DPG DEGREE COLLEGE

APPROVED BY UGC, AFFILIATED TO MDU (ROHTAK)

ENERGY AUDIT REPORT

2021-2022

PREPARED BY

EHS ALLIANCE SERVICES

CONTENTS

CERTIFICATE

EHS alliance

CERTIFICATE

PRESENTED TO

DPG DEGREE COLLEGE GURGAON

70A, Delhi-Jaipur Expy, Block A, Sector 34, Gurugram, Haryana 122001

Has been assessed by EHS Alliance Services for the comprehensive study of Energy Audit on institutional working framework to fulfill the requirement of

ENERGY AUDIT

ACADEMIC YEAR 2021-22

The energy-saving initiatives carried out by the institution have been verified in the report submitted and were found to be satisfactory.

The efforts taken by management and faculty towards all types of energy used in the institution and sustainability are highly appreciated and noteworthy.

SIGNATURE

EHS ALLIANCE SERVICES GURGAON

23.03.2023
DATE OF AUDIT

EHS ALLIANCE SERVICES, PLOT A-72, SURYA VIHAR, GURUGRAM, 122001
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ACKNOWLEDGEMENT

EHS Alliance Services would like to thank the management of DPG Degree College for assigning this important work of Energy Audit. We appreciate the co-operation to the teams for completion of assessment.

We would also like to thank ***Dr. Anita Chauhan, Audit Co-ordinator***, for her continuous support and guidance, without which the completion of the project would not have been possible. We are also thankful to other staff members who were actively involved while collecting the data and conducting field measurements.

We are also thankful to

Dr. Devkanya Gupta	**Co-ordinator, IQAC**
Dr. Priyanka Kumari	**Member, IQAC**
Dr. Priya Shukla	**Member, IQAC**
Dr. Lalit Kumar	**Co-ordinator, NSS**

Last but not the least, we would like to thank ***Mr. Deepak Gahlot, Vice-President*** and ***Dr. S. S. Boken, Principal*** DPG Degree College for giving us an opportunity to evaluate the environmental performance of the campus.

DISCLAIMER

EHS Alliance Services Energy Audit Team has prepared this Energy Audit Report for DPG Degree College based on input data submitted by the representatives of college complemented with the best judgment capacity of the expert team.

While all reasonable care has been taken in its preparation, details contained in this report have been compiled in good faith based on information gathered.

It is further informed that the conclusions are arrived following best estimates and no representation, warranty or undertaking, express or implied is made and no responsibility is accepted by Audit Team in this report or for any direct or consequential loss arising from any use of the information, statements or forecasts in the report.

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EHS ALLIANCE SERVICES GURGAON

Vijay Singh
Lead Auditor EMS & Energy

Dr. Uday Pratap
Co-Auditor EMS & Energy

ABBREVIATION

A	Amps
AC	Air Conditioner
AC	Alternating Current
AMET	Academy of Maritime Education and Training
CFL	Compact fluorescent lamp
CIP	Comprehensive Inspection Programme
DC	Direct Current
HSD	High Speed Diesel
Hz	Hertz
kg	Kilogram
kVA	kilo-volt-ampere
kW	kilo Watts
kWh	kilowatt hour
kWp	Kilowatt peak
LED	Light Emitting Diode
LPG	Liquefied Petroleum Gas
MMS	Module mounting structure
MPPT	Maximum Power Point Tracker
NAAC	The National Assessment and Accreditation Council
SEC	Specific Energy Consumption
SPV	Solar Photovoltaic
STC	Standard Test Condition
TV	Television
V	Volts
W	Watts
W/m2	watt per square metre

OVERVIEW OF THE COLLEGE

DPG Degree College, a premier higher educational institution, imparts holistic professional and vocational education. The college provides a dynamic learning environment to its students to pursue excellence, gain knowledge and acquire skill to achieve their goals. The campus is located to Gurugram.

The educational programmers of the society are dedicated for the promotion of holistic education and academic excellence in the technical arena. Along with carving a niche for itself, the Society has promoted the general advancement of knowledge by igniting the cerebral dimensions of students and by nurturing their innate talents. The vision of the society is to establish institutions of academic excellence to provide quality education which is known for the total commitment to professional education and research.

Modern world class campus spread over beautifully landscaped area, with intellectually vibrant ambience in a erene and lush green environment are among one of the most impressive ones in the State of Haryana. The wi-fi enabled campus has the

state-of-art infrastructure comprising environment friendly Administrative block, academic blocks, spacious class rooms with internet and intranet connectivity and hi-tech multimedia and audio-visual equipment's, well equipped modern laboratories and lab, Learning Resource Centre, auditoriums, seminar halls etc. Besides building the learning resources, the college has also created several other facilities such as separate hostels for boys and girls, faculty and staff residence, sports facilities, medical room, open-air theatres, food courts, bookshops and other utilities and services. The College campus has playgrounds and courts for various games such as cricket, football, basketball, volleyball, badminton, well equipped gymnasium and facilities for indoor games for recreational activities of the college inmates. Athletic tracks, swimming pool and other sports facilities are also fast coming up at the campus. The world class physical and academic infrastructure developed by the College, essential for imparting quality education, facilitate teaching learning process and delight the students, faculty, corporate visitors and parents. Special emphasis have been placed on developing an environment highly conducive to build a solid foundation of knowledge, personality development, confidence building, pursuit of excellence, self-discipline and enhancement of creativity through motivation.

MISSION & VISION

VISION

To be an Institution of academic excellence with total commitment to quality education, research and improvement in human values with a holistic concern for better life, environment and society

MISSION

To provide inclusive and value-based quality education by making it accessible to all sections of the society.

To impart outcome-based holistic education through multi-disciplinary learning.

To nurture an environment that promotes healthy and strong minds by synergizing the benefits of curricular, co-curricular and extra-curricular activities.

To inculcate human values and enable students to be responsible citizens at national and global levels.

Facilities in the campus

Classrooms: The Classrooms provide the most conducive atmosphere for dynamic and focused discussion and are a significant factor in creating harmony in the teacher student relationship. The spacious classrooms have been designed to propel an enquiry based learning that fosters liberation of mind and eagerness to learn.

Computer Labs: computer labs are full air conditioned with computers of latest configurations. Furniture are meeting International standard. Labs are provided with campus wide network-Lawn Facility.

Spacious classrooms

Computer Lab

Library: The library of the College is fully computerized, is a veritable storehouse of information with ample number of text and reference books, national and international periodicals & journals, thesis & dissertations. The library has a special collection of prescribed text books called 'Book Bank'.

Sports ground: With lush green campus, sports ground becomes the very beautiful place to rejuvenate inner self. Advanced sports equipment's are provided to students so that they exuberantly participate in various events.

Cafeteria: The Cafeteria not only provides a vibrant atmosphere and unleaded fuel for the day but also puts forth a new method of knowledge sharing called the "Cafeteria approach.

Hostel

Transport

Hostel: The College campus at present has 2 separate hostels for boys and girls. Boys hostels with a capacity of 150 students and girls hostel with 100 students The hostel rooms are spacious, well furnished and are provided with LAN connectivity with 24 hours internet facility, AC, reading rooms with dailies and magazines and additional indoor sports facilities.

Transport: College's network of transport buses cover all nearby neighborhood, including local communities and townships lying within the radius of 50km. It is designed for the convenience of our students and staff members who are residing outside the campus. This ensures their personal safety, travel reliability and punctuality on the campus.

Geo Location
Geo Coordinates from Google maps:
28.4244639, 77.0206835

AUDIT PARTICIPANTS

On behalf of College

Name	Designation
Dr. S. S. Boken	*Principal*
Dr. Devkanya Gupta	*Co-ordinator, IQAC*
Dr. Priyanka Kumari	*Member, IQAC*
Dr. Priya Shukla	*Member, IQAC*
Dr. Lalit Kumar	*Co-ordinator, NSS*
Dr. Anita Chauhan	*Audit Co-ordinator*

On behalf of EHS Alliance Services

Name	Position	Qualifications
Mr. Vijay Singh	Lead Auditor	*M.Sc. M. Tech (Environment Science & Engineering), Energy Auditor, Post Diploma in Industrial Safety Management*
Dr. Uday Pratap	Co-Auditor	*Ph.D., EMS: Lead Auditor ISO14001:2015, QCI–WASH*

EXECUTIVE SUMMARY

The purpose of this Energy Audit was to seek opportunities to improve the energy efficiency of the DPG Degree College. Reducing the energy consumption despite improving the human comfort, health and safety were of primary concern.

Beyond just identifying the energy consumption pattern, this audit sought to detect and categorize the most energy efficient appliances. Additionally, some daily practices relating common appliances have been shared which may help reducing the energy consumption. Data collection for energy audit of the campus was carried out by the EHS Alliance Team. The Energy Audit Report accounts for the energy consumption patterns of the institution on actual survey and detailed analysis during the audit.

The work comprehends the area wise consumption traced using suitable equipment. The analysis was carried out by our team with the support of the staff members from DPG Degree College. The report provides a list of possible actions to preserve and efficiently access the available source, resources and their saving potential was also identified. We look forward towards optimization that the authorities, students and staff members would follow the recommendations in the best possible way. The report is based on certain generalizations including the approximations wherever necessary. The views conveyed may not reveal the general opinion. They merely represent the opinion of the team guided by the interviews of clients. We are happy to submit this Energy audit report to the DPG Degree College.

ENERGY AUDIT - ANALYSIS

1. ENERGY CONSUMPTION

To understand the Energy Consumption trends and for analyzing the average monthly consumption we have collected electricity energy bills from March 2022 to Feb 2023

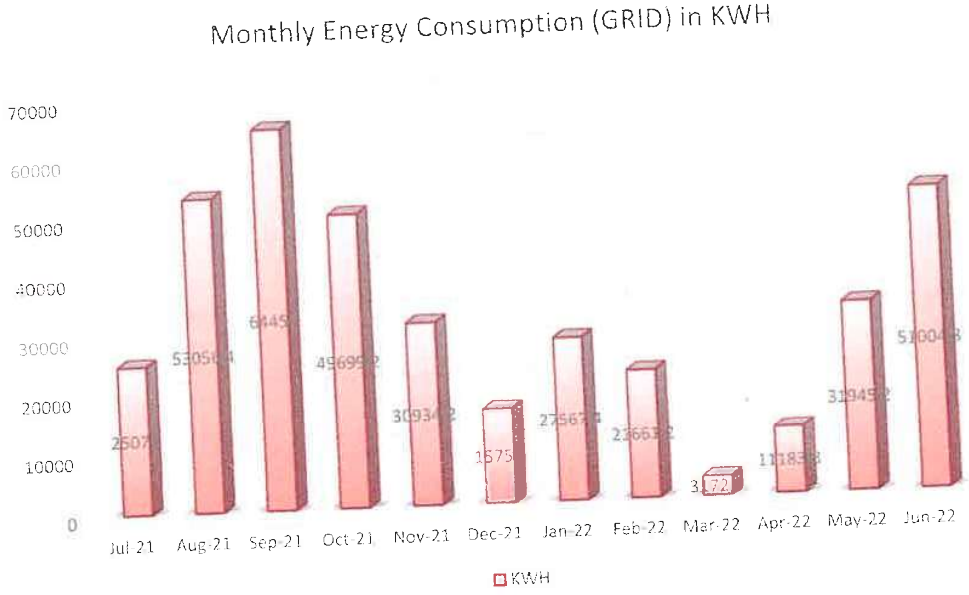
The details of **"Meter Connection"** at **"DPG Degree College"** are as follows-

Name	-	Choudhary Pratap Singh Memorial
CA No.	-	1026760000

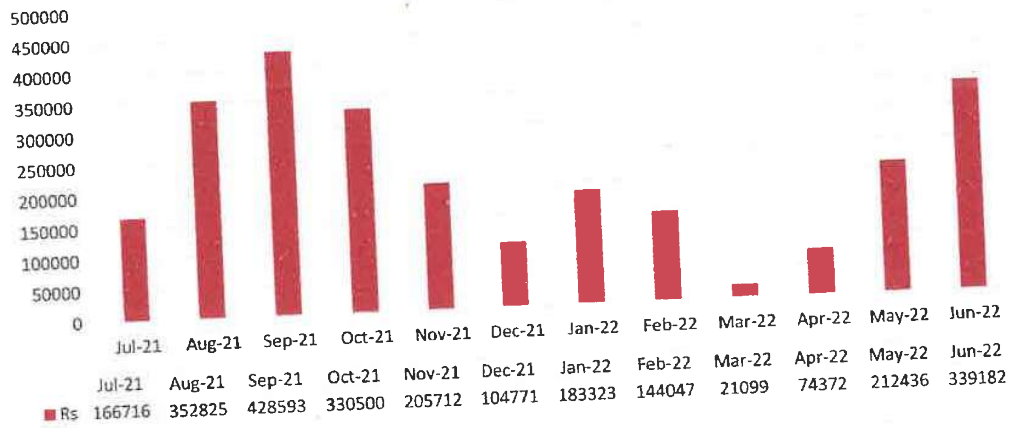
1.1 Summary of Monthly Electricity Consumption and Total Bill Amount

To understand the Energy consumption trend and for developing the baseline parameter we have collected monthly energy bill for the 12 months i.e. from July 2021 to June 2022

Month	Grid Units	Amount	Solar Units	Total Units	Amount
Jul-21	25070	6.65	53431.2	78,501	1,66,716
Aug-21	53056.4	6.65	10818	63,874	3,52,825
Sep-21	64450	6.65	11824.4	76,274	4,28,593
Oct-21	49699.2	6.65	10385.2	60,084	3,30,500
Nov-21	30934.2	6.65	11984	42,918	2,05,712
Dec-21	15755	6.65	8620.4	24,375	1,04,771
Jan-22	27567.4	6.65	7718.8	35,286	1,83,323
Feb-22	21661.2	6.65	8169.6	29,831	1,44,047
Mar-22	3172.8	6.65	10546.4	13,719	21,099
Apr-22	11183.8	6.65	13287.6	24,471	74,372
May-22	31945.2	6.65	12998	44,943	2,12,436
Jun-22	51004.8	6.65	13269.6	64,274	3,39,182
SUM	**328896**		**1,73,053**	**5,58,553**	**25,63,575**



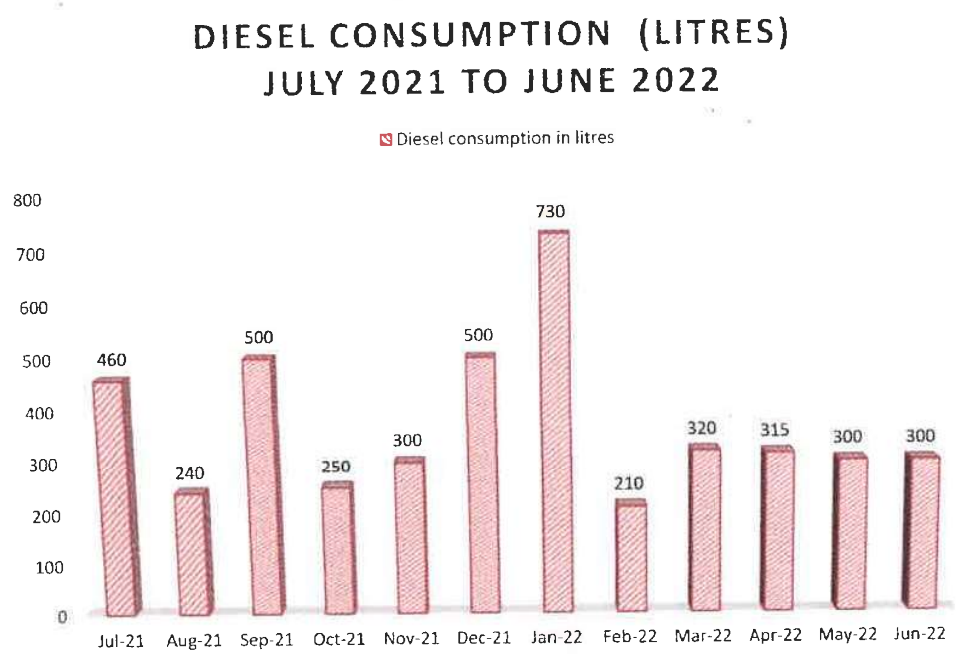
Monthly Energy Consumption - from July 2021 to June 2022



2. DIESEL CONSUMPTION

Below is the diesel consumption details in litres from from July 2021 to June 2022

Period	Diesel consumption (in litres)
Jul-21	460
Aug-21	240
Sep-21	500
Oct-21	250
Nov-21	300
Dec-21	500
Jan-22	730
Feb-22	210
Mar-22	320
Apr-22	315
May-22	300
Jun-22	300
Total	**4425**



3. ANALYSIS OF DG SETS

In the campus, there is only one Diesel Generator (DG) set for its electrical power needs in case of Grid power failure. DG sets capacity is 250 kVA.

DG Set Design Details		
Description	***Unit***	***DG at Station 1***
Rated capacity	kVA	250 KVA
Hz		50
Sl No.		84511087
Make		Cummins
Volts	Volts	415 Volts
PF		0.98
Phase		3 Phase
RPM		1500
Amps	Amps	400
Mfg.		28.03.2018

DG Set Operation details		
Operating hours during testing	Hours	0.50
% Loading	%	75.37
Energy Generation	kWh	33.98
Load	kVA	91.34
Fuel consumption during testing	Litre	8
Specific energy generation	kWh/litre	3.31

Observation and Suggestions:-

Soundproof silent generators are an efficient tool to keep both noise and vibration at low levels. For the power backup of the institution, the soundproof model is installed in the institution.

As per the trial taken during the energy audit the percentage loading of DG set is 75.37% which is ok and specific energy consumption of DG Sets 3.31 kWh/Litre which is satisfactory because as per manufacturer recommendation, best practices for SEC in DG sets range from 3.0 to 3.5 kWh/Litre and above.

We recommend college to initiate stack monitoring of DG set through authorized lab.

4. AC SYSTEM

Energy Efficiency Ratio (EER): Performance of smaller chillers and rooftop units is frequently measured in EER rather than kW/ton. EER is calculated by dividing a chiller's cooling
Capacity (in Btu/h) by its power input (in watts) at full-load conditions. The higher the EER, the More efficient the unit. The cooling effect produced is quantified as tons of refrigeration (TR). The above TR is also called as air-conditioning tonnage.

There are Split ACs installed in DPG Degree College in various areas of various capacity which detail is given below:-

Sl No.	Location/Identification	Type(Window/Split)	2.0 TR(Qty.)	Room Temp. (°C)	AC-Tout (°C)	AC-Tin (°C)	Room-RH (%)	Area (m2)	Air velocity (m/s)	Enthalpy Hout	Enthalpy Hin	Heat Load in TR	KW supplied	(Eff.) Power per Ton (KW /TON)	EER
1	Block A Ground Floor	W	10	24	12	20	52	0.03	2.2	25.0	38.0	0.3	0.6	1.7	2.0
2	Block A Ground Floor	S	8	24	11	19	52	0.03	2.6	24.0	37.0	0.4	0.6	1.5	2.3
3	Block A Floor-1	W	18	24	10	18	52	0.03	2.4	24.0	37.0	0.4	0.5	1.5	2.3
4	Block A Floor-2	S	3	23	12	20	52	0.03	2.3	25.0	38.0	0.3	0.6	1.7	2.1
5	Block A Floor-2	W	22	24	12	20	52	0.03	2.2	25.0	38.0	0.3	0.6	1.7	2.0
6	Block A Floor-3	S	2	24	11	19	52	0.03	2.6	24.0	37.0	0.4	0.6	1.5	2.3
7	Block A Floor-3	W	31	24	10	18	52	0.03	2.4	24.0	37.0	0.4	0.5	1.5	2.3
8	Block A Floor-4	S	2	24	12	20	52	0.03	2.2	25.0	38.0	0.3	0.6	1.7	2.0
9	Block D Ground Floor	W	2	24	11	19	52	0.03	2.6	24.0	37.0	0.4	0.6	1.5	2.3
10	Block D Floor-1	W	26	24	12	20	52	0.03	2.2	25.0	38.0	0.3	0.6	1.7	2.0
11	Block D Floor-2	W	26	24	11	19	52	0.03	2.6	24.0	37.0	0.4	0.6	1.5	2.3
12	Block D Floor-3	W	26	24	10	18	52	0.03	2.4	24.0	37.0	0.4	0.5	1.5	2.3
	TOTAL		176	23	12	20	52	0.03	2.3	25.0	38.0	0.3	0.6	1.7	2.1

Remarks: - We have checked Energy Efficiency Ratio of AC's and EER of AC's is fairly OK. But in future you should purchase 5-Star rated invertor based split AC's because power consumption of Inverter based BEE 5-Star rated AC's is less than non-star rated AC's.

Also, we recommend DPG Degree College to organize periodic maintenance schedule and take corrective actions for insulating of AC's refrigerant lines in order to protect energy losses.

5. FANS ANALYSIS

In the DPG Degree College, there are 725 fans installed, all are ceiling fans of 70W. The observation and suggestion are given below.

Sl No.	Location/Identification	Ceiling Fan-70W
1	Block – A, Ground Floor	96
2	Block – A, Floor-1	111
3	Block – A, Floor-2	114
4	Block – A, Floor-3	104
5	Block – D, Ground Floor	75
6	Block – D, Floor-1	74
7	Block – D, Floor-2	79
8	Block – D, Floor-3	72
Total		725

Total no of Ceiling Fans (70W)	=	735	Nos.
Total wattage of 70W Ceiling Fans	=	50750	Watt
Total wattage of BEE 5 Star rated Fans (30W)	=	21750	Watt
Total saving in Wattage after replacement	=	29000	Watt
Operating hours per day	=	8	Hours
Operating days per annum	=	200	Days
Energy charges per unit in Rs.	=	6.65	INR
Saving in Rs./annum	=	308560	INR
Investment INR	=	1740000	INR
Payback period	=	5.64	Years

Observation and Suggestions:-

In the college, all the ceiling fans are of 70 W but BEE 5 Star Rated of 30W Ceiling Fans are present in the market. We recommend college to replace the existing fans with energy efficient BEE 5 star rating fans.

Note:- Energy saving will increase or decrease if operating hours of machine /equipment will be increased or decreased and payback period will also increase or decrease if cost of investment (Cost of machine/equipment/accessories of machine) will increase or decrease because cost of investment is taken on tentative basis.

6. ANALYSIS OF LIGHTING SYSTEM

6.1 Brief description of existing system

For assessing energy efficiency of lighting system, Inventory of the Lighting System has been noted / collected, with the aid of a lux meter, measurement and documentation of the lux levels at various locations at working level has been done.

6.2 Inventory of Lighting

Sl. No.	Location/Identification	9 W LED	18W LED Light	36W Light
1	Block A Ground Floor	65	4	
2	Block A Floor-1	42	7	2
3	Block A Floor-2	48	1	
4	Block A Floor-3	27	11	22
1	Block D Ground Floor	60	4	
2	Block D Floor-1	47	7	4
3	Block D Floor-2	62	3	
4	Block D Floor-3	55	14	20
	Total	406	51	48

6.3 Lux Measurement

Description	Lux	Remark
Class Rooms	120 to 235	Acceptable
Offices	130 to 240	Acceptable
Corridors	35 to 90	Acceptable
Washrooms	45 to 76	Acceptable
Outdoor	36 to 95	Acceptable
Computer Lab	150 to 289	Acceptable
Parking area	45 to 94	Acceptable
Canteen	69 to 185	Acceptable

Observation : College has initiated LED based lighting solution, but still there are 48 (36W) tube lights. LEDs save energy, the life span is much greater and emit virtually no heat. We recommend to replace the tube lights with LEDs.

Additionally, we recommend to install motion sensor-based lights in common areas such as library, washrooms, corridors, etc.

We also recommend to use solar lights for open areas like parking, ground, street lights, etc. Table below shows the performance characteristics comparison of all luminaries.

Table - Luminous Performance Characteristics of Commonly Used Luminaries

Type of Lamp	Lumens/Watt		Colour Rendering Index	Typical Application	Typical Life
	Range	Avg.			
Incandescent	8-18	14	Excellent (100)	Homes, restaurants, general lighting emergency lighting	1000
Fluorescent lamps	46-60	50	Good w.r.t coating (67-77)	Offices, shops, hospitals, homes	5000
Compact fluorescent Lamps (CFL)	40-70	60	Very Good (85)	Hotels, shops, homes, offices	8000-10000
High pressure mercury (HPMV)	44-57	50	Fair (45)	General lighting in factories, garages, car parking. flood lighting	5000
Halogen lamps	18-24	22	Excellent (100)	Display, flood lightening, stadium exhibition grounds, construction areas	2000 - 4000
High pressure sodium (HPSV) SON	67-121	90	Fair (22)	General lighting in ware houses, factories, street lighting	6000 - 12000
Low pressure sodium (LPSV) SOX	101-175	150	Poor (10)	Roadways, tunnels, canals, street lighting	6000 - 12000
Metal halide lamps	75-125	100	Good (70)	Industrial bays, spot lighting, flood lighting, retail stores	8000
LED Lamps	30-50	40	Good (70)	Reading lights, desk lamps, night lights, spotlights, security lights, signage lights, etc.	40000 - 100000

7. OTHER POWER CONSUMPTION

7.1 Inventory of IT Infrastructure

Sl No.	Location/Identification	Desktop	Laptop	Printers	Scanners	Xerox Machine
1	Principal Office	1		1		
2	Registrar Office	1		1	1	
3	HOD Room	5		5		
4	Exam Cell	2		2	1	2
5	Staff Room	10		4		
6	Board Room	1	1	1	1	
7	Library	3		3	1	3
Total		38	1	17	4	5

7.2 Water pump details

Sl. No.	Description	Unit	Pump No.-1
1	Rated Power of Motor	KW	7.3
2	Motor Eff.	%	80%
3	Discharge Head	m	152
4	Suction Head	m	
5	Pump Type	Submersible/ Monoblock/ Centrifugal Etc.	Submersible

ANALYSIS

There should be regular maintenance schedule of equipment like pumps, exhaust fans and IT equipment. Electronics such as computers, printers, scanners, etc. more than 3 year or 5 years (as per their life) should be replaced with new computers/laptops. Ideal Temperature should be maintained for all electronic appliances.

******* END OF THE REPORT *******

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2020-2021

PREPARED BY
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Principal
D.P.G. Degree College
Sector-34, Gurugram

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06.01.2022
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Vijay Singh
Lead Auditor EMS & Energy

Dr. Uday Pratap
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ABBREVIATION

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AC	Air Conditioner
AC	Alternating Current
AMET	Academy of Maritime Education and Training
CFL	Compact fluorescent lamp
CIP	Comprehensive Inspection Programme
DC	Direct Current
HSD	High Speed Diesel
Hz	Hertz
kg	Kilogram
kVA	kilo-volt-ampere
kW	kilo Watts
kWh	kilowatt hour
kWp	Kilowatt peak
LED	Light Emitting Diode
LPG	Liquefied Petroleum Gas
MMS	Module mounting structure
MPPT	Maximum Power Point Tracker
NAAC	The National Assessment and Accreditation Council
SEC	Specific Energy Consumption
SPV	Solar Photovoltaic
STC	Standard Test Condition
TV	Television
V	Volts
W	Watts
W/m2	watt per square metre

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DPG Degree College, a premier higher educational institution, imparts holistic professional and vocational education. The college provides a dynamic learning environment to its students to pursue excellence, gain knowledge and acquire skill to achieve their goals. The campus is located to Gurugram.

The educational programmers of the society are dedicated for the promotion of holistic education and academic excellence in the technical arena. Along with carving a niche for itself, the Society has promoted the general advancement of knowledge by igniting the cerebral dimensions of students and by nurturing their innate talents. The vision of the society is to establish institutions of academic excellence to provide quality education which is known for the total commitment to professional education and research.

Modern world class campus spread over beautifully landscaped area, with intellectually vibrant ambience in a erene and lush green environment are among one of the most impressive ones in the State of Haryana. The wi-fi enabled campus has the state-of-art infrastructure comprising environment friendly Administrative block, academic blocks, spacious class rooms with internet and intranet connectivity and hi-tech multimedia and audio-visual equipment's, well equipped modern laboratories and lab, Learning Resource Centre, auditoriums, seminar halls etc. Besides building the learning resources, the college has also created several other facilities such as separate hostels for boys and girls, faculty and staff residence, sports facilities, medical room, open-air theatres, food courts, bookshops and other utilities and services. The College campus has playgrounds and courts for various games such as cricket, football, basketball, volleyball, badminton, well equipped gymnasium and facilities for indoor games for recreational activities of the college inmates. Athletic tracks, swimming pool and other sports facilities are also fast coming up at the campus. The world class physical and academic infrastructure developed by the College, essential for imparting quality education, facilitate teaching learning process and delight the students, faculty, corporate visitors and parents. Special emphasis have been placed on developing an

environment highly conducive to build a solid foundation of knowledge, personality development, confidence building, pursuit of excellence, self-discipline and enhancement of creativity through motivation.

MISSION & VISION

VISION

To be an Institution of academic excellence with total commitment to quality education, research and improvement in human values with a holistic concern for better life, environment and society

MISSION

To provide inclusive and value-based quality education by making it accessible to all sections of the society.

To impart outcome-based holistic education through multi-disciplinary learning.

To nurture an environment that promotes healthy and strong minds by synergizing the benefits of curricular, co-curricular and extra-curricular activities.

To inculcate human values and enable students to be responsible citizens at national and global levels.

Facilities in the campus

Classrooms: The Classrooms provide the most conducive atmosphere for dynamic and focused discussion and are a significant factor in creating harmony in the teacher student relationship. The spacious classrooms have been designed to propel an enquiry based learning that fosters liberation of mind and eagerness to learn.

Computer Labs: computer labs are full air conditioned with computers of latest configurations. Furniture are meeting International standard. Labs are provided with campus wide network-Lawn Facility.

Library: The library of the College is fully computerized, is a veritable storehouse of information with ample number of text and reference books, national and international periodicals & journals, thesis & dissertations. The library has a special collection of prescribed text books called 'Book Bank'.

Sports ground: With lush green campus, sports ground becomes the very beautiful place to rejuvenate inner self. Advanced sports equipment's are provided to students so that they exuberantly participate in various events.

Cafeteria: The Cafeteria not only provides a vibrant atmosphere and unleaded fuel for the day but also puts forth a new method of knowledge sharing called the "Cafeteria approach.

Hostel: The College campus at present has 2 separate hostels for boys and girls. Boys hostels with a capacity of 150 students and girls hostel with 100 students The hostel rooms are spacious, well furnished and are provided with LAN connectivity with 24 hours internet facility, AC, reading rooms with dailies and magazines and additional indoor sports facilities.

Transport: College's network of transport buses cover all nearby neighborhood, including local communities and townships lying within the radius of 50km. It is designed for the convenience of our students and staff members who are residing outside the campus. This ensures their personal safety, travel reliability and punctuality on the campus.

Hostel

Transport

Spacious classrooms

Computer Lab

Geo Location

Geo Coordinates from Google maps:
28.4244639, 77.0206835

AUDIT PARTICIPANTS

On behalf of College

Name	Designation
Dr. S. S. Boken	*Principal*
Dr. Devkanya Gupta	*Co-ordinator, IQAC*
Dr. Priyanka Kumari	*Member, IQAC*
Dr. Priya Shukla	*Member, IQAC*
Dr. Lalit Kumar	*Co-ordinator, NSS*
Dr. Anita Chauhan	*Audit Co-ordinator*

On behalf of EHS Alliance Services

Name	Position	Qualifications
Mr. Vijay Singh	Lead Auditor	*M.Sc. M. Tech (Environment Science & Engineering), Energy Auditor, Post Diploma in Industrial Safety Management*
Dr. Uday Pratap	Co-Auditor	*Ph.D., EMS: Lead Auditor ISO14001:2015, QCI–WASH*

EXECUTIVE SUMMARY

The purpose of this Energy Audit was to seek opportunities to improve the energy efficiency of the DPG Degree College. Reducing the energy consumption despite improving the human comfort, health and safety were of primary concern.

Beyond just identifying the energy consumption pattern, this audit sought to detect and categorize the most energy efficient appliances. Additionally, some daily practices relating common appliances have been shared which may help reducing the energy consumption. Data collection for energy audit of the campus was carried out by the EHS Alliance Team. The Energy Audit Report accounts for the energy consumption patterns of the institution on actual survey and detailed analysis during the audit.

The work comprehends the area wise consumption traced using suitable equipment. The analysis was carried out by our team with the support of the staff members from DPG Degree College. The report provides a list of possible actions to preserve and efficiently access the available source, resources and their saving potential was also identified. We look forward towards optimization that the authorities, students and staff members would follow the recommendations in the best possible way. The report is based on certain generalizations including the approximations wherever necessary. The views conveyed may not reveal the general opinion. They merely represent the opinion of the team guided by the interviews of clients. We are happy to submit this Energy audit report to the DPG Degree College.

ENERGY AUDIT - ANALYSIS

1. ENERGY CONSUMPTION

To understand the Energy Consumption trends and for analyzing the average monthly consumption we have collected electricity energy bills from July 2021 to June 2022

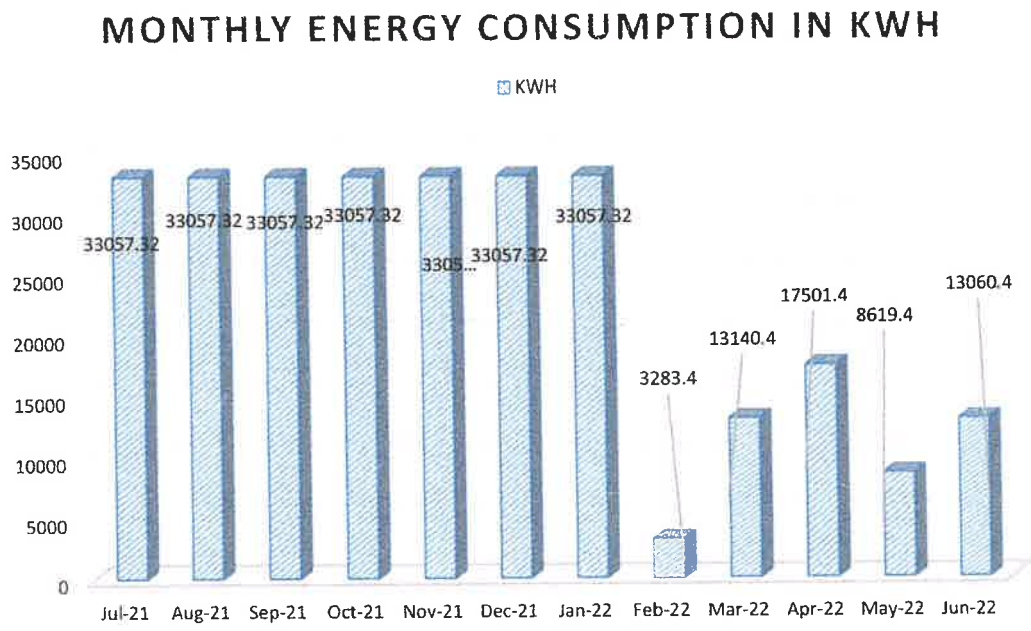
The details of **"Meter Connection"** at **"DPG Degree College"** are as follows-

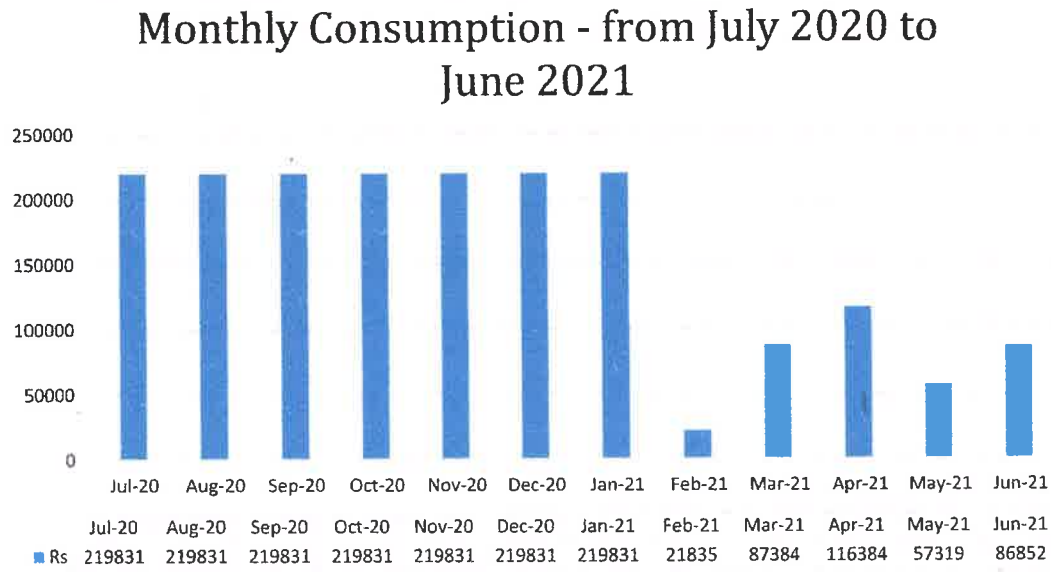
Name	-	Choudhary Pratap Singh Memorial
CA No.	-	1026760000

1.1 Summary of Monthly Electricity Consumption and Total Bill Amount

To understand the Energy consumption trend and for developing the baseline parameter we have collected monthly energy bill for the 12 months i.e. from July 2020 to June 2021

Month	Grid Billing	Solar PV	Net Readings	Rate INR	Amount in INR
Jul-20	33057.32	19116.48	19,116	6.65	2,19,831
Aug-20	33057.32	19116.48	19,116	6.65	2,19,831
Sep-20	33057.32	19116.48	19,116	6.65	2,19,831
Oct-20	33057.32	19116.48	19,116	6.65	2,19,831
Nov-20	33057.32	19116.48	19,116	6.65	2,19,831
Dec-20	33057.32	19116.48	19,116	6.65	2,19,831
Jan-21	33057.32	19116.48	19,116	6.65	2,19,831
Feb-21	3283.4	3555.6	3,556	6.65	21,835
Mar-21	13140.4	10628	10,628	6.65	87,384
Apr-21	17501.4	13399.6	13,400	6.65	1,16,384
May-21	8619.4	13951.6	13,952	6.65	57,319
Jun-21	13060.4	13675.6	13,676	6.65	86,852
SUM	**287006.2**	**1,89,026**	**1,89,026**		**19,08,591**

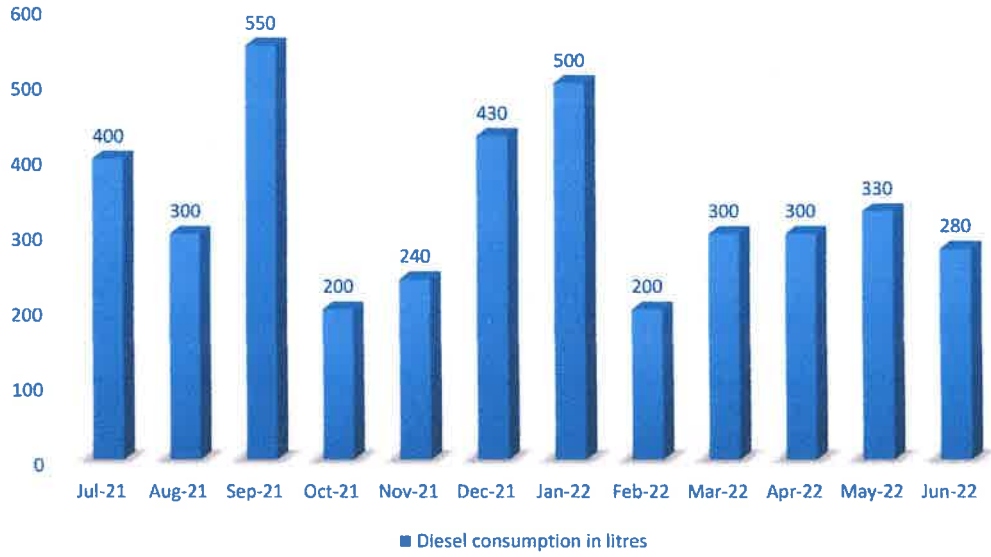




2. DIESEL CONSUMPTION

Below is the diesel consumption details in litres from from July 2020 to June 2021.

Period	Diesel consumption (in litres)
Jul-20	400
Aug-20	300
Sep-20	550
Oct-20	200
Nov-20	240
Dec-20	430
Jan-21	500
Feb-21	200
Mar-21	300
Apr-21	300
May-21	330
Jun-21	280
Total	**4030**



3. ANALYSIS OF DG SETS

In the campus, there is only one Diesel Generator (DG) set for its electrical power needs in case of Grid power failure. DG sets capacity is 250 kVA.

DG Set Design Details		
Description	***Unit***	***DG at Station 1***
Rated capacity	kVA	250 KVA
Hz		50
Sl No.		84511087
Make		Cummins
Volts	Volts	415 Volts
PF		0.98
Phase		3 Phase
RPM		1500
Amps	Amps	400
Mfg.		28.03.2018

DG Set Operation details		
Operating hours during testing	Hours	0.50
% Loading	%	74.56
Energy Generation	kWh	33.76
Load	kVA	89.78
Fuel consumption during testing	Litre	8
Specific energy generation	kWh/litre	3.24

Observation and Suggestions:-

Soundproof silent generators are an efficient tool to keep both noise and vibration at low levels. For the power backup of the institution, the soundproof model is installed near canteen of the institution.

As per the trial taken during the energy audit the percentage loading of DG set is 74.56% which is ok and specific energy consumption of DG Sets 3.24 kWh/Litre which is satisfactory because as per manufacturer recommendation, best practices for SEC in DG sets range from 3.0 to 3.5 kWh/Litre and above.

We recommend college to initiate periodic maintenance schedule and stack monitoring of DG set through authorized lab.

4. AC SYSTEM

Energy Efficiency Ratio (EER): Performance of smaller chillers and rooftop units is frequently measured in EER rather than kW/ton. EER is calculated by dividing a chiller's cooling
Capacity (in Btu/h) by its power input (in watts) at full-load conditions. The higher the EER, the More efficient the unit. The cooling effect produced is quantified as tons of refrigeration (TR). The above TR is also called as air-conditioning tonnage.

There are Split ACs installed in DPG Degree College in various areas of various capacity which detail is given below:-

Sl No.	Location/Identification	Type (Window/Split)	2 TR(Qty.)
1	Block A Ground Floor	Window	10
2	Block A Ground Floor	Split	8
3	Block A Floor-1	Window	18
4	Block A Floor-2	Split	3
5	Block A Floor-2	Window	22
6	Block A Floor-3	Split	2
7	Block A Floor-3	Window	31
8	Block A Floor-4	Split	2
9	Block D Ground Floor	Window	2
10	Block D Floor-1	Window	26
11	Block D Floor-2	Window	26
12	Block D Floor-3	Window	26
	TOTAL		176

Observation: We recommend DPG Degree College to organize periodic maintenance schedule and take corrective actions for insulating of AC's refrigerant lines in order to protect energy losses. And, in future college should purchase 5-Star rated invertor based split AC's because power consumption of Inverter based BEE 5-Star rated AC's is less than non-star rated AC's.

5. FANS ANALYSIS

In the DPG Degree College, there are 725 fans installed, all ceiling fans are of 70W. The observation and suggestion are given below.

Sl No.	Location/Identification	Ceiling Fan-70W
1	Building-1 Ground Floor	96
2	Building-1 Floor-1	111
3	Building-1 Floor-2	114
4	Building-1 Floor-3	104
5	Building-2 Ground Floor	75
6	Building-2 Floor-1	74
7	Building-2 Floor-2	79
8	Building-2 Floor-3	72
Total		725

Observation and Suggestions:-

In the college, all the ceiling fans are of 70 W but BEE 5 Star Rated of 30W Ceiling Fans are present in the market. We recommend to replace existing fans to BEE 5 Star rated 30W fans. And, for future purchases, college should buy BEE 5 star rating 30W fans.

Note:- Energy saving will increase or decrease if operating hours of machine /equipment will be increased or decreased and payback period will also increase or decrease if cost of investment (Cost of machine/equipment/accessories of machine) will increase or decrease because cost of investment is taken on tentative basis.

6. ANALYSIS OF LIGHTING SYSTEM

6.1 Brief description of existing system

For assessing energy efficiency of lighting system, Inventory of the Lighting System has been noted / collected, with the aid of a lux meter, measurement and documentation of the lux levels at various locations at working level has been done.

6.2 Inventory of Lighting

Sl. No.	Location/Identification	9 W LED	18W LED Light	36W Lights

1	Block A Ground Floor	65	4	0
2	Block A Floor-1	42	7	2
3	Block A Floor-2	48	1	0
4	Block A Floor-3	27	0	33
1	Block D Ground Floor	60	4	0
2	Block D Floor-1	47	7	4
3	Block D Floor-2	62	3	0
4	Block D Floor-3	55	0	34
	Total	406	26	73

6.3 Lux Measurement

Description	Lux	Remark
Class Rooms	120 to 235	Acceptable
Offices	130 to 240	Acceptable
Corridors	35 to 90	Acceptable
Washrooms	45 to 76	Acceptable
Outdoor	36 to 95	Acceptable
Computer Lab	150 to 289	Acceptable
Parking area	45 to 94	Acceptable
Canteen	69 to 185	Acceptable

Observation

College has initiated LED based lighting solution, but still there are 73 (36W) tube lights. LEDs save energy, the life span is much greater and emit virtually no heat. We recommend to replace the tube lights with LEDs.

We also recommend to use solar lights for open areas like parking, ground, street lights, etc. Table below shows the performance characteristics comparison of all luminaries.

Table - Luminous Performance Characteristics of Commonly Used Luminaries					
Type of Lamp	Lumens/Watt		Colour Rendering Index	Typical Application	Typical Life
	Range	Avg.			
Incandescent	8-18	14	Excellent (100)	Homes, restaurants, general lighting emergency lighting	1000
Fluorescent lamps	46-60	50	Good w.r.t coating (67-77)	Offices, shops, hospitals, homes	5000
Compact fluorescent Lamps (CFL)	40-70	60	Very Good (85)	Hotels, shops, homes, offices	8000-10000
High pressure mercury (HPMV)	44-57	50	Fair (45)	General lighting in factories, garages, car parking. flood lighting	5000
Halogen lamps	18-24	22	Excellent (100)	Display, flood lightening, stadium exhibition grounds, construction areas	2000 - 4000
High pressure sodium (HPSV) SON	67-121	90	Fair (22)	General lighting in ware houses, factories, street lighting	6000 - 12000
Low pressure sodium (LPSV) SOX	101-175	150	Poor (10)	Roadways, tunnels, canals, street lighting	6000 - 12000
Metal halide lamps	75-125	100	Good (70)	Industrial bays, spot lighting, flood lighting, retail stores	8000
LED Lamps	30-50	40	Good (70)	Reading lights, desk lamps, night lights, spotlights, security lights, signage lights, etc.	40000 - 100000

7. OTHER POWER CONSUMPTION

7.1 Inventory of IT Infrastructure

Sl No.	Location/Identification	Desktop	Laptop	Printers	Scanners	Xerox Machine
1	Principal Office	1		1		
2	Registrar Office	1		1	1	
3	HOD Room	5		5		
4	Exam Cell	2		2	1	2
5	Staff Room	10		4		
6	Board Room	1	1	1	1	
7	Library	18		3	1	3
Total		38	1	17	4	5

7.2 Water pump details

Sl. No.	Description	Unit	Pump No.-1
1	Rated Power of Motor	KW	7.3
2	Motor Eff.	%	80%
3	Discharge Head	m	152
4	Suction Head	m	
5	Pump Type	Submersible/ Monoblock/ Centrifugal Etc.	Submersible

ANALYSIS

There should be regular maintenance schedule of equipment like pumps, exhaust fans and IT equipment. Electronics such as computers, printers, scanners, etc. more than 3 year or 5 years (as per their life) should be replaced with new computers/laptops. Ideal Temperature should be maintained for all electronic appliances.

******* END OF THE REPORT ********