

# Energy Audit Report

OF

ST . BEDE'S COLLEGE NAVBAHAR  
SHIMLA ,H.P -171002



**Conducted By**

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## EXECUTIVE SUMMARY

Energy is one of the most important in Industrial development, and, as such, acts as a key factor in determining the economic development of all countries. The Indian energy sector has witnessed a rapid growth. However, resource augmentation and growth in energy supply have failed to meet the ever-increasing demands exerted by consumers. The higher energy consumption also create serious environment issues, affect our ozone layer.

As per BEE prevailing guidelines The interval of time for conduct and completion of subsequent energy audits shall be three years with effect from the date of submission of the previous energy audit report by the accredited energy auditor to the management of the designated consumer.

The Energy Audit helps to reduce the demand & supply gap in some extent and protect ozone layer as well as our environment. In general, Energy Audit is identifying the areas where Energy **waste can occur**, and where scope for **improvement exists**. Ultimately it will reduce the energy demand at same level of outcomes. And with this objective, the **Energy Audit of St. Bede's College Navbahar Shimla** has been carried out.

Based on our observations of the various areas, we have identified certain potential areas for energy conservation opportunities, which are summarized in the table as under

### Energy Conservation Opportunities

#	Item	Saving potentials in lacs			PBP
		kWh	Amount	Investment	
	Narration				
	Replace 1x36&2x36 Watt CFL300 lights with 20 watt LED lights	7132	42150	45000	13 Month
i	Shift Part of load from 52.2 Kw connection No 4 on Connection 1 & 2 to use unutilised solar power	6933	40000	5000	1.5 Month
iii	Reduce the contract demand from 52.2 KVA to 40 KVA	nil	16800	nil	
	Total	14065	98950	50000	

#### In addition

1. Generation of the solar plants is around **2.8 kWh per kWp per day**

where as it should be **4.5 kWh per Kwp per day** . Proper **cleaning of cells** be given **prime importance** and also take up issue with contractor as these must be under gaurantee .



Er. S.K.KANSAL AEA-0129

ENKON ENGINEERS

# 249, Phase-II, Housing Board,  
Baddi, Distt. Solan, HP-173205

DATE: 21.10.2024

## 1. ACKNOWLEDGEMENT

In response to the **Service order by St. Bede's College**, Our Energy Audit team has carried out the Energy Audit carried out study of the campus of **M/s , St. Bede's College Located at Chota Shimla –Sanjauli Road Navbahar Shimla on 9<sup>TH</sup> October 2024**

After the detailed study our team has analysed usage of all Energies used for various operations in the college & detailed report has been prepared with **“Energy Efficiency Probabilities**.

**Enkon Engineers expresses sincere thanks** to the Management of **“St. Bede's College** particularly


- **Prof Dr. Molly Abraham ( Principal)**
- **Dr. Shweta Thakur ( NAAC Coordinator )**
- **Dr. Sapna Sharma Incharge Energy Audit**
- **Mr. Amit Katoch Member Energy Audit team**
- **Mr. Salil Sud ( Office )**

For their kind assistance and co-operation to carry out this Energy Audit study, we express our thanks to the officers, technicians, staff and plant operators who have rendered their valuable assistance directly or indirectly.

The Following team members from Enkon Engineers were engaged in this study,

- **Sh. S.K. Kansal - BEE Accredited Energy Auditor ( AEA-0129)**
- **Sh. Arvind Saini Executive Engineer**
- **Sh. Rattan Chand Assistant Engineer**

**DATE: 21.10.2024**

  
**Er. S.K.KANSAL AEA-0129**  
**ENKON ENGINEERS**  
**# 249, Phase-II, Housing Board,**  
**Baddi, Distt. Solan, HP-173205**

## **1.2. INTRODUCTION**

St. Bede's College, Shimla, established in 1904, is a historical and educational landmark of North India. The college is located in the picturesque surroundings against the backdrop of the Hill ranges. It has a vast campus, spread over ten acres of land with green lawns and elegant buildings of much sprawling architectural merit. The college has excellent infrastructure, with state of the art Laboratories, Seminar room ,Amphitheatre, Library, Playground and Cafeteria.

The campus is Wi-Fi enabled. Being a multi-disciplinary, co-educational institution it has approximately 1000 students pursuing different courses in Arts, Commerce and Science streams which aims primarily at providing quality higher education and training to women.

It is engaged in equipping students with relevant and appropriate skills, attitudes and experiences, for meeting the challenges of the life. The institute was Re-Accredited with A grade in 4th cycle by NAAC in 2024. It has also been granted College with Potential for Excellence, Heritage Status by UGC, CURIE grant by DST, Govt. of India, and Star College Grant by DBT, Govt. of India.

### **Scope of Work**

- **Review of electricity bills, Contract Demand and Power Factor .**
- Detailed study of Transformer operation, their operation pattern, No load losses etc. Power Factor measurement on individual PDBs Under different loading conditions and advise for improvement if any, the study will also cover possible improvement in metering assessment losses in distribution network etc. wherever feasible.
- Study of illumination system at different location and suggest the measures for improvement wherever feasible. Lux level measurement in various areas.
- Study of Various M/C's and find out load pattern of major M/Cs, suggest the measures for improvement wherever feasible.
- Study of air compressors, evaluation of FAD, SEC, feasibility of pressure optimization, study of reduction in power consumption etc., wherever feasible / improvement.
- Detail study of current harmonics and voltage harmonics level at transformer output, at source and suggest the measures for improvement where ever feasible
- Study of capacitor bank performance installed at various location with current drawn and suggest the measures for improvement where ever feasible

## Methodology

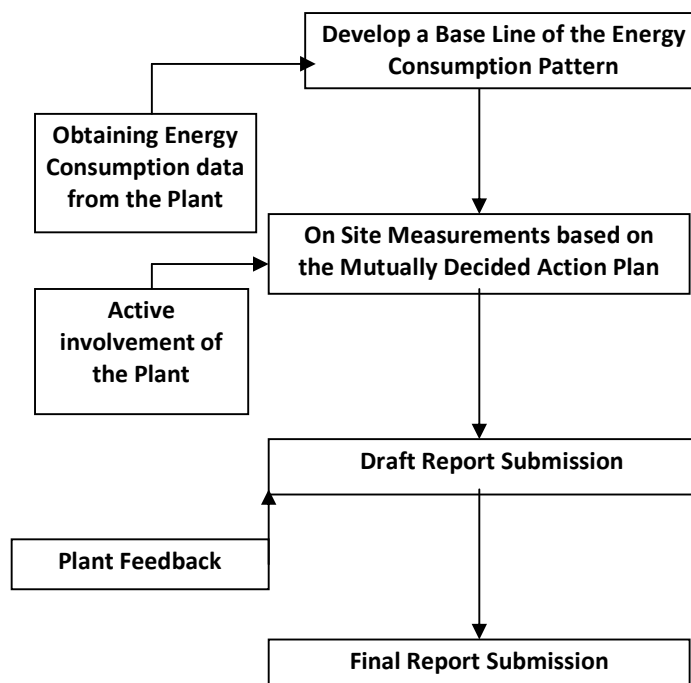
Methodology adopted for achieving the desired objectives viz: an assessment of the current utilization and energy saving opportunities include the following:

Discussions with the Energy Head, & college Head, Maintenance Head to finalized the action of plan.

A team of engineers under guidance of Accredited Energy Auditor visited the college, held Discussions with the concerned officials/supervisors to collect data on the operations and Load Distribution of Power.

Online Data collection at site with the help of appropriate portable instruments including continuous recording, instantaneous reading indicator, visual observations &

historical data were make to identify the energy losses in the system. Computation and **in-depth analysis of the collected data, as appropriate done to draw inferences and to of the collected data, as appropriate done to draw inferences and t evolve a suitable energy conservation plan/s for improvements/ reduction in specific energy consumption.**



### **Instrumentation Support**

Some of the instruments used for undertaking the audit include the following:

1. **Three Phase Power Manger with appropriate CTs & PTs for HT & LT Power measurements with recording facility, : 2 nos Clamp-on type Kilowatt, Power factor, Voltage and Ampere Meters.**
2. **Lux Meter**
3. **IR thermometer**
4. **Thermo vision camera.**

### 1.3. BASE LINE DATA

Brief description of assignment	Energy Audit of <b>St. Bede's College Navbahar Shimla</b>
Name & Address of Company	<b>St. Bede's College Located at Chota Shimla –Sanjauli Road Navbahar Shimla</b>
Address of communication With energy auditors	Enkon Engineers ,249 , Housing Board Phase II Baddi Distt Solan H.P -173209 ,
Profession	Educational Institute
Weekly Working	<b>6 days week</b>
Annual Working Days	<b>200 days</b>
<b>Power power supply</b>	<b>From HPSEB -4 connections + Solar 34 Kwp</b>
Connected Load	<b>85.48 Kw</b>
Contract demand	<b>52.4 KVA of one 3 Phase connection</b>
Power supply Level	400 Volts
Average Unit Power Cost	<b>Rs.8.15 per kvah</b>
<b>Annual cost of energy consumption : 9/23 to 8/2024</b>	
Purchased from <b>Grid in FY 23-24</b>	<b>29920 kwh</b>
<b>Annual cost of energy consumption : 9/23 to 8/2024</b>	<b>Rs 244054/-</b>
<b>Solar Plant capacity</b>	<b>34 kWp</b>
<b>Solar Generation 4/23-9.10.24</b>	<b>19256 kWh</b>

## 2. STUDY OF CONNECTED LOAD

Our team has collected the connected load of Whole campus . Area wise , room wise detail is tabulated as under

### AREAWISE CONNECTED LOAD

Block	Area	Description	Watt	Qty.	Total	
<b>D</b>	<b>Computer Lab 1</b>	PC Set		35	0	
		LED Light	20	12	240	
		Ex.Fan	150	2	300	
		Projector	400	1	400	
		UPS	10000	2	20000	
						0
	<b>Class Room</b>	Led Light	20	24	480	
		Lamp	100	1	100	
						0
	<b>Auditorium</b>	CFL 1*36	36	4	144	
		LED Round	14	106	1484	
		Led Fog light	70	5	350	
		Halogen Light	1	1000	1000	
		Music system	1	240	240	
						0
<b>C</b>	<b>Physics Lab C-1</b>	CFL 2*36	72	11	792	
		Lamp	200	1	200	
		LED	20	16	320	
	<b>C-2</b>	CFL 2*36	72	6	432	
	<b>C-3</b>	CFL 2*36	72	6	432	
		Hot Air Oven	2000	1	2000	
		Water Incubator	2000	1	2000	
		Research Centrifuge	1000	1	1000	
		Refrigerator	500	1	500	
		BOD	1500	1	1500	
		Auto Clave	4000	1	4000	
	<b>C-4 Bio Lab</b>	CFL 1*36	36	9	324	
		CFL 2*36	72	1	72	

		Incubator Remi	1500	1	1500
		Auto Clave	4000	1	4000
					0
	<b>C-5 Computer Lab</b>	PC		12	0
		CFL 2*36	72	6	432
	<b>C-6</b>	CFL 1*36	36	9	324
		CFL 2*36	72	1	72
		LED	20	1	20
	<b>C-7</b>	FTL	40	6	240
	<b>Reception</b>	LED 2*2	42	2	84
		Hot pillar	1000	1	1000
		Photo copier	1000	1	1000
<b>B</b>	<b>B-1 Lab</b>	CFL 1*36	36	9	324
		LAMP	15	1	15
		HEATER	1000	1	1000
		EX. FAN	300	8	2400
		GYSER	2000	2	4000
		OVEN	4000	1	4000
		MUFEL FURNACE	4000	1	4000
		LED 2*2	42	17	714
		EX. FAN	450	4	1800
	<b>B-2 PG BOTANY LAB</b>	CFL 1*36	36	6	216
		EX. FAN	300	2	600
		LAF	500	1	500
		AUTO CLAVE	4000	1	4000
		LED 2*2	42	15	630
		REFRIGRATOR	400	1	400
		OVEN	2000	1	2000
	<b>B-5</b>	LED	36	8	288
		LED	20	4	80
	<b>B-3</b>	CFL 1*36	36	8	288
		OVEN	2000	1	2000
		LAMP	45	1	45
	<b>B-4</b>	CFL 1*36	36	6	216



		LED	20	4	80
	<b>B-8 TO B-17</b>	CFL 1*36	36	75	2700
		LED	20	10	200
	<b>CORRIDOOR</b>	CFL 1*36	36	8	288
	<b>OFFICE POLITICAL SCIENCE</b>	CFL 1*36	36	2	72
	<b>STAFF ROOM</b>	LED	20	3	60
		PC		3	0
		Printer	500	1	500
		Hot pillar	2000	1	2000
		oven	2000	1	2000
	<b>Deptt. Office English</b>	led	20	1	20
	<b>Store</b>	REFRIGRATOR	500	1	500
		MOCROWAVE	2000	1	2000
		INDUCTION HEATER	1500	1	1500
		GYSER	2000	1	2000
	<b>ACCOUNT OFFICE</b>	LED	20	4	80
		Photo copier	500	2	1000
		PC		2	0
		Printer	1000	1	1000
	<b>GENRAL OFFICE</b>	LED	20	4	80
		PC		2	0
		PRINTER	500	1	500
		HOT PILLER	2000	1	2000
	<b>PRINCEPLE OFFICE</b>	LED 2*2	42	4	168
		PC		1	0
		PRINTER	500	1	500
		LCD TV	500	1	500
<b>A</b>	<b>A-1</b>	ROOM HEATER	1000	1	1000
		FTL	40	2	80
		LED 2*2	42	16	672
		CFL 1*36	36	2	72
		PROJECTOR	500	1	500

	<b>A-2</b>	LED 2*2	42	12	504
		PC		1	0
		HEATER	1000	1	1000
	<b>A-3</b>	CFL 1*36	36	20	720
		REFRIGATOR	500	1	500
		GYSER	2000	1	2000
		EX. FAN	300	2	600
		OVEN	2000	1	2000
	<b>CORRIDOOR</b>	FTL	18	4	72
	<b>A-4</b>	CFL 1*36	36	6	216
	<b>A-6 TO A-13</b>	CFL 1*36	36	30	1080
	<b>CORRIDOOR</b>	CFL 1*36	36	4	144
	<b>SEMINAR ROOM</b>	LED TV 82"	500	1	500
		CFL 1*36	36	6	216
		LAMP	15	3	45
	<b>HINDI DEPTT.</b>	CFL 1*36	36	1	36
	<b>LIBRARY GF</b>	LAMP	18	30	540
		CFL 1*36	36	8	288
		PC		12	0
		PRINTER	500	1	500
	<b>LIBRARY GF</b>	CFL 1*36	36	20	720
		LED	20	20	400
	<b>CANTEEN</b>	LAMP	7	15	105
		CFL 1*36	36	3	108
		REFRIGATOR	500	1	500
		MICROWAVE	2000	1	2000
		WATER COOLER	1000	1	1000
		COFEE M/C	1000	1	1000
		WATER DISPENSOR	500	5	2500
	<b>COMMON ROOM GYMNOSIUM</b>	CFL 1*36	36	33	1188
		EX. FAN	300	1	300
			Total	Watts	119352
			Total	KW	119.352

## **CONCLUSION :**

From details we observed that

1. Total connected load of the college campus is 119 kW whereas the sanctioned load is 85.48 kW .
- 2 . In few areas approximately **300 No CFL- 1x36Watt & 2x36Watt** are installed for lighting Purposes.

## **RECOMMENDATIONS**

In fact **CFLs are being banned** around the world due to the **negative impact these bulbs have on the environment**. Also CFL bulbs use more energy and resources than the LEDs. And CFLs also contain small **amounts of mercury that is harmful to the environment, people, and animals**.

**Thus these be replaced with LED 20 Watt**. as LED lights has **projected life 25000 hours in place of 10000 hrs of CFL** . Similarly **LED 8 Watt Lux Level is equivalent to 14 Watt CFL or 60 Watt incandescent Lamp** .

### **PAY BACK PERIOD**

	Watt	Quantity	Total	Unit
CFL 2*36	72	31	2232	Watt
CFL 1*36	36	269	9684	Watt
	108	300	11916	
Repace With LED 20 Watts	20	150	3000	Watt
Reduced Light Load	A-B		8916	Watt
Average running 4 hours per day for 200 Days per year				
Annual Energy saved		8.916 x4x200	7132	Kwh
Cost of Energy Saved	@Rs 5.91 X7132		42150	Rupees
Cost of LED 20 watt Bulb @ 300/-			Rs300/- per bulb	Rupees
Total cost of replacement 300x150			45000	Rupees
Pay back period			45000/42150	1.1 Year

### 3. POWER SUPPLY SOURCES

The Institution is using Power supply from Two Sources

1. HPSEBL through four Electric connections
2. **Green Power** from in House Solar Generation Capacity 34 Kw.

#### **A. HPSEB POWER**

There are four electric Connections at the college premises. And after commissioning Grid Connected Solar Power plant HPSEB has provided import & export energy Meters on three connections for recording both import & export power & fourth connection is only for import of power from HPSEB .

#### **B. SOLAR GENERATION**

Four Grid connected Solar Power Plants as per Capacity below has been provided in the college premises in 2023 by HIMURJA ( Table -1 )

Sr. No	Location	Capacity/Unit	No of units	Total kWp	ThreePhase /Single Phase
1	Auditorium roof top	20 kWp	1	20 kWp	3 Phase
2	Auditorium roof top	6 kWp	1	6 kWp	Single Phase
3	Auditorium roof top	4 kWp	2	8 kWp	2x Single Phase
	Total			34 kWp	

#### **C. POWER PURCHASED**

Monthly energy bills of all the four connections have been collected from the collage for last one year i.e. from 09/23 to 08/24.

The Bills have been analysed and the result of our study are as under. Three connections do import & export energy, and fourth connection is used only for import of power.

**i). AC No. 1111404107 (Meter No. A1043848)**

This is a single phase import & export meter connect with solar having **sanctioned load 9.86 kW** . Energy received from HPSEB & Generated by **Solar 6 kWp** is recorded by this meter. **Month wise details are as under**

**( Table 2 )**

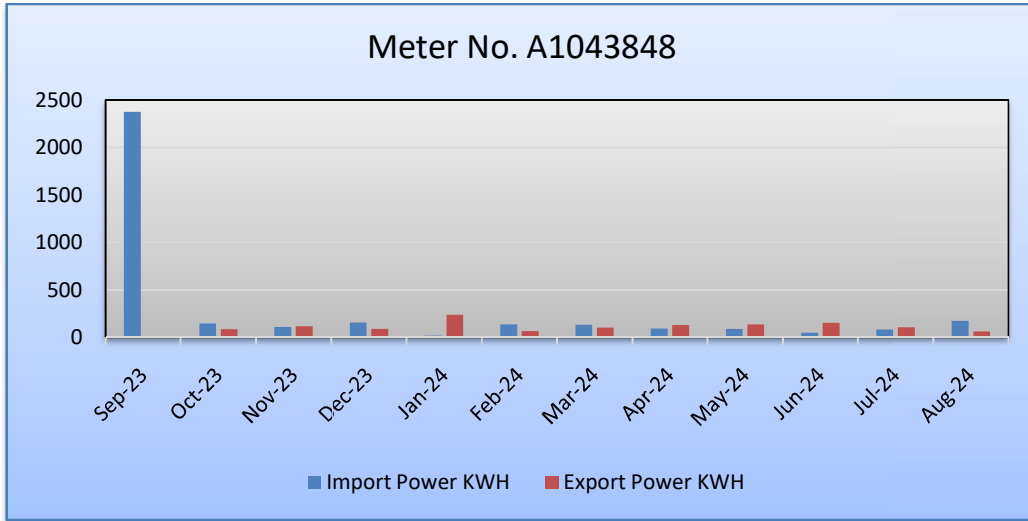
Month	Import Power KWH			Export Power					
Month	Old Reading	New Reading	Import Power kWh	Old Reading	New Reading	Export Power kWh	Consumption Units	Carry forward Units	Monthly Bill Amount
Sep-23	0	2375	2375	0	0	0	2375		13639
Oct-23	2375	2521	146	0	86	86	60	0	489
Nov-23	2521	2628	107	86	200	114	0	7	143
Dec-23	2628	2787	159	200	287	87	65	0	517
Jan-24	2787	2804	17	287	524	237	0	22	148
Feb-24	2804	2939	135	524	588	64	0	149	138
Mar-24	2939	3069	130	588	689	101	29	0	412
Apr-24	3069	3160	91	689	818	129	0	38	143
May-24	3160	3249	89	818	953	135	0	84	148
Jun-24	3249	3299	50	953	1107	154	0	188	143
Jul-24	3299	3380	81	1107	1213	106	0	213	148
Aug-24	3380	3554	174	1213	1275	62	0	101	148
			3554			1275		802	16216

**CONCLUSION** : From above detail we find that **802 kWh generated by Solar unit** connected to this meter has been carried forward as per energy settlement policy of HP Govt given below .

**Energy Billing and Settlement**

- **A bi-directional meter** records both the electricity consumed from the grid and the electricity exported back to the grid.
- Consumers are billed based on the **net energy** consumed (imported energy minus exported energy).
- **Settlement Period**: Energy credits are settled on a monthly basis, and any excess energy credits can be carried forward to the next billing cycle. **At the end of the financial year, any unutilized credits will lapse.**

### Trend of Import & export power



### ii). AC No. 1111404108 (Meter No. A1034927)

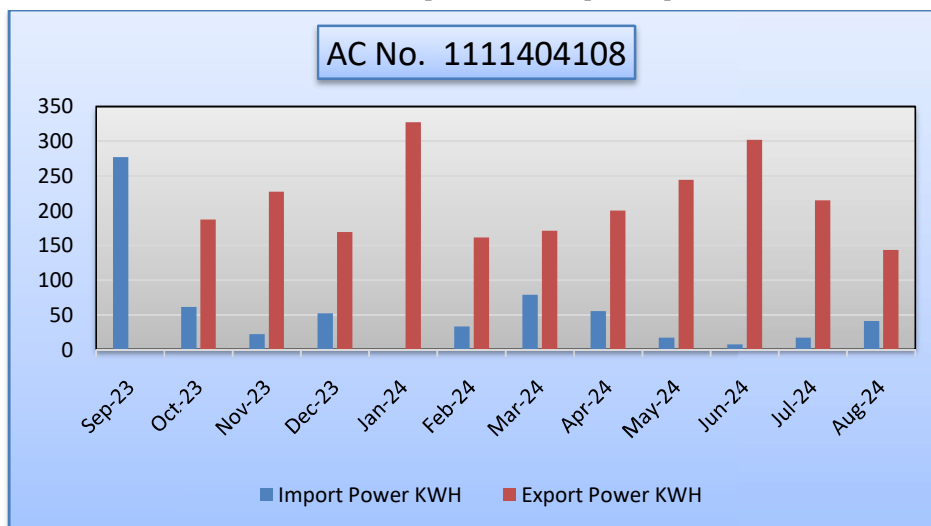
Monthly energy bill of AC No. 1111404108 (Meter No. A1034927) is single phase import & export meter connect with **solar 4x2 kWp** . Connected load 9.18 KW Energy received from HPSEB , Generated by **Solar** is recorded by this meter. **Month wise details are as under ( Table 3 )**

Month	Import Power kWh			Export Power					
Month	Old Reading	New Reading	Import Power kWh	Old Reading	New Reading	Export Power kWh	Consumption Units	Carry forward Units	Bill Amount
Sep-23	4475	4752	277	0	0	0	277		1865
Oct-23	4752	4813	61	0	187	187	0	126	147.78
Nov-23	4813	4835	22	187	414	227	0	331	143
Dec-23	4835	4887	52	414	583	169	0	448	147
Jan-24	4887	4887	0	583	910	327	0	775	148
Feb-24	4887	4920	33	910	1071	161	0	903	138
Mar-24	4920	4999	79	1071	1242	171	0	92	248
Apr-24	4999	5054	55	1242	1442	200	0	217	143
May-24	5054	5071	17	1442	1686	244	0	464	148
Jun-24	5071	5078	7	1686	1988	302	0	759	143
Jul-24	5078	5095	17	1988	2203	215	0	957	148
Aug-24	5095	5136	41	2203	2346	143	0	1059	148
<b>Total</b>			<b>661</b>			<b>2346</b>		<b>6131</b>	<b>3566.78</b>

## CONCLUSION

From above detail we find that **6131 kWh** generated by Solar unit connected to this meter has been carried forward as per energy settlement policy of HP Govt Policy explained above

### Trend of Import & export power



### iii). AC No. AC1111404626 (Meter No. B2201852)

Monthly energy bill of **AC No. AC1111404626 (Meter No. B2201852)** is three phase import & export meter connect with solar. **Connected load 14.24 kW** Energy received from HPSEB , Generated by **20 kWp Solar** is recorded by this meter. **Month wise details are as under ( Table 4 )**

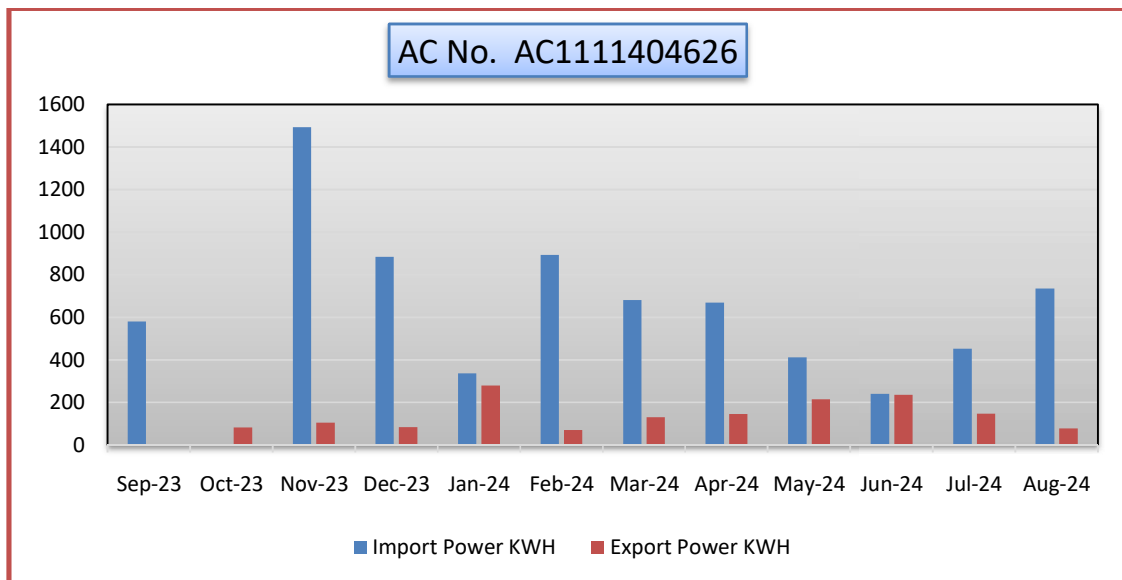
Month	Import Power kWh			Export Power			Consumption Units	Carry forward Units
	Old Reading	New Reading	Difference	Old Reading	New Reading	Difference		
Sep-23	11337	11917	580	0	0	0	580	0
Oct-23	11917	11917	0	0	82	82	628	0
Nov-23	11917	13410	1493	82	188	106	677	0
Dec-23	13410	14294	884	188	271	83	801	0
Jan-24	14294	14630	336	271	550	279	57	0
Feb-24	14630	15523	893	550	620	70	823	0
Mar-24	15523	16204	681	620	750	130	551	0
Apr-24	16204	16873	669	750	895	145	524	0

<b>May-24</b>	16873	17284	411	895	1110	215	196	0
<b>Jun-24</b>	17284	17524	240	1110	1346	236	4	0
<b>Jul-24</b>	17524	17976	452	1346	1493	147	305	0
<b>Aug-24</b>	17976	18711	735	1493	1571	78	657	0
<b>Total</b>			<b>7374</b>			<b>1571</b>		

**CONCLUSION :**

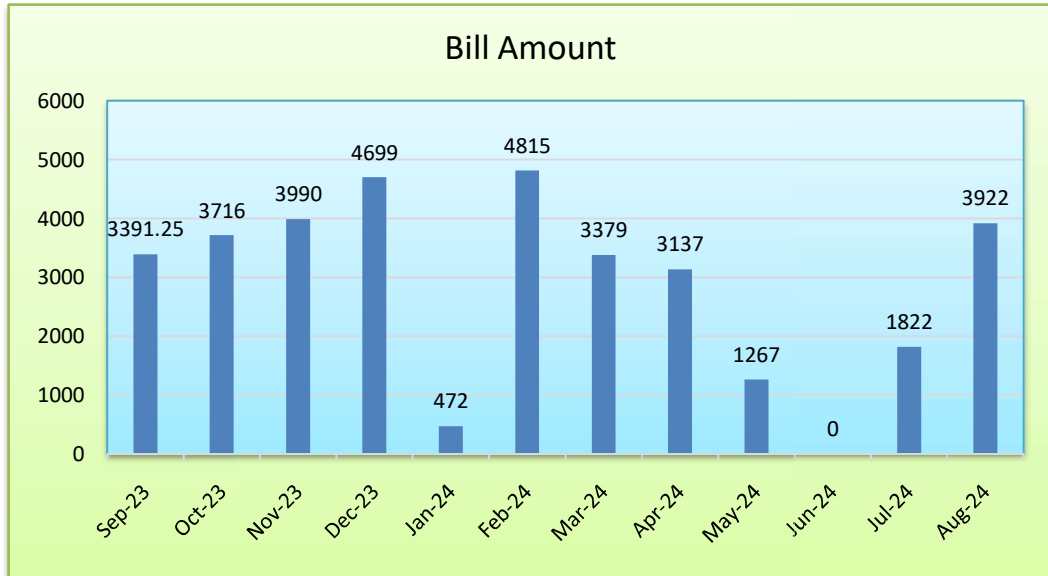
From above detail we find that **all units generated by Solar unit** connected to this meter has been used by the institute & there is no carry forward .

**Trend of Import & export power**

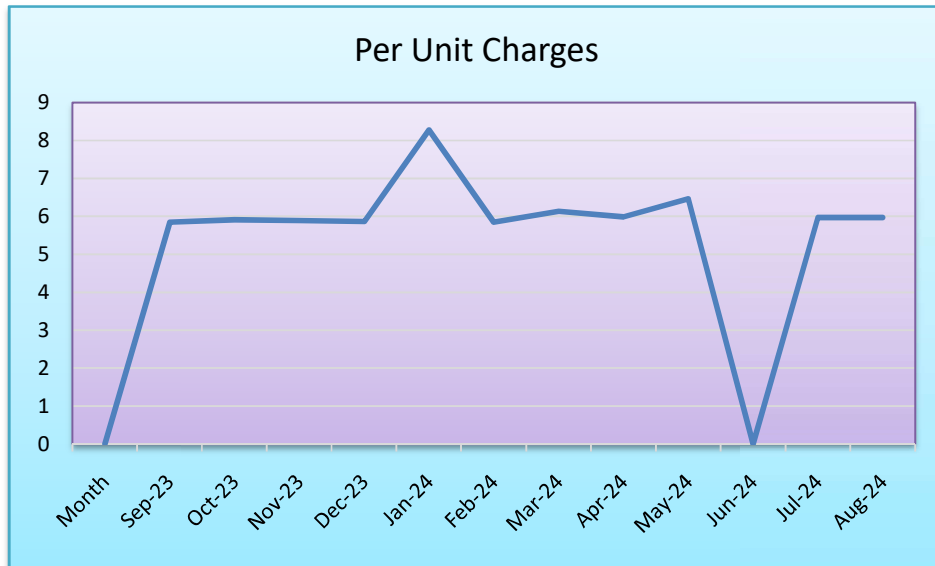




### Trend of monthly bill



### Rs. Per unit charges



**iv). AC No. 1111411051(Meter No. B2202559)**

This is three phase meter uses for direct HPSEB supply for sanctioned load 52.20 kW

**( Table 5 )**

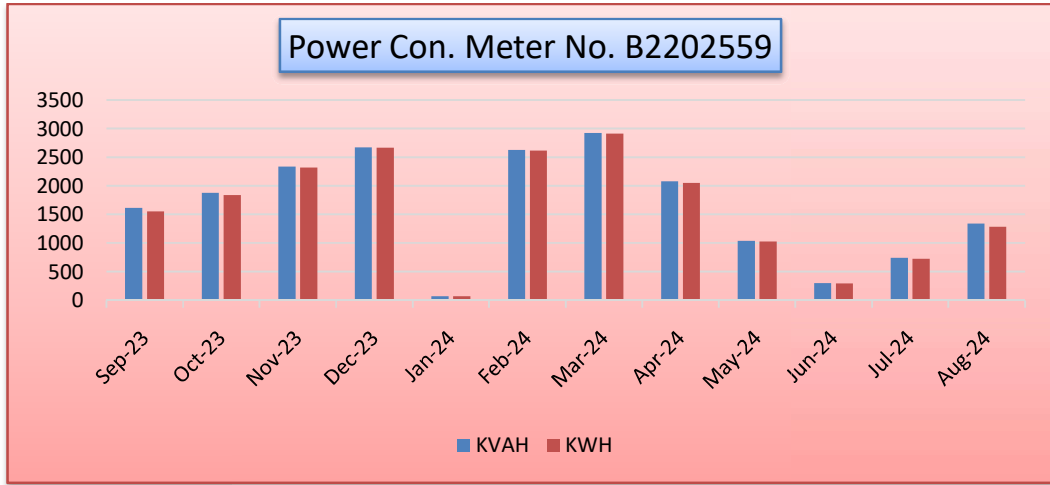
Month	kVah			kWh				
Month	Old Reading	New Reading	kVah	Old Reading	New Reading	kWh	Power factor	Bill Amount
Sep-23	1114.415	1194.9	1609.66	1098.653	1176.326	1553.46	0.97	16917
Oct-23	1194.898	1288.7	1876.26	1176.326	1268.267	1838.82	0.98	17049
Nov-23	1288.711	1405.5	2335.9	1268.267	1384.299	2320.64	0.99	19704
Dec-23	1405.506	1539.3	2675.24	1384.299	1517.57	2665.42	1.00	21834
Jan-24	1539.268	1542.9	73.42	1517.57	1521.163	71.86	0.98	6636
Feb-24	1542.939	1674	2621.6	1521.163	1651.842	2613.58	1.00	21354
Mar-24	1674.019	1820.2	2924.44	1651.842	1797.55	2914.16	1.00	23213
Apr-24	1820.241	1924.1	2078.16	1797.55	1900.264	2054.28	0.99	18573
May-24	1924.149	1976.2	1041.64	1900.264	1951.703	1028.78	0.99	12333
Jun-24	1976.231	1991.3	300.42	1951.703	1966.448	294.9	0.98	7365
Jul-24	1991.252	2028.3	741.92	1966.448	2002.706	725.16	0.98	10571
Aug-24	2028.348	2095.2	1337.28	2002.706	2066.886	1283.6	0.96	14113
			19615.9			19364.7	0.99	189662

**CONCLUSION :**

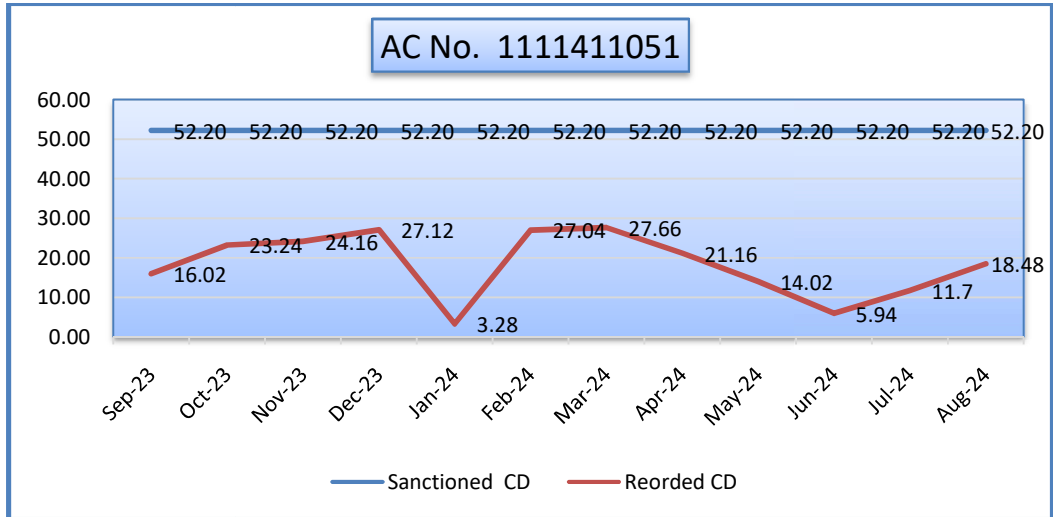
From this connection

1. Total 19616 kWh energy has been used in college in past one year .
2. Sanctioned CD is 52.2 KVA where as actual recorded is max 27.7 KVA .
3. Because of two part tariff and less consumption average per unit charges comes to Rs 23/- per kVah and in Jan 2024 it was around Rs 90/- per kVah .

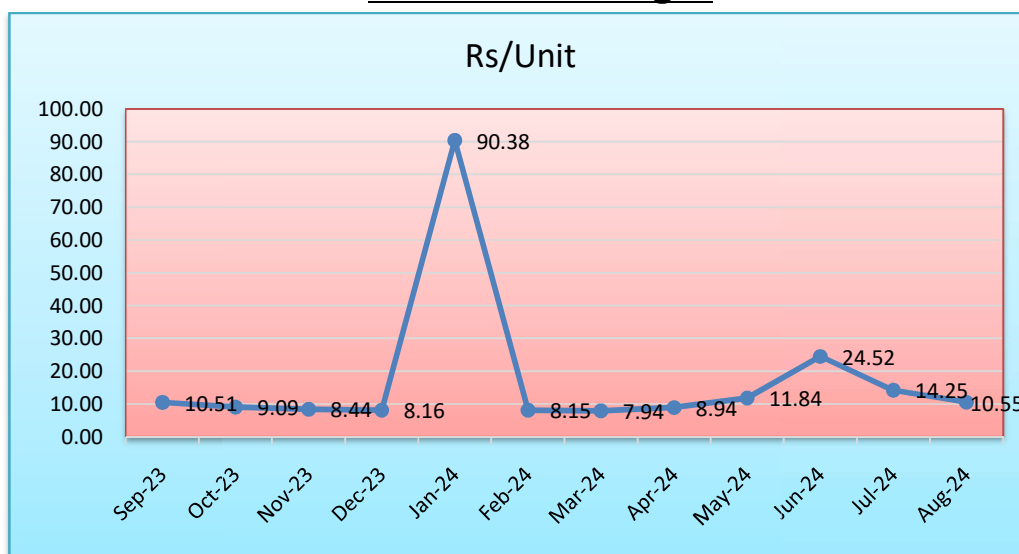
### Trend Import Power



### Trend Usage of CD



### Rs. Per unit charges



### **ABSTRACT OF ALL THREE METERES POWER SUMMARY ( Table 6 )**

Sr No	Connection No & Type	Conne cted Load	Import Power kWh	Export Power kWh	Units Consum ed in College	Carry forward Units	Monthly Bill Amount
1	AC No. 1111404107 <b>Single Phase</b>	9.86	3554	1275	2529	<b>802</b>	16216
2	AC No. 1111404108 <b>Single Phase</b>	9.18	661	2346	277	<b>6131</b>	3566.78
3	AC No. AC1111404626 <b>Three Phase</b>	14.8	7374	1571	5803	0	34610.25
	Total Sum		11589	5192	8609	9133	54393.03

Sr. No .	Connection No & Type	Connected Load	kVah	kWh	Power factor	Sanctioned Contract Demand	Recorded C.D Max Peak winter	Bill Amount
4	AC No. 1111411051 <b>Three Phase</b>	52.20	19615.9	19364.7	0.99	52.20	27.66	189662

### **Contract Demand & usage ( Table 7)**

Month		85% of CD 44.37	Rs @140/KVA		
Month	Sanctioned CD	Recorded CD	Demand Charges	% of CD usages	Excess Pay for Non used CD
Sep-23	52.20	16.02	6211.8	31%	3969
Oct-23	52.20	23.24	6211.8	45%	2958.2
Nov-23	52.20	24.16	6211.8	46%	2829.4
Dec-23	52.20	27.12	6211.8	52%	2415
Jan-24	52.20	3.28	6211.8	6%	5752.6
Feb-24	52.20	27.04	6211.8	52%	2426.2
Mar-24	52.20	27.66	6211.8	53%	2339.4
Apr-24	52.20	21.16	6211.8	41%	3249.4
May-24	52.20	14.02	6211.8	27%	4249
Jun-24	52.20	5.94	6211.8	11%	5380.2

## **OBSERVATIONS & RECOMMENDATIONS**

From above details we have concluded

1. That the college has provided grid connected **Solar Power Plant of 34 kWp capacity on Roof top of the college Auditorium.**
2. HPSEB has provided three Import Export Meters (Two No single Phase & One No 3- Phase) as per capacity of Solar units.
3. From **tables 2 & 3 above** it is evident that Two single **Phase connections 1 & 2** have **surplus carried over & Less usage** of solar power . And because of less usage of energy in the College from these particular connections . Thus **this energy will remain reserve for one year & thereafter it will lapse (as per HP Govt solar Billing policy )**
4. On the other hand the college is using maximum power from 4rth three phase connection with 52.2 Kw sanctioned Load ( **See Table 5** ) .
5. Thus **6933 solar generated KWh units remains unutilised** & on the other hand the **college purchasing 19615 Kvah** power from **HPSEB** through meter No 4 .

6. It is also observed from **table No 7 that contract demand ( CD) has never crossed 27.66 kW** where as college is being billed for **85% of 52.2 KVA** sanctioned CD thus college **has paid Rs 43776/- extra** due to less usage of CD .

## RECOMMENDATIONS

It is advised that

1. **Himurja &HPSEB be requested to provide import export meter at 52.2 kW connection if Feasible.**
2. Or **Shift partial load from 52.2 kW connections to all three meters having import export meters.**

## 4. PERFORMANCE OF SOLAR PLANTS

Collage has installed solar power plant for renewal energy in **March 2023.Total Power generation to 09.10.2024 & current power generation as below table is:**

Sr No	Power generation up to 09.10.2024	Capacity of Units kWp	Kwh Generated	Solar days	Average Generation per day kWp /Day	Less Generation Assuming 4 kWp /Day	Less %Gen
1	3 Phase Solar plant	20	12620	225	2.80	5400	
2	1 Phase Solar Plant	6	3616	225	2.68	1782	
3	2 Phase Solar Plant	8	3020	225	1.68	4176	
			19256			11358	37%

## Conclusion

**1 Kwp Rooftop solar** system can generate **3-5 kWh of energy per day (considering 5.5 sunshine hours)** Say Average **4.00 kWh/Day per kWp** . But we see above that generation is **37% Less** .

## RECOMMENDATIONS

**As solar panels are exposed to open air**, making them susceptible to airborne particles, fallen leaves, debris, bird dropping, snow, and build-ups of ice. These accumulations make cleaning solar panels mandatory not only for aesthetics but also because they can reduce energy production—blocking the reception of sun rays.

1. Thus to keep solar panels in good condition, you must clean them at least one every three month & one at the end of fall and another at the start of winter.
2. The maintenance and cleaning of solar panels must be carried out during the early hours of the morning, when the panels are fresher. Cleaning them when they are still warm or exposed to direct sunlight may be counterproductive, as the combination of heat and cold water can generate thermal stresses and damage the equipment. Avoid when windy, rainy, or snowy.
3. Clean Gently & Make sure that you remove any kind of dirt, dust, or debris that may affect the performance of the solar panels.

## 5. STUDY OF RUNNING LOAD

We have studied the loading parameters on the three phase connection **having 52.2 Kw** as maximum load of the college is being catered by this connection by providing Power Logger at L.T Panel . The details of loading parameters recorded during measurements on L.V Panel are given below:-

**Loading on Distribution Panel**

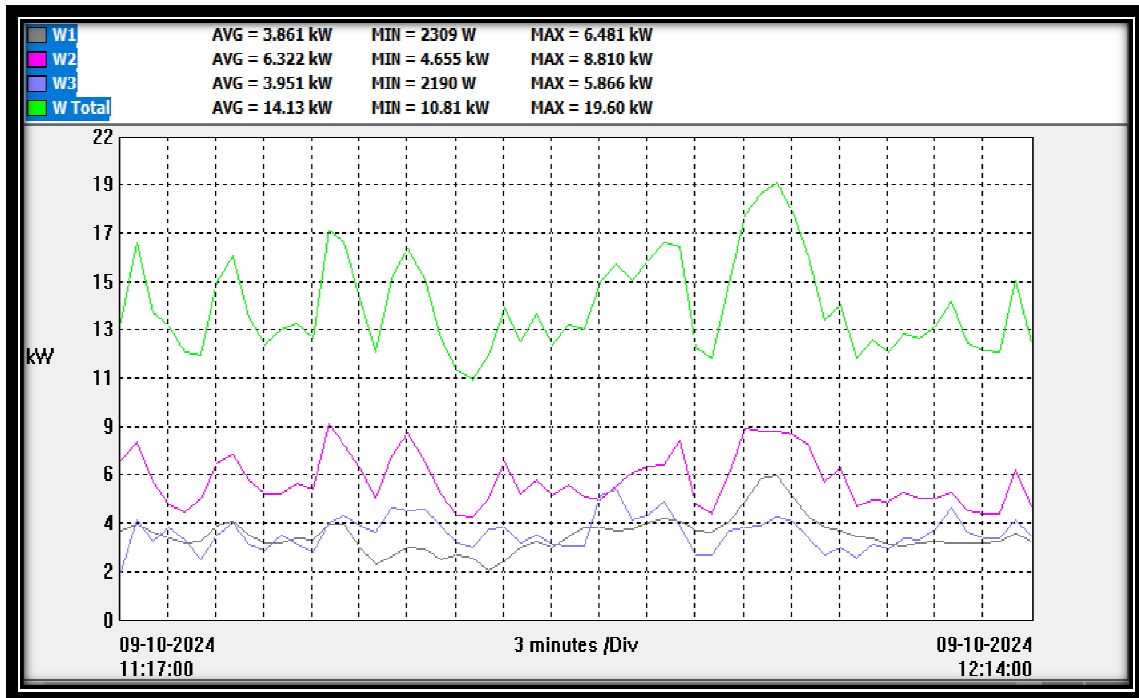
Phase →	R	Y	B
<b>PARAMETER</b>			
<b>VOLTAGE</b>	<b>402</b>	<b>404</b>	<b>403</b>
<b>CURRENT</b>	<b>30</b>	<b>38</b>	<b>37</b>
<b>% THD VOLTAGE</b>	<b>1.8</b>	<b>1.6</b>	<b>1.7</b>
<b>% THD CURRENT</b>	<b>8.6</b>	<b>22.8</b>	<b>8.4</b>
<b>POWER FACTOR</b>	<b>0.91</b>	<b>0.98</b>	<b>0.93</b>
$\sum$ kW	<b>19.60</b>	<b>AVERAGE PF</b>	<b>0.92</b>
$\sum$ kVa	<b>21.60</b>		

### CONCLUSION :

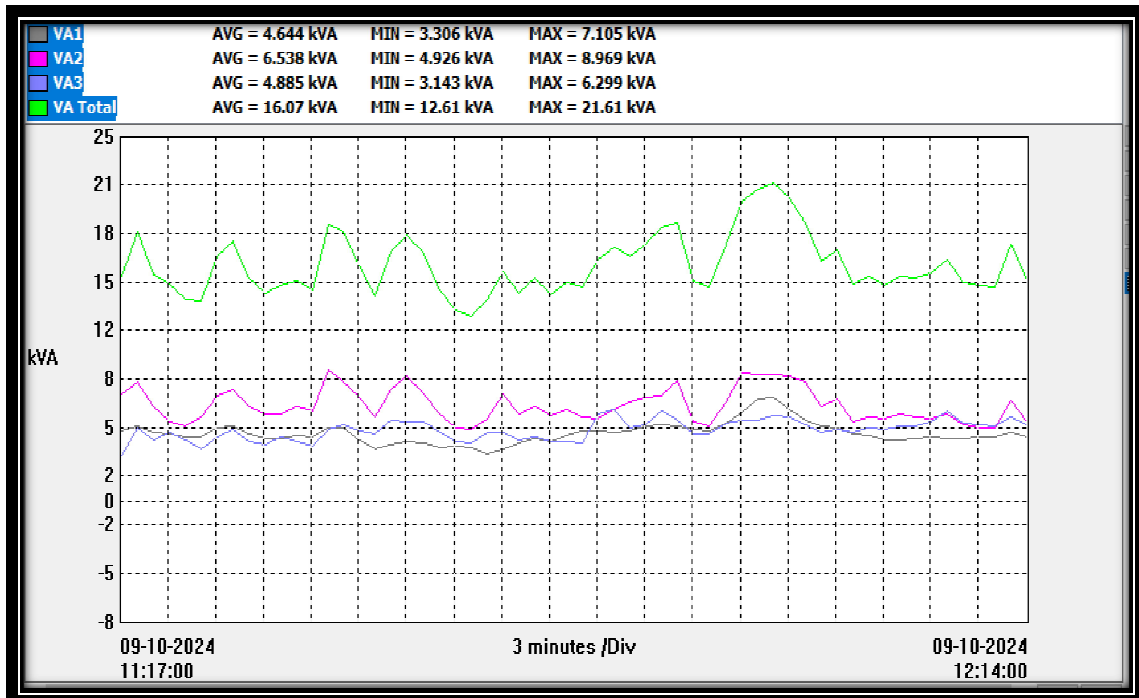
The average running load was **19.60 Kw /21.60 Kva** , Average **Power factor 0.92**, **Voltage between Phases** is 402 to 404 Volts . **Current Harmonics THD %** is near 8% & **Voltage THD V%** 1.6-1.8%. Thus very Good .

The recorded trends are also given below showing all parameter **Maximum , minimum & Average Phase wise.**

### KW Trend an hour recording



### KVA Trend an hour recording





## 6. STUDY OF LIGHTING LUX LEVEL

Experts advise that surrounding in any educational institute plays a vital role in the health and behavior of the students, and so it becomes important to keep a check on sound levels, air quality, natural light, ventilation, etc. But apart from this, **lighting is another factor that plays a much greater role in making an educational institute productive for students.**

It is believed that a proper LED lighting system creates an optimal visual setting that is highly favorable for learning. Right Lighting conditions can create a relaxed and lively environment that ultimately results in the growth of the students. Lightings play a major role in giving the aura to all the educational institutes, be it schools, colleges, or universities, and increase the concentration of the students. It also helps to keep the students active and energetic, which reflects in their academic performance.

We have checked the Lux level ( Lumnes ) in most of the areas of the college & have found that the **light at most of place is inadequate** .

### Lux level

Block	Area	Lumnes at present	Required Lumnes
D	Computer Lab 1	158, 198	500
	Class Room	100	300
	Auditorium	180	
C	Physics Lab C-1	374	300-500
	Reception	290	300
B	B-1 Lab	75,97	300-500
	B-2 PG BOTANY LAB	95	300-500
	B-2 PG BOTANY LAB	191, 195	300-500
	B-3	79	300-500
	B-4	78	300-500
	Store	105	200
	ACCOUNT OFFICE	147	400
A	GENERAL OFFICE	204	400
	PRINCEPLE OFFICE	345, 390	400
	A-1	106	300
	SEMINAR ROOM	14,66	400

## **RECOMMENDATION**

Since we have recommended to **replace the CFL lights with LED** . We hope that **lux level will improve in most of the areas with this exercise only**

## **7. ENERGY SAVING OPPURTUNITIES**

The **opportunities explained from chapters 1 to 6** has been summed up and are shown below for immediate action by the institution

### **Energy Conservation Opportunities**

#	Item	Saving potentials in lacs			PBP
		kWh	Amount	Investment	
	Narration				
	Replace 1x36&2x36 Watt CFL300 lights with 20 watt LED lights	7132	42150	45000	13 Month
i	Shift Part of load from 52.2 kW connection No 4 on Connection 1 & 2 to use unutilised solar power	6933	40000	5000	1.5 Month
iii	Reduce the contract demand from 52.2 kVa to 40 kVa	nil	16800	nil	
		14065	98950	50000	

#### **In addition**

1. Generation of the solar plants is around **2.8 Kwh per kWp per day**

where as it should be **4.5 kWh per kWp per day** . Proper **cleaning of cells be given prime importance** and also take up issue with contractor as these must be under gaurantee .

**DATE: 21.10.2024**



**Er. S.K.KANSAL AEA-0129**

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