

# Enrich Consultants

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Ref EC/BSCOER/01  
Date 10/10/2018

## CERTIFICATE

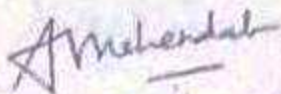
This is to certify that we, Enrich Consultants, Pune have conducted Energy & Green Audit at TSSM's Bhivarabai Sawant College of Engineering & Research, Narhe, Pune as per the guidelines of Maharashtra Energy Development Agency ([www.mahaedea.com](http://www.mahaedea.com)), in the year 2017-18.

The College has already adopted **Energy Efficient and Green Initiatives** like:

- Installation of Energy Efficient LED fittings
- Installation of Solar Thermal Water Heating System at Hostel Block
- Installation of Roof top Solar PV Plant
- Installation of S T P

We appreciate the involvement of the students and faculty members and the cooperation extended by the management, in the process of Energy Conservation & making the campus Green.

For Enrich Consultants,



A Y Mehendale,  
Certified Energy Auditor  
EA-8192

**Report  
on  
Energy Audit & Green Initiatives  
at  
TSSM's Bhivarabai Sawant College of Engineering &  
Research,  
Narhe, Pune**

*Year: 2017-18*



*Prepared by*

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MAHARASHTRA ENERGY DEVELOPMENT AGENCY



**Maharashtra Energy Development Agency**

(A Government of Maharashtra undertaking)

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ECN/2017-18/CR-01/5726

30<sup>th</sup> November 2017

**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 under Save Energy Programme of MEDA.

**Name and Address of the firm** : Enrich Consultants  
Yashashree, Plot No. 26, Nirmal Baug  
Society, Parvati, Pune - 411009.

**Registration Category** : Empanelled Consultant for Save Energy  
Programme.

**Registration Number** : **MEDA/ECN/CR-01/2017-18/EA-37**

- The Save Energy 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 upto **3 year** from the date of registration, to carry out energy audits under the Save Energy Programme of MEDA.
- The Director General, MEDA reserves the right to cancel the registration at any time without assigning any reasons thereof.

(Smita Kudarikar)  
Manager (EC)

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## **ACKNOWLEDGEMENT**

We at Enrich Consultants, Pune, express our sincere gratitude to the management of TSSM's Bhivarabai College of Engineering & Research, Narhe, Pune for awarding us the assignment of Energy & Green Audit of their Narhe Campus

We are thankful to:

- Prof Dr G A Hinge, Principal
- Prof U K Shinde, Head, Electrical Engg Department
- Prof A S Jaibhai, Asstt Professor, Electrical Engg Department

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

## EXECUTIVE SUMMARY

1. TSSM's Bhivarabai Sawant College of Engineering & Research, Narhe, Pune consumes Energy in the form of **Electrical Energy** used for various gadgets, Office & other facilities.

### 2. Present Level of Energy Consumption:

No	Value	Maximum Demand, kVA	Energy Consumed, kWh	Power Factor	CO2 emissions, MT
1	Maximum	174	41950	0.961	33.56
2	Minimum	110	28921	0.923	23.14
3	Average	141.33	34621.17	0.942	27.70

### 3. Various Majors Adopted for Energy Conservation:

The various projects already implemented by the College are

- Maintenance of Unity Power Factor
- Usage of Energy Efficient T-5 fittings for new installations
- Usage of Electronic chokes for Tube light fittings
- Usage of LEDs at some locations.

### 4. Usage of Alternate Energy Source:

The College has installed 6000 LPD Solar Thermal Water Heating System, for heating the Water at Hostel block. The College has also installed 1 kWp Capacity Roof top Solar PV Plant. Due to these projects, the percentage of usage of Renewable Energy to the total Power demand works out to be **18.34 %**.

### 5. Percentage of Lighting Power Requirements met by LED bulbs:

No	Parameter	Value	Unit
1	Total Lighting Load of the campus	241713	kWh/Annum
2	Total LED Lighting Load	19200	kWh/Annum
3	% of LEDs to total Lighting Load	<b>7.94</b>	<b>%</b>

### 6. Waste Management:

#### 6.1 Solid Waste Management:

The College has installed a Bio Gas unit, wherein the organic waste is digested and bio gas is generated. The bio gas is used for cooking purpose.

## 6.2. Liquid Waste Management:

The College has already installed a Sewage Treatment Plant of Capacity **500 KLPD**. The water on treatment is used for Gardening purpose.

## 6.3 e-Waste Management:

All the internal communication is through emails and hardly any e-Waste is generated in the Day to Day operation of the College. The College authorities have already contacted Authorized e-Waste management vendor to dispose off any wastage generated during the day-to-day operations.

## 7. Rain Water Harvesting:

The College has already installed **Rainwater Harvesting System** to collect the Rain Water collected at the Terrace & coming from other slopes, which in turn is used to enrich the bore well water source.

## 8. Recommendations:

No	Recommendation	Energy Saving, kWh/Annum	CO <sub>2</sub> reduction, MT/Annum	Monetary Saving, Rs	Investment, Rs	Payback period, Months
2	Replacement of 500 Nos T-12 FTL fittings by 20 W LEDs	46500	37.2	423150	125000	4
3	Installation of 10 kW Solar PV Plant	12000	9.6	109200	500000	55
4	<b>Total</b>	<b>58500</b>	<b>46.8</b>	<b>532350</b>	<b>625000</b>	<b>14</b>

## 9. Notes & Assumptions:

- 1 Unit of Electrical Energy releases **0.8 Kg of CO<sub>2</sub>** into atmosphere
- 1 kWp** Solar PV system generates **4 Units (kWh)** of Electrical Energy per Day
- Daily working hours-10 Nos
- Annual working Days-300 Nos
- Average Rate of Electrical Energy : **Rs 9.10/- per kWh**

## **ABBREVIATIONS**

DP	:	Double Pole
CFL	:	Compact Fluorescent Lamp
EESL		Energy Efficiency Services Limited
F P	-	Feeder Pillar
TSSM	-	The Shetkari Shikshan Prasarak Mandal
LED	-	Light Emitting Diode
MSEDCL	:	Maharashtra State Electricity Distribution Company Ltd.
MEDA	-	Maharashtra Energy Development Agency
MIDC	-	Maharashtra Industrial Development Corporation
V	:	Voltage
I	:	Current
kW	:	kilo-Watt
kVA	:	Active Power
kVA <sub>r</sub>	:	Reactive Power
P F	:	Power Factor
Kms.	:	Kilometers



## **CHAPTER-I INTRODUCTION**

### **1.1 Objectives:**

1. To study present level of Energy Consumption
2. To Study the present CO<sub>2</sub> emissions
3. To assess the various equipment/facilities from Energy efficiency aspect
4. To study Scope for usage of Renewable Energy
5. To study various measures to reduce the Energy Consumption

### **1.2 Audit Methodology:**

1. Study of connected load
2. Study of Electrical Energy Consumption pattern
3. Study usage of Renewable Energy Usage
4. Study of Lighting Load and Usage of LED Lights
5. Study of Rain water harvesting, Waste management
6. To prepare the Report with various Energy conservation measures

### **1.3 Table No-1: General Details of College:**

<b>No</b>	<b>Head</b>	<b>Particulars</b>
1	Name	TSSM's Bhivarabai College of Engineering & Research
2	Address	Narhe, Pune
3	Year of Establishment	2010
4	Courses Offered	UG & PG courses in Engineering Streams

## **CHAPTER-VIII**

### **STUDY OF RAIN WATER HARVESTING**

The College has already implemented the Rain Water Harvesting Project. The College has installed Pipes from the terrace and the Rain water falling on the terrace is gathered and is fed to the Main Water Storage Tank.

**Photograph of Rain water Harvesting project at College Terrace:**



## RWH Photos



Figure 1 Rain Water Harvesting Through Lawn in Campus



Figure 2 Collection of Terrace Water to Recharge Ground Water





**TSSM Map Showing Jambhulwadi Lake**



**Figure 1 TSSM Through Satellite**