Kopargaon Taluka Education Society's

K.J. Somaiya Arts, Commerce and Science College, Kopargaon

Criterion 7- Institutional Values and Best Practices

7.1: Institutional Values and Social Responsibilities

7.1.3: Quality audits on environment and energy regularly undertaken by the Institution. The institutional environment and energy initiatives are confirmed through the following

1. Green audit / Environment audit
2. Energy audit
3. Clean and green campus initiatives
4. Beyond the campus environmental promotion and sustainability activities

Energy Audit Report 2018-2019

ADITI ENGINEERING SERVICES NASHIK

Consultant in – Energy Management, Energy Audit, Electrical Safety Audit, MSEDCL Grievances, 33 & 11 KV Substation Testing & Earthing Design, HT /LT Industrial Installation, Power Factor & Harmonics Solution.

Firm Address- Flat No-604, Hari Aakruti Apartment, opposite Aananda Laundry, Pakhal Road, Dwarka, Nashik-422011

Proprietor - Er. Deokar B. L. Mo. No- 9960691191 Email -bldeokar61@gmail.com

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CERTIFICATE OF ENERGY AUDIT

This is to certify that

KOPARGAON TALUKA EDUCATION SOCIETY'S K J SOMAIYA SENIOR & K.B. ROHMARE JUNIOR COLLEGE KOPARGAON

Mohanirajnagar, Kopargaon-423601, Dist- Ahmednagar, Maharashtra, India

has conducted **Electrical Energy Audit** *in April 2019 for year 2018 - 2019 for knowing present profile of electrical energy consumption, Identification of energy conservation &saving opportunities for implementation to save energy & to mitigate greenhouse gas emission for environmental protection.*

(**Er. Deokar Bhausaheb**)

Certified Energy Auditor EA-2700

(Bureau of Energy Efficiency Govt. Of India)

Aditi Engineering Services, Nashik

Date-30 April 2019

Co ordinator
IQAC, K. J. Somaiya College
Kopargaon, Dist. A.Nagar

K.J.Somaiya College of Arts Commerce & Science Estd. 1964 Kopargaon

Principal
K. J. Somaiya College of Arts
Commerce & Science, Kopargaon

ENERGY AUDIT REPORT
2018 - 2019

K J SOMAIYA SENIOR & K.B. ROHMARE JUNIOR COLLEGE KOPARGAON

ENERGY AUDITED DURING
DT-03-04-2019 TO DT–05-04-2019
AUDITED BY
ADITI ENGINEERING SERVICES NASHIK

Acknowledgement

Energy Audit of system is key instrument in knowing the present level of efficiency of various components and establishing the areas of shortfall for improvement.

We are very thankful for Hon. Shri-Ashokraoji Rohmare Saheb, Chairman, Hon. The Principal Shri- Yadav sir , K.J. Somaiya Senior & K. B. Rohmare Junior College Kopargaon who have opted such prudential step on the behalf of Management & have given opportunity to conduct Energy audit of college campus facility .We are also thankful for subordinate staffs who have given their valuable contribution for guiding & supporting us during college premise round for data collection , network study & measurement for accomplishing successful Energy audit.

This report made with sincere efforts gives details of the relevant data collected during energy audit study, observation, analysis & recommendations made pertaining to different systems in college premises.

Several Energy Conservation Opportunities(Measures) have been identified & proposed in course of our study & these options when implemented , are expected to bring in lasting benefits(saving) in term of energy as well as cost to the management.

We are pleased to submit this Detailed Energy Audit Report to Hon. the Principal, K.J. Somaiya Senior & K. B. Rohmare Junior College Kopargaon representing on behalf of management and wish him all the best for implementation of identified Energy Conservation Opportunity as well as recommendations after sincere study & observations.

Aditi Engineering services Nashik is willing to support management technically toward implementation of Energy Saving Measures for deriving energy conservation & cost effective benefits.

For Aditi Engineering services Nashik

Er. Deokar B. L.

BEE Certified Energy Auditor & Team

Mob No- 9960691191

Email- bldeokar61@gmail.com

K.J. Somaiya College of Arts & Science Estd 1964 Kopargaon

Energy Audit Team

Name	Company	Designation
Mr. Kolhe sir	K.J. Somaiya Senior & K. B. Rohmare Junior College Kopargaon	Lecturer
Mr Nitin Rohmare	K.J. Somaiya Senior & K. B. Rohmare Junior College Kopargaon	Electrician
Er. Deokar Bhausaheb & Team	Aditi Engineering Services Nashik	Energy Auditor

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1) Introduction

K.J. Somaiya Senior & K. B. Rohmare Junior College Kopargaon is leading college imparting education to rural & urban student majorly from Kopargaon Taluka. This college is founded in 1964 & is governed by Management of Kopargaon Education Society. The students from farmer's family have been taking education in **Science, Commerce & Art** faculty from graduate level to postgraduate level. Electricity is unique source of energy to run college activity. In this college building, electricity is used basically for laboratory instruments, lighting system, split air conditioner & for operating computers. It is using electrical power from MSEDCL LT 1- phase & 3-phase connection.

2) SCOPE OF ENERGY AUDIT :-

The task of energy audit undertaken by Aditi Engineering Services Nashik has the objective of finding opportunities of energy conservation & saving and to recommend action plan with calculation of investment options & energy saving thereof. **The Energy audit of information pertaining to year 2018 & 2019 has been conducted during 3-04-2019 to 5-04-2019.**

Scope of work is defined below

1. Study & Audit of MSEDCL electricity Bill
2. Inventory of loads & analysis of it
3. Input power measurement at input terminal & study.
4. UPS Loading study
5. Submersible pump loading study.

6. Photovoltaic solar power system benefits assessment.
7. Benefit quantification study of solar water heater
8. Lighting System study & measurement
9. Illumination Measurement & Study
10. Split Air conditioner study & measurement.
11. Identification of energy saving opportunity & energy conservation measures
12. Submission of technical & financial analysis report of energy audit.

ENERGY AUDIT METHODOLOGY :-

The audit involves visiting physical position of load & carry out inventory of load. Due measurement of electrical load of equipment & circuit is carried out. Energy bill received from MSEDCL is audited & studied for KWH requirement & how efficiently energy is used. Energy conservation & saving opportunities are identified during round & measurement for implementation

3) Executive Summery

The management of college has taken many electrical service connections from MSEDCL to meet the requirement of electricity of college for various purposes. The demand of electricity of The college requires electricity for lighting load, air conditioner load, motor pump set & laboratory equipment loads majorly. MSEDCL supplies electricity to college & college uses it. Monthly electricity bill is served by MSEDCL to college against cost of electricity unit (KWH) used & college pays it regularly. The electricity bills for preceding 12 months of all category of connections are referred for KWH consumption & payment made against it to MSEDCL to work out Average cost of power. Details of same are given below.

1) Overall Average purchase cost of power-

Month	1-ϕ Connection No- 164810025509 LT II com	LT IRes 1-Phase Meter No- 09801488159 Connection No- 164810025541	LT X-B 1-Phase (0--20 KW) public service other meter no- 09801474883 Connection No- 164810025517	LT X-B 1-Phase (0--20 KW) public service other meter no- 09801488158 Connection No- 164810071144	1-ϕ Connection No- 164810025525 LT II com	Average cost of power Rs /KWH

	KWH	Amount in Rs	KWH	Amount in Rs	KWH	Amount in Rs	KWH	Amount in Rs	KWH	Amount in Rs	
Mar-18	166	1781									10.7
Apr-18	220	2398									10.9
May-18	123	1457									11.8
Jun-18	308	3632	312	2840	602	5760	654	6020	0	270	9.9
Jul-18	829	10165	356	3410	616	6130	1112	10770	0	270	10.6
Aug-18	628	7667	241	1830	827	7590	2195	20000	0	270	9.6
Sep-18	288	3500	226	1750	714	6760	1816	16970	0	270	9.6
Oct-18	438	5769	230	1880	769	7700	2283	22560	0	350	10.3
Nov-18	0	350	335	3150	722	7560	496	4890	0	350	10.5
Dec-18	40	807	250	2030	486	4730	3301	32120	0	350	9.8
Jan-19	114	1528	233	1910	655	6610	306	2830	0	350	10.1
Feb-19	181	2136	233	1650	734	5550	2618	24390	0	350	9.0
Mar-19	359	4525	221	1830	611	6180	1492	14730	0	350	10.3
Apr-19			260	2190	719	7388	442	4260	0	351	10.0
Total	3694	45715	2897	24470	7455	71958	16715	159540	0	3531	9.9

Month	LT X-B 1 3-Phase (0--20 KW) public service other meter no-MS199230 Connection No-164818841569		LT X-B 1 3-Phase (0--20 KW) public service other meter no-06524594 Connection No-164810303045		Average cost of power Rs /KWH	**Overall Average cost of power**
	KWH	Amount in Rs	KWH	Amount in Rs		Rs/KWH
Apr-18	457	4236	4015	39386	9.8	9.8
May-18	396	3644	3383	33551	9.8	9.9
Jun-18	437	4171	3014	30348	10.0	10.1
Jul-18	350	3076	2895	27874	9.5	9.7
Aug-18	464	4301	4019	39551	9.8	10.1

Sep-18	478	4750	4565	47330	10.3	10.0
Oct-18	413	4201	3636	39251	10.7	10.2
Nov-18	505	4923	3258	33053	10.1	10.2
Dec-18	449	4443	3714	38729	10.4	10.4
Jan-19	525	5396	3810	40395	10.6	10.2
Feb-19	503	5049	4321	44860	10.3	10.3
Mar-19	422	4160	3857	39980	10.3	9.7
Total	5399	52350	44487	454308	10.2	**10.2**

Overall Average purchase cost of power works out Rs 10.20 per KWH

Major observation—

1) Applicable tariff category for billing for college is LT X-B & MSEDCL applied it to some connections.
2) LT II-B billing tariff category is incorrect for college. Its tariff cost per KWH is higher than LT X- B category by Rs 2.80 per KWH. You are paying higher cost unnecessary. So it is strongly recommended to get converted existing LT II-B billing tariff category into LT X- B category from MSEDCL to save cost.

Cost saving is worked out as below

Month	LT II A 3-Phase Connection No-164810025509				Billing as per LT X B category				Cost saving
	Fixed charge Rs	Total KWH	Total Amount Rs	Average cost Rs/KWH	Fixed charge Rs	Total KWH	Total Amount Rs	Average cost Rs/KWH	Total Amount Rs
Mar-18	270	166	1781	10.7	270	166	1593.6	9.6	187.4
Apr-18	270	220	2398	10.9	270	220	2112	9.6	286
May-18	270	123	1457	11.8	270	123	1180.8	9.6	276.2
Jun-18	270	308	3632	11.8	270	308	2956.8	9.6	675.2

Jul-18	270	829	10165	12.3	270	829	7958.4	9.6	2206.6
Aug-18	270	628	7667	12.2	270	628	6028.8	9.6	1638.2
Sep-18	350	288	3500	12.2	350	288	2764.8	9.6	735.2
Oct-18	350	438	5769	13.2	350	438	4204.8	9.6	1564.2
Nov-18	350	0	350		350	0	0	9.6	350
Dec-18	350	40	807	20.2	350	40	384	9.6	423
Jan-19	350	114	1528	13.4	350	114	1094.4	9.6	433.6
Feb-19	350	181	2136	11.8	350	181	1737.6	9.6	398.4
Mar-19	350	359	4525	12.6	350	359	3446.4	9.6	1078.6
Total	4070	3694	45715	**12.40**	4070	3694	35462.4	**9.60**	**10252.6**

3) 1-phase connection No-164810025525 is kept without any consumption on it & you are paying unnecessary fixed charges to MSEDCL making financial loss. So it is recommended either to get converted the category of connection LT II Com into LT X-B & use it or get it permanently disconnected in MSEDCL ledger to stop further billing. You pay bill unnecessary as below.

Month	LT II Com 1-Phase (0--20KW) Meter No-09801488160 Connection No-164810025525			
	Fixed charge Rs	Total KWH	Total Amount Rs	Average cost Rs/KWH
Jun-18	270	0	270	#DIV/0!
Jul-18	270	0	270	#DIV/0!
Aug-18	270	0	270	#DIV/0!
Sep-18	270	0	270	#DIV/0!
Oct-18	350	0	350	#DIV/0!
Nov-18	350	0	350	#DIV/0!
Dec-18	350	0	350	#DIV/0!

Jan-19	350	0	350	#DIV/0!
Feb-19	350	0	350	#DIV/0!
Mar-19	350	0	350	#DIV/0!
Apr-19	351	0	351	#DIV/0!
Total	**3531**	0	**3531**	#DIV/0!

4) It is necessary to watch regularly whether MSEDCL representatives reads monthly regularly & correctly to avoid any exorbitant cost of accumulated KWH units
5) It is necessary to wash & clean regularly dirt & dust deposited on photovoltaic solar power panel to get optimum output power.

6) Identified Energy saving opportunity & saving potential

Sr No	Details of study	Energy saving opportunity identified	Saving potential		Remark
			KWH	Amount in Rs	
1	Overall average purchase cost of power	change of LT II A Connection No-164810025509 category from MSEDCL into LT X B I tariff category.	-	**10252**	
		Connection No-164810025525 LT II com category change category of this connection as LT X B I tariff category and use it or get it permanently disconnected from MSEDCL to stop monthly billing permanently.		3531	
2	Photovoltaic Solar power system study	solar power generation	10395.2	306065	Already implemented

3	UPS Loading Study	UPS-2 along with batteries shall be kept off to save loss energy	**8260**	**84252**	
4	Motor Loading Study	Inefficient motor	996	10159	
5	Split Air Conditioner Performance Assessment Study	Maintenance work requires due to poor performance.	6653.472	67865.42	
6	Solar Water Heater	Electrical Energy purchase cost saving	**30006**	**306065**	Already implemented
7	Replacement of Existing FTL with Energy Efficient LED Tube Light	Energy conservation & saving	**7975**	**81342**	
8	Energy Loss due to unwanted operation without cause	Awareness program & necessary switch control	**6752**	**68872**	
9	Replacement of conventional resistance type fan regulator with electronic fan speed regulator-	Energy conservation & saving	422	3924	
	Total		**71460**	**942327**	

Identified Energy & Cost saving potential KWH 31058

Amount in Rs 330197

4) Electrical Connected Load study

Electrical load other than motive power load has been physically inventoried & recorded in table in various types of load. Details of various load inventories are given below. As Viewed from below table, it understands that lighting & fan load has dominance in total load mix & shares more electrical consumption. This load has most potential to identify energy saving opportunity. College has been taking initiative in energy conservation & energy saving work. As part of this college has replaced some CFL down light, FTL & incandescent lamp with LED down light & LED Tube light as well as CRT monitor of PCS replaced with LCD monitor during year 2017-2018. This work benefitted college to reduce electrical load for same output leading to reduction in annual energy cost.

Sr No	Location	FTL Tube light T12			FTL Tube light T8			LED Tube light		
		No	Watt	Total watt	No	Watt	Total watt	No	Watt	Total watt
	Science Building									
	Second floor			0			0			0
1	Computer Lab-1 (S-54)	0	0	0			0	3	20	60
2	Computer Lab-2 (S-53)	0	0	0			0	3	20	60
3	Computer Lab-3 (S-52)	0	0	0			0	3	20	60
4	Computer Lab-4 (S-51)	0	0	0			0	3	20	60
5	Computer Lab-5 (S-50)	0	0	0			0	3	20	60
6	Computer Lab-6 Digital(S-48)	0	0	0			0	3	20	60
7	Staff Room (S-55)	0	0	0			0	2	20	40
8	Department of math. (S-49)	0	0	0			0	2	20	40
9	Digital class Room(S-47)	0	0	0			0	4	20	80
10	Digital class Room(S-46)	0	0	0			0	4	20	80
11	Class Room (S-45)	0	0	0			0	2	20	40
12	Conference Room(S-44)	0	0	0			0	7	20	140
13	Ladies Toilet	0	0	0			0	1	20	20
14	Class Room (S-42)	0	0	0			0	1	20	20
15	Class Room (S-41)	0	0	0			0	2	20	40
16	Passage	0	0	0			0	6	20	120
	Third floor	0	0	0			0			0
17	Class Room N0-1	0	0	0			0			0

18	Class Room N0-2	0	0	0			0			0
19	Class Room N0-3	0	0	0			0			0
20	Class Room N0-4	0	0	0			0			0
21	Class Room N0-5	0	0	0			0			0
22	Class Room N0-6	0	0	0			0			0
23	Class Room N0-7	0	0	0			0			0
24	Class Room N0-8	0	0	0			0			0
25	Class Room N0-9	0	0	0			0			0
26	Class Room N0-10	0	0	0			0			0
27	Staff Room -1	0	0	0			0			0
28	Staff Room -2	0	0	0			0			0
29	Toilet	0	0	0			0	1	20	20
30	Corridor	0	0	0			0	4	20	80
	Floor No-1	0	0	0			0			0
31	Ladies Toilet(S-29)	0	0	0			0	2	20	40
32	Instrumentation Lab- (S-30)	0	0	0			0			0
33	Electronic Lab (S-31)	0	0	0	6	18	108			0
34	General Physics Lab-1(S-32)	0	0	0	3	18	54			0
35	staff room(s-33)	0	0	0	2	18	36			0
36	HOD physics(S-34)	0	0	0	3	36	138			0
37	General Physics Lab-2(S-35)	0	0	0	5	18	90			0
38	PG Laboratory(S-36)	0	0	0	5	18	90			0
39	Gents Toilet (S-37)	0	0	0	2	18	36			0
40	Class Room (S-38)	0	0	0			0	2	20	40
41	Class Room (S-39)	0	0	0			0	2	20	40
42	Corridor	0	0	0	5	36	230	1	20	20
43	HOD microbiology (S-28)	1	40	50	1	23	23			0

44	Microbiology Lab-03(S-24)	0	0	0	2	36	92			0
45	Room (S-27)	1	40	50	1	36	46			0
46	Store (S-26)	1	40	50			0			0
47	Porch S-14 &15	6	40	300			0			0
48	Zoology depart. Store S-16			0	1	36	46			0
49	Zoology Lab S-17	2	40	100	1	36	46			0
50	Dark Room S-18	1	40	50			0			0
51	Toilet block	0	0	0	2	18	36			0
52	Zoology Lab-3 S-21	0	0	0	1	36	46	2	20	40
53	HOD Zoology S-22	0	0	0	2	36	92			0
54	Zoology Lab-2 S-23	1	40	50	1	36	46			0
55	HOD Botany S-63	0	0	0	2	36	92			0
56	Class Room S-64	0	0	0	5	36	230			0
57	Botany Lab-2 S-62	1	40	50	2	36	92			0
58	Botany Lab-1 S-56	2	40	100			0			0
59	Store (S-57)	1	40	50	1	36	46			0
60	Lab-S-61	1	40	50	1	36	46			0
61	Lab-3 S-58	3	40	150			0			0
62	Culture Room	1	40	50			0			0
63	Passage	4	40	200			0			0
	Ground floor			0			0			0
64	Physical chemistry lab S-11	1	40	50	4	36	184			0
65	Inorganic chemistry S-10	0	0	0	2	36	92			0

66	store S-9	0	0	0	2	36	92			0
67	Organic Chemistry S-8	0	0	0	2	36	92			0
68	HOD cabin Chemistry S-7	0	0	0	3	36	138			0
69	Class S-6	0	0	0	1	13	13	2	20	40
70	Toilet block	0	0	0			0	3	20	60
71	Class Room S-2	0	0	0	2	36	92			0
72	Class Room	0	0	0			0	2	20	40
73	Class Room S-14	0	0	0	2	36	92			0
74	Class Room S-15	0	0	0	2	36	92			0
75	General chemistry laboratory S-5	2	40	100	3	36	138	1	20	20
76	**Boyes hostel Total Room-11 No**			0	2	36	82	9	20	180
77	**Ladies hostel Total Room-36 No**				0	0	0	42	20	840
78								15	7	105
79	Toilet block	0	0	0			0	2	20	40
80	Gymkhana	0	0	0	4	36	184	6	24	144
81	Passage	0	0	0	2	36	92	1	20	20
82	Ladies Hostel Total Room-36	0	0	0			0			0
83	Room	0	0	0			0	36	20	720
84	Passage	0	0	0			0	15	7	105

85	**Mess**	0	0	0			0	6	20	120
86	**Library**	0	0	0	14	36	644	12	20	240
87	Class Room M-45	0	0	0			0	4	20	80
88	Class Room M-47	0	0	0			0	4	20	80
89	Class Room M-48	0	0	0	1	36	41	1	20	20
90	**Department of Geography**	0	0	0			0			0
91	Lecture hall M-48	0	0	0	1	36	41	3	20	60
92	Laboratory M-50	0	0	0			0	3	20	60
93	Staff Room	0	0	0			0	1	20	20
94	HOD cabin	0	0	0			0	1	20	20
	Main building						0			0
95	Exam control room(M14)	1	40	50	1	36	46			0
96	Class room M-15	0	0	0			0	3	20	60
97	Class room M-2	0	0	0			0	1	20	20
98	Class room M-13	0	0	0			0	1	20	20
99	Class room M-3	0	0	0	1	36	41			0
100	Class room M-12	0	0	0			0	1	20	20
101	Class room M-6	0	0	0			0	1	20	20
102	Class room M-7	0	0	0			0	1	20	20
103	NCC Unit M-11	0	0	0			0	1	20	20
104	Board of student M-10	0	0	0			0	1	20	20
105	NSS M-9	0	0	0			0	1	20	20

106	Class room M-8	0	0	0			0	1	20	20
107	Class room M-24	0	0	0			0	1	20	20
108	Class room M-18	0	0	0			0	1	20	20
109	Class room M-23	0	0	0			0	1	20	20
110	Depart. Of economics M22	Lock	0				0			0
111	Depart. Of marathi M-21	Lock	0				0			0
112	M-20	Lock	0				0			0
113	Class room M-19	0	0	0	1	36	41	1	20	20
114	Class room M-17	0	0	0			0	1	20	20
115	Class room M-25	0	0	0			0	1	20	20
116	Depart. Of politics	1	40	50	1	36	46			0
117	Class room M-16			0			0	4	20	80
118	Class room M-27			0			0	2	20	40
119	Depart. Of commerce			0			0	3	36	108
120	Depart. Of hystory			0			0	3	36	108
121	Depart. Of English			0			0	2	20	40
122	Language Laboratory			0			0	2	20	40
123	Passage			0	2	36	92	3	20	60
124	Administrative section M-43			0	3	36	123	6	20	120
125	Account room M42			0	1	36	36			0
126	Faculty room M-41			0	4	36	184	1	20	20
127	Toilet block			0	2	36	92			0
128	Passage	1	40	50	1	36	46	4	20	80
129							0			0
130							0			0
131							0			0
132	Total									0
133							0			0

134							0			0
135	Sakarben hall				1	23	23	22	36	792
136							0	12	7	84
137	Secretary office M35						0	2	20	40
138	President office						0	4	20	80
139	Principal cabin						0	2	36	72
140							0	10	7	70
141	Street Light							21	12	252
	Total	34		1600	120	1648	4663	272		6720

Sr No	Location	Split AC		exhaust fan			Ceiling fan			
				No	Watt	Total watt	No	Watt	Regulator watt	Total watt
		No	Total watt			0				
	Science Building									
	Second floor		0			0	3	70	5	225
1	Computer Lab-1 (S-54)		0			0	3	70	5	225
2	Computer Lab-2 (S-53)		0			0	3	70	5	225
3	Computer Lab-3 (S-52)		0			0	3	70	5	225
4	Computer Lab-4 (S-51)		0			0	3	70	5	225
5	Computer Lab-5 (S-50)		0			0	3	70	5	225
6	Computer Lab-6 Digital(S-48)		0			0	1	70	5	75
7	Staff Room (S-55)		0			0	2	70	5	150
8	Department of math. (S-49)		0			0	3	70	5	225
9	Digital class Room(S-47)		0			0	3	70	5	225
10	Digital class Room(S-46)		0			0	5	70	5	375
11	Class Room (S-45)		0			0				0

12	Conference Room(S-44)		0			0				0
13	Ladies Toilet		0			0				0
14	Class Room (S-42)		0			0				0
15	Class Room (S-41)		0			0				0
16	Passage		0			0				0
	Third floor		0			0				0
17	Class Room N0-1		0			0				0
18	Class Room N0-2		0			0				0
19	Class Room N0-3		0			0				0
	Class Room N0-4		0			0				0
	Class Room N0-5		0			0				0
	Class Room N0-6		0			0				0
	Class Room N0-7		0			0				0
	Class Room N0-8		0			0				0
	Class Room N0-9		0			0				0
	Class Room N0-10		0			0				0
	Staff Room -1		0			0				0
	Staff Room -2		0			0				0
	Toilet		0			0				0
	Corridor		0			0				0
	Floor No-1		0			0				0
	Ladies Toilet(S-29)		0			0				0
	Instrumentation Lab- (S-30)		0			0	4	70	5	300
	Electronic Lab (S-31)		0			0	2	70	5	150
	General Physics Lab-1(S-32)		0			0	2	70	5	150
	staff room(s-33)		0			0	2	70	5	150
	HOD physics(S-34)		0			0	3	70	5	225
	General Physics Lab-2(S-35)		0			0	4	70	5	300

	PG Laboratory(S-36)		0			0				0
	Gents Toilet (S-37)		0			0				0
	Class Room (S-38)		0			0				0
	Class Room (S-39)		0			0				0
	Corridor		0			0	1	70	15	85
	HOD microbiology (S-28)		0			0	1	70	5	75
	Microbiology Lab-03(S-24)		0	2	35	70	1	70	5	75
	Microbiology Lab-01(S-25)		0	1	35	35	1	70	5	75
	Room (S-27)		0	1	35	35	1	70	5	75
	Store (S-26)		0			0	3	70	15	255
	Porch S-14 &15		0			0	1	70	15	85
	Zoology depart. Store S-16		0			0	1	70	15	85
	Zoology Lab S-17		0			0				0
	Dark Room S-18		0			0				0
	Toilet block		0			0				0
	Zoology Lab-3 S-21		0			0	1	70	5	75
	HOD Zoology S-22		0			0	1	70	5	75
	Zoology Lab-2 S-23		0			0	2	70	5	150
	HOD Botany S-63		0			0	1	70	5	75
	Class Room S-64		0			0	1	70	15	85
	Botany Lab-2 S-62		0			0	2	70	15	170
	Botany Lab-1 S-56		0			0	1	70	15	85
	Store (S-57)		0			0	2	70	15	170
	Lab-S-61		0			0	2	70	15	170
	Lab-3 S-58		0			0				0
	Culture Room		0			0				0
	Passage		0			0				0
	Ground floor		0	2	35	70	2	70	5	150

	Physical chemistry lab S-11	1	1099	2	35	70	3	70	5	225
	Inorganic chemistry S-10		0	1	35	35	2	70	5	150
	store S-9		0	1	35	35	1	70	5	75
	Organic Chemistry S-8		0	1	35	35	3	70	5	225
	HOD cabin Chemistry S-7		0			0				0
	Class S-6		0			0				0
	Toilet block		0			0				0
	Class Room S-2		0			0				0
	Class Room		0			0				0
	Class Room S-14		0			0				0
	Class Room S-15		0	5	35	175	2	70	5	150
	General chemistry laboratory S-5		0			0				0
	Boyes hostel Total Room-11 No		0			0	11	70	5	825
	Ladies hostel Total Room-36 No						40	70	5	3000
	Toilet block		0			0				0
	Gymkhana		0			0	3	70	5	225
	Passage		0			0				0
	Ladies Hostel Total Room-36		0			0	36	70	5	2700
	Room		0			0				0
	Passage		0			0	1	70	5	75
	Mess		0			0	10	70	5	750
	Library		0			0				0
	Class Room M-45		0			0				0
	Class Room M-47		0			0				0
	Class Room M-48		0			0				0
	Department of Geography		0			0	3	70	5	225
	Lecture hall M-48		0			0	2	70	5	150

	Laboratory M-50		0			0	1	70	5	75
	Staff Room		0			0	1	70	5	75
	HOD cabin		0			0				0
	Main building		0			0	2	70	15	170
	Exam control room(M14)		0			0				0
	Class room M-15		0			0				0
	Class room M-2		0			0	1	70	5	75
	Class room M-13		0			0	1	70	5	75
	Class room M-3		0			0				0
	Class room M-12		0			0	1	70	5	75
	Class room M-6		0			0				0
	Class room M-7		0			0	1	70	5	75
	NCC Unit M-11		0			0	1	70	5	75
	Board of student M-10		0			0	1	70	5	75
	NSS M-9		0			0	1	70	5	75
	Class room M-8		0			0				0
	Class room M-24		0			0				0
	Class room M-18		0			0				0
	Class room M-23		0			0				0
	Depart. Of economics M22		0			0				0
	Depart. Of marathi M-21		0			0				0
	M-20		0			0				0
	Class room M-19		0			0				0
	Class room M-17		0			0				0
	Class room M-25		0			0	1	70	5	75
	Depart. Of politics		0			0	1	70	5	75
	Class room M-16		0			0				0

	Class room M-27		0			0	3	70	5	225
	Depart. Of commerce		0			0	2	70	5	150
	Depart. Of history		0			0	2	70	5	150
	Depart. Of English		0			0	1	70	5	75
	Language Laboratory		0			0				0
	Passage		0			0	5	70	5	375
	Administrative section M-43		0			0	1	70	5	75
	Account room M42		0			0	5	70		350
	Faculty room M-41		0			0				0
	Toilet block		0			0				0
	Passage		0			0				0
			0			0				0
			0			0				0
			0							
	Total					0				0
			0			0				0
	Sakarben hall		0			0	14	70	5	1050
			0			0				0
			0			0				
	Secretary office M35	1	1895			0	1	70	5	75
	President office	2	2400			0	2	70	5	150
	Principal cabin	1	1099			0	4	70	5	300
	Total	5	6493	16	315	560	244	4970	450	18435

Sr No	Location	PC	Printer	Zerox/copier machine/Projector/public address system/TV

		No	Watt	total Watt	No	Watt	total Watt	No	Watt	total Watt
	Science Building						0			0
	Second floor	25	40	1000			0			0
1	Computer Lab-1 (S-54)	18	40	720			0			0
2	Computer Lab-2 (S-53)	20	40	800			0			0
3	Computer Lab-3 (S-52)	13	40	520			0			0
4	Computer Lab-4 (S-51)	18	40	720			0			0
5	Computer Lab-5 (S-50)	1	40	40			0	1	100	100
6	Computer Lab-6 Digital(S-48)			0			0			0
7	Staff Room (S-55)	1	40	40	1	200	200			0
8	Department of math. (S-49)			0			0	1	100	100
9	Digital class Room(S-47)			0			0			0
10	Digital class Room(S-46)			0			0	2	220	440
11	Class Room (S-45)			0			0			0
12	Conference Room(S-44)			0			0			0
13	Ladies Toilet			0			0			0
14	Class Room (S-42)			0			0			0
15	Class Room (S-41)			0			0			0
16	Passage			0			0			0
	Third floor			0			0			0
17	Class Room N0-1			0			0			0
18	Class Room N0-2			0			0			0
19	Class Room N0-3			0			0			0
20	Class Room N0-4			0			0			0
21	Class Room N0-5			0			0			0
22	Class Room N0-6			0			0			0

23	Class Room N0-7			0			0			0
24	Class Room N0-8			0			0			0
25	Class Room N0-9			0			0			0
26	Class Room N0-10			0			0			0
27	Staff Room -1			0			0			0
28	Staff Room -2			0			0			0
29	Toilet			0			0			0
30	Corridor			0			0			0
	Floor No-1			0			0			0
31	Ladies Toilet(S-29)			0			0			0
32	Instrumentation Lab- (S-30)	12	40	480			0			0
33	Electronic Lab (S-31)			0			0			0
34	General Physics Lab-1(S-32)			0			0			0
35	staff room(s-33)	1	40	40			0			0
36	HOD physics(S-34)			0			0	1	100	100
37	General Physics Lab-2(S-35)			0			0			0
38	PG Laboratory(S-36)			0			0			0
39	Gents Toilet (S-37)			0			0			0
40	Class Room (S-38)			0			0			0
41	Class Room (S-39)			0			0			0
42	Corridor	1	40	40			0			0
43	HOD microbiology (S-28)			0			0			0
44	Microbiology Lab-03(S-24)			0			0			0
45	Microbiology Lab-01(S-25)			0			0			0
46	Room (S-27)			0			0			0
47	Store (S-26)			0			0			0
48	Porch S-14 &15			0			0			0

49	Zoology depart. Store S-16			0			0			0
50	Zoology Lab S-17			0			0			0
51	Dark Room S-18			0			0			0
52	Toilet block			0			0			0
53	Zoology Lab-3 S-21	1	40	40	1	200	200			0
54	HOD Zoology S-22			0			0			0
55	Zoology Lab-2 S-23	1	40	40			0			0
56	HOD Botany S-63			0			0			0
57	Class Room S-64			0			0			0
58	Botany Lab-2 S-62			0			0			0
59	Botany Lab-1 S-56			0			0			0
60	Store (S-57)			0			0			0
61	Lab-S-61			0			0			0
62	Lab-3 S-58			0			0			0
63	Culture Room			0			0			0
64	Passage			0			0			0
	Ground floor	3	40	120			0			0
65	Physical chemistry lab S-11			0			0			0
66	Inorganic chemistry S-10			0			0			0
67	store S-9			0			0			0
68	Organic Chemistry S-8	1	40	40			0			0
69	HOD cabin Chemistry S-7			0			0			0
70	Class S-6			0			0			0
71	Toilet block			0			0			0
72	Class Room S-2			0			0			0
73	Class Room			0			0			0
74	Class Room S-14			0			0			0

75	Class Room S-15			0			0			0
76	General chemistry laboratory S-5			0			0			0
77	**Boyes hostel Total Room-11 No**			0			0			0
78	**Ladies hostel Total Room-36 No**	0	0	0	0	0	0	0	0	0
79	Toilet block			0			0			0
80	Gymkhana	1	40	40			0			0
81	Passage			0			0			0
82	Ladies Hostel Total Room-36			0			0			0
83	Room			0			0			0
84	Passage			0			0			0
85	**Mess**	6	40	240			0			0
86	**Library**			0			0			0
87	Class Room M-45			0			0			0
88	Class Room M-47			0			0			0
89	Class Room M-48			0			0			0
90	**Department of Geography**			0			0			0
91	Lecture hall M-48			0			0			0
92	Laboratory M-50			0			0			0
93	Staff Room			0			0			0
94	HOD cabin			0			0			0
	Main building	1	40	40	1	200	200	1	750	750
95	Exam control room(M14)			0			0			0
96	Class room M-15			0			0			0
97	Class room M-2			0			0			0
98	Class room M-13			0			0			0
99	Class room M-3			0			0			0

100	Class room M-12			0			0			0
101	Class room M-6			0			0			0
102	Class room M-7	1	40	40			0			0
103	NCC Unit M-11			0			0			0
104	Board of student M-10			0			0			0
105	NSS M-9			0			0			0
106	Class room M-8			0			0			0
107	Class room M-24			0			0			0
108	Class room M-18			0			0			0
109	Class room M-23			0			0			0
110	Depart. Of economics M22			0			0			0
111	Depart. Of marathi M-21			0			0			0
112	M-20			0			0			0
113	Class room M-19			0			0			0
114	Class room M-17			0			0			0
115	Class room M-25	1	40	40			0			0
116	Depart. Of politics			0			0			0
117	Class room M-16			0			0			0
118	Class room M-27			0			0			0
119	Depart. Of commerce	1	40	40			0			0
120	Depart. Of history	1	40	40			0			0
121	Depart. Of English	8	40	320			0			0
122	Language Laboratory			0			0			0
123	Passage	7	40	280	3	200	600	1	750	750
124	Administrative section M-43			0			0			0
125	Account room M42			0			0			0
126	Faculty room M-41			0			0			0

127	Toilet block			0			0			0
128	Passage			0			0			0
135	Sakarben hall						0	2	300	600
136							0			0
137	Secretary office M35						0	1	90	90
138	President office						0			0
139	Principal cabin						0			0
							0			0
	Total	143	920	5720	6	800	1200	10	2410	2930

Sr No	Location	Fridge		Incubator		Hot air oven		Oven		Water cooler		Water pump/ RO system	
		No	Watt	No	Watt	No	Watt	No	Watt	No	Watt	No	Watt
1	Chairman chamber	1	170										
2	Ladies Hostel									2	600	1	3000
3	Microbiology S-26	1	230										
4	Microbiology S-24			2	350								
5	Zoology Lab S-17	1	230										
6	Class Room S-18			1	350	1	2250						
7	Botany Lab--2 S-62							1	1200				
8	Store	1	230										
9	Botany Lab--1			1	1500								
10	Inorganic S-10			1	1500								
11	Organic chemistry S-8					1	1500						

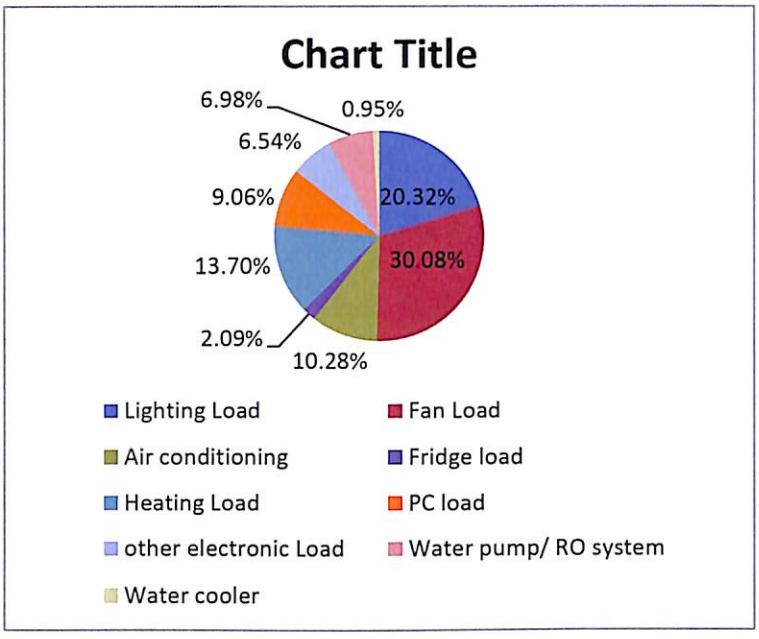
12	Inorganic chemistry S-10	1	230										
13	General chemistry Lab S-5	1	230										
14	College campus											1	4410
	Total	5	1320	5	3700	2	3750	1	1200	2	600	2	7410

5) Analysis of Connected Load in Campus

There are various types of load operated in college campus for various reasons. These loads have been physically inventoried to know the realistic position of load mix & their share in total load. The total inventoried load has been classified as below.

Sr No	Type of load	Total Watts	% on total
1	Lighting Load	12983	20.32%
2	Fan Load	18995	30.08%
3	Air conditioning	6493	10.28%
4	Fridge load	1320	2.09%
5	Heating Load	8650	13.70%
6	PC load	5720	9.06%
7	other electronic Load	4130	6.54%
8	Water pump/ RO system	4410	6.98%
9	Water cooler	600	0.95%
	Total	63301	100

Graphical Presentation of Load mix



Observation- As viewed from above, it is observed that Lighting & fan load has dominance in total load mix.

6) Input Power measurement-

There are no of electrical service connection meters provided by MSEDCL to supply electric power to college at applicable tariff category. The college uses electricity from these connections & pay monthly electricity bill served by MSEDCL. Recently college has taken prudential step & holistic approach & installed photovoltaic solar power system to meet it partly requirement. In this mechanism of NET Metering policy of MSEDCL, surplus solar power is exported to MSEDCL grid when demand of power of college is lean & imported power from MSEDCL when demand of power of college is more than solar generation. Electrical KWH exported to MSEDCL grid is accounted for Relief in electricity bill.

Connection type	Location	Measurement					
		KW	KVAR	KVA	PF	Volts	Amps
3- Phase	New science building	2.79	2.11	3.5	0.793	233.3	15
1- Phase	DG set (Staff Room)	2.44	-0.88	2.59	0.7	222.7	11.6
3- Phase	DG set (	0.22	-0.42	1.01	0.22	230	1.43

	Office)						
1- Phase	DG set (Laboratory)	No Load , fuse removed					
3-phase	Science Building	1.6	-0.82	1.8	0.89	232	2.58

7) Photovoltaic Solar power system study-

Recently college has taken prudential step & holistic approach & installed photovoltaic solar power system to meet it partly requirement. In this mechanism of NET Metering policy of MSEDCL, surplus solar power is exported to MSEDCL grid when demand of power of college is lean & imported power from MSEDCL when demand of power of college is more than solar generation. Electrical KWH exported to MSEDCL grid is accounted for Relief in electricity bill.

a) PV Panel Details-

PV Panel	Make	Max power watt	open circuit voltage	Max power volt	Max power current Amp	Total Panel No	Total string	Total installed capacity in Watt
	WAAREE	315	45.25	36.75	8.58	32	3	10.8

b) PV Grid Inverter Details-

PV Grid inverter	Make	Max DC Volt	DC Voltage Range	MPPT Volt Range	Max input current per string	Max Apparent power KVA	Nominal output	Hz
	Growatt	1000	300-1000	400-800	15 A	10	3/N/PE230V/400	50+/-6

c) Solar Power Generation measurement-

Phase	Measurement					
	KW	KVAR	KVA	PF	Volts	Amps
R	1.19	0.09	1.2	1.00	249.20	4.80
Y	1.23	0.08	1.24	1.00	248.40	5.00
B	1.14	0.01	1.15	1.00	225.20	5.10
Total	3.56	0.18	3.59	0.99	240.93	4.97

d) Financial & Environment Impact Assessment Of Solar Power

Measured solar power generation	Average sun availability per day	No of day in operation per year	Annual electricity generation from Solar power system	Average cost of MSEDC power	Annual energy cost saving in	Average emission factor(Source-CEA)	Equivalent CO2 gas emission mitigated in
KW	Hours	No	KWH	Rs/ KWH	Rs	Kg of Co_2/KWH	Kg
3.56	8	365	10395.2	10.2	306065	0.82	8524.064

8) UPS Loading Study-

There are two UPS working in science Building which caters exclusively load of computers. Loading study of both UPS has been carried out in following is major observation in output power measurement with respect to switched on load of all computers.

Sr No	UPS Details					Measured Output power				Load Details		Average load per PC	% Loading on UPS
	Make	DC Volt	Hz	Rating in KVA	Output Volt	KW	KVAR	KVA	PF	Location	No of PC	Watt	
1	Sukam	192	50	7.5	230	2.05	-2.45	3.2	0.641	BCA Lab (1)Lab No- S-52,53,54 2) Computer Lab-1,2,3)	51	40.20	42.67
2	Sukam	192	50	7.5	230	1.29	-0.91	1.58	0.816	BCS Lab(Lab No- S-50,51)	32	40.31	21.07

Observation & Recommendation-

1) As viewed from above, it looks that Sr No-1 UPS is found loaded 43% i.e. total capacity of UPS is booked only 43 % by connected load.

2) Sr No-2 UPS is found loaded only 21% i.e. total capacity of UPS is booked only 21 % by connected load

3) Both UPS are under loaded & Sr No- 2 is very under loaded.

4) There are energy losses taking place on account of internal resistance of batteries during continuous charging phenomenon of batteries. These energy losses are measured as below which make increase operating cost per annum.

Location	12 V Battery		Power measurement				Annual working Hours	Energy Loss KWH	Average cost of MSEDC power	Annual energy cost Loss in
	No	AH	KW	KVAR	KVA	PF			Rs/ KWH	Rs
BCS Lab-4 & 5	16	165	0.58	0.69	0.74	0.784	7000	4060	10.2	41412
Computer Lab-1,2,3	16	165	0.6	0.77	0.97	0.619	7000	4200	10.2	42840

Total			1.18	1.46	1.71		7000	8260	10.2	84252

1) There found heavy dust deposited on UPS & batteries. This is not good thing as maintenance point of view. So there is necessary periodic maintenance & cleaning.

Recommendation-

As loading on both UPS Sr No- 1 & 2 is namely 43 % & 21% & are under loaded , connected load on UPS No-2 (21% Loading) is recommended to divert on UPS No-1 (43% loading) & UPS-2 along with batteries shall be kept off to save loss energy on account of its operation to reduce(save) annual operating cost of UPS operation.

Sample Harmonic Measurement-

Sample Total Harmonic Distortion is measured at input terminal of UPS feeding to BCS Lab (Lab No- S-50,S-51) & results are given below. As UPS are operated much under loaded, Dominance of % THD is much higher than tolerable limit. So it is necessary to optimize loading on UPS.

Voltage Harmonics

Phase	Order	1	2	3	4	5	6	7	8	9	10
R	Vr-n	221.2	0.6	12.3	0.4	9.3	0.2	8.7	0.3	5.6	0.2
	% THD	8.7	8.8	8.7	8.7	8.9	8.8	8.8	8.8	8.9	8.9

As per IEEE 519 2014 standard, % Total Voltage Harmonics Distortion is exceeding permissible limit. But its adverse effect on total load at input terminal is immaterial.

Current Harmonics

Phase	Order	1	2	3	4	5	6	7	8	9	10
R	Ir	1.9	0.1	0.7	0.1	4.9	0.1	3	0.2	1.3	0.1
	% THD	85	75	76	72	76	76	76	76.8	75.7	75

As per IEEE 519 2014 standard, % Total Current Harmonics Distortion is exceeding permissible limit. But its adverse effect on total load at input terminal is immaterial.

9) Motor Loading Study-

There is one submersible pump near gymkhana building which pumps the water to supply usable water other than drinking water. This motor is claimed of 3 HP rating. Input electrical power is measured during its normal operation. Input power is admeasured 4.41 KW which is at very higher side & power factor of motor is also poor i.e. 0.659. So it can be concluded that

efficiency of motor is very poor. The Operating cost of motor is assessed 60% more than expected. So this point is advised seriously to focus attention.

Submersible Motor details			measured Load details				% Motor Efficiency	Excess operating cost assessment
stage	Rating KW	Volt	KW	KVAR	KVA	PF		%
8	2.2	415	4.41	5.03	6.7	0.659	50	60.36

Excess input power	Daily operation hours	Annual working days	Energy Loss per annum	Average Cost of power per KWH in	Total Loss amount per year in
KW	No	No	KWH	Rs	Rs
1.66	2	300	**996**	10.2	**10159**

10) SPLIT AIR CONDITIONER PERFORMANCE ASSESSMENT STUDY-

Split Air Conditioner Performance assessment study is conducted when they were in operation. For the sake of performance study; measurement of Dry bulb & Wet bulb temperature has been done at return air side & supply air side. Velocity of air & dimension of supply air window is measured at supply air side at indoor unit. Electrical input power to respective whole unit is measured under guidance of college representative. By referring this temperature in psychometric chart cooling effect prevailing at time of measurement is worked out & Energy Efficiency Ratio (EER) is assessed to know energy performance in unit. The Performance assessment work is tabulated as below

a) Technical Specification of Split Air conditioning system

Sr No	Split AC Location	Make	Rated cooling capacity Watt	Input power Watts	EER	Input power measured in Watt
1	Physical chemistry cabin	Voltas	3200	1099	2.91	Outdoor Unit couldn't be operated. Remote control is not available

2	Secretary cabin	Azure	4849	1895	2.56	AC is faulty
3	Chairman cabin	Blue I	3200	1200	2.67	1430
4	Principal cabin	Voltas	3200	1099	2.91	1180

b) Performance assessment of Split Air conditioner-

Sr No	Split AC Location	Evaporator in air temperature		Evaporator out air temperature		Enthalphy Kcal/Kg		Difference in enthalpy in Kcal/Kg
		DB	WB	DB	WB	In	Out	
1	Physical chemistry cabin	31	20	31	20	0	0	Remote control found faulty. Outdoor unit does not start
2	Secretary cabin			AC faulty				AC faulty
3	Chairman cabin	28	18	14	12	12.01	8.12	3.89
4	Principal cabin	26	17	10	7	11.29	5.38	5.91

Sr No	Split AC Location	Air throw window Dimension		Average Air in velocity m/s	Volume flow rate of air m3/s	Density of in air Kg/m3	Assessed Cooling in Watts	EER
		Length cm	Height cm					
1	Physical chemistry cabin							

2	Secretary cabin							
3	Chairman cabin	60	5	3.46	0.104	1.157	1952.36	1.37
4	Principal cabin	56	5	1.93	0.054	1.166	1555.59	1.32

c) Energy & financial losses assessment due to poor performance-

Sr No	Split AC Location	Assessed Cooling effect in Watts	Input power measured in Watt	Energy efficiency Ratio W/W		Loss in EER	Average cost of power Rs/KWH	Loss of cooling effect in Watt	Input power loss in Watt	Working hours per year	Energy Loss per year in KWH	Annual loss in amount Rs
				Design	Assessed							
1	Physical chemistry cabin					Remote control found faulty. Outdoor unit does not start						
2	Secretary cabin					AC Faulty						
3	Chairman cabin	1952.36	1430	2.67	1.37	1.3	10.2	1859	696	4000	2785	28407
4	Principal cabin	1555.59	1180	2.91	1.32	1.59	10.2	1876	645	6000	3868	39458

Observation-

Assessed Energy Efficiency Ratio (EER) is deviating from design EER & is very poor. So energy performance of AC is very poor. It is not getting as much as cooling for input power wasting energy. Hence maintenance is very necessary from skilled AC Technician to restore good energy performance to save energy & cost.

11) Solar Water Heater quantification of benefits-

College has installed solar water heater in boys & Girls hostel to harness cost free solar green energy for heating water requiring student to bathe. This reduces demand of conventional commercial energy & save cost. This will also help to reduce greenhouse gas emission mitigating environmental damage. Application of this hot water in various laboratory can be explored which is generated without input energy cost.

Solar Heater (SH) Location	No of Student occupancy	No of Solar Heaters	Each SH Capacity in Ltrs/Day	Average Water Temperature	Specific heat Kcal/Kg/°C	Toal Solar Heat gained by water per Day in Kcal	Equivalent Electricity saving in KWH per year	Average Electricity Cost in Rs/KWH	**Electricity Cost saving in Rs per year**	**Estimated CO2 Green House Gas Emission reduction per year in Kg**

				Hot(Out)	Cold (In)						
Ladies Hostel	140	1	1500	62	25	1	55500	23555	10.2	**240263**	**20022**
Boys Hostel	44	2	200	63	25	1	15200	6451	10.2	**65802**	**5483**
Total	184	3					70700	**30006**	10.2	**306065**	**25505**

12) Replacement of Existing FTL with Energy Efficient LED Tube Light

There is major load of lighting & fan in college campus. Hence it is focused for identification of energy saving opportunity. It is proposed to replace existing FTL with energy efficient LED tube light. Energy saving & conservation opportunities are identified which are mentioned below with cost benefit analysis based on annual average cost of power.

Type of lamp	Existing			Proposed replacement with LED tube light		Saving in	**Saving in**	**Saving in Amount**	Capital investment in Rs	Pay-back period in
	No	Watt/unit(inclusive of choke watt)	Total Load including choke in Watt	Watt/Lamp	Total Load including choke in Watt	Watt	KWH	Rs	Rs	year
FTL T12	34	50	1700	18	612	1088	2350.08	23970.816	15300	0.64
FTL T8	93	46	4278	18	1674	2604	5624.64	57371.328	41850	0.73
Total	127		5978		2286	3692	**7975**	**81342**	57150	**0.70**

13) Energy Loss due to unwanted operation without cause-

During study round, it has been observed that tube lamp & fan found on without cause wasting energy & its cost. Details are given below. This shall be strictly arrested to zero level even though rigorous action is required to be proposed against errant to save energy & cost. Necessary control switches in place shall be provided to control load. Caution board shall be displayed near each switch board to appeal to switch off load when not required& awareness program on massive scale shall be implemented in all level to contribute for energy & water saving.

sr no	location	Load found on without cause			Annual estimated energy loss KWH	Average cost of power per KWH in Rs	Annual estimated loss in Rs	Reason
		Type	No	Total Watt				
1	Class Room M-15	Tube light	3	60	388.8	10.2	3965.76	No control at place
2	Class Room M-24	Tube light	1	20	129.6	10.2	1321.92	No control at place
3	Class Room M-23	Tube light	1	20	129.6	10.2	1321.92	No control at place
4	Class Room M-19	Tube light	1	20	129.6	10.2	1321.92	No control at place
5	S.y. B Com M-48	Tube light	2	62	401.76	10.2	4097.95	No control at place
6	Class Room M-47	Tube light	3	60	388.8	10.2	3965.76	Negligence
7	Class Room M-45	Tube light	4	80	518.4	10.2	5287.68	Negligence
8	Library	Tube light	12	240	1555.2	10.2	15863	This tube can be switched off when there is not any book handling in book selves in library
		FAN	8	480	3110	10.2	31726	This fan can be switched off when there is not any book handling in book selves in library
	Total		35	1042	**6752**	10.2	**68872**	

Nobody is inside the class but tube lights are on

14) Illumination Measurement & Study-

Illumination is measured with Lux Meter vide reference standard **IS 3646(Part1): 1992**. This is measured at working plane in sample premises. Illumination level is much below the standard quoted. Hence artificial lighting shall have to add or modify adequately to attain illumination level for enhancing human eye comfort & work efficiency prescribed in **IS 3646(Part1): 1992** standard. It is advised to use energy efficient LED Tube Light to distribute light uniformly without change in existing wiring.

Sr No	Location	Natural light source	Measured lux level	Recommended Lux level
1	Chairman Cabin	yes	98	300
2	Secretary cabin	No	89	300
3	Principal Cabin	No	105	300
4	Administrative office			
	Cabin	No	125	300
	Office working area	yes	113	300
5	**Library**			
	Cabin	yes	52	300
	Reception	Yes	83	300
	Book Rack	yes	54	100
	Reading Room	Yes	192	300
	Periodical section cabin	No	35	300
6	**Class Room**			
	M-45	Yes	110	300
7	**Boys Hostel**			
	Room No-5	Yes	94	300
	Room No- 9	yes	95	300

	Room No-4	yes	63	300
	Room no-3	yes	101	300

15) Replacement of conventional resistance type fan regulator with electronic fan speed regulator-

It is proposed to replace existing conventional resistance type fan speed regulator with electronic fan speed regulator to conserve & save energy & cost. Technical analysis of same is given below.

Regulator position	conventional regulator		electronic regulator		Relative % energy saving
	Watt	Energy saving	Watt	Energy saving	
1	47.6	32	28.4	61.4	43.2
5	70	0	70	0	0

conventional regulator		electronic regulator		Saving in Watt	Saving per year in		Investment in Rs	Pay-back period in year
No of fans of 70 W each	Watt at position-1	No	Watt at position-1		KWH	Amount Rs		
10	476	10	284	192	422	3924	3500	0.89

16) List Of Instrument used for measurement in Energy Audit

Sr No	Instrument Name
1	3- Phase Electric Power Analyzer
2	Lux Meter

3	Thermometer
4	Whirling psychomotor
5	Measuring tape

Coordinator
IQAC, K. J. Somaiya College
Kopargaon, Dist. A.Nagar

K. J. Somaiya College of Arts Commerce & Science Estd. 1964 Kopargaon

Principal
K. J. Somaiya College of Arts
Commerce & Science, Kopargaon

Kopargaon Taluka Education Society's

K.J. Somaiya Arts, Commerce and Science College, Kopargaon

Criterion 7- Institutional Values and Best Practices

7.1: Institutional Values and Social Responsibilities

7.1.3: Quality audits on environment and energy regularly undertaken by the Institution. The institutional environment and energy initiatives are confirmed through the following

1. Green audit / Environment audit
2. Energy audit
3. Clean and green campus initiatives
4. Beyond the campus environmental promotion and sustainability activities

Energy Audit Report 2019-2020

ADITI ENGINEERING SERVICES NASHIK

Consultant in – Energy Management, Energy Audit, Electrical Safety Audit, MSEDCL Grievances, 33 & 11 KV Substation Testing & Earthing Design, HT /LT Industrial Installation, Power Factor & Harmonics Solution.

Firm Address- Flat No-604, Hari Aakruti Apartment, opposite Aananda Laundry, Pakhal Road, Dwarka, Nashik-422011

Proprietor - Er. Deokar B. L. Mo. No- 9960691191 Email -bldeokar61@gmail.com

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CERTIFICATE OF ENERGY AUDIT

This is to certify that

KOPARGAON TALUKA EDUCATION SOCIETY'S K J SOMAIYA SENIOR & K.B. ROHMARE JUNIOR COLLEGE KOPARGAON

Mohanirajnagar, Kopargaon-423601, Dist- Ahmednagar, Maharashtra, India

has conducted **Electrical Energy Audit** *in October 2020 for year 2019 - 2020 for knowing present profile of electrical energy consumption, Identification of energy conservation &saving opportunities for implementation to save energy & to mitigate greenhouse gas emission for environmental protection.*

(**Er. Deokar Bhausaheb**)

Certified Energy Auditor EA-2700

(Bureau of Energy Efficiency Govt. Of India)

Aditi Engineering Services, Nashik

Date-12 November 2022

Co ordinator
IQAC, K. J. Somaiya College
Kopargaon, Dist. A.Nagar

K.J.Somaiya College of Arts, Commerce & Science Estd Kopargaon

Principal
K. J. Somaiya College of Arts
Commerce & Science, Kopargaon

ENERGY AUDIT REPORT
2019 - 2020

K J SOMAIYA SENIOR & K.B. ROHMARE JUNIOR COLLEGE KOPARGAON, DIST- AHMEDNAGAR

ENERGY AUDITED DURING DATE 26-10-2020 TO 28-10-2020

AUDITED BY
ADITI ENGINEERING SERVICES NASHIK

ACKNOWLEDGEMENT

Energy Audit of system is key instrument in knowing the present level of efficiency of various components and establishing the areas of shortfall for improvement.

We are very thankful for Hon. Shri-Ashokraoji Rohmare Saheb, Chairman, Hon. The Principal Shri- Yadav sir, K.J. Somaiya Senior & K. B. Rohmare Junior College Kopargaon who have opted such prudential step on the behalf of Management & have given opportunity to conduct Energy audit of college campus facility. We are also thankful for subordinate staffs who have given their valuable contribution for guiding & supporting us during college premise round for data collection, network study & measurement for accomplishing successful Energy audit.

This report is made with sincere efforts gives details of the relevant data collected during energy audit study, observation, analysis & recommendations made pertaining to different systems in college premises.

Several Energy Conservation Opportunities (Measures) have been identified & proposed in course of our study & these options when implemented, are expected to bring in lasting benefits(saving) in term of energy as well as cost to the management.

We are pleased to submit this Detailed Energy Audit Report to Hon. the Principal, K.J. Somaiya Senior & K. B. Rohmare Junior College Kopargaon representing on behalf of management and wish him all the best for implementation of identified Energy Conservation Opportunity as well as recommendations after sincere study & observations.

Aditi Engineering services Nashik is willing to support management technically toward implementation of Energy Saving Measures for deriving energy conservation & cost-effective benefits.

For Aditi Engineering services Nashik

Er. Deokar B. L.

BEE Certified Energy Auditor & Team

Mob No- 9960691191

Email- bldeokar61@gmail.com

Date- 12-11-2020

ENERGY AUDIT TEAM

Name	Company	Designation
Mr. Kolhe sir	K.J. Somaiya Senior & K. B. Rohmare Junior College Kopargaon	Lecturer
Mr Nitin Rohmare	K.J. Somaiya Senior & K. B. Rohmare Junior College Kopargaon	Electrician
Er. Deokar Bhausaheb & Team	Aditi Engineering Services Nashik	Energy Auditor

INDEX

1) Introduction

K.J. Somaiya Senior & K. B. Rohmare Junior College Kopargaon is leading college imparting education to rural & urban student majorly from Kopargaon Taluka. This college is founded in 1964 & is governed by Management of Kopargaon Education Society. The students from farmer's family have been taking education in **Science, Commerce & Art** faculty from graduate level to postgraduate level. Electricity is unique source of energy to run college activity. In this college building, electricity is used basically for laboratory instruments, lighting system, split air conditioner & for operating computers. It is using electrical power from MSEDCL LT 1- phase & 3-phase connection

2)Scope Of Energy Audit: -

The task of energy audit undertaken by Aditi Engineering Services Nashik has the objective of finding opportunities of energy conservation & saving and to recommend action plan with calculation of investment options & energy saving thereof. **The Energy audit of information pertaining to year 2019- 2020 has been conducted during 26-10-2020 to 28-10-2020.**

Scope of work is defined below

1. Study & Audit of MSEDCL electricity Bill
2. Inventory of loads & analysis of it
3. UPS Loading study
4. Submersible pump loading study.
5. Photovoltaic solar power system benefits assessment.
6. Benefit quantification study of solar water heater
7. Lighting System study
8. Identification of energy saving opportunity & energy conservation measures
9. Submission of technical & financial analysis report of energy audit.

ENERGY AUDIT METHODOLOGY: -

The audit involves visiting physical position of load & carry out inventory of load. Due measurement of electrical load of equipment & circuit is carried out. Energy bill received from MSEDCL is audited & studied for KWH requirement & how efficiently energy is used. Energy conservation & saving opportunities are identified during round & measurement for implementation

3)Executive Summery

The management of college has taken many electrical service connections from MSEDCL to meet the requirement of electricity of college for various purposes. The demand of electricity of The college requires electricity for lighting load, air conditioner load, motor pump set & laboratory equipment loads majorly. MSEDCL supplies electricity to college & college uses it. Monthly electricity bill is served by MSEDCL to college against cost of electricity unit (KWH) used & college pays it regularly. The electricity bills for preceding 12 months of all category of connections are referred for KWH consumption & payment made against it to MSEDCL to work out Average cost of power. Details of same are given below.

1) Overall Average purchase cost of power-

Month	Existing Connection Position												
	LT II A 3-Phase Connection No-164810025509		LT II Com 1-Phase Connection No-164810025525		LT VII (B) - 1-Phase up to 20 KW Connection No-164810025517		LT VII (B) - 1-Phase Less than 20 KW Connection No-164810071144		LT VII (B) Public other - 3-Phase Less than 20 KW Connection No-164810303045		Average cost of power		
	KWH	Total Bill Amount in Rs	KWH	Total Bill Amount in Rs	KWH	Total Bill Amount in Rs	KWH	Total Bill Amount in Rs	KWH	Total Bill Amount in Rs	Total KWH	Total Amount in Rs	Rs/KWH
Feb-20	432	5991							4008	32304	4440	38295	8.63
Mar-20	432	5629	0	403	614	5207	1340	9527	4008	32304	6394	53070	8.30
Apr-20	32	835	1	498	649	5517	1363	10576	4008	31801	6053	49227	8.13
May-20	32	835	5	542	649	5477	1363	10576	4008	31801	6057	49231	8.13
Jun-20	0	403	0	403	1138	9274	2271	17343	2956	23569	6365	50992	8.01
Jul-20	0	403	0	403	444	3886	571	4675	1341	10931	2356	20298	8.62
Aug-20	0	3786	0	403	564	4817	577	4719	966	7997	2107	21722	10.31
Sep-20	0	3276	0	403	539	4623	663	5360	1254	10251	2456	23913	9.74
Oct-20	0	3829	0	403	685	5757	429	3617	1368	11143	2482	24749	9.97
Total	928	24987	6	3458	5282	44558	8577	66393	23917	192101	38710	331497	8.56

Major observation—

1) Applicable tariff category for billing for college is LT X-B & MSEDCL applied it to some connections.
2) LT II billing tariff category is incorrect for college. Its tariff cost per KWH is higher than LT X- B category

per KWH. You are paying higher cost unnecessary. So it is strongly recommended to get converted existing LT II billing tariff category into LT X- B category from MSEDCL to save cost.

3) 1-phase connection No-164810025525 is kept without any consumption on it & you are paying unnecessary fixed charges to MSEDCL making financial loss. So it is recommended either to get converted the category of connection LT II Com into LT X-B & use it or get it permanently disconnected in MSEDCL ledger to stop further billing. You pay bill unnecessary as below.

2) Identified Energy saving opportunity & saving potential

Sr No	Details of study	Energy saving opportunity identified	Saving potential		Remark
			KWH	Amount in Rs	
2	Photovoltaic Solar power system study	solar power generation	11589	99200	The Solar power system is already commissioned.
3	UPS Loading Study	UPS-2 along with batteries shall be kept off to save loss energy	8260	70706	
4	Motor Loading Study	Inefficient motor	996	8526	
6	Solar Water Heater	Electrical Energy purchase cost saving	30006	256851	The Solar water system is already commissioned
7	Replacement of Existing FTL with Energy Efficient LED Tube Light	Energy conservation & saving	6930	59321	
	Total		57781	494604	

Identified Energy & Cost saving potential KWH 57781

Amount in Rs 494604

4) Electrical Connected Lighting Load study

Lighting Electrical load has been physically inventoried & recorded in table in as below. As Viewed from below table, it understands that lighting load has dominance in total load mix & shares more electrical consumption. This load has most potential to identify energy saving opportunity. College has been taking initiative in energy conservation & energy saving work. As part of this college has replaced some CFL down light, FTL & incandescent lamp with LED down light & LED Tube light as well as CRT monitor of PCS replaced with LCD monitor during year 2017-2020. This work benefitted college to reduce electrical load for same output leading to reduction in annual energy cost.

Sr No	Location	FTL Tube light T12			FTL Tube light T8			LED Tube light		
		No	Watt	Total watt	No	Watt	Total watt	No	Watt	Total watt
	Science Building									
	Second floor			0			0			0
1	Computer Lab-1 (S-54)	0	0	0			0	3	20	60
2	Computer Lab-2 (S-53)	0	0	0			0	3	20	60
3	Computer Lab-3 (S-52)	0	0	0			0	3	20	60
4	Computer Lab-4 (S-51)	0	0	0			0	3	20	60
5	Computer Lab-5 (S-50)	0	0	0			0	3	20	60
6	Computer Lab-6 Digital(S-48)	0	0	0			0	3	20	60
7	Staff Room (S-55)	0	0	0			0	2	20	40
8	Department of math. (S-49)	0	0	0			0	2	20	40
9	Digital class Room(S-47)	0	0	0			0	4	20	80
10	Digital class Room(S-46)	0	0	0			0	4	20	80
11	Class Room (S-45)	0	0	0			0	2	20	40
12	Conference Room(S-44)	0	0	0			0	7	20	140
13	Ladies Toilet	0	0	0			0	1	20	20
14	Class Room (S-42)	0	0	0			0	1	20	20
15	Class Room (S-41)	0	0	0			0	2	20	40
16	Passage	0	0	0			0	6	20	120
	Third floor	0	0	0			0			0
17	Class Room N0-1	0	0	0			0			0
18	Class Room N0-2	0	0	0			0			0
19	Class Room N0-3	0	0	0			0			0
20	Class Room N0-4	0	0	0			0			0
21	Class Room N0-5	0	0	0			0			0
22	Class Room N0-6	0	0	0			0			0
23	Class Room N0-7	0	0	0			0			0
24	Class Room N0-8	0	0	0			0			0
25	Class Room N0-9	0	0	0			0			0
26	Class Room N0-10	0	0	0			0			0
27	Staff Room -1	0	0	0			0			0

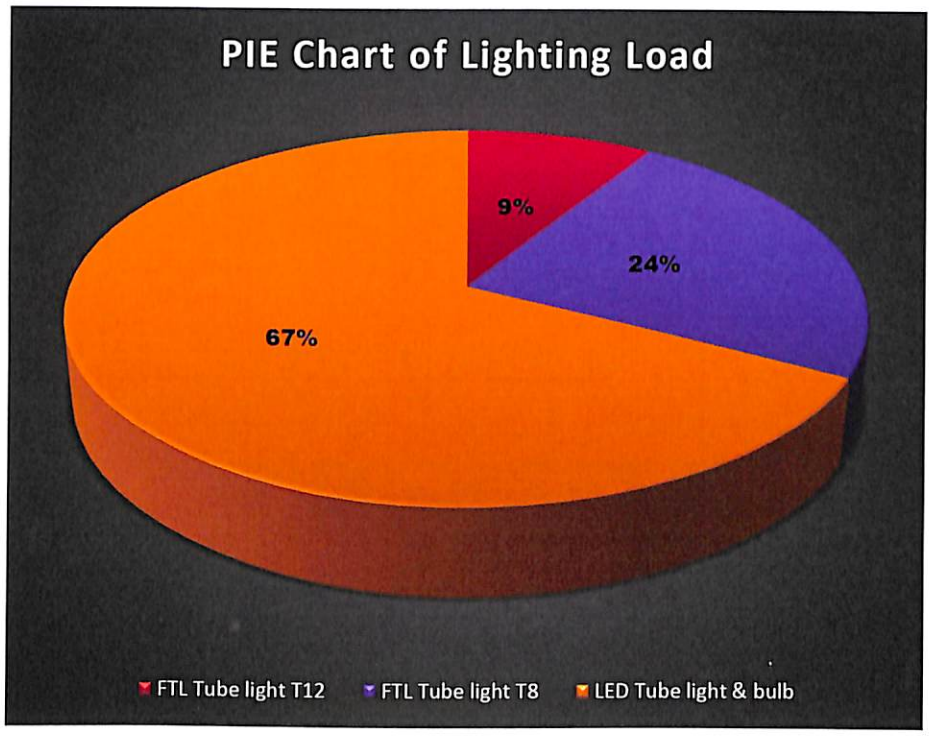
28	Staff Room -2	0	0	0			0			0
29	Toilet	0	0	0			0	1	20	20
30	Corridor	0	0	0			0	4	20	80
	Floor No-1	0	0	0			0			0
31	Ladies Toilet(S-29)	0	0	0			0	2	20	40
32	Instrumentation Lab- (S-30)	0	0	0			0			0
33	Electronic Lab (S-31)	0	0	0	0	45	0	10	20	200
34	General Physics Lab-1(S-32)	0	0	0		45	0	13	20	260
35	staff room(s-33)	0	0	0	2	45	90			0
36	HOD physics(S-34)	0	0	0	3	45	135			0
37	General Physics Lab-2(S-35)	0	0	0	5	45	225			0
38	PG Laboratory(S-36)	0	0	0	5	50	250			0
39	Gents Toilet (S-37)	0	0	0	0	45	0	2	20	40
40	Class Room (S-38)	0	0	0		45	0	2	20	40
41	Class Room (S-39)	0	0	0		45	0	2	20	40
42	Corridor	0	0	0	0	45	0	7	20	140
43	HOD microbiology (S-28)	1	40	50	0	45	0	2	20	40
44	Microbiology Lab-03(S-24)	0	0	0	2	27	54	2	20	40
45	Room (S-27)	1	40	50	1	45	45			0
46	Store (S-26)	1	40	50		45	0	2	20	40
47	Porch S-14 &15	6	40	300		45	0	6	20	120
48	Zoology departs. Store S-16			0	1	45	45			0
49	Zoology Lab S-17	0	0	0	0	45	0	7	20	140
50	Dark Room S-18	1	40	50		45	0			0
51	Toilet block	0	0	0	0	45	0	1	20	20
52	Zoology Lab-3 S-21	0	0	0	1	45	45	2	20	40
53	HOD Zoology S-22	0	0	0	2	45	90			0
54	Zoology Lab-2 S-23	0	0	0	1	45	45			0
55	HOD Botany S-63	0	0	0	2	45	90			0
56	Class Room S-64	0	0	0	5	45	225			0
57	Botany Lab-2 S-62	1	40	50	2	45	90	2	20	40
58	Botany Lab-1 S-56	0	0	0		45	0	3	20	60
59	Store (S-57)	1	40	50	1	45	45			0
60	Lab-S-61	0	0	0	1	45	45	1	20	20
61	Lab-3 S-58	3	40	150		45	0			0
62	Culture Room	1	40	50		45	0			0
63	Passage	0	0	0		45	0			0
	Ground floor			0		45	0			0
64	Physical chemistry lab S-11	1	40	50	4	45	180	2	20	40
65	Inorganic chemistry S-10	0	0	0	2	45	90	3	20	60

66	store S-9	0	0	0	2	45	90	1	20	20
67	Organic Chemistry S-8	0	0	0	2	45	90			0
68	HOD cabin Chemistry S-7	0	0	0	0	45	0			0
69	Class S-6	0	0	0	0	45	0	2	20	40
70	Toilet block	0	0	0		45	0	3	20	60
71	Class Room S-2	0	0	0	2	45	90			0
72	Class Room	0	0	0		45	0	2	20	40
73	Class Room S-14	0	0	0	2	45	90			0
74	Class Room S-15	0	0	0	2	45	90			0
75	General chemistry laboratory S-5	2	40	100	0	45	0	4	20	80
76	**Boyes hostel Total Room-11 No**			0	2	45	90	9	20	180
77	**Ladies hostel Total Room-36 No**				0	45	0	42	20	840
78						45	0	15	7	105
79	Toilet block	0	0	0		45	0	2	20	40
80	Gymkhana	0	0	0	0	45	0	6	24	144
81	Passage	0	0	0	2	45	90	6	20	120
82	Ladies Hostel Total Room-36	0	0	0		45	0			0
83	Room	0	0	0		45	0	36	20	720
84	Passage	0	0	0		45	0	15	7	105
85	**Mess**	0	0	0		45	0	6	20	120
86	**Library**	0	0	0	0	45	0	12	20	240
87	Class Room M-45	0	0	0		45	0	4	20	80
88	Class Room M-47	0	0	0		45	0	4	20	80
89	Class Room M-48	0	0	0	1	45	45	1	20	20
90	**Department of Geography**									
91	Lecture hall M-48	0	0	0	1	45	45	3	20	60
92	Laboratory M-50	0	0	0		45	0	3	20	60
93	Staff Room	0	0	0		45	0	4	20	80
94	HOD cabin	0	0	0		45	0	1	20	20
	Main building									
95	Exam control room(M14)	1	40	50	1	45	45	3	20	60
96	Class room M-15	0	0	0		45	0	3	20	60
97	Class room M-2	0	0	0		45	0	1	20	20
98	Class room M-13	0	0	0		45	0	1	20	20
99	Class room M-3	0	0	0	1	45	45	1	20	20
100	Class room M-12	0	0	0		45	0	1	20	20
101	Class room M-6	0	0	0		45	0	1	20	20
102	Class room M-7	0	0	0		45	0	1	20	20

103	NCC Unit M-11	0	0	0		45	0	1	20	20
104	Board of student M-10	0	0	0		45	0	1	20	20
105	NSS M-9	0	0	0		45	0	2	20	40
106	Class room M-8	0	0	0		45	0	1	20	20
107	Class room M-24	0	0	0		45	0	1	20	20
108	Class room M-18	0	0	0		45	0	1	20	20
109	Class room M-23	0	0	0		45	0	1	20	20
110	Depart. Of economics M22	0	0			45	0	2	20	40
111	Depart. Of Marathi M-21	0	0			45	0	2	20	40
112	M-20	0	0			45	0	2	20	40
113	Class room M-19	0	0	0	1	45	45	1	20	20
114	Class room M-17	0	0	0		45	0	1	20	20
115	Class room M-25	0	0	0		45	0	1	20	20
116	Depart. Of politics	1	40	50	1	44	44			0
117	Class room M-16			0		45	0	4	20	80
118	Class room M-27			0		45	0	2	20	40
119	Depart. Of commerce			0		45	0	3	36	108
120	Depart. Of history			0		45	0	3	36	108
121	Depart. Of English			0		45	0	2	20	40
122	Language Laboratory			0		45	0	2	20	40
123	Passage			0	2	45	90	3	20	60
124	Administrative section M-43			0	0	45	0	6	20	120
125	Account room M42			0	1	45	45	1	20	20
126	Faculty room M-41			0	0	45	0	1	20	20
127	Toilet block			0	2	45	90			0
128	Passage	1	40	50	1	45	45	4	20	80
129						45	0			0
130						45	0			0
131						45	0			0
132	Total					45	0			0
133						45	0			0
134						45	0			0
135	Sakarben hall				0	45	0	22	36	792
136						45	0	12	7	84
	Secretary office M35					45	0	2	20	40
138	President office					45	0	4	20	80
139	Principal cabin					45	0	2	20	40
140						45	0	10	8	80
141	Street Light					45	0	21	12	252
	Total	22		1100	66		2958	439		8418

Summary of total lighting load & pie chart -

Type of Lighting Fixtures									Total	
FTL Tube light T12			FTL Tube light T8			LED Tube light & bulb				
No	Total watt	% On Total Load	No	Total watt	% On Total Load	No	Total watt	% On Total Load	No	Watts
22	1100	9	66	2958	24	439	8418	67	527	12476



Observation- As viewed from above, it is observed that LED Lighting load has dominance in total load mix.

5) Photovoltaic Solar power system study-

Recently college has taken prudential step & holistic approach & installed photovoltaic solar power system to meet it's partly requirement. In this mechanism of NET Metering policy of MSEDCL, surplus solar power is exported to MSEDCL grid when demand of power of college is lean & imported power from MSEDCL when

demand of power of college is more than solar generation. Electrical KWH exported to MSEDCL grid is accounted for Relief in electricity bill.

a) PV Panel Details-

PV Panel	Make	Max power watt	open circuit voltage	Max power volt	Max power current Amp	Total Panel No	Total string	Total installed capacity in Watt
	WAAREE	315	45.25	36.75	8.58	32	3	10.8

b) PV Grid Inverter Details-

PV Grid inverter	Make	Max DC Volt	DC Voltage Range	MPPT Volt Range	Max input current per string	Max Apparent power KVA	Nominal output	Hz
	Growatt	1000	300-1000	400-800	15 A	10	3/N/PE230V/400	50+/-6

c) Solar Power Generation measurement-

Location of meter	Connection detail		Measurement Location	Measurement							
	Type	Consumer No		Phase	KW	KVAR	KVA	PF	Volts	Amps	Hz
Main Building-DG Room	3-Phase NET Meter	1648110025509	Distribution Bus bar Box-Solar power incoming terminal	R	2.1	-1.67	2.7	0.783	251	10.69	50
				Y	1.95	-1.64	2.5	0.765	236	10.80	
				B	2.3	-1.69	2.9	0.806	242	11.79	
				Total	6.35	-5	8.1	0.785			

d) Financial & Environment Impact Assessment Of Solar Power

Measured solar power generation	Average sun availability per day	No of day in operation per year	Annual electricity generation from Solar power system	Average cost of MSEDC power	Annual energy cost saving in	Average emission factor (Source-CEA)	Equivalent CO2 gas emission mitigated in
KW	Hours	No	KWH	Rs/ KWH	Rs	Kg of Co_2/KWH	Kg
6.35	5	365	11589	8.56	99200	0.82	8524

6) UPS Loading Study-

There are two UPS working in science Building which caters exclusively load of computers. Loading study of both UPS has been carried out. The following are major observation in output power measurement with respect to switched on load of all computers.

Sr No	UPS Details					Measured Output power				Load Details		Average load per PC	% Loading on UPS
	Make	DC Volt	Hz	Rating in KVA	Output Volt	KW	KVAR	KVA	PF	Location	No of PC	Watt	
1	Sukam	192	50	7.5	230	2.05	-2.45	3.2	0.641	BCA Lab (1)Lab No-S-52,53,54 2) Computer Lab-1,2,3)	51	40.20	42.67
2	Sukam	192	50	7.5	230	1.29	-0.91	1.58	0.816	BCS Lab (Lab No- S-50,51)	32	40.31	21.07

Observation & Recommendation-

1) As viewed from above, it looks that Sr No-1 UPS is found loaded 43% i.e., total capacity of UPS is booked only 43 % by connected load.

2) Sr No-2 UPS is found loaded only 21% i.e., total capacity of UPS is booked only 21 % by connected load

3) Both UPS are under loaded & Sr No- 2 is very under loaded.

4) There are energy losses taking place on account of internal resistance of batteries during continuous charging phenomenon of batteries. These energy losses are measured as below which make increase operating cost per annum.

Location	12 V Battery		Power measurement				Annual working Hours	Energy Loss KWH	Average cost of MSEDC power	Annual energy cost Loss in
	No	AH	KW	KVAR	KVA	PF			Rs/ KWH	Rs
BCS Lab- 4 & 5	16	165	0.58	0.69	0.74	0.784	7000	4060	8.56	34753.6
Computer Lab-1,2,3	16	165	0.6	0.77	0.97	0.619	7000	4200	8.56	35952
Total			1.18	1.46	1.71		7000	8260	8.56	70706

They're found heavy dust deposited on UPS & batteries. This is not good thing as maintenance point of view. So, there is necessary periodic maintenance & cleaning.

Recommendation-

As loading on both UPS Sr No- 1 & 2 is namely 43 % & 21% & are under loaded, connected load on UPS No-2 (21% Loading) is recommended to divert on UPS No-1 (43% loading) & UPS-2 along with batteries shall be kept off to save loss energy on account of its operation to reduce(save) annual operating cost of UPS operation.

7)Motor Loading Study-

There is one submersible pump near gymkhana building which pumps the water to supply usable water other than drinking water. This motor is claimed of 3 HP rating. Input electrical power is measured during its normal operation. Input power is admeasured 4.41 KW which is at very higher side & power factor of motor is also poor i.e., 0.659. So, it can be concluded that efficiency of motor is very poor. The Operating cost of motor is assessed 60% more than expected. So, this point is advised seriously to focus attention.

Submersible Motor details			measured Load details				% Motor Efficiency	Excess operating cost assessment
stage	Rating KW	Volt	KW	KVAR	KVA	PF		%
8	2.2	415	4.41	5.03	6.7	0.659	50	60.36

Excess input power	Daily operation hours	Annual working days	Energy Loss per annum	Average Cost of power per KWH in	Total Loss amount per year in
KW	No	No	KWH	Rs	Rs
1.66	2	300	996	8.56	8526

8) Solar Water Heater quantification of benefits-

College has installed solar water heater in boys & Girl's hostel to harness cost free solar green energy for heating water requiring student to bathe. This reduces demand of conventional commercial energy & save cost. This will also help to reduce greenhouse gas emission mitigating environmental damage. Application of this hot water in various laboratory can be explored which is generated without input energy cost.

Solar Heater	No of Student occupancy	No of Solar Heaters	Each SH Capacity in Litres/Day	Average Water Temperature		Specific heat	Total Solar Heat gained by water per Day in Kcal	Equivalent Electricity saving in KWH per year	Average Electricity Cost in Rs/KWH	**Electricity Cost saving in Rs per year**	**Estimated CO2 Green House Gas Emission reduction per year in Kg**
(SH) Location				Hot (Out)	Cold (In)	Kcal/Kg/°C					
Ladies Hostel	140	1	1500	62	25	1	55500	23555	8.56	**201630.8**	**20022**
Boys Hostel	44	2	200	63	25	1	15200	6451	8.56	**55220.56**	**5483**
Total	184	3	1700				70700	**30006**	17.12	**256851**	**25505**

9) Replacement of Existing FTL with Energy Efficient LED Tube Light

There is major load of lighting & fan in college campus. Hence it is focused for identification of energy saving opportunity. It is proposed to replace existing FTL with energy efficient LED tube light. Energy saving & conservation opportunities are identified which are mentioned below with cost benefit analysis based on annual average cost of power.

Type of lamp	Existing			Proposed replacement with LED tube light		Saving in	Working hours	**Saving in**	Average cost of power	**Saving in Amount**	Capital investment in Rs	Pay-back period in
	No	Watt/unit (inclusive of choke watt)	Total Load including choke in Watt	Watt/unit	Total Load in Watt	Watt	Hours/year	KWH	Rs/KWH	Rs	Rs	Months
FTL T12	22	50	1100	20	440	660	3000	1980	8.56	16949	9900	7
FTL T8	66	45	2970	20	1320	1650	3000	4950	8.56	42372	29700	8
Total	88	95	4070	40	1760	2310	6000	**6930**	8.56	**59321**	39600	**8**

Remark - Cost per LED Tube Light in Rs- 450

10)List Of Instrument used for measurement in Energy Audit

Sr No	Instrument Name
1	3- Phase Electric Power Analyzer
2	Lux Meter
3	Thermometer
4	Whirling psychomotor
5	Measuring tape

Co ordinator
IQAC, K. J. Somaiya College
Kopargaon, Dist. A.Nagar

K. J. Somaiya College of Arts Commerce & Science Estd. 1954 Kopargaon

Principal
K. J. Somaiya College of Arts
Commerce & Science, Kopargaon

Kopargaon Taluka Education Society's

K.J. Somaiya Arts, Commerce and Science College, Kopargaon

Criterion 7- Institutional Values and Best Practices

7.1: Institutional Values and Social Responsibilities

7.1.3: Quality audits on environment and energy regularly undertaken by the Institution. The institutional environment and energy initiatives are confirmed through the following

1. Green audit / Environment audit
2. Energy audit
3. Clean and green campus initiatives
4. Beyond the campus environmental promotion and sustainability activities

Energy Audit Report 2020-2021

ADITI ENGINEERING SERVICES NASHIK

Consultant in – Energy Management, Energy Audit, Electrical Safety Audit, MSEDCL Grievances, 33 & 11 KV Substation Testing & Earthing Design, HT /LT Industrial Installation, Power Factor & Harmonics Solution.

Firm Address- Flat No-604, Hari Aakruti Apartment, opposite Aananda Laundry, Pakhal Road, Dwarka, Nashik-422011

Proprietor - Er. Deokar B. L. Mo. No- 9960691191 Email -bldeokar61@gmail.com

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CERTIFICATE OF ENERGY AUDIT

This is to certify that

KOPARGAON TALUKA EDUCATION SOCIETY'S K J SOMAIYA SENIOR & K.B. ROHMARE JUNIOR COLLEGE KOPARGAON

Mohanirajnagar, Kopargaon-423601, Dist- Ahmednagar, Maharashtra, India

has conducted **Electrical Energy Audit** *in April 2021 for year 2020 - 2021 for knowing present profile of electrical energy consumption, Identification of energy conservation &saving opportunities for implementation to save energy & to mitigate greenhouse gas emission for environmental protection.*

(**Er. Deokar Bhausaheb**)

Certified Energy Auditor EA-2700

(Bureau of Energy Efficiency Govt. Of India)

Aditi Engineering Services, Nashik

Date-27 April 2021

Co ordinator
IQAC, K. J. Somaiya College
Kopargaon, Dist. A.Nagar

K.J. Somaiya College of Arts Commerce & Science Estd. 1954 Kopargaon

Principal
K. J. Somaiya College of Arts
Commerce & Science, Kopargaon

ENERGY AUDIT REPORT
2020 - 2021

K J SOMAIYA SENIOR & K.B. ROHMARE JUNIOR COLLEGE KOPARGAON

ENERGY AUDITED DURING
DT-01-04-2021 TO DT–03-04-2021
AUDITED BY
ADITI ENGINEERING SERVICES NASHIK

ACKNOWLEDGEMENT

Energy Audit of system is key instrument in knowing the present level of efficiency of various components and establishing the areas of shortfall for improvement.

We are very thankful for Hon. Shri-Ashokraoji Rohmare Saheb, Chairman, Hon. The Principal Shri- Yadav sir , K.J. Somaiya Senior & K. B. Rohmare Junior College Kopargaon who have opted such prudential step on the behalf of Management & have given opportunity to conduct Energy audit of college campus facility .We are also thankful for subordinate staffs who have given their valuable contribution for guiding & supporting us during college premise round for data collection , network study & measurement for accomplishing successful Energy audit.

This report made with sincere efforts gives details of the relevant data collected during energy audit study, observation, analysis & recommendations made pertaining to different systems in college premises.

Several Energy Conservation Opportunities(Measures) have been identified & proposed in course of our study & these options when implemented , are expected to bring in lasting benefits(saving) in term of energy as well as cost to the management.

We are pleased to submit this Detailed Energy Audit Report to Hon. the Principal, K.J. Somaiya Senior & K. B. Rohmare Junior College Kopargaon representing on behalf of management and wish him all the best for implementation of identified Energy Conservation Opportunity as well as recommendations.

Aditi Engineering services Nashik is willing to support management technically toward implementation of Energy Saving Measures for deriving energy conservation & cost effective benefits.

For Aditi Engineering services Nashik

Er.Deokar B. L.

BEE Certified Energy Auditor & Team

Mob No- 9960691191

Email- bldeokar61@gmail.com

Date- 28-4-2021

ENERGY AUDIT TEAM

Name	Company	Designation
Mr. Kolhe sir	K.J. Somaiya Senior & K. B. Rohmare Junior College Kopargaon	Lecturer
Mr Nitin Rohmare	K.J. Somaiya Senior & K. B. Rohmare Junior College Kopargaon	Electrician
Er. Deokar Bhausaheb & Team	Aditi Engineering Services Nashik	Energy Auditor

INDEX

1) INTRODUCTION

K.J. Somaiya Senior & K. B. Rohmare Junior College Kopargaon is leading college imparting education to rural & urban student majorly from Kopargaon Taluka. This college is founded in 1964 & is governed by Management of Kopargaon Education Society. The students from farmer's family have been taking education in **Science, Commerce & Art** faculty from graduate level to postgraduate level. Electricity is unique source of energy to run college activity. In this college building, electricity is used basically for laboratory instruments, lighting system, split air conditioner & for operating computers. The college is using electrical power procured from MSEDCL through LT 1- phase & 3-phase service connection. The college has also installed no of two photovoltaic solar power system bearing 10KVA capacity each.

2) SCOPE OF ENERGY AUDIT :-

The task of energy audit undertaken by Aditi Engineering Services Nashik has the objective of finding opportunities of energy conservation & saving and to recommend action plan with calculation of investment options & energy saving thereof. **The Energy audit of information pertaining to year 2020 & 2021 has been conducted during 01-04-2021 to 03-04-2021.**

Scope of work is defined below

1. Study & Audit of MSEDCL electricity Bill for cost saving.
2. Inventory of loads & analysis of it
3. UPS Loading study
4. Submersible pump loading study.
5. Photovoltaic solar power system measurement & benefits assessment.
6. Benefit quantification study of solar water heater
7. Lighting System study & measurement
8. Identification of energy saving opportunity & energy conservation measures
9. Submission of technical & financial analysis report of energy audit.

3) ENERGY AUDIT METHODOLOGY :-

The audit involves visiting physical position of load & carry out inventory of load. Due measurement of electrical loads of equipment & circuit is carried out. Energy bill received from MSEDCL is audited & studied for KWH requirement & how efficiently energy is used. Energy conservation & saving opportunities are identified during round & measurement for implementation.

4) EXECUTIVE SUMMERY

The management of college has taken many electrical service connections from MSEDCL to meet the requirement of electricity of college for various purposes. In addition to this, the management of college has also installed renewable source of electric power in which two separate on-grid photovoltaic Solar power system are installed at two separate roof top bearing 10 KVA capacity of each connected in grid of MSEDCL through Net Metering.

The total demand of electricity of college is met through MSEDCL Grid power & photovoltaic Solar power system. The college requires electricity for lighting load, air conditioner load, motor pump set & laboratory equipment loads majorly. MSEDCL supplies electricity to college & college uses it. Monthly electricity bill is served by MSEDCL to college against cost of electricity unit (KWH) used subject to Net Meter logged data & college pays it regularly. The electricity bills for preceding months of all category of connections are referred for KWH consumption & payment made against it to MSEDCL to work out Average cost of power. Details of same are given below.

MSEDCL Various Electricity Connection Bill & Overall Average Purchase Cost Of Power Study -

A) Administrative main Building- LT II A- 3-Phase Connection No-164810025509 NET Meter No-055-XD561718

LT II-A billing tariff category is incorrect for college. Its tariff cost per KWH is higher than LT VII- B Public Other category by Rs 2.50 per KWH. You are procuring & paying higher cost unnecessary for KWH. So it is strongly recommended to get converted existing LT II-A billing tariff category into LT VII- B Public Other category from MSEDCL to save cost.

Administrative main Building- LT II A- 3-Phase Connection No-164810025509 NET Meter No-055-XD561718				NET Metering Reading result Details			
Month	Fixed charge Rs	KVA MD	Total Billed KWH	Import	Export	NET KWH	**Cumulative banked**
Apr-20	403	3	32	32	0.0	32	**0**
May-20	403	3	32	32	0.0	32	**0**
Jun-20	403	2	0	1495	2636.0	-1141	**0**
Jul-20	403	4	0	836	860.0	-24	**1141**
Aug-20	403	4	0	594	290.0	304	**1165**

Sep-20	403	5	0	606	349.0	257	**861**
Oct-20	403	5	0	663	355.0	308	**604**
Nov-20	403	4	0	472	533.0	-61	**296**
Dec-20	403	3	0	510	382.0	128	**357**
Jan-21	403	2	0	522	401.0	121	**229**
Feb-21	403	2	0	407	479.0	-72	**180**

Observation-

1) KWH units are imported from MSEDCL

2) Solar electrical power is generated, consumed & surplus KWH are exported in MSEDCL Power Grid.

3) In most cases; Solar generated KWH are more than requirement of college, Surplus electrical KWH are exported in MSEDCL power grid & banked. As banked KWH are more than net KWH worked out, Billing amount is looking zero in many month.

4) Solar energy generated KWH per day reading must be read daily & maintained in register regularly to know

1) Total solar unit share in total annual consumption to work out cost saving

2) Extreme variation to take timely corrective action to avoid financial loss by making import costly . MSEDCL power

5) Solar energy project relieved college by & large from dependency on MSEDCL as well as relieved from costly power procurement from MSEDCL. Solar project also mitigated greenhouse gas emission leading to protect environment from pollution.

Considering no banking of solar KWH, NET KWH billing is worked out & average cost of power is calculated as below.

Administrative main Building- LT II A- 3-Phase Connection No-164810025509						MSEDCL Electricity bill calculation & Average Cost of power in Rs/KWH					
Month	**Fixed charge Rs**	**KVA MD**	**Total KWH**	**NET KWH**	**Cumulative banked KWH**	**Energy charge Rs (Rs 7.36/KWH)**	**Wheeling charges Rs (Rs 1.45/KWH)**	**Electricity duty 21% in Rs**	**Tax on sale Rs (Rs 0.19/KWH)**	**Total Current Bill Rs**	**Average cost of power Rs/ KWH**
Apr-20	403	3	32	32	0	236	46.4	144	6.08	835	26.09
May-20	403	3	32	32	0	236	46.4	144	6.08	835	26.09
Jun-20	403	2	0	-1141	0	-8398	0	0	0	403	0
Jul-20	403	4	0	-24	1141	-177	0	0	0	403	0
Aug-20	403	4	0	304	1165	2237	440.8	647	57.76	3786	12.45
Sep-20	403	5	0	257	861	1892	372.65	560	48.83	3276	12.75
Oct-20	403	5	0	308	604	2267	446.6	654	58.52	3829	12.43
Nov-20	403	4	0	-61	296	-449	0	0	0	403	0

Dec-20	403	3	0	128	357	942	185.6	321	24.32	1876	14.66
Jan-21	403	2	0	121	229	891	175.45	308	22.99	1800	14.88
Feb-21	403	2	0	-72	180	-530	0	0	0	403	0
	4433			-116	4833	0	1713.9	2779	224.58	9151	#DIV/0!

B) Science Building - LT VII (B) Public other - 3-Phase Less than 20 KW Connection No-164810303045 NET Meter No-055-X1021232

Science Building - LT VII (B) Public other - 3-Phase Less than 20 KW Connection No-164810303045 NET Meter No-055-X1021232			NET Metering Reading result Details			
Month	Fixed charge Rs	KVA MD	Import KWH	Export KWH	NET KWH	Cumulative Banked KWH
Apr-20	362	Reading not available	4008.0	0	4008	0
May-20	362	as above	4008.0	0	4008	0
Jun-20	362	as above	4883	1927.0	2956	0
Jul-20	362	as above	2336	995.0	1341	0
Aug-20	362	as above	1264	298.0	966	0
Sep-20	362	as above	1598	344.0	1254	0
Oct-20	362	as above	1651	283.0	1368	0
Nov-20	362	as above	1249	417.0	832	0
Dec-20	362	as above	1379	278.0	1101	0
Jan-21	362	as above	1769	212.0	1557	0
Feb-21	362	as above	2245	178.0	2067	0
			26390.0	4932.0	21458	0

Science Building - LT VII (B) Public other – 3-Phase Connection No-164810303045				MSEDCL Electricity bill calculation & Average Cost of power in Rs/KWH					
Month	Fixed charge Rs	NET KWH	Cumulative banked KWH	Energy charge Rs (Rs 4.86/KWH)	Wheeling charges Rs (Rs 1.45/KWH)	Electricity duty 21% in Rs	Tax on sale Rs (Rs 0.19/KWH)	Total Current Bill Rs	Average cost of power Rs/ KWH
Apr-20	362	4008	0	19479	5811.6	5387	761.52	31801	7.93
May-20	362	4008	0	19479	5811.6	5387	761.52	31801	7.93

Jun-20	362	2956	0	14366	4286.2	3993	561.64	23569	7.97
Jul-20	362	1341	0	6517	1944.45	1853	254.79	10931	8.15
Aug-20	362	966	0	4695	1400.7	1356	183.54	7997	8.28
Sep-20	362	1254	0	6094	1818.3	1738	238.26	10251	8.17
Oct-20	362	1368	0	6648	1983.6	1889	259.92	11143	8.15
Nov-20	362	832	0	4044	1206.4	1179	158.08	6949	8.35
Dec-20	362	1101	0	5351	1596.45	1535	209.19	9053	8.22
Jan-21	362	1557	0	7567	2257.65	2139	295.83	12622	8.11
Feb-21	362	2067	0	10046	2997.15	2815	392.73	16613	8.04
		21458	0	104286	31114.1	29270	4077.02	168747	7.86

Observation-

1) KWH units are imported from MSEDCL

2) Solar electrical power is generated, consumed & surplus KWH are exported in MSEDCL Power Grid.

3) In most cases; Solar generated KWH are more than requirement of college, Surplus electrical KWH are exported in MSEDCL power grid & no KWH is banked. As KWH import from MSEDCL is always more than export KWH, KWH are not banked.

4) Solar energy generated per day reading must be read & maintained in register daily regularly to know

   1) Total solar unit share in total annual consumption to work out cost saving

   2) Extreme variation to take timely corrective action to avoid loss by making import costly MSEDCL power

5) Solar energy project relieved college by & large from dependency on MSEDCL as well as relieved from costly power procurement from MSEDCL. Solar project also mitigated greenhouse gas emission leading to protect environment from pollution.

C) Ladies hostel LT VII (B) - 1-Phase Less than 20 KW Connection No-164810071144 Meter No-09801488158

Ladies hostel LT VII (B) - 1-Phase Less than 20 KW Connection No-164810071144 Meter No-09801488158	MSEDCL Electricity bill calculation & Average Cost of power in Rs/KWH

Month	Fixed charge Rs	Total KWH	Energy charge Rs (Rs 4.86/KWH)	Wheeling charges Rs (Rs 1.45/KWH)	Electricity duty 16 % in Rs	Tax on sale Rs (Rs 0.19/KWH)	Total Current Bill Rs	Average cost of power Rs/ KWH
Apr-20	362	1363	6624.18	1908.2	1423	259	10576	7.76
May-20	362	1363	6624.18	1908.2	1423	259	10576	7.76
Jun-20	362	2271	11037.06	3179.4	2333	431	17343	7.64
Jul-20	362	571	2775.06	799.4	630	108	4675	8.19
Aug-20	362	577	2804.22	807.8	636	110	4719	8.18
Sep-20	362	663	3222.18	928.2	722	126	5360	8.08
Oct-20	362	429	2084.94	600.6	488	82	3617	8.43
Nov-20	362	447	2172.42	625.8	506	85	3751	8.39
Dec-20	362	441	2143.26	617.4	500	84	3706	8.40
Jan-21	362	465	2259.9	651	524	88	3885	8.35
Feb-21	362	489	2376.54	684.6	548	93	4064	8.31
Mar-21	362	637	3095.82	891.8	696	121	5167	8.11
Total	4344	9716	47219.76	13602.4	10427	1846	77439	7.97

D) Staff Room LT VII (B) - 1-Phase Less than 20 KW Connection No-164810025517 Meter No-09801474883

Staff Room LT VII (B) - 1-Phase Less than 20 KW Connection No-164810025517 Meter No-09801474883			MSEDCL Electricity bill calculation & Average Cost of power in Rs/KWH					
Month	Fixed charge Rs	Total KWH	Energy charge Rs (Rs 4.86/KWH)	Wheeling charges Rs (Rs 1.45/KWH)	Electricity duty 21 % in Rs	Tax on sale Rs (Rs 0.19/KWH)	Total Current Bill Rs	**Average cost of power Rs/ KWH**
Apr-20	362	649	3154.14	941.05	936	123	5517	**8.50**
May-20	362	649	3154.14	908.6	929	123	5477	**8.44**
Jun-20	362	1138	5530.68	1593.2	1572	216	9274	**8.15**
Jul-20	362	444	2157.84	621.6	660	84	3886	**8.75**
Aug-20	362	564	2741.04	789.6	817	107	4817	**8.54**
Sep-20	362	539	2619.54	754.6	785	102	4623	**8.58**
Oct-20	362	685	3329.1	959	977	130	5757	**8.40**
Nov-20	362	672	3265.92	940.8	959	128	5656	**8.42**
Dec-20	362	534	2595.24	747.6	778	101	4584	**8.58**
Jan-21	362	607	2950.02	849.8	874	115	5151	**8.49**
Feb-21	362	635	3086.1	889	911	121	5369	**8.45**
Mar-21	362	632	3071.52	884.8	907	120	5345	**8.46**

	4344	7748	37655.28	10879.65	11105	1472	65456	**8.45**

E) Laboratory LT II Com 1-Phase (0--20KW) Meter No-09801488160 Connection No-164810025525

1-phase connection No-164810025525 is kept without any consumption on it & **you are paying Rs 5070 per annum unnecessary fixed charges to MSEDCL making financial loss.** So it is recommended either to get converted the category of connection LT II Com into LT VII-B & use it or get it permanently disconnected in MSEDCL ledger to stop further billing. You pay bill unnecessary as below.

LT II (A) - 1-Phase Connection No-164810025525			MSEDCL Electricity bill calculation & Average Cost of power in Rs/KWH					
Month	Fixed charge Rs	Total KWH	Energy charge Rs (Rs 7.36/KWH)	Wheeling charges Rs (Rs 1.45/KWH)	Electricity duty 21 % in Rs	Tax on sale Rs (Rs 0.19/KWH)	**Total Current Bill Rs**	Average cost of power Rs/ KWH
Apr-20	403	1	7.36	1.45	86	0.19	**498**	498.48
May-20	403	5	36.8	7.00	94	0.95	**542**	108.32
Jun-20	403	0	0	0.00	0	0.00	**403**	#DIV/0!
Jul-20	403	0	0	0.00	0	0.00	**403**	#DIV/0!
Aug-20	403	0	0	0.00	0	0.00	**403**	#DIV/0!
Sep-20	403	0	0	0.00	0	0.00	**403**	#DIV/0!
Oct-20	403	0	0	0.00	0	0.00	**403**	#DIV/0!
Nov-20	403	0	0	0.00	0	0.00	**403**	#DIV/0!
Dec-20	403	0	0	0.00	0	0.00	**403**	#DIV/0!
Jan-21	403	0	0	0.00	0	0.00	**403**	#DIV/0!
Feb-21	403	0	0	0.00	0	0.00	**403**	#DIV/0!
Mar-21	403	0	0	0.00	0	0.00	**403**	#DIV/0!
Total	4836	6	44.16	8.45	180	1.14	**5070**	

F) It is necessary to watch regularly whether MSEDCL representatives reads monthly regularly & correctly to avoid any exorbitant cost of accumulated KWH units

G) It is necessary to wash & clean regularly dirt & dust deposited on photovoltaic solar power panel to get optimum output power.

H) Recommendation For Reduction In Quantity Of MSEDCL Service Connection

The management of college has taken many electrical service connections from MSEDCL to meet the requirement of electricity of college for various purposes. In addition to this, the management of college has also installed renewable source of electric power in which two separate on-grid photovoltaic Solar power system are installed at two separate roof top bearing 10 KVA capacity of each connected in grid of MSEDCL through Net Metering.

The total demand of electricity of college is met through MSEDCL Grid power & photovoltaic Solar power system. In relevance of prevailing tariff of MSEDCL, It is recommended to get permanently disconnected following connections to save monthly fixed charges & optimize solar power application for own purpose to reduce costly power procurement from MSEDCL to save cost.

Month	Existing Connection Position					Proposed Connection position	
	Connection No-164810025509	Connection No-164810025525	Connection No-164810025517	Connection No-164810071144	Connection No-164810303045	Connection No-164810025509	Connection No-164810303045
	Fixed Charges in Rs	Fixed Charges in Rs	Fixed Charges in Rs	Fixed Charges in Rs	Fixed Charges in Rs	Fixed Charges in Rs	Fixed Charges in Rs
Apr-20	403	403	362	362	362	362	362
May-20	403	403	362	362	362	362	362
Jun-20	403	403	362	362	362	362	362
Jul-20	403	403	362	362	362	362	362
Aug-20	403	403	362	362	362	362	362
Sep-20	403	403	362	362	362	362	362
Oct-20	403	403	362	362	362	362	362
Nov-20	403	403	362	362	362	362	362
Dec-20	403	403	362	362	362	362	362
Jan-21	403	403	362	362	362	362	362
Feb-21	403	403	362	362	362	362	362
Mar-21	403	403	362	362	362	362	362
Total	4836	4836	4344	4344	4344	4344	4344
Connection Sr No	1	2	3	4	5	1	2
Existing total of 5 No connections in Rs	22704						
Proposed total of 2 No connections in Rs						8688	

Saving in Annual cost of fix charges in MSEDCL Bill Rs- 14016

Modification suggested on following remaining MSEDCL NET metering connection -

Main Building Connection No-164810025509	Science Building Connection No-164810303045
Divert existing load from connection No-164810025525 , 164810025517, 164810071144 to Main Building Connection No-164810025509 & operate it from Connection No-164810025509. The Ladies hostel shall be provided own meter of college to measure, monitor & control electricity use in ladies hostel. Similarly boys hostel shall be provided separate meter to measure, monitor & control electricity use.	No Changes

I) Identified Energy saving opportunity & saving potential

Sr No	Details of study	Energy saving opportunity identified	Saving potential		Remark
			KWH	Amount in Rs	
1	Service connection of MSEDCL & its tarrif	1) Change of LT II A category from MSEDCL into LT VII B tariff category. 2) Permanent disconnection of MSEDCL connection to save fixed charges	0	**14016**	
2	UPS Loading Study	5KVA UPS along with batteries shall be kept off to save loss energy	**8880**	**69797**	
3	Additional 5KW Solar photovoltaic Power System	Reduction in costly power procurement from MSEDCL	6388	50205	
4	Replacement of Existing FTL with Energy Efficient LED Tube Light	Energy conservation & saving	**4648**	**36533**	
	Total		**19916**	**170551**	

Identified Energy & Cost saving potential **KWH 19916**

Amount in Rs 170551

5)ELECTRICAL CONNECTED LOAD STUDY

Electrical load other than motive power load has been physically inventoried & recorded in table in various types of load. Details of various load inventories are given below. As Viewed from below table, it understands that lighting & fan load has dominance in total load mix & shares more electrical consumption. This load has most potential to identify energy saving opportunity. College has been taking initiative in energy conservation & energy saving work. As part of this college has replaced almost FTL with LED down light & LED Tube light during year 2020-2021. This work benefitted college to reduce electrical load for same output leading to reduction in annual energy cost.

Sr No	Location	FTL Tube light T12			FTL Tube light T8			LED Tube light		
		No	Watt	Total watt	No	Watt	Total watt	No	Watt	Total watt
	Science Building									
	Second floor			0			0			0
1	Computer Lab-1 (S-54)	0	0	0			0	3	20	60
2	Computer Lab-2 (S-53)	0	0	0			0	3	20	60
3	Computer Lab-3 (S-52)	0	0	0			0	3	20	60
4	Computer Lab-4 (S-51)	0	0	0			0	3	20	60
5	Computer Lab-5 (S-50)	0	0	0			0	3	20	60
6	Computer Lab-6 Digital(S-48)	0	0	0			0	3	20	60
7	Staff Room (S-55)	0	0	0			0	2	20	40
8	Department of math. (S-49)	0	0	0			0	2	20	40
9	Digital class Room(S-47)	0	0	0			0	4	20	80
10	Digital class Room(S-46)	0	0	0			0	4	20	80
11	Class Room (S-45)	0	0	0			0	2	20	40
12	Conference Room(S-44)	0	0	0			0	7	20	140
13	Ladies Toilet	0	0	0			0	1	20	20
14	Class Room (S-42)	0	0	0			0	1	20	20
15	Class Room (S-41)	0	0	0			0	2	20	40
16	Passage	0	0	0			0	6	20	120
	Third floor	0	0	0			0			0
17	Class Room N0-1	0	0	0			0			0
18	Class Room N0-2	0	0	0			0			0
19	Class Room N0-3	0	0	0			0			0
20	Class Room N0-4	0	0	0			0			0
21	Class Room N0-5	0	0	0			0			0
22	Class Room N0-6	0	0	0			0			0
23	Class Room N0-7	0	0	0			0			0

24	Class Room N0-8	0	0	0			0			0
25	Class Room N0-9	0	0	0			0			0
26	Class Room N0-10	0	0	0			0			0
27	Staff Room -1	0	0	0			0			0
28	Staff Room -2	0	0	0			0			0
29	Toilet	0	0	0			0	1	20	20
30	Corridor	0	0	0			0	4	20	80
	Floor No-1	0	0	0			0			0
31	Ladies Toilet(S-29)	0	0	0			0	2	20	40
32	Instrumentation Lab- (S-30)	0	0	0			0			0
33	Electronic Lab (S-31)	0	0	0	6	18	108			0
34	General Physics Lab-1(S-32)	0	0	0	3	18	54			0
35	staff room(s-33)	0	0	0	2	18	36			0
36	HOD physics(S-34)	0	0	0	0	0	0	3	20	60
37	General Physics Lab-2(S-35)	0	0	0	5	18	90			0
38	PG Laboratory(S-36)	0	0	0	5	18	90			0
39	Gents Toilet (S-37)	0	0	0	2	18	36			0
40	Class Room (S-38)	0	0	0			0	2	20	40
41	Class Room (S-39)	0	0	0			0	2	20	40
42	Corridor	0	0	0	0	0	0	6	20	120
43	HOD microbiology (S-28)	0	0	0	1	23	23	1	20	20
44	Microbiology Lab-03(S-24)	0	0	0	2	36	92			0
45	Room (S-27)	0	0	0	0	0	0	2	20	40
46	Store (S-26)	0	0	0			0	1	20	20
47	Porch S-14 &15	0	0	0			0	6	20	120
48	Zoology depart. Store S-16			0	0	0	0	1	20	20
49	Zoology Lab S-17	0	0	0	0	0	0	3	20	60
50	Dark Room S-18	0	0	0			0	1	20	20
51	Toilet block	0	0	0	2	18	36			0
52	Zoology Lab-3 S-21	0	0	0	0	0	0	3	20	60
53	HOD Zoology S-22	0	0	0	0	0	0	2	20	40
54	Zoology Lab-2 S-23	0	0	0	0	0	0	2	20	40
55	HOD Botany S-63	0	0	0	0	0	0	2	20	40
56	Class Room S-64	0	0	0	0	0	0	5	20	100
57	Botany Lab-2 S-62	0	0	0	0	0	0	3	20	60
58	Botany Lab-1 S-56	0	0	0	0	0	0	2	20	40
59	Store (S-57)	0	0	0	0	0	0	2	20	40
60	Lab-S-61	0	0	0	0	0	0	2	20	40
61	Lab-3 S-58	3	40	150			0			0
62	Culture Room	1	40	50			0			0
63	Passage	4	40	200			0			0
	Ground floor			0			0			0

64	Physical chemistry lab S-11	0	0	0	4	36	184	1	20	20
65	Inorganic chemistry S-10	0	0	0	2	36	92			0
66	store S-9	0	0	0	2	36	92			0
67	Organic Chemistry S-8	0	0	0	2	36	92			0
68	HOD cabin Chemistry S-7	0	0	0	3	36	138			0
69	Class S-6	0	0	0	1	13	13	2	20	40
70	Toilet block	0	0	0			0	3	20	60
71	Class Room S-2	0	0	0	2	36	92			0
72	Class Room	0	0	0			0	2	20	40
73	Class Room S-14	0	0	0	2	36	92			0
74	Class Room S-15	0	0	0	2	36	92			0
75	General chemistry laboratory S-5	2	40	100	3	36	138	1	20	20
76	**Boyes hostel Total Room-11 No**			0	0	0	0	11	20	220
77	**Ladies hostel Total Room-36 No**				0	0	0	42	20	840
78								15	7	105
79	Toilet block	0	0	0			0	2	20	40
80	Gymkhana	0	0	0	0	0	0	10	20	200
81	Passage	0	0	0	2	36	92	1	20	20
82	Ladies Hostel Total Room-36	0	0	0			0			0
83	Room	0	0	0			0	36	20	720
84	Passage	0	0	0			0	15	7	105
85	**Mess**	0	0	0			0	6	20	120
86	**Library**	0	0	0	0	0	0	26	20	520
87	Class Room M-45	0	0	0			0	4	20	80
88	Class Room M-47	0	0	0			0	4	20	80
89	Class Room M-48	0	0	0	0	0	0	2	20	40
90	**Department of Geography**	0	0	0			0			0
91	Lecture hall M-48	0	0	0	0	0	0	4	20	80
92	Laboratory M-50	0	0	0			0	3	20	60
93	Staff Room	0	0	0			0	1	20	20
94	HOD cabin	0	0	0			0	1	20	20
	Main building						0			0
95	Exam control room(M14)	0	0	0	0	0	0	2	20	40
96	Class room M-15	0	0	0			0	3	20	60
97	Class room M-2	0	0	0			0	1	20	20
98	Class room M-13	0	0	0			0	1	20	20
99	Class room M-3	0	0	0	0	0	0	1	20	20
100	Class room M-12	0	0	0			0	1	20	20
101	Class room M-6	0	0	0			0	1	20	20

102	Class room M-7	0	0	0			0	1	20	20
103	NCC Unit M-11	0	0	0			0	1	20	20
104	Board of student M-10	0	0	0			0	1	20	20
105	NSS M-9	0	0	0			0	1	20	20
106	Class room M-8	0	0	0			0	1	20	20
107	Class room M-24	0	0	0			0	1	20	20
108	Class room M-18	0	0	0			0	1	20	20
109	Class room M-23	0	0	0			0	1	20	20
110	Depart. Of economics M22	Lock	0				0			0
111	Depart. Of marathi M-21	Lock	0				0			0
112	M-20	Lock	0				0			0
113	Class room M-19	0	0	0	0	0	0	2	20	40
114	Class room M-17	0	0	0			0	1	20	20
115	Class room M-25	0	0	0			0	1	20	20
116	Depart. Of politics	0	0	0	0	0	0	2	20	40
117	Class room M-16			0			0	4	20	80
118	Class room M-27			0			0	2	20	40
119	Depart. Of commerce			0			0	3	36	108
120	Depart. Of hystory			0			0	3	36	108
121	Depart. Of English			0			0	2	20	40
122	Language Laboratory			0			0	2	20	40
123	Passage			0	0	0	0	5	20	100
124	Administrative section M-43			0	0	0	0	9	20	180
125	Account room M42			0	0	0	0	1	20	20
126	Faculty room M-41			0	0	0	0	5	20	100
127	Toilet block			0	0	0	0	2	20	40
128	Passage	0	0	0	0	0	0	5	20	100
129							0			0
130							0			0
131							0			0
132	Total									0
133							0			0
134							0			0
135	Sakarben hall				1	23	23	22	36	792
136							0	12	7	84
137	Secretary office M35						0	2	20	40
138	President office						0	4	20	80
139	Principal cabin						0	2	36	72
140							0	10	7	70
141	Street Light							21	12	252
	Total	10		500	54		1705	439		8416

Sr No	Location	Split AC		exhaust fan			Ceiling fan			
		No	Total watt	No	Watt	Total watt	No	Watt	Regulator watt	Total watt
						0				
	Science Building									
	Second floor		0			0	3	70	5	225
1	Computer Lab-1 (S-54)		0			0	3	70	5	225
2	Computer Lab-2 (S-53)		0			0	3	70	5	225
3	Computer Lab-3 (S-52)		0			0	3	70	5	225
4	Computer Lab-4 (S-51)		0			0	3	70	5	225
5	Computer Lab-5 (S-50)		0			0	3	70	5	225
6	Computer Lab-6 Digital(S-48)		0			0	1	70	5	75
7	Staff Room (S-55)		0			0	2	70	5	150
8	Department of math. (S-49)		0			0	3	70	5	225
9	Digital class Room(S-47)		0			0	3	70	5	225
10	Digital class Room(S-46)		0			0	5	70	5	375
11	Class Room (S-45)		0			0				0
12	Conference Room(S-44)		0			0				0
13	Ladies Toilet		0			0				0
14	Class Room (S-42)		0			0				0
15	Class Room (S-41)		0			0				0
16	Passage		0			0				0
	Third floor		0			0				0
17	Class Room N0-1		0			0				0
18	Class Room N0-2		0			0				0
19	Class Room N0-3		0			0				0
	Class Room N0-4		0			0				0
	Class Room N0-5		0			0				0
	Class Room N0-6		0			0				0

	Class Room N0-7		0			0				0
	Class Room N0-8		0			0				0
	Class Room N0-9		0			0				0
	Class Room N0-10		0			0				0
	Staff Room -1		0			0				0
	Staff Room -2		0			0				0
	Toilet		0			0				0
	Corridor		0			0				0
	Floor No-1		0			0				0
	Ladies Toilet(S-29)		0			0				0
	Instrumentation Lab- (S-30)		0			0	4	70	5	300
	Electronic Lab (S-31)		0			0	2	70	5	150
	General Physics Lab-1(S-32)		0			0	2	70	5	150
	staff room(s-33)		0			0	2	70	5	150
	HOD physics(S-34)		0			0	3	70	5	225
	General Physics Lab-2(S-35)		0			0	4	70	5	300
	PG Laboratory(S-36)		0			0				0
	Gents Toilet (S-37)		0			0				0
	Class Room (S-38)		0			0				0
	Class Room (S-39)		0			0				0
	Corridor		0			0	1	70	5	85
	HOD microbiology (S-28)		0			0	1	70	5	75
	Microbiology Lab-03(S-24)		0	2	35	70	1	70	5	75
	Microbiology Lab-01(S-25)		0	1	35	35	1	70	5	75
	Room (S-27)		0	1	35	35	1	70	5	75
	Store (S-26)		0			0	3	70	5	255
	Porch S-14 &15		0			0	1	70	5	85
	Zoology depart. Store S-16		0			0	1	70	5	85
	Zoology Lab S-17		0			0				0

	Dark Room S-18		0			0				0
	Toilet block		0			0				0
	Zoology Lab-3 S-21		0			0	1	70	5	75
	HOD Zoology S-22		0			0	1	70	5	75
	Zoology Lab-2 S-23		0			0	2	70	5	150
	HOD Botany S-63		0			0	1	70	5	75
	Class Room S-64		0			0	1	70	5	85
	Botany Lab-2 S-62		0			0	2	70	5	170
	Botany Lab-1 S-56		0			0	1	70	5	85
	Store (S-57)		0			0	2	70	5	170
	Lab-S-61		0			0	2	70	5	170
	Lab-3 S-58		0			0				0
	Culture Room		0			0				0
	Passage		0			0				0
	Ground floor		0	2	35	70	2	70	5	150
	Physical chemistry lab S-11	1	1099	2	35	70	3	70	5	225
	Inorganic chemistry S-10		0	1	35	35	2	70	5	150
	store S-9		0	1	35	35	1	70	5	75
	Organic Chemistry S-8		0	1	35	35	3	70	5	225
	HOD cabin Chemistry S-7		0			0				0
	Class S-6		0			0				0
	Toilet block		0			0				0
	Class Room S-2		0			0				0
	Class Room		0			0				0
	Class Room S-14		0			0				0
	Class Room S-15		0	5	35	175	2	70	5	150
	General chemistry laboratory S-5		0			0				0
	Boys hostel Total Room-11 No		0			0	11	70	5	825

	Ladies hostel Total Room-36 No						40	70	5	3000
	Toilet block		0			0				0
	Gymkhana		0			0	3	70	5	225
	Passage		0			0				0
	Ladies Hostel Total Room-36		0			0	36	70	5	2700
	Room		0			0				0
	Passage		0			0	1	70	5	75
	Mess		0			0	10	70	5	750
	Library		0			0				0
	Class Room M-45		0			0				0
	Class Room M-47		0			0				0
	Class Room M-48		0			0				0
	Department of Geography		0			0	3	70	5	225
	Lecture hall M-48		0			0	2	70	5	150
	Laboratory M-50		0			0	1	70	5	75
	Staff Room		0			0	1	70	5	75
	HOD cabin		0			0				0
	Main building		0			0	2	70	5	170
	Exam control room(M14)		0			0				0
	Class room M-15		0			0				0
	Class room M-2		0			0	1	70	5	75
	Class room M-13		0			0	1	70	5	75
	Class room M-3		0			0				0
	Class room M-12		0			0	1	70	5	75
	Class room M-6		0			0				0
	Class room M-7		0			0	1	70	5	75
	NCC Unit M-11		0			0	1	70	5	75
	Board of student M-10		0			0	1	70	5	75

	NSS M-9		0			0	1	70	5	75
	Class room M-8		0			0				0
	Class room M-24		0			0				0
	Class room M-18		0			0				0
	Class room M-23		0			0				0
	Depart. Of economics M22		0			0				0
	Depart. Of marathi M-21		0			0				0
	M-20		0			0				0
	Class room M-19		0			0				0
	Class room M-17		0			0				0
	Class room M-25		0			0	1	70	5	75
	Depart. Of politics		0			0	1	70	5	75
	Class room M-16		0			0				0
	Class room M-27		0			0	3	70	5	225
	Depart. Of commerce		0			0	2	70	5	150
	Depart. Of history		0			0	2	70	5	150
	Depart. Of English		0			0	1	70	5	75
	Language Laboratory		0			0				0
	Passage		0			0	5	70	5	375
	Administrative section M-43		0			0	1	70	5	75
	Account room M42		0			0	5	70		350
	Faculty room M-41		0			0				0
	Toilet block		0			0				0
	Passage		0			0				0
			0			0				0
			0			0				0
			0							
	Total					0				0
			0			0				0

	Sakarben hall		0			0	14	70	5	1050
			0			0				0
			0			0				
	Secretary office M35	1	1895			0	1	70	5	75
	President office	2	2400			0	2	70	5	150
	Principal cabin	1	1099			0	4	70	5	300
	Total	5	6493	16	315	560	244	4970	350	18435

Sr No	Location	PC			Printer			Xerox/copier machine/Projector/public address system/TV		
		No	Watt	total Watt	No	Watt	total Watt	No	Watt	total Watt
	Science Building						0			0
	Second floor	25	40	1000			0			0
1	Computer Lab-1 (S-54)	18	40	720			0			0
2	Computer Lab-2 (S-53)	20	40	800			0			0
3	Computer Lab-3 (S-52)	13	40	520			0			0
4	Computer Lab-4 (S-51)	18	40	720			0			0
5	Computer Lab-5 (S-50)	1	40	40			0	1	100	100
6	Computer Lab-6 Digital(S-48)			0			0			0
7	Staff Room (S-55)	1	40	40	1	200	200			0
8	Department of math. (S-49)			0			0	1	100	100
9	Digital class Room(S-47)			0			0			0
10	Digital class Room(S-46)			0			0	2	220	440
11	Class Room (S-45)			0			0			0
12	Conference Room(S-44)			0			0			0
13	Ladies Toilet			0			0			0

14	Class Room (S-42)			0			0			0
15	Class Room (S-41)			0			0			0
16	Passage			0			0			0
	Third floor			0			0			0
17	Class Room N0-1			0			0			0
18	Class Room N0-2			0			0			0
19	Class Room N0-3			0			0			0
20	Class Room N0-4			0			0			0
21	Class Room N0-5			0			0			0
22	Class Room N0-6			0			0			0
23	Class Room N0-7			0			0			0
24	Class Room N0-8			0			0			0
25	Class Room N0-9			0			0			0
26	Class Room N0-10			0			0			0
27	Staff Room -1			0			0			0
28	Staff Room -2			0			0			0
29	Toilet			0			0			0
30	Corridor			0			0			0
	Floor No-1			0			0			0
31	Ladies Toilet(S-29)			0			0			0
32	Instrumentation Lab- (S-30)	12	40	480			0			0
33	Electronic Lab (S-31)			0			0			0
34	General Physics Lab-1(S-32)			0			0			0
35	staff room(s-33)	1	40	40			0			0
36	HOD physics(S-34)			0			0	1	100	100
37	General Physics Lab-2(S-35)			0			0			0
38	PG Laboratory(S-36)			0			0			0
39	Gents Toilet (S-37)			0			0			0

40	Class Room (S-38)			0			0			0
41	Class Room (S-39)			0			0			0
42	Corridor	1	40	40			0			0
43	HOD microbiology (S-28)			0			0			0
44	Microbiology Lab-03(S-24)			0			0			0
45	Microbiology Lab-01(S-25)			0			0			0
46	Room (S-27)			0			0			0
47	Store (S-26)			0			0			0
48	Porch S-14 &15			0			0			0
49	Zoology depart. Store S-16			0			0			0
50	Zoology Lab S-17			0			0			0
51	Dark Room S-18			0			0			0
52	Toilet block			0			0			0
53	Zoology Lab-3 S-21	1	40	40	1	200	200			0
54	HOD Zoology S-22			0			0			0
55	Zoology Lab-2 S-23	1	40	40			0			0
56	HOD Botany S-63			0			0			0
57	Class Room S-64			0			0			0
58	Botany Lab-2 S-62			0			0			0
59	Botany Lab-1 S-56			0			0			0
60	Store (S-57)			0			0			0
61	Lab-S-61			0			0			0
62	Lab-3 S-58			0			0			0
63	Culture Room			0			0			0
64	Passage			0			0			0
	Ground floor	3	40	120			0			0
65	Physical chemistry lab S-11			0			0			0
66	Inorganic chemistry S-10			0			0			0

67	store S-9			0			0			0
68	Organic Chemistry S-8	1	40	40			0			0
69	HOD cabin Chemistry S-7			0			0			0
70	Class S-6			0			0			0
71	Toilet block			0			0			0
72	Class Room S-2			0			0			0
73	Class Room			0			0			0
74	Class Room S-14			0			0			0
75	Class Room S-15			0			0			0
76	General chemistry laboratory S-5			0			0			0
77	**Boyes hostel Total Room-11 No**			0			0			0
78	**Ladies hostel Total Room-36 No**	0	0	0	0	0	0	0	0	0
79	Toilet block			0			0			0
80	Gymkhana	1	40	40			0			0
81	Passage			0			0			0
82	Ladies Hostel Total Room-36			0			0			0
83	Room			0			0			0
84	Passage			0			0			0
85	**Mess**	6	40	240			0			0
86	**Library**			0			0			0
87	Class Room M-45			0			0			0
88	Class Room M-47			0			0			0
89	Class Room M-48			0			0			0
90	**Department of Geography**			0			0			0
91	Lecture hall M-48			0			0			0
92	Laboratory M-50			0			0			0
93	Staff Room			0			0			0
94	HOD cabin			0			0			0

	Main building	1	40	40	1	200	200	1	750	750
95	Exam control room(M14)			0			0			0
96	Class room M-15			0			0			0
97	Class room M-2			0			0			0
98	Class room M-13			0			0			0
99	Class room M-3			0			0			0
100	Class room M-12			0			0			0
101	Class room M-6			0			0			0
102	Class room M-7	1	40	40			0			0
103	NCC Unit M-11			0			0			0
104	Board of student M-10			0			0			0
105	NSS M-9			0			0			0
106	Class room M-8			0			0			0
107	Class room M-24			0			0			0
108	Class room M-18			0			0			0
109	Class room M-23			0			0			0
110	Depart. Of economics M22			0			0			0
111	Depart. Of marathi M-21			0			0			0
112	M-20			0			0			0
113	Class room M-19			0			0			0
114	Class room M-17			0			0			0
115	Class room M-25	1	40	40			0			0
116	Depart. Of politics			0			0			0
117	Class room M-16			0			0			0
118	Class room M-27			0			0			0
119	Depart. Of commerce	1	40	40			0			0
120	Depart. Of history	1	40	40			0			0
121	Depart. Of English	8	40	320			0			0

122	Language Laboratory			0			0			0
123	Passage	7	40	280	3	200	600	1	750	750
124	Administrative section M-43			0			0			0
125	Account room M42			0			0			0
126	Faculty room M-41			0			0			0
127	Toilet block			0			0			0
128	Passage			0			0			0
135	Sakarben hall						0	2	300	600
136							0			0
137	Secretary office M35						0	1	90	90
138	President office						0			0
139	Principal cabin						0			0
							0			0
	Total	143	920	5720	6	800	1200	10	2410	2930

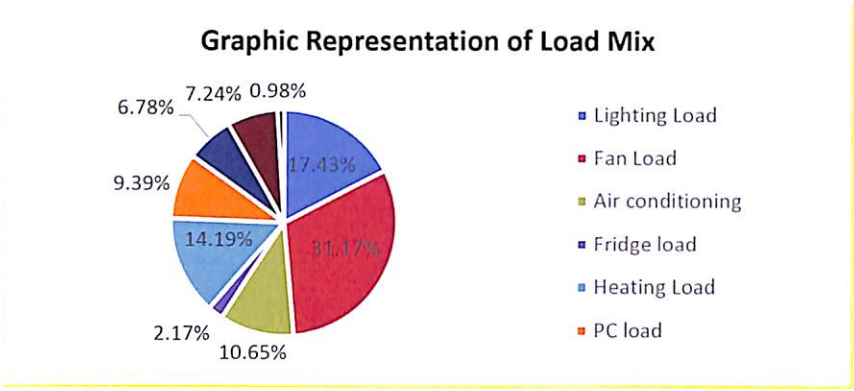
Sr No	Location	Fridge		Incubator		Hot air oven		Oven		Water cooler		Water pump/ RO system	
		No	Watt	No	Watt	No	Watt	No	Watt	No	Watt	No	Watt
1	Chairman chamber	1	170										
2	Ladies Hostel									2	600	1	3000
3	Microbiology S-26	1	230										
4	Microbiology S-24			2	350								
5	Zoology Lab S-17	1	230										
6	Class Room S-18			1	350	1	2250						
7	Botany Lab--2 S-62							1	1200				
8	Store	1	230										

9	Botany Lab--1			1	1500								
10	Inorganic S-10			1	1500								
11	Organic chemistry S-8					1	1500						
12	Inorganic chemistry S-10	1	230										
13	General chemistry Lab S-5	1	230										
14	College campus											1	4410
	Total	5	1320	5	3700	2	3750	1	1200	2	600	2	7410

Analysis of Connected Load Mix in Campus

The total inventoried load has been classified as below.

Sr No	Type of load	Total Watts	% On Total
1	Lighting Load	10621	17.43
2	Fan Load	18995	31.17
3	Air conditioning	6493	10.65
4	Fridge load	1320	2.17
5	Heating Load	8650	14.19
6	PC load	5720	9.39
7	other electronic Load	4130	6.78
8	Water pump/ RO system	4410	7.24
9	Water cooler	600	0.98
	Total	**60939**	**100**



Observation- **As viewed from above, it is observed that Lighting & fan load has dominance in total load mix.**

6) POWER MEASUREMENT AT VARIOUS TERMINAL-

There are various electrical service connection meters provided by MSEDCL to supply electric power to college at applicable tariff category. The college uses electricity from these connections & pay monthly electricity bill served by MSEDCL. The college management has taken prudential step & holistic approach & installed photovoltaic solar power system to meet it partly requirement. In this mechanism of NET Metering policy of MSEDCL, surplus solar power is exported to MSEDCL grid when demand of power of college is lean & imported power from MSEDCL when demand of power of college is more than solar generation. Electrical KWH exported to MSEDCL grid is accounted for Relief in electricity bill.

Location of meter	Connection detail		Measurement Location	Measurement							
	Type	Consumer No		Phase	KW	KVAR	KVA	PF	Volts	Amps	Hz
Main Building- DG Room	3- Phase NET Meter	1648110025509	Distribution Bus bar Box- Solar power incoming terminal	R	2.73	-1.84	3.29	0.830	250.4	13.1	50.1
				Y	2.66	-1.66	3.13	0.850	237.7	13.2	
				B	2.73	-1.73	3.23	0.845	240	13.4	
				Total	8.12	-5.23	9.65	0.841			
			Distribution Bus bar Box- From meter outgoing terminal	R	1.33	1.31	1.87	0.711	255.4	7.3	50
				Y	1.83	-0.48	1.9	0.963	240.8	7.9	
				B	0.46	0.94	1.05	0.438	245.6	4.3	
				Total	3.62	1.77	4.82	0.751			

			Distribution Bus bar Box- To load side outgoing terminal for Administrative Building	R	0.51	-0.17	0.55	0.927	241.2	2.3	49.9
				Y	1.91	-0.16	1.93	0.990	245.1	7.9	
				B	0.68	-0.12	0.7	0.971	254.9	2.7	
				Total	3.1	-0.45	3.18	0.975			
Main Building- DG Room	1- Phase	164810025517	Meter - At meter load side terminal supply going in staff room	R	3.45	-2.24	4.11	0.839	234.3	17.5	49.9
Ladies Hostel	1- Phase	164810071144	Meter - At meter load side terminal supply going in hostel	Y	1.22	0.38	1.28	0.953	231.2	5.5	49.9
New science building	3- Phase NET Meter	164810303045	Meter incoming	R	2.61	-3.7	4.53	0.576	247.4	18.3	49.9
				Y	-2.17	-0.58	2.26	-0.960	265.7	8.5	
				B	4.05	2.14	4.59	0.882	235.6	19.5	
				Total	4.49	-2.14	11.38	0.395			
			Solar power in to NET Meter outgoing terminal	R	2.13	0.19	2.15	0.991	233.4	9.2	49.8
				Y	2.41	0.59	2.49	0.968	264.9	9.4	
				B	2.19	0.69	2.31	0.948	247.8	9.3	
				Total	6.73	1.47	6.95	0.968			
			Total Load side terminal after meter	R	6.01	2.44	6.49	0.926	234.5	27.7	
				Y	0.35	-0.02	0.35	1.000	265.2	1.3	
				B	4.85	-3.72	6.11	0.794	246.9	24.8	
				Total	11.21	-1.3	12.95	0.866			
New science building			DOL starter outgoing terminal going to submersible motor	R	1.15	2.16	2.45	0.469	240.6	10.2	50.1
				Y	1.59	1.72	2.35	0.677	228.4	10.3	
				B	1.88	2.56	3.18	0.591	264.3	12	
				Total	4.62	6.44	7.98	0.579			

Remark- **Supply Voltage from MSEDCL is very unbalance & abnormal. This is hazardous & detrimental to connected electrical & electronic loads.**

7) PHOTOVOLTAIC SOLAR POWER SYSTEM STUDY-

Recently college has taken prudential step & holistic approach & installed no of two photovoltaic roof top solar power system to meet its partly requirement. In this mechanism of NET Metering policy of MSEDCL, surplus solar power is exported to MSEDCL grid when demand of power of college is lean & imported power from MSEDCL when demand of power of college is more than solar generation. Electrical KWH exported to MSEDCL grid is accounted for Relief in electricity bill.

A) System No-1 Roof top of main building

1) PV Panel Details-

PV Panel	Make	Max power watt	open circuit voltage	Max power volt	Max power current Amp	Total Panel No	Total string	Total installed capacity in Watt
	WAAREE	315	45.25	36.75	8.58	32	3	10000

2) PV Grid Inverter Details-

PV Grid inverter	Make	Max DC Volt	DC Voltage Range	MPPT Volt Range	Max input current per string	Max Apparent power KVA	Nominal output	Hz
	Growatt	1000	300-1000	400-800	15 A	10	3/N/PE230V/400	50+/-6

3) Solar Power Generation measurement-

Phase	KW	KVAR	KVA	PF	Volts	Amps	Hz	% Reference Voltage Unbalance
R	2.73	-1.84	3.29	0.83	250.4	13.1	50.1	2.06
Y	2.66	-1.66	3.13	0.85	237.7	13.2		
B	2.73	-1.73	3.23	0.845	240	13.4		
Total	8.12	-5.23	9.65	0.841	242.7			

B) System No-2 Roof top of Science building

1) PV Panel Details-

PV Panel	Make	Max power watt	open circuit voltage	Max power volt	Max power current Amp	Total Panel No	Total string	Total installed capacity in Watt
	Vikramsolar	330	46.3	38	8.76	31	3	10,000

2) PV Grid Inverter Details-

PV Grid inverter	Make	Max DC Volt	DC Voltage Range	MPPT Volt Range	Max input current per string	Max Apparent power KVA	Nominal output	Hz
	Delta	1000	200-1000	200-1000	16 A	10	3/N/PE230V/400	50+/-6

3) Solar Power Generation measurement-

Phase	KW	KVAR	KVA	PF	Volts	Amps	Hz	% Reference Voltage Unbalance
R	2.13	0.19	2.15	0.991	233.4	9.2	49.8	6.15
Y	2.41	0.59	2.49	0.968	264.9	9.4		
B	2.19	0.69	2.31	0.948	247.8	9.3		
Total	6.73	1.47	6.95	0.968	248.7			

C) Financial & Environment Impact Assessment Of Existing Solar Power generation

Location	Photovoltaic solar power capacity	Measured solar power generation	Average sun availability per day	No of day in operation per year	**Estimated Annual electricity generation from Solar power system**	Average cost of MSEDC power	**Annual Power Purchase cost saving in**	Average emission factor(Source-CEA)	**Equivalent CO2 gas emission mitigated in**
	KVA	KW	Hours	No	**KWH**	Rs/ KWH	**Rs**	Kg of Co_2/KWH	**Kg**

Main Building	10	8.12	5	365	**14819**	7.86	**116477.3**	0.82	**12152**
Science Building	10	6.73	5	365	**12282**	7.86	**96538.5**	0.82	**10071**
Total	20				**27101**		**213015.8**		**22223**

D) Existing solar power generation Data

Main Building Solar generation data						
Month	Initial Reading in MWH	Final Reading in MWH	Difference in MWH	Total generated KWH	Days	Average per day generation in KWH
Oct-19	30.15	31.1	0.95	950	31	
Nov-19	31.1	32.07	0.97	970	30	
Dec-19	32.07	32.81	0.74	740	31	
Jan-20	32.81	33.59	0.78	780	31	
Feb-20	33.59	34.37	0.78	780	29	
Mar-20	34.37	34.84	0.47	470	16	
			Total	4690	168	27.9

Note- Daily Reading of Solar energy generated from Main Building system is read & maintained. Daily Reading of Solar energy generated from both system shall be read & maintained its separate record consistently to assess annual energy met by solar power system, power purchase cost saving & its environmental impact.

E) Identification of potential for solar power generation capacity expansion

Location of meter	Connection detail		Measurement Location	Measurement			
	Type	Consumer No		KW	KVAR	KVA	PF
New science building	3- Phase NET Meter	164810303045	Meter incoming	4.49	-2.14	11.38	0.395
			Solar power in to NET Meter outgoing terminal	6.73	1.47	6.95	0.968
			Total Load side terminal after meter	11.22	-1.3	12.95	0.866

As viewed from above total KW load demand met 1) by MSEDC - 4.49 KW

2) by solar power system - 6.73 KW

Additional 5KW Solar Power System Can Be Added To Existing System To Save Cost of Costly Power Purchase From MSEDCL

Financial & Environment Impact Assessment Of additional Solar Power generation

Location	Proposed Photovoltaic solar power capacity	Estimated solar power generation	Average sun availability per day	No of day in operation per year	Estimated Annual electricity generation from Solar power system	Average cost of MSEDC power	Estimated Annual power purchase cost saving in	Average emission factor(Source-CEA)	Equivalent CO2 gas emission mitigated in
	KVA	KW	Hours	No	KWH	Rs/ KWH	Rs	Kg of Co_2/KWH	Kg
Science Building	5	3.5	5	365	6387.5	7.86	50205	0.82	5238

F) Requirement of dedicated distribution transformer for college

It has been studied voltage profile in measurement which indicates abnormality in Voltage magnitude & Voltage unbalance. This may be due to unbalance distribution of load on LT circuits emanating from transformer of MSEDCL or due to faulty transformer.

The adverse effects of abnormal & unbalance voltage exceeding permissible limit i.e. 2% are described as below.

1) Abnormal rise in supply voltage leads to damage electrical & electronics loads i.e. tube, fan, bulb , motor, PCS
2) Increment in power consumption by load & electricity bill.
3) Deterioration in performance of 3- Phase motor loads.
4) Increment in maintenance cost.
5) Disturbances in various activity due to unpredictable failures.
6) **Most of time isolation of Photovoltaic Solar power system from MSEDCL supply grid & this makes stop to deliver solar power to load & import maximum time costly power from MSEDCL grid leading to increase power procurement expenses imposing additional financial burden on college.**

Hence it is strongly recommended to provide 50 KVA, 3-Phase dedicated distribution transformer for catering power supply to campus electrical & electronics load at almost balance voltage within permissible limit. This will lead to improve performance of load & reduce failure of electrical & electronics load leading to reduce maintenance cost. This will also help to reduce procurement of costly power from MSEDCL.

8)UPS LOADING STUDY-

There are two UPS working in science Building which caters exclusively load of computers. Loading study of both UPS has been carried out & following are major observation in output power measurement with respect to switched on load of computers.

1) Measurement in 2019 Energy Audit

Sr No	UPS Details					Measured Output power				Load Details		Average load per PC	% Loading on UPS
	Make	DC Volt	Hz	Rating in KVA	Output Volt	KW	KVAR	KVA	PF	Location	No of PC	Watt	
1	Sukam	192	50	7.5	230	2.05	-2.45	3.2	0.641	BCA Lab (1)Lab No- S-52,53,54 2) Computer Lab-1,2,3)	51	40.20	42.67
2	Sukam	192	50	5	230	1.29	-0.91	1.58	0.816	BCS Lab(Lab No- S-50,51)	32	40.31	21.07

2) Measurement in 2021 Energy Audit

Location	1-Phase UPS Details (Output Volt 230 V)		12 V Battery		Power measurement								Loading based on capacity
	Make	KVA	No	AH	Measured at	KW	KVAR	KVA	PF	Volt	Amps	Hz	%
BCA Lab	Sukam	5	16	165	Input	1.52	-1.79	2.35	0.647	230.2	10.2		
					Output	0.72	-0.56	0.91	0.791	228.5	4		18.2
					Loss power	0.8							
Computer Lab-1,2,3	Sukam	7.5	16	160	Input	2.39	-2.57	3.5	0.683	228.1	15.4	49.9	
					Output	1.28	-0.83	1.53	0.837	229.6	6.6		20.4
					Loss power	1.11							

Observation & Recommendation-

1) As viewed from above, it looks that BCS Lab- 4 & 5 UPS is found loaded 18 % i.e. total capacity of UPS is booked only 18 % by prevailing load.

2) Computer Lab-1, 2, 3 UPS is found loaded only 21 % i.e. total capacity of UPS is booked only 21 % by prevailing load

3) Both UPS are very under loaded.

4) There is energy losses taking place on account of UPS & internal resistance of batteries during trickle charging phenomenon of batteries as shown above in table. These energy losses are measured as below which make increase operating cost per annum.

Location	1-Phase UPS Details		**Loss of power in UPS system at respective loading**	Annual working Hours	**Energy Loss**	Average cost of power	**Annual Financial Loss in**
	Make	KVA	**KW**	No	**KWH**	Rs/KWH	**Rs**
BCA Lab-	Sukam	5	**0.8**	8000	**6400**	7.86	**50304**
Computer Lab-1,2,3	Sukam	7.5	**1.11**	8000	**8880**	7.86	**69797**

Note- There found heavy dust deposited on UPS & batteries. There is tremendous scope for good maintenance of system. So there is necessary to schedule periodic maintenance & cleaning.

RECOMMENDATION-

As both UPS are under loaded, connected load on 5 KVA UPS of BCS Lab- 4 & 5 (18 % Loading) is recommended to divert on 7.5 KVA UPS Computer Lab-1,2,3 (21 % loading) & 5 KVA UPS of BCS Lab- 4 & 5 along with batteries shall be kept off to save loss energy on account of its operation to reduce(save) annual operating cost of UPS operation.

9)MOTOR LOADING STUDY-

There is one submersible pump near gymkhana building which pumps the water to supply usable water other than drinking water. This motor is claimed of 3 HP rating. I have been informed that old motor has been replaced with new one. Input electrical power is measured during its normal operation. Input power is admeasured 4.62 KW & power factor of motor is also poor i.e. 0.579.

1) Old Motor Measured power

Submersible Motor details			measured Load details				% Motor Efficiency
stage	Rating KW	Volt	KW	KVAR	KVA	PF	
8	2.2	415	4.41	5.03	6.7	0.659	50

2) Replaced Motor Measured power

Phase	KW	KVAR	KVA	PF	Volts	Amps	Hz
R	1.15	2.16	2.45	0.469	240.6	10.2	50.1
Y	1.59	1.72	2.35	0.677	228.4	10.3	
B	1.88	2.56	3.18	0.591	264.3	12	
Total	**4.62**	**6.44**	**7.98**	**0.579**			

The measured power of earlier motor & replaced motor does not differ much. The measured power factor of motor is very poor. So power capacitor of 5 KVAR rating shall be connected across motor to reduce KVA demand of motor & improve power factor of motor load.

10) SOLAR WATER HEATER QUANTIFICATION OF BENEFITS-

College has installed solar water heater in boys & Girls hostel to harness cost free solar green energy for heating water requiring student to bathe. This reduces demand of conventional commercial energy & save cost. This will also help to reduce greenhouse gas emission mitigating environmental damage. Application of this hot water in various laboratory can be explored which is generated without input energy cost.

Solar Heater Location	No of Student occupancy	No of Solar Heaters	Each SH Capacity in	Average Water Temperature ^{O}C		Specific heat in	Solar Heat gained by water per Day in	Estimated Equivalent Electricity saving in	Average Electricity Cost in	Estimated Electricity purchase Cost saving in	Estimated CO2 GHG Emission reduction per year in
	No	No	Litres/ Day	Hot(Out)	Cold (In)	Kcal/Kg/^{o}C	Kcal	KWH per year	Rs/KWH	Rs per year	Kg
Ladies Hostel	140	1	1500	58	25	1	49500	17267	7.86	135722	14159
Boys Hostel	44	2	200	56	25	1	6200	2163	7.86	65802	1773
Total	184	3	1700				55700	19430	7.86	201524	15933

11) REPLACEMENT OF EXISTING FTL WITH ENERGY EFFICIENT LED TUBE LIGHT

There is major load of lighting & fan in college campus. It has been told that most of replacement of existing FTL with energy efficient led tube light has been completed & minor work is remained. It is proposed to replace remaining FTL with energy efficient LED tube light. This Energy saving & conservation opportunities is mentioned below with cost benefit analysis based on annual average cost of power.

Type of lamp	Existing			Proposed replacement with LED tube light		Saving in	Saving in	Saving in Amount	Capital investment in Rs	Pay-back period in
	No	Watt/unit(inclusive of choke watt)	Total Load including choke in Watt	Watt/Lamp	Total Load including choke in Watt	Watt	KWH	Rs	Rs	Months
FTL T12	10	50	500	18	200	300	2100	16506	4500	3.27
FTL T8	14	46	644	18	280	364	2548	20027	6300	3.77
Total	24		1144		480	664	4648	36533	10800	3.55

Average cost of LED tube per unit in Rs- 450 Running Hours per year of tube - 7000 No

Average cost of power Rs/KWH- 7.86

12) ILLUMINATION MEASUREMENT & STUDY-

Illumination is measured with Lux Meter vide reference standard **IS 3646(Part1): 1992**. This is measured on sample basis at working plane in premises. Illumination level is much below the standard quoted. Hence artificial lighting shall have to add or modify adequately to attain illumination level for enhancing human eye comfort & work efficiency prescribed in **IS 3646(Part1): 1992** standard. It is advised to use energy efficient LED Tube Light to distribute light uniformly without change in existing wiring.

Sr No	Location	Natural light source	Measured lux level	Recommended Lux level
1	Chairman Cabin	yes	100	300
2	Principal Cabin	No	110	300
3	Administrative office			
	Cabin	No	123	300
	Office working area	yes	116	300
4	**Library**			
	Cabin	yes	55	300
	Reception	Yes	86	300
	Book Rack	yes	53	100
	Periodical section cabin	No	37	300
5	**Class Room**			
	M-45	Yes	113	300
6	**Boys Hostel**			

	Room No-5	Yes	92	300
	Room No-4	yes	66	300
	Room no-3	yes	105	300

Observation & Recommendation-

1) **Administrative main Building- LT II A- 3-Phase Connection No-164810025509 NET Meter No-055-XD561718** - LT II-A billing tariff category is incorrect for college. Its tariff cost per KWH is higher than LT VII-B Public Other category by Rs 2.50 per KWH. You are procuring & paying higher cost unnecessary for KWH. So it is strongly recommended to get converted existing LT II-A billing tariff category into LT VII- B Public Other category from MSEDCL to save cost.
2) Solar energy generated KWH per day reading must be read daily & maintained in register regularly to know

   1) Total solar unit share in total annual consumption to work out cost saving

   2) Extreme variation to take timely corrective action to avoid financial loss by making import costly MSEDCL power.
3) Solar energy project relieved college by & large from dependency on MSEDCL as well as relieved from costly power procurement from MSEDCL. Solar project also mitigated greenhouse gas emission leading to protect environment from pollution.
4) **Laboratory LT II Com 1-Phase (0--20KW) Meter No-09801488160 Connection No-164810025525-** 1-phase connection No-164810025525 is kept without any load (consumption) on it & **you are paying Rs 5070 per annum unnecessary fixed charges to MSEDCL making financial loss**. So it is recommended to get connection permanently disconnected in MSEDCL ledger to stop further billing.
5) It is necessary to watch & witness regularly whether MSEDCL representatives reads monthly regularly & correctly to avoid any exorbitant cost of accumulated KWH units
6) It is necessary to wash & clean regularly dirt & dust deposited on photovoltaic solar power panel to get optimum output power.
7) **Recommendation For Reduction In Quantity Of MSEDCL Service Connection—**_Modification suggested on following remaining MSEDCL NET metering connection

Main Building Connection No-164810025509	Science Building Connection No-164810303045
Divert existing load from connection No-164810025525 , 164810025517, 164810071144 to Main Building Connection No-164810025509 & operate it from Connection No-164810025509. The Ladies hostel shall be provided own meter of college to	No Changes

measure, monitor & control electricity use in ladies hostel. Similarly boys hostel shall be provided separate meter to measure, monitor & control electricity use.	

8) Analysis of Connected Load Mix in Campus

The total inventoried load has been classified as below.

Sr No	Type of load	Total Watts	% On Total
1	Lighting Load	10621	17.43
2	Fan Load	18995	31.17
3	Air conditioning	6493	10.65
4	Fridge load	1320	2.17
5	Heating Load	8650	14.19
6	PC load	5720	9.39
7	other electronic Load	4130	6.78
8	Water pump/ RO system	4410	7.24
9	Water cooler	600	0.98
	Total	**60939**	**100**

9) **Supply Voltage from MSEDCL is very unbalance & abnormal. This is hazardous & detrimental to connected electrical & electronic loads.**

10) **Requirement of dedicated distribution transformer for college**

It has been studied voltage profile in measurement which indicates abnormality in Voltage magnitude & Voltage unbalance. This may be due to unbalance distribution of load on LT circuits emanating from transformer of MSEDCL or due to faulty transformer.

The adverse effects of abnormal & unbalance voltage exceeding permissible limit i.e. 2% are described as below.

7) Abnormal rise in supply voltage leads to damage electrical & electronics loads i.e. tube, fan, bulb , motor, PCS
8) Increment in power consumption by load & electricity bill.
9) Deterioration in performance of 3- Phase motor loads.
10) Increment in maintenance cost.
11) Disturbances in various activity due to unpredictable failures.
12) **Most of time isolation of Photovoltaic Solar power system from MSEDCL supply grid & this makes stop to deliver solar power to load & import maximum time costly power from MSEDCL grid leading to increase power procurement expenses imposing additional financial burden on college.**
13) Hence it is strongly recommended to provide 50 KVA, 3-Phase dedicated distribution transformer for catering power supply to campus electrical & electronics load at almost balance voltage within permissible limit. This will lead to improve performance of load & reduce failure of electrical & electronics load leading to reduce maintenance cost. This will also help to reduce procurement of costly power from MSEDCL.

11) **As both UPS are under loaded, connected load on 5 KVA UPS of BCS Lab- 4 & 5 (18 % Loading) is recommended to divert on 7.5 KVA UPS Computer Lab-1,2,3 (21 % loading) & 5 KVA UPS of BCS Lab- 4 & 5 along with batteries shall be kept off to save loss energy on account of its operation to reduce(save) annual operating cost of UPS operation.**

12) The measured power of earlier motor & replaced motor does not differ much. The measured power factor of motor is very poor. So power capacitor of 5 KVAR rating shall be connected across motor to reduce KVA demand of motor & improve power factor of motor load.

13) It is proposed to replace remaining FTL with energy efficient LED tube light. This Energy saving & conservation opportunities is mentioned in report with cost benefit analysis based on annual average cost of power.

14) **SOLAR WATER HEATER QUANTIFICATION OF BENEFITS**

Estimated Equivalent Electricity saving in KWH	**19430**
Estimated Electricity purchase Cost saving in Rs	**201524**
Estimated CO2 GHG Emission reduction per year in Kg	**15933**

(Note- You are requested to refer entire report also to understand things clearly)

13) LIST OF INSTRUMENT USED FOR MEASUREMENT IN ENERGY AUDIT

Sr No	Instrument Name
1	3- Phase Electric Power Analyzer
2	Lux Meter
3	Thermometer
4	Whirling psychomotor
5	Measuring tape

Co ordinator
IQAC, K. J. Somaiya College
Kopargaon, Dist. A.Nagar

K. J. Somaiya College of Arts Commerce & Science Estd. 1954 Kopargaon

Principal
K. J. Somaiya College of Arts
Commerce & Science, Kopargaon

115A

ADITI ENGINEERING SERVICES NASHIK

Consultant in – Energy Management, Energy Audit, Electrical Safety Audit, MSEDCL Grievences,33 & 11 KV Substation Testing & Earthing Design, HT /LT Industrial Installation, Power Factor & Harmonics Solution.

Firm Address- Flat No-604, Hari Aakruti Apartment, opposite Sagar samrat sweet, Bhabhanagar, Dwarka,Nashik-422011

Proprietor - Er. Deokar B. L. Mo. No- 9960691191 Email -bldeokar61@gmail.com

Tax- Invoice

Dt- 16-06-2021

To,

The Principal,

K J Somaiya Senior & K.B. Rohmare Junior College Kopargaon

Sub- Tax- Invoice for Energy audit.

Dear Sir,

It is submitted herewith Tax- Invoice of Energy audit of college for making payment. Energy Audit Report is already submitted.

You are requested to make payment against engineering services provided in energy audit. If you have any query please feel free to contact to clear the same.

SR No	Energy Audit of Industry name	Unit	Rate	Quantity	Total in Rs
2	Energy audit of college campus & submission of its Technical Report.	Job	20,000=00	1	20,000=00
.			Total	1	20,000=000

Total amount Rupees in word- Twenty Thousand Only.

Note- GST is not applicable

Thanks

Er. Deokar B. L.

Certified Energy Auditor

(Bureau of Energy Efficiency Govt. of India)

Aditi Engineering Services Nashik

ch No. 2703
17/06/2021

K.J. Somaiya College of Arts Commerce & Science Estd. 1954 Kopargaon

Kopargaon Taluka Education Society's

K.J. Somaiya Arts, Commerce and Science College, Kopargaon

Criterion 7- Institutional Values and Best Practices

7.1: Institutional Values and Social Responsibilities

7.1.3: Quality audits on environment and energy regularly undertaken by the Institution. The institutional environment and energy initiatives are confirmed through the following

1. Green audit / Environment audit
2. Energy audit
3. Clean and green campus initiatives
4. Beyond the campus environmental promotion and sustainability activities

Energy Audit Report 2021-2022

ADITI ENGINEERING SERVICES NASHIK

Consultant in – Energy Management, Energy Audit, Electrical Safety Audit, MSEDCL Grievances, 33 & 11 KV Substation Testing & Earthing Design, HT /LT Industrial Installation, Power Factor & Harmonics Solution.

Firm Address- Flat No-604, Hari Aakruti Apartment, opposite Aananda Laundry, Pakhal Road, Dwarka, Nashik-422011

Proprietor - Er. Deokar B. L. Mo. No- 9960691191 Email -bldeokar61@gmail.com

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CERTIFICATE OF ENERGY AUDIT

This is to certify that

KOPARGAON TALUKA EDUCATION SOCIETY'S K J SOMAIYA SENIOR & K.B. ROHMARE JUNIOR COLLEGE KOPARGAON

Mohanirajnagar, Kopargaon-423601, Dist- Ahmednagar, Maharashtra, India

has conducted **Electrical Energy Audit** *in September 2022 for year 2021- 2022 for knowing present profile of electrical energy consumption, Identification of energy conservation &saving opportunities for implementation to save energy & to mitigate greenhouse gas emission for environmental protection.*

(**Er. Deokar Bhausaheb)**

Certified Energy Auditor EA-2700

(Bureau of Energy Efficiency Govt. Of India)

Aditi Engineering Services, Nashik

Date-26 October 2022

Co ordinator
IQAC, K. J. Somaiya College
Kopargaon, Dist. A.Nagar

K.J. Somaiya College of Arts, Commerce & Science Estd. 1994 Kopargaon

Principal
K. J. Somaiya College of Arts
Commerce & Science, Kopargaon

ENERGY AUDIT REPORT
2021 - 2022

K J SOMAIYA SENIOR & K.B. ROHMARE JUNIOR COLLEGE, KOPARGAON, DIST- AHMEDNAGAR.

ENERGY AUDITED DURING DATE 29-09-2022 To 1-10-2022

AUDITED BY

ADITI ENGINEERING SERVICES NASHIK

ACKNOWLEDGEMENT

Energy Audit of system is key instrument in knowing the present level of efficiency of various components and establishing the areas of shortfall for improvement.

We are very thankful for Hon. Shri-Ashokraoji Rohmare Saheb, Chairman, Hon. The Principal Shri- Yadav sir, K.J. Somaiya Senior & K. B. Rohmare Junior College Kopargaon who have opted such prudential step on the behalf of Management & have given opportunity to conduct Energy audit of college campus facility. We are also thankful for subordinate staffs who have given their valuable contribution for guiding & supporting us during college premise round for data collection, network study & measurement for accomplishing successful Energy audit.

This report made with sincere efforts gives details of the relevant data collected during energy audit study, observation, analysis & recommendations made pertaining to different systems in college premises.

Several Energy Conservation Opportunities (Measures) have been identified & proposed in course of our study & these options when implemented, are expected to bring in lasting benefits(saving) in term of energy as well as cost to the management.

We are pleased to submit this Detailed Energy Audit Report to Hon. the Principal, K.J. Somaiya Senior & K. B. Rohmare Junior College Kopargaon representing on behalf of management and wish him all the best for implementation of identified Energy Conservation Opportunity as well as recommendations after sincere study & observations.

Aditi Engineering services Nashik is willing to support management technically toward implementation of Energy Saving Measures for deriving energy conservation & cost-effective benefits.

For Aditi Engineering services Nashik

Er. Deokar B. L.

BEE Certified Energy Auditor & Team

Mob No- 9960691191

Email- bldeokar61@gmail.com

Date-14-10-2022

ENERGY AUDIT TEAM

Name	Company	Designation
Mr. Kolhe sir	K.J. Somaiya Senior & K. B. Rohmare Junior College Kopargaon	Lecturer
Mr Nitin Rohmare	K.J. Somaiya Senior & K. B. Rohmare Junior College Kopargaon	Electrician
Er. Deokar Bhausaheb & Team	Aditi Engineering Services Nashik	Energy Auditor

INDEX

1) Introduction

K.J. Somaiya Senior & K. B. Rohmare Junior College Kopargaon is leading college imparting education to rural & urban student majorly from Kopargaon Taluka. This college is founded in 1964 & is governed by Management of Kopargaon Education Society. The students from farmer's family have been taking education in **Science, Commerce & Art** faculty from graduate level to postgraduate level. Electricity is unique source of energy to run college activity. In this college building, electricity is used basically for laboratory instruments, lighting system, split air conditioner & for operating computers. It is using electrical power from MSEDCL LT 1- phase & 3-phase connection

2)Scope Of Energy Audit: -

The task of energy audit undertaken by Aditi Engineering Services Nashik has the objective of finding opportunities of energy conservation & saving and to recommend action plan with calculation of investment options & energy saving thereof. **The Energy audit of information pertaining to year Oct 2021- Sept 2022 has been conducted during 29-09-2022 to 1-10-2022.**

Scope of work is defined below

1. Study & Audit of MSEDCL electricity Bill
2. Inventory of loads & analysis of it
3. Input power measurement at input terminal & study.
4. UPS Loading study
5. Submersible pump loading study.
6. Photovoltaic solar power system benefits assessment.
7. Benefit quantification study of solar water heater
8. Lighting System study & measurement
9. Illumination Measurement & Study
10. Split Air conditioner study & measurement.
11. Identification of energy saving opportunity & energy conservation measures
12. Submission of technical & financial analysis report of energy audit.

ENERGY AUDIT METHODOLOGY :-

The audit involves visiting physical position of load & carry out inventory of load. Due measurement of electrical

load of equipment & circuit is carried out. Energy bill received from MSEDCL is audited & studied for KWH requirement & how efficiently energy is used. Energy conservation & saving opportunities are identified during round & measurement for implementation

3)Executive Summery

The management of college has taken many electrical service connections from MSEDCL to meet the requirement of electricity of college for various purposes. The demand of electricity of The college requires electricity for lighting load, air conditioner load, motor pump set & laboratory equipment loads majorly. MSEDCL supplies electricity to college & college uses it. Monthly electricity bill is served by MSEDCL to college against cost of electricity unit (KWH) used & college pays it regularly. The electricity bills for preceding 12 months of all category of connections are referred for KWH consumption & payment made against it to MSEDCL to work out Average cost of power. Details of same are given below.

1) Overall Average purchase cost of power-

Month	Existing Connection Position												
	Connection No-164810025509		Connection No-164810025525		Connection No-164810025517		Connection No-164810071144		Connection No-164810303045		Average cost of power		
	KWH	Total Bill Amount in Rs	KWH	Total Bill Amount in Rs	KWH	Total Bill Amount in Rs	KWH	Total Bill Amount in Rs	KWH	Total Bill Amount in Rs	Total KWH	Total Amount in Rs	Rs/KWH
Oct-21	6	565							1148	9088	1154	9653	8.36
Nov-21	82	1367							1583	12360	1665	13727	8.24
Dec-21	286	3519							2140	16551	2426	20070	8.27
Jan-22	150	2084							1840	14068	1990	16152	8.12
Feb-22	241	3044							2449	18875	2690	21919	8.15
Mar-22	191	2563							2897	22738	3088	25301	8.19
Apr-22	503	5860	1	527	660	5318	1703	12988	3373	25880	6240	50573	8.10
May-22	548	6340	1	527	1608	12289	1879	14282	4187	32010	8223	65448	7.96
Jun-22	516	6750	1	527	931	7310	2018	15304	2705	23300	6171	53191	8.62
Jul-22	727	9290	1	527	845	6678	1550	11863	3017	25940	6140	54298	8.84
Aug-22	316	4330	1	527	805	6384	1723	13135	3129	79260	5974	103636	17.35
Sep-22	532	6940	1	527	684	5494	1615	12341	3707	74790	6539	100092	15.31
Total	4098	52652	6	3162	5533	43473	10488	79913	32175	354860	52300	534060	10.21

Major observation—

1) Applicable tariff category for billing for college is LT X-B & MSEDCL applied it to some connections.

2) LT II billing tariff category is incorrect for college. Its tariff cost per KWH is higher than LT X- B category per KWH. You are paying higher cost unnecessary. So it is strongly recommended to get converted existing LT II billing tariff category into LT X- B category from MSEDCL to save cost.

3) 1-phase connection No-164810025525 is kept without any consumption on it & you are paying unnecessary fixed charges to MSEDCL making financial loss. So it is recommended either to get converted the category of connection LT II Com into LT X-B & use it or get it permanently disconnected in MSEDCL ledger to stop further billing. You pay bill unnecessary as below.

2) Comparison & Saving In Cost after Change of Tariff Category

LT II billing tariff category is incorrect for college. Its tariff cost per KWH is higher than **LT VII (B)** category per KWH. You are paying higher cost unnecessary. So, it is strongly recommended to get converted existing LT II billing tariff category into **LT VII (B)** category from MSEDCL to save cost.

Month	Existing Position			Proposed Position			Monthly Saving in Bill
	Administrative main Building- LT II A-3-Phase Less than 20 KW Connection No-164810025509			Administrative main Building- LT VII (B) I-3-Phase Connection No-164810025509			
	Total KWH	Cost per KWH excluding taxes	Total Current Bill Rs	Total KWH	Cost per KWH excluding taxes	Total Current Bill Rs	Rs
Oct-21	6	7.18	43	6	4.68	28	15
Nov-21	82	7.18	589	82	4.68	384	205
Dec-21	286	7.18	2053	286	4.68	1338	715
Jan-22	150	7.18	1077	150	4.68	702	375
Feb-22	241	7.18	1730	241	4.68	1128	603
Mar-22	191	7.18	1371	191	4.68	894	478
Apr-22	503	7.07	3556	503	4.57	2299	1258
May-22	548	7.07	3874	548	4.57	2504	1370
Jun-22	516	7.07	3648	516	4.57	2358	1290
Jul-22	727	7.07	5140	727	4.57	3322	1818
Aug-22	316	7.07	2234	316	4.57	1444	790
Sep-22	532	7.07	3761	532	4.57	2431	1330
Total	4098	85.5	29078	4098	55.5	18833	10245

3) Erroneous Billing by MSEDCL

Science Building - LT VII (B) Public other - 3-Phase Less than 20 KW Connection No-164810303045 NET Meter No-055-X1021232								NET Metering Reading result Details				
Month	Fixed charge Rs	KVA MD	Recorded KW MD	Total KWH	Cost per KWH	Current bill Amount Rs	Power factor	Import	Export	NET KWH	Generation meter KWH	Cumulative banked
Apr-23	384	15		3373	4.57	25880	0	3492	119	3373	1074	0
May-23	384	15		4187	4.57	32010	0	4268	81	4187	1081	0
Jun-23	384	13		2705	4.57	23300	0	2839	134	2705	992	0
Jul-23	384	13		3017	4.57	25940	0	3084	67	3017	839	0
Aug-23	6528	26	15	3129	7.23	79260	0.04	3227	99	3128	1132	0
Sep-23	6912	27	17	3707	7.23	74790	0.75	3749	42	3707	860	0
Total		109	32	20118		261180		20659	542	20117	5978	0

MSEDCL Electricity bill calculation & Average Cost of power in Rs/KWH										
Month	Energy charge (Rs 4.57/KWH)	Wheeling charges (Rs 1.35/KWH)	Electricity duty 21% in Rs	Tax on sale (Rs 0.1904/KWH)	FCA @Rs0.15/ U	TOD Tariff Rs	PF penalty/ Incentive	Excess Demand Charges in Rs	Total Current Bill Rs	Average cost of power Rs/ KWH
Apr-22	15415	4553.6	4380	642.2	505.95	0	0	0	25881	7.7
May-22	19135	5652.5	5418	797.2	628		0	0	32014	7.7
Jun-22	12362	3651.8	3955	515	2435	0	0	0	23302	8.6
Jul-22	13788	4073	4402	574.4	2715.3	0	0	0	25936	8.6
Aug-22	22615	4222.8	10801	595.6	4537	-177.6	16414	13709	79246	25.3
Sep-22	26802	5004.45	12246	705.8	5375	-65.6	3522	14285	74786	20.2
Total	110117	27158.15	41202	3830.2	16196.25	-243.2	19937	27994	261165	13.0

There is no violation of monthly KW demand attained vide COMMERCIAL CIRCULAR NO.323 Outward No- CE/COMM/Tariff/MYT20-25/9061 Date: 03/04/2020. However MSEDCL has changed category of from **LT VII (B)-I to LT VII (B)-ii & billed in month August 22 & Sept 22 as viewed above. This action is wrong in relevance to COMMERCIAL CIRCULAR NO.323**. So it is strongly recommended to ask for refund of power factor penalty Rs **19937** & excess demand charges Rs **27994** from MSEDCL & if MSEDCL denies,

proceed legal action as per Electricity Act 2003 by filing complaint in **CONSUMER GRIEVANCE REDRESSAL FORUM** to get it refunded.

4) Identified Energy saving opportunity & saving potential

Sr No	Details of study	Energy saving opportunity identified	Saving potential		Remark
			KWH	Amount in Rs	
2	Photovoltaic Solar power system study	solar power generation	15148	154656	The Solar power system is already commissioned.
3	UPS Loading Study	UPS-2 along with batteries shall be kept off to save loss energy	8260	84335	
4	Motor Loading Study	Inefficient motor	996	10169	
6	Solar Water Heater	Electrical Energy purchase cost saving	30006	307862	The Solar water system is already commissioned
7	Replacement of Existing FTL with Energy Efficient LED Tube Light	Energy conservation & saving	6354	64874	
	Science Building - LT VII (B) Public Other - 3-Phase Less Than 20 Kw Connection No- 164810303045	Refund Claim Of Power Factor Penalty		19937	
		Refund Claim Of Excess Demand Charges		27994	
	Science Building - LT VII (B) Public other - 3-Phase Less than 20 KW Connection No- 164810303045	Change Of LT II A Category From MSEDCL Into LT VII B Tariff Category.		10225	
	Total		60764	680052	

Identified Energy & Cost saving potential KWH 60764

Amount in Rs **680052**

4) Electrical Connected Lighting Load study

Lighting Electrical load has been physically inventoried & recorded in table in as below. As Viewed from below table, it understands that lighting load has dominance in total load mix & shares more electrical consumption. This load has most potential to identify energy saving opportunity. College has been taking initiative in energy conservation & energy saving work. As part of this college has replaced some CFL down light, FTL & incandescent lamp with LED down light & LED Tube light as well as CRT monitor of PCS replaced with LCD monitor during year 2017-2020. This work benefitted college to reduce electrical load for same output leading to reduction in annual energy cost.

Sr No	Location	FTL Tube-light T12			FTL Tube-light T8			LED Tube-light		
	Science Building	No	Watt	Total watt	No	Watt	Total watt	No	Watt	Total watt
	Second floor									
1	Computer Lab-1 (S-54)	0	0	0			0	3	20	60
2	Computer Lab-2 (S-53)	0	0	0			0	3	20	60
3	Computer Lab-3 (S-52)	0	0	0			0	3	20	60
4	Computer Lab-4 (S-51)	0	0	0			0	3	20	60
5	Computer Lab-5 (S-50)	0	0	0			0	3	20	60
6	Computer Lab-6 Digital(S-48)	0	0	0			0	3	20	60
	Computer Lab-7			0						
7	Staff Room (S-55)	0	0	0			0	2	20	40
8	Department of math. (S-49)	0	0	0			0	2	20	40
9	Digital class Room(S-47)	0	0	0			0	4	20	80
10	Digital class Room(S-46)	0	0	0			0	4	20	80
11	Class Room (S-45)	0	0	0			0	2	20	40
12	Conference Room(S-44)	0	0	0			0	7	20	140
13	Ladies Toilet	0	0	0			0	1	20	20
14	Class Room (S-42)	0	0	0			0	1	20	20
15	Class Room (S-41)	0	0	0			0	2	20	40
16	Passage	0	0	0			0	6	20	120
	Third floor	0	0	0			0			0
17	Class Room N0-1	0	0	0			0			0
18	Class Room N0-2	0	0	0			0			0

19	Class Room N0-3	0	0	0			0			0
20	Class Room N0-4	0	0	0			0			0
21	Class Room N0-5	0	0	0			0			0
22	Class Room N0-6	0	0	0			0			0
23	Class Room N0-7	0	0	0			0			0
24	Class Room N0-8	0	0	0			0			0
25	Class Room N0-9	0	0	0			0			0
26	Class Room N0-10	0	0	0			0			0
27	Staff Room -1	0	0	0			0			0
28	Staff Room -2	0	0	0			0			0
29	Toilet	0	0	0			0	1	20	20
30	Corridor	0	0	0			0	4	20	80
	Floor No-1	0	0	0			0			0
31	Ladies Toilet(S-29)	0	0	0			0	2	20	40
32	Instrumentation Lab- (S-30)	0	0	0			0			0
33	Electronic Lab (S-31)	0	0	0	0	0	0	6	18	108
34	General Physics Lab-1(S-32)	0	0	0	0	0	0	3	18	54
35	staff room(s-33)	0	0	0	0	0	0	2	18	36
36	HOD physics(S-34)	0	0	0	3	36	138			0
37	General Physics Lab-2(S-35)	0	0	0	0	0	0	5	18	90
38	PG Laboratory(S-36)	0	0	0	0	0	0	5	18	90
39	Gents Toilet (S-37)	0	0	0	0	0	0	2	18	36
40	Class Room (S-38)	0	0	0			0	2	20	40
41	Class Room (S-39)	0	0	0			0	2	20	40
42	Corridor	0	0	0	5	36	230	1	20	20
43	HOD microbiology (S-28)	1	40	50	1	23	23			0
44	Microbiology Lab-03(S-24)	0	0	0	2	36	92			0
45	Microbiology Lab-01(S-25)	2	40	100	1	23	23			0
46	Room (S-27)	1	40	50	1	36	46			0
47	Store (S-26)	1	40	50			0			0
48	Porch S-14 &15	6	40	300			0			0
49	Zoology depart. Store S-16			0	1	36	46			0
50	Zoology Lab S-17	2	40	100	1	36	46			0
	Dark Room S-18	1	40	50			0			0
	Toilet block	0	0	0	0		0	2	18	36
	Zoology Lab-3 S-21	0	0	0	0	36	0	2	20	40
	HOD Zoology S-22	0	0	0	0	36	0	2	20	40
	Zoology Lab-2 S-23	0	40	0	0	36	0	2	20	40
	HOD Botany S-63	0	0	0	0	36	0	2	20	40
	Class Room S-64	0	0	0	0	36	0	5	20	100

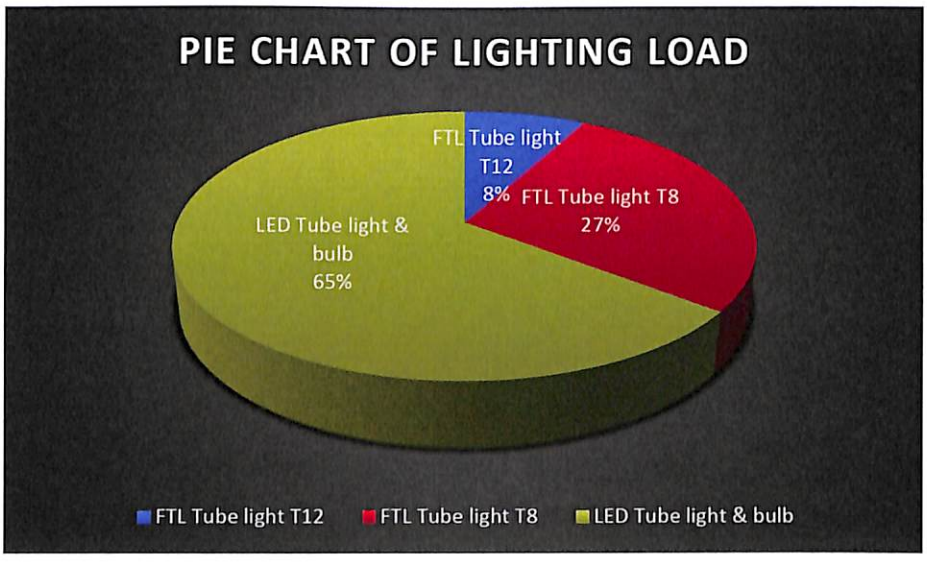
	Botany Lab-2 S-62	0	40	0	0	36	0	3	20	60
	Botany Lab-1 S-56	0	40	0			0	2	20	40
	Store (S-57)	0	40	0	1	36	46	1	20	20
	Lab-S-61	0	40	0	1	36	46	1	20	20
	Lab-3 S-58	0	40	0			0	3	20	60
	Culture Room	0	40	0			0	1	20	20
	Passage	0	40	0			0	4	20	80
	Ground floor			0			0			0
	Physical chemistry lab S-11	0	40	0	0	36	0	5	20	100
	Inorganic chemistry S-10	0	0	0	0	36	0	2	20	40
	store S-9	0	0	0	0	36	0	2	20	40
	Organic Chemistry S-8	0	0	0	0	36	0	2	20	40
	HOD cabin Chemistry S-7	0	0	0	0	36	0	3	20	60
	Class S-6	0	0	0	1	13	13	2	20	40
	Toilet block	0	0	0			0	3	20	60
	Class Room S-2	0	0	0	2	36	92			0
	Class Room	0	0	0			0	2	20	40
	Class Room S-14	0	0	0	2	36	92			0
	Class Room S-15	0	0	0	2	36	92			0
	General chemistry laboratory S-5	2	40	100	3	36	138	1	20	20
	Boyes hostel Total Room-11 No			0			0			0
	Room -1	0	0	0	1	36	41			0
	Room -2	0	0	0			0	1	20	20
	Room -11	0	0	0			0	1	20	20
	Room -3	0	0	0			0	1	20	20
	Room -10	0	0	0	1	36	41			0
	Room -4	0	0	0			0	1	20	20
	Toilet block	0	0	0			0	2	20	40
	Gymkhana	0	0	0	4	36	184	6	24	144
	Passage	0	0	0	2	36	92	1	20	20
	Ladies Hostel Total Room-36	0	0	0			0			0
	Room	0	0	0			0	36	20	720
	Passage	0	0	0			0	15	7	105
	Mess	0	0	0			0	6	20	120
	Library	0	0	0	14	36	644	12	20	240
	Class Room M-45	0	0	0			0	4	20	80
	Class Room M-47	0	0	0			0	4	20	80
	Class Room M-48	0	0	0	1	36	41	1	20	20
	Department of Geography	0	0	0			0			0

	Lecture hall M-48	0	0	0	1	36	41	3	20	60
	Laboratory M-50	0	0	0			0	3	20	60
	Staff Room	0	0	0			0	1	20	20
	HOD cabin	0	0	0			0	1	20	20
	Main building			0			0			0
	Exam control room(M14)	1	40	50	1	36	46			0
	Class room M-15	0	0	0			0	3	20	60
	Class room M-2	0	0	0			0	1	20	20
	Class room M-13	0	0	0			0	1	20	20
	Class room M-3	0	0	0	1	36	41			0
	Class room M-12	0	0	0			0	1	20	20
	Class room M-6	0	0	0			0	1	20	20
	Class room M-7	0	0	0			0	1	20	20
	NCC Unit M-11	0	0	0			0	1	20	20
	Board of student M-10	0	0	0			0	1	20	20
	NSS M-9	0	0	0			0	1	20	20
	Class room M-8	0	0	0			0	1	20	20
	Class room M-24	0	0	0			0	1	20	20
	Class room M-18	0	0	0			0	1	20	20
	Class room M-23	0	0	0			0	1	20	20
	Depart. Of economics M22	0	0	0			0	2	20	40
	Depart. Of Marathi M-21	0	0	0			0	2	20	40
	M-20	0	0	0			0	1	20	20
	Class room M-19	0	0	0	1	36	41	1	20	20
	Class room M-17	0	0	0			0	1	20	20
	Class room M-25	0	0	0			0	1	20	20
	Depart. Of politics	0	40	0	0	36	0	2	20	40
	Class room M-16			0			0	4	20	80
	Class room M-27			0			0	2	20	40
	Depart. Of commerce			0			0	3	36	108
	Depart. Of history			0			0	3	36	108
	Depart. Of English			0			0	2	20	40
	Language Laboratory			0			0	2	20	40
	Passage			0	2	36	92	3	20	60
	Administrative section M-43			0	3	36	123	6	20	120
	Account room M42			0	1	36	36			0
	Faculty room M-41			0	4	36	184	1	20	20
	Toilet block			0	2	36	92			0
	Passage	0	40	0	0	36	0	6	20	120
				0			0			0

				0			0			0
				0			0			0
	Total			0						
				0			0			0
				0			0			0
	Sakarben hall			0	1	23	23	22	36	792
				0			0	12	7	84
	Secretary office M35			0			0	4	20	80
	President office			0			0	4	20	80
	Principal cabin			0			0	2	36	72
				0			0	10	7	70
				0			0			0
	Total	17		850	67		2925	346		6893

Summary of total lighting load & pie chart –

Type of Lighting Fixtures									Total	
FTL Tube light T12			FTL Tube light T8			LED Tube light & bulb				
No	Total watt	% On Total Load	No	Total watt	% On Total Load	No	Total watt	% On Total Load	No	Watts
17	850	8	67	2925	27	346	6893	65	430	10668



Observation- As viewed from above, it is observed that LED Lighting load has dominance in total load mix.

5) Photovoltaic Solar power system study-

Recently college has taken prudential step & holistic approach & installed photovoltaic solar power system to meet it's partly requirement. In this mechanism of NET Metering policy of MSEDCL, surplus solar power is exported to MSEDCL grid when demand of power of college is lean & imported power from MSEDCL when demand of power of college is more than solar generation. Electrical KWH exported to MSEDCL grid is accounted for Relief in electricity bill.

a) PV Panel Details-

PV Panel	Make	Max power watt	open circuit voltage	Max power volt	Max power current Amp	Total Panel No	Total string	Total installed capacity in Watt
	WAAREE	315	45.25	36.75	8.58	32	3	10.8

b) PV Grid Inverter Details-

PV Grid inverter	Make	Max DC Volt	DC Voltage Range	MPPT Volt Range	Max input current per string	Max Apparent power KVA	Nominal output	Hz
	Growatt	1000	300-1000	400-800	15 A	10	3/N/PE230V/400	50+/-6

c) Solar Power Generation measurement-

Location of meter	Connection detail		Measurement Location	Measurement							
	Type	Consumer No		Phase	KW	KVAR	KVA	PF	Volts	Amps	Hz
Main Building-DG Room	3- Phase NET Meter	1.65E+12	Distribution Bus bar Box-Solar power incoming	R	2.6	-1.67	3.09	0.841	253	12.2	50

			terminal								
				Y	2.9	-1.64	3.33	0.871	239	13.9	
				B	2.8	-1.69	3.27	0.856	246	13.3	
				Total	8.3	-5	9.69				

d) Financial & Environment Impact Assessment Of Solar Power

Measured solar power generation	Average sun availability per day	No of day in operation per year	Annual electricity generation from Solar power system	Average cost of MSEDC power	Annual energy cost saving in	Average emission factor (Source-CEA)	Equivalent CO2 gas emission mitigated in
KW	Hours	No	KWH	Rs/ KWH	Rs	Kg of Co_2/KWH	Kg
8.3	5	365	**15148**	10.21	**154656**	0.82	**126818**

6) UPS Loading Study-

There are two UPS working in science Building which caters exclusively load of computers. Loading study of both UPS has been carried out. The following are major observation in output power measurement with respect to switched on load of all computers.

Sr No	UPS Details					Measured Output power				Load Details		Average load per PC	% Loading on UPS
	Make	DC Volt	Hz	Rating in KVA	Output Volt	KW	KVAR	KVA	PF	Location	No of PC	Watt	
1	Sukam	192	50	7.5	230	2.05	-2.45	3.2	0.641	BCA Lab (1)Lab No-S-52,53,54 2) Computer Lab-1,2,3)	51	40.20	42.67
2	Sukam	192	50	7.5	230	1.29	-0.91	1.58	0.816	BCS Lab (Lab No- S-50,51)	32	40.31	21.07

Observation & Recommendation-

1) As viewed from above, it looks that Sr No-1 UPS is found loaded 43% i.e., total capacity of UPS is booked only 43 % by connected load.

2) Sr No-2 UPS is found loaded only 21% i.e., total capacity of UPS is booked only 21 % by connected load

3) Both UPS are under loaded & Sr No- 2 is very under loaded.

4) There are energy losses taking place on account of internal resistance of batteries during continuous charging phenomenon of batteries. These energy losses are measured as below which make increase operating cost per annum.

Location	12 V Battery		Power measurement				Annual working Hours	Energy Loss KWH	Average cost of MSEDC power	Annual energy cost Loss in
	No	AH	KW	KVAR	KVA	PF			Rs/ KWH	Rs
BCS Lab-4 & 5	16	165	0.58	0.69	0.74	0.784	7000	4060	10.21	41453
Computer Lab-1,2,3	16	165	0.6	0.77	0.97	0.619	7000	4200	10.21	42882
Total			1.18	1.46	1.71		7000	8260	10.21	84335

They're found heavy dust deposited on UPS & batteries. This is not good thing as maintenance point of view. So, there is necessary periodic maintenance & cleaning.

Recommendation-

As loading on both UPS Sr No- 1 & 2 is namely 43 % & 21% & are under loaded, connected load on UPS No-2 (21% Loading) is recommended to divert on UPS No-1 (43% loading) & UPS-2 along with batteries shall be kept off to save loss energy on account of its operation to reduce(save) annual operating cost of UPS operation.

7) Motor Loading Study-

There is one submersible pump near gymkhana building which pumps the water to supply usable water other than drinking water. This motor is claimed of 3 HP rating. Input electrical power is measured during its normal operation. Input power is admeasured 4.41 KW which is at very higher side & power factor of motor is also poor i.e., 0.659. So, it can be concluded that efficiency of motor is very poor. The Operating cost of motor is assessed 60% more than expected. So, this point is advised seriously to focus attention.

Submersible Motor details			measured Load details				% Motor Efficiency	Excess operating cost assessment
stage	Rating KW	Volt	KW	KVAR	KVA	PF		%
8	2.2	415	4.41	5.03	6.7	0.659	50	60.36

Excess input power	Daily operation hours	Annual working days	Energy Loss per annum	Average Cost of power per KWH in	Total Loss amount per year in
KW	No	No	KWH	Rs	Rs
1.66	2	300	996	10.21	10169

8) Solar Water Heater quantification of benefits-

College has installed solar water heater in boys & Girl's hostel to harness cost free solar green energy for heating water requiring student to bathe. This reduces demand of conventional commercial energy & save cost. This will also help to reduce greenhouse gas emission mitigating environmental damage. Application of this hot water in various laboratory can be explored which is generated without input energy cost.

Solar Heater	No of Student occupancy	No of Solar Heaters	Each SH Capacity in Litres/Day	Average Water Temperature		Specific heat	Total Solar Heat gained by water per Day in Kcal	Equivalent Electricity saving in KWH per year	Average Electricity Cost in Rs/KWH	**Electricity Cost saving in Rs per year**	**Estimated CO2 Green House Gas Emission reduction per year in Kg**
(SH) Location				Hot (Out)	Cold (In)	Kcal/Kg/°C					
Ladies Hostel	140	1	1500	62	25	1	55500	23555	10.21	**240497**	**19668**
Boys Hostel	44	2	200	63	25	1	15200	6451	10.21	**65865**	**5387**
Total	184	3	1700				70700	**30006**	10.21	**306361**	**25055**

9) Replacement of Existing FTL with Energy Efficient LED Tube Light

There is major load of lighting & fan in college campus. Hence it is focused for identification of energy saving opportunity. It is proposed to replace existing FTL with energy efficient LED tube light. Energy saving & conservation opportunities are identified which are mentioned below with cost benefit analysis based on annual average cost of power.

Type of lamp	Existing			Proposed replacement with LED tube light		Saving in	Working hours	Saving in	Average cost of power	Saving in Amount	Capital investment in Rs	Pay-back period in
	No	Watt/unit (inclusive of choke watt)	Total Load including choke in Watt	Watt/unit	Total Load in Watt	Watt	Hours/year	KWH	Rs/KWH	Rs	Rs	Months
FTL T12	17	50	850	20	340	510	3000	1530	10.21	15621	7650	6
FTL T8	67	44	2948	20	1340	1608	3000	4824	10.21	49253.04	30150	7
Total	88	95	4070	40	1680	2118	6000	6354	10.21	64874	37800	7

Remark - Cost per LED Tube Light in Rs- 450

10)List Of Instrument used for measurement in Energy Audit

Sr No	Instrument Name
1	3- Phase Electric Power Analyzer
2	Lux Meter
3	Thermometer
4	Whirling psychomotor
5	Measuring tape

Co ordinator
IQAC, K. J. Somaiya College
Kopargaon, Dist. A.Nagar

Principal
K. J. Somaiya College of Arts
Commerce & Science, Kopargaon

Kopargaon Taluka Education Society's

K.J. Somaiya Arts, Commerce and Science College, Kopargaon

Criterion 7- Institutional Values and Best Practices

7.1: Institutional Values and Social Responsibilities

7.1.3: Quality audits on environment and energy regularly undertaken by the Institution. The institutional environment and energy initiatives are confirmed through the following

1. Green audit / Environment audit
2. Energy audit
3. Clean and green campus initiatives
4. Beyond the campus environmental promotion and sustainability activities

Energy Audit Report 2022-2023

ADITI ENGINEERING SERVICES NASHIK

Consultant in – Energy Management, Energy Audit, Electrical Safety Audit, MSEDCL Grievances, 33 & 11 KV Substation Testing & Earthing Design, HT /LT Industrial Installation, Power Factor & Harmonics Solution.

Firm Address- Flat No-604, Hari Aakruti Apartment, opposite Aananda Laundry, Pakhal Road, Dwarka, Nashik-422011

Proprietor - Er. Deokar B. L. Mo. No- 9960691191 Email -bldeokar61@gmail.com

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CERTIFICATE OF ENERGY AUDIT

This is to certify that

KOPARGAON TALUKA EDUCATION SOCIETY'S K J SOMAIYA SENIOR & K.B. ROHMARE JUNIOR COLLEGE KOPARGAON

Mohanirajnagar, Kopargaon-423601, Dist- Ahmednagar, Maharashtra, India

has conducted **Electrical Energy Audit** *in April 2023 for year 2022 - 2023 for knowing present profile of electrical energy consumption, Identification of energy conservation &saving opportunities for implementation to save energy & to mitigate greenhouse gas emission for environmental protection.*

(**Er. Deokar Bhausaheb**)

Certified Energy Auditor EA-2700

(Bureau of Energy Efficiency Govt. Of India)

Aditi Engineering Services, Nashik

Date-8 May 2023

Coordinator
IQAC, K. J. Somaiya College
Kopargaon, Dist. A.Nagar

K.J. Somaiya College of Arts Commerce & Science Kopargaon Estd. 1994

Principal
K. J. Somaiya College of Arts
Commerce & Science, Kopargaon

ENERGY AUDIT REPORT
2022 - 2023

K J SOMAIYA SENIOR & K.B. ROHMARE JUNIOR COLLEGE KOPARGAON, DIST- AHMEDNAGAR

ENERGY AUDITED DURING

DT-26-04-2023 TO DT–27-04-2023

AUDITED BY
ADITI ENGINEERING SERVICES NASHIK

ACKNOWLEDGEMENT

Energy Audit of system is key instrument in knowing the present level of efficiency of various components and establishing the areas of shortfall for improvement.

We are very thankful for Hon. Shri-Ashokraoji Rohmare Saheb, Chairman, Hon. The Principal Shri- Yadav sir , K.J. Somaiya Senior & K. B. Rohmare Junior College Kopargaon who have opted such prudential step on the behalf of Management & have given opportunity to conduct Energy audit of college campus facility .We are also thankful for subordinate staffs who have given their valuable contribution for guiding & supporting us during college premise round for data collection , network study & measurement for accomplishing successful Energy audit.

This report made with sincere efforts gives details of the relevant data collected during energy audit study, observation, analysis & recommendations made pertaining to different systems in college premises.

Several Energy Conservation Opportunities(Measures) have been identified & proposed in course of our study & these options when implemented , are expected to bring in lasting benefits(saving) in term of energy as well as cost to the management.

We are pleased to submit this Detailed Energy Audit Report to Hon. the Principal, K.J. Somaiya Senior & K. B. Rohmare Junior College Kopargaon representing on behalf of management and wish him all the best for implementation of identified Energy Conservation Opportunity as well as recommendations.

Aditi Engineering services Nashik is willing to support management technically toward implementation of Energy Saving Measures for deriving energy conservation & cost effective benefits.

FOR ADITI ENGINEERING SERVICES, NASIK

Er.Deokar Bhausaheb

BEE Certified Energy Auditor & Team

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ENERGY AUDIT TEAM

Name	Company	Designation
Mr. Kolhe sir	K.J. Somaiya Senior & K. B. Rohmare Junior College Kopargaon	Assist. Professor
Mr Nitin Rohmare	K.J. Somaiya Senior & K. B. Rohmare Junior College Kopargaon	Electrician
Er. Deokar Bhausaheb & Team	Aditi Engineering Services Nashik	Certified Energy Auditor

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1) INTRODUCTION

K.J. Somaiya Senior & K. B. Rohmare Junior College Kopargaon is leading college imparting education to rural & urban student majorly from Kopargaon Taluka. This college is founded in 1964 & is governed by Management of Kopargaon Education Society. The students from farmer's family have been taking education in Science, Commerce & Art faculty from graduate level to postgraduate level. Electricity is unique source of energy to run college activity. In this college building, electricity is used basically for laboratory instruments, lighting system, split air conditioner & for operating computers. The college is using electrical power procured from MSEDCL through LT 1- phase & 3-phase service connection. The college has also installed no of two photovoltaic solar power system bearing 10KVA capacity each.

2). SCOPE OF ENERGY AUDIT :-

The task of energy audit undertaken by Aditi Engineering Services Nashik has the objective of finding opportunities of energy conservation & saving and to recommend action plan with calculation of investment options & energy saving thereof. **The Energy audit of information pertaining to year 2022 & 2023 has been conducted during 26-04-2023 to 27-04-2023.**

Scope of work is defined below

1. Study & Audit of MSEDCL electricity Bill for cost saving.
2. Inventory of loads & analysis of it
3. UPS Loading study
4. Submersible pump loading study.
5. Photovoltaic solar power system measurement & benefits assessment.
6. Benefit quantification study of solar water heater
7. Split Air Conditioner performance study study & measurement
8. Identification of energy saving opportunity & energy conservation measures
9. Submission of technical & financial analysis report of energy audit.

3)ENERGY AUDIT METHODOLOGY :-

The audit involves visiting physical position of load & carry out inventory of load. Due measurement of electrical loads of equipment & circuit is carried out. Energy bill received from MSEDCL is audited & studied for KWH requirement & how efficiently energy is used. Energy conservation & saving opportunities are identified during round & measurement for implementation.

4)EXECUTIVE SUMMERY

The management of college has taken many electrical service connections from MSEDCL to meet the requirement of electricity of college for various purposes. In addition to this, the management of college has also installed renewable source of electric power in which two separate on-grid photovoltaic Solar power system are installed at two separate roof top bearing 10 KVA capacity of each connected in grid of MSEDCL through Net Metering.

The total demand of electricity of college is met through MSEDCL Grid power & photovoltaic Solar power system. The college requires electricity for lighting load, air conditioner load, motor pump set & laboratory equipment loads majorly. MSEDCL supplies electricity to college & college uses it. Monthly electricity bill is served by MSEDCL to college against cost of electricity unit (KWH) used subject to Net Meter logged data & college pays it regularly. The electricity bills for preceding 12 months of all category of connections are referred for KWH consumption & payment made against it to MSEDCL to work out Average cost of power. Details of same are given below.

1).Cost Saving Opportunities Identified--

Sr No	Details Of Study	Cost Saving Opportunity Identified	Saving Potential	
			Kwh	Amount In Rs
1	Service Connection Of MSEDCL & Its Tariff	1) Change Of LT II A Category From MSEDCL Into LT VII B Tariff Category.	0	20690

		2) Permanent Disconnection Of MSEDCL Connection To Save Fixed Charges		14856
2	Science Building - LT VII (B) Public Other - 3-Phase Less Than 20 Kw Connection No-164810303045	1) Refund Claim Of Power Factor Penalty		39928.51
		2) Refund Claim Of Excess Demand Charges		101721.6
3	Additional 25kw Solar Photovoltaic Power System	Reduction In Costly Power Procurement From Msedcl	0	492070
4	Replacement Of Existing FTL With Energy Efficient LED Tube Light	Energy Conservation & Saving	5029	63921
	Total		5029	733187

2) MSEDCL VARIOUS ELECTRICITY CONNECTION BILLING STUDY-

1) Administrative main Building-

Tariff Category - LT II A- 3-Phase Upto 20 KW

Connection No-164810025509 NET Meter

NET Metering Reading result Details

Month	Fixed charge Rs	Recorded KVA MD	Total KWH	Cost per KWH excluding taxes	Current bill Amount Rs	Power factor	Import	Export	NET KWH	Generation meter KWH	Cumulative banked
Apr-22	427	6	503	7.07	5860	0	750	247.0	503	0	0
May-22	427	6	548	7.07	6340	0	764	216.0	548	0	0
Jun-22	427	6	516	7.07	6750	0	718	202.0	516	0	0
Jul-22	427	5	727	7.07	9290	0	891	164.0	727	0	0
Aug-22	427	5	316	7.07	4330	0	610	294.0	316	0	0
Sep-22	427	5	532	7.07	6940	0	755	223.0	532	0	0
Oct-22	427	5	132	7.07	2110	0	635	503	132	0	0

Nov-22	427	3	217	7.07	3140	0	551	334	217	0	0
Dec-22	427	3	448	7.07	5930	0	644	196	448	0	0
Jan-23	427	3	388	7.07	5200	0	616	228	388	0	0
Feb-23	427	2	280	7.07	3900	0	497	217	280	0	0
Mar-23	427	5	157	7.07	2410	0	550	393	157	0	0
Total	5124	54	4764	7.07	62200	0	**7981**	**3217.0**	4764	0	0

MSEDCL Electricity bill calculation & Average Cost of power in Rs/KWH

Month	Energy charge (Rs 7.07/KWH)	Wheeling charges (Rs 1.35/KWH)	Electricity duty 21% in Rs	Tax on sale (Rs 0.19/KWH)	FCA @Rs1.4/U	TOD Tariff Rs	PF penalty/ Incentive	Excess Demand Charges in Rs	Total Current Bill Rs	Average cost of power Rs/ KWH
Apr-22	3556	679	1000	95.77	100.6	0	0	0	5758	11.45
May-22	3874	739.8	1082	104.34	109.6		0	0	6337	11.56
Jun-22	3648	697	1154	98	722	0	0	0	6746	13.07
Jul-22	5140	981.45	1589	138	1017.8	0	0	0	9293	12.78
Aug-22	2234	426.6	741	60.04	442.4	0	0	0	4331	13.71
Sep-22	3761	718.2	1187	101.08	744.8	0	0	0	6939.1	13.04
Oct-22	933	178.2	362	25.08	184.8	0	0	0	2110	15.99
Nov-22	1534	292.95	537	41.23	303.8	0	0	0	3136	14.45
Dec-22	3167	604.8	1014	85.12	627.2	0	0	0	5925	13.23
Jan-23	2743	523.8	890	73.72	543.2	0	0	0	5201	13.40
Feb-23	1980	378	667	53.2	392	0	0	0	3897	13.92
Mar-23	1110	211.95	413	29.83	219.8	0	0	0	2412	15.36
Total	33681	6431.35	10635	906.08	5408.4	0	0	0	62086	13.03

Observation-

1) **LT II-A billing tariff category is incorrect for college. The billing tariff category should be LT VII (B)- i. At present tariff cost per KWH is higher than LT VII- B-i (Public Other) category by Rs 2.50 per KWH. You are procuring & paying higher cost unnecessary for KWH. So it is strongly recommended to get converted existing LT II-A Commercial billing tariff category into LT VII- B- I (Public Other) category from MSEDCL to save cost.**

2) **7981 KWH units are imported from MSEDCL & 3217 KWH are exported over the year. It is advised to use solar generated units for self instead of letting export to grid. So divert the load of connection No-164810025517 on NET Meter Connection No-164810025509 after getting changed existing LT II-A Commercial billing tariff category into LT VII- B- I (Public Other) category from MSEDCL to save cost of procurement of costly power. Saving in cost 3217 KWH X Rs 7.94 = Rs 25543**
(Rs 7.94 is average cost of power connection No-164810025517)

3) The TOD Tariff is applicable for LT-VII (A) (ii) and LT-VII (A) (iii) (i.e., above 20 kW) and optionally available to LT- VII (A) (i) (i.e., up to 20 kW) having ToD meter installed. It is recommended to apply for TOD tariff to get incentive in bill to reduce cost of power.

4) **Solar energy generated KWH per day reading must be read daily & maintained in register regularly to know**

1) Total solar unit share in total annual consumption to work out cost saving

2) Extreme variation to take timely corrective action to avoid financial loss by making import costly MSEDCL power

5) Solar energy project relieved college by & large from dependency on MSEDCL as well as relieved from costly power procurement from MSEDCL. Solar project also mitigated greenhouse gas emission leading to protect environment from pollution.

After Change of Tariff Category

Administrative main Building- LT VII (B) I- 3-Phase Less than 20 KW Connection No-164810025509 NET Meter No-055-XD561718					NET Metering Reading result Details				
Month	Fixed charge Rs	Recorded KVA MD	Total KWH	Cost per KWH excluding taxes	Import	Export	NET KWH	Generation meter KWH	Cumulative banked
Apr-22	384	6	503	4.57	750	247.0	503	0	0
May-22	384	6	548	4.57	764	216.0	548	0	0
Jun-22	384	6	516	4.57	718	202.0	516	0	0
Jul-22	384	5	727	4.57	891	164.0	727	0	0
Aug-22	384	5	316	4.57	610	294.0	316	0	0
Sep-22	384	5	532	4.57	755	223.0	532	0	0
Oct-22	384	5	132	4.57	635	503	132	0	0
Nov-22	384	3	217	4.57	551	334	217	0	0

Dec-22	384	3	448	4.57	644	196	448	0	0
Jan-23	384	3	388	4.57	616	228	388	0	0
Feb-23	384	2	280	4.57	497	217	280	0	0
Mar-23	384	5	157	4.57	550	393	157	0	0
Total	4608	54	4764	7.07	7981	3217.0	4764	0	0

MSEDCL Electricity bill calculation & Average Cost of power in Rs/KWH										
Month	Energy charge Rs (Rs 7.07/KWH)	Wheeling charges Rs (Rs 1.35/KWH)	Electricity duty 21% in Rs	Tax on sale Rs (Rs 0.19/KWH)	FCA @Rs 0.15/U	TOD Tariff Rs	PF penalty/ Incentive	Excess Demand Charges in Rs	Total Current Bill Rs	Average cost of power Rs/ KWH
Apr-22	2299	679	722	95.77	75.45	0	0	0	4179	8.31
May-22	2504	739.8	779	104.34	82.2		0	0	4594	8.38
Jun-22	2358	697	738	98	77.4	0	0	0	4353	8.44
Jul-22	3322	981.45	1007	138	109.05	0	0	0	5943	8.17
Aug-22	1444	426.6	483	60.04	47.4	0	0	0	2846	9.01
Sep-22	2431	718.2	759	101.08	79.8	0	0	0	4473.1	8.41
Oct-22	603	178.2	249	25.08	19.8	0	0	0	1459	11.05
Nov-22	992	292.95	357	41.23	32.55	0	0	0	2100	9.68
Dec-22	2047	604.8	652	85.12	67.2	0	0	0	3840	8.57
Jan-23	1773	523.8	575	73.72	58.2	0	0	0	3388	8.73
Feb-23	1280	378	438	53.2	42	0	0	0	2574	9.19
Mar-23	717	211.95	281	29.83	23.55	0	0	0	1648	10.49
Total	21771	6431.35	7040	906.08	714.6	0	0	0	41396	8.69

Comparison & Saving In Cost after Change of Tariff Category

Month	Existing Position	Proposed Position	Monthly Saving in Bill
	Administrative main Building- LT II A- 3-Phase Less than 20 KW Connection No-164810025509	Administrative main Building- LT VII (B) I- 3-Phase Less than 20 KW Connection No-164810025509	

	Total KWH	Cost per KWH excluding taxes	Total Current Bill Rs	Average cost of power Rs/ KWH	Total KWH	Cost per KWH excluding taxes	Total Current Bill Rs	Average cost of power Rs/ KWH	Rs
Apr-22	503	7.07	5758	11.45	503	4.57	4179	8.31	1579
May-22	548	7.07	6337	11.56	548	4.57	4594	8.38	1743
Jun-22	516	7.07	6746	13.07	516	4.57	4353	8.44	2393
Jul-22	727	7.07	9293	12.78	727	4.57	5943	8.17	3351
Aug-22	316	7.07	4331	13.71	316	4.57	2846	9.01	1486
Sep-22	532	7.07	6939	13.04	532	4.57	4473	8.41	2466
Oct-22	132	7.07	2110	15.99	132	4.57	1459	11.05	651
Nov-22	217	7.07	3136	14.45	217	4.57	2100	9.68	1037
Dec-22	448	7.07	5925	13.23	448	4.57	3840	8.57	2085
Jan-23	388	7.07	5201	13.40	388	4.57	3388	8.73	1813
Feb-23	280	7.07	3897	13.92	280	4.57	2574	9.19	1323
Mar-23	157	7.07	2412	15.36	157	4.57	1648	10.49	764
Total	4764	7.07	62086	13.03	4764	4.57	41396	8.69	20690

2) Ladies hostel

Tariff Category - LT VII (B) - 1-Phase Up to 20 KW

Connection No-164810071144

MSEDCL Electricity bill calculation & Average Cost of power in Rs/KWH

Month	Fixed charge Rs	Total KWH	Energy charge Rs (Rs 4.57/KWH)	Wheeling charges Rs (Rs 1.35/KWH)	Electricity duty 21 % in Rs	Tax on sale Rs (Rs 0.1904/KWH)	FCA Rs 0.15/KWH	Total Current Bill Rs	Average cost of power Rs/ KWH
Apr-22	384	1703	7783	2299	2198	324	255	12988	7.63
May-22	384	1879	8587	2537	2417	358	282	14282	7.60
Jun-22	384	2018	9222	2724	2589	384	303	15304	7.58
Jul-22	384	1550	7084	2093	2008	295	233	11863	7.65
Aug-22	384	1723	7874	2326	2223	328	258	13135	7.62
Sep-22	384	1615	7381	2180	2088	307	242	12341	7.64
Oct-22	384	1610	7358	2174	2082	307	242	12304	7.64
Nov-22	384	1553	7097	2097	2011	296	233	11885	7.65
Dec-22	384	1318	6023	1779	1719	251	198	10157	7.71
Jan-23	384	1490	6809	2012	1933	284	224	11422	7.67

Feb-23	384	1410	6444	1904	1834	268	212	10833	7.68
Mar-23	384	1135	5187	1532	1492	216	170	8811	7.76
Total	4608	19004	86848	25655	24593	3618	2851	145323	7.65

Billing Tariff Category - LT VII (B) - 1-Phase Up to 20 KW is correct

3) Staff Room

Tariff Category - LT VII (B) -I, 1-Phase Up to 20 KW

Connection No-164810025517

MSEDCL Electricity bill calculation & Average Cost of power in Rs/KWH

Month	Fixed charge Rs	Total KWH	Energy charge Rs (Rs 4.57/KWH)	Wheeling charges Rs (Rs 1.35/KWH)	Electricity duty 21 % in Rs	Tax on sale Rs (Rs 0.19/KWH)	FCA Rs0.15/KWH	Total Current Bill Rs	Average cost of power Rs/ KWH
Apr-22	384	660	3016	891	901	125	99	5318	8.06
May-22	384	1608	7349	2171	2080	306	241	12289	7.64
Jun-22	384	931	4255	1257	1238	177	140	7310	7.85
Jul-22	384	845	3862	1141	1131	161	127	6678	7.90
Aug-22	384	805	3679	1087	1081	153	121	6384	7.93
Sep-22	384	684	3126	923	931	130	103	5494	8.03
Oct-22	384	685	3130	925	932	130	103	5502	8.03
Nov-22	384	636	2907	859	871	121	95	5141	8.08
Dec-22	384	631	2884	852	865	120	95	5105	8.09
Jan-23	384	722	3300	975	978	137	108	5774	8.00
Feb-23	384	723	3304	976	979	137	108	5781	8.00
Mar-23	384	636	2907	859	871	121	95	5141	8.08
Total	4608	9566	43717	12914	12860	1818	1435	75916	7.94

Billing Tariff Category - LT VII (B) - 1-Phase Up to 20 KW is correct

4) Laboratory

Tariff Category - LT II (A) - 1-Phase Up to 20 KW

Connection No-164810025525

1-phase connection No-164810025525 is kept without load on it& is having wrong tariff category & you are paying Rs 5124 per annum unnecessary fixed charges at higher rate to MSEDCL making financial loss. So it is recommended either to get converted the category of connection LT II Com into LT VII-B-I & use it or get it permanently disconnected in MSEDCL ledger to stop further billing. You pay bill unnecessary as below.

MSEDCL Electricity bill calculation & Average Cost of power in Rs/KWH									
Month	Fixed charge Rs	Total KWH	Energy charge Rs (Rs 7.07/KWH)	Wheeling charges Rs (Rs 1.35/KWH)	Electricity duty 21 % in Rs	Tax on sale Rs (Rs 0.19/KWH)	FCA Rs 1.4 /KWH	Total Current Bill Rs	Average cost of power Rs/ KWH
Apr-22	427	1	7.07	1.35	91	0.19	1.4	527	527.05
May-22	427	1	7.07	1.35	91	0.19	1.4	527	527.05
Jun-22	427	1	7.07	1.35	91	0.19	1.4	527	527.05
Jul-22	427	1	7.07	1.35	91	0.19	1.4	527	527.05
Aug-22	427	1	7.07	1.35	91	0.19	1.4	527	527.05
Sep-22	427	1	7.07	1.35	91	0.19	1.4	527	527.05
Oct-22	427	1	7.07	1.35	91	0.19	1.4	527	527.05
Nov-22	427	1	7.07	1.35	91	0.19	1.4	527	527.05
Dec-22	427	1	7.07	1.35	91	0.19	1.4	527	527.05
Jan-23	427	1	7.07	1.35	91	0.19	1.4	527	527.05
Feb-23	427	1	7.07	1.35	91	0.19	1.4	527	527.05
Mar-23	427	1	7.07	1.35	91	0.19	1.4	527	527.05
Total	5124	12	84.84	16.20	1097	2.28	16.8	6325	527.05

Billing Tariff Category - LT II (A) - 1-Phase Up to 20 KW is incorrect. It should be LT VII (B) - 1-Phase Up to 20 KW

5) Science Building -

Tariff Category - LT VII (B) Public other - 3-Phase Up to 20 KW
Connection No-164810303045

Science Building - LT VII (B) Public other - 3-Phase Less than 20 KW Connection No-164810303045 NET Meter No-055-X1021232								NET Metering Reading result Details				
Month	Fixed charge Rs	KVA MD	Recorded KW MD	Total KWH	Cost per KWH	Current bill Amount Rs	Power factor	Import	Export	NET KWH	Generation meter KWH	Cumulative banked
Apr-22	384	15		3373	4.57	25880	0	3492.0	119	3373	1074	0

May-22	384	15		4187	4.57	32010	0	4268.0	81	4187	1081	0
Jun-22	384	13		2705	4.57	23300	0	2839	134.0	2705	992	0
Jul-22	384	13		3017	4.57	25940	0	3084	67.0	3017	839	0
Aug-22	6528	26	15	3129	7.23	79260	0.04	3227	99.0	3128	1132	0
Sep-22	6912	27	17	3707	7.23	74790	0.75	3749	42.0	3707	860	0
Oct-22	6912	27	17	3097	7.23	67090	0.73	3339	243.0	3096	1210	0
Nov-22	6528	26	15	3007	7.23	65050	0.72	3098	90.0	3008	1083	0
Dec-22	7680	30	18	4029	7.23	84020	0.68	4063	34.0	4029	1026	0
Jan-23	7296	29	16	3023	7.23	68400	0.71	3082	59.0	3023	964	0
Feb-23	384	24	12	2455	4.57	21190	0	2531	76.0	2455	868	0
Mar-23	6912	27	15	3533	7.23	3533	0.73	3593.0	61.0	3532	1238	0
Total	50688	272	125	39262	73.46	570463	4.36	40365.0	1105	39260	12367	0

MSEDCL Electricity bill calculation & Average Cost of power in Rs/KWH

Month	Energy charge (Rs 4.57/KWH)	Wheeling charges (Rs 1.35/KWH)	Electricity duty 21% in Rs	Tax on sale (Rs 0.1904/KWH)	FCA @Rs0.15/U	TOD Tariff Rs	PF penalty/ Incentive	Excess Demand Charges in Rs	Total Current Bill Rs	Average cost of power Rs/ KWH
Apr-22	15415	4553.6	4380	642.2	505.95	0	0	0	25881	7.67
May-22	19135	5652.5	5418	797.2	628		0	0	32014	7.65
Jun-22	12362	3651.8	3955	515.0	2435	0	0	0	23302	8.61
Jul-22	13788	4073.0	4402	574.4	2715.3	0	0	0	25936	8.60
Aug-22	22615	4222.8	10801	595.6	4537	-177.6	16414.41	13708.8	79246	25.33
Sep-22	26802	5004.45	12246	705.8	5375	-65.6	3522.21	14284.8	74785.9	20.17
Oct-22	22384	4179.6	10949	589.5	4490	-112.9	3407.58	14284.8	60199	19.44
Nov-22	21748	4060.8	10587	572.7	4360.15	8.7	3486.21	13708.8	65060	21.63
Dec-22	29130	5439.15	13486	767.1	5842	115.2	5543.7	16012.8	84016	20.85
Jan-23	21856	4081.05	11120	575.6	4383.35	-102.7	3751.4	15436.8	68397	22.63
Feb-23	11219	3314.25	3597	467.4	2209.5	0	0	0	21191	8.63
Mar-23	25536	4768.2	11891	672.5	5122.85	-91.3	3803	14284.8	72899	20.64
Total	241989	53001.0	102830	7475.1	42603.6	-426.2	39928.51	101721.6	632926	16.12

Observation-

1) Billing Tariff Category - **LT VII (B) - 1-Phase Up to 20 KW is correct**

2) There is no violation of monthly KW demand attained vide COMMERCIAL CIRCULAR NO.323 Outward No- CE/COMM/Tariff/MYT20-25/9061 Date: 03/04/2020. However MSEDCL has changed category of from **LT VII (B)-I to LT VII (B)-ii & billed in month August**

22 to Feb 23 & again in March 23. This action is wrong in relevance to COMMERCIAL CIRCULAR NO.323. So it is strongly recommended to ask for refund of power factor penalty Rs **39928.51** & excess demand charges Rs **101721.6** from MSEDCL & if MSEDCL denies, proceed legal action as per Electricity Act 2003 by filing complaint in **CONSUMER GRIEVANCE REDRESSAL FORUM** to to get it refunded.

3) The TOD Tariff is applicable for LT-VII (A) (ii) and LT-VII (A) (iii) (i.e., above 20 kW) and optionally available to LT- VII (A) (i) (i.e., up to 20 kW) having ToD meter installed. It is recommended to apply for TOD tariff to get incentive in bill to reduce cost of power.

4) Solar energy generated KWH per day reading must be read daily & maintained in register regularly to know

1) Total solar unit share in total annual consumption to work out cost saving

2) Extreme variation to take timely corrective action to avoid financial loss by making import costly MSEDCL power

5) Solar energy project relieved college by & large from dependency on MSEDCL as well as relieved from costly power procurement from MSEDCL. Solar project also mitigated greenhouse gas emission leading to protect environment from pollution.

Overall Average cost of power Rs/ KWH

Connection No	Tariff Category	Month	Total KWH	Total Current Bill Rs	Average cost of power Rs/ KWH	Remark
164810025525	LT II (A)	April-22 to March -23	12	6325	527.08	No use of connection
164810025517	LT VII (B) -I	April-22 to March -23	9566	75916	7.94	
164810071144	LT VII (B) -I	April-22 to March -23	19004	145323	7.65	
164810303045	LT VII (B) -I	April-22 to March -23	39260	632926	16.12	Higher due to penalty against PF

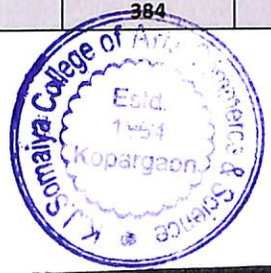
						& excess demand
164810025509	LT II (A)	April-22 to March -23	4764	62086	13.03	Higher due to wrong commercial category
Total			**72606**	**922576**	**12.71**	

RECOMMENDATION FOR REDUCTION IN QUANTITY OF MSEDCL SERVICE CONNECTION

The management of college has taken many electrical service connections from MSEDCL to meet the requirement of electricity of college for various purposes. In addition to this, the management of college has also installed renewable source of electric power in which two separate on-grid photovoltaic Solar power system are installed at two separate roof top bearing 10 KVA capacity of each connected in grid of MSEDCL through Net Metering.

The total demand of electricity of college is met through MSEDCL Grid power & photovoltaic Solar power system. In relevance of prevailing tariff of MSEDCL, It is recommended to get permanently disconnected following connections to save monthly fixed charges & optimize solar power application for own purpose to reduce costly power procurement from MSEDCL to save cost.

Month	Existing Connection Position					Proposed Connection position		Monthly Saving in
	Connection No-164810025509	Connection No-164810025525	Connection No-164810025517	Connection No-164810071144	Connection No-164810303045	Connection No-164810025509	Connection No-164810303045	
	Fixed Charges in Rs	Fixed Charges in Rs	Fixed Charges in Rs	Fixed Charges in Rs	Fixed Charges in Rs	Fixed Charges in Rs	Fixed Charges in Rs	Fixed Charges in Rs
Apr-22	427	427	384	384	384	384	384	1238
May-22	427	427	384	384	384	384	384	1238
Jun-22	427	427	384	384	384	384	384	1238
Jul-22	427	427	384	384	384	384	384	1238
Aug-22	427	427	384	384	384	384	384	1238
Sep-22	427	427	384	384	384	384	384	1238
Oct-22	427	427	384	384	384	384	384	1238
Nov-22	427	427	384	384	384	384	384	1238
Dec-22	427	427	384	384	384	384	384	1238



Jan-23	427	427	384	384	384	384	384	1238
Feb-23	427	427	384	384	384	384	384	1238
Mar-23	427	427	384	384	384	384	384	1238
Total	5124	5124	4608	4608	4608	4608	4608	14856.0

5)._ELECTRICAL CONNECTED LOAD STUDY

Electrical load other than motive power load has been physically inventoried & recorded in table in various types of load. Details of various load inventories are given below. As Viewed from below table, it understands that lighting & fan load has dominance in total load mix & shares more electrical consumption. This load has most potential to identify energy saving opportunity. College has been taking initiative in energy conservation & energy saving work. As part of this college has replaced almost FTL with LED down light & LED Tube light during year 2022-2023. This work benefitted college to reduce electrical load for same output leading to reduction in annual energy cost.

Sr No	Location	FTL Tube-light T12			FTL Tube-light T8			LED Tube-light		
	Science Building	No	Watt	Total watt	No	Watt	Total watt	No	Watt	Total watt
	Second floor									
1	Computer Lab-1 (S-54)	0	0	0			0	3	20	60
2	Computer Lab-2 (S-53)	0	0	0			0	3	20	60
3	Computer Lab-3 (S-52)	0	0	0			0	3	20	60
4	Computer Lab-4 (S-51)	0	0	0			0	3	20	60
5	Computer Lab-5 (S-50)	0	0	0			0	3	20	60
6	Computer Lab-6 Digital(S-48)	0	0	0			0	3	20	60
	Computer Lab-7			0						
7	Staff Room (S-55)	0	0	0			0	2	20	40
8	Department of math. (S-49)	0	0	0			0	2	20	40
9	Digital class Room(S-47)	0	0	0			0	4	20	80
10	Digital class Room(S-46)	0	0	0			0	4	20	80
11	Class Room (S-45)	0	0	0			0	2	20	40
12	Conference Room(S-44)	0	0	0			0	7	20	140
13	Ladies Toilet	0	0	0			0	1	20	20
14	Class Room (S-42)	0	0	0			0	1	20	20
15	Class Room (S-41)	0	0	0			0	2	20	40
16	Passage	0	0	0			0	6	20	120
	Third floor	0	0	0			0			0

17	Class Room N0-1	0	0	0			0			0
18	Class Room N0-2	0	0	0			0			0
19	Class Room N0-3	0	0	0			0			0
20	Class Room N0-4	0	0	0			0			0
21	Class Room N0-5	0	0	0			0			0
22	Class Room N0-6	0	0	0			0			0
23	Class Room N0-7	0	0	0			0			0
24	Class Room N0-8	0	0	0			0			0
25	Class Room N0-9	0	0	0			0			0
26	Class Room N0-10	0	0	0			0			0
27	Staff Room -1	0	0	0			0			0
28	Staff Room -2	0	0	0			0			0
29	Toilet	0	0	0			0	1	20	20
30	Corridor	0	0	0			0	4	20	80
	Floor No-1	0	0	0			0			0
31	Ladies Toilet(S-29)	0	0	0			0	2	20	40
32	Instrumentation Lab- (S-30)	0	0	0			0			0
33	Electronic Lab (S-31)	0	0	0	0	0	0	6	18	108
34	General Physics Lab-1(S-32)	0	0	0	0	0	0	3	18	54
35	staff room(s-33)	0	0	0	0	0	0	2	18	36
36	HOD physics(S-34)	0	0	0	3	36	138			0
37	General Physics Lab-2(S-35)	0	0	0	0	0	0	5	18	90
38	PG Laboratory(S-36)	0	0	0	0	0	0	5	18	90
39	Gents Toilet (S-37)	0	0	0	0	0	0	2	18	36
40	Class Room (S-38)	0	0	0			0	2	20	40
41	Class Room (S-39)	0	0	0			0	2	20	40
42	Corridor	0	0	0	5	36	230	1	20	20
43	HOD microbiology (S-28)	1	40	50	1	23	23			0
44	Microbiology Lab-03(S-24)	0	0	0	2	36	92			0
45	Microbiology Lab-01(S-25)	2	40	100	1	23	23			0
46	Room (S-27)	1	40	50	1	36	46			0
47	Store (S-26)	1	40	50			0			0
48	Porch S-14 &15	6	40	300			0			0
49	Zoology depart. Store S-16			0	1	36	46			0
50	Zoology Lab S-17	2	40	100	1	36	46			0
	Dark Room S-18	1	40	50			0			0
	Toilet block	0	0	0	0		0	2	18	36
	Zoology Lab-3 S-21	0	0	0	0	36	0	2	20	40
	HOD Zoology S-22	0	0	0	0	36	0	2	20	40
	Zoology Lab-2 S-23	0	40	0	0	36	0	2	20	40
	HOD Botany S-63	0	0	0	0	36	0	2	20	40
	Class Room S-64	0	0	0	0	36	0	5	20	100
	Botany Lab-2 S-62	0	40	0	0	36	0	3	20	60
	Botany Lab-1 S-56	0	40	0			0	2	20	40
	Store (S-57)	0	40	0	1	36	46	1	20	20
	Lab-S-61	0	40	0	1	36	46	1	20	20

	Lab-3 S-58	0	40	0			0	3	20	60
	Culture Room	0	40	0			0	1	20	20
	Passage	0	40	0			0	4	20	80
	Ground floor			0			0			0
	Physical chemistry lab S-11	0	40	0	0	36	0	5	20	100
	Inorganic chemistry S-10	0	0	0	0	36	0	2	20	40
	store S-9	0	0	0	0	36	0	2	20	40
	Organic Chemistry S-8	0	0	0	0	36	0	2	20	40
	HOD cabin Chemistry S-7	0	0	0	0	36	0	3	20	60
	Class S-6	0	0	0	1	13	13	2	20	40
	Toilet block	0	0	0			0	3	20	60
	Class Room S-2	0	0	0	2	36	92			0
	Class Room	0	0	0			0	2	20	40
	Class Room S-14	0	0	0	2	36	92			0
	Class Room S-15	0	0	0	2	36	92			0
	General chemistry laboratory S-5	2	40	100	3	36	138	1	20	20
	Boyes hostel Total Room-11 No			0			0			0
	Room -1	0	0	0	1	36	41			0
	Room -2	0	0	0			0	1	20	20
	Room -11	0	0	0			0	1	20	20
	Room -3	0	0	0			0	1	20	20
	Room -10	0	0	0	1	36	41			0
	Room -4	0	0	0			0	1	20	20
	Toilet block	0	0	0			0	2	20	40
	Gymkhana	0	0	0	4	36	184	6	24	144
	Passage	0	0	0	2	36	92	1	20	20
	Ladies Hostel Total Room-36	0	0	0			0			0
	Room	0	0	0			0	36	20	720
	Passage	0	0	0			0	15	7	105
	Mess	0	0	0			0	6	20	120
	Library	0	0	0	14	36	644	12	20	240
	Class Room M-45	0	0	0			0	4	20	80
	Class Room M-47	0	0	0			0	4	20	80
	Class Room M-48	0	0	0	1	36	41	1	20	20
	Department of Geography	0	0	0			0			0
	Lecture hall M-48	0	0	0	1	36	41	3	20	60
	Laboratory M-50	0	0	0			0	3	20	60
	Staff Room	0	0	0			0	1	20	20
	HOD cabin	0	0	0			0	1	20	20
	Main building			0			0			0
	Exam control room(M14)	1	40	50	1	36	46			0
	Class room M-15	0	0	0			0	3	20	60
	Class room M-2	0	0	0			0	1	20	20
	Class room M-13	0	0	0			0	1	20	20
	Class room M-3	0	0	0	1	36	41			0

	Class room M-12	0	0	0			0	1	20	20
	Class room M-6	0	0	0			0	1	20	20
	Class room M-7	0	0	0			0	1	20	20
	NCC Unit M-11	0	0	0			0	1	20	20
	Board of student M-10	0	0	0			0	1	20	20
	NSS M-9	0	0	0			0	1	20	20
	Class room M-8	0	0	0			0	1	20	20
	Class room M-24	0	0	0			0	1	20	20
	Class room M-18	0	0	0			0	1	20	20
	Class room M-23	0	0	0			0	1	20	20
	Depart. Of economics M22	0	0	0			0	2	20	40
	Depart. Of marathi M-21	0	0	0			0	2	20	40
	M-20	0	0	0			0	1	20	20
	Class room M-19	0	0	0	1	36	41	1	20	20
	Class room M-17	0	0	0			0	1	20	20
	Class room M-25	0	0	0			0	1	20	20
	Depart. Of politics	0	40	0	0	36	0	2	20	40
	Class room M-16			0			0	4	20	80
	Class room M-27			0			0	2	20	40
	Depart. Of commerce			0			0	3	36	108
	Depart.of hystory			0			0	3	36	108
	Depart.of english			0			0	2	20	40
	Language Laboratory			0			0	2	20	40
	Passage			0	2	36	92	3	20	60
	Administrative section M-43			0	3	36	123	6	20	120
	Account room M42			0	1	36	36			0
	Faculty room M-41			0	4	36	184	1	20	20
	Toilet block			0	2	36	92			0
	Passage	0	40	0	0	36	0	6	20	120
				0			0			0
				0			0			0
				0			0			0
	Total			0						
				0			0			0
				0			0			0
	Sakarben hall			0	1	23	23	22	36	792
				0			0	12	7	84
	Secretary office M35			0			0	4	20	80
	President office			0			0	4	20	80
	Principal cabin			0			0	2	36	72
				0			0	10	7	70
				0			0			0
	Total	17		850	67		2925	346		6893

Sr No	Location	Split AC		exhaust fan			Ceiling fan			
				No	Watt	Total watt	No	Watt	Regulator watt	Total watt
		No	Total watt			0				
	Science Building									
	Second floor		0			0	3	70	5	225
1	Computer Lab-1 (S-54)		0			0	3	70	5	225
2	Computer Lab-2 (S-53)		0			0	3	70	5	225
3	Computer Lab-3 (S-52)		0			0	3	70	5	225
4	Computer Lab-4 (S-51)		0			0	3	70	5	225
5	Computer Lab-5 (S-50)		0			0	3	70	5	225
6	Computer Lab-6 Digital(S-48)		0			0	1	70	5	75
7	Staff Room (S-55)		0			0	2	70	5	150
8	Department of math. (S-49)		0			0	3	70	5	225
9	Digital class Room(S-47)		0			0	3	70	5	225
10	Digital class Room(S-46)		0			0	5	70	5	375
11	Class Room (S-45)		0			0				0
12	Conference Room(S-44)		0			0				0
13	Ladies Toilet		0			0				0
14	Class Room (S-42)		0			0				0
15	Class Room (S-41)		0			0				0
16	Passage		0			0				0
	Third floor		0			0				0
17	Class Room N0-1		0			0				0
18	Class Room N0-2		0			0				0
19	Class Room N0-3		0			0				0

	Class Room N0-4		0			0				0
	Class Room N0-5		0			0				0
	Class Room N0-6		0			0				0
	Class Room N0-7		0			0				0
	Class Room N0-8		0			0				0
	Class Room N0-9		0			0				0
	Class Room N0-10		0			0				0
	Staff Room -1		0			0				0
	Staff Room -2		0			0				0
	Toilet		0			0				0
	Corridor		0			0				0
	Floor No-1		0			0				0
	Ladies Toilet(S-29)		0			0				0
	Instrumentation Lab- (S-30)		0			0	4	70	5	300
	Electronic Lab (S-31)		0			0	2	70	5	150
	General Physics Lab-1(S-32)		0			0	2	70	5	150
	staff room(s-33)		0			0	2	70	5	150
	HOD physics(S-34)		0			0	3	70	5	225
	General Physics Lab-2(S-35)		0			0	4	70	5	300
	PG Laboratory(S-36)		0			0				0
	Gents Toilet (S-37)		0			0				0
	Class Room (S-38)		0			0				0
	Class Room (S-39)		0			0				0
	Corridor		0			0	1	70	5	85
	HOD microbiology (S-28)		0			0	1	70	5	75
	Microbiology Lab-03(S-24)		0	2	35	70	1	70	5	75
	Microbiology Lab-01(S-25)		0	1	35	35	1	70	5	75
	Room (S-27)		0	1	35	35	1	70	5	75
	Store (S-26)		0			0	3	70	5	255
	Porch S-14 &15		0			0	1	70	5	85

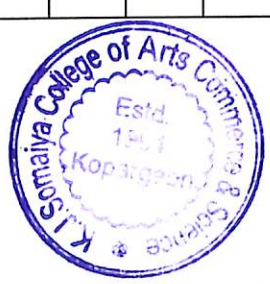
	Zoology depart. Store S-16		0			0	1	70	5	85
	Zoology Lab S-17		0			0				0
	Dark Room S-18		0			0				0
	Toilet block		0			0				0
	Zoology Lab-3 S-21		0			0	1	70	5	75
	HOD Zoology S-22		0			0	1	70	5	75
	Zoology Lab-2 S-23		0			0	2	70	5	150
	HOD Botany S-63		0			0	1	70	5	75
	Class Room S-64		0			0	1	70	5	85
	Botany Lab-2 S-62		0			0	2	70	5	170
	Botany Lab-1 S-56		0			0	1	70	5	85
	Store (S-57)		0			0	2	70	5	170
	Lab-S-61		0			0	2	70	5	170
	Lab-3 S-58		0			0				0
	Culture Room		0			0				0
	Passage		0			0				0
	Ground floor		0	2	35	70	2	70	5	150
	Physical chemistry lab S-11	1	1099	2	35	70	3	70	5	225
	Inorganic chemistry S-10		0	1	35	35	2	70	5	150
	store S-9		0	1	35	35	1	70	5	75
	Organic Chemistry S-8		0	1	35	35	3	70	5	225
	HOD cabin Chemistry S-7		0			0				0
	Class S-6		0			0				0
	Toilet block		0			0				0
	Class Room S-2		0			0				0
	Class Room		0			0				0
	Class Room S-14		0			0				0
	Class Room S-15		0	5	35	175	2	70	5	150
	General chemistry laboratory S-5		0			0				0

	Boys hostel Total Room-11 No		0			0	11	70	5	825
	Ladies hostel Total Room-36 No						40	70	5	3000
	Toilet block		0			0				0
	Gymkhana		0			0	3	70	5	225
	Passage		0			0				0
	Ladies Hostel Total Room-36		0			0	36	70	5	2700
	Room		0			0				0
	Passage		0			0	1	70	5	75
	Mess		0			0	10	70	5	750
	Library		0			0				0
	Class Room M-45		0			0				0
	Class Room M-47		0			0				0
	Class Room M-48		0			0				0
	Department of Geography		0			0	3	70	5	225
	Lecture hall M-48		0			0	2	70	5	150
	Laboratory M-50		0			0	1	70	5	75
	Staff Room		0			0	1	70	5	75
	HOD cabin		0			0				0
	Main building		0			0	2	70	5	170
	Exam control room(M14)		0			0				0
	Class room M-15		0			0				0
	Class room M-2		0			0	1	70	5	75
	Class room M-13		0			0	1	70	5	75
	Class room M-3		0			0				0
	Class room M-12		0			0	1	70	5	75
	Class room M-6		0			0				0
	Class room M-7		0			0	1	70	5	75
	NCC Unit M-11		0			0	1	70	5	75
	Board of student M-10		0			0	1	70	5	75

	NSS M-9		0			0	1	70	5	75
	Class room M-8		0			0				0
	Class room M-24		0			0				0
	Class room M-18		0			0				0
	Class room M-23		0			0				0
	Depart. Of economics M22		0			0				0
	Depart. Of marathi M-21		0			0				0
	M-20		0			0				0
	Class room M-19		0			0				0
	Class room M-17		0			0				0
	Class room M-25		0			0	1	70	5	75
	Depart. Of politics		0			0	1	70	5	75
	Class room M-16		0			0				0
	Class room M-27		0			0	3	70	5	225
	Depart. Of commerce		0			0	2	70	5	150
	Depart. Of history		0			0	2	70	5	150
	Depart. Of English		0			0	1	70	5	75
	Language Laboratory		0			0				0
	Passage		0			0	5	70	5	375
	Administrative section M-43		0			0	1	70	5	75
	Account room M42		0			0	5	70		350
	Faculty room M-41		0			0				0
	Toilet block		0			0				0
	Passage		0			0				0
			0			0				0
			0			0				0
			0							
	Total					0				0
			0			0				0
	Sakarben hall		0			0	14	70	5	1050

			0			0				0
			0			0				
	Secretary office M35	1	1895			0	1	70	5	75
	President office	2	2400			0	2	70	5	150
	Principal cabin	1	1099			0	4	70	5	300
	Total	5	6493	16	315	560	244	4970	350	18435

Sr No	Location	PC			Printer			Xerox/copier machine/Projector/public address system/TV		
		No	Watt	total Watt	No	Watt	total Watt	No	Watt	total Watt
	Science Building **Second floor**									
1	Computer Lab-1 (S-54)	30	40	1200			0			0
2	Computer Lab-2 (S-53)	21	40	840			0			0
3	Computer Lab-3 (S-52)	21	40	840			0			0
4	Computer Lab-4 (S-51)	21	55	1155			0			0
5	Computer Lab-5 (S-50)	23	55	1240			0	1	100	100
6	Computer Lab-6 Digital(S-48)	21	40	840			0			0
	Computer Lab-7	20	55	1100						
7	Staff Room (S-55)	1	40	40	1	200	200			0
8	Department of math. (S-49)			0			0	1	100	100
9	Digital class Room(S-47)			0			0			0
10	Digital class Room(S-46)			0			0	2	220	440
11	Class Room (S-45)			0			0			0
12	Conference Room(S-44)			0			0			0
13	Ladies Toilet			0			0			0

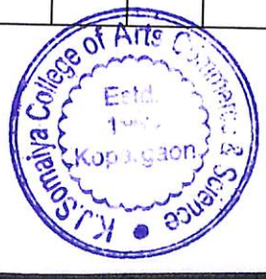


14	Class Room (S-42)			0			0			0
15	Class Room (S-41)			0			0			0
16	Passage			0			0			0
	Third floor			0			0			0
17	Class Room N0-1			0			0			0
18	Class Room N0-2			0			0			0
19	Class Room N0-3			0			0			0
20	Class Room N0-4			0			0			0
21	Class Room N0-5			0			0			0
22	Class Room N0-6			0			0			0
23	Class Room N0-7			0			0			0
24	Class Room N0-8			0			0			0
25	Class Room N0-9			0			0			0
26	Class Room N0-10			0			0			0
27	Staff Room -1			0			0			0
28	Staff Room -2			0			0			0
29	Toilet			0			0			0
30	Corridor			0			0			0
	Floor No-1			0			0			0
31	Ladies Toilet(S-29)			0			0			0
32	Instrumentation Lab- (S-30)	12	40	480			0			0
33	Electronic Lab (S-31)			0			0			0
34	General Physics Lab-1(S-32)			0			0			0
35	staff room(s-33)	1	40	40			0			0
36	HOD physics(S-34)			0			0	1	100	100
37	General Physics Lab-2(S-35)			0			0			0
38	PG Laboratory(S-36)			0			0			0
39	Gents Toilet (S-37)			0			0			0
40	Class Room (S-38)			0			0			0

41	Class Room (S-39)			0			0			0
42	Corridor	1	40	40			0			0
43	HOD microbiology (S-28)			0			0			0
44	Microbiology Lab-03(S-24)			0			0			0
45	Microbiology Lab-01(S-25)			0			0			0
46	Room (S-27)			0			0			0
47	Store (S-26)			0			0			0
48	Porch S-14 &15			0			0			0
49	Zoology depart. Store S-16			0			0			0
50	Zoology Lab S-17			0			0			0
51	Dark Room S-18			0			0			0
52	Toilet block			0			0			0
53	Zoology Lab-3 S-21	1	40	40	1	200	200			0
54	HOD Zoology S-22			0			0			0
55	Zoology Lab-2 S-23	1	40	40			0			0
56	HOD Botany S-63			0			0			0
57	Class Room S-64			0			0			0
58	Botany Lab-2 S-62			0			0			0
59	Botany Lab-1 S-56			0			0			0
60	Store (S-57)			0			0			0
61	Lab-S-61			0			0			0
62	Lab-3 S-58			0			0			0
63	Culture Room			0			0			0
64	Passage			0			0			0
	Ground floor	3	40	120			0			0
65	Physical chemistry lab S-11			0			0			0
66	Inorganic chemistry S-10			0			0			0
67	store S-9			0			0			0
68	Organic Chemistry S-8	1	40	40			0			0

69	HOD cabin Chemistry S-7			0			0			0
70	Class S-6			0			0			0
71	Toilet block			0			0			0
72	Class Room S-2			0			0			0
73	Class Room			0			0			0
74	Class Room S-14			0			0			0
75	Class Room S-15			0			0			0
76	General chemistry laboratory S-5			0			0			0
77	**Boyes hostel Total Room-11 No**			0			0			0
78	**Ladies hostel Total Room-36 No**	0	0	0	0	0	0	0	0	0
79	Toilet block			0			0			0
80	Gymkhana	1	40	40			0			0
81	Passage			0			0			0
82	Ladies Hostel Total Room-36			0			0			0
83	Room			0			0			0
84	Passage			0			0			0
85	**Mess**	6	40	240			0			0
86	**Library**			0			0			0
87	Class Room M-45			0			0			0
88	Class Room M-47			0			0			0
89	Class Room M-48			0			0			0
90	**Department of Geography**			0			0			0
91	Lecture hall M-48			0			0			0
92	Laboratory M-50			0			0			0
93	Staff Room			0			0			0
94	HOD cabin			0			0			0
	Main building	1	40	40	1	200	200	1	750	750
95	Exam control room(M14)			0			0			0

96	Class room M-15			0			0			0
97	Class room M-2			0			0			0
98	Class room M-13			0			0			0
99	Class room M-3			0			0			0
100	Class room M-12			0			0			0
101	Class room M-6			0			0			0
102	Class room M-7	1	40	40			0			0
103	NCC Unit M-11			0			0			0
104	Board of student M-10			0			0			0
105	NSS M-9			0			0			0
106	Class room M-8			0			0			0
107	Class room M-24			0			0			0
108	Class room M-18			0			0			0
109	Class room M-23			0			0			0
110	Depart. Of economics M22			0			0			0
111	Depart. Of marathi M-21			0			0			0
112	M-20			0			0			0
113	Class room M-19			0			0			0
114	Class room M-17			0			0			0
115	Class room M-25	1	40	40			0			0
116	Depart. Of politics			0			0			0
117	Class room M-16			0			0			0
118	Class room M-27			0			0			0
119	Depart. Of commerce	1	40	40			0			0
120	Depart. Of history	1	40	40			0			0
121	Depart. Of English	8	40	320			0			0
122	Language Laboratory			0			0			0
123	Passage	7	40	280	3	200	600	1	750	750
124	Administrative section M-43			0			0			0



125	Account room M42			0			0			0
126	Faculty room M-41			0			0			0
127	Toilet block			0			0			0
128	Passage			0			0			0
135	Sakarben hall						0	2	300	600
136							0			0
137	Secretary office M35						0	1	90	90
138	President office						0			0
139	Principal cabin						0			0
							0			0
	Total	205		9410	6		1200	10		2930

Sr No	Location	Fridge		Incubator		Hot air oven		Oven		Water cooler		Water pump/ RO system	
		No	Watt	No	Watt	No	Watt	No	Watt	No	Watt	No	Watt
1	Chairman chamber	1	170										
2	Ladies Hostel									2	600	1	3000
3	Microbiology S-26	1	230										
4	Microbiology S-24			2	350								
5	Zoology Lab S-17	1	230										
6	Class Room S-18			1	350	1	2250						
7	Botany Lab--2 S-62							1	1200				
8	Store	1	230										
9	Botany Lab--1			1	1500								

10	Inorganic S-10			1	1500								
11	Organic chemistry S-8					1	1500						
12	Inorganic chemistry S-10	1	230										
13	General chemistry Lab S-5	1	230										
14	College campus											1	4410
	Total	5	1320	5	3700	2	3750	1	1200	2	600	2	7410

ANALYSIS OF CONNECTED LOAD MIX IN CAMPUS

The total inventoried load has been classified as below.

Sr No	Type of load	Total Watts	% on total
1	Lighting Load	10668	17.49
2	Fan Load	18995	31.15
3	Air conditioning	6493	10.65
4	Fridge load	1320	2.16
5	Heating Load	8650	14.18
6	PC load	5720	9.38
7	other electronic Load	4130	6.77
8	Water pump/ RO system	4410	7.23
9	Water cooler	600	0.98
	Total	60986	100

LED Lighting Load Sharing In Total Lighting Load –

Load Details	Total Fixtures in No	KW	% Share
Total Lighting Load	430	10.668	100
LED Lighting Load	346	6.893	65

6).MOTOR LOADING STUDY-

There is one submersible pump near gymkhana building which pumps the water to supply usable water other than drinking water. This motor is claimed of 3 HP rating. I have been informed that old motor has been replaced with new one. Input electrical power is measured during its normal operation. Input power is admeasured 4.87 KW & power factor of motor is also poor i.e. 0.544. It is very hard to say motor has rating 3HP. Motor quality & performance is poor.

Sr	Equipment	Motor Rating in		Measured parameter									Starter	Motor Loading in	Remark
		KW	% Efficiency	Phase	KW	KVAR	KVA	PF	Hz	Volt	Amp	% Reference Voltage Unbalance	Type	%	
1	Raw water pump	3.7	70	R	1.55	2.35	2.82	0.550		231.60	12.20	4.17			
				Y	1.81	2.55	3.14	0.576		254.40	12.30				
				B	1.51	2.58	3.00	0.503		239.00	12.50				
				Total	4.87	7.48	8.96	0.544	50.10	241.67			DOL	92	Normally Loaded

Capacitor connected across motor found faulty. Hence it is recommended to replace it with 3-Phase, 6 KVAR capacitor unit on urgently on top priority.

7). SOLAR WATER HEATER QUANTIFICATION OF BENEFITS-

College has installed solar water heater in boys & Girls hostel to harness cost free solar green energy for heating water requiring student to bathe. This reduces demand of conventional commercial energy & save cost. This will also help to reduce greenhouse gas emission mitigating environmental damage. Application of this hot water in various laboratory can be explored which is generated without input energy cost.

Solar Heater (SH) Location	No of Student	No of Solar Heaters	Each SH Capacity in Ltrs/Day	Average Water Temperature	Specific heat in Kcal/ Kg/oC	Total Solar Heat gained by water	Average available sun per year in days	Estimated Equivalent Electricity saving in KWH per year	Average Electricity Cost in Rs/KWH	Estimated Electricity purchase Cost saving in	Estimated CO2 Green House Gas Emission

							per Day in Kcal				Rs per year	reduction per year in Kg
				Hot(Out)	Cold (In)							
Ladies Hostel	140	1	1500	57	24	1	49500	300	17267	12.71	219469	14159
Boys Hostel	44	2	200	56.5	24	1	13000	300	4535	12.71	57638	3719
Total	184	3	1700				62500	300	21802	12.71	277108	17878

8). SPLIT AIR CONDITIONER PERFORMANCE STUDY

Performance assessment study is conducted on sample Split Air Conditioner systems when it was in operation. For the sake of performance study; measurement of DB temperature & WB temperature has been done at return air side & supply air side. Velocity of air & dimension of conditioned air throw window is measured at supply air side at indoor unit. Electrical input power to respective whole unit is measured under guidance of office representative. By referring psychometric chart cooling effect prevailing at time of measurement is worked out & Energy Efficient Ratio (EER) is assessed to know energy performance in unit. The Performance assessment work is tabulated as below

1) Technical Specification Of Split Air conditioning system

Sr No	Location of indoor	Air Conditioner Technical Specification							Air Throw window - Supply Air side	
		Type	Make	Nominal Cooling capacity in Watts	Nominal Input Power in Watts	EER	Indoor Air Flow in CMH	Indoor Air Flow in cfm	width cm	Height cm
1	Principal Cabin	Split Air conditioner	Voltas	3200	1099	2.91	500	294	57	5

2) Assessment of energy performance

Air Measurement				Return air temperature in °C		Supply air temperature in °C		Enthalpy Kcal/KgDA		Assessed Cooling in		Measured Input Electrical Power in	**Actual**	**Design**
Velocity m/s	Volume flow m3/s	Volume flow cfm	Density	DB	% RH	DB	% RH	Inlet	Outlet	TR	Watt	Watt	**EER**	**EER**
2.48	0.07068	149.7	0.8625	26.9	44	8.5	45	12.38	3.89	0.83	2912.16	1030	**2.83**	**2.91**

Working energy performance of Split AC is good.

9). PHOTOVOLTAIC SOLAR POWER SYSTEM STUDY-

The college has taken prudential step & holistic approach & installed no of two photovoltaic roof top solar power system to meet its partly requirement. In this mechanism of NET Metering policy of MSEDCL, surplus solar power is exported to MSEDCL grid when demand of power of college is lean & imported power from MSEDCL when demand of power of college is more than solar generation. Electrical KWH exported to MSEDCL grid is accounted for Relief in electricity bill.

A) System No-1 Roof top of main building

1) PV Panel Details-

PV Panel	Make	Max power watt	open circuit voltage	Max power volt	Max power current Amp	Total Panel No	Total string	Total installed capacity in Watt
	WAAREE	315	45.25	36.75	8.58	32	3	10000

2) PV Grid Inverter Details-

PV Grid inverter	Make	Max DC Volt	DC Voltage Range	MPPT Volt Range	Max input current per string	Max Apparent power KVA	Nominal output	Hz
	Growatt	1000	300-1000	400-800	15 A	10	3/N/PE230V/400	50+/-6

B) System No-2 Roof top of Science building

1) PV Panel Details-

PV Panel	Make	Max power watt	open circuit voltage	Max power volt	Max power current Amp	Total Panel No	Total string	Total installed capacity in Watt
	Vikramsolar	330	46.3	38	8.76	31	3	10,000

2) PV Grid Inverter Details-

PV Grid inverter	Make	Max DC Volt	DC Voltage Range	MPPT Volt Range	Max input current per string	Max Apparent power KVA	Nominal output	Hz
	Delta	1000	200-1000	200-1000	16 A	10	3/N/PE230V/400	50+/-6

3) Solar Power Generation- NET Meter

	Science Building - LT VII (B) Public other - 3-Phase Less than 20 KW Connection No-164810303045 NET Metering Reading result Details				
Month	**Import**	**Export**	**NET KWH**	**Generation meter KWH**	**Cumulative banked**

Apr-22	3492.0	119	3373	1074	0
May-22	4268.0	81	4187	1081	0
Jun-22	2839	134.0	2705	992	0
Jul-22	3084	67.0	3017	839	0
Aug-22	3227	99.0	3128	1132	0
Sep-22	3749	42.0	3707	860	0
Oct-22	3339	243.0	3096	1210	0
Nov-22	3098	90.0	3008	1083	0
Dec-22	4063	34.0	4029	1026	0
Jan-23	3082	59.0	3023	964	0
Feb-23	2531	76.0	2455	868	0
Mar-23	3593.0	61.0	3532	1238	0
Total	40365.0	1105	39260	12367	0

C) Additional Solar electric Power system requirement –

In view of requirement of Additional Solar electric Power system in campus by management, it has been assessed Additional Solar electric Power system capacity required to be installed & add to existing to offset entire energy procurement from MSEDCL.

Connection No-	Month	Total KWH	Solar Generation during preceding year					
			Installed Capacity in KW	Generated KWH	No of days	Average KWH /Day	Average Sun Hours per day	Average Power generation per hour KW
164810025525	April-22 to March -23	12	0	0	365			
164810025517	April-22 to March -23	9566	0	0	365			
164810071144	April-22 to March -23	19004	0	0	365			
164810303045	April-22 to March -23	39260	10	12367	365	34	5.2	6.5
164810025509	April-22 to March -23	4764	10	Data not available	365			
Total		72606						

Note – 1) Ladies hostel day time energy use on connection No-164810071144 is Considered 40 % of total KWH.

3) Science Building day time energy use on connection No-164810303045 is considered 50 % of total KWH.

4) Administrative Building day time energy use on connection No-164810025509 is considered 40 % of total KWH.

5) Existing solar Photo Voltaic panels surfaces are not found cleaned. Hence it affects badly on solar power generation. Solar Photo Voltaic panel's surfaces shall be cleaned periodically to maintain good generation efficiency.

Cost Analysis-

Additional capacity for total offset in						Average cost of power	Saving in Energy Cost	Capital Cost of solar system		Pay Back period
Total KWH	No of days in year	KWH/Day	Average Sun Hours per day	De-rating factor	Total KW	Rs/KWH	Rs	Cost in Rs/KW	Total Cost in Rs	Years
38715.2	365	106	5.2	0.8	25	12.71	492070.2	55000	1402355	2.85

10). UPS LOADING STUDY-

There are two UPS working in science Building which caters exclusively load of computers. Loading study of all UPS has been carried out & following are major observation in output power measurement with respect to switched on load of computers.

Location	1-Phase UPS Details						12 V Battery			Loading Measured			
	Make	KVA	Input Volt	Output Volt	Hz	Input DC Volt	Volt	No	AH	Volt	Amp	KVA	% Loading
Science Building Computer Lab-1,2,3,6)	Sukam	7.5	220-240	230	50	192	12	16	190	204.1	24.5	5.0	67

Science Building Computer Lab-4,5,7)	Sukam	7.5	220-240	230	50	192	12	16	165	193.6	22	4.3	57
Admin Section	Michrotech	3	220-240	230	50	72	12	6	165	229	5.38	1.2	41
Library	Michrotech	3	220-240	230	50	72	12	6	165	230	1.4	0.3	11

	UPS Details					Measured Output power				Load Details		
Sr No	Make	DC Volt	Hz	Rating in KVA	Output Volt	KW	KVAR	KVA	PF	Location	No of PC	Average load per PC in Watt
1	Sukam	192	50	7.5	230	3.68	-3.38	4.99	0.737	Science Building Computer Lab-1,2,3,6)	93	40
2	Sukam	192	50	7.5	230	3.5	-2.43	4.26	0.822	Science Building Computer Lab-4,5,7)	64	55

11).REPLACEMENT OF EXISTING FTL WITH ENERGY EFFICIENT LED TUBE LIGHT

There is major load of lighting & fan in college campus. It has been told that most of replacement of existing FTL with energy efficient led tube light has been completed & minor work is remained. It is proposed to replace remaining FTL with energy efficient LED tube light. This Energy saving & conservation opportunities is mentioned below with cost benefit analysis based on annual average cost of power.

Existing	Proposed	Saving in

Type of lamp	No	Watt/unit(inclusive of choke watt)	Total Load including choke in Watt	Type of lamp	Watt/Lamp	Total Load including Driver in Watt	Watt
FTL T12	17	50	850	LED Tube light	18	306	544
FTL T8	67	44	2948	LED Tube light	18	1206	1742

Saving in	working hours per year	Saving in energy	Average cost of power	Saving in Amount Rs	Capital investment in Rs		Pay-back period
Watt	No	KWH	Rs/KWH	Rs	Cost per unit in Rs	Total Cost in Rs	Months
544	2200	1196.8	12.71	15211	400	6800	5
1742	2200	3832.4	12.71	48710	400	26800	7

Total Saving per annum in Energy – 5029 KWH

Total Saving Per Annum in Cost in Rs – 63921

12).REQUIREMENT OF DEDICATED DISTRIBUTION TRANSFORMER FOR COLLEGE

It has been studied voltage profile in measurement which indicates abnormality in Voltage magnitude & Voltage unbalance. This may be due to unbalance distribution of load on LT circuits emanating from transformer of MSEDCL or due to faulty transformer.

The adverse effects of abnormal & unbalance voltage exceeding permissible limit i.e. 2% are described as below.

1) Abnormal rise in supply voltage leads to damage electrical & electronics loads i.e. tube, fan, bulb , motor, PCS
2) Increment in power consumption by load & electricity bill.
3) Deterioration in performance of 3- Phase motor loads.
4) Increment in maintenance cost.
5) Disturbances in various activity due to unpredictable failures.
6) **Most of time isolation of Photovoltaic Solar power system from MSEDCL supply grid & this makes stop to deliver solar power to load & import maximum time**

costly power from MSEDCL grid leading to increase power procurement expenses imposing additional financial burden on college.

Hence it is strongly recommended to provide 50 KVA, 3-Phase dedicated distribution transformer for catering power supply to campus electrical & electronics load at almost balance voltage within permissible limit. This will lead to improve performance of load & reduce failure of electrical & electronics load leading to reduce maintenance cost. This will also help to reduce procurement of costly power from MSEDCL.

13).OBSERVATION & RECOMMENDATION-

1) **Administrative main Building- LT II A- 3-Phase Connection No-164810025509 NET Meter No-055-XD561718** - LT II-A billing tariff category is incorrect for college. Its tariff cost per KWH is higher than LT VII- B Public Other category by Rs 2.50 per KWH. You are procuring & paying higher cost unnecessary for KWH. So it is strongly recommended to get converted existing LT II-A billing tariff category into LT VII- B Public Other category from MSEDCL to save cost.
2) Solar energy generated KWH per day reading must be read daily & maintained in register regularly to know

   1) Total solar unit share in total annual consumption to work out cost saving

   2) Extreme variation to take timely corrective action to avoid financial loss by making Import costly MSEDCL power.
3) Solar energy project relieved college by & large from dependency on MSEDCL as well as relieved from costly power procurement from MSEDCL. Solar project also mitigated greenhouse gas emission leading to protect environment from pollution.
4) **Laboratory LT II Com 1-Phase (0--20KW) Meter No-09801488160 Connection No-164810025525-** 1-phase connection No-164810025525 is kept without any load (consumption) on it & **you are paying unnecessary fixed charges to MSEDCL making financial loss.** So it is recommended to get connection permanently disconnected in MSEDCL ledger to stop further billing.
5) It is necessary to watch & witness regularly whether MSEDCL representatives reads monthly regularly & correctly to avoid any exorbitant cost of accumulated KWH units

6) It is necessary to wash & clean regularly dirt & dust deposited on photovoltaic solar power panel to get optimum output power.

7) **Recommendation For Reduction In Quantity Of MSEDCL Service Connection—** Modification suggested on following remaining MSEDCL NET metering connection

Main Administrative Building Connection No-164810025509	Science Building Connection No-164810303045
Divert existing load from connection No-164810025525, 164810025517, and 164810071144 to Main Building Connection No-164810025509 & operate it from Connection No-164810025509. The Ladies hostel shall be provided own meter of college to measure, monitor & control electricity use in ladies hostel. Similarly boys hostel shall be provided separate meter to measure, monitor & control electricity use.	**No Changes**

8) **Analysis of Connected Load Mix in Campus**

The total inventoried load has been classified as below.

Sr No	Type of load	Total Watts	% On Total
1	Lighting Load	10621	17.43
2	Fan Load	18995	31.17
3	Air conditioning	6493	10.65
4	Fridge load	1320	2.17
5	Heating Load	8650	14.19
6	PC load	5720	9.39
7	other electronic Load	4130	6.78
8	Water pump/ RO system	4410	7.24
9	Water cooler	600	0.98
	Total	**60939**	**100**

9) **Supply Voltage from MSEDCL is very unbalance & abnormal. This is hazardous & detrimental to connected electrical & electronic loads.**

10) **Requirement of dedicated distribution transformer for college**

It has been studied voltage profile in measurement which indicates abnormality in Voltage magnitude & Voltage unbalance. This may be due to unbalance distribution of load on LT circuits emanating from transformer of MSEDCL or due to faulty transformer.

The adverse effects of abnormal & unbalance voltage exceeding permissible limit i.e. 2% are described as below.

1) Abnormal rise in supply voltage leads to damage electrical & electronics loads i.e. tube, fan, bulb , motor, PCS

2) Increment in power consumption by load & electricity bill.
3) Deterioration in performance of 3- Phase motor loads.
4) Increment in maintenance cost.
5) Disturbances in various activity due to unpredictable failures.
6) **Most of time isolation of Photovoltaic Solar power system from MSEDCL supply grid & this makes stop to deliver solar power to load & import maximum time costly power from MSEDCL grid leading to increase power procurement expenses imposing additional financial burden on college.**
7) Hence it is strongly recommended to provide 50 KVA, 3-Phase dedicated distribution transformer for catering power supply to campus electrical & electronics load at almost balance voltage within permissible limit. This will lead to improve performance of load & reduce failure of electrical & electronics load leading to reduce maintenance cost. This will also help to reduce procurement of costly power from MSEDCL.

11) The measured power of earlier motor & replaced motor does not differ much. The measured power factor of motor is very poor due to failure of capacitor connected across it. So power capacitor of 6KVAR rating shall be connected across motor to reduce KVA demand of motor & improve power factor of motor load.

12) It is proposed to replace remaining FTL with energy efficient LED tube light.

13) **Submit application to MSEDCL in regard to application of load up to 20KW on Main Administrative Building Connection No-164810025509 & Science Building Connection No-164810303045 under LT VII- B Public Other tariff category**

(Note- You are requested to refer entire report also to understand things clearly)

14).LIST OF INSTRUMENT USED FOR MEASUREMENT IN ENERGY AUDIT

Sr No	Instrument Name
1	3- Phase Electric Power Analyzer
2	Lux Meter
3	Thermometer
4	Whirling psychomotor
	Measuring tape

Co ordinator
IQAC, K. J. Somaiya College
Kopargaon, Dist. A.Nagar

K. J. Somaiya College of Arts Commerce & Science, Kopargaon Estd

Principal
K. J. Somaiya College of Arts
Commerce & Science, Kopargaon

ADITI ENGINEERING SERVICES NASHIK

Consultant in – Energy Management, Energy Audit, Electrical Safety Audit, MSEDCL Grievances, 33 & 11 KV Substation Testing & Earthing Design, HT /LT Industrial Installation, Power Factor & Harmonics Solution.

Firm Address- Flat No-604, Hari Aakruti Apartment, opposite Aananda Laundry, Pakhal Road, Dwarka, Nashik-422011

Proprietor - Er. Deokar B. L. Mo. No- 9960691191 Email -bldeokar61@gmail.com

Tax-Invoice

To, Dt- 8-05-2023

The Principal,

Kopargaon Taluka Education Society's K J Somaiya Senior & K.B. Rohmare Junior College
Kopargaon, District- Ahmednagar

Sub- Tax-Invoice for Energy Audit of College.

Ref-Your work order Dated 17-04-2023

Dear Sir,

In pursuance of your work order in respect to Energy Audit College, We have conducted energy audit of college. The energy audit report & certificate is submitted herewith along with tax invoice against cost of engineering services toward Energy Audit.

Bank current account details are given below for on line payment.

Firm name- Aditi Engineering Services, Nashik Bank- ICICI Bank Branch – Bodhalenagar, Nashik
Current Account No- 186805000718 IFSC – ICIC0001868

Sr No	Energy Audit of Industry name	Unit	Rate	Total in Rs
1	Energy Audit of college & submission of its Technical Report.	Job-1	20,000=00	20000=00

Total amount Rupees in word- Twenty Thousand Only.

(GST is not applicable at present to firm)

Yours faithfully,

Thanks

Er. Deokar B. L.

Certified Energy Auditor EA-2700

(Bureau of Energy Efficiency Govt. of India)

Accountant

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Somaiya College of Arts Estd