Maratha Vidya Prasarak Samaj's ARTS, COMMERCE & SCIENCE COLLEGE,DINDORI,NASHIK

(MAHARASHTRA)

Internal Quality Assurance Cell(IQAC)

Energy Audit Report

(2018-19)

Save energy - Save Money - Save the Earth

Prepared by

SOLASTA

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Date: 13/06/2019

I N D E X

Preface

Data collection for energy audit of the **MVP'S Arts, Science and Commerce College, Dindori, Nashik** was approved by team for the period of July 2018 to June 2019.

This audit was over sighted to inquire about convenience to progress the energy competence of the campus. Energy audit survey was completed by the firm **SOLASTA Energy Solutions , Services & Maintenance** with the help of faculty members of Physics Department. Data was collected for each classroom, laboratory, office, library and of the campus. The work is completed by considering how many tubes, fan, A.C.'s, electronic instruments, etc. installed in every room. While preparing the energy audit report. New load/changes in load if any, and its participation in total electricity consumption was taken in consideration.

We really appreciate the effort put by MVP'S management for creating awareness of Energy Audit, Use of renewable energy such as solar energy and its roll in energy saving amongst all of us. We really appreciate Hon. Management of the college for encouraging us by providing this opportunity to do the energy audit and participate in the energy saving program. Through this, we have been cleared the vision of Institution towards the Green campus and save our nature. We really appreciate for various efforts taken by the college.

Acknowledgement

We are very much thankful to **Principal Dr. V.V.Thigale Madam and IQAC coordinator, NAAC Mr. R.R. Zoman** for motivating us and giving us the opportunity for energy audit. We would like to express our sincere thanks to **Dr. N. K. Nawale** Head Department of Physics, faculty members of Physics Department. such as **Prof. M. M. Bagul** and all respected staff, faculty members and students who have taken part in this audit survey etc. of MVP'S Arts, Commerce and Science College, Dindori, Nashik. We tried our best to present this energy report as per requirements of college and our expertise work.

Main Building

Summary

The objective of the audit was to study the energy consumption pattern of the college, identify the areas where potential for energy/cost saving exists and prepare proposals for energy/cost saving along with investment and payback periods.
The salient observations and recommendations are given below:

MVP'S Arts, Commerce and Science College, Dindori, Nashik uses energy in the following forms:

a. **From MSEDCL**
b. **High Speed Diesel Generator (HSDG)**

Electrical energy is used for various applications, like: Computers, Lighting, Air-Conditioning, Fans, Laboratory Equipment, Printers, Xerox machines, UPS, LCD Projector, Router system, Flood light, Pumping motor etc.

After the measurement and analysis, we propose herewith following Chapter regarding the efficient use of energy:

Abbreviations

AHU	Air handling unit
APFC	Automatic Power Factor Controller
ECP	Energy Conservation Proposal
MD	Maximum Demand
HSDG	High speed diesel Generator
MSEDCL	Maharashtra State Electricity Distribution Co.Ltd.
Co2	Carbon Di-Oxide
FTL	Fluorescent Tube Light/ Faster Than Light
LT/HT	Low Tension/ High Tension
BU	Billing Unit
kW	Kilo watt
kVA	Kilo Volt Ampere

Chapter: 1

Introduction to Energy Audit

- **General:**

The MVP'S Arts , Commerce and Science College, Dindori, Nashik entrusted the work of conducting a detailed Energy Audit of campus with the main objectives as given bellow:

- ✓ To study the present pattern of energy consumption
- ✓ To identify potential areas for energy optimization
- ✓ To recommend energy conservation proposals with cost benefit analysis.

- **Scope of Work, Methodology and Approach:**

Scope of work and methodology were as per the proposal. While undertaking data collection, field trials and their analysis, due care was always taken to avoid abnormal situations so as to generate normal/representative pattern of energy consumption at the facility.

- **Approach to Energy Audit:**

We focused our attention on energy management and optimization of energy efficiency of the systems, sub systems and equipments. The key to such performance evaluation lies in the sound knowledge of performance of equipments and system as a whole.

- **Energy Audit:**

The objective of Energy Audit is to balance the total energy inputs with its use and to identify the energy conservation opportunities in the stream. Energy Audit also gives focused attention to energy cost and cost involved in achieving higher performance with technical and financial analysis. The best alternative is selected on financial analysis basis.

Energy Audit Methodology: Energy Audit Study is divided into following steps:

1. **Historical Data Analysis:**

The historical data analysis involves establishment of energy consumption pattern to the established base line data on energy consumption and its variation with change in production volumes.

2. **Actual measurement and data analysis:**

This step involves actual site measurement and field trials using various portable measurement instruments. It also involves input to output analysis to establish actual operating equipment efficiency and finding out losses in the system.

3. **Identification and evaluation of Energy Conservation Opportunities:**

This step involves evaluation of energy conservation opportunities identified during the energy audit. It gives potential of energy saving and investment required to implement the proposed modifications with payback period.

Chapter: 2

About Institute

Sr. No.	Particulars	Details
1	Name of the Institute:	Maratha Vidya Prasarak Samaj's Arts , Commerce and Science College,Dindori, Nashik
2	Address:	PO-Dindori , Tal: Dindori, Dist: Nashik-422202 Maharashtra State, India.
3	Affiliation:	Affiliated to Savitribai Phule, Pune University,Pune-07 Affiliation ID No. PU/NS/ACS/69/2001
3	Year of Establishment:	2001
5	NAAC Accrediation:	NAAC REACCREDITED "B" GRADE with CGPA 2.34 AISHE: C-41332
6	Contact:	Phone : 02557-222333 FAX : 02557222277 Email :bcudmvpdindoricollege@gmail.com Website :www.mvpdindoricollege.com
4	Courses Offered:	Graduate / Post Graduate B. A./B.Com./B.Sc. M. A. English (2 years) M.COM.(2 Years)

Chapter: 3

Energy Consumption Profile

3.1 Source of Energy:

MVP'S Arts, Commerce and Science College, Dindori, Nashik uses Energy in following forms:

A. Electricity from MSEDCL :

MVP'S Arts, Science and Commerce College, Dindori, Nashik receives Electricity from 5410 Dindori/Nasik (R) S/DN Of NASIK RURAL:

B. Generator 2.5 kVA (HSG) :

HSG is used as a fuel Generator which is run whenever power supply from MSEDCL is not available. Generator is of CHAMP make, 1phase , 230V AC and rated output Voltage is 2.5kVA OF 50Hz frequency, Maximum Output Voltage is 3.0 kVA. Champ generator is silent gas generator which can run on LPG or Natural Gas.

CHAMP Fuel Generator (2.5KVA)

3.2 Following are the major consumers of electricity in the facility:

- Computers
- Lighting
- Air-Conditioning systems
- Fans
- Laboratory Equipment
- Printers
- Xerox machines
- UPS
- LCD Projector
- Flood light
- Pumping motor

Seminar Hall

Chemistry Lab

Electronics Lab

RO System & Water Cooler

Computer Lab

Office

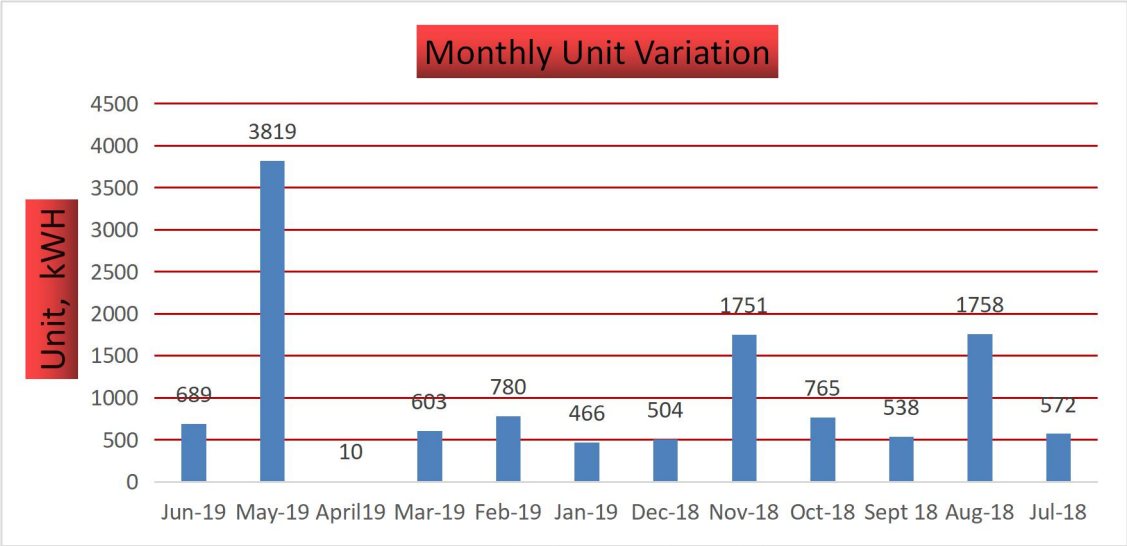
Chapter: 4

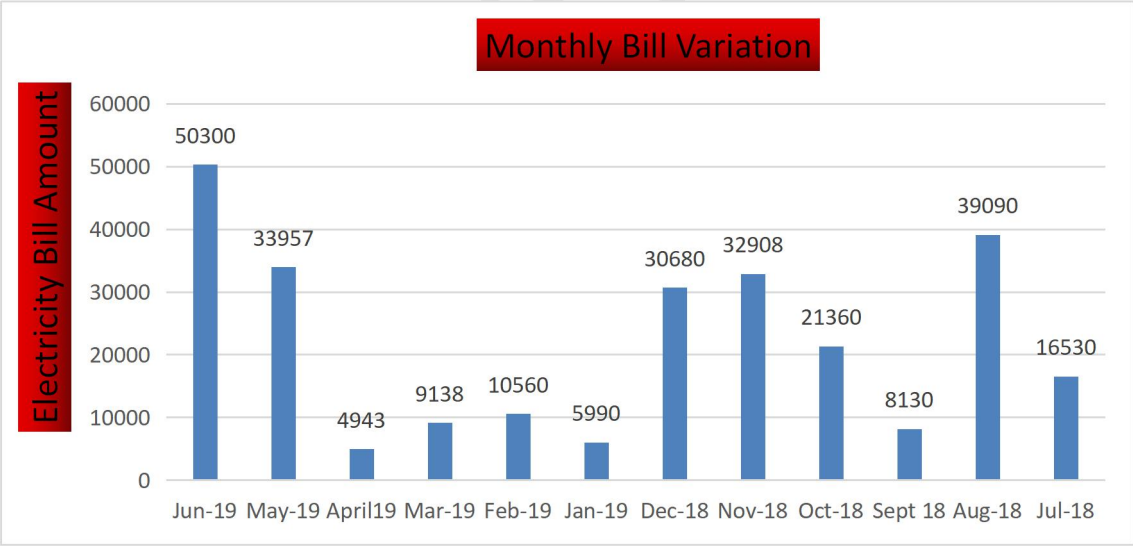
Data Analysis

Sr. No.	Month	No. Units kWh	Electricity Bill Amount (Rs.)
1.	June 19	689	50300
2.	May 19	3819	33957
3.	April19	10	4943
4.	Mar 19	603	9138
5.	Feb 19	780	10560
6.	Jan 19	466	5990
7.	Dec 18	504	30680
8.	Nov 18	1751	32908
9.	Oct 18	765	21360
10.	Sept 18	538	8130
11.	Aug 18	1758	39090
12.	July 18	572	16530
	Total Units & Bill Amount	**12,255**	**₹ 2,63,586/-**
	Avg. Of Unit & Bill Amount	**1022**	**₹ 21,966/-**

Conclusion : Monthly Unit Consumption & Electricity Bill Variation has been identified.

Month wise unit consumption





Month wise Electricity Bill Variation

Chapter: 5

Actual Measurements and its Analysis

Summary:-

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption /day (Watt)
A	B	C	D	E = C X D	F	G = E X F
1	FTL	40	86	3440	6	20640
2	Fan	80	51	4080	6	24480
3	PC	60	21	1260	6	7560
4	Printer: Standby mode: 30-50w/	printing mode:300-500w	11	330	2	660
5	LED 18 W	18	2	36	2	72
6	Xerox machine	650	1	650	2	1300
7	Fax machine	30	1	30	2	60
8	AC	3500	1	3500	2	7000
9	UPS	2-5KVA, 51 batteries of 80 Amp-hr	2	5000	1	5000
10	Water Cooler	2.8kwh/day	1	2800	1	2800
11	RO System	3-7 kWhr/m3	1	3000	1	3000
12	LCD Projector	282	1	282	1	282
13	Charging socket	23	4	92	2	184
14	P.A.System	560	1	560	1	560
15	Exhaust fan	60	3	180	6	1080
16	Electric bell	5	1	5	1	5
17	Refrigerator	2kwhr/day	1	2000	6	12000
18	Incubator	1500	1	1500	1	1500
19	Research Microscope	100	1	100	1	100
20	Lab Equip. for practical	300	10	3000	3	9000
21	Pumping motor	1.0 HP	1	746	2	1492
22	DG Gen set	2.5KVA	1	AS PER USE		AS PER USE

Department wise Load Analysis:

1) Principal Office/Cabin:

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption/day (Watt)
A	B	C	D	E = C X D	F	G = E X F
1	FTL	40	2	80	6	480
2	Fan	80	1	80	6	480
3	PC	60	1	60	2	120
4	Printer	Standby mode: 30-50w/ printing mode:300-500w	1	30	2	60
5	AC	3500	1	3500	2	7000
6	Bell	5	1	5	6	30

2) Administration Office:

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption/day (Watt)
A	B	C	D	E = C X D	F	G = E X F
1	FTL	40	4	160	6	960
2	Fan	80	2	160	6	960
3	PC	60	4	240	6	1440
4	Printer	Standby mode: 30-50w/ printing mode:300-500w	4	120	6	720
5	Xerox machine	650	1	650	1	650
6	UPS	2-5KVA,	1	2500	1	2500
7	Charging socket	23	2	46	2	92

3) IQAC Office:

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption/day (Watt)
A	B	C	D	E = C X D	F	G = E X F
1	Fan	80	1	80	6	480
2	PC	60	1	60	6	360
3	Printer	Standby mode: 30-50w/ printing mode:300-500w	1	30	2	60
4	FTL	40	1	40	6	240

4) Store Room:

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption/day (Watt)
A	B	C	D	E = C X D	F	G = E X F
1	FTL	40	1	40	1	40
2	Fan	80	1	80	1	80

5) Staff Room:

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption/day (Watt)
A	B	C	D	E = C X D	F	G = E X F
1	FTL	40	2	80	6	480
2	Fan	80	1	80	6	480

6) Department & Labs of I.T., Physics, Electronics etc.:

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption/day (Watt)
A	B	C	D	E = C X D	F	G = E X F
1	FTL	40	12	480	6	2880
2	Fan	80	12	960	4	3840
3	PC	60	12	720	6	4320
4	Printer	Standby mode: 30-50w/ printing mode:300-500w	3	90	2	180
5	UPS	2.5 KVA,	1	2500	1	2500
6	Charging socket	23	2	46	2	92

7) Chemistry Lab:

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption/day (Watt)
A	B	C	D	E = C X D	F	G = E X F
1	FTL	40	2	80	6	480
2	Fan	80	2	160	6	960
3	Exhaust Fan	60	3	180	6	1080
4	Refrigerator	2kwhr/day	1	2000	24	48000
5	Incubator	1500	1	1500	2	3000
6	Research Microscope	100	1	100	2	200

8) Department of Botany/Zoology and Labs:

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption/day (Watt)
A	B	C	D	E = C X D	F	G = E X F
1	FTL	40	12	480	6	2880
2	Fan	80	6	480	6	2880

9) Dept. of Commerce

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption/day (Watt)
A	B	C	D	E = C X D	F	G = E X F
1	FTL	40	2	80	6	480
2	Fan	80	2	160	6	960

10) Seminar Hall, Library, and Porch, Passage, Staircase:

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption/day (Watt)
A	B	C	D	E = C X D	F	G = E X F
1	FTL	40	18	720	6	4320
2	Fan	80	6	480	6	2880
3	PC	60	1	60	6	360
4	Printer	Standby mode: 30- 50w/ printing mode: 300- 500w	1	30	2	60
5	LCD Projector	282	1	282	2	564
6	PA System	3500	1	3500	2	7000
7	Water Cooler	2.8kwh/day	1	2800	1	2800
8	RO System	3-7 kWhr/m3	1	3000	1	3000
9	LED 18W	18	2	36	2	72

11) Dept. Of Marathi, Maths, English, Geography & Total Classrooms:

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption/day (Watt)
A	**B**	**C**	**D**	**E = C X D**	**F**	**G = E X F**
1	FTL	40	30	1200	6	7200
2	Fan	80	16	1280	6	7680
3	PC	60	2	120	6	720
4	Printer	30	1	30	1	30
5	Charging socket	23	2	46	2	92
6	Lab equip. for practicals	300	10	3000	3	9000
7	Pumping motor	1.0 HP	1	746	2	1492
8	DG Gen set	2.5KVA	1	AS PER USE		AS PER USE

Lighting System Analysis:

Observations and suggestions:

- It is found that FTL, Bulbs, CFLs are installed in the facility.
- It is recommended that some tube lights in this area be switched off when sufficient daylight is available.
- Presently there are no reflectors installed for tube lights.
- Every light or electric gadget left ON when not needed which is wasting energy and money and is causing pollution that is totally unnecessary.
- **Stand-by power can use up to 8% of a household's total electricity.**

For most homes a 10% reduction in electricity consumption can save 15000 a more a year off our electricity bill and nearly ¾ of a tone of CO_2 pollution. A 20% reduction on average consumption will save over Approximately 30,000 and over 1.5 tones of CO_2.

6.6 Don't forget to power down these things when not in use:

- Lights,Bulbs
- Heaters and fans (or air-conditioning)
- Printers and scanners
- Battery and phone chargers
- Computers
- Gaming consoles
- LED, Projector
- PA System

Chapter: 6

Study of Air Conditioners

In the facility for air conditioning there is no centralized system with AHU (air handling unit), but mostly spilt air conditioners are installed.

Load of ACs was as follows:

Item	Rated Power (kW)	Qty	Voltage	Current Amp	Actual Power (kW)
ACs	4	1	406	8.4	3.5

Observations and suggestions:

1. Normal air conditioning temperature should be kept as high as possible (I.e.24 Deg.cels.). By thumb rule, increase in 3 degrees in indoor air temperatures can save 1% of electricity.
2. The ventilation in area can be provided with installation of natural ventilation. Natural ventilation will also minimize the requirement of exhaust fans.

Chapter: 7

Carbon Di-Oxide Emission

In this Chapter we compute the CO_2 emissions. For consumption of 1 Unit (1 kWh) of Electricity, the CO_2 emitted is 0.8 Kg. OR the Emission is 0.8 Kg/kWh. In the following Table we present the total units consumed and CO_2 emitted as under:

CO_2 Emission Variation:

Month wise CO2 Emission Chart

Sr. No.	Month	kWh	CO_2 Emitted in Kg
1	June 19	689	5.65
2	May 19	3819	31.31
3	April 19	10	0.09
4	Mar 19	603	4.94
5	Feb 19	780	6.40
6	Jan 19	466	3.82
7	Dec 18	504	4.13
8	Nov 18	1751	14.35
9	Oct 18	765	6.27
10	Sept 18	538	4.41
11	Aug 18	1758	14.41
12	July 18	572	4.69
	Total	12,255	**Avg. Emission = 7.87**

Merits/Existing Features for Energy Saving in College Campus:

1. Computers are connected in LAN.
2. Printers are shared in LAN.
3. Screen savers facility implemented for every computer.
4. ACs used are of three STARS.
5. Refrigerators are of three STARS.
6. They are replacing by CFL tubes from electronic choke.
7. Maximum use of natural light is considered.
8. Cross Ventilation is provided in laboratory & class rooms.
9. Walls are painted with off white colour to have sufficient brightness
10. Solar powered street lamp is used.
11. LED light/Flood lights are used in Seminar hall.
12. Energy Saving Displays are observed in labs, class rooms.

Chapter: 8

Energy Conservation Proposals

Providing Energy Saver Circuit to the Air Conditioners:

The **energy saver circuits for the air conditioners, intelligently reduces the operating hours** of the compressors either by timing or temperature difference logic without affecting the human comfort. This can save around 15% to 30% of the electricity depending on the weather conditions and temperature settings.

There are total 7 split type air conditioners. It is Recommended that the old air conditioners are being replaced with new energy efficient BEE STAR labeled (3 Star and above) air conditioners in a phased manner.

- Considering the average compressor ON Time = 2h/day
- Power consumption by 2 TN compressor = 3.5kW
- Average daily consumption = 3.5 x 2 = 7 hr
- kWh/day/ air conditioner Yearly operating days = 300 days/year/ air conditioner
- Yearly electricity consumption = 2100 kWh/year/ air conditioner
- Considering a saving of 15%, total annual savings
  = 15% x 2100= 18 kWh/year/ air conditioner
  *Cost of electricity = Rs. 6.80 / kWh

- Total number of Air Conditioner =1

Summary For Energy Saver Circuit:

- ✓ Total Cost of each energy saver circuit = Rs. 4500 x 1 = Rs. 4500/-

9.2 Replacing Fluorescent Tube Lights (FTL) with LED Tube Lights:

The 86Watt FTLs can be replaced with the LED tube lights 16 W. These changes can be made at the places where the life is higher. Usually minimum of 3 years warranty is given and approximate burning hours is 40000.

(15 years considering 8 hours per day running)

Following calculations are done for 8 hours working:

- Power consumption by 36 W FTL with conventional choke = 40 W/ Tube Light
- Equivalent LED tube light = 16 W/ Tube Light
- Savings in power = 24 W/ Tube Light
- Operating hours = 6 h/day x 300 = 1800 h/year
- Tube Light Yearly savings = 1800 x 24 W = 43.2kWh/year/Tube Light
- Average Cost of electricity = Rs.6.80/ kWh
- Saving = 43.2 kWh x 6.80 = Rs.293.76/ year/ Tube light
- Approximate investment on single LED Tube lights = Rs. 200
- Number of Tube Lights to be replaced = 86

Summary For FTLs:

- ✓ Total Yearly Saving =86 x 293 = Rs. 25198/year
- ✓ Total Investment = 86x Rs. 200 = Rs. 17200/ONLY

CHAPTER: 9
Energy Saving Recommendations

General Recommendations:

- All Class Rooms and labs to have More **Display Messages** regarding optimum use of electrical appliances in the room like, lights, fans, computers and projectors. Save electricity. **Display the stickers of save electricity**, **save nature** everywhere in the campus. So that all stakeholders encouraged to save the electricity
- Care should be taken to keep lights in classroom off and keep ON whenever necessary.
- All projectors must be keep OFF when not in use or in stand by mode if there is No any presentation work is scheduled
- All computers to have power saving settings to turn off monitors and hard discs, say after 10 minutes/30 minutes.
- The Default air conditioning temperature must be set between 24˚C to26˚C.
- Need to replace existing ordinary CRT monitor by LED where ever still in use.

Executive Recommendations:

1.There has to be Institute level student community that keeps track of the energy consumption Parameters of the various departments, class rooms, halls, areas, meters, etc

2. Energy auditing inside the campus has to be done on a regular basis and report should be made public to generate awareness.

3.Need to Create energy efficiency/ renewable energy awareness among the college campus i.e. solar, wind, Biogas energy. College should take initiative to arrange seminars, lectures, among students and staff for general awareness.

4.Check for feasibility to shift for 3phase commercial energy connection,consult with respective Gov. Electrical Contractor and MSEDCL office for same.

References:

References:

1) "Energy Management, Audit and Conservation" by Barun Kumar De

2) "Guide to Energy Management" by Barney L

3) "Energy Audits: A Workbook for Energy Management in Buildings" by Tarik Al–Shemmeri

4) "Fundamentals of Energy Conservation and Audit" by Agarkar Santosh Vyankatro and Mateti Naresh Kumar

5) "Industrial Energy Conservation (UNESCO Energy Engineering)" by Charles MGottschalk

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Address: 7, Dattakunj Appt., Anand Nagar, Gangapur Road, Nashik-422013

WORK COMPLETION REPORT

- Name of Work Project : Energy Audit of MVP'S Arts,Commerce and Science college,Dindori, Nashik
- Work Order Number : 2018-19
- Work Period : From 30/05/2019 To 11/06/2019
- This is to Certify that SOLASTA Energy Solutions , Services & Maintenance has successfully completed Energy audit at Arts,Commerce and Science college, Dindori, Nashik

The work of energy audit is completed on 13/06/2019 for year 2018-19.

Thanking you and assuring you for our best service always.

Audit Report BY,

Er. Anil S. Dube

Er. Anil S. Dube
BEE Certified Energy Auditor
Regn.No.EA-4973
Date: 13/06/2019
Place: Nashik

FOR SOLASTA,

SOLASTA
Energy Solutions, Services & Maintenance
Mr. Pushpendra P. Pagar
Proprietor

Regn. No. EA-4973

No. 2487

National Productivity Council

(National Certifying Agency)

PROVISIONAL CERTIFICATE

This is to certify that Mr. / Ms. Anil Siddhanarayan Dube

son / daughter of Mr. Siddhanarayan Dube

has passed the National Certification Examination for Energy Auditors in 2006, conducted on behalf of the Bureau of Energy Efficiency, Ministry of Power, Government of India.

He / She is qualified as Certified Energy Manager as well as Certified Energy Auditor.

He / She shall be entitled to practice as Energy Auditor under the Energy Conservation Act 2001, subject to the fulfillment of qualifications for the Accredited Energy Auditor and issue of certificate of Accreditation by the Bureau of Energy Efficiency under the said Act.

This certificate is valid till the issuance of an official certificate by the Bureau of Energy Efficiency.

Place : Chennai, India

Date : 30th April 2007

Controller of Examination