Detailed Energy Audit Report

Of

Sunbeam College for Women

[Affiliated to M. G. Kashi Vidyapith, Varanasi for B.Com., B.Sc., B.C.A.]

206, Bhagwanpur, Lanka, Varanasi - 221005 ■ Phone : 0542-2368488

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Presented by

GO GREEN INDIA

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Acknowledgement

We are grateful to the senior management of Sunbeam College for women for their keen interest in energy solutions' portfolio and for allowing us to conduct an energy audit of the campus situated at Bhagwanpur, Varanasi.

We are thankful to the entire management of Sunbeam College for women for showing keen interest and extending full co-operation to our team during the study, without which it would have been tough to strategize a realistic report.

We hope that the analysis provides in this report will be valuable and worthy of discussions to take things forward to help university management meet their aspirations of energy cost reduction. While we have made every attempt to adhere to high-quality standards in data collection and analysis, and in presentation through the report, we would welcome suggestions to improve this report further.

Mr. Amit Kumar Purbey
Certified Energy Auditor
(CEA-17686)
GO GREEN INDIA, SONBHADRA

Auditor Certification

BUREAU OF ENERGY EFFICIENCY

Examination Regstration No. : EA-17686 Serial Number: 11254

Certificate Registration No. : 11254

Certificate For Certified Energy Manager

This is to certify that Mr./Mrs./Ms. Amit Kumar Purbey Son/Daughter of Mr./Mrs. Sushil Purbey who has passed the National Examination for certification of energy manager held in the month of August 2013 is qualified as certified energy manager subject to the provisions of Bureau of Energy Efficiency (Certification Procedures for Energy Managers) Regulations, 2010.

This certificate shall be valid for five years with effect from the date of award of this certificate and shall be renewable subject to attending the prescribed refresher training course once in every five years.

His /Her name has been entered in the Register of certified energy manager at Serial Number 11254 being maintained by the Bureau of Energy Efficiency under the aforesaid regulations.

Mr./Mrs./Ms. Amit Kumar Purbey is deemed to have qualified for appointment or designation as energy manager under clause (/) of Section 14 of the Energy Conservation Act, 2001 (Act No.52 of 2001).

Given under the seal of the Bureau of Energy Efficiency, this 4th day of March, 2014

Digitally Signed: RAKESH KUMAR RAI
Sun Mar 01 10:10:14 IST 2020
Secretary, BEE New Delhi

Secretary
Bureau of Energy Efficiency
New Delhi

Dates of attending the refresher course	Secretary's Signature	Dates of attending the refresher course	Secretary's Signature
19.01.2020			

SUNBEAM COLLEGE FOR WOMEN

SUNBEAM COLLEGE FOR WOMEN
210 Bhagwanpur, Lanka, Varanasi

SUNBEAM COLLEGE FOR
Principal

Work Completion Certificate

Customer Name:	**Sunbeam College for Women**
Customer Location:	**Bhagwanpur, Varanasi, Uttar Pradesh**
Date of Audit:	**09/09/2021 to 11/09/2021**

This is to certify that **Mr. Amit Kumar Purbey**, **Mr. Krishna Kant Dubey** and Team Members have completed a detailed energy audit at **Sunbeam College for Women, Bhagwanpur, Varanasi.** The audit was conducted from 09/09/2021 to 11/09/2021 and completed on 11/09/2021.

We are thankful to **Mr. Sandeep Dixit**, Estate Manager, Sunbeam College For Women, Bhagwanpur electrical and maintenance, for the assistance provided to complete the audit.

Amit kumar purbey

Mr. Amit Kumar Purbey
Certified Energy Auditor
(CEA-17686)
GO GREEN INDIA, SONBHADRA

(Signature & Stamp)

Date: 15/09/2021.

Overview of College

Sunbeam College for Women provides an environment conducive for the students to develop into creative individuals. A natural progression from school-level education was Sunbeam College for Women's setting up at Bhagwanpur in 2000. Affiliated to Mahatma Gandhi Kashi Vidyapeeth, Varanasi, it answers the long felt need for an English medium college for girls in Varanasi, a 7.5 km straight drive from Varanasi Cantt. Station, the college focuses on the academic, intellectual and cultural development of its students. They face the challenges of today with a base firmly rooted in India's cultural heritage. The qualities of fortitude, justice and benevolence are the cornerstone of the education imparted here. The college has qualified and motivated faculty committed to teaching and research. Sunbeam believes in upholding traditional values. Keeping pace with the same rhythm, various cultural activities are organized in the Sunbeam College to retain cultural ethos and values. Several educational, recreational and extra-curricular activities are an integral part of the college's work. In each of the extra-curricular activities of the college, we make sure to include the participation of the students. Such a step gives them experience in understanding the know-how of organizing the events, an experience that would stand them in good stead when they would assume positions of importance. Quizzes, Debates, Extempore, and Public Speaking are the order of the day the country is over, and nothing serves to develop student's faculties better. Keeping this in mind, the college ensures that students are provided with ample opportunities to participate in all such events. A range of indoor and outdoor games are available, and students are encouraged to keep fit and healthy by participating in sports.

Sunbeam was founded in 1972 by Dr. Amrit Lal 'Ishrat Madhok and Mrs. Deesh ' Ishrat' Madhok, who felt the need for a private educational institution to cater to the holistic educational needs of the student fraternity in Varanasi and thus was born Sunbeam. Sunbeam started its momentous journey in a small rented apartment. Armed with a vision plus boundless energy and gaining credibility by the day, giant strides were made. The young institution increased in enrollment, quality and community recognition and soon outgrew its place of birth. It became apparent that a new location was needed.

After Sunbeam Bhagwanpur came to Sunbeam Schools at Annapurna (1996), Sunbeam Women's College (2000), Lahartara (2002), Varuna (2002), Indiranagar (2005) and Suncity (2010), the progressive march to spread education also resulted in opening up of Associate Sunbeam Schools at Mughalsarai (2004) Jaunpur, Allahabad, Ghazipur and Mau (all in 2011) and Deoria, Bhadohi and Narayanpur (2012) with many more on the anvil. Today, more than 16000 students are part of

Sunbeam Schools, which have given to the society, citizens par excellence and continue to contribute to the society through innumerable CBSE board toppers, national and international players of repute and stars that are shining bright on the cultural horizon.

Sunbeam College for Women Offer the following undergraduate courses to the students:

- Bachelor of Commerce, B.Com
- Bachelor of Computer Application, B.C.A.
- Bachelor of Science, B.Sc

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List of Abbreviations

APFC	Automatic Power Factor Controller
CFL	Compact Fluorescent light
DEA	Detailed Energy Audit
DG	Diesel generator
DPR	Detailed Project Report
EE	Energy Efficiency
EEM	Energy Efficiency Measure
kWh	Kilo watt-hour
LED	Light Emitting Diode
SEGR	Specific Energy Generation Ratio
SPV	Solar Photovoltaic
SVL	Sodium Vapor Lamp
TOD	Time of day
VFD	Variable Frequency Drive
SEB	State Electricity Board
PSPCL	Punjab State Power Corporation Limited

Units and Measures

°C	Degree Centigrade
CFM	Cubic Feet per minute
HP	Horsepower
Kg	Kilo Gram
kW	Kilo Watt

MJ	Mega Joule
RPM	Revolutions per minute
T or MT	Tons
V	Voltage

Conversion Factors

1 kgoe	10000 kCal
1 kWh	860 kCal
HSD	9783 kCal/ Ltr(Density = 0.8263 Kg /Lit.)
1 MTOE	10^7 kCal

EXECUTIVE SUMMARY

With the advent of the energy crisis and exponential hikes in the cost of different forms of energy, Energy Audit is manifesting its due importance in Industrial & institutional Establishments.

The detailed energy audit at Sunbeam College for Women, Bhagwanpur, Varanasi, was carried out from **09/09/2021** to **11/09/2021**. The study primarily covers the:

- Present energy scenario of the buildings/university.
- Detailed analysis of the data obtained through onsite measurements using portable gadgets, discussions with concerned personnel etc.
- Recommendations for energy savings in all possible areas with cost benefit analysis.
- Technical specifications for any retrofit options

Annual Energy Consumption Data

Sl. No.	Item	Values
1	Contract Demand (kVA)	500 kVA
2	Installed capacity: DG Sets (kVA)	2no's (625 kVA, 320 kVA)
3	Annual Electricity Consumption, purchased from Grid - Last One year	274550 kWh
4	Annual Electricity generation through DG Sets - Last One year	32972 kWh
	Annual Electricity generation through Solar Power System - Last One year	115479 kWh
5	Total Annual Electricity Consumption, Grid + DG Sets + Solar - Last One year	274550 kWh (Grid Supply) 32972 kWh (DG Supply) 115479 kWh (Solar) **Total: 423001 kWh per annum**
6	Annual Cost of Electricity, purchased from Grid - Last One year	Rs 47,70,625
7	Annual Fuel Cost of Electricity generated through DG Sets - Last One year	Rs 8,14,500
8	Total Annual Electricity Cost, Purchased Power+ DG Sets	Rs 47,70,625 (Grid Supply) Rs 8,14,500 (DG Fuel Supply) **Total: Rs 55,85,125 per annum**

Sl. No.	Item	Values
9	Working hours	**Office Building Lighting** 2080 Hrs./annum (8 hrs./day, 260 Days/Annum 6 Days/week) **Compound Lighting** 3650 Hrs./annum (10 hrs. /day & 365 days) **Air Conditioning** 1720Hrs./annum (8 hrs. /day,215Days/Annum &6 days a week) **Ceiling Fans for the office building** 1720 Hrs./annum (8 hrs. /day, 215 Days/Annum &6 days a week)
10	Working days/week	6 days per week
11	Installed capacity of Air Conditioning System	1.5-Ton -11 nos 2-Ton 2 nos 3-Ton 11 nos
12	HSD Consumption in DG Sets in the year	9050 Ltr.

Annual Energy Consumption in MTOE Terms

Source of Energy	Consumption	Calorific Value	kCal/annum	MTOE/annum
Average Purchased Power per annum	274550 kWh/annum	860 kCal/ kWh	236113000	23.61
HSD for DG Set	9050 Ltr. /annum	9783 kCal/Ltr	88536150	8.85
Average Solar Power Generation per annum	115479 kWh/annum	860 kCal/kWh	99311940	9.93
Total				**42.39**

Cumulative Energy Saving Measures (EEM)
(Quantum, Monetary Benefit, Investment & Payback)

ENERGY SAVING POTENTIAL

EEMs	Annual Energy Savings			Estimated Investment (Rs in Lacs)	Simple Payback Period (months)
	kVAh	kWh	Rs in Lacs		
EEM-1: Reduce Contract Demand from 500 kVA to 400 kVA to avoid higher demand charge	-	-	3.87	-	-
EEM-2: Improvement in the Operating Power Factor	16090	-	1.38	1	9
EEM-4: Replacement of conventional lights with LED Lights in campus building	-	1144	0.12	0.18	18
Total	***16090***	***1144***	***4.68***	***1.18***	

Particulars	Values
❑ Annual Purchased Power Bill	= Rs 47.70 Lacs
❑ Annual Purchased HSD Bill	= Rs. 8.14 Lacs
❑ Total Annual Energy Bill	= Rs. 55.84 Lacs
❑ Total Annual Energy Saving Potential identified	= Rs. 4.68 Lacs
❑ **Percentage Energy Cost Saving Potential**	= **8.4 %**

1 INTRODUCTION

1.1 THE PROJECT

With the advent of the energy crisis and exponential hikes in the cost of different forms of energy, Energy Audit is manifesting its due importance in Industrial Establishments.

Energy Audit is the key to a systematic approach for decision-making in energy management as it attempts to evaluate the energy usage pattern in an establishment. Also, it serves to identify all the energy streams in an establishment so that potential areas wherein energy savings are practically feasible are identified.

With this objective of the study team, Sunbeam College for Women Management team was entrusted with the energy audit of their college campus situated at Varanasi.

1.2 REPORTING REQUIREMENT (CONTACT DETAILS)

Table 1: Contact Details of the Organization

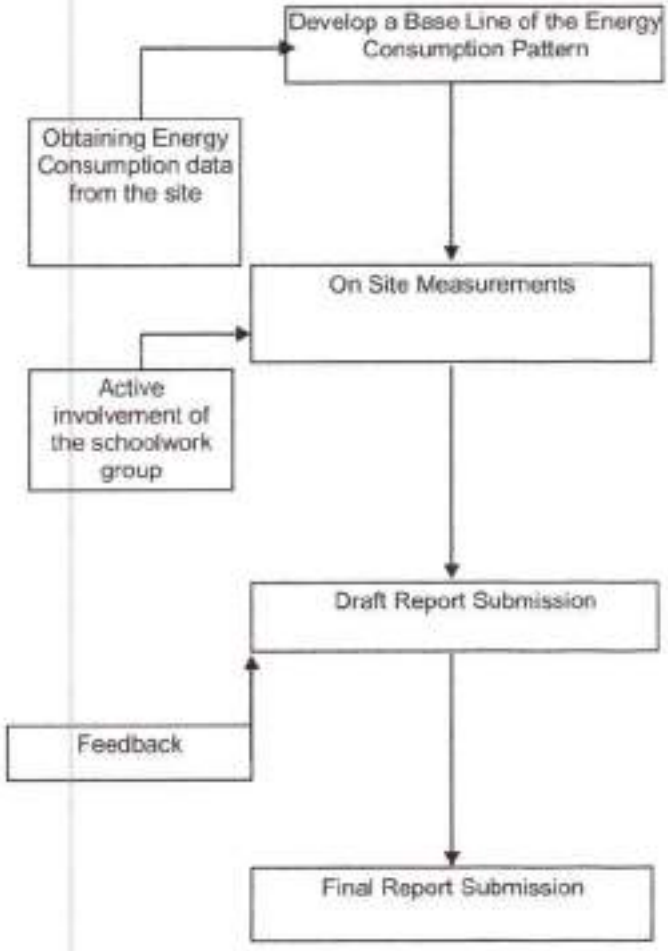
Name of Head (Principal)	Dr. Vibha Srivastava
Organization Name & Address	Sunbeam College for Women 206, Bhagwanpur, Lanka Varanasi, Varanasi, UP 221005 Mo. No: 9721452110 Website: https://sunbeamcollege.com/

1.3 DELIVERABLES

- Present energy scenario of the building.
- Detailed analysis of the data obtained through onsite measurements using portable gadgets, discussions with concerned personnel etc.
- Recommendations for energy savings in all possible areas with cost benefit analysis.
- Technical specifications for any retrofit options and
- List of suppliers / manufacturers of energy efficient technologies.

1.4 METHODOLOGY

The methodology adopted for achieving the desired objectives viz: Assessment of the Current operational status and Energy savings include the following:



- Discussions with the concerned officials for identification of major **areas of focus** and other related systems.
- A team of engineers visited the campus premises and had discussions with the concerned officials/ supervisors to collect data/ information on the operations and energy distribution in the building. The data was analyzed to arrive at a **baseline energy consumption pattern.**

Measurements and monitoring with the help of appropriate instruments including continuous and/ or time-lapse recording, as appropriate and visual observations were made to identify the energy usage pattern and losses in the system.

- Computation and **in-depth analysis** of the collected data, including utilization of computerized analysis and other techniques as appropriate, were done to draw inferences and evolve suitable energy conservation plan/s for improvements/ reduction in specific energy consumption.
- Draft Report submission on the findings of the audit.

  Final report submission after incorporating the observations/ comments made by Sunbeam College for Women management team.

1.5 Instrumentation Support Used

Table 2: Instrumentation Support Used

Name of the Instrument (Make/ Model)	Primary Measured Parameters	Measuring Range	Accuracy	Resolution
Load Manager with appropriate CT's and Voltage Probes for HT &LT measurements (Krykard/ALM 10	Active Power	0 – 9999 kW	± 1%	4 digits
	Reactive Power	0 – 9999 kVAr	± 1%	4 digits
	Power Factor	0.14 – 1	± 1.5%	0.001
Anemometer (Extech/ 45118)	Air Velocity	0.5 – 89 miles/hr.	± 3%	3½ digit LCD with multi-function indicators
Digital Pressure Meter (Comark, UK)	Pressure	0 – 350 mbar	± 0.2%	4 digits
Meter (TES 1332)	Lux	0 to 200000 lux	± 3%	3½ digit LCD
Surface Temperature Indicator with appropriate Probe (CHY 501 K)	Temperature	-50°C to 450°C	± 0.3%	0.5°C

1.6 Operating Hours Considered for Calculation Purpose

Table 3: Operating hours of electrical equipment

Particulars	Values
• Office Building Lighting (8 hrs./day, 260 Days/Annum 6 Days/week)	= 2080 hrs. per annum
• Compound Lighting (10 hrs./day, 365 days a year)	= 3650 hrs. per annum
• Air Conditioning (8 hrs./day, 215 Days/Annum & 6 days a week)	= 1720 hrs. per annum
• Ceiling Fans for Office Building (8 hrs./day, 215 Days/Annum)	= 1720 hrs. per annum

1.7 Annual Energy Consumption Data

Table 4: Annual Energy Consumption Data

Sl. No.	Item	Values
1	Contract Demand (kVA)	500 kVA
2	Installed capacity: DG Sets (kVA)	2no's (625 kVA, 320 kVA)
3	Annual Electricity Consumption, purchased from Grid - Last One year	274550 kWh
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Sl. No.	Item	Values
		Ceiling Fans 1720 Hrs./annum (8 hrs. /day, 215 Days/Annum &6 days a week)
10	Working days/week	6 days per week
11	Installed capacity of Air Conditioning System	1.5-Ton –11 nos 2-Ton 2 nos 3-Ton 11 nos
12	HSD Consumption in DG Sets in the year	9050 Ltr.

1.8 MTOE Calculation

Table 5: Annual Energy Consumption in MTOE Terms

Source of Energy	Consumption	Calorific Value	kCal/annum	MTOE/annum
Average Purchased Power per annum	274550 kWh/annum	860 kCal/ kWh	236113000	23.61
HSD for DG Set	9050 Ltr. /annum	9783 kCal/Ltr	88536150	8.85
Average Solar Power Generation per annum	115479 kWh/annum	860 kCal/kWh	99311940	9.93
Total				**42.39**

2 POWER SUPPLY SYSTEM AND ENERGY CONSUMPTION PATTERN

2.1 Power Supply System

The Power Supply to the building is sourced from the PuVVNL at 11 kV. The voltage is stepped down to 433 V using one transformer of 630 kVA. Billing is on a kVAh basis. The additional power is generated in-house 2 DG Sets of One 625 kVA & One 320 kVA operated from time to time as per requirement and load profile in the campus. Single line diagram of the existing system is mentioned below

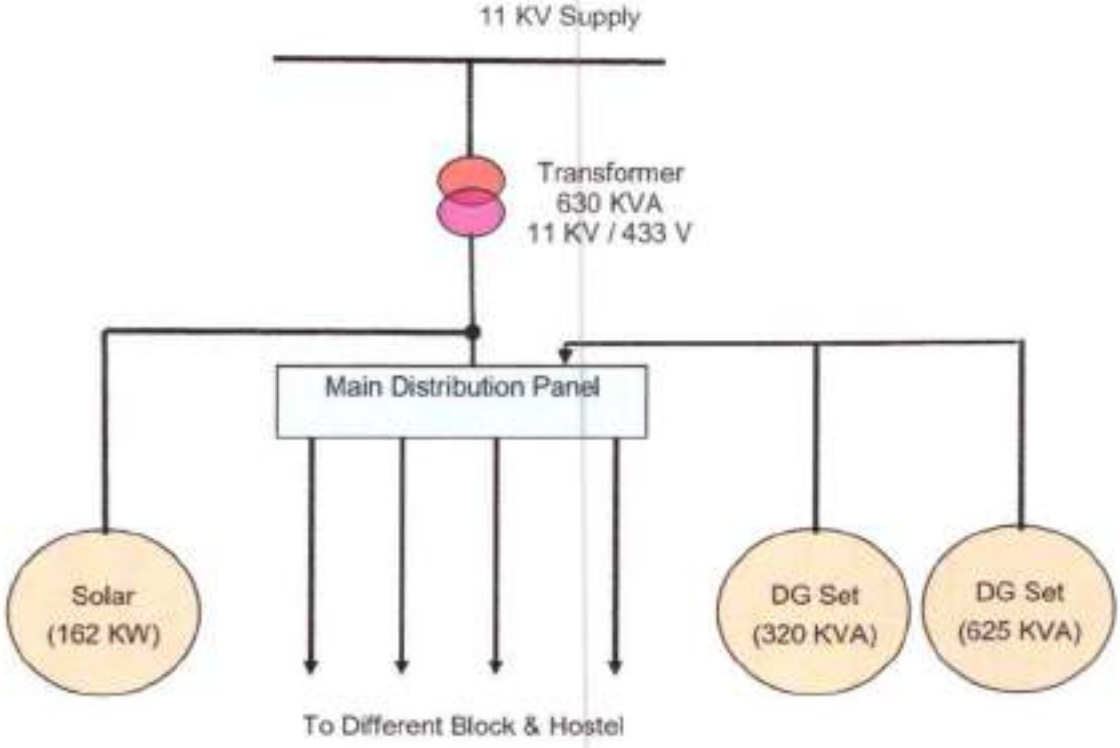


Table 6: Existing Transformer Specifications

Particulars	Transformer 630 kVA
Make	Lakshmi
Rating	630 kVA
Voltage Ratio	11 kV / 433 V
Current Ratio	33 Amps / 840 Amps
Year	2019
Type of Cooling	ONAN

Table 7: DG SET Specifications

Particulars	DG Set-1	DG Set-2
	Kirloskar	Kirloskar
Capacity	625 kVA	320 kVA
Rated Voltage	415 V/ 50 Hz	415V / 50 Hz
Rated Current	870 Amps	445 Amps
Model	DV12TA G2 2018	320WS2 2010

2.2 Monthly Purchased Power Consumption Pattern

Table 8: Monthly Electricity Bill Analysis

Contract Demand: 500 kVA

Period: Jul-20 to Aug-21

Month	Maximum Demand	Total Energy Consumption		Demand Charge	Energy Charge	P.F.	Total Billing Amount	Unit Cost
	kVA	kWh	kVAh	Rs.	Rs.		Rs.	Rs./ Unit
Aug-21	345.92	41300	43318	161250	375082.8	0.95	576565.18	8.7
May-21	285.5	36102	37500	161250	322500	0.96	520030.33	8.6
Apr-21	120.64	23254	23868	161250	206274	0.97	395093.9	8.6
Mar-21	192.8	37372	38236	161250	330988.4	0.98	529175.11	8.7
Feb-21	78.56	22266	22620	161250	195441.6	0.98	383453.96	8.6
Jan-21	86.24	24298	24924	161250	215440.3	0.97	404961.45	8.6
Dec-20	66.72	20786	21916	161250	189330.8	0.95	373884.46	8.6
Nov-20	100.8	15028	17082	161250	146905.2	0.88	332658.25	8.6
Oct-20	100.8	15028	17082	161250	147371.7	0.88	331775.31	8.6
Sep-20	97.36	15128	17406	161250	150184.0	0.87	334808.05	8.6
Aug-20	75.36	12042	13538	161250	116609	0.89	295964.18	8.6
Jul-20	55.76	11946	13150	161250	113242	0.91	292254.98	8.6

As per the one-year electricity consumption data, the college has excess contract demand to meet the power requirement. Therefore, fixed/demand charges are based on current contract demand, which can be minimized to avoid excess charges.

Table 9: Yearly Diesel Bill Analysis

Month	units generated	Diesel rate	Amount of Diesel	Diesel consumption	Unit Cost
	kWh	Rs	Rs	Lit.	Rs/Unit
Sep-20 to Aug-21	32972	90	814500	9050	24.7

Monthly power generation data of both DG sets are not available at college, it would be a good Practice for the maintenance team to record monthly details of each DG sets for energy analysis.

The values in the above table are summarised below

Table 10: Yearly overall Energy Consumption

Particulars	Values
Basic Energy Charges for PuVVNL	Rs 8.60 per kVAh
Basic Energy Charges for DG Set	Rs 24.7 per kVAh
Overall Purchased Power Rate considered for energy savings calculation in the report	Rs 10.5 per kWh

2.3 TRANSFORMER LOADING

Time-lapse recording of various electrical parameters was done during the energy audit. Based on the measurements made, the average load of the office building and hostel was measured, and Summarized results are given below:

Table 10: Transformer power consumption details

Transformer Data	Voltage Harmonics	Current Harmonics	Energy Consumption kWh	Power Factor	Voltage in Volts	Current in Amps
Average	0.6	8.8	178.8	0.96	432.4	249.1
Min	0.3	3.9	27.1	0.93	422.1	39.8
Max	0.9	12.7	305.6	0.97	447.3	407.2

Figure 1: Power consumption trend of LT side of transformer

Figure 2: Current Trend of LT side of transformer

Figure 3: Voltage Trend of LT side of transformer

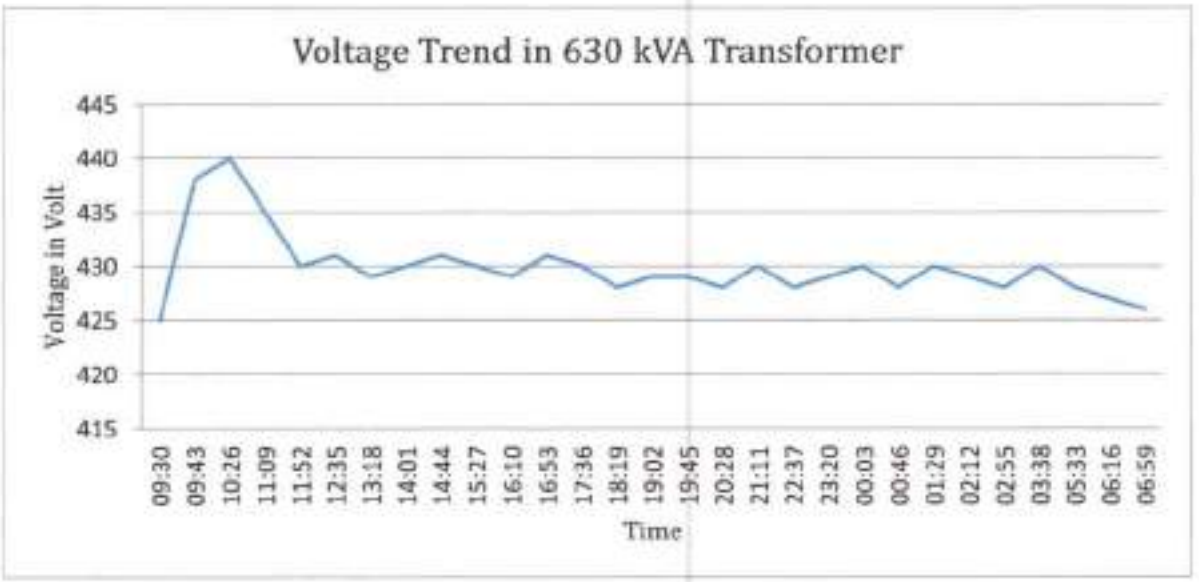
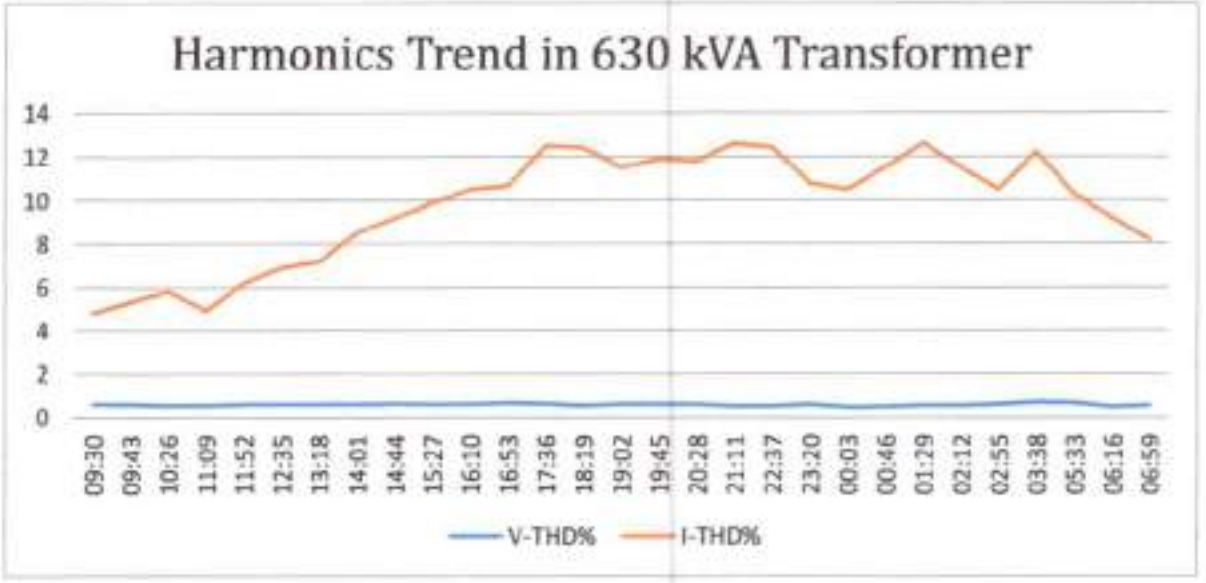


Figure 4: Harmonics Trend of LT side of transformer



2.4 RECOMMENDATIONS

2.4.1 *EEM-1: Reduce Contract Demand from 500 kVA to 400 kVA to avoid excess fixed charges*

The existing contract demand limit of the college is 500 kVA. As per the one-year electricity consumption data, the college has excess contract demand to meet the power requirement. Therefore, fixed/demand charges are based on current contract demand, which can be minimized to avoid excess charges.

Figure 5: MDI and Contract Demand Trend

Table 11: Electrical Energy Details of PSPCL

Contract Demand: 500 kVA

Period: Jul-20 to Aug-21

Month	Maximum Demand	Total Energy Consumption		Demand Charge	Energy Charge	P.F.	Total Billing Amount	Unit Cost
	kVA	kWh	kVAh	Rs.	Rs.		Rs.	Rs./ Unit
Aug-21	**345.92**	41300	43318	161250	375082.8	0.95	576565.18	8.7
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Jul-20	**55.76**	11946	13150	161250	113242	0.91	292254.98	8.6

Thus, based on the above table of energy consumption through PuVVNL , maximum demand in the College campus was evaluated.

If the Institute does have not continuous yearly expansion plans, there is an opportunity to save energy costs by reducing contract demand from 500 kVA to 400 kVA. This will reduce the energy bill by reducing the need.

Table 12: Cost-benefit analysis of increment in contract demand

Particulars	Values
Contract Demand at present	500 kVA
Suggested contract demand	400 kVA
The net reduction in contract demand	100 kVA
Annual cost Saving potential	[(500*0.75)-(400*0.75)]*(430*12) = Rs 3.87 Lakhs
Investment	As per PuVVNL processing charge

2.4.2 EEM-2: Improvement in the Operating Power Factor

Based on the measurements made during the site visits, the average power factor was around 0.94. Since billing is done on a kVAh basis, the power factor directly impacts the energy bills. Thus we recommended installing APFC panel details as follows:

Table 13: Improvement in power factor cost Saving, Investments & Payback Period

Present Scenario	Values
Overall average operating power factor based on last one-year electricity bills	0.94
Average kVAh Consumption	290640 kVAh per annum
Average kWh Consumption	274550 kWh per annum
Scenario post improvement of power factor	
Average kVAh Consumption at 1.00 pf	274550 kVAh per annum
Net reduction in the kVAh consumption with improvement in pf from 0.94 to unity	16090 kVAh per annum
Basic Energy Charges	Rs 8.6 per kVAh
Monetary Benefits	**Rs 1.38 Lakhs per annum**
Estimated Investments for APFC panel & kVAr capacitor banks	Rs 1 Lakhs
Simple Payback Period	9 months

3 AIR CONDITIONING SYSTEMS

3.1 AIR CONDITIONING & HVAC

The majority of the cooling load is met by split and window ACs. Details of installed ACs are mentioned below in the following table.

Table 14: Performance data of A/Cs

Sr. No.	Location	Floor	Make	Type of Machine	Capacity	Quantity	Manufacturing Year
1	College Common Room	Ground	Voltas	Split	3 T	1	2016
2	College BCA Lab	Third	Voltas	Window	1.5 T	1	2016
3	College BCA Lab	Third	Voltas	Window	1.5 T	1	2016
4	Hall – 1	Fourth	Voltas	Window	1.5 T	1	2016
5	Hall – 1	Fourth	Voltas	Window	1.5 T	1	2016
6	Hall – 1	Fourth	Voltas	Split	3 T	1	2016
7	Hall – 2	Fourth	Voltas	Window	1.5 T	1	2016
8	Hall – 2	Fourth	Voltas	Window	1.5 T	1	2016
9	Hall – 2	Fourth	Voltas	Window	1.5 T	1	2016
10	Hall – 2	Fourth	Voltas	Split	3 T	1	2016
11	College Library	Ground	Blue Star	Split	3 T	1	2016
12	College Library	Ground	Blue Star	Split	3 T	1	2016

Sr. No.	Location	Floor	Make	Type of Machine	Capacity	Quantity	Manufacturing Year
13	College Library	Ground	Blue Star	Split	3 T	1	2016
14	College Library	Ground	Blue Star	Split	3 T	1	2016
15	Admin Block College Reception	Ground	Blue Star	Split	3 T	1	2016
16	Admin Block College Reception	Ground	Voltas	Split	3 T	1	2016
17	Administrator Office	Ground	Blue Star	Split	1.5 T	1	2016
18	Principal Office	Ground	Blue Star	Split	1.5 T	1	2016
19	College Staff Room	Ground	Voltas	Split	3 T	1	2016
20	Music Room	First	Voltas	Split	2 T	1	2016
21	Art Room	Second	Daikin	Split	2 T	1	2016
22	Dance Room	Third	Voltas	Split	1.5 T	1	2016
23	Infirmary	Ground	Blue Star	Split	3 T	1	2016
24	IQAC	Ground	Voltas	Split	1.5 T	1	2016

3.1.1 Observation

During the study, it was observed that most of the ACs have significantly less operational time. Thus, energy-saving measures do not contribute to significant savings. Therefore, we suggest operating ACs continuously at a minimum 24°C temperature for efficient mode.

4 OTHER AREA OF FOCUS

4.1 EEM-3: REPLACEMENT OF CONVENTIONAL LIGHTS WITH LED LIGHTS

The building has several conventional lights installed at various locations; these include the following:

Table 16: Details of lighting fixtures installed.

Orientation	Lighting Fixture Type	Rated Wattage	Quantity	Total Power in kW
Ceiling Light	**CFL**	**12**	**92**	**1.11**
Wall-Tube light	LED	18	200	3.60
Street Light	LED	60	24	1.44
Total in kW				**6.14**

Most of the lights installed are LED type, and some are conventional CFL which can be replaced by the high efficacy LED lamps for the same lumen output.

New technology LED lighting

An LED lamp is a light-emitting diode (LED) product assembled into a lamp (or light bulb) for use in lighting fixtures. LED lamps have a lifespan and electrical efficiency that is several times better than incandescent lamps, and significantly better than most fluorescent lamps. Some chips can emit more than 100 lumens per watt. General-purpose lighting needs white light. LEDs emit light in a very narrow band of wavelengths, emitting light of a color characteristic of the energy band-gap of the semiconductor material used to make the LED.

Advantages of Energy Efficient LED Lamps

- High efficacy (Lumens / Watt)
- Environmentally friendly
- Reduces work-related headaches
- Reduces sick building syndrome
- Operates at low voltage
- High PF

Table 17: Saving Potential calculations

Particulars	values
Power Saving Potential	(1.1-0.55) kW
	=0.55 kW
Annual Operational hours	2080 hours
Average Energy Tariff (DG + SEB)	Rs 10.50per kWh
Energy Saving potential	1144 kWh per annum
Net Monetary Benefit	**Rs12012 per annum**
Estimated Investment	**Rs 18000**
Simple Payback Period	**18 months**

4.2 DG Set

During the detailed audit, DG sets were also studied. Presently plant team has 2 nos of DG sets.

Table 18: The rating of DG sets is

Particulars	DG Set-1	DG Set-2
	Kirloskar	Kirloskar
Capacity	625 kVA	320 kVA
Rated Voltage	415 V/ 50 Hz	415 V / 50 Hz
Rated Current	870 Amps	445 Amps
Model	DV12TA G2 2018	320WS2 2010

Table 19: The performance of all the DG Set was evaluated, results of which are given hereunder:

DG set no & Rating	Duration of the test	Energy Generated in kWh	Power Factor	Average Load	HSD Consumed	Specific Power Generation	Percentage Loading on DG set
1. 625 kVA	1 hour	452	0.84	268	74.4	3.6	52%
2. 320 kVA	1 hour	204	0.81	118	31.8	3.7	46%

The SEC of DG set varies typically in the range of 3.50-4.0 kWh/Litre. Thus, the existing DG sets are working within the good SEC range.

5 SUMMARY

5.1 Implementation Plan

Implementation of the recommendations should be taken up in a phased manner. Recommendations, which involve the least changes, should be taken up under phase-1 of the implementation program. These would include the following:

- EEM-1: Reduce Contract Demand from 500 kVA to 400 kVA to avoid higher demand charge
- EEM-2: Improvement in the Operating Power Factor
- EEM-3: Replacement of conventional lights with LED Lights in campus building

5.2 Cumulative Energy Efficiency Measures

Table 20: Cumulative Energy Saving Measures, Investments & Payback Period

EEMs	Annual Energy Savings			Estimated Investment (Rs in Lacs)	Simple Payback Period (months)
	kVAh	kWh	Rs in Lacs		
EEM-1: Reduce Contract Demand from 500 kVA to 400 kVA to avoid higher demand charge	-	-	3.87	-	-
EEM-2: Improvement in the Operating Power Factor	16090	-	1.38	1	9
EEM-4: Replacement of conventional lights with LED Lights in campus building	-	1144	0.12	0.18	18
Total	***16090***	***1144***	***4.68***	***1.18***	

5.3 Energy Saving Potential

Particulars	Values
❑ Annual Purchased Power Bill	= Rs 47.70 Lacs
❑ Annual Purchased HSD Bill	= Rs. 8.14 Lacs
❑ Total Annual Energy Bill	= Rs. 55.84 Lacs
❑ Total Annual Energy Saving Potential identified	= Rs. 4.68 Lacs
❑ **Percentage Energy Cost Saving Potential**	= **8.4 %**

Annexure-1

Recommended Lux Levels

- **Entrance**

Entrance halls, lobbies, waiting rooms	=	200
Enquiry Desks	=	500
Gate Houses	=	200

- **Circulation Areas**

Lifts	=	100
Corridors, passageways, stairs	=	100
Escalators, revelators	=	150

- **Staff Rooms**

Offices	=	300
Changing, locker and cleaners' room, Cloak rooms, lavatories	=	100
Rest Rooms	=	150

- **Staff Restaurants**

Canteens, Cafeterias, dining rooms, mess rooms	=	200

- **Communication**

Switch board rooms	=	300
Telephone, apparatus rooms	=	150
Telex room, post rooms	=	500
Reprographic room	=	300

- **Education**

Assembly Halls	=	200-500 (average 300)
Teaching Places	=	200-500 (average 300)
Lecture Theatres	=	200-500 (average 300)
Seminar Rooms	=	300-750 (average 500)
Art Rooms	=	300-750 (average 500)
Needle Work Rooms	=	300-750 (average 500)
Laboratories	=	300-750 (average 500)
Libraries	=	200-500 (average 300)
Music Rooms	=	200-500 (average 300)
Sports Halls	=	200-500 (average 300)
Workshops	=	200-500 (average 300)

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Annexure-2

ELECTRICAL SAFETY EXERCISE

Electrical Safety Exercise is a systematic approach to evaluate potential hazards and to give recommendations for improvement. It is an essential tool for identifying deterioration of standards, areas of risks or vulnerability, hazards and potential accidents in plants for determining necessary action to / minimize hazards and for ensuring that the whole safety effort is effective and meaningful.

Electrical Safety Exercises are essential due to various reasons such as:

- Statutory requirement (environmental concerns, Risk Analysis for hazardous industries, etc.)
- Requirement of financial institution (for loans, etc.)
- The suggestion of a regulatory authorities
- Process change/plant capacity addition
- Change of management (Merger / Acquisition)
- Genuine management concern as a measure of improvement
- Part of OH and S (Occupational Health and Safety) policy of the organization
- Major accident in the campus / major accident in the neighbouring industry / major accident in a similar university

Many organizations in India are establishing periodic safety exercises, although safety is still not a statutory requirement in India. This is a very positive and welcome change in a developing country like ours. The collaboration with developed nations also helped to re-orient the safety perception of several Indian companies. It also provides an opportunity to get updated with the latest information on safety developments and statutory amendments. It is a normal part of good business practice to initiate and carry out systems of inspection and to check to ensure that operations are carried out efficiently and profitably.

The loss potential in industry is not restricted to large-scale incidents related to accidents, fires, explosions and similar incidents. For example, failure or damage to cables and instrumentation equipment due to a minor incident has led to lengthy downtime of plant, resulting in heavy financial loss.

Factories Act, 1948 (Section 7A) makes the occupier responsible for providing a safe working environment. Periodic Safety checks is one method of evaluating the safe environment provided in the plant.

SUMMARY

Total involvement and commitment of the top management are essential for the success of any safety program right from the initiation stage. They have to demonstrate active support to the safety management system by providing the required resources, workforce or materials. The management system is fundamental to loss prevention. Much prudent management is experiencing the obvious benefits from STEP - Safety through Employee Participation, which is crucial for success.

A properly designed, planned and executed electrical system can bring out many hazards to save life and property. In addition, it helps to identify the potential electrical risks, understand the consequences, and help them implement Electrical Safety recommendations.

An organization's culture determines the number and severity of accidents, how they are handled and the number and magnitude of accidents. Japan's accidents are seven times lesser than those in the US because of the difference in 'culture climate' in the two countries. It is natural that the top management philosophy cascades down through the organization and reflects on every aspect of its functions. Accepting accidents as part of doing business is mismanagement. A pragmatic approach works better than a dogmatic one.

As someone has rightly said, 'Safety is good business and like most business situations, has an optimal level of activity beyond which are diminishing returns. If adequate initial expenses are made on safety, plants will be inherently safe from major accidents. To conclude, the management system is fundamental to lose prevention and hence,

Electricity Safety and Loss Prevention programs in an organization stand or fall by the attitude of the top management.

GREEN AUDIT REPORT

Sunbeam College for Women

[Affiliated to M.G.Kashi Vidyapith, Varanasi]

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SUNBEAM COLLEGE FOR WOMEN

BHAGWANPUR, VARANASI, UTTAR PRADESH

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CONTENTS

1 ACKNOWLEDGEMENT

Go Green India, Green Audit Team thanks the management of **Sunbeam College for Women, Bhagwanpur, Varanasi** for assigning this important work of Green Audit (Environmental Audit). We appreciate the co-operation to our team for completion of study.

Our special thanks are due to:

- Principal of the College – Dr. Vibha Srivastava
- Assistant Professor- Dr. Suruchi Singh
- Other Teaching & Supporting Staff of Institute

For giving us necessary inputs to carry out this very vital exercise of Green Audit (Environment Audit). We are also thankful to other staff members who were actively involved whilecollecting the data and conducting field measurements.

2.0 DISCLAIMER

Go Green India, Green Audit/Environment Audit Team has prepared this report for **Sunbeam College for Women, Bhagwanpur, Varanasi** based on input data submitted by the representatives of the Institute complemented with the best judgment capacity of the expert team.

It is further informed that the conclusions are arrived following best estimates and no representation, warranty or undertaking, express 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.

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Amit Kumar Purbey

Mr. Amit Kumar Purbey
Certified Energy Auditor (CEA-17686)
Lead Auditor, ISO 50001:2011 & ISO 19011:2011
Go Green India, Sonbhadra

BUREAU OF ENERGY EFFICIENCY

Examination Registration No. : EA-17686 Serial Number : 11254

Certificate Registration No. : 11254

Certificate For Certified Energy Manager

This is to certify that Mr./Mrs./Ms. Amit Kumar Purbey Son/Daughter of Mr./Mrs. Sushil Purbey who has passed the National Examination for certification of energy manager held in the month of August 2013 is qualified as certified energy manager subject to the provisions of Bureau of Energy Efficiency (Certification Procedures for Energy Managers) Regulations, 2010.

This certificate shall be valid for five years with effect from the date of award of this certificate and shall be renewable subject to attending the prescribed refresher training course once in every five years.

His /Her name has been entered in the Register of certified energy manager at Serial Number 11254 being maintained by the Bureau of Energy Efficiency under the aforesaid regulations.

Mr./Mrs./Ms. Amit Kumar Purbey is deemed to have qualified for appointment or designation as energy manager under clause (/) of Section 14 of the Energy Conservation Act, 2001 (Act No.52 of 2001).

Given under the seal of the Bureau of Energy Efficiency, this 4th day of March, 2014

Digitally Signed: RAKESH KUMAR RAI
Sun Mar 01 10:10:14 IST 2020
Secretary, BEE New Delhi

Secretary
Bureau of Energy Efficiency
New Delhi

Dates of attending the refresher course	Secretary's Signature	Dates of attending the refresher course	Secretary's Signature
19.01.2020			

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Certificate of Attendance

FICCI

Intertek

This is to Certify that

AMIT KUMAR PURBEY

has attended the

Intertek

Energy Management Systems

Auditor / Lead Auditor Training Course

The Course includes the assessment and evaluation of Energy Management Systems to conform to the requirements of ISO 50001:2011 and ISO 19011:2011

Authorising Signature: Vijaya Srivastava

Course Dates: 18th –22nd July 2016

Certificate Number: 112270X

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3.0 CONTEXT

The National Assessment and Accreditation Council, New Delhi (NAAC) has made it mandatory from the academic year 2016–17 onwards that all Higher Educational Institutions should submitan annual Green Audit Report. Moreover, it is part of Corporate Social Responsibility of the Higher Educational Institutions to ensure that they contribute towards the reduction of global warming through Carbon Footprint reduction measures.

In view of the NAAC circular regarding Green Auditing, the College Management decided to conduct an external Green Evaluation by a competent Green Auditor along with a Green AuditAssessment Team headed by Dr. Suruchi Singh, Green Audit coordinator, **Sunbeam College for Women, Bhagwanpur, Varanasi.**

Green Audit or Environment Audit focuses on the Green Campus, Waste Management, Water Management, Air Pollution, Energy Management & Carbon Footprint etc. being implemented by the Institute Management. The concept, structure, objectives, methodology, tools of analysis, objectives of the audit are mentioned below.

4.0 CONCEPT

The term 'Environmental audit' or 'Green audit' means differently to different people. Terms like 'assessment', 'survey' and 'review' are also used to describe similar activities. Furthermore, some organizations/Institutions believe that an 'environmental audit' addresses only environmental matters, whereas others use the term to mean an audit of health, safety and environment-related matters. Although there is no universal definition of Green Audit, many leading companies/institutions follow the basic philosophy and approach summarized by the broad definition adopted by the International Chambers of Commerce (ICC) in its publication ofEnvironmental Auditing (1989).

The ICC defines Environmental Auditing as:

"A management tool comprising a systematic, documented, periodic and objective evaluation of how well environmental organization, management and equipment are performing with the aim of safeguarding the environment and natural resources in its operations/projects."

The outcome of Green Audit should be established with concrete evidence that the measures undertaken and facilities in the institution under green auditing.

5.0 INTRODUCTION

A Nation's growth starts from its educational institutions, where the ecology is thought as a prime factor of development associated with environment. Educational institutions now daysare becoming more sensitive to environmental factors and more concepts are being introduced to make them eco-friendly. To preserve the environment within the campus, various viewpoints are applied by the several educational institutes to solve their environmental problems such aspromotion of the energy savings, recycle of waste, water reduction, water harvesting etc. The activities pursued by colleges can also create a variety of adverse environmental impacts.

Environmental auditing is a process whereby an organization's environmental performance is tested against its environmental policies and objectives. Green audit is defined as an official examination of the effects a college has on the environment. As a part of such practice, internal environmental audit (Green Audit) is conducted to evaluate the actual scenario at the campus. Green audit can be a useful tool for a college to determine how and where they are using the most energy or water or resources; the college can then consider how to implement changes and make savings. It can also be used to determine the type and volume of waste, which can be used for a recycling project or to improve waste minimization plan. Green auditing and the implementation of mitigation measures is a win-win situation for all the college, the learners and the planet. It can also create health consciousness and promote environmental awareness, values and ethics. It provides staff and students better understanding of Green impact on campus.

Green auditing promote financial savings through reduction of resource use. It gives an opportunity for the development of ownership, personal and social responsibility for the students and teachers. Thus it is imperative that the college evaluate its own contributions toward a sustainable future. As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher educational institutions in relation to environmental sustainability is more prevalent.

A clean and healthy environment aids effective learning and provides a conducive learning environment. There are various efforts around the world to address environmental education issues.

Environmental Management Systems (EMS) is very popular in the industrial sector, but the general belief is that EMS is something pertaining to industries only. Other parts of the world have started adopting compatible environmental management systems either voluntarily or for promoting standards by external certification. International environmental standards do not suit the existing Indian educational system. Hence EHS Alliance has developed a compatible system by developing locally-applicable techniques.

A very simple indigenized system has been devised to monitor the environmental performance of educational institutions. It comes with a series of questions to be answered on a regular basis. Environmental conditions may be monitored from angles that are relevant to Indian requirements, without stresson legal issues or compliance.

This innovative scheme is user-friendly and totally voluntary. The environmental monitoring system helps the institution to set environmental examples for the community and to educate younglearners. It can be adapted to urban and / or rural situations.

OVERVIEW OF INSTITUTE

Sunbeam College for Women provides an environment conducive for the students to develop into creative individuals. A natural progression from school level education was the setting up of Sunbeam College for Women at Bhagwanpur in 2000. Affiliated to Mahatma Gandhi Kashi Vidyapeeth, Varanasi, it answers to the long felt need for an English medium college for girls in Varanasi, 7.5 km straight drive from Varanasi Cantt. Station, the college focuses on the academic, intellectual and cultural development of its students such that they face the challenges of today with a base firmly rooted in India's cultural heritage. The qualities of fortitude, justice and benevolence are the cornerstone of the education imparted here. The college has qualified and motivated faculty, committed to teaching and research. Sunbeam believes in upholding the traditional values. Keeping pace with the same rhythm, various cultural activities are being organized in the Sunbeam College to retain cultural ethos and values. Several educational, recreational and extra-curricular activities are integral part of the college's working. In each of the extra-curricular activities of the college, we make sure to include the participation of the students. Such a step gives them experience in understanding the knowhow of organizing the events, an experience that would stand them in good stead when they would assume positions of importance. Quizzes, Debates, Extempore, and Public Speaking are the order of the day the country over and nothing serves to develop student's faculties better. Keeping this in mind the college ensures that students are provided with ample opportunities to participate in all such events. A range of indoor and outdoor games are available and students are encouraged to keep fit and healthy by participating in sports.

Sunbeam founded in 1972 by Dr. Amrit lal 'Ishrat Madhok and Mrs. Deesh ' Ishrat' Madhok, who felt the need of a private educational institution to cater to the holistic educational needs of the student fraternity in Varanasi and thus was born Sunbeam. Sunbeam started its momentous journey in a small rented apartment. Armed with a vision plus boundless energy and gaining credibility by the day, giant strides were made and the young institution grew rapidly in enrollment, quality and community recognition and soon outgrew its place of birth and it became obvious that a new location was needed.

After Sunbeam Bhagwanpur came Sunbeam Schools at Annapurna (1996), Sunbeam Women's College (2000), Lahartara (2002), Varuna (2002), Indiranagar (2005) and Suncity (2010). The progressive march to spread education also resulted in opening up of Associate Sunbeam Schools at Mughalsarai (2004) Jaunpur, Allahabad, Ghazipur and Mau (all in 2011) and Deoria, Bhadohi and Narayanpur (2012) with many more on the anvil. Today, more than 16000 students are part of Sunbeam Schools which over the years have given to the society, citizens par excellence and continue to contribute to the society through innumerable CBSE board toppers, national and international players of repute and stars that are shining bright on the cultural horizon.
Sunbeam College for Women Offer following undergraduate courses to the students:

- Bachelor of Commerce, B.Com
- Bachelor of Computer Application, B.C.A.
- Bachelor of Science, B.Sc

OBJECTIVES AND SCOPE

The broad aims/benefits of the eco-auditing system would be

- Environmental education through systematic environmental management approach
- Improving environmental standards
- Benchmarking for environmental protection initiatives
- Sustainable use of natural resource in the campus.
- Financial savings through a reduction in resource use
- Curriculum enrichment through practical experience
- Development of ownership, personal and social responsibility for the College campus and its environment
- Enhancement of College profile
- Developing an environmental ethic and value systems in young people

AUDIT PARTICIPANTS

On behalf of College:

Name	Position/Department
Dr. Vibha Srivastva	Principal, Sunbeam College for Women, Bhagwanpur, Varanasi
Dr. Suruchi Singh	Assistant Professor, Sunbeam College for Women, Bhagwanpur, Varanasi

On behalf of Go Green India:

Name	Position	Qualification
Mr. Amit Kumar Purbey	Lead Auditor	Certified Energy Auditor (CEA-17686) Lead Auditor, ISO 50001:2011, ISO 19011:2011
Mr. Krishna Kant Dubey	Energy and Environment Analyst	B. Tech, M. Tech (Energy Management)

EXECUTIVE SUMMARY

An environmental audit is a snapshot in time, in which one assesses campus performance in complying with applicable environmental laws and regulations. Though a helpful benchmark, the audit almost immediately becomes outdated unless there is some mechanism in place to continue the effort of monitoring environmental compliance.

This is very first environmental audit of institute for NACC affiliation; QS Programme and doing their bid towards environmental protection and environmental awareness at local and global front. Audit criterion is environmental cognizance, waste minimization and management, biodiversity conservation, water conservation, energy conservation and environmental legislative compliance by the campus. A questionnaire is used during audit. This audit report contains observations and recommendations for improvement of environmental consciousness.

AREAS OF IMPROVEMENT

- Environment Policy to be adopted by the College Campus.
- Stack height of DG set should be as per DG Rules
- Display of environment awareness posters should be there in the prominent areas ofcampus.

The areas of eco/environmental/green auditing to be followed/practiced by participating institutions:

Waste Minimization and Recycling
Greening
Energy Conservation
Water Conservation
Clean Air
Animal Welfare
Environmental Legislative
General Practices

LAND USE ANALYSIS, SUNBEAM COLLEGE FOR WOMEN, BHAGWANPUR, VARANASI (As on 11/09/2021):

GENERAL OVERVIEW OF THE CONCEPT OF LANDUSE

Land use refers to man's activities and the various uses which are carried on and derived from land. Viewing the earth from space, it is now very crucial in man's activities on natural resource. In situations of rapid changes in land use, observations of the Earth from space give the information ofhuman activities and utilization of the landscape.

Remote sensing and GIS techniques are now providing new tools for advanced land use mapping and planning. The collection of remotely sensed data facilitates the synoptic analyses of earth system, functions, patterning, and change in the local, regional as well as at global scales over time. Satellite imagery particularly is a valuable tool for generating land use map.

METHODOLOGY ADOPTED FOR LAND USE MAPPING

Three types of data that are GPS points, field survey data and Google earth data for Geo referencing have been used in this study. Land use map of the study area have been prepared using the above three types of data with the help of Google Map application.

DATA PROCESSING AND ANALYSIS

Land use map preparation is executed through the following steps:

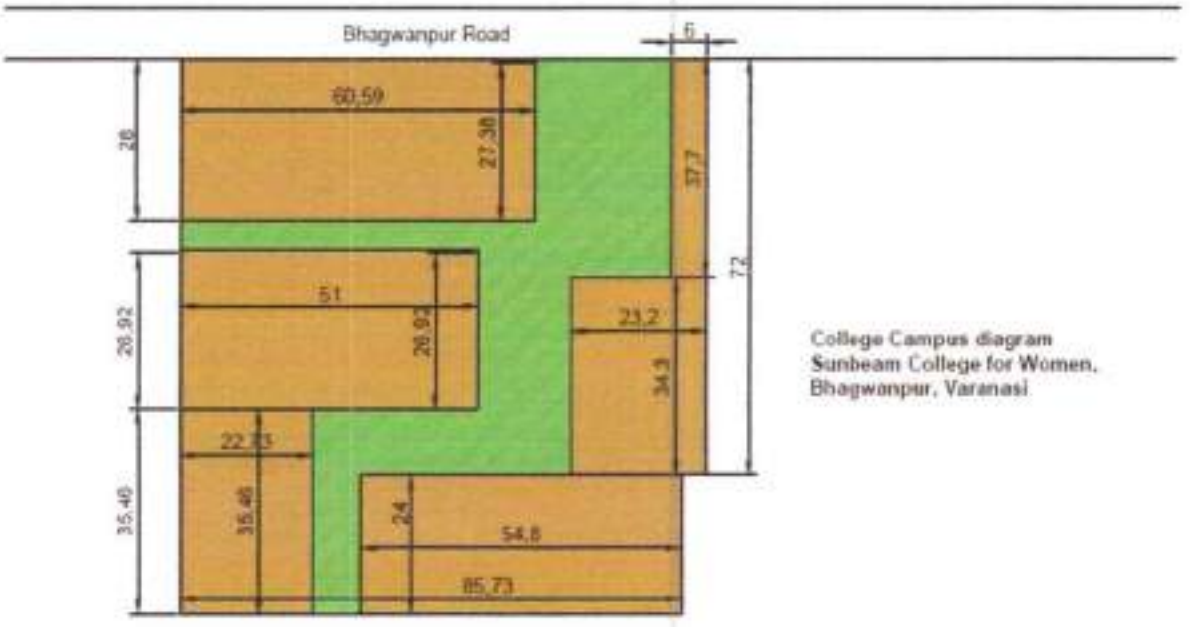
Acquisition of data (Location: 25.2731° N, 83.0012° E), Geo-coding and Geo referencing of satellite imageries by extracting the ground control points. Supervised classification was

carried out with the aid of ground truth data collected during field survey. Scanning and digitization of mapsand editing of all the Geo referenced maps were done using GIS. Data manipulation and analysis andlinking the spatial data with the attribute data for creation of topology was carried out using GIS software. Creation of GIS output in the form of land use map showing various land use have been prepared.

Therefore, attempt has been made in this study to map land use for Sunbeam College for Women, Bhagwanpur, Varanasi with a view to detect the land consumption in the built-up land area using both remote sensing and GIS techniques.

GEOGRAPHICAL LOCATION WITH CAMPUS MAP IN SCALE

The college has a **sprawling pollution-free campus spread over 3018.9549 sq. meter** of land in the heart of District Varanasi.



All dimensions are in meter (m).

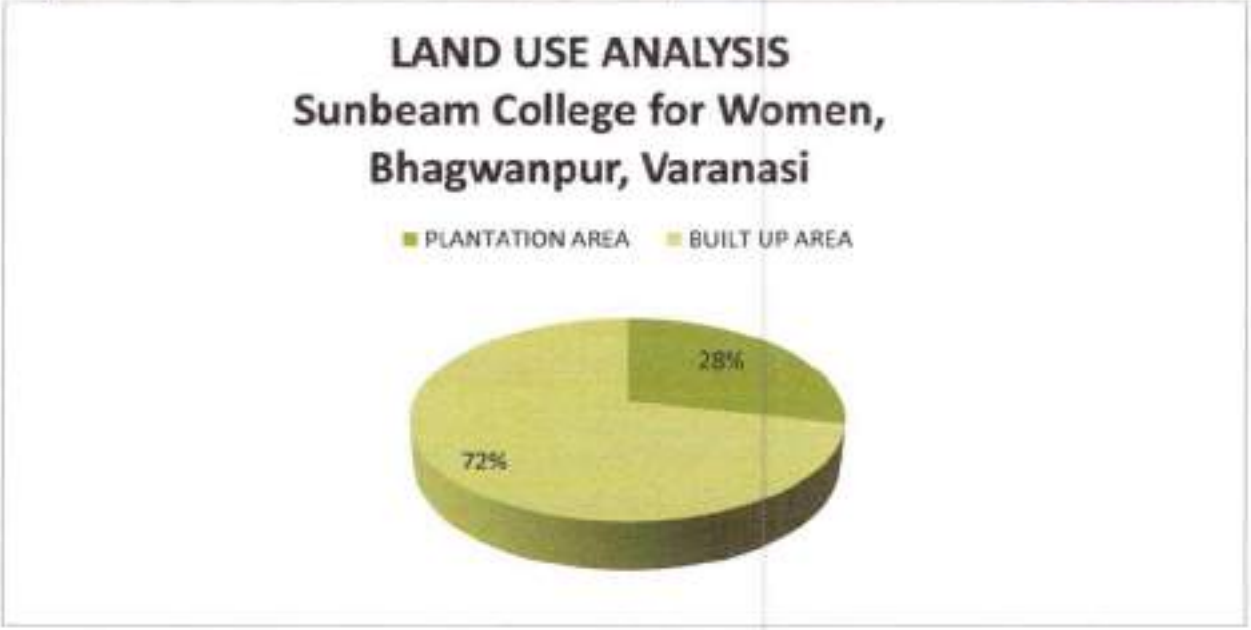
Photo 1: Map of College Campus

Photo 2: Aerial View of College Campus Part1 (Source Google Earth)

Photo 3: Aerial View of College Campus Part 2 (Source Google Earth)

LAND USE DATA OF SUNBEAM COLLEGE FOR WOMEN, BHAGWANPUR

CATEGORIES OF LAND USE	*AREA (m^2)*
BUILT UP AREA	2821.09
REST AREA	197.86
TOTAL AREA	3018.95



The total area of Sunbeam College for Women, Bhagwanpur, is **3018.9549** m^2 out of which the built up area is 72% and plantation area is 28%.

LAND USE (BUILT UP AREA) ANALYSIS:

The built up area of 72% (i.e 6181 m^2) consists of the following regions as stated below for land consumption in built up area of Sunbeam College for Women, Bhagwanpur:

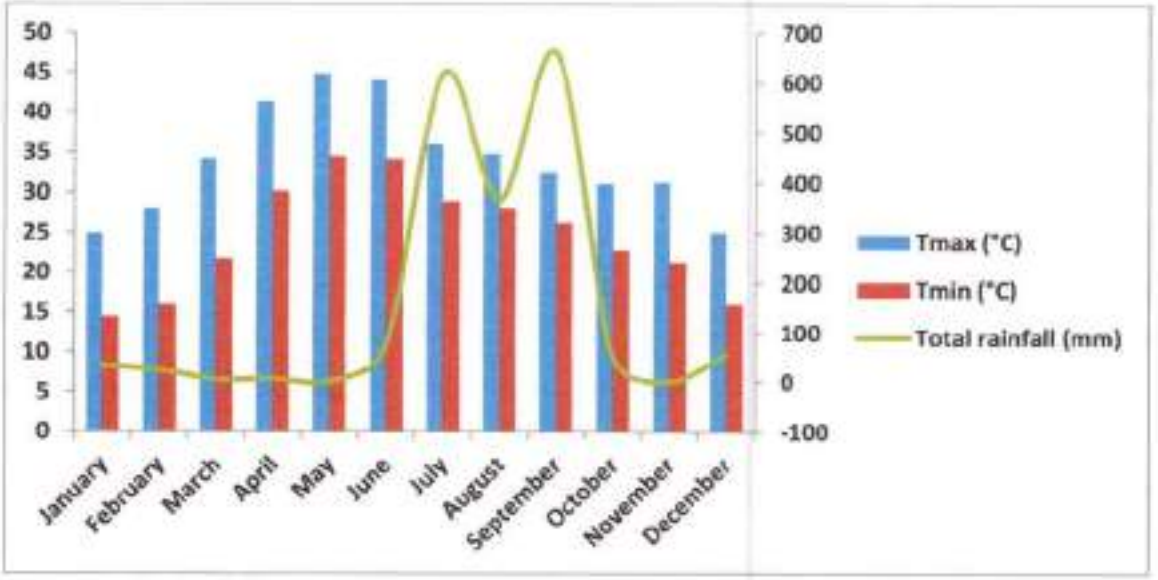
- Buiding 1
- Building 2
- Cafetaria
- Auditorium
- Attrium

FINDINGS

Sunbeam College for Women, Bhagwanpur, which was established in the year 2000, has an eco-friendly environment. It has a long legacy of healthy environmental practices including periodic plantation, their preservation and maintenance. Its land use is such that about 28% of the total area is occupied by open land and plantation that generates a better and sustainable campus environment.

METEOROLOGICAL CONDITIONS

The whole year of this region is classified into three main seasons, winter (November to February), summer (March to June) and rainy (July to August). Winter is characterized by low temperature, summer by high temperature and rainy is wetter.



Meteorological data for the year 2019

November was the driest month with minimum rainfall whereas September was wettest. May was the hottest month and January was the coldest month.

Floral and Faunal Diversity

Sunbeam College For Women, Bhagwanpur is within the geo-position between latitude 25.27 °N and longitude 83.00 °E in the Indo-Gangetic plain of Varanasi, U.P. It encompasses an area of 0.746 Acres. The area is diverse, with various plant species performing a variety of functions. Seasonal flowering plants are planted whose nectars attract a variety of birds and insects. Following plants species are planted on the college campus in over 700 pots:

S.No.	Botanical name	Family	Common name
1.	*Asparagus densiflorous*	Liliaceae	
2.	*Euphorbia hirta*	Euphorbiaceae	
3.	*Euphorbia milli*	Euphorbiaceae	
4.	*Euphorbia sp.*	Euphorbiaceae	
5.	*Tradescantia*	Commelinaceae	Spiderworts
6.	*Aglaonema*	Araceae	Chinese evergreen
7.	*Chlorophytum*	Asparagaceae	Spider plant
8.	*Araucaria*	Araucariaceae	monkey puzzle tree
9.	Crassula ovata	Crassulaceae	Jade
10.	*Plectranthus scutellarioides*	Lamiaceae	Common coleus
11.	*Strobilanthes dyeriana*	Lamiaceae	**Persian Shield**
12.	Duranta repens	Verbenaceae	Golden Duranta
13.	*Phlebodium aureum*	Polypodiaceae	Fern
14.	*Trachyspermum ammi*	Apiaceae	Carom
15.	*Dracaena trifasciata*	Asparagacaea	Snake plant
16.	*Jasminum*	Oleaceae	Jasmine
17.	*Pothos*	Araceae	Money plant
18.			Rosemary
19.	*Bougainvillea glabra*	Nyctaginaceae	Paper flower
20.	*Thuja occidentalis*	Cupressaceae	Thuja
21.	*Tabernaemontana divaricata*	Apocyanaceae	Chandni
22.	*Dracaena*	Asparagaceae	Song of India
23.	*Portulaca*	Portulacaceae	9 o'clock
24.	*Ixora*	Rubiaceae	Flame of the woods
25.	*Catharanthus*	Apocyanaceae	Periwinkle
26.	*Crinum lilly*	Liliaceae	Spider Lilly
27.	Dypsis lutescens	Arecaceae	Arika palm

28.	Delonix regia	Fabaceae	Golmohar
29.	*Dracaena fragrans*	Asparagaceae	Corn Palm
30.	*Nerium*	Apocyanaceae	
31.	*Jasminum sambac*	Oleaceae	Arabian Jasmine
32.	*Agave perryi*	Asparagaceae	Parry's agave
33.	Livistona chinensis	Arecaceae	China palm
34.	*Adenium sp.*	Apocyanaceae	-
35.	*Ficus sp.*	Moraceae	-
36.	*Artocarpus heterophyllus*	Moraceae	Jackfruit
37.	*Citrus limon*	Rutaceae	Lemon
38.	*Ficus sp.*	Moraceae	-
39.	*Yucca sp.*	Asparagaceae	-
40.	*Pandanus*	Pandanaceae	-
41.	*Alstonia sp.*	Apocyanaceae	Devil's tree
42.	*Tecoma stans*	Bignoniaceae	Yellow Bells
43.	*Croton sp.*	Euphorbiaceae	-
44.	*Polyalthia pendula*	Annonaceae	Ashoka
45.	*Cymbopogon citratus*	Poaceae	Lemon grass
46.	*Vetiver*	Poaceae	Khus-khus
47.	*Ricinus communis*	Euphorbiaceae	Castor
48.	*Ferula asafoetida*	Apiaceae	Asafoetida
49.	*Piper nigrum*	Piperaceae	Black pepper
50.	*Cinnamomum tamala*	Lauraceae	Indian Bay leaf
51.	*Elettaria cardamomum*	Zingiberaceae	Cardamom
52.	*Myristica officinalis L.*	Myristicaceae	Javitri/Jaiphal
53.	*Cinnamomum verum*	Lauraceae	Cinnamom
54.	*Curcuma longa*	Zingiberaceae	Turmeric
55.	*Syzygium aromaticum*	Myrtaceae	Clove
56.	*Cuminum cyminum*	Apiaceae	Cumin
"	*Withania*	Solanaceae	
58.	*Adhatoda sp.*	Acanthaceae	Adus
59.	*Rauwolfia serpentina*	Apocyanaceae	Sarpagandha
60.	*Eclipta alba*	Asteraceae	Bhringraj
61.	*Costus*	Malvaceae	Insulin plant
62.	*Andrographis*	Acanthaceae	Kalmegh
63.	*Aloe vera*	Asphodelaceae	-
64.	*Nyctanthus*	Nyctanthaceae	Harshingar
65.	*Jatropha*	Euphorbiaceae	-
66.	*Boerhavia*	Nyctaginaceae	-
67.	*Bignonia*	Bignoniaceae	-
68.	*Muhenbeckia*	Polygonaceae	-
69.	*Casuarina*	Casuarinaceae	-
70.	*Ranunculus*	Ranunculaceae	Butter-cup
71.	*Gossypium*	Malvaceae	Cotton
72.	Psidium guajava	Mystaceae	Guava
73.	*Rosa indica*	Rosaceae	Rose
74.	*Haemellia*	Rubiaceae	Fire-bush

75.	*Cuscuta*	Cucutaceae	Dodder
76.	*Convovulus*	Convolvulaceae	Morning glory
77.	*Mangifera indica*	Anacardiaceae	Mango
78.	*Syzygium cumini*	Myrtaceae	Jamun
79.	*Pyrus sp.*	Rosaceae	Pear
80.	*Cactus sp.*	Cactaceae	Cactus
81.	*Emblica officinalis*	Euphorbiaceae	Amla
82.	*Cestrum nocturnum*	Solanaceae	Raat ki Rani
83.	*Cestrum diurnum*	Solanaceae	Din ka Raja
84.	*Clitoria ternatea*	Fabaceae	Aprajita
85.	*Corchorus*	Malvaceae	Jute

Similarly, faunal diversity has been studied and documented as below:

S.No.	Common name	Scientific name
1.	Common myna	*Acidotheres tristis*
2.	Bank myna	*Acidotheres ginginianus*
3.	House sparrow	*Pesser domesticus*
4.	House crow	*Cornus splendens*
5.	Cuckoo	*Cuculidae*
6.	Yellow wasp	*Ropalidia marginata*
7.	Butter fly	*Danaus genutia*
8.	Red-vented bulbul	*Pycnonotus cafer*
9.	Monkey	*Platyrrhini*
10.	Langoor	*Semnopithecus desmarest*

ELECTRICAL POWER CONSUMPTION AT SUNBEAM COLLEGE FOR WOMEN, BHAGWANPUR

Sunbeam College for Women, Bhagwanpur, being one of the largest colleges of Varanasi, having 500 kVA electricity load which turns out to be 2,74,550 kWh per year only to maintain its volumetric activities throughout the year. The authority keeps on replacing the old filament bulbs, CFL bulbs and tube lights by low energy consuming LED bulbs and LED tubes and bulky high-power consuming fans with energy-efficient fans to keep the college's electricity consumption as low as possible.

In addition to making Environmental Studies a vital subject in our syllabus, Sunbeam College for Women, Bhagwanpur, Varanasi has gone a step further by putting that theory into practice. The college has installed two sets of solar panels. The energy from this solar installation is helping offset the institute's daytime peak electricity demand from the grid. Sunbeam College for Women, Bhagwanpur, with the installation of its

KW solar rooftop plant, can **offset 27.3% of its energy usage from the state grid.** Thus moving towards a more reliable and greener option and **reducing its carbon footprint.**

Percentage of annual power requirement of the Institution met by the renewable energy sources
Response: 27.3%

Annual power requirement met by the renewable energy sources (in KWH)

Response: 115479

Total annual power requirement (in KWH)

Response: 423001

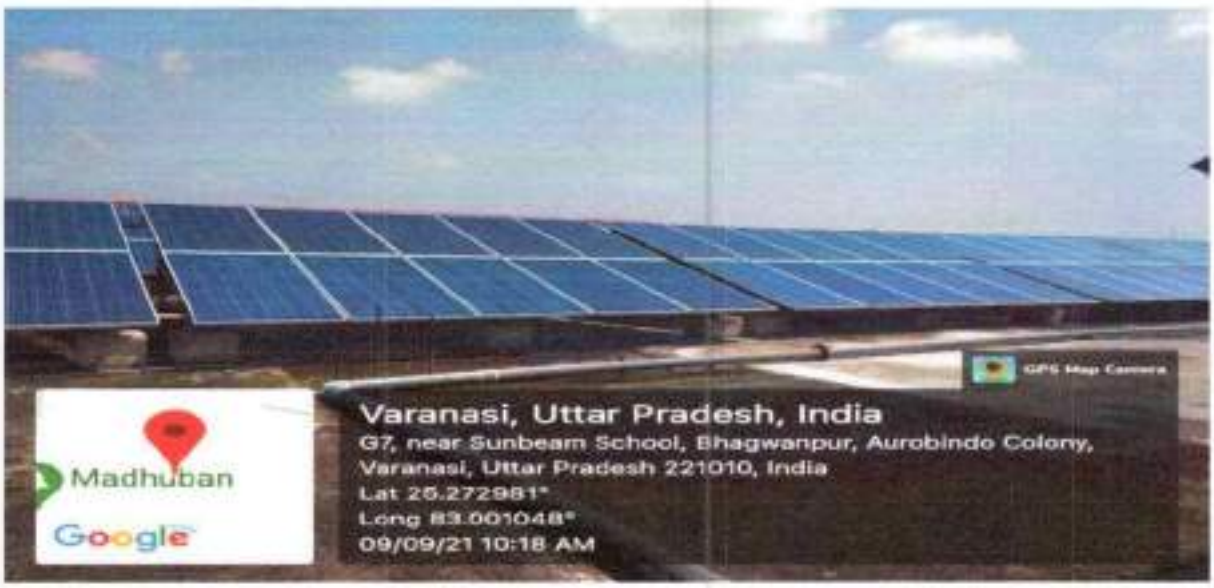
Power Requirements met by renewable energy sources	**Total Power Requirements**	**Renewable energy Source**	**Renewable energy generated and used**	**Energy supplied to thegrid**
115479 KWH/year	423001 KWH/Year	Solar	115479 KWH/year	NIL

Percentage of annual lighting power requirements met through LED bulbs
Response: 81.95%

Annual lighting power requirement met through LED bulbs (in KWH)
Response: 10483.2

Annual lighting power requirement (excluding LED)(in KWH)
Response: 2308.8

Total Annual Lighting Power Requirements = 12792 KWH



Total Lighting Requirements	Percentage Lighting through LED Bulbs	Percentage Lighting through other sources
12792 KWH/Year	81.95%	18.05%

WATER ANALYSIS REPORT

Water quality testing is important because it identifies contaminants and prevents water- borne diseases. Drinking or using contaminated water can result in severe illness or death. That is why it is important to ensure that drinking water is safe, clean and free from bacteria and disease.

The parameters for water quality are determined by the intended use. Work in the area of water quality tends to be focused on water that is treated for human consumption, or in the environment.

Drinking water indicators:

The following is a list of indicators often measured by situational category:

- Alkalinity
- Color of water
- pH value
- Taste and odor (geosmin, 2-Methylisoborneol (MIB), etc.)
- Dissolved metals and salts (sodium, chloride, potassium, calcium, manganese,magnesium)
- Microorganisms such as fecal coliform bacteria (Escherichia coli), Cryptosporidium,and Giardia lamblia; see Bacteriological water analysis
- Dissolved metals and metalloids (lead, mercury, arsenic, etc.)
- Dissolved organics: colored dissolved organic matter (CDOM), dissolved organiccarbon (DOC)
- Heavy metals
- Nitrate and nitrite
- Flouride
- Residual chlorine

राज्य स्वास्थ्य संस्थान, उत्तर प्रदेश,अलीगंज, लखनऊ

मेसर्स सनबीम इंग्लिस स्कूल,206 भगवानपुर,लंका,वाराणसी से लिये गये पानी के नमूनों की जीवाणु का परिणाम—

नमूना एकत्र करने वाले व्यक्ति का नाम तथा पद—श्री सत्यराम यादव F.S.O

क्रम संख्या	एकत्र करने का दिनांक तथा समय	प्राप्त होने का दिनांक तथा आयतन (इनाकुलेशन)	जल प्राप्ति का स्थान	प्लेट पर कॉलोनी गणना प्रति मि०ली० (Colony count on Nut Agar)		अनुमानित कोलिफार्म (Presumptive coliform count)				सम्भाव्य कोलिफार्म प्रति 100 मि०ली० (एम०पी०एन०)	ई०कोलाई / 44° c	अवशेषित क्लोरीन (Residual Chlorine)	अभ्युक्ति
						प्रत्येक परखनली में डाले गये जल की मात्रा	50 मि०ली०	10 मि०ली०	1 मि०ली०				
				48 घंटे में 37 सें०ग्रे० तापमान पर	72 घंटे में कमरे के तापमान पर	लगी गई परखनली की संख्या	1	5	5				
920 / एफ0	08.03.2021	06.03.2021	सबमर्सिबल	12	24	–	0	2	0	2	–	नहीं	संतोषप्रद

संख्या 10/91 दिनांक 16/3/2

सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित :—

1— मेसर्स सनबीम इंग्लिस स्कूल,206 भगवानपुर,लंका,वाराणसी।
2— नगर स्वास्थ्य अधिकारी नगर निगम/नगर पलिका परिषद, वाराणसी।
3— मुख्य चिकित्सा अधिकारी, वाराणसी।
4— अभिहित अधिकारी,खाद्य सुरक्षा एवं औषधि प्रशासन,जिला अधिकारी, वाराणसी।

वरिष्ठ प्रयोगशाला प्राविधिज्ञ
राज्य स्वास्थ्य संस्थान, उ0प्र0
लखनऊ

अपर निदेशक,
राज्य स्वास्थ्य संस्थान, उ0प्र0
लखनऊ

राज्य स्वास्थ्य संस्थान,उत्तर प्रदेश,
सेक्टर–सी, अलीगंज, गेएस बाल वाटिका के पीछे, लखनऊ

मेसर्स सनबीम इंग्लिस स्कूल,206 भगवानपुर,लंका,वाराणसी से प्राप्त जल के रसायनिक विश्लेषण का परिणाम

द्वारा एकत्रित / द्वारा भेजा गया	श्री सत्यराम यादव F.S.O.
एकत्र करने का दिनांक	06–03–2021
प्राप्त होने का दिनांक	06–03–2021
विश्लेषण का दिनांक	08–03–2021
जल प्राप्ति का स्थान	[illegible]
भौतिक लक्षण	[illegible]
पोटेशियम	[illegible]
असंयोजित एवं स्वतंत्र तिक्तातति भाग(सी) एवं सेलाइन अमोनिया) पी०पी०एम०	नही
शिवत्याभ तिक्तातति भाग(एल्बूमिनाइड अमोनिया) पी०पी०एम०	नही
37 से०ग्रे० पर 3 घण्टे मे अवशोषित जारक भाग(आक्सीजन एब्जार्व) पी०पी०एम०	नही
सांद्र विलयन मे समस्त भाग(सालिड्स इन सालूशन टोटल्स) पी०पी०एम०	184.0
सांद्र विलयन मे अनुत्पत भाग(सालिड्स इन सालूशन डिजल्व्ड) पी०पी०एम०	60.0
सांद्र विलयन मे उत्पत भाग(सालिड्स इन सालूशन कोलेशन) पी०पी०एम०	124.0
प्रज्वलन पर रूप	ना चारिंग
सम्पूर्ण कठोरता भाग पी०पी०एम०	36.0
स्थायी कठोरता भाग पी०पी०एम०	12.0
अस्थायी कठोरता भाग पी०पी०एम०	24.0
नोरेय भाग(क्लोराईड्स) पी०पी०एम०	26.0
भूथित भाग(नाईट्राइट्स) पी०पी०एम०	नही
भूथिय भाग(नाइट्रेट्स) पी०पी०एम०	नही
फ्लोरीन एजफलोराइड पी०पी०एम०	0.1
रेजीडुअल क्लोरीन पी०पी०एम०	नही
अभियुक्ति	पेय योग्य

10, 191

संख्या –919 / एफ०/ दिनांक: 16/3/21

सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित :–

1– मेसर्स सनबीम इंग्लिस स्कूल,206 भगवानपुर,लंका,वाराणसी।
2– मुख्य चिकित्सा अधिकारी , वाराणसी।
3– नगर स्वास्थ्य अधिकारी, नगर निगम / नगर पालिका वाराणसी।
4– अभिहीत अधिकारी,खाद्य सुरक्षा एवं औषधि प्रशासन,जिला अधिकारी कार्यालय, वाराणसी।

वरिष्ठ प्रयोगशाला प्राविधिज्ञ,
राज्य स्वास्थ्य संस्थान,
उ०प्र०,लखनऊ।

अपर निदेशक
राज्य स्वास्थ्य संस्थान,
उ०प्र०,लखनऊ।

Scanned By Scanner Go

Glimpse of some good practices in Sunbeam College For Women

Image 1. Dustin for wet and dry waste

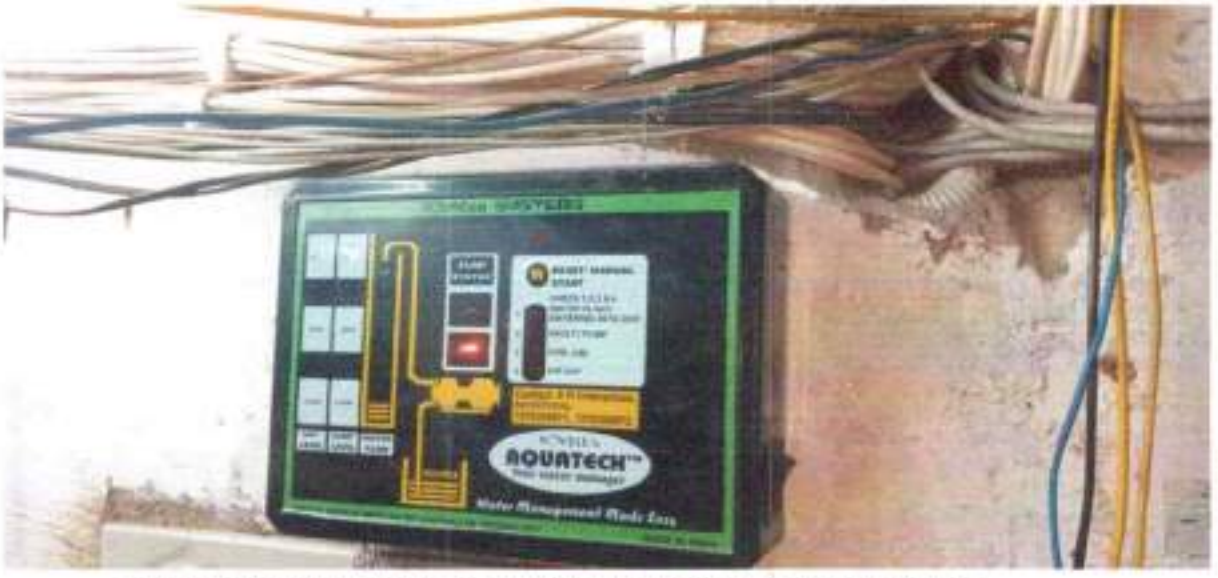


Image 2. Sensors installed in water tanks to check the overflow

Image 3. Collection of AC effluents

Image 4.

Vertical plantation

Image 5. Sample of PUC certificate of one of the vehicles

Image 6. Installed Solar panels at college building roof

Image 7. Tobacco-free campus banner

Image 8: Fire extinguisher

RECOMENDATIONS

- Formation of Environment Policy and communicated to all faculties and other staff members.
- Environmental Monitoring i.e. (Ambient Air Quality monitoring, Stack Monitoring of DG sets, need to be conducted by State Pollution Control Committee, approved laboratory
- Rain water harvesting/ground water recharging system needed

CONCLUSION

This audit involved extensive consultation with all the campus team, interactions with key personnel on wide range of issues related to Environmental aspects. The audit has identified several observations for making the campus premise more environmental friendly. The recommendationsare also mentioned with observations for campus team to initiate actions.

The audit team opines that the overall site is maintained well from environmental perspective. There is no major observations but few things are important to initiate urgently are waste management records by monthly inventory of hazardous waste, rainwater harvesting recharge; water balance cycle and periodic inspection of buildings housekeeping and environment policy.

TRANSPARENCY OF GREEN AUDIT REPORT

Green audit report is one of the useful means of demonstrating an organization/Institution's commitment to openness and transparency. If an Institute believes it has nothing to hide from its stakeholders, then it should feel confident enough to make its green audit reports freely available to those who request them. As a basic rule, green audit reports should be made available to all stakeholders.