need to be installed in the LV1 domestic supply.

Improvements to be done in the university according to the bill:

- All the LT Non domestic connections (LV2ND3) need to ensure the PF should be more than 0.85 by installing the LT capacitors.
- Connected load of most of the connections under the LV2ND3 category are greater than the contracted load which should be enhanced at the earliest.

5.0 DEPARTMENT OR BUILDING VIA DETAILS:

I. MEASUREMENTS TAKEN ON 25-11-2015:

A. GUEST HOUSE:

Building : Guesthouse
Consumer No : 1000144880
Service No : 405439

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity that is CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity provider	CSPDCL
2	Tariff	LV1DL1GN14 : 3phase
3	Connected load (kw)	51.86
4	Average monthly energy CONSUMPTION (kwh)	2373.41
5	Monthly total electricity cost (avg. In rs)	15853.33
6	Average power factor	-

Observations:

- **At present PF values are not included in the bill.**

2. Electrical Load analysis:

Department	-	Guest house		
Consumer / meter No	-	405439		
Date & time of measurement		25-11-2015, 10:21		
Actual Energy	kWh	1.22		
Apparent Energy	kVAh	1.57		
Power factor	-	0.777		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	0.54	2.30	0.95
Apparent power	kVA	0.72	2.60	1.23
Voltage (V_L)	Volts	239.1	244.6	241.7
Current	Amps	0	16	8
Voltage unbalance	%	0.02	0.6	0.33
Current unbalance	%	47.7	123.8	90.70
THD voltage	%	1.7	2.1	1.90
THD current	%	4.1	41	15.31

Observations:

- PF found to be low in the Guest house during normal operation hours, day time. We expect that it will improve up to 0.85 during the night period when the AC and other light loads gets on.

Suggestions:

- PF can be improved to greater than 0.9 by installing LV capacitors in parallel with the EB Metre.

1. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T12	BULB	CEILING FAN NEW	CEILING FAN OLD	EXHAUST FAN
Watts(W)	40	60	60	90	60
Total Nos.	50	2	-	36	2
Total KW	2	0.12	-	3.24	0.12
Net total kW	**5.48**				

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs should be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators should be replaced by energy efficient BLDC fans and electronic regulators.

4. LUX MEASUREMENTS

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods which is applicable to all commercial buildings. One of the methods is Illuminance method which is the most practicable one. Lux values at various location in the building is given below in Table-

LOCATION	MEASURED LUX	REQUIRED LUX	REMARKS
Tv room	236	150	Good
Dining hall	229	150	Good
Room 2	189	150	Good
Room 6	206	150	Good
Room 5	224	150	Good
Room 3	324	150	Good
Room 13	204	150	Good
Room 11	197	150	Good
Room 10	241	150	Good
Room 9	213	150	Good
Room 1	229	150	Good
Room 4	198	150	Good

Room 12	278	150	Good
Room 7	219	150	Good
Room 8	196	150	Good

Standards:

- Standard value is taken from the ECBC user guide.
- All the values are taken during the day time.

5. COMPUTER & its ACCESSORIES:

DETAILS	WATTS	TOTAL NO	TOTAL KW
LCD computer	200	2	0.4

7. Air conditioning:

Guest house have installed a total of 4 Split AC and 9 window AC and their efficiency calculations are given below in table.

LOCATION	TYPE	RATED COOLING CAPACITY (TR)	MEASURED COOLING CAPACITY (kW)	RATED POWER ELECTRICAL (kW)	RATED EER	MEASURED EER	REMARKS
Room 2	Split	1.5	4.0	1.818	2.75	2.2	
Room 6	Split	1.5	3.9	1.818	2.75	2.17	
Room 5	Split	1.5	4.2	1.818	2.75	2.31	
Room 3	Split	1.5	3.9	1.818	2.75	2.14	
Room 13	Window	1.5	3.3	2.5	2.10	1.31	To be replaced with 5 star rated split air conditioners.
Room 11	Window	1.5	3.1	2.5	2.10	1.24	
Room 10	Window	1.5	3.4	2.5	2.10	1.34	
Room 9	Window	1.5	3.6	2.5	2.10	1.43	
Room 1	Window	1.5	3.0	2.5	2.10	1.18	
Room 4	Window	1.5	3.2	2.5	2.10	**1.27**	
Room 12	Window	1.5	3.1	2.5	2.10	1.22	
Room 7	Window	1.5	2.8	2.5	2.10	1.11	
Room 8	Window	1.5	3.6	2.5	2.10	1.43	

Suggestions:

- All the window AC should be replace with 4star split AC.
- Set temperature of air conditioner to be maintained at 26^0C

8. Water consumption:

Guest house building consumes water for various purposes like

- Drinking.
- Cooking.
- Toilet flushing's
- Cleaning

Note:

- Water consumption is not monitored.
- Two stage flushing control should be used in toilets for reducing water wastage.

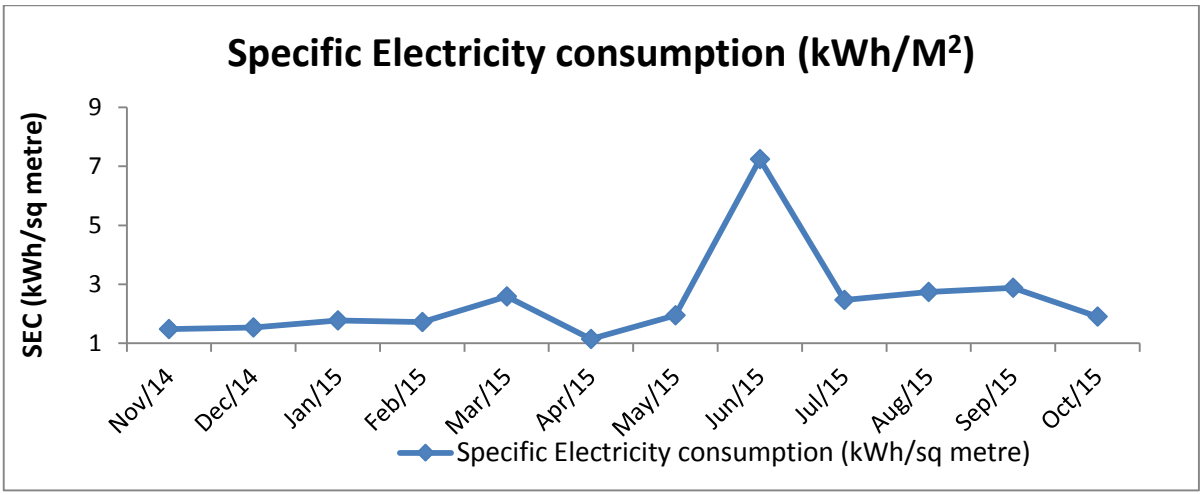
9. EFFICIENCY ANALYSIS:

1. Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Nov-14	1433	967.98	1.48
Dec-14	1477	967.98	1.53
Jan-15	1714	967.98	1.77
Feb-15	1666	967.98	1.72
Mar-15	2508	967.98	2.59
Apr-15	1107	967.98	1.14
May-15	1890	967.98	1.95
Jun-15	7011	967.98	7.24
Jul-15	2394	967.98	2.47
Aug-15	2649	967.98	2.74
Sep-15	2788	967.98	2.88
Oct-15	1844	967.98	1.90

The energy performance index is plotted in the below chart.



Chart

Note:

- **The sudden increase in the SEC in the month of June was found to be unnatural. High SEC in June due to building renovation**
- Specific electricity consumption found to be varying in all those months.
- Maximum units consumed during the month of June-2015.
- SEC is highly depended on the occupation of rooms in the guest house. Variations are observed in specific electricity consumption due to energy usage variation in different climatic conditions of the year.

B.GANDHI HOSTEL:

Building : Gandhi Hostel
Consumer No : 1000143819
Service No : 403267

1. **Electricity Bill Analysis:**

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity Provider	CSPDCL
2	Tariff	LV1DL1GN14 : 3phase
3	Connected Load (kW)	9.96
4	Average monthly energy consumption (Kwh)	2293.33
5	Monthly Total Electricity Cost (Avg. In Rs)	13836.66

Observations:

- **At present PF values are not included in the bill.**

2. **Electrical Load analysis:**

Department	-	Gandhi hostel		
Consumer / meter No	-	403267		
Date & time of measurement		25-11-2015, 16:10		
Actual Energy	kWh	1.071		
Apparent Energy	kVAh	1.43		
Power factor	-	0.748		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	2.01	2.23	2.09
Apparent power	kVA	2.67	2.69	2.80
Voltage (V_L)	Volts	236.4	240.3	239.67
Current	Amps	2.08	6.58	3.89
Voltage unbalance	%	0.5	1.2	0.95
Current unbalance	%	46.4	69.3	58.11
THD voltage	%	2.3	2.8	2.47
THD current	%	6.3	21.4	11.94

Observations:

- PF found to be low during the logging period.

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T12	CFL	Incandescent Bulb	Ceiling Fan New	Ceiling Fan Old	Exhaust Fan
Watts(W)	40	15	40	60	90	60
Total Nos.	79	5	-		56	4
Total KW	3.16	0.075	-		5.04	0.24
Net total kW		**8.515**				

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs should be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators should be replaced by energy efficient BLDC fans.

4. LUX MEASUREMENTS

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods, which is applicable to all commercial buildings. One of the methods is Illuminance method, which is the most practicable one. Lux values at various location in the building is given below in Table-

Location	Measured Lux	Required Lux	Remarks
Mess hall	321	150	Good
Corridors	86	80	Good
Average lux in rooms	179	150	Good

Note:

- Standard value is taken from the ECBC user guide.
- All the values are taken during the day time.
- LPD value is given in the Annexure-2

5. COMPUTER & its ACCESSORIES:

Details	Watts	Total No	Total KW
Laptop	100	5	0.5

6. Water consumption:

Gandhi Hostel consumes water for various purposes like

- Drinking.
- Toilets
- Cleaning.
- Washing.

Observations & Suggestions:

- Water consumption is not monitored.
- Two stage flushing control should be used in toilets for reducing water wastage.
- Water leakage was found in the pipes in the toilets and should be fixed soon.

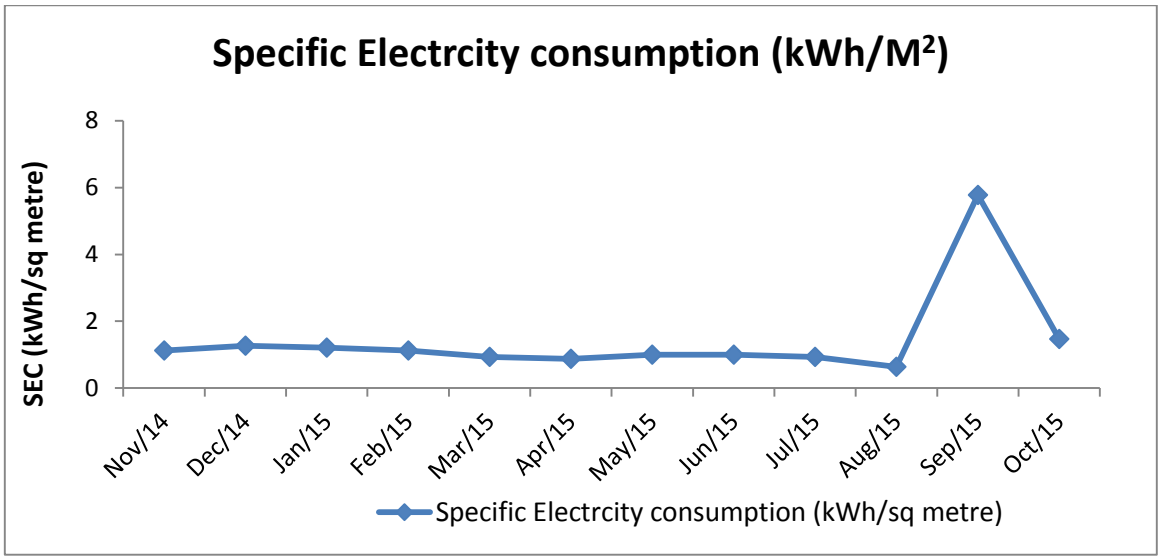
7. EFFICIENCY ANALYSIS:

Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

Month 2014-15	Electricity Consumption CSEB (Kwh)	Area Of The Building ($M^{2)}$	Specific Electricity Consumption (Kwh/M^2)
Nov-14	1780	1589.46	1.12
Dec-14	2015	1589.46	1.27
Jan-15	1920	1589.46	1.21
Feb-15	1780	1589.46	1.12
Mar-15	1481	1589.46	0.93
Apr-15	1389	1589.46	0.87
May-15	1580	1589.46	0.99
Jun-15	1580	1589.46	0.99
Jul-15	1475	1589.46	0.93
Aug-15	1003	1589.46	0.63
Sep-15	9181	1589.46	5.78
Oct-15	2336	1589.46	1.47

The energy performance index is plotted in the below chart.



Chart

Note:

- **The sudden increase in the SEC in the month of September was found to be unnatural. High SEC in June due to building renovation.**
- Specific electricity consumption found to be constant in all other months.
- Maximum SEC measured in the Sep-2015 and is 5.78 kWh/m^2.
- SEC is highly depended on the occupants in the hostel. Variations are also possible in specific electricity consumption due to energy usage variation in different seasons of the year.

C. PG GIRLS HOSTEL:

Building : PG GIRLS HOSTEL
Consumer No : 1000143820
Service No : 403268

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows in table-.

Base Line Data (based on last 12 months)		
1	Electricity Provider	CSPDCL
2	Tariff	LV1DL1GN14
3	Connected Load (KW)	3.7
4	Average monthly energy consumption (Kwh)	1378.41
5	Monthly Total Electricity Cost (Avg. In Rs)	7352.5
6	Average Power Factor	-

Observations:

- **At present PF values are not included in the bill.**

2. Electrical Load analysis:

Department	-	P.G ladies hostel		
Consumer / meter No	-	403268		
Date & time of measurement		25-11-2015, 11:21		
Actual Energy	kWh	3.86		
Apparent Energy	kVAh	5.45		
Power factor	-	0.708		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	3.09	3.86	3.53
Apparent power	kVA	4.39	5.40	4.98
Voltage (V_L)	Volts	244.2	250.1	247.4
Current	Amps	5.41	8.41	6.61
Voltage unbalance	%	0.01	0.6	0.35
Current unbalance	%	1.4	22.8	12.87
THD voltage	%	1.6	2.3	1.87
THD current	%	10.6	14.1	12.15

Observations:

- PF found to be low during the logging period.

Suggestions:

- PF should be improving using the LV capacitors to more than 0.90 to avoid the penalty in future. At present no penalisation has been done in the bill.

3. LIGHT & FAN LOAD CONSUMPTION PATTERN :-

Details	T12	SVL	CEILING FAN NEW	CEILING FAN OLD	EXHAUST FAN
Watts(W)	40	250	60	90	60
Total Nos.	112	2	-	66	1
Total KW	4.48	0.5	-	5.94	0.06
Net total	**10.98**				

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs should be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators should be replaced by energy efficient BLDC fans and electronic regulators.

4. LUX MEASUREMENTS

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods which is applicable to all commercial buildings. One of the methods is Illuminance method which is the most practicable one. Lux values at various location in the building is given below in Table-

LOCATION	MEASURED LUX	REQUIRED LUX	REMARKS
Corridors	198	120	Good
Avreage lux in rooms	162	150	Good

Observations & suggestions:

- Light intensity is found to be good at the measured locations.

5. COMPUTER & its ACCESSORIES:

DETAILS	WATTS	TOTAL NO	TOTAL KW
LCD computer	200	6	1.2
Laptop	100	5	0.5
TOTAL kW			**1.7**

6. Water consumption:

PG ladies hostel consumes water for various purposes like

- Drinking.
- Toilets

- Cleaning.
- Washing.

Note:

- Water consumption is not monitored.
- Two stage flushing control should be used in toilets for reducing water wastage.

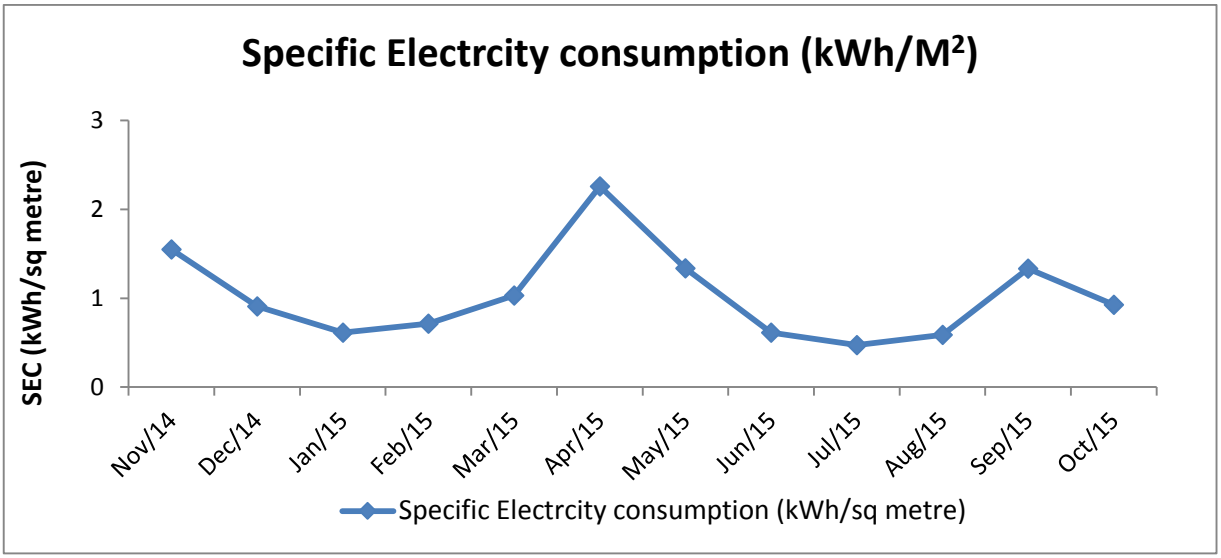
7. EFFICIENCY ANALYSIS:

Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Nov-14	2076	1339.52	1.55
Dec-14	1218	1339.52	0.91
Jan-15	824	1339.52	0.62
Feb-15	959	1339.52	0.72
Mar-15	1380	1339.52	1.03
Apr-15	3025	1339.52	2.26
May-15	1791	1339.52	1.34
Jun-15	822	1339.52	0.61
Jul-15	632	1339.52	0.47
Aug-15	789	1339.52	0.59
Sep-15	1785	1339.52	1.33
Oct-15	1240	1339.52	0.93

The energy performance index is plotted in the below chart.



Chart

Note:

- Specific electricity consumption found to be varying in all those months.
- Maximum SEC measured in the Apr-2015 and is 2.26 kWh/m^2.
- SEC is highly depended on the occupants in the hostel. Variations are also possible in specific electricity consumption due to energy usage variation in different seasons of the year.

D.TEACHERS HOSTEL:

Building : TEACHERS HOSTEL
Consumer No : 11000143832
Service No : 403288

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity Provider	CSPDCL
2	Tariff	LV2ND1OT14
3	Connected Load (KW)	3.7
4	Average Monthly Energy Consumption (Kwh)	519.58
5	Monthly Total Electricity Cost (Avg. In Rs)	5342.5
6	Average Power Factor	-

Observations:

- **At present PF values are not included in the bill.**

2. Electrical Load analysis:

Department	-	Teachers hostel		
Consumer / meter No	-	403288		
Date & time of measurement		25/11/2015 11:12:30		
Actual Energy	kWh	1.2		
Apparent Energy	kVAh	2.70		
Power factor	-	0.44		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	1	1.37	1.20
Apparent power	kVA	2.22	3.21	2.70
Voltage (V_L)	Volts	240.56	252.75	245.77
Current	Amps	0.3	5.43	2.50
Voltage unbalance	%	1.79	3.39	2.26
Current unbalance	%	3.91	6.49	5.64
THD voltage	%	1.80	2.24	2.04
THD current	%	4.85	9.13	7.26

Standards:

- Permissible voltage limit as per CEA standards on grid connectivity is 230 plus or minus 10%, which means 254V is the maximum allowable.

Observations:

- At present maximum voltage came to around 252V which is at the brim. Slight increase in voltage leads damage to the instruments and equipment's

Suggestions:

- Check the voltage level frequently and ascertain that it is within the limits.
- Inform electricity board authorities.

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T8	T12	CEILING FAN NEW	CEILING FAN OLD	EXHAUST FAN
Watts(W)	36	40	60	90	60
Total Nos.	4	52	-	25	2
Total KW	0.14	2.08	-	2.25	0.12
Net total kW	4.59				

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs should be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators should be replaced by energy efficient BLDC fans.

4. LUX MEASUREMENTS

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods, which is applicable to all commercial buildings. One of the methods is Illuminance method, which is the most practicable one. Lux values at various location in the building is given below in Table-

LOCATION	MEASURED LUX	REQUIRED LUX	REMARKS
Corridors	225	150	Good
Average lux in rooms	177	150	Good
Mess hall	123	150	Good

Notes:

- Lux measurements are taken during the day time.

5. Computer & Its Accessories:

DETAILS	WATTS	TOTAL NO	TOTAL KW
Laptop	100	5	0.5

6. Water consumption:

Teachers Hostel consumes water for various purposes like

- Drinking.
- Cooking.
- Toilet flushing's
- Cleaning.
- Washing.

Note:

- Water consumption is not monitored.
- Two stage flushing control should be used in toilets for reducing water wastage.

7. EFFICIENCY ANALYSIS:

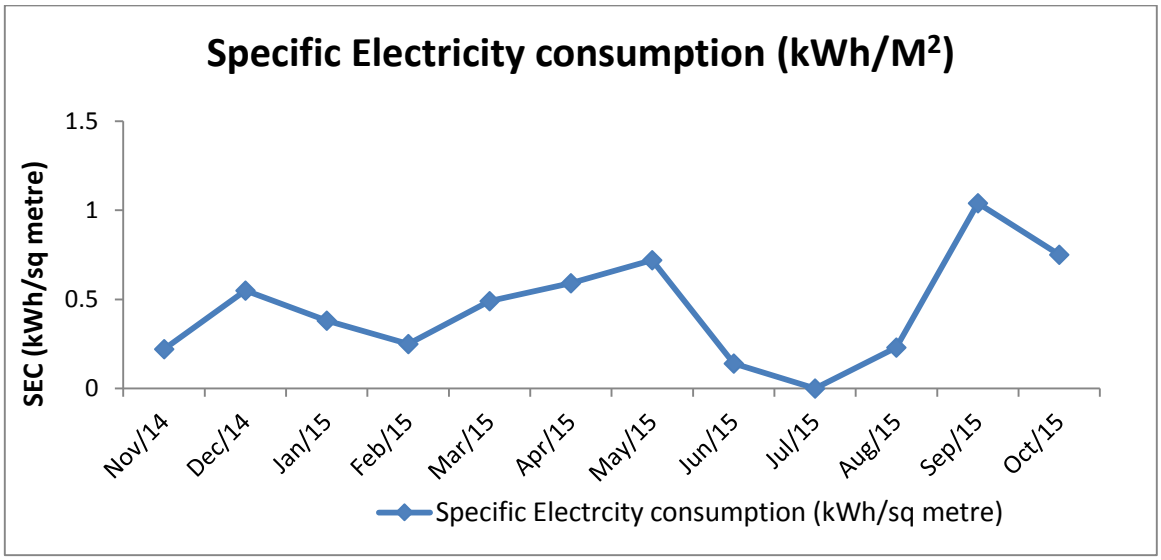
A. Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Nov-14	259	1163.4	0.22
Dec-14	638	1163.4	0.55
Jan-15	444	1163.4	0.38
Feb-15	296	1163.4	0.25
Mar-15	566	1163.4	0.49
Apr-15	688	1163.4	0.59
May-15	840	1163.4	0.72
Jun-15	159	1163.4	0.14
Jul-15	0	1163.4	0.00
Aug-15	265	1163.4	0.23

Sep-15	1209	1163.4	1.04
Oct-15	871	1163.4	0.75

The energy performance index is plotted in the below chart.



Chart

Note:

- Specific electricity consumption found to be varying in all those months.
- Maximum SEC measured in the Sep-2015 and is 1.04 kWh/m^2.
- SEC is highly depended on the occupants in the hostel. Variations are also possible in specific electricity consumption due to energy usage variation in different seasons of the year.

E. AZAD HOSTEL:

Building : AZAD HOSTEL
Consumer No : 1000143929
Service No : 404408

1. **Electrical Bill Analysis:**

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity provider	CSPDCL
2	Tariff	LV2ND1OT14
3	Connected load (kw)	2.1
6	Average monthly energy consumption (kWh)	1149
7	Monthly total electricity cost (avg. In rs)	8050
9	Average power factor	-

Observations:

- **At present, PF is not included in the bill.**

2. **Electrical Load analysis:**

Department	-	Azad hostel		
Consumer / meter No	-	404408		
Date & time of measurement		25-11-2015, 15:41		
Actual Energy	kWh	2.443		
Apparent Energy	kVAh	3.268		
Power factor	-	0.747		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	2.09	7.79	3.37
Apparent power	kVA	2.90	9.94	4.50
Voltage (V_L)	Volts	231.93	246.002	239.92
Current	Amps	3.21	14.08	6.06
Voltage unbalance	%	0.5	0.9	0.7
Current unbalance	%	1.2	12.5	8.5
THD voltage	%	2.35	3.32	2.71
THD current	%	5.48	15.87	9.36

Observations:

- PF found to be low. It should be increase to more than 0.90 using the LV capacitors.

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T12	SVL	CEILING FAN NEW	CEILING FAN OLD	EXHAUST FAN
Watts(W)	40	250	60	90	60
Total Nos.	76	2	-	48	2
Total KW	2.88	0.5	-	4.32	0.12
Net total kW	7.82				

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs should be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators should be replaced by energy efficient BLDC fans.

4. LUX MEASUREMENTS

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods which is applicable to all commercial buildings. One of the methods is Illuminance method which is the most practicable one. Lux values at various location in the building is given below in Table-

LOCATION	MEASURED LUX	REQUIRED LUX	REMARKS
Average lux in rooms	177	150	Good
Corridors	98	150	Poor
Mess hall	212	150	Good

Standards:

- Light intensity measured during the day time.
- Standard lux value based on the ECBC user guide.

5. COMPUTER & its ACCESSORIES:

DETAILS	WATTS	TOTAL NO	TOTAL KW
LCD computer	200	6	1.2
CRT computer	250	--	--
Laptop	100	5	.5
TOTAL kW			1.7

6. Water consumption:

Azad Hostel consumes water for various purposes like

- Drinking.
- Cooking.
- Toilet
- Cleaning.
- Washing.

Note:

- Water consumption is not monitored.
- Two stage flushing control should be used in toilets for reducing water wastage.

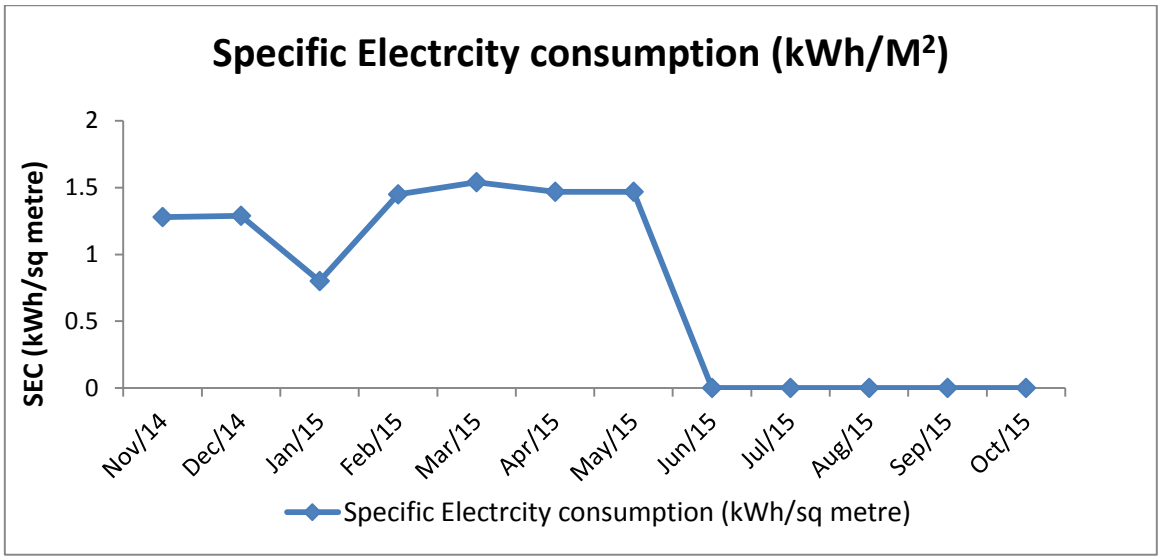
7. EFFICIENCY ANALYSIS:

A. Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Nov-14	1897	1484	1.28
Dec-14	1907	1484	1.29
Jan-15	1183	1484	0.80
Feb-15	2150	1484	1.45
Mar-15	2279	1484	1.54
Apr-15	2186	1484	1.47
May-15	2186	1484	1.47

The energy performance index is plotted in the below chart.



Chart

Note:

- **Energy meter was not working and the unit consumption is not recorded in the bill.**
- Specific electricity consumption found to be varying in all those months.
- Maximum SEC measured in the Mar-2015 and is 1.54 kWh/m^2.
- SEC is highly depended on the occupants in the hostel. Variations are also possible in specific electricity consumption due to energy usage variation in different seasons of the year.

F. RESEARCH HOSTEL GIRLS:

Building : RESEARCH HOSTEL GIRLS
Consumer No : 1000147723
Service No : 771284

1. **Electrical Bill Analysis:**

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity provider	CSPDCL
2	Tariff	LV2ND1OT14
3	Connected load (kw)	2.25
4	Average monthly energy consumption (kwh)	2135.6
5	Monthly total electricity cost (avg. In rs)	14954
6	Average power factor	-

Observations:

- **At present, PF is not included in the bill.**

2. **Electrical Load analysis:**

Department	-	Research hostel girls		
Consumer / meter No	-	771284		
Date & time of measurement		25-11-2015, 11:21		
Actual Energy	kWh	3.86		
Apparent Energy	kVAh	5.45		
Power factor	-	0.708		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	3.09	3.86	3.53
Apparent power	kVA	4.39	5.40	4.98
Voltage (V_L)	Volts	244.2	250.1	247.4
Current	Amps	5.41	8.41	6.61
Voltage unbalance	%	.01	0.6	0.35
Current unbalance	%	1.4	22.8	12.87
THD voltage	%	1.6	2.3	1.87
THD current	%	10.6	14.1	12.15

Observations:

- PF found to be low.

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T8	T12	SVL	CEILING FAN NEW	CEILING FAN OLD	EXHAUST FAN
Watts(W)	36	40	250	60	90	60
Total Nos.	9	45	2	-	26	2
Total KW	0.324	1.8	0.5	-	2.34	0.12
Net total kW	**5.08**					

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs should be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators should be replaced by energy efficient BLDC fans and electronic regulators.

4. LUX MEASUREMENTS

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods which is applicable to all commercial buildings. One of the methods is Illuminance method which is the most practicable one. Lux values at various location in the building is given below in Table-

LOCATION	MEASURED LUX	REQUIRED LUX	REMARKS
Average lux in rooms	167	150	Good
Corridors	118	150	Good

Note:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBE user guide.

5. COMPUTER & its ACCESSORIES:

DETAILS	WATTS	TOTAL NO	TOTAL KW
LCD computer	200	---	----
CRT computer	250	5	1.25
Laptop	100	10	1
TOTAL kW			2.25

6. Water consumption:

Research hostel girls consumes water for various purposes like

- Drinking.
- Cooking.
- Toilet
- Cleaning.
- Washing.

Note:

- Water consumption is not monitored.
- Two stage flushing control should be used in toilets for reducing water wastage.

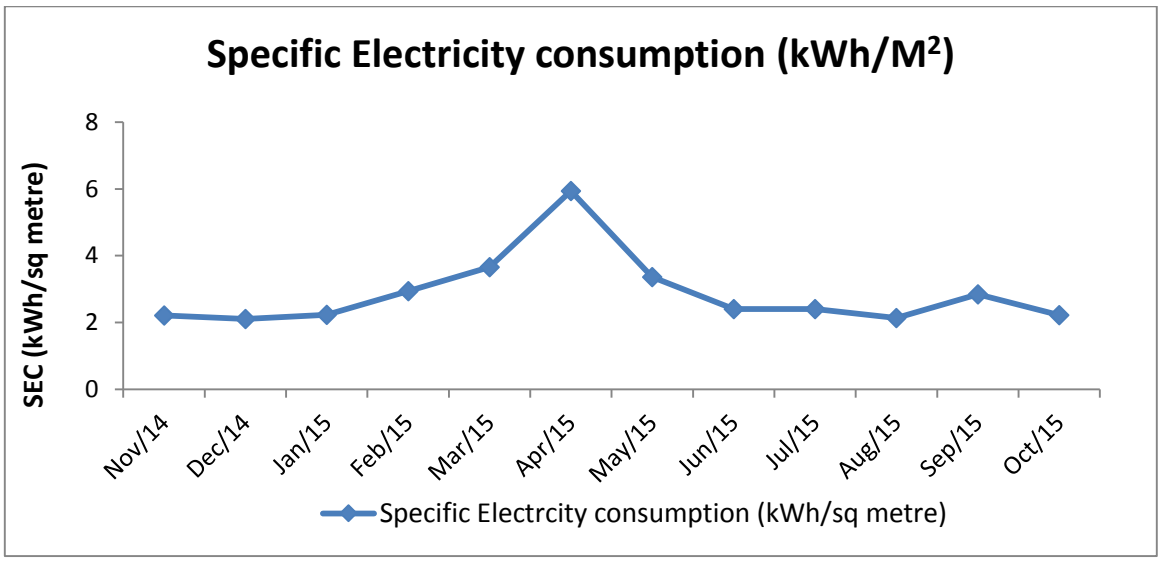
7. EFFICIENCY ANALYSIS:

Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Nov-14	1643	744	2.21
Dec-14	1563	744	2.10
Jan-15	1662	744	2.23
Feb-15	2189	744	2.94
Mar-15	2719	744	3.65
Apr-15	4418	744	5.94
May-15	2500	744	3.36
Jun-15	1790	744	2.41
Jul-15	1790	744	2.41
Aug-15	1588	744	2.13
Sep-15	2113	744	2.84
Oct-15	1653	744	2.22

The energy performance index is plotted in the below chart.



Chart

Note:

- Specific electricity consumption found to be varying in all those months.
- Maximum SEC measured in the Apr-2015 and is 5.94 kWh/m^2.
- SEC is highly depended on the occupants in the hostel. Variations are also possible in specific electricity consumption due to energy usage variation in different seasons of the year.

G.PROFESSIONAL GIRLS HOSTEL:

Building : GIRLS HOSTEL
Consumer No : 1000150618
Service No : 774229

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity provider	CSPDCL
2	Tariff	LV2ND1OT14
3	Connected load (kw)	7.4
4	Average monthly energy consumption (kwh)	2483.66
5	Monthly total electricity cost (avg. In rs)	18066.66
6	Average power factor	-

Observations:

- **At present, PF is not included in the bill.**

2. Electrical Load analysis:

Department	-	Professional girls hostel		
Consumer / meter No	-	774229		
Date & time of measurement		25-11-2015,13:11		
Actual Energy	kWh	1.36		
Apparent Energy	kVAh	2.10		
Power factor	-	0.64		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	1.77	2.02	1.90
Apparent power	kVA	2.77	3.07	2.93
Voltage (V_L)	Volts	249.7	256.5	252.49
Current	Amps	3.24	4.21	3.94
Voltage unbalance	%	0.4	1.3	0.86
Current unbalance	%	10.6	16.23	11.4
THD voltage	%	1.7	2.5	2.20
THD current	%	6.9	12.2	9.79

Standards:

- Permissible voltage limit as per CEA standards on grid connectivity is 230 plus or minus 10%, which means 254V is the maximum allowable.

Observations:

- At present maximum voltage exceeded the permissible limit which should be taken care of by reporting it to the supplier.
- Increase in the voltage increases the consumption of electricity and also the failure frequency of the equipment.

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T12	SVL	BULB	CEILING FAN NEW	CEILING FAN OLD	EXHAUST FAN
Watts(W)	40	250	40	60	90	60
Total Nos.	72	2	2	-	39	3
Total KW	2.88	0.5	0.08	-	3.51	0.18
Net total kW	**7.15**					

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs should be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators should be replaced by energy efficient BLDC fans.

4. LUX MEASUREMENTS

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods, which is applicable to all commercial buildings. One of the methods is Illuminance method, which is the most practicable one.

LOCATION	MEASURED LUX	REQUIRED LUX	REMARKS
Average lux in rooms	225	150	Good
Average lux corridors	189	150	Good

Note:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBC user guide.

5. Computer & Its Accessories:

DETAILS	WATTS	TOTAL NO	TOTAL KW
Laptop	100	5	0.5

6. Water consumption:

Girls' hostel consumes water for various purposes like

- Drinking.
- Cooking.
- Toilet flushing's
- Cleaning

Note:

- Water consumption is not monitored.
- Two stage flushing control should be used in toilets for reducing water wastage.

7. EFFICIENCY ANALYSIS:

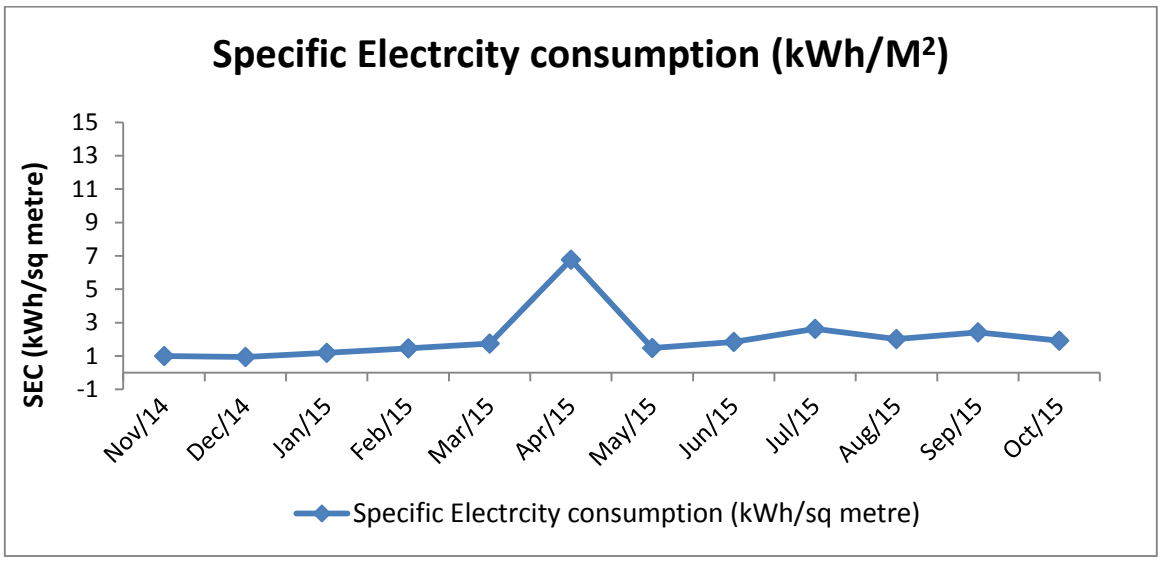
Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Nov-14	1185	1172.4	1.01
Dec-14	1115	1172.4	0.95
Jan-15	1400	1172.4	1.19
Feb-15	1710	1172.4	1.46
Mar-15	2060	1172.4	1.76
Apr-15	7926	1172.4	6.76
May-15	1725	1172.4	1.47
Jun-15	2153	1172.4	1.84
Jul-15	3077	1172.4	2.62
Aug-15	2368	1172.4	2.02
Sep-15	2839	1172.4	2.42

Oct-15	2246	1172.4	1.92

The energy performance index is plotted in the below chart.



Chart

Note:

- Specific electricity consumption found to be varying in all those months.
- Maximum SEC measured in the Apr-2015 and is 6.76 kWh/m^2.
- SEC is highly depended on the occupants in the hostel. Variations are also possible in specific electricity consumption due to energy usage variation in different seasons of the year.
- Variation in SEC due to the variation in accommodation

H. RESEARCH BOYS HOSTEL:

Building : RESEARCH BOYS HOSTEL
Consumer No : 1000604598
Service No : 606167

1. **Electrical Bill Analysis:**

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity provider	CSPDCL
2	Tariff	LV1DL1GN14
3	Connected load (kw)	3.94
4	Average monthly energy consumption (kwh)	345.5
5	Monthly total electricity cost (avg. In rs)	1414.16
6	Average power factor	-

Observations:

- **PF is not mentioned in the EB bill.**

2. **Electrical Load analysis:**

Department	-	Research boys hostel		
Consumer / meter No	-	606167		
Date & time of measurement		25-11-2015, 15:32		
Actual Energy	KWh	.032		
Apparent Energy	KVAh	.044		
Power factor	-	0.72		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	Kw	0.15	0.19	0.16
Apparent power	Kva	0.20	0.29	0.21
Voltage (V_L)	Volts	238.3	241.3	239.3
Current	Amps	0	0.96	0.34
Voltage unbalance	%	0.1	0.8	0.41
Current unbalance	%	109.3	136.1	112.8
THD voltage	%	2.9	3	2.9
THD current	%	3.2	4.1	2.30

Notes:

PF found to be low during the logging period.

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T12	CFL	BULB	CEILING FAN NEW	CEILING FAN OLD	EXHAUST FAN
Watts(W)	40	36	40	60	90	60
Total Nos.	34	1	2	-	25	2
Total KW	1.36	0.036	.08	-	2.25	0.12
Net total kW	**3.84**					

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs may be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators may be replaced by energy efficient fans.

4. Lux Measurements

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods which is applicable to all commercial buildings. One of the methods is Illuminance method which is the most practicable one.

Location	Measured	Required	Remarks
Average lux in rooms	189	150	Good
Corridors	226	150	Good

Note:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBC user guide.

5. Computer & Its Accessories:

DETAILS	WATTS	TOTAL NO	TOTAL KW
Laptop	100	5	0.5

6. WATER CONSUMPTION:

Electronics and photonics department consumes water for various purposes like

- Drinking.
- Cooking.
- Toilet flushing's
- Cleaning

Note:

- Water consumption is not monitored.
- Two stage flushing control may be used in toilets for reducing water wastage.

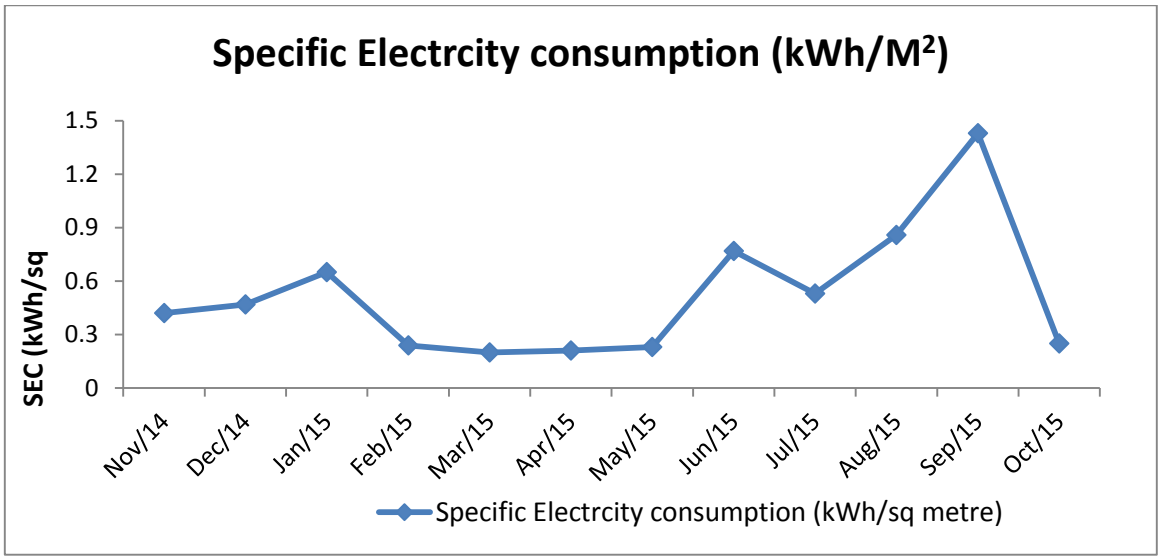
7. EFFICIENCY ANALYSIS:

Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Nov-14	281	656	0.42
Dec-14	314	656	0.47
Jan-15	432	656	0.65
Feb-15	158	656	0.24
Mar-15	135	656	0.20
Apr-15	140	656	0.21
May-15	157	656	0.23
Jun-15	506	656	0.77
Jul-15	348	656	0.53
Aug-15	565	656	0.86
Sep-15	940	656	1.43
Oct-15	170	656	0.25

The energy performance index is plotted in the below chart.



Chart

Note:

- Specific electricity consumption found to be varying in all those months.
- Maximum SEC measured in the Sep-2015 and is 1.43 kWh/m^2.
- SEC is highly depended on the occupants in the hostel. Variations are also possible in specific electricity consumption due to energy usage variation in different seasons of the year.

I. GIRLS HOSTEL PUMP HOUSE:

Building : Near GIRLS HOSTEL
Consumer No : 1000145454
Service No : 406131

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity provider	CSPDCL
2	Tariff	LV2ND1OT14
3	Connected load (kw)	3.73
4	Average monthly energy consumption (kwh)	983.5
5	Monthly total electricity cost (avg. In rs)	6405
6	Average power factor	-

Observations:

- **At present, PF is not included in the bill.**

2. Electrical Load analysis:

Submersible pumps is used in the premises to pump the water to geography, Girls hostel, Registrar bungalow, Teachers colony etc. Rated power found to be 5HP and the rated discharge and head was not available at the university records.

Department	-	Pump room		
Consumer / meter No	-	406131		
Date & time of measurement		25-11-2015, 16:54		
Actual Energy	kWh	0.387		
Apparent Energy	kVAh	0.602		
Power factor	-	0.642		
Particulars	**Units**	Minimum	Maximum	Average
Active power	kW	3.01	3.13	3.03
Apparent power	kVA	4.69	4.77	4.61
Voltage (V_L)	Volts	251.1	254.1	252.4
Current	Amps	6.01	6.43	6.22
Voltage unbalance	%	0.3	0.4	0.37
Current unbalance	%	2.8	3.5	3.08
THD voltage	%	1.7	2.0	1.89
THD current	%	2.3	2.6	2.44

Standards:

- Permissible voltage limit as per CEA standards on grid connectivity is 230 plus or minus 10%, which means 254V is the maximum allowable.

Observations:

- At present maximum voltage exceeded the permissible limit which should be taken care of by reporting it to the supplier.
- Increase in the voltage increases the consumption of electricity and also the failure frequency of the equipment.
- PF found to be low should be increase to more than 0.9 using the LV capacitor

Specific electricity consumption:

- Area was not available for the pump house thus SEC couldn't calculate.

J. Street Light:

Consumer No : 1000145454

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity provider	CSPDCL
2	Tariff	LV6PU3SL14
3	Connected load (kw)	23.76
4	Average monthly energy consumption (kwh)	4756
5	Monthly total electricity cost (avg. In rs)	25,000
6	Average power factor	0.93

Observations:

- **At present, maximum demand is not provided in the bill.**
- **PF found to be within the prescribed limit.**

2. Electrical Load analysis:

The whole university street lights are supplied from this single metre which is a good practice. Operating hours of street lights found to be 12 hours. Using the power quality analyser street lights are logged for half an hour and details are given below in table

Department	-	Street light
Consumer / meter No	-	1002273059
Date & time of measurement		25/11/2015 16:54:00
Active Energy	kWh	10.50
Apparent Energy	kVAh	15.89

Power factor	-	0.66		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	13.24	14.0	13.69
Apparent power	kVA	19.84	21.51	20.73
Voltage (V_L)	Volts	241.23	263.21	251.87
Current	Amps	10.10	36.26	21.13
Voltage unbalance	%	0.2	0.9	0.5
Current unbalance	%	1.5	15.2	10.5
THD voltage	%	1.41	2.09	1.75
THD current	%	22.34	42.00	30.23

Standards:

- Permissible voltage limit as per CEA standards on grid connectivity is 230 plus or minus 10%, which means 254V is the maximum allowable.

Observations:

- At present, maximum voltage exceeded the permissible limit which should be taken care of by reporting it to the supplier.
- Increase in the voltage increases the consumption of electricity and also the failure frequency of the equipment.

3. LIGHT LOAD DETAILS:

Details	T8	SVL
Watts(W)	36	300
Total Nos.	30	60
Total KW	1.08	18
Net total kW	**19.08**	

Specific electricity consumption:

- Area was not available for the pump house thus SEC couldn't calculate.

II. MEASUREMENTS TAKEN ON 26-11-2015

A. SOS IN ELECTRONICS AND PHOTONICS:

Building : ELECTRONICS AND PHOTONICS
Department : ELECTRONICS AND PHOTONICS
Consumer No : 1000147721
Service No : 771282

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity provider	CSPDCL
2	Tariff	LV2ND1OT14
3	Connected load (kw)	34.3
4	Average monthly energy consumption (kwh)	1150.09
5	Monthly total electricity cost (avg. In rs)	18684.5
6	Average power factor	-

Observations:

- **At present, PF is not included in the bill.**

2. Electrical Load analysis:

Department	-	Electronics and photonics		
Consumer / meter No	-	771282		
Date & time of measurement		26/11/2015 11:25		
Actual Energy	kWh	4.81		
Apparent Energy	kVAh	5.75		
Power factor	-	0.83		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	2.29	11.5	4.78
Apparent power	kVA	3.1	12.3	5.71
Voltage (V_L)	Volts	240	248.2	244.94
Current	Amps	0	38.18	8.08
Voltage unbalance	%	1.2	2	1.41
Current unbalance	%	99.2	199.3	149.72
THD voltage	%	1.7	2.3	2.0
THD current	%	6.3	84	26.21

Observations:

- PF found to be low in the department.

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T12	CFL	CEILING FAN NEW	CEILING FAN OLD	EXHAUST FAN
Watts(W)	40	15	60	90	60
Total Nos.	3J5	3	5	13	1
Total KW	1.4	0.045	0.3	1.17	.06
Net total kW	**2.975**				

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs should be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators should be replaced by energy efficient BLDC fans.

4. LUX MEASUREMENTS

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods, which is applicable to all commercial buildings. One of the methods is Illuminance method, which is the most practicable one.

LOCATION	MEASURED LUX	REQUIRED LUX	REMARKS
Embedded lab	334	250	Good
Mr. Tiwary's cabin	221	150	Good
Ms. Kavitha Takur's	196	150	Good
Class room	210	150	Good
HOD cabin	264	150	Good
Office	256	250	Good
Photonics lab	351	250	Good
M-Tech class room	267	150	Good

Note:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBC user guide.

5. COMPUTER & its ACCESSORIES:

DETAILS	WATTS	TOTAL NO	TOTAL KW
LCD computer	200	13	2.6
CRT computer	250	16	4
Laptop	100	-	-
Scanner	200	2	0.5
Xerox	350	1	0.35
Laser	200	2	0.4
3 in one printer	300	2	0.6
TOTAL kW			8.45

6. Air conditioning:

Electronics and photonics department have installed a total of 13 Split AC in the department including office, class rooms, laboratories etc. and their efficiency calculations are given below in table.

LOCATION	TYPE	COOLING CAPACITY (TR)	MEASURED COOLING CAPACITY (KW)	RATED POWER ELECTRICAL (kW)	RATED EER	MEASURED EER	RERKS
Embedded lab	Split 1	2		NO AIR FLOW			To be check
Embedded lab	Split 2	2	4.8	2.3	2.8	2.09	
Tiwari sir cabin	Split	1.5	4.3	1.773	2.72	2.45	
Kavitha takur cabin	Split	1.5	4.1	1.773	2.72	2.33	
Class room	Split 1	1.5	4.2	1.875	2.75	2.29	
Class room	Split 2	1.5	4.10	1.9	2.66	2.16	
Hod cabin	Split	1.5	4.3	1.8	2.92	2.42	
Office	Split	1.5	4.02	1.773	2.72	2.27	
Photonics lab	Split	1.5	4.09	1.773	2.76	**2.31**	
Photonics lab	Split	1.5	3.9	1.773	2.76	2.24	
Photonics lab	Split	1.5	4.1	1.773	2.76	2.36	
M-Tech class room	Split	2	Not connected				Check
M-Tech class room	Split	2	Not connected				Check

Notes:

- General suggestions are given in the annexure:
- Most of the AC found to be new and are working well.

7. Water consumption:

Electronics and photonics department consumes water for various purposes like

- Drinking.
- Toilet flushing's
- Cleaning

Note:

- Water consumption is not monitored.
- Two stage flushing control should be used in toilets for reducing water wastage.

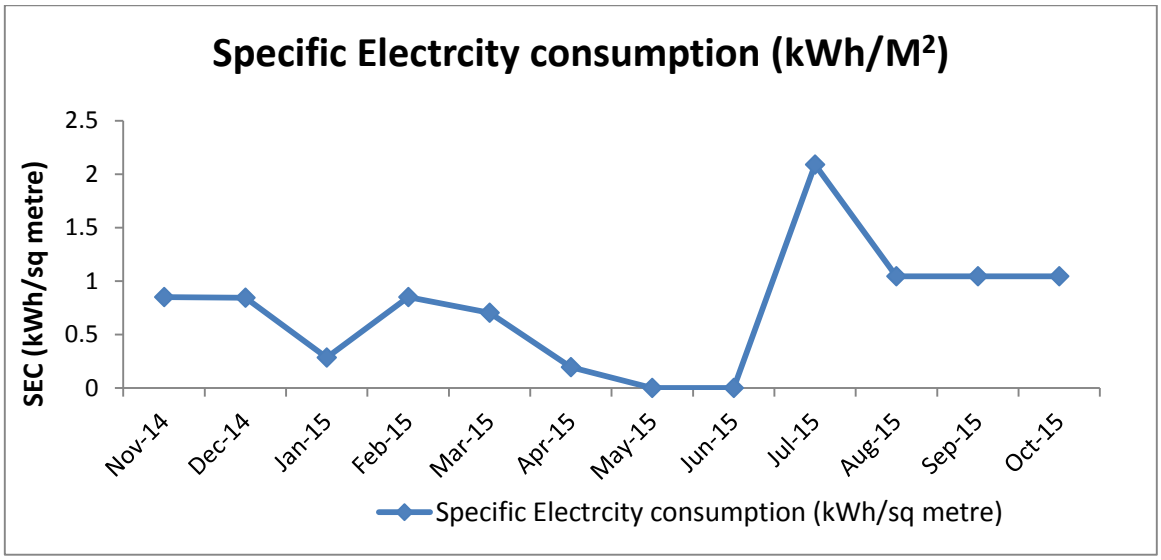
8. EFFICIENCY ANALYSIS:

A. Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Nov-14	1201	1409.44	0.85
Dec-14	1193	1409.44	0.845
Jan-15	403	1409.44	0.285
Feb-15	1202	1409.44	0.85
Mar-15	997	1409.44	0.705
Apr-15	280	1409.44	0.195
May-15	–	1409.44	0
Jun-15	-	1409.44	0
Jul-15	2950	1409.44	2.09
Aug-15	1475	1409.44	1.045
Sep-15	1475	1409.44	1.045
Oct-15	1475	1409.44	1.045

The energy performance index is plotted in the below chart.



Chart

Note:

- Specific electricity consumption found to be varying in all those months.
- Maximum SEC measured in the Jul-2015 and is 2.09 kWh/m^2.
- SEC is highly depended on the occupants in the hostel. Variations are also possible in specific electricity consumption due to energy usage variation in different seasons of the year.

B. SOS IN COMPUTER SCIENCE & IT :

i. Building : OLD COMPUTER BUILDING
Department : SOS IN COMPUTER SCIENCE & IT
Consumer No : 1000298132
Service No : 773349

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity provider	CSPDCL
2	Tariff	LV2ND3OT14
3	Connected load (kw)	20
4	Average monthly energy consumption (kwh)	1335.5
5	Monthly total electricity cost (avg. In rs)	13303.33
6	Average power factor	0.86

Observations:

- **PF is found to be greater than 0.85 which is the limit in last 6 months electricity bill which is good practice.**

2. Electrical Load analysis:

Department	-	Old Computer science building		
Consumer / meter No	-	773349		
Date & time of measurement		26/11/2015 16:08:30		
Actual Energy	KWh	1.28		
Apparent Energy	KVAh	2.30		
Power factor	-	0.55		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	Kw	2.26	4.32	3.49
Apparent power	Kva	3.82	7.96	6.29
Voltage (V_L)	Volts	249.62	256.22	252.84
Current	Amps	2.10	13.33	5.62
Voltage unbalance	%	0.5	1.1	0.8
Current unbalance	%	2.5	25.6	12.5
THD voltage	%	2.92	3.51	3.32
THD current	%	11.51	37.95	22.0

Standards:

- Permissible voltage limit as per CEA standards on grid connectivity is 230 plus or minus 10%, which means 254V is the maximum allowable.

Observations:

- At present maximum voltage exceeded the permissible limit which should be taken care of by reporting it to the supplier.
- Increase in the voltage increases the consumption of electricity and also the failure frequency of the equipment.

ii. Building : NEW COMPUTER BUILDING
Department : SOS IN COMPUTER SCIENCE & IT
Consumer No : 1001927961
Service No : 406284

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity provider	CSPDCL
2	Tariff	LV2ND3OT14
3	Connected load (kW)	40
4	Average monthly energy consumption (kWh)	923.25
5	Monthly total electricity cost (avg. In Rs)	19356.66
6	Average power factor	0.96

Observations:

- **PF found to be good according to the EB bill**

2. Electrical Load analysis:

Department	-	Computer science New building		
Consumer / meter No	-	406284		
Date & time of measurement		26/11/2015 15:54		
Actual Energy	kWh	0.52		
Apparent Energy	kVAh	0.76		
Power factor	-	0.68		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	0.58	0.84	0.75
Apparent power	kVA	0.80	1.2	1.09

Voltage (V_L)	Volts	246.1	259.3	252.1
Current	Amps	0	2.25	1.53
Voltage unbalance	%	2.4	2.98	2.7
Current unbalance	%	61.8	112.1	72.96
THD voltage	%	3.1	3.6	3.29
THD current	%	9.4	54.2	19.0

Standards:

- Permissible voltage limit as per CEA standards on grid connectivity is 230 plus or minus 10%, which means 254V is the maximum allowable.

Observations:

- At present maximum voltage exceeded the permissible limit which should be taken care of by reporting it to the supplier.
- Increase in the voltage increases the consumption of electricity and also the failure frequency of the equipment.

iii. Building :COMPUTER SERVER ROOM
Department : SOS IN COMPUTER SCIENCE & IT
Consumer No : 1001980067
Service No : 406285

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity provider	CSPDCL
2	Tariff	LV2ND3OT14
3	Connected load (kW)	10
4	Average monthly energy consumption (kWh)	3167.91
5	Monthly total electricity cost (avg. In Rs)	28151.66
6	Average power factor	0.83

Observations:

- **PF found to be low. It should be increased to more than 0.85 to avoid the penalty from the CSPDCL. At present, no penalty issued by the CSPDCL in this regard.**

2. Electrical Load analysis:

Department	-	Computer science server room
Consumer / meter No	-	406285
Date & time of measurement		26/11/2015 15:11
Actual Energy	kWh	0.48

Apparent Energy	kVAh	4.54		
Power factor	-	0.10		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	0.22	1.08	0.66
Apparent power	kVA	4.38	8.25	6.20
Voltage (V_L)	Volts	243.9	264.3	252.2
Current	Amps	4.62	13.38	7.09
Voltage unbalance	%	0.6	0.85	0.65
Current unbalance	%	5.3	36.3	22.1
THD voltage	%	3.03	4.20	3.49
THD current	%	23.17	96	69.5

Standards:

- Permissible voltage limit as per CEA standards on grid connectivity is 230 plus or minus 10%, which means 254V is the maximum allowable.

Observations:

- At present maximum voltage exceeded the permissible limit which should be taken care of by reporting it to the supplier.
- Increase in the voltage increases the consumption of electricity and also the failure frequency of the equipment.

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T12	CFL	CFL	CEILING FAN NEW	CEILING FAN OLD	EXHAUST FAN
Watts(W)	40	36	15	60	90	60
Total Nos.	125	5	2	33	50	3
Total KW	5	0.18	0.03	1.98	4.5	0.18
Net total Kw	**13.76**					

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs should be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators should be replaced by energy efficient BLDC fans.

4. Lux Measurements

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods, which is applicable to all commercial buildings. One of the methods is Illuminance method, which is the most practicable one. Light intensity at the various locations are given below in table-

LOCATION	MEASURED LUX	REQUIRED LUX	REMARKS
Average lux in class rooms	175	150	Good
Faculty room	198	150	Good
Dr Sanjay kumar	202	150	Good
Dr UK. Patel	189	150	Good
Seminar hall	221	150	Good
Computer lab ground floor	342	250	Good
Computer lab first floor	369	250	Good

Note:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBC user guide.

5. Computer & Its Accessories:

DETAILS	WATTS	TOTAL NO	TOTAL KW
LCD computer	200	67	13.4
CRT computer	250	-	-
Laptop	100	2	0.2
Scanner	200	1	0.2
Xerox	350	1	0.35
Laser	200	3	0.6
3 in one printer	300	-	-
TOTAL kW			14.75

6. Air conditioning:

Computer science department have installed a total of 22 Split AC in the department including office, class rooms, laboratories etc. and their efficiency calculations are given below in table.

LOCATION	TYPE	COOLING CAPACITY (TR)	MEASURED COOLING CAPACITY KW	RATED POWER ELECTRICAL (KW)	RATED EER	MEASURED EER
Dr.Sanjay	Split	2	6.4	2.5	2.7	2.56
Dr.VK Patel	Split	2	6.2	2.5	2.7	2.49
Computer lab FF	Split 1	1.5	4.9	1.55	3.4	3.21
	Split 2	1.5	5.1	1.55	3.4	3.3
	Split 3	1.5	5.06	1.55	3.4	3.27

	Split 4	1.5	4.82	1.55	3.4	3.11
	Split 5	1.5	5.05	1.55	3.4	3.26
	Split 6	1.5	5.14	1.55	3.4	3.32
	Split 7	1.5	5.03	1.55	3.4	3.25
	Split 8	1.5	4.80	1.55	3.4	3.10
	Split 9	1.5	5.14	1.55	3.4	3.32
	Split 10	1.5	4.78	1.55	3.4	3.09
	Split 11	1.5	4.99	1.55	3.4	3.22
	Split 12	1.5	4.89	1.55	3.4	3.16
	Split 13	1.5	4.99	1.55	3.4	3.22
	Split 14	1.5	4.91	1.55	3.4	3.17
	Split 15	1.5	5.11	1.55	3.4	3.30
	Split 16	1.5	4.89	1.55	3.4	3.16
	Split 17	1.5	5.02	1.55	3.4	3.24
	Split 18	1.5	5.09	1.55	3.4	3.29
	Split 19	1.5	4.92	1.55	3.4	3.18
	Split 20	1.5	5.06	1.55	3.4	3.27
Computer lab gf	Split 1	Not working				
	Split 2	Not working				
	Split 3	1.5	3.4	2.5	2.11	1.36
Seminar hall	12 split ac	Damaged				

Notes:

- In seminar hall Split AC are in poor condition and are not working. Change the Split AC in the seminar hall with new one.

7. WATER CONSUMPTION:

Computer science department consumes water for various purposes like

- Drinking.
- Toilet
- Cleaning

Note:

- Water consumption is not monitored.
- Two stage flushing control should be used in toilets for reducing water wastage.

8. EFFICIENCY ANALYSIS:

Specific electricity consumption:

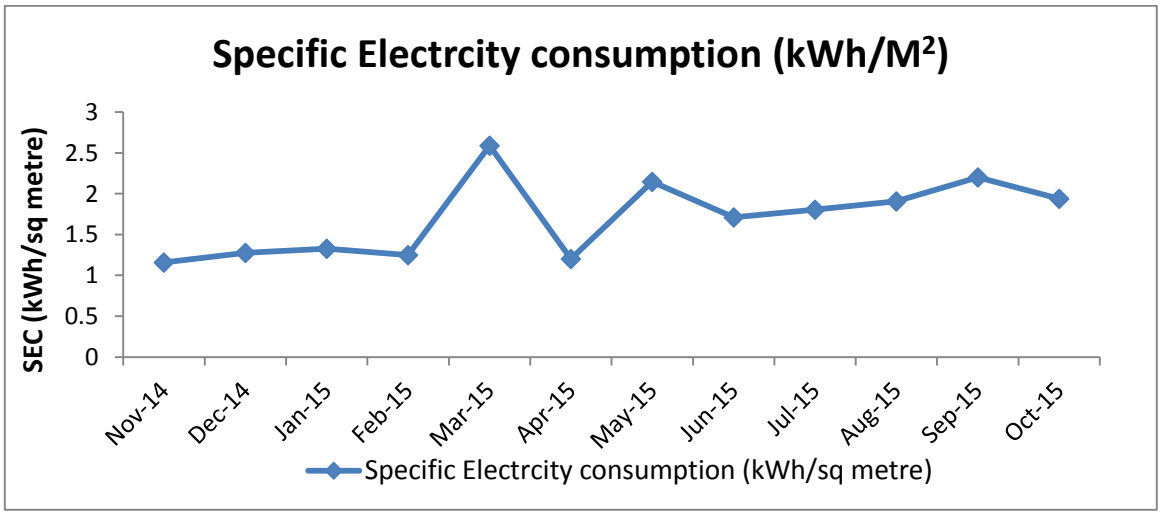
Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Nov-14	3690	3171.36	1.16
Dec-14	4048	3171.36	1.275
Jan-15	4205	3171.36	1.325
Feb-15	3975	3171.36	1.25
Mar-15	8216	3171.36	2.59
Apr-15	3813	3171.36	1.2
May-15	6817	3171.36	2.145
Jun-15	5428	3171.36	1.71
Jul-15	5736	3171.36	1.805
Aug-15	6049	3171.36	1.905
Sep-15	6986	3171.36	2.2
Oct-15	6157	3171.36	1.94

Note:

- The electricity consumption taken from the last 12 months electricity bill. It's the sum of units consumed through the three meter installed in the computer science building

The energy performance index is plotted in the below chart.



Note:

- Specific electricity consumption found to be varying in all those months.
- Maximum SEC measured in the Mar-2015 and is 2.59 kWh/m^2.
- SEC is highly depended on the seasonal changes and the number of working days in a month. Variations are also possible in specific electricity consumption due to energy usage variation in different seasons of the year

C. HUMAN RECOURCES DEVELOPMENT CENTRE:

Building : HRDC
Department : HRDC
Consumer No : 1005795195

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity provider	CSPDCL
2	Tariff	LV2ND3OT14
3	Connected load (kW)	40
4	Average power factor	0.85

Observations:

- **PF found to be good in the department.**
- **New metre installed in the premises and the previous data are not available.**

1. Electrical Load analysis:

Department	-	HRDC		
Consumer / meter No	-	1005795195		
Date & time of measurement		26/11/2015 14:59		
Actual Energy	kWh	3.42		
Apparent Energy	kVAh	3.74		
Power factor	-	0.91		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	3.05	5.17	4.02
Apparent power	kVA	3.44	5.53	4.40
Voltage (V_L)	Volts	250.1	255.2	252.0
Current	Amps	2.43	9.55	5.80
Voltage unbalance	%	0.7	0.9	0.81

Current unbalance	%	32.6	84.6	59.43
THD voltage	%	3	4.4	3.55
THD current	%	7	47.2	29.43

Standards:

- Permissible voltage limit as per CEA standards on grid connectivity is 230 plus or minus 10%, which means 254V is the maximum allowable.

Observations:

- At present maximum voltage exceeded the permissible limit which should be taken care of by reporting it to the supplier.
- Increase in the voltage increases the consumption of electricity and also the failure frequency of the equipment.
- PF found to be good in the system.

2. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T12	CFL	BULB	CEILING FAN NEW	CEILING FAN OLD	EXHAUST FAN
Watts(W)	40	15	40	60	90	60
Total Nos.	90	6	-	-	57	3
Total KW	3.6	.09	-	-	5.13	0.18
Net total Kw	**9**					

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs should be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators should be replaced by energy efficient BLDC fans.

3. Lux Measurements

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods which is applicable to all commercial buildings. One of the methods is Illuminance method which is the most practicable one.

LOCATION	MEASURED LUX	REQUIRED LUX	REMARKS
Director room	207	150	Good
Dr.Aravind Agarwal	172	150	Good
Lecture hall	189	150	Good
Computer lab	266	250	Good
Lecture hall 1	196	150	Good
Lecture hall 2	201	150	Good
Seminar hall	226	**150**	**Good**

Faculty room	241	**150**	**Good**
Library	223	**250**	**Average**

Note:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBC user guide.

4. Computer & Its Accessories:

DETAILS	WATTS	TOTAL NO	TOTAL KW
LCD computer	200	20	4
Scanner	200	1	0.2
Xerox	350	1	0.35
Laser	200	4	0.8
3 in one printer	300	1	0.3
TOTAL kW			5.65

5. Air conditioning:

HRDC department have installed a total of 17 Split AC in the department including office, class rooms, laboratories etc. and their efficiency calculations are given below in table.

LOCATION	TYPE	COOLING CAPACITY (TR)	MEASURED COOLING CAPACITY (KW)	RATED POWER ELECTRICAL (KW)	RATED EER	MEASURED EER
Store room	Split	1.5	5.16	1.55	3.4	3.33
Director room	Split	1.5	5.14	1.55	3.4	3.32
Dr.Aravind	Split	1.5	5.25	1.55	3.4	3.39
Lecture hall	Split	1.5	5.22	1.55	3.4	3.37
	Split	1.5	5.23	1.55	3.4	3.38
Computer lab	Split	1.5	5.20	1.55	3.4	3.36
	Split	1.5	5.23	1.55	3.4	3.38
Lecture hall 1	Split	1.5	5.17	1.55	3.4	3.34
	Split	1.5	5.19	1.55	3.4	3.35
Lecture hall 2	Split	1.5	5.25	1.55	3.4	**3.39**
	Split	1.5	5.23	1.55	3.4	3.38
Seminar hall	Split	1.5	5.17	1.55	3.4	3.34
	Split	1.5	5.14	1.55	3.4	3.32
	Split	1.5	5.19	1.55	3.4	3.35
Faculty room	Split	1.5	5.17	1.55	3.4	3.34
Library	Split	1.5	5.13	1.55	3.4	3.31
	Split	1.5	5.16	1.55	3.4	3.33

6. WATER CONSUMPTION:

HRDC department consumes water for various purposes like

- Drinking.
- Toilet flushing's
- Cleaning

Note:

- Water consumption is not monitored.
- Two stage flushing control should be used in toilets for reducing water wastage.

D. INSTITUTE OF MANAGEMENT:

Building : MBA
Department : MBA
Consumer No : 100298314
Service No : 773578

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity provider	CSPDCL
2	Tariff	LV2ND3OT14
3	Connected load (kW)	51.7
4	Average monthly energy consumption (kWh)	1883.33
5	Monthly total electricity cost (avg. In Rs)	64740
6	Average power factor	0.80

Observations:

- **PF found to be low in the building. Increase the PF to above 0.9 by installing the LV capacitors**

2. Electrical Load analysis:

Department	-	MBA dept		
Consumer / meter No	-	773578		
Date & time of measurement		26/11/2015 12:58		
Actual Energy	kWh	5.26		
Apparent Energy	kVAh	7.23		
Power factor	-	0.72		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	4.25	6.28	5.26
Apparent power	kVA	5.84	8.61	7.23

Voltage (V_L)	Volts	251.8	255.1	253.2
Current	Amps	0.77	16.31	10.07
Voltage unbalance	%	0.1	0.6	0.35
Current unbalance	%	62.5	90.7	76.3
THD voltage	%	2.7	3.2	2.9
THD current	%	6.1	15.5	8.38

Standards:

- Permissible voltage limit as per CEA standards on grid connectivity is 230 plus or minus 10%, which means 254V is the maximum allowable.

Observations:

- At present maximum voltage exceeded the permissible limit which should be taken care of by reporting it to the supplier.
- Increase in the voltage increases the consumption of electricity and also the failure frequency of the equipment.

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T12	CFL	CFL	WALL FAN	CEILING FAN OLD	EXHAUST FAN
Watts(W)	40	15	36	60	90	60
Total Nos.	126	7	8	2	81	1
Total KW	5.04	0.105	0.288	0.12	7.29	0.06
Net total Kw	**12.90**					

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs should be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators should be replaced by energy efficient BLDC fans.

4. Lux Measurements

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods which is applicable to all commercial buildings. One of the methods is Illuminance method which is the most practicable one.

LOCATION	MEASURED LUX	REQUIRED LUX	REMARKS
AK Srivasthava	298	150	Good
RP Das	276	150	Good
Computer lab	298	250	Good
Faculty room	176	150	Good
Office	203	150	Good

Average lux in class rooms	231	150	Good

Observations & suggestions:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBC user guide.

5. Computer & Its Accessories:

DETAILS	WATTS	TOTAL NO	TOTAL KW
LCD computer	200	9	1.8
CRT computer	250	20	5
Scanner	200	1	0.2
Xerox	350	1	0.35
Laser	200	4	0.8
3 in one printer	300	1	0.3
Total kW			8.45

6. Air conditioning:

Management department have installed a total of 7 Split AC in the department including office, class rooms, laboratories etc. and their efficiency calculations are given below in table.

LOCATION	TYPE	COOLING CAPACITY (TR)	MEASURED COOLING CAPACITY KW	RATED POWER ELECTRICAL (Kw)	RATED EER	MEASURED EER
Ak Srivasthava	Split	1.5	4.02	1.8	2.9	2.24
RP Das	Split	1.5	3.65	1.8	2.9	2.31
Computer lab	Split	2	Not working			
Computer lab	Split	2	Not working			
Computer lab	Split	2	Not working			
Computer lab	Split	2	Not working			
Computer lab	Split	2	Not working			

Note:

- **Computer Lab AC is found to be old and not working. It needs an urgent replacement with Five star split AC.**

7. WATER CONSUMPTION:

The institute of management consumes water for various purposes like

- Drinking.
- Toilet

- Cleaning

Note:

- Water consumption is not monitored.
- Two stage flushing control should be used in toilets for reducing water wastage.

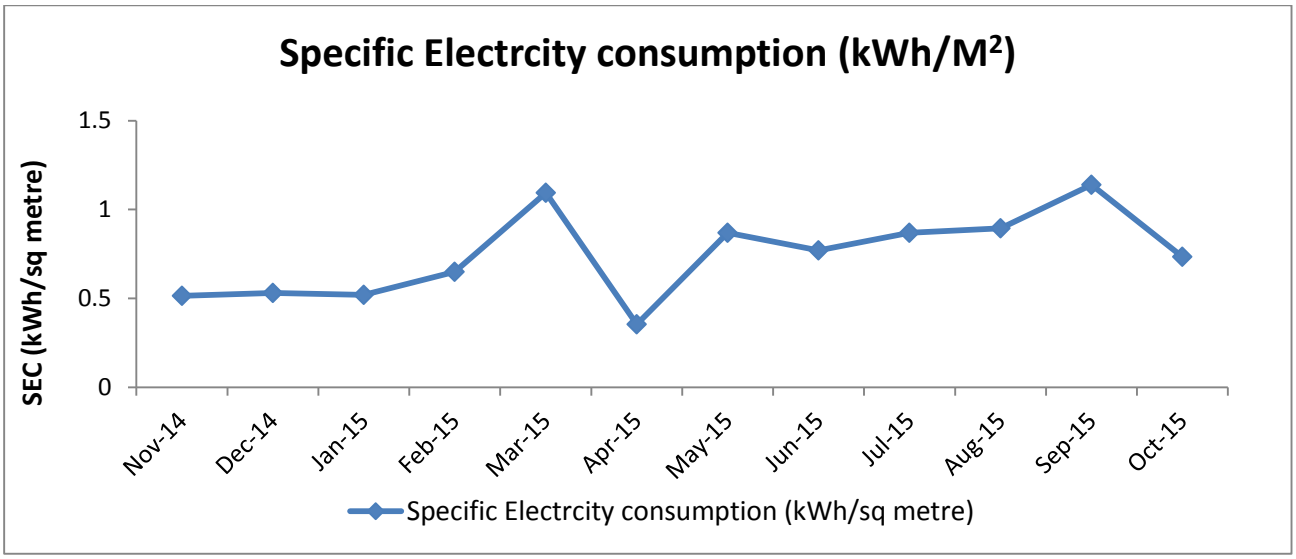
8. EFFICIENCY ANALYSIS:

Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Nov-14	1300	2514.02	0.515
Dec-14	1340	2514.02	0.53
Jan-15	1320	2514.02	0.52
Feb-15	1640	2514.02	0.65
Mar-15	2760	2514.02	1.095
Apr-15	900	2514.02	0.355
May-15	2200	2514.02	0.87
Jun-15	1940	2514.02	0.77
Jul-15	2200	2514.02	0.87
Aug-15	2260	2514.02	0.895
Sep-15	2880	2514.02	1.14
Oct-15	1860	2514.02	0.735

The energy performance index is plotted in the below chart.



Note:

- Specific electricity consumption found to be varying in all those months.
- Maximum SEC measured in the Mar-2015 and is 1.01 kWh/m^2.
- SEC is highly depended on the seasonal changes and the number of working days in a month. Variations are also possible in specific electricity consumption due to energy usage variation in different seasons of the year.

E. NATIONAL CENTRE FOR NATURAL RECOURCES:

Building : CENTRE FOR NATURAL RECOURCES
Department : CENTRE FOR NATURAL RECOURCES
Consumer No : 1005248369

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity provider	CSPDCL
2	Tariff	LV2ND3OT14
3	Connected load (kW)	30.6
4	Average monthly energy consumption (kWh)	1351
5	Monthly total electricity cost (avg. In Rs)	13510
6	Average power factor	0.87

Observations:

- **PF found to be good in the building.**

2. Electrical Load analysis:

Department	-	National Centre for natural resource		
Consumer / meter No	-	1005248369		
Date & time of measurement		26/11/2015 13:16		
Actual Energy	kWh	2.87		
Apparent Energy	kVAh	7.25		
Power factor	-	0.39		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	2.55	4.21	2.87
Apparent power	kVA	6.69	11.29	7.25
Voltage (V_L)	Volts	251.46	255.70	254.37
Current	Amps	0.07	18.08	4.39
Voltage unbalance	%	1.2	2.5	2.3
Current unbalance	%	6.2	22.1	15.6
THD voltage	%	2.95	3.46	3.16
THD current	%	11.19	31.13	23.11

Standards:

- Permissible voltage limit as per CEA standards on grid connectivity is 230 plus or minus 10%, which means 254V is the maximum allowable.

Observations:

- At present maximum voltage exceeded the permissible limit which should be taken care of by reporting it to the supplier.
- Increase in the voltage increases the consumption of electricity and also the failure frequency of the equipment.

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T8	T12	CFL	CEILING FAN NEW
Watts(W)	36	40	15	60
Total Nos.	15	12	8	8
Total KW	0.54	0.48	0.12	0.48
Net total Kw	**1.62**			

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs should be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators should be replaced by energy efficient BLDC fans.

3. Lux Measurements

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods, which is applicable to all commercial buildings. One of the methods is Illuminance method, which is the most practicable one.

LOCATION	MEASURED LUX	REQUIRED LUX	REMARKS
NMR	234	150	Good
Data processing lab	277	250	Good
HPLC	301	250	Good

Note:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBC user guide.

4. Computer & Its Accessories:

DETAILS	WATTS	TOTAL NO	TOTAL KW
LCD computer	200	5	1
CRT computer	250	-	
Laptop	100	4	0.4
Scanner	200	1	0.1
Xerox	350	-	-
Laser	200	2	0.4
3 in one printer	300	1	0.3
TOTAL kW			1.2

5. Air conditioning:

The department have installed a total of 11 Split AC in the department and their efficiency calculations are given below in table.

LOCATION	TYPE	COOLING CAPACITY (TR)	MEASURED COOLING CAPACITY KW	RATED POWER ELECTRICAL (kW)	RATED EER	MEASURED EER
NMR	Split	2	6.01	1.98	3.1	3.04
	Split	2	6.07	1.98	3.1	3.07
HPLC	Split	2	5.95	1.98	3.1	3.01
	Split	2	6.05	1.98	3.1	3.06
Data processing lab	Split	1.5	5.17	1.55	3.4	3.34
	Split	1.5	5.22	1.55	3.4	3.37
	Split	1.5	5.13	1.55	3.4	3.31
	Split	1.5	5.13	1.55	3.4	3.31
	Split	1.5	5.23	1.55	3.4	3.38
	Split	1.5	5.16	1.55	3.4	**3.33**
	Split	1.5	5.22	1.55	3.4	3.37
Store room	Split	1.5	5.25	1.57	3.1	3.35

Note:

- **All the Split AC are new and found to be working well**

6. WATER CONSUMPTION:

The NCNR department consumes water for various purposes like

- Drinking.
- Toilet flushing's
- Cleaning

Note:

- Water consumption is not monitored.
- Two stage flushing control should be used in toilets for reducing water wastage.

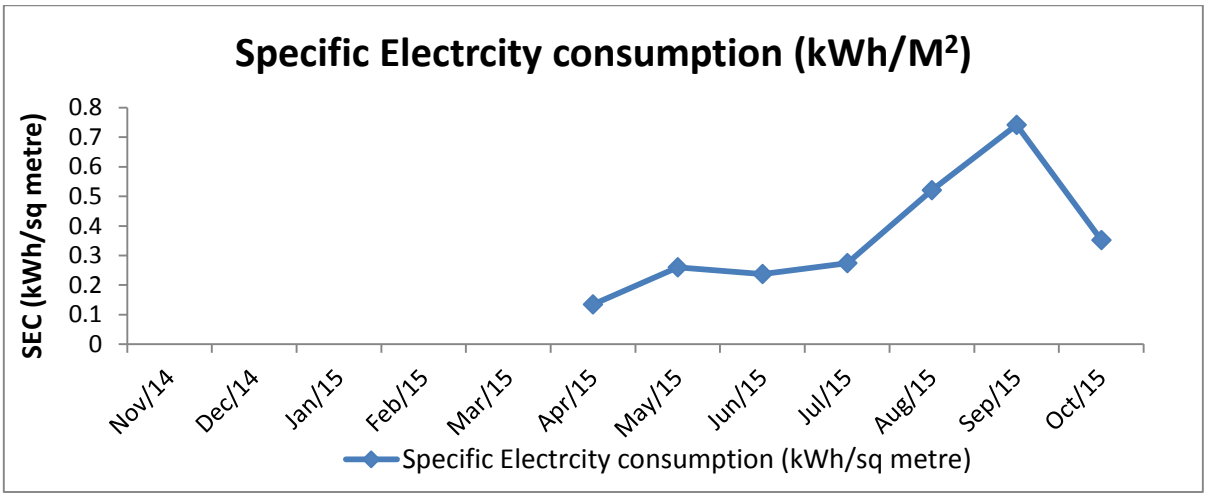
7. EFFICIENCY ANALYSIS:

Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Apr-15	504	3754.54	0.134
May-15	975	3754.54	0.260
Jun-15	890	3754.54	0.237
Jul-15	1027	3754.54	0.274
Aug-15	1955	3754.54	0.521
Sep-15	2785	3754.54	0.742
Oct-15	1323	3754.54	0.352

The energy performance index is plotted in the below chart.



Chart

Note:

- Specific electricity consumption found to be varying in all those months.
- Maximum SEC measured in the Sep-2015 and is 0.742 kWh/m^2.
- SEC is highly depended on the seasonal changes and the number of working days in a month. Variations are also possible in specific electricity consumption due to energy usage variation in different seasons of the year.

F. SOS IN PHYSICS AND CHEMISTRY:

i. Building : PHYSICS &CHEMISTRY
Department : PHYSICS &CHEMISTRY
Consumer No : 1000143839
Service No : 404300

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity provider	CSPDCL
2	Tariff	LV2ND3OT14
3	Connected load (kW)	69.8
4	Average monthly energy consumption (kWh)	6995.08
5	Monthly total electricity cost (avg. In Rs)	65150
6	Average power factor	0.85

Observations:

- **PF found to be in brim. It should be greater than 0.85 to avoid the penalty. At present PF penalty is not imposed by the CSPDCL to the department.**

2. Electrical Load analysis:

Department	-	Physics and chemistry dept		
Consumer / meter No	-	404300		
Date & time of measurement		26/11/2015 10:58		
Actual Energy	kWh	10.53		
Apparent Energy	kVAh	13.75		
Power factor	-	0.76		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	9.31	11.63	10.53
Apparent power	kVA	11.99	15.50	13.75
Voltage (V_L)	Volts	237.11	249.67	244.85
Current	Amps	13.64	24.30	17.99
Voltage unbalance	%	0.5	0.9	0.65
Current unbalance	%	5.2	26.5	15.6
THD voltage	%	1.96	2.81	2.30
THD current	%	5.04	19.17	7.29

Standards:

- PF found to be low during the logging period which should be increased to above 0.85 to avoid the penalty.

ii. Building : PHYSICS & CHEMISTRY
Department : PHYSICS & CHEMISTRY
Consumer No : 1000297278
Service No : 406134

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity provider	CSPDCL
2	Tariff	LV2ND3OT14
3	Connected load (kW)	71.9
4	Average monthly energy consumption (kWh)	3732.75
5	Monthly total electricity cost (avg. In Rs)	40093.33
6	Average power factor	0.78

Observations:

- **PF found to be low in the CSPDCL bill. PF should be greater than 0.85 to avoid the penalty.**
- **Install LV capacitors to increase the PF is parallel with the MSB.**

2. Electrical Load analysis:

Department	-	PHYSICS AND CHEMISTRY		
Consumer / meter No	-	406134		
Date & time of measurement		26/11/2015 12:10		
Actual Energy	kWh	3.38		
Apparent Energy	kVAh	6.52		
Power factor	-	0.51		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**

Active power	kW	3.14	7.45	6.25
Apparent power	kVA	4.41	15.29	12.03
Voltage (V_L)	Volts	246.12	254.58	250.20
Current	Amps	3.57	21.76	15.57
Voltage unbalance	%	0.3	1.5	1.0
Current unbalance	%	25.6	32.1	27.5
THD voltage	%	2.04	2.71	2.34
THD current	%	3.71	5.94	4.78

Standards:

- Permissible voltage limit as per CEA standards on grid connectivity is 230 plus or minus 10%, which means 254V is the maximum allowable.

Observations:

- At present maximum voltage exceeded the permissible limit which should be taken care of by reporting it to the supplier.
- Increase in the voltage increases the consumption of electricity and also the failure frequency of the equipment.

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T12	CFL	WALL FAN	CEILING FAN NEW	CEILING FAN OLD	EXHAUST FAN
Watts(W)	40	15	60	60	90	60
Total Nos.	235	48	5	18	99	21
Total KW	9.4	0.72	0.3	1.08	8.91	1.20
Net total Kw	**21.61**					

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs should be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators should be replaced by energy efficient BLDC fans

4. Lux Measurements

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods which is applicable to all commercial buildings. One of the methods is Illuminance method which is the most practicable one.

LOCATION	MEASURED LUX	REQUIRED LUX	REMARKS
HOD room	194	150	Good
KK Khose - lab	234	250	Good
Computer lab	264	250	Good
Research lab	272	250	Good

Environmental lab	301	250	Good
Nano technology lab	275	250	Good
MK.Deb	197	150	Good
CV Raman hall	165	150	Good
Office	334	150	Good
Room 202	164	150	Good
Room 205	174	150	Good
Room 201	168	150	Good

Standards:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBC user guide.

5. Computer & Its Accessories:

DETAILS	WATTS	TOTAL NO	TOTAL KW
LCD computer	200	63	12.6
CRT computer	250	6	1.5
Laptop	100	4	0.4
Scanner	200	2	0.4
Xerox	350	4	1.4
Laser	200	26	5.2
3 in one printer	300	2	0.6
TOTAL kW			22.1

6. Air conditioning:

The physics and chemistry department have installed a total of 27 Split AC in the department including office, class rooms, laboratories etc. and their efficiency calculations are given below in table.

LOCATION	TYPE	COOLING CAPACITY (TR)	MEASURED COOLING CAPACITY (KW)	RATED POWER ELECTRICAL (KW)	RATED EER	MEASURED EER
		PHYSICS DEPARTMENT				
Room 101	SPLIT	1.5	3.63	1.925	2.6	1.89
Room 103	SPLIT	1.5	3.86	1.925	2.6	2.01
Room 104	SPLIT	1.5	4.44	1.538	3.15	2.89
Room 104	WINDOW	1.5	3.9	2.5	2.08	1.56

Room 105	Window	1.5	4.02	2.5	2.08	1.61
Room 106	Window	1.5	4.3	2.5	2.08	1.72
CV Raman hall	Split	1.5	3.86	1.86	2.54	2.08
CV Raman hall	Split	1.5	3.79	1.86	2.54	2.04
CV Raman hall	Split	1.5	3.68	1.86	2.54	1.98
CV Raman hall	Split	1.5	3.55	1.86	2.54	**1.91**
CV Raman hall	Split	1.5	3.70	1.86	2.54	1.99
Room 202	Window	1.5	5.1	2.5	2.08	2.04
Room 205	Window	1.5	4.72	2.5	2.08	1.89
Room 201	Split	1.5	4.83	1.55	3.4	3.12
	Split	1.5	4.88	1.55	3.4	3.15
Room 203	Window	1.5	3.6	2.5	2.08	1.44
	Window	1.5	3.42	2.5	2.08	1.37
		CHEMISTRY DEPARTMENT				
HOD room	Window	1.5	NOT WORKING			
KK Khose - lab	Split	1.5	4.68	1.55	3.4	3.02
KK Khose - lab	Split	1.5	4.77	1.55	3.4	3.08
Computer lab	Window	1.5	3.69	2.545	2.39	1.45
Computer lab	Window	1.5	3.51	2.545	2.39	1.38
Research lab	Split	1.5	4.1	2.5	2.1	1.64
Environmental lab	Split	1.5	3.9	2.5	2.1	1.56
Nano technology lab	Split	1.5	4.03	1.74	3	2.32

MK.Deb	Split	2	4.55	2.21	2.9	2.06
MK.DEB	Split	1.5	2.88	1.8	2.9	1.56

Table

Note:

- **Window AC should be converted into Five star split AC to reduce the electricity consumption.**
- Most of the AC are more than five years old. Damaged AC which are more than Five years old should be replace with new one.

7. WATER CONSUMPTION:

The department consumes water for various purposes like

- Drinking.
- Toilet
- Cleaning

Note:

- Water consumption is not monitored.
- Two stage flushing control should be used in toilets for reducing water wastage.

8. EFFICIENCY ANALYSIS:

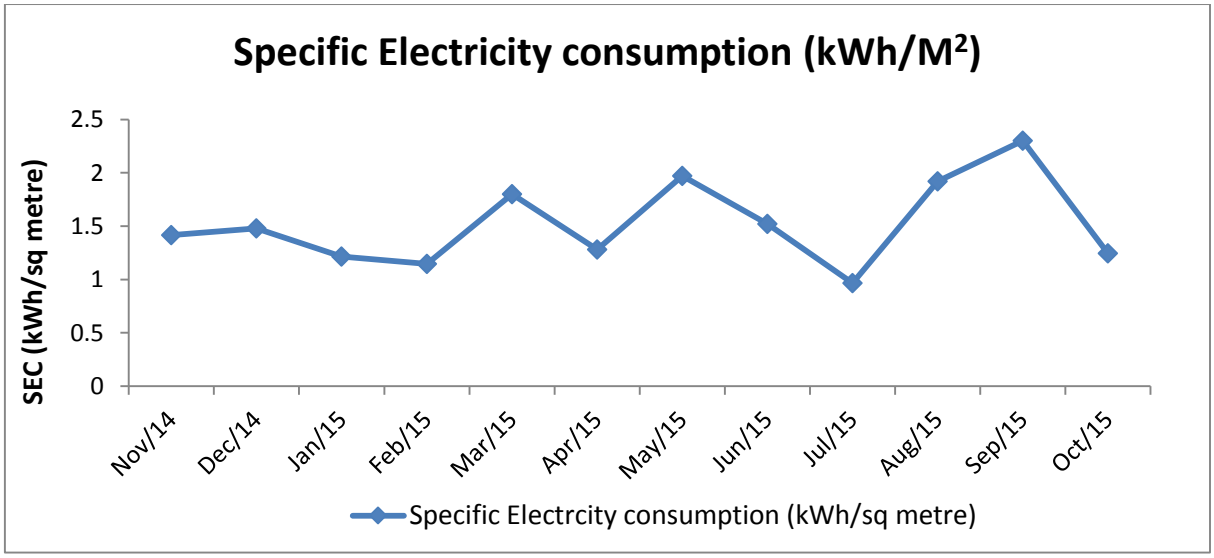
Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Nov-14	5135	3616.34	1.415
Dec-14	5366	3616.34	1.48
Jan-15	4405	3616.34	1.215
Feb-15	4149	3616.34	1.145
Mar-15	6516	3616.34	1.8
Apr-15	4638	3616.34	1.28
May-15	7128	3616.34	1.97
Jun-15	5506	3616.34	1.52

Jul-15	3492	3616.34	0.965
Aug-15	6955	3616.34	1.92
Sep-15	8327	3616.34	2.3
Oct-15	4520	3616.34	1.245

The energy performance index is plotted in the below chart.



Chart

Note:

- Specific electricity consumption found to be varying in all those months.
- Maximum SEC measured in the Aug-2015 and is 2.3 kWh/m^2.
- SEC is highly depended on the seasonal changes and the number of working days in a month. Variations are also possible in specific electricity consumption due to energy usage variation in different seasons of the year.

G. USIC:

Building : USIC
Department : USIC
Consumer No : 1000297281
Service No : 406148

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity provider	CSPDCL
2	Tariff	LV2ND3OT14
3	Connected load (kW)	9
4	Average monthly energy consumption (kWh)	366.75
5	Monthly total electricity cost (avg. In Rs)	3504.54
6	Average power factor	0.89

Observations:

- **PF found to be good in the section**

2. Electrical Load analysis:

Department	-	USIC workshop		
Consumer / meter No	-	406148		
Date & time of measurement		26/11/2015 11:37		
Actual Energy	kWh	9.99		
Apparent Energy	kVAh	11.42		
Power factor	-	0.87		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	7.39	14.72	10.71
Apparent power	kVA	9.08	16.18	12.24
Voltage (V_L)	Volts	241.9	249.2	244.68
Current	Amps	6.39	26.38	17.21
Voltage unbalance	%	0.6	1.2	0.97
Current unbalance	%	1.5	56.3	30.33
THD voltage	%	2	2.5	2.26
THD current	%	5.3	21.4	10.44

Note:

- Ascertain the above readings during the no load period. All the motors in the lathe, drilling machine are no load.

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T8	T12	CFL	CEILING FAN NEW	CEILING FAN OLD	EXHAUST FAN
Watts(W)	36	40	15	60	90	60
Total Nos.	2	16	1	-	7	-
Total KW	0.072	0.64	0.015	-	0.63	-
Net total Kw	**1.35**					

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs should be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators should be replaced by energy efficient BLDC fans.

4. Lux Measurements

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods, which is applicable to all commercial buildings. One of the methods is Illuminance method, which is the most practicable one.

LOCATION	MEASURED LUX	REQUIRED LUX	REMARKS
Average lux in workshop	436	250	Good

Standards:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBC user guide.

5. WATER CONSUMPTION:

The department consumes water for various purposes like

- Lathe purpose
- Toilets.

Note:

- Water consumption is not monitored.
- Two stage flushing control should be used in toilets for reducing water wastage.

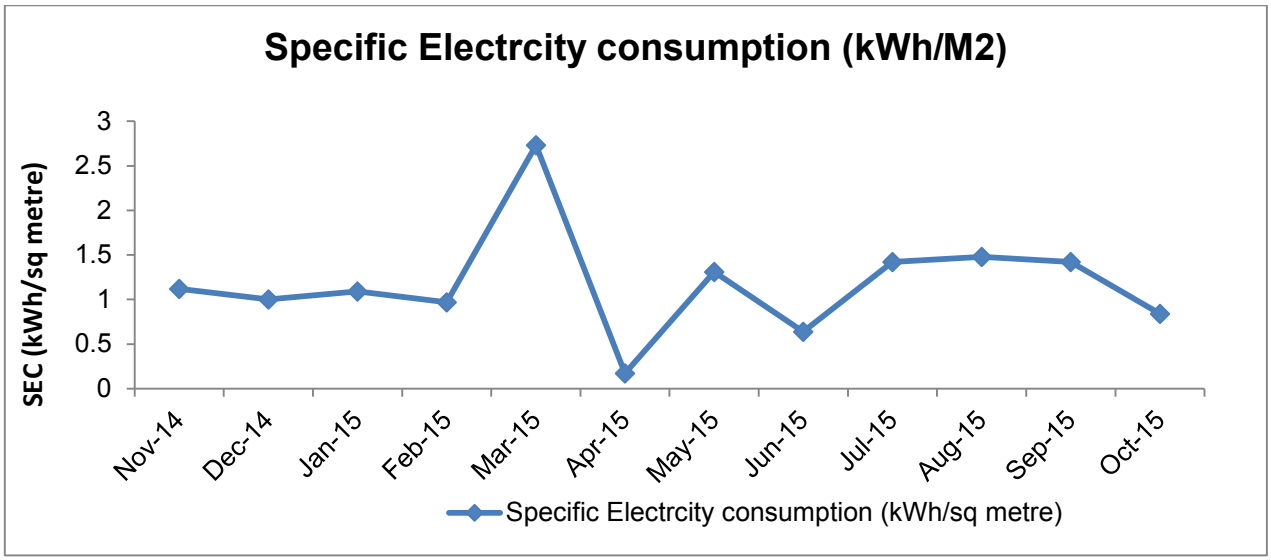
6. EFFICIENCY ANALYSIS:

Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Nov-14	348	308.83	1.12
Dec-14	310	308.83	1.00
Jan-15	337	308.83	1.09
Feb-15	301	308.83	0.97
Mar-15	845	308.83	2.73
Apr-15	54	308.83	0.17
May-15	405	308.83	1.31
Jun-15	200	308.83	0.64
Jul-15	441	308.83	1.42
Aug-15	460	308.83	1.48
Sep-15	440	308.83	1.42
Oct-15	260	308.83	0.84

The energy performance index is plotted in the below chart.



Chart

Note:

- Specific electricity consumption found to be varying in all those months.
- Maximum SEC measured in the Mar-2015 and is 2.73 kWh/m^2.
- SEC is highly depended on the seasonal changes and the number of working days in a month. Variations are also possible in specific electricity consumption due to energy usage variation in different seasons of the year.

iii. MEASUREMENTS TAKEN ON 27-11-2015:

A. SOS IN GEOLOGY AND WATER RESOURCES MANAGMENT:

Building : GEOLOGY
Department : GEOLOGY
Consumer No : 1000297294
Service No : 406195

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity provider	CSPDCL
2	Tariff	LV2ND1OT14
3	Connected load (kW)	22.5
4	AVERAGE MONTHLY ENERGY CONSUMPTION (kWh)	2773.41
5	Monthly total electricity cost (avg. In Rs)	22133.33
6	Average power factor	0.87

Observations:

- **PF found to be good in the department.**

2. Electrical Load analysis:

Department	-	Geology dept		
Consumer / meter No	-	406195		
Date & time of measurement		27/11/2015 12:51		
Actual Energy	kWh	1.50		
Apparent Energy	kVAh	1.98		
Power factor	-	0.75		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	1.94	2.44	2.23
Apparent power	kVA	2.70	3.17	2.95
Voltage (V_L)	Volts	246.5	253.9	250.88
Current	Amps	2.51	5.6	3.80
Voltage unbalance	%	0.5	1.1	0.79
Current unbalance	%	15.4	51.1	30.95
THD voltage	%	2.3	3.4	2.85
THD current	%	8.5	42.3	17.54

Standards:

- Permissible voltage limit as per CEA standards on grid connectivity is 230 plus or minus 10%, which means 254V is the maximum allowable.

Observations:

- At present maximum voltage exceeded the permissible limit which should be taken care of by reporting it to the supplier.
- Increase in the voltage increases the consumption of electricity and also the failure frequency of the equipment.

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T12	CFL	CFL	CEILING FAN NEW	CEILING FAN OLD	EXHAUST FAN
Watts(W)	40	15	36	60	90	60
Total Nos.	76	2	1	-	42	2
Total KW	3.04	0.03	0.036	-	3.78	0.12
Net total Kw	**7.006**					

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs should be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators should be replaced by energy efficient BLDC fans.

4. Lux Measurements

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods, which is applicable to all commercial buildings. One of the methods is Illuminance method, which is the most practicable one.

LOCATION	MEASURED LUX	REQUIRED LUX	REMARKS
Prof.Bodhanker	196	150	Good
Prof. Hari	201	150	Good
Average lux in class rooms	174	150	Good
Optical metrology lab	255	250	Good
Store room	136	150	Average

Note:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBC user guide.

5. Computer & Its Accessories:

DETAILS	WATTS	TOTAL NO	TOTAL KW
LCD computer	200	15	3
CRT computer	250	1	0.25
Xerox	350	1	0.35
Laser	200	2	0.4
TOTAL kW			4

6. Air conditioning:

The department have installed a total of 3 Split AC in the department and their efficiency calculations are given below in table.

LOCATION	TYPE	COOLING CAPACITY (TR)	MEASURED COOLING CAPACITY KW	RATED POWER ELECTRICAL (Kw)	RATED EER	MEASURED EER
Prof. Bodhanker	SPLIT	1.5	4.6	1.55	3.3	3.02
Prof. Hari	SPLIT	1.5	4.75	1.55	3.4	3.07
Optical metrology lab	SPLIT	1.5	4.46	1.55	3.2	2.88

Table

7. WATER CONSUMPTION:

The department consumes water for various purposes like

- Drinking.
- Toilet flushing's
- Cleaning

Note:

- Water consumption is not monitored.
- Two stage flushing control should be used in toilets for reducing water wastage.

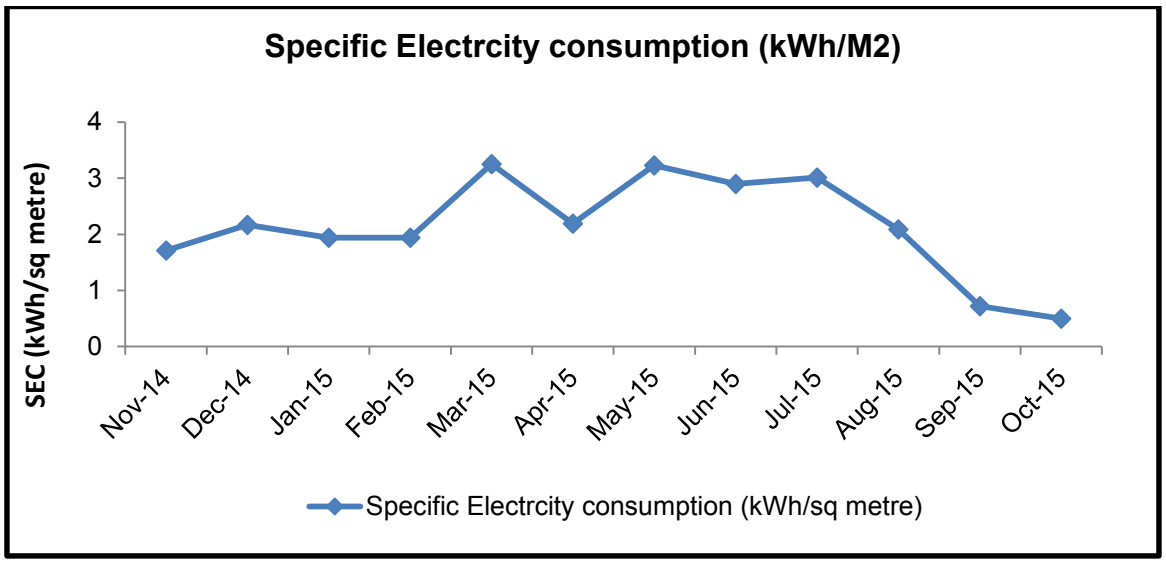
8. EFFICIENCY ANALYSIS:

Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Nov-14	2225	1294.34	1.71
Dec-14	2819	1294.34	2.17
Jan-15	2515	1294.34	1.94
Feb-15	2522	1294.34	1.94
Mar-15	4214	1294.34	3.25
Apr-15	2842	1294.34	2.19
May-15	4188	1294.34	3.23
Jun-15	3756	1294.34	2.9
Jul-15	3908	1294.34	3.015
Aug-15	2707	1294.34	2.09
Sep-15	935	1294.34	0.72
Oct-15	650	1294.34	0.5

The energy performance index is plotted in the below chart.



Chart

Note:

- Specific electricity consumption found to be varying in all those months.
- Maximum SEC measured in the Mar-2015 and is 3.25 kWh/m^2.
- SEC is highly depended on the seasonal changes and the number of working days in a month. Variations are also possible in specific electricity consumption due to energy usage variation in different seasons of the year.

B. LIFE SCIENCE POWER METER:

I. Building : LIFE SCIENCE
Department : SOS IN LIFE SCIENCE
Consumer No : 1000297294
Service No : 406147

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity provider	CSPDCL
2	Tariff	LV2ND3OT14
3	Connected load (kW)	10.444
4	Average monthly energy consumption (kWh)	2651.25
5	Monthly total electricity cost (avg. In Rs)	20496.91
6	Average power factor	0.89

Observations:

- **PF found to be good in the department.**

2. Electrical Load analysis:

Department	-	LIFE SCIENCE POWER METER		
Consumer / meter No	-	406147		
Date & time of measurement		27/11/2015 16:02		
Actual Energy	kWh	1.28		
Apparent Energy	kVAh	1.79		
Power factor	-	0.71		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	3.15	5.52	4.06
Apparent power	kVA	2.15	7.67	4.53
Voltage (V_L)	Volts	197.8	238.98	234.3
Current	Amps	6.48	11.85	7.51
Voltage unbalance	%	0.5	1.2	0.8
Current unbalance	%	1.5	32.1	20.2
THD voltage	%	1.92	3.03	2.45
THD current	%	15.18	48.92	30.95

II. LIFE SCIENCE METER

Building : LIFE SCIENCE
Consumer No : 1000297270
Service No : 404446

I. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity Provider	CSPDCL
2	Tariff	LV2ND3OT14
3	Connected Load (kW)	9.04
4	Average monthly energy consumption (kWh)	2061
5	Monthly Total Electricity Cost (Avg. In Rs)	15450
6	Average Power Factor	0.83

Observations:

- **PF found to be low in the department. PF should be increase to more than 0.85 to avoid the penalty. At present, no penalty is imposed in the EB bill.**

II. Electrical Load analysis:

Department	-	Life science-3		
Consumer / meter No	-	404446		
Date & time of measurement		27/11/2015 15:22		
Actual Energy	KWh	5.02		
Apparent Energy	KVAh	6.41		
Power factor	-	0.78		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	Kw	5.75	9.78	8.03
Apparent power	Kva	8.56	11.46	10.27
Voltage (V_L)	Volts	228.22	239.48	234.40
Current	Amps	8.31	18.38	13.78
THD voltage	%	2.03	3.06	2.52
THD current	%	4.97	11.15	8.61

III. BIO SCIENCE LAB

Building : LIFE SCIENCE
Department : SOS IN LIFE SCIENCES
Consumer No : 1000147655
Service No : 771215

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity provider	CSPDCL
2	Tariff	LV2ND1OT14
3	Connected load (kW)	4.0
4	Average monthly energy consumption (kWh)	1749.75
5	Monthly total electricity cost (avg. In Rs)	12,000
6	Average power factor	----

Observations:

- **At present, PF is not included in the bill.**

2. Electrical Load analysis:

Department	-	BIOSCIENCE LAB		
Consumer / meter No	-	771215		
Date & time of measurement		27/11/2015 15:40		
Actual Energy	kWh	0.52		
Apparent Energy	kVAh	0.58		
Power factor	-	0.89		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	0.50	1.7	0.92
Apparent power	kVA	0.62	1.7	1.03
Voltage (V_L)	Volts	234.4	258.8	249.9
Current	Amps	0.44	6.49	1.23
Voltage unbalance	%	0.7	5.9	1.8
Current unbalance	%	75.9	161	121.0
THD voltage	%	2.1	3.3	2.67
THD current	%	7.9	44.6	22.0

Standards:

- Permissible voltage limit as per CEA standards on grid connectivity is 230 plus or minus 10%, which means 254V is the maximum allowable.

Observations:

- At present maximum voltage exceeded the permissible limit which should be taken care of by reporting it to the supplier.
- Increase in the voltage increases the consumption of electricity and also the failure frequency of the equipment.

iv. Building : Life science
Department : Tissue culture
Consumer No : 1000297296
Service No : 406200

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity Provider	CSPDCL
2	Tariff	LV2ND1OT14
3	Connected Load (Kw)	9.0
4	Average Monthly Energy Consumption (Kwh)	660
5	Monthly Total Electricity Cost (Avg. In Rs)	12,000
6	Average Power Factor	0.87

Observations:

2. Electrical Load analysis:

- As the supply was not provided after the re routing of wires we couldn't analyse the power consumption in tissue culture.
- Supply was not provided for the last one week from the date of measurement of audit.

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T12	CFL	T8	CEILING FAN NEW	CEILING FAN OLD	EXHAUST FAN
Watts(W)	40	15	36	60	90	60
Total Nos.	320	88	44	-	138	4
Total KW	12.8	1.32	1.584	-	12.42	0.24
Net total Kw	**28.364**					

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs should be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators should be replaced by energy efficient BLDC fans.

4. Lux Measurements

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods which is applicable to all commercial buildings. One of the methods is Illuminance method which is the most practicable one.

LOCATION	MEASURED	REQUIRED	REMARKS
HOD Room	191	150	Good
Professor NC Naithani	202	150	Good
Parasitology Lab	276	250	Good
Endocrinology Lab	324	250	Good
Network Lab	279	250	Good
Seed Biology Lab	345	250	Good
Chronobiology Lab	339	250	Good
Dr.Arathi Praganitha	208	250	Good
Professor V.Koche Cabin	336	150	Good
Microbiology Lab	421	250	Good
Dr Gupta Cabin	309	150	Good
Seminar Hall	225	150	Good
Aquarium	241	150	Good
Animal House	234	150	Good

Note:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBC user guide.

5. Computer & Its Accessories:

DETAILS	WATTS	TOTAL NO	TOTAL KW
LCD Computer	200	28	5.6
CRT Computer	250	5	1.25
Laptop	100	4	0.4

Scanner	200	2	0.4
Xerox	350	1	0.35
Laser	200	11	2.2
3 In One Printer	300	3	0.9
TOTAL kW			11.1

6. Air conditioning:

The department have installed Split AC& window AC in the department and their efficiency calculations are given below in table.

Location	TYPE	COOLING CAPACITY (TR)	MEASURED COOLING CAPACITY KW	RATED POWER ELECTRICAL (kW)	RATED EER	MEASURED EER
Inoculation Room	Window	1.5	Not working			
Culture Room	Split	1.5	No supply			
	Split	1.5	No supply			
	Split	1.5	No supply			
HOD Room NC	Split	2	5.59	2.22	2.9	2.52
Professor	Split	1.5	4.73	1.925	2.6	2.46
	Split	1.5	4.58	1.925	2.6	2.39
Seed Biology	Split	1.5	4.55	1.8	2.9	2.53
Chronobiology Lab	Window	1.5	3.37	2.5	2.08	1.35
	Window	1.5	Not working			
Professor V.Koche	Window	1.5	Damaged			
Dr.Arathi Praganitha	Split	1.5	3.72	2.5	2.08	1.49
Network Lab	Split	1.5	4.47	1.85	2.84	2.42
Parasitology Lab	Window	1	2.68	1.21	2.89	2.22
Endocrinology Lab	Window	1.5	Not working			
Culture room first floor	Split	2	5.71	1.81	3.29	3.16

LOCATION	TYPE	COOLING CAPACITY (TR)	MEASURED COOLING CAPACITY KW	RATED POWER ELECTRICAL (kW)	RATED EER	MEASURED EER
Microbiology Lab	Split	2	6.06	2.10	3	2.89
	Split	1.5	4.26	1.67	2.95	2.56
Dr Gupta	Split	2	5.44	2.23	2.89	2.44
Seminar Hall	Window	1.5	3.9	2.5	2.1	1.59
	Window	1.5	4.0	2.5	2.1	1.58
Ak Patil	Split	2	4.05	2.8	2.1	1.62
Animal House	Window	1.5	Not working			
	Split	1.5	Not working			
Aquarium	Split	1.5	4.6	1.65	3.2	2.81
	Split	1.5	4.49	1.85	2.8	2.43
	Split	1.5	4.45	1.85	2.8	2.41
	Split	1.5	4.42	1.85	2.8	2.39
	Split	1.5	4.42	1.85	2.8	2.39

- Supply to the culture room was terminated due to some civil works in the area during the period of audit.

7. WATER CONSUMPTION:

The department consumes water for various purposes like

- Drinking.
- Toilet flushing's
- Cleaning

Note:

- Water consumption is not monitored.
- Two stage flushing control should be used in toilets for reducing water wastage.

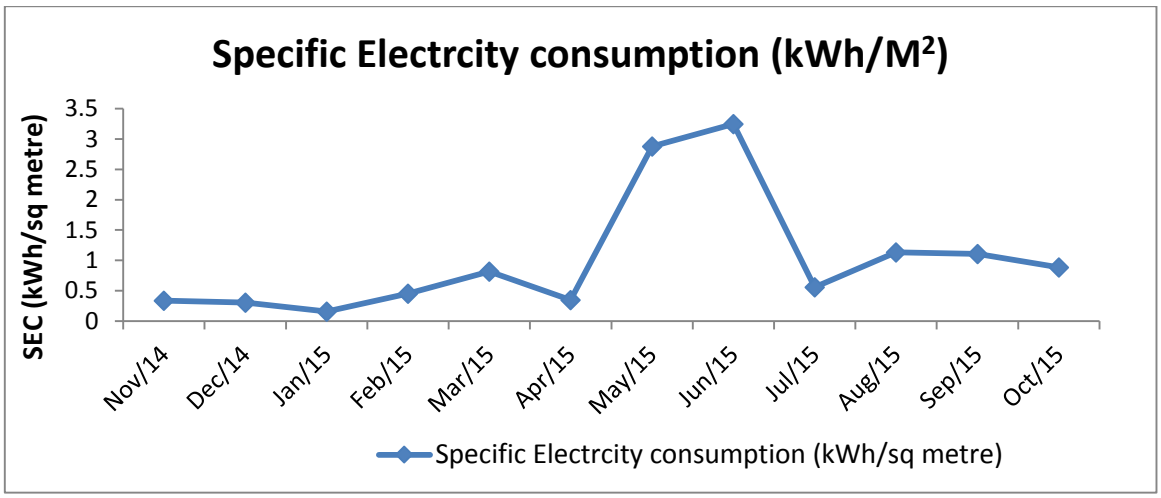
8. EFFICIENCY ANALYSIS:

Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building (M^2)	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Nov-14	820	2441.28	0.34
Dec-14	749	2441.28	0.31
Jan-15	386	2441.28	0.16
Feb-15	1103	2441.28	0.45
Mar-15	1996	2441.28	0.82
Apr-15	847	2441.28	0.35
May-15	7026	2441.28	2.88
Jun-15	7936	2441.28	3.25
Jul-15	1368	2441.28	0.56
Aug-15	2766	2441.28	1.13
Sep-15	2706	2441.28	1.11
Oct-15	2156	2441.28	0.88

The energy performance index is plotted in the below chart.



Note:

- Specific electricity consumption found to be varying in all those months.
- Maximum SEC measured in the Jun-2015 and is 3.25 kWh/m^2.
- The department has informed us that during the month of May and June-15 construction work was going on in the Life science which was supplied from this metre

C. SOS IN PHARMACY:

Building : SOS IN PHARMACY
Department : SOS IN PHARMACY
Consumer No : 1000298133
Service No : 773533

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity Provider	CSPDCL
2	Tariff	LV2ND3OT14
3	Connected Load (Kw)	74.99
4	Average Monthly Energy Consumption (Kwh)	2940.33
5	Monthly Total Electricity Cost (Avg. In Rs)	35778.33
6	Average Power Factor	0.89

Observations:

- **PF found to be good when analysed the electricity bill**

2. Electrical Load analysis:

Department	-	Pharmacy dept.		
Consumer / meter No	-	773533		
Date & time of measurement		27/11/2015 10:46		
Actual Energy	kWh	16.6		
Apparent Energy	kVAh	20.30		
Power factor	-	0.81		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	12.18	23.37	16.93
Apparent power	kVA	15.95	27.29	20.65
Voltage (V_L)	Volts	241.2	252.3	247
Current	Amps	16.07	46.38	28.09
Voltage unbalance	%	1.4	2.2	1.6
Current unbalance	%	5.6	48.7	28.7
THD voltage	%	1.8	2.3	1.97
THD current	%	2.7	8.1	4.7

Standards:

- Permissible voltage limit as per CEA standards on grid connectivity is 230 plus or minus 10%, which means 254V is the maximum allowable.

Observations:

- At present maximum voltage exceeded the permissible limit which should be taken care of by reporting it to the supplier.
- Increase in the voltage increases the consumption of electricity and also the failure frequency of the equipment.

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T12	CFL	CFL	WALL FAN	CEILING FAN OLD	EXHAUST FAN
Watts(W)	40	15	36	60	90	60
Total Nos.		32	26	4	106	6
Total KW	8.04	0.48	0.936	0.24	9.54	0.36
Net total Kw						**19.59**

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs should be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators should be replaced by energy efficient BLDC fans.

4. Lux Measurements

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods, which is applicable to all commercial buildings. One of the methods is Illuminance method, which is the most practicable one.

LOCATION	MEASURED LUX	REQUIRED LUX	REMARKS
Sophisticated Instruments Lab	324	250	Good
Computer Lab	321	250	Good
Biotechnology Lab	433	250	Good
Dr.Preethi Suresh Room	187	150	Good
Dr.Manju Sing Room	194	150	Good
Cosmetics Lab	345	250	Good
Professor Room	201	150	Good
PhD Students Room	184	150	Good
HOD Room	166	150	Good
Professor.Dharwal	171	150	Good

Note:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBC user guide.

5. Computer & Its Accessories:

DETAILS	WATTS	TOTAL NO	TOTAL KW
LCD Computer	200	25	5
Laptop	100	2	0.2
Xerox	350	1	0.35
Laser	200	5	1
3 In One Printer	300	1	0.3
TOTAL kW			6.85

6. Air conditioning:

The department have installed Split AC and Window AC in the department and their efficiency calculations are given below in table.

LOCATION	TYPE	COOLING CAPACITY (TR)	MEASURED COOLING CAPACITY (KW)	RATED POWER ELECTRICAL (KW)	RATED EER	MEASURED EER
Sophisticated Instruments Lab	SPLIT	2	5.88	2.8	2.4	2.01
	Window	1.5	3.7	2.5	2.08	1.48
Computer Lab	Split	2	Wiring problem			
Biotechnology	Window	1.5	3.8	2.5	2.08	1.52
	Window	1.5	4.1	2.5	2.08	1.64
Dr.Preethi	Split	1.5	5.25	1.55	3.4	3.39
Dr.Manju Singh	Split	1.5	5.19	1.55	3.4	3.35
Professor Room	Split	1.5	5.19	1.55	3.4	3.35
Seminar Hall	Split	1.5	5.16	1.55	3.4	3.33
	Split	1.5	4.85	1.55	3.4	3.13
	Split	1.5	4.91	1.55	3.4	3.17
Cosmetics Lab	Split	1.5	4.96	1.55	3.4	3.20
	Split	1.5	3.47	2.5	2.08	1.39
PhD Students	Split	1.5	Not working			
HOD Room	Split	1.5	3.55	2.5	2.08	1.42
	Split	1.5	3.5	2.5	2.08	1.40
Professor Dharwal	Window	1.5	Not working			
Sailendra Rao	Split	1.5	3.35	2.5	2.08	1.34

7. WATER CONSUMPTION:

The department consumes water for various purposes like

- Drinking.
- Toilet flushing's
- Cleaning

Note:

- Water consumption is not monitored.
- Two stage flushing control should be used in toilets for reducing water wastage.

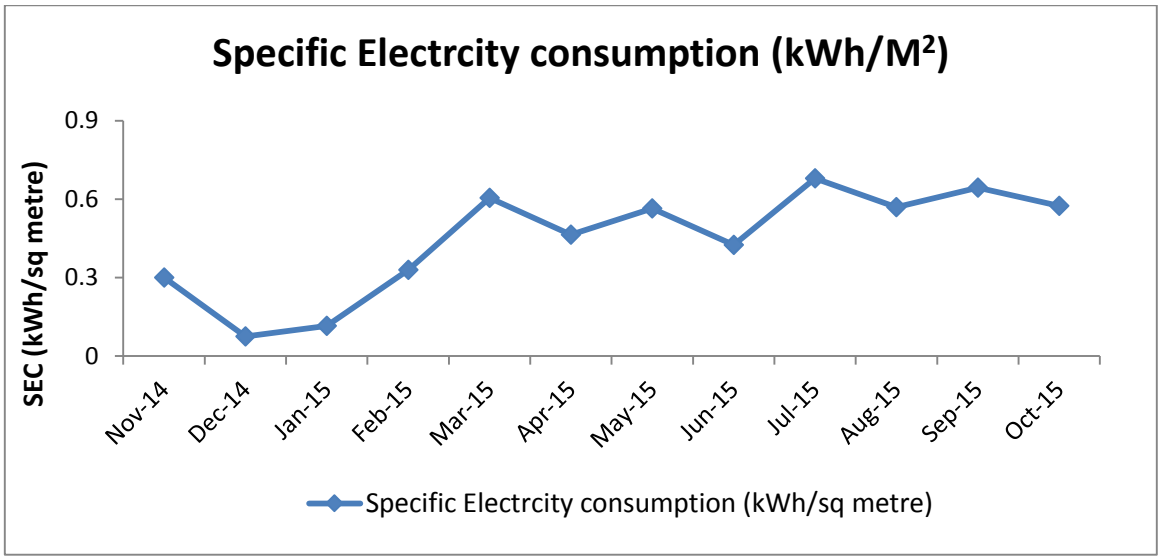
8. EFFICIENCY ANALYSIS:

Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Nov-14	2000	6558.98	0.3
Dec-14	517	6558.98	0.075
Jan-15	758	6558.98	0.115
Feb-15	2196	6558.98	0.33
Mar-15	3986	6558.98	0.605
Apr-15	3054	6558.98	0.465
May-15	3730	6558.98	0.565
Jun-15	2800	6558.98	0.425
Jul-15	4464	6558.98	0.68
Aug-15	3761	6558.98	0.57
Sep-15	4234	6558.98	0.645
Oct-15	3784	6558.98	0.575

The energy performance index is plotted in the below chart.



Chart

Note:

- Specific electricity consumption found to be varying in all those months.
- Maximum SEC measured in the Jul-2015 and is 0.68 kWh/m^2.
- SEC is highly depended on the seasonal changes and the number of working days in a month. Variations are also possible in specific electricity consumption due to energy usage variation in different seasons of the year.

D. SOS IN STATISTICS & MATHEMATICS:

Building : STATISTICS& MATHEMATICS
Department : SOS IN STATISTICS
Consumer No : 1000150617
Service No : 774228

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity provider	CSPDCL
2	Tariff	LV2ND3OT14
3	Connected load (kW)	12
4	Average monthly energy consumption (kWh)	1721.5
5	Monthly total electricity cost (avg. In Rs)	11,153
6	Average power factor	0.85

Observations:

2. Electrical Load analysis:

Department	-	Statistics dept		
Consumer / meter No	-	774228		
Date & time of measurement		27/11/2015 12:19		
Actual Energy	kWh	4.27		
Apparent Energy	kVAh	6.35		
Power factor	-	0.67		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	4.13	5.15	4.57
Apparent power	kVA	6.20	7.86	6.81
Voltage (V_L)	Volts	245.16	253.24	248.70
Current	Amps	4.41	13.61	7.40
Voltage unbalance	%	0.5	1.2	0.8
Current unbalance	%	1.8	26.2	15.2
THD voltage	%	2.44	3.55	2.95
THD current	%	6.84	26.68	15.56

Standards:

- Permissible voltage limit as per CEA standards on grid connectivity is 230 plus or minus 10%, which means 254V is the maximum allowable.

Observations:

- At present maximum voltage exceeded the permissible limit which should be taken care of by reporting it to the supplier.
- Increase in the voltage increases the consumption of electricity and also the failure frequency of the equipment.

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T12	CFL	SVL	CEILING FAN NEW	CEILING FAN OLD	EXHAUST FAN
Watts(W)	40	15	250	60	90	60
Total Nos.	32	30	1	-	38	-
Total KW	1.2	0.45	0.25	-	3.42	-
Net total Kw	**5.32**					

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs should be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators should be replaced by energy efficient BLDC fans.

4. Lux Measurements

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods, which is applicable to all commercial buildings. One of the methods is Illuminance method, which is the most practicable one.

LOCATION	MEASURED LUX	REQUIRED LUX	REMARKS
Computer Lab	287	**150**	Good
Average Lux In Class Rooms	168	**150**	Good
HOD Room	189	**150**	Good
Gouri Shankar Room	224	**150**	Good
Prabha Rohtagi Room	239	**150**	Good
Shailendra Kumar Room	198	**150**	Good

Note:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBC user guide.

5. Computer & Its Accessories:

DETAILS	WATTS	TOTAL NO	TOTAL KW
LCD Computer	200	5	0.5
CRT Computer	250	15	3.75
Laptop	100	-	-
Scanner	200	1	0.2
Xerox	350	-	-
Laser	200	5	1
3 In One Printer	300	1	0.3
TOTAL kW			5.75

6. Air conditioning:

The department have installed 6 Split AC in the department and their efficiency calculations are given below in table.

LOCATION	TYPE	COOLING CAPACITY (TR)	MEASURED COOLING CAPACITY (KW)	RATED POWER ELECTRICAL (KW)	RATED EER	MEASURED EER
Computer Lab	Split	2	6.421	2.412	2.66	2.12
Computer Lab	Window	1.5	5.2	2.5	2.08	1.34
HOD Room	Split	2	6.421	2.412	2.66	2.23
Gouri Shankar	Window	1.5	5.2	2.5	2.08	1.56
Prabha Rohtagi	Split	1.5	5.325	1.8	2.95	2.59
Shailendra Kumar	Window	1	5.2	2.5	2.08	1.65

7. WATER CONSUMPTION:

The department consumes water for various purposes like

- Drinking.
- Toilet flushing's
- Cleaning

Note:

- Water consumption is not monitored.
- Two stage flushing control should be used in toilets for reducing water wastage.

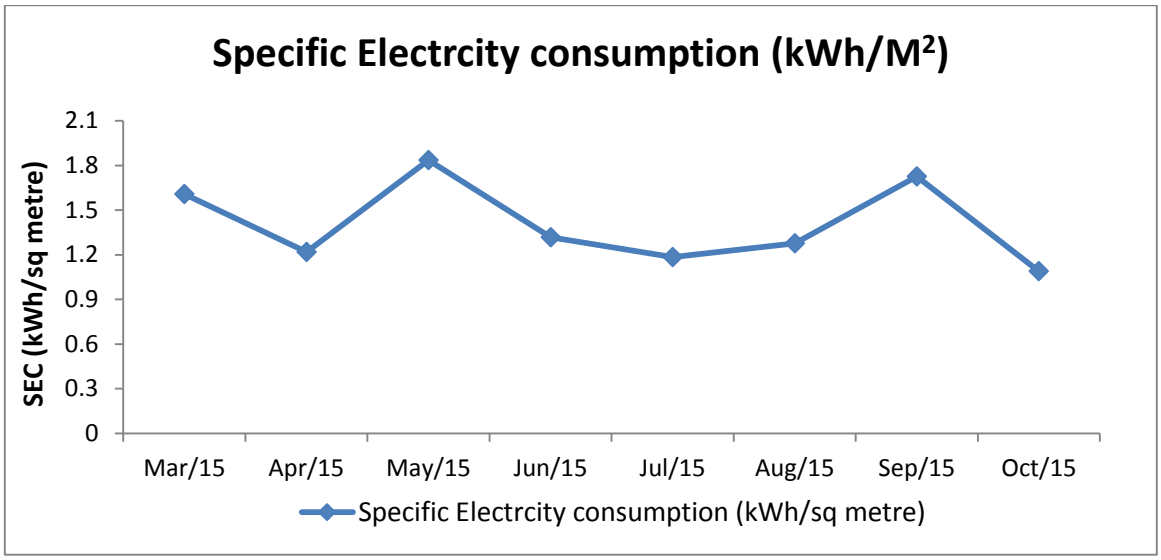
8. EFFICIENCY ANALYSIS:

Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2) kWh/ M^2
Mar-15	1967	1223.24	1.61
Apr-15	1492	1223.24	1.22
May-15	2245	1223.24	1.84
Jun-15	1611	1223.24	1.32
Jul-15	1448	1223.24	1.18
Aug-15	1562	1223.24	1.28
Sep-15	2113	1223.24	1.73
Oct-15	1334	1223.24	1.09

The energy performance index is plotted in the below chart.



Note:

- Specific electricity consumption found to be varying in all those months.
- Maximum SEC measured in the May-2015 and is 1.84kWh/m^2.
- SEC is highly depended on the seasonal changes and the number of working days in a month. Variations are also possible in specific electricity consumption due to energy usage variation in different seasons of the year.

E. UNIVERSITY PRESS

Building : PRESS
Consumer No : 1000143794
Service No : 403232

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity provider	CSPDCL
2	Tariff	LV2ND1OT4
3	Connected load (kW)	0.9
4	Average monthly energy consumption (kWh)	517.16
5	Monthly total electricity cost (avg. In Rs)	3462.5
6	Average power factor	------

Observations:

- At present PF is not mentioned in the bill.
- Also found out that in the last two bills, electricity consumption (units) is not mentioned or remitted by the CSPDCL.

2. Electrical Load analysis:

Department	-	Press		
Consumer / meter No	-	403232		
Date & time of measurement		27/11/2015 13:47		
Actual Energy	kWh	0.98		
Apparent Energy	kVAh	3.52		
Power factor	-	0.27		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	0.77	1.64	0.98
Apparent power	kVA	2.98	5.07	2.52
Voltage (V_L)	Volts	239.55	247.0	243.19
Current	Amps	0.04	9.15	2.49
THD voltage	%	2.62	3.35	2.97
THD current	%	4.24	9.90	7.92

Notes:

- Only 2 motors that is hand press in working in the section during the time of audit.
- PF found to be low. All the motors in the press should be installed with corresponding rated capacitors to increase the PF in the system.

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T12	SVL	WALL FAN	EXHAUST FAN
Watts(W)	40	250	60	60
Total Nos.	40	1	5	-
Total KW	1.6	0.25	0.3	
Net total kW	**4.4**			

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs should be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators should be replaced by energy efficient BLDC fans.

4. LUX MEASUREMENTS

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods which is applicable to all commercial buildings. One of the methods is Illuminance method which is the most practicable one.

LOCATION	MEASURED LUX	REQUIRED LUX	REMARKS
Press area	185	**250**	Poor
Proof reading area	325	**500**	Poor

Note:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBC user guide.

5. Water consumption:

Press department consumes water for various purposes like

- Drinking.
- Toilet flushing's
- Cleaning

Note:

- Water consumption is not monitored.
- Two stage flushing control should be used in toilets for reducing water wastage.

F. SOS IN REGIONAL STUDY AND RESEARCH:

Building : SOS IN REGIONAL STUDY AND RESEARCH
Department : SOS IN REGIONAL STUDY AND RESEARCH
Consumer No : 1000147722
Service No : 771283

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity Provider	CSPDCL
2	Tariff	LV2ND1OT14
3	Connected Load (Kw)	2.25
4	AVERAGE MONTHLY ENERGY CONSUMPTION (Kwh)	1599.08
5	Monthly Total Electricity Cost (Avg. In Rs)	10879.06
6	Average Power Factor	---

Observations:

- **At present PF is not included in the bill.**

2. Electrical Load analysis:

Department	-	Regional study and research		
Consumer / meter No	-	771283		
Date & time of measurement		27/11/2015 13:39		
Actual Energy	kWh	2.85		
Apparent Energy	kVAh	4.05		
Power factor	-	0.70		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	4.2	5.2	4.8
Apparent power	kVA	6	7.42	6.85
Voltage (V_L)	Volts	230.2	241.2	236.5
Current	Amps	3.1	5.2	4.4
Voltage unbalance	%	1.1	1.2	1.1
Current unbalance	%	12	65.2	45.1
THD voltage	%	0.1	0.5	0.32
THD current	%	5.3	56.7	25.5

Notes:

- **PF found to be low in the department.**

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T12	CFL	BULB	CEILING FAN NEW	CEILING FAN OLD	EXHAUST FAN
Watts(W)	40	15	40	60	90	60
Total Nos.	5	21	5	1	17	-
Total KW	0.2	0.315	0.18	0.04	1.53	-
Net total Kw	**2.265**					

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs should be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators should be replaced by energy efficient BLDC fans.

4. Lux Measurements

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods which is applicable to all commercial buildings. One of the methods is Illuminance method which is the most practicable one.

LOCATION	MEASURED	REQUIRED	REMARKS
Average Lux In Class Rooms	197	150	Good
HOD Room	221	150	Good
Faculty Room	214	150	Good

Note:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBC user guide.

5. Computer & Its Accessories:

DETAILS	WATTS	TOTAL NO	TOTAL KW
LCD Computer	200	1	0.2
CRT Computer	250	1	0.25
Xerox	350	3	1.05
Laser	200	1	0.2
3 In One Printer	300	1	03
Total			2.0

6. Air conditioning:

The department have installed a total of Split AC in the department and their efficiency calculations are given below in table.

LOCATION	TYPE	COOLING CAPACITY (TR)	MEASURED COOLING CAPACITY KW	RATED POWER ELECTRICAL (Kw)	RATED EER	MEASURED EER
HOD Room	Split	1.5	4.7	1.55	3.40	3.09
Seminar Hall	Split	1.5	4.8	1.55	3.40	3.15
Class Room	Split	1.5	4.2	1.93	2.55	2.18

7. WATER CONSUMPTION:

The department consumes water for various purposes like

- Drinking.
- Toilet
- Cleaning

Note:

- Water consumption is not monitored.
- Two stage flushing control should be used in toilets for reducing water wastage.

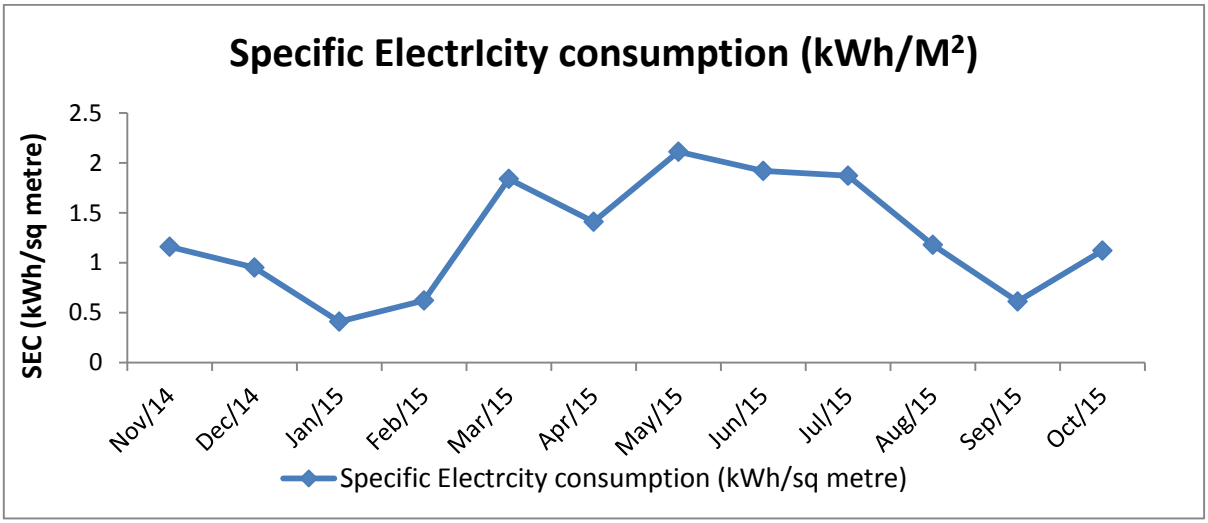
8. EFFICIENCY ANALYSIS:

Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Nov-14	651	560.54	1.16
Dec-14	530	560.54	0.95
Jan-15	230	560.54	0.41
Feb-15	349	560.54	0.62
Mar-15	1030	560.54	1.84
Apr-15	791	560.54	1.41
May-15	1185	560.54	2.11
Jun-15	1078	560.54	1.92
Jul-15	1047	560.54	1.87
Aug-15	661	560.54	1.18
Sep-15	342	560.54	0.61
Oct-15	628	560.54	1.12

The energy performance index is plotted in the below chart.



Note:

- Specific electricity consumption found to be varying in all those months.
- Maximum SEC measured in the May-2015 and is 2.11 kWh/m^2.
- SEC is highly depended on the seasonal changes and the number of working days in a month. Variations are also possible in specific electricity consumption due to energy usage variation in different seasons of the year.

G. SOS IN PHYSICAL EDUCATION:

Building : PHYSICAL EDUCATION
Department : PHYSICAL EDUCATION
Service No : 606210

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity Provider	CSPDCL
2	Tariff	
3	Connected Load (Kw)	
4	AVERAGE MONTHLY ENERGY CONSUMPTION (Kwh)	1459.41
5	Monthly Total Electricity Cost (Avg. In Rs)	11528.18
6	Average Power Factor	-

Observations:

- **Electricity Bill was not available during the audit.**
-

2. Electrical Load analysis:

Department	-	Physical education		
Consumer / meter No	-	606210		
Date & time of measurement		27/11/2015 11:9		
Actual Energy	kWh	1.13		
Apparent Energy	kVAh	1.92		
Power factor	-	0.58		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	0.87	3.9	1.34
Apparent power	kVA	1.12	6.99	2.28
Voltage (V_L)	Volts	244.80	251.85	249.03
Current	Amps	0.30	9.79	2.34
THD voltage	%	1.93	2.48	2.13
THD current	%	3.70	20.65	9.40

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T12	CFL	T8	SVL	MVL	CEILING FAN OLD	EXHAUST FAN
Watts(W)	40	15	36	250	150	90	60
Total Nos.	49	40	25	1	9	65	6
Total KW	1.96	0.6	0.9	0.25	1.35	5.85	0.36
Net total Kw	**11.27**						

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs may be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators may be replaced by energy efficient fans.
- MVL consumption occurred rarely as it is placed inside the indoor stadium.

4. Lux Measurements

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods which is applicable to all commercial buildings. One of the methods is Illuminance method which is the most practicable one.

LOCATION	MEASURED	REQUIRED	REMARKS
Professors Cabin	177	150	Good
Conference Hall	159	150	Good
HOD Room	201	150	Good
Average Lux In Classrooms	198	150	Good

Note:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBC user guide.

5. Computer & Its Accessories:

DETAILS	WATTS	TOTAL NO	TOTAL KW
LCD Computer	200	12	2.4
Scanner	200	1	0.2
Laser	200	4	0.8
Total kW			3.4

6. Air conditioning:

The department have installed a total of Split AC in the department including office, class rooms, laboratories etc. and their efficiency calculations are given below in table.

LOCATION	TYPE	COOLING CAPACITY (TR)	MEASURED COOLING CAPACITY KW	RATED POWER ELEC (kW)	RATED EER	MEASURED EER
Professors	Split	1.5	5.25	1.505	3.50	3.49
Conference Hall	Split 1	1.5	5.08	1.465	3.60	3.47
Conference	Split 2	1.5	5.09	1.465	3.60	3.48
Conference	Split 3	1.5	5.09	1.465	3.60	3.48
Conference	Split 4	1.5	5.06	1.465	3.60	3.46

- All the AC was 5 star rated one which gives the higher EER in the Physical education.

7. WATER CONSUMPTION:

The department consumes water for various purposes like

- Drinking.
- Toilet flushing's
- Cleaning

Note:

- Water consumption is not monitored.
- Two stage flushing control may be used in toilets for reducing water wastage.

8. EFFICIENCY ANALYSIS:

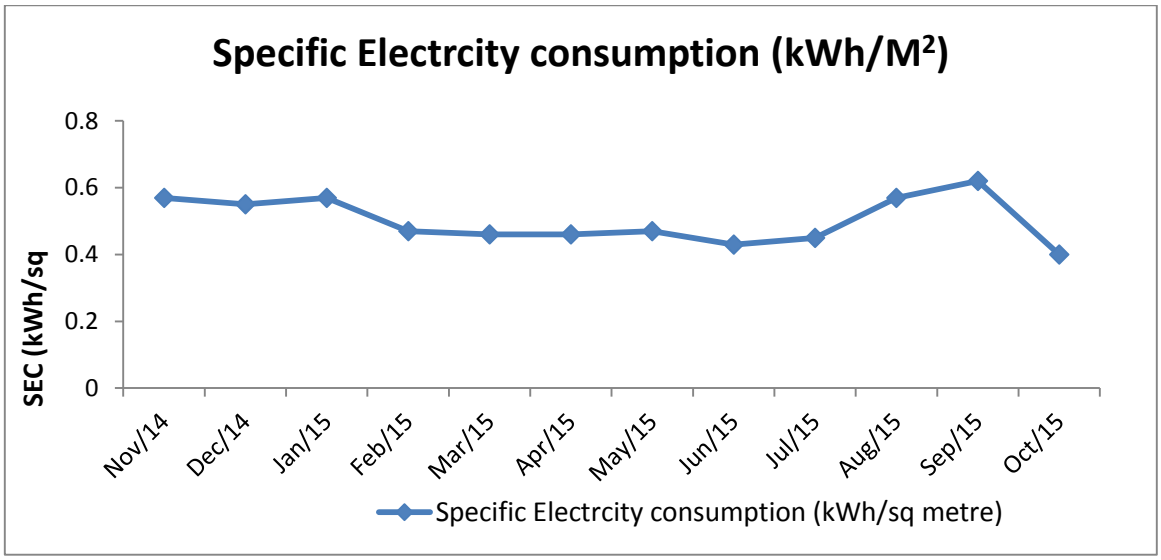
Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Nov-14	1657	2905.06	0.57
Dec-14	1589	2905.06	0.55
Jan-15	1669	2905.06	0.57
Feb-15	1357	2905.06	0.47
Mar-15	1350	2905.06	0.46

Apr-15	1345	2905.06	0.46
May-15	1369	2905.06	0.47
Jun-15	1240	2905.06	0.43
Jul-15	1307	2905.06	0.45
Aug-15	1655	2905.06	0.57
Sep-15	1811	2905.06	0.62
Oct-15	1164	2905.06	0.40

The energy performance index is plotted in the below chart.



Chart

Note:

- Specific electricity consumption found to be varying in all those months.
- Maximum SEC measured in the Sep-2015 and is 0.62 kWh/m^2.
- SEC is highly depended on the seasonal changes and the number of working days in a month. Variations are also possible in specific electricity consumption due to energy usage variation in different seasons of the year.

H. SOS IN LAW:

Building : SOS IN LAW
Department : SOS IN LAW
Consumer No : 1000144879
Service No : 405438

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity Provider	CSPDCL
2	Tariff	LV2ND1OT14
3	Connected Load (Kw)	8.72
4	AVERAGE MONTHLY ENERGY CONSUMPTION (Kwh)	1209
5	Monthly Total Electricity Cost (Avg. In Rs)	9319.5
6	Average Power Factor	-

Observations:

- **At present, PF is not included in the bill.**

2. Electrical Load analysis:

Department	-	SOS IN LAW		
Consumer / meter No	-	405438		
Date & time of measurement		27/11/2015 15:54		
Actual Energy	kWh	1.59		
Apparent Energy	kVAh	1.30		
Power factor	-	0.87		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	2.18	2.47	2.31
Apparent power	kVA	2.47	2.85	2.64
Voltage (V_L)	Volts	245.8	250.1	247.74
Current	Amps	0	6.56	3.04
Voltage unbalance	%	0.4	0.7	0.57
Current unbalance	%	94.1	100	99.43
THD voltage	%	2.4	2.8	2.57
THD current	%	7.2	14.7	8.01

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T12	CFL	BULB	CEILING FAN NEW	CEILING FAN OLD	EXHAUST FAN
Watts(W)	40	15	40	60	90	60
Total Nos.	53	-	-	-	53	1
Total KW	2.12	-	-	-	4.77	0.06
Net total kW	**6.95**					

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs may be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators may be replaced by energy efficient fans.

4. Lux Measurements

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods which is applicable to all commercial buildings. One of the methods is Illuminance method which is the most practicable one.

LOCATION	MEASURED	REQUIRED	REMARKS
HOD Cabin	453	150	Good
Office	339	150	Good
Average Lux In Class Room	342	150	Good
Staff Room	267	150	Good

Note:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBC user guide.

5. Computer & Its Accessories:

DETAILS	WATTS	TOTAL NO	TOTAL KW
LCD Computer	200	3	0.6
CRT Computer	250	13	3.25
Scanner	200	1	0.2
Xerox	350	1	0.35
Laser	200	1	0.2
Total kW			4.6

6. Air conditioning:

Law department have installed a total of 3 Split AC in the department and their efficiency calculations are given below in table.

LOCATION	TYPE	COOLING CAPACITY (TR)	MEASURED COOLING CAPACITY KW	RATED POWER ELECTRICITY (Kw)	RATED EER	MEASURED EER
Room 3	Split	1.5	5.225	1.74	3.40	3.12
	Split	1.5	5.225	1.74	3.40	3.16
	Split	Connection problem				

7. WATER CONSUMPTION:

LAW department consumes water for various purposes like

- Drinking.
- Toilet
- Cleaning

Note:

- Water consumption is not monitored.
  Two stage flushing control may be used in toilets for reducing water wastage.

8. EFFICIENCY ANALYSIS:

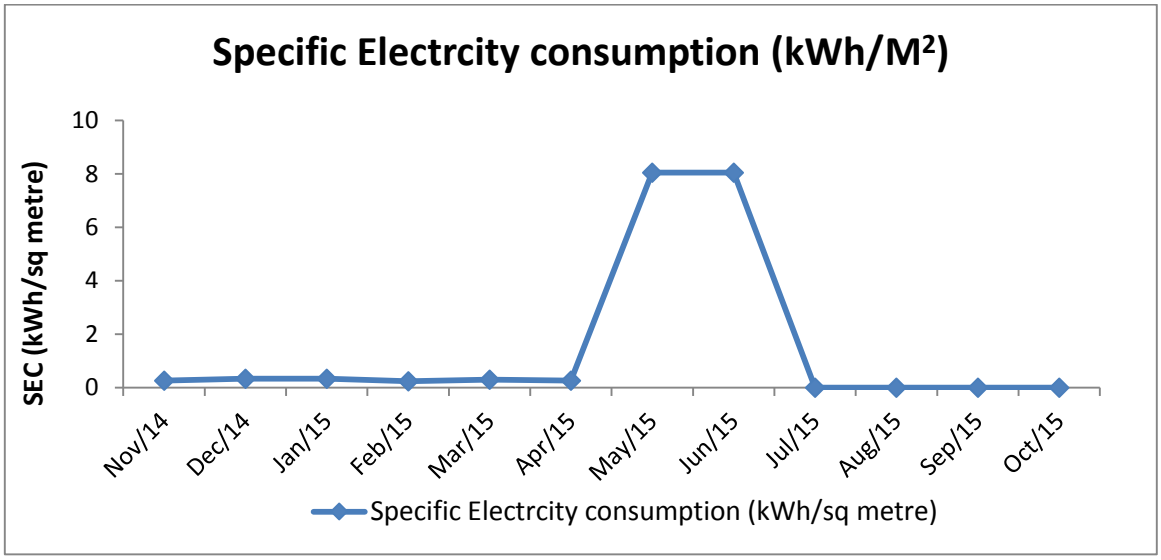
Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Nov-14	215	812.71	0.26
Dec-14	275	812.71	0.33
Jan-15	270	812.71	0.33
Feb-15	200	812.71	0.24
Mar-15	245	812.71	0.30
Apr-15	215	812.71	0.26
May-15	6544	812.71	8.05

Jun-15	6544	812.71	8.05
Jul-15	0	812.71	0
Aug-15	0	812.71	0
Sep-15	0	812.71	0
Oct-15	0	812.71	0

The energy performance index is plotted in the below chart.



Chart

Note:

- Specific electricity consumption found to be varying in all those months.
- Maximum SEC measured in the May and June-2015 and is 8.05 kWh/m^2.
- Unit's consumption was not measured in last 4 months bill.
- SEC is highly depended on the seasonal changes and the number of working days in a month. Variations are also possible in specific electricity consumption due to energy usage variation in different seasons of the year.
- Semester examination of BA LLB examination was held on MAY and June-15. That's the main reason of excess electricity consumption in those months.

IV. MEASUREMENTS TAKEN ON 28-11-2015:

A. AUDITORIUM:

Building : AUDITORIUM
Department : AUDITORIUM
Consumer No : 1000297274
Service No : 405914

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity provider	CSPDCL
2	Tariff	LV2ND3 OT14
3	Connected load (kW)	13.965
4	Average monthly energy consumption (kWh)	927
5	Monthly total electricity cost (avg. In Rs)	
6	Average power factor	-

Observations:

- **Bill couldn't available from the university.**

2. Electrical Load analysis:

Department	-	Auditorium		
Consumer / meter No	-	405914		
Date & time of measurement		28/11/2015 15:46		
Actual Energy	kWh	0.64		
Apparent Energy	kVAh	0.68		
Power factor	-	0.94		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	0.90	1.5	0.99
Apparent power	kVA	2.07	3.73	2.29
Voltage (V_L)	Volts	232.8	246.10	237.64
Current	Amps	.05	6.59	1.49
THD voltage	%	2.38	3.18	2.76
THD current	%	3.49	6.14	3.98

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T12	CFL	SVL	CEILING FAN NEW	CEILING FAN OLD	EXHAUST FAN
Watts(W)	40	36	250	60	90	60
Total Nos.	25	12	1	-	26	-
Total KW	1	0.432	0.25	-	2.34	-
Net total Kw	**4.022**					

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs may be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators may be replaced by energy efficient fans.

4. Lux Measurements

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods which is applicable to all commercial buildings. One of the methods is Illuminance method which is the most practicable one.

LOCATION	MEASURED	REQUIRED	REMARKS
Average lux	337	150	Good

Notes:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBC user guide.

5. WATER CONSUMPTION:

The department consumes water for various purposes like

- Drinking.
- Toilet flushing's
- Cleaning

Note:

- Water consumption is not monitored.
- Two stage flushing control may be used in toilets for reducing water wastage.

6. EFFICIENCY ANALYSIS:

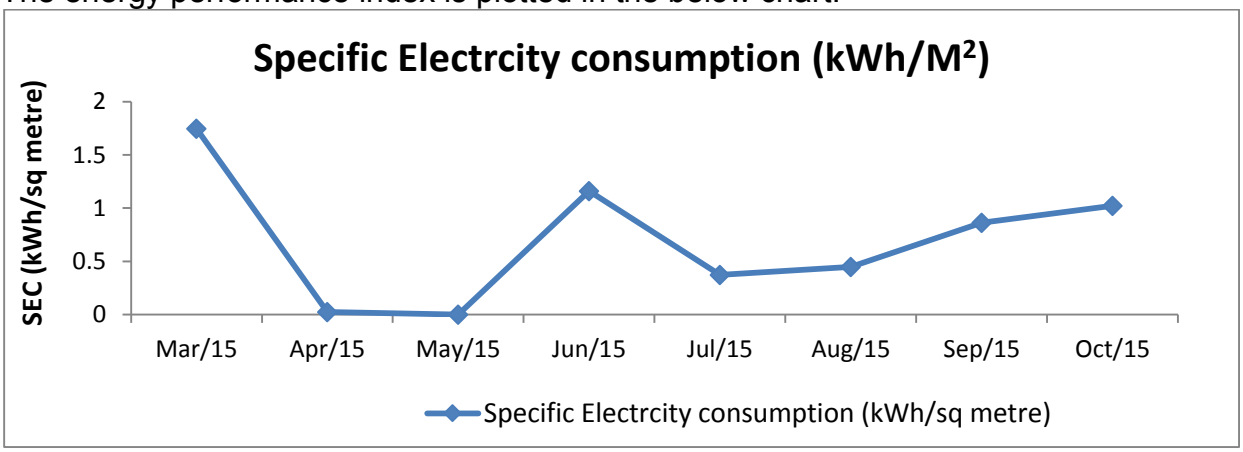
Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Mar-15	2300	1315.98	1.75

Apr-15	30	1315.98	0.02
May-15	0	1315.98	0.00
Jun-15	1529	1315.98	1.16
Jul-15	491	1315.98	0.37
Aug-15	590	1315.98	0.45
Sep-15	1137	1315.98	0.86
Oct-15	1344	1315.98	1.02

The energy performance index is plotted in the below chart.



Note:

- SEC highly depends on the frequency of programs conducting in the Auditorium. As the frequency of programs is not readily available, the other base value taken here is month.
- Maximum SEC occurred in the month of March-15.

B. COMMUNITY HALL:

Building : COMMUNITY HALL:
Consumer No : 1002049789
Service No : 406296

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity Provider	CSPDCL
2	Tariff	LV2ND39G14
3	Connected Load (Kw)	8
4	Average Monthly Energy Consumption (Kwh)	183.33
5	Monthly Total Electricity Cost (Avg. In Rs)	2951.81
6	Average Power Factor	0.85

Observations:

- **PF found to be good and within the limits.**

2. Electrical Load analysis:

Department	-	Community hall		
Consumer / meter No	-	406296		
Date & time of measurement		25-11-2015, 12:05		
Actual Energy	kWh	0.29		
Apparent Energy	kVAh	0.68		
Power factor	-	0.42		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	0.90	1.5	0.99
Apparent power	kVA	2.07	3.73	2.29
Voltage (V_L)	Volts	232.8	246.10	237.64
Current	Amps	0.05	6.59	1.49
THD voltage	%	2.38	3.18	2.76
THD current	%	3.49	6.14	3.98

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T12	CFL	CEILING FAN NEW
Watts(W)	40	15	60
Total Nos.	24	-	31
Total KW	0.96	-	1.86
Net total Kw	**2.82**		

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs may be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators may be replaced by energy efficient fans.

4. Lux Measurements

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods which is applicable to all commercial buildings. One of the methods is Illuminance method which is the most practicable one.

LOCATION	MEASURED	REQUIRED	REMARKS
Average Lux	287	150	Good

Notes:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBC user guide

5. WATER CONSUMPTION:

The department consumes water for various purposes like

- Drinking.
- Toilet flushing's
- Cleaning

Note:

- Water consumption is not monitored.
- Two stage flushing control may be used in toilets for reducing water wastage.

6. EFFICIENCY ANALYSIS:

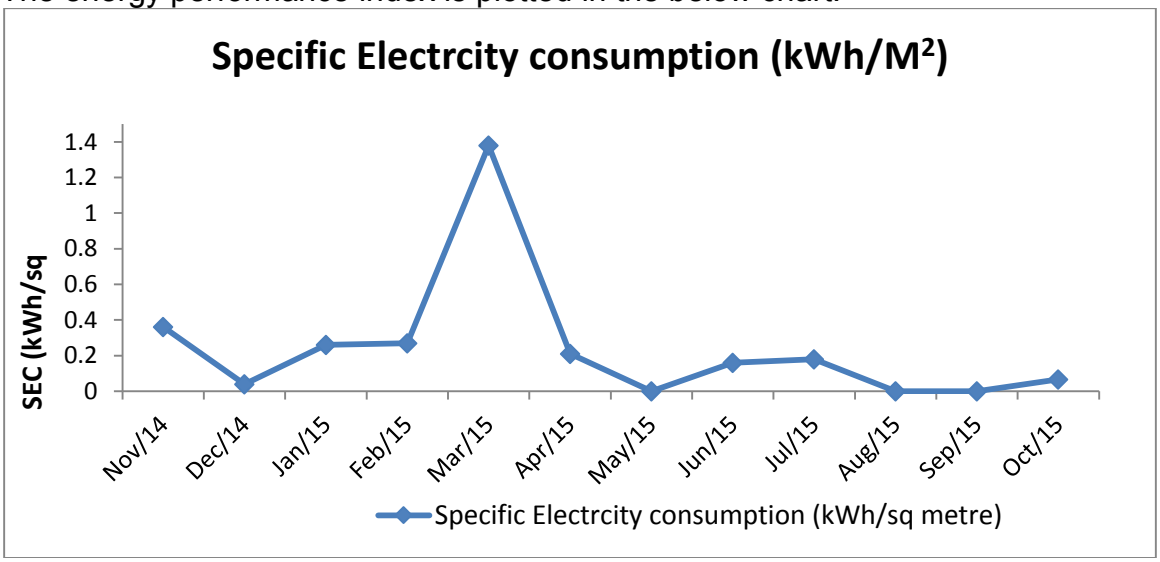
Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Nov-14	270	744.18	0.36

Dec-14	36	744.18	0.04
Jan-15	200	744.18	0.26
Feb-15	205	744.18	0.27
Mar-15	1027	744.18	1.38
Apr-15	160	744.18	0.21
May-15	0	744.18	0
Jun-15	123	744.18	0.16
Jul-15	135	744.18	0.18
Aug-15	0	744.18	0
Sep-15	0	744.18	0
Oct-15	50	744.18	0.067

The energy performance index is plotted in the below chart.



Note:

- Specific electricity consumption found to be varying in all those months.
- Maximum SEC measured in the Mar-2015 and is 1.38 kWh/m^2.
- SEC is highly depended on the seasonal changes and the number of working days in a month. Variations are also possible in specific electricity consumption due to energy usage variation in different seasons of the year.

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C. ENGINEERING DEPARTMENT:

Building : ENGINEERING DEPARTMENT:
Consumer No : 1000145148
Service No : 405708

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity Provider	CSPDCL
2	Tariff	LV2ND1OT14
3	Connected Load (Kw)	3.36
4	Average Monthly Energy Consumption (Kwh)	470.33
5	Monthly Total Electricity Cost (Avg. In Rs)	3571.66
6	Average Power Factor	-

Observations:

- **PF is not included in the electricity bill.**

2. Electrical Load analysis:

Department	-	Engineering dept.		
Consumer / meter No	-	405708		
Date & time of measurement		2811-2015,11:29		
Actual Energy	kWh	0.85		
Apparent Energy	kVAh	0.97		
Power factor	-	0.87		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	1.2	2.745	1.95
Apparent power	kVA	1.37	3.15	2.24
Voltage (V_L)	Volts	236.5	240.5	238.5
Current	Amps	0.9	4.39	2.67
THD voltage	%	0.5	1.5	0.9
THD current	%	12.2	39.5	25.2

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T12	CFL	CEILING FAN OLD
Watts(W)	40	15	90
Total Nos.	8	-	6
Total KW	0.32	-	0.54
Net total Kw	**0.86**		

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs may be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators may be replaced by energy efficient fans.

4. Lux Measurements

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods which is applicable to all commercial buildings. One of the methods is Illuminance method which is the most practicable one.

LOCATION	MEASURED	REQUIRED	REMARKS
Sub engineer electrical	254	150	Good
Engineering head	267	150	Good
Sub engineer mechanical	285	150	Good

Notes:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBC user guide.

5. Computer & Its Accessories:

DETAILS	WATTS	TOTAL NO	TOTAL KW
LCD Computer	200	2	0.4
Laser	200	1	0.2
3 In One Printer	300	-	
Total kW			0.6

6. WATER CONSUMPTION:

The department consumes water for various purposes like

- Drinking.
- Toilet
- Cleaning

Note:

- Water consumption is not monitored.
- Two stage flushing control may be used in toilets for reducing water wastage.

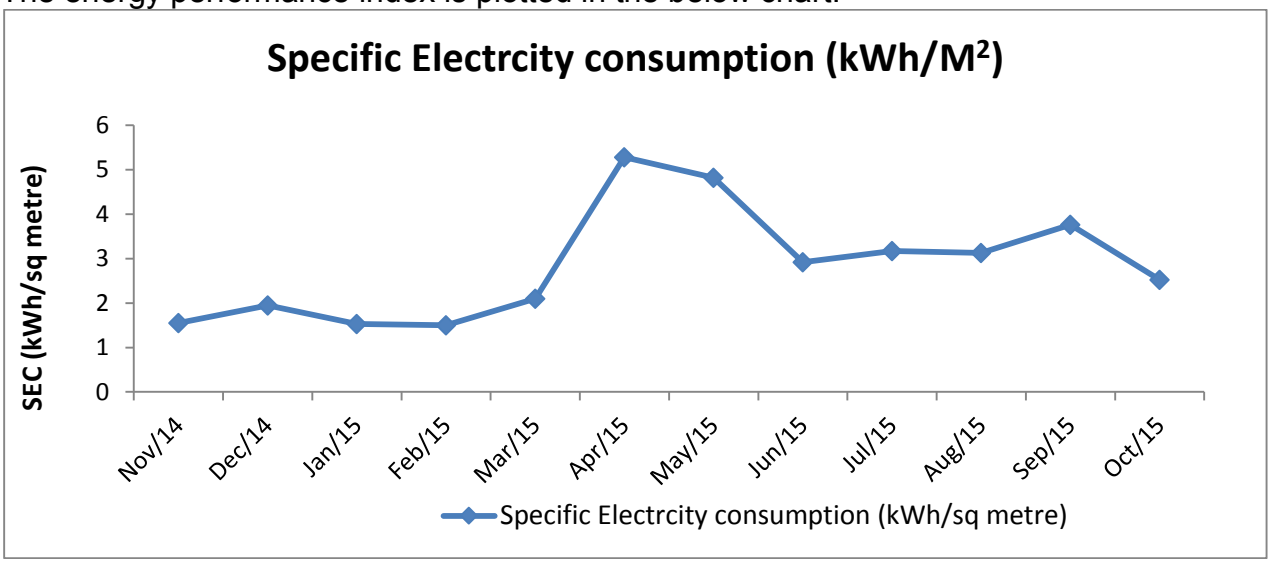
7. EFFICIENCY ANALYSIS:

Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Nov-14	256	164.67	1.55
Dec-14	322	164.67	1.95
Jan-15	253	164.67	1.53
Feb-15	248	164.67	1.50
Mar-15	346	164.67	2.10
Apr-15	870	164.67	5.28
May-15	794	164.67	4.82
Jun-15	481	164.67	2.92
Jul-15	523	164.67	3.17
Aug-15	516	164.67	3.13
Sep-15	620	164.67	3.76
Oct-15	415	164.67	2.52

The energy performance index is plotted in the below chart.



Note:

- Specific electricity consumption found to be varying in all those months.
- Maximum SEC measured in the Apr-2015 and is 5.28 kWh/m^2.
- SEC is highly depended on the seasonal changes and the number of working days in a month. Variations are also possible in specific electricity consumption due to energy usage variation in different seasons of the year.

D. SOS IN GEOGRAPHY:

Building : GEOGRAPHY
Department : GEOGRAPHY
Consumer No : 1003103609
Service No : 606211

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity Provider	CSPDCL
2	Tariff	LV2ND3OT14
3	Connected Load (Kw)	33.38
4	Average Monthly Energy Consumption (Kwh)	1170.63
5	Monthly Total Electricity Cost (Avg. In Rs)	11365.33
6	Average Power Factor	-

Observations:

- **PF is not included in the bill.**

2. Electrical Load analysis:

Department	-	GEOGRAPHY		
Consumer / meter No	-	606211		
Date & time of measurement		28-11-2015, 12:36		
Actual Energy	kWh	1.43		
Apparent Energy	kVAh	2.85		
Power factor	-	0.50		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	2.61	3.28	2.87
Apparent power	kVA	5.27	6.26	5.71
Voltage (V_L)	Volts	41.83	257.20	184.42
Current	Amps	4.47	12.92	7.72
THD voltage	%	1.85	7.94	3.56
THD current	%	8.31	64.54	26.80

Standards:

- Permissible voltage limit as per CEA standards on grid connectivity is 230 plus or minus 10%, which means 254V is the maximum allowable.

Observations:

- At present maximum voltage exceeded the permissible limit which should be taken care of by reporting it to the supplier.
- Increase in the voltage increases the consumption of electricity and also the failure frequency of the equipment.

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T12	CFL	BULB	CEILING FAN NEW	CEILING FAN OLD	EXHAUST FAN
Watts(W)	40	15	40	60	90	60
Total Nos.	125	-	1	-	92	2
Total KW	5	-	0.04	-	8.580	0.12
Net total Kw	**13.74**					

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs may be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators may be replaced by energy efficient fans.

4. Lux Measurements

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods which is applicable to all commercial buildings. One of the methods is Illuminance method which is the most practicable one.

LOCATION	MEASURED	REQUIRED	REMARKS
Sarala Sharma's Cabin	223	150	Good
Zt Khan's Room	189	150	Good
S Sharma 'S Room	231	150	Good
Computer Lab	321	250	Good
Average Lux In Class Rooms	220	150	Good

Note:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBC user guide.

5. Computer & Its Accessories:

DETAILS	WATTS	TOTAL NO	TOTAL KW
LCD Computer	200	38	7.6
CRT Computer	250	4	1
Laptop	100	1	0.1
Scanner	200	1	0.2
Xerox	350	1	0.35
Laser	200	9	1.8
3 In One Printer	300	1	0.3
TOTAL kW			11.35

6. Air conditioning:

The department have installed Split AC in office, class rooms, laboratories etc. and their efficiency calculations are given below in table.

LOCATION	TYPE	COOLING CAPACITY (TR)	MEASURED COOLING CAPACITY KW	RATED POWER ELECTRICAL (KW)	RATED EER	MEASURED EER
Sarala	Split	1.5	4.82	1.55	3.4	3.11
ZT Khan	Split	1.5	4.77	1.55	3.4	3.08
S Sharma	Split	2	5.94	2.36	2.8	2.52
Computer Lab	Split	1.5	4.75	1.55	3.4	3.07
	Split	1.5	4.92	1.55	3.4	3.18
	Split	1.5	4.97	1.55	3.4	3.21

7. WATER CONSUMPTION:

The department consumes water for various purposes like

- Drinking.
- Toilet flushing's
- Cleaning

Note:

- Water consumption is not monitored.
- Two stage flushing control may be used in toilets for reducing water wastage.

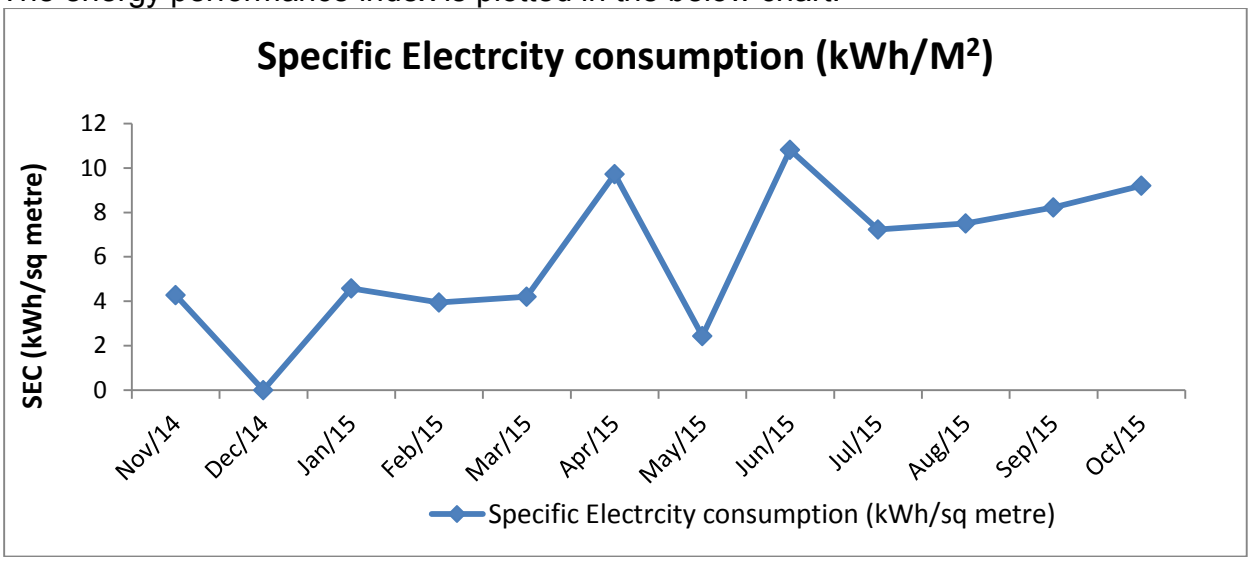
8. EFFICIENCY ANALYSIS:

Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Nov-14	669	1751.3	4.28
Dec-14	740	1751.3	4.58
Jan-15	618	1751.3	3.95
Feb-15	678	1751.3	4.20
Mar-15	1954	1751.3	9.72
Apr-15	390	1751.3	2.44
May-15	2320	1751.3	10.82
Jun-15	1229	1751.3	7.23
Jul-15	1343	1751.3	7.50
Aug-15	1519	1751.3	8.23
Sep-15	1680	1751.3	9.21
Oct-15	904	1751.3	5.65

The energy performance index is plotted in the below chart.



Note:

- Specific electricity consumption found to be varying in all those months.
- Maximum SEC measured in the Jun-2015 and is 10.82 kWh/m^2.
- SEC is highly depended on the seasonal changes and the number of working days in a month. Variations are also possible in specific electricity consumption due to energy usage variation in different seasons of the year.

E. LIBRARY:

Building :LIBRARY
Department :LIBRARY
Consumer No : 1000143738
Service No :402164

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity Provider	CSPDCL
2	Tariff	LV2ND3OT14
3	Connected Load (kW)	65
4	Average Monthly Energy Consumption (kWh)	4224.83
5	Monthly Total Electricity Cost (Avg. In Rs)	67402.5
6	Average Power Factor	-

Observations:

- **PF is not provided in the bill**

2. Electrical Load analysis:

Department	-	Library		
Consumer / meter No	-	402164		
Date & time of measurement		28/11/2015 15:06		
Actual Energy	kWh	6.84		
Apparent Energy	kVAh	7.97		
Power factor	-	0.85		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	12.42	15.19	13.69
Apparent power	kVA	14.83	17.43	15.95
Voltage (V_L)	Volts	232.8	237.1	235.3
Current	Amps	11.6	39	24.19
Voltage unbalance	%	0	0.6	0.25
Current unbalance	%	43.5	58.1	48.5
THD voltage	%	2	2.6	2.29
THD current	%	4.4	10.7	8.19

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T5	T12	CFL	CEILING FAN NEW	CEILING FAN OLD
Watts(W)	28	40	15	60	90
Total Nos.	07	132	126	15	16
Total KW	0.19	5.28	1.89	0.9	1.44
Net total Kw	**9.70**				

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs may be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators may be replaced by energy efficient fans.

4. Lux Measurements

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods which is applicable to all commercial buildings. One of the methods is Illuminance method which is the most practicable one.

LOCATION	MEASURED LUX	REQUIRED LUX	REMARKS
Average Lux In Library	321	250	Good
Librarians Room	289	150	Good

Note:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBC user guide.

5. Computer & Its Accessories:

DETAILS	WATTS	TOTAL NO	TOTAL KW
LCD Computer	200	12	2.4
Scanner	200	02	0.4
Xerox	350	01	0.7
Laser	200	03	0.6
3 In One Printer	300	01	0.3
TOTAL kW			**4.4**

6. Air conditioning:

The department have installed a total of Split AC in the department including office, class rooms, laboratories etc. and their efficiency calculations are given below in table.

LOCATION	TYPE	COOLING CAPACITY (TR)	MEASURED COOLING CAPACITY KW	RATED POWER ELECTRICAL (KW)	RATED EER	MEASURED EER
Library	Split1	2	5.28	2.4	2.68	2.20
	SPLIT2	2	5.25	2.4	2.68	2.19
	SPLIT3	2	2.13	2.4	2.68	2.14
	SPLIT4	2	5.36	2.4	2.68	2.24
	SPLIT5	2	5.52	2.4	2.68	2.30
Librarians room	Split	1.5	4.40	1.6	3.29	2.75

7. WATER CONSUMPTION:

The department consumes water for various purposes like

- Drinking.
- Toilet flushing's
- Cleaning

Note:

- Water consumption is not monitored.
- Two stage flushing control may be used in toilets for reducing water wastage.
-

8. EFFICIENCY ANALYSIS:

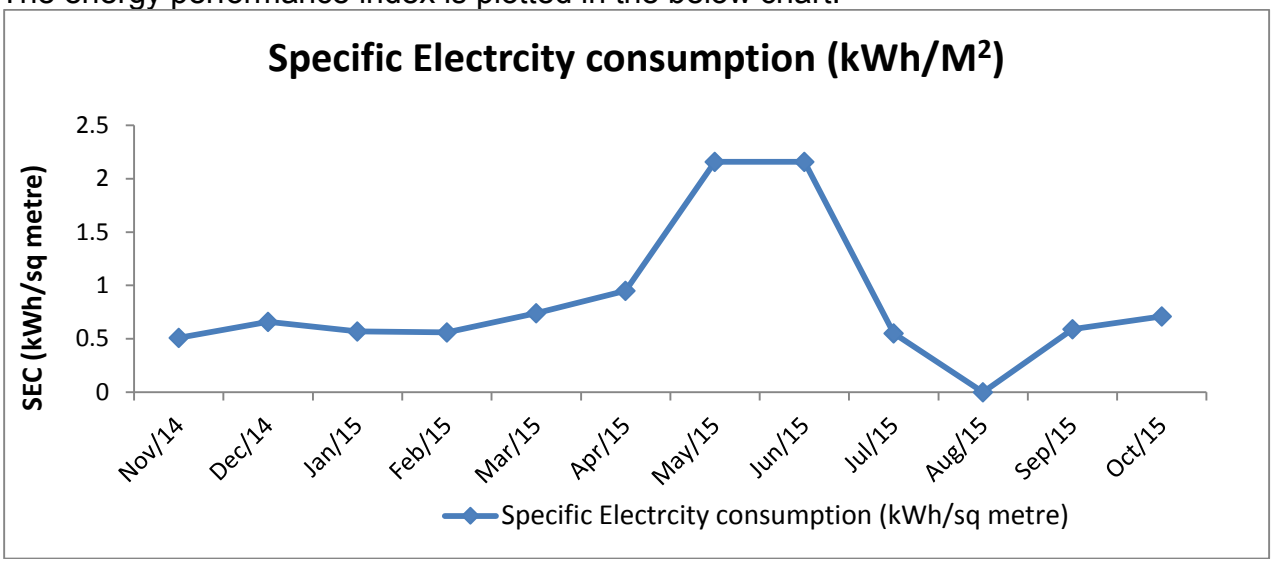
Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Nov-14	2556	4950.7	0.52
Dec-14	3300	4950.7	0.67
Jan-15	2847	4950.7	0.58
Feb-15	2817	4950.7	0.57

Mar-15	3708	4950.7	0.75
Apr-15	4743	4950.7	0.96
May-15	10740	4950.7	2.17
Jun-15	10740	4950.7	2.17
Jul-15	2734	4950.7	0.55
Aug-15	0	4950.7	0.00
Sep-15	2961	4950.7	0.60
Oct-15	3543	4950.7	0.72

The energy performance index is plotted in the below chart.



Note:

- Specific electricity consumption found to be varying in all those months.
- Maximum SEC measured in the May & June-2015 and is 2.17 kWh/m^2.
- SEC is highly depended on the seasonal changes and the number of working days in a month. Variations are also possible in specific electricity consumption due to energy usage variation in different seasons of the year.

F. ANIMAL HOUSE :

Building : LIFE SCIENCE
Department : LIFE SCIENCE
Consumer No : 1000145146
Service No : 405706

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity Provider	CSPDCL
2	Tariff	LV2ND1OT14
3	Connected Load (Kw)	3.36
4	Average Monthly Energy Consumption (Kwh)	373
5	Monthly Total Electricity Cost (Avg. In Rs)	1730.83
6	Average Power Factor	-

Observations:

- **PF is not included in the bill.**

2. Electrical Load analysis:

Department	-	Life science		
Consumer / meter No	-	405706		
Date & time of measurement		28/11/2015 15:55		
Actual Energy	kWh	0.06		
Apparent Energy	kVAh	0.01		
Power factor	-	0.6		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	.58	1.67	.73
Apparent power	kVA	1.86	4.76	2.37
Voltage (V_L)	Volts	232.7	253	244.99
Current	Amps	.04	7.93	1.35
THD voltage	%	2.95	3.52	3.18
THD current	%	5.10	13.43	6.58

Standards:

- Permissible voltage limit as per CEA standards on grid connectivity is 230 plus or minus 10%, which means 254V is the maximum allowable.

Observations:

- At present maximum voltage is at the brim of the permissible limit which should be taken care of by reporting it to the supplier.
- Increase in the voltage increases the consumption of electricity and also the failure frequency of the equipment.

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T12	CFL
Watts(W)	40	15
Total Nos.	6	4
Total KW	0.24	0.06
Net total Kw	**0.3**	

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs may be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators may be replaced by energy efficient fans.

4. Lux Measurements

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods which is applicable to all commercial buildings. One of the methods is Illuminance method which is the most practicable one.

LOCATION	MEASURED	REQUIRED	REMARKS
Average Lux In Animal House	226	**150**	**Good**

Notes:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBC user guide.

5. Air conditioning:

The department have installed a total of 6 Split AC and a window AC In the department and their efficiency calculations are given below in table.

LOCATION	TYPE	COOLING CAPACITY (TR)	MEASURED COOLING CAPACITY KW	RATED POWER ELECTRICAL (KW)	RATED EER	MEASURED EER
ANIMAL HOUSE	WINDOW	1.5	NOT WORKING			
	SPLIT	1.5	NOT WORKING			
AQUARIUM	SPLIT	1.5	4.6	1.65	3.2	2.81
	SPLIT	1.5	4.49	1.85	2.8	2.43
	SPLIT	1.5	4.45	1.85	2.8	2.41
	SPLIT	1.5	4.42	1.85	2.8	2.39
	SPLIT	1.5	4.42	1.85	2.8	2.39

6. WATER CONSUMPTION:

The department consumes water for various purposes like

- Drinking.
- Toilet flushing's
- Cleaning

Note:

- Water consumption is not monitored.
- Two stage flushing control may be used in toilets for reducing water wastage.

7. EFFICIENCY ANALYSIS:

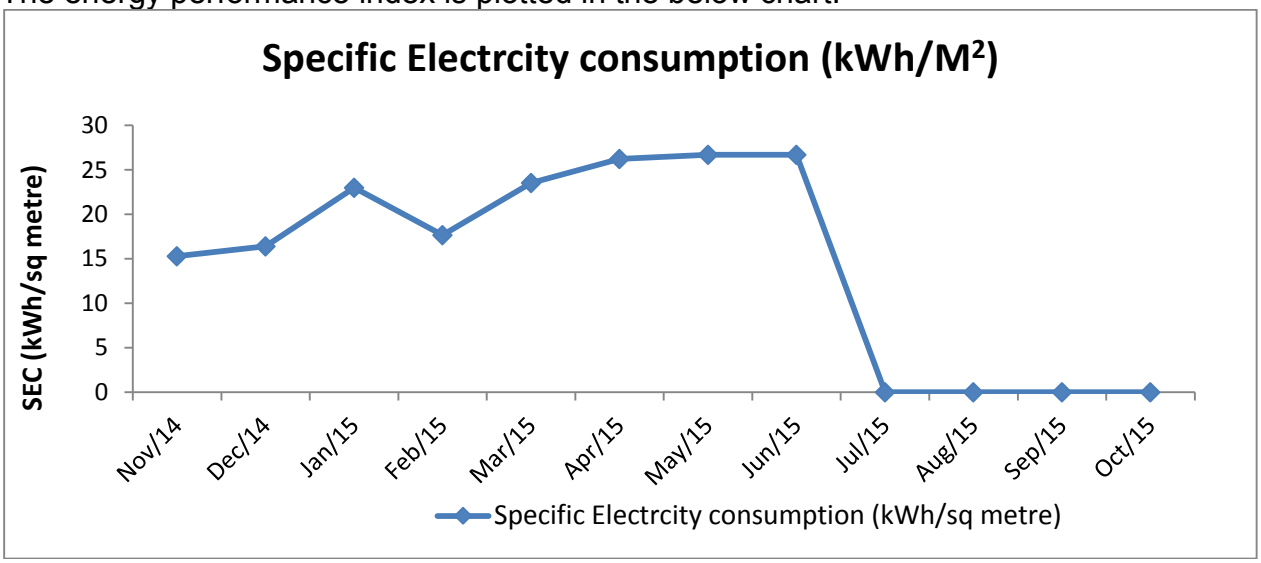
Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Nov-14	260	17	15.29
Dec-14	279	17	16.41
Jan-15	391	17	23.00
Feb-15	300	17	17.65

Mar-15	400	17	23.53
Apr-15	446	17	26.24
May-15	454	17	26.71
Jun-15	454	17	26.71
Jul-15	0	17	0.00
Aug-15	0	17	0.00
Sep-15	0	17	0.00
Oct-15	0	17	0.00

The energy performance index is plotted in the below chart.



Note:

- Specific electricity consumption found to be varying in all those months.
- Maximum SEC measured in the Jun-2015 and is 26.7 kWh/m^2.
- SEC is highly depended on the seasonal changes and the number of working days in a month. Variations are also possible in specific electricity consumption due to energy usage variation in different seasons of the year.
- The kWh consumption was nil from the Jul-15 as the energy metre is not working for the same.

G. PUMP AD BLOCK:

Consumer No : 1000145478
Service No : 406185

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity Provider	CSPDCL
2	Tariff	LV2ND1OT14
3	Connected Load (Kw)	
4	Average Monthly Energy Consumption (Kwh)	677.54
5	Monthly Total Electricity Cost (Avg. In Rs)	4850.90
6	Average Power Factor	-

Observations:

- **Original EB bill was not available thus connected load and other details couldn't include in the above table.**
- **Capacitor is not in the premises. Thus PF would be less than the permissible limit.**

2. Electrical Load analysis:

Department	-	Pump ad block		
Consumer / meter No	-	406185		
Date & time of measurement		28-11-2015, 16:12		
Actual Energy	kWh	0.36		
Apparent Energy	kVAh	0.60		
Power factor	-	0.6		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	3.39	3.43	3.41
Apparent power	kVA	5.51	5.58	5.55
Voltage (V_L)	Volts	236.39	251.45	242.90
Current	Amps	7.26	8.11	7.60
THD voltage	%	2.85	2.96	3.13
THD current	%	4.07	4.67	4.44

Note:

- PF found to be low in the Pump. By installing the capacitor of required rating we can improve the PF.
- Capacitor of 1 kVAr is sufficient for the motor.

H. BOTANICAL GARDEN PUMP:

Consumer No : 1000297299
Service No : 406203

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity Provider	CSPDCL
2	Tariff	LV2ND3OT14
3	Connected Load (Kw)	3.75
6	Average Monthly Energy Consumption (Kwh)	510.25
7	Monthly Total Electricity Cost (Avg. In Rs)	4847.5
9	Average Power Factor	-

Observations:

- **PF is not included in the bill.**

2. Electrical Load analysis:

Department	-	Pump Life science		
Consumer / meter No	-	406203		
Date & time of measurement		28/11/2015 11:01		
Actual Energy	kWh	1.25		
Apparent Energy	kVAh	1.47		
Power factor	-	0.85		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	3.54	3.61	3.58
Apparent power	kVA	4.21	4.24	4.22
Voltage (V_L)	Volts	230.5	238.5	235.5
Current	Amps	7.85	9.22	8.56

Note:

- **Average working hours of the pump found to be four**
- **Rated Power of the pump was 5 hp which is 3.62 kW**

I. PUMP NEAR LIBRARY

Building : PUMP NEAR LIBRARY
Consumer No : 100014550
Service No : 406126

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity Provider	CSPDCL
2	Tariff	LV2ND1OT14
3	Connected Load (Kw)	2.238
6	Average Monthly Energy Consumption (Kwh)	1041.6
7	Monthly Total Electricity Cost (Avg. In Rs)	8532
9	Average Power Factor	-

Observations:

2. Electrical Load analysis:

Department	-	Pump house near library		
Consumer / meter No	-	406126		
Date & time of measurement		28/11/2015 15:28		
Actual Energy	kWh	1.2		
Apparent Energy	kVAh	1.39		
Power factor	-	0.86		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	3.56	3.62	3.58
Apparent power	kVA	4.09	4.16	4.11
Voltage (V_L)	Volts	231.2	245.5	238.5
Current	Amps	8.38	9.19	8.98

Note:

- **Average working hours of the pump found to be twelve**
- **Rated Power of the pump was 5 hp which is 3.62 kW**

J. ARTS BHAVAN GROUND FLOOR

Building : ARTS BHAVAN
Department : ARTS BHAVAN
Consumer No : 1000143737
Service No : 402163

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity Provider	CSPDCL
2	Tariff	LV2ND3OT14
3	Connected Load (Kw)	65
4	Average Monthly Energy Consumption (Kwh)	4141.83
5	Monthly Total Electricity Cost (Avg. In Rs)	93062.5
6	Average Power Factor	-

Observations:

- **PF is not included in the bill.**

2. Electrical Load analysis:

Department	-	Arts Bhavan Ground Floor		
Consumer / meter No	-	402163		
Date & time of measurement		28-11-2015, 11:53		
Actual Energy	kWh	4.33		
Apparent Energy	kVAh	5.64		
Power factor	-	0.76		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	3.33	6.34	4.81
Apparent power	kVA	4.84	7.69	6.27
Voltage (V_L)	Volts	232.5	243.2	240.0
Current	Amps	5.51	14.84	9.08
Voltage unbalance	%	1.1	2.3	1.61
Current unbalance	%	6.5	54.6	31.30
THD voltage	%	1.8	2.5	2.12
THD current	%	6.3	22.6	10.87

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T12	CFL	CEILING FAN OLD
Watts(W)	40	15	90
Total Nos.	143	7	78
Total KW	1.72	0.105	7.02
Net total Kw	**8.845**		

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs may be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators may be replaced by energy efficient fans.

4. Lux Measurements

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods which is applicable to all commercial buildings. One of the methods is Illuminance method which is the most practicable one.

LOCATION	MEASURED	REQUIRED	REMARKS
UGC Coaching Centre Hall A	231	150	Good
UGC Coaching Centre Hall B	254	150	Good
UGC Office	196	150	Good
Assistant Professor	167	150	Good
Women's Study Centre	229	150	Good
Psychology Office	198	150	Good
Psychology Office	217	150	Good
Mr. Shrivastava Cabin	238	150	Good
MPhil Room	177	150	Good
Yoga Office	202	150	Good
Room 4	199	150	Good
Room 3	231	150	Good
Room 2	241	150	Good

Notes:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBC user guide.

5. Computer & Its Accessories:

DETAILS	WATTS	TOTAL NO	TOTAL KW
LCD Computer	200	25	5
Scanner	200	2	0.4
Xerox	350	1	0.35
Laser	200	7	1.4
3 In One Printer	300	1	0.3
TOTAL kW			7.45

6. WATER CONSUMPTION:

The department consumes water for various purposes like

- Drinking.
- Toilet flushing's
- Cleaning

Note:

- Water consumption is not monitored.
- Two stage flushing control may be used in toilets for reducing water wastage.

7. Air conditioning:

Arts bhavan have installed a total of 7 Split AC and a window in the department including office , class rooms, laboratories etc. and their efficiency calculations are given below in table.

LOCATION	TYPE	COOLING CAPACITY (TR)	MEASURED COOLING CAPACITY (KW)	RATED POWER ELECTRICAL (Kw)	RATED EER	MEASURED EER
Computer Lab	Split 1	1.5	4.82	1.55	3.40	3.11
	Split 2	1.5	4.78	1.55	3.40	3.09
	Split 3	1.5	4.72	1.55	3.40	3.05
Coordinators Room	Split	1.5	4.89	1.55	3.40	3.16
Promila Singh Cabin	Split	1.5	4.44	1.77	2.84	2.51
Vansh Gopal Singh Cabin	Split	1.5	4.28	1.77	2.84	2.42
Genomics Lab	Split	1.5	4.99	1.55	3.40	3.22

Faculty Room	Window	1.5	Not working		

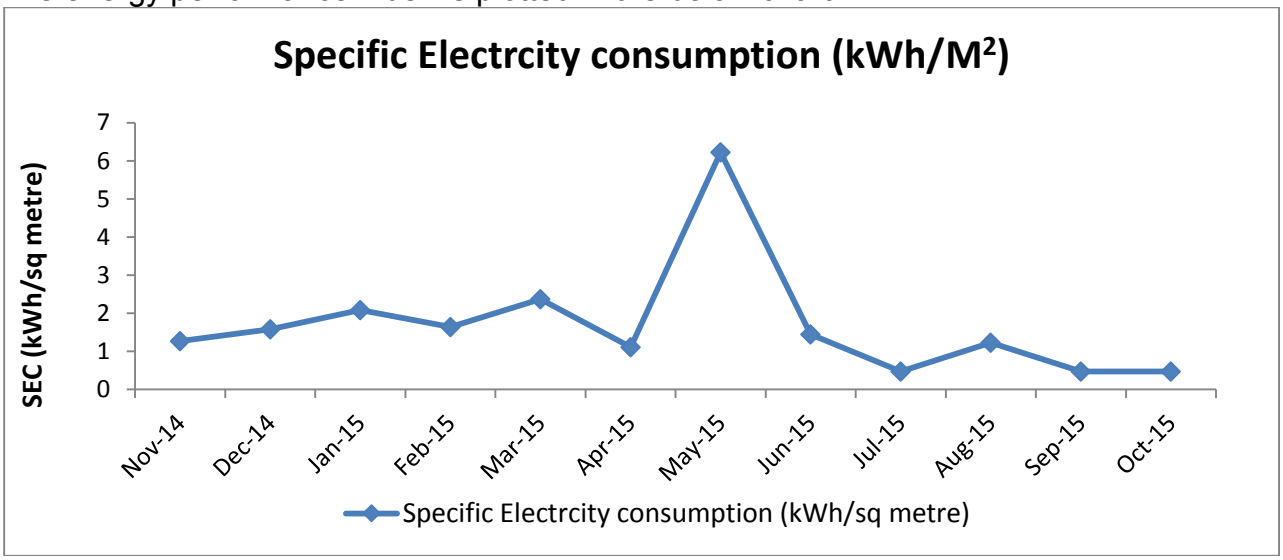
8. EFFICIENCY ANALYSIS:

Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Nov-14	3100	2433.48	1.27
Dec-14	3858	2433.48	1.58
Jan-15	5091	2433.48	2.09
Feb-15	3993	2433.48	1.64
Mar-15	5778	2433.48	2.37
Apr-15	2718	2433.48	1.11
May-15	15168	2433.48	6.23
Jun-15	3537	2433.48	1.45
Jul-15	1150	2433.48	0.47
Aug-15	3007	2433.48	1.23
Sep-15	1150	2433.48	0.47
Oct-15	1152	2433.48	0.47

The energy performance index is plotted in the below chart.



Note:

- Specific electricity consumption found to be varying in all those months.
- Maximum SEC measured in the May-2015 and is 6.23 kWh/m^2.
- SEC is highly depended on the seasonal changes and the number of working days in a month. Variations are also possible in specific electricity consumption due to energy usage variation in different seasons of the year.
- High SEC due to building renovation

9. General mentions:

- Building was under renovation during the period of audit.
- AC is provided in some of the rooms. Most of them are old and not working due to the renovation in the area.

K. ARTS BHAVAN FIRST FLOOR :

Building : ARTS DEPARTMENT
Department : ARTS DEPARTMENT
Consumer No : 10005394049
Service No : 406354

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity Provider	CSPDCL
2	Tariff	LV2ND3OT14
3	Connected Load (kW)	32
4	Average Monthly Energy Consumption (kWh)	576
5	Monthly Total Electricity Cost (Avg. In Rs)	5928.75
6	Average Power Factor	-

Observations:

- **PF is not provided in the bill.**

2. Electrical Load analysis:

Department	-	Arts dept. first floor		
Consumer / meter No	-	406354		
Date & time of measurement		25-11-2015, 12:49		
Actual Energy	kWh	0.74		
Apparent Energy	kVAh	0.96		
Power factor	-	0.77		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	1.19	1.53	1.32
Apparent power	kVA	1.55	1.96	1.72
Voltage (V_L)	Volts	240.2	246.6	243.8
Current	Amps	0	6.06	2.71
Voltage unbalance	%	0.4	0.9	0.6
Current unbalance	%	119.9	140.6	134.4
THD voltage	%	1.8	2.3	2.10
THD current	%	5.4	11.1	7.14

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T12	CFL	BULB	CEILING FAN NEW	CEILING FAN OLD	EXHAUST FAN
Watts(W)	40	15	40	60	90	60
Total Nos.	108	5	-	4	58	2
Total KW	4.32	0.75	-	0.24	5.22	0.12
Net total Kw	**10.65**					

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs may be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators may be replaced by energy efficient fans.

4. Lux Measurements

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods which is applicable to all commercial buildings. One of the methods is Illuminance method which is the most practicable one.

LOCATION	MEASURED LUX	REQUIRED LUX	REMARKS
Anthropology Office	201	150	Good
Seminar Office	225	150	Good
Human Genome Lab	288	250	Good
Staff Room	196	150	Good
HOD Cabin	159	150	Good
Forensic Lab	287	250	Good
Lecture Room	229	150	Good
Sahitya Academy Room	198	150	Good
Sociology Office	217	150	Good
Program Office	156	150	Good
Class Room	175	150	Good
Computer Lab	287	250	Good
Dr Tiwari Cabin	293	150	Good
Ancient Indian History Office	356	150	Good
SOS In Language And	187	150	Good
Dr Madhulatha Office	176	150	Good
HOD Cabin	264	150	Good
Scholar Room	281	150	Good
MPhil Class Room	241	150	Good
Staff Room	209	150	Good
Hall	226	150	Good

Notes:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBC user guide.

5. Computer & Its Accessories:

DETAILS	WATTS	TOTAL NO	TOTAL KW
LCD Computer	200	28	5.6
CRT Computer	250	3	0.75
Scanner	200	4	0.8
Xerox	350	2	0.7
Laser	200	4	0.8
Total kW			**8.65**

6. WATER CONSUMPTION:

The department consumes water for various purposes like

- Drinking.
- Toilet flushing's
- Cleaning

Note:

- Water consumption is not monitored.
- Two stage flushing control may be used in toilets for reducing water wastage.

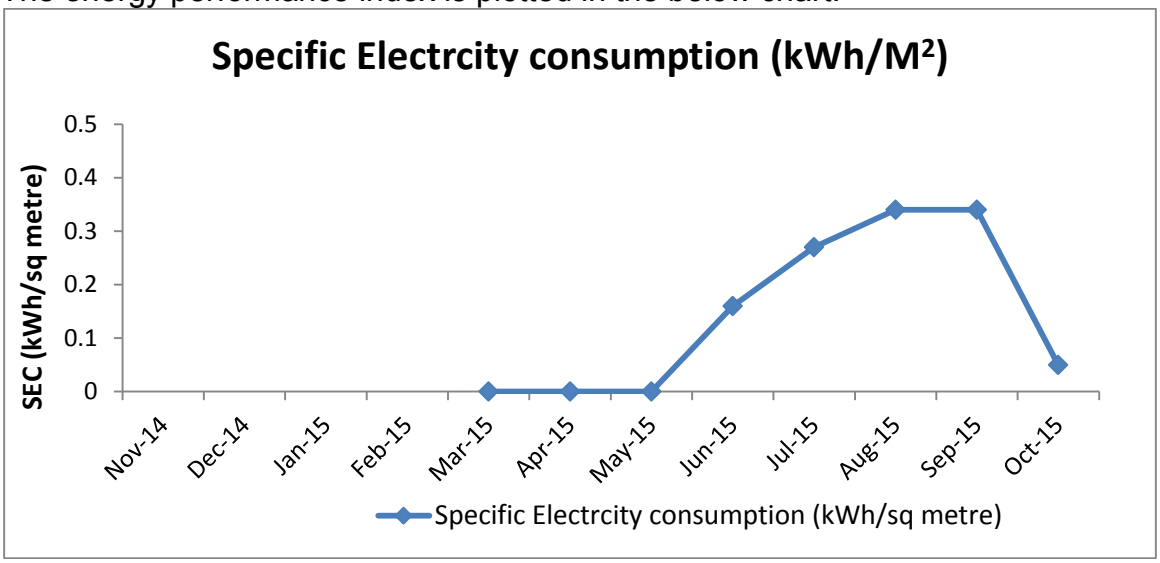
7. EFFICIENCY ANALYSIS:

Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Mar-15	0	2433.48	0
Apr-15	0	2433.48	0
May-15	0	2433.48	0
Jun-15	400	2433.48	0.16
Jul-15	660	2433.48	0.27
Aug-15	840	2433.48	0.34
Sep-15	840	2433.48	0.34
Oct-15	140	2433.48	0.05

The energy performance index is plotted in the below chart.



Note:

- **Unit's consumption is not available for the first six months.**
- Specific electricity consumption found to be varying in all those months.
- Maximum SEC measured in the Aug-2015 and is 0.34 kWh/m^2.
- SEC is highly depended on the seasonal changes and the number of working days in a month. Variations are also possible in specific electricity consumption due to energy usage variation in different seasons of the year.

10. General mentions:

- Building was under renovation during the period of audit.
- AC is provided in some of the rooms. Most of them are old and not working due to the renovation in the area.

L. ARTS BHAVAN SECOND FLOOR:

Building : ATRS BHAVAN
Department : ARTS BHAVAN
Consumer No : 1005394112
Service No : 406355

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity Provider	CSPDCL
2	Tariff	LV2ND1OT14
3	Connected Load (Kw)	32.14
4	Average Monthly Energy Consumption (Kwh)	672.5
5	Monthly Total Electricity Cost (Avg. In Rs)	11857.5
6	Average Power Factor	-

Note:

- **PF is not provided in the bill.**

2. Electrical Load analysis:

Department	-	Arts bhavan second floor		
Consumer / meter No	-	406355		
Date & time of measurement		28-11-2015, 13:25		
Actual Energy	kWh	3.53		
Apparent Energy	kVAh	4.92		
Power factor	-	0.71		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	3.40	4.94	3.59
Apparent power	kVA	4.81	6.10	5.01
Voltage (V_L)	Volts	241.4	247.9	245
Current	Amps	0	14.35	6.98
Voltage unbalance	%	0.3	0.8	0.6
Current unbalance	%	100	106	101.5
THD voltage	%	1.8	2.5	2.1
THD current	%	6.8	16.7	9.77

Note:

- **PF found to be low in the logging period. This may due to the low load present under the meter.**

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T12	CFL	CEILING FAN OLD	EXHAUST FAN
Watts(W)	40	15	90	60
Total Nos.	87	2	48	2
Total KW	3.4	0.03	4.32	0.12
Net total Kw	**7.87**			

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs may be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators may be replaced by energy efficient fans.

4. Lux Measurements

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods which is applicable to all commercial buildings. One of the methods is Illuminance method which is the most practicable one.

LOCATION	MEASURED	REQUIRED	REMARKS
SOS In History	302	150	Good
Average Lux In Class Rooms	254	150	Good
Staff Room	289	150	Good
HOD Cabin	264	150	Good
SOS In Economics	351	150	Good
Average Lux In Class Rooms	168	150	Good
Staff Room	225	150	Good
HOD Cabin	354	150	Good

Notes:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBC user guide.

5. Computer & Its Accessories:

DETAILS	WATTS	TOTAL NO	TOTAL KW
LCD Computer	200	8	0.8
Scanner	200	2	0.4
Laser	200	6	1.2
TOTAL kW			1.4

6. WATER CONSUMPTION:

The department consumes water for various purposes like

- Drinking.
- Toilet flushing's
- Cleaning

Note:

- Water consumption is not monitored.
- Two stage flushing control may be used in toilets for reducing water wastage.

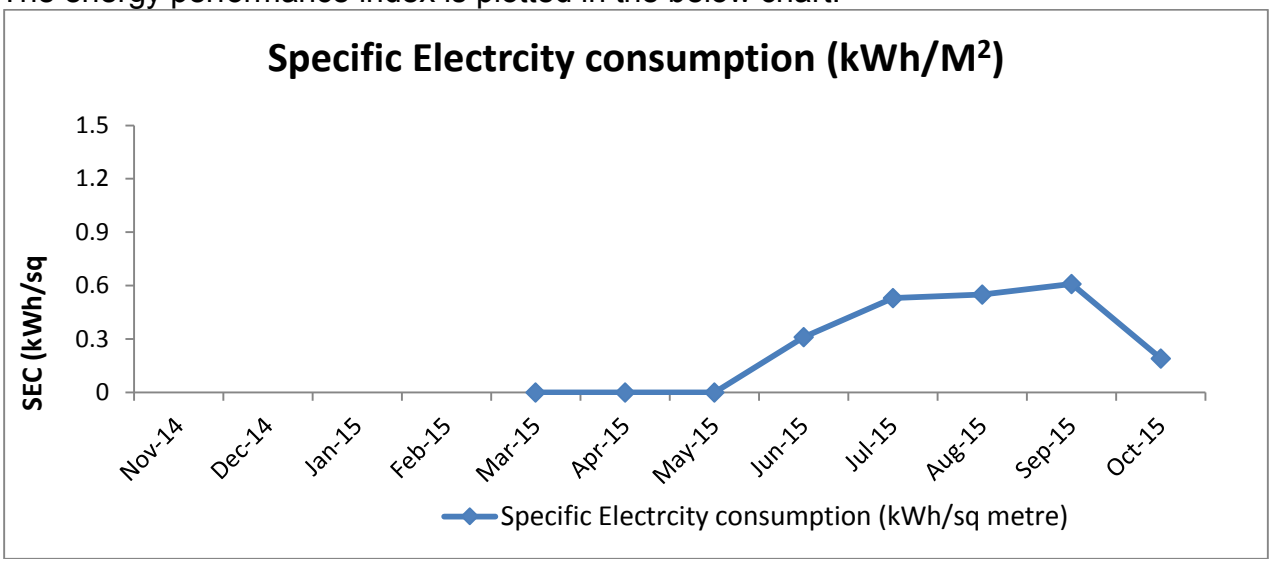
7. EFFICIENCY ANALYSIS:

Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Mar-15	0	2433.48	0
Apr-15	0	2433.48	0
May-15	0	2433.48	0
Jun-15	760	2433.48	0.31
Jul-15	1300	2433.48	0.53
Aug-15	1340	2433.48	0.55
Sep-15	1500	2433.48	0.61
Oct-15	480	2433.48	0.19

The energy performance index is plotted in the below chart.



Note:

- **Unit's consumption is not available for the first six months.**
- Specific electricity consumption found to be varying in all those months.
- Maximum SEC measured in the Sep-2015 and is 0.61 kWh/m^2.
- SEC is highly depended on the seasonal changes and the number of working days in a month. Variations are also possible in specific electricity consumption due to energy usage variation in different seasons of the year.

11. General mentions:

- Building was under renovation during the period of audit.
- AC is provided in some of the rooms. Most of them are old and not working due to the renovation in the area.

M. HEALTH CENTRE :

Building : Health centre
Department : Health centre
Consumer No : 1000143732
Service No :402158

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity Provider	CSPDCL
2	Tariff	LV2ND1OT14
3	Connected Load (Kw)	4.95
4	Average Monthly Energy Consumption (Kwh)	317.83
5	Monthly Total Electricity Cost (Avg. In Rs)	2573
6	AVERAGE POWER FACTOR	-

Notes:

- **PF is not available in the bill.**

2. Electrical Load analysis:

Department	-	Health centre		
Consumer / meter No	-	402158		
Date & time of measurement		28-11-2015, 11:24		
Actual Energy	kWh	0.42		
Apparent Energy	kVAh	0.74		
Power factor	-	0.56		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	0.56	2.16	0s.87
Apparent power	kVA	0.99	4.68	1.54
Voltage (V_L)	Volts	230.85	240.22	236.40
Current	Amps	0.62	7.98	1.67
THD voltage	%	2.15	3.14	2.51
THD current	%	4.76	6.67	6.12

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T5	T12	CFL	BULB	CEILING FAN NEW	CEILING FAN OLD
Watts(W)	28	40	15	60	60	90
Total Nos.	2	10	1	1	5	2
Total KW	.056	0.4	.015	0.06	0.3	0.18
Net total		**1.011**				

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs may be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators may be replaced by energy efficient fans.

4. LUX MEASUREMENTS

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods which is applicable to all commercial buildings. One of the methods is Illuminance method which is the most practicable one.

LOCATION	MEASURED	REQUIRED	REMARKS
Doctor	233	150	Good
Madame's Room	196	150	Good
Pathology	251	150	Good

Notes:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBC user guide.

5. Computer & Its Accessories:

DETAILS	WATTS	TOTAL NO	TOTAL KW
LCD Computer	200	2	0.4
CRT Computer	250	-	
Total kW			0.4

6. Air conditioning:

Health centre have installed 2 window AC and a split AC, and their efficiency calculations are given below in table.

LOCATION	TYPE	COOLING CAPACITY (TR)	MEASURED COOLING CAPACITY KW	RATED POWER ELECTRICAL (KW)	RATED EER	MEASURED EER
Doctor's Room	Window	1.5	3.75	2.5	2.1	1.5
Room	Split	1	3.399	1.1	3.2	3.09
Pathology	Window	1.5	3.55	2.5	2.1	1.42

Table

7. Water consumption:

Health centre consumes water for various purposes like

- Drinking.
- Toilets
- Cleaning

Note:

- Water consumption is not monitored.
- Two stage flushing control may be used in toilets for reducing water wastage.

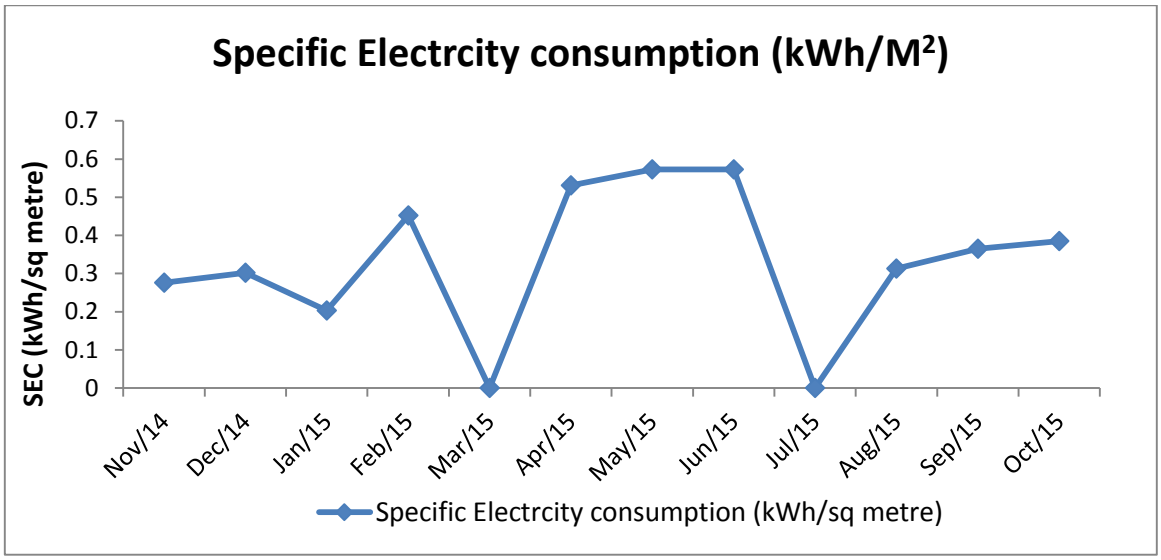
8. EFFICIENCY ANALYSIS:

Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Nov-14	265	960	0.28
Dec-14	290	960	0.30
Jan-15	195	960	0.20
Feb-15	434	960	0.45
Mar-15	0	960	0.00
Apr-15	510	960	0.53
May-15	550	960	0.57
Jun-15	550	960	0.57
Jul-15	0	960	0.00
Aug-15	300	960	0.31
Sep-15	350	960	0.36
Oct-15	370	960	0.39

The energy performance index is plotted in the below chart.



Chart

Note:

- Specific electricity consumption found to be varying in all those months.
- SEC is highly depended on electricity consumption. Variations are observed in specific electricity consumption due to energy usage variation in different seasons of the year.

V. MEASUREMENTS TAKEN ON 30-11-2015:

A. ADMINSTRATIVE BUILDING:

i. Building : ADMINSTRATIVE BUILDNG
Consumer No : 1000297279
Service No : 406135

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity Provider	CSPDCL
2	Tariff	LV2ND3OT14
3	Connected Load (kW)	63.35
4	Average Monthly Energy Consumption (kWh)	4842.5
5	Monthly Total Electricity Cost (Avg. In Rs)	50725.83
6	Average power factor	-

Observations:

- **PF is not included in the bill.**

2. Electrical Load analysis:

Department	-	AD block Power meter		
Consumer / meter No	-	406135		
Date & time of measurement		30-11-2015, 11:41		
Actual Energy	kWh	8.27		
Apparent Energy	kVAh	9.53		
Power factor	-	0.86		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	11.89	17.18	14.74
Apparent power	kVA	14.30	19.34	16.99
Voltage (V_L)	Volts	231.6	242.1	235.9
Current	Amps	1.9	44.38	26.62
Voltage unbalance	%	1.6	2.1	1.9
Current unbalance	%	90.5	92.7	91.75
THD voltage	%	2.1	2.8	2.46
THD current	%	9.8	19.1	14.16

i. Building: ADMINSTRATIVE BUILDING

Consumer No : 1000143837
Service No : 404298

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity Provider	CSPDCL
2	Tariff	LV2ND3OT14
3	Connected Load (kW)	69.95
6	Average Monthly Energy Consumption (kWh)	2471.27
7	Monthly Total Electricity Cost (Avg. In Rs)	19725.44
9	Average Power Factor	-

Observations:

- **PF is not included in the bill**

2. Electrical Load analysis:

Department	-	Ad block		
Consumer / meter No	-	404298		
Date & time of measurement		30-11-2015, 11:09		
Actual Energy	kWh	1.71		
Apparent Energy	kVAh	2.10		
Power factor	-	0.81		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	3.54	4.04	3.68
Apparent power	kVA	4.37	4.80	4.50
Voltage (V_L)	Volts	233	240.3	235.74
Current	Amps	0	13.78	5.55
Voltage unbalance	%	1.4	1.8	1.6
Current unbalance	%	100	102.7	100
THD voltage	%	2.2	2.7	2.4
THD current	%	7.3	18	11.86

ii. **PAREEKSHA BHAVAN:**

Building : ADMINSTRATIVE BUILDING
Consumer No : 1000297353
Service No : 406267

1. **Electrical Bill Analysis:**

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity Provider	CSPDCL
2	Tariff	LV2ND1OT14
3	Connected Load (kW)	----
4	Average Monthly Energy Consumption (kWh)	3992.75
5	Monthly Total Electricity Cost (Avg. In Rs)	34413
6	Average Power Factor	-

2. **Electrical Load analysis:**

Department	-	Exam. centre		
Consumer / meter No	-	406267		
Date & time of measurement		30-11-2015, 12:30		
Actual Energy	kWh	8.90		
Apparent Energy	kVAh	11.17		
Power factor	-	0.79		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	8.81	11.09	97.71
Apparent power	kVA	11.38	12.26	13.32
Voltage (V_L)	Volts	238.2	249.4	243.9
Current	Amps	6.88	31.69	15.70
Voltage unbalance	%	1.41	1.7	1.5
Current unbalance	%	48.6	76.4	63.2
THD voltage	%	2.7	3.4	3.04
THD current	%	4.7	13.3	8.96

iii. **VC CHAMBER AC:**

Building : ADMINSTRATIVE BUILDING
Department : ADMINSTRATIVE BUILDING
Consumer No : 1000145477
Service No : 406184

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity PROVIDER	CSPDCL
2	Tariff	LV2ND1OT14
3	Connected Load (kW)	3.375
4	Average Monthly Energy Consumption (kWh)	345.83
5	Monthly Total Electricity Cost (Avg. In Rs)	2686.36
6	Average Power Factor	-

Observations:

2. Electrical Load analysis:

Department	-	VC chamber AC		
Consumer / meter No	-	406184		
Date & time of measurement		30/11/2015 12:19		
Actual Energy	kWh	0.8		
Apparent Energy	kVAh	0.9		
Power factor	-	0.88		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	2.04	2.23	2.11
Apparent power	kVA	2.24	2.55	2.32
Voltage (V_L)	Volts	236.7	249.5	244.5
Current	Amps	2.5	9.52	3.55
Voltage unbalance	%	2.5	3.1	2.87
Current unbalance	%	42.6	176.5	107.06
THD voltage	%	2.4	2.7	2.54
THD current	%	15.9	53.1	34.3

3. LIGHT & FAN LOAD CONSUMPTION PATTERN- GROUND FLOOR

Details	T8	T12	CFL	CFL	CEILING FAN NEW	CEILING FAN OLD	EXHAUST FAN
Watts(W)	36	40	15	36	60	90	60
Total Nos.	26	157	110	28	38	59	10
Total KW	0.94	6.28	1.65	1.008	2.28	5.31	0.6
Net total kW	**18.068**						

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs may be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators may be replaced by energy efficient fans.

4. LIGHT & FAN LOAD CONSUMPTION PATTERN- FIRST AND SECOND FLOOR

Details	T8	T 12	CFL	CFL	CEILING FAN NEW	CEILING FAN OLD	EXHAUST FAN
Watts(W)	36	40	15	36	60	90	60
Total Nos.	16	257	15	52	107	56	28
Total KW	0.576	10.28	0.225	1.87	6.42	5.04	1.68
Net total Kw	**26.091**						

5. Lux Measurements

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods which is applicable to all commercial buildings. One of the methods is Illuminance method which is the most practicable one.

LOCATION	MEASURED	REQUIRED	REMARKS
VC Office Waiting Room	164	150	Good
VC Chamber	201	150	Good
Finance Manager	198	150	Good
Deputy Registrar	166	150	Good
RP Das Office	171	150	Good
Registrar Office	163	150	Good
Registrar Chamber	184	150	Good
Pareeksha Bhawan	192	150	Good
Computer Room First Floor	187	150	Good
UGC Grant Sell	174	150	Good
Confidential Room	155	150	Good
Deputy Registrar Confidential	159	150	Good
Manohar Dathey	162	150	Good
Computer Room	159	150	Good

Note:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBC user guide.

6. Computer & Its Accessories:

DETAILS	WATTS	TOTAL NO	TOTAL KW
LCD Computer	200	75	15
CRT Computer	250	3	0.75
Scanner	200	7	1.4
Xerox	350	10	3.5
Laser	200	32	6.4
3 In One Printer	300	15	4.5
Total kW			31.55

7. Air conditioning:

The department have installed a total of 27 Split AC in the AD Block and their efficiency calculations are given below in table.

LOCATION	TYPE	COOLING CAPACITY (TR)	MEASURED COOLING CAPACITY KW	RATED POWER ELECTRICAL (Kw)	RATED EER	MEASURED EER
VC Office	Split	1.5	4.23	1.8	2.92	2.35
VC Office	Split	1.5	4.35	1.8	2.92	2.42
VC Office Waiting Room	Split	1.5	4.78	1.55	3.4	3.09
VC Office Waiting Room	Split	1.5	4.82	1.55	3.4	3.11
VC Chamber	Split	1.5	4.86	1.55	3.4	3.14
VC Chamber	Split	1.5	4.82	1.55	3.4	3.11
VC Chamber	Split	1.5	4.88	1.55	3.4	3.15
Registrar Office	Split	1.5	4.77	1.55	3.4	3.08
Registrar Chamber	Split	1.5	3.99	1.8	2.92	2.22
	Split	1.5	3.94	1.8	2.92	2.19
RP Das Office	Split	1.5	4.01	1.8	2.92	2.23
	Split	1.5	4.12	1.8	2.92	2.29
Deputy Registrar	Split	1.5	5.49	1.695	3.4	3.24
Server Room	Split	1.5	5.54	1.695	3.4	3.27
Finance Manager	Split	1.5	5.53	1.74	3.4	3.18
Pareeksha Bhawan	Split	2	6.14	2.55	2.67	2.41

Computer Room First Floor	Window	1.5	NOT WORKING			
	Split	1.5	4.46	1.55	3.4	2.88
UGC Grant Sell	Split	1.5	5.00	1.55	3.4	3.23
Confidential Room	Split	2	6.17	2.55	2.69	2.42
	Split	2	6.40	2.55	2.69	2.51
Manohar Dathey Room	Split	1.5	5.97	2.4	2.69	2.49
Computer Room	Split	1.5	5.88	2.4	2.69	2.45
Strong Room	Split	1.5	5.71	1.55	3.83	3.69
Strong Room	Split	1.5	4.97	1.55	3.4	3.21
Deputy Registrar Confidential	Spkit	1.5	5.78	2.4	2.69	2.41
Deputy Registrar Confidential	Window	Connection problem				

8. WATER CONSUMPTION:

The AD block consumes water for various purposes like

- Drinking.
- Toilets
- Cleaning

Note:

- Water consumption is not monitored.
- Two stage flushing control may be used in toilets for reducing water wastage.

9. EFFICIENCY ANALYSIS:

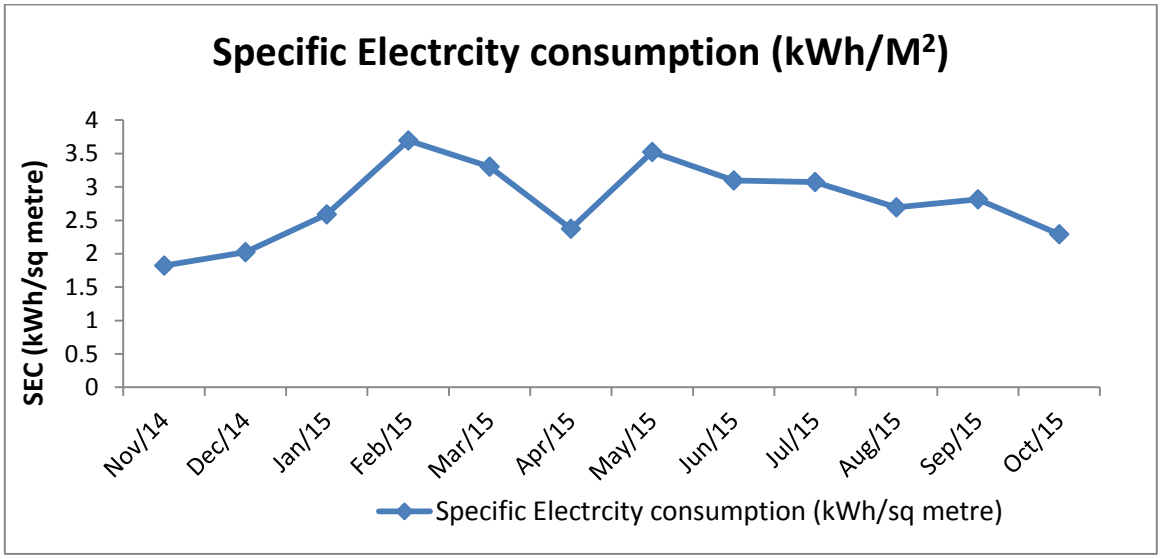
Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Nov-14	7142	3916.35	1.82
Dec-14	7927	3916.35	2.02

Jan-15	10133	3916.35	2.59
Feb-15	14470	3916.35	3.69
Mar-15	12938	3916.35	3.30
Apr-15	9302	3916.35	2.38
May-15	13805	3916.35	3.52
Jun-15	12121	3916.35	3.09
Jul-15	12042	3916.35	3.07
Aug-15	10554	3916.35	2.69
Sep-15	11019	3916.35	2.81
Oct-15	8968	3916.35	2.29

The energy performance index is plotted in the below chart.



Chart

Note:

- Specific electricity consumption found to be varying in all those months.
- Maximum SEC measured in the Feb-2015 and is 3.69 kWh/m^2.
- SEC is highly depended on the seasonal changes and the number of working days in a month. Variations are also possible in specific electricity consumption due to energy usage variation in different seasons of the year.

B. VICE CHANCELLORS BUNGALOW POWER METER

Building : VICE CHANCELLORS BUNGALOW
Consumer No : 1000143833
Service No : 403290

1. **Electrical Bill Analysis:**

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity provider	CSPDCL
2	Tariff	LV1DL1GN14
3	Connected load (kW)	2.25
4	Average monthly energy consumption (kWh)	670.16
5	Monthly total electricity cost (avg. In Rs)	4033.63
6	Average power factor	-

Observations:

- **PF is not included in the bill.**

2. **Electrical Load analysis:**

- Load was very low to measure in our metre.

C. VICE CHANCELLORS BUNGALOW LIGHT METER:

Building : VICE CHANCELLORS BUNGALOW
Consumer No : 1000145444
Service No : 406098

1. **Electrical Bill Analysis:**

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity Provider	CSPDCL
2	Tariff	LV2ND1OT14
3	Connected Load (Kw)	2.518
4	Average Monthly Energy Consumption (Kwh)	1031.6
5	Monthly Total Electricity Cost (Avg. In Rs)	5882
6	Average Power Factor	-

Observations:

- **PF is not included in the bill**

2. Electrical Load analysis:

Department	-	VC BUNGALOW light meter		
Consumer / meter No	-	406098		
Date & time of measurement		30/11/2015 12:16		
Actual Energy	kWh	0.20		
Apparent Energy	kVAh	0.35		
Power factor	-	0.57		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	1.49	1.68	1.60
Apparent power	kVA	2.71	2.85	3.06
Voltage (V_L)	Volts	246.8	259.76	252.5
Current	Amps	.65	5.45	2.65
THD voltage	%	1.58	2.10	1.83

Standards:

- Permissible voltage limit as per CEA standards on grid connectivity is 230 plus or minus 10%, which means 254V is the maximum allowable.

Observations:

- At present maximum voltage exceeded the permissible limit which should be taken care of by reporting it to the supplier.
- Increase in the voltage increases the consumption of electricity and also the failure frequency of the equipment.

3. LIGHT& FAN LOAD CONSUMPTION PATTERN

Details	**T12**	**CFL**	**SVL**	**CEILING FAN NEW**	**CEILING FAN OLD**	**EXHAUST FAN**
Watts(W)	40	15	150	60	90	60
Total Nos.	42	-	3	4	10	3
Total kW	1.68	-	0.45	0.24	0.9	0.18
Net total kW	**3.45**					

Observations & suggestions:

- All the old ceiling fans and their resistance type regulators may be replaced by energy efficient fans.

4. Lux Measurements

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods which is applicable to all commercial buildings. One of the methods is Illuminance method which is the most practicable one.

LOCATION	MEASURED	REQUIRED	REMARKS
Drawing room	198	150	Good
Dining room	289	150	Good
Average lux at entrance	346	150	Good

Note:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBC user guide.

5. Computer & Its Accessories:

DETAILS	WATTS	TOTAL NO	TOTAL KW
LCD computer	200	3	0.6
Laser	200	1	0.2
Total kW			0.8

6. WATER CONSUMPTION:

The building consumes water for various purposes like

- Drinking.
- Cooking.
- Toilet flushing's
- Cleaning

Note:

- Water consumption is not monitored.
- Two stage flushing control may be used in toilets for reducing water wastage.

7. EFFICIENCY ANALYSIS:

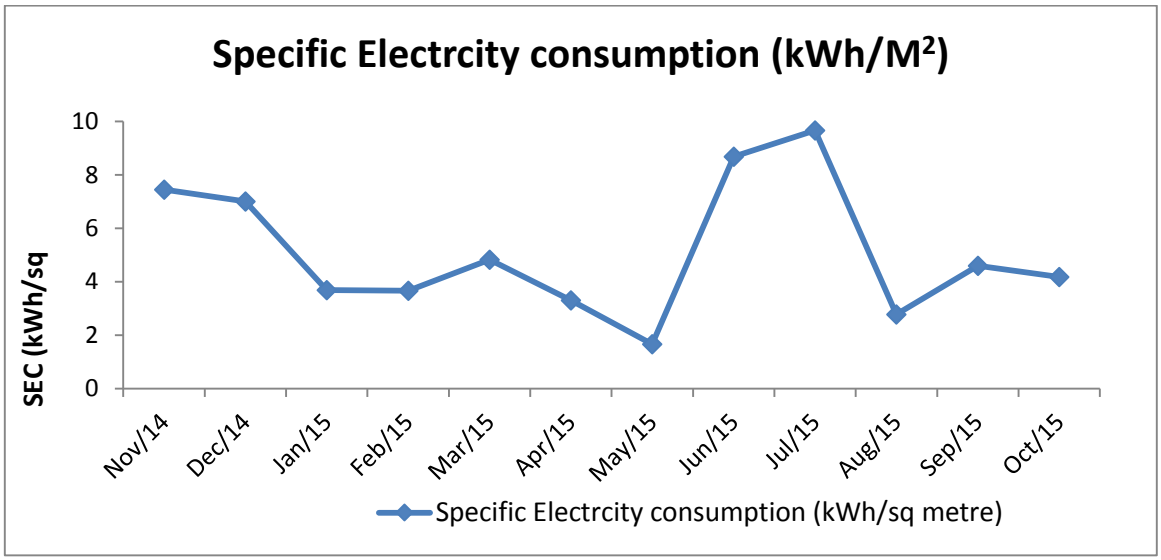
Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Nov-14	3504	470.13	7.45
Dec-14	3300	470.13	7.01

Jan-15	1738	470.13	3.69
Feb-15	1721	470.13	3.66
Mar-15	2269	470.13	4.82
Apr-15	1556	470.13	3.30
May-15	785	470.13	1.66
Jun-15	4083	470.13	8.68
Jul-15	4543	470.13	9.66
Aug-15	1311	470.13	2.78
Sep-15	2163	470.13	4.60
Oct-15	1967	470.13	4.18

The energy performance index is plotted in the below chart.



Chart

Note:

- Specific electricity consumption found to be varying in all those months.
- Maximum SEC measured in the Jul-2015 and is 9.66 kWh/m^2.
- SEC is highly depended on the seasonal changes and the number of working days in a month. Variations are also possible in specific electricity consumption due to energy usage variation in different seasons of the year.

D. VICE CHANCELLORS BUNGALOW STREET LIGHT:

Consumer No : 1000143742
Service No : 402168

1. **Electrical Bill Analysis:**

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity Provider	CSPDCL
2	Tariff	LV2ND1OT14
3	Connected Load (kW)	0.36
4	Average Monthly Energy Consumption kWh)	317.83
5	Monthly Total Electricity Cost (Avg. In Rs)	2573
6	Average Power Factor	-

Observations:

- **PF is not included in the bill.**

2. **Electrical Load analysis:**

- **Load was very low and found to be insignificant to measure.**

E. VICE CHANCELLORS BUNGALOW PUMP HOUSE:

Consumer No : 1000145451
Service No : 406127

1. **Electrical Bill Analysis:**

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity Provider	CSPDCL
2	Tariff	LV2ND1OT14
3	Connected Load (kW)	2.238
4	Average monthly energy consumption (kWh)	943.63
5	Monthly Total Electricity Cost (Avg. In Rs)	42179
6	Average Power Factor	-

Observations:

- **PF is not included in the bill.**

2. Electrical Load analysis:

Department	-	VC pump house		
Consumer / meter No	-	406127		
Date & time of measurement		30/11/2015 11:08		
Actual Energy	kWh	1.25		
Apparent Energy	kVAh	1.50		
Power factor	-	0.83		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	0	3.62	3.55
Apparent power	kVA	0	4.36	4.27
Voltage (V_L)	Volts	0	245.2	238.5
Current	Amps	0	8.25	7.1

F. REGISTRARS BUNGALOW:

Consumer No : 1001992610
Service No : 775464

1. Electrical Bill Analysis:

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity provider	CSPDCL
2	Tariff	--
3	Connected load (kW)	---
6	Average monthly energy consumption (kWh)	570.63
7	Monthly total electricity cost (avg. In Rs)	2983.63
9	Average power factor	---

Observations:

- **PF is not present in the bill.**

2. Electrical Load analysis:

- Load was very low and found to be insignificant to measure.

3. LIGHT & FAN LOAD CONSUMPTION PATTERN

Details	T12	SVL	BULB	CEILING FAN NEW	CEILING FAN OLD	EXHAUST FAN
Watts(W)	40	150	40	60	90	60
Total Nos.	8	1	2	8	-	1
Total kW	0.32	0.15	0.08	0.48	-	0.06
Net total kW	**1.09**					

Observations & suggestions:

- All the T12 fluorescent tube lights and CFLs may be replaced with LED tubes and LED bulbs.
- All the old ceiling fans and their resistance type regulators may be replaced by energy efficient fans.

4. Lux Measurements

According to BEE there is a lighting code to determine the overall energy efficiency of lighting system using measurements and methods which is applicable to all commercial buildings. One of the methods is Illuminance method which is the most practicable one.

LOCATION	MEASURED LUX	REQUIRED LUX	REMARKS
Average lux in rooms	169	150	Good
Dining room	224	150	Good
Kitchen	177	150	Good

Notes:

- The entire measurement taken during the day time.
- Standard lux is based on the ECBC user guide.

5. WATER CONSUMPTION:

The Bungalow consumes water for various purposes like

- Drinking.
- Toilet flushing's
- Cooking
- Cleaning

Note:

- Water consumption is not monitored.

- Two stage flushing control may be used in toilets for reducing water wastage.

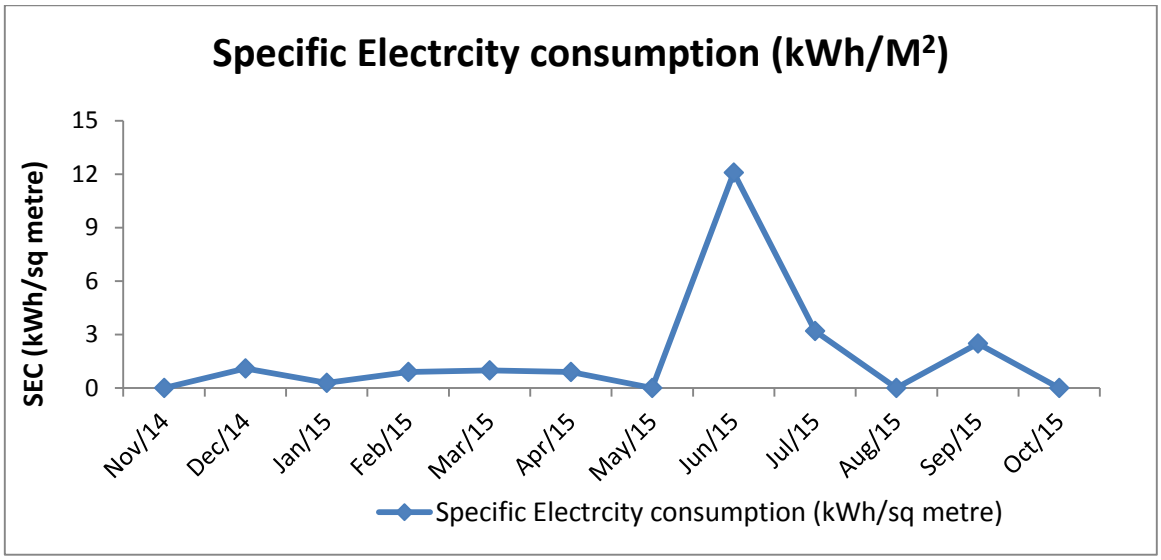
6. EFFICIENCY ANALYSIS:

Specific electricity consumption:

Specific electricity is calculated based on electricity consumed per building area in square meters. The details of specific electricity consumption for last few months are given below in table.

MONTH 2014-15	ELECTRICIY CONSUMPTION KSEB (kWh)	Area of the building ($M^{2)}$	SPECIFIC ELECTRICITY CONSUMPTION (kWh/M^2)
Nov-14	0	285.51	0.0
Dec-14	310	285.51	1.1
Jan-15	90	285.51	0.3
Feb-15	250	285.51	0.9
Mar-15	290	285.51	1.0
Apr-15	260	285.51	0.9
May-15	0	285.51	0.0
Jun-15	3453	285.51	12.1
Jul-15	900	285.51	3.2
Aug-15	0	285.51	0.0
Sep-15	724	285.51	2.5
Oct-15	–	285.51	-

The energy performance index is plotted in the below chart.



Chart

Note:

- Specific electricity consumption found to be varying in all those months.
- Maximum SEC measured in the Jun-2015 and is 12.1 kWh/m^2.
- SEC is highly depended on the seasonal changes and the number of working days in a month. Variations are also possible in specific electricity consumption due to energy usage variation in different seasons of the year.

G. H TYPE PUMP:

Consumer No : 1000297290
Service No : 406188
Motor rated power : 5 HP

1. **Electrical Bill Analysis:**

Base line data given below is based on the Electricity bill provided by the supplier of electricity CSPDCL. Details obtained from the Electricity bill is as follows.

Base Line Data (based on last 12 months)		
1	Electricity Provider	CSPDCL
2	Tariff	LV2ND3OT14
3	Connected Load (kW)	3.62
4	Average Monthly Energy Consumption (kWh)	---
5	Monthly Total Electricity Cost (Avg. In Rs)	----
6	Average Power Factor	

Observations:

- **PF is not present in the bill**

2. **Electrical Load analysis:**

Department	-	H type pump		
Consumer / meter No	-	406188		
Date & time of measurement		30/11/2015 10:50		
Actual Energy	kWh	0.22		
Apparent Energy	kVAh	0.38		
Power factor	-	0.57		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active power	kW	2.99	3.68	3.36
Apparent power	kVA	5.60	5.88	5.74
Voltage (V_L)	Volts	13.98	220.84	159.78
Current	Amps	9.81	11.47	10.70
THD voltage	%	2.29	5.94	3.08
THD current	%	4.18	4.60	4.43

6.0 DIESEL GENERATOR ANALYSIS:

Diesel generator is provided as standby power in most of the departments. Diesel generator efficiency is calculated from the rated values and the details are given below in table:

Sl no	Location	Capacity	Make	Date of Manufacture	Measured Load	% of loading	AMF condition	Rated SEGR	Actual SEGR	Remarks
		kVA			kVA	%				
1	Library	125	Kirloskar	2012	23.2	18.56	Not working	1.14	2.1	Poor
2	Electronics & Photonics	63	Kirloskar	2012	12.3	19.52	Not working	1.14	2.01	Poor
3	Physics & chemistry	125	Kirloskar	2012	30.79	24.63	Not working	1.5	1.85	Poor
4	MBA									
5	Computer science	125	Kirloskar	2012	17.41	13.93	Not working	1.14	1.95	Poor
6	Pharmacy	125	Kirloskar		27.29	21.83	Not provided	1.14	1.96	Poor
7	Statistics & mathematics	63	Kirloskar	2012	7.86	12.48	Working well	1.14	1.56	Poor
8	Geology	63	Kirloskar	2012	5.29	8.40	Working well	0.3	1.65	Poor
9	Life sciences	125	Kirloskar	2012	20.83	16.66	Not working	1.14	1.88	Poor
10	Administrative block	125	Kirloskar	2014	36.4	29.12	Not working	1.86	1.96	Satisfactory

Observations:

- **Most of the DG are under loaded during the period of audit.**
- DG maintenance records are not available at the respective departments.
- Diesel consumption is also not monitored by any of the departments.
- Only the AD block DG are having the SEGR (Specific energy generation ratio) in satisfactory.
- Diesel spillage found out near the location in most of the areas. Take almost care when handling the Diesel or during the filling time.
- Also most of the DG found to running even after the CSPDCL supply reinstated. (Example in Library). This is mainly due to the failure in operation of AMF (Auto mains failure).
- Manual operation of DG found out to be in most of the departments.

Suggestions:

- DG should be loaded for at least 50% during the working period. Even if loaded below 50% of the rated power, the DG consumed same diesel as of 50% loading.
- DG maintenance records should be properly maintained.
- Diesel consumption in litres should be monitored. Cost of the Diesel at the period also to be mention in the records.
- Use precautionary measures such as use of funnel, while filling the Diesel into it to avoid the spillage losses.
- All the AMF should be repaired and reinstate for the proper usage of DG. In some AMF panels, contactor problems are also found out (E.g. in library) which can be repaired easily.
- Always operate the DG in unload condition whether we are operating in manual.

7.0 PUMP LOADS AT VARIOUS LOCATIONS:

Sl no	Location	Metre no	Pumping area	Rated kW	No of working hours/day
1	LH pump	406187	Ladies hostel	5.62	6
2	Azad hostel pump	Azad hostel meter	Boys hostels	3.75	6
3	Pump room	406131	Girls hostel-1, Geography, Registrar bungalow, Guest house	3.75	6
4	Computer science	computer science server room metre	computer science, HRDC	3.75	2
5	Pharmacy	Pharmacy metre	Pharmacy,	3.75	2
6	Physical education	PE metre	Physical education	3.75	2
7	Regional studies & research	Regional studies metre	Regional studies	1.5	
8	Life science pump room	406203	Life science	2.2	4
9	Near library	406126	Library, Arts bhavan, Engineering dept,	3.75	12
10	Auditorium	Auditorium metre	Auditorium, garden,		
11	Administrative block	AD block metre	AD block,	3.75	6
12	Near quarters	406188	Quarters	3.75	6
13	VC bungalow pump	406127	VC bungalow	3.75	6

- Always keep a spare pump in your premises.
- Replace all the pumps which had more than 3 rewinding in their life period, with new one.
- Rated discharge and Rated head was not available neither at the pump location nor at the department.
- **There is no provision provided for the measurement of discharge head thus we couldn't measure the efficiency of the pump, as the discharge head is an important parameter to measure the hydraulic power of pump, which itself is the output power.**
- Efficiency also couldn't measure due to the high scaling in the pump

8.0 Power Quality in the University

Following Observations are made by auditors during the audit

- 90% of actual measurements shows heavy current unbalances in the electric distribution system
- Voltage level of some of the connections are higher than the specified limit which is indicated in the EC proposals
- Current harmonics levels are found high in the system
- Power factor found as low in most of the area especially hostels, SOS areas.

Recommendations

- Detailed study and urgent preparing of single line diagram of electrical distribution system. This will gave clear cut indication about distribution of loads among each phase.
- Purchase the equipment's like UPS, Lighting,and Luminariesetc. as per IEEE 519 standards for harmonics. Thus we can ensure the harmonic level in the whole system within the limits.
- Separate earthing for each UPS , computer system ,LED lights, air conditioner is as per earthing standards to be provided at the earliest.

Standards to follow:

- IEE standard for Harmonic limits are given in below table:

Sl. No.	Description	Allowable Limit (%)
1	Individual Voltage Harmonic Distortion (Max.)	3.0
2	Total Voltage Harmonic Distortion (Max.)	5.0
3	Total Current Harmonic Distortion (TDD) (MAX)	8.0

- The above Limits for Harmonic Distortions are specified by CEA Technical standards for connectivity of the Distribution resources regulations-2010, based on IEC 610000 – 4 – 30 & IEEE 519-1992.
- Earthing standards as per IS3043 /1987 should follow for the earthing

9.0 THERMAL STUDY OF PANELS:

Thermal study has been conducted in every panel in each department to analyse the insulation failure in cables and it's overheat. Most of the cables are found to be unbalanced state due to the variation in current in each phase. Due to this unbalance condition the respective neutral cables having higher current and the some of the cables are very critical in condition. Follows the thermal images of various DBs in the **Annexure-5**(Separately attached).

10.0 ENERGY CONESERVATION OPTIONS AND RECOMMENDATIONS:-

Sl.No	PARTICULARS	ANNUAL ENERGY SAVINGS(kWh)	ANNUAL FINANCIAL SAVINGS (Rs)	INVESTMENT (Rs)	SIMPLE PAY BACK PERIOD(Months)
1	Replacing 400 Nos.T12(40 W) Fluorescent Lamps (fitted with Copper Chokes) with electronic choke and T-8 Tubes	14400	1,15,200	62500	07
2	Replacing 500 Nos.T12(40 W) Fluorescent Lamps (fitted with Electronic Chokes) with 28 W T-5 Fitting:	11520	92160	85000	13
3	Replacing 250 Nos.T12(40 W) Fluorescent Lamps with LED Lights	24000	1,92,000	3,00,000	19
4	Replacing 300 Nos. Of Ordinary resistance type regulators with electronic regulators	7200	57600	1,00,000	20
5	Replacement of existing 300 ceiling fans with BLDC fans	54000	432000	9,00,000	25
6	Replacement of old 1.5TR window a/c with 5 star Split A/c	60480	483840	12,60,000	32
7	Replacement of existing CRT computer screens with LCD screen	7500	60,000	2,50,000	50

11.0 ENERGY SAVING PROPOSALS

ENERGY SAVING PROPOSAL No: 1

Replacing 500 Nos.T12 (40 W) Fluorescent Lamps (fitted with Electronic Chokes) with 28 W T-5 Fitting:

The replacement of T-12 to T-5 to be done in a phase manner .We is calculated only for phase -01. In this replacement importance should be given to according to duration and importance of position. First phase of replacement to be given hostels, and class room in the arts block

Replacement of existing FTL with T-5 will give the following benefits

- State of art aesthetics
- Reduced power consumption
- Lesser space requirement
- Futuristic lighting system

Existing Tube Type	=	40W with Copper Ballast
Power Rating of 40 W Copper Ballast	=	52W
Total Numbers selected	=	500Nos
Working hours per day	=	8
Annual working days	=	300
Annual working Hours	=	2400
Energy consumption of T-5 tubes with Electronic ballast	=	28Wh
Annual Energy Savings with this Conversion	=	11520 kWh
Tariff rate	=	Rs.8
Annual Financial Savings	=	Rs .92160
Investment for T-5 Tubes	=	Rs: 85000
Simple Payback period	=	12Months

ENERGY SAVING PROPOSAL No: 2

Replacement of existing ceiling fans with BLDC fans :

Existing Condition

Presently old conventional ceiling fan are used in the building .After few years of service this will becomes an energy eaters

Proposed condition with ESP

We can replace these old ceiling fans with BLDC Fans. We can control the speed by remote also. The replacement of the old ceiling fans to be done I a phase manner. For first phase gave importance in the HOD rooms, hostels, and administrative building

Preferable locations:

Administrative building, Vice chancellors Bungalow. Institute of management, SOS Physics and Chemistry,

Particulars	Ceiling fan (Old)
Institute of Management	81
SOS Physics and Chemistry	99
Administrative building First Floor	59
Administrative building second Floor	56
VC bungalow	05
Registrars bungalow	
Total Nos	**300**

Rated power of existing ceiling fans	=	90w
Rated power of BLDC fans	=	30w
Power saving by replacement	=	60w
Number of ceiling fans	=	300
Annual hours of operation	=	3000
Tariff rate	=	Rs.8.00
Annual energy savings	=`	54000 kWh
Annual financial savings	=	Rs.432000
Approximate rate per fan	=	Rs.3000
Investment	=	Rs.900000
Simple payback period	=	25Months

Note:

- No salvage value is taken for the replaced fans.

Merits:

- A brushless DC (BLDC) motor is a synchronous electric Motor powered by direct-current (DC) electricity and having an electronic commutation system, rather than a mechanical commutator and brushes. In BLDC motors, current to torque and voltage to rpm are linear relationships. BLDC Motors use the DC voltage as input which is converted using the Pulse Width Modulation Techniques to control the excitation of the coils to generate the motion in prescribed fashion.
- The power consumption is less than half at full speed and is about 20% at low speed for the BLDC motor compared to the conventional motor based ceiling fan

ENERGY SAVING PROPOSAL No: 3
Replacement of Window air conditioners with Split type in 1.5 TR 4 star rated Air conditioners Star rating system chart.

Presently air conditioners are selected according to the star rating of air conditioners And it is on the base of EER (Energy Efficiency ratio) means cooling capacity in Watts divided by power consumption in watts
Cooling capacity of I TR = 3514watts
Star 1- 2.7 to 2.89, Star 2=2.9 to 3.09. , Star 3= 3.1 to 3.29, Star 4= 3.3 to 3.49, Star 5=3.5 and above are the EER ratios as approved by BEE for standard labelling

Power consumption variation according to the star rating given below

AC Tonnage(TR)	Cooling capacity(Watts)	Power consumption(Watts)				
		Star 1	Star 2	Star 3	Star 4	Star 5
0.75	2635.5	976 to 912	909 to 853	850 to 801	799 to 755	753
1	3514	1301 to 1216	1212 to 1137	1134 to 1068	1065 to 1007	1004
1.5	5271	1952 to 1824	1818 to 1706	1700 to 1602	1597 to 1510	1506
2	7028	2603 to 2432	2423 to 2274	2267 to 2136	2130 to 2014	2008
2.5	8785	3254 to 3040	3029 to 2843	2834 to 2670	2662 to 2517	2510
3	10542	3904 to 3648	3635 to 3412	3401 to 3204	3195 to 3021	3012

Here we are to be changed the air conditioners according to their working hours.

Preferable Locations

Guest House,-SOS IN Physics and Chemistry, SOS in Science, SOS in pharmacy, SOS in Statistics and mathematics, Health Centre, Administrative building

All thewindow air conditioners are to be in the changed into star rated air conditioners and before installation following calculations and rectifications to be done in the rooms

Rated power of existing window air conditioner	=	2200w
Rated power of4 star rated air conditioner	=	1500w
Power saving by replacement	=	700w
Number of window air conditioners	=	36
Tariff rate	=	Rs.8
Annual running hours	=	2400
Annual energy savings	=`	60480 kWh
Annual financial savings	=	Rs.483840
Approximate rate per 4 Star rated air conditioner 1.5 TR=		Rs.35000
Investment	=	Rs.1260000
Simple payback period	=	32Months

ENERGY SAVING PROPOSAL No: 4

Replacement of existing CRT computer screens with LCD screen

There is total of 142 CRT computers in the university which is to be replaced with LCD computers in a phased manner. First replace the computers in the maximum usage areas, like in the administrative building etc.

Rated power of existing CRT computers	=	250w
Rated power of LCD computers	=	200w
Power saving by replacement	=	50w
Number of CRT computers	=	50
Tariff rate	=	Rs.8.00
Annual running hours	=	3000
Annual energy savings	=`	7500 kWh
Annual financial savings	=	Rs.60, 000
Approximate rate per computers	=	Rs.5000
Investment	=	Rs.250000
Simple payback period	=	50Months

ENERGY SAVING PROPOSAL No: 5

Replacing 500 Nos.T12 (40 W) Fluorescent Lamps (fitted with Copper Chokes) with electronic choke and T-8 Tubes

Existing Tube Type	=	40W with Copper Ballast
Power Rating of 40 W Copper Ballast	=	52W
Power Rating of T-8 with electronic ballast	=	40w
Energy saving per tube	=	12W
Total Numbers selected	=	500Nos
Working hours per day	=	8
Annual working days	=	300
Annual working Hours	=	2400
Annual Energy Savings with this Conversion	=	14400 kWh
Tariff rate	=	Rs.8.00
Annual Financial Savings	=	Rs 1, 15,200.
Investment for T-8 with Electronic chock	=	Rs: 62500
Simple Payback period	=	07Months

ENERGY SAVING PROPOSAL No: 6

Replacing 300 nos. of ordinary resistance type regulators with electronic regulator

Particulars	Ceiling fan resistance regulators
Guest house	36
Gandhi hostel	56
PG girls hostel	66
Teachers hostel	25
Azad hostel	48
Research Hostel for Girls	26
Professional girls hostel	39
Research boys hostel	4
Total	300

Existing regulator Type	=	Resistance type 12 W
Power Rating of electronic regulator	=	02W
Energy saving per regulator	=	10W
Total Numbers selected	=	300Nos
Working hours per day	=	8
Annual working days	=	300
Annual working Hours	=	2400
Annual Energy Savings with this Conversion	=	7200 kWh
Tariff rate	=	Rs.8.00
Annual Financial Savings	=	Rs 57600.
Investment for electronic regulator	=	Rs: 1,00,000
Simple Payback period	=	20Months

ENERGY SAVING PROPOSAL No: 7

Replacing 250 Nos.T12 (40 W) Fluorescent Lamps with LED Lights

Replace the T-12 tube lights into LED lights in type administrative building. Vice chancellors, registrars room, and all Head of the departments room .and common areas. This will create awareness among students and public. Public relation, and other guests and VIP are visiting mainly in these areas, hence opt for LED lights, BLDC fans and star rated air conditioners are in these areas.

Rated power of existing Tube lights (T-12)	=	52w
Rated power of LED tube lights	=	12w
Power saving by replacement	=	40w
Number of led LIGHTS	=	250
Tariff rate	=	Rs.08
Annual running hours	=	2400
Annual energy savings	=`	24000 kWh
Annual financial savings	=	Rs.192000
Approximate rate per computers	=	Rs.1200
Investment	=	Rs.3, 00,000
Simple payback period	=	19Months

ANNEXURE-A

POTENTIAL SAVING RECOMMENDATIONS:

Distribution of power

	Potential area for energy savings and safety issues	Identified issue	Recommendations	
8	No isolation switches for building or rooms	Short circuit and for energy saving by single isolation	MCB/ELCB or master switch for isolation for electric supply.	Details are given in annexure -2
9	Selection of cables	Due to harmonics and unbalance current neutral wire can burn	Avoid unbalance and provide 4 core wiring	
10	Over voltage in transformers	Over voltage increase energy consumption and safety and maintenance issues for luminaries and equipment's	Taken up issue with CSPDCL for lowering the tap setting in the corresponding transformer	Details are given in annexure-2
11	Connected loads	Connected Load is more than sanctioned Load which will invite penalty from CDPDCL	Increase the connected load from CSPDCL and change it is in the next bills	
12	Low Power factor	Power factor found as lower than 0.85 invite penalty from CSPDCL	Increase the power factor by installing LV capacitors with loads.	
13	Cable joint and termination burning	For safety cable termination and fuses are found red hot	Proper crimping and terminal joints and fuse proper fuses instead of wires as fuses.	Refer the Annexure2 and Thermal image Photos

Lighting

	Potential area for energy savings and safety issues	Identified issue	Recommendations
14	Street Light, garden lights	Operated by security persons	Provision for timers for operation
15	Common lights in toilets , corridor steps	Found as burn in normal time	Energy volunteers to be formed among students and responsibility , stickers and posters in the lighting switch boards, change these lights as in first phase of changing
16	For New buildings under construction	T-12 tubes are using	Change into LED tubes and Luminaries order to be issued
17	Cleaning of luminaries	Most of the tubes and Luminaries are dusty	Energy team to be made among students in collaboration with NSS volunteers foe scheduled cleaning

Ceiling Fans

	Potential area for energy savings and safety issues	Identified issue	Recommendations	
18	Cleaning	Old fans are not cleaning leads to corrosion in side of blades and improper lubrication of bearings increase power consumption	Energy team to be made among students in collaboration **with NSS volunteers for scheduled cleaning,**	

Air conditioners:

	Potential area for energy savings and safety issues	**Identified issue**	**Recommendations**
20	Engineering practice	Lengthy copper tube from compressor to condenser, installation of air conditioner evaporator and condenser locations against its installation manual	Installation of condenser as minimum as possible from the evaporator , minimum gap between top ceiling and top of evaporator should be 1 feet, and for condenser side and back gaps between are to be 1feet for proper circulation of air, avoid the blockage of air in front of condenser fan.
21	Cleaning	Condenser fins and evaporator suction filter are not cleaned	Cleaning schedule to be incorporated, AMC for repairing and cleaning, along with checking of power consumption periodically and record the same.
22	Ingress of heat into the room	The windows are plane glass and the gaps are found between doors and old windows are properly loosing	The old metal frame of windows are to be changed, proper ceiling on doors and windows, Cool film installation on windows
23	Set temperature	Set temperature are found as in 16 to 20 ^{o}C in many areas	Set temperature to be changed into 23^{0}C to 26^{0}C as per ASHRAE standard for HVAC

Diesel generators:

SL No	Potential area for energy savings and safety issues	Identified issue	Recommendations
25	AMF installed in many DG sets	AMF is not working and CSPDCL supply restored DG will work continuously without knowing about the same.	AMF to be repaired with Supplier, Indication with lights and alarm against failure and restoration of CSPDCL supply.
26	Log book	No log book is maintained regarding type diesel consumption, running hours, energy generation and for maintenance check-ups and issues	Log book to be maintained and thus it became health card of the DG.

PUMPS

SL no	Potential area for energy savings and safety issues	Identified issue	Recommendations
27	No record of re winded motors and repaired pumps	Most of the pumps bore well pumps , and motors are rewinded many times.	Monitoring of repairing will be required for alternate pumping solutions, and record for reason for replacement
28	Peak time running	Peak time charges are more and we observed pumps are running during peak hours,	Peak time pumping to be shifted and pumping should be at off peak time ,
29	Capacitors in pumping installations	LV Capacitors installed in pumps are not working	Change the LV capacitors for better operation and improving power factor.

DISTRIBUTION OF POWER:

ENERGY SAVING PROPOSAL No: 8

Provide Isolation Switches/ MCB/ELCB
Present system

At present in most of the departments and buildings do not have isolation switches. When an accident or short circuit occurs isolation of power supply or tripping of power supply is not possible.

Proposed System

Circuit breakers shall preferably be air break horizontal type fully interlocked and meeting the requirements of IS: 2516 or BS: 3659. Breakers shall be rated for a medium voltage of 600 V and rated full load amperes as indicated on drawings. Breakers shall be capable of making and breaking system short circuits. Breakers shall be manually operated complete with panel operating handle, isolating plug with safety shutters, mechanical ON/OFF indicator, silver plated arcing and main contact arc chutes and trip free operation. Breakers shall be capable of being racked out into 'Testing', 'Isolated' and 'Maintenance' positions and kept locked in any of the positions.

Merits of the system

- Energy savings by avoid cable losses after Isolation switches
- Avoid safety hazard by short circuit during non-working hours.
- Safe operation and maintenance working of system made easy

Preferable locations and sizing

SL NO	PARTICULARS	Service No/Consumer no	Full load Ampere rating (A)	MCB or MCCB RATING			RCCB
				Ampere rating (In)	Short circuit breaking capacity (kA)	Type	
1	Guest house	405439	90.19	100	10.00	B	Class AC - 30 mA rating
2	Gandhi hostel	403267	17.32	20	10.00	B	Class AC - 30 mA rating
3	PG girls hostel	403268	22.05	25	10.00	B	Class AC - 30 mA rating
4	Teachers hostel	403288	8.85	10	10.00	B	Class AC - 30 mA rating
5	Azad hostel	404408	16.56	20	10.00	B	Class AC - 30 mA rating
6	Research Hostel for Girls	771284	12.75	16	10.00	B	Class AC - 30 mA rating

7	Professional girls hostel	774229	13.30	16	10.00	B	Class AC - 30 mA rating
8	Research boys hostel	606167	7.55	10	10.00	B	Class AC - 30 mA rating
9	Girls hostel pump house	406131	6.49	10	10.00	C	Class AC - 30 mA rating
10	Street light	1000145454	41.32	50	10.00	B	Class AC - 30 mA rating
11	SOS in electronics and photonics	771282	66.99	80	10.00	B	Class AC - 30 mA rating
12	SOS in computer science and IT	773349	45.93	50	10.00	B	Class AC - 30 mA rating
13	New Computer building	406284	69.56	80	10.00	B	Class AC - 30 mA rating
14	Computer server room	406285	17.39	20	10.00	B	Class AC - 30 mA rating
15	HRDC	1005795195	71.30	80	10.00	B	Class AC - 30 mA rating
16	Institute of Management	773578	89.91	100	10.00	B	Class AC - 30 mA rating
17	National Centre for Natural Resources	1005248369	53.22	63	10.00	B	Class AC - 30 mA rating
18	SOS Physics and Chemistry	404300	121.39	125	10.00	B	Class AC - 30 mA rating
19	SOS Physics and Chemistry	406134	125.04	125	10.00	B	Class AC - 30 mA rating
20	USIC	406148	20.00	20	10.00	D	Class AC - 30 mA rating
21	SOS geology and water resource management	406195	40.21	40	10.00	B	Class AC - 30 mA rating
22	SOS in life Science-1	406147	36.87	40	10.00	B	Class AC - 30 mA rating
23	SOS in life Science-2	404446	32.17	32	10.00	B	Class AC - 30 mA rating

24	Bio science Lab	771215	14.78	16	10.00	C	Class AC - 30 mA rating
25	Tissue culture	406200	28.17	32	10.00	D	Class AC - 30 mA rating
26	SOS in Pharmacy	773533	130.41	160	10.00	B	Class AC - 30 mA rating
27	SOS in statistics & mathematics	774228	43.81	50	10.00	B	Class AC - 30 mA rating
28	University press	403232	14.17	16	10.00	D	Class AC - 30 mA rating
29	SOS in regional study and research:	771283	15.24	20	10.00	B	Class AC - 30 mA rating
30	SOS in Physical education	606210	47.08	50	10.00	C	Class AC - 30 mA rating
31	SOS in Law	405438	29.91	32	10.00	B	Class AC - 30 mA rating
32	Auditorium:	405914	24.29	25	10.00	B	Class AC - 30 mA rating
33	Community hall	406296	13.91	16	10.00	B	Class AC - 30 mA rating
34	Engineering department :	405708	5.84	6	10.00	D	Class AC - 30 mA rating
35	SOS in Geography	606211	65.35	80	10.00	B	Class AC - 30 mA rating
36	Library	402164	113.04	125	10.00	B	Class AC - 30 mA rating
37	Animal house	405706	22.69	25	10.00	B	Class AC - 30 mA rating
38	Pump and block	406185	6.09	10	10.00	C	Class AC - 30 mA rating
39	Botanical garden pump	406203	6.52	10	10.00	C	Class AC - 30 mA rating
40	Pump near library	406126	6.30	10	10.00	C	Class AC - 30 mA rating
41	Arts bhavan ground floor	402163	113.04	125	10.00	B	Class AC - 30 mA rating
42	Arts Dept. In first Floor	406354	55.65	63	10.00	B	Class AC - 30 mA rating
43	Arts bhavan second floor	406355	55.89	63	10.00	B	Class AC - 30 mA rating

44	Health centre	402158	14.35	16	10.00	B	Class AC - 30 mA rating
45	Administrative building	406135	116.95	125	10.00	B	Class AC - 30 mA rating
46	Administrative building	404298	121.65	125	10.00	B	Class AC - 30 mA rating
47	Pareeksha Bhawan	406267	23.56	25	10.00	B	Class AC - 30 mA rating
48	VC chamber	406184	5.87	6	10.00	B	Class AC - 30 mA rating
49	VC bungalow	403290	7.39	10	10.00	B	Class AC - 30 mA rating
50	VC Bungalow Street light	402168	0.70	1	10.00	B	Class AC - 30 mA rating
51	Registrars bungalow	775464	10.87	16	10.00	B	Class AC - 30 mA rating
52	Bio technology	1005623708	116.52	125	10.00	D	Class AC - 30 mA rating

ENERGY SAVING PROPOSAL No: 9

Selection of cables

Present system

The connected load is increased above the sanctioned which is connected earlier is increased, but the cables and other accessories provided are the same, Due to the increase of load the cables and its joints are became chances of failure and short circuiting

Proposed system

The cables are to bechanged into higher size according to the connected load +safety factor for future expected additional load, the neutral cable size is also in the same size of the cable
All cables shall conform to I.S-692, IS-7098, IS-1554 (Part-I) 1964 and IS 694-1990 or latest. Conductors of all cables except for flexible cables, shall be of aluminium

Merits

- By increase size of cable energy saving by increase of cross-sectional area of cable.
- Avoidance of safety hazards by short circuiting
- Maintenance will be reduced

ENERGY SAVING PROPOSAL No: 10
Overvoltage problem rectification

Present system

Voltage level is very high in Teachers hostel, Girls hostel, girls hostel pump house, street light, SOS computer science and IT , computer room , Human resources development centre, Institute of management , national centre for natural resources, SOS In geography and water management, Bio science lab, Vice chancellors bungalow, In most the cases voltage level is 260V and allowable limit is 254V ,

Proposed

The issue to be taken up with CSPDCL authorities for changing the tapping of corresponding transformers to the lower

Problems due to overvoltage

Effects of High Voltage.

An assumption people often make is that since low voltage increases the amperage draw on motors, then high voltage must reduce the amperage draw and heating of the motor. This is not the case. High voltage on a motor tends to push the magnetic portion of the motor into saturation. This causes the motor to draw excessive current in an effort to magnetize the iron beyond the point where magnetizing is practical.

Motors will tolerate a certain change in voltage above the design voltage. However, extremes above the design voltage will cause the amperage to go up with a corresponding increase in heating and a shortening of motor life.

For example, manufacturers previously rated motors at 220/440V, with a tolerance band of 510%. Thus, the voltage range they can tolerate on the high-voltage connections is 396V to 484V. Even though this is the so-called tolerance band, the best performance would occur at the rated voltage. The extreme ends (either high or low) put unnecessary stress on the motor.

High voltage will always tend to reduce power factor, thus increasing the losses in the system. This results in higher operating costs for the equipment and the system.

Operation on a continuous basis at either the high or low extreme will shorten the life of the motor.

Such sensitivity to voltage is not unique to motors. In fact, voltage variations affect other magnetic devices in similar ways. The solenoids and coils you find in relays and starters tolerate low voltage better than they do high voltage. This is also true of ballasts in fluorescent, mercury, and high-pressure sodium light fixtures. And it's true of transformers of all types. Incandescent lights are

especially susceptible to high voltage. A 5% increase in voltage results in a 50% reduction in the life of the lamp. A 10% increase in voltage above the rating reduces incandescent lamp life by 70%.

Overall, it's definitely better for the equipment if you change the taps on incoming transformers to optimize the voltage on the plant floor to something close to the equipment ratings. The best life and most efficient operation usually occur when you operate motors at voltages very close to the nameplate ratings.

Merits

- The damage of equipment's will avoid
- Short circuiting will be avoid
- The energy consumption will be reduced for luminaries
- Maintenance cost will be reduced

ENERGY SAVING PROPOSAL No: 11

Enhancement of sanctioned load according to the actual connected load

Present system

In some of the buildings, connected load is more than the sanctioned load which will invite penalty from CSPDCL

SL NO	PARTICULARS	Service No/Consumer no	SANCTIONED LOAD (kW)	CONNECTED LOAD (Kw)	REMARKS
1	PG girls hostel	403268	3.7	12.68	Greater than the Sanctioned load
2	Teachers hostel	403288	3.7	5.09	Greater than the Sanctioned load
3	Azad hostel	404408	2.1	9.52	Greater than the Sanctioned load
4	Research Hostel for Girls	771284	2.25	7.33	Greater than the Sanctioned load
5	Professional girls hostel	774229	7.3	7.65	Greater than the Sanctioned load
6	Research boys hostel	606167	3.94	4.34	Greater than the Sanctioned load
7	SOS in electronics and photonics	771282	34.3	38.52	Greater than the Sanctioned load

8	SOS in computer science and IT	773349	20	26.41	Greater than the Sanctioned load
9	HRDC	1005795195	40	41	Greater than the Sanctioned load
10	USIC	406148	9	11.5	Greater than the Sanctioned load
11	SOS geology and water resource managem ent	406195	22.5	23.12	Greater than the Sanctioned load
12	SOS in life Science-1	406147	10.444	21.2	Greater than the Sanctioned load
13	SOS in life Science-2	404446	9.04	18.5	Greater than the Sanctioned load
14	Bio science Lab	771215	4	8.5	Greater than the Sanctioned load
15	Tissue culture	406200	9	16.2	Greater than the Sanctioned load
16	SOS in statistics & mathemati cs	774228	12	25.194	Greater than the Sanctioned load
17	University press	403232	0.9	8.15	Greater than the Sanctioned load
18	SOS in regional study and research:	771283	2.25	8.765	Greater than the Sanctioned load
19	SOS in Law	405438	8.72	17.2	Greater than the Sanctioned load
20	SOS in Geograph y	606211	33.38	37.58	Greater than the Sanctioned load
21	Pump near library	406126	2.238	3.62	Greater than the Sanctioned load
22	Arts bhavan ground floor	402163	65	29.435	Maintenance work was going on during the period of audit.
23	Arts Dept In first Floor	406354	32	19.3	Maintenance work was going on during the period of audit.

24	Arts bhavan second floor	406355	32.14	9.27	Maintenance work was going on during the period of audit.
25	Administrative building	406135	63.35	67.25	Greater than the Sanctioned load
26	VC bungalow	403290	2.25	4.25	Greater than the Sanctioned load

Provisions of billing in case of Excess Supply

II. For Normal Tariff consumers

c) In case the connected load of any LT consumer, except the domestic (LV-1) consumers, is found at any time in excess of contracted load, the consumer shall have to pay charges at tariff (fixed and energy charge) corresponding to the excess load at the rate of one and half times the normal tariff for the excess load to the extent of 20% of contracted load and at the rate of two times of the normal tariff if the excess load is found beyond 20% of contracted load for actual period of enhancement of load or 6 months whichever is less, including the month in which the existence of excess load is detected and shall be continued to be billed till excess load is removed or contract load is enhanced.

Proposed system

Regularise the system with CSPDCL at the earliest.

Merits

- Avoid the penalty from the CSPDCL
- Avoid the unnecessary query from financial auditors of University as if penalty charged by CSPDCL

ENERGY SAVING PROPOSAL No: 12

Improvement in power factor
Present system

In guest house, Gandhi hostel, P.G Girls hostel, Teachers Hostel, Azad Hostel, Research girls Hostel, Professional Girls Hostel, Research boys hostel, Institute of management, University Press, SOS in Regional studies and research, Community hall, SOS in Geography, Arts Bhavan ground floor, First Floor, Second floor, areas the power factor is found lower than the minimum specified of 0.85. This will invite penalty from CSPDCL

Proposed system

Improve the power factor by the installation of LV capacitors and its rating chart is given below, Power factor indicated in our analysis at the time of measurement it may vary according to the usage. Hence take while deciding the proper value of capacitors

CSPDCL Act.

All **LT non-domestic consumers** with contracted load/connected load of 15 kW or above shall arrange to install suitable low tension capacitors of appropriate capacity at their cost. The consumer

shall ensure that the capacitors installed by him properly match with the actual requirement of the load so as **to ensure average monthly power factor of 0.85 or above.** A consumer who fails to do so will be liable to pay power factor surcharge @ 35 paisa per kWh on the entire consumption of the month

Existing Power FACTOR	DESIRED POWER FACTOR							
	0.85	0.90	0.95	0.96	0.97	0.98	0.99	1.00
0.40	1.668	1.805	1.959	1.998	2.037	2.085	2.146	2.288
0.50	1.112	1.248	1.403	1.441	1.481	1.528	1.590	1.732
0.60	0.714	0.849	1.005	1.043	1.083	1.131	1.192	1.334
0.65	0.549	0.685	0.840	0.878	0.918	0.966	1.027	1.169
0.67	0.488	0.624	0.779	0.817	0.857	0.905	0.966	1.108
0.68	0.459	0.595	0.750	0.788	0.828	0.876	0.937	1.079
0.69	0.429	0.565	0.720	0.758	0.798	0.840	0.907	1.049
0.70	0.400	0.536	0.691	0.729	0.769	0.811	0.878	1.020
0.71	0.372	0.508	0.663	0.701	0.741	0.783	0.850	0.992
0.72	0.343	0.479	0.634	0.672	0.712	0.754	0.821	0.963
0.73	0.316	0.452	0.607	0.645	0.685	0.727	0.794	0.936
0.74	0.289	0.425	0.580	0.618	0.658	0.700	0.767	0.909
0.75	0.262	0.398	0.553	0.591	0.631	0.673	0.740	0.882
0.76	0.235	0.371	0.526	0.564	0.604	0.652	0.713	0.855
0.77	0.209	0.345	0.500	0.538	0.578	0.620	0.687	0.829
0.78	0.183	0.319	0.474	0.512	0.552	0.594	0.661	0.808
0.79	0.156	0.292	0.447	0.485	0.525	0.567	0.635	0.776
0.80	0.130	0.266	0.421	0.459	0.499	0.541	0.608	0.750
0.81	0.104	0.240	0.395	0.433	0.473	0.515	0.582	0.724
0.82	0.078	0.214	0.369	0.407	0.447	0.489	0.556	0.698
0.83	0.052	0.118	0.343	0.381	0.421	0.463	0.530	0.672
0.84	0.026	0.162	0.317	0.355	0.395	0.437	0.504	0.645
0.85	-	0.136	0.291	0.329	0.367	0.417	0.478	0.620

ENERGY SAVING PROPOSAL No: 13

Proper termination of cable joints and proper insertion of fuses

Present system

In most of the areas cable joints are without any proper methods, terminal joints are not properly jointed, Wires are used in most of the fuses instead of proper rated fuses. Please refer thermal images in annexure-3

Proposed system

1. **CABLES AND CONDUCTORS**

   All cables shall conform to I.S-692, IS-7098, IS-1554 (Part-I) 1964 and IS 694-1990 or latest.

   Conductors of all cables except for flexible cables shall be of aluminium.

   FLEXIBLE CABLES

Conductors of flexible cables shall be of copper. The minimum size of core acceptable is 1.50 sq.mm.

2. **CABLE JOINTING**

All cable joints shall be carried out by experienced and Licence jointers under strict supervision. Electro plated brass cable glands, aluminium/tinned copper cable sockets and approved jointing materials must be used. The cable armouring is to be properly terminated. All cable accessories and other associated materials shall conform to Indian Standard Specification where applicable.

ENERGY SAVING PROPOSAL-14:-

Timers in the operation of Street Light, garden lights

Present System

Security persons are the deciding authority for switching on and off the street lights,this will vary according to the person to person.

Proposed system

Install the timers for the operation of street lights and garden lights .This automation will increase of services and energy savings and calculation on power consumption will, be easier prior to the bill.

ENERGY SAVING PROPOSAL-15

Switching off of Common lights in corridor and toilets

Present system

Lights are switched on in the morning and it may be switched off in the night by security,this will increase the power consumption affecting the life of luminaries and creating a misunderstanding to the students and public about energy saving attitudes.

Proposed

Energy team to be formed among students and responsibility given, stickers and posters to be provided in the lighting switch boards. These lights should be changed in first phase of changing

Merits

Reduction in energy consumption

Life of luminaries are increased and thus the maintenance cost will came down

Creating awareness about energy conservation in the university students and staff.

ENERGY SAVING PROPOSAL-16

Changing of luminaries in new buildings with LED lights

Present system

Purchasing of new conventional lighting systems will increase the energy consumption

Proposed

The new luminaries are be changed into LED lights , Rules and regulations to be changed accordingly , Decision for change to be taken at the planning and designing stage of the building for opting the new technological luminaries .

ENERGY SAVING PROPOSAL-17

Improvement of light by cleaning of Luminaries

Present system

Cleaning of luminaries is note done in any of the areas. There is no dedicated team for cleaning and thus improves the illumination levels and life of luminaries.

Proposed

Energy volunteers to be formed among students and responsibility with the help of NSS Volunteers.

ENERGY SAVING PROPOSAL-18

Cleaning of ceiling fans

Present system

Cleaning of ceiling fans and exhaust fans are not done in any of the areas. There is no dedicated team for cleaning and thus improve the air circulation levels and life of ceiling fans

Proposed

Energy team to be formed among students and responsibility with the help of NSS Volunteers

ENERGY SAVING PROPOSAL-19

Follow up on proper engineering practice while installation of air conditioner

Present system

Lengthy copper tube from compressor to condenser, installation of air conditioner evaporator and condenser locations against its installation manual

Proposed

Installation of condenser as minimum as possible from the evaporator , minimum gap between top ceiling and top of evaporator should be 1 feet, side and back gaps between are to be 1feet for proper circulation of air, avoid the blockage of air in front of condenser fan.
Installation of air conditioners is to be done as per the instruction manual on indoor and outdoor units and its refrigerant piping.

Merits

- Reduction in power consumption
- Proper air circulation in the air conditioned room
-

ENERGY SAVING PROPOSAL-20

Cleaning of indoor and outdoor units

Present system

Condenser fins and evaporator suction filter are not cleaned

- Fouled condenser tubes force compressor to work hard to attain the derived capacity. For 0.8mm scaling build up in the condenser coils can increase the power consumption by 35%.
- Similarly the fouled or chocked suction filter in the evaporator increases the running time of compressor and reduces the circulation of cold in the room.
- For every 1^{o}C increase in the condensing temperature increases the specific energy consumption by 1%.

Proposed

Cleaning schedule to be incorporated, AMC for repairing and cleaning, along with checking of power consumption periodically and record the same.

ENERGY SAVING PROPOSAL-21

Avoid ingress of heat into the AC room

Present system

The windows are plane glass and the gaps are found between doors and old windows are properly loosing

Proposed

The old metal frame of windows are to be changed, proper ceiling on doors and windows, Cool film installation on windows

ENERGY SAVING PROPOSAL-22

Increase of set temperature of Air conditioners
Present system

Set temperature are found as in 16 to 20 ºC in many areas

Proposed system

As per the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) has their recommended temperature range to be from 22°C-27°C (64.4°F-80.6°F) for human comfort level at 55% RH.

Merits

- Every 1^0C increment in evaporator temperature or setting temperature in the air conditioners reduced power consumption by 3%
- Energy saving by increase of temperature.

ENERGY SAVING PROPOSAL-23

Repairing of ASMF panels of DG SET
Present system

AMF is not working and CSPDCL supply restored DG will work continuously without knowing about the same.

Proposed

AMF to be repaired with Supplier, Indication with lights and alarm against failure and restoration of CSPDCL supply.

ENERGY SAVING PROPOSAL-23:-

PF improvement in Pumps:

Present system:

At present all the pumps are running without any LV capacitors and thus in low PF ranging from 0.75 to 0.8 (Pease refer pumps houses power table).
Merits

Proposed system:
Provide LV capacitors to all the pumps with multiplication factor as given below in table: to improve the PF to 0.95 and above. At least improve the PF to 0.95 and above from the present system.

Existing Power FACTOR	DESIRED POWER FACTOR							
	0.85	0.90	0.95	0.96	0.97	0.98	0.99	1.00
0.40	1.668	1.805	1.959	1.998	2.037	2.085	2.146	2.288
0.50	1.112	1.248	1.403	1.441	1.481	1.528	1.590	1.732
0.60	0.714	0.849	1.005	1.043	1.083	1.131	1.192	1.334
0.65	0.549	0.685	0.840	0.878	0.918	0.966	1.027	1.169
0.67	0.488	0.624	0.779	0.817	0.857	0.905	0.966	1.108
0.68	0.459	0.595	0.750	0.788	0.828	0.876	0.937	1.079
0.69	0.429	0.565	0.720	0.758	0.798	0.840	0.907	1.049
0.70	0.400	0.536	0.691	0.729	0.769	0.811	0.878	1.020
0.71	0.372	0.508	0.663	0.701	0.741	0.783	0.850	0.992
0.72	0.343	0.479	0.634	0.672	0.712	0.754	0.821	0.963
0.73	0.316	0.452	0.607	0.645	0.685	0.727	0.794	0.936
0.74	0.289	0.425	0.580	0.618	0.658	0.700	0.767	0.909
0.75	0.262	0.398	0.553	0.591	0.631	0.673	0.740	0.882
0.76	0.235	0.371	0.526	0.564	0.604	0.652	0.713	0.855
0.77	0.209	0.345	0.500	0.538	0.578	0.620	0.687	0.829
0.78	0.183	0.319	0.474	0.512	0.552	0.594	0.661	0.808
0.79	0.156	0.292	0.447	0.485	0.525	0.567	0.635	0.776
0.80	0.130	0.266	0.421	0.459	0.499	0.541	0.608	0.750
0.81	0.104	0.240	0.395	0.433	0.473	0.515	0.582	0.724
0.82	0.078	0.214	0.369	0.407	0.447	0.489	0.556	0.698
0.83	0.052	0.118	0.343	0.381	0.421	0.463	0.530	0.672
0.84	0.026	0.162	0.317	0.355	0.395	0.437	0.504	0.645
0.85	-	0.136	0.291	0.329	0.367	0.417	0.478	0.620

Merits

Reduces the motor cable losses by reducing the current through it.

Required capacitors with locations

Sl no	Location	Metre no	Pumping area	Rated kW	Present PF	Required PF	Required Capacitor (kVAr)
1	LH pump	406187	Ladies hostel	5.62	0.85	0.94	1.57
2	Azad hostel pump	Azad hostel meter	Boys hostels	3.75	0.85	0.94	1.05
3	Pump room	406131	Girls hostel-1, Geography, Registrar bungalow, Guest house	3.75	0.85	0.94	1.05
4	Computer science	computer science server room metre	computer science, HRDC	3.75	0.85	0.94	1.05

5	Pharmacy	Pharmacy metre	Pharmacy,	3.75	0.85	0.94	1.05
6	Physical education	PE metre	Physical education	3.75	0.85	0.94	1.05
7	Regional studies & research	Regional studies metre	Regional studies	1.5	0.85	0.94	0.42
8	Life science pump room	406203	Life science	2.2	0.85	0.94	0.62
9	Near library	406126	Library, Arts bhavan, Engineering dept,	3.75	0.85	0.94	1.05
10	Auditorium	Auditorium metre	Auditorium, garden,		0.85	0.94	0.00
11	Administrative block	AD block metre	AD block,	3.75	0.85	0.94	1.05
12	Near quarters	406188	Quarters	3.75	0.85	0.94	1.05
13	VC bungalow pump	406127	VC bungalow	3.75	0.85	0.94	1.05

Note:

As each pump used to supply water to several areas, the actual power consumption varies and thus PF too. Maximum PF will arrive only during the Maximum load. In the above calculation we assume that maximum power takes all the time during the running hours.

GENERAL SUGGESTIONS:

ANNEXURE-1:-

Implications if all the Existing LT Connections are converted to a Single HT Connection. :-

Given below is a comparative study on the financial implications if all the existingLT Connections are converted to a single HT Connection.

Present situation:

At present Electricity Supply to all the Installations are given from about 64 LT connections.

Approximate Total kW of connected load	=	1200 kW
Average kWh consumption/ month by PRSU	=	83,885kWh (From the last 12 month electricity bill)
Approximately	**=**	**85,000 kWh**
Average cost/ unit (including surcharge & Duties)	**=**	**Rs 7.00**
Approximate total cost/Month	**=**	**Rs 5, 95,000/-**

Proposed Situation:

As per the CSPDC tariff structure, HT tariff applicable to Universities is HV-2. HV-2 tariff is applicable to the following categories:

1. This tariff is applicable to the mines, coal mines, cement industries, and other industries not covered under categories HV-1 and HV-4 for power, lights, fans, cooling ventilation, etc., which shall mean and include all energy consumption in factory and consumption for residential and general use therein including offices, stores, canteen yard lighting, etc.

2. This tariff is also applicable for supply to establishment such as Railways (other than traction), hospitals, offices, hotels, shopping malls, power supplied to outside of State (border villages), educational institutions, mixture and/or stone crushers and other institutions, etc., having mixed load or non-industrial and/or non-residential load. This tariff is also applicable to all other HT consumers not covered specifically in any other HV tariff category.

HV-2 tariff Structure is given below:

Category of Consumers	Demand Charge (Rs./kVA/month)	Energy Charge (Rs. per kVAh)
HV-2 11 kV & 33 kV	365	4.50

Determination of Maximum Demand

The maximum demand in each month shall be four times the largest number of kilo Volt Ampere hours delivered at the point of supply during any consecutive 15 minutes during the month as per sliding window principle of measurement of demand.

Power Factor Incentive/Penalty is not applicable as the energy charges are billed on kVAh.

But if PF is improved, kVA as well as kVAh will come down resulting in reduction in Demand Charge as well as Energy Charge.

Calculation:

Contract Demand proposed	=	1200 kVA
Average Maximum Demand	=	1000 kVA
Total Demand Charges (1000*350)	=	Rs 3, 50,000/-
Total Energy Charges (82,500*4.5) (3% Reduction for Transformer Loss)	=	Rs 3, 71,250/-
Total Charges (438000+450000)	=	Rs 7, 21,250/- + surcharge, duties
Approximate Monthly Amount	=	Rs 8, 00,000/-

A. Merits:

1. As the Substation is in the University compound itself, the chance of Electricity failure is very less
2. Operation and Maintenance of Transformer and the whole LT Installation can be done by the University Staff.
3. Providing 64 nos. LT connections in the same premises are very untidy and chaotic. If HT supply is taken, it can be avoided.

B. Demerits:

- Initial investment will be very high. It has to be estimated by a competent Electrical Consultant.
- There will be approximately 35% hike in monthly Energy Charges.
- Exclusive space for Transformer and Switchgear has to be provided.
- Staff exclusively for Operation and Maintenance has to be posted.

ANNEXURE-2:

Review of Present Maintenance Practice:

Present practice:

University does the maintenance whenever there occurs any breakdowns. This is the case of all the equipment's present in the university like pumps, cables, MCB etc. Pumps maintenance records are present in the university which contains Rewinding details, number of breakdowns and occurred date. Most of the maintenance work are done by the external contractors which called upon whenever requires.

Proposal:

Maintain a preventive maintenance program to reduce the interruptions and breakdowns in the system and proper recording of the maintenance practice

Methods to follow:

1. Routine Inspections (Regularly Scheduled) – Daily Walk-Through / Checklists
2. Detailed Inspections / Testing (Programmed Scheduled)
3. Analysis of Testing Reports/inspections – Both Current and Past – Recommended Corrective Measures / Action Items
4. Implementation of Corrective Measures / Action Items
5. Record Keeping / Trending Both Hard & Soft Copies
6. Gather Support / Funding / Commitment From Management
7. Survey All Systems / Equipment
8. Perform Failure Mode Effects Analysis (FMEA) – Safety of Personnel / Technicians – Uniqueness of System / Equipment –Equipment Redundancy
9. Determine Maintenance Intervals Based On The Following – Importance / Critical Nature of Equipment –Age of Equipment –Environment
10. Determine Resources / Staffing Requirements – Management of Program Shall Always Be Performed Internally – Timeline to Perform Maintenance (1 Week or 3 Months) – In sourcing
    - Ownership / Calibration of Equipment
    - Size of System
    - Define Scope of Work / Testing Specification • Regularly Engaged In Electrical Testing (Minimal of 5 Yrs.

Benefits:

1. Improves Safety For Facility and Technicians
2. Provides Assurance That Protective Devices Will Function
3. Safely Clears Fault Conditions (Short Circuits, Overloading, Ground Faults, etc.)

4. Arc-Flash Calculations Assume Equipment is Maintained
5. Calculation Required for Inspection and Selection of Proper PPE
6. Provides Higher Level of Reliability / Dependability – Reduces Risk of Equipment / System Failure
7. Minimizes Property Loss Claims / Lowers Insurance Premiums –
8. Strengthens Operational Learning / Training of Electrical System – Observe Reactions of Electrical, Mechanical, and Control Systems
9. Enables Equipment / System To Operate At Peak Efficiency – 1% - 3% Energy Savings Over Non-Maintained Equipment

ANNEXURE-3:

Renewable Energy Option -

The Sun is an inexhaustible, reliable and non-polluting source of power. Since the inception of life on earth, the only energy that was available came from the sun. The time is now approaching when mankind will again depend upon the sun as dominant energy source. We are aware that fossil fuels are not going to last forever. A growing worldwide concern for conservation of energy has reignited our interest in ecologically sustainable materials, processes and sources of energy.

Of the numerous renewable sources of energy known to mankind, Solar Photo Voltaic or SPV is one that has the potential to supply power for our future needs:

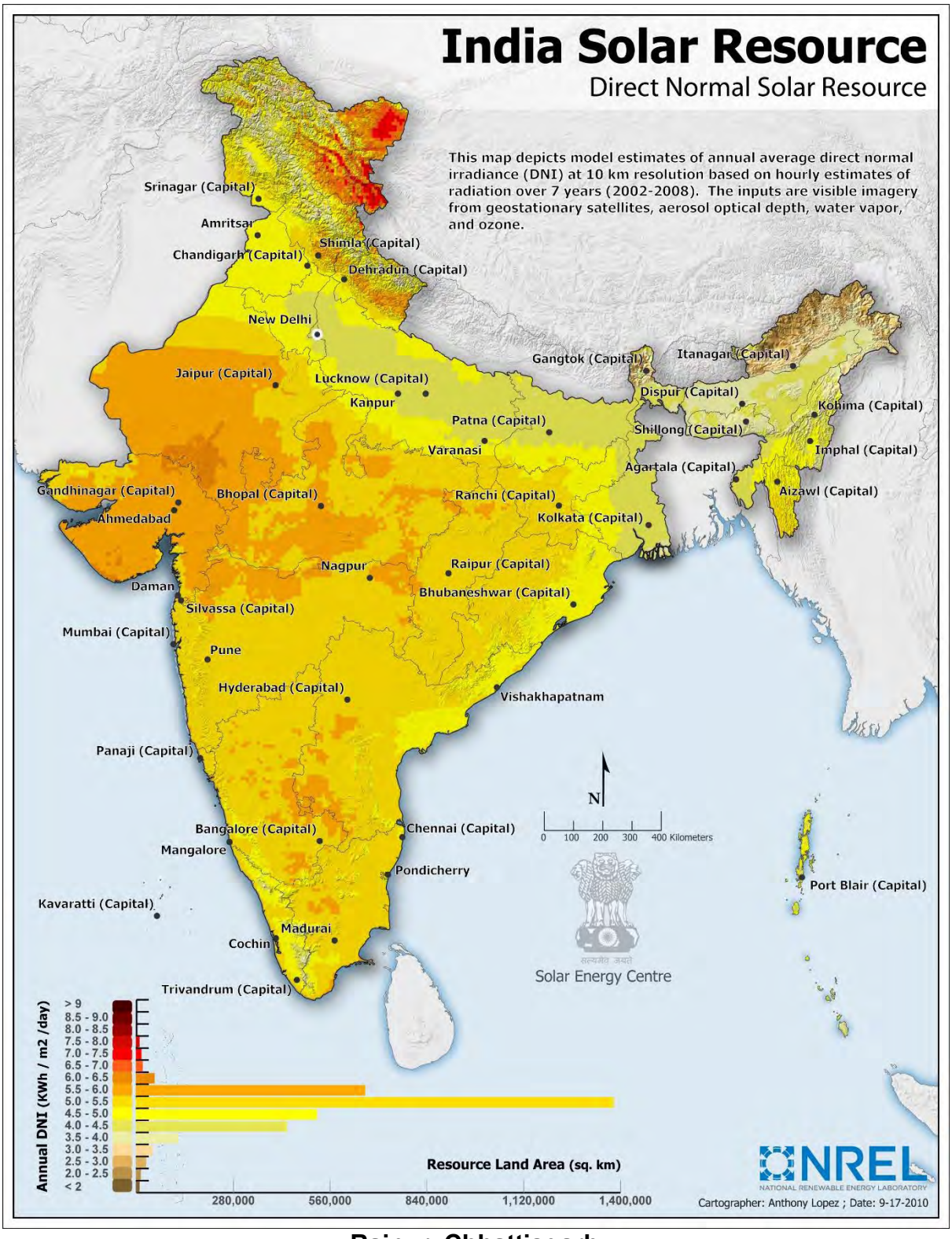
- Solar radiation is the largest renewable energy source
- The solar energy is more evenly distributed in the world than wind or bio-mass.
- It is well proven and demonstrated technology
- It promises to be most cost effective renewable power at high volumes.

In addition the solar photovoltaic technology offers following advantages: No recurring fuel cost

- Clean, silent and no moving parts
- Modular, Reliable with Low Maintenance
- Environmentally sound, does not contribute to greenhouse gas emission.
- Can be installed at the point of use and prevents transmission line losses.
- Solar panels have life in excess to 25 years and can withstand high winds, severe hail impact, high humility, ambient temperatures.

The solar energy potential in India is immense due to its convenient location near the Equator. India receives nearly 3000 hours of sunshine every year, which is equivalent to 5000 trillion kWh of energy. The following image shows the solar generation potential of India.

Solar Potential Analysis for Pandit Ravi Shankar Shukla University (PRSU) Campus,



Raipur, Chhattisgarh

Geographical Location:

Latitude: **21.24795** Longitudes: **81.602142**

NASA Surface meteorology and Solar Energy: RET Screen Data
(Ref website: https://eosweb.larc.nasa.gov/sse/RETScreen/)

	Unit	Climate data location
Latitude	°N	21.248
Longitude	°E	81.602
Elevation	m	391
Heating design temperature	°C	13.70
Cooling design temperature	°C	36.78
Earth temperature amplitude	°C	18.07
Frost days at site	day	0

Month	Air temperature	Relative humidity	Daily solar radiation - horizontal	Atmospheric pressure	Wind speed	Earth temperature	Heating degree-days	Cooling degree-days
	°C	%	kWh/m^2/d	kPa	m/s	°C	°C-d	°C-d
January	19.8	46.5%	4.58	97.0	2.8	21.6	12	302
February	23.0	41.9%	5.44	96.8	3.0	25.8	0	363
March	27.6	34.8%	6.19	96.5	3.0	31.6	0	537
April	31.0	34.9%	6.71	96.2	3.0	34.9	0	620
May	32.9	38.9%	6.58	95.8	2.8	36.5	0	700
June	29.7	63.8%	4.89	95.7	2.8	31.6	0	585
July	26.6	79.3%	3.96	95.8	2.7	27.4	0	510
August	25.8	82.2%	3.79	95.9	2.6	26.1	0	484
September	25.6	76.8%	4.46	96.2	2.2	26.2	0	472
October	24.5	63.0%	5.07	96.6	2.3	25.2	0	451
November	22.1	47.8%	4.76	97.0	2.5	23.1	0	365
December	19.3	46.5%	4.49	97.2	2.5	20.5	7	292
Annual	25.7	54.7%	5.08	96.4	2.7	27.5	19	5681
Measured at (m)					10.0	0.0		

(Courtesy: eosweb.larc.nasa.gov)

General Requirement for Roof Top Solar PV plant Installation:-

Space Requirement for Panel Mounting:

A minimum shadow free space of 8m^2 is required for the solar panel mounting for the capacity of 1KW. The panel must be mounted facing south with appropriate inclination for maximum output from installation. Suitable structure according to wind speed and roof structure must be used without shading the panel surface.

Solar PV modules and Inverter:

Solar PV panels of 200W or above must be selected for the rooftop installation above 10KW. The efficiency of individual panel must not be less than 13%.

String invert with MPPT charge controllers is more suitable for the solar power plant installation in roof top. Equipment and installation must be complied with **CSERC Rooftop PV Regulation, 2013**.

Solar Air conditioning

Solar Air conditioning can be done in two ways

1, Solar powered air conditioning

2, Solar thermal power air conditioning (Vapour Absorption system)

Solar powered air conditioning

As in solar powered air conditioning uses photovoltaic system for generating power, then to inverter, battery and make whole thing is to use work with the air conditioner, In the existing systems in India have A/C power, which is to be switches to DC technology as of western countries. This takes time and not economical at the present situation and hence it is not recommended.

Solar Thermal power (VAM)

This is the greenest and latest technology and consumes least electricity for air conditioning and do not use CFC as refrigerant. Hence it is harmless to the environment. But the minimum of 25TR solar thermal power set up in India for Mamta ENERGY Pvt. Ltd. The cost of install VAM is very much higher than VAC

ANNEXURE-4:-

Innovative areas for energy conservation training-

- 'Start with campaign on energy conservation slogans, pictures, posters, and articles on notice boards, magazines, and tips on boards.
- Training programme for selected students and declare them as energy volunteers , train them for taking small group classes on energy conservation
- Promote cycling among the campus
- Train and mould the students to clean the luminaries fans, air conditioners and classes and public areas
- Celebrate energy conservation day, Science day, Technological days and other important scientist birth days
- Call industry specialists (Preferable old students) for took classes on energy related subjects but it should be in connection with their study areas.
- Promote home energy audits and building audit of university buildings (Equipments and specialists are available in CREDA)
- Conduct special training programs for engineering department with the support of CREDA
- Start energy conservation campaign on Raipur Nagar Palika with students. Arrange a procession from different parts of Raipur Town with energy slogans, street play, posters etc and joined at one place were public meeting to be arranged. Invite special guests who are working in the field of Energy conservation in rural areas.
- Energy quiz, posters , awards for best projects are one of the area for innovation

Annexure-5:-

Thermal Images (Separate file attached).

ANNEXURE-6:-

LIST OF SUPPLIERS:

SL No:	Particulars	Brand	Address	Approx. Cost per piece
1	T-5	Bajaj	Bajaj Electricals,Bajaj Bhawan,Doongagi Colony.GE Road,Near Anupam Udyan,Raipur-492001	Rs.500
		Phillips	Regional MarketingManager –Lighting, Philips India Ltd. Techno police Knowledge Park, Mahakali Caves Road, ChakkalaAndheri (E)	Rs, 500
		GE	General Electricals	Rs.500
2	LED	Bajaj	Bajaj Electricals,Bajaj Bhavan,Doongagi Colony.GE Road,Near Anupam Udyan,Raipur-492001	8 W-Rs.626
		Phillips	Regional Marketing Mnager –Lighting, Philips India Ltd. Technopolice Knowledge Park , Mahakali Caves Road,Chakkala Andheri(E)	8W- Rs. 700
		GE	General Electricals, 361/362, Solitair Park, Mr. Vasanji Road, Chakkala ,Andheri (E)Mumbai -400093	8W Rs. 750
3	Air conditioners	Samsung	2nd&3rdFloor, Tower C, Vipul Tech Square, Golgi Course Road,Sector-43,Gurgaon - 122002	1TR, 5 star Rs33979 1.5TR, 5Star Rs 35058
		LG	L.G Electronics India Pvt. Ltd.A-Wing, 3rd floor, D-3 District Centre Saket, New delhi	1TR, 5 star Rs34000 1.5TR, 5Star Rs 36000
		Carrier	Carrier Refrigewration and Air conditioning Ltd, 605A, Lokmat Building,Lokmat Square, Vardha Road, Ramdas Pet, Nagpur	1TR, 5 star Rs35000 1.5TR, 5 Star Rs 37058
4	BLDC Fans	Orient Eco	Orient Electricals Ltd., 82,Ist floor,Okhala Industrial Estate, Phase -111, New delhi - 110020	4000
		Ruchi	Ruchi Electricals Ltd,F-81, Khanpur Extension , New Delhi-110620	3000

5	RCCB	Havel's	QRG Towers, 2D, SEC-16, Express High way, Noida UP-201304	Rs. 2600
		Bajaj	Bajaj Electricals,Bajaj Bhavan,Doongagi Colony.GE Road,Near Anupam Udyan,Raipur-492001	Rs. 2600
		GE	General Electricals 361/362, Solitair Park, Mr. Vasanji Road, Chakkala ,Andheri (E)Mumbai -400093	Rs. 2750

ANNEXURE- 7:-

LIST OF INSTRUMENTS:-

SL.NO	EQUIPMENT DESCRIPTION	MAKE & MODEL
1	Power Energy & Harmonic Analyzer	Fluke 1735 With Flexi Probes (3000a)) Krykard Alm 35
2	Infrared Thermometer	Fluke Mini 62
3	Non Contact Tachometer	Metravi Nctm – 1000
4	Lux Meter ,	Amprobe Lm 120
5	Clamp On Meter	Metravi Dt 2250
6	Vane Flow Meter	Metravi
7	Ultrasonic Flow Meter	Portlock 7s
8	Thermal Imager	Flir

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As part of the Institution's initiatives for a Healthy & Sustainable University the audit was conducted.
We appreciate the immense efforts taken by Staff and students towards the Energy Management and Conservation.

Issued on **Wednesday, 23 March 2022** valid till **March 2023**

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