Maratha Vidya Prasarak Samaj's KARMAVEER SHANTARAMBAPU KONDAJI WAVARE ARTS, SCIENCE AND COMMERCE COLLEGE,

UTTAM NAGAR, CIDCO, NASHIK-08

(MAHARASHTRA)

# **Internal Quality Assurance Cell(IQAC)**

# **Energy Audit Report**

(2019-20)



## Prepared by



## **Energy Solutions, Services & Maintenance**

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## Date: 13/06/2020



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## **Preface**

Data collection for energy audit of the **MVP'S KSKW Arts, Science and Commerce College, Uttamnagar, CIDCO, Nashik-08** was approved 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 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, we have referred energy audit report of previous year (2018-19). 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

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## **Acknowledgement**

We are very much thankful to **Principal Dr. J. D. Sonkhaskar and IQAC coordinator, NAAC** for motivating us and giving us the opportunity for energy audit. We would like to express our sincere thanks to **Dr. Smt. P.G.Loke** Head Department of Physics, faculty members of Physics Department. such as **Prof. S.M.Pagar** and all respected staff, faculty members and students who have taken part in this audit survey etc. of MVP'S KSKW Arts, Science and Commerce College, Uttamnagar, CIDCO, Nashik-08. We tried our best to present this energy report as per requirements of college and our expertise work.



Annex 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:

- **1.** MVP'S KSKW Arts, Science And Commerce College, Uttamnagar, CIDCO, Nashik uses energy in the following forms:
  - a. From MSEDCL
  - b. Electricity SOLAR Grid connected solar plant (15.3kw)
  - c. High Speed Diesel Generator (HSDG)

Electrical energy is used for various applications, like: Computers, Lighting, Air-Conditioning, Fans, 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. 31921.58/Month.
- 3. The Specific Energy Consumption (SEC) is the ratio of energy required per square meter. In this case the SEC is evaluated as electrical units consumed per square meter of area. It is calculated as under for (Electricity): 0.21504 kWh/Sq.m
- **4.** 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



## **Introduction to Energy Audit**

## • General:

The MVP'S KSKW Arts, Science and Commerce College, Uttamnagar, CIDCO, 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.



## About Institute

Sr. No.	Particulars	Details			
1	Name of the Institute:	Maratha Vidya Prasarak Samaj's			
		Arts Science and Commerce College CIDCO			
		Arts , science and commerce conege, cibeo,			
2	Address:	Uttamnagar, Nashik-422008			
		Manarashtra State, India.			
		Affiliated to Savitribai Phyle, Pune University Pune-07			
3	Affiliation:	ID No. PU/NS/ASC/047/1993			
3	Year of Establishment:	08/08/1994			
		08/08/1994			
5	NAAC Accrediation:	NAAC REACCREDITED "A" GRADE			
		with CGPA 3.20 (Third Cycle)			
6	Contact:	Phone : 0253-2391110,			
		FAX : 0253-2372210			
		Email : <u>cidcocollegenasik@rediffmail.com</u>			
		Website : www.cidcocollgenashik.com			
4	Courses Offered:	XI <sup>th</sup> and XII <sup>th</sup> Arts , Commerce & Science			
		B. A./B.Com./B.Sc., B. Sc. (Computer Science)			
		B. Voc.			
		1.Electrical Appliances Maintenance & Repairing			
		2.Food Technology			
		M. Sc.: Physics, Chemistry, Computer Science, Geography			
		M.Com.			



## **Energy Consumption Profile**

### 3.1 Source of Energy:

MVP'S KSKW Arts Science and Commerce College, UTTAM NAGAR, CIDCO Nashik, uses Energy in following forms:

## A. Electricity from MSEDCL :

MVP'S KSKW Arts Science and Commerce College receives Electricity from Nasik (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):



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

- > Computers
- Lighting
- Air-Conditioning systems
- ➤ Fans
- Laboratory Equipment
- > Printers



- > CCTV
- ≻ UPS
- LCD Projector
- Router system
- Flood light
- Pumping motor



I.T. Lab





**Exam Section** 

## A.C. Computer Lab







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



## **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 20	2472	0.00
2.	May 20	2472	0.00
3.	April 20	2472	0.00
4.	Mar 20	2352	0.00
5.	Feb 20	2352	0.85
6.	Jan 20	2219	0.83
7.	Dec 19	2845	0.87
8.	Nov 19	1445	0.71
9.	Oct 19	2311	0.82
10.	Sept 19	3145	0.87
11.	Aug 19	3343	0.90
12.	July 19	3454	0.90
	Total Units	30,882	Average = 0.8266





#### MONTH WISE UNIT CONSUMPTION



### MONTHWISE POWER FACTOR VARIATION

### 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



## 4.3 Study of Month wise Electricity Bill Variation:

Sr. No.	Month	Electricity Bill Amount (Rs.)
1	June 20	35245
2	May 20	35245
3	April 20	8238
4	Mar 20	31172
5	Feb 20	31930
6	Jan 20	30121
7	Dec 19	37703
8	Nov 19	22269
9	Oct 19	31301
10	Sept 19	38983
11	Aug 19	39630
12	July 19	41222
	Total Annual Bill=	383059
	Average Monthly Bill=	31921.58

 TABLE 2: Variation in Electricity Bill:

Conclusion : Monthly Electricity Bill Variation has been identified.



## 4.4 Study of Month wise Maximum Demand Variation:

Sr. No.	Month	Maximum Demand (kVA/Month)
1	June 20	18
2	May 20	18
3	April 20	18
4	Mar 20	11
5	Feb 20	11
6	Jan 20	11
7	Dec 19	14
8	Nov 19	12
9	Oct 19	14
10	Sept 19	14
11	Aug 19	15
12	July 19	14

#### TABLE:3 Month wise Maximum Demand Variation:





## Month wise Maximum Demand Variation

## 4.5 General Observations based on Electricity Bill:

- 1. For College Campus the Contract Demand (CD) is 28 kVA and minimum billing Demand is 50% of the Contract Demand (i.e. 14 kVA) or the 75% of previous Maximum Demand recorded whichever is higher. Since, the MD recorded is less than 14kVA.
- 2. The average electricity cost is Rs. 6.80 considering the last twelve months. (Excluding TOD charges, MD and PF charges)
- 3. Average monthly Power Factor is maintained near P.F.0.8266.
- 4. Average Monthly bill is Rs. 31921/-
- 5. Maximum Demand Recorded is 18 kVA
- 6. Power factor is affected during September19 to February 20 which is below and Similarly during March and Feb. 2020 is and which is need to improve power factor up to 0.9



#### Chapter: 5 Actual Measurements and its Analysis **College Camp Annex Porch Seminar Hall** Quantit Power Power Name of Power Usage Sr. Consumption Consumption/da No. Appliance Rating per Day y (Watt) (Watt) Hr. y (Watt) С E = C X DF G = E X FВ D Α FTL 40 416 6 99840 1 16640 6 2 Fan 80 192 15360 92160 PC 60 3 90 5400 6 32400 34 4 Printer: 10200 2 20400 printing Standby mode: mode:300-30-50w/ 500w LED 18 W 5 18 8 144 6 864 LED 22 W 22 6 132 6 792 CFL 20 4 80 6 480 6 7 Xerox 650 4 2600 2 5200 machine 2 Fax machine 30 1 30 60 8 AC 3500 7 24500 4 98000 9 LED Tube 20 200 1200 10 10 6 11 CCTV 10 32 320 24 7680 2-5KVA, 51 5 12 UPS 12500 6 75000 batteries of 80 Amp-hr Water Cooler 2.8kwh/day 1 1 2800 13 2800

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14	RO System	3-7 kWhr/m3	3	9000	1	9000
15	LCD Projector	282	19	5358	2	10716
16	Internet Box with wifi router W/Hr	850	4	3400	6	20400
17	Charging socket	23	4	92	2	184
18	Weather station	100w/day	1	100	1	100
19	P.A.System	560	1	560	1	560
20	Exhaust fan	60	3	180	6	1080
21	Electric bell	5	3	15	1	15
22	Refrigerator	2kwhr/day	4	8000	1	8000
23	Flood light	400	5	2000	11	22000
24	Incubator	1500	1	1500	6	9000
25	Research Microscope	100	1	100	6	600
26	Vacuum cleaner	1400	1	1400	2	2800
27	Hot air oven	1000-1400	1	1400	2	2800
28	Centrifugal machine	125	1	125	2	250
29	Lab Equip. for practical	300	10	3000	3	9000
30	Pumping motor	1.0 HP	1	746	2	1492
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. In our case In June only 216 units are generated through solar. Other months also get affected for optimum power generation.					

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

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# 5.2 Department wise load consumption:

## A) Old Building:

Sr. No.	Premises	Existing Load During (2018-19) in Watt	Additional Load during (2019-20) in Watt	Remark (Name Of Appliances)
1	Principal Office	39752	Nil	
2	Administration Office:	28284	10	CCTV
3	Passage:	2604	20	CCTV
4	IQAC Office:	3784	20	CCTV
5	Store Room:	18060	Nil	
6	Staff Room:	8332	Nil	
7	Department OF IT,Comp.Centre,PG Lab(Physics),Battery Room Etc.:	32972	20	ССТV
8	Chemistry Lab:	4440	Nil	
9	Y.C.M.O.U.:	3220	10	CCTV
10	Department Of Botony/Zoology:	4800	85	CCTV, Fan
11	First Floor Staircase:	1480	40	CCTV
12	Dept.Of Commerce,Class Room(11,12,13,14,15,16,17,18,19,20) Physics Lab 2,Second Floor Staircase:	36468	40	CCTV
13	Class Room (22,23,24,25,26,27,28,29):	10530	20	CCTV
14	Dept., Of Geography, NSS, Staff Quarters:	15120	Nil	
<u>B)</u>	NEW BUILDING			
15	Basement: Seminar Hall, Library, Network Resource Centre, Staff and Girls Reading Room, NSS, Porch, Staircase:	54868	98	CCTV, LED tube
16	Dept.Of Physics And Electronics, Staff Room:	8400	20	CCTV
17	Dept. Of Computer Science:	66764	10	ССТУ
18	Dept., Of Hindi Sociology,Politics,First Floor,Exam Section,Chemistry,Psychology&economic s	26364	10	ССТV
19	Class Room (8,9,10,11,16,17,18,19), Staircase II, Dept. of Botany, Zoology, Marathi, Maths, English, Geography, Microbiology, Third Floor Staircase:	178306	80	ССТV
20	Open Auditorium, Gymnasium, open Premises:	7200	80	CCTV

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption/day (Watt)
Α	В	С	D	E = C X D	F	G = E X F
1	CCTV	10	47	470	24	11,280
2	FAN	75	1	75	6	450
3	LED Tube	18	1	18	6	108
					Total:	11838Watts

## 5.3 Additional Load During (2019 - 20):

## 5.4 Incentives/Penalty Based On Power Factor:

## TABLE 4: Incentives/ Penanlty ON Power Factor Variation:

Sr.	Month Power		Incentive/Penalty
NO.		Factor	(In Rs)
1.	June 20	0.00	0
2.	May 20	0.00	0
3.	April 20	0.00	470.67
4.	Mar 20	0.00	743.34
5.	Feb 20	0.85	761.68
6.	Jan 20	0.83	950.36
7.	Dec 19	0.87	604.26
8.	Nov 19	0.71	1678.94
9.	Oct 19	0.82	1106.60
10.	Sept 19	0.87	624.14
11.	Aug 19	0.90	0
12.	July 19	0.90	0
		TOTAL Penalty	INR 6939.99/-

### 5.6 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.

### 5.7 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 0.8225 in annual power consumption.

Similarly there is scope for further improvement of power factor at particular case. Power factor is affected during June and May 2019 is 0.86 and 0.230. Similarly during March and Feb. 2019 is 0.680 and 0.150 need to improve power factor up to 0.95. If we more focus on average power factor of 0.95, we will get the incentives instead of penalty.

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



## 5.8 Prompt Payment variation Calculation:

Sr. No.	Month	Prompt Payment Discount	Discount Received Y/N?	
1.	June 20	0	NA	
2.	May 20	0	NA	
3.	April 20	0	NA	
4.	Mar 20	0	NA	
5.	Feb 20	0	NA	
6.	Jan 20	0	NA	
7.	Dec 19	308.17	Y	
8.	Nov 19	184.68	Ŷ	
9.	Oct 19	256.98	N	
10.	Sept 19	320.31	Y	
11.	Aug 19	322.27	Ŷ	
12.	July 19	340	Ν	
1.TOTAL Discount received by prompt payment =INR 1135.43 2. TOTAL Discount not received by prompt payment=INR 596.98				

#### **TABLE 5: Prompt payment Variation:**

3. Late Payment Charges= INR 00.00

NOTE: Prompt Payment Discount is not given for the months JANUARY 2020 TO JUNE 2020 because of principal arrears received (INR 4,60,201.61/-)









## **Study of Electrical Systems**

## 6.1 Electrical Supply Details:

The electrical supply to MVP'S Arts Science and Commerce College, Uttam Nagar,CIDCO 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

LITEISY IVI	Lifergy weter betails.					
Sr. No.	Details of Electricity Demand	Tariff	LT-X B II (88)			
	Meter No:	04901518	5111			
1	Sanctioned Load	30.00	kW			
2	Contract Demand	28.00	kVA			
3	Recorded Maximum Demand	18.00	kVA			

### **Energy Meter Details:**

Thus we observe that:

Total Sanctioned Load is **30 kW** while the recorded Maximum Demand is **18 kVA**.



### 6.3 Electrical Energy Cost Analysis

The electrical bills from MSEDCL for 12 months from July 2019 to June 2020 have been studied.

## 6.4 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 We studied the energy bill of 12 months from july19 to june20, and observe the following figures:

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)	-972-865-801-747-742-949- 864-796-796-927-927-927 =-10313
В	0600 – 0900Hrs & 1200 – 1800Hrs	(0 i.e same rate)	0+0+0+0+0+0+0+0+0+0+0+0=0
С	0900 – 1200 Hrs	(0.80 rate in addition to actual rate))	492+465+472+265+74+382+268 +297+297+494+494+494 =4494
D	1800 – 2200 Hrs	(0.1.10 rate in addition to actual rate)	358+316+298+283+283+346+ 323+294+294+679+679+679 =4832

In addition to base tariff of Rs. 6.80 per unit consumed, TOD tariff as indicated is levied



## 6.5 Lighting System:

#### **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 <sup>3</sup>/<sub>4</sub> 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.

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

- Lights
- Heaters and fans (or air-conditioning)
- Printers and scanners
- Battery and phone chargers
- Computers
- Gaming consoles
- TVs, DVD players
- Stereos
- Kitchen/Canteen gadgets such as blenders, kettles, toasters etc.



## **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.

## 7.1 Load of ACs was as follows:

ltem	Rated Power (kW)	Qty	Voltage	Current Amp	Actual Power (kW)
ACs	4	7	406	8.4	3.5

## 7.2 Observations and suggestions:

- 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.



### **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:

### 8.1 CO<sub>2</sub> Emission Variation:

Sr. No.	Month	kWh	CO <sub>2</sub> Emitted in Kg
1	June 20	2472	19.77
2	May 20	2472	19.77
3	April 20	2472	19.77
4	Mar 20	2352	18.81
5	Feb 20	2352	18.81
6	Jan 20	2219	17.75
7	Dec 19	2845	22.76
8	Nov 19	1445	11.56
9	Oct 19	2311	18.48
10	Sept 19	3145	25.16
11	Aug 19	3343	26.74
12	July 19	3454	27.63
	Total	30,882	Avg. Emission = 20.58

### TABLE 6: Monthwise CO2 Emmison Chart

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## Carbon Di-Oxide Emission

## 8.2 Merits/Existing Features for Energy Saving

- 1. Staff vigilance.
- 2. Computers are connected in LAN.
- 3. Printers are shared in LAN.
- 4. Screen savers facility implemented for every computer.
- 5. ACs used are of three STARS.
- 6. Refrigerators are of three 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.
- 11. Walls are painted with off white colour to have sufficient brightness
- 12. Solar powered street lamp is used.
- 13. LED flash light is used in Seminar hall.



### **Energy Conservation Proposals**

#### 9.1 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= 1372.5 kWh/year/ air conditioner \*Cost of electricity = Rs. 6.80 / kWh
- Yearly savings = 6.80 x 1372.5 = Rs. 9333/year/ air conditioner
- Total number of Air Conditioner =7

#### Summary For Energy Saver Circuit:

- ✓ Total yearly Saving = 7 x 9333/year = Rs. 65331/year
- ✓ Total Cost of each energy saver circuit = Rs. 4500 x 7 = Rs. 31500/-



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

The 416Watt 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 = 8 h/day x 300 = 2400 h/year
- Tube Light Yearly savings = 2400 x 24 W = 57.6 kWh/year/Tube Light
- Average Cost of electricity = Rs.6.80/ kWh
- Saving = 57.6 kWh x 6.80 = Rs.391.68 / year/ Tube light
- Approximate investment on single LED Tube lights = Rs. 200
- Number of Tube Lights to be replaced = 416

#### Summary For FTLs:

- ✓ Total Yearly Saving =416 x 391.16 = Rs. 162722.56/year
- ✓ Total Investment = 416 x Rs. 200 = Rs. 83200



<b>TABLE 7</b> :	<b>Energy Effic</b>	iency Improv	ement:
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Sr. No.	Recommendations	Annual Saving Potential (Rs.)	Estimated Investment (Rs.)	Pay Back period (Years)	Remarks (Feasibility)
1	Use of motion sensor in corridors, passage and toilets	6000	8000	1.33	Mid Term
2	Replacing Tube Lights (FTL) with LED Tube Lights	162722	83200	0.51	Mid/Short Term
3	Replacing Fan with 5 star energy saving Fan or BLDC fan	50000	230000	4.6	Long Term
4	Replacing Flood light with smart Radiato ES Ultra Thin LED Street Light SMD (White, Waterproof IP65) - 50 by Radiato ES	3273	5000	1.5	Mid Term
5	Providing Energy Saver Circuit to the Air Conditioners	Saving 7x9333 =65331	Total Cost 4500x7 =31500	0.48	Mid/Short Term
	Total Amount	Rs. 2,87,326/-	Rs. 3,57,700/-	1.68 Years	

• Total savings during the energy audit is estimated at Rs. 2,87,326/-

• The total energy cost with an overall payback period of 1.6 Years for techn and economical feasibility.

## CHAPTER: 10

## **Energy Saving Recommendations**

### **General Recommendations:**

- 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
- 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.
- 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 to 26°C.
- Use AUTOMATIC POWER FACTOR CORRECTION (APFC) Panel FOR PF improvement
- Need to use power saver circuits for AC.
- 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, paper presentation competition among students and staff for general awareness.



Month	Net Meter Status				MSEB Billed Units			Remarks
	Import	Export	Generation	Status	Import	Export	Units	
July 19	3484	31		?			3454	*
Aug 19	0	0	0	NA	3392	49	3343	
Sept19	0	0	0	NA	3216	71	3145	
Oct 19	0	0	0	NA	2572	261	2311	
Nov 19	0	0	0	NA	1628	183	1445	
Dec 19	0	0	0	NA	2911	66	2845	
Jan 20	0	0	0	NA	2370	151	2219	
Feb 20	2439	86	6160		2439	87	2352	**
March 20	2352	00	00				2352	
April 20	2472	00	00				2472	
May 20	2472	00	00				2472	
June 20	2472	00	00				2472	

## TABLE 8 : Analysis from Energy Bill:

#### Note:

## \* From August 19 to January 20 Solar Net Meter Data is Not Available <u>Take the Follow-up with appointed</u> <u>Solar Integrated Agency for</u> proper Operation and Maintenance (O & M) of NET meter

## \*\* Due to COVID-19 Pandemic Lockdown (from 22/03/2020) From March 20 to June 20.

 Non – Availability of NET Meter Import – Export reading / Generator reading, bill is on assessed consumption (based on last month consumption). Actual Import / Export Will be considered upon availability of actual reading.

For correction in the bill on account of export due to solar generation contact MSEB Billing Section.

 Energy Bill for the months from Jan-20 onward is shown 0.00, as it is debited from the Principal Arrears (Rs 4,60,201/-) Refer the Circular Attached

### 11. <u>References</u>

#### **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





Energy Solutions, Services & Maintenance

Website : www.solasta.in Email: solastasustain@gmail.com Contact: +918007552123 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 KSKW Arts, Science and Commerce college, Uttamnagar, CIDCO, Nashik-08

- Work Order Number : 2019-20
- Work Period

: From 1/06/2020 To 12/06/2020

This is to Certify that SOLAST'A Energy Solutions, Services & Maintenance has successfully completed Energy audit at KSKW College, Uttam nagar, CIDCO, Nashik-08. The work of energy audit is completed on 13/06/2020 for year 2019-20.

Thanking you and assuring you for our best service always.

Audit Report BY,

Regn.No.EA-4973



FOR SOLASTA,

Energy Solutions, Services & Maintenance

Mr. Pushpendra P. Pagar Proprietor



kegn. No. EA4973 No. 2487 National Productivity Council (National Certifying Agency) PROVISIONAL CERTIFICATE This is to certify that Mr. / Ms. Anil Siddhanarayan Oube on / daughter of Mr. Siddhanarayan Oube on / daughter of Mr. Siddhanarayan Oube on / daughter of Mr. Siddhanarayan Oube furgy Efficiency. Ministry of Power, Government of India. He / She is qualified as Certified Energy Auditors in 2006, conducted on behalf of the Burean of Energy Efficiency. Ministry of Power, Government of India. He / She is qualified as Certified Energy Auditor. He / She shall be entitled to practice as Energy Auditor under the Energy Conservation Act 2001, subject to the huffiliment of qualifications for the Accredited Energy Auditor and issue of certificate of Accreditation by the Burean of Energy Efficiency under the said Act. This certificate is valid till the issuance of an official certificate by the Bureau of Energy Efficiency.	All in chidaulaund	Place : Chennal, India Date : 30 <sup>th</sup> April 2007
tegn. No. EA-1973 Autional Productivity Council (National Certifying Agency) PROVISIONAL CERTIFICATE This is to certify that Mr. / Ms. Antil Siddhattarayan Oube on / daughter of Mr. Siddhanarayan Oube on / daughter of Mr. Siddhanarayan Oube for syssed 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 hulfillment of qualifications for the Accredited Energy Auditor and issue of certificate of Accreditation by the Bureau of Energy Efficiency under the said Act.	official certificate by the Bureau of Energy Efficiency.	This certificate is valid till the issuance of an
tegn. No. EA4973       No. 2487         National Productivity Council (National Certifying Agency)       No. 2487         PROVISIONAL CERTIFICATE       PROVISIONAL CERTIFICATE         This is to certify that Mr. / Ms. Anil Siddhanarayan Dube       No. 2487         om / daughter of Mr. Siddhanarayan Oube       Siddhanarayan Oube         on / daughter of Mr. Siddhanarayan Oube       No. 2487         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         huffilment of qualifications for the Accredited Energy Auditor and issue of certificate of Accreditation by the Bureau		of Energy Efficiency under the said Act.
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No. EA-4973 National Productivity Council (National Certifying Agency) No. 2487	VAL CERTIFICATE	PROVISION
Regn. No. EA-4973 No. 2487	oductivity Council	National Pro
	No. 2487	tegn. No. EA-4973



उपराक्त विषयाच्या अनुषगान सदभ के.१ व र च आदशाताल तरतुदानुसार में. मराठा विद्या प्रसारक समाज , पायाय ,कला – विज्ञान व वाणिज्य सिडको महाविद्यालय, उत्तमनगर, नाशिक जि.नाशिक यांचा संदर्भ के.३ अन्वये प्राप्त विद्युत शुल्क विवरण पत्रा अन्वये दिनांक २६/०३/२०१९ रोजीच्या विद्युत शुल्क परतावा समितीच्या बैठकीत संदर्भ के.४ चे निर्णयानुसार मंजुर करण्यात आलेला विद्युत शुल्क परतावा रक्कमेचे खालील प्रभाणे आदेश पारीत करण्यात येत आहेत.

٤	) ग्राहकाचे नाव	मे. मराठा विद्या प्रसारक समाज , पाचार्य कला  विज्ञान व वाणिज्य, सिडको महाविद्यालय, उत्तमनगर, नाशिक जि.नाशिक			
2	ग्राहक क्रमांक	०४९०१५१८५१११ बिलिंग युनिट/सकेल :- ४६६९/५९५.			
ş	ग्राहकाने म.रा.वि.वि कंपनी कडे अर्ज केल्याचा दिनांक	दि. १०.०८.२०१६ ( On Line Application No ६८२३ )			
8	परतावा कालावधी	मे - २००१ ते ऑगस्ट - २०१६	मे - २००१ ते ऑगस्ट - २०१६		
4	परतावा रक्कम रुपये (समायोजनाहारे)	रु,४,६०,५११/- ( रुपये - चार लाख, साठहजार, पाचशे अकरा फक्त )			
Ę	विद्युत शुल्क परताव्याचे कारण	रु,४,६०,५११/- ( रुपये - चार लाख, साठ हजार, पाचशे अकरा फक्त ) महाराष्ट्र विद्युत शुल्क अधिनियम १९५८ मधील नियम ३ मधील २ (तीन-क) अन्वये मुंबई सार्वजनिक विश्वस्त व्यवस्था अधिनियम १९५० अंतर्गत नॉदणी केलेल्या शैक्षणीक संस्थांना शैक्षणीक प्रयोजनासाठी वापरलेल्या उर्जेच्या युनिटांबर निवासी वापर वगळुन विज शुल्क माफ असल्याने व सदर परतावा हा महाराष्ट्र विद्युत शुल्क अधिनियम २०१६ मधील नियम 3 (२) मधील तरतुदीनुसार सप्टेंबर २०१६(३१/०८/२०१६) पूर्वीचा असल्यानेविदयत शुल्क रक्कम परताव देय आहे.			

 सदर ग्राहकास येणा-या चालु विज देवकात परताव्यांची जी रक्कम समायोजित केली जाईल ती रक्कम शासनास अदा करण्यात येणा-या पृढील महिन्याच्या विद्युत शुल्क रक्कमेतून समायोजित करण्यात यावी.

 मुंबई विद्युत कर अधिनियम १९६२ च्या नियम ९ ब नुसार आपण अदा केलेल्या परताव्याची रक्कम मासिक नमुना ई- मध्ये विद्युत निरीक्षक नाशिक यांना सादर करण्यात यावी.

 ग्राहका कडून जादा वसुल झालेली विद्युत शुल्काची खकम त्यांना त्या त्यामहिन्याला परत केली असल्याची नोंद बिल नोंदवही /सेल नोंद वही मध्ये घेण्यात यावी.

४) आपण समायोजित केलेल्या रक्कमांचे विवरण पत्र दरमहा विद्युत निरीक्षक नाशिक यांना सादर करण्यात यावे .

gIstang

गांगुडे ) विद्यंत निरोक्षक (गट-अ) विद्युत निरीक्षण विभाग नाशिक

प्रतः- मुख्य विद्युत निरीक्षक, उद्योग उर्जा व कामगार विभाग , चेंबुर(पुर्व) मुंबई यांना माहितीसाठी सविनय सादर.

प्रत:- अधीक्षक अभियंता प्रादेशिक विद्युत निरीक्षण मंडळ, उद्योग उर्जा व कामगार विभाग, औरंगाबाद यांना माहितीसाठी सविनय सादर.

40

प्रतः- अध्रीक्षक अभियंता म.रा.वि.वि.कंपनी लि. नाशिक शहर मंडळ कार्यालय, नाशिक यांना माहितीसाठी व योग्य त्या उचित कार्यवाहीसाठी.

प्रतः में. मराठा विद्या प्रसारक समाज , पाचार्य ,कला विज्ञान व वाणिज्य सिडको महाविद्यालय, उत्तमनगर , नाशिक नि.नाशिक यांना माहितीसाठी.