Ref:

SCPL-PR-846-090422

Date: April 9, 2022

Green, Energy and Environment Audit Report
S M Shetty College of Science, Commerce & Management Studies

Report

On

Green, Energy & Environment Audit

For

S M Shetty College of Science, Commerce & Management Studies
Mumbai 400 076

Prepared

By

Senergy Consultants Pvt Ltd
Mumbai

Helping You to Conserve Energy

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I
Introduction

Green, Energy & Environment Audit was undertaken at S M Shetty College of Science, Commerce & Management Studies (Hiranandani Gardens, Powai, Mumbai 400076) during the month of April 2022.

The organization along with their students is very keen to promote green culture wherever possible, as a commitment towards better environment and conservation of energy. A lot of efforts have already been put up to bring down the carbon footprint. To further optimize consumption and identify saving opportunities, M/s Senergy Consultants was assigned to carry out Green & Environment Audit of the premises.

This Audit Report presents the analysis of the data collected, observations made at the facility and is governed by the objectives, scope of work, methodology etc. discussed in the ensuing paragraphs.

Team:

The team members of the audit study.

- Mr. Ravindra Datar
- Mr. Ishan Datar

Acknowledgment:

We wish to express our gratitude towards Mr Sandeep Singh and Mr. Subhash Pandit for having given us the opportunity for conducting the study and the support provided during the study.

II
Executive Summary

The premises were evaluated against the various criterions laid down by the National Assessment and Accreditation Council (NAAC). The major observations are.

Renewable Energy

- The college is in a process of installing Roof-top Solar Photovoltaic System for self-use.
- The quantity of plate waste (organic waste with higher starch contents) is negligible, consequently, there is no potential for biogas generation. The plan has been proposed for installing Compost pit.
- The institute has already procured and is been using vermi and bio composter.

Green Campus Initiative

- The movement of vehicle inside the campus is restricted.
- The campus is surrounded by a lot trees, has a lot of potted plants and proper landscaping.

Environment & Energy Initiative

- The College host a lot of activities for promoting sustainability with the help of Nature Club and other committees.
- The college hosted Eco Brick making, Tree Plantation Drives, and Beach Clean-Ups which have been successful and recognized by relevant government department.

Air Quality & Ventilation

- Most of the classrooms and other areas are well ventilated to ensure proper air quality.
- The fans are appropriately installed to ensure proper air circulation.
- Three and four star air conditioning units have been installed everywhere to ensure proper circulation of air.
- The outdoor plants have also been provided to improve the environment.

Lighting System

- The usage of natural light is optimized through well designed structure and windows.
- Almost all the light fitting are provided with high efficiency LED lamps, the balance are being replaced progressively.
- It is suggested to automate switching of lamps in the common areas and rest rooms with sensor based control.

Water Quality & Conservation

- The water is supplied by the Municipal Corporation, which is a common practice in Mumbai & Navi Mumbai.
- Water coolers are provided at convenient locations and on each floor.
- The distribution network and piping are satisfactory and adequate.
- The water meter needs to be calibrated / replaced as the meter reading has been 0 for too long.

Waste Management

- The effluent water is discharged in the municipal drain, which is a common practice in and around Mumbai & Navi Mumbai.
- The dry and wet waste is not currently segregated and disposed of through Municipal waste.
- There is little generation of waste, however, the waste may be segregated and organic waste may be composted by installing cans / small composting pits.
- The electronic gadgets / waste is either donated if useful or disposed of in their E-Waste Collection Bin.
- The general solid waste is disposed through municipal corporation.

Air Conditioning System

- The Air Conditioners are operated as required with manual control. The operation is minimal consequently automation may not be economical.
- The room temperature is maintained at 24 to 25 °C, which is well within the recommended values.
- The Air Conditioners are serviced and maintained as and when required. It is suggested to opt for annual service contract to ensure efficient operation of the units.

Green Culture

- The Energy efficient computer systems and laptops have been procured.
- The electronic communication is practiced to minimize usage of papers. Digitization of the records is currently being done.
- Most of the papers are reused for doubled sided printing to further minimize usage of paper. Majority of the paper waste is generated during exam period.
- The college hosts several events both inside and outside which promote sustainability and health awareness.
- They have conduct E-Waste collection drives for collecting e-waste.

III
Electrical System

Equipment List

Lamps:

The details are as below.

Sr. No.	Item	Gr. Flr.	1st Flr.	2nd Flr.	3rd Flr.	4th Flr.	5th Flr.	7th Flr.	6th Flr.	8th Flr.	Terrace	Total Qty
1	TL small with fittings	11	0	0	0	0	4	0	0	64	0	79
2	TL (Double)	8	35	46	0	0	0	144	84	94	0	411
3	TL (Single)	51	65	62	0	0	0	13	51	38	0	280
4	Flood Light - Play Ground	10	0	0	0	0	0	0	0	0	0	10
5	OSRAM 1000W Spark Light	20	0	0	0	0	0	0	0	0	0	20
6	100 W LED Flood Lights	23	0	0	0	0	0	0	0	0	0	23
7	15W LED	97	146	121	175	166	339	355	135	214	0	1748
8	20W LED	109	32	6	43	0	40	18	0	0	0	248
9	Spot Lights	177	43	10	54	13	111	48	15	0	0	471

Computers:

There are a total of 110 Computers out of which 40 are new and 70 are old. The computer systems have LCD monitors.
These systems are turned off as soon the lab session ends.

Fans:

All the fans are of standard rating and efficiency, the details are as below.

Location	Ceiling Fan
Ground Floor	48
1st Floor	89
2nd Floor	56
3rd Floor	54
4th Floor	146

5th Floor	94
6th Floor	84
7th Floor	88
8th Floor	88
Total Qty	747

Air Conditioning Units:

Majority of the Air Conditioning Units are not rated. The with star rating of 3 and 4, with most of them rated with 3 stars. These intrinsically operate at high energy efficiency; the details are as below.

Item	Gr. Floor	1st Floor	2nd Floor	3rd Floor	4th Floor	5th Floor	6th Floor	7th Floor	8th Floor	Total
3.5 Ton	0	0	0	0	0	0	2	0	2	4
5.5 ton Duct	0	0	0	1	0	0	0	0	0	1
Split 1 ton	2	1	3	0	8	0	3	5	0	22
Split 1.5 ton	20	27	7	33	39	25	6	30	29	216
Split 1.8 ton	0	0	0	0	0	0	0	0	0	0
Split 2 ton	19	8	13	3	4	9	11	6	6	79
Split 2.5 ton	0	0	0	0	0	0	0	0	0	0
Split 2.8 ton	2	0	0	0	0	0	0	0	0	2
Cassette-Inverter 3.0 ton	0	0	0	0	0	0	2	6	6	14
Cassette-Inverter 4.0 ton	0	0	0	0	0	0	11	6	2	19
Cassette-Inverter 1.5 ton	2	0	0	0	0	0	0	0	0	2
Cassette-Inverter 2.0 ton	1	0	0	0	0	0	0	0	0	1
Total	**43**	**36**	**23**	**37**	**51**	**34**	**35**	**53**	**45**	**360**

Observations & Suggestions:

- Energy conservation activities are being implemented and the students are also encouraged to do so.
- The air conditioners which are old (installed between 2010 and 2012) should be replaced by three or higher stars ACs.
- The Air Conditioners are operated as required with manual control. The operation is minimal consequently automation may not be economical.
- The fans may be progressively replaced with energy efficient BLDC fans, especially during replacements and new purchases.
- Most of the rooms are well ventilated and provided with fans at appropriate location for proper air circulation.
- The temperature is maintained at 24 to 25 ^{o}C for air conditioning spaces, which is within the recommended values.
- Posters are put up to switch of the appliances and maintain the energy efficient temperature when not in use.
- The campus is following the ideology: "Energy saved is energy generated" which is being implemented.
- The remaining TFLs may be replaced by LEDs.
- The flood lights may also be replaced with LED lamps.

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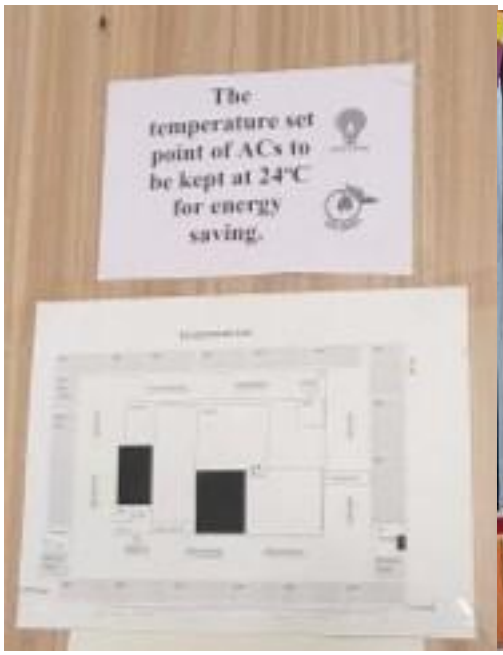

Electricity Bill:

Consumer: 151469763									
Tariff Category: HT V (B)									
Contract Demand: 320 KVA									
Supplier: Adani Electricity									
Description	**Unit**	**Mar-21**	**Apr-21**	**May-21**	**Jun-21**	**Aug-21**	**Oct-21**	**Nov-21**	**Average**
Energy Consumption	KWH	19811	13427	12243	16516	20183	44516	26570	21895
	KVAH	22020	15948	14964	18612	22080	48228	28440	24327
Reactive Energy	$KVARH_{Lg}$	12	0	12	0	0	0	12	5
	% KVAH	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0
	$KVARH_{La}$	9612	8604	8604	8580	8952	18552	10140	10435
	% KVAH	43.7%	54.0%	57.5%	46.1%	40.5%	38.5%	35.7%	0
Recorded Demand	KVA	172.8	55.2	32.4	99.6	82.8	126	184.8	108
Billed Demand	KVA	176	55.2	42	99.6	82.8	105.6	184.8	107
Power Factor Lead		0.90	0.84	0.82	0.89	0.91	0.90	0.93	0.89
Load Factor		8%	27%	23%	21%	25%	26%	18%	0
Demand Charges	Rs	56320	18492	14070	33366	27738	77586	61908	41354
Bill	Rs	225195	160223	145921	202069	226062	515145	324186	256972
Cost	Rs/KWH	11.4	11.9	11.9	12.2	11.2	11.6	12.2	11.8
Saving Potential through Optimizing gap between KVAH & KWH consumption									
Present Difference in KVAH & KWH	KVAH	2209	2521	2721	2096	1897	3712	1870	2432
	% KWH	11.2%	18.8%	22.2%	12.7%	9.4%	8.3%	7.0%	0
Desired Difference in KVAH & KWH	%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
	KVAH	99	67	61	83	101	223	133	109
Reduction in KVAH	KVAH	2110	2454	2660	2013	1796	3489	1737	2323
Potential gains	Rs	17935	20858	22608	17114	15267	29660	14766	19744
Overall Saving	L Rs/Year	1.58							

Observations & Suggestions:

- The billing is based on KVAH consumption while the equipment requirements are in KWH. Thus, maintaining near unity power factor on continuous basis can maximize the saving and reduce the power costs. The consumption of KVARH is marginally higher than KWH values, which may be optimized through effective and proper power factor management throughout the period.

- The saving potential has been tabulated above.
- There will not be any investment as the power factor in on the leading side, consequently few of the capacitors need to eb switched off to maintain the power factor at around 0.995 on the lagging side.

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Consumer Name: B.S.S.M SHETTY OF SCI, COM& MGT STU					
Tariff Category: HT V (B) - PUBLIC					
Contract Demand: 500 KVA					
Supplier: Tata Power					
Description	**Unit**	**Apr-22**	**May-22**	**Jul-22**	**Average**
Energy Consumption	KWH	58260	30900	81990	57050
	KVAH	60360	33540	84540	59480
Billed Units		64980	33540	84540	
Reactive Energy	$KVARH_{Lg}$	0	270	2700	990
	% KVAH	0.0%	0.8%	3.2%	0
	$KVARH_{La}$	0.965	8910	7770	5560
	% KVAH	0.0%	26.6%	9.2%	0
Recorded Demand	KVA	396	208	406	337
Billed Demand	KVA	396	325	406	376
Power Factor		0.965	0.921	0.970	1
Load Factor		18.1	9.0	22.7	17
Demand Charges	Rs	140580	115375	144130	133362
Bill	Rs	699747	410690	970382	693606
Cost	Rs/KWH	12.01	13.29	11.84	12
Saving Potential through Optimizing gap between KVAH & KWH consumption					
Present Difference in KVAH & KWH	KVAH	2100	2640	2550	2430
	% KWH	3.6%	8.5%	3.1%	4.3%
Desired Difference in KVAH & KWH	%	0.5%	0.5%	0.5%	0.5%
	KVAH	291	155	410	285
Reduction in KVAH	KVAH	1809	2486	2140	2145
Potential gains	Rs	15374	21127	18190	18230
Overall Saving	L Rs/Year	0.73			

Observations & Suggestions:

- The billing is based on KVAH consumption while the equipment requirements are in KWH. Thus, maintaining near unity power factor on continuous basis can maximize the saving and reduce the power costs. The consumption of KVARH is marginally higher than KWH values, which may be optimized through effective and proper power factor management throughout the period.

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IV
Environmental System

Ventilation & Air Quality:

- The air ventilation is more than adequate in majority of the rooms. Some rooms which require better air flow into them have air conditioning installed since almost all of them are close to the ducts.
- Several outdoor plants have been installed to improve air quality. There are around 88 Ashoka trees and 300 potted plants of indigenous species.
- Installing some indoor plants is recommended to further enhance the air quality.
- All the laboratories in the building have proper ventilations and exhaust fans installed.

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V
Water Management

Consumption Pattern:

The water supplied by the municipal corporation is used for drinking and other requirements.

The incoming water from the municipal corporation is metered. The details of the bills are as under.

Period	Days	Consumption	Bill Amount	Cost
		KL	Rs	Rs/KL
Connection No- 8919111				
Feb-22 to May-22	87	0	1035.00	5.94
Nov-20 to Feb-22	418	0	5175.00	5.94
Connection No- 8806653				
Feb-22 to May-22	87	0	765.00	5.94
Nov-20 to Feb-22	418	0	3825.00	5.94

Period	Days	Consumption	Total No. Of Person	Water Consumption
		KL		KL/Person/Day
Connection No- 8919111				
Feb-22 to May-22	87		5101	
Nov-20 to Feb-22	418		5101	
Connection No- 806653				
Feb-22 to May-22	87		5101	

Nov-20 to Feb-22	418		5101	

The meters may not be functioning properly leading to zero consumption data. It is suggested to recalibrate / replace the meters to assess the consumption pattern.

Water Coolers & Filters:

The water coolers are installed on all the floors. The water coolers do not have star rating. There are 5 water coolers which are over 10 years old.

Below is the list of the equipment installed:

Sr. No.	Item	Gr. Flr.	1st Flr.	2nd Flr.	3rd Flr.	4th Flr.	5th Flr.	7th Flr.	6th Flr.	8th Flr.	Total
1	Aqua Guard	3	2	3	2	2	1	1	2	1	**17**
2	Cooler Cum Purifier	1									**1**
3	Water Cooler	2	1	3	2	2	1	1	2	1	**15**
	Total	**6**	**3**	**6**	**4**	**4**	**2**	**2**	**4**	**2**	**33**

Water Distribution System:

The distribution network and piping are satisfactory and adequate.

Rainwater Harvesting:

The campus has implemented a rainwater harvesting system on the ground. All the rainwater from the ground is collected in 22 chambers and is directed into a water storage tank close to the pump room.

VI
Waste Generation & Management

Solid Waste:

- The waste is not segregated in the college premises and disposed of through Municipal system.
- Each floor and classroom are provided is with a dustbin for waste disposal. There are no separate bins for dry and wet waste.
- Plastic recycling has been exceptional. Students and the faculty are involved in major projects like making plastic bricks to utilize all the plastic bottles which have been praised by the government bodies.
- The electronic gadgets with residual life are donated while the electronic waste is properly.
- There E-Waste is collected and disposed of regularly and responsibly.
- Students and faculty have been diligent in conducting sustainability practices and spreading the importance of nature conservation.
- The canteen in the building is hygienic but needs separation of wet waste and dry waste in order to utilize the wet waste for composting.

Sewage & Wastewater:

- The sewage is let out in the municipal system, which is a common practice in Mumbai and Navi Mumbai. The corporation charges cess towards collection and treatment of sewage.

VII
Infrastructure and Safety

- The premises are provided with requisite staircases with necessary entrances and signages to ensure quick and effective movement in normal as well as emergency conditions
- The movement of vehicles is restricted, and parking is not provided on premises

Draining System:

- Drains from the washrooms and the canteen are connected to the municipal drainage, which is a common practice in the colleges in Mumbai

Seepage in the building:

- The premises was visually inspected for seepages. No seepages were discovered in any place.

Fire Extinguishers:

- Fire extinguishers are provided at all key locations, staircases and outside the campus. Signages are installed near the extinguishers and the exits. Floor plans are printed out and posted in all the classrooms, laboratories and around the hallway. The firefighting system is serviced regularly and maintained properly.

- There are a total of 110 fire extinguishers installed in the building.

- Below is the list of the fire safety system installed:
  1 Fire Alarm System
  2 20 Zone Microprocessor based Semi Addressable Fire alarm
  3 Control System with control Panel & LCD Display. Including 20 nos
  4 Sone Monitro Module for receiving signal from MCP. Detectro to system
  5 PA calling system interconnected with main Fire Alarm Panel with console panel
  6 60 channel Terminal Junction Box
  7 20 Channel terminal Junction Box
  8 12V/24AH Rechargeable Battery & Battery Box
  9 Supply and laying of 1.5 sq mm x4 core cable-120mtr
  10 Entire Fire alarm control system (20 Zone) Installation, Testing,
  11 Commissioning with all detector & MCP & Hooter
  12 Fire Extinguisher


THIS AREA IS UNDER
CCTV
SURVEILLANCE
Emergency Numbers
•Police 100
•Fire 101
•Ambulance 102
•Women Safety 103
•Blood on Demand 104


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Canvas Hose Pipe
Hose Reel Drum
Branch Pipe
Fire Blanket
Fire Extinguisher
SERVICE
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Sign
Remark
8433990077

Wheelchair Accessibility:

- Ramps are provided near the entrances and the premises is equipped with wheelchairs in case of emergencies. The lift is available to use and near the ramps which makes movement easier.

VIII
Green Culture

- The LCD monitors have been procured, which are energy efficient.
- These monitors are not only energy efficient but also generate minimal heat and cut down on air conditioning load.
- The electronic communication is being undertaken to minimize usage of papers.
- Most of the papers are reused for doubled sided printing to further minimize usage of paper.
- The paper waste is usually very less and increases only during exams.

The following steps may be initiated to further enhance efficiency of the systems.

1. An automated and efficient power management system may be incorporated to
    a. Switch off the display if not in use.
    b. Put the computer in Sleep mode / switching off the machines, if not used for prolonged period.
2. Optimize brightness of the screen.

Paper-less communication:

The major internal as well as external communication is through electronic medium. The digitization of the records is in progress.

Re-using one sided paper for printing:

It was observed that two side printing / printing on the back side of used paper in more than 80% of the cases.

Student Clubs and Activities:

- The college has Nature Club which hosts events inside the campus and outside the campus.
- The notice boards are filled with importance of sustainability, energy conservation, mindfulness and conservation of nature. These are all done by the students.
- The events hosted regularly include Plastic Brick Making, Tree Plantation Drives, Beach Clean ups and Blood Collection Drives

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Rainwater Harvesting:

The Rainwater harvesting is already being done in the playground.

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IX
Renewable Energy

Solar Photovoltaic:

- The Solar PV is currently being installed with net metering facility.
- The panels are being strategically placed to maximize energy generation.
- It will reduce the electricity bill and will be beneficial in the long run.

Solar Thermal:

There is no application of solar thermal system and does not find attractive in this case.

Biogas Plant:

There is no possibility of installing biogas plant for cooking as the quantity of wet waste is negligible.