

Energy Audit Report
NK College of Commerce, Arts & Mgmt. Studies and SNK College of Science

Report

On

ENERGY, GREEN & ENVIRONMENT AUDIT

For

**Nagindas Khandwala College of Commerce, Arts & Mgmt.
Studies and Shantaben Nagindas Khandwala College of
Science
Malad**

Prepared

By

**Senergy Consultants Pvt Ltd
Mumbai**

February – 2021

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I

Introduction

Energy, Green & Environment Audit was undertaken at Nagindas Khandwala College of Commerce, Arts & Mgmt. Studies and Shantaben Nagindas Khandwala College of Science, Bhavishya Bharat Campus , S.V. Road, Malad (West), Mumbai -400 064 during the month of February 2021.

The organization is very keen to optimize the resources wherever possible and to further optimize energy consumption and identify opportunities for energy and resource saving, M/s Senergy Consultants Pvt Ltd was assigned to carry out the 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. Umesh Phatakare

Acknowledgment:

We wish to express our gratitude towards Principal, Dr. Ancy Jose and Vice Principal, Dr. Moushumi Datta for having given us the opportunity for conducting the study and the support provided during the study.

We are also thankful to Mr. Ashish Jain for extending the necessary help and co-operation from their side.

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II Executive Summary

The premises were evaluated against the various criteria laid down by the National Assessment and Accreditation Council (NAAC).

The major observations are

1. Electrical System & Bills
 - a. The overall average cost of the power procured from electricity board is Rs 11.3/- per kWh.

2. Lighting System
 - a. The usage of natural lighting has been maximized.
 - b. Energy efficient light fittings have been installed at some of the places. However, possibility of replacing the present light fitting with LED lamps may be evaluated, especially for lamps operating for longer period or while making new purchases.
 - c. The fans & lights are switched off when not in use.

3. Air Conditioning System
 - a. The air conditioners are switched off, when not in use.
 - b. The hall temperature was observed to be 24 to 26 °C; which are standard values.
 - c. The system is properly maintained.

4. Air Quality & Ventilation
 - a. The air ventilation is adequate.
 - b. The campus is well covered with green plants to improve air quality.

5. Water Quality & Conservation
 - a. The water supplied by the Municipal Corporation is used for drinking after purification; which is a common practice in and around Mumbai.
 - b. A borewell water is used for other applications like toilets flushing, washing of utensils, etc.
 - c. Water fountains / coolers are provided at convenient locations.
 - d. The various water conservation measures are initiated; The water consumption is generally within the norms.

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6. Waste Management
 - a. The generation of waste is minimized through use of electronic communication and effective water management system.
 - b. The waste water is disposed of through common drainage system, which is usual practice in Mumbai.
 - c. The solid waste is segregated; while organic waste is converted in to manure in a composting pit, the non-organic waste is disposed through common system.

7. Infrastructure usage
 - a. Movement on-campus is distributed with multiple entrances as well as staircases.
 - b. There is limited parking space for vehicles/four wheelers due to space constraints. Nonetheless, parking space has been provided for faculty. Almost all the students and many of the faculty members avail public transport system which is very convenient due to proximity to railway station and bus services.
 - c. There are adequate fire extinguishers located at key areas. The college has initiated appropriate measures to meet the safety requirement.
 - d. The draining system for washrooms is efficient and effective.
 - e. No seepages were observed in the building premises.

Potential Saving Area:

Major savings can be achieved by

1. Replacing conventional lamps with LED lamps.

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III Electrical System & Bill

Electricity Bill

The electricity for the entire premises is supplied by Adani Electricity Low tension (LT) & (HT) connections. The details of energy consumption with costs are as under.

Description	Unit	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Jan-21	Average
Consumer No.: 102002582		Tariff Category: LT II A						
Meter No.: 7977321								
Energy Consumption	KWH	862	766	933	1087	1015	816	913
Bill	Rs	8801	7465	8991	10398	9740	7922	8886
Cost	Rs/KWH	10.2	9.7	9.6	9.6	9.6	9.7	9.7

The average cost of the power procured from electricity board for consumer no. 102002582 is Rs 9.7/- per kWh.

Description	Unit	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Jan-21	Average
Consumer No.: 102002567		Tariff Category: LT II A						
Meter No.: 7954908								
Energy Consumption	KWH	327	315	344	270	480	350	348
Bill	Rs	3913	3344	3609	2933	4852	3660	3719
Cost	Rs/KWH	12.0	10.6	10.5	10.9	10.1	10.5	10.8

The average cost of the power procured from electricity board for consumer no. 102002567 is Rs 10.8/- per kWh.

Description	Unit	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Jan-21	Average
Consumer No.: 152374080		Tariff Category: HT II						
Energy Consumption	KWH	8320	6360	6960	10580	9520	8980	8453
Bill	Rs	153110	76000	82120	156670	170330	164170	133733
Cost	Rs/KWH	18.4	11.9	11.8	14.8	17.9	18.3	15.5

The average cost of the power procured from electricity board for consumer no. 152374080 is Rs 15.5/- per kWh.

Description	Unit	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Jan-21	Average
Consumer No.: 102693892		Tariff Category: LT II C						
Energy Consumption	KWH	2632	3684	4332	5024	5588	5860	4520
Bill	Rs			59340	66630	72500	75490	68490
Cost	Rs/KWH			13.7	13.3	13.0	12.9	13.2

The average cost of the power procured from electricity board for consumer no. 102693892 is Rs 13.2/- per kWh.

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Description	Unit	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Jan-21	Average
Consumer No.: 102002538		Tariff Category: LT I B						
Meter No.: 7977322		Adani Electricity						
Energy Consumption	KWH	77	88	134	231	239	255	171
Bill	Rs	600	630	960	1710	1770	1670	1223
Cost	Rs/KWH	7.8	7.2	7.2	7.4	7.4	6.5	7.2

The average cost of the power procured from electricity board for consumer no. 102002538 is Rs 7.2/- per kWh.

The overall average cost of the power procured from electricity board is Rs 11.3/- per kWh.

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IV Lighting System

Institute has replaced maximum number of lights with LED lamps & initiated installation of LED lights thereby replacing remaining Conventional Lights.

The details are as under.

Location	Type of Light	No. of Lights
Aided Building		
Ground Floor	TFL	22
	LED	89
First Floor	TFL	43
	LED	46
Second Floor	TFL	41
	LED	31
Third Floor	TFL	37
	LED	46
Fourth Floor	TFL	77
	LED	9
Fifth Floor	TFL	18
	LED	2
Sixth Floor	TFL	18
	LED	1
Seventh Floor	LED	18
Self-Finance		
Fourth Floor	TFL	33
Fifth Floor	TFL	36

Abbreviations:

LED: Light Emitting Diode Lamp

TFL: Tubular Fluorescent Lamp

The efficacy of LED lamps is 100 to 140 lumen per watt as against 80-90 for TFLs; 60 to 70 for PLs, 10 to 15 for GLS and 50 to 60 for MV lamps. The light emittance of LED is typically 120 to 140° Cone as against 360° for all the other fittings. It is therefore possible to save 30 to 60% energy by replacing various lamps with LED.

The details are as under,

Description	Unit	TFL
		36 W
Rating of the lamp	Watt	36
Rating of the switchgear	Watt	5
Power consumption of the lamp	Watt	41

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Description	Unit	TFL
		36 W
Alternative Lamp: LED Lamp		
Rating of the lamp	Watt	18
Rating of the switchgear	Watt	2
Power consumption of the lamp	Watt	20
Controllable loss		
Loss	Watt	21
	% Present	51%
Saving Potential		
Number of lamps	No	325
Cost of power	Rs/kWh	11.3
Operating Period	Hr/Day	5
	Day/Year	270
Energy Saving	kW	6.83
	kWh/Year	9214
	L Rs/Year	1.0
Economics		
Investment	L Rs	2.2
Payback period	Month	25.3

Observations and Recommendations:

- The illumination level is generally as per the norms; the illumination level is higher mainly due to usage of day light.
- The use of daylight has been maximized through windows.
- The lamps are strategically located to optimize usage of day light.
- The practice of switching off the lamps in the unoccupied areas has been followed.
- Occupancy sensors may be installed for washroom lighting.

It is suggested to replace the conventional lamps with LED lamps.

The expected savings shall be around 9214 kWh/Year or 1.0 Lakh/year. The investment shall be around 2.2 Lakh and payback period is 25.3 months.

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V Air Conditioners

Air conditioning system is basically provided to maintain comfortable ambience inside the premises by maintaining the temperature (and relative humidity, at times) at appropriate levels. The performance of human being is optimal at the temperature of 24 ± 2 °C and at relative humidity (RH) of $60 \pm 5\%$.

The warmer and humid air from the premises is drawn and fed to the Air Conditioning System by a circulating fan. This air is chilled in an evaporator by vaporizing the refrigerant and is distributed throughout the conditioned area. The refrigerant is pressurized by a compressor and subsequently cooled and condensed by an air-cooled condenser. The compressor and condenser are placed in an outdoor unit, located on the external side of the premise. While the circulating fan and

The details are as under,

Location	Quantity
Aided Building	
Ground Floor	16
First Floor	21
Second Floor	20
Third Floor	20
Fourth Floor	10
Fifth Floor	6
Sixth Floor	6
Seventh Floor	4
Self-Finance	
Fourth Floor	13
Fifth Floor	14

Observations:

- The air conditioners are switched off, when not in use.
- The hall temperature was observed to be 24 to 26 °C; which are standard values.
- The overall condition of indoor as well as outdoor units is satisfactory.
- It is suggested to procure energy efficient machines of 5 star rating while making new purchases.

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VI Renewable Energy

Solar Photovoltaic:

The possibility of installing solar photovoltaic system with NET metering may be assessed. The typical cost of such system is Rs 50,000/- to Rs 60,000/- per kWh, giving a payback period of less 3 to 4 years.

The possibility of installing the system on ESCO basis may be ascertained.

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VII Environmental System

Ventilation & Air Quality:

- The air ventilation is adequate. It is suggested to provide additional fresh air through windows, fresh air / exhaust fans, whatever is feasible.
- It has been a general practice to switch off the fans & lights in an occupied area.
- The campus is well covered with green plants to improve air quality. There are total 68 plants of different categories within the campus.



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VIII Water Management

Consumption Pattern:

The water supplied by the municipal corporation is used only for drinking; while borewell water is used for other applications like toilets, washing of utensils and other requirements.

The incoming water from the municipal corporation is metered.



The consumption pattern was analyzed by the water bills. The details are as under.

Municipal Water

There are three municipal water connections for St Francis Institute of Management and Research Campus. The details are as under.

Connection	Period	Days	Consumption	Amount	Cost
			KL	Rs	Rs/KL
PN0038294	17/10/19 to 21/01/20	96	2019	18966	9.4
	16/07/19 to 17/10/19	93	1587	15133	9.5
	22/04/19 to 16/07/19	85	658	6796	10.3
	21/01/19 to 22/04/19	91	2646	24996	9.4

There are about 4552 students and staff members. The specific water consumption was computed based on the number of persons and working days. The details are as under.

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Period	Days	Consumption	Specific Consumption
		KL	L/Day/Person
17/10/19 to 21/01/20	96	2019	5
16/07/19 to 17/10/19	93	1587	4
22/04/19 to 16/07/19	85	658	2
21/01/19 to 22/04/19	91	2646	6

The specific water consumption is within the nominal range against the typical values of 6 to 8 Liters per person.

The possibility of providing low flow taps/flushing system at major locations may also be evaluated.



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Water Purifiers:

The water purifiers & coolers are installed on each floor and bottled water is not used in the campus.



Rain Water Harvesting:

The rain water from the terrace area is being rained through the pipes. There is a provision to store the water in well after filtration by rain water harvesting.

Rain water harvesting is implemented.



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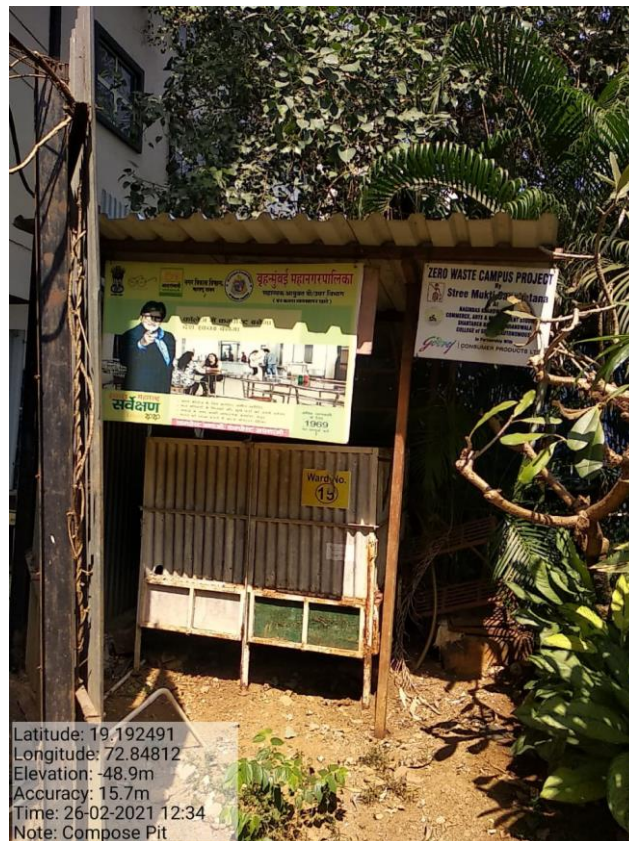
VIII Waste Generation & Management

Sewage & Waste Water:

The sewage is fed in to the municipal drainage. This is a common practice and the municipal corporation which charges cess towards the sewage charges.

Solid Waste:

The organic as well as inorganic waste is segregated in the college premises. The organic waste is used to generate manure by composting.



The non-organic waste is collected in garbage bins and disposed of through common system.

Electronic waste collected is handed over to scrap collector/ Environmental Consultant.

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IX Infrastructure & Safety

Movement on-campus (Distributed / non-distributed leading to crowds)

The premises are provided with single staircase with necessary entrance to ensure quick and effective movement in normal conditions.

Parking space:

There is less parking space for vehicles/four wheelers due to space constraints. Nonetheless, parking space has been provided for faculty.

Almost all the students and most of the faculty members avail public transport system which is very convenient due to efficient bus services.

Fire-fighting & fire escape system:

There are efficient fire extinguishers in the premises; which are checked / refilled as per the stipulated frequency.



The premises are provided with single staircase with necessary entrance to ensure quick and effective movement in normal conditions and for emergency the assembly point is provided at first floor.

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Draining system:

The drains from the washrooms are connected to the municipal drainage; which is a common practice in the colleges in and around Mumbai.

It is neither feasible nor practical to segregate the drains, install a sewage treatment plant and recycle the treated water for toilet flushing and / or gardening.

Seepage in the building:

The premise was visually inspected for seepages.

No seepages were observed in any of the places.

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XI Green Culture

Computers/Laptops:

1. The LCD monitors & Laptops has been procured, which are energy efficient.
2. These monitors are not only energy efficient but also generate minimal heat and cut down on air conditioning load.

Recommendations:

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

1. An 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.
3. Discourage use of screen savers, which has similar power consumption.

Paper-less communication:

The major internal as well as external communication is through electronic medium.

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.

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