Green Audit Report

of

Progressive Education Society's

Modern College of Arts, Science & Commerce

Ganeshkhind, Pune 411 016

Year: 2018-19

Prepared by

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MAHARASHTRA ENERGY DEVELOPMENT AGENCY

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(A Government of Maharashtra undertaking)
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ECN/2018-19/CR-05/4174 — 19th September , 2018

CERTIFICATE OF REGISTRATION
FOR CLASS 'A'

We hereby certify that, the firm having following particulars is registered with ***MAHARASHTRA ENERGY DEVELOPMENT AGENCY (MEDA)*** under given category as "Energy Planner & Energy Auditor" in Maharashtra for Energy Conservation Programme of MEDA.

Name and Address of the firm	:	**Enrich Consultants** Yashashree, Plot No. 26, Nirmal Bag Society, Near Muktangan English School, Parvati, Pune - 411009.
Registration Category	:	Empanelled *Consultant for Energy Conservation Programme*
Registration Number	:	***MEDA/ECN/CR-05/2018-19/EA-03***

- Energy Conservation Programme intends to identify areas where wasteful use of energy occurs and to evaluate the scope for Energy Conservation and take concrete steps to achieve the evaluated energy savings.
- MEDA reserves the right to visit the firm at any time without giving any prior information and canceling the registration, if the information is found incorrect.
- This empanelment is valid till **31st March 2021** from the date of registration, to carry out energy audits under the Energy Conservation Programme
- The Director General, MEDA reserves the right to cancel the registration at any time without assigning any reasons thereof.

19/9/18

(Smita Kudarikar)
General Manager (EC)

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Ref: EC/PES/MCASC/18-19/02 Date: 10/8/2019

CERTIFICATE

This is to certify that we have conducted **Green Audit** at P.E.S. Modern College of Arts, Science & Commerce, Ganeshkhind, Pune in the year 2018-19.

The College has already adopted following projects for making the campus **Green:**

- Installation of Bio Composting Tumbler System
- Installation of Rain Water Harvesting System
- Installation of **13 kW Hybrid Roof Top Solar PV-Wind** Power Plant.
- Maintenance of Garden in the campus.

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

For Enrich Consultants,

A Y Mehendale,
Certified Energy Auditor
EA-8192

CONTENTS

No	Particulars	Page No
I	Acknowledgement	5
II	Executive Summary	6
III	Abbreviations	8
1	Introduction	9
2	Study of Present Energy Consumption	10
3	Carbon Foot Printing	12
4	Study of Usage of Renewable Energy	14
5	Study of Rain Water Harvesting	16
6	Study of Waste Management	17
7	Study of Green Practices	18

ACKNOWLEDGEMENT

We at Enrich Consultants, Pune wish to express our sincere gratitude to the management of Progressive Education Society's Modern College of Arts, Science & Commerce, Ganeshkhind, Pune for assigning the work of Green Audit of Ganeshkhind campus for the Year: 2018-19.

We express our sincere thanks to

1. Prof. Dr. G. R. Ekbote, Chairman, Progressive Education Society
2. Prof. Dr. Sanjay S. Kharat, Principal
3. Prof. Dr. Mrs. Pallawi Bulakh, Faculty Member

We are also thankful to all other staff members who helped us during the field study.

EXECUTIVE SUMMARY

Based on the Field Study and analysis, we present herewith the summary of major points observed during the assignment of Green Audit.

1. Progressive Education Society's Modern College of Arts, Science & Commerce, Ganeshkhind, Pune uses Electrical Energy as the source of Energy for various equipment in the college campus.

2. Present Energy Consumption:

No	Parameter /Value	Energy, kWh	Maximum Demand, kVA	Power Factor	CO_2 Emissions, MT
1	Total	199076	-	-	159.26
2	Maximum	20388	97	0.96	16.31
3	Minimum	9290	73	0.916	7.43
4	Average	16590	84	0.927	13.27

3. Various measures adopted for Energy Conservation & Renewable Energy:

1. Usage of LED tube lights
2. Usage of STAR Rated equipment
3. Maintenance of good power factor
4. Installation of **13 kWp Solar-Wind Hybrid** roof top plant.

4. Usage of Renewable Energy:

In order to reduce the dependency on Grid Power, the College has installed a Roof Top Solar PV/Wind Hybrid Power Plant of Capacity 13 kW. Due to this Plant, the College is able to reduce the CO2 Emissions of **12.48 MT per Annum.**

5. Rain Water Harvesting:

The College has installed the Rainwater harvesting project and the water is used to enhance the underground Water level.

6. Waste Management:

6.1 Solid Waste Management:

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

6.2 e-Waste Management:

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

7. Notes & Assumptions:

1. **1 kWh** of Electrical Energy releases **0.8 Kg of CO_2** into atmosphere
2. Average Daily usage period: **8 Hours**
3. Annual Working Days: **300 Nos**
4. **1 kWp** Wind- Solar PV Hybrid plant generates **4 kWh/day** Electrical Energy

ABBREVIATIONS

AC	:	Air conditioner
PES	:	Progressive Education Society
CFL	:	Compact Fluorescent Lamp
FTL	:	Fluorescent Tube Light
LED	:	Light Emitting Diode
kWh	:	kilo-Watt Hour
Qty	:	Quantity
W	:	Watt
kW	:	Kilo Watt
PF	:	Power Factor
M D	:	Maximum Demand
PC	:	Personal Computer
MSEDCL	:	Maharashtra State Electricity Distribution Company Ltd

CHAPTER 1
INTRODUCTION

1.1 Objectives:

1. To study present level of Energy Consumption
2. To Study the present CO_2 emissions
3. To measure various Electrical parameters
4. To study Scope for usage of Renewable Energy
5. To study Waste Management
6. To study Rain Water Harvesting

1.2 General Details of College: Table No-1:

No	Head	Particulars
1	Name of Institution	PES Modern College of Arts, Commerce & Science
2	Address	Ganeshkhind, Pune
3	Affiliation	Savitribai Phule Pune University

CHAPTER-II
STUDY OF PRESENT ENERGY CONSUMPTION

In this chapter, we present the analysis of last year Electricity Bills

Table No-2: Electrical Bill Analysis- 2018-19:

No	Month	Energy Consumed kWh	Maximum Demand, kVA	Power Factor
1	Aug-18	19866	92	0.916
2	Sep-18	17724	96	0.919
3	Oct-18	18370	87	0.925
4	Nov-18	9290	74	0.927
5	Dec-18	13716	74	0.93
6	Jan-19	14668	74	0.92
7	Feb-19	16002	86	0.919
8	Mar-19	20388	91	0.927
9	Apr-19	19700	97	0.917
10	May-19	15536	75	0.921
11	Jun-19	15464	73	0.94
12	Jul-19	18352	94	0.96
13	Total	199076	-	-
14	Maximum	20388	97	0.96
15	Minimum	9290	73	0.916
16	Average	16590	84	0.928

Chart No-1: Monthly Unit Consumption (kWh) Variation:

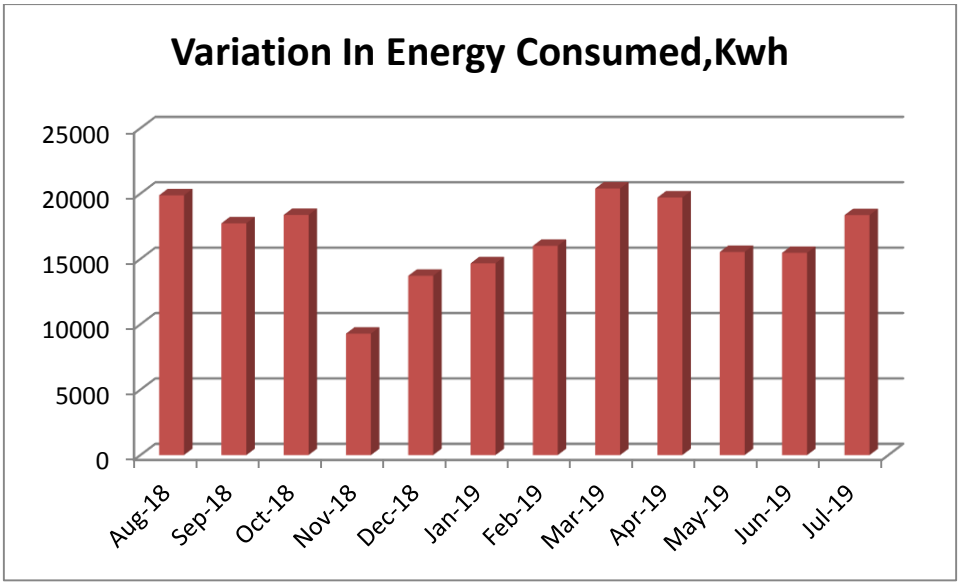


Chart No-2: Monthly Variation in Maximum Demand, kVA:

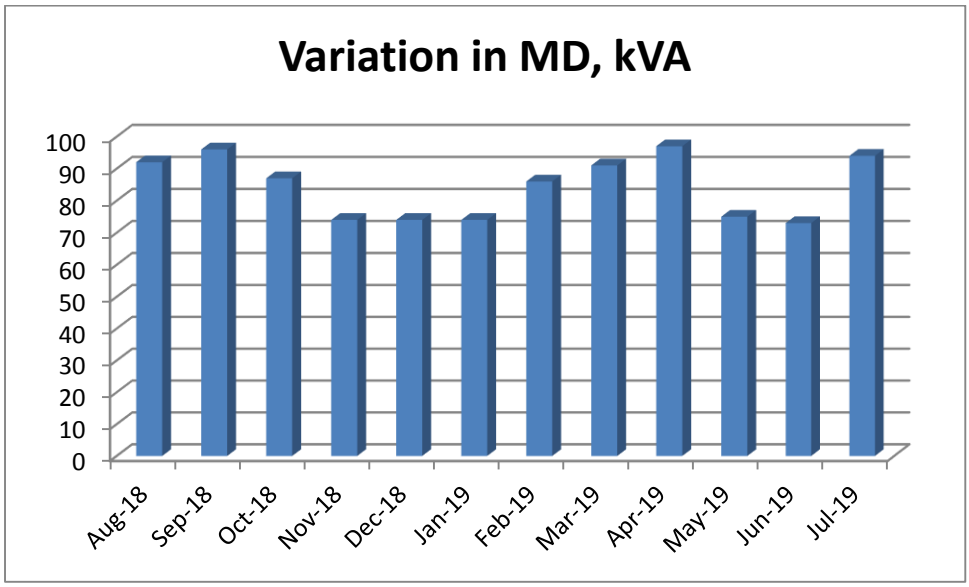
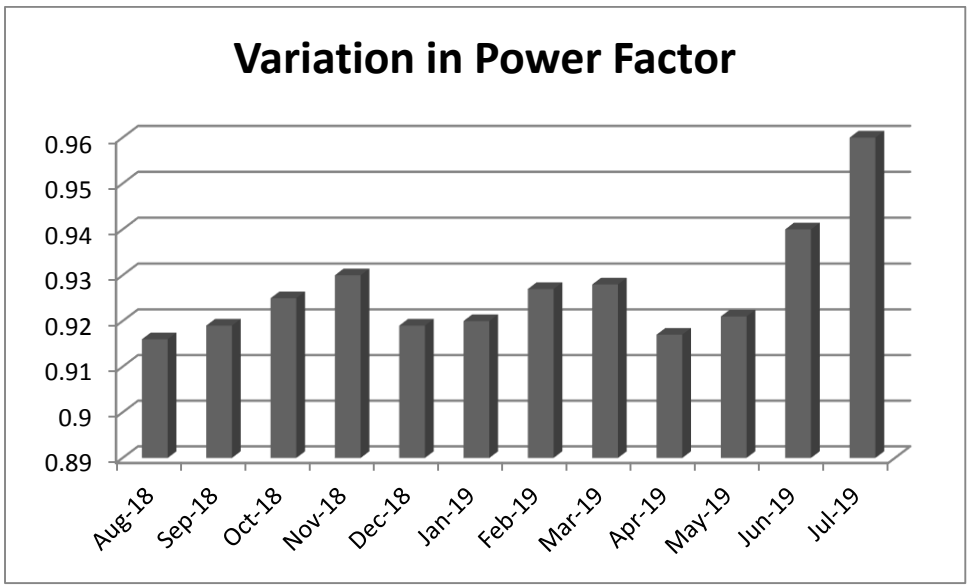


Chart No-3: Monthly Variation in Power Factor:



CHAPTER III
CARBON FOOTPRINTING

3.1 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

3.2 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

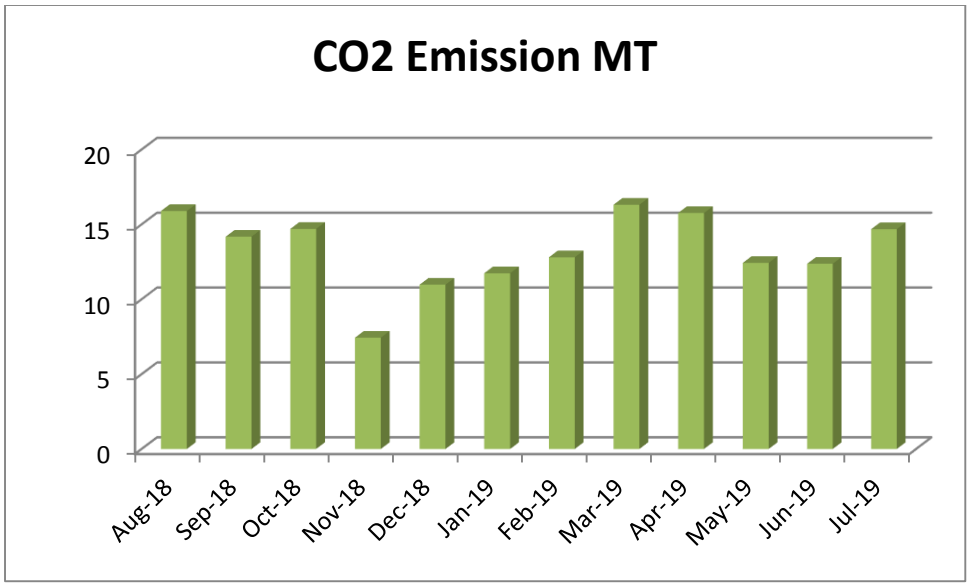
Based on the above Data we compute the CO_2 emissions which are being released in to the atmosphere by the College due to its Day to Day operations
We herewith furnish the details of various forms of Energy consumption as under

Table No-3: Month wise Consumption of Electrical Energy & CO_2 Emissions:

No	Month	Energy Consumed kWh	CO_2 Emission MT
1	Aug-18	19866	15.89
2	Sep-18	17724	14.18
3	Oct-18	18370	14.70
4	Nov-18	9290	7.43
5	Dec-18	13716	10.97
6	Jan-19	14668	11.73
7	Feb-19	16002	12.80
8	Mar-19	20388	16.31
9	Apr-19	19700	15.76
10	May-19	15536	12.43
11	Jun-19	15464	12.37
12	Jul-19	18352	14.68
13	Total	199076	159.26
13	Maximum	20388	16.31
14	Minimum	9290	7.43
15	Average	16590	13.27

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

3.3 Representation of Month wise CO_2 emissions: Chart No-4:



CHAPTER-IV
STUDY OF USAGE OF ALTERNATE ENERGY

4.1 In this Chapter, we compute the percentage of Usage of Alternate/Renewable Energy to Annual Energy Requirement of the College. The College has installed Roof Top Solar Wind Hybrid System of Capacity **13 kW.**

4.2 Table No 4: Computation of % Usage of Alternate Energy to Annual Energy Requirement:

No	Particulars	Value	Unit
1	Annual Energy Purchased from MSEDCL	199076	kWh
2	Energy Generated by Roof Top Hybrid System per Day	52	kWh
3	Annual Generation Days	300	Nos
4	Annual Energy Generated = (2) * (3)	15600	kWh
5	Total Energy Requirement of College= (1) + (4)	214676	kWh/Annum
6	% of Usage of Alternate Energy to Annual Energy Requirement = (4) * 100 / (5)	**7.27**	**%**

Photograph of Hybrid Solar/Wind Power Generation Plant:

Table No 5: Computation of Annual Reduction in CO2 Emissions due to Hybrid Power Plant:

No	Particulars	Value	Unit
1	Hybrid Power Plant Capacity	13	kW
2	Energy Generated per kW	4	kWh/kW
3	Energy Generated by Roof Top Hybrid System per Day	52	kWh
4	Annual Generation Days	300	Nos
5	Annual Energy Generated = (3) * (4)	15600	kWh
6	1 kWh of Electrical Energy emits	4	Kg of CO_2
6	Annual Reduction in CO2 Emissions by 13 kW Plant	**12.48**	MT

CHAPTER V
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 used to increase the Underground Water Level.

Photograph of Rain Water Harvesting Pipe:

CHAPTER-VI
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.

Photograph of Bio Composting Tumbler:

6.2 e-Waste Management:

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

CHAPTER-VII
STUDY OF GREEN PRACTICES

7.1 Pedestrian Friendly Roads:

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

Photograph of Road within campus:

7.2 Plastic Free Campus:

The College is taking all the possible measures in making the Campus Plastic Free.

7.3 Paperless Office:

It is advised to reduce the Day-to-Day paper consumption by using more and more Information Technology based Systems.

7.4 Green Landscaping with Trees and Plants:

Photograph of Garden/Tree plantation in the campus: