GIANJYOTI
Aspire. Achieve. Ascend
Institute of Management and Technology

Energy Policy

Purpose

Sustainable Development Goals (SDGs) for any organization, environmental and energy-harvesting practices are of critical importance. Rising energy consumption is an area of concern. GJIMT Energy Policy aims to promote renewable energy resources, so that the carbon footprints can be controlled and thereby help to conserve the environment. It defines the roles and responsibilities of all the stakeholders at each level of organization so that the energy resources are optimally utilized and managed to reduce energy consumption and control cost. It aims to make all the people in the organization about the need to conserve energy.

Scope

In order to provide an eco-friendly and sustainable environment, energy policy applies to all the stakeholders of the organization.

Policy Statement

The stakeholders of GJIMT are responsible for helping the organization achieve the goals of energy saving and judicious use. The following objectives to be maintained to implement energy conservation in the organization:

- Efficient use of energy to save both time and money.
- Use energy-efficient equipment to reduce the amount of energy used.
- Encourage use of renewable energy sources.
- Use only high-star-rated appliances to reduce power consumption.
- Shift the usage of non-priority loads during non-peak hours.
- Ensure proper backup of the supply.
- Energy efficiency initiatives in the supply and demand systems are part of the campus's overall energy management.

- The gradual replacement of existing incandescent bulbs with LED models.
- The organization's policy will be reviewed and updated regularly, and its implementation is guaranteed.

Effective Measures

- Identify the potential energy conservation measures that can be installed in the organizations.
- Evaluate the energy-efficiency of the appliances.
- Analyze the electricity consumption through utility bills and set a benchmark to converse the energy periodically.
- Form a team to monitor the use of energy-conserving measures.
- Alternative energy resources like solar, biogas and power-efficient equipment.
- Application of rainwater harvesting system and proper water irrigation.

Problem-Solving

- Implement 'Green campus audit', 'Environment audit' and 'Energy audit practice in the College.
- Creating an eco-friendly culture through seminars/conferences/ workshops.
- Motivate the students to adopt water, air, soil, energy, hygiene etc.
- Creation of rain harvesting system, water reservoir facility and construction of tanks and bonds inside the Organization campus.

Implement the green campus motto with the vision of Swachh Bharath Abhiyan under the Clean India Mission.

Members of the Energy Audit Committee

1.	Dr. Aneet Bedi	-- Director
2.	Prof. Gurdeepak Singh	-- Director (Intl. studies)
3.	Dr. Shiv	-- AP/ Computer Applications
4.	Mr. Vivek Sharma	-- AP/ Management
5.	Ms. Zeba	-- AP/ Computer Applications

RK's
Energy Audits
Valuation (Plant & Machinery)

ENERGY AUDIT CERTIFICATE

This is to certify that the **R.K. ELECTRICALS & ENERGY AUDIT SERVICES** conducted the Energy Audit of **"GIAN JOYTI INSTITUTE OF MANAGEMENT AND TECHNOLOGY, PHASE-2 Mohali Punjab)"**, from 19th May to 25th May for the academic year 2022-2023. This audit involved extensive consultation with all the related team, office record, data collection, measurements and cost benefit analysis

The study exhibited the Annual Energy saving potential of **0.35 Lacs KWH** with annual monetary saving: **Rs 3.13 Lacs** by investing **Rs. 1.95 Lacs**

Date
10/8/23

For R.K. ELECTRICALS & ENERGY AUDIT SERVICES

Er. R. K. Sharma MIE, FIV
BEE's Energy Auditor (EA-10080) MoP, GoI
HP Govt. Emp Energy Auditor, DoE, Shimla
Green Building Accredited Professional (IGBC)
Govt. Regd. Valuer & Chartered Engineer

ENERGY AUDIT REPORT

GIAN JOYTI INSTITUTE OF MANAGEMENT AND TECHNOLOGY, PHASE-2, MOHALI

CONDUCTED BY:

R.K. ELECTRICALS & ENERGY AUDIT SERVICES (An ISO Co.)

Er. R. K. Sharma MIE, FIV
BEE's Energy Auditor (EA-10080) MoP, GoI
HP Govt. Emp Energy Auditor, DoE, Shimla
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Academic Year

2022-23

INDEX

ACKNOWLEDGEMENT

R.K. ELECTRICALS & ENERGY AUDIT SERVICES places on record its sincere thanks to the management of "**Gian Joyti Institute of Management & Technology, Mohali"** for entrusting the project of Energy audit of the building of GJIMT, Mohali particularly: -

Dr. J S Bedi: Chairman

Dr. Aneet Bedi: Director

We express our thanks to the following:

Prof. Gurdeepak Singh: Director International Studies

Assistant Prof. Sh. Sanjay Gupta

Assistant Prof. Sh. Vivek Sharma

& Electrical staff without whose constant support, we could not have carried out this audit.

ER. R.K. Sharma MIE, FIV

BEE's Energy Auditor (EA-10080) MoP, GoI

ABBREVIATIONS

A	Ampere
AC	Alternating Current
APFC	Automatic Power factor Controller
Avg.	Average
BEE	Bureau of Energy Efficiency
CEA	Certified Energy Auditor
CFL	Compact florescent lamp
EER	Energy Efficiency Ratio
FTL	Florescent Tube Light
Kcal	Kilo Calories
Kg.	Kilogram
KL	Kilo Liter
KV	Kilo Volt
kVA	Kilo Volt Ampere
KVAr	Kilo Volt Ampere Reactive
kW	Kilo Watts
kWh	Kilo Watt Hour
M or m	Meter
Mm	Millimeters
Max.	Maximum
Min.	Minimum
MT	Metric Ton
No.	Number
PF	Power Factor
TR	Tons of Refrigeration
V	Voltage
W	Wattage (watt)

EXECUTIVE SUMMARY

The Institution's management is conscious with regard to its Energy Efficiency Levels and they have initiated several measures to reduce the energy consumption. During field studies, it was observed that the management was found to be progressive as it has done very well on energy conservation front by implementing several energy conservation initiatives such as good usage of day light in campus, installation of LED light fixtures at few locations etc. We acknowledge and appreciate the commitment of the **Gian Joyti Institute of Management & Technology, Mohali** management towards conservation of Energy.

However, energy conservation is a continuous process and there is always scope for further improvements.

The objective – The Energy Conservation Act (EC Act) was enacted in 2001 with the goal of reducing energy intensity of Indian economy. Bureau of Energy Efficiency (BEE) was set up as the statutory body on 1st March 2002 at the central level to facilitate the implementation of the EC Act. The Act provides regulatory mandate for: standards & labeling of equipment and appliances; energy conservation campus codes for commercial campus; and energy consumption norms for energy intensive industries.

India faces formidable challenge in meeting its energy needs and in providing adequate energy of desired quality in various forms in a sustainable manner and at competitive prices. Due to rising tariffs, everybody is making efforts to reduce specific energy consumption with the twin aim of reducing energy bills, fast depleting natural resources and pollution. With this aim in mind, the management got this study done to explore energy saving potential to reduce further energy consumption. This involved a detailed Energy:

i) Establish a baseline of the present energy consumption pattern,

ii) Identify Energy Efficiency Measures (EEM's) which can lead to sustained energy savings in the campus and

iii) Prepare an action plan to implement the same.

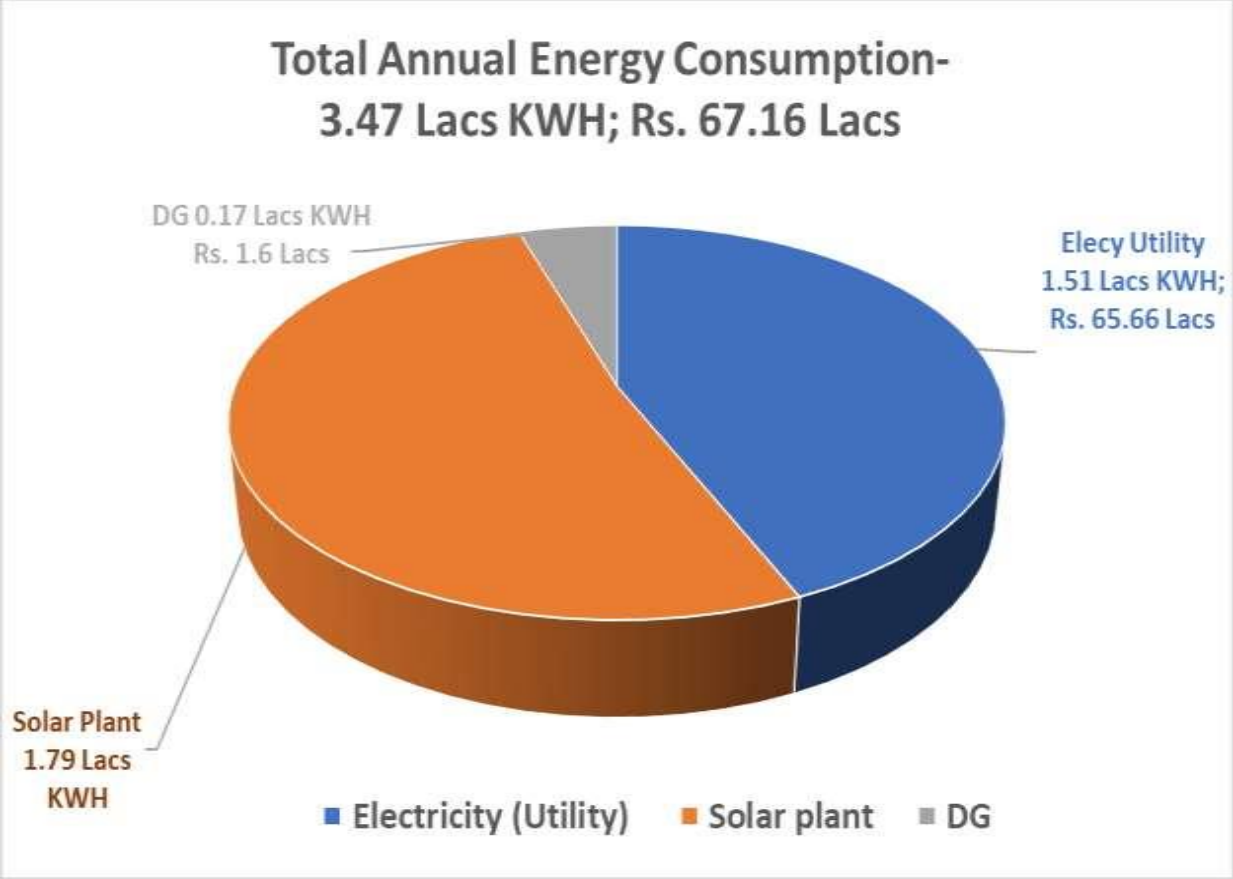
This report is an attempt to provide an overview of energy consumption, its variation and energy reduction potential of **Gian Joyti Institute of Management & Technology, Mohali** campus. The report also highlights the major energy saving opportunities available in the air conditioners, fans, lighting at the campus. A set of recommendations which will assist in improving energy efficiency has also been highlighted in this report.

Detail of Energy Consumption

Using the historical data, the total energy consumption of the building during the last 12 months was **4.14 Lacs KWH** with the annual energy cost amounting to Rs **61.20 Lacs**. Electricity, Solar and HSD are the sources of energy in the campus.

Annual Existing Energy Consumption

Energy Source	Annual Consumption- (Lacs KWH)	Energy cost (Rs. Lacs)
Electricity (Utility)	1.51	65.66
Solar plant	1.79	
DG	0.17	1.60
Total	**3.47**	**67.16**



SUMMARY OF GJIMT CAMPUS

Sr No.	Description	Details
1	Name of the campus	Gian Joyti Institute of Management & Technology, Mohali
2	Location/Address	Gian Joyti Institute of Management & Technology, Phase-2, Mohali
4	Ground covered area of the campus	37800 sq ft
5	Date of Energy Audit	19,22,&24 May 2023
6	Energy Audit report No.	RKS/EA-25/2023
7	Connected load/Contract demand of the campus	272.18 KW
8	No. Of Gen sets with capacity	250 KVA ,125 KVA & 30 KVA
9	Average annual consumption of the Diesel	2000Litres/yr. App.
10	Nature of the campus	Educational Institute
11	Storey	Ground, + 2 Floors
12	Hours of normal operation of the campus	8-9 hrs.
13	Percentage of air-conditioned floor area	More than 50%
14	a) Annual Electricity Consumption purchased from utility	1.51 Lakh kWh
	b) Annual Electricity Consumption through DG set	0.17 Lakh KWh
	c) Annual Electricity Consumption through Solar plant	1.79 KWh (58 % of total consumption)
	d) Total Lighting Load consumption	0.61 Lakh kWh (14.7 % of Total consumption)
	e) Total LED lights load	18% of Total lights load
	f) Total LED Light consumption	13.7% of Total lighting load
	g) Total annual existing Electricity consumption, Utility+ through DG+ Solar Plant	1.51+0.17+1.79=3.47 Lakh KWh
15	Energy Performance Index (EPI of the bdg.)	94.1kWh/Sqm/Annum
16	a) Annual Electricity Cost purchased from utility	Rs.65.66 Lakh
	b) Annual cost of electricity through DG Set	Rs.1.60 Lakh
	c) Total annual existing Electricity cost, (Utility+ DG)	Rs. 67.16 Lakh
17	Electricity rate/KWh as per Tariff – NRS more than 100 KW	Rs.6.55/KWh+11Paise / kWh as electricity duty=Rs.**6.66/KWh**
18	Proposed Annual Electricity Units saving	**0.35 Lakh KWh**
19	Proposed total annual monetary savings	**3.13 Lakh**
20	Proposed investment	**1.95 Lakh**
21	Payback	**1Years**

BRIEF PROPOSED SAVINGS SCOPE

Sr No	DESCRIPTION	VALUE
1	Proposed Annual Electricity Units saving	0.35 Lakh KWh
2	Proposed Annual Monetary Savings	Rs.3.13 Lakh
3	Proposed investment	Rs.1.95 Lakh
4	Payback	1 Years

RECOMMENDATIONS

1. Current Energy Audit Report Academic Year (2022-23):

Findings/Comments Recommendations contained in the current energy audit

i) Utility system:

a) Transformers: Checked Voltage, Current, harmonics and power factor profile of both the transformers installed in the electric substation and found well within the permissible limits**.**

b) Diesel Generator Sets: Checked the performance of DG Sets installed in the substation for power back up and found their efficiency excellent.

ii) Campus electric wiring: inspected campus electric wiring and found healthy with no defect.

iii) Campus lighting system: Checked Lux level of some rooms and found excellent. With the retrofitting of remaining conventional lighting with the LED lighting and LED fixtures, proposed average energy Savable is 13 % from total savings

iv) Renewable Energy Application (Solar power plant): Solar energy is one of the most widely used renewable source of energy one can use renewable energy technologies to convert solar energy in to electricity, it is very reliable source of energy and can significantly reduce the electricity bills, as such, institute's management has installed 200 KWp roof top grid interactive Solar plant and it is generating 700-800 units of electricity which is excellent. The expected annual saving in electricity shall be about 24000 units Which will be 13.2% of total savings

v) Switching off lights, when not required: Some postures & stickers installed at all important locations so that staff and students remain conscious about it.

vi) Awareness campaigns: Awareness campaigns made in the campus for energy conservations covering lighting and renewable source of energy in the campus like solar parking/street lighting.

vii) National Energy conservation day: Energy conservation day celebrated during December 2022 in the campus where various initiatives were taken by the management and students for promoting energy conservation.

SUMMARY OF ENERGY EFFICIENCY MEASURES

EEM (Energy Efficiency Measures)	Proposed Energy Efficiency Measures	Nos.	Annual energy consumption -Kwh	Annual energy consumption after replacement-Kwh	Annual energy saving -Kwh	Annual monetary saving-Rs.	Total investment including installations-Rs.	Simple pay back period (years)
EEM-1	Installation of additional 4 nos. small capacitors to reduce fluctuations & improvement in power factor.					77103	5000	0.06
EEM-2	Replacement of existing FTL 1x40 Watt 4' long with 1x18 Watt LED Tube light 4' long	308	34304	11226	23078	153699	92400	0.6
EEM-3	Replacement of existing round 2x10Watt CFL PL with round 7 Watt LED PL	90	4374	1276	3098	20633	15750	0.7
EEM-4	Replacement of Existing 2'X2' CFL PL 2X18 watt with LED PL 2X10 Watt.	81	7217	3280	3937	26220	28350	1
EEM-5	Maintenance and performance of water cooler installed in the campus	7	10463	9835	628	4181	3750	1

EEM-6	Replacement of existing Monoblock 1 phase 1hp conventional motor pump set with BEE star rated energy efficient 1 phase Monoblock pump set complete in all respects	2	4800	3600	1200	7992	20000	2.5
EEM (Energy Efficiency Measures)	**Proposed Energy Efficiency Measures**	**Nos.**	**Annual energy consumption -Kwh**	**Annual energy consumption after replacement-Kwh**	**Annual energy saving -Kwh**	**Annual monetary saving-Rs.**	**Total investment including installations-Rs.**	**Simple pay back period (years)**
EEM-7	Expected extra generation from existing Solar power plant by improving cleanliness of solar panels	1			3522	23455	30000	1.3
	TOTAL	489	61158	29217	**35463**	**3,13,283**	**195250**	**1**

NET SAVINGS
Units Savable: 0.35 Lakh KWH
Amount Savable: Rs. 3.13 Lakh
Investment: Rs. 1.95 Lacs
Simple Payback Period – 1 Years

For R.K. ELECTRICALS & ENERGY AUDIT SERVICES

INTRODUCTION

The Project

The Project was to prepare a DPR for energy efficiency improvements of the entire campus of Gian Joyti Institute of Management & Technology, Mohali with the advent of energy crisis and exponential hikes in the costs of different forms of energy, Energy Audit is manifesting its due importance in Commercial as well as Industrial Establishments. Energy Audit helps to understand more about the ways energy and fuels are used in any Establishments and helps in identifying areas where waste may occur and scope for improvement exists.

Energy Audit is the key to a systematic approach for decision-making in the area of energy management as it attempts to balance the total energy inputs with its use and serves to identify all the energy streams in a facility/ Establishment.

It was with this objective that **R.K Electricals and Energy Audit Services** was entrusted by the authorities of Gian Joyti Institute of Management & Technology, Mohali, for the study of their Institute. The basic objective of the Audit was to study the load distribution/ consumption pattern in the campus and also to study the operations of major energy intensive equipment/ systems to identify potential areas wherein energy savings are practically feasible.

Background of Gian Joyti Institute of Management & Technology, Mohali

Gian Jyoti Institute of Management & Technology (GJIMT) was established under the aegis of Gian Jyoti Educational Society (GJES) in the year 1998. GJIMT is an ISO 9001:2008 certified. approved by All India. Council of Technical Education (AICTE), New Delhi and affiliated to IKG Punjab Technical University (PTU), Kapurthala. Being Best Colleges in Mohali & North India's premier destination in the fields of management and computer applications, located in the heart of Mohali City, GJIMT has been setting milestones in academics and placements.

GJIMT imparts holistic management and technical education to nurture and develop human resources globally. standards, capable of serving the industry and society productively. Hence, a conscious effort made to give latest and practical exposure to its students of MBA, MCA, BBA, BCA & B.Com programs.

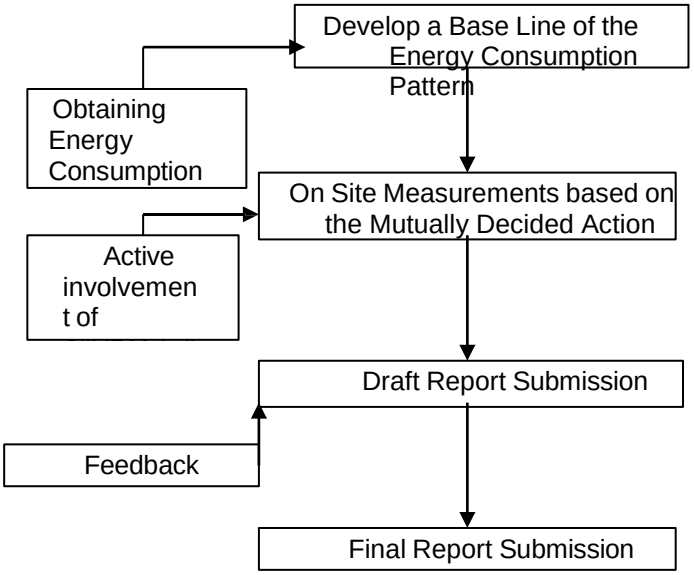
GJIMT has maintained the Top B-Schools of the country rankings for more than a decade now in surveys conducted by the various prestigious publications like Business Standard (2017), Outlook (2016) and Bureaucracy Today (2015). These surveys have been carried out on various parameters involving academics, pedagogy, infrastructure, training, and placement.

The Institute aims to make value addition to the professional skills of its students from day one by introducing the Employment Readiness Program (ERP). GJIMT maintains strong. industry connections that help students to get industry exposure before their final placements.

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.
- A team of engineers visited the campus and had discussions with the concerned officials/ supervisors to collect data/ information on the operations and Load Distribution in the campus. 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.



- 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 measure/s for improvements/ reduction in specific energy consumption.

The entire recommendations have been backed up with techno-economic calculations including the estimated investments required for implementation of the suggested measures and payback period.

INSTRUMENT SUPPORT

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

- Digital Pressure Meter
- Anemometer with Vane Type Probe &Hygrometer
- Three Phase Power Analyzer ALM-31 with appropriate CT's & PT's
- Single Phase Power Analyzer with appropriate CT's
- Digital Temperature Meter
- Ultrasonic Flow meter
- Infrared Temperature Meter
- Lux Meter and digital distance meter

Engineers Who Participated in Audit & Report Preparation

1) Er Rakesh Kumar Sharma MIE, FIV	BEEs Energy Auditor (EA: 10080)
2) Er Vibhor Aggarwal B Tech	BEEs Energy Manager(M-300062/21)
3) Er Varun Sharma	Energy Engineer, B Tech, MBA, PGDC (Ind. Safety)

CHAPTER- I. BASE LINE SCENARIO & REVIEW OF ENERGY CONSUMPTION

1.1 OVERVIEW OF THE BUILDING

1.2 Total area

Area of plot-2.5 Acre (108900 sq ft)

Covered area of the building-37800 sq ft

1.3. Area wise summary and detail of rooms:

The building has two blocks, Ground +3 floors
UG Block-Comprises of 18 rooms, GF, FF & 2nd floor

PG Block - comprises of about 18 rooms, GF, FF, Library,2nd floor & top floor

MISC-Galleries, Labs & parking area etc.

1.4. PURCHASED POWER

Gian Joyti Institute of Management & Technology, Mohali draws power from PSPCL through dedicated feeder at 11 KV. The building has two transformers of 315 KVA each to step down the voltage from 11 KV to 433V. The connected/sanctioned load of the building is 272.18 Kw

1.5. SELF GENERATED POWER

The campus has 03 Nos. of DG Set 250,125 & 30 kVA installed in acoustic covers for in-house power generation. The operation of the DG set is limited to power cuts only.

1.6 REVIEW OF PRESENT ENERGY CONSUMPTION & BILLING: The details of electrical consumption copied from electricity bills for 2022-23 is shown below:

ANNUAL ENERGY DATA 2022-23

MONTH -->	SOLAR GENERATION	SOLAR EXPORT	UTILITY CONSUMPTION	NET UTILITY CONSUMPTION	NET SOLAR CONSUMPTION	TOTAL CONSUMPTION	AMOUNT
	KWH	KWH	KWH	KWH	KWH	KWH	RS
22.MAR-21.APR	24946	6556	14548	7992	18390	26382	480890
21.APR-19 MAY	18840	1963	22412	20449	16877	37326	636980
19.MAY-20.JUNE	26852	1300	33716	32416	25552	57968	735910
21.JUN-18. JUL	19736	3248	15640	12392	16488	28880	903350
18.JULY-22.AUG	25276	3232	29688	26456	22044	48500	1205530
22.AUG-30.SEPT	26024	2224	51292	49068	23800	72868	1722700
30.SEPT-21.OCT	15070	2436	15356	12920	12634	25554	649500
21.OCT-22.NOV	20108	11256	-2228	-13484	8852	-4632	41620
22.NOV-22.DEC	16756	9116	8380	-736	7640	6904	32210
22.DEC-21.JAN	11467	6124	10628	4504	5343	9847	59630
21.JAN-22.FEB	19913	8644	10248	1604	11269	12873	56630
22.FEB-22.MAR	20217	9708	7504	-2204	10509	8305	30760
TOTAL	245205	65807	217184	151377	179398	330775	6555710

Simplified-KWH

SOLAR GENERAT	SOLAR EXPORT	NET SOLAR CONSUMP	UTILITY CONSUM	UTILITY IMPORT	NET UTILITY CONSUMP	TOTAL CONSUMP	BILLING AMT-Rs.
245205	65807	179398	217184	65807	151377	330775	6555710

More Simplified-KWH

NET SOLAR CONSUMP-KWH	UTILITY IMPORT-KWH	TOTAL CONSUMP-KWH	BILLING AMT-Rs.
179398	151377	330775	6563660

Financial Year	22-23
Annual electricity consumption purchased from utility- Lacs kWh	1.51
Annual electricity consumption through solar system- Lacs kWh	1.79
Annual electricity consumption through (Utility+ Solar)- Lacs kWh	3.30
Annual electricity consumption through DG set -Lacs kWh	0.17
Total annual electricity consumption (Utility+ Solar+ DG) - Lacs kWh	3.47
Amount of utility billing+ amount of DG fuel billing (*65.56+1.60) – Rs lacs	67.16
Electricity tariff rate –Energy charges +electricity duty (6.55+0.11) -Rs / kWh	6.66

***The Billing amount of Rs.67.16 Lacs includes the fixed charges and pending arrears**

Thus, electrical energy of about **3.46 Lakh kWh** costing **Rs. 67.16 Lakh** is consumed annually

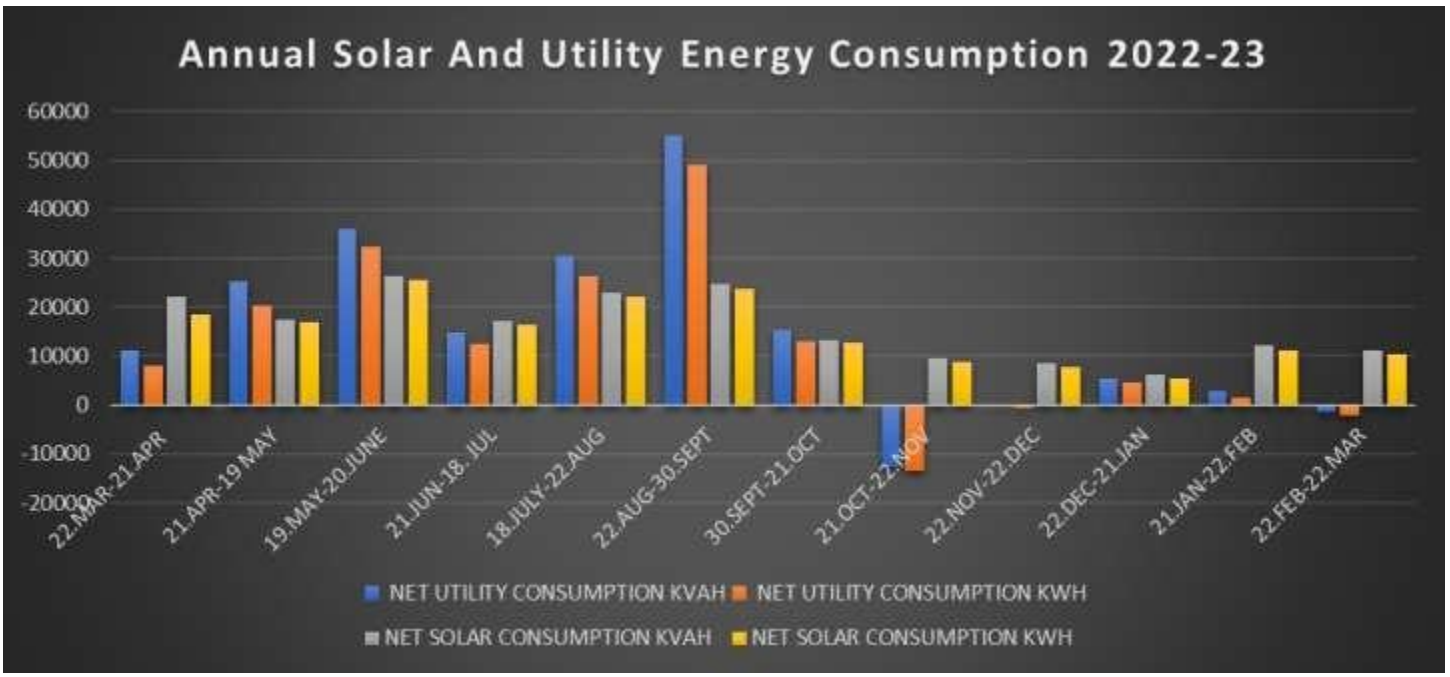
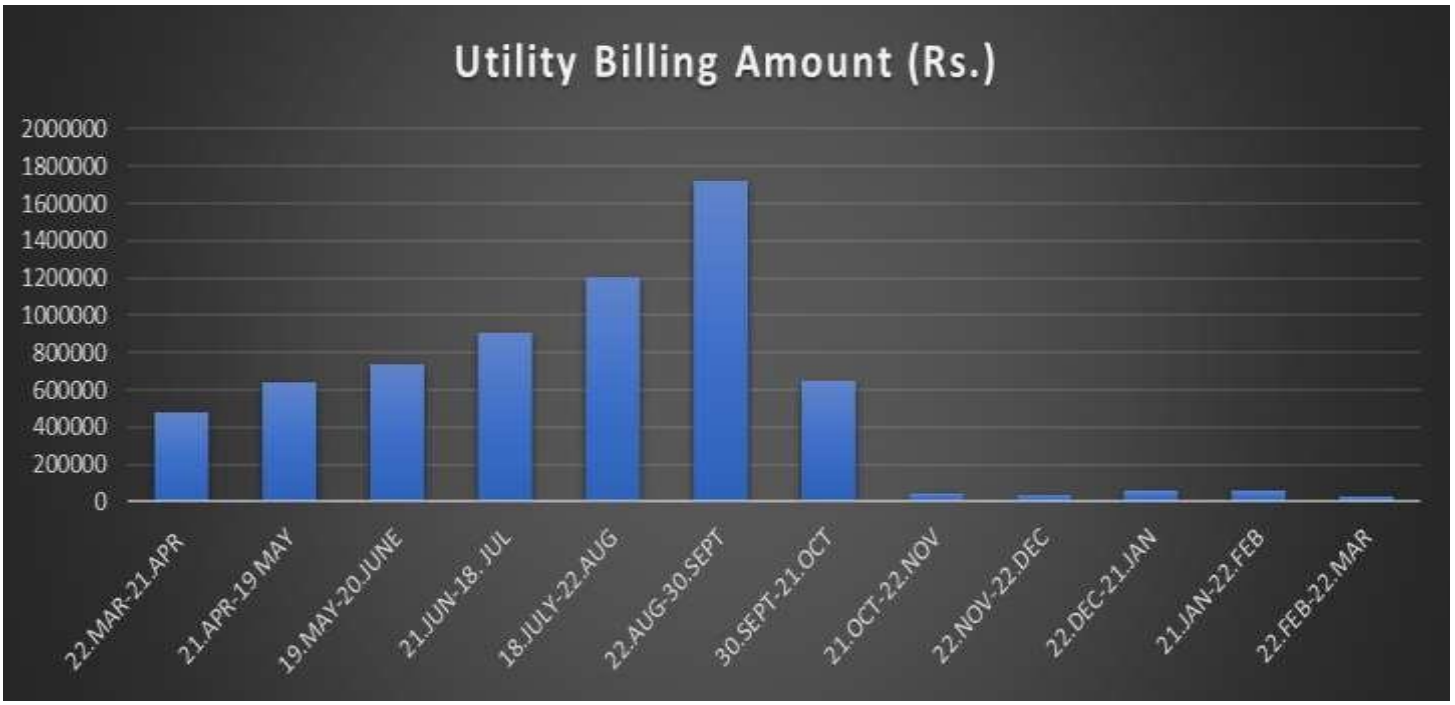


Figure 2 Energy Consumption Profile for FY 2022-2023 KWh Vs Month

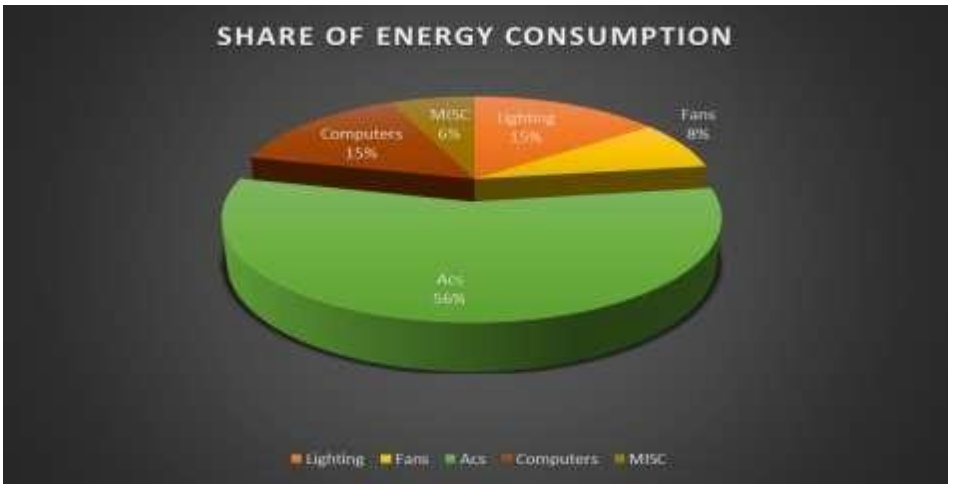


1.7. SHARE OF ENERGY CONSUMPTION IN DIFFERENT AREAS

The auditors tried to calculate energy consumption of various equipment. The energy consumption purchased from utility as well as self generated through DG Sets for the year 2022-23:

SHARE OF ENERGY CONSUMPTION

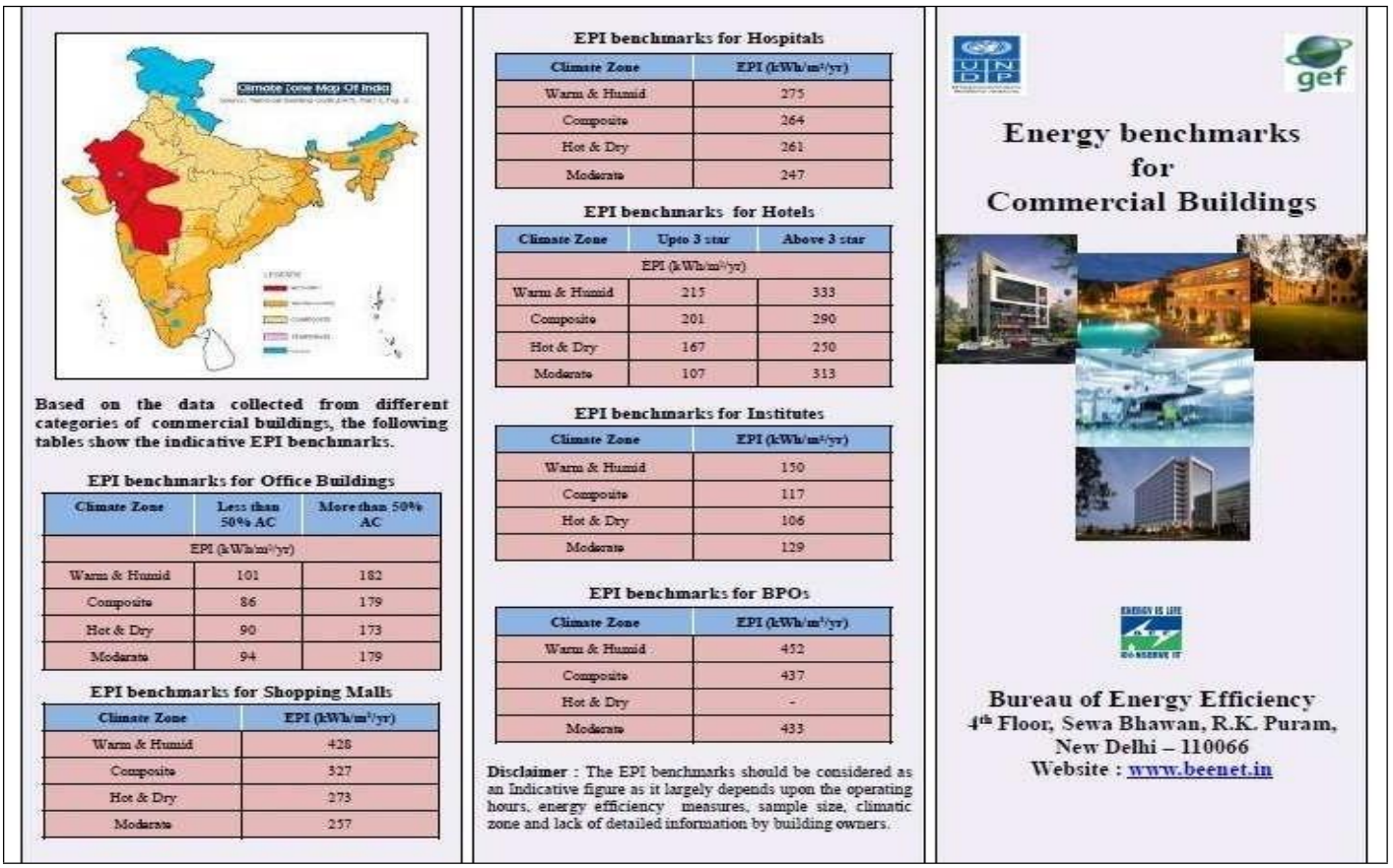
Item	KWH	%age
Lighting	50997.58	14.78
Fans	26622	7.66
Acs	218895	62.98
Computers	24300	6.99
MISC	26744.052	7.69
TOTAL	347559	100



Sharing of the Energy consumption within the boundary is shown graphically.

2.5. ENERGY PERFORMANCE OF THE CAMPUS (EPI): Energy performance index (EPI) is total energy consumed in a campus over a year divided by total built up area in kWh/sq m/year and is considered as the simplest and most relevant indicator for qualifying a campus as energy efficient or not

Benchmarking for EPI is tabulated as below



Calculation of EPI

Considering composite climate as Punjab falls under Composite climate zone

Annual energy consumption during the year 2022-23=330775KWh

Total built up area of the campus – 3511.73 sqm

EPI=330775/3511.73

EPI=94.1/sqm/year

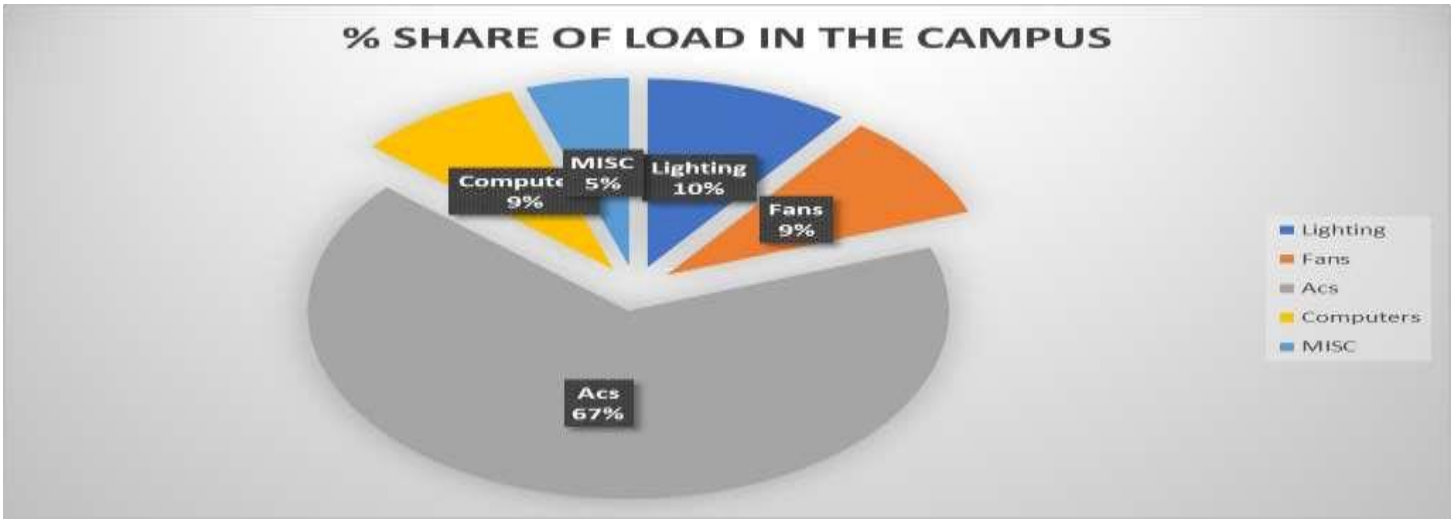
2.6 CAMPUS LOAD PROFILE

It was noticed during onsite assessment that two Transformers having capacity of 315 KVA each are installed for the entire premises. Inventory list of the Campus is shown below:

Connected / Sanctioned load: 272.18 KW

The auditors checked and calculated the electric load of the campus and the load detail is as under:

% SHARE OF LOAD IN THE CAMPUS		
Item	**KW**	**% Share**
Lighting	27.784	10.37
Fans	24.54	9.16
Acs	179.2	66.86
Computers	22.5	8.4
MISC	13.99	5.22
TOTAL	**268**	**100**



CHAPTER- II. ELECTRICAL DISTRIBUTION SYSTEM

a) Review of present electrical distribution like Single Line Diagram (SLD), transformer loading, cable loading, normal & emergency loads, electricity distribution in various areas/floors etc.

2. TRANSFORMERS

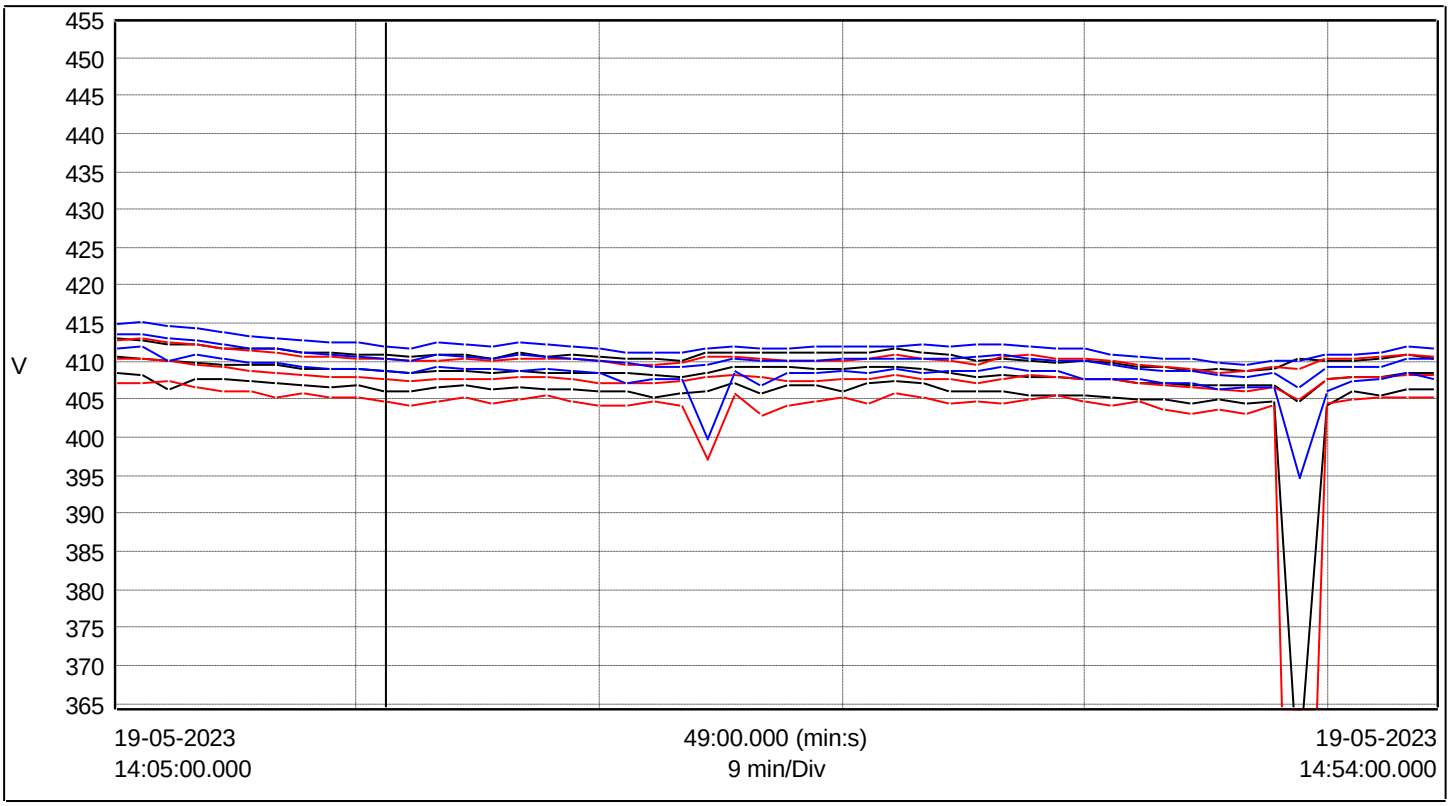
2.1 The Campus has three distribution transformers, 2 nos. of 315 KVA each to step down the voltage from 11 KV to 433V.

2.2. TRANSFORMER 1-315 KVA

2.2.1. VOLTAGE PROFILE – LT IN COMMER T/F 1

During the audit, quality of in-coming power is measured through 3 Phase Power Analyzer in order to measure the power quality parameters at incomer panel of T/F 1 Thus, various parameters were recorded which included Voltage, Current, Power Factor, Total Harmonic Distortion (THD), and Unbalancing of Load:

VOLTAGE PROFILE



Voltage profile of Transformer- 315 KVA

Urms	Urms	Urms	Average	%age
Line 1	**Line 2**	**Line 3**		**im-balance**
408.625	407.931	410.404	409.0	**0.60**

Imbalance voltage

IMBALANCE VOLTAGE

The unbalanced voltage is o.60 % which is under the prescribed limit as per IEEE standards. An unbalance of 2% is acceptable as it doesn't affect the cable.

2.2.2. CURRENT PROFILE

Arms	Arms	Arms	Average	%age
Line 1	**Line 2**	**Line 3**		**im-balance**
186.8	155.9	169.8	170.9	**18.11**

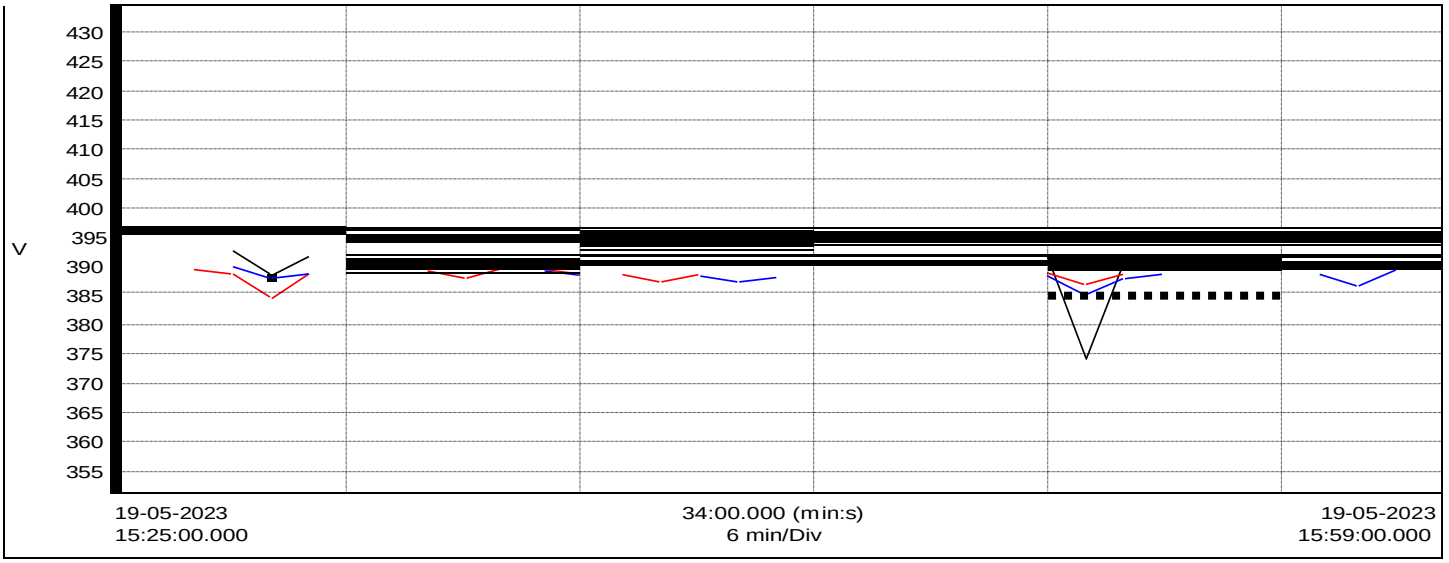
Imbalance current

IMBALANCE CURRENT

The unbalanced current was observed to be 18.11 %. and does not indicate any fault. Any large single-phase load, or a number of small loads connected to only one phase cause more current to flow from that particular phase causing voltage drop on line. All the single-phase loads should be distributed on the three-phase system such that they put equal load on three phases. The unbalanced current is not within the permissible limit of 2%.

2.3. TRANSFORMER 2-315 KVA

2.3.1. VOLTAGE PROFILE – LT IN COMMER T/F 2- 315 KVA



Voltage profile of transformer 2-1600 KVA

Urms	Urms	Urms	Average	%age
Line 1	**Line 2**	**Line 3**		**im-balance**
394.106	390.977	391.495	392.2	**0.13**

Voltage imbalance in 315 kVA Transformer No. 2

IMBALANCE VOLTAGE

The unbalanced voltage is 0.13%, which is under the prescribed limit as per IEEE standards. An unbalance of 2% is acceptable as it doesn't affect the cable.

2.3.2. CURRENT PROFILE

Arms	Arms	Arms	Average	%age
Line 1	**Line 2**	**Line 3**		**im-balance**
44.656	51.281	49.579	48.5	13.66

Current imbalance in 315 kVA Transformer No. 2

IMBALANCE CURRENT

An unbalanced load occurs when there is significantly more power drawn. This can lead to the overheating of the electrical components and possibly overloading the panel.

The unbalance current was observed to be 13.66 %. and does not indicate any fault. Any large single-phase load, or a number of small loads connected to only one phase cause more current to flow from that particular phase causing voltage drop on line. All the single-phase loads should be distributed on the three-phase system such that they put equal load on three phases. The unbalance current is not within the permissible limit of 2%

HARMONIC

2.3.3. HARMONIC GENERATIONS

Equipment based on frequency conversion techniques generates harmonics. With the increased use of such equipment, harmonics related problems have enhanced which are leading to heating of cables, bus bars and transformers, overloading of electrical distribution system, frequent tripping of switchgears, frequent failure of costly mother boards and capacitors of equipment etc.

The harmonic currents generated by different types of loads, travel back to the source. While travelling back to the source, they generate harmonic voltages, following simple Ohm's Law. Harmonic voltages, which appear on the system bus, are harmful to other equipment connected to the same bus, in general sensitive electronic equipment connected to this bus, will be affected.

System Problem	Common Causes	Possible Effects	Solutions
Harmonics (non sinusoidal voltages and /or current wave forms)	Office – Electronics, UPSs, variable frequency drives, high intensity discharge lighting and electronic and core coil ballasts.	Over- heating of neutral conductors, motors. transformers, switch gear. Voltage drop, low power factors, reduced capacity.	Take care with equipment selection and isolate sensitive electronics from noisy circuits.

Common causes and solution of harmonics

OBSERVATIONS & RECOMMENDATIONS

During the assessment, the Audit team also measured the harmonics level of the transformers. Voltage harmonics are observed to be in range of average 2.1% - 2.5 % which is in the prescribed limit as per IEE standard of Voltage harmonics of 5%. Average current THD (%) observed to be in range of average 3.7% - 6.3 % which is in the prescribed limit of 12%

2.4. BALANCING THE LOAD ON TRANSFORMERS & REACTIVE LOAD MANAGEMENT

2.4.1. Transformer 1-315 KVA; Transformer 2-315 KVA

2.5. LOADING POSITION ON TRANSFORMERS

The auditors measured the Electrical parameters of the transformers for calculation of % load on the transformers

TRANSFORMER 1-315 KVA

MEASURED DATA OF T/F 1				
V	I	PF	KW	KVA
409.0	170.9	0.928	112.32	121.06
Load on T/F 1-315 KVA	38.43 %			

TRANSFORMER 2- 315 KVA

MEASURED DATA OF T/F-2				
V	I	PF	KW	KVA
425.8	173.7	0.991	126.92	125.08
Load on T/F 2 - 315 KVA	10.46%			

2.5.1. Load on transformers --***The distribution transformers are designed for taking variation of load with optimum efficiency between 40 & 50% of load. But their maximum utilization is at their rated capacity*. It is observed that average load on these transformers remains approximate 38.43% and 10.46% 2.6.2. Distribution of load on transformers--** ***For minimum copper losses, the load distribution on all the transformers should be equal. While exact distribution is not possible, efforts should be made to make them as equal as possible*.** It is apparent from all these above that distribution of load is not uniform.

The sample calculations of the loading and efficiency are given below:

Transformer capacity – kVa	No load loss- kW	Copper loss – kW	% load	Efficiency
1000	3.3	11.38	45%	98.77%
1000	3.3	11.38	50%	98.79%
1000	3.3	11.38	60%	98.78%
1000	3.3	11.38	70%	98.75%
1000	3.3	11.38	80%	98.69%
1000	3.3	11.38	80%	98.69%
Fall in efficiency between 50% & 80% load				0.09%

OBSERVATIONS AND RECOMMENDATIONS

General condition of substation: The substation and transformers are well maintained

i) Working of all the transformers found ok
ii) **Silica gel** of transformer 1 required to be replaced
iii) **Silica gel-** Transformers do not need much maintenance. The only routine maintenance required is maintenance of its silica gel & oil in breather cup. Due to the increase & decrease of load, its temperature rises & falls. Then, due to atmospheric temperature variations also, temperature fluctuates. So, either silica gel inhales air or expels it. With inhalation, moisture in air is also sucked & it is detrimental first to oil & then winding. This should be checked daily. It takes hardly 10 seconds. The silica gel of transformer 1 needs to be re-conditioned. Similarly, oil needs to be filled in breather cup.
iv) **Unbalance load on**:
v) Transformer -315 KVA = 18%
vi) Transformer 2-315 KVA = 13%
vii) It is recommended to balance the load on all the transformers to save the losses due to unbalance loading where no investment is required

*In the electrical system, unbalanced load on the three-phase of transformer is often found. It is due to the load operational time which does not occur simultaneously. If the unbalanced load occurs continuously on the transformer, it will **decrease the transformer's performance**.*
*The unequal distribution of loads between the three phases of the system causes the flow of unbalanced currents in the system, that produce **unbalanced voltage drops on the electric lines**. This increase in neutral current which causes line losses.*

*An unbalance of **1%** is acceptable as it doesn't affect the cable. But above 1% it increases linearly and at 4% the de-rating is 20%. This implies that- 20% of the current flowing in the cable will be unproductive and thus the copper losses in the cable will increase by 25% at 4% unbalance.*

- Excessive power loss
- The imbalance of current will increase the I2R Losses

Balance the load of both the transformers

The details of capacitors installed: Very good APFC panels are installed. Still average power factor is 0.92 against desirable & possible 0.99

At present 95 KVAr capacitors installed on each APFC panel which are sufficient,4 Nos. additional small 10 KVAr capacitors are recommended to install to reduce the fluctuations and improvement in power factor

EEM- 1 Installation of additional 4 nos. small capacitors to reduce fluctuations & improvement in power factor.

Energy consumption - KWH	330775
Average energy bill @ 6.66/ kWh	2202962
Existing power factor	0.92
Proposed power factor	0.99
Amount saveable;0.5(0.99-0.92) *2202962 -Rs	77103
Expenditure for installing additional 4 nos. small capacitors for improving and reducing the fluctuations in power factor	5000
Pay ack period = Yr.	0.06

CHAPTER- III. LIGHTING SYSTEM

3.1. STUDY OF WIRING SYSTEM

The wiring laid in the campus is of proper sizes with no defect

3.2. COLLEGE LIGHTING SYSTEM

Adequate and proper lighting contributes both directly and indirectly towards productivity, safety and towards providing an improved atmosphere. Primary considerations to ensure energy efficiency in lighting systems are:

a. Selection of the most efficient light source as far as possible in order to minimize power cost and energy consumption.
b. Matching proper lamp type to the intended work task or aesthetic application, consistent with color, brightness control and other requirements.
c. Establish adequate light levels to maintain productivity, improve security and improve safety.

3.2.1. LIGHTING INVENTORY

During the onsite assessment, Audit team has carried out the lighting survey for various locations in GJIMT Campus

The Total lighting details installed in the premises are given below

Type of Luminary	No.	Watt
FTL 4' long	308	40
Round P L CFL 2x10 W	90	20
2'X2' P L CFL 2X18 W	81	36
LED PL	50	10
LED 4' long T/L	106	20
LED Flood Light	44	50
LED Flood Light	3	100

3.2.2 Electricity consumption of existing lighting system of the campus

Type of Luminary	No.	Watt	Ballast Watt	Total-Watts	Hrs	Days	LF	Total KWH
FTL 4' long	308	40	15	55	9	240	0.75	34304
Round P L CFL 2x10 W	90	20	4	24	9	240	0.75	4374
2'X2' P L CFL 2X18 W	81	36	8	44	9	240	0.75	7217
LED PL	50	10		10	9	240	0.75	1013
LED 4' long T/L	106	20		20	9	240	0.75	4293
LED FL	44	50		50	11	365	1	8833
LED FL	3	100		100	11	365	1	1205
						KWH		**50998**

3.3. LUX MEASUREMENT

A high-quality DIGITAL LUX METER was used to measure the illumination levels at various locations GJIMT, Mohali and the recommended level of lightning in these areas is given in the table

The recommended light level as per standard is shown below:

Location	Recommended LUX
Normal work station space, open or closed office	500
Conference Rooms	300
Training Rooms	500
Internal Corridors	200
Auditorium	150-200
Entrance Lobbies, Atria`	200
Stairwells	200
Toilets	200
Dining Areas	150-200

Recommended Standard Light Level Details

3.4. STUDY FINDING OF LIGHTING

The college authorities provided the details of luminaries installed within their Campus premises. The auditors surveyed area and compared type of fittings, their height, and type of reflectors. Based upon this survey and data obtained from the authorities, hours and days of running, the energy consumption is calculated as follows

Assessment of the Lighting

Sr. No	LOCATION	Measured Lux	REMARKS
1	UG Block, GF Room-B101, PA-Chairman	325	Excellent
2	UG Block, GF Room-B108	300	Satisfactory
3	UG Block, GF Room-B103	390	Excellent
4	FF-Lab 6	415	Excellent
5	FF-Lab 13	405	Excellent
6	TF Room-A 402, Lab 3	385	Excellent
7	A-210, Guest room	310	Satisfactory
8	SF-B 307, Lab 15	320	Satisfactory
9	SF-B 301, Lab 12	300	Satisfactory
10	Reception	450	Excellent
11	PG Block, A-201	375	Satisfactory
12	PG Block, A-202, Syndicate room	420	Excellent
13	PG Block, A-208	320	Satisfactory
14	Wash room	215	Satisfactory
15	Library	365	Satisfactory

OBSERVATIONS

- Lux level found to be **excellent**
- During Audit, It was observed that some fluorescent tubes are fitted with magnetic blasts on conventional 40W luminaries and some CFL PLs
- It was also observed during the audit that reflector/diffuser were provided for most of the fluorescent tubes and CF PLs to distribute the uniform lighting in the room.
- It is recommended for converting the remaining installation to use more efficient lighting equipment.

RECOMMENDATION

3.4.1 Installation of Energy Efficient Lights

EEM-2 Replacement of existing 308 nos. 1x4'x40W T-12 WITH 1x4'18 W LEDTUBE LIGHT

In the existing system 308 nos. 40 W, T-12 FTLs are being used to provide general illumination to part of the campus. The proposed scenario includes replacement of T- 12 type with 18 W LED 4' long Tube Light. The energy saving calculations is shown below.

Energy Saving Calculation		Units	Value
Total Number of fittings	=	Nos.	308
Electricity Consumption of existing 1*40W FTL (including ballast) as per "above at Sr No.3.2.2. Electricity consumption of existing lighting system of college"	=	kWh	34304
Electricity Consumption of proposed 1x18W LED tube light, (308 no18wx9hrx300daysx0.75LF/1000=11226Kwh)	=	kWh	11226
Cost Benefit Analysis			
Annual Electricity Savings potential	=	kWh	23078
Per Unit cost	=	Rs.	6.66
Annual Monetary Savings	=	Rs.	153699
Investment/ fixture (including replacement cost)	=	Rs.	300
Total Investment	=	Rs.	92400
Simple Payback Period	=	Years	0.6

The payback period is calculated to be 0.6 years. Since the product life is much more than that, the move is economically beneficial and energy saving

EEM-3 Replacement of existing 90 No. Round CFL P L 2x10 W with Round LED PL 1X7 W

Energy Saving Calculation		Units	Value
Total Number of fittings	=	Nos.	90
Annual electricity Consumption of CFLPL2X10W (including ballast) as "above at Sr No 3.2.2 electricity consumption of existing lighting system"	=	kWh	4374
Annual electricity Consumption of proposed 5W direct fit LED lamp (90nox7wx9hrx300daysx0.75LF/1000=1276 KWH)	=	kWh	1276
Cost Benefit Analysis			
Proposed Annual electricity Savings potential	=	kWh	3098
Per Unit cost	=	Rs.	6.66
Proposed Annual Monetary Savings	=	Rs.	20633
Investment/ fixture (including replacement cost)	=	Rs.	175
Total Investment	=	Rs.	15750
Simple Payback Period	=	Years	0.76

The payback period is calculated to be 0.76 years. Since the product life is much more than that, the move is economically beneficial and energy saving.

EXISTING 2 X 2 AND ROUND CFL FITTINGS IN CAMPUS

EEM-4 Replacement of existing 81 nos. 2'X2'CFL P L 2X18 W with 2'X2'LED P L 2X10 Watt

Energy Saving Calculation		Units	Value
Total Number of fittings	=	Nos.	81
Annual electricity Consumption of 2'X2'CFL P L 2X18 W (including ballast) as "above at Sr No 3.2.2. electricity consumption of existing lighting system"	=	kWh	7217
Annual electricity Consumption of proposed 2'x2'LED PL 2x10 watt (81 nox20wx9hrx300daysx0.75LF/1000=3280 KWH)	=	kWh	3280
Cost Benefit Analysis			
Proposed Annual Energy Savings potential	=	kWh	3937
Per Unit cost	=	Rs.	6.66
Proposed Annual Monetary Savings	=	Rs.	26220
Investment/ fixture (including replacement cost)	=	Rs.	350
Total Investment	=	Rs.	28350
Simple Payback Period	=	Years	1.0

The payback period is calculated to be 1 year. Since the product life is much more than that, the move is economically beneficial and energy saving.

3.4.2. Occupancy Sensors for existing Lighting System

Lighting is the biggest energy consuming area. The **Occupancy sensor, Passive infrared type (PIR)** detects presence of people in the target monitored area. They provide convenience by turning lights on automatically when someone enters a room, and save energy consumption by turning lights off room or reducing light output when a space is unoccupied.

The motion sensor responds to moving objects only. The difference between them is occupancy sensor produce signals whenever an object is stationary or not while motion sensor is sensitive to only moving objects. These types of sensors utilize some kind of a human body's property or body's actions. For instance, a sensor may be sensitive to body weight, heat, sounds, dielectric constant and so on. Occupancy sensors differ from motion sensors in that they don't require significant motion in order to work. Their purpose is not to detect motion, but to detect whether people are present, even if they're not moving around. Many occupancy sensors will use a combination of sensors and various technologies

Observations

It is observed that in many rooms the light, fans and AC units were running even when there was no occupant in the room. After office hours in a few rooms, the FCU fan supply was on lead to energy consumption irrespective of useful output.

Recommendation: It is recommended to install the occupancy sensor for individual rooms to switch off the running load when there is no occupant. Occupancy sensors are one kind of device used for detecting occupancy in space that automatically deactivates the light so that the energy can be conserved. This sensor may also activate the lights. This device can also activate the lights routinely by detecting the occurrence of people and provides security and convenience help. the calculated energy saving is as below:

Providing and fixing Occupancy Sensors (PIR) for existing lighting at various locations in the building.

Energy Saving Calculations:

Based on the laboratory like Lawrence Berkeley National, the strategies based on occupancy can generate 24% of normal savings of lighting energy Lighting load of the rooms, labs, washrooms and at some other locations is 28 KW

EEM-5(not accounted for) providing and fixing of Occupancy/motion Sensors for existing lighting

Energy Saving Calculations:

Description		Units	Value
Locations-Rooms and other connected area of the building.	=	Nos.	50
Annual existing electricity consumption of existing lighting load (28 KW x9 hrs. x300 days=86400 KWh)	=	KWh	75600
Proposed annual Saving in electricity Consumption after fixing the proposed occupancy (PIR) sensors with existing lightings @ 24%(75600x24%) =18144 KWh	=	KWH	18144
Cost Benefit Analysis			
Per Unit cost	=	Rs.	6.66
Annual Monetary Savings=6.66x18144	=	Rs.	120839
Investment/fixt. per sensor	=	Rs.	3000
Total Investment	=	Rs.	150000
Simple Payback Period	=	year	1.2

The payback period would be 1.2 years, which is viable. Since the product's life is much longer than that. Moving is economically beneficial and energy saving.

CHAPTER- IV. STUDY OF COMPUTER SYSTEM

This office has about 450 nos. of computers with LED monitors. The computers are generally for students

An equivalently sized LED monitor is upwards of 80% smaller in size and weight compared to a CRT/LCD. The larger the screen, the bigger the size difference. The other major drawback of LCD deals with the power consumption. The energy needed for the electron beam means that the monitors consume and generate a lot more heat than the LED monitors. On an average, CRT Monitors and LCD monitors consume more Watt while LED computers consume less power. Auditors found no savings in it.

CHAPTER- V. HEATING VENTILATION AND AIR-CONDITIONING SYSTEM

5. STUDY FINDING OF FANS

The Fan details installed in the premises are given below

Sr No	Specification Item	Total nos
1	Ceiling fan	225
3	Wall fan	11
4	Exhaust fan	16

5.1. CEILING FANS

The standard fans are installed in the premises. 100 W Ceiling fan should be replaced with BEE 5 star rated energy efficient BLDC fan comparatively with same air

Flow but reduced in their wattage.

Service Value= Minimum Air Delivery (m3/min) / Power Consumption (kWh)Star: Service Value ≥ 3.2 to <3.4
2 star: Service Value ≥ 3.4 to <3.6
Star: Service Value ≥ 3.6 to <3.8
Star: Service Value ≥ 3.8 to <4.5star: Service Value ≥ 4.0

OBSERVATIONS

- During Audit, Air delivery was not observed on their name plate

RECOMMENDATION

There are 225 nos. ceiling fans installed in the college area are taken for replacement with energy efficient BEE star rated 26watt BLDC Fans

5.2. Energy consumption of existing fans in the college

EEM-6(not accounted for) Replacement of 225 nos. existing old inefficient ceiling fans with 26 W Energy efficient/5 star rated BLDC ceiling fans in the colleges

Energy Saving Calculation		Units	Value
Total Number of ceiling fans	=	Nos.	225
Electricity Consumption of existing old inefficient 100 watt Ceiling fan , 225no.x100wx9hrx150days/1000=30375)	=	Watt	30375
Electricity Consumption of proposed 26 W energy efficient fans(225no.x26wx9hrx150days/1000=78975)	=	Watt	7897
Cost Benefit Analysis			
Annual Savings potential	=	kWh/year	22477
Per Unit cost	=	Rs.	6.66
Annual Monetary Savings	=	Rs.	149700
Investment-1200 mm sweep 26watt BLDC ceiling fan	=	Rs.	2800
Total Investment -Rs	=	Rs.	630000
Simple Payback Period	=	year	4.2

The payback period is calculated to be 4.2 year, which is high. Since the product life is much more than that, the move is economically beneficial and energy saving

5.4. Wall fans

Lower wattage wall fans are being used for air circulation and lowering the temperature of the rooms. It is generally seen that these are rarely used, thus, it is not viable to replace these.

5.4. EXHAUST FANS

Presently 16 no. old inefficient 85-100 W exhaust fans are being used to provide general ventilation to the washrooms/mess, labs on the campus and these may consume up to 100 watts. These are recommended to replace with 40watt energy efficient BEE star rated BLDC exhaust fans

5.5. Energy consumption of existing E/fans in the colleges

EEM-7(not accounted for) Replacement of 16 nos. of100 W inefficient exhaust fan with 40 W Energy efficient BEE 5 Star rated BLDC exhaust fan

The energy saving calculation is shown below

Energy Saving Calculation		Units	Value
Total Number of Exhaust fans	=	Nos.	16
Electricity Consumption of existing old inefficient 80/85watt (16 no.x100wx9hrx150days/1000=2160 KWH)	=	kwh	2160
Electricity Consumption after replacement with 40 W energy efficient BEE 5 star rated BLDC E/fans (16 no.x40wx9hrx150days/1000=864 KWH)	=	kwh	864
Cost Benefit Analysis			
Annual Savings potential	=	kWh/year	1296
Per Unit cost	=	Rs.	6.66
Annual Monetary Savings	=	Rs.	8631
Investment/ fixture replacement	=	Rs./fixture	2350
Total Investment-Rs	=	Rs.	37600
Simple Payback Period	=	year	4.3

The payback period is calculated to be 4.3 years, which is high. Since the product life is much longer than that, the move is economically beneficial and energy saving.

5.6. AIR CONDITIONERS

The main purpose of an Air Conditioning (AC) system is to help maintain good indoor air quality through adequate ventilation with filtration and provide thermal comfort. AC systems are among the largest energy consumers in campus. The choice and design of the AC system can also affect many other high-performance goals, including water consumption (water-cooled air conditioning equipment) and acoustics.

5.6.1. DESCRIPTION OF AC SYSTEM

Campus has installed 59 Nos. of 1.5 and 2T Window /Split Air Conditioners make mostly Hitachi, carrier in various blocks of the campus. These are recommended to replace with energy efficient BEE 5 star rated air conditioners being very old and had served their life

5.6.2. POWER CONSUMPTION MEASUREMENT OF EXISTING AIR CONDITIONERS

The auditors measured the power consumption of some of air conditioners installed at PG block room no. and in the reception, area shown in shown below:

Measured data:

AC	Date	Volts	Amps	PF	KW
Window at RN-	10-06-2023	228	13.7	0.71	2.22
Split in the reception	10-06-2023	228.2	10.66	0.782	1.90

Power consumption of the Air Conditioners

5.6.3. PERFORMANCE OF AIR CONDITIONERS: The audit team has carried out the performance of some of the Air Conditioners by measuring the actual Tonnage (Cooling Capacity) using a hygrometer and anemometer. The performance of the Air conditioner is shown below:

Description	Window-AC in RN 107	Split Reception outside chairman's office
Tons	1.5	1.5
Make	Hitachi	Hitachi
Year		
Ambient air temp - Dry	22.7	28.5
Dry bulb temperature at inlet	15	14.1
Wet bulb temperature at inlet	14.1	12.2

Enthalpy of inlet air - K J / kg	39.72	38.5
Dry bulb temperature at outlet	13.9	11.8
Wet bulb temperature at out let	9.2	7.1
Enthalpy of outlet air - K J / kg	25.63	24.5
Heat shed at evaporator - KJ/kg	14.09	14
outlet duct area -square m	0.0419	0.1597
Air speed - m/second	5.33	1.30
Flow- Cubic meter/ hour	804.0	746.8
Flow - Kg/ hour at inlet temperature	989	926
Total enthalpy KJ/ hour	13938	12959
Total enthalpy KCal/ hour	3331	3097
Total tons/ hour	1.10	1.02
Power consumption - kw	2.22	1.90
Power consumption - kw/ ton	2.01	1.85
Heat shed at evaporator - kw	3.87	3.60
EER of AC	1.7	1.9

Performance analysis of Air Conditioner

OBSERVATIONS & RECOMMENDATIONS

The Performance assessment of units was done only for the purpose of comparison. .

The detailed analysis of the power consumption and performance of AC's were checked and shown above in the tabulated form.

1. The power consumption of ACs is 2.2 kw & 1.9 kw with low EER. The performance of these checked AC's is unsatisfactory. It is recommended to replace the window and split ACs with BEE 5star rated AC's which is a mandatory phase as per star rated plan of BEE.

4. Regular Maintenance of the A/C is required for proper refrigeration effect by attending the gas leakages present and cleaning of the filters.

5.6.4. Electricity consumption of existing ACs

Capacity	Type	Total	Hrs/ day	Days	kWh
1.5T	**window**	**44**	9	**150**	**130680**
1.5T	**Split**	**15**	9	**150**	**38475**

EEM-8 & 9 (Not accounted for) about 44/15 Nos. old inefficient window and split AC'S are proposed to be replaced with new BEE 5 star rated ACs installed in various rooms in the campus. The energy saving calculations is provided below:

Energy Saving Calculation	Units	1.5T/ window	1.5T/ split
Total Number of Air conditioners	Nos.	44	15
Electricity Consumption of existing old inefficient Air conditioners as per Para above "Existing consumption details" 6.5.	Kwh	130680	38475
Annual Savings potential after replacement with energy efficient 1.5 T W/S BEE star rated AC (1200x44X9X150=71280Kwh) & (1200x15X9X150=24300Kwh)	kWh/year	71280	24300
Cost Benefit Analysis			
Per Unit cost	Rs.	6.66	6.66
Annual Monetary Savings	Rs.	395604	94405
Investment/ fixture replacement	Rs. /fixt.	24000	31000
Total Investment	Rs.	1056000	465000
Simple Payback Period	year	2.6	4.9

The payback period would be 2.6, 4.9, years, which is viable. Since the product's life is much longer than that. Move is economically beneficial and energy saving

5.7. DUCTABLE AIR CONDITIONING SYSTEM

5.7.1. **Ductable air conditioning** systems are basically large multi-split systems where a number of indoor units are connected to the outdoor unit. These air conditioning systems are generally used for larger applications where the alternative might be a central chilled water system or central ducted system. Unlike those other types of system these air conditioning would generally be comparable in capital cost but would be quicker to install and more energy efficient to run.

The main advantages of using ducted air conditioning Systems are as follows: -

- A ducted air conditioning system is one which functions by pumping cool air through a centrally located cooling unit. The unit comes equipped with ducts that through a series of ducts transfer the cool air to the living space.
- They provide temperature-controlled cooling and work fine in winters as well by supplying hot air into space.
- A Ductable air conditioner cools the entire area of the property as it comes with separate air-conditioned zones

These units have become very popular for all types of retail, office or commercial applications due to their high degree of flexibility.

The details of the existing Ductable AC system are as under:

Tower AC- 8 Nos.

VRV AC-4 Nos.

5.8. PERFORMANCE OF DUCTABLE AIR CONDITIONERS

5.8.1. RATED PARAMETERS

Description	Voltas/Tower	General/VRV
volts	380-420	380-420
current	12.5Amps	18.9A
Power	6500 watts	6.5 kw
Pressure	4.1Mpa	
A-410	14.3K	
Air flow	4480CFM	8400 m3/hr

5.8.2. Measured Power Data of Ductable AC

V	I	PF	KW	KVA
408.16	8.94	0.823	5.20	6.32

A

B

A & B → PERFORMANCE TESTING OF AIR CONDITIONERS

C→ VRV OUTDOOR UNIT INSTALLED ON ROOFTOP

C

Parameters	1/ VRV	2/ Tower
Average Speed-m/sec	3.50	3.80
Inlet Area-sqm	0.16	0.11
Suction Air Flow -m3/hr	8288	1464
Dry bulb temperature-oC	29.5	28.4
Wet Bulb Temperature-oC	22	23.5
Enthalpy KJ/Kg	65	70
Density of air at 0°C	1.293	1.29
Density of air at inlet temperature	1.167	1.171
Flow in Kg/Hour	9671	1714
Dry bulb temperature--oC	24	23.8
Wet Bulb Temperature--oC	21.8	21.7
Enthalpy KJ/Kg	63.82	64
Heat shed by Air in Evaporator -Kcal	11412	10286
Heat shed by Air in Evaporator - Tons	3.77	3.40
Power - kW	6.1	5.2
kW/Ton	1.62	1.53
EER	2.18	2.30

OBSERVATIONS

The Performance assessment of units was done only for the purpose of comparison. .

1. The detailed analysis of the power consumption and performance of AC's were checked and shown above in the tabulated form. The performance of these checked units is satisfactory.
2. Filters required to be cleaned

RECOMMENDATION

Regular Maintenance of the A/C is required for proper refrigeration effect by attending the gas leakages present and cleaning of the filters on maintenance of the AC'

5.9. Water Coolers

5 Nos. of water coolers are installed in the building premises to enable the employees, students and visitors to get cool water. The water temperature is controlled with a thermostat. Normally it is kept at tap no. 4. Refrigerant R-22 is used in these coolers. No pressure gauges are installed on the refrigerant circuit.

5.9.1. Energy consumption of existing water coolers

Nos	Watts	Hrs.	Days	kWh
5	1550	9.0	150	10463
			Total	10463

Measured parameters of water cooler

Measured the parameters of the cooler installed near reception office and the Performance is as below:

5.9.2. Performance of water coolers

EEM-5

water cooler	Units	Value
Normal water temperature	ºC	24
Reasonable chilled water temperature	ºC	14
Water Temperature measured	ºC	12
Difference in temperature	ºC	2
Excess energy consumption @ 3%/ ºC rise in temperature	%	6
Energy consumption in water cooler as per above Para 6.4.1.	=	10463
Energy saving potential @ 6% ,10463x0.06=933 kwh	=	628
Amount savable @ Rs.6.66/ kWh	=	4181
Expenditure for maintenance of all evaporator coils-Rs750/WC	=	3750
Payback period		1

The payback period would be 1 year which is viable. Since the product life is much more than that

CHAPTER- VI DIESEL GENERATOR SETS

6.1. SELF GENERATED POWER

GJIMT campus has 3 Nos. DG Set of 250 KVA, 125 & 30 KVA capacities installed in acoustic covers for in-house power generation. The operation of the DG set is limited to power cuts only.

HSD Consumption of DG Sets

Diesel Consumption Details	FY 22-23	Units Generated-KWh
Annual- Lts	2000	16460 and added in utility consumption
Rate Rs / lts	80	
Amount – Rs lacs	160000	

6.2 DG SET 1 of 250 KVA

6.2.1 Rated parameters of DG Sets

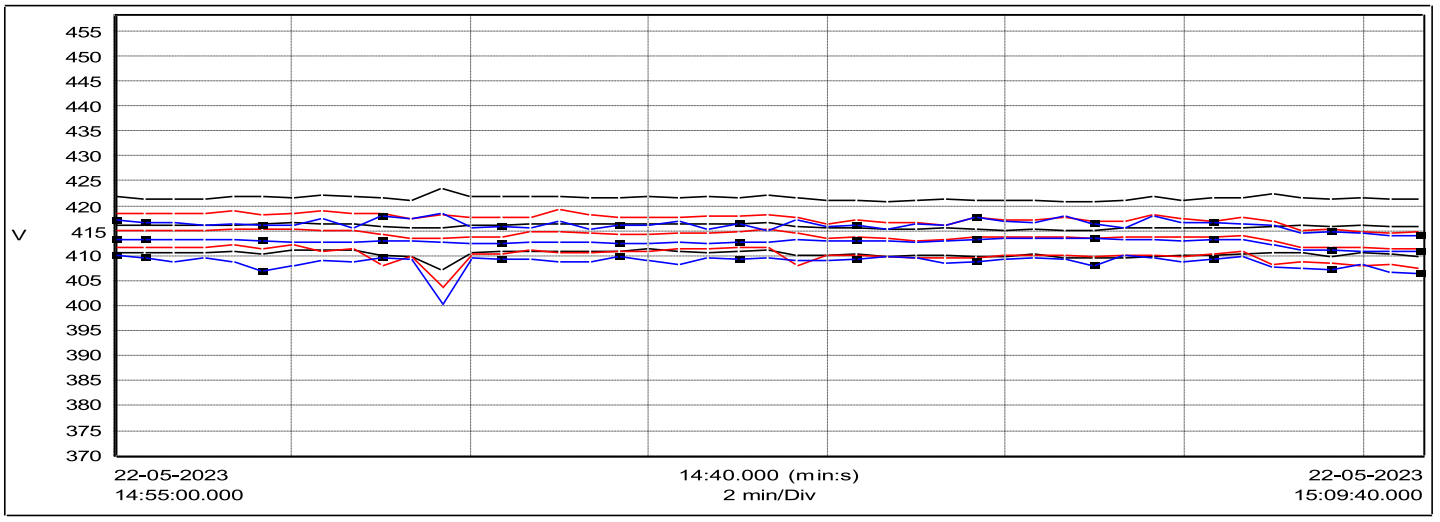
Description	Details
Make	KIRLOSKAR
Capacity-KVA	250
Volts	415
Amps	1405.1
Power factor	0.8 lag
Rpm	1503
Connection	Series
Rated Power-KW	808
Frequency-HZ	50

For analyzing DG of 250 KVA DG set was on 22.05.2023

Measuring Parameters of DG Set No. 1- 250 KVA installed at GJIMT Campus

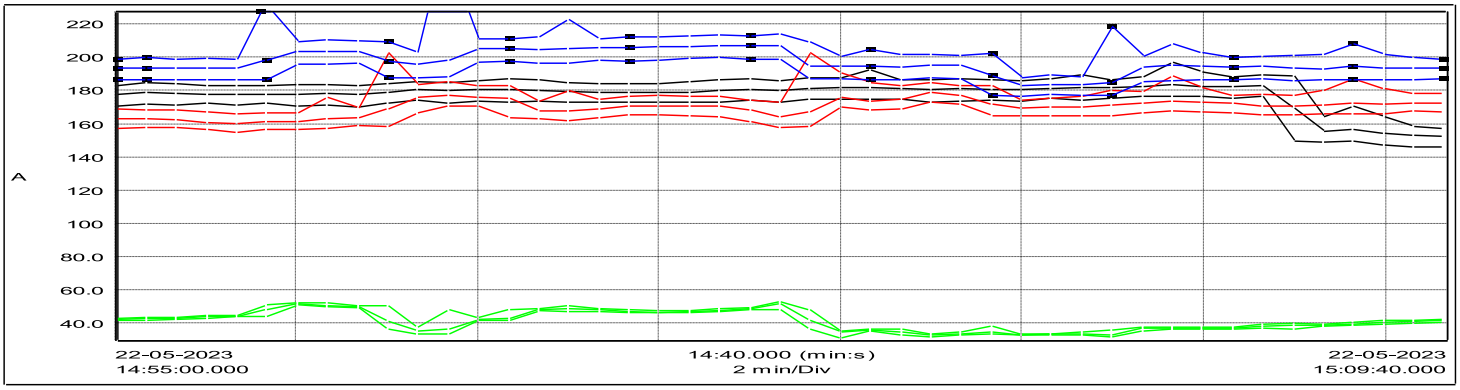
6.2.2. VOLTAGE PROFILE DG-1

Urms	Urms	Urms	Average
Line 1	**Line 2**	**Line 3**	
415.994	414.059	412.845	414.3



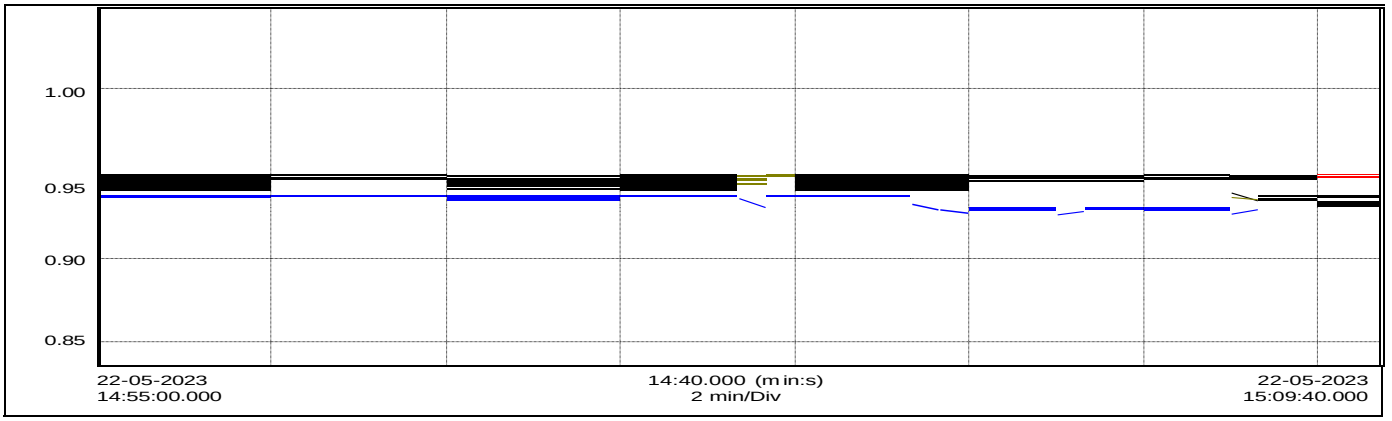
6.2.3. CURRENT PROFILE DG-1

Arms	Arms	Arms	Average
Line 1	Line 2	Line 3	
177.461	170.157	197.301	181.64



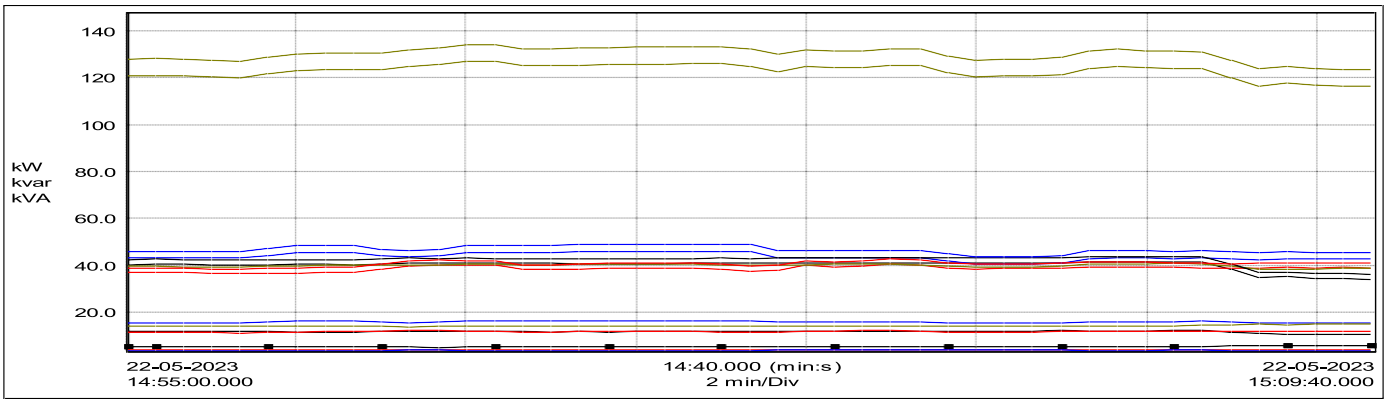
6.2.4. POWER FACTOR PROFILE DG-1

Item	Date	Av	Min	Max
PF1	22-05-2023	0.95	0.939	0.952
PF2	22-05-2023	0.949	0.946	0.953
PF3	22-05-2023	0.935	0.929	0.938
PFT	22-05-2023	0.944	0.941	0.947



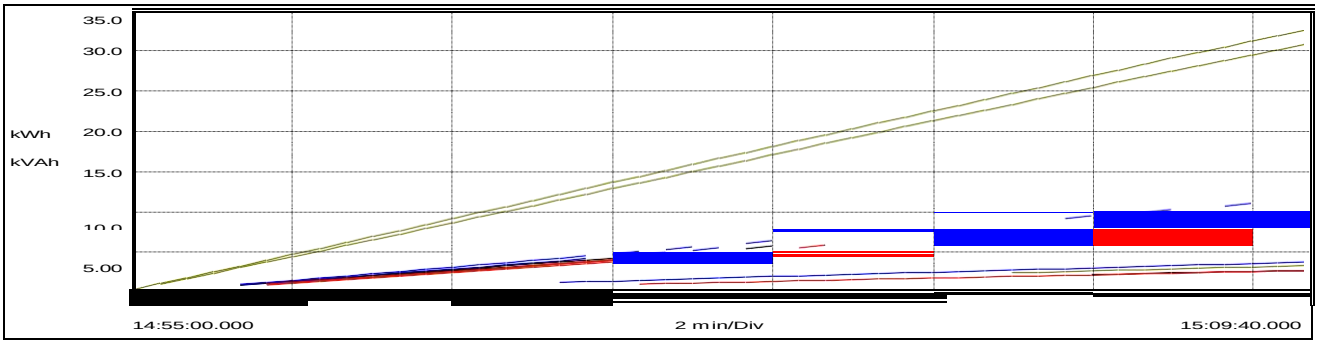
6.2.5. POWER GENERATION PROFILE DG-1

Item	Date	Av	Min	Max	Power
P1	22-05-2023	40.343	34.382	41.909	k W
P2	22-05-2023	38.829	36.651	40.819	k W
P3	22-05-2023	43.91	40.666	46.328	k W
PT	22-05-2023	123.082	116.427	127.361	k W



6.2.6. UNITS GENERATED PROFILE

Item	Date	kWh
Ep1	22-05-2023	10.086
Ep2	22-05-2023	9.707
Ep3	22-05-2023	10.978
EpT	22-05-2023	30.771



GRAPHS OF ENERGY GENERATED BY 250 KVA GENERATOR DURING TRIAL

6.2.7 DATA ANALYSIS OF DG SETs, OBSERVATIONS & RECOMMENDATIONS

All the measurement data is being analyzed

The following is supplemented in management's efforts to further bring down energy costs.

1. Specific energy consumption: -The most important thing is to know specific energy consumption. Log book is maintained for DG. At present only hours of operations are being monitored.
2. Effect of temperature & suction pressure - For every 3.5 °C increase in inlet air temperature, fuel consumption increases by 1%. The DG Sets is normally designed for ambient temperatures of 25 to 30 degree centigrade. Higher temperature & lower suction pressure decreases efficiency. The position of set is as below: -

A. Exhaust pipe- Not insulated. It be insulated

B. Expansion joint & bend- These are insulated.

C. Oil pressure: It varied from 3.72 bar. It was found satisfactory.

D. Water temperature: It remained 80 °C. It is found satisfactory.

E. With balanced load, it can be loaded up to normal75%. With some control on power factor, it can be loaded up to 85%

F. Supply voltage: Average voltage of DG- is 414.3

G. Supply Current: Average supply current of DG-1 is 181.64

H. The load on the GEN SETs is very less.

I. Power factor: Power factor of DG-1 is 0.944 which is more than 0.8

J. The load power factor is entirely dependent on the load The AC generator is designed for the power factor of 0.8 lag as specified by standards

K. Power: Power generated by DG-1 is 123 KW

L. Energy: Energy generated by DG- 31 kwh during its trial

M. Efficiency of DG is satisfactory

Typically, a diesel generator will run at about 40 percent efficiency in its designed optimum operating range, usually up to 80 percent of total load capacity. That means for every 100 units of energy input, 40 units are delivered as output.

-It is recommended to use additive in lubrication oil in HSD for DG it will increase the average and efficiency and will reduce the carbon deposit on the burner nozzles in the DG Set. **The auditors found nil saving in it**

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CHAPTER-7. MOTOR & PUMPING SYSTEM

The campus has made the provision for storage of 35000 lts of water per day in pvc tanks placed on the roof top of the campus for the facility of the staff and students in the campus by pumping with two mono block pumps of 1 HP each installed near stage area Each pump runs 7-8 hour a day

7.1.1. POWER CONSUMPTION OF PUMPSET

During the audit power consumption of 2 X 1 hp Monoblock water pump installed behind reception area was measured The auditors measured the power consumption of the motor pump and measured details are shown below:-

7.1.2. PUMP-1HP Power consumption of one of the Pump-motor was measured

Measured Data

V	I	PF	KW
234	9.5	0.924	2.05

OBSERVATIONS AND RECOMMENDATIONS

Power consumption of the pump found high; it is recommended to replace with Energy efficient BEE star rated pump set of same capacity

EEM-6 Replacement of existing inefficient water pump set with energy efficient BEE 5star rated pump set

ENERGY SAVING CALCULATIONS

Energy Saving Calculation		Units	Pump Set
Floor mounted pump set of 1 HP	=	Nos.	2
Annual Electricity consumption of pump set for water pumping ,2*2*4*300=4800 kwh	=	kWh	4800
Saving Potential after replacing existing motor pump sets with BEE star rated energy efficient pump set of single phase 1hp @ 25 %	=	KWh	1200

Cost Benefit Analysis			
Per Unit cost		Rs.	6.66
Annual Monetary Savings	=	Rs.	7992
Investment for replacing with BEE star rated energy efficient, 1 phase 1hp with flow 900-2500 l/hr. motor pump sets complete in all respect@Rs.10000/-	=	Rs.	20000
Simple payback period	=	Years	2.5

The payback period is calculated to be 2.5 year. Since the product life is much more than that, the move is economically beneficial and energy saving

7.2. LIFT SYSTEM

1no Passenger lift have been provided for comfort of students and staff of KONE make **7.2.1. RATED**

7.2.1. RATED PARAMETERS

Make	KONE
Motor	3 phase squirrel cage induction
Motor voltage	380 V ±5%
Motor current	10A
Motor capacity	5.5KW
Car speed	2 m/s

KONE LIFT & MOTOR

7.2.2. Main observations:

Main observations are as follows:

1 Occupancy level: Since presently occupancy level is much more in this building being one lift, actual operation is also being controlled very effectively on account of in-built technology

2 Latest technologies: The lift is as per latest technology.

7.2.3. POWER MEASUREMENT DATA

We measured power in three conditions:

a) Lift moving upward

b) Lift moving downward

c) Lift at no load

Summary of all the measurement data is as below:

v	A	PF	KW	REMARKS
428.7	3.1	0.785	1.77	**lift on load moving downward**
429	2.9	0.768	1.6	**lift on load moving upward**
429.5	0.32	0.712	0.16	**lift on no load**

Power measurement of lift:

Power consumption is at the low level.
No load power consumption is less than 0.16KW

CONCLUSION:

The lift is operating very efficiently. The auditors do not find any saving in it.
Therefore, Energy saving potential – Nil.

CHAPTER-VIII. SOLAR POWER PLANT

Detailed Report of 200 KWp Solar Roof Top Grid Interactive Power Plant

Solar energy is one of the most widely used renewable source of energy one can use renewable energy technologies to convert solar energy into electricity, it is very reliable source of energy and can significantly reduce the electricity bills

8.1. Installation of a 200 KWp roof top Solar Power Plant:

At present, power is sourced from the PSPCL at 11 kV, which is subsequently stepped down to 433 V using 2 nos. transformer of 315 KVA each Metering is done at the 11 kV level. Power is also generated using 3 DG sets of 250,125 & 30 kVA. The college has ample space i.e. Roof top area on campus. The average power generation from a 1 KWp SPV System is around 4-5 kWh per day. Since the proposed SPV system does not have a battery backup grid connection would be required to meet the power requirements during the night. Also, the SPV power generation varies with time of day, the balance power requirements are automatically met by the grid supply during this period.


GPS Map Camera
Sahibzada Ajit Singh Nagar, चंडीगढ़, India
JUNIOR WING, GIAN JYOTI GLOBAL SCHOOL, Gian Jyoti Rd, Phase 2, Sector 54, Sahibzada Ajit Singh Nagar, चंडीगढ़ 160059, India
Lat 30.724493°
Long 76.726144°
14/03/23 03:54 PM GMT +05:30
Google


GPS Map Camera
Sahibzada Ajit Singh Nagar, Punjab, India
371, Phase 2, Sector 54, Sahibzada Ajit Singh Nagar, Punjab 160055, India
Lat 30.724516°
Long 76.726146°
22/05/23 04:06 PM GMT +05:30
Google

One 200 kW solar plant for generating own electricity is installed on roof top. The electricity generated by unit installed for which 12 months data is available is as follows:

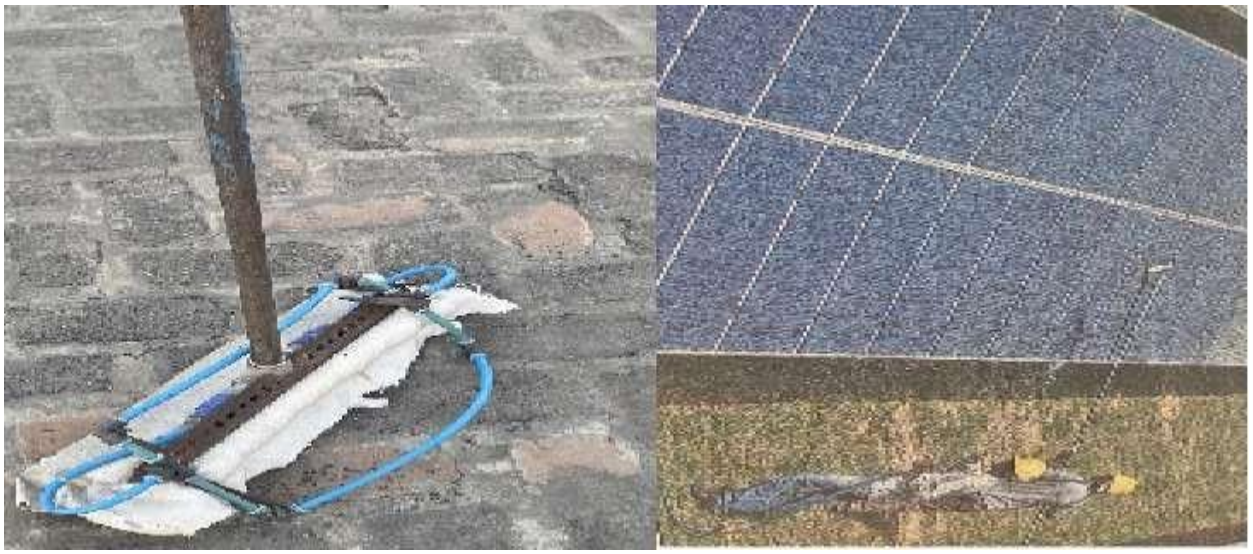
MONTH 2022-23	Apr	May	Jun	Jul	Aug	Sep
Solar Generation-KWH	24946	18840	26852	19736	25276	26024

Oct	Nov	Dec	Jan	Feb	Mar	Total
15070	20108	16756	11467	19913	20217	**245205**

8.2. The generation of electricity from above table is as follows:

Narration	Value
Total for 2022-23	245202
Average /day; (245202/365=672) KWH	672
Energy /kw installed capacity ;(672/200 KWp=3.36)-KWh	3.36

The Solar panel is expected to generation an average over the year 4.6 kWh of electricity per day (considering 5.5 sunshine hours). If we consider 300 sunshine days, it comes to 4.6*200*300 = 276000 KWH/annum for one 200 kW panel. We do not expect 4.6kwh/kw/day in this campus due to some deficiencies. Cleaning at roof top is difficult. The campus authorities have installed a water pipe connection at certain locations. But it is not sufficient. Water pipe with proper tee off &valves be laid all around & each panel washed with water & cleaned with cloth at least once a week instead of fortnightly as done now. Practices at some buildings are shown below:



In the first image, a locally made scrubber with water pipe connected is used. The water pipe is connected to the handle top & one person can do all the cleaning. Here, both manpower & water is saved but cleaning is not very perfect. In second method, one person spays water & 2nd cleans it. It involves a lot of water. Secondly a good approach & safety be provided for person going up for cleaning so that he feels secure.

We expect extra generation

8.3. Expected saving potential & investment for it are as follows:

EEM-7

Energy Saving Calculations

Item	Value
Solar Generation capacity-taking 300 sunny days,4.6*200*300 = 276000 - KWH	276000
Total generation in 22-23-KWh	245205
Extra expected generation from solar power plant-KWH	30795
Total Energy salvable, assuming @10% from expected generation - kwh	3080
Amount salvable @ Rs 6.66/ kWh - Rs	20513
Appr investment for improving stairs, water piping, safety, extra lab chgs@2days/week	30000
Pa back period	1.4

The payback period is calculated to be 1.4 year. Since the product life is much more than that, the move is economically beneficial and energy saving

CHAPTER-IX. ENERGY MONITORING & ACCOUNTING SYSTEM

9.1. Detail review of present energy monitoring & accounting system terms of metering record keeping, data logging, periodic performance analysis etc.

9.2 Energy management monitoring system

Energy is costly & its consumption causes environmental degradation. So, without sacrificing production & growth, it is worthwhile saving it to the extent possible

Monitoring and targeting is an important management tool to control energy consumption. Monitoring gives existing energy consumption pattern and targeting is desirable/achievable energy consumption pattern. By proper monitoring & targeting, it is possible to save 2 to 5% energy. For its effectiveness, proper records of energy consumption and production needs to be maintained.

Somehow, the auditors feel that proper records are either confined to 1-2 persons or not maintained. It is necessary to maintain &monitor& record following things:

i Electricity consumption, power factor & maximum demand

ii Maximum, minimum voltage from grid. This will enable them to install Servo stabilizer at important locations.

9.3. For maintenance:

Transformer – 2 No. transformers of 315 KVA each for which routine maintenance schedule be adhered to.

Generator set- Some maintenance schedule should be prepared for DG Set. It can be as follows

L D System

9.3.1. Initially tightening of all connections. Later, once a month &after 1-2 months, once a year

Thermo graphic images: Be taken after tightening all connections.

There after once in 2 years.

9.3.2. Bench marking

Benchmarking of energy consumption is a powerful tool for performance assessment and logical evolution of avenues for improvement. Historical data, well documented, helps to bring out energy consumption and cost trends month-wise / daily. Trend analysis of energy consumption, cost, relevant production features, specific energy consumption, help to understand effects of capacity utilization on energy use efficiency and costs on a broader scale.

9.3.3. Suggestions to carry out this monitoring & bench marking: Presently, the campus building is being looking after by the competent technical staff provided by the Govt. & accounts staff of the college. But, monitoring, targeting etc. is itself professional work. The energy consumption in this campus is about 3.47 Lakh KWH. It can hire a professional energy manager to visit & guide their staff –initially once afterwards1 visit once in 6 months.

CHAPTER-X. CHECKLISTS AND ENERGY SAVING TIPS

Below are some of the energy efficiency tips in electrical utilities

10.1. ELECTRICITY

- Optimize the tariff structure with utility supplier
- Schedule your operations to maintain a high load factor
- Shift loads to off-peak times if possible.
- Minimize maximum demand by tripping loads through a demand controller
- Stagger start-up times for equipment with large starting currents to minimize load peaking.
- Use standby electric generation equipment for on-peak high load periods.
- Correct power factor to at least 0.90 under rated load conditions.
- Relocate transformers close to main load.
- Set transformer taps to optimum settings.
- Disconnect primary power to transformers that do not serve any active loads
- Consider on-site electric generation or cogeneration.
- Export power to grid if you have any surplus in your captive generation
- Check utility electric meter with your own meter.
- Shut off unnecessary computers, printers, and copiers at night.

10.2. MOTORS

- Proper size to the load for optimum efficiency.
- (High efficiency motors offer of 4 - 5% higher efficiency than standard motors)
- Using energy-efficient motors was economical.
- Use synchronous motors to improve power factor.
- Check alignment.
- Provide proper ventilation
- (For every 10 oC increase in motor operating temperature over recommended peak, the motor life is estimated to be halved)
- Check for under-voltage and over-voltage conditions.
- Balance the three-phase power supply.
- (An imbalanced voltage can reduce 3 - 5% in motor input power)
- Demand efficiency restoration after motor rewinding.

- (If rewinding is not done properly, the efficiency can be reduced by 5 - 8%)

10.3. PUMPS

- Operate pumping near the best efficiency point.
- Modify pumping to minimize throttling.
- Adapt to wide load variation with variable speed drives or sequenced control of smaller units.
- Stop running both pumps -- add an auto-start for an on-line spare or add a booster pump in the problem area.
- Use booster pumps for small loads requiring higher pressures.
- Increase fluid temperature differentials to reduce pumping rates.
- Repair seals and packing to minimize water waste.
- Balance the system to minimize flows and reduce pump power requirements.
- Source: Bureau of Energy Efficiency, New Delhi 4
- Use siphon effect to advantage: don't waste pumping head with a free-fall (gravity) return.

FOR R.K. ELECTRICALS & ENERGY AUDIT SERVICES

(END OF THE REPORT)

10.4. ANNEXURES - LIST OF SOME VENDORS

FOR LIGHTING	SYSKA LED DELHI, D-, 108, Patpar Ganj Rd, South Ganesh Nagar, Block D, Ganesh Nagar 1, Ganesh Nagar, New Delhi, Delhi 110092 Phone: 099101 11242
	Philips Lighting India Limited,9th Floor, DLF 9-B, DLF Cyber City DLF Phase-3, Gurgaon – 122002, India

FOR FANS	Havells Galaxy, SCO 19, Madhya Marg, Sector 7 C Chandigarh
	Orient Fans, Gupta Electronics, SCO 1117, Sector 22 , Chandigarh M - 7947243304

FOR PUMPS	Grundfos Pumps India Pvt. Ltd. 301C, 3rd Floor, D21, Corporate Park, Dwarka Depot, Near Sector 8 Metro Station, Sector 21, Dwarka, New Delhi – 110075, India
	Kirloskar Brothers Limited, M-11, 3rd Floor, Middle Circle, Connaught Place, New Delhi - 110 001 Tel : 011 - 41501055

10.5. Annexures - Copies of electricity bill

(pgBillPay.aspx) PSPCL (pgBillPay.aspx)

Print Bill

PUNJAB STATE POWER CORPORATION LIMITED
(Regd. Office P.S.E.B. Head Office, The Mall Patiala-147001,Ph. 1912), **CIN: U40109PB2010SGC033813**
E-mail: 1912@pspcl.in, Website: www.pspcl.in, **GSTIN NO: 03AAFCP5120Q1ZC**

Billing Category: **NRS RATE CATEGORY FOR NRS>100KWA DPC**

Sub Division	Division	Circle	Bill Cycle	Bill Date	Bill No.
SUB DIVISION TECHNICAL-1	MOHALI SPECIAL DIVIS	MOHALI	03-2023	27-MAR-2023	50020798290

A/C No.: 3000328913
Old A/C No.:
Consumer Name: M/S GIAN JYOTI GLOBAL SCHOOL
Address: PH 2 MOHALI-160055-INDIA
GST No.:
Connection Date: 01-04-2014
Mobile No.: 90XXXXX278

Load	Contract Demand	Tariff Type	Bill Status	Due Date (Cash/Online)	Due Date (DD/Cheque)	Bill Amount
272.18		NRS RATE CATEGORY FOR NRS>100KWA DPC	O	06-Apr-2023	06-Apr-2023	Rs.30760/-

Voltage Supply	Details of Meter				Meter Status	CT Make	CT No.
	Meter Number	Make	Capacity	Digit			
11.00	PB849387	SECURE	5-6	8	O	1482	

Feeder Code	Date of New Reading	Date of Old Reading	Bill Period	Meter Security	Secuirt Cons.	Security cons/Meter Security Interest
FDC0000003961	22-MAR-2023	22-FEB-2023	28	30010	298185	

Meter Reading

Type	Old Reading	New Reading	Current Units	Meter Multiplier	Line CT Ratio	Meter CT Ratio	Overall Multiplier	MMTS Correction	Old Meter Cons.	Unit Consumed
KWH				1.00	20/5	5/5	4.00			
KVAH				1.00	20/5	5/5	4.00			
MDI	19.86	14.54		1.00	20/5	5/5	4.00			58.16

(A) Fixed Charges

Contract Load / Contract Demand (L) KWH/KVA	Actual Load/Demand KWH/KVA (A)	80% of (L) KWH/KVA (B)	A or B whichever greater KWH/KVA (C)	Rate per KWH/KVA per month (R)	Billing Days (D)	A: Fixed Charges Amount =CxRxDx12/365
	58.16	241.78	241.78	110.00	28	24482.00

(B) Energy Charges			(C) Fuel Cost Adjustment Charges			*Additional Surcharge			
KWH/KVAH	Tariff Rate	B: Amount	KWH/KVAH Consumption	Rate of FCS/KWH-KVAH	C: Amount	Units	Tariff Rate	Amount	Total Energy Charges(Rs.) + FCA + Addl. Surcharge
	8.55	0			0.00			0.00	0

(D) Rental Charges				GST				
Meter Rent for PSPCL Meter	MCB, CT/PT Unit Rental	Rent for any other equipment	Total Rent	HSN Code	SGST	CGST	Total GST	D: Total Rent with Tax
1257	0		1257		113.13	113.13	226.26	1483.26

(E) Surcharges

Voltage Surcharge				Demand Surcharge			ToD Surcharge			
Supply Voltage	Catered Voltage	Surcharge Rate	Voltage Surcharge Amount	Demand in excess	Rate of Demand Surcharge	Amount of Demand Surcharge	Peak Hours KWH/KVAH	Rate	Amount	E: Total Surcharge (Rs.)
11.00	11.00			0.00	0.00	0.00	0.00		0.00	0.00

(F) Rebates

Voltage Rebates			ToD Rebates			
Units	HT/EHT Rebate	Amount	Non-Peak Hours KWH/KVAH	Rate	Amount	F: Total Rebates (Rs.)
	0.00	0.00	0.00	1.25	0.00	0.00

(G) Previous Adjustment/Outstanding Amount Notice No.: and Date:

Units	Fixed Charges	Energy Charges	FCA	Rentals	Surcharges(+)	Rebates(-)	Taxes	Subsidy	Total	G: Net Previous Adjustment (Rs.)
		/		/			/0		0/-100	0/-100

(H) Sundry Charges/Allowances Notice No.: - and Date: -

Late Payment Interest	Units	Fixed Charges	Energy Charges	FCA	Rentals	Surcharges(+)	Rebates(-)	Taxes	Subsidy	Total	H: Net Sundry Charges/Allowances (Rs.)
	/	/	/ 0	/ 0	/ 0	/	/ 0	/ 0	/	0	0

(I) Subsidy

Subsidised KWH/KVAH	Rate for Subsidy	Amount	I: Net Subsidy (Rs.)
	0.00	0.00	0.00

(J) Taxation

Electricity Duty	Municipal Tax	IDF	Cow Cess	Total Tax (J)	Net Energy Charges	TCS/TDS	Curr/Prev Rounding Amount	NET BILL AMOUNT
3183.00	490.00	1224.00	0.00	4897		0.00		**Rs.30760/-**
								Thirty Thousand Seven Hundred Sixty Rupees Only

(K) Total Billed Amount

Due Date by Cash/Online	Due Date by DD/Cheque	Net Amount Payable by due date	Late Payment Surcharge for LT consumer upto 15 days @2% of unpaid amount	Amount Payable by LT consumer upto 15 days after due date	Late Payment Surcharge for HT consumer upto 7 days after due date	Amount Payable by HT consumer upto 7 days after due date	Late Payment Surcharge for HT consumer upto 7 days @5% of unpaid amount	Amount Payable by HT consumer after 7 days & upto 15 days after due date
06-Apr-2023	06-Apr-2023	30760	617		617		1543	

Interest @ 1.5% per month on gross unpaid amount including surcharge shall be levied after 15 days from due date of bill.

(L) Previous Cycle's Consumption

Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6	Cycle 7	Cycle 8	Cycle 9	Cycle 10	Cycle 11	Cycle 12
MONTH:MAR-22 MDI:57 KWH:20904 KVAH:26308	APR-22 88 - 23220	MAY-22 185 44536 19336	JUN-22 202 63700 27556	JUL-22 167 34184 20364	AUG-22 217 56656 26120	SEP-22 285 82164 26936	OCT-22 291 31027 15867	NOV-22 153 19650 20974	DEC-22 86 17466 17594	JAN-23 79 49 17708 12376	FEB-23 79 23638 20770

Payment History:
Last Payment Amount:Rs. 56630, Dated: 28-02-2023

Message:

1. **Payments exceeding Rs.20,000/- shall be accepted in digital mode only w.e.f. 01-07-2021.**
2. In case the payment of billed amount is not made by the due date,the power supply shall be liable for disconnection after expiry of 15 days of the due date and this may be taken as notice under section 56 of the Electricity Act 2003 read with regulation 32 of the Supply Code, 2014.
3. **SEE DETAILS OF METER/CONSUMPTION ON 2ND PAGE.**
4. **CHARGES HAS BEEN CHARGED AS ED @ 13% OF SOP, MT @ 2% OF SOP, IDF @ 5% OF SOP, COWCESS @ 1 OR 2 PAISA PER KWH/KVAH**
5. **- UNPAID DUES :- A) LATE PAYMENT SURCHARGES : 0 B) LATE PAYMENT INTEREST : 0**
6.
7.
8.
9.

Description (HSN Code)	Quantity	UQC	Non-Taxable Amount	Taxable Amount	CGST 9%	SGST 9%	Total
Meter Rent (997319)	1	-	0	1257	113.13	113.13	1483.26
MCB Rent (997319)	1	-	0	0	0	0	0
Electrical Energy (271600)	0	UNT-Units	0	0	0	0	0

PUNJAB STATE POWER CORPORATION LIMITED
website:www.pspcl.in form RO 3-B

	Meter Reading		Overall Multiplier	Consumption
		New Status / Old Status		

Bi-Directional Meter	Import (From PSPCL)	KWH	140786	138910	4.00	7504
		KVAH	169430	167341	4.00	8356
		KVA	14.54	0	4.00	58.16
	Export (To PSPCL)	KWH	170376	167949	4.00	9708
		KVAH	170394	167966	4.00	9712
		KVA	26.82	0	4.00	107.28
	Net	KWH	28590	28039	4.00	2204
		KVAH	964	625	4.00	1356
		KVA	12.28	0	4.00	49.12
Solar Meter	Solar	KWH	325820	320766	4.00	20217
		KVAH	337876	332844	4.00	20927
		KVA	36.9631	0	4.00	147
Previous Carry Forward: 0	Net Consumption: 0	Net Cons. for Billing: -1356		Total Consumption: 19571		Current Carry Forward: 1356

Powered by O/o CE(IT) PSPCL

Print Date: 07-07-2023 10:09 AM

10. Credentials in r/o "R.K. Electricals and Energy Audit Services"

10.6. Certificate ISO 50001:2018(Energy Management Services)

CERTIFICATE

This is to Certify that the Management System of

R.K. ELECTRICALS & ENERGY AUDIT SERVICES

PROGRESSIVE SOCIETY, 1131, SECTOR 50 B, CHANDIGARH - 160047, INDIA.

has been audited and found to comply with the requirements of:

ISO 50001:2018
(Energy Management System)

For the Scope of activities described bellow:

DEALS IN ENERGY MANAGEMENT, ENERGY, ENVIRONMENT & GREEN AUDITS,

THERMOGRAPHY OF ELECTRIC EQUIPMENT AND ELECTRIC INSTALLATIONS OF BUILDINGS & INSTITUTIONS AND INDUSTRIES.

Certificate No.: 279101

Date of initial registration	*Date of this Certificate*	*Surv. audit on or before/ Certificate expiry*	*Recertification Due*
16-07-2022	*16-07-2022*	*15-06-2023*	*15-06-2025*

Validity of this certificate is subject to successful completion of surveillance audit on or before due date, in case surveillance audit not conducted this certificate shall suspended/cancelled

Director

This Certificate is the property of LMS Certification Limited and shall be returned immediately when demanded.

LMS Certification Limited
Labrynth Business Centre, 43 Middle Hill Gate, Stockport,
Great Manchester, England-SK1 3DG
Phone :+44 208 935 5094
Company No.: 11029175

KAB-EN-06

10.7. Certificate ISO 9001:2015 Quality Management

Certificate of Registration

This is to Certify that
Quality Management System of

R.K. ELECTRICALS & ENERGY AUDIT SERVICES

PROGRESSIVE SOCIETY, 1131, SECTOR 50 B, CHANDIGARH - 160047, INDIA.

has been assessed and found to conform to the requirements of

ISO 9001:2015

for the following scope :

DEALS IN ENERGY MANAGEMENT, ENERGY, ENVIRONMENT & GREEN AUDITS, THERMOGRAPHY OF ELECTRIC EQUIPMENT AND ELECTRIC INSTALLATIONS OF BUILDINGS & INSTITUTIONS AND INDUSTRIES.

Certificate No	: 22EQHU11		
Initial Registration Date	: 01/07/2022	Issuance Date	: 01/07/2022
Date of Expiry	: 30/06/2025		
1st Surve. Due	: 01/06/2023	2nd Surve. Due	: 01/06/2024

mms

EGAC Accredited QMS Certification CAB # 118005

MEMBER OF MULTILATERAL RECOGNITION ARRANGEMENT IAF

Director

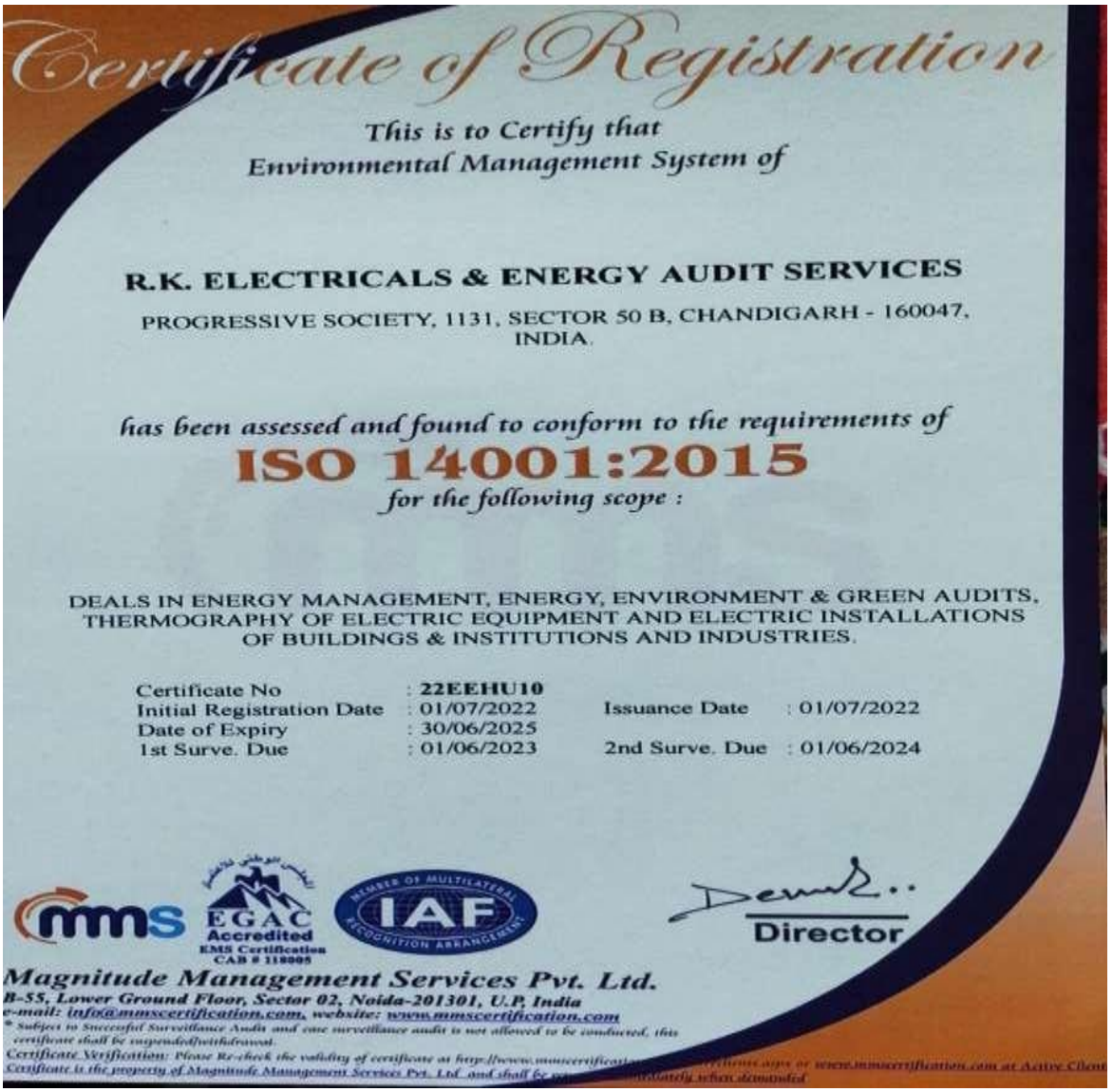
Magnitude Management Services Pvt. Ltd.
B-55, Lower Ground Floor, Sector 02, Noida-201301, U.P, India
e-mail: info@mmscertification.com, website: www.mmscertification.com

* Subject to Successful Surveillance Audit and case surveillance audit is not allowed to be conducted, this certificate shall be suspended/withdrawal.

Certificate Verification: Please Re-check the validity of certificate at http://www.mmscertification...

Certificate is the property of Magnitude Management Services Pvt. Ltd. and shall be ... immediately when demanded

10.8. Certificate ISO 14001:2015 (Environmental Management System)



Certificate of Registration

This is to Certify that
Environmental Management System of

R.K. ELECTRICALS & ENERGY AUDIT SERVICES

PROGRESSIVE SOCIETY, 1131, SECTOR 50 B, CHANDIGARH - 160047, INDIA.

has been assessed and found to conform to the requirements of

ISO 14001:2015

for the following scope :

DEALS IN ENERGY MANAGEMENT, ENERGY, ENVIRONMENT & GREEN AUDITS, THERMOGRAPHY OF ELECTRIC EQUIPMENT AND ELECTRIC INSTALLATIONS OF BUILDINGS & INSTITUTIONS AND INDUSTRIES.

Certificate No	: 22EEHU10		
Initial Registration Date	: 01/07/2022	Issuance Date	: 01/07/2022
Date of Expiry	: 30/06/2025		
1st Surve. Due	: 01/06/2023	2nd Surve. Due	: 01/06/2024

mms EGAC Accredited EMS Certification CAB # 118005 IAF

Director

Magnitude Management Services Pvt. Ltd.
B-55, Lower Ground Floor, Sector 02, Noida-201301, U.P, India
e-mail: info@mmscertification.com, website: www.mmscertification.com

10.9. BEE Regn Certificate of Energy Auditor EA-10080 MoP GoI

Regn. No. EA-10080 Certificate No. 5591

National Productivity Council

(National Certifying Agency)

PROVISIONAL CERTIFICATE

This is to certify that Mr. / Ms. Rakesh Kumar Sharma

son / daughter of Mr. Krishan Datt

has passed the National Certification Examination for Energy Auditors held in July - 2010, conducted on behalf of the Bureau of Energy Efficiency, Ministry of Power, Government of India.

He / She is qualified as Certified Energy Manager as well as Certified Energy Auditor.

He / She shall be entitled to practice as Energy Auditor under the Energy Conservation Act 2001, subject to the fulfillment of qualifications for the Accredited Energy Auditor and issue of certificate of Accreditation by the Bureau of Energy Efficiency under the said Act.

This certificate is valid till the issuance of an official certificate by the Bureau of Energy Efficiency.

Place : Chennai, India

Date : 7th October, 2010

Controller of Examination

10.9.1. Certificate of IGBC Accreditated Professional (IGBC India)

IGBC

CII Confederation of Indian Industry

The Indian Green Building Council

hereby certifies that

Rakesh Kumar Sharma

has successfully demonstrated knowledge on the Green Building Design & Construction, Building Standards & Codes, IGBC Resources & Processes and Green Design Strategies & their Impacts, required to be awarded the title of

IGBC Accredited Professional

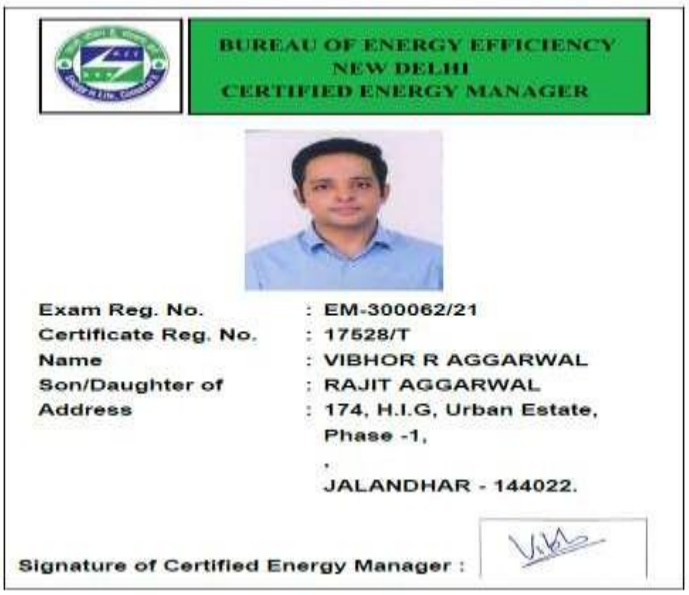
K S Venkatagiri
Executive Director
CII-Godrej GBC

Gurmit Singh Arora
Chairman
Indian Green Building Council

B Thiagarajan
Vice-Chairman
Indian Green Building Council

220022 19-Feb-22

10.9.2 BEE Regn. Certificate of Er. Vibhor Aggarwal



BUREAU OF ENERGY EFFICIENCY
NEW DELHI
CERTIFIED ENERGY MANAGER

Exam Reg. No.	: EM-300062/21
Certificate Reg. No.	: 17528/T
Name	: VIBHOR R AGGARWAL
Son/Daughter of	: RAJIT AGGARWAL
Address	: 174, H.I.G, Urban Estate, Phase -1, , JALANDHAR - 144022.

Signature of Certified Energy Manager :

Date of Issue : 28.02.2022 Valid Upto : 27.02.2027

Digitally Signed: RAKESH KUMAR RAI
Wed Feb 23 16:15:08 IST 2022
Secretary, BEE New Delhi

Issuing Authority

Name	: R. K RAI
Designation	: Secretary (BEE)
Office Address	: 4th Floor SEWA Bhavan, R. K. Puram, New Delhi- 110066.

10.9.3. Engineering Graduation Certificate of Er. Varun Sharma

Regn. cum Roll No. L-40405009

ਪੰਜਾਬ ਟੈਕਨੀਕਲ ਯੂਨੀਵਰਸਿਟੀ

Punjab Technical University

Jalandhar

BACHELOR OF TECHNOLOGY

Mr./Ms. Varun Sharma *son/daughter of* Sh. Rakesh Sharma *student of* Chandigarh Engineering College, Landran, *having completed the course of studies approved by the University and having passed the prescribed examination held in* Dec.-2007, *has been conferred the degree of Bachelor of Technology of this University in the discipline of* Electrical Engineering *in* First Division.

Given under the seal of the University

ਰਜਿਸਟਰਾਰ
Registrar
Jalandhar, 25/10/10

ਵਾਈਸ-ਚਾਂਸਲਰ
Vice-Chancellor

ਚਾਂਸਲਰ
Chancellor

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