



**Energy Audit Report of  
Gandhi Memorial National College  
Ambala cantt. Haryana  
Year 2020-21**



**ENERGY AUDIT REPORT  
CONSULTATION REPORT**



**Gandhi Memorial National College  
Ambala Cantt. -133001**

**PREPARED BY**

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(2020-21)

	<p style="text-align: center;"><b>Energy Audit Report of Gandhi Memorial National College Ambala cantt. Haryana Year 2020-21</b></p>	
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## **ACKNOWLEDGEMENT**

**Empirical Exergy Private Limited (EEPL), Indore** takes this opportunity to appreciate & thank the management of **Gandhi Memorial National College Ambala Cantt. Haryana** for giving us an opportunity to conduct energy audit for the college.

We are indeed touched by the helpful attitude and co-operation of all faculties and technical staff, who rendered their valuable assistance and co-operation the course of study.

**Rajesh Kumar Singadiya**

**(Director)**

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Member of ISHRAE [58150]



## EXECUTIVE SUMMARY

The executive summary of the energy audit report furnished in this section briefly gives the identified energy conservation measures and other recommendation during the project that can be implemented in a phased manner to conserve energy, increase productivity inside the college campus.

### ENERGY MANAGEMENT INITIATIVE TAKEN BY COLLEGE

#### 30 KWp SOLAR PHOTOVOLTAIC ROOFTOP INSTALLATION:



College has 30 KWp solar photovoltaic roof top grid connected system installed on college building in Jul-2021. Total unit generation from July-2017 to June-2021 is **1,18,953 units**. The solar unit generated 26,163 from July-2020-Jun-2021 **It is 34 % of total unit consumption of the year 2020-21.**

Air conditioning (AC) units in electrical panel room was installed in during the audit to maintain life of the solar inverter and Electronics components.

Motion sensor was installed for energy saving in campus premises in month of July-2021.

#### Its Appreciable

The total CO<sub>2</sub> reduction is **114.55-ton CO<sub>2</sub>e/year** as up to Jun-2021. It is big contribution for toward CO<sub>2</sub> emission reduction. (Reference: Central Electricity Authority (CEA) Baseline Carbon Dioxide Emission database [http://cea.nic.in/reports/others/thermal/tpece/cdm\\_co2/database\\_11.zip](http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/database_11.zip)) Electricity Purchased from the grid.

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## AREAS FOR IMPROVEMENT

### Lighting System:

- ✚ Management has replaced 200 no of the “conventional T-12 (40 Watt) and T-8 (36 Watt)” tube light by energy efficient LED lighting fixture T-5 (20 Watt). **Its Appreciable**
- ✚ There is still good potential for replacement of conventional lighting (CFL by LED lighting) (CFL downlighter by LED downlighter) (36 X 3 =72-Watt square fixture by 36-Watt LED Square Fitting) by energy efficient lightings in admin building class rooms, laboratories and faculties cabin” have great potential for energy saving. Expected energy saving and simply payback period is subject of load factor and annual operating hours.
- ✚ Installation of “**Timer control on focus light and street lighting**” in college campus recommended for energy saving in the campus.

### Ceiling Fan and Exhaust Fan:

- ✚ Replacement of “conventional ceiling fan (60-Watt ,80 Watt and 230 watt)” by energy efficient star rated fan or BLDC based energy efficient fan (20 to 25 Watt) in “admin building, class rooms, Auditorium Hall laboratories and faculties cabin” have great potential for energy saving.
- ✚ Replacement of “conventional exhaust fan (90 Watt ,125 Watt and 230 Watt)” by energy efficient star rated fan or BLDC based energy efficient Fan (20 to 40 Watt) in old building class rooms, laboratories and faculties cabin have great potential for energy saving.
- ✚ Installation of HVLS Fan (high volume low speed) in auditorium in place of conventional wall mounting and pedestal fan
- ✚ Expected energy saving and simply payback period is subject of load factor and annual operating hours. Expected energy saving and simply payback period is subject of load factor and annual operating hours.





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#### **IOT based energy monitoring system:**

- ✚ Installation of “Cloud based (IoT based) energy monitoring system” at main feeder.
- ✚ Installation of “Cloud based (IoT based) energy monitoring system” for solar system.
- ✚ Installation of “Cloud based (IoT based) energy monitoring system” at DG sets for Fuel consumption and unit generation monitoring.

#### **Synchronization of DG set with solar system**

- ✚ Installation of “cloud-based fuel and unit generation monitoring system” in DG set. It will help to monitor specific unit generation by DG set during the power failure of the grid power.
- ✚ It was observed that during the power failure of the grid, solar unit generations also stop. Synchronization of the solar system with DG set increases the utilization capacity of the solar system.

#### **Air Conditioning System:**

- ✚ Management has adapted procurement policy for BEE star rated Air conditioning in the faculties’ cabins. **It’s APPRECIABLE.**
- ✚ It is recommended to replaced old modal window and Sprit AC by BEE star rated AC
- ✚ It is recommended “Fall Ceiling “in air conditioning area. it will be reduced air conditioning load of AC and unit consumption.
- ✚ Reduced the infiltration from door and window in air conditioning area

#### **Solar System**

- ✚ There is good potential to increase solar installation capacity in college campus up to 20 KW. As per Net Metering policies of State Government and MNRE.

#### **Energy Management Workshop and Training:**

- ✚ Develop energy management policies for college. Establish a procurement policy that is energy saving and eco-friendly.
- ✚ Conduct awareness and training programs for faculty, student and non-teaching staffs. Conduct seminars, workshops and exhibitions on energy management education.



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### CHAPTER-1 INTRODUCTION

#### 1.1 About College

Through seven eventful decades of its history, Gandhi Memorial National College, Ambala Cantt has celebrated the quest for expanding landscapes of learning and critical thinking. Today, this college is recognised as a premier institution of higher learning that nurtures intellectual and academic striving, vibrant curricular activities, outreach initiatives and civic engagement. The college offers a unique combination of resources where community of inspired faculty and talented students learn and grow together to share the dynamic energy field. It is a place not only of teaching but collaborated scholarship reinforcing a very special interaction between students and faculty.

After partition, a great visionary and philanthropist Sh. Jaswant Rai with other eminent associates planted the seeds of D.A.V. College, Rawalpindi at Ambala which flourished into G.M.N. College in 1948. Having had a modest beginning in a building with thatched roofs, today the college has a whole range of infrastructural facilities such as high-tech seminar rooms, Smart Class Rooms, Arts, Science and Commerce block, well-equipped laboratories, departmental rooms equipped with computers and internet facilities, gymnasium, fully automated library, E-library, sprawling sports fields.

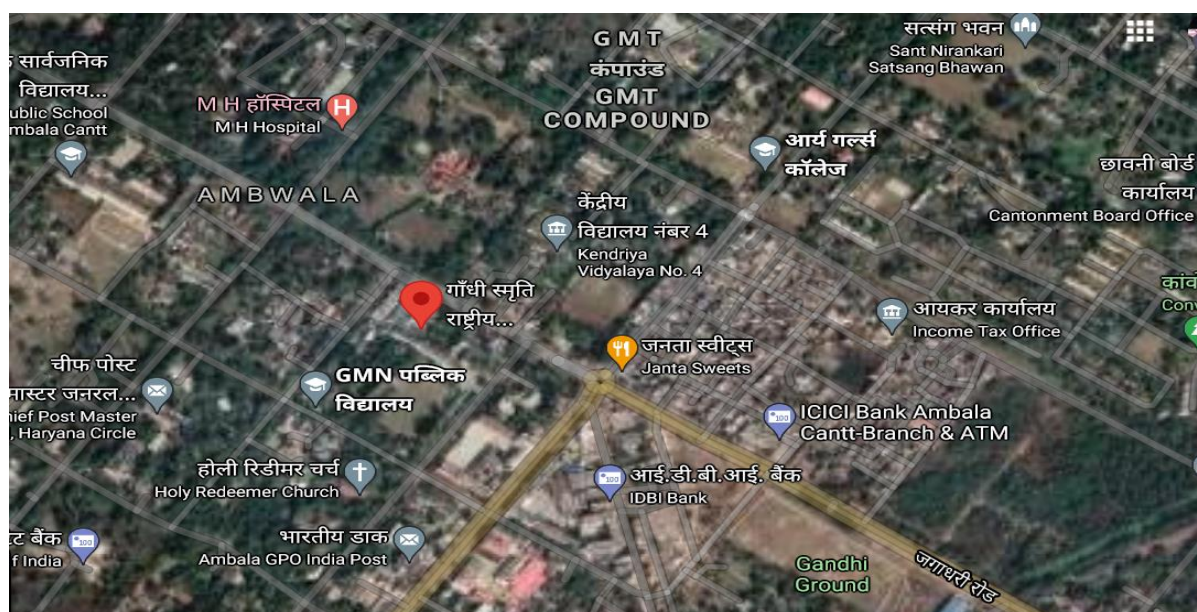


Figure: 1.1 - Image of Gandhi Memorial National College from Google map







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The college has become a byword for academic and extra-curricular achievements. The dynamic, enlightened and supportive Managing Committee comprising of members from industry, medicine, academic and administration is constantly engaged in taking the college to newer heights of excellence. Its alumni occupy distinguished positions in almost all spheres of society – Government, Banking, Finance, Academics, Sports, Armed Forces, Business and Media. The college believes in the motto “Be the First and be with the First”.

### **Institutional Strength**

- + Highly qualified and experienced teaching staff
- + Blend of traditional and modern pedagogical methods
- + Pioneers in offering post-graduation in English and Political Science
- + Pioneer in installing solar grid in educational institution
- + Facilitation of research activities
- + Automated library and administrative block
- + Well-equipped laboratories
- + Well-maintained infrastructure
- + Vast and well-managed sports ground and gymnasium
- + Clean and green campus
- + Eco-friendly premises
- + Achievements in sports and cultural activities
- + Co-educational institution
- + Locational advantage

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### **Vision:**

- ✚ To impart qualitative value-based education and to reinvent itself constantly in the context of ever-changing scenario so as to create a happier and growth-oriented society.

### **Mission:**

- ✚ To pursue and disseminate knowledge with commitment to all the sections of society.
- ✚ To create and provide opportunity for the overall development of students that can transform the society too.
- ✚ To evolve skilled human resource of higher calibre.
- ✚ To revive high ideal of student-teacher relationship so as to inspire the youth to have yearning for acquiring knowledge and professional skills.
- ✚ To imbibe the ideals of Gandhian Philosophy amongst the youth in order to instill in their minds high moral values, instinct for social justice, awareness and equality.
- ✚ To uplift the mind, body and soul of the new generation of the society.



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## 1.2 About College Campus:

The college is spread over 405979.2(sq. Ft) beautiful land with plenty of open space and sports area interspersed within academic buildings. The details of various department and building are given below:

Table 1.1 Name of the various Building and area in Gandhi Memorial National College

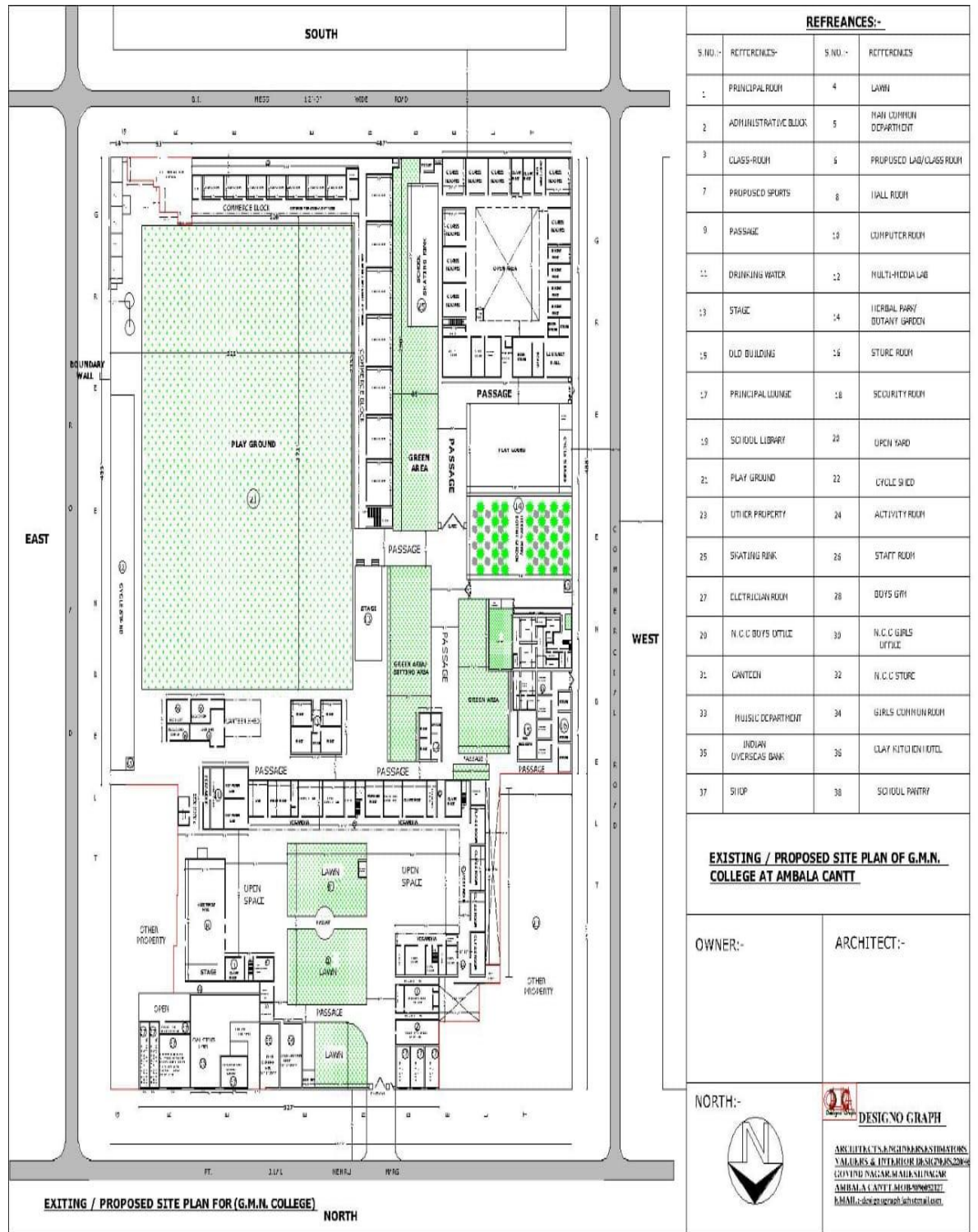
Sr.no	Department Name	Length	Width	Area (sq. ft)
1	Commerce Block	40	204	8160
2	Commerce Block	26	219	5694
3	Stage	45	29.5	1327.5
7	PG block	35.4	53	1876.2
8	Canteen Shed	86.4	33	2851.2
9	Canteen Phy. Edu & Other	74	33	2442
10	Principal Residence	72	54	3888
11	Music room	32	49	1568
12	Sanskrit Department	21	25	525
13	Cycle Stand Shed	300	35	10500
14	Servant and water pump room	110	20	2200
15	Servant House	59	16	944
16	Stores	120	25	3000
17	Auditorium Hall	48	75	3600
18	Room No -26	36	24	864
19	Mass communication to maths Eng.	28	68	1904
20	Girls Common room	28	35	980
21	Main power Supply room	17	13	221
22	Comp. lab to Phys. Lab	358.8	42.8	15356.64
23	Room no - 6 to 9	123	19.4	2386.2
24	Room no - 1 to 5	82	36.9	3025.8
25	Principal Office	59	30.3	1787.7
26	Clerical room	56	34	1904
27	Shops Area			4138
	<b>Total Build Up Area</b>			<b>81143.24</b>
	<b>Total Open Area</b>			<b>324836</b>
	<b>Total Area</b>			<b>405979.2</b>



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## **Gandhi Memorial National College layout of various buildings**






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### 1.3 Green Monitoring Committee

**GANDHI MEMORIAL NATIONAL COLLEGE**  
**AMBALA CANTT - 133001**  
Phones: 0171-2640321, 2633151 (O), 2601281 (R)  
Fax: 0171-2633151

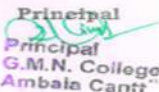
Ref. No. GMNC/107/159 Dated: 28/06/2021

**Energy, Water, Green & Environment Audit Committee**

Energy, Water, Green & Environment Audit Committee will consist of the following faculty members.

S.No.	Name	Designation	Department
1.	Dr. Anju Jain	Associate Professor	English
2.	Mrs. Kamlesh Kumari	Assistant Professor	English
3.	Dr. Kuldeep Yadav	Assistant Professor	Botany
4.	Dr. Neha Aggarwal	Assistant Professor	Chemistry
5.	Mr. Ravinder Singh	Office Supdt.	Admin. Office





Time duration of this committee is 2 years up to June 2023, after which the committee will be reconstituted.

  
Principal  
G.M.N. College  
Ambala Cantt

e-mail: gmncollege@gmail.com, Website: gmncollegeambala.ac.in

### 1.4 Energy Audit Team

The study team constituted of the following senior technical executives from **Empirical Exergy Private Limited**,

-  **Rajesh Kumar Singadiya**, [Director & Accredited Energy Auditor ,AEA-0284]
-  **Mr. Rakesh Pathak**, [Director & Reviewer]
-  **Mrs. Laxmi Raikwar Singadiya**, [Energy Engineer]
-  **Mr. Sachin Kumawat** [ Project Engineer]
-  **Mr. Ajay Nahra**, [Site Engineer]





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### **1.5 About Energy Audit**

Energy audit helps to understand more about the ways energy is used in any plant and helps in identifying areas where waste may occur and scope for improvement exists. ***The overall energy efficiency from generation to final consumer becomes 50%. Hence one unit saved in the end user is equivalent to two units generated in the power plant. (1 Unit / 0.5 Efficiency = 2Units)***

Energy audit is the most efficient way to identify the strength and weakness of energy management practices and to find a way to solve problem. Energy audit is one kind of professional approach towards a responsible way in utilizing economic, financial, and social and natural resources. Energy audits can “add value” to the management approaches being taken by the institute and is a way of identifying, evaluating the system.

The Empirical Exergy Private Limited (EEPL), Indore M.P. carried out the “**Energy Audit**” at the site to find loopholes in the energy consumption pattern for **Gandhi Memorial National College, Ambala Cantt** .A technical report has been prepared as per the need and the requirement of the project.

### **1.6 Objectives of Energy Auditing**

The energy audit provides the vital information base for overall energy conservation program covering essentially energy utilization analysis and evaluation of energy conservation measures. It aims at:

- Identifying the quality and cost of various energy inputs.
- Assessing present pattern of energy consumption in different cost centers of operations.
- Relating energy inputs and production output.
- Identifying potential areas thermal and electrical energy economy.
- Highlighting wastage's in major areas.
- Fixing of energy saving potential targets for individual cost centers.
- Implementation of measures for energy conservation & realization of savings.

### 1.7 Methodology:

Methodology adopted for achieving the desired objectives viz.: Assessment of the current operational status and energy savings include the following:

- ✚ Discussions with the concerned officials for identification of major areas of focus and other related systems.
- ✚ Team of engineers visited the site and had discussions with the concerned officials / supervisors to collect data / information on the operations and load distribution within the plant and same for the overall premises. The data was analyzed to arrive at a base line energy consumption pattern.
- ✚ Measurements and monitoring with the help of appropriate instruments including continuous and / or time-lapse recording, as appropriate and visual observations were made to identify the energy usage pattern and losses in the system.
- ✚ Trend analysis of costs and consumptions.
- ✚ Capacity and efficiency test of major utility equipment's, wherever applicable.
- ✚ Estimation of various losses
- ✚ Computation and **in-depth analysis** of the collected data, including utilization of computerized analysis and other techniques as appropriate were done to draw inferences and to evolve suitable energy conservation plan/s for improvements/reduction in specific energy consumption.

### 1.8 Gandhi Memorial National College Present Energy Scenario:

Gandhi Memorial National College, Ambala cantt. uses energy in the form of electricity purchased from Uttar Haryana Bijli vitran Nigam, under Tariff Category NDS Non-Industrial on 11 KV. The college has sectioned load 139.9 KW. The fixed charges is Rs 170 per KW and Energy charges Rs. 6.75 per KVAH.

Total billing amount has been found to be about **INR 4,83,375 / -** for 12 months analysis period from July - 2020 to June- 2021. The overall average energy charges as **Rs. 8.90 per unit** in last 12 months. College has 30 KWp grid connected roof top solar plant in college campus. Unit generation of the plant from July-2020 to June-2021 is 26,163 units. It is 34 % of total unit consumption of the year 2020-21.

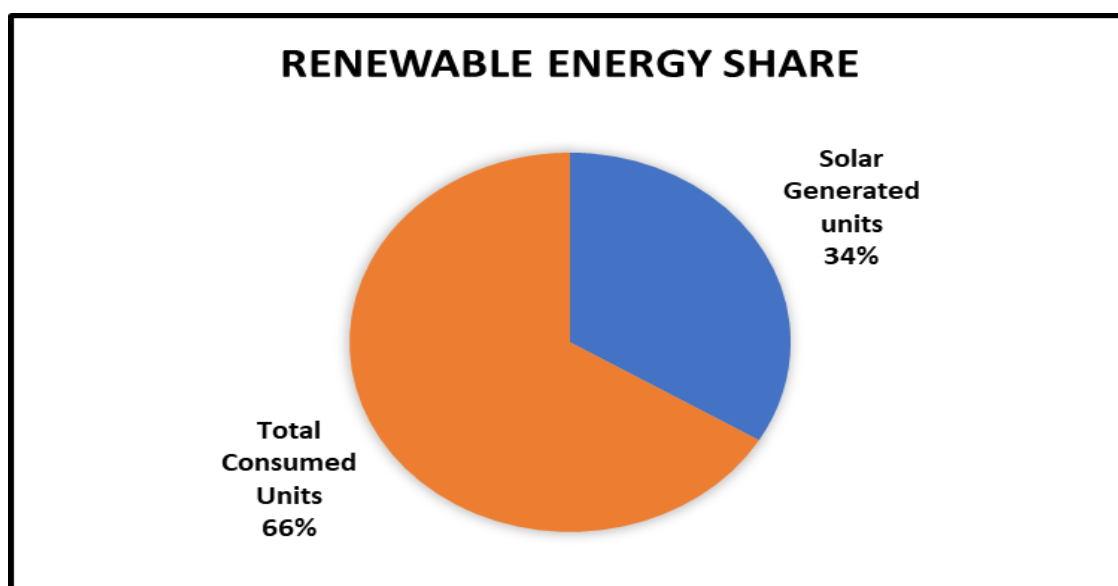


Figure 1.2: - Graphical presentation of Renewable energy share



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**CHAPTER- 2  
POWER SUPPLY SYSTEM**

**2.1 Power Station & Transformer:**

The power supply for the college is from UHBVNL. with the help of 11 KV feeders under Tariff category NDS with sanctioned load 139.90 KV. There is one Step down transformer with capacity 160 KVA. The details are given in following table 2.1

**Table: 2.1 Name plate detailed of transformer**

Sr. No.	Items	Technical Specification of Transformer
1	Make	Jay BEE Industries
2	Rating (KVA)	160
3	Voltage (HV/ LV)	11000/433
4	Current Rating (HV/ LV)	8.5/213.3
5	Frequency (Hz)	50
6	Impedance at 75°C (%)	4.5
7	Vector group	Dyn-11
8	Type of cooling	ONAN
9	Total no of Tap	5
10	Ideal Tap Potion	3



Figure 2.1: - 11 KV Feeder and 160 KVA TR

**Observation:** It was observed that during the audit of substation, transformer is in operation.

## 2.2 DG Sets :

There is 2 DG set in power house . Detailed of the DG Sets are given table2.3:

Table 2.2 Technical Specifications for DG sets

Sr. No.	Parameter	Technical Specification DG-01	Technical Specification DG-02
1	Make	Sterling Generators Pvt. Ltd	Kirloskar Brother Ltd
2	M/C No	KLAC1239	NA
3	Capacity	125 KVA	30 KVA
4	Rated Voltage	415 V	415 V
5	Full load current	174 A	NA
6	Frequency	50 Hz	50 Hz
7	Power factor	0.80	0.80
8	RPM	1500	1500
9	Phase	3	3



Figure 2.2 DG sets in college campus





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Table 2.3 Total Fuel consumption and running hours .

Sr. no	Year	Diesel Consumption	Running Hours
1	2017-18	2750	347
2	2018-19	3290	518
3	2019-20	1300	169
4	2020-21	655	273
	<b>Total</b>	<b>7995</b>	<b>1307</b>

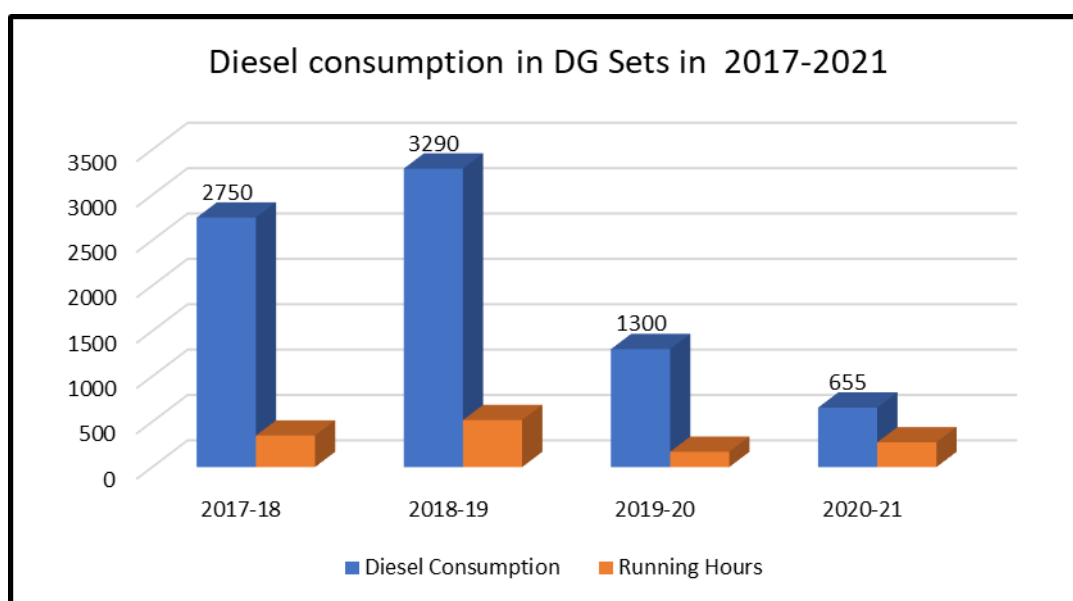


Figure 2.3: - Total Diesel consumption in year -2017-21

**Observation & Suggestion:**

- ✚ DG set use only in case of grid power failure.
- ✚ Installation of “Cloud Based Fuel and unit generation monitoring system” in DG Set. It will help to monitor specific unit generation by DG set during the power failure of the grid power.
- ✚ It was observed that during the power failure of the grid, solar unit generations also stop. synchronization of the solar system with DG set increases the utilization capacity of the solar system.



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### 2.3 Capacitor Bank Health Check-up

Energy audit team was carried out health check up of exiting bank in Electrical room. Details of bank are given in table 2.4.

Table: 2.4 Health check of Capacitor bank

Sr. No.	Capacitor No	Capacity KVAR	Phase	Measured Current	Rated Current	Output KVAR	Derating %	Remarks
1	Capacitor-1	25	R	0.0	32	0.0	100.0	Need to replaced
			Y	0.0				
			B	0.0				
			Avg.	0.0				
2	Capacitor-2	25	R	31.0	32	24.2	3.1	OK
			Y	32.0				
			B	30.0				
			Avg.	31.0				



Figure 2.4: - Capacitor bank in Electrical room

#### Observation & Recommendation:

- It was found that one capacitor needs to be replaced immediate.
- Installation Automatic power factor controller (APFC) penal for maintain the power factor unity. at present its control by manually.



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### 2.4 Single Line Diagram:

This figure represents single line diagram of substation of Gandhi Memorial National College Ambala Cantt.

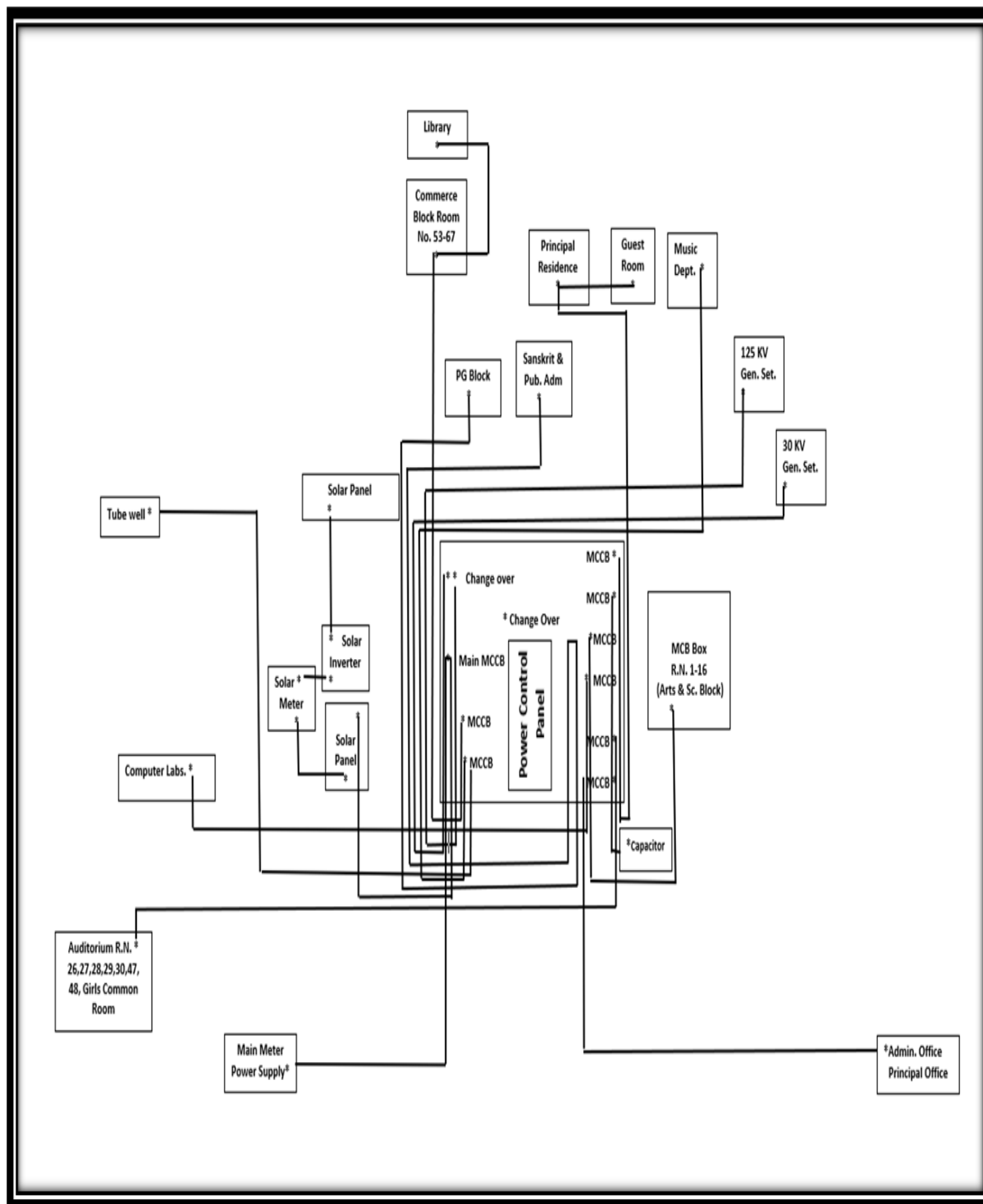


Figure 2.5 Single line diagram of Gandhi Memorial National college

## 2.5 Grid Connected Solar Photovoltaic System (30 Kwp)

There is 30 KWp solar photovoltaic roof top grid connected systems installed on Science building in July-2017. Detailed of the system is given below:

Table 2.5 Solar plant detailed

Sr. No	Description	Technical Specification
<b>1</b>	<b>Plant Information</b>	
1.1	Plant capacity	30 KWp
1.2	Location	Science Block, Gandhi Memorial National College
<b>2</b>	<b>PV Panel Details</b>	
2.1	Make	Vikram Solar
2.2	Modal	ELDORA VSP.72.315.03.04
2.3	Panel Wattage	315 Watt
2.4	No of PV Panels	96
2.5	Panel Tilt Angle	23°
<b>3.</b>	<b>Inverter Information</b>	
3.1	Make/ Modal Name	Delta (RPI M30A_121)
3.2	Modal No	RPI303FA0E1100
3.3	Capacity of Inverter	33000 Watt
3.4	No of Inverter	1



Figure 2.6 Solar Plant 30 KWp and Inverter System



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Table 2.6 Detailed of solar unit generation from July-2017 to Jun-2021

Sr. no	Years	Unit Generation (kWh)
1	2017-18	28,959
2	2018-19	31,878
3	2019-20	31,953
4	2020-21	26,163
	<b>Total Units</b>	<b>1,18,953</b>

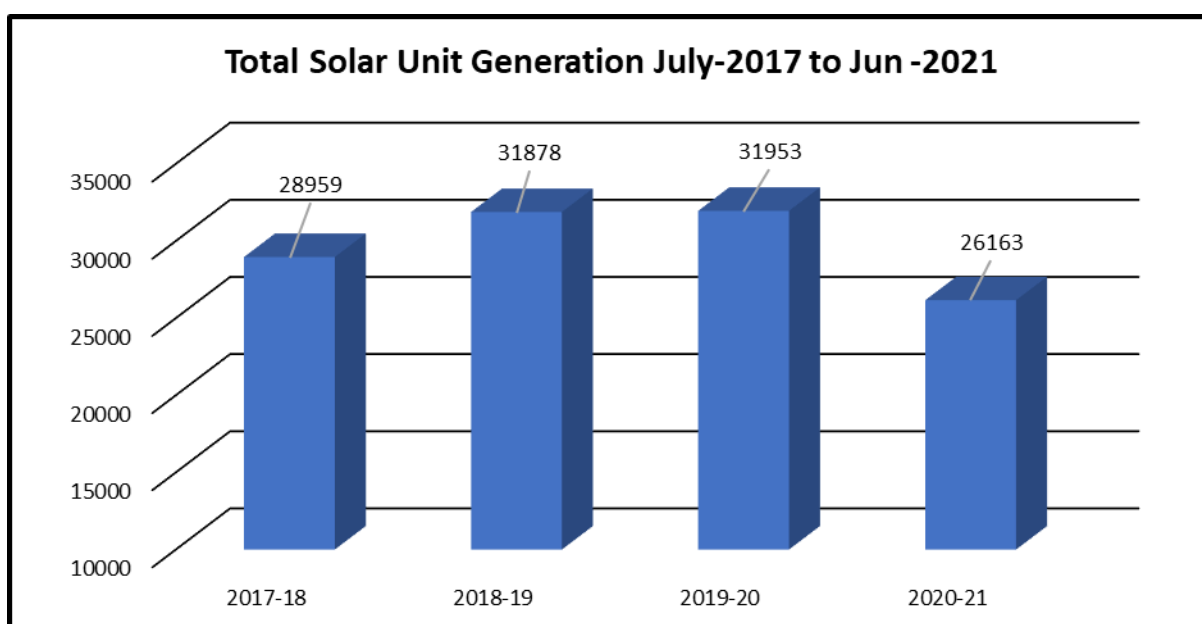


Figure 2.7 Solar Unit Generation July-2017 to Jun -2021

**Observation:**

During the energy audit it was observed that plant is working, **however external glasses of Dirty panels are found. They should be clean immediately.** Total unit generation from July-2017 to June-2021 is 1,18,953 units.





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### CHAPTER- 3

#### ELECTRICITY BILL ANALYSIS

Energy audit team was analysed last 1 years electricity bill of university. Detailed of unit consumption, annual payable amount and annual per unit charges are determined as follow:

#### 3.1 Monthly electrical energy consumption (2020-21):

The monthly electrical consumption for the college is given in the table 3.1

Table 3.1 Energy consumption and billing amount (year 2020-21)

Sr.no	Month & year	Solar Generated units (kWh)	Total Consumed Units (KVAH)	Amount (Rs.)
1	Jul-20	4020	7456	55200
2	Aug-20	2184	7370	60916
3	Sep-20	3312	9392	66513
4	Oct-20	2016	4598	41717
5	Nov-20	264	3312	44247
6	Dec-20	0	2800	43371
7	Jan-21	348	3378	45058
8	Feb-21	2076	3968	34422
9	Mar-21	3396	3516	23575
10	Apr-21	4032	4104	22535
11	May-21	3720	3816	23286
12	Jun-21	3840	3912	22535
	<b>Total</b>	<b>29208</b>	<b>57622</b>	<b>483375.1</b>

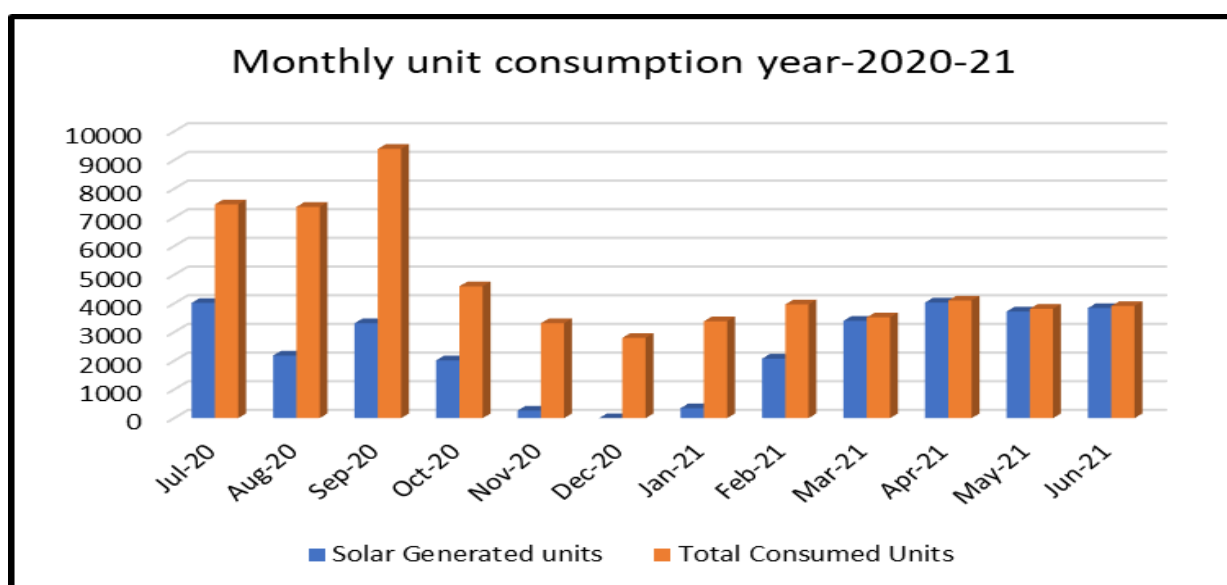


Figure3.1 Graphical presentation of total units in year 2020-21



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### 3.2 Overall Unit Charges year-2020-21

Table 3.2 Overall Energy Consumption (year 2020-21)

Sr. No	Month & Year	Per unit charges (Rs/KVAH)
1	Jul-20	7.40
2	Aug-20	8.27
3	Sep-20	7.08
4	Oct-20	9.07
5	Nov-20	13.36
6	Dec-20	15.49
7	Jan-21	13.34
8	Feb-21	8.67
9	Mar-21	6.71
10	Apr-21	5.49
11	May-21	6.10
12	Jun-21	5.76
	<b>Average</b>	<b>8.90</b>

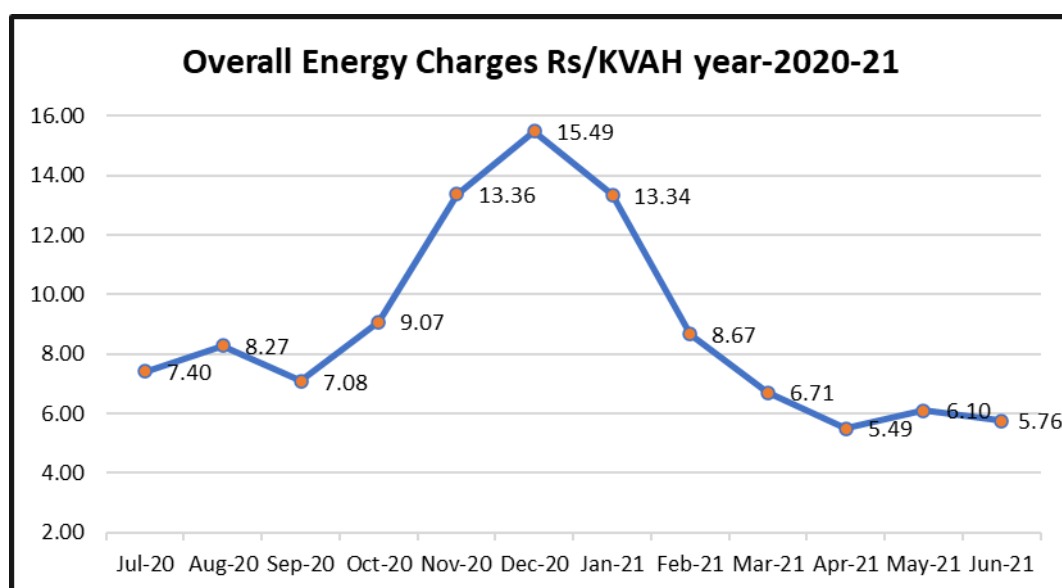


Figure3.2 Graphical presentation of actual per unit charges year 2020-21

Observation: - It was found out that total energy consumption in last 12 month was 57,622/- unit. Average annual energy charges Rs 8.90 /KVAH



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### 3.3. Solar unit generation of year- 2020-2021

Table 3.3 Solar unit Generation in year -2020-21

Sr. no	Month & Year	Unit Generation (KW)
1	Jul-20	3262
2	Aug-20	2640
3	Sep-20	3319
4	Oct-20	0
5	Nov-20	0
6	Dec-20	0
7	Jan-21	323
8	Feb-21	1933
9	Mar-21	3455
10	Apr-21	4031
11	May-21	3454
12	Jun-21	3746
	Total	26163

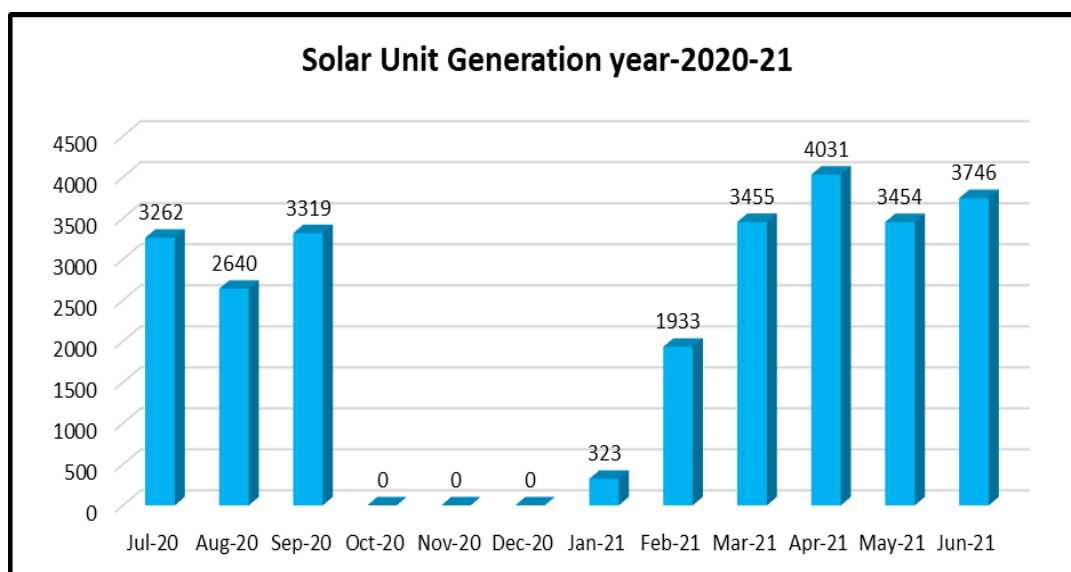


Figure 3.3 :- Total Solar Unit Generation in year-2020-21

#### Observation:

During the energy audit it was observed that plant is working, Total unit generation from July-2020 to June-2021 is 26,163 units. It is 34 % of total unit consumption of the year 2020-21.



## Energy Audit Report of Gandhi Memorial National College Ambala cantt. Haryana Year 2020-21



### 3.4 Fuel Consumption in DG sets

Table 3.4 Total Fuel Consumption and running Hours in DG sets in Year-2020-21

Sr. No	Month & year	Desal Consumption (125 KVA)	Running Hr	Desal Consumption (30 KVA)	Running Hr
1	Jul-20	100	9	50	8
2	Aug-20	200	22	50	8
3	Sep-20	130	3	30	5
4	Oct-20	0	9	240	57
5	Nov-20	0	0	0	0
6	Dec-20	0	1	140	35
7	Jan-21	0	0	220	54
8	Feb-21	0	0	40	10
9	Mar-21	0	3	50	12
10	Apr-21	0	1	50	13
11	May-21	0	0	50	13
12	Jun-21	0	0	50	10
	Total	430	48	970	225

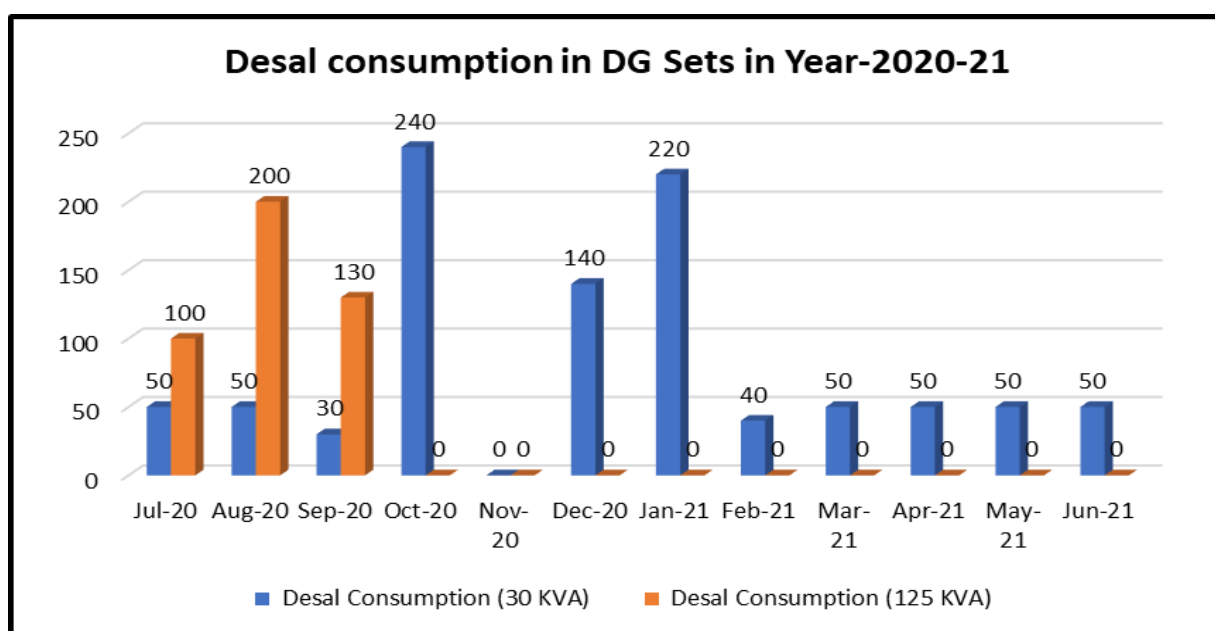


Figure 3.4 :- Graphical Presentation of Total Fuel consumption in year-2020-21



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### 3.5 Connected Load of College:

Details of connected load are given in the table 3.5

Sr. No	Location	Celling Fan	Tube Light (40/36 W)	LED 9 W	LED 15 W	Ex. Fan	Wall Fan	LED 40 W	LED 18 W	LED 12 W	LED 20 W	PL4 36 W	LED 30	LED 100	LED 50	fan 180W
1	Admin	14	0	2	16	1	1	2	0	0	0	3	0	0	0	0
2	Principal	14	0	4	9	2	2	0	0	0	0	18	0	0	0	0
3	Room-1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
4	Room-2	4	0	0	0	0	3	0	0	8	0	0	0	0	0	0
5	Room-3 dis	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	IQAC	1	0	0	0	0	0	0	0	6	0	0	0	0	0	0
7	Room-4	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0
8	Room-5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	Room-6	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	Room-7	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	Room-8	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	Room-9	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	Room-10 History	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
14	Room-11	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	Room-12 Sosial	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	Room-13	5	0	2	0	0	0	0	0	0	2	0	0	0	0	0
17	Room-14 Pol.sc	3	0	0	0	0	0	0	0	0	3	0	0	0	0	0



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18	Room-15 Panjabi	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	Room-16 Eel.	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
20	Room-17	11	0	0	0	5	0	0	0	0	3	0	0	0	0	0
21	Staff Room	4	0	1	2	0	0	0	0	0	4	0	0	0	0	0
22	Hindi	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	NCC Room	1	0	0	0	0	0	0	0	4	0	0	0	0	0	0
24	Phys	15	0	10	0	1	0	0	0	0	0	0	0	0	0	0
25	Zoology	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0
26	Room-40	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
27	Botanical	7	0	5	0	0	0	0	0	0	0	0	0	0	0	0
28	Zoology Lab	3	0	0	0	0	0	0	0	0	1	0	0	0	0	0
29	Electronic Dept.	5	0	2	0	0	0	0	0	0	3	0	0	0	0	0
30	room-26	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	Room-27 Mass	4	0	0	4	0	1	0	0	0	2	0	0	0	0	0
32	room-28 Eng.	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0
33	Room-29 Este	2	0	0	4	0	0	0	0	0	0	0	0	0	0	0
34	Maths	2	0	0	0	0	0	0	0		2	0	0	0	0	0
35	Girls Comm. Room	4	0	4	5	2	1	0	0	0	0	0	0	0	0	0
36	Room-47	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	Room-48	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	Auditorium	14	0	0	0	0	2	0	0	0	0	8	9	2	2	10
39	Store	1	0	4	0	0	0	0	0	0	0	0	0	0	0	0
40	NSS Room	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
41	Room -49	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0





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42	Room -50	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43	Room -51	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44	Room -52	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45	Room -53	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46	Room -54	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
47	Room -55	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	Room -56	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
49	Room -57	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	Room -58	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51	Room -59	4	0	0	0	0	0	0	0	0	2	0	0	0	0	0
52	Room -60	3	0	2	0	0	0	0	6	0	0	0	0	0	0	0
53	Room -61	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54	Room -62	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55	Room -63	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
56	Room -64	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57	Room -65	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58	Room -66	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
59	Room -67	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60	Girls Wash Room	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
61	Boys Wash Room	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
62	Music v	2	0	0	0	0	0	0	5	0	0	0	0	0	0	0
63	Music ist	2	0	0	0	0	0	0	5	0	0	0	0	0	0	0
64	LIB	41	1	1	0	0	0	0	0	12	7	36	0	0	0	0
65	Lag.	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
66	DG Store	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0



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67	Pub.	1	0	0	2	1	0	0	0	0	0	0	0	0	0	0
68	Sanskrit	0	1	0	0	0	6	0	0	0	1	0	0	0	0	0
69	Management Dept.	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0
70	NCC Girls	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0
71	Office Store	2	0	0	0	0	0	0	0	0	3	0	0	0	0	0
72	Principal Rec	25	0	0	0	0	1	0	0	0	2	0	0	0	3	0
73	Gust House	4	0	0	0	3	2	0	4	0	0	14	0	0	0	0
74	Sociology Lab	7	0	0	0	0	0	0	0	4	0	0	0	0	0	0
75	Room-32	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0
76	Room-33	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
77	Room-34	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0
78	Gandhi Museum	4	0	9	0	1	0	0	0	0	0	0	0	0	0	0
79	Physics lab	6	0	0	0	1	0	0	0	0	0	0	3	0	0	0
80	Computer Lab	17	0	2	0	2	0	0	0	0	4	0	0	0	0	0
81	Red Cross	1	0	0	1		0	0	0	0	0	0	0	0	0	0
82	Canteen	7	1	0	0	1	0	0	0	0	0	0	0	0	0	0
83	Water Cooler Room	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
84	Principal Reiss. Store	10	0	6	0	0	0	0	0	0	0	0	0	0	0	0
85	Street Light	0	0	13	0	0	0	0	0	0	20	0	17	0	4	0
	<b>Total</b>	<b>400</b>	<b>10</b>	<b>73</b>	<b>46</b>	<b>22</b>	<b>20</b>	<b>2</b>	<b>20</b>	<b>34</b>	<b>62</b>	<b>79</b>	<b>29</b>	<b>2</b>	<b>9</b>	<b>10</b>

#### Total connected load in Watt %

Sr. no	Electrical Equipment's	Watt (%)
1	Celling Fan	56.90
2	Tube Light (40/36W)	13.44
3	LED 9 W	1.17
4	LED 15 W	1.23
5	Ex. Fan	9.00
6	Wall Fan	3.56
7	LED 40 W	0.14
8	LED 18 W	0.64
9	LED 12 W	0.73
10	LED 20 W	2.21
11	PL4 36 W	5.06
12	LED 30	1.55
13	LED 100	0.36
14	LED 50	0.80
15	fan 180W	3.20
16	Water Cooler (Average)	0.01
17	Water Pump (Average)	0.02
	<b>Total Watt %</b>	<b>100.00</b>

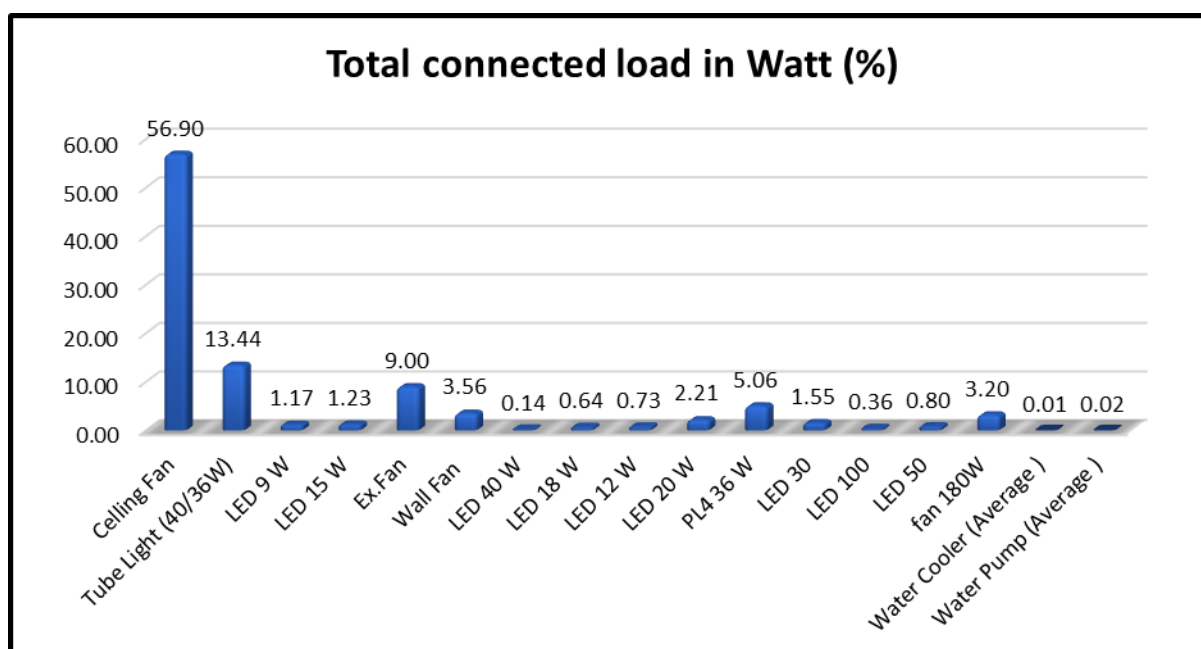






Figure 3.5: - Graphical Presentation of connected load in college campus

#### Some Photograph of Electrical Equipment's: -

	<p align="center"><b>Energy Audit Report of Gandhi Memorial National College Ambala cantt. Haryana Year 2020-21</b></p>	
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Printer	Fan
	
AC	Computer System

Figure 3.6 Electrical Equipment Ceiling Fan, Printer AC, and Computer system

	<p align="center"><b>Energy Audit Report of Gandhi Memorial National College Ambala cantt. Haryana Year 2020-21</b></p>	
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### 3.6 Lux Measurement in College Campus

Sr. No	Location	Lux Measurement
1	Admin Building	165, 187, 178, 197, 156, 188
2	Principal office	109, 104, 156, 153, 124, 158, 136,
3	Room-1	210, 256, 125, 145, 152, 140
4	Room-2	101, 89, 95, 96, 85, 87, 91, 105
5	Room-3 dis	145, 123, 135, 189, 135
6	IQAC Office	45, 75, 44, 56, 65, 75
7	Room-4	214, 256, 201, 236, 211, 209
8	Room-5	102, 100, 96, 75, 58
9	Room-6	63, 54, 65, 42, 36, 47, 96
10	Room-7	52, 65, 84, 89, 75, 68, 49
11	Room-8	36, 56, 45, 68, 49, 78, 58
12	Room-9	155, 165, 189, 145, 136, 178
13	Room-10 History	85, 89, 78, 72, 65, 63, 55
14	Room-11	210, 256, 233, 215, 196, 188
15	Room-12 Sosial	125, 156, 133, 144, 189, 142
16	Room-13	102, 164, 122, 136, 125, 198
17	Room-14 Pol.sc	112, 145, 188, 150, 156, 144
18	Room-15 Panjabi	185, 178, 168, 195, 175, 155
19	Room-16 Eel.	123, 145, 125, 139, 157, 145
20	Room-17	123, 175, 166, 158, 145, 169
21	Staff Room	205, 210, 266, 230
22	Hindi	122, 145, 136, 186, 156
23	NCC Room	80, 69, 56, 88, 96, 54, 88, 95, 76, 85, 65
24	Phys	104, 98, 96, 125, 133, 85
25	Zoology	65, 59, 48, 89, 66, 78
26	Room-40	144, 125, 155, 165, 189, 145
27	Botanical	112, 156, 175, 145, 155, 163
28	Zoology Lab	99, 85, 56, 59, 64, 58
29	Electronic Dept.	158, 169, 185, 125, 186, 165
30	room-26	185, 162, 189, 165, 185, 165, 175
31	Room-27 Mass	69, 65, 68, 85, 79, 51
32	room-28 Eng.	210, 256, 222, 236, 245, 298
33	Room-29 Ester	156, 128, 139, 145, 165, 155
34	Maths	100, 106, 89, 165, 188, 145
35	Girls Comm. Room	177, 187, 190, 171
36	Room-47	256, 265, 159, 165, 145, 165
37	Room-48	158, 162, 156, 136, 165, 186, 165
38	Auditorium	210, 199, 156, 185, 136, 175, 155
39	Store	88, 89, 40, 51, 46, 52
40	NSS Room	56, 58, 69, 98, 59, 75, 57
41	Room -49	166, 185, 152, 102, 165

42	Room -50	100, 165, 144, 145, 176,
43	Room -51	145, 176, 115, 117, 134,
44	Room -52	115, 143, 156, 132, 178
45	Room -53	178, 156, 198, 178.
46	Room -54	187, 156, 145, 176, 189
47	Room -55	156, 198, 178, 156, 187
48	Room -56	198, 156, 1098, 167, 109
49	Room -57	210, 188, 156, 198, 176,
50	Room -58	152, 167, 198, 167, 176
51	Room -59	145, 187, 109, 144, 161
52	Room -60	154, 188, 198, 167, 187
53	Room -61	154, 178, 155, 188, 198
54	Room -62	100, 167, 187, 145, 165
55	Room -63	198, 144, 165, 142, 167
56	Room -64	100, 109, 181, 156, 187
57	Room -65	144, 156, 134, 178, 187
58	Room -66	156, 198, 176, 187, 167
59	Room -67	156, 176, 109, 178
60	Girls Wash Room	76, 87, 34, 98, 76
61	Boys Wash Room	54, 78, 121, 98,
62	Music v	176, 167, 44, 109
75	Room-32	154, 187, 167, 188, 190
76	Room-33	133, 176, 156, 188, 145
77	Room-34	111, 128, 210, 178,

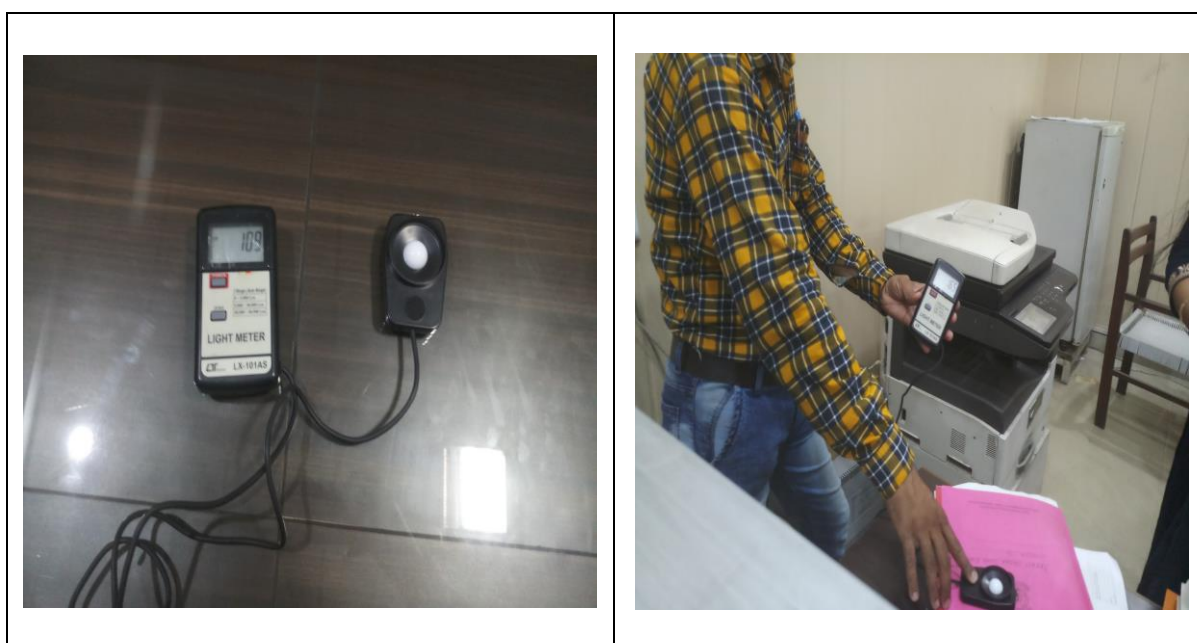


Figure 3.7: - Lux Measurement in College campus





**GANDHI MEMORIAL NATIONAL COLLEGE**  
**AMBALA CANTT – 133001**

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**POLICY DOCUMENT ON ENVIRONMENT AND**  
**ENERGY USAGE**

The Environment & Energy Usage Policy of Gandhi Memorial National College, Ambala Cantt. is to manage energy in such a systematic way so as to minimize its impact on the environment. The policy implies to explore the renewable energy resources to reduce the burden of the government and to find out substitute natural resources as solutions to energy crisis. It will help us to embed efficiently and environmental awareness into our everyday activities, thus helping us to realize our responsibilities and commitment to conservation of natural resources and to limit its usage. The Botany, Zoology, Chemistry, Electronics & Physics Departments along with Biological Society, Eco Club, NSS, NCC units of our college are devoted to the cause of environmental awareness to undertake green initiatives to save energy and to protect the environment.

### **Policies:**

Gandhi Memorial National College, Ambala Cantt., Haryana pledges to fulfil its commitment to the environment through following levels of action by:

- **30 KV solar panels** are installed on the roof top.
- Phased manner changing of normal conventional lights to energy efficient LED lights. All new lights procured will be LED lights only.
- Timely switching off and switching on of street lights.
- Optimum use of air conditioners. Switch on as and when required.
- Minimum use of blowers and heaters.
- Phased manner replacement of electrical appliances like ACs, Fridge, etc. with Energy efficient (Higher star rating) appliances.
- Activate power management features on your computer and monitor, so that it will go into a low power “sleep” mode when you are not working on it.
- Minimum use of ground water by reduced hours of pumping.
- Regular checking of leakage in water pipe lines and taps.
- Four water harvesting units.
- Save water and save electricity stickers placed at prominent places.
- Conduct of different awareness campaign on “Save Water”, “Save Trees” & Save Electricity through lectures/different competitions etc.

- Vermicomposting is also in practice for disposing the wet waste from canteen and also other biodegradable wastes.
- Tree plantation in Campus.
- Ensuring ban on single use plastic bags in campus.
- Encourage use of public transport & Car-pooling (i.e. reduced vehicular use in the campus).
- Waste collection bins (i.e. burnable, non-burnable & recyclable) and their management.
- Ensuring proper e-waste management.
- Initiation for paperless (e-office) & e-documents for routine work.
- Increasing use of digital library.

### **Policy communication & Review**

This policy will be communicated to students, teaching and nonteaching staff through internal communication channels and will be made available to public through college website.

All out efforts will be made for the implementation of policy in the right spirit. The Environment & Energy Policy, objectives and targets will be reviewed on regular basis under the guidance of the Principal of the college.

**Principal**