Maratha Vidya Prasarak Samaj

G. M. D. Arts, B. W. Commerce and Science College, Sinnar, Dist. Nashik

Affiliated to Savitribai Phule Pune University, Pune
Best College Awarded by SPPU2012-13

Id.No.PU/NS/ASC/013/1969
AISHE:C-41292

ISO 9001:2015 Certified College
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INTERNAL QUALITY ASSURANCE CELL

CRITERION VII: INSTITUTIONAL VALUES AND BEST PRACTICES

7.1.3 Energy Audit (2019-20)

MVP'S

G.M.D ART'S, B.W. COMMERCE AND SCIENCE COLLEGE, SINNAR.

Energy Audit Report (2019-20)

INDEX

Preface

Data collection for energy audit of the **G.M.D. Arts, B. W Commerce and Science College, Sinnar** was conceded by team for the period of July 2019 to June 2020.

This audit was over sighted to inquire about convenience to progress the energy competence of the campus. Energy audit survey was completed by all committee members. All data collected from each classroom, laboratory, Departments, Hostel, Canteen, Gymkhana. The work is completed by considering how many tubes, fan, A.C, electronic instruments, etc in each room. How much was participation of each component in total electricity consumption.

We really appreciate the effort put by MVP'S management for creating awareness of Energy Audit, Use renewable energy such as solar energy and their significance use for efficient energy saving and our nature among the all of us. We really appreciate Hon. Management of the college for encouraging us by providing this wonderful opportunity to do the energy audit. Through this, we have been cleared the vision of Institution towards the Green campus and save our green nature. We really appreciate to develop good quality weather station in house of the college.

Acknowledgement

I acknowledge my deepest gratitude to the Management of Maratha Vidya Prasarak Samaj, Hon. Sarchitnis Neelimatai Pawar and the Director Hon. Hemantnana Waje for their continuous guidance and encouragement. I render my special thanks to our Principal Dr. P. V. Rasal, Vice Principals Dr. D. M. Jadhav, Mr. R. V. Pawar, Dr. M. K. Zate and IQAC Coordinator Mr. D. S. Sanap for their valuable suggestions and guidance given to me from time to time in preparing ENERGY AUDIT REPORT of Maratha Vidya Prasarak Samaj, Nashik G.M.D. Arts, B.W. Commerce & Science College, Sinnar.

I also acknowledge my great indebtedness to the committee members Mr. A. V. More, Smt. M. H. Magar, Mr. D. K. Khurche and Mr. B. A. Khairnar of Energy Audit Committee for collection of the data and data analysis. I also thankful to Dr. M. K. Zate (HOD department of Physics) for their valuable guidance. The entire work is an inculcation of eventual execution into constructive work. I extend my gratitude towards the Teaching and Non-Teaching staff of our college. A special thanks to Mr. Vikram Sonawane for assisting me in computer work. Thanks to all for their kind motivational incessant support.

Mrs. Pratiksha D. Garud

Convenor

Sr. No.	Name	Designation
1.	Dr. P. V. Rasal	Principal
2.	Dr. M. K. Zate	Internal Expert
3.	Mr. D. S. Sanap	IQAC Co-Ordinator
4.	Mrs. P. D. Garud	Convenor
5.	Mr. A. V. More	Member
6.	Mr. B. A. Khairnar	Member
7.	Mr. D. K. Khurche	Member
8.	Mrs. M. H. Magar	Member

Energy Audit Committee

Summary

The objective of the audit was to study the energy consumption pattern of the facility, 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.

1. MVP'S. G.M.D. Arts, B.W Commerce and Science College, Sinnar. Nashik uses energy in the following forms:
    a. **From MSEDCL**
    b. **Electricity Roof top SOLAR Grid connected solar plant (15.3 KWh)**
    c. **Electricity Roof Top Solar Off Grid Solar System (7.5 KWh)**
    d. **High Speed Diesel Generator (HSDG) (40 KVA)**
    e. **Solar Water Heater System (2000 LPD)**

    Electrical energy is used for various applications, like: Computers, Lighting, Air-Conditioning, Fans Other Laboratory Equipment, Printers, Xerox machines, CCTV, UPS, LCD Projector, Router system, Flood light, Pumping motor etc.
2. The average cost of energy is around **Rs. 44,858.00/Month.**
3. After the measurement and analysis, we propose herewith following Energy Efficiency improvement measures.

Table: Energy Efficiency Improvement

Sr. No.	Recommendations	Annual Saving Potential (Rs.)	Estimated Investment (Rs.)	Pay Back period (Years)	Remarks (Feasibility)
1	Use of Automatic Digital Timer Switch for street light	4500	2000	1	Automatic on off option
2	Replacing Fluorescent Tube Lights (FTL) with LED Tube Lights	98963	50600	1	Saves electricity
3	Replacing Fan with 5 star energy saving Fan	26000	21000	1	Saves electricity
4	Energy Saver Circuit to A.C.	27999	13500	1	Control Power factor
5	Replacing Inductor Chock by Electronic blast Circuit In Tube Light	16000	7500	1	Work even if low voltage
Total Amount		**1,73,462**	**94,600**		

Abbreviations

AHU	**Air handling unit**
APFC	Automatic Power Factor Controller
DG	Diesel generator
ECP	Energy Conservation Proposal
GCV	Gross Calorific Value
HVAC	Heating, Ventilation and Air Conditioning
HSDG	High speed diesel Generator
PF	Power Factor
SEC	Specific Energy Consumption
TR	Tons of Refrigeration
UOM	Unit of Measurement
MAHADISCO	Maharashtra State Electricity Distribution Company

Chapter: 1

INTRODUCTION TO ENERGY AUDIT

- **General:**

MVP'S. G.M.D. Arts, B.W Commerce and Science College, Sinnar. Nashik entrusted the work of conducting a detailed Energy Audit of campus with the main objectives are as bellows:

- ✓ 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 equipment's 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

GENERAL DETAILS

Sr. No.	Particulars	Details
1	Name of the Institute	MVP'S. G.M.D.Arts, B.W Commerce and Science College, Sinnar. Nashik
2	Address	Nashik Pune Highway, Sinnar, Dist. Nashik 422 103
3	Year of Establishment	1969
4	Courses Offered	XIth and XIIth Arts , Commerce & Science
		B. A./B.Com./B.Sc.
		B. Sc. (Computer Science)
		B. Voc. 1. Livestock production and management 2. Food Processing and Preservation
		M. Sc.(Organic Chemistry)
		M. Sc. (Geography)
		M.Sc. (Physics)
		M. Sc. (Zoology)
		M. Com.
		M.A. (Marathi) (English) (Defence) (Political Science)
		M.A.(Economics)(Geography)
5	Affiliation	Savitribai Phule Pune University,Ganeshkhind Pune-07

Chapter: 3

Energy Consumption Profile

Source of Energy:

MVP'S. G.M.D. Arts, B.W Commerce and Science College, Sinnar. Nashik, uses Energy in following forms:

a. Electricity from MSEDCL :

MVP'S. G.M.D.Arts,B.W Commerce and science College receives Electricity from Sinnar Substation.

b. High Speed Diesel Generator (HSDG) :

HSD is used as a fuel for Diesel Generator which is run whenever power supply from MSEDCL is not available.

Diesel Generator

Electricity Roof top SOLAR Grid connected solar plant (15.3 KWh)

SOLAR Grid connected solar plant (15.3KWh)

Solar On Grid Invertor

c. Electricity Roof Top Solar Off Grid Solar System (7.5 KWh)

Top Solar Off Grid Solar System (7.5 KWh)

d. Solar Water Heater System (2000 LPD)

Solar Water Heater System (2000 LPD)

Following are the major consumers of electricity in the facility:

- Computers
- Lighting
- Air-Conditioning
- Fans
- Other Lab Equipment
- Printers
- Pumping motor
- Xerox machines
- Computers
- CCTV
- UPS
- LCD Projector
- Router system
- Flood light

Exam Section

IQAC & NAAC Room

Principal Office

Administrative Office

UPS

Library

Computer Lab

B.Voc.

Specific Energy Consumption (SEC):

Specific Energy Consumption (SEC) is defined as energy usage per Square meter of area. it is calculated total electrical kWh/total area of the campus. By calculating SEC, we can crudely target the factors of energy efficiency or inefficiency

Chapter: 4

Historical Data

Analysis

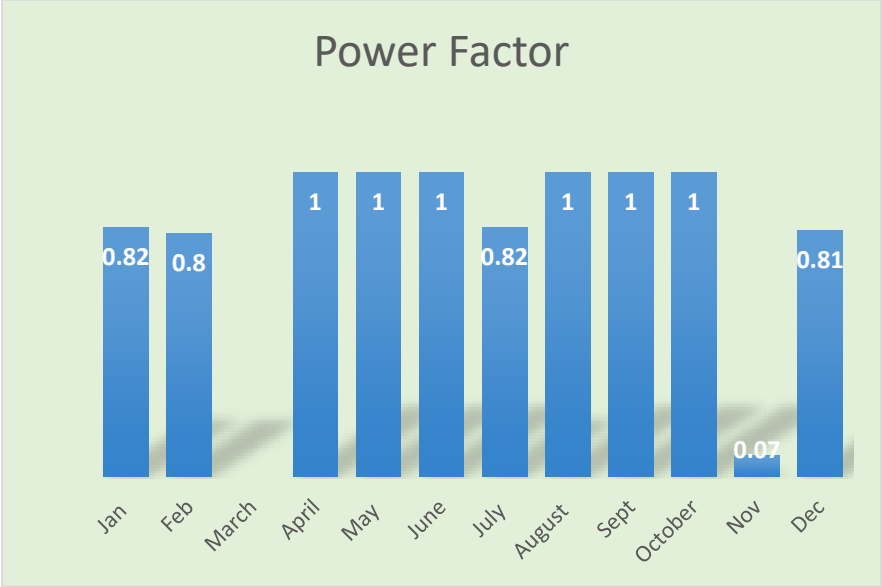
Study of Variation of Monthly Units consumption & Power Factor:

In this Chapter, we study the details of the 12 month Electricity Bills.

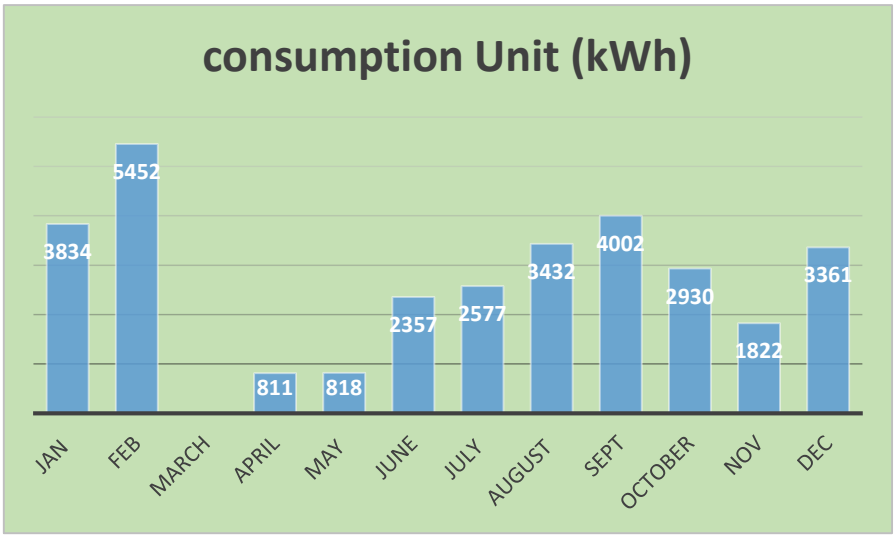
Table No 4.1 Variation in Units Consumption & Power Factor (PF)

Sr. No.	Month	No. of Units kWh	Power Factor
1	Jan	3834	0.82
2	Feb	5452	0.8
3	March	-	-
4	April	**811**	1
5	May	818	1
6	June	2357	1
7	July	2577	0.82
8	August	3432	1
9	Sept	4002	1
10	October	2930	1
11	Nov	1822	0.07
12	Dec	3361	0.81
Total Units		**31396**	**Average = 0.84**

Month wise Power Factor variation



Month wise Energy consumption variation



The Power Factor to reduce the utility power bill. Most utility bills are influenced by KVAR usage. A good Power Factor provides a better voltage. Reducing the pressure on electrical distribution network. Reducing cable heating, cable over loading and cable losses. Reducing over loadings of control gears and switch-gears etc…..

Whenever the average power factor over a billing cycle or a month, whichever is lower, of a High Tension consumer is below 90%, Penal charges shall be levied to the consumer at the rate of 2 % (two %) of the amount of monthly energy bill (excluding of Demand Charges, FOCA, Electricity Duty and Regulatory Liability Charge etc.)

For power factor of 0.99, the effective incentive will amount to 5% (five percent) reduction in the energy bill and for unity power factor; the effective incentive will amount to 7% (seven percent) reduction in the energy bill.

4.1 Study of Month wise Electricity Bill Variation:

Sr. No.	Month	Electricity Bill Amount (Rs.)
1	Jan	40110
2	Feb	152740
3	March	-
4	April	40570
5	May	8638
6	June	25231
7	July	47669
8	August	50786
9	Sept	59456
10	October	37237
11	Nov	32742
12	Dec	43120
Total Annual Bill		**Rs.538299**
Average Monthly Bill		**Rs. 44858**

4.1 Table No 4.2 Variation in Electricity Bill

Conclusion: Monthly Electricity Bill Variation has been identified.

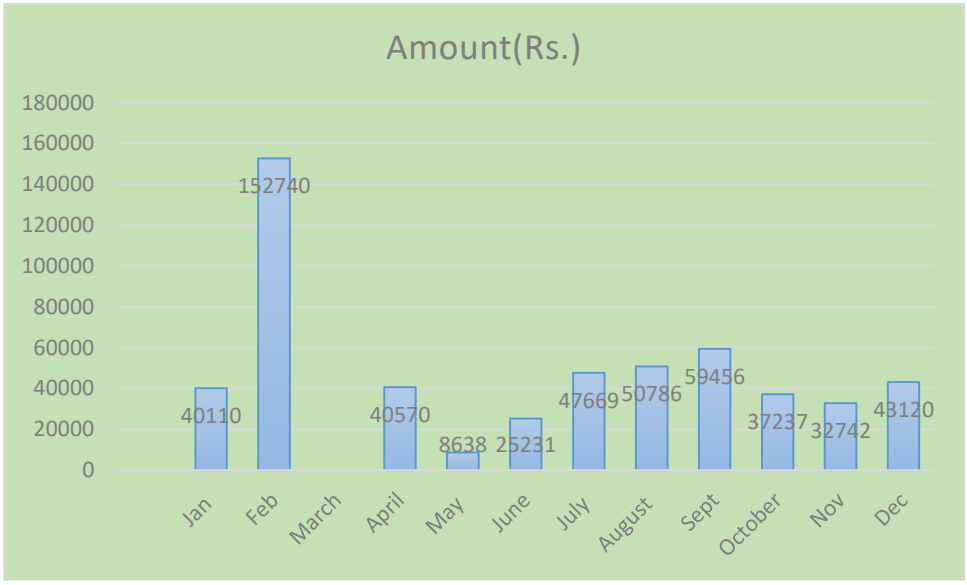


Table No 4.2 Month wise Maximum Demand Variation

Sr. No.	Month	Maximum Demand (kVA/Month)
1	Jan	16
2	Feb	13
3	March	16
4	April	16
5	May	15
6	June	12
7	July	22
8	August	20
9	Sept	22
10	October	28
11	Nov	12
12	Dec	13

4.3: Study of Month wise Maximum Demand Variation:

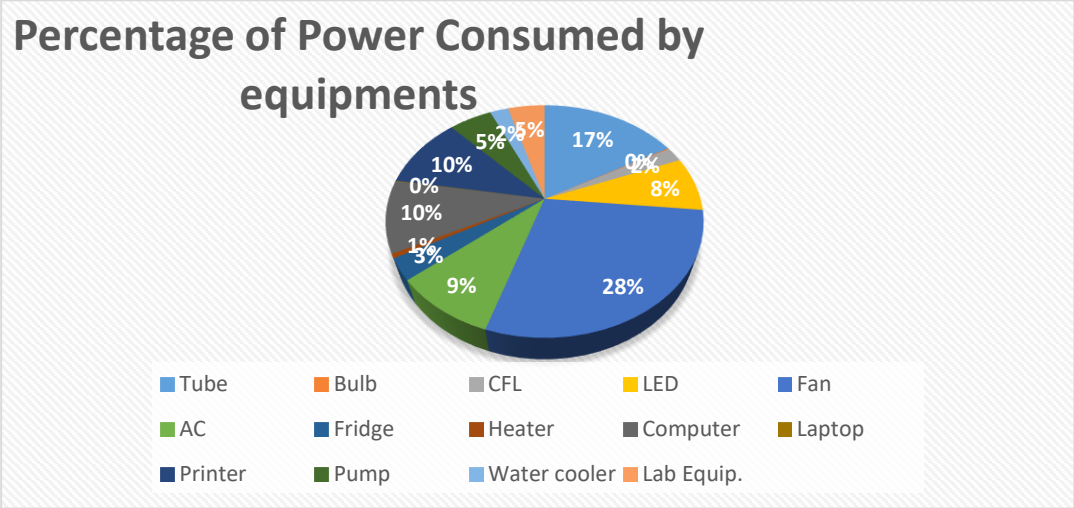
Chapter 5

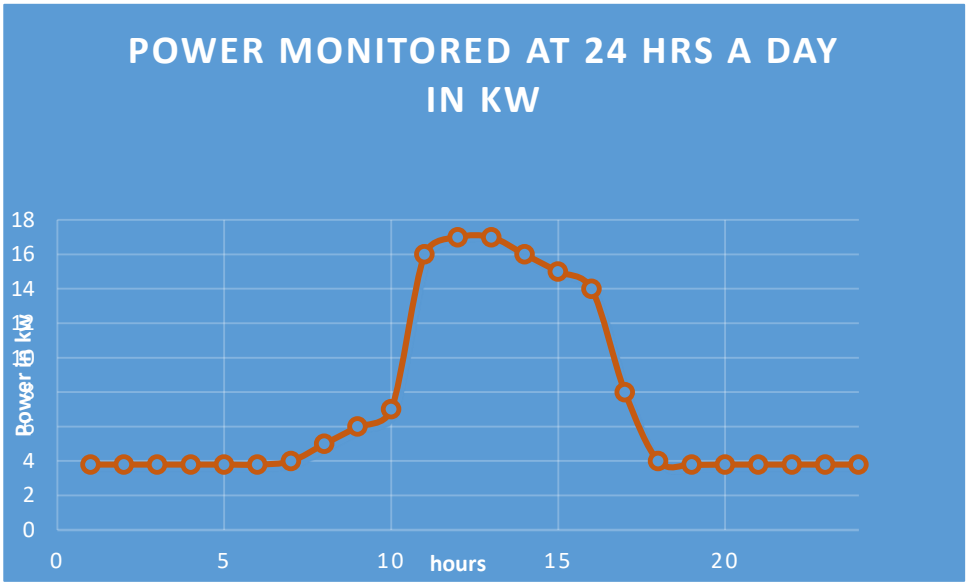
Electrical Equipment used in College Campus

The Electrical equipment available in college are run on grid power as well as solar power system. These are used according to the need. All equipment is not used at a time. The average working day of campus is 8 hrs in that span of time maximum demand power is used. That is why all the time there is different need of power. The Following table shows the number of different equipment are used in college campus.

Department	Tube	Bulb	CFL	LED	Fan	AC	Fridge	Heater	Computer	Laptop	Printer	Pump	Water cooler	Lab Equip.
B. Voc.	2	0	0	0	2	0	2	0	2	0	1	0	0	5
Botany	17	0	0	0	5	0	0	0	1	0	1	0	0	3
Chemistry	23	0	0	0	16	0	2	0	3	0	1	0	0	63
Classroom	151	0	0	0	108	0	0	0	0	0	0	0	0	0
Commerce	3	0	0	0	2	0	0	0	2	0	1	0	0	0
Computer Sci.	9	0	0	0	6	1	0	0	60	0	2	0	0	1
Defence	1	0	0	0	1	0	0	0	1	0	1	0	0	0
Economics	1	0	0	0	1	0	0	0	1	0	1	0	0	0
English	3	0	0	0	2	0	0	0	4	0	2	0	0	0
Exam	11	0	0	0	6	0	0	0	5	0	2	0	0	3
Geography	6	2	0	0	4	0	0	0	2	0	1	0	0	0
Gymkhana	8	10	0	0	2	0	0	0	2	0	1	0	0	0
History	1	0	0	0	1	0	0	0	1	0	1	0	0	0
IQAC	2	0	0	0	2	1	0	0	3	0	3	0	0	1
Jr. Staff room	3	1	0	0	3	0	0	0	0	0	0	0	0	0
Ladies Hostel	76	25	1	0	37	0	2	0	0	1	0	0	1	10
Library	75	0	3	0	55	0	0	0	8	0	2	0	1	1
Marathi	1	0	0	0	1	0	0	0	1	0	1	0	0	0
Mathematics	1	0	0	0	1	0	0	0	1	0	1	0	0	0
MCVC	12	3	0	0	13	0	2	1	7	0	2	0	0	13
Microbiology	0	1	0	0	1	0	0	0	0	0	0	0	0	0
NCC	1	0	0	0	1	0	0	0	1	0	1	0	0	0
NSS	3	0	0	0	2	0	0	0	1	0	1	0	0	0
Office	21	0	0	0	11	1	1	0	14	1	13	0	0	2
Physics	12	0	0	4	12	0	0	1	8	0	3	0	0	40

Political Sci.	1	0	0	0	1	0	0	0	1	0	1	0	0	0
Staff Quarter	2	30	1	0	10	0	0	0	0	0	0	0	0	10
Store	8	1	0	0	3	0	0	0	0	0	0	0	0	0
Tea Club	1	0	0	0	2	0	0	0	0	0	0	0	1	0
YCMOU	1	0	0	0	1	0	0	0	1	0	1	0	0	0
Zoology	11	0	0	0	4	0	1	0	3	0	2	0	0	7
Total	467	73	5	4	316	3	10	2	133	2	46	0	3	159





Remark:

- It has been observed that in old and new building majority of electrical power consumption is through light load such as fan, FTL and power load such as refrigerator, ups, etc. unnecessary use of electrical equipment must be avoided.
- As per individual dept. level load consumption, we understand the scope for improvement of energy saving. Hence our electricity bill will be reduced by proper load management techniques along with optimum utilization of resources.

Sr. No.	Details of Electricity Demand	Tariff	LT-X B II (88)
	Meter No:	075940000254	
1	Sanctioned Demand	30	kVA
2	Contract Demand	30	kVA
3	Recorded Maximum Demand	28	kVA

Thus we observe that:

Total Sanctioned Demand is **30 kVA** while the recorded Maximum Demand is **28 kVA**.

- Electrical Energy Cost Analysis
  The electrical bills from MSEDCL for 12 months from Jan 2019 to Dec 2019 have been studied.
- TOD Charges
  For all LT consumers the Time of Day (TOD) tariff is applicable in Maharashtra for above 20HP.

  For this purpose the day has been divided into 4 different time Zones as given in table

Chapter 6

Study of Electrical Systems

6.1: Electrical Supply Details:

The electrical supply to MVP'S G.M.D. Arts, B.W. Commerce and Science College Sinnar. Nashik comes from MSEDCL supply at 11 kV, which is stepped down to 220 V by a transformer with neutral line.

6.1.2 Study of Electrical Demand:

There is a single meters installed in the premises. The details of meters are as under

Table No 6.1: Meter Details:

Zone	Consumption during following hours of the day	Rate of Consumption	Energy Charge (Paise/unit)
A	2200 – 0600 Hrs	(-01.50 rate in addition to actual rate)	0-0-0-0-0-0-936-1515-1572-1120-1207-1588=**7938**
B	0600 – 0900Hrs & 1200 – 1800Hrs	(0 i.e same rate)	0+0+0+0+0+0+0+0+0+0+0+0=00
C	0900 – 1200 Hrs	(0.80 rate in addition to actual rate))	0+0+0+0+0+0+382+456+561+372+0+369=**2140**
D	1800 – 2200 Hrs	(0.1.10 rate in addition to actual rate)	0+0+0+0+0+0+366+553+624+448+526+573=**3090**

In addition to base tariff of Rs. 6.80 per unit consumed, TOD tariff as indicated is levied depending on time zone during which the unit has been consumed

PF Incentive:

As per the MSEDCL tariff, whenever average power factor in a month, is more than 0.95, following incentives are offered:

- For every 0.01 improvement of average PF above 0.95, an incentive of 1% of the amount of monthly energy bill, (excluding RLC, Demand Charges, FOCA, and Electricity Duty) is offered.
- For PF of 0.99 the effective incentive will amount to 5% of the energy charges, and for unity PF the effective incentive will amount to 7% of the energy charges.

PF Penalty:

As per the MSEDCL tariff, whenever average power factor in a month, is less than 0.95, following incentives are offered:

- For every 0.01 decreases of average PF below 0.95, an penalty of 1% of the amount of monthly energy bill, (excluding RLC, Demand Charges, FOCA, and Electricity Duty) is offered. Similarly it would be changes by 1 % for further decrement of PF.

Performance in power factor is appreciable as the PF is maintained average 0.84 in annual power consumption.

Hence we have to more focus on **power factor correction/improvement using capacitor bank Or APFC panel.**

Lighting System

Observations and suggestions:

- It is found that FTL, Bulbs is installed in the facility.
- It is recommended that some tube lights in this area be switched off when sufficient daylight is available.
- For better brightness tube light must be cleaned.
- It is observed that most of the equipment's are unnecessary kept in power on state.
- Most of the appliances like computers, Printers etc. are kept at Stand-by mode that causes wastage of electric power.
- At some places there is improper grounding that may causes damage of electric appliances or wastage of electricity.

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

- LED light, FTL
- fans (or air-conditioning)
- Printers and scanners
- Computers
- LCD projectors
- Laboratory equipment
- Turn off UPS, Inverters

Chapter: 7

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	3.5	3	220	8.4	3.5

Observations and suggestions:

1. Normal air conditioning temperature should be kept as high as possible (I.e.24 d.cel.). 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: 8

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:

Table 8.1: CO_2 Emission:

Sr. No.	Month	kWh	CO_2 Emitted in Kg
1	Jan	3834	3067.2
2	Feb	5452	4361.6
3	March	-	-
4	April	**811**	648.8
5	May	818	654.4
6	June	2357	1885.6
7	July	2577	2061.6
8	August	3432	2745.6
9	Sept	4002	3201.6
10	October	2930	2344
11	Nov	1822	1457.6
12	Dec	3361	2688.8
Total Units		**31396**	**Avg. Emission = 2283.3kg**

Merits/Existing Features for Energy Savings.

1. Staff vigilance.
2. Computers are connected in LAN.
3. Printers are shared in LAN.
4. Screen savers facility implemented for every computer.
5. AC's used are of five STARS.
6. Refrigerators are of five STARS.
7. Incandescent Bulbs are nowhere used.
8. They are replaced by CFL tubes with electronic choke.

9. Maximum use of natural light.

10. Cross Ventilation is provided in laboratory & class rooms, which reduced number of fans.

11. Most of the practical's are scheduled in noon time where Billing Rate in normal.

12. Walls are painted with off white colour to have sufficient brightness.

13. Automatic timer switch are used in street light

14. LED tube light is used in Seminar hall.

15. PV solar system (15KW) is installed which is expected to generate 63 Unit/day. This saves Rs. 1,25,000/ Year.

16. Off grid PV system 7.5 KW which gives battery backup even of grid power is off.

Chapter: 9

Energy generated from Non Renewable energy source

9.1 Energy generated from Roof Grid Tie Solar System

The Campus has 15.3 KW on grid solar system that is connected to grid via NET meter. The following Table Shows Energy Generated by solar system and sent to Grid. Also table shows CO2 Saved in Kg.

Sr. No.	Month	Energy Generated kWh	Energy Sent to Grid kWh	CO_2 credit in Kg
1	Jan	1705	0	1364
2	Feb	1640	0	1312
3	March	1720	0	1376
4	April	1716	0	1372.8
5	May	2214	782	1771.2
6	June	1670	146	1336
7	July	1403	70	1122.4
8	August	1420	176	1136
9	Sept	1351	142	1080.8
10	October	1431	111	1144.8
11	Nov	1541	521	1232.8
12	Dec	1588	54	1270.4
Total Units		19399	**2002**	**Avg. CO2 Credit =1293 kg**

Roof Top PV Solar System (15kw) installed on terrace of department of Chemistry

- Before Installation Average Monthly Bill = Rs. 54000/-
- **After Installation Average Monthly Bill = Rs. 44858/-**
- **Savings in Bill due to Installation (per month) = Rs. 9142/-**

Annual Savings in Bill (One Year) = Rs. 1,09,704/-

9.2 Energy generated from Roof Grid Tie Solar System

The Campus has 7.5 kw off grid solar system that generates daily average 25 kwh units. The average that generates yearly 9000 kwh units approx. and saves the electricity from grid as well. This System works even if grid power is cut off and helps the campus in emergency conditions also.

9.3 Power generated from Roof Grid Tie Solar System

The campus has Roof Top Solar water heater on Girls Hostel & Staff quarter of 2000 LDP connected to washrooms and bathrooms. The estimated energy saved per day is 134.3kwh energy assumed when water is heated at 60 ^{o}C of 2000 Ltr. per day.

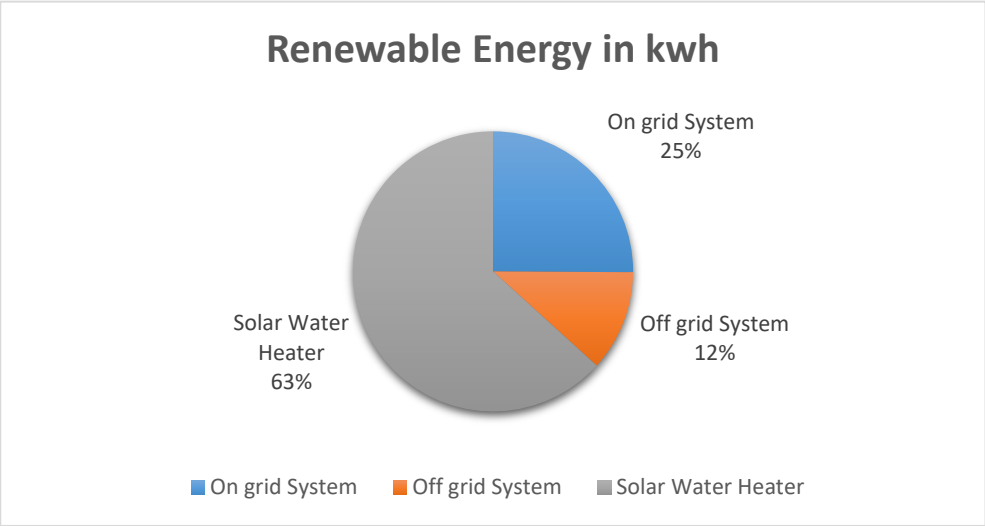


Fig. Percentage of renewable energy Used in College Campus

Chapter: 10
Energy Conservation Proposals

10.1 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 = 5 h/day
- Power consumption by 2 TR compressor = 6.1 kW
- Average daily consumption = 6.1 x 5 = 30.5
- kWh/day/ air conditioner Yearly operating days = 300 days/year/ air conditioner
- Yearly electricity consumption = 9150 kWh/year/ air conditioner
- Considering a saving of 15%, total annual savings = 15% x 9150
  Cost of electricity = Rs. 6.80 / kWh
- Yearly savings = 6.80 x 1372.5 = Rs. 9333/year/ air conditioner
- Total number of Air Conditioners = 3

Summary:

- ✓ **Total yearly Saving = 3 x 9333/year = Rs. 27999/year**
- ✓ **Total Cost of each energy saver circuit = Rs. 4500 x 3 = Rs. 13500/-**

✓

10.2 Replacing Fluorescent Tube Lights (FTL) with LED Tube Lights

The 416 W 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 40 000. (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

10.2.1 Savings in power = 24 W/ Tube Light

10.2.2 Operating hours = 8 h/day x 300 = 2400 h/year

10.2.3 Tube Light Yearly savings = 2400 x 24 W = 57.6 kWh/year/Tube Light

10.2.4 Average Cost of electricity = Rs.6.80/ kWh

10.2.5 Saving = 57.6 kWh x 6.80 = Rs.391.68 / year/ Tube light

10.2.6 Approximate investment on single LED Tube lights = Rs. 200

10.2.7 Number of Tube Lights to be replaced = 253

Summary:

10.2.7.1 Total Yearly Saving =253 x 391.16 = Rs. 98963 /year

10.2.7.2 Total Investment = 416 x Rs. 200 = Rs. 50600

11 General Recommendations

11.1.1 All Class Rooms and labs to have **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.

11.1.2 Most of the time, all the tube lights in a class room are kept ON, even though, there is sufficient light level near the window opening. In such cases, the light row near the window may be kept OFF.

11.1.3 Trying to get the benefit of -01.50 rate in addition to actual rate for per unit consumption of **electric motor pumping during 2200 – 0600 Hrs.**

11.1.4 All projectors to be kept OFF or in idle mode if there will be no presentation slides.

11.1.5 All computers to have power saving settings to turn off monitors and hard discs, say after10 minutes/30 minutes.

11.1.6 The comfort/Default air conditioning temperature to be set between 24˚C to26˚C.

11.1.7 Lights in toilet area may be kept OFF during daytime

11.1.8 Use AUTOMATIC POWER FACTOR CORRECTION (APFC) Panel FOR PF improvement.

11.1.9 Need to focus on existing solar plant which is generating power below the rated power

11.1.10 Need to use power saver circuits for AC.

11.1.11 Need to replace FTL by smart LED Tube

11.1.12 Need to replace ordinary bulb by LED bulb.

11.1.13 Need to replace ordinary CRT monitor by LED.

11.1.14 Need to replace ordinary refrigerator by BEE power saver refrigerator if possible.

11.1.15 Out of total electricity bill paid, 53 percentage are actual energy utilized charges and remaining expense belongs to additional taxes on energy consumption

11.1.16 Recently govt. has declared the exemption on electricity duty charges for school and colleges trying to get the benefit of the same as soon as possible.

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, paper presentation competition among students and staff for general awareness.

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