



Nutan Vidyalaya Shikshan Sanstha's

**Nutan Mahavidyalaya, Selu Dist Parbhani**

*Affiliated to*  
**Swami Ramanand Teerth Marathwada University, Nanded**



**Electrical  
Audit 2021-  
22**

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SELU, Dist. Parbhani



## Introduction

Nutan Mahavidyalaya, Selu has been established on 15<sup>th</sup> June 1968 in the building of Nutan Vidyalaya, Selu. The pleasure and proud movement of college is-- Swami Ramanand Teerth visited the college at the time of building construction. The college has been settled in the new building which located at Jintoor Road Selu, on 15<sup>th</sup> June, 1970. The college has been accredited by NAAC with 'B' Grade in the year 2003 and reaccredited with 'B' Grade in the year 2013. The college has excellent, highly qualified & dedicated faculties with good infrastructure, disciplines and competent administration with the track of good results in all the disciplines.

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 submit an annual Green Audit Report. Also it is our responsibility 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 Audit Assessment Team headed by Dr. S. S. Kulkarni, Principal, Nutan Mahavidyalaya, Selu Dist Parbhani.

### Objectives:

- To determine the electricity consumption in the campus.
- To increase the renewable energy sources in the campus area.
- To assess whether the measures implemented by Nutan Mahavidyalaya, Selu has helped to reduce the Carbon Footprint.
- To assess whether non-academic activities of the Institution support to Collection, recovery, reuse and recycling of solid wastes etc. which is harmful to the environment.
- Suggestions & recommendations to improve the Green Campus status of the institution.

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### Team Members:

The following are the members of the Green Audit Team.

Sr no.	Name	Designation
1	Dr. P. R. Kanthale	Head, Department Of Botany, NM Selu
2	Dr. B. K. Kumthekar	Head, Department Of Physics, NM Selu
3	Mr. R. B. Faritkhane	Lab. Assistant, Department Of Physics, NM Selu
4	Mr. V. S. Rathod	Lab. Assistant, Department Of Botany, NM Selu

### Energy Consumption in the Campus

There are seven (07) number of electricity meters in the campus. There brief information as follows:

Sr. no	Meter no.	Place in the campus
1	532530011129	NMS BCA LAB
2	532530027131	NMS BOTANTY LAB
3	532530169156	CHEMISTRY LAB
4	532530166971	WOMEN HOSTEL
5	532530076409	BCA CLASS ROOM
6	532530037390	SRB BOYS HOSTEL
7	532530010475	SRB BOYS HOSTEL

Sr. No.	Name of Particulars	Total No
		<b>225</b>
01	Total No. of Electrical fans	<b>25</b>
02	Exhaust fans	<b>03</b>
03	Air Conditioner	<b>125</b>
04	Total No. of Tubes	<b>110</b>
05	Total No. of LED lamps	<b>160</b>
	Total No. of LED tubes	<b>10</b>
06	Street LED focus	<b>50</b>
07	Total No. of CFL lamps	<b>450</b>
08	Total No. of Sockets	

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	<b>Water Motor</b>	
	1 HP	02
	2 HP	01
	3 HP	01
	5 HP	01
	RO motors	
	<b>R.O. Motors</b>	01
	1KW	
	250W	02
		03
10	Water Cooler	112
11	No. of Computer	36
12	Printers	05
13	Xerox Machine	05
14	Inverters	23
15	LCD TV	01
16	Smart Board	06
17	LCD Projectors	06

Average Electricity Consumption / Month = 96 KW Unit

**USE OF RENEWABLE ENERGY:** There are 05 solar units are working. Each one has 12 W powers. Therefore, total power receive from solar energy is 60 W.

### Solar LED Lamps (focus) With Panel Photos



  
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Solar Units Photo

## Solar Water Heater



By using these renewal energy sources, we have reduced one electricity meter. As earlier we have 08 electricity meters but now a day as mentioned above we have 07 meters in our campus.

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## CARBON FOOTPRINT REDUCTION

**Carbon footprint** is historically defined as *the total set of greenhouse gas emissions caused by an individual, event, organization or product, expressed as carbon dioxide equivalent.*

### 1. Installing energy-efficient lighting system

The Institution has reduced CO<sub>2</sub> emissions indirectly by replacing high energy-consuming electric bulbs with energy-efficient CFL/LED Lamps & tubes lighting systems. To understand the carbon emission reduction, it is appropriate to compare the units of electricity consumed between incandescent lamps and CFL.

The brief explanations of the above statement is as follows

Total no. of incandescent lamps used earlier 70

Average energy consumption by an incandescent lamp 60 W

Energy consumed by lamp is  $60 \times 70 = 4200$  watt per hour

Energy consumed by 70 lamps for 5 hr/day 21 kW hr or 21 units

We consider 300 days in a year then  $21 \text{ kW hr} \times 300 = 6300 \text{ kW hr / year}$

Energy consumption of 70 lamps for 300 days/year 6300 kW hr or 6300 units

**70 incandescent lamps are replaced with 70 CFL**

Average energy consumption by CFL lamp 15W

Energy consumed by CFL is  $15 \times 70 = 1050$  Watt per hour

Energy consumed by 70 CFL for 5 hr/day  $1050 \times 5 = 5.250$  kW hr per day

Energy consumption of 70 CFL for 300 days/year **1575 kW hr or 1575 units**

Energy saved by CFL for 300 days/year  $6300 - 1575 = 4725 \text{ kW hr or } 4725 \text{ Units}$

### Carbon Footprint reduction analysis

**1 incandescent bulb consumes 90 units of energy; 1 LED bulb consumes 22.5 units of energy.**

First, it is appropriate to analyse the carbon emission due to consumption of 6300 units of electricity by 70 incandescent lamps per year. The standard tool of analysis employed in this Green Audit is coal equivalent of electricity.

0.538 kg of coal is required to produce 1 unit of electricity.

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Total units of electricity consumed by 70 incandescent lamps = **6300 units**

Coal equivalent of 6300 units ( $6300 \times 0.538$  kg coal) = 3389 kg or **3.4 tonnes**.

1 kg coal emits 2.86 kg CO<sub>2</sub> into the atmosphere.

At this rate, 3389 kg coal emits ( $3389 \times 2.86$ ) = 9692.54 kg or **9.7 tonnes of CO<sub>2</sub>**.

The following are the CO<sub>2</sub> reduction measures adopted in the Institution.

### 1. CFL

70 incandescent lamps were replaced with 70 CFL which consume 1575 units of electricity.

At this rate the coal equivalent ( $1575 \times 0.538$  kg) = **847.35 kg or 0.85 tonnes**.

### LED lamps in the campus

The Institution has installed **160 LED tube lights** in the College campus. The power consumption and carbon footprint reduction are discussed below.

#### Formula for energy consumption

A 100-W bulb left on for 10 hr consumes  $100 \times 10 = 1000$  W hr, i.e. 1 kW hr, which is 1 unit. Similarly a 10-W bulb left on for 100 hr leads to the consumption of 1 unit of electricity. The Institution procured 20-W bulbs numbering 100, which had been fixed in the renovated campus.

#### Average power consumption analysis

##### Assumption

On average, a bulb is on for 5 hours per day. The bulbs burn for 300 days in a year. The remaining 65 days are considered holidays. Based on the above information, the total units of power consumed by 160 LED bulbs for 1 year at the rate of 5 hours per day is Watt rating of bulb  $\times$  unit hour  $\times$  quantity of bulbs  $\times$  No. of days = Total units or kW hr.

$20 \text{ W} \times 5 \text{ hr} \times 160 \times 300 = 48,00,000 \text{ W}$ , which is **4800 units of electricity**.

It is appropriate here to calculate the quantity of coal required to generate 4800 units of electricity.

0.538 kg coal is required to produce 1 unit of electricity. Hence, the total quantity of coal required to produce 4800 units of electricity is  $4800 \times 0.538$  kg = **2582.4 kg**.

Carbon reduction through this measure is based on the calculation that 1 kg coal emits 2.86 kg of CO<sub>2</sub>.

Hence CO<sub>2</sub> emitted by **2582.4 kg of coal** ( $2582.4 \times 2.86$ ) = **7385.66 kg**.

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The real carbon reduction value can be assessed if the energy consumption of 160 LED lights is compared with that of 160 incandescent bulbs. One incandescent bulb consumes 90 units of electricity. Therefore, 160 bulbs consume 14400 units.

But 160 LED tubes consume only 4800 units of electricity. Replacement value in favour of carbon emission is  $(14400 - 4800) = 9600$  units of electricity.

Coal required for generating 9600 units of electricity  $(9600 \times 0.538 \text{ kg}) = 5165 \text{ kg}$ .

Based on the calculation that 1 kg coal emits 2.86 kg CO<sub>2</sub>, the total quantity of CO<sub>2</sub> emitted by 5165 kg coal  $(5165 \times 2.86) = 14771 \text{ kg}$  or **14.7 tonnes**.

Carbon footprint reduction through installation of 100 LED lamps per year is 14771 kg or **14.7 tonnes of CO<sub>2</sub>**.

### **Solar Energy for electricity**

Solar energy is the most feasible and viable green energy available around the globe. Its viability is very high in tropical countries like India. Five solar panels, each measuring 4 × 3 ft, were installed on the terrace of the college building where light intensity is very high. Each panel produces 12 W of electricity. However, the panels will function effectively only for about 10 months per year (300 days). Monsoon and clouds prevent sun's rays for more than 2 months. At this rate, the 05 panels produce electricity to the tune of  $12 \text{ W} \times 05 \times 300 \text{ days} = 18,000 \text{ W}$ , which is equivalent to 18 units of electricity per year. This solar power PV power system is connected to the college grid via a solar string inverter. The 18-kW power generated per year from this solar panel, the coal equivalent  $(18 \times 0.538) = 9.684 \text{ kg}$  coal. The CO<sub>2</sub> equivalent is  $9.684 \times 2.86 = 27.69 \text{ kg}$ .

### **Solar energy for Water heater**

In campus there is women's Hostel in which consisting 16 rooms. Each room 3 girls are living together. If we use a geyser of 10 liters capacity, it has power consumption 1500 watt per hour. Therefore  $16 \times 1500 = 24000 \text{ w hr}$  is required.

Total power consumed in year is  $24 \text{ kwhr} \times 300 \text{ days} = 7200 \text{ kwhr}$  or 7200 units/year

Instead of this we have used solar water heater for women's Hostel. Therefore,

Coal required for generating 7200 units of electricity  $(7200 \times 0.538 \text{ kg}) = 3873.6 \text{ kg}$ .

Based on the calculation that 1 kg coal emits 2.86 kg CO<sub>2</sub>, the total quantity of CO<sub>2</sub> emitted by 3873.6 kg coal  $(3873.6 \times 2.86) = 11078.49 \text{ kg}$  or **11.07 tonnes**.

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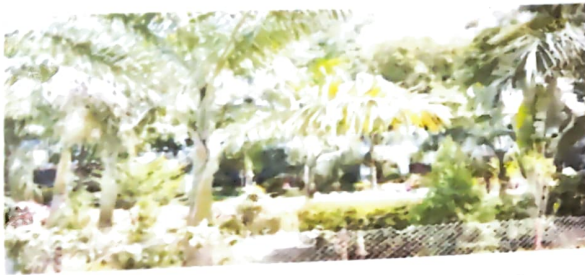




Carbon footprint reduction through installation of Solar Water heater per year is 11078.49 kg or 11.07 tonnes of CO<sub>2</sub>.

### Campus Plantations:

Our total campus area is 113313 sq. M. out of which plantation covered area 16032.54 sq. M. Generally trees absorb CO<sub>2</sub> and emit Oxygen, which is very useful for us. Therefore this plantation plays an important role in the reduction of CO<sub>2</sub> from the environment.



### Suggestions & Recommendations:

- Increase the use of CFL/LED lamps
- Use the solar inverter.
- Use the instruments which operate on solar energy
- Increase the number of plants which reduce the greenhouse effect.



Coordinator (IQAC)



Principal

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