

ENERGY AUDIT REPORT

OF

GOVT. EKLAVYA COLLEGE DONDI LOHARA, BALOD, CHHATTISGARH.



**ADDRESS: - Govt. Eklavya College DondiLohara,
Dalli Rajhara Road, DondiLohara, Distt. - Balod (C.G.)**

Prepared By-



Audittech Industrial Services Private Limited

Opps. Mahavir Bhawan, Tikrapara, Balod, Chhattisgarh-491226

Contact- 9827143100/9407702444

Email- info@audittech.co.in Website- www.audittech.co.in

DECEMBER-2021

Contents

ACKNOWLEDGEMENT	3
1. EXECUTIVE SUMMARY	5
1.1 Need for Green Audit & Energy Audit	9
1.2 Introduction	9
1.3 Energy Audit Objectives	10
1.4 Source of Energy	10
1.5 Indirect Benefits of Energy Audit	10
1.6 Introduction of Auditing Firm.....	11
1.7 Energy audit team	12
1.8 List of Instruments.....	12
1.9 Methodology of Energy Audit	13
2. ELECTRICAL SYSTEM	14
2.1 Electricity Bill Summary-	14
2.2 Transformer Load Profile-	15
2.3 Voltage Unbalance of Transformer -	16
3. LIGHTING SYSTEM.....	22
3.1 Introduction.....	22
3.2 Basic Terms in Lighting System and Features.....	22
3.3 Light Details	23
3.4. Lux Level: -.....	27
4. Green Building Analysis.....	32
4.1 Water Use.....	32
4.2 Waste Generation	32
4.3 E-Waste Generation.....	33
4.4 Green Area	34
5. SOLAR POWER GENERATION SYSTEM	35
5.1 Introduction	35
5.2 Salient Benefits of Solar Energy	35
5.3 Proposed Solar Power Plant	36
6. GENERAL TIPS FOR ENERGY CONSERVATION IN DIFFERENT UTILITIES SYSTEMS.....	38
6.1 ELECTRICITY	38
6.2 FANS.....	38
6.3 PUMPS	38
6.4LIGHTING.....	39
6.5. WATER & WASTE WATER	39
7. General Energy Conservation awareness posters to aware users	42

ACKNOWLEDGEMENT

We express our sincere gratitude to **Higher Education Institute Govt. Eklavya College Dondi Lohara** for giving us the opportunity to be a part of their mission towards Energy Conservation.

We are thankful to all officers and employees of **HEI Govt. Eklavya College Dondi Lohara** with whom we interacted during the field study for their whole hearted support in undertaking measurements and eagerness to assess the system/equipment efficiencies and saving potential. The willingness of these key personnel to participate in this program and acknowledge the call for energy efficiency is more than half the issues received.



Signature:

Date: DEC 2021

Place: Raipur

Mr. Aashish Bafna, Director

Certified Energy Auditor

Energy Auditor Certificate

Reg No.: EA-28916



Certificate No.: 9780/19

National Productivity Council

(National Certifying Agency)

PROVISIONAL CERTIFICATE

This is to certify that Mr./Mrs./Ms. **AASHISH BAFNA**
son / daughter of Mr. **ASHOK BAFNA**.....has passed the National certification
Examination for Energy Auditors held in September 2018, conducted on behalf of the Bureau of Energy Efficiency,
Ministry of Power, Government of India. He / She is qualified as **Certified Energy Manager** as well as
Certified Energy Auditor.

He/She shall be entitled to practice as Energy Auditor under the Energy Conservation Act 2001, subject to the fulfillment
of qualifications for Accredited Energy Auditor and issuance of certificate of Accreditation by the Bureau of Energy
Efficiency under the said Act.

This certificate is valid till the Bureau of Energy Efficiency issues an official certificate.

Place : Chennai, India

Date : **22nd April, 2019**

Controller of Examination

1.EXECUTIVE SUMMARY

An Energy Audit is a study of a facility to determine how & where energy is used and to identify methods for Energy Savings. There is now a Universal recognition of the fact that new Technologies and much greater use of some that already exist provide the most hopeful prospects for the future. The Opportunities lie in the use of existing Renewable Energy Technologies, greater efforts at Energy Efficiency and the dissemination of these Technologies and Options.

This report is just one step, a mere Mile Marker towards our destination of Achieving Energy Efficiency and we would like to emphasize that an Energy Audit is a Continuous Process. We have compiled a list of possible actions to Conserve and efficiently utilize our scarce Resources and identified their Savings Potential. The next step would be to prioritize their Implementation.

We look forward with Optimism that the College Authorities, staffs and students shall ensure the maximum execution of the recommendations and the success of this work.

The rapid urbanization and economic development at local, regional and global level has led to several environmental and ecological crises. On this background it becomes essential to adopt the system of the Green Campus for the institute which will lead for sustainable development.

Govt Eklavya College is deeply concerned and unconditionally believes that there is an urgent need to address these fundamental problems and reverse the trends. The purpose of the audit was to ensure that the practices followed in the campus are in accordance with the Green Policy & Energy Policy adopted by the institution. The methodology included: preparation and filling up of questionnaire, physical inspection of the campus, observation and review of the documentation, interviewing key persons and data analysis, measurements and recommendations. It works on the several facets of 'Green Campus' including Water Conservation, Tree Plantation, Waste Management, Paperless Work, Alternative Energy and Mapping of Biodiversity. With this in mind, the specific objectives of the audit was to evaluate the adequacy of the management control framework of environment sustainability as well as the degree to which the Departments are in compliance with the applicable regulations, policies and standards. It can make a tremendous impact on student health and learning college operational costs and the environment. The criteria, methods and recommendations used in the audit were based on the identified risks.

Higher Education Institute Govt. Eklavya College Dondi Lohara Facility

Govt. Eklavya College Dondi Lohara affiliated to Hemchand Yadav Vishwa vidyalaya comes under higher education department of Chhattisgarh government in district Balod. This college was established in the year 2006. This college was established to provide higher education to young and deserving students. Arts, science, commerce faculties are functioning in this College. The co-curricular and sports activities are organized to stimulate the creativity and to maintain physical fitness of the students. The units of National Service Scheme and Youth Red Cross Society create a sense of social responsibility

among the students. Career counselling and coaching classes for entering into various services are also organized under the banner of Career guidance scheme.

Electrical power:

The establishment has a Electricity Connection of 1.5 KW connection from Chhattisgarh state power distribution company Ltd. The transformer is installed outside of the boundary of campus which is not dedicated for the college.

SN	Energy saving measures	Investment in Rs.	Yearly Energy savings		
			Electricity (kWh)	Cost saving /year (in Rs.)	Payback Period (Year)
1	2	3	7	9	10
1	Replacement of Tube Light of 40W + 15 W(Choke) with Energy Efficient 20W LED Tube	24900.00	2905	18882.00	1.32
2	Replacement of Ceiling Fan of 80W With EESL Energy Efficient 35WBLDC Ceiling Fan	94500.00	3402	22113.00	4.07
3	Installation of 10 kW Solar Power Generation Unit in Roof Top	500000.00	15000	97000.00	5.15
Total		619400.00	21307	137000.00	3.51

Total implementation cost proposed	6.19	Rs. Lakhs
Total Energy saving Potential identified (in kWh)	0.21	Lakhs kWh
Total cost Saving Potential	1.37	Rs. Lakhs
Simple Pay Back Period	3.51	Yrs.

Note: Consider Electricity unit rate- Rs. 6.5/kWh

Green Audit Summary

S.No.	Area	Observation	Remark
1	Solid Waste Management	Waste bins are placed separately for dry and wet waste at some corner of the corridor, Organic waste like leaves food waste etc. Had outside vendors to manage the paper waste also.	Good initiative taken by college towards use of solid waste Management System. But in some more places dustbins should need to be placed for proper disposal of the solid wastage.
2	Liquid waste Management	However rain water harvesting is used to recharge the ground level Water. Water wastage through taps of washroom and flush system is maximum	Good initiative taken by college Towards Water Conservation. Using ecomist water saver tap nozzles to save 80% of water wastage. Using solar water sprinkler for gardening can save energy as well as water also
3	Plastic free campus	College is taking initiative by displaying banner about awareness of plastic free campus.	Good initiative by college towards to implement Plastic Free Campus.
4	E- waste Management	There is no such process found for the disposal of E-waste	College should take some measures for the proper management of E-Waste material.

1.1 Need for Green Audit & Energy Audit

Green Audit & Energy audit can be defined as systematic identification, quantification, recording, reporting and analysis of components of environmental diversity, energy usage. The 'Green Audit' aims to analyze environmental practices within and outside the college campus, which will have an impact on the eco- friendly ambience. It was initiated with the motive of inspecting the work conducted within the organizations whose exercises can cause risk to the health of inhabitants and the environment. Through Green Audit, one gets a direction as how to improve the condition of environment and there are various factors that have determined the growth of carrying out Green Audit.

In any Educational Institute, the three top operating expenses are often found to be Energy, Manpower, and Operational Expenses. If one were to relate to the manageability of the cost or potential cost savings in each of the above components, Energy would invariably emerge as a Key Component, and thus Energy Management function constitutes a strategic area for cost reduction. Energy Audit will help to understand more about ways Energy and Fuel are used in any identity, and help in identifying the areas where waste car occurs and where scope for improvement-exists.

The Energy Audit would give a Positive Orientation to the Energy cost reduction, preventive maintenance and quarterly Central Programmes which are vital for production and utility activities. Such an Audit Programme will help to keep focus on variations which occur in the Energy costs, availability and reliability of supply of Energy, decide on approximate Energy mix, identify Energy Conservation Technologies, retrofit for Energy Conservation Equipment etc.

In General, Energy Audit is the translation of conservative ideas into realities, by lending technically feasible solutions with economic and other Organizational considerations within a specified time frame.

The Primary Objective of Energy Audit is to determine ways to reduce Energy Consumption per unit of Product Output or to lower Operating costs. Energy Audit provides a "Bench-Mark" for managing Energy in the Organization and also provides the basis for Planning a more effective use of Energy throughout the Organization.

1.2 Introduction

This Project is the vision to make Govt. Eklavya College Dondi Lohara Energy Efficient. campus Energy bill keeps up around INR **15000 per year**. This amount is huge and thus naturally attracts attention when we understand that quite a lot of energy is being wasted, which in turn would mean that huge amount of Financial resources is being wasted.

Making the Campus Energy Efficient will not only help the College reduce its expenses but also helps us fulfil our moral responsibility of not wasting this precious resource, which is scarcely available to rest of the people of the country.

We are confident that the results that will come out of this exercise are bound to be of interest to everyone and can be the first step to make Govt. Eklavya College Dondi Lohara campus energetically the most efficient campus in India.

1.3 Energy Audit Objectives

Primary: -

- 1) The first objective is to acquire and analyze data and finding the necessary consumption pattern of these facilities.
- 2) The second objective will be to calculate the wastage pattern based on the results of the first objective.
- 3) The final objective is to find and implement solutions that are acceptable and feasible.

Secondary: -

- 1) This would be our first exposure to this field hence experience gain would be vital.
- 2) This project will precede many follow up projects and hence helps to gain technical and management exposure required for future energy projects.
- 3) It is sure to help create a repertoire of vital contacts hence will develop interaction with alumni, faculty and students.

1.4 Source of Energy

HEI Govt. Eklavya College Dondi Lohara uses Energy in Following Forms:

- a. Electricity from CSPDCL

The Following are the Major consumers of Electricity in the facility

- a. Lightning
- b. Fans
- c. Computers
- d. Other Lab Equipment

1.5 Indirect Benefits of Energy Audit

Every time the Energy Audit is carried out it rekindles the interest in Energy Conservation as an important function. Energy Auditors sharing their experience and knowledge with the Plant Personnel, helps in fuelling the innovative ideas for further action of reduction in

Specific Power consumption (SPC). Any loose connections or heating of cables come to timely vision. For an external agency due to unbiased vision, a few points for Energy Conservation may be visible each time they perform the audit and this would help in achieving further saving. Inform any irregularities in Energy meter CT connections for rectification.

1.6 Introduction of Auditing Firm

M/s. Audittech Industrial Services Private Limited is an empanelled Accredited Energy Audit Firm from Bureau of Energy Efficiency, Ministry of Power, Government of India. It is one of the fast growing Energy Audit & Energy services providing company executed several projects covering all the energy Intensive Sectors & states of India. The directors and associate team members are very well experienced in the field of Energy Audit and executed more than 150 no's Detailed Energy Audit so far.

The associate team and expert are highly qualified and experienced in the field of Energy Audit and Services. Individual credential of each member in the field of Energy Audit is very rich due to their past association with very reputed organization of Energy Audit Services.

Name of Firm:	Audittech Industrial Services Private Limited
Address:	Opps. Mahavir Bhawan, Tikarapara, Balod, Chhattisgarh-491226
Contact details:	9827143100 / 9407702444, Email id: info@audittech.co.in, aispl.rpr@gmail.com

Company have Head office at Balod (C.G.) & Branch offices at Durg, Bhopal, Mumbai & Delhi.

Directors Details

Sr. No.	Name	Designation / Technical Experience	Technical Experience /Qualification
1	Mr. Aashish Bafna	Managing Director - 10yrs	B.E (E&I)., MBA(Energy Management), Certified Energy Auditor, Surveyor & Loss Assessor
2	Mr. Rakesh Khichariya	Director- 25Yrs	B.E (Elect.), Accredited Energy Auditor

3	Mr. Ramesh Patel	Director- 25Yrs	B.E.(Mtech), Govt Approved Valuer, Competent Person for Factory Act
4	Mr. Isshant Chainani	Director- 10 Yrs	B.E. (Elect & telecom)
5	Mrs. Shikha Golchha	Director- 8 yrs	B.E., MBA (Finance)

1.7 Energy audit team

Following are the team involved in the Energy Audit of the Govt. Eklavya College DondiLohara.

SN	Name	Designation/ Qualification	Experience	Contact Details
1	Mr. Rakesh khichariya	Accredited Energy Auditor (AEA-0295)	25 yrs.	9827411444
2	Mr. Aashish Bafna	Certified Energy Auditor (EA-28916)	10 yrs.	9827143100
3	Mr. Isshant Chainani	Certified Energy Manager (EA-29062)	10 yrs.	9407702444
4	Mr. Dhaleshwar Prasad	Certified Energy Manager (EA-27299)	10 yrs.	9179294953
5	Mr. Sumit Singh Thakur	Certified Energy Manager (EA-28549)	10 yrs.	8770632688
6	Mr. Mahaveer Bafna	Energy Engineer	3 yrs	8962369293
7	Mr. Chandra Prakash	Energy Engineer	1 yrs	8817255897

1.8 List of Instruments

Following are the instrument used at the time of the Energy Audit.

Sr.No.	Instrument	Make/Sr.No.
1	Power & Harmonics Analyser, 1 Set (With CT, PT) LT	Krykard ALM 31/ 123673RCH
2	Power & Harmonics Analyser, 1 Set (With CT, PT) LT	Krykard ALM 20/ 28107280
4	Lux Meter 1Set (Digital Lux Meter)	MECO G 930P/201704004601

1.9 Methodology of Energy Audit

The purpose of the Audit was to ensure that the practices followed in the campus with the criteria, methods and recommendations used in the audit were based on the identified risks. The methodology includes: preparation and filling up of questionnaire, Physical inspection of the campus, observation and review of the document, interviewing responsible persons and data analysis, measurements and recommendations. The methodology adopted for this Audit was a three-step process comprising of:

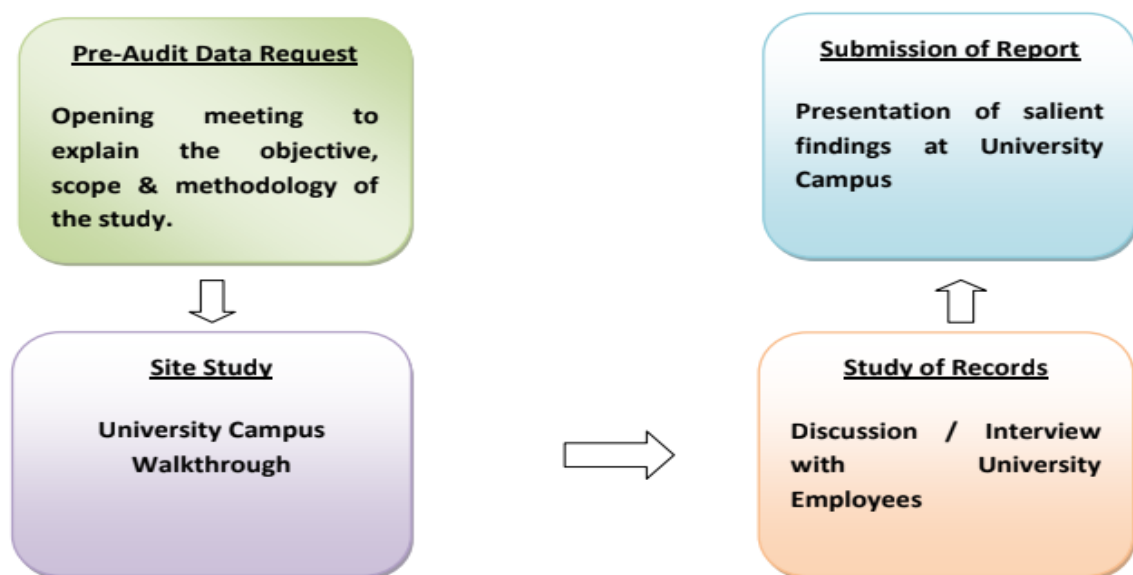
- 1. Data Collection** – In preliminary data collection phase, exhaustive data collection was performed using different tools such as observation, survey communicating with responsible persons and measurements. Following steps were taken for data collection:

The team went to each department, centres, Library, canteen, Student Blocks, labs, etc.

Data about the general information was collected by observation and interview.

The power consumption of appliances was recorded by taking an average value in some cases.

- 2. Data Analysis-** Detailed analysis of data collected include: calculation of energy consumption, analysis of latest electricity bill of the campus, understanding the tariff plan provided by the. Chhattisgarh State Power Distribution Company (CSPDCL). Data related to water usages were also analysed using appropriate methodology.
- 3. Recommendation /Suggestions** – On the basis of results of data analysis and observations, some steps for reducing power and water consumption were recommended. Proper treatments for waste were also suggested. Use of fossil fuels has to be reduced for the sake of community health.



AUDIT FLOW CHART

2.ELECTRICAL SYSTEM

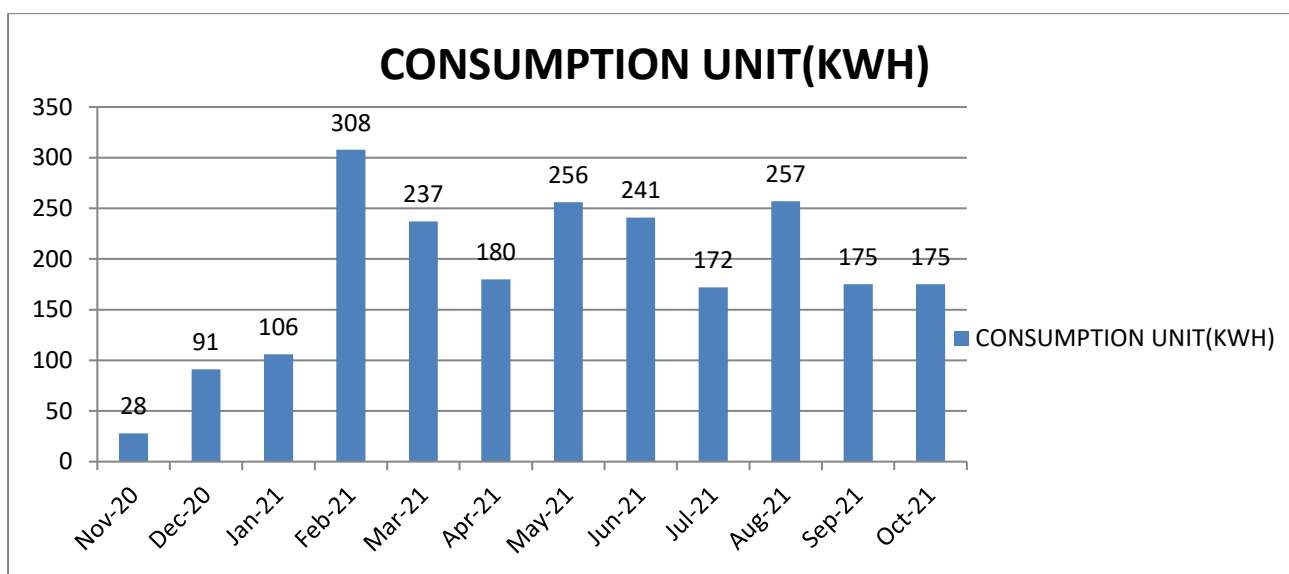
2.1 Electricity Bill Summary-

This table shows the Electricity Bill of last 12 Months from Nov 2020 to Oct 2021.

BILL MONTH	CONSUMPTION UNIT(KWH)	CONTRACT DEMAND(KW)	AMOUNT (In Rs.)	Unit Cost (In Rs./KW)
Nov-20	28	1.52	182	6.5
Dec-20	91	1.52	591.5	6.5
Jan-21	106	1.52	689	6.50
Feb-21	308	1.52	2,002	6.5
Mar-21	237	1.52	1541	6.5
Apr-21	180	1.52	1170	6.5
May-21	256	1.52	1664	6.5
Jun-21	241	1.52	1566.5	6.5
Jul-21	172	1.52	1118	6.5
Aug-21	257	1.52	1721.9	6.7
Sep-21	175	1.52	1172.5	6.7
Oct-21	175	1.52	1172.5	6.7
Total	2226		14590.4	
Average	185.50	1.52	1215.87	6.55
Max	308	1.52	2002	6.70
Min	28	1.52	182	6.50

Note:- Yearly energy consumption of the college from Nov_20 to Oct_21 is very low as per the connected load because of the Covid-19 situation and lockdown conditions where as saving calculations are calculated as per the normal condition of operation of 5 Hours per day for 200 days in a Year.

Graphical Representation of Consumption Unit(KWH)



2.2 Transformer Load Profile-

The Below Table Shows the Transformer Load Profile of Govt. Eklavya College Dondi Lohara.

Parameter	Unit	Min	Max	Average
R RMS Voltage	V	448	449	448.5
Y RMS Voltage	V	451	453	452
B RMS Voltage	V	445	446	445.5
R RMS Current	Amp	5.76	13.51	9.63
Y RMS Current	Amp	0.23	2.63	1.43
B RMS Current	Amp	1.53	1.54	1.53
L1 PF	-	0.87	0.98	0.92
L2 PF	-	0	0	0
L3 PF	-	0.67	0.68	1.35
R Active Power	W	1420	3452	2436
Y Active Power	W	0	0	0
B Active Power	W	367	373	370
Total Active Power	W	1787	3825	2806
R Apparent Power	VA	1633	3498	2566
Y Apparent Power	VA	0	0	0
B Apparent Power	VA	548	867	707.5
Total Apparent Power	VA	2181	4365	3273
R THD Voltage	%	1.6	4.6	3.1
Y THD Voltage	%	1.1	4.7	2.9
B THD Voltage	%	1.3	3.9	2.6
R THD Current	%	5.6	7.1	6.35
Y THD Current	%	3.9	4.9	4.4
B THD Current	%	5.8	2.8	4.3

Note: Total Load profile of Transformer is enclosed in Annexure-1

Observation:

1. It is observed from the above table that Load is not properly distributed phase wise, 90% of load is in the R phase i.e. 13 Amps as compared to Y & B phase.
2. Maximum running load is 3.49 kW on R phase which is higher than the contracted demand as per the electricity bill i.e. 1.5 kW.

2.3 Voltage Unbalance of Transformer –

The Below Table Shows the Voltage Unbalance of Transformer Govt. Eklavya College Dondi Lohara.

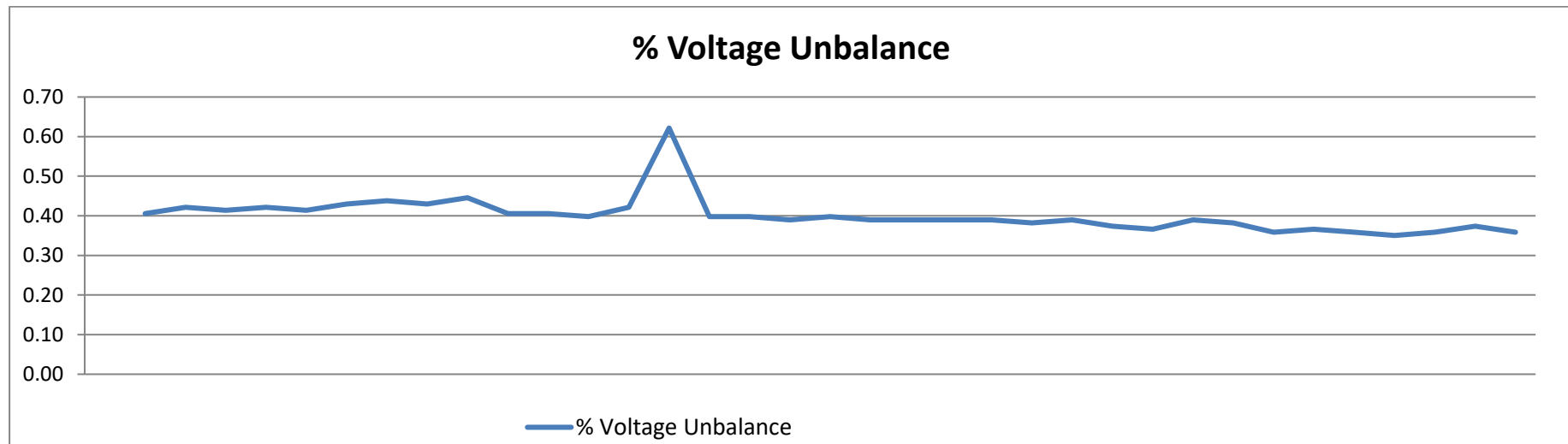
Voltage Unbalance of Main Transformer											
S.No.	Rated voltage	Measured Voltage			Average Voltage	Calculated Unbalance			Maximum unbalance	% Voltage Unbalance	%Temperature rise
		R	Y	B		R	Y	B			
1	440.00	420.80	417.50	419.00	419.10	1.70	1.60	0.10	1.70	0.41	0.33
2	440.00	420.90	417.50	419.00	419.13	1.77	1.63	0.13	1.77	0.42	0.36
3	440.00	420.80	417.50	418.90	419.07	1.73	1.57	0.17	1.73	0.41	0.34
4	440.00	420.80	417.40	418.90	419.03	1.77	1.63	0.13	1.77	0.42	0.36
5	440.00	420.70	417.40	418.80	418.97	1.73	1.57	0.17	1.73	0.41	0.34
6	440.00	420.50	417.20	418.40	418.70	1.80	1.50	0.30	1.80	0.43	0.37
7	440.00	420.50	417.20	418.30	418.67	1.83	1.47	0.37	1.83	0.44	0.38
8	440.00	420.40	417.10	418.30	418.60	1.80	1.50	0.30	1.80	0.43	0.37
9	440.00	420.60	417.30	418.30	418.73	1.87	1.43	0.43	1.87	0.45	0.40
10	440.00	420.60	417.70	418.40	418.90	1.70	1.20	0.50	1.70	0.41	0.33
11	440.00	420.70	417.80	418.50	419.00	1.70	1.20	0.50	1.70	0.41	0.33
12	440.00	420.70	417.80	418.60	419.03	1.67	1.23	0.43	1.67	0.40	0.32
13	440.00	420.80	417.80	418.50	419.03	1.77	1.23	0.53	1.77	0.42	0.36
14	440.00	420.80	417.90	418.50	418.20	2.60	0.30	0.30	2.60	0.62	0.77
15	440.00	420.40	417.50	418.30	418.73	1.67	1.23	0.43	1.67	0.40	0.32
16	440.00	420.50	417.60	418.40	418.83	1.67	1.23	0.43	1.67	0.40	0.32
17	440.00	420.50	417.70	418.40	418.87	1.63	1.17	0.47	1.63	0.39	0.30
18	440.00	420.60	417.70	418.50	418.93	1.67	1.23	0.43	1.67	0.40	0.32
19	440.00	420.50	417.70	418.40	418.87	1.63	1.17	0.47	1.63	0.39	0.30
19	440.00	420.50	417.70	418.40	418.87	1.63	1.17	0.47	1.63	0.39	0.30
19	440.00	420.40	417.60	418.30	418.77	1.63	1.17	0.47	1.63	0.39	0.30
20	440.00	420.40	417.60	418.30	418.77	1.63	1.17	0.47	1.63	0.39	0.30
21	440.00	420.30	417.50	418.30	418.70	1.60	1.20	0.40	1.60	0.38	0.29

22	440.00	420.40	417.60	418.30	418.77	1.63	1.17	0.47	1.63	0.39	0.30
23	440.00	420.50	417.70	418.60	418.93	1.57	1.23	0.33	1.57	0.37	0.28
24	440.00	420.50	417.70	418.70	418.97	1.53	1.27	0.27	1.53	0.37	0.27
25	440.00	420.60	417.70	418.60	418.97	1.63	1.27	0.37	1.63	0.39	0.30
26	440.00	420.40	417.50	418.50	418.80	1.60	1.30	0.30	1.60	0.38	0.29
27	440.00	420.20	417.50	418.40	418.70	1.50	1.20	0.30	1.50	0.36	0.26
28	440.00	420.30	417.50	418.50	418.77	1.53	1.27	0.27	1.53	0.37	0.27
29	440.00	420.20	417.50	418.40	418.70	1.50	1.20	0.30	1.50	0.36	0.26
30	440.00	420.10	417.30	418.50	418.63	1.47	1.33	0.13	1.47	0.35	0.25
31	440.00	420.20	417.30	418.60	418.70	1.50	1.40	0.10	1.50	0.36	0.26
32	440.00	420.30	417.30	418.60	418.73	1.57	1.43	0.13	1.57	0.37	0.28
33	440.00	420.10	417.20	418.50	418.60	1.50	1.40	0.10	1.50	0.36	0.26

Observation: -

1. It is Observed that the voltage unbalance is not Exceed 1%, and the Voltage Unbalance as per above Table is within acceptable range

Graphical Representation of Percentage Voltage Unbalance





Transformer

2.4 Power Quality

Power Quality & Harmonics

Equipment based on frequency conversion techniques generates harmonics. With the increased use of such equipment's, harmonics related problems have enhanced.

The harmonic currents generated by different types of loads, travel back to the source. While travelling back to the source, they generate harmonic voltages, following simple Ohm's Law. Harmonic voltages, which appear on the system bus, are harmful to other equipment connected on the same bus.

In general, sensitive electronic equipment connected on this bus, will be affected.

The Harmonics Level on the LT side of the Transformers was measured, details of which is as under:-

- Maximum Individual Frequency Voltage Harmonic: 3%
- Total Harmonic Distortion of the Voltage: 5%

harmonic current limitations

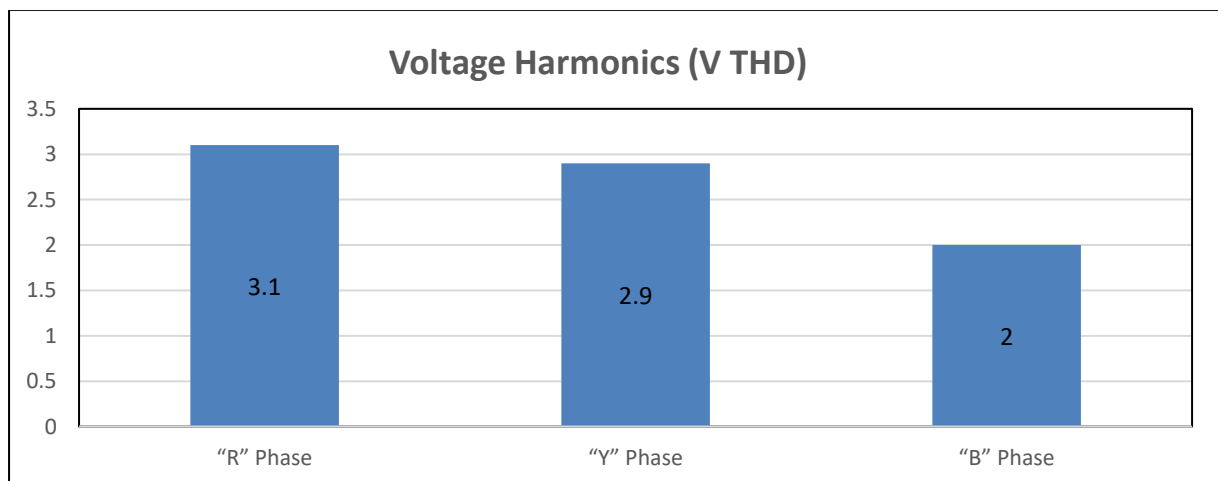
Maximum Harmonic Current Distortion in Percent of IL 120 Volt through 69 KV						
Individual Harmonic Order (Odd Harmonics)						
ISC/IL	h<11	11<h<17	17<h<23	23<h<35	35<h	TDD
<20*	4.0	2.0	1.5	0.6	0.3	5.0
20<50	7.0	3.5	2.5	1.0	0.5	8.0
50<100	10.0	4.5	4.0	1.5	0.7	12.0
100<1000	12.0	5.5	5.0	2.0	1.0	15.0
>1000	15.0	7.0	6.0	2.5	1.4	20.0

Even harmonics are limited to 25% of the odd harmonic limits
TDD refers to Total Demand Distortion based on the average demand current at the fundamental frequency and measured at the PCC (Point of Common Coupling).

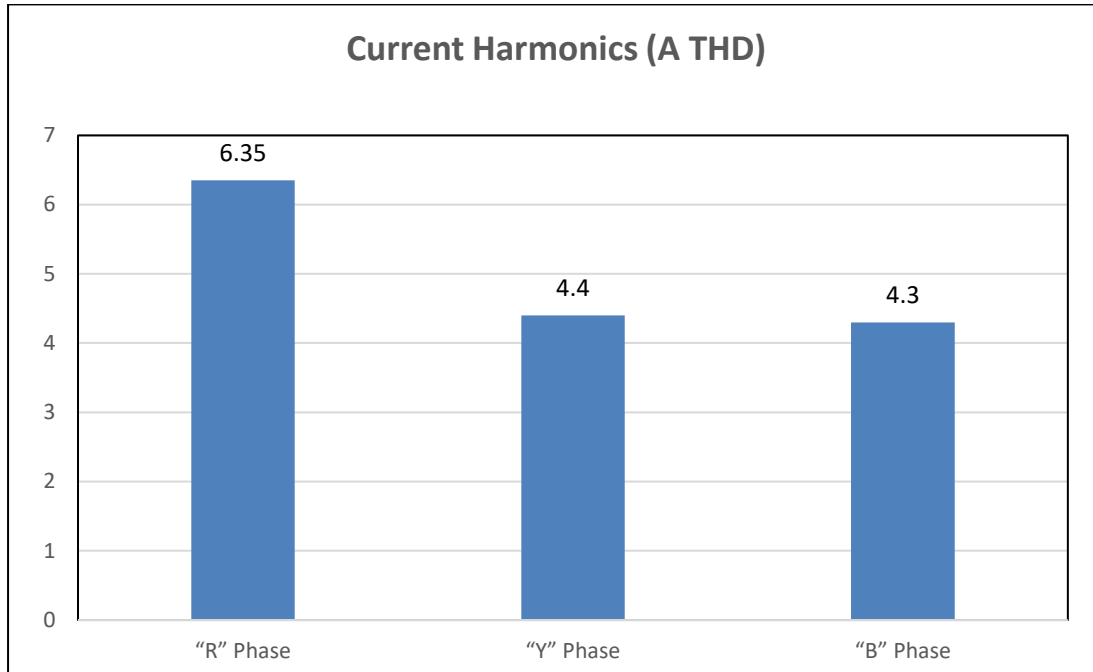
*All power generation equipment is limited to these values of current distortion regardless of ISC/ IL value.
ISC = Maximum short-circuit current at PCC,
IL = Maximum demand load current (fundamental) at the PCC.
h = Harmonic number.

Particulars	TR
Voltage Harmonics (VTHD)	
"R" Phase	3.1
"Y" Phase	2.9
"B" Phase	2.6
Current Harmonics (ATHD)	
"R" Phase	6.35
"Y" Phase	4.4
"B" Phase	4.3

Graphical Representation of Voltage Harmonics (V THD)



Graphical Representation of Current Harmonics (A THD)



OBSERVATIONS & SUGGESTIONS:

As detailed above, the voltage harmonics levels were around 2.6-3.1% and the current harmonics levels were 4.3-6.35%. **The Overall harmonics are within limits.**

If Harmonics level is on higher side then appropriate harmonic filters may have to be installed in the system.

Different technologies are available mitigating the harmonics from the system. These include: **Detuned or broadband harmonic filters:** these filter banks are tuned to a frequency just below the predominant harmonic frequency. If the predominant harmonic frequency is say, 5th, it is normal practice to tune the filters to 189 Hz, or 3.78th harmonic, in 50 Hz systems.

Active Harmonic Filters: these units are designed in such manner that, they will inject harmonic frequencies in the system, which will be in anti-phase of the load harmonic frequencies. This will effectively free the source being loaded due to harmonics.

MAJOR CAUSES OF HARMONICS

Devices that draw non-sinusoidal currents when a sinusoidal voltage is applied create harmonics. Frequently these are devices that convert AC to DC. Some of these devices are listed below:

Electronic Switching Power Converters

- Computers, Uninterruptible power supplies (UPS), Solid-state rectifiers
- Electronic process control equipment, PLC's, etc.
- Electronic lighting ballasts, including light dimmer
- Reduced voltage motor controllers
- Arcing Devices

- Discharge lighting, e.g. Fluorescent, Sodium and Mercury vapor
- Transformers operating near saturation level
- Magnetic ballasts (Saturated Iron core)
- Induction heating equipment, Chokes, Motors, Appliances
- TV sets, air conditioners, washing machines, microwave ovens
- Fax machines, photocopiers, printers
- These devices use power electronics like SCRs, diodes, and thyristors, which are a growing percentage of the load in industrial power systems.

Many problems can arise from harmonic currents in a power system. Some problems are easy to detect; others exist and persist because harmonics are not suspected. Higher RMS current and voltage in the system are caused by harmonic currents, which can result in any of the problems listed below:

Blinking of Incandescent Lights	Transformer Saturation
Capacitor Failure	Harmonic Resonance
Circuit Breakers Tripping	Inductive Heating and Overload
Conductor Failure	Inductive Heating
Electronic Equipment Shutting down	Voltage Distortion
Flickering of Fluorescent Lights	Transformer Saturation
Fuses Blowing for No Apparent Reason	Inductive Heating and Overload
Motor Failures (overheating)	Voltage Drop
Electromagnetic Load Failures	Inductive Heating
Overheating of Metal Enclosures	Inductive Heating
Power Interference on Voice Communication	Harmonic Noise
Transformer Failures	Inductive Heating

3.LIGHTING SYSTEM

3.1 Introduction

Lighting is an essential service in all the industries, Universities, Hospitals, Malls etc. Innovation and continuous improvement in the field of lighting, has given rise to tremendous energy saving opportunities in this area. Lighting is an area, which provides a major scope to achieve energy efficiency at the design stage, by incorporation of modern energy efficient lamps, luminaries and gears, apart from good operational practices.

3.2 Basic Terms in Lighting System and Features

- **Lamps**

Lamp is equipment, which produces light. The most commonly used lamps are described briefly as follows:

- **Incandescent lamps:**

Incandescent lamps produce light by means of a filament heated to incandescence by the flow of electric current through it. The principal parts of an incandescent lamp, also known as GLS (General Lighting Service) lamp include the filament, the bulb, the fill gas and the cap.

- **Reflector lamps:**

Reflector lamps are basically incandescent, provided with a high quality internal mirror, which follows exactly the parabolic shape of the lamp. The reflector is resistant to corrosion, thus making the lamp maintenance free and output efficient.

- **Gas discharge lamps:**

The light from a gas discharge lamp is produced by the excitation of gas contained in either a tubular or elliptical outer bulb. The most commonly used discharge lamps are as follows:

- Fluorescent tube lamps (FTL)
- Compact Fluorescent Lamps (CFL)
- Mercury Vapour Lamps
- Sodium Vapour Lamps
- Metal Halide Lamps

3.3 Light Details

Audit team done the Inventory with Wattage analysis of different type of lighting installed across the campus. Below table shows the overall fixtures install in the College.

Inventory Details Of Ground Floor			
S.No	Location	Tube light of 40w	Fan Of 80W
1	Room No.1 (Staff Room)	3	2
2	Room No.2(Principal Room)	2 (1 Running)	3
3	Room No.3 (Office)	4	2
4	Room NO.4 (Physics Lab)	5 (4 Running)	4
5	Room No.5(Zoology Lab)	6	4
6	Room No.6(Classes)	0	2
7	Room No.7 (Classes)	1	1
8	Room NO.8 (Botany Lab)	4	3
9	Room No.9 (Classes)	5	3
10	Room No.10 (Office Room)	2	2
11	Room No.11 (Classes)	2	1
12	Room No.12 (Classes)	6	3
13	Room No.13 (Classes)	4	3
14	Room No.14 (Lab)	2	1
15	Room No.15 (Library)	2	1
16	Hall	7	1
Total		53	36

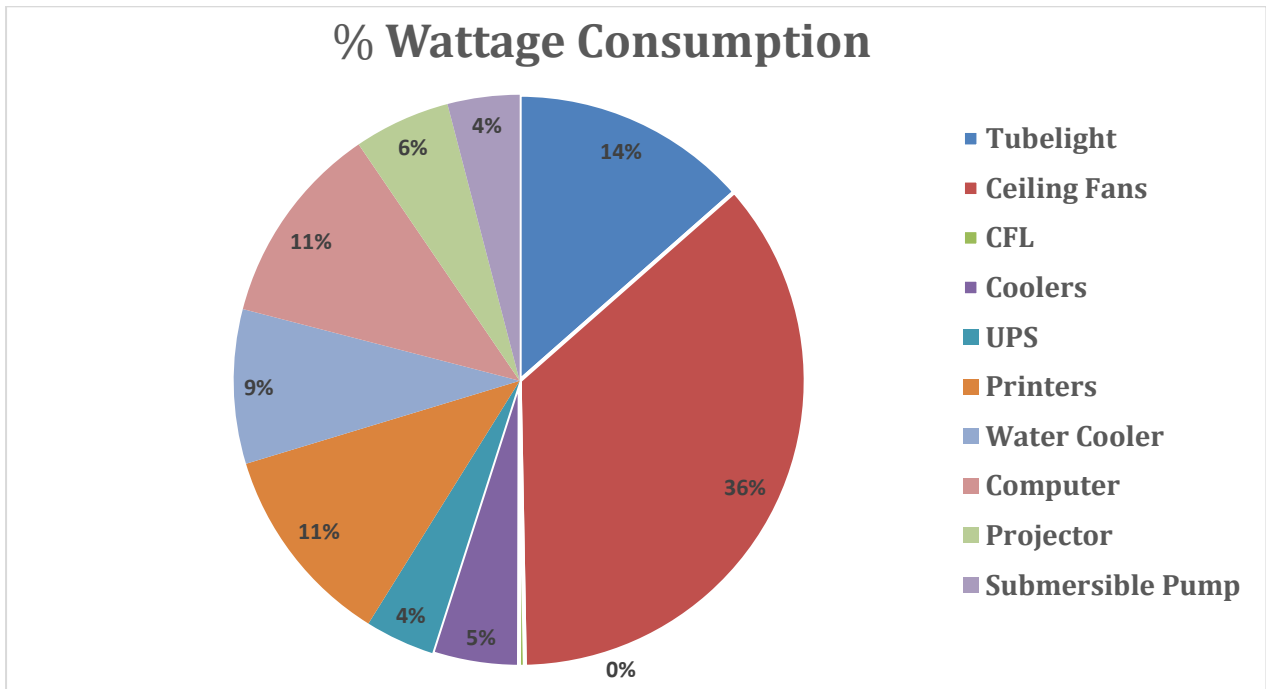
Inventory Details Of First Floor			
S.No.	Location	Tubelight of 40w	Fan Of 80W
1	Room No.16 (Classes)	9	4
2	Room No.17 (Classes)	2	3
3	Room No.18 (Biology Lab)	2	2
4	Room NO.19 (Chemistry Lab)	1	1
5	Room No.20 (Classes)	2	2
6	Room No.21 (Classes)	3 (1 Running)	2
7	Room NO.22 (Computer lab)	2	2
8	Room No.23 (Classes)	5 (3 Running)	4
9	Room No.24 (Classes)	4 (1 Running)	4
10	Room No.25 (Sports Room)	3	2
11	Hall	4	0
Total		30	26

Some Other Energy Consuming Equipment		
S.No.	Equipment	Quantity
1	Cooler (G.F.& F.F)	2
2	Water Cooler (G.F.&F.F.)	2
3	Computer	7
4	Printer	7
5	UPS	3
6	Submersible Pump	1
7	CFL	3
8	Overhead Projector	1

Total Connected Load of College Campus				
S.No.	Lighting Details/Type of light	Quantity	Wattage/HP	Total load (Watt)
1	Tube light	83	40	3320
2	Ceiling Fans	62	80	4960
3	CFL	3	20	60
4	Coolers	2	450	900
5	UPS	2	360	720
6	Printers	7	300	2100
7	Water Cooler	2	800	1600
8	Computer	7	300	2100
9	Projector	1	300	300
10	Submersible Pump	1	746	746
Total Connected Load in kilo Watt				16.806

Total connected load of the campus is 16.80 kW as per the inventory of the equipments and the running load with Pump is 3.4 kW and without Pump it is 1.45 kW.

Representation of Percentage Wattage Consumption



Observation:

1. It is observed from above table there are unconventional Tube Lights and fans are installed in College Premises.

Recommendation:

1. It is Recommended to Replace all unconventional 40 Watt + 15 W (Choke) Tube lights with 20 W retrofit LED tube lights.
2. It is recommended to replace inefficient Fans with Brushless Direct current Energy Efficient Fans (BLDC Fan).

Energy Saving Potential

The below table shows the energy saving potential of Govt. Eklavya College DondiLohara.

Replacement of Tube Light of 40W+15 W (choke) with 20W LED Tube		
Particulars		Units
Total Number of 40 Watt Tube Light	83	No.s
Measured Watt	55	Watts
Total Watts	4565	Watts
Proposed watt after replacement	20	Watts
Total Watts savings After Replacement	2905	Watts
Operating Hours in a day	5	Hours
Estimated Energy Saving after Replacement Annual KWH	2905	KWH
Per Unit Cost as Per CSPDCL Bill	6.5	Rs/kWh
Estimated Cost Saving Per Year	18882.5	Rs
Cost of Per Fixtures	300	Rs
Total Investment Cost	24900	Rs
Payback	1.32	Year

Replacement of Ceiling Fan of 80W With EESL Energy Efficient 35W Ceiling Fan		
Particulars		Units
Total Number of 80 Watt	63	No.s
Measured Watt	80	Watts
Total Watts	5040	Watts
Proposed watt after replacement	35	Watts
Total Watts savings After Replacement	2835	Watts
Operating Hours in a day	6	Hours
Estimated Energy Saving after Replacement Annual KWH	3402	KWH
Per Unit Cost as Per CSPDCL Bill	6.5	Rs/kWh
Estimated Cost Saving Per Year	22113	Rs
Cost of Per Fixtures	1500	Rs
Total Investment Cost	94500	Rs
Payback	4.07	Year

3.4. Lux Level: -

Lux is a standardised unit of measurement of light level intensity, which is commonly referred to as "luminance" or "illumination". A measurement of **1 lux is equal to the illumination of a one metre square surface** that is one metre away from a single candle.

Ground Floor Layout

GROUND FLOOR

Wash Room	Botany lab	Stairs	Room No 9 Classes	Wash Room	
Gate	Open Area		Gate		
Room No 7 Classes			Office		
Room No6 Classes			Room No 11 Classes		
Zoology Lab			Room No 12 Classes		
Physics Lab			Room No 13 Classes		
Office Room			Lab		
	Principal room	Staff Room	Main Gate	stairs	Library

Ground Floor

This table Shows the Average value of Lux

AREA	Average Lux with Open Window & Light	Average Lux with Open Window only	Average Lux with Light Only
Room No.1 (Staff Room)	350	110	75
Room No.2(Principal Room)	370	280	110
Room No.3 (Office)	157	100	80
Room NO.4 (Physics Lab)	260	150	80
Room No.5(Zoology Lab)	250	140	90
Room No.6(Classes)	137	130	110
Room No.7 (Classes)	147	110	95
Room NO.8 (Botony Lab)	240	220	190
Room No.9 (Classes)	230	210	180
Room No.10 (Office Room)	137	110	85
Room No.11 (Classes)	180	120	90
Room No.12 (Classes)	160	150	110
Room No.13 (Classes)	210	170	150
Room No.14 (Lab)	190	156	148
Room No.15 (Library)	150	135	110

Observation:

1. It is observed from above table that the Average LUX Level is between 370 to 80 when all Windows are Open in Rooms and No Lights are Switched ON, **which is above Standard Level for Class Rooms i.e. 300 LUX.**
2. Day light is full available and as per the timing of classes it can be used properly to save much energy.

Recommendation:

1. It is recommended to switch off all the Lights during day time or off the half of the Total Lights of the Rooms if Required, which can save too Much Energy.

First Floor Layout

Wash Room	Room No 20 Classes	Stairs	Room No 21 Classes	Wash Room
	Open Area			
Room No 19 Chemistry Lab			Computer Lab	
Room No 18 Biology Lab			Room No23 Classes	
Room No 17 Classes			Room No24 Classes	
Room No 16 (Classes)		Stairs	Sports Room	

First Floor

This Table Shows the Average Value of Lux

AREA	Lux with Open Window & Light	Lux with Open Window only	Lux with Light Only
Room No.16 (Classes)	397	280	197
Room No.17 (Classes)	175	110	75
Room No.18 (Biology Lab)	165	100	65
Room No.19 (Chemistry Lab)	185	120	95
Room No.20 (Classes)	280	220	180
Room No.21 (Classes)	309	230	150
Room No.22 (Computer lab)	220	210	180
Room No.23 (Classes)	240	150	110
Room No.24 (Classes)	210	200	170
Room No.25 (Sports Room)	110	100	95

Observation:

1. It is Observed from above table that the Average LUX Level is between 390 to 90 with only all Windows are Open in Rooms and No Lights are Switched ON, **which is above Standard Level for Class Rooms i.e. 300 LUX.**

Recommendation:

1. It is recommended that Switch off all the Lights during day time or can Switch ON Half of the Lights of the Rooms if Required, which can save too Much Energy.

4. Green Building Analysis

4.1 Water Use

This indicator addresses water consumption, water sources, irrigation, storm water, appliances and fixtures. A water audit is a non-site survey and assessment to determine the water use and hence improving the efficiency of its use.

a) Observation

The Source of Water is only from the ground water through pumps the study observed that the bore wells are major sources for water collection in the tanks of college. Water is used for drinking purpose, toilets and gardening. The waste water from the RO water purifier is not being used in any other purpose. During the survey no loss of water is observed neither by any leakages nor by over flow of water from overhead tanks.

The data collected from all the departments' is examined and verified. On an average the total use of water in the college is 1500 L/day, which include 1400 L/day for domestic, gardening purposes and 100 L/day for drinking purpose.

b) Recommendation

- In campus small scale/medium scale/ large scale reuse and recycle of water system is necessary.
- Minimize wastage of water and use of electricity during water filtration process, if used, such as RO filtration process and ensure that the equipment's used for such usage are regularly serviced.
- Ensure that all cleaning products used by college staff have a minimal detrimental impact on the environment, i.e. they are biodegradable and non-toxic, even where this exceeds the Control of Substances Hazardous to Health (COSHH) regulations.
- Gardens should be watered by using drip/sprinkler irrigation system to minimize water use.
- It is recommended to use ecologist water saver retrofit tap nozzles which can save 80% of wastage tap water.

4.2 Waste Generation

This indicator addresses waste production and disposal of different wastes like paper, food, plastic, biodegradable, construction, glass, dust etc. and recycling. Furthermore, solid waste often includes wasted material resources that could otherwise be channeled into better service through recycling, repair, and reuse. Solid waste generation and management is a burning issue.

Unscientific handling of solid waste can create threats to everyone. The survey focused on volume, type and current management practice of solid waste generated in the campus.

a) Observation

Waste generation from tree droppings and lawn management is a major solid waste generated in the campus. The waste need to be segregated at source by providing separate dustbins for Bio-degradable and Plastic waste.

Single sided used papers reused for writing and printing in all departments and recently both side printing is carried out as per requirements.

The waste generated by newspapers 50kg/year, magazine and other booklets 100kg/year and of cartons is 20kg/year. Very less plastic waste (0.1Kg/day) is generated by the department, office, garden etc. but it is neither categorized at point source nor sent for recycling. Metal waste and wooden waste is stored and given to authorized scrap agents for further processing.

The solid waste is collected by the municipal corporation and disposed by their methods.

b) Recommendations

- Reduce the absolute amount of waste that is produced from college staff offices.
- Make full use of all recycling facilities provided by Municipality and private suppliers, including glass, cans, white, colored and brown paper, plastic bottles, batteries, print cartridges, cardboard and furniture.
- Provide sufficient, accessible and well-publicized collection points for recyclable waste, with responsibility for recycling clearly allocated.
- Important and confidential papers after their validity to be sent for pulping.
- Vermi composting should be adopted on at least 100 sq.ft. of land.

4.3 E-Waste Generation

E-waste can be described as consumer and business electronic equipment that is near or at the end of its useful life. This makes up about 5% of all municipal solid waste worldwide but is much more hazardous than other waste because electronic components contain cadmium, lead, mercury, and Polychlorinated biphenyls (PCBs) that can damage human health and the environment.

a) Observation

E-waste generated in the campus is very less in quantity. Administration should conduct the awareness programs regarding E-waste Management with the help of various departments. The E-waste and defective item from computer laboratory is being stored properly. The institution should decide to contact approved E-waste management and disposal facility in order to dispose E-waste in scientific manner.

b) Recommendations

- Recycle or safely dispose of white goods, computers and electrical Appliances or tie up with agency.
- Use reusable resources and containers and avoid unnecessary packaging where possible.
- Always purchase recycled resources where these are both suitable and available.

4.4 Green Area

This includes the plants, greenery and sustainability of the campus to ensure that the buildings conform to green standards. This also helps in ensuring that the Environmental Policy is enacted, enforced and reviewed using various environmental awareness programs.

a) Recommendations

- Review periodically the list of trees planted in the garden, allot numbers to the trees and keep records. Assign scientific names to the trees.
- Promote environmental awareness as a part of course work in various curricular areas, independent research projects, and community service.
- Create awareness of environmental sustainability and take actions to ensure environmental sustainability.
- Establish a College Environmental Committee that will hold responsibility for the enactment, enforcement and review of the Environmental Policy.
- The Environmental Committee shall be the source of advice and guidance to staff and students on how to implement this Policy.
- Ensure that an audit is conducted annually and action is taken on the basis of audit report, recommendation and findings.
- Celebrate every year 5th June as 'Environment Day' and plant trees on this day to make the campus more Green.
- Indoor plantation to inculcate interest in students, Bonsai can be planted in corridor to bond a relation with nature.

5.SOLAR POWER GENERATION SYSTEM

5.1 Introduction

Solar energy is the energy obtained by capturing heat and light from the Sun. Energy from the Sun is referred to as solar energy. Technology has provided a number of ways to utilize this abundant resource. It is considered a green technology because it does not emit greenhouse gases. Solar energy is abundantly available and has been utilized since long both as electricity and as a source of heat.

Solar technology can be broadly classified as –

- **Active Solar** – Active solar techniques include the use of photovoltaic systems, concentrated solar power and solar water heating to harness the energy. Active solar is directly consumed in activities such as drying clothes and warming of air.
- **Passive Solar** – Passive solar techniques include orienting a building to the Sun, selecting materials with favorable thermal mass or light-dispersing properties, and designing spaces that naturally circulate air.

5.2 Salient Benefits of Solar Energy

1. Energy Saving
2. Reduce Operating Cost
3. Provides Unlimited and reliable Energy
4. A clean, silent and eco-friendly source of power
5. Energy Independence
6. Available throughout the year
7. Protection against future escalation of energy costs
8. Solar modules convert sunlight into electricity without pollution
9. Modular design and easily expandable

5.3 Proposed Solar Power Plant

There is a proposed plan for on-grid solar power plant of 10kwp at Govt. Eklavya College Dondi Lohara

Benefits of on-grid Solar power System

1. Huge Reduction in Electricity Bill
2. Easy Maintenance
3. Synchronize with other source of Power
4. Huge Saving in Energy
5. Generated more power than other solar system



Proposed Site for 10kwp Solar Power Plant

College Proposed around 1000 Sq.ft. Space at roof of Govt. Eklavya College DondiLohara for Installation of Maximum 10kwp on-grid solar power plant.

Our Suggestion -

During Energy Audit we have measured the electrical power at different blocks of Govt. College Eklavya and we observed that the proposed site for the solar power plant has more than connected load.

We Suggest to install Solar power plant at the roof of college because the maximum load of College has connected in the said building.

Generally as a thumb rule, the solar module of 1kW generate approximately 4-5 kWh per day which requires 100 sq.ft area for installation.

The potential capacity of Solar module is depend upon the availability of shadow free area. Considering all the above points and present scenario of energy, there is potential of installation of capacity upto 10 kW. However considering the CAPEX issue, it is advisable to Installed Solar module Phase wise. Initially on pilot project basis, 5 KW modules can be installed and after desirable result, the management can look forward to install the Maximum capacity considering Techno-Economic Viability.

The suitable operating day considered for Govt. Eklavya College DondiLohara is 300 days.

The resultant monetary benefit has been worked out as follows:

Installation cost	Rs. 5.00 Lakhs
Daily Power generation	10 kW
Daily estimated power generation Hours	50 kwh
Annual estimated power generation (300 Days)	0.15 Lakh kWh
Electricity Cost per unit	Rs. 6.5
Annual cost saving	Rs. 0.97 Lakhs
Simple Payback period	5.15 Years

6. GENERAL TIPS FOR ENERGY CONSERVATION IN DIFFERENT UTILITIES SYSTEMS

6.1 ELECTRICITY

- ❖ Schedule your operations to maintain a high load factor
- ❖ Minimize maximum demand by tripping loads through a demand controller
- ❖ Use standby electric generation equipment for on-peak high load periods.
- ❖ Correct power factor to at least 0.99 under rated load conditions.
- ❖ Set transformer taps to optimum settings.
- ❖ Shut off unnecessary computers, printers, and copiers at night.

6.2 FANS

- ❖ Use smooth, well-rounded air inlet cones for fan air intakes.
- ❖ Avoid poor flow distribution at the fan inlet.
- ❖ Minimize fan inlet and outlet obstructions.
- ❖ Clean screens, filters, and fan blades regularly
- ❖ Use aerofoil-shaped fan blades.
- ❖ Minimize fan speed.
- ❖ Use low-slip or flat belts.
- ❖ Check belt tension regularly.
- ❖ Eliminate variable pitch pulleys.
- ❖ Use variable speed drives for large variable fan loads.
- ❖ Use energy-efficient motors for continuous or near-continuous operation
- ❖ Eliminate leaks in ductwork.
- ❖ Minimize bends in ductwork
- ❖ Turn fans off when not needed

6.3 PUMPS

- ❖ Operate pumping near best efficiency point.
- ❖ Modify pumping to minimize throttling.
- ❖ Adapt to wide load variation with variable speed drives or sequenced control of smaller units.
- ❖ Stop running both pumps -- add an auto-start for an on-line spare or add a booster pump in the problem area.
- ❖ Use booster pumps for small loads requiring higher pressures.
- ❖ Increase fluid temperature differentials to reduce pumping rates.
- ❖ Repair seals and packing to minimize water waste.
- ❖ Balance the system to minimize flows and reduce pump power requirements.
- ❖ Use siphon effect to advantage: don't waste pumping head with a free-fall (gravity) return.

6.4 LIGHTING

- ❖ Reduce excessive illumination levels to standard levels using switching, de-lamping, etc. (Know the electrical effects before doing de-lamping.)
- ❖ Aggressively control lighting with clock timers, delay timers, photocells, and/or occupancy sensors.
- ❖ Install efficient alternatives to incandescent lighting, mercury vapor lighting, etc.
- ❖ Efficiency (lumens/watt) of various technologies range from best to worst approximately as follows: low pressure sodium, high pressure sodium, metal halide, fluorescent, mercury vapor, incandescent.
- ❖ Select ballasts and lamps carefully with high power factor and long-term efficiency in mind.
- ❖ Upgrade obsolete fluorescent systems to Compact fluorescents and electronic ballasts
- ❖ Consider lowering the fixtures to enable using less of them.
- ❖ Consider day lighting, skylights, etc.
- ❖ Consider painting the walls a lighter color and using less lighting fixtures or lower wattages.
- ❖ Use task lighting and reduce background illumination.
- ❖ Re-evaluate exterior lighting strategy, type, and control. Control it aggressively.
- ❖ Change exit signs from incandescent to LED.

6.5. WATER & WASTE WATER

- ❖ Recycle water, particularly for uses with less-critical quality requirements.
- ❖ Recycle water, especially if sewer costs are based on water consumption.
- ❖ Balance closed systems to minimize flows and reduce pump power requirements.
- ❖ Eliminate once-through cooling with water.
- ❖ Use the least expensive type of water that will satisfy the requirement.
- ❖ Fix water leaks.
- ❖ Test for underground water leaks. (It's easy to do over a holiday shutdown.)
- ❖ Check water overflow pipes for proper operating level.
- ❖ Automate blow down to minimize it.
- ❖ Provide proper tools for wash down -- especially self-closing nozzles.
- ❖ Install efficient irrigation.
- ❖ Reduce flows at water sampling stations.
- ❖ Eliminate continuous overflow at water tanks.
- ❖ Promptly repair leaking toilets and faucets.
- ❖ Use water restrictors on faucets, showers, etc.
- ❖ Use self-closing type faucets in restrooms.
- ❖ Use the lowest possible hot water temperature.

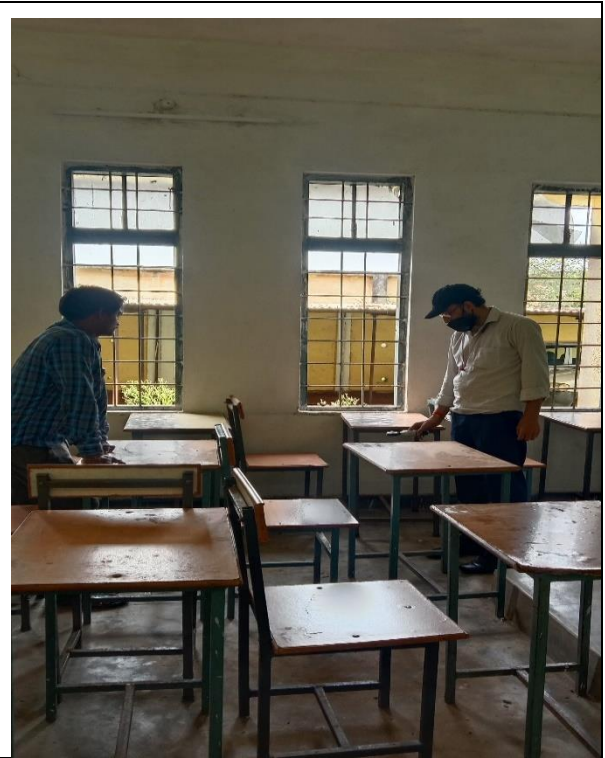
List of Energy Efficient Equipment Suppliers

Product/Equipment	ContactDetails
LED lighting	Synergy Solar (P)ltd SCO 133, sector 28D, Chandigarh Ph 0172- 6451133 www.synergysolars.com
Lighting Systems	Philips IndiaLtd Regional office-North, 9th floor Ashoka Estate, 24, Barakhamba Road New Delhi – 110 001 Telephone No.: 3353280, 3317442, Fax No.: 3314332
Lighting Systems	Crompton Greaves Ltd. Lighting Business Group, 405, Concorde, RC Dutt Road, Baroda – 390 007
Lighting Systems	OSRAM India Ltd. SignatureTowers, 11th Floor, Tower B, South City-I, Gurgaon 122001,
Product/Equipment	Contact Details
	Fax: 0124- 6526184
Lighting Systems	AsianElectronics Surya Place, First Floor, K-185/1, Sarai
Lighting Systems	Julena, New Friends Colony, New Delhi – 110 025 AsianElectronics Surya Place, First Floor, K-185/1, Sarai
Lighting Systems	WiproLimited Sco 196-197, Sector 34-A, Chandigarh - 160 022
Lighting Systems	OSRAM India Ltd. SignatureTowers, 11th Floor, Tower B, South City-I, Gurgaon 122001, Haryana Tel: 0124- 6526175, 6526178, 6526185 Fax: 0124- 6526184
Solar Implementation	Avarna Alliance Rameshwaram Delux, Baghmugaliya Bhopal-462043 Mr. Raghvendra – 9713912340 support@avarnaalliance.in
Solar Implementation	Shankeshwar Energies HIG C-1 Infront of HDFC Bank , Shailendra Nagar Raipur Mr. Govinda – 9755020202 Energies.shankeshwar@gmail.com

Note: - The suppliers mentioned above are not the only ones or the best in the market. The management may contact other suppliers for competitive rates/ specifications.

Site Photograph

Annexure-2



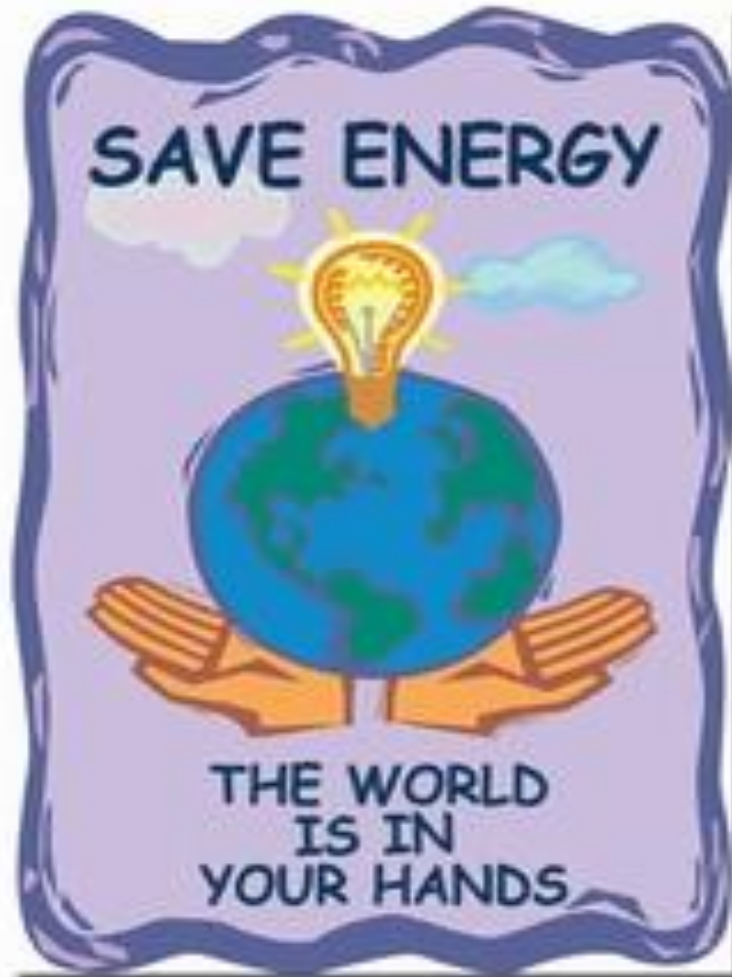
Electrical Data Logging

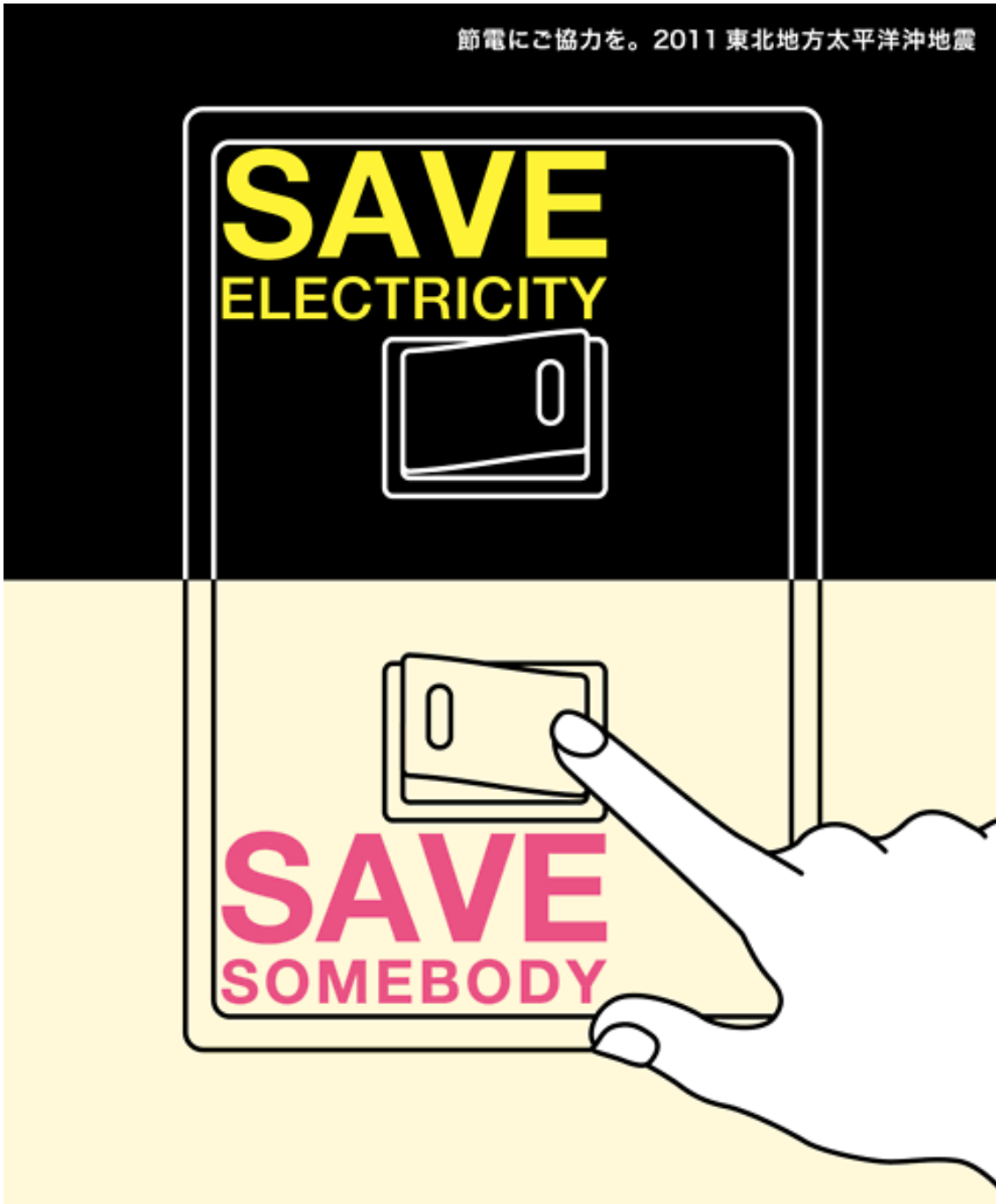
Measuring Lux Level



Field Survey

7. General Energy Conservation awareness posters to aware users









Switch off, save more

We all deserve a rest, office equipment too! So when you're not using it, shut it down. A PC monitor left on overnight can waste enough electricity to laser print over 500 pages.

Simple ways to save a little more.

**Clear
business.**



shutterstock.com · 1771962323