

Maratha Vidya Prasarak Samaj's
Karmveer Abasaheb Alias N.M. Sonawane
ARTS, COMMERCE AND SCIENCE COLLEGE,
MORE NAGAR, BAGLAN (SATANA), NASHIK- 422301
(MAHARASHTRA)

NAAC Accredited "A" grade with CGPA 3.19

Internal Quality Assurance Cell(IQAC)

Energy Audit Report

(2020-21)



Report By



Energy Solutions, Services & Maintenance

Website : www.solasta.in

Contact: +91 8007552123

Email: solastasustain@gmail.com

Address: 7, Dattakunj , Anand Nagar , Gangapur Road, Nashik-13

Date: **15/06/2021**

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Preface

Data collection for energy audit of the **MVP'S Arts, Commerce & Science College, Morenagar, Baglan (Satana) , Nashik-422301** was approved by team for the period of July 2020 to June 2021.

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 at previous years and updated year by year. 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, we have referred maintained record and college internal survey, 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.



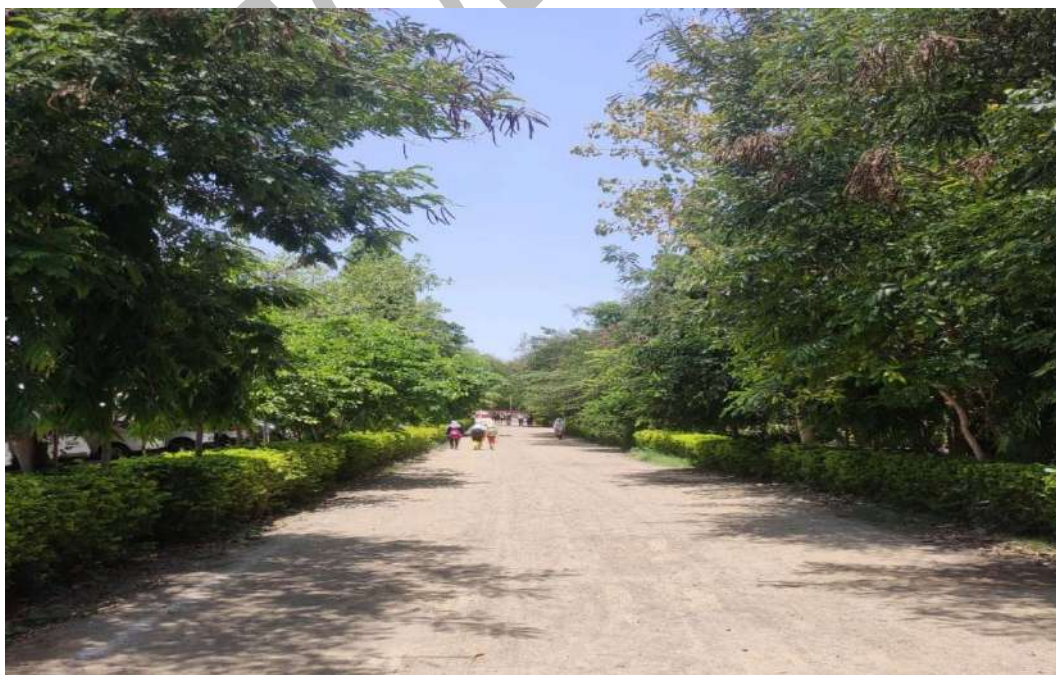
Main Building

Acknowledgement

We are very much thankful to **Principal Dr. R. D. Patil** for motivating us and giving us the opportunity for energy audit. We would like to express our thanks to Prof. Swapnil S. Shendge from Department Physics , and special thanks for Mr. Gavit and all respected staff, faculty members and students who have taken part in this audit survey etc. of MVP'S KANMS Arts, Commerce & Science College, morenagar, Baglan (Satana), Nashik. We tried our best to present this energy report as per requirements of college and our expertise work.

Energy Audit Committee

Sr.No.	Names	Designation
1	Dr. R. D. Patil	Chairperson
2	Asso. Prof. C.I. Sasle	Vice Principal
3	Asso. Prof. S.S. Saundankar	IQAC Co-Ordinator
4	Asso. Prof. S.S. Shendge	Energy Audit Co-Ordinator
5	Asso. Prof. S.H. Mane	Member
6	Asso. Prof. T.S. Pagar	Member



Green Campus

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:

1. MVP'S KANANS Arts, Commerce & Science College, Morenagar, Baglan (Satana), Nashik.

Uses energy in the following forms:

- a. From MSEDCL
- b. Electricity SOLAR Grid connected solar plant (15.3kWp)
- c. High Speed Diesel Generator (HSDG)

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

2. The average cost of energy is around Rs. **34176 / Month.**
3. After the measurement and analysis, we propose herewith following aspect regarding the efficient use of energy:

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:**

Nashik entrusted the work of conducting a walk through Energy Audit of campus with the main objectives as given below:

- ✓ 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, 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 data analysis:**

This step involves actual trials measurement 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 Karmveer Abasaheb Alias N.M. Sonawane Arts, Commerce & Science College, Satana
2	Address:	Morenagar, Baglan (Satana), Nashik-422301
3	Affiliation:	Affiliated to Savitribai Phule Pune University Affiliation ID No: PU/NS/ACS/008/(1967) College Under Sec. : UGC Act 12(b)(2f)
4	Year of Establishment:	June 1967
5	NAAC Accrediation:	NAAC REACCREDITED "A" GRADE with
6	Contact:	Phone : 02555223042, FAX : 02555223042 Email : nmsasc@yahoo.co.in Website : www.satanacollege.com
7	Courses Offered:	XI th and XII th Arts , Commerce & Science B. A./B.Com./B.Sc., B. Sc. (Computer Science)/B.B.A./P.G.D.T./ Certificate Course in French B. Voc: 1. Agriculture & Horticulture 2. Beauty & Wellness M.Science: Botony, Microbiology, Organic Chemistry, Computer Science, Zoology M.Com, MA (Marathi), MA (Hindi), MA (English), MA (Economics), MA (Geography), MA (History), MA (Polytics)

Chapter: 3

Energy Consumption Profile

3.1 Source of Energy:

MVP'S KANMS Arts, Commerce & Science College, Morenagar, Baglan (Satana), Nashik, uses Energy in following forms:

A. Electricity from MSEDCL :

MVP'S KANMS Arts, Commerce & Science College, Morenagar, Baglan (Satana), Electricity from Nashik (U) Circle: 595 Of NASIK URBAN DN. 1. : 040 AMBAD S/DN. : 669 1

B. High Speed Diesel Generator 15 KW (HSDG) :

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



Kirloskar Diesel Generator (15KVA)

C. Electricity SOLAR Grid connected solar plant (15.3kw):



**Solar - On Grid Inverter System
(15.3KW)**

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
- Router system
- Flood light
- Pumping motor



Electronics Lab



Physics Lab



IT Lab



Chemistry Lab

Chapter: 4

Data Analysis

4.1. Study of Variation of Monthly Units consumption & Power Factor:

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

TABLE 1: Variation in Units Consumption & Power Factor (PF):

Sr. No.	Month	No. Units kWh	Power Factor (P.F.)
1.	June 21	2068	0.85
2.	May 21	1225	NA
3.	April 21	2355	0.83
4.	Mar 21	4695	0.94
5.	Feb 21	2030	0.87
6.	Jan 21	2391	0.85
7.	Dec 20	2598	0.82
8.	Nov 20	2407	0.81
9.	Oct 20	3204	0.85
10.	Sept 20	3251	0.88
11.	Aug 20	2977	NA
12.	July 20	18091	NA
	Total Units	47292	Average: 0.41

4.2 Conclusion : Variation of PF

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% (2 percent) 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

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4.3 Study of Month wise Electricity Bill Variation:

TABLE 2: Variation in Electricity Bill:

Sr. No.	Month	Electricity Bill Amount (Rs.)
1	June 21	28792
2	May 21	19994
3	April 21	32131
4	Mar 21	58862
5	Feb 21	28832
6	Jan 21	32802
7	Dec 20	35335
8	Nov 20	33241
9	Oct 20	41726
10	Sept 20	41530
11	Aug 20	38377
12	July 20	18493
	Total Annual Bill=	410115
	Average Monthly Bill=	34176

Conclusion : Monthly Electricity Bill Variation has been identified.

4.4 Study of Month wise Maximum Demand Variation:

TABLE:3 Month wise Maximum Demand Variation:

Sr. No.	Month	Bill Demand (kVA/Month)
1	June 21	15
2	May 21	15
3	April 21	15
4	Mar 21	18
5	Feb 21	15
6	Jan 21	15
7	Dec 20	15
8	Nov 20	15
9	Oct 20	15
10	Sept 20	15
11	Aug 20	15
12	July 20	15

4.5 General Observations based on Electricity Bill:

1. For College Campus the Contract Demand (CD) is 38 kVA and minimum billing Demand is 50% of the Contract Demand (i.e. 19 kVA) or the 75% of previous Maximum Demand recorded whichever is higher.
2. Since, the MD recorded is more than 21kVA. I.e. 21.52 kVA for month.
The average electricity cost is Rs. 7.44 considering the last twelve months.
(Excluding TOD charges, MD and PF charges)
3. Average monthly Power Factor (P.F.) is maintained near **0.41**
4. Average Monthly bill is Rs. **34176** /-
5. Maximum Demand Recorded is 21.52 kVA
6. Power factor should be monitored and need to maintain close to unity on priority.

Chapter: 5

5.1 Actual Measurements and its Analysis

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	314	12560	6	75360
2	Fan	80	126	10080	6	60480
3	PC	60	207	12420	6	74520
4	Printer: Standby mode: 30-50w/	printing mode:300- 500w	38	11400	2	22800
5	LED 18 W	18	12	216	6	1296
	LED 22 W	22	4	88	6	528
6	CFL	20	8	160	6	960
7	Xerox machine	650	3	1950	2	3900
8	Fax machine	30	1	30	2	60
9	AC	3500	3	10500	4	42000
10	LED bulb	20	2	40	6	240
11	CCTV	10	11	110	24	2640
12	UPS	2-5KVA, 51 batteries of 80 Amp-hr	2	5000	6	30000
13	Water Cooler	2.8kwh/day	1	2800	1	2800

14	RO System	3-7 kWhr/m3	1	3000	1	3000
15	LCD Projector	282	4	1128	2	2256
16	Internet Box with wifi router W/Hr	850	1	850	6	5100
17	Charging socket	23	16	368	2	736
18	Weather Station	100w/day	1	100	1	100
19	P.A.System	560	1	560	1	560
20	Exhaust fan	60	12	720	6	4320
21	Electric bell	5	1	5	1	5
22	Refrigerator	2kwhr/day	2	2000	1	2000
23	Flood light	400	6	2400	11	26400
24	Incubator	1500	1	1500	6	9000
25	Research Microscope	100	3	300	6	1800
26	Chem. Lab Equipment	1400	1	1400	2	2800
27	Hot air oven	1000-1400	1	1000	2	2000
28	Centrifugal machine	125	1	125	2	250
29	Lab Equip. for practical	900	1	900	3	2700
30	Pumping motor	1.0 HP	2	1490	2	2980
31	DG Gen set	15KVA	1	AS PER USE		AS PER USE
32	Grid connected solar plant	15.36kw	1	15.36kw	12	15.36kw
It is expected to generate 60 units/day, 1800 units per month Aprox. through Solar Rooftop On grid System 15.3kWp.						

**** This is total load consumption considered approximately. Actual load consumption might be different according to actual use of power for particular time period.***

5.2 Department wise load Consumption:

A) Old Building, New Building:

Sr. No.	Premises	Existing Load During (2020-21) in Watt	Remark (Name Of Appliances)
1	Principal Office	2010	
2	Administration Office:	2430	Nil
3	IQAC Office:	1560	
4	Chemistry, Physics, electronics, computer, IT, geography Lab, botony, zoology Lab and all other	23940	Nil
5	Girls Hostel (Old+New)	11290	
6	Dept.Of Commerce, dept., Of Geography, Botony, Zoology, hindi, english ., library , ncc and all other	13940	Nil
7	Seminar Hall, Classroom, , Staff and Girls Reading Room, Porch, Staircase, Porch , All Classrooms, Vcov, VLC, Language Lab,Store Room,	9540	Nil

**** This is total load consumption considered approximately. Actual load consumption might be different according to actual use of power for particular time period.***

5.4 PF Incentive/ Penalty :

As per the MSEDCL tariff, whenever average power factor in a month, is less/more than 0.95, incentives/penalty are offered which we need to have take into consideration:

Similarly there is scope for further improvement of power factor at particular case. Because Power factor is affected . If we more focus on average power factor of 0.95, we will get the incentives instead of penalty.

Check for **power factor correction/improvement panel using capacitor bank Or APFC panel feasibility** with experts opinion.

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Chapter: 6

Study of Electrical Systems

6.1 Electrical Supply Details:

The electrical supply to MVP'S KANMS Arts, Commerce & Science College, Morenagar, Baglan (Satana), Nashik comes from MSEDCL supply at 11 kV, which is stepped down to 415 V by a transformer.

6.2 Study of Electrical Demand:

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

Energy Meter Details:

Sr. No.	Details of Electricity Demand	Tariff	LT-VII B I (88)
	Consumr No:	055020001258	
1	Sanctioned Load:	32.00	kW
2	Contract Demand:	38.00	kVA
3	Recorded Maximum Demand:	21.52	kVA

Thus we observe that:

Total Sanctioned Load is **32 kW** while the recorded Maximum Demand is **21.52 kVA**.

6.3 Lighting System:

Observations and suggestions:

- It is found that FTL, Bulbs, CFLs are installed and replacing with LEDS
- light or electric gadget left ON when not needed which is wasting energy and money , causing pollution that is totally unnecessary , we can surely avoid this.
- **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 $\frac{3}{4}$ of a tone of CO₂ pollution. A 20% reduction on average consumption will save over Approximately 30,000 and over 1.5 tones of CO₂.

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

- Lights
- Projectors
- Air Conditions
- Exhaust and ceiling or table fan
- Printers and scanners
- Battery and phone chargers
- Computers
- TV
- PA Systems
- Pantry /Canteen gadgets such as blenders, kettles, toasters , Induction etc.

Chapter: 7

Study of Air Conditioners

In the facility for air conditioning there is no centralized system with AHU (air handling unit), mostly split air conditioners are installed. The **energy saver circuits/ inverter Based Air Conditioners 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 3 split type air conditioners. It is observed that the air conditioners are with new energy efficient BEE STAR labeled (3 Star and above) air conditioners and are in minimum operational whenever necessary.

7.1 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: 8

Energy Conservation Proposals

8.1 Energy Efficiency Improvement:

Sr. No.	Recommendations	Annual Saving Potential (Rs.)	Estimated Investment (Rs.)	Pay Back period (Years)	Remarks (Feasibility)
2	Auto power factor correction panel	At Actual	20000	1.5 Years	Mid -Term
	Total Amount	At Actual	Rs. 20000/-	2 Years	Short -Term

- The total energy cost with an overall payback period of aprox 2 Years for technical and economical feasibility.

CHAPTER: 9

Energy Saving Recommendations

General Recommendations:

- Care should be taken to keep lights in classroom off and keep ON whenever necessary.
- Try to get the benefit of TOD time slot(Refer Pt.6.4) i.e. -01.50 rate at night in addition to actual rate for per unit consumption for **electric motor pumping purpose during 2200 – 0600 Hrs.**
- Use Solar Street Light, Solar High mast , Solar Garden Light in Premises.

Executive Recommendations:

1. Form 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 implementing actions should be taken
3. Arrange Seminars 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.

10. 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
- 6) Msedcl Energy Bills/ CPL



Energy Solutions, Services & Maintenance

Website : www.solasta.in

Contact: +918007552123

Email: solastasustain@gmail.com

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

SOLAR Rooftop Energy, Energy Auditing.

WORK COMPLETION REPORT

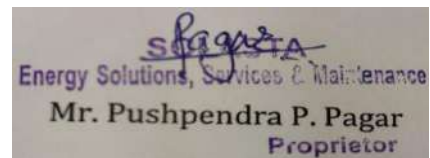
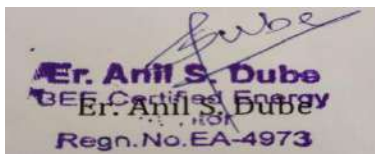
- Name of Work Project : Energy Audit of MVP'S Arts, Commerce & Science College, Morenagar, Baglan (Satana) , Nashik-422301
- Work Order Number : 2020-21
- Work Period : From 01/06/2021 To 14/06/2021

This is to Certify that SOLASTA Energy Solutions, Services & Maintenance has successfully completed Energy audit at MVP'S Arts, Commerce & Science College, Morenagar, Baglan (Satana). The work of energy audit is Completed on 15/06/2021 for year 2020-21.

Thanking you and assuring you for our best service always.

Audit Report BY,

FOR SOLASTA,



Date: 15/06/2021

Place: Nashik

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