# Report

# On

# Green Audit

# At

# Dr. Madhukarrao Wasnik P.W.S. Arts, Commerce, Science College, Nagpur

# (Year 2018-19)

Prepared by

**Nutan Urja Solutions**

A 703, Balaji Witefield, Near Sunni's World,

Sus Road, Sus, Pune 411 021

Phone: 83568 18381. Email: nutanurja.solutions@gmail.com

# Contents

## Acknowledgement

We at Nutan Urja Solutions, Pune, express our sincere gratitude to the management of Dr. Madhukarrao Wasnik P.W.S. Arts, Commerce, Science College, Nagpur for awarding us the assignment of Green Audit of their college premises.

We are also thankful to various Head of Departments & other Staff members for helping us during the field measurements.

We hope that the recommendations stated in this report will be useful and worthy of discussions to take things forward to help implementation of energy conservation measures and green practices. While we have made every attempt to adhere to high quality standards, in both data collection and analysis through the report, we would welcome your suggestions so as to improve upon this report further.

## Executive Summary

Green Audit of Dr. Madhukarrao Wasnik P.W.S. Arts, Commerce, Science College, Nagpur is conducted by Nutan Urja Solutions, Pune. Based On the audit field study, following important points can be presented.

**1. Present Energy Consumption**

Dr. Madhukarrao Wasnik P.W.S. Arts, Commerce, Science College, Nagpur uses Electrical Energy as the source of Energy for various equipment in the college campus. In the following Table, we present the details of Energy Consumption.

**Table no 1: Details of energy consumption**

| Sr no | Parameter | Energy consumed, (Units) | CO2 Emission (MT) |
|---|---|---|---|
| 1 | Maximum | 3,145 | 2.52 |
| 2 | Minimum | 1,608 | 1.29 |
| 3 | Average | 2,470 | 1.98 |
| 4 | Total | 29,645 | 23.72 |

**2. Various Measures Adopted for Energy Conservation**

1. Usage of STAR Rated ACs at new installations
2. Usage of LED lights at some indoor locations
3. Usage of LED Lights for outdoor lighting.

**3. Usage of Renewable Energy**

The collage has installed **20 kW** Solar PV Power Plant.

**4. Rain Water Harvesting**

The College has installed the Rainwater harvesting project, to reduce dependency on municipal corporation water supply.

**5. Waste Management**

The College has already installed a Bio composting Plant, wherein, the bio-degradable waste is composted & is used as fertilizer for the garden.

The internal communication is through emails and hence there is hardly any generation of e-Waste in the premises.

## 6. Notes and Assumptions

1. Daily working hours-10 Nos
2. Annual working Days-250 Nos
3. Average Rate of Electrical Energy : **Rs 11/- per kWh**

## Abbreviations

| | | |
|---|---|---|
| CFL | : | Compact Fluorescent Lamp |
| FTL | : | Fluorescent Tube Light |
| LED | : | Light Emitting Diode |
| V | : | Voltage |
| I | : | Current |
| kW | : | Kilo- Watt |
| kWh | : | kilo-Watt Hour |
| kVA | : | Active Power |

# 1. Introduction

People's Welfare society established its first college, named PWS College of Arts and Commerce, on Kamptee Road, Nagpur in 1967. This is one of the biggest and well known institutions for marginalized sections in North Nagpur. Since its inception, more than 4000 students have joined the college every year and with various facilities at its disposal, the college is one of the best colleges in Northern Nagpur. The institute envisions molding of students who have humanitarian views, scientific approaches and are firm believer in positive social change. Such inspired youth will uphold the human values of liberty, equality and fraternity, and also shoulder the responsibilities of taking their nations to greater heights. The institute also offers affordable and various courses in the disciplines of Arts and Commerce.

## 1.1 Objectives

1. To study present level of Energy Consumption
2. To Study the present $CO_2$ emissions
3. To assess the various equipment/facilities from Energy efficiency aspect
4. To measure various Electrical parameters
5. To study Scope for usage of Renewable Energy
6. To study various measures to reduce the Energy Consumption

## 1.2 Audit methodology

1. Study of connected load
2. Study of various Electrical parameters
3. To prepare the Report with various Encon measures with payback analysis

## 2. Study of Electrical Energy Consumption

In this chapter, electricity bills are studied for the analysis of electrical energy consumption.

**Table no 2.1: Summary of electricity bills**

| No | Month | Energy (kWh) | Bill Amount (Rs) |
|---|---|---|---|
| 1 | Aug-19 | 3,048 | 45,540 |
| 2 | Jul-19 | 3,145 | 43,087 |
| 3 | Jun-19 | 2,945 | 46,780 |
| 4 | May-19 | 3,116 | 50,350 |
| 5 | Apr-19 | 2,644 | 39,920 |
| 6 | Mar-19 | 2,399 | 35,480 |
| 7 | Feb-19 | 1,781 | 24,400 |
| 8 | Jan-19 | 1,868 | 25,592 |
| 9 | Dec-18 | 1,608 | 22,030 |
| 10 | Nov-18 | 1,670 | 22,879 |
| 11 | Oct-18 | 2,680 | 36,716 |
| 12 | Sep-18 | 2,741 | 37,552 |
| | **Total** | **29,645** | **430,324** |

Variation in energy consumption is as follows,

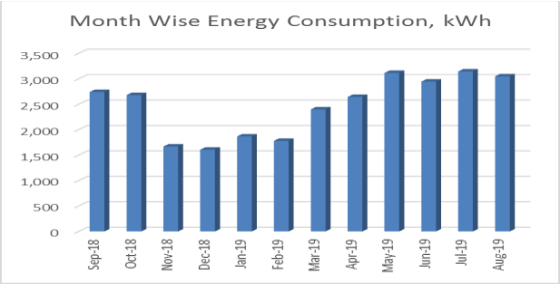



**Figure 2.1: Month wise energy consumption**

Monthly variation in electricity bill is as follows,

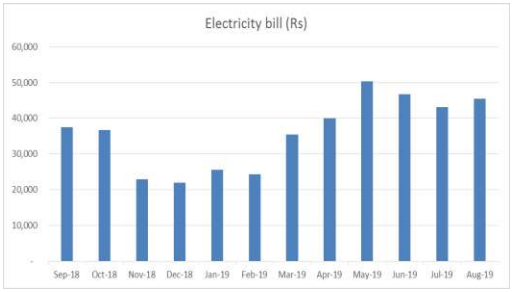



**Figure 2.2: Month wise electricity bill**

Key observations of electricity bill are as follows,

**Table no 2.2: Key observations**

| Sr no | Parameter | Energy consumed, (Units) | CO2 Emission (MT) |
|---|---|---|---|
| 1 | Maximum | 3,145 | 2.52 |
| 2 | Minimum | 1,608 | 1.29 |
| 3 | Average | 2,470 | 1.98 |
| 4 | Total | 29,645 | 23.72 |

## 3. Carbon Foot printing

**1. A Carbon Foot print** is defined as the Total Greenhouse Gas emissions ($CO_2$ emissions), emitted due to various activities. In this we compute the emissions of Carbon-Di-Oxide, by usage of the various form of Electrical Energy used by the College for performing its day to day activities

**2. Basis for computation of $CO_2$ Emissions:**

The basis of Calculation for $CO_2$ emissions due to Electrical Energy is as under

- 1 Unit (kWh) of Electrical Energy releases **0.8 Kg of $CO_2$** into atmosphere.

Based on the above Data we compute the $CO_2$ emissions which are being released in to the atmosphere by the College due to its Day to Day operations

We herewith furnish the details of various forms of Energy consumption as under

**Table 3.1: Month wise Consumption of Electrical Energy & CO2 Emissions**

| No | Month | Energy Consumed, kWh | CO2 Emissions, MT |
|---|---|---|---|
| 1 | Aug-19 | 3,048 | 2.44 |
| 2 | Jul-19 | 3,145 | 2.52 |
| 3 | Jun-19 | 2,945 | 2.36 |
| 4 | May-19 | 3,116 | 2.49 |
| 5 | Apr-19 | 2,644 | 2.12 |
| 6 | Mar-19 | 2,399 | 1.92 |
| 7 | Feb-19 | 1,781 | 1.42 |
| 8 | Jan-19 | 1,868 | 1.49 |
| 9 | Dec-18 | 1,608 | 1.29 |
| 10 | Nov-18 | 1,670 | 1.34 |
| 11 | Oct-18 | 2,680 | 2.14 |
| 12 | Sep-18 | 2,741 | 2.19 |
| | **Total** | **29,645** | **23.72** |

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

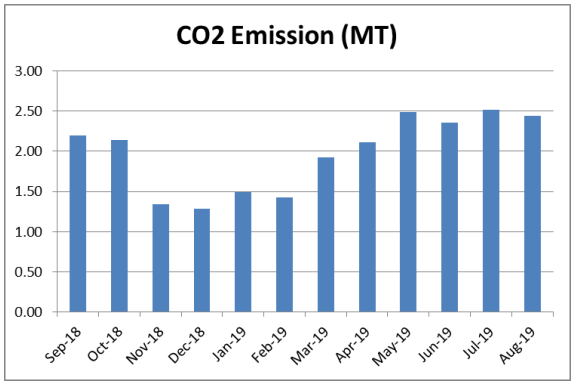



**Figure 3.1: Month wise CO2 Emission**

# 4. Study of Usage of Alternate Energy

In this Chapter, we compute the percentage of Usage of Alternate/Renewable Energy to Annual Energy Requirement of the College. The College has installed Solar PV System of 20kW capacity.

**Table 4.1: Computation of % Usage of Alternate Energy to Annual Energy Requirement**

| No | Particulars | Value | Unit |
|---|---|---|---|
| 1 | Annual Energy Purchased from MSEDCL | 29,645 | kWh/Annum |
| 2 | Energy Generated by Roof Top Solar PV System | 30000 | kWh/Annum |
| 3 | Total Energy Requirement of College | 59645 | kWh/Annum |
| 4 | % of Usage of Alternate Energy to Annual Energy Requirement | 50 | **%** |

**Photograph of Solar PV plant**

## 5. Study of Rain Water Harvesting

The College has already installed Rain Water Harvesting project, wherein the rain water falling on the terrace is collected and through pipes it is fed to underground Water Storage tank. This stored water is then reused for domestic purpose.

**Photograph of Rain Water Harvesting pipe**

# 6. Study of Waste Management

## 6.1 Solid Waste Management

The College has already installed a Bio composting Plant, wherein, the bio-degradable waste is composted & is used as fertilizer for the garden.

**Photographs of Bio Composting Storage Tanks:**

## 6.2 e-Waste Management

The internal communication is through emails and there is hardly any generation of e-Waste in the premises.

# 7. Study of Green Practices

## 7.1 No of students who don't use own Vehicle for coming to Institute

Out of total students coming to Institute, about 60% students use own Automobile.

## 7.2 Usage of Public Transport

During the Students transport study, it was revealed that the local students who are residing near areas make use of Public Transport like Municipal Transport local buses, local sharing type auto rickshaws. Some students use bicycles. Institute encourages students to not to use automobiles.

## 7.3 Pedestrian Friendly Roads

The Institute has well defined pedestrian foot paths as to facilitate the easy movement of the students within the campus.

**Photograph of Road within campus**

## 7.4 Plastic Free Campus

The Institute is an active participant in the Government of India's most prestigious project of SWATCHH BHART ABHIYAN. The Institute has displayed boards in the Campus, to make the campus plastic free. Various measures adopted for this purpose are as follows

- Installation of Separate waste bins for Dry waste & wet waste
- Usage of paper tea cups in the Institute canteen
- Display of boards in the campus for Plastic Free campus

## 7.5 Paperless Office

The internal communication of the Institute is through the Internet. There are hardly any day to day operations, where printing is required.

## 7.6 Green Landscaping with Trees and Plants

The Institute has beautiful maintained Garden.

**Figure 7.1: Beautiful maintained Garden of college**

## 8. Recommendations

- Plantation in college premises
- Ban on tobacco consumption in college premises. Teaching students about harm caused by tobacco on health.
- Teach students about importance of Energy Saving. Encourage students and teachers to switch off lights and fans when not in use.
- Teach students about importance of cleanliness. Conduct college cleanliness drive with the help of students to pick up plastic packet, paper bits etc once in month in college premises.
- Guest lecture arrangement on E-waste, solid waste and liquid waste management.

# Report

# On

# Green Audit

# At

# Dr. Madhukarrao Wasnik P.W.S. Arts, Commerce, Science College, Nagpur

# (Year 2019-20)

Prepared by

**Nutan Urja Solutions**

A 703, Balaji Witefield, Near Sunni's World,

Sus Road, Sus, Pune 411 021

Phone: 83568 18381. Email: nutanurja.solutions@gmail.com

# Contents

## Acknowledgement

We at Nutan Urja Solutions, Pune, express our sincere gratitude to the management of Dr. Madhukarrao Wasnik P.W.S. Arts, Commerce, Science College, Nagpur for awarding us the assignment of Green Audit of their college premises.

We are also thankful to various Head of Departments & other Staff members for helping us during the field measurements.

We hope that the recommendations stated in this report will be useful and worthy of discussions to take things forward to help implementation of energy conservation measures and green practices. While we have made every attempt to adhere to high quality standards, in both data collection and analysis through the report, we would welcome your suggestions so as to improve upon this report further.

## Executive Summary

Green Audit of Dr. Madhukarrao Wasnik P.W.S. Arts, Commerce, Science College, Nagpur is conducted by Nutan Urja Solutions, Pune. Based On the audit field study, following important points can be presented.

**1. Present Energy Consumption**

Dr. Madhukarrao Wasnik P.W.S. Arts, Commerce, Science College, Nagpur uses Electrical Energy as the source of Energy for various equipment in the college campus. In the following Table, we present the details of Energy Consumption.

**Table no 1: Details of energy consumption**

| Sr no | Parameter | Energy consumed, (Units) | CO2 Emission (MT) |
|---|---|---|---|
| 1 | Maximum | 3,579 | 2.86 |
| 2 | Minimum | 1,068 | 0.85 |
| 3 | Average | 1,761 | 1.41 |
| 4 | Total | 21,135 | 16.91 |

**2. Various Measures Adopted for Energy Conservation**

1. Usage of STAR Rated ACs at new installations
2. Usage of LED lights at some indoor locations
3. Usage of LED Lights for outdoor lighting.

**3. Usage of Renewable Energy**

The collage has installed **20 kW** Solar PV Power Plant.

**4. Rain Water Harvesting**

The College has installed the Rainwater harvesting project, to reduce dependency on municipal corporation water supply.

**5. Waste Management**

The College has already installed a Bio composting Plant, wherein, the bio-degradable waste is composted & is used as fertilizer for the garden.

The internal communication is through emails and hence there is hardly any generation of e-Waste in the premises.

## 6. Notes and Assumptions

1. Daily working hours-10 Nos
2. Annual working Days-250 Nos
3. Average Rate of Electrical Energy : **Rs 11/- per kWh**

## Abbreviations

| | | |
|---|---|---|
| CFL | : | Compact Fluorescent Lamp |
| FTL | : | Fluorescent Tube Light |
| LED | : | Light Emitting Diode |
| V | : | Voltage |
| I | : | Current |
| kW | : | Kilo- Watt |
| kWh | : | kilo-Watt Hour |
| kVA | : | Active Power |

# 1. Introduction

People's Welfare society established its first college, named PWS College of Arts and Commerce, on Kamptee Road, Nagpur in 1967. This is one of the biggest and well known institutions for marginalized sections in North Nagpur. Since its inception, more than 4000 students have joined the college every year and with various facilities at its disposal, the college is one of the best colleges in Northern Nagpur. The institute envisions molding of students who have humanitarian views, scientific approaches and are firm believer in positive social change. Such inspired youth will uphold the human values of liberty, equality and fraternity, and also shoulder the responsibilities of taking their nations to greater heights. The institute also offers affordable and various courses in the disciplines of Arts and Commerce.

## 1.1 Objectives

1. To study present level of Energy Consumption
2. To Study the present $CO_2$ emissions
3. To assess the various equipment/facilities from Energy efficiency aspect
4. To measure various Electrical parameters
5. To study Scope for usage of Renewable Energy
6. To study various measures to reduce the Energy Consumption

## 1.2 Audit methodology

1. Study of connected load
2. Study of various Electrical parameters
3. To prepare the Report with various Encon measures with payback analysis

## 2. Study of Electrical Energy Consumption

In this chapter, electricity bills are studied for the analysis of electrical energy consumption.

**Table no 2.1: Summary of electricity bills**

| No | Month | Energy (kWh) | Bill Amount (Rs) |
|---|---|---|---|
| 1 | Sep-20 | 1,243 | 17,110 |
| 2 | Aug-20 | 1,317 | 16,090 |
| 3 | Jul-20 | 1,068 | 13,760 |
| 4 | Jun-20 | 3,579 | 49,032 |
| 5 | May-20 | 1,626 | 22,276 |
| 6 | Apr-20 | 1,626 | 22,276 |
| 7 | Mar-20 | 1,822 | 24,961 |
| 8 | Feb-20 | 1,645 | 25,200 |
| 9 | Jan-20 | 1,410 | 21,090 |
| 10 | Dec-19 | 1,753 | 27,370 |
| 11 | Nov-19 | 1,320 | 19,690 |
| 12 | Oct-19 | 2,726 | 43,350 |
| | Total | 21,135 | 302,206 |

Variation in energy consumption is as follows,

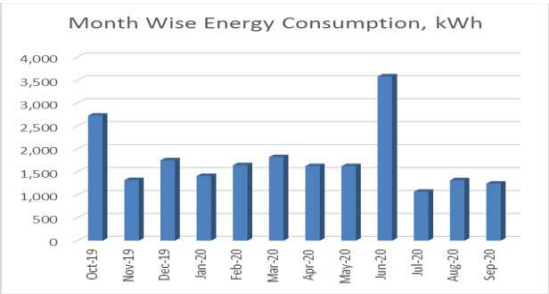



**Figure 2.1: Month wise energy consumption**

Monthly variation in electricity bill is as follows,

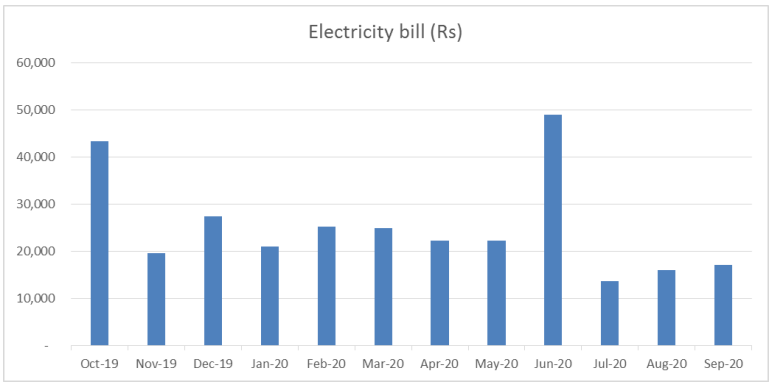



**Figure 2.2: Month wise electricity bill**

Key observations of electricity bill are as follows,

**Table no 2.2: Key observations**

| Sr no | Parameter | Energy consumed, (Units) | CO2 Emission (MT) |
|---|---|---|---|
| 1 | Maximum | 3,579 | 2.86 |
| 2 | Minimum | 1,068 | 0.85 |
| 3 | Average | 1,761 | 1.41 |
| 4 | Total | 21,135 | 16.91 |

## 3. Carbon Foot printing

**1. A Carbon Foot print** is defined as the Total Greenhouse Gas emissions ($CO_2$ emissions), emitted due to various activities. In this we compute the emissions of Carbon-Di-Oxide, by usage of the various form of Electrical Energy used by the College for performing its day to day activities

**2. Basis for computation of $CO_2$ Emissions:**

The basis of Calculation for $CO_2$ emissions due to Electrical Energy is as under

- 1 Unit (kWh) of Electrical Energy releases **0.8 Kg of $CO_2$** into atmosphere.

Based on the above Data we compute the $CO_2$ emissions which are being released in to the atmosphere by the College due to its Day to Day operations

We herewith furnish the details of various forms of Energy consumption as under

**Table 3.1: Month wise Consumption of Electrical Energy & CO2 Emissions**

| No | Month | Energy Consumed, kWh | CO2 Emissions, MT |
|---|---|---|---|
| 1 | Sep-20 | 1,243 | 0.99 |
| 2 | Aug-20 | 1,317 | 1.05 |
| 3 | Jul-20 | 1,068 | 0.85 |
| 4 | Jun-20 | 3,579 | 2.86 |
| 5 | May-20 | 1,626 | 1.30 |
| 6 | Apr-20 | 1,626 | 1.30 |
| 7 | Mar-20 | 1,822 | 1.46 |
| 8 | Feb-20 | 1,645 | 1.32 |
| 9 | Jan-20 | 1,410 | 1.13 |
| 10 | Dec-19 | 1,753 | 1.40 |
| 11 | Nov-19 | 1,320 | 1.06 |
| 12 | Oct-19 | 2,726 | 2.18 |
| | **Total** | **21,135** | **16.91** |

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

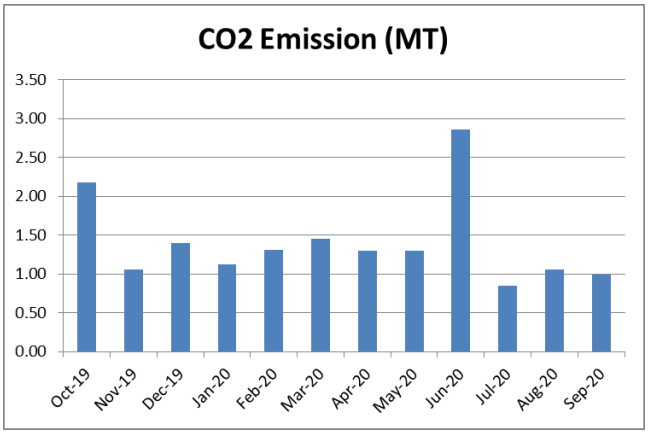



**Figure 3.1: Month wise CO2 Emission**

# 4. Study of Usage of Alternate Energy

In this Chapter, we compute the percentage of Usage of Alternate/Renewable Energy to Annual Energy Requirement of the College. The College has installed Solar PV System of 20kW capacity.

**Table 4.1: Computation of % Usage of Alternate Energy to Annual Energy Requirement**

| No | Particulars | Value | Unit |
|---|---|---|---|
| 1 | Annual Energy Purchased from MSEDCL | 21,135 | kWh/Annum |
| 2 | Energy Generated by Roof Top Solar PV System | 30000 | kWh/Annum |
| 3 | Total Energy Requirement of College | 51135 | kWh/Annum |
| 4 | % of Usage of Alternate Energy to Annual Energy Requirement | 59 | **%** |

**Photograph of Solar PV plant**

## 5. Study of Rain Water Harvesting

The College has already installed Rain Water Harvesting project, wherein the rain water falling on the terrace is collected and through pipes it is fed to underground Water Storage tank. This stored water is then reused for domestic purpose.

**Photograph of Rain Water Harvesting pipe**

# 6. Study of Waste Management

## 6.1 Solid Waste Management

The College has already installed a Bio composting Plant, wherein, the bio-degradable waste is composted & is used as fertilizer for the garden.

**Photographs of Bio Composting Storage Tanks:**

## 6.2 e-Waste Management

The internal communication is through emails and there is hardly any generation of e-Waste in the premises.

# 7. Study of Green Practices

## 7.1 No of students who don't use own Vehicle for coming to Institute

Out of total students coming to Institute, about 60% students use own Automobile.

## 7.2 Usage of Public Transport

During the Students transport study, it was revealed that the local students who are residing near areas make use of Public Transport like Municipal Transport local buses, local sharing type auto rickshaws. Some students use bicycles. Institute encourages students to not to use automobiles.

## 7.3 Pedestrian Friendly Roads

The Institute has well defined pedestrian foot paths as to facilitate the easy movement of the students within the campus.

**Photograph of Road within campus**

## 7.4 Plastic Free Campus

The Institute is an active participant in the Government of India's most prestigious project of SWATCHH BHART ABHIYAN. The Institute has displayed boards in the Campus, to make the campus plastic free. Various measures adopted for this purpose are as follows

- Installation of Separate waste bins for Dry waste & wet waste
- Usage of paper tea cups in the Institute canteen
- Display of boards in the campus for Plastic Free campus

## 7.5 Paperless Office

The internal communication of the Institute is through the Internet. There are hardly any day to day operations, where printing is required.

## 7.6 Green Landscaping with Trees and Plants

The Institute has beautiful maintained Garden.

**Figure 7.1: Beautiful maintained Garden of college**

## 8. Recommendations

- Plantation in college premises
- Ban on tobacco consumption in college premises. Teaching students about harm caused by tobacco on health.
- Teach students about importance of Energy Saving. Encourage students and teachers to switch off lights and fans when not in use.
- Teach students about importance of cleanliness. Conduct college cleanliness drive with the help of students to pick up plastic packet, paper bits etc once in month in college premises.
- Guest lecture arrangement on E-waste, solid waste and liquid waste management.

# Report

# On

# Green Audit

# At

# Dr. Madhukarrao Wasnik P.W.S. Arts, Commerce, Science College, Nagpur

# (Year 2020-21)

Prepared by

**Nutan Urja Solutions**

A 703, Balaji Witefield, Near Sunni's World,

Sus Road, Sus, Pune 411 021

Phone: 83568 18381. Email: nutanurja.solutions@gmail.com

# Contents

## Acknowledgement

We at Nutan Urja Solutions, Pune, express our sincere gratitude to the management of Dr. Madhukarrao Wasnik P.W.S. Arts, Commerce, Science College, Nagpur for awarding us the assignment of Green Audit of their college premises.

We are also thankful to various Head of Departments & other Staff members for helping us during the field measurements.

We hope that the recommendations stated in this report will be useful and worthy of discussions to take things forward to help implementation of energy conservation measures and green practices. While we have made every attempt to adhere to high quality standards, in both data collection and analysis through the report, we would welcome your suggestions so as to improve upon this report further.

## Executive Summary

Green Audit of Dr. Madhukarrao Wasnik P.W.S. Arts, Commerce, Science College, Nagpur is conducted by Nutan Urja Solutions, Pune. Based On the audit field study, following important points can be presented.

**1. Present Energy Consumption**

Dr. Madhukarrao Wasnik P.W.S. Arts, Commerce, Science College, Nagpur uses Electrical Energy as the source of Energy for various equipment in the college campus. In the following Table, we present the details of Energy Consumption.

**Table no 1: Details of energy consumption**

| Sr no | Parameter | Energy consumed, (Units) | CO2 Emmision (MT) |
|---|---|---|---|
| 1 | Maximum | 1,809 | 1.45 |
| 2 | Minimum | 649 | 0.52 |
| 3 | Average | 1,135 | 0.91 |
| 4 | Total | 13,616 | 10.89 |

**2. Various Measures Adopted for Energy Conservation**

1. Usage of STAR Rated ACs at new installations
2. Usage of LED lights at some indoor locations
3. Usage of LED Lights for outdoor lighting.

**3. Usage of Renewable Energy**

The collage has installed **20 kW** Solar PV Power Plant.

**4. Rain Water Harvesting**

The College has installed the Rainwater harvesting project, to reduce dependency on municipal corporation water supply.

**5. Waste Management**

The College has already installed a Bio composting Plant, wherein, the bio-degradable waste is composted & is used as fertilizer for the garden.

The internal communication is through emails and hence there is hardly any generation of e-Waste in the premises.

## 6. Notes and Assumptions

1. Daily working hours-10 Nos
2. Annual working Days-250 Nos
3. Average Rate of Electrical Energy : **Rs 11/- per kWh**

## Abbreviations

| | | |
|---|---|---|
| CFL | : | Compact Fluorescent Lamp |
| FTL | : | Fluorescent Tube Light |
| LED | : | Light Emitting Diode |
| V | : | Voltage |
| I | : | Current |
| kW | : | Kilo- Watt |
| kWh | : | kilo-Watt Hour |
| kVA | : | Active Power |

# 1. Introduction

People's Welfare society established its first college, named PWS College of Arts and Commerce, on Kamptee Road, Nagpur in 1967. This is one of the biggest and well known institutions for marginalized sections in North Nagpur. Since its inception, more than 4000 students have joined the college every year and with various facilities at its disposal, the college is one of the best colleges in Northern Nagpur. The institute envisions molding of students who have humanitarian views, scientific approaches and are firm believer in positive social change. Such inspired youth will uphold the human values of liberty, equality and fraternity, and also shoulder the responsibilities of taking their nations to greater heights. The institute also offers affordable and various courses in the disciplines of Arts and Commerce.

## 1.1 Objectives

1. To study present level of Energy Consumption
2. To Study the present $CO_2$ emissions
3. To assess the various equipment/facilities from Energy efficiency aspect
4. To measure various Electrical parameters
5. To study Scope for usage of Renewable Energy
6. To study various measures to reduce the Energy Consumption

## 1.2 Audit methodology

1. Study of connected load
2. Study of various Electrical parameters
3. To prepare the Report with various Encon measures with payback analysis

## 2. Study of Electrical Energy Consumption

In this chapter, electricity bills are studied for the analysis of electrical energy consumption.

**Table no 2.1: Summary of electricity bills**

| No | Month | Energy (kWh) | Bill Amount (Rs) |
|---|---|---|---|
| 1 | Jul-21 | 1809 | 26,010 |
| 2 | Jun-21 | 918 | 12,110 |
| 3 | May-21 | 649 | 18,600 |
| 4 | Apr-21 | 881 | 11,560 |
| 5 | Mar-21 | 952 | 13,050 |
| 6 | Feb-21 | 1321 | 18,190 |
| 7 | Jan-21 | 1215 | 16,750 |
| 8 | Dec-20 | 1121 | 15,300 |
| 9 | Nov-20 | 1025 | 13,710 |
| 10 | Oct-20 | 1165 | 16,330 |
| 11 | Sep-20 | 1243 | 17110 |
| 12 | Aug-20 | 1317 | 16090 |
| | **Total** | **13616** | **194810** |

Variation in energy consumption is as follows,

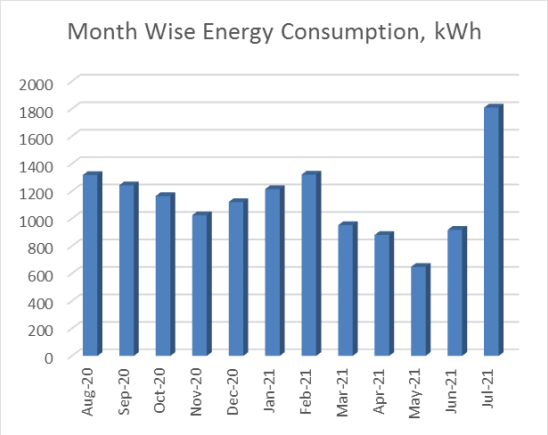



**Figure 2.1: Month wise energy consumption**

Monthly variation in electricity bill is as follows,

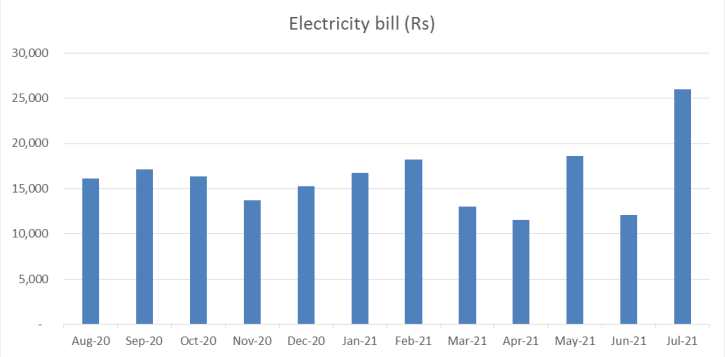



**Figure 2.2: Month wise electricity bill**

Key observations of electricity bill are as follows,

**Table no 2.2: Key observations**

| Sr no | Parameter | Energy consumed, (Units) | CO2 Emission (MT) |
|---|---|---|---|
| 1 | Maximum | 1,809 | 1.45 |
| 2 | Minimum | 649 | 0.52 |
| 3 | Average | 1,135 | 0.91 |
| 4 | Total | 13,616 | 10.89 |

## 3. Carbon Foot printing

**1. A Carbon Foot print** is defined as the Total Greenhouse Gas emissions ($CO_2$ emissions), emitted due to various activities. In this we compute the emissions of Carbon-Di-Oxide, by usage of the various form of Electrical Energy used by the College for performing its day to day activities

**2. Basis for computation of $CO_2$ Emissions:**

The basis of Calculation for $CO_2$ emissions due to Electrical Energy is as under

- 1 Unit (kWh) of Electrical Energy releases **0.8 Kg of $CO_2$** into atmosphere.

Based on the above Data we compute the $CO_2$ emissions which are being released in to the atmosphere by the College due to its Day to Day operations

We herewith furnish the details of various forms of Energy consumption as under

**Table 3.1: Month wise Consumption of Electrical Energy & CO2 Emissions**

| No | Month | Energy Consumed, kWh | CO2 Emissions, MT |
|---|---|---|---|
| 1 | Jul-21 | 1,809 | 1.45 |
| 2 | Jun-21 | 918 | 0.73 |
| 3 | May-21 | 649 | 0.52 |
| 4 | Apr-21 | 881 | 0.70 |
| 5 | Mar-21 | 952 | 0.76 |
| 6 | Feb-21 | 1,321 | 1.06 |
| 7 | Jan-21 | 1,215 | 0.97 |
| 8 | Dec-20 | 1,121 | 0.90 |
| 9 | Nov-20 | 1,025 | 0.82 |
| 10 | Oct-20 | 1,165 | 0.93 |
| 11 | Sep-20 | 1,243 | 0.99 |
| 12 | Aug-20 | 1,317 | 1.05 |
| | **Total** | **13,616** | **10.89** |

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

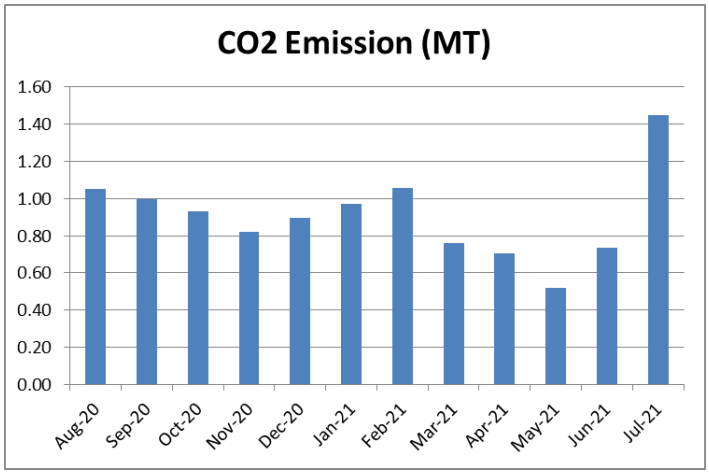



**Figure 3.1: Month wise CO2 Emission**

# 4. Study of Usage of Alternate Energy

In this Chapter, we compute the percentage of Usage of Alternate/Renewable Energy to Annual Energy Requirement of the College. The College has installed Solar PV System of 20kW capacity.

**Table 4.1: Computation of % Usage of Alternate Energy to Annual Energy Requirement**

| No | Particulars | Value | Unit |
|---|---|---|---|
| 1 | Annual Energy Purchased from MSEDCL | 13616 | kWh/Annum |
| 2 | Energy Generated by Roof Top Solar PV System | 30000 | kWh/Annum |
| 3 | Total Energy Requirement of College | 43616 | kWh/Annum |
| 4 | % of Usage of Alternate Energy to Annual Energy Requirement | 68.8 | **%** |

**Photograph of Solar PV plant**

## 5. Study of Rain Water Harvesting

The College has already installed Rain Water Harvesting project, wherein the rain water falling on the terrace is collected and through pipes it is fed to underground Water Storage tank. This stored water is then reused for domestic purpose.

**Photograph of Rain Water Harvesting pipe**

# 6. Study of Waste Management

## 6.1 Solid Waste Management

The College has already installed a Bio composting Plant, wherein, the bio-degradable waste is composted & is used as fertilizer for the garden.

**Photographs of Bio Composting Storage Tanks:**

## 6.2 e-Waste Management

The internal communication is through emails and there is hardly any generation of e-Waste in the premises.

# 7. Study of Green Practices

## 7.1 No of students who don't use own Vehicle for coming to Institute

Out of total students coming to Institute, about 60% students use own Automobile.

## 7.2 Usage of Public Transport

During the Students transport study, it was revealed that the local students who are residing near areas make use of Public Transport like Municipal Transport local buses, local sharing type auto rickshaws. Some students use bicycles. Institute encourages students to not to use automobiles.

## 7.3 Pedestrian Friendly Roads

The Institute has well defined pedestrian foot paths as to facilitate the easy movement of the students within the campus.

**Photograph of Road within campus**

## 7.4 Plastic Free Campus

The Institute is an active participant in the Government of India's most prestigious project of SWATCHH BHART ABHIYAN. The Institute has displayed boards in the Campus, to make the campus plastic free. Various measures adopted for this purpose are as follows

- Installation of Separate waste bins for Dry waste & wet waste
- Usage of paper tea cups in the Institute canteen
- Display of boards in the campus for Plastic Free campus

## 7.5 Paperless Office

The internal communication of the Institute is through the Internet. There are hardly any day to day operations, where printing is required.

## 7.6 Green Landscaping with Trees and Plants

The Institute has beautiful maintained Garden.

**Figure 7.1: Beautiful maintained Garden of college**

## 8. Recommendations

- Plantation in college premises
- Ban on tobacco consumption in college premises. Teaching students about harm caused by tobacco on health.
- Teach students about importance of Energy Saving. Encourage students and teachers to switch off lights and fans when not in use.
- Teach students about importance of cleanliness. Conduct college cleanliness drive with the help of students to pick up plastic packet, paper bits etc once in month in college premises.
- Guest lecture arrangement on E-waste, solid waste and liquid waste management.

# Nutan Urja Solutions

A 703, Balaji Witefield, Near Sunni's World,
Sus Road, Sus, Pune 411 021
Phone: 83568 18381. Email: nutanurja.solutions@gmail.com

Date: 10/07/2022

**CERTIFICATE**

This is to certify that we have conducted Green Audit at Dr. Madhukarrao Wasnik P.W.S. Arts, Commerce, Science College, Nagpur for the year 2021–22.

The College has already adopted **Green** practices like:

- Installation of Rain Water Harvesting system
- Installation of Bio composting pit
- Installation of **20 kW** Roof Top Solar PV Power Plant.
- Usage of Energy Efficient LED
- Usage of Energy Efficient BEE STAR Rated equipment

We appreciate the support of Management, involvement of faculty members and students in the process of making the campus Green.

**Nutan Urja Solutions,**


K G Bhatwadekar,
Certified Energy Auditor,
EA - 22428

# Report

# On

# Green Audit

# At

# Dr. Madhukarrao Wasnik P.W.S. Arts, Commerce, Science College, Nagpur

# (Year 2021-22)

Prepared by

**Nutan Urja Solutions**

A 703, Balaji Witefield, Near Sunni's World,

Sus Road, Sus, Pune 411 021

Phone: 83568 18381. Email: nutanurja.solutions@gmail.com

# Contents

## Acknowledgement

We at Nutan Urja Solutions, Pune, express our sincere gratitude to the management of Dr. Madhukarrao Wasnik P.W.S. Arts, Commerce, Science College, Nagpur for awarding us the assignment of Green Audit of their college premises.

We are also thankful to various Head of Departments & other Staff members for helping us during the field measurements.

We hope that the recommendations stated in this report will be useful and worthy of discussions to take things forward to help implementation of energy conservation measures and green practices. While we have made every attempt to adhere to high quality standards, in both data collection and analysis through the report, we would welcome your suggestions so as to improve upon this report further.

## Executive Summary

Green Audit of Dr. Madhukarrao Wasnik P.W.S. Arts, Commerce, Science College, Nagpur is conducted by Nutan Urja Solutions, Pune. Based On the audit field study, following important points can be presented.

**1. Present Energy Consumption**

Dr. Madhukarrao Wasnik P.W.S. Arts, Commerce, Science College, Nagpur uses Electrical Energy as the source of Energy for various equipment in the college campus. In the following Table, we present the details of Energy Consumption.

**Table no 1: Details of energy consumption**

| Sr no | Parameter | Energy consumed, (Units) | CO2 Emmision (MT) |
|---|---|---|---|
| 1 | Maximum | 1,809 | 1.45 |
| 2 | Minimum | 649 | 0.52 |
| 3 | Average | 1,135 | 0.91 |
| 4 | Total | 13,616 | 10.89 |

**2. Various Measures Adopted for Energy Conservation**

1. Usage of STAR Rated ACs at new installations
2. Usage of LED lights at some indoor locations
3. Usage of LED Lights for outdoor lighting.

**3. Usage of Renewable Energy**

The collage has installed **20 kW** Solar PV Power Plant.

**4. Rain Water Harvesting**

The College has installed the Rainwater harvesting project, to reduce dependency on municipal corporation water supply.

**5. Waste Management**

The College has already installed a Bio composting Plant, wherein, the bio-degradable waste is composted & is used as fertilizer for the garden.

The internal communication is through emails and hence there is hardly any generation of e-Waste in the premises.



Nutan Urja Solutions

## 6. Notes and Assumptions

1. Daily working hours-10 Nos
2. Annual working Days-250 Nos
3. Average Rate of Electrical Energy : **Rs 11/- per kWh**

## Abbreviations

| | | |
|---|---|---|
| CFL | : | Compact Fluorescent Lamp |
| FTL | : | Fluorescent Tube Light |
| LED | : | Light Emitting Diode |
| V | : | Voltage |
| I | : | Current |
| kW | : | Kilo- Watt |
| kWh | : | kilo-Watt Hour |
| kVA | : | Active Power |

# 1. Introduction

People's Welfare society established its first college, named PWS College of Arts and Commerce, on Kamptee Road, Nagpur in 1967. This is one of the biggest and well known institutions for marginalized sections in North Nagpur. Since its inception, more than 4000 students have joined the college every year and with various facilities at its disposal, the college is one of the best colleges in Northern Nagpur. The institute envisions molding of students who have humanitarian views, scientific approaches and are firm believer in positive social change. Such inspired youth will uphold the human values of liberty, equality and fraternity, and also shoulder the responsibilities of taking their nations to greater heights. The institute also offers affordable and various courses in the disciplines of Arts and Commerce.

## 1.1 Objectives

1. To study present level of Energy Consumption
2. To Study the present $CO_2$ emissions
3. To assess the various equipment/facilities from Energy efficiency aspect
4. To measure various Electrical parameters
5. To study Scope for usage of Renewable Energy
6. To study various measures to reduce the Energy Consumption

## 1.2 Audit methodology

1. Study of connected load
2. Study of various Electrical parameters
3. To prepare the Report with various Encon measures with payback analysis

## 2. Study of Electrical Energy Consumption

In this chapter, electricity bills are studied for the analysis of electrical energy consumption.

**Table no 2.1: Summary of electricity bills**

| No | Month | Energy (kWh) | Bill Amount (Rs) |
|---|---|---|---|
| 1 | Jun-22 | 676 | 8,880 |
| 2 | May-22 | 792 | 10,530 |
| 3 | Apr-22 | 848 | 10,360 |
| 4 | Mar-22 | 865 | 15,320 |
| 5 | Feb-22 | 328 | 3,590 |
| 6 | Jan-22 | 402 | 4,492 |
| 7 | Dec-21 | 1,743 | 27,614 |
| 8 | Nov-21 | 1,916 | 28,120 |
| 9 | Oct-21 | 1,672 | 24,220 |
| 10 | Sep-21 | 2,151 | 59,380 |
| 11 | Aug-21 | 1,926 | 27,990 |
| 12 | Jul-21 | 1,809 | 26,010 |
| | **Total** | **15128** | **246506** |

Variation in energy consumption is as follows,

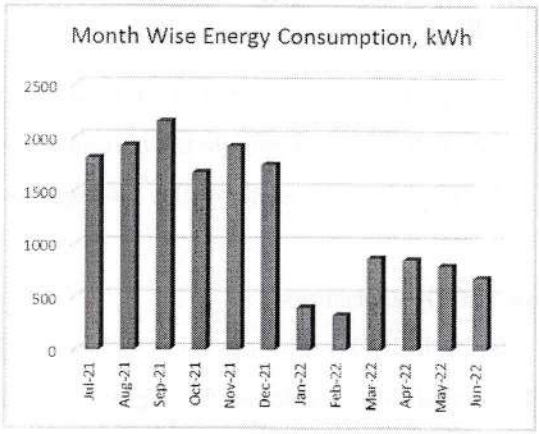



**Figure 2.1: Month wise energy consumption**

Monthly variation in electricity bill is as follows,

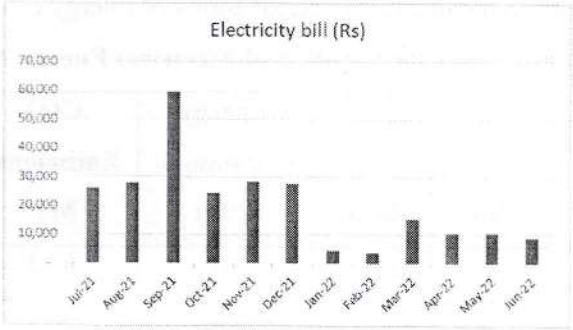



**Figure 2.2: Month wise electricity bill**

Key observations of electricity bill are as follows,

**Table no 2.2: Key observations**

| Sr no | Parameter | Energy consumed, (Units) | CO2 Emission (MT) |
|---|---|---|---|
| 1 | Maximum | 2,151 | 1.72 |
| 2 | Minimum | 328 | 0.26 |
| 3 | Average | 1,261 | 1.01 |
| 4 | Total | 15,128 | 12.10 |

## 3. Carbon Foot printing

**1. A Carbon Foot print** is defined as the Total Greenhouse Gas emissions ($CO_2$ emissions), emitted due to various activities. In this we compute the emissions of Carbon-Di-Oxide, by usage of the various form of Electrical Energy used by the College for performing its day to day activities

**2. Basis for computation of $CO_2$ Emissions:**

The basis of Calculation for $CO_2$ emissions due to Electrical Energy is as under

- 1 Unit (kWh) of Electrical Energy releases **0.8 Kg of $CO_2$** into atmosphere.

Based on the above Data we compute the $CO_2$ emissions which are being released in to the atmosphere by the College due to its Day to Day operations

We herewith furnish the details of various forms of Energy consumption as under

**Table 3.1: Month wise Consumption of Electrical Energy & CO2 Emissions**

| No | Month | Energy Consumed, kWh | CO2 Emissions, MT |
|---|---|---|---|
| 1 | Jun-22 | 676 | 0.54 |
| 2 | May-22 | 792 | 0.63 |
| 3 | Apr-22 | 848 | 0.68 |
| 4 | Mar-22 | 865 | 0.69 |
| 5 | Feb-22 | 328 | 0.26 |
| 6 | Jan-22 | 402 | 0.32 |
| 7 | Dec-21 | 1,743 | 1.39 |
| 8 | Nov-21 | 1,916 | 1.53 |
| 9 | Oct-21 | 1,672 | 1.34 |
| 10 | Sep-21 | 2,151 | 1.72 |
| 11 | Aug-21 | 1,926 | 1.54 |
| 12 | Jul-21 | 1,809 | 1.45 |
| | **Total** | **15,128** | **12.10** |

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

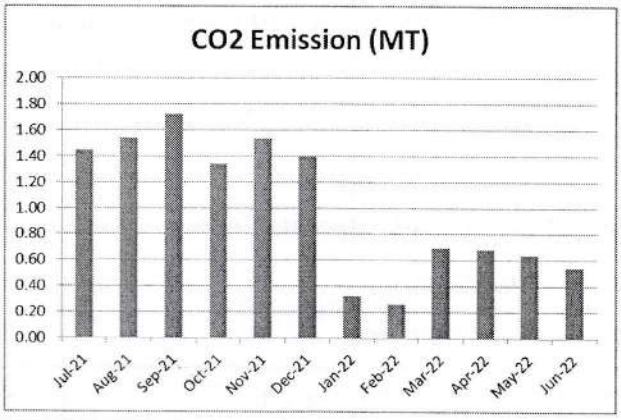



**Figure 3.1: Month wise CO2 Emission**

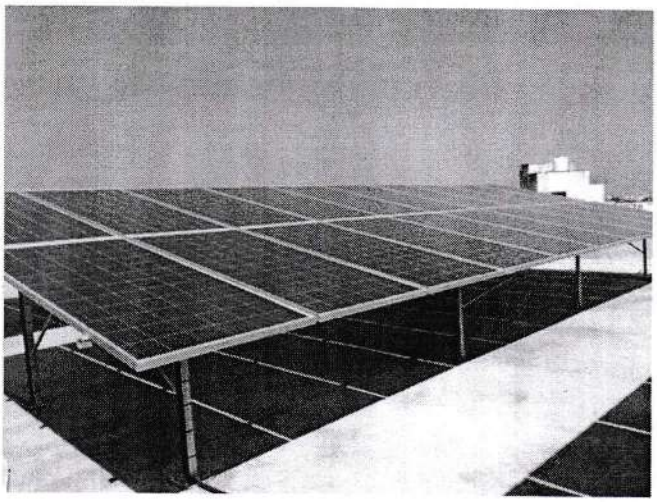
## 4. Study of Usage of Alternate Energy

In this Chapter, we compute the percentage of Usage of Alternate/Renewable Energy to Annual Energy Requirement of the College. The College has installed Solar PV System of 20kW capacity.

**Table 4.1: Computation of % Usage of Alternate Energy to Annual Energy Requirement**

| No | Particulars | Value | Unit |
|---|---|---|---|
| 1 | Annual Energy Purchased from MSEDCL | 15128 | kWh/Annum |
| 2 | Energy Generated by Roof Top Solar PV System | 30000 | kWh/Annum |
| 3 | Total Energy Requirement of College | 45128 | kWh/Annum |
| 4 | % of Usage of Alternate Energy to Annual Energy Requirement | 66 | % |

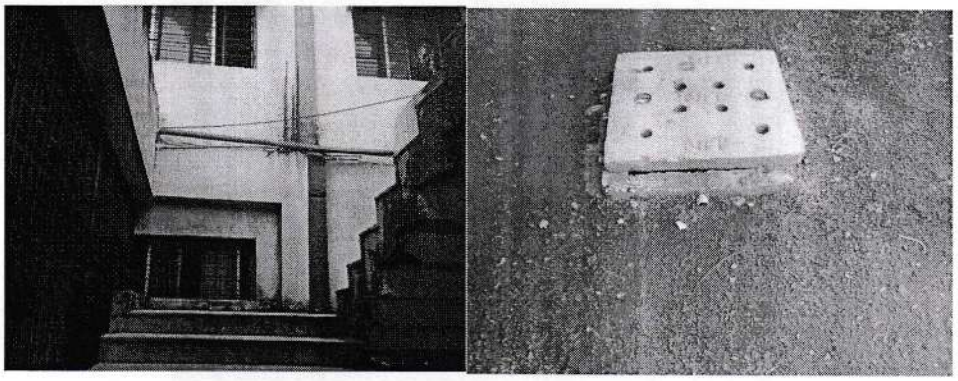
**Photograph of Solar PV plant**



## 5. Study of Rain Water Harvesting

The College has already installed Rain Water Harvesting project, wherein the rain water falling on the terrace is collected and through pipes it is fed to underground Water Storage tank. This stored water is then reused for domestic purpose.

**Photograph of Rain Water Harvesting pipe**

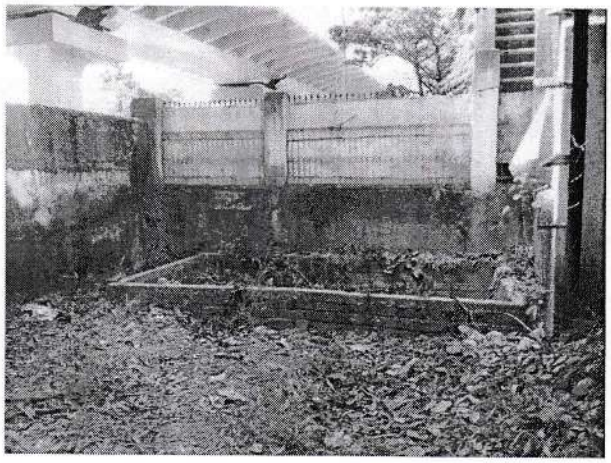


# 6. Study of Waste Management

## 6.1 Solid Waste Management

The College has already installed a Bio composting Plant, wherein, the bio-degradable waste is composted & is used as fertilizer for the garden.

**Photographs of Bio Composting Storage Tanks:**



## 6.2 e-Waste Management

The internal communication is through emails and there is hardly any generation of e-Waste in the premises.

# 7. Study of Green Practices

### 7.1 No of students who don't use own Vehicle for coming to Institute

Out of total students coming to Institute, about 60% students use own Automobile.

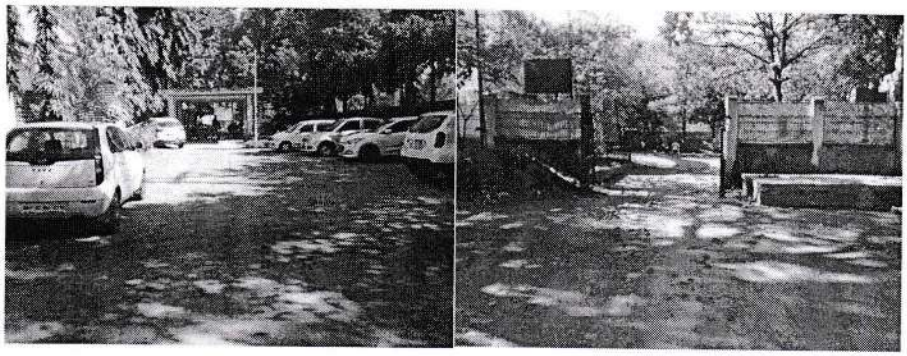
### 7.2 Usage of Public Transport

During the Students transport study, it was revealed that the local students who are residing near areas make use of Public Transport like Municipal Transport local buses, local sharing type auto rickshaws. Some students use bicycles. Institute encourages students to not to use automobiles.

### 7.3 Pedestrian Friendly Roads

The Institute has well defined pedestrian foot paths as to facilitate the easy movement of the students within the campus.

**Photograph of Road within campus**



### 7.4 Plastic Free Campus

The Institute is an active participant in the Government of India's most prestigious project of SWATCHH BHART ABHIYAN. The Institute has displayed boards in the Campus, to make the campus plastic free. Various measures adopted for this purpose are as follows

- Installation of Separate waste bins for Dry waste & wet waste
- Usage of paper tea cups in the Institute canteen
- Display of boards in the campus for Plastic Free campus

### 7.5 Paperless Office

The internal communication of the Institute is through the Internet. There are hardly any day to day operations, where printing is required.

## 7.6 Green Landscaping with Trees and Plants

The Institute has beautiful maintained Garden.

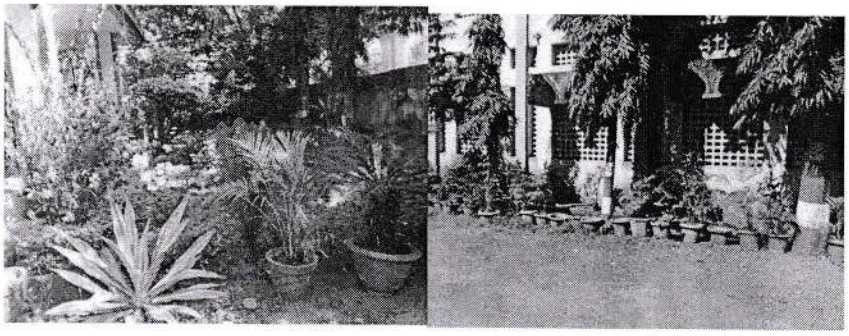


**Figure 7.1: Beautiful maintained Garden of college**

## 8. Recommendations

- Plantation in college premises
- Ban on tobacco consumption in college premises. Teaching students about harm caused by tobacco on health.
- Teach students about importance of Energy Saving. Encourage students and teachers to switch off lights and fans when not in use.
- Teach students about importance of cleanliness. Conduct college cleanliness drive with the help of students to pick up plastic packet, paper bits etc once in month in college premises.
- Guest lecture arrangement on E-waste, solid waste and liquid waste management.

# Report

# On

# Green Audit

# At

# Dr. Madhukarrao Wasnik P.W.S. Arts, Commerce, Science College, Nagpur

# (Year 2022-23)

Prepared by

**Nutan Urja Solutions**

A 703, Balaji Witefield, Near Sunni's World,

Sus Road, Sus, Pune 411 021

Phone: 83568 18381. Email: nutanurja.solutions@gmail.com

# Contents

## Acknowledgement

We at Nutan Urja Solutions, Pune, express our sincere gratitude to the management of Dr. Madhukarrao Wasnik P.W.S. Arts, Commerce, Science College, Nagpur for awarding us the assignment of Green Audit of their college premises.

We are also thankful to various Head of Departments & other Staff members for helping us during the field measurements.

We hope that the recommendations stated in this report will be useful and worthy of discussions to take things forward to help implementation of energy conservation measures and green practices. While we have made every attempt to adhere to high quality standards, in both data collection and analysis through the report, we would welcome your suggestions so as to improve upon this report further.

## Executive Summary

Green Audit of Dr. Madhukarrao Wasnik P.W.S. Arts, Commerce, Science College, Nagpur is conducted by Nutan Urja Solutions, Pune. Based On the audit field study, following important points can be presented.

**1. Present Energy Consumption**

Dr. Madhukarrao Wasnik P.W.S. Arts, Commerce, Science College, Nagpur uses Electrical Energy as the source of Energy for various equipment in the college campus. In the following Table, we present the details of Energy Consumption.

**Table no 1: Details of energy consumption**

| Sr no | Parameter | Energy consumed, (Units) | CO2 Emission (MT) |
|---|---|---|---|
| 1 | Maximum | 1,454 | 1.16 |
| 2 | Minimum | - | - |
| 3 | Average | 425 | 0.34 |
| 4 | Total | 5,104 | 4.08 |

**2. Various Measures Adopted for Energy Conservation**

1. Usage of STAR Rated ACs at new installations
2. Usage of LED lights at some indoor locations
3. Usage of LED Lights for outdoor lighting.

**3. Usage of Renewable Energy**

The collage has installed **20 kW** Solar PV Power Plant.

**4. Rain Water Harvesting**

The College has installed the Rainwater harvesting project, to reduce dependency on municipal corporation water supply.

**5. Waste Management**

The College has already installed a Bio composting Plant, wherein, the bio-degradable waste is composted & is used as fertilizer for the garden.

The internal communication is through emails and hence there is hardly any generation of e-Waste in the premises.

## 6. Notes and Assumptions

1. Daily working hours-10 Nos
2. Annual working Days-250 Nos
3. Average Rate of Electrical Energy : **Rs 11/- per kWh**

## Abbreviations

| | | |
|---|---|---|
| CFL | : | Compact Fluorescent Lamp |
| FTL | : | Fluorescent Tube Light |
| LED | : | Light Emitting Diode |
| V | : | Voltage |
| I | : | Current |
| kW | : | Kilo- Watt |
| kWh | : | kilo-Watt Hour |
| kVA | : | Active Power |

# 1. Introduction

People's Welfare society established its first college, named PWS College of Arts and Commerce, on Kamptee Road, Nagpur in 1967. This is one of the biggest and well known institutions for marginalized sections in North Nagpur. Since its inception, more than 4000 students have joined the college every year and with various facilities at its disposal, the college is one of the best colleges in Northern Nagpur. The institute envisions molding of students who have humanitarian views, scientific approaches and are firm believer in positive social change. Such inspired youth will uphold the human values of liberty, equality and fraternity, and also shoulder the responsibilities of taking their nations to greater heights. The institute also offers affordable and various courses in the disciplines of Arts and Commerce.

## 1.1 Objectives

1. To study present level of Energy Consumption
2. To Study the present $CO_2$ emissions
3. To assess the various equipment/facilities from Energy efficiency aspect
4. To measure various Electrical parameters
5. To study Scope for usage of Renewable Energy
6. To study various measures to reduce the Energy Consumption

## 1.2 Audit methodology

1. Study of connected load
2. Study of various Electrical parameters
3. To prepare the Report with various Encon measures with payback analysis

## 2. Study of Electrical Energy Consumption

In this chapter, electricity bills are studied for the analysis of electrical energy consumption.

**Table no 2.1: Summary of electricity bills**

| No | Month | Energy (kWh) | Bill Amount (Rs) |
|---|---|---|---|
| 1 | Jul-23 | 0 | 600 |
| 2 | Jun-23 | 0 | 595 |
| 3 | May-23 | 0 | 595 |
| 4 | Apr-23 | 0 | 555 |
| 5 | Mar-23 | 0 | 555 |
| 6 | Feb-23 | 0 | 555 |
| 7 | Jan-23 | 0 | 555 |
| 8 | Dec-22 | 645 | 555 |
| 9 | Nov-22 | 545 | 9990 |
| 10 | Oct-22 | 1454 | 7349 |
| 11 | Sep-22 | 1197 | 24032 |
| 12 | Aug-22 | 1263 | 19393 |
| | **Total** | **5104** | **65329** |

Variation in energy consumption is as follows,

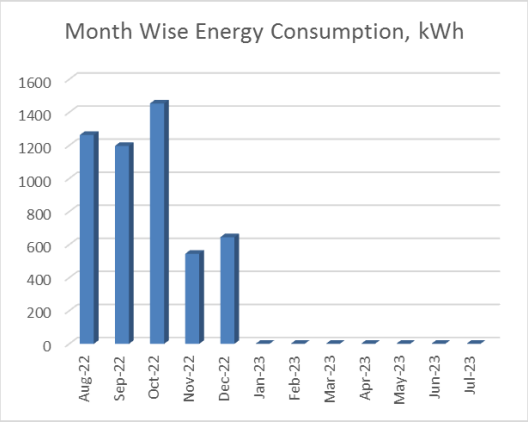



**Figure 2.1: Month wise energy consumption**

Monthly variation in electricity bill is as follows,

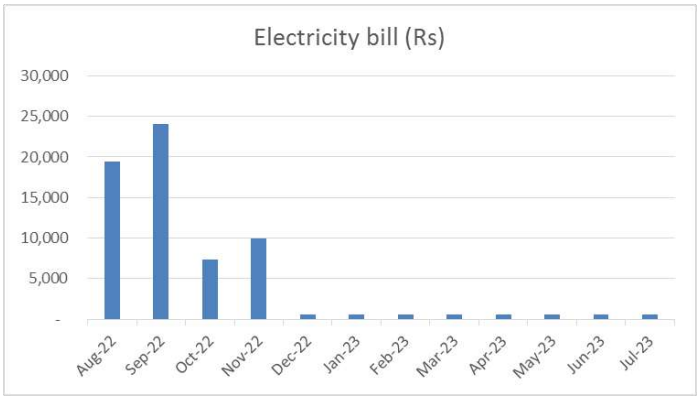



**Figure 2.2: Month wise electricity bill**

Key observations of electricity bill are as follows,

**Table no 2.2: Key observations**

| Sr no | Parameter | Energy consumed, (Units) | CO2 Emission (MT) |
|---|---|---|---|
| 1 | Maximum | 1,454 | 1.16 |
| 2 | Minimum | - | - |
| 3 | Average | 425 | 0.34 |
| 4 | Total | 5,104 | 4.08 |

## 3. Carbon Foot printing

**1. A Carbon Foot print** is defined as the Total Greenhouse Gas emissions ($CO_2$ emissions), emitted due to various activities. In this we compute the emissions of Carbon-Di-Oxide, by usage of the various form of Electrical Energy used by the College for performing its day to day activities

**2. Basis for computation of $CO_2$ Emissions:**

The basis of Calculation for $CO_2$ emissions due to Electrical Energy is as under

- 1 Unit (kWh) of Electrical Energy releases **0.8 Kg of $CO_2$** into atmosphere.

Based on the above Data we compute the $CO_2$ emissions which are being released in to the atmosphere by the College due to its Day to Day operations

We herewith furnish the details of various forms of Energy consumption as under

**Table 3.1: Month wise Consumption of Electrical Energy & CO2 Emissions**

| No | Month | Energy Consumed, kWh | CO2 Emissions, MT |
|---|---|---|---|
| 1 | Jul-23 | - | 0.00 |
| 2 | Jun-23 | - | 0.00 |
| 3 | May-23 | - | 0.00 |
| 4 | Apr-23 | - | 0.00 |
| 5 | Mar-23 | - | 0.00 |
| 6 | Feb-23 | - | 0.00 |
| 7 | Jan-23 | - | 0.00 |
| 8 | Dec-22 | 645 | 0.52 |
| 9 | Nov-22 | 545 | 0.44 |
| 10 | Oct-22 | 1,454 | 1.16 |
| 11 | Sep-22 | 1,197 | 0.96 |
| 12 | Aug-22 | 1,263 | 1.01 |
| | **Total** | **5,104** | **4.08** |

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

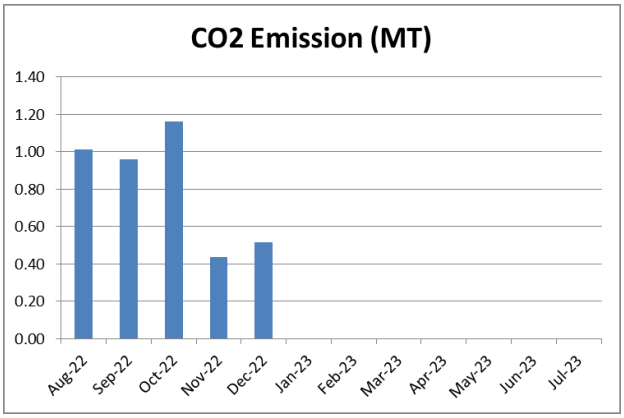



**Figure 3.1: Month wise CO2 Emission**

# 4. Study of Usage of Alternate Energy

In this Chapter, we compute the percentage of Usage of Alternate/Renewable Energy to Annual Energy Requirement of the College. The College has installed Solar PV System of 20kW capacity.

**Table 4.1: Computation of % Usage of Alternate Energy to Annual Energy Requirement**

| No | Particulars | Value | Unit |
|---|---|---|---|
| 1 | Annual Energy Purchased from MSEDCL | 15128 | kWh/Annum |
| 2 | Energy Generated by Roof Top Solar PV System | 30000 | kWh/Annum |
| 3 | Total Energy Requirement of College | 45128 | kWh/Annum |
| 4 | % of Usage of Alternate Energy to Annual Energy Requirement | 66 | **%** |

**Photograph of Solar PV plant**

## 5. Study of Rain Water Harvesting

The College has already installed Rain Water Harvesting project, wherein the rain water falling on the terrace is collected and through pipes it is fed to underground Water. This stored water is then reused for domestic purpose.

**Photographs of Rain Water Harvesting**

# 6. Study of Waste Management

## 6.1 Solid Waste Management

The College has already installed a Bio composting Plant, wherein, the bio-degradable waste is composted & is used as fertilizer for the garden.

**Photographs of Bio Composting Storage Tanks:**

## 6.2 e-Waste Management

The internal communication is through emails and there is hardly any generation of e-Waste in the premises.

## 6.3 RO Discharge Water Waste

Waste water discharged from RO water plant is collected and used for garden and other domestic purposes.

**Photograph of RO discharge collection tank**

# 7. Study of Green Practices

## 7.1 No of students who don't use own Vehicle for coming to Institute

Out of total students coming to Institute, about 60% students use own Automobile.

## 7.2 Usage of Public Transport

During the Students transport study, it was revealed that the local students who are residing near areas make use of Public Transport like Municipal Transport local buses, local sharing type auto rickshaws. Some students use bicycles. Institute encourages students to not to use automobiles.

## 7.3 Pedestrian Friendly Roads

The Institute has well defined pedestrian foot paths as to facilitate the easy movement of the students within the campus.

**Photograph of Road within campus**

## 7.4 Plastic Free Campus

The Institute is an active participant in the Government of India's most prestigious project of SWATCHH BHART ABHIYAN. The Institute has displayed boards in the Campus, to make the campus plastic free. Various measures adopted for this purpose are as follows

- Installation of Separate waste bins for Dry waste & wet waste
- Usage of paper tea cups in the Institute canteen
- Display of boards in the campus for Plastic Free campus

## 7.5 Paperless Office

The internal communication of the Institute is through the Internet. There are hardly any day to day operations, where printing is required.

## 7.6 Green Landscaping with Trees and Plants

The Institute has beautiful maintained Garden.

**Figure 7.1: Beautiful maintained Garden of college**

## 8. Recommendations

- Plantation in college premises
- Ban on tobacco consumption in college premises. Teaching students about harm caused by tobacco on health.
- Teach students about importance of Energy Saving. Encourage students and teachers to switch off lights and fans when not in use.
- Teach students about importance of cleanliness. Conduct college cleanliness drive with the help of students to pick up plastic packet, paper bits etc once in month in college premises.
- Guest lecture arrangement on E-waste, solid waste and liquid waste management.