ENERGY AUDIT REPORT

SANT BABA BHAG SINGH UNIVERSITY, JALANDHAR

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
Indian Green Building Council of India Accredited Professional
HP Govt. Emp Energy Auditor, DoE, Shimla
Govt. Regd. Valuer & Chartered Engineer
M: 09501332233 E-Mail: **er.rakesh50@ymail.com**

2024-2025

ENERGY AUDIT CERTIFICATE

(2024-25)

This is to certify that the **"R.K. Electricals and Energy Audit Services**" conducted Energy Audit of **"Sant Baba Bhag Singh University Jalandhar** from **21/07/2025 to 23/07/2025** for the academic year **2024-25**. This audit involved extensive consultation with all the related campus team, office record, data collection, measurements and cost benefit analysis

The study exhibited the Annual Energy saving potential of 3.74 Lacs KWH with annual monetary saving: Rs. 31.19 Lacs by investing Rs.114.86 Lacs

R.K. ELECTRICALS & ENERGY AUDIT SERVICES
ER. R.K. SHARMA MIE, FIV
BEE's C/Energy Auditor (EA-10080)
HP GOVT. Emp. Energy Auditor, DoE, Shimla
Govt. Regd. Valuer & Chartered Engineer

For R.K. Electricals & Energy Audit Services

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ACKNOWLEDGEMENT

"R.K. ELECTRICALS & ENERGY AUDIT SERVICES" expresses sincere thanks to the authorities of **Sant Baba Bhag Singh University Jalandhar** for giving us an opportunity to carry out the study in the campus & for their kind assistance and co-operation during the Detailed Energy Audit Project Report & Preparation for energy efficiency improvements of their Campus.

We would like to place on record our sincere thanks to the

Hon'ble Chancellor:	Sant Manmohan Singh ji
Hon'ble Secretary:	S. Hardaman Singh Minhas
Hon'ble Vice – Chancellor:	Dr. Dharamjit Singh Parmar
Manager Facilities In- Charge:	Capt. Sukhdev Singh
Dean Academics:	Dr. Vijay Dhir
Registrar:	Mr. Rajinder Kumar
Dy. Registrar:	Mr. Roop Singh
Director IQAC:	Dr. Anil Kumar Singh
Dean UIE:	Dr. Aneet Kumar'
Dean UIL:	Dr. Pooja Bali
Dean UIS:	Dr. Shweta Singh
Dean UIET:	Dr. Jagdeep Kaur
Dean UIA:	Dr. Vikas
HOD Department of Electrical Engineering:	Dr. Gurmanik Kaur
HOD Department of Agriculture:	Dr. Vikrant Jaryan
Dean of Alumni and Extension Activities:	Dr. Indu Sharma

We would also like to extend gratitude to all the officers, technicians, staff and operators of **Sant Baba Bhag Singh University Jalandhar** who have rendered their valuable assistance during the course of study.

ER. R.K, Sharma MIE, FIV

For R.K. Electricals & Energy Audit Services

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	Millimetre
Max.	Maximum
Min.	Minimum
MT	Metric Ton
No.	Number
PF	Power Factor
TR	Tons of Refrigeration
V	Voltage
W	Wattage (watt)

EXECUTIVE SUMMARY

R.K. ELECTRICALS & ENERGY AUDIT SERVICES was entrusted the DPR for energy efficiency improvement in the **Sant Baba Bhag Singh University** Punjab. 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 awareness on energy efficiency, and is in process of making Green Building Campus, Good usage of day light in campus, installation of LED light fixtures at few locations and solar plant etc. We acknowledge and appreciate the commitment of the **Sant Baba Bhag Singh University** management towards conservation of Energy.

However, energy conservation is a continuous process and there is always scope for further improvements. The objective was to reduce further the 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 overview of energy consumption, its variation and energy reduction potential of **Sant Baba Bhag Singh University Jalandhar**. 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. This report has emerged after a detailed energy audit of campus during 21/07/2025 to 23/07/2025 to find out the performance level of, and lighting, fans, air conditioners, pumps other equipment installed in the premises and find out potential for energy conservation and reduction in power consumption.

Total saving potential: **Amount of expected annual saving – Rs.31.19Lacs, Investment-Rs. 114.86 Lacs, Energy (KWh) Saveable- 3.74 Lakh**

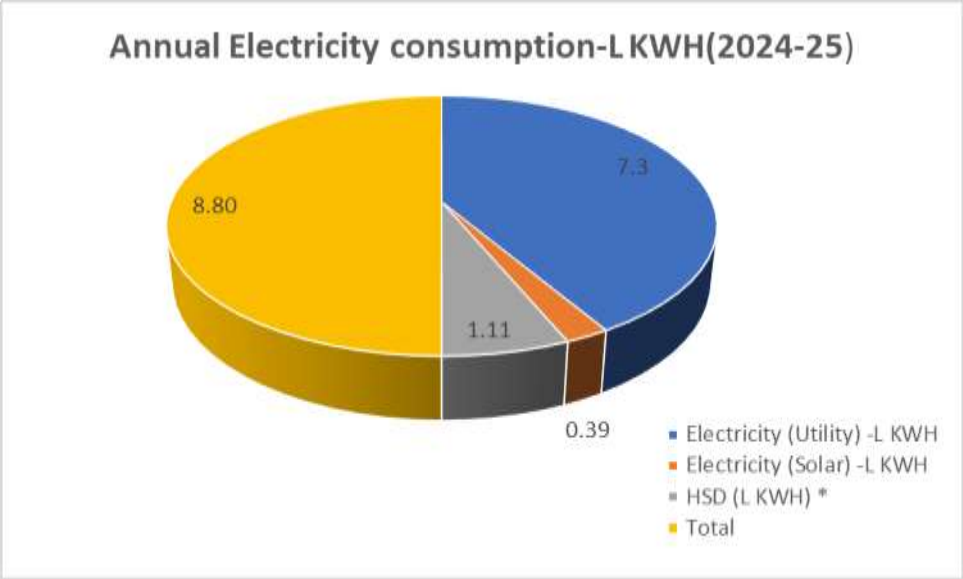
Detail of Energy Consumption

Using the historical data, the total energy consumptionof the University campus during the 2024-25 was **8.80 Lacs KWH** with the annual energy cost amounting to Rs **74.61 Lacs**. Electricity sourced from Utility, Solar and Diesel Generator in the campus

Annual Existing Energy Consumption

Energy Source	Annual consumption	Energy cost (Lacs)
Electricity (Utility) -L KWH	7.30	66.88
Electricity (Solar) -L KWH	0.39	
HSD (L KWH) *	1.11	7.73
Total	**8.80**	**74.61**

*Equivalent Annual cost of electricity through DG Set



Summary:

Sr.No.	Description	Details
1	Name of the building	Sant Baba Bhag Singh University
2	Location/Address	Sant Baba Bhag Singh University Jalandhar
3	Name and address of the owner	Sant Baba Bhag Singh University Jalandhar
4	Ground covered area of the building	46159.4 Sq mt
5	Connected load/Contract demand of the building	980 KW/324 KVA
6	No. Of Gen sets with capacity	500 KVA +200 KVA (200 KVA not working)
7	Average annual consumption of the Diesel	13510 Litres/yr. App.
8	Nature of the building	Educational Institution
9	Storey	Ground, +5 Floor
10	No. of Rooms	7 No. blocks & 2 Hostels
11	Hours of normal operation of the building	6-7 hrs
12	Percentage of air-conditioned floor area	Less than40%
13	Name & contact Number of the Nodal officer I/C	Dr. Anil Kumar Singh M:819976193
14	Energy Audit Report No.	RKS/EA-56/2025, Dt.28/07/25
15	a) Existing annual electricity Consumption purchased from utility	7.30 LAKH KWH
	b) Existing annual Electricity Consumption through DG sets	1.11 LAKH KWH
	c) Existing annual Electricity Consumption through solar	0.39 LAKH KWH
	d)Total existing annual existing Electricity consumption (Utility+ Solar+ DG)	8.80 LAKH KWH
16	Energy Performance Index (EPI of the Bldg.)	19.05 kWh/Sqm/Annum
17	a) Annual Electricity Cost purchased from utility	Rs.66.88 Lakh
	b) Existing equivalent annual cost of electricity through DG Set	Rs.7.73 Lakh
	c) Total annual electricity cost (utility + DG) - Rs	66.88+7.73=Rs.74.61Lakh
18	Avg overall Electricity rate/KWH	Energy charges Rs.8.48
19	Proposed Annual Electricity Units saving (KWH)	**3.74 Lakh KWH**
20	Proposed Annual Monetary Savings	**Rs.31.19 Lakh**
21	Proposed investment	**Rs.114.86 Lakh**

22	ROI / Payback	**3.6 Years**
23	**Recommendations**	
Sr No.	**Summary of Recommendations**	**Monetary Savings in Rs.**
i	By Balancing the load on the TF (no investment required)	13424
ii	Improvement in power factor of the system from 0.952 to 0.999 by adjustment in capacitor bank/addition of capacitors/replacing defective capacitor	155024
iii	Replacement of 40-watt fluorescent tube T-12 with 18-watt LED Tube light	327565
iv	Replacement of Existing 12-watt direct fit CFL lamp with direct fit 7-watt LED lamp	2389
v	Replacement of old conventional ceiling fan with 26-watt energy efficient BEE 5 star rated BLDC ceiling fan	1776119
vi	Replacement of existing old conventional inefficient exhaust fan with 20-watt energy efficient BEE 5 star rated BLDC exhaust fan	130126
vii	Replacement of existing 1.5 T old conventional window type-air conditioner with BEE 5 star rated 1.5 T window type AC	285742
viii	Replacement of existing 1.5 T old conventional split type-air conditioner with BEE 5 star rated 1.5 T split type AC	146534
ix	Maintenance of all evaporator coils and setting temperature of water in existing water coolers	166080
x	Replacement of existing 5 hp standard motor of blower of STP with energy efficient motor	22077
xi	Replacement of existing 10 hp standard motor of collection tank of STP with energy efficient motor	21420
xii	Extra generation of electricity units from Installed (55+45) KWp Solar plant in the campus as Renewal energy source	72495
TOTAL-Rs.		31,18,995
TOTAL in Rs. LACS		**31.19**

SUMMARY OF PROPOSED SAVINGS

Energy Source	Saving- Lacs KWH	Monetary saving- Rs. Lacs	Investment -Rs. Lacs
Electricity	3.74	31.19	114.86

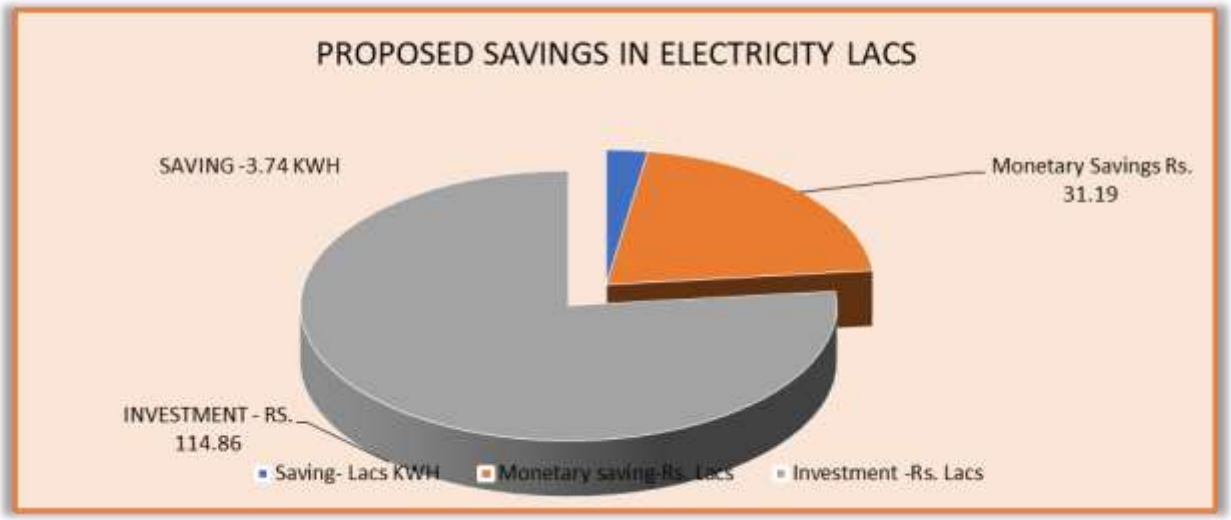


Chart Showing Proposed Annual Energy Savings

COMMENTS & CONCLUSION

1. Current Energy Audit Report Academic Year (2025-26):

Findings/Comments Recommendations contained in the current energy audit

i) Utility system:

a) Main LT panel: Checked Voltage, Current, harmonics and power factor profile of the main LT panel installed in the electric substation and found well within the permissible limits**.**

b) Diesel Generator Sets: Checked the working of DG Sets installed in the substation for power back up and found their working 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 **10 %** from total savings

iv) Campus Fans & HVAC system: With the retrofitting of remaining conventional ceiling fans and air conditioners proposed average energy **Savable is 78%** from total savings

v)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 100 KWp roof top grid interactive Solar plant and it is generating about 32636 units of electricity annually which is excellent. The expected annual saving in electricity shall be about 10416 units Which will be **3 %** app of total savings

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

vii) Awareness campaigns: Awareness campaigns made in the campus for energy conservations covering lighting and renewable source of energy in the campus

viii) National Energy conservation day: Energy conservation day celebrated during December 2024 in the campus where various initiatives were taken by the management and students for promoting energy conservation.

SUMMARY OF ENERGY EFFICIENCY MEASURES

EEM	Proposed Energy Efficiency Measures	Nos	Annual energy saving - kwh	Annual monetary saving-Rs.	Total investment including installations -Rs.	SPB period - yrs
EEM-1	By Balancing the load on the TF (no investment required)		1929	13424		
EEM-2	Improvement in power factor of the system from 0.952 to 0.999 by adjustment in capacitor bank/addition of capacitors/replacing defective capacitor	1	22274	155024	50000	0.3
EEM-3	Replacement of 40-watt fluorescent tube T-12 with 18-watt LED Tube light	725	38628	327565	145000	0.4
EEM-4	Replacement of Existing 12-watt direct fit CFL lamp with direct fit 7-watt LED lamp	8	281	2389	1200	0.5
EEM-5	Replacement of old conventional ceiling fan with 26-watt energy efficient BEE 5 star rated BLDC ceiling fan	3287	209448	1776119	9203600	5
EEM-6	Replacement of existing old conventional inefficient exhaust fan with 20-watt energy efficient BEE 5 star rated BLDC exhaust fan	155	15345	130126	401450	3
EEM-7	Replacement of existing 1.5 T old conventional window type-air conditioner with BEE 5 star rated 1.5 T window type AC	39	33696	285742	936000	3.1
EEM-8	Replacement of existing 1.5 T old conventional split type-air conditioner with BEE 5 star rated 1.5 T split type AC	20	17280	146534	600000	4
EEM-9	Maintenance of all evaporator coils and setting temperature of water in existing water coolers	39	19586	166080	39000	0.2
EEM-10	Replacement of existing 5 hp standard motor of blower of STP with energy efficient motor	1	2526	22077	35000	1.5
EEM-11	Replacement of existing 5 hp standard motor of blower of STP with energy efficient motor	1	2526	21420	35000	1.6

EEM	Proposed Energy Efficiency Measures	Nos	Annual energy saving - kwh	Annual monetary saving-Rs.	Total investment including installations -Rs.	SPB period - yrs
EEM-12	Extra generation of electricity units from Installed (55+45) KWp Solar plant in the campus as Renewal energy source	1	10416	72495	40000	**0.5**
TOTAL		4277	3,73,935	31,18,995	1,14,86,250	3.6

NET SAVINGS

Units Saveable: - 3.74 Lacs KWH
Amount Saveable: - Rs. 31.19 Lacs
Investment: - Rs. 114.86 Lacs
Payback period: -3.6 Yrs.

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CHAPTER – 1 INTRODUCTION

1.1 The Project

the Project was to prepare a DPR for energy efficiency improvements of the entire campus of Sant Baba Bhag Singh University, near Adampur Jalandhar

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 & ENERGY AUDIT SERVICES** was entrusted by the authorities of Sant Baba Bhag Singh University 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.

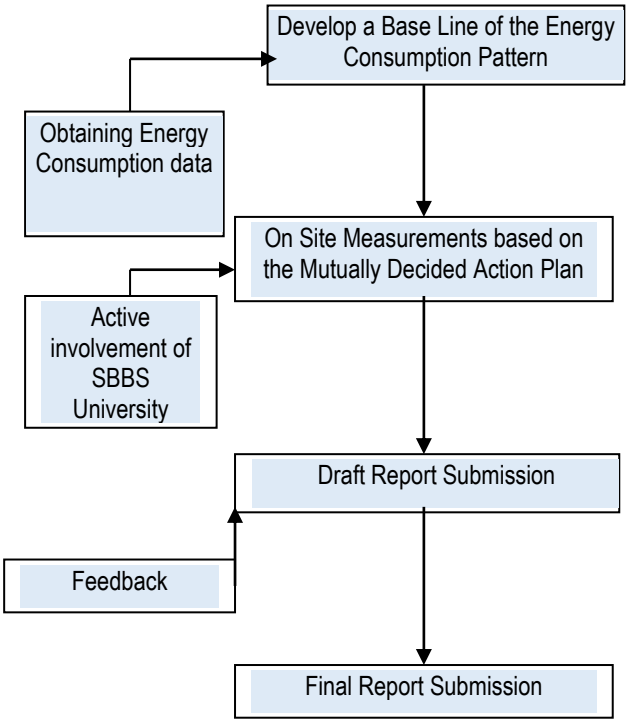
1.2 Back ground of Sant Baba Bhag Singh University, Jalandhar

The Sant Baba Bhag Singh Memorial Charitable Society, under the dynamic leadership of Sant Baba Malkit Singh Ji, has been providing essential infrastructure facilities to the people living in the vicinity of Dera Sant Pura Jabbar, near Adampur Doaba, Dist. Jalandhar. This includes constructing bridges and roads and providing street lights to villages. The Society began offering formal education by establishing the SBBS Institute of Engineering & Technology in 2003. This was followed by the establishment of SBBS International School in 2004, SBBS Institute of Education in 2005, SBBS Institute of Nursing in 2005, SBBS Research & Development Centre in 2010, SBBS Post Graduate College in 2011, and SBBS Public School, Binjon in 2011. Rural healthcare has been provided through Guru Nanak Sadh Sangat Charitable Hospital, Kalra, since 2003.
In pursuance of the vision: "To encourage each and every child to get educated, acquire knowledge and wisdom so as to learn the art of leading a happy, successful, and meaningful life," all these institutions established their presence in the field of education, leading to their flowering into Sant Baba Bhag Singh University, established under the

Sant Baba Bhag Singh University Act, 2014.
The institutions have made significant contributions in the field of education, as evidenced by excellent results and placement records. With state-of-the-art infrastructure catering to the needs of students, a pollution-free and drug-free campus, a focus on excellence in teaching, and the active involvement of students and faculty in co-curricular and extracurricular activities—including NCC, NSS, industrial visits, and a remarkable presence in sports among educational institutions—along with a culture of imbibing ethical values, Sant Baba Bhag Singh University is an ideal choice for quality education.

1.3 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.

1.4 Instrumentation 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

1.5. Calibration of measuring instruments

All the above measuring instruments used in the instant energy audit are duly calibrated from Accredited Lab.

1.6 Engineers who participated in audit & report preparation

1) Er. R.K. Sharma BEEs Energy Auditor – EA-10080
2) Er Paramjeet Singh BEEs Energy Auditor – EA-19322
3) Er Varun Sharma: Energy Engineer, B (Tech), PGD industrial Safety Management

CHAPTER – 2 BASE LINE SCENARIO & HISTORIC DATA ANALYSIS

2.1 OVER VIEW OF THE BUILDING

Area wise summary and detail of rooms:

Plot area- 469516.2821 Sq mt

Covered area of the building- 46159.4 Sq mt

The building has Ground + 5 floors

Block 3- comprise of education and society Lobby, wash rooms etc.

Block 5 comprise of Ground floor -room no.101 to120 Reception office, VC office, seminar hall, Faculty rooms and wash rooms etc.

Floor-1 Rooms 201 to 225, chancellor's office, conference room and wash rooms etc.

Floor-2 Rooms 301 to 325 and wash rooms etc.

Floor-3 Rooms 401 to 428, Faculty rooms and wash rooms etc.

Block 7 comprise of Law, computer applications, institute of commerce and management and wash rooms etc.

Block 8 comprise of Administration branch

Boys hostel and girls' hostel with mess, STP plant and wash rooms etc.

Auditorium, dispensary, gymnasium, canteen, transport office, mechanical workshop etc.

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2.2. REVIEW OF PRESENT ENERGY CONSUMPTION & BILLING:

PSPCL Account no	**3005850320**
Connected load	980 KW
Contract demand	324 KVA

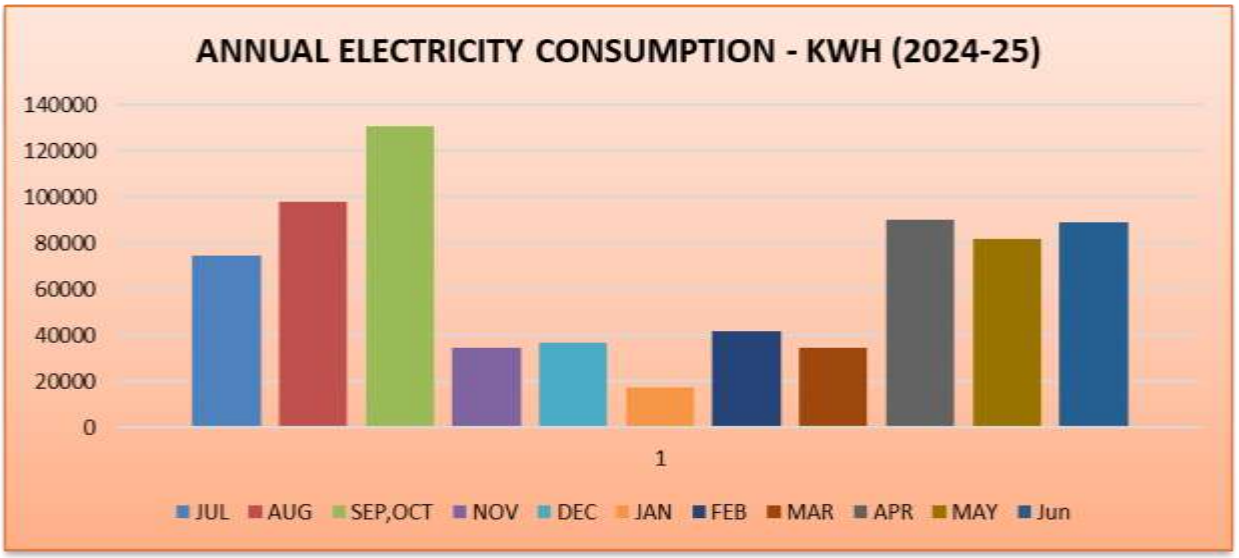
The details of electrical consumption copied from electricity bills for 2024-25

MONTH --> 2024-25	UTILITY CONSUMPTION	UTILITY CONSUMPTION	BILLING AMOUNT	SOLAR CONSUMTION	TOTAL CONSUMPTION (Utility +solar)
	KVAH	KWH	Rs	KWH	KWH
JUL	76076	74572	693340	6060	80,632
AUG	99488	97740	927320	4565	1,02,305
SEP-OCT	133932	130620	1208700	6350	1,36,970
NOV	36260	34628	327838	5561	40,189
DEC	38188	36756	346600	3841	40,597
JAN	17792	17496	179090	2207	19,703
FEB	43756	41752	384470	4894	46,646
MAR	36372	34812	311850	4654	39,466
APR	93052	90248	706920	120	90,368
MAY	84684	81744	759676	0	81,744
JUN	93700	89180	842520	351	89,531
TOTAL	**753300**	**729548**	**6688324**	38603	**7,68,151**

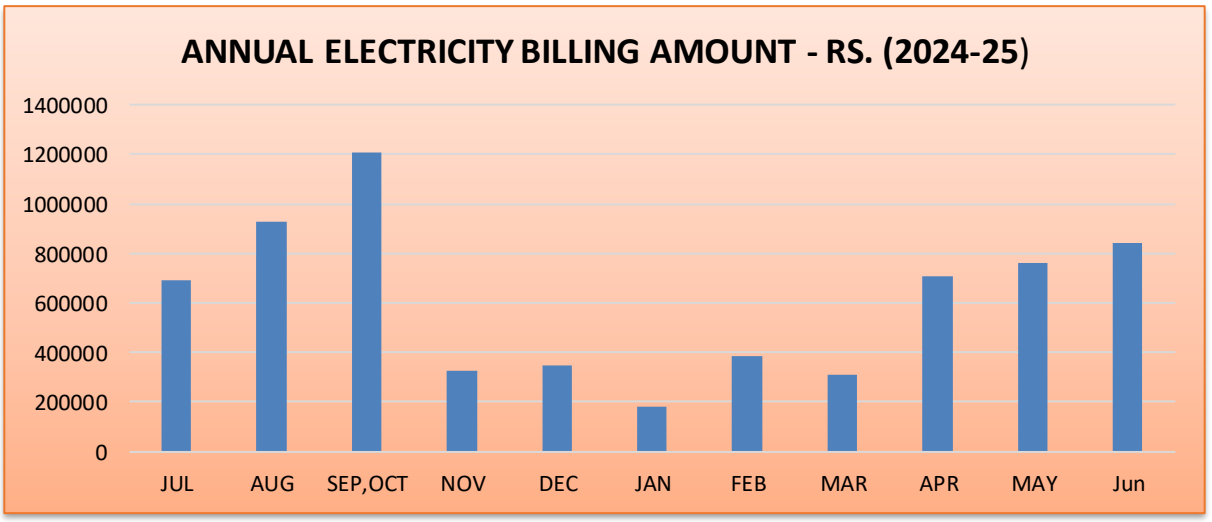
DG consumption -lts	Equivalent DG charges- Lakh Rs.	DG-Lakh KWH	Total consumption (Utility+Solar+DG)- Lakh. KWH	Total Cost (Utility+DG)- Lakh Rs
13510	**7.74**	**1.11**	**8.8**	**74.62**

Year-2024-25	Value
Annual electricity consumption purchased from utility - Lacs kWh	7.30
Annual Amount of utility billing – Rs lacs	66.88
Existing Annual electricity consumption through Solar -kWh	0.39
Equivalent Annual electricity consumption through DG set - kWh	1.11
Equivalent Amount of DG consumption) – Rs lacs	7.73
Total Annual electricity consumption (Utility +Solar +DG) - Lacs kWh	8.8
Existing Amount of Total billing (utility + DG fuel) – Rs lacs	74.63
Existing Electricity overall rate, (74.62/8.8)-Rs/KWH	8.48

Thus, annual electricity consumption from utility of about **7.30 kWh** costing Rs.**66.88 Lakh** is consumed annually



Existing Annual Electricity Consumption During 2024-25

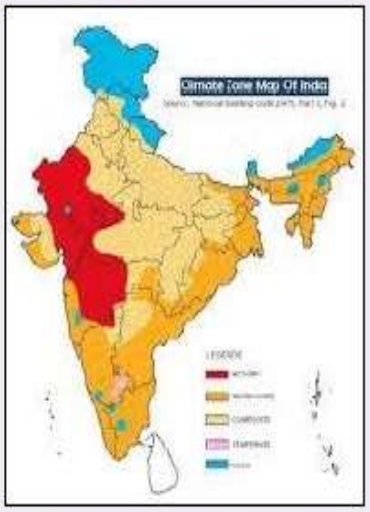


Existing Annual Amount of utility billing – Rs 66.88 lacs

2.3. ENERGY PERFORMANCE OF THE BUILDING (EPI)

Energy performance index (EPI) is total energy consumed in a building 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 building as energy efficient or not

Benchmarking for EPI is tabulated as below



Based on the data collected from different categories of commercial buildings, the following tables show the indicative EPI benchmarks.

EPI benchmarks for Office Buildings

Climate Zone	Less than 50% AC	More than 50% AC
	EPI (kWh/m²/yr)	
Warm & Humid	101	182
Composite	86	179
Hot & Dry	90	173
Moderate	94	179

EPI benchmarks for Shopping Malls

Climate Zone	EPI (kWh/m²/yr)
Warm & Humid	428
Composite	327
Hot & Dry	273
Moderate	257

EPI benchmarks for Hospitals

Climate Zone	EPI (kWh/m²/yr)
Warm & Humid	275
Composite	264
Hot & Dry	261
Moderate	247

EPI benchmarks for Hotels

Climate Zone	Upto 3 star	Above 3 star
	EPI (kWh/m²/yr)	
Warm & Humid	215	333
Composite	201	290
Hot & Dry	167	250
Moderate	107	313

EPI benchmarks for Institutes

Climate Zone	EPI (kWh/m²/yr)
Warm & Humid	150
Composite	117
Hot & Dry	106
Moderate	129

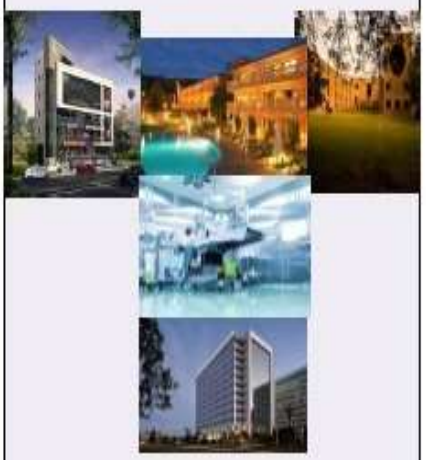
EPI benchmarks for BPOs

Climate Zone	EPI (kWh/m²/yr)
Warm & Humid	452
Composite	437
Hot & Dry	-
Moderate	433

Disclaimer : The EPI benchmarks should be considered as an indicative figure as it largely depends upon the operating hours, energy efficiency measures, sample size, climatic zone and lack of detailed information by building owners.

UNDP gef

Energy benchmarks for Commercial Buildings



Bureau of Energy Efficiency
4th Floor, Sewa Bhawan, R.K. Puram,
New Delhi – 110066
Website : www.beenet.in

Calculation of EPI

Considering composite climate as Chandigarh/Punjab falls under Composite climate zone

Annual energy consumption during the year 2024-25=879338 KWh

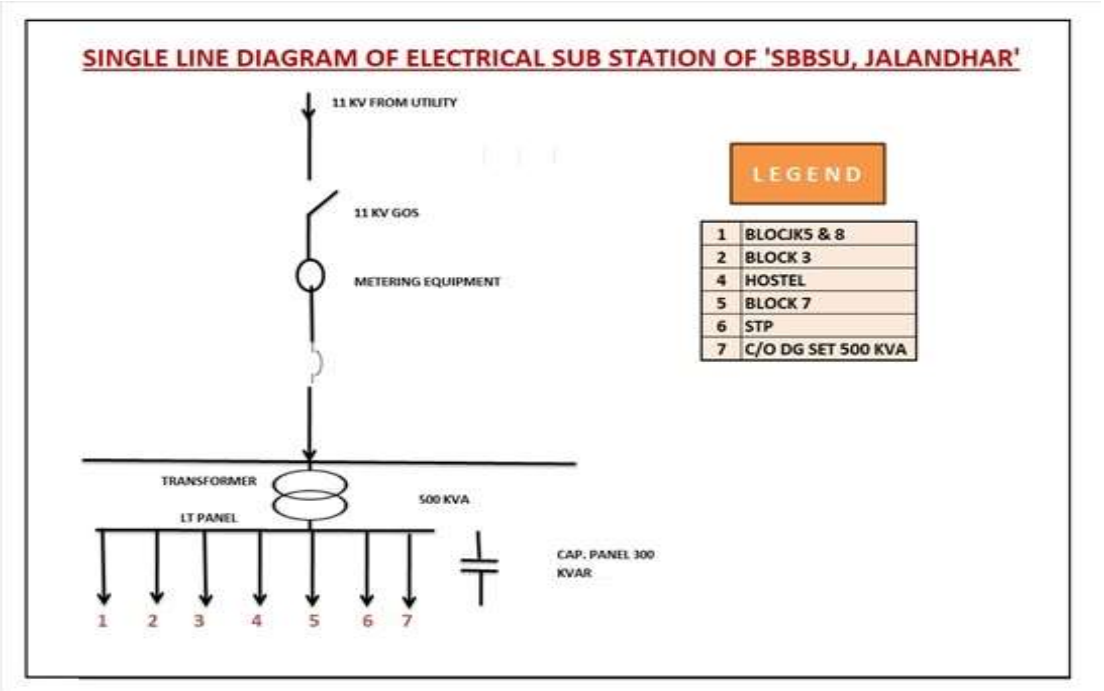
Total built up area of the building-46159.4 sqm

EPI=879338/46159.4; Hence EPI=19.05 S/sqm/year

CHAPTER – 3 ELECTRICAL DISTRIBUTION SYSTEM

3.1. PURCHASED/SELF GENERATED POWER

Sant Baba Bhag Singh University, Jalandhar, Punjab draws power from PSPCL through 11 KV system from utility and has installed 500 KVA transformer in the substation. The connected/sanctioned load of the building is 980 kW. Bi-directional metering equipment has been installed due to installation of roof top 50 & 45 KWp grid interactive solar power plants for the University campus. DG Set of 500 KVA and 200 KVA installed in acoustic cover for in-house power generation. The operation of the DG set is limited to power cuts only. SLD/key diagram of the building is shown below:



SLD/KEY DIAGRAM OF THE ELECTRIC SUBSTATION

3.2. BUILDING LOAD PROFILE

Connected / Sanctioned load of college: **980 KW**

It was noticed during onsite assessment that one Transformer 500 KVA installed for the entire campus at one farthest end. Inventory list of the building is shown below:

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

% Share of electric Load		
Item	**KW**	**% Share**
Lighting	118.41	17
Computers	28.65	4
HVAC	367.5	54
Pumps	61.8	9
lift, WC	65.45	10
STP, Misc equipment	41.23	6
TOTAL	**683.04**	**100**

Load details of the building

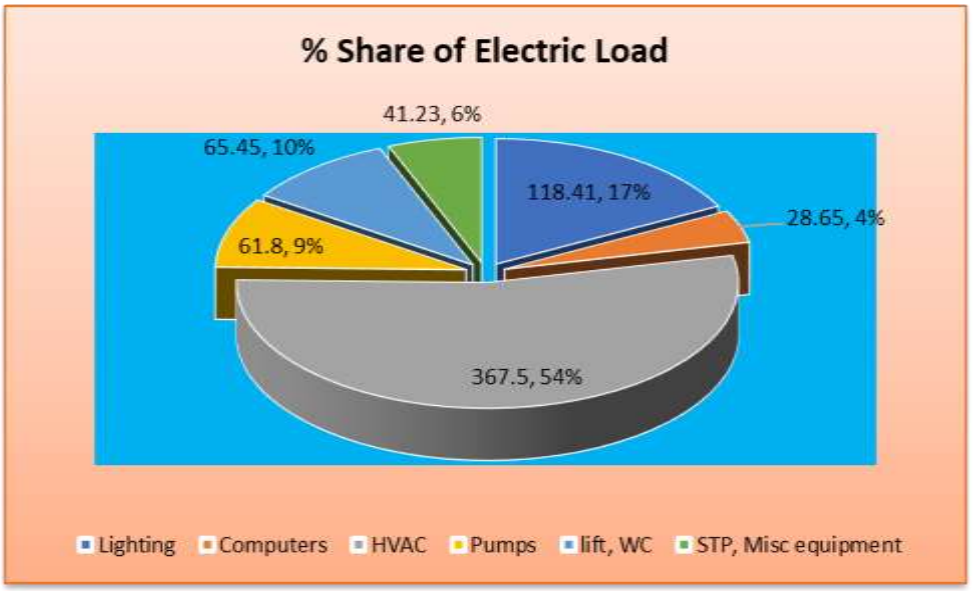


Chart showing sharing of load

3.3. Findings and Recommendations

Sanctioned connected load of university building is 980 KW whereas load found to be 683 KW and found within permissible limits.

3.4. POWER QUALITY

MEASURING ELECTRICAL PARAMETERS OF T/F AT LT SIDE

A

B

TRANSFORMER AND RECORDING OF PARAMETERS OF MAIN LT SIDE OF T/F

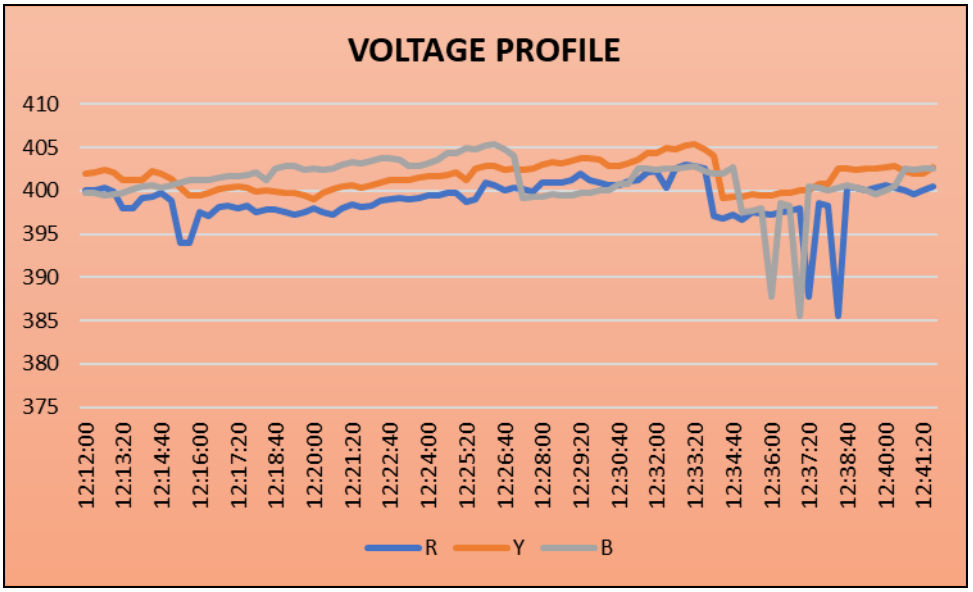
During the audit, quality of in-coming power is measured through 3 Phase Power Analyser. The observations on power quality of various loads/connections are provided in below paragraph.

The Load Analyses was done in order to measure the power quality parameters using power analyser at incomer panels of T/F Thus, various parameters were recorded which included Voltage, Current, Power Factor, Total Harmonic Distortion (THD), and Unbalancing of Load etc.

3.4.1. VOLTAGE PROFILE – LT IN COMMER

U rms	U rms	U rms	Average	%age
Line 1	Line 2	Line 3		im-balance
398.4	401.1	400.6	400.0	0.12%

IMBALANCE VOLTAGE



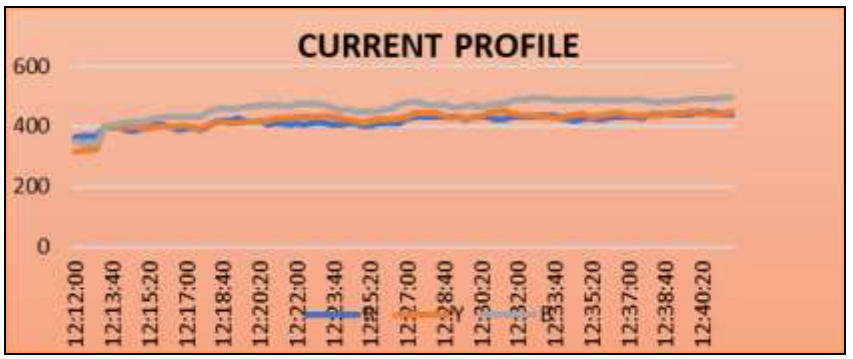
Voltage profile

IMBALANCE VOLTAGE

The unbalanced voltage is 0.12% which is under the prescribed limit as per IEEE standards. An unbalance of 1% is acceptable as it doesn't affect the cable.

3.4.2. CURRENT PROFILE– LT IN COMMER

Arms	Arms	Arms	Average	%age
Line 1	Line 2	Line 3		im-balance
417.3	421.8	461.0	433.4	10.08%



IMBALANCE CURRENT

The unbalance current was observed to be **10.08 %.** The long term running with three phase unbalance of the distribution system shall lead to series of problems, such as increase of transformer loss, reduction of output of the transformer, reduction of the output of the transformer, reduction of the active output of the motor, increase of loss of the distribution line and damage of the electric equipment 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.

Load balancing on a transformer

Load balancing on a transformer refers to the process of distributing electrical load evenly across the transformer's phases to prevent overloading and ensure efficient operation. This is particularly important in three-phase systems where uneven load distribution can lead to inefficiencies, voltage fluctuations, and potential damage. It reduces energy consumption thus reduces operational cost

Recommendations: Recommended to re-check the load again in peak summer and take action accordingly.

Energy saving calculations

Losses due to unbalance current in the transformer

Line 1	Line 2	Line 3	R	I2	I2	I2	Total I2	Total I2R	KW
417.3	421.8	461.0	0.00039	174130.9	177913.4	212514.9	564559.2	220.1781	0.220178

EEM-1 Energy saving by balancing the load on transformer

Equipment	Annu Saving-kwh	A/Monetary saving-Rs	Investment-Rs	SPB
By Balancing the load on the TF	1928.76	13424	-	-

3.4.3. 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

The Harmonic Voltage and Current Limitations set forth by IEEE 519 1992 are:

- Maximum Individual Frequency Voltage Harmonic: 3%
- Total Harmonic Distortion of the Voltage: 5%

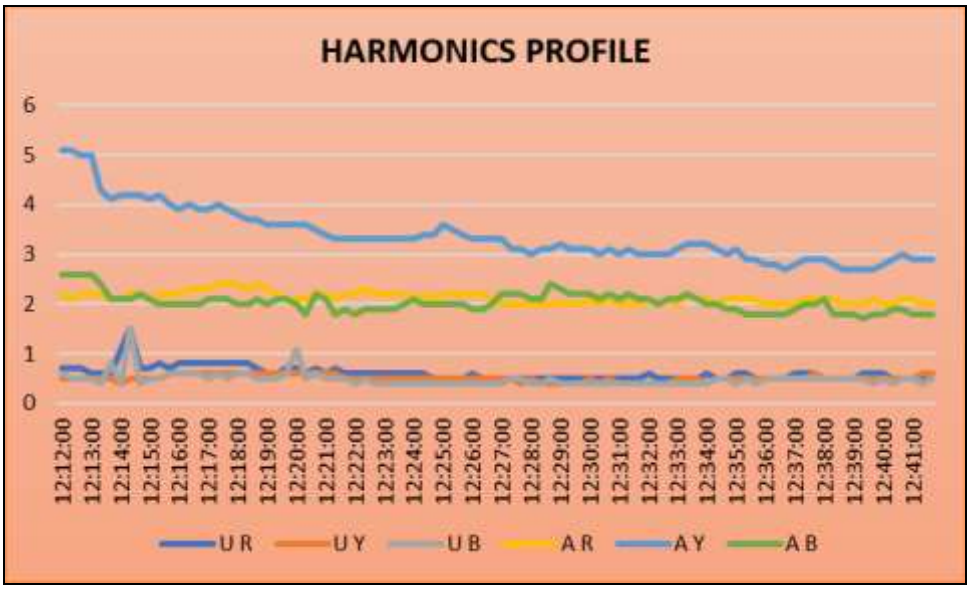
harmonic current limitations

Maximum Harmonic Current Distortion in Percent of IL
120 Volt through 69 KV
Individual Harmonic Order (Odd Harmonics)

ISC/IL	h<11	11<h<17	17<h<23	23<h<35	35<h	TDD
<20*	4.0	2.0	1.5	0.6	0.3	5.0
20<50	7.0	3.5	2.5	1.0	0.5	8.0
50<100	10.0	4.5	4.0	1.5	0.7	12.0
100<1000	12.0	5.5	5.0	2.0	1.0	15.0
>1000	15.0	7.0	6.0	2.5	1.4	20.0

Even harmonics are limited to 25% of the odd harmonic limits
TDD refers to Total Demand Distortion based on the average demand current at the fundamental frequency and measured at the PCC (Point of Common Coupling).
*All power generation equipment is limited to these values of current distortion regardless of ISC/ IL value.
ISC = Maximum short-circuit current at PCC.
IL = Maximum demand load current (fundamental) at the PCC.
h = Harmonic number.

Harmonics (%)



During the assessment, Audit team also measured the harmonics level. Details are mentioned below:

Narration	Date	Average	Minimum	Maximum	% f
A1 THDf	21-07-2025	2.12	2.0	2.24	% f
A2 THDf	21-07-2025	3.38	2.7	5.1	% f
A3 THDf	21-07-2025	2.04	1.7	2.6	% f
U12 THDf	21-07-2025	0.60	0.5	1.5	% f
U23 THDf	21-07-2025	0.51	0.4	0.6	% f
U31 THDf	21-07-2025	0.49	0.5	1.5	% f

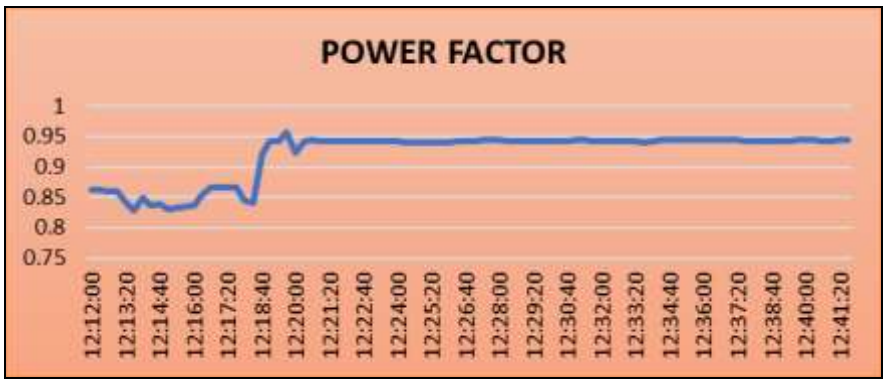
Av. Voltage THD & Current THD (%)

It is evident from the above table that the average voltage THD (%) was observed to be in range of 0.49 % to 0.6 % which is in the prescribed limit as per IEE standard of Voltage harmonics of 5%. It is also evident from the above table that the average current THD (%) was observed to be in range of 2.04 % to 3.38 % which is in the prescribed limit as per IEE standard of Voltage harmonics of 12%.

3.5. REACTIVE LOAD MANAGEMENT

3.5.1. Power factor measurement

Auditors measured the power factor by installing the load master and recorded the parameters as below:



Findings & Recommendations:

Total 300 kVAR capacity capacitors have been installed.

The capacitors are installed in enclosed panels. The heat dissipated by capacitors is thus entrapped in enclosure and reduces their life. Even the louvers do not provide proper ventilation. The auditors measured room and capacitors enclosure temperature. It was 32.2^0C & 33.6^0C respectively. The difference is not much. It may again be measured in summer season and if substantial difference is observed, then, some louvers be provided. The auditors checked some capacitors most of capacitors are highly de-rated and drawing very less current. The capacitors drawing less current increase losses without appreciably increasing capacitance. These also increase harmonics level. It is suggested that these be opened. Their connections checked and damaged out of these be replaced. It is difficult to exactly calculate adverse effect

Study and analysis done of Power Factor in Electricity Bill of One Year 2024-2025

Billing Month 2024-25	Consumption from Grid - KVAH	Consumption from Grid - KWH	PF	0.999	KWH Saving/Annum	SAVINGS - Rs
JUL	76076	74,572	0.980	0.019	1400	9742
AUG	99488	97740	0.982	0.017	1620	11272
SEP, OCT	133932	130620	0.975	0.024	3099	21572
NOV	36260	34628	0.955	0.044	1524	10606
DEC	38188	36756	0.963	0.036	1342	9337
JAN	17792	17496	0.983	0.016	274	1904
FEB	43756	41752	0.954	0.045	1870	13018
MAR	36372	34812	0.957	0.042	1458	10150
APR	93052	90248	0.970	0.029	2629	18300
MAY	84684	81744	0.965	0.034	2756	19183
JUN	93700	89180	0.952	0.047	4213	29321
TOTAL	753300	729548	0.968	0.031	22274	155024

EEM-2 Improvement in Power Factor of the system from 0.952 to 0.999 by adjustment in capacitor bank /Addition of Capacitor/replacement of defective capacitors

Energy Saving Opportunities

Description	Existing Power Factor	Gap in Power Factor	KWH Savings Per Annum	Cost per KWH	Investment-Rs	Saving Per Annum Value in Rs	SPB
Power Factor Improvement from 0.952 to 0.99	Min 0.952 Max 0.999	Varies as per above record	22274	6.96	50000	155024	0.3

3.5.2. LOADING POSITION ON TRANSFORMER

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

TRANSFORMER -500 KVA

MEASURED DATA OF T/F				
V	**I**	**PF**	**KW**	**KVA**
400.6	433.4	0.914	276.8	302.8
Load on Transformer-500 KVA	60.56 %			

3.5.3. Load on transformer --***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 this transformer remains approximate 60.56%** ***Thus at present, transformer is working in efficient regime.***

CHAPTER – 4 STUDY OF 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 system are**:** selection of most efficient light source as far as possible in order to minimize power cost and energy consumption.

a. Matching proper lamp type to the intended work task or aesthetic application, consistent with colour, brightness control and other requirements.
b. Establish adequate light levels to maintain productivity improve security and improve safety.

4.1. LIGHTING INVENTORY

During the onsite assessment, Audit team has carried out the lighting survey for various locations in Sant Baba Bhag Singh University, Jalandhar. The Total lighting details installed in the premises including hostel are given below.

4.2. LIGHTING LOAD DETAILS OF THE BUILDING **Total load: 118.41 KW**

Type of Luminary	No.	Watt	Ballast-Watts	Total-Watts	KW
LED lights 18-watt Panel	4435	18	0	18	79.83
LED lights 20-watt T/L	325	20	0	20	6.5
CFL 12-Watt main road	8	12	3	15	0.096
FTL 4',40 watt	725	40	15	55	29
LED lights 36-watt Panel	12	36	0	36	0.432
LED lights 60 watt	23	60	0	60	1.38
LED lights 30 watt on main road	29	30	0	30	0.87
LED lights 50-watt FL on main road	6	50	0	50	0.3

TOTAL: -118.41 KW

4.3. LUX MEASUREMENT

A high-quality DIGITAL LUX METER was used to measure the illumination levels at various locations of Sant Baba Bhag Singh University, Jalandhar 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	200-500
Conference Rooms	300
Training Rooms	500
Internal Corridors	200
Auditorium	150-200
Entrance Lobbies, Atria`	200
Stairwells	200
Toilets	100-200
Dining Areas	150-200

LUX LEVEL IN ROOM OF DEAN ACADEMICS AND ADMISSION CELL

4.3.1. STUDY FINDING OF LIGHTING

The building authorities provided the details of luminaries installed within their Building premises. Based upon this survey and data obtained from the authorities, we checked Lux level of all rooms & halls. The details checking & calculations & comparison with others are as follows:

Lux level of some locations

Location	LUX	REMARKS
Training & placement Room	290	Satisfactory
Boy's Hostel room-110	288	Satisfactory
Boy's Hostel room-205	294	Satisfactory
Internal Corridors	200	Satisfactory
Room-224	250	Satisfactory
Class room 501 `	270	Satisfactory
Conference Hall	355	Satisfactory
Library	280	Satisfactory
Room Dean Academics	166	Action required to improve
Admission Cell Hall	177	Action required to improve

i) Analysis of lighting performance indices **So lighting is satisfactory**. One major reason for very good result is use of energy efficient luminaries, sufficient natural lights. It was observed that some fluorescent tubes are fitted with magnetic blasts on conventional 40W luminaries

OBSERVATIONS

- During Audit, it was observed that the fluorescent tubes are fitted with magnetic blasts on conventional 40W luminaries.
- It was also observed during the audit that reflector/diffuser were not provided for most of the fluorescent tubes to distribute the uniform lighting in the room.

RECOMMENDATION

4.4 Installation of Energy Efficient Lights

EEM-3 Replacement of 40W T-12 WITH 18 W LEDTUBE LIGHT

In the existing system out of 770 nos.40 W, T-12 FTLs 45 nos. have been replaced with LED T/Lights.The proposed scenario includes replacement of balance 725 Nos. T- 12 type with 18 W LED 4' long Tube Light. The energy saving calculations is shown below.

Existing FTL 40 watts installed in the campus

←

Energy Saving Calculation

Energy Saving Calculation		Units	Value
Total Number of fittings	=	Nos.	725
Existing annual Energy Consumption of 40 W T-12 FTL (including ballast) 725 No.X55 WX6 HrX300 daysX.8 LF/1000=57420	=	kWh	57420
Proposed annual Energy Consumption of 18 W LED Tube Light;(725X18x6x300x.8/1000= 18792KWH)	=	kWh	18792
Cost Benefit Analysis			
Proposed Annual Energy Savings potential;(57420-18792=38628)	=	kWh	38628
Per Unit cost	=	Rs.	8.48
Proposed annual monetary savings;(8.48X38628)		Rs	327565
Investment/ fixture (including replacement cost)	=	Rs.	200
Total Investment	=	Rs.	145000
Simple Payback Period	=	Years	0.4

Energy saving by replacement of Florescent Light with Energy Efficient Tube Light

The payback period is calculated to be 0.4 years. Since the product life is much more than that, the move is economically beneficial and energy saving.

EEM-4 Replacement of existing CFL 12 watts with direct fit 7 W LED bulb

Energy Saving Calculation

Energy Saving Calculation		Units	Value
Total Number of fittings	=	Nos.	8
Existing annual Energy Consumption of 12-watt CFL including ballast 8Nos.x15WX12Hrx365/1000 days=526	=	kWh	526
Proposed annual Energy Consumption of direct fit 7W LED bulb;(8x7x12x365/1000=245 KWH)	=	kWh	245
Cost Benefit Analysis			
Proposed Annual Energy Savings potential (526-245) =281	=	kWh	281
Per Unit cost	=	Rs.	8.48
Proposed Annual Monetary Savings (281x8.48) =2389	=	Rs.	2389
Investment/ fixture (including replacement cost)	=	Rs.	150
Total Investment	=	Rs.	1200
Simple Payback Period	=	Years	0.5

Replacement of existing 12 W CFL with direct fit LED 7-Watt direct fit lamp

CHAPTER – 5 STUDY OF FANS

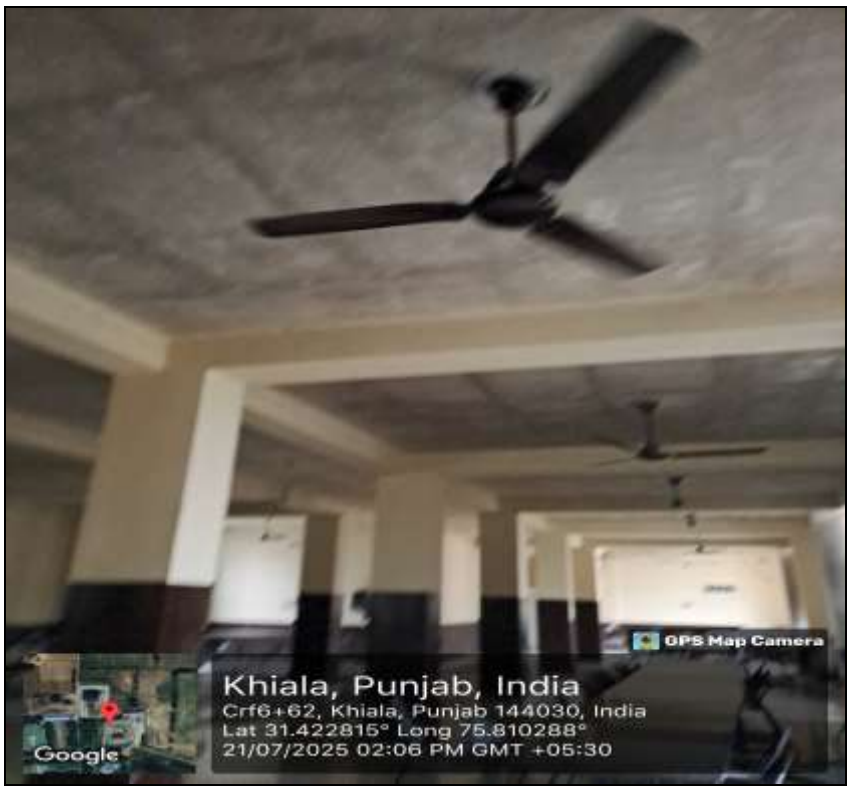
5.1. STUDY FINDING OF FANS

The Fan details installed in the premises are given below

Sr No	Specification	Rating	Total nos.	Total load
	Item	Watt		(KW)
1	Ceiling Fans 1200mm sweep	75	3287	247
2	Wall fans	50	12	0.6
3	Exhaust fans	35/50	155	7.15

Inventory list of existing fans

5.2. CEILING FANS



Existing old 75/85W Ceiling fan installed in the campus

The standard fans are installed in the premises. 75W Ceiling fan, consumes up to 85 watts, thus 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

EEM-5 Replacement of 3287 nos. old conventional ceiling fans with 26W Energy efficient/5 star rated BLDC ceiling fans

It was observed and discussed with college authorities during the audit that 3287 Nos. ceiling fans are installed in the different Floors, class rooms and hostels building. Thus 3287 no. ceiling fans are recommended to replace the existing old ceiling fans with 26W BLDC energy efficient fans. The energy saving calculation is shown below:

Energy Saving Calculations

Energy Saving Calculation		Units	Value
Total Number of ceiling fans	=	Nos.	3287
Existing annual Energy Consumption of old conventional 80-85-watt Ceiling fan ;(3287x85x6x180/1000=301747KWH)	=	Watt	301747
Energy Consumption after replacement with 26 W energy efficient BLDC ceiling fans;(3287x26x6x180/1000=92299 KWH)	=	Watt	92299
Cost Benefit Analysis			
Proposed Annual Savings potential (301747-92299) =209448	=	kWh/year	209448
Per Unit cost	=	Rs.	8.48
Proposed Annual Monetary Savings;(8.74X209448=1773923)	=	Rs.	1776119
Investment-1200 mm sweep ceiling fan	=	Rs.	2800
Total Investment	=	Rs.	9203600
Simple Payback Period	=	year	5

Replacement of 3287 nos. old conventional ceiling fans with 26 W Energy efficient/5 star rated BLDC ceiling fans

5.3. Wall fans

Only 12 nos. wall fans of 50 watt each are being used rarely in the campus, thus not recommended to replace as replacement is not viable.

5.4. EXHAUST FANS

155 nos. Exhaust fans of 35/50 watt each are being used rarely in the campus, thus not recommended to replace as replacement is not viable.

An exhaust fan's primary function is to remove stale, polluted, or moisture-laden air from a room or building. Exhaust fans work by:

- Removing unwanted air: Drawing in and expelling unwanted air outside
- Improving air quality: Removing pollutants and allowing fresh air to enter naturally through cracks, windows, or other openings
- Reducing odors: Removing unwanted odors from the air
- Maintaining humidity level: Maintaining a comfortable humidity level

Exhaust fans are often used in bathrooms and kitchens.

Presently 155 no. old inefficient conventional exhaust fans with power ranging from 35-50W as per table Sr. No.5 are being used to provide general ventilation to the washrooms, labs in the building. Taking average power as 45 watt and these may consume up to 75 watts

Recommendation

These are recommended to replace with 20watt energy efficient BEE star rated BLDC exhaust fans with air delivery 1150 CHM,250 mm2 and speed 1300 rpm (which are readily available in the market, as annexure- List of Vendors)

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

EEM-6 Replacement of 155 nos. of average 75 W inefficient exhaust fan with 20W 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.	155
Existing Electricity Consumption of old inefficient E/F, (155x75x6x300/1000=6026 KWH)	=	kwh	20925
Proposed annual Electricity Consumption after replacement with 20 W energy efficient BEE 5 star rated BLDC E/fans with air delivery 1150 CHM,250 mm2 and speed 1300 rpm (155x20x6x300/1000=5580 KWH)	=	kwh	5580
Cost Benefit Analysis			
Proposed Annual Savings potential	=	kWh/year	15345
Per Unit cost	=	Rs.	8.48
Proposed Annual Monetary Savings	=	Rs.	130126
Investment/ fixture replacement	=	Rs. /Fixture	2590
Total Investment-Rs	=	Rs.	401450
Simple Payback Period	=	year	3

Replacement of 155 nos. existing conventional exhaust fans with energy efficient BLDC exhaust fans

The payback period is calculated to be 3 years, which is high. Since the product life is much more than that, the move is economically beneficial and energy saving.

CHAPTER – 6 STUDY OF HVAC SYSTEM

6.1. AIR CONDITIONING SYSTEM & WATER COOLERS

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 buildings. 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.

6.2. DESCRIPTION OF AC SYSTEM

Sant Baba Bhag Singh University, Jalandhar has installed 30 Nos. Window Air Conditioners & 25 Split air conditioners The detail is given below:

OBSERVATIONS & RECOMMENDATIONS

The Performance assessment of units not done due to lien season. BEE star rated AC's. **It is recommended to replace the old 25 no. Split Acs and 39 nos. window Acs with energy efficient BEE 5 star rated Acs which is a mandatory phase** as per star rated plan of BEE

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

EEM-7 & 8

39 Nos. existing old inefficient window AC'S and 20 no. split Acs are proposed to be replaced with new BEE 5 star rated ACs in the building.

The energy saving calculations shown below:

Energy Saving Calculations		Units	Window 1.5 T	Split 1.5 T
Total Number of Air conditioners	=	Nos.	39	20
Annual Energy Consumption of existing old and split ACs;(39x2000x6x180x/1000=84240KWH)	=	kwh	84240	43200

;(20X2000X6X180/1000=42340 KWH)				
Proposed annual Energy Consumption of BEE 5 star rated energy efficient window and split ACs ;(39x1200x6x180/1000=50544KWH) ;(20X1200X6X180/1000= 28512 KWH)	=	Kwh/year	50544	25920
Cost Benefit Analysis				
Proposed annual electricity savings	=	Kwh	33696	17280
Per Unit cost	=	Rs.	8.48	8.48
Annual Monetary Savings;(8.48x33696);8.48x17280)	=	Rs.	285742	146534
Investment/ fixture replacement	=	Rs. Fixtr	24000	30000
Total Investment	=	Rs.	936000	600000
Simple Payback Period	=	year	3.2	4

The payback period is calculated to be 3.2 and 4 years. Since the product life is much more than that, the move is economically beneficial and energy saving.

6.3. Water Coolers

Existing water cooler in the campus

39 Nos. of water coolers are installed in the building premises to enable the students and staff 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 refrigerant circuit.

6.3.1. Measured parameters of water cooler Measured the parameters of the one cooler installed near main office of the campus and the Energy saving calculation is as below**:**

6.3.2. Recommendations & Maintenance & Energy Saving Calculation

-Install temp. and pressure gauges

-Temperature of cooled water be maintained near about 17 degrees centigrade

EEM-9 Maintenance of all evaporator coils and setting temperature of water in existing water coolers

Energy Saving Calculations

Energy Saving Calculation		Units	Value
No. of water coolers		No.	39
Normal water temperature	=	ºC	24
Reasonable chilled water temperature	=	ºC	17
Water Temperature measured	=	ºC	7
Difference in temperature	=	ºC	10
Cost Benefit Analysis			
Excess energy consumption @ 3%/ ºC rise in temperature	=	%	30
Energy consumption of water cooler, (39 no.x1550 wx6x180 /1000=65286 kwh)	=	KWH	65286
Energy saving potential @ 30%,65286x0.30=4865.6 kwh	=	KWH	19586
Amount saveable @ Rs 8.48	=	Rs.	166080
Expenditure for maintenance of all evaporator coils-Rs1000/- per WC	=	Rs.	39000
Payback period			0.2

CHAPTER – 7 STUDY OF COMPUTER SYSTEM

This institute has about 573 nos. of computers with LED monitors. The computers are generally for IT/computer classes and for office use

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 consume 500W while LCD monitors consume 300 Watt while LED computer consume only 100 watts. The annual energy consumption is about 38678 KWh units. The auditors find no any saving in it as already existing computers are energy saver.

CHAPTER – 8 STUDY OF WATER PUMPING & STP SYSTEM

8.1. WATER PUMPING SYSTEM

The building has made the provision for storage the water for the facility of the staff and students in the campus and hostels and has installed 25 no. PVC overhead tanks of 2000 lts capacity each on roof tops and 1 main overhead water tank with capacity of 5 Lakh KL. There is 1 no. submersible pump set of 1.5 hp for hostel and 2 hp installed for college to feed and store the water direct in the PVC tanks located at roof top. The pump installed for filling the tanks runs for app. 4-5 hrs. daily. Recently the Submersible Pump Near Block 8 was replaced with new

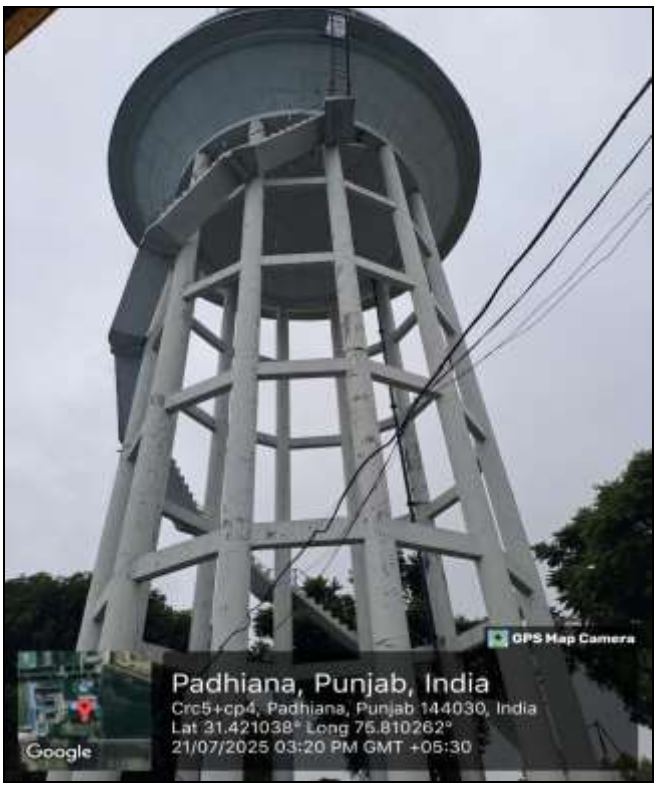
Details of Pumps installed in the Campus

Sr.No.	Name	Quantity (Nos)	Capacity HP	Location	Working (per day)
1	Submersible Pump	1	20 HP	Near workshop	205 minutes
2	Submersible Pump	1	15 HP	Near Block 7	40 minutes
3	Submersible Pump	1	15 HP	Near Block 5	70 minutes

4	Submersible Pump	1	15 HP	Near Block 8	45 minutes
5	Submersible Pump	1	15 HP	Boys Hostel	225 minutes
6	Submersible Pump	1	1.5 HP	Ground	20 minutes
7	Submersible Pump	1	1.5 HP	Football Stadium	25 minutes

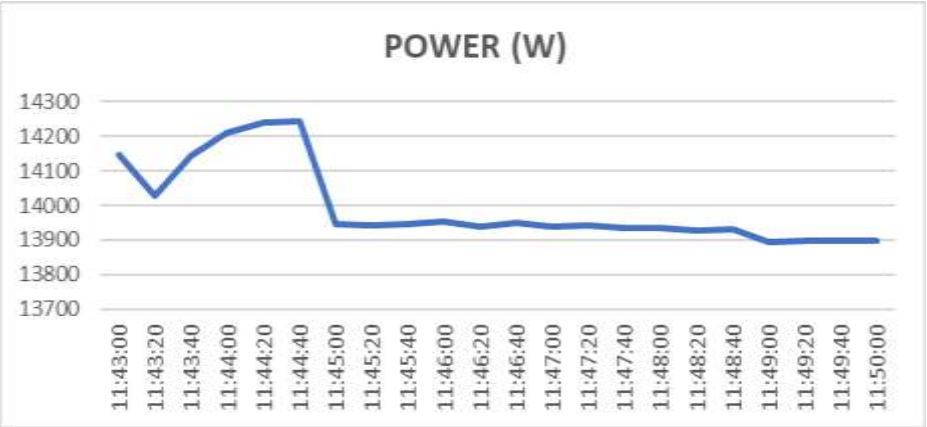
Auditors measured the parameters of submersible pump feeding to main overhead tank located near the work shop for checking the performance of the pump

8.2. MEASURED PARAMETERS OF SUBMERSIBLE PUMP



Submersible pump near work shop

Volts	Amps.	PF	kw
401.2	26.2	0.856	14.001
398.6	24.2	0.845	13.633
399.7	24.9	0.846	14.082
399.83	**25.07**	**0.848**	**13.905**



Findings & Recommendations

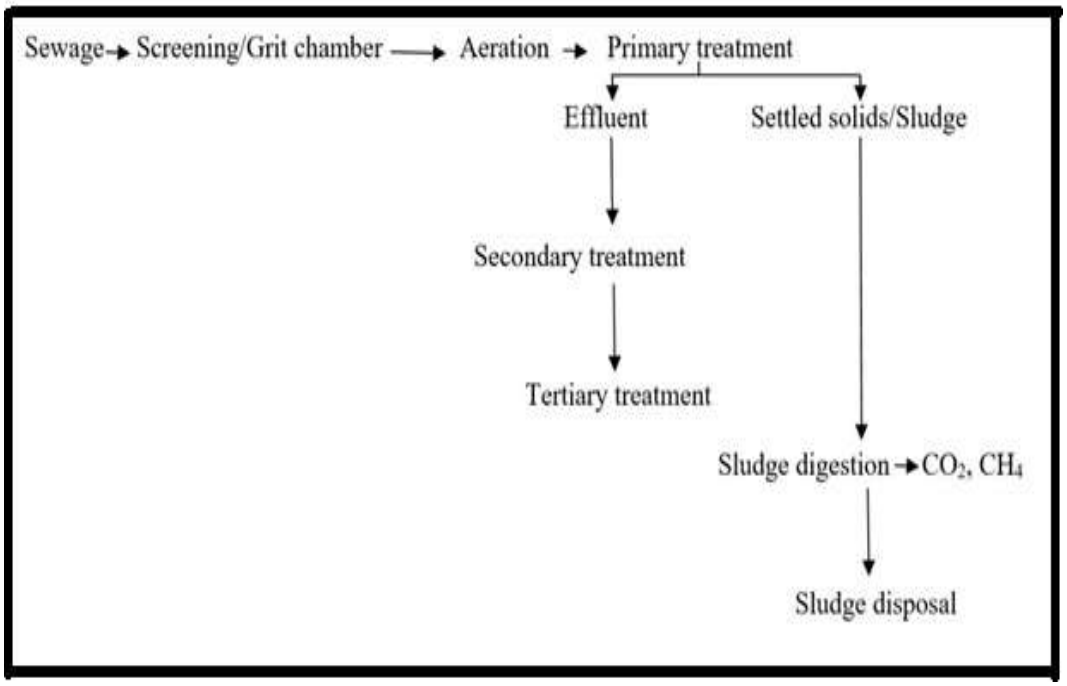
The power consumed by the pump motor set found to be in the permissible limit. At present energy efficient motor-pump sets, whose efficiency is higher than normal standard motor-pump sets are competitively available in market. These have higher efficiency, higher power factor and longer life than normal standard motor-pump sets. Further on each damage & rewinding, efficiency drops from 0.75% to 1.5%. But as inquired, damage rate is not high**.** In case when gone bunt/damaged it may replace with the energy efficient pump motor set

8.3. SEWAGE TREATMENT PLANT (STP SYSTEM)

Sewage treatment plant of capacity 600 KL/Day (MBBR BASED) comprises of Raw effluent pump, Air blowers and Filtration pumps

In a sewage treatment plant, sewage water is first allowed to pass through screens or grit chamber where large solids are removed. Effluent from primary treatment consists of 45-50 % unstable organic matter. The effluent then undergoes secondary treatment where fine solids settle out by means of bacterial activities resulting in secondary sedimentation The effluent then undergoes tertiary treatment/disinfection. Sand filters and reverse osmosis used in this stage of treatment,

Sludge is digested in a tank which results in the release of combustible gases: methane (CH_4) and carbon dioxide (CO_2); that can be used as fuel. The digested sludge can either be disposed by incineration or used as a fertilizer



Sewage treatment plant process flow

MBBR TYPE 600 KLD STP AT SBBS UNIVERSITY CAMPUS

As discussed with the STP personals on duty, the collection tank pump motor which was rewound many times is likely to be replaced with new 5 HP as it has been purchased and is lying with them. Auditors already measured the parameters of Root

blower motor-pump set for checking the performance of the pump in last energy audit i.e. 2024-25and is reproduced again as below

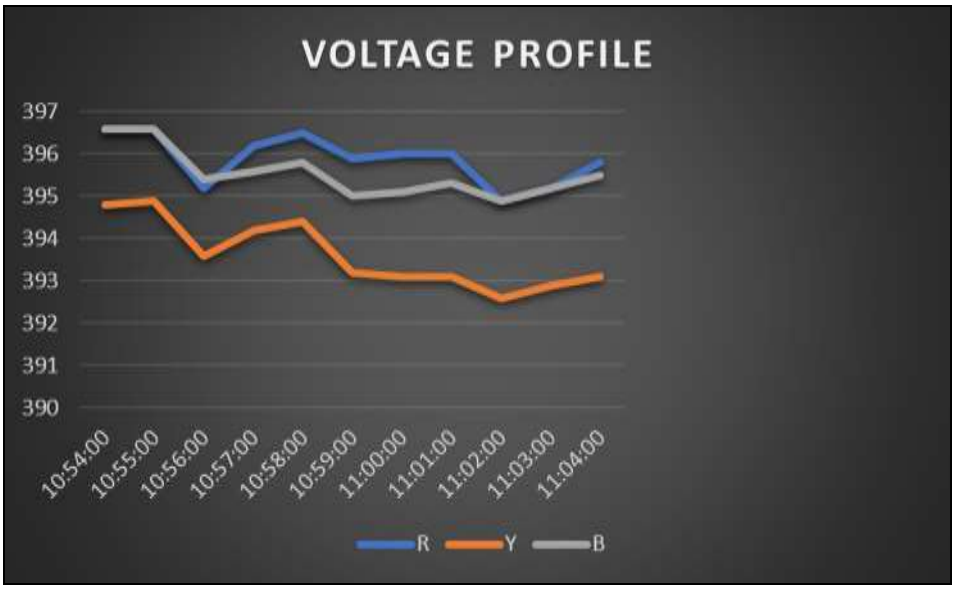
Root blower of 5 hp-Rated parameters

Capacity	5 HP
Pressure	0.40
RPM	1200
H	15M

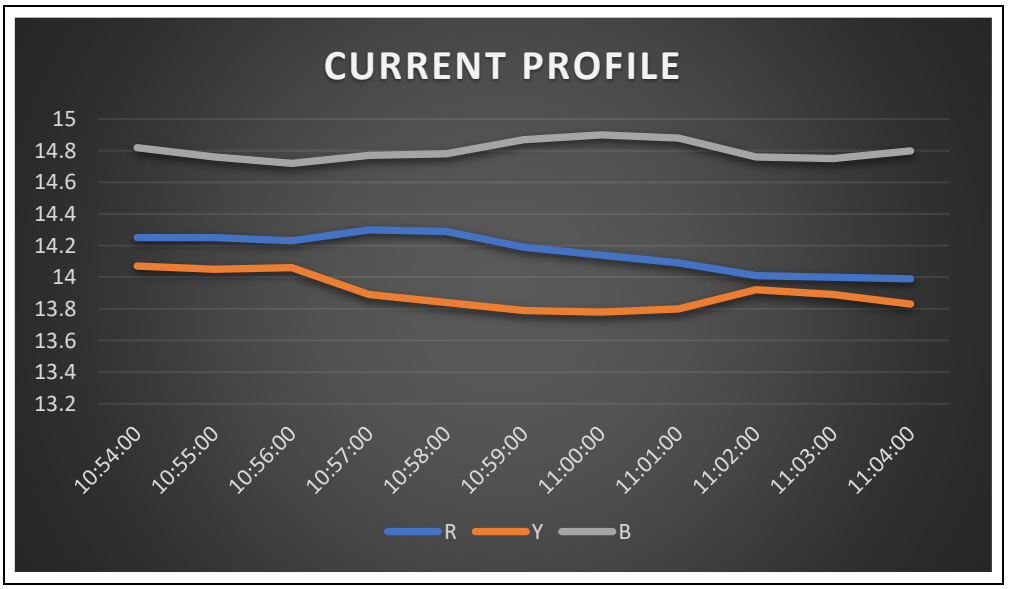
Measured parameters

V1	V2	V3	V Avg
395.9	393.6	395.5	395.02

A1	A2	A3	AAV	P(KW)
14.2	13.9	14.8	14.29	9.25



Voltage Profile



Current Profile

Power Profile

DEPARTMENT	KW	Head -M		Flow- LPS		Actual	Possible
STP	KW	Actual or Reqd	Rated	Actual or reqd.	Rated	motor load - KW	motor load - KW
Blower	3.7	4	4	41	41	9.25	3.8

EEM-10 Replacement of standard motor of blower with energy efficient motor of STP

Energy Saving Calculation

Existing Motor	Rated HP	1no.5hp	
	Input at FL KW	3.7	
	Avg..Load kw	9.25	
	% Age Load	250%	
	App. eff. of standard motor	81.00%	
Proposed motor	**App. eff. of E E motor**	87.00%	
	Energy saveable - kw	0.638	
	Hrs / annum	3960	
	Energy saveable- kwh	2526.21	
	Amount saveable @ Rs 8.48/ kwh	21420	
	Investment	35000	
	Payback period--yrs	1.6	

The payback period is calculated to be 1.5 years. Since the product life is much more than that, the move is economically beneficial and energy saving

CHAPTER – 9 STUDY OF DG SET SYSTEM

9.1. Sant Baba Bhag Singh University Jalandhar has installed 2 No. of DG Sets of 500 KVA & 200 kVA capacity with acoustic cover for providing backup to power cut-off from utility supply.

Existing DG Set 500 & 200 KVA installed in the university

9.2. Rated parameter

Make-Power Waves Industries, Mohali

DG Sr No.-1037**, Model-**GW-620

Rating: KVA-500**, KW-**400**, RPM-**1500

Diesel Consumption Details	FY 24-25
Annual- Lts	13510
Rate Rs / lts	86
HSD Billing – Rs	1161860
Equivalent HSD charges -Rs	773863
Electricity Generated-KWH	111187

9.3. DG SETs, OBSERVATIONS & RECOMMENDATIONS

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 is 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 temperature of 25 to 30 degree centigrade. Higher temperature & lower suction pressure decreases efficiency. The position of set is as below: -

3. As verbally informed, normally lubricating oil pressure reaches 79 psi, oil temperature 80 °
4. All are placed in a big covered in open space. The side from where air is sucked by sets is open.
5. Thus, fresh air at ambient conditions is sucked in. It is good
6. All are housed in accosted cover. The exhaust pipe inside is well insulated. It is also good so that
   temperature inside does not unnecessarily increase.

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. **No saving is found, for smooth running of the DG sets and for considerable savings the implementation of above recommendations are essential**

9.4. Energy saving in DG Set

i) **Operate the DG set so as to get at 400 – 405 volts** instead of 415 -420 volts at heavy load end motor terminals. **This gives instant savings in Diesel and without compromising the loading levels**.

Also, majority of loads like pumps, fans and compressors etc are centrifugal type and that too not loaded fully.

ii) Reduce the DG set frequency from 50 Hz + to 48.5 Hz + after studying all the loads into consideration.

Iii) **The DG set is rated by KVA only and hence how much KVA we can take from the DG set is the focus point.** The power factor of the electrical system depends upon the nature of characteristics of the load. If the load ends are compensated so that **an average of 0.8 to 0.9 max at the load end, then we can efficiently make use of the DG set.** See that the PF is around 0.8. **If the PF of load is less than 0.8 PF, alternator gets overloaded** and the energy losses through the alternator increases.
If PF of load is more than 0.8 PF the engine gets overloaded. Hence operating the DG set at low PF increases the alternator losses. **At present average power factor is 0.927 it is recommended to keep it around 0.8**
we can plan for higher loading up to 85 % for old set and 90 % for new genset.

CHAPTER – 10 STUDY OF LIFT SYSTEM

One lift- has been provided for the comfort of students, staff and visitors in block-5

10.1. RATED PARAMETERS

Make	Ottis
Motor	3 phase squirrel cage induction
Motor voltage	415 V
RPM	1500
Power	4.5 KW

LIFT

The auditors checked the lift in block-5 in

10.2. Summary of all the measurement data is tabulated as below:

Measured Parameters

v	A	PF	KW	REMARKS
400	7	0.830	4.02	**lift on load moving down ward**
399	4.5	0.925	2.87	**lift on load moving upward**
398.5	0.76	0.870	0.453	**lift on no load**

Main observations:

Main observations are as follows:

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

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

POWER MEASUREMENT DATA

We measured power in three conditions:

a) Lift moving upward

b) Lift moving downward

c) Lift at no load

10.3. DATA ANALYSIS FOR LIFT:

Power consumption is at the low level.

No load power consumption is less i.e. 0.453 KW

CONCLUSION:

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

CHAPTER – 11 STUDY OF SOLAR POWER SYSTEM

11.1. Solar energy is one of the most widely used renewable sources 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

11.2. Installation of 55 KWp & 45 KWp roof top Solar Power Plant in block-8 & block-3 respectively:

At present, power is sourced from the PSPCL at HV system
Metering is done at the HV level. Power is also generated using 1 DG set of 500 kVA. The average power generation from a 1 KWp SPV System is around 4-5 kWh per day. Since the installed SPV system does not have a battery backup grid connection is there to meet the power requirements during 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.

11.3. Solar power plant Overview

The following are the salient features of the photovoltaic plant

Item	Description	Details
1	Project Type	CAPTIVE USE
3	Plant Capacity	**55 KWp & 45 KWp=100 KWp**
4	Project Location	Jalandhar
5	Project Applicant Name	Sant Baba Bhag Singh University Jalandhar
6	Technology – Modules	Mono perc Technology
7	Inverter type	50 KW
8,	Mounting Structure	Fixed Tilt- Rooftop
9	Evacuation Voltage	440 V
10	Annual Energy generation estimated end of 1st year with clear 330 sunny days	150480 kWh in the first year with fixed mounting structure.

INSPECTION AT SITE

11.4. Load distribution for solar system: Whole campus Load -980 KW

11.5 Performance evaluation

For performance evaluation some data has been collected and verified to the extent possible

The performance of a PV power plant is often denominated by a metric called the capacity utilization factor. It is the ratio of the actual output from a solar plant over the year to the maximum possible output from it for a year under ideal conditions. Capacity utilization factor is usually expressed in percentage. Capacity Utilization Factor (C.U.F) = (Actual energy from the plant (kwh)) / (Plant Capacity (KWp) x 24 x 365)

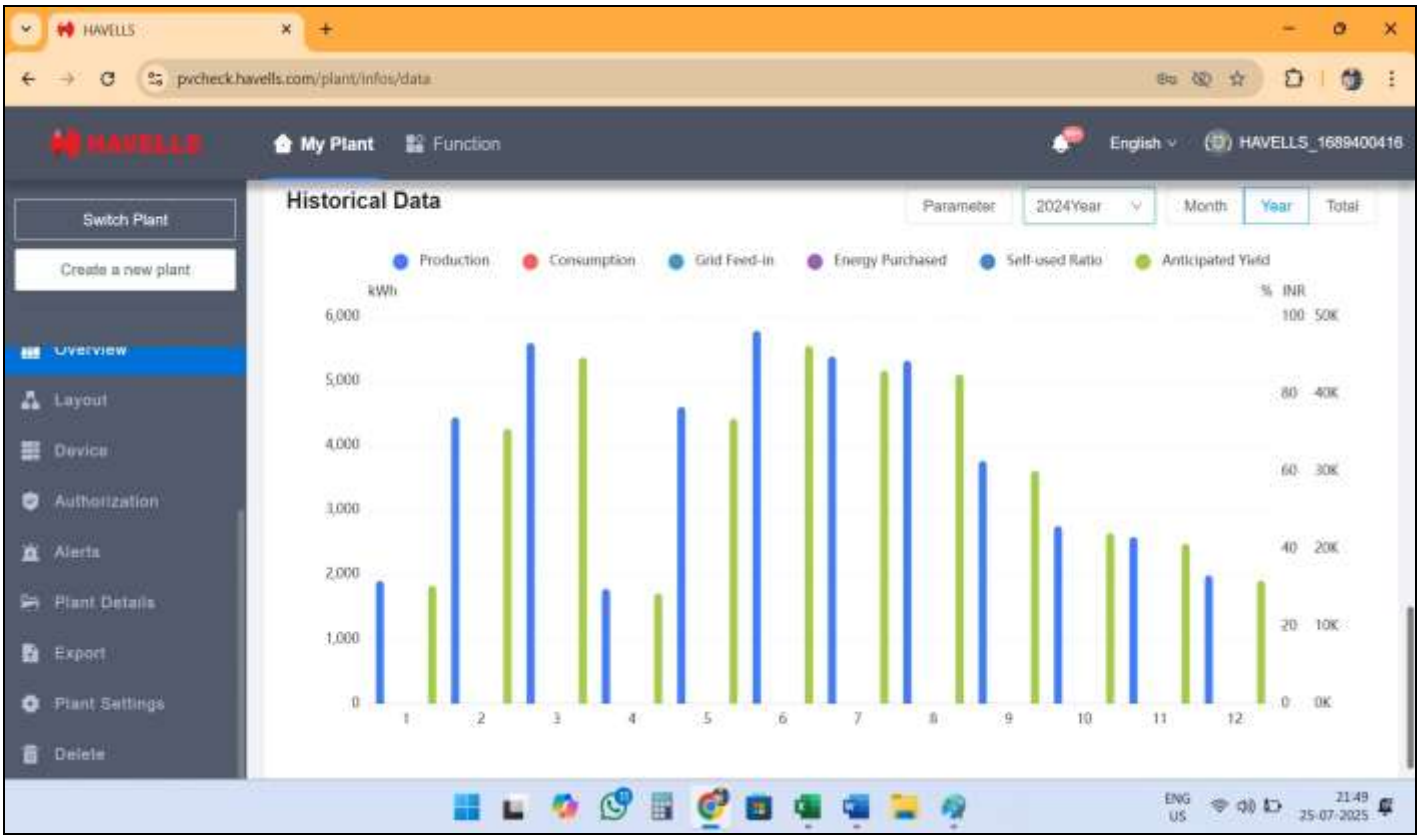
The energy generation of a plant primarily depends on two key parameters; solar radiation received and the number of clear sunny days experienced by the plant's location. These two factors affect the capacity utilization factor as well. According to the reports from MNRE in 2013, the average capacity utilization factor of solar PV plants in India is in the range of 15-19%. In particular, solar plants in Rajasthan has recorded the highest capacity utilization factor; it being in the range of 20%. The geophysical location of these states has helped this cause. Moreover, it is interesting to note that the highest capacity utilization factor was for a Concentrated PV (CPV) plant and it came up to almost 35%. The C.U.F for several solar friendly states in India and the approximate output per day for a 1kWp plant is given below

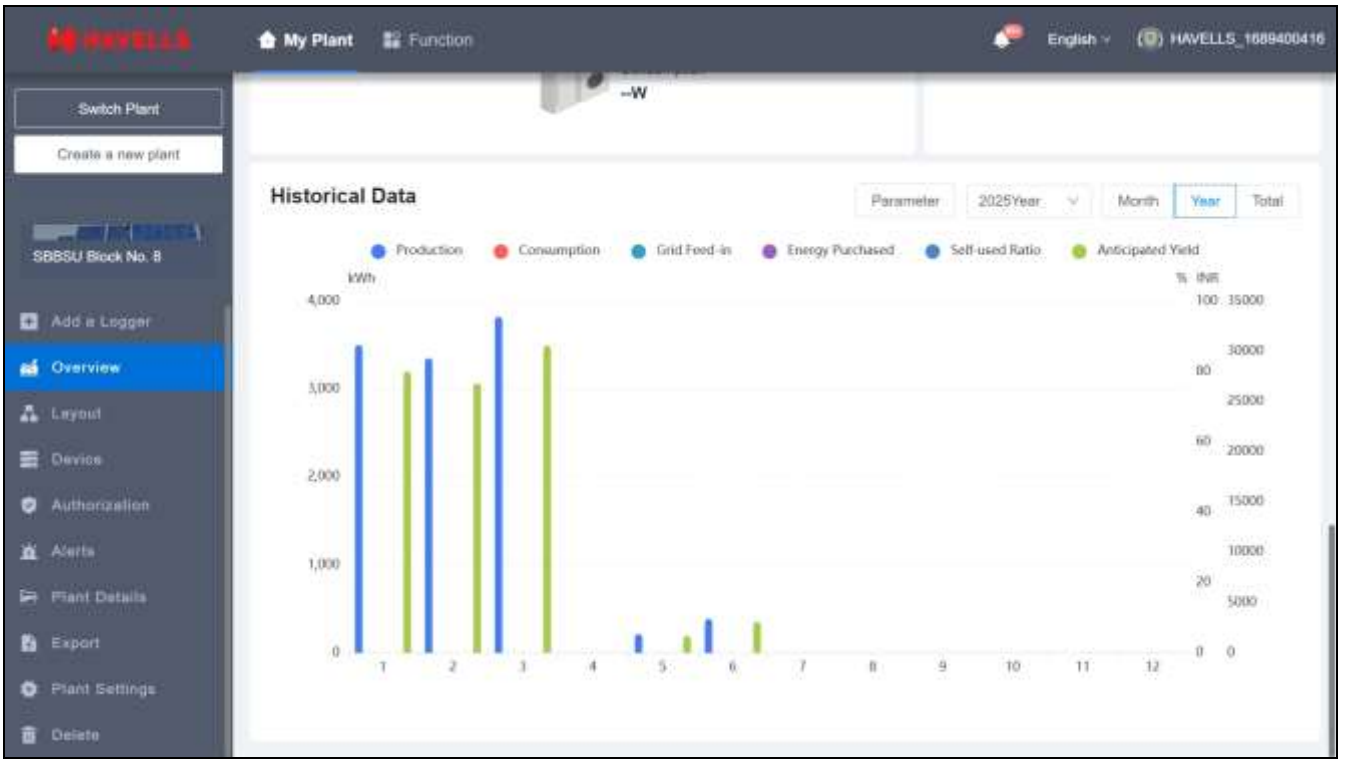
11.6. The C.U.F for several solar friendly states in India:

State	CUF-%	Output for 1 KWp panel (kWh/day
Gujarat	18	4.32
Karnataka	19	4.56
Madhya Pradesh	19	4.56
Maharashtra	19	4.56
Punjab	19	4.56
Rajasthan	20	4.80
Uttarakhand	19	4.56
Tamil Nadu	19	4.56

11.7. Details of the unit generated during July 2024-June 2025:

Screen shot of solar generation and other data down loaded from the website


HAVELLS
pvcheck.havells.com/plant/infos/data
My Plant
Function
English
HAVELLS_1689400416
Switch Plant
Create a new plant
Overview
Layout
Device
Authorization
Alerts
Plant Details
Export
Plant Settings
Delete
Historical Data
Parameter
2024Year
Month
Year
Total
Production
Consumption
Grid Feed-in
Energy Purchased
Self-used Ratio
Anticipated Yield
kWh
% INR
6,000
5,000
4,000
3,000
2,000
1,000
0
100 50K
80 40K
60 30K
40 20K
20 10K
0 0K
1
2
3
4
5
6
7
8
9
10
11
12
ENG
US
21:49
25-07-2025



MONTH/2024-25	SOLAR GENERATION-KWH
JUL	5370
AUG	5310
SEP	3760
OCT	2750
NOV	2580
DEC	1980
JAN	3500
FEB	3350
MAR	3820

APR	**-**
MAY	212
JUN	3.88
TOTAL	**32636**

11.8. Calculations of the Capacity utilization factor

Actual energy from the plant (Kwh) for the year 2024-25=32636

Plant capacity=55+45=100 KWp

Average Radiations=5.08 Kwh/m2

Capacity Utilization Factor (C.U.F) = (Actual energy from the plant (Kwh)) / (Plant Capacity (KWp) x 24 x365

CUF= 32636/100*8760

=0.037X100 = 3.7%

Findings: Thus, Utilization factor found less than as against prescribed value of 19, may be due to either some cloudy or maintenance issue

11.9. Losses in PV Solar systems

The estimated system losses are all the losses in the system, which cause the power actually delivered to the electricity grid to be lower than the power produced by the PV modules. There are several causes for this loss, such as losses in cables, power inverters, dirt on the modules, ambient temperature, varying insolation levels and so on.

11.10. Inverter efficiency

A solar PV inverter is a type of electrical inverter that is made to change the direct current (DC) electricity from a photovoltaic array into alternating current (AC) for use with home appliances or to be fed into the utility grid. These inverters may be standalone inverters, which are used in isolated systems, or grid tie inverters which are used to connect the power plant to the grid.

The efficiency of an inverter has to do with how well it converts the DC voltage into AC. The currently available grid connected inverters have efficiencies of 96 to 98.5%, and hence choosing the correct inverter is crucial to the design process.

There are less efficient inverters below 95% also available.

Inverters are also much less efficient when used at the low end of their maximum power. Most inverters are most efficient in the 30% to 90% power range

Checked up the inverter

Findings: The auditors tried to check the performance of the inverters but the same were not working, thus could not checked their performance

11.11. Module Degradation

The degradation of solar modules with temperature and time contributes significantly to the final output from the panel. As the output reduces each year. The effect of degradation of photovoltaic solar modules and arrays and their subsequent loss of performance has a serious impact on the total energy generation

11.12. Causes of degradation

Tests on module degradation are performed using real-time and accelerated exposures. These tests are conducted by institutions of international repute such as the Fraunhofer Institute, the National Renewable Energy Laboratory, Solar Energy Research Institute of Singapore and so on. These tests have successfully demonstrated that there is module degradation (usually less than 1% per year), and the possible reasons for this are the slow breakdown of a module's encapsulate (usually ethylene vinyl acetate; EVA) and back sheet (polyvinyl fluoride films), the gradual obscuration of the EVA layer between the module's front glass and the cells themselves, and the deterioration of solar cells due to temperature increase. The silicon cells themselves have infinite life, except for the slight degradation due to thermal effects. The degradation of the module itself is due to a collection of factors as mentioned above.

Module encapsulate protects the cells and internal electrical connections against moisture ingress. Some amount of moisture does enter, and is forced back out on a daily basis, as module temperature increases. Sunlight slowly breaks down the encapsulation materials through ultraviolet (UV) degradation, making them less elastic and more plastic. Over time, this limits a module's ability to force out moisture. The trapped moisture eventually leads to corrosion at the cell's electrical connections, resulting in higher resistance at the affected connections and, ultimately, decreased module operating voltage.

The other cause for degradation is inherent to the silicon cells, resulting from exposure to sunlight, resulting in defects called metastable dangling bonds. These can be removed by heating the cell to a high temperature, something that is not possible in practice. The dangling bonds capture electrons, therefore reducing the electrical output and hence the efficiency. Research has shown that this form of degradation leads to a 15-20% reduction in efficiency.

11.13. Temperature

Module performance is generally rated under Standard Test Conditions

(STC): irradiance of 1,000 W/m², solar spectrum of AM 1.5 and module temperature at 26°C. All electrical parameters of solar module depend on temperature. The module output decreases with increase in temperature.

Modules could not be tested due to rain.

Observations & Recommendations:

The audit team inspected and measured some data at site and observations are as under:

PV modules found physically installed per plans (number and layout)

All are found shadow free

Array installation found neat and permanent

Roof penetrations are secure and weather tight

String fuses or circuit breakers are DC-rated and no larger than module fuse rating

PV modules are in good condition (no broken glass or cells, no discoloration, frames not damaged but needs cleaning

The generation of electricity from above table is as follows:

Narration	Value
Total for 2024-25	32636
Average /day; 32636/365=152.29) KWH	89.4
Energy /kw installed capacity ;(89.4/100 KWp=1.52)	0.894

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 4.56*100*300 =136800 kWH/annum for one 100 kW panel. We do not expect 4.56kwh/kw/day in this campus due to some deficiencies. Cleaning at roof top is difficult. The campus authorities may install 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

11.15. We expect extra generation

EEM-11 Extra generation from solar power plant by improving cleaning process

Energy Savings Calculations

Item	Value
Solar Generation capacity-taking 300 sunny days,4.56*100*300 = 27600 - KWh	136800
Total generation in 2024-25-KWh	32636
Extra expected generation from solar power plant-KWh	104164
Total Energy saveable, assuming @10% from expected generation - kwh	10416
Amount saveable @ Rs 6.96/ kWh - Rs	72495
Appr investment for improving stairs, water piping, safety, extra lab chgs@2days/fortnightly -Rs.	30000
Payback period -yrs	0.4

The payback period is calculated to be 0.4 years. Since the product life is much more than that, the move is economically beneficial and energy saving

CHAPTER-12 Energy Monitoring & Accounting System

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

12.2. 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 record of energy consumption and production needs to be maintained.

Somehow, the auditors feel that proper record is 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.

12.3. For maintenance:

Transformer - Some maintenance schedule should be prepared for transformer. It can be as follows

Checking of silica Jal breather, HV/LV connections, testing of dielectric strength of transformer oil periodically, insulation resistance test periodically etc.

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

L D System

12.3.1. Initially tightening of all connections. Later on, 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.

12.3.2. 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

12.3.3. Suggestions to carry out this monitoring & bench marking: Presently, the campus building is being looking after by the competent technical staff provided by the campus authorities. & accounts staff of the college. But, monitoring, targeting etc. is itself a professional work. The energy consumption in this campus is about 8.8 Lakh KWH. It can hire a professional energy manager to visit & guide their staff –initially once afterwards1 visit once in 6 months.

CHAPTER – 13 ENERGY SAVING TIPS

Below are some of the energy efficiency tips in electrical utilities

13.1. 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 loads.
- 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.

13.2. MOTORS

- Properly size to the load for optimum efficiency.
- (High efficiency motors offer of 4 - 5% higher efficiency than standard motors)
- Use energy-efficient motors were 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%)

13.3. PUMPS

- Operate pumping near 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.

R.K. ELECTRICALS & ENERGY AUDIT SERVICES
ER. R.K. SHARMA MIE, FIV
BEE's C/Energy Auditor (EA-10080)
HP GOVT. Emp. Energy Auditor, DoE, Shimla
Govt. Regd. Valuer & Chartered Engineer

For R.K. Electricals and Energy Audit Services

(END OF THE REPORT)

ANNEXURES

i) Copy of Electricity Bill

PSPCL

PUNJAB STATE POWER CORPORATION LIMITED
Electricity Bill

M/S S.B.B.S UNIVERSITY
KHALA GHURIAL ADAMPUR-
144102-INDIA
Mobile: 98XXXXX381
Email: [redacted]
Circle: JALANDHAR
Division: CANTT DIVISION JALAN
Sub-Division: ADAMPUR
JALANDHAR

Category: GSC/SAP-NONSBM-/NRS RATE CATEGORY FOR NRS>100KWA DPC
Nature of Industry: MISCELLANEOUS (OTHER
Connection Date: 20-09-2011
Sanctioned Load: 980 KW
Sanctioned CD: 324 kVA

Bill Cycle: 11-2024
Solar Meter Status: O
Bidirectional Meter Status:
Bill Status:
Bill Date: 25-NOV-2024
Meter Security: 43800
Security Consumption : 668256
ACD: 668256

Bill No-1007461475
Meter Make: LBT
Meter Digit: 8
Meter No. 21006067
Meter Phase:
Meter Type:
Bill days: 30

Account- 3005850320	Due Date:	Units Consumed	Current Bill (A+B+C+D+E+F-G+H+I-J+K)	Previous Outstanding ₹	Amount payable within one month of the due date :
Payable Amount: ₹ 1060990	10-Dec-2024 (Online/RTGS)	36260 kWh	₹ 327506.00	733152	₹ 1076905

Previous Payment Total (Rs.)	₹ 1208700
Previous Payment Date	09-10-2024

Feeder Code	
Feeder Name	

Admissible Voltage (KV)	Supply Voltage (KV)	Metering Voltage (KV)
11.00	11.00	11.00

Meter Reading Details

Last MCO Date: | Last SJO Date: 20241120 | CTPT:

Current Reading 24-NOV-2024			Previous reading 25-OCT-2024			Meter Multiplier	Line CTR	MTR Ratio	Mtr. Volt. ratio	Overall Multiplier	MMTS Correction	Add. Supply Units	Consumption
kVAh	kWh	MD	kVAh	kWh	MD								
						1.00	200/5	200/5	11.00	1.00			

Total kWh: | Total kVAh: | PF: | MDI: | TOD on peak:0.00 | TOD Off-peak:9012.00

Fixed Charges (A)

Contract Demand kVA	(i)	General	0
		PU	324
Actual Demand kVA	(a)	General	
		PU	
80% of (L) kVA	(b)	General	259.2
		PU	
A or B whichever is greater	(c)	General	259.2
		PU	259.2
Rate per kVA/month	(r)	General	140.00
		PU	
Billing Days	(d)		30
Fixed Charges	C*r*d/12/365 or 366	General	35693.00
		PU	
Fixed Charges (₹)			35693.00

Other Charges

Fuel Cost Adj. Charges (C) (₹))	0.00
Additional Surcharge (D) (₹)	0.00
Rentals (E) (₹)	2784
Surcharges(F) (₹)	0.00
Rebates(G) (₹)	16264.00
Subsidy(H) (₹)	0.00
Open Access Charges (Applicable to LS Open Access Consumers (I) (₹)	
Previous Outstanding (J) (₹)	733152

Energy Charges(B)

Total kVAh	Tariff Rate	Amount	Energy Charges (₹
	General	General	
36260	6.96	252370	252370

Previous Outstanding (J) (₹)

Current Charges (₹)	327506.00
Unpaid Arrears (₹)	733152
Adjustments (₹)	0
Sundry Charges/ Allowances (₹)	0

Taxes/Duty/Cess(K)

Electricity Duty (₹)	40770.00
Municipal Tax (₹)	0.00
IDF (₹)	13590.00
Cow Cess (₹)	0.00
Any Other (₹)	
Total Taxes (₹)	54360
TCS/TDS (₹)	327.51/0.00
PQ penalty (₹)	

Regd. Office P.S.E.B. Head Office, The Mall Patiala-147001 GSTIN NO: 03AAFCP5120Q1ZC CIN: U40109PB2010SGC033813
Powered by O/o (CE/IT) PSPCL

Print Date: 21-Jul-2025 01:45 PM
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ii)LIST OF SOME VENDORS

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

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

a) Certificate ISO 50001:2018(Energy Management Services)

ICL Integral Certification Ltd.

Certificate OF REGISTRATION

This is to Certify that the Management System of

R.K. ELECTRICALS & ENERGY AUDIT SERVICES

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

has been found to conform to the Energy Management System standard:

ISO 50001:2018

This certificate is valid for the following scope of operations:

DEALS IN PRODUCTS / SERVICE PROVIDER, ENERGY AUDIT, ENERGY MANAGEMENT, ENVIRONMENT AUDIT GREEN AUDIT, ELECTRICAL SAFETY AUDIT OF BUILDINGS, COLLEGE UNIVERSITY, HOSPITALS, INDUSTRIES, SOLAR PLANTS, THERMOGRAPHY OF ELECTRICAL AND MECHANICAL EQUIPMENT OF INDUSTRIES AND SOLAR PANELS AND ELECTRICAL INSTALLATIONS.

Certificate No.: 09112620G

Date of initial registration	*Date of this Certificate*	*Surv. audit on or before/ Certificate expiry*	*Recertification Due*
01 October 2024	*01 October 2024*	*30 September 2025*	*30 September 2027*

This Certificate remains valid subject to satisfactory surveillance audits.

Accreditation

EGAC Accredited MSCB CAB # 0112H

IAF

ICL/PM-001/REV07

Director

For verification and updated information concerning the present certificate visit to www.iclcert.com

This certificate is property of Integral Certification Ltd. and shall be returned immediately when demanded.

Integral Certification Ltd.
International Office : 45, Middle Hillgate, Stockport, Greater Manchester SK1 3DG
Contact No. : +44 7404 823687
(Company Number 15218428 Registered in England and Wales)
Integral Certification Pvt. Ltd.
Corporate Office : 301, U-60 (3rd Floor), Laxmi Nagar, Delhi-110092, India.
Contact No. : +91 9319332223
E-mail: info@iclcert.com Website : www.iclcert.com

b) Certificate ISO 9001:2015(Quality Management System

MANAGEMENT SYSTEM
CERTIFICATE

ROYAL ASSESSMENTS PVT. LTD.

VERIFIED
www.royalapl.com

This is to certify that

R.K. ELECTRICALS & ENERGY AUDIT SERVICES

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

has been assessed by RAPL and found to comply with the requirements of

ISO 9001 : 2015
Quality Management Systems

For the following activities:

DEALS IN PRODUCTS / SERVICE PROVIDER, ENERGY AUDIT, ENERGY MANAGEMENT, ENVIRONMENT AUDIT GREEN AUDIT, ELECTRICAL SAFETY AUDIT OF BUILDINGS, COLLEGE UNIVERSITY, HOSPITALS, INDUSTRIES, SOLAR PLANTS, THERMOGRAPHY OF ELECTRICAL AND MECHANICAL EQUIPMENT OF INDUSTRIES AND SOLAR PANELS AND ELECTRICAL INSTALLATIONS.

Certificate Number: E20241014012
Date of certification: 07/10/2024
Ist Surveillance on or before: 06/10/2025
IInd Surveillance on or before: 06/10/2026
Certification Valid Until: 06/10/2027

MEMBER OF MULTILATERAL RECOGNITION ARRANGEMENT
IAF
EGAC
Accredited
QMS Certification CAB# 119012

Director (Certification)
Royal Assessments Pvt. Ltd.

623 A, Tower-B, iThum, Plot No. A - 40, Sector - 62, Noida 201301, India.
www.royalapl.com, info@royalapl.com
Phone : +91 120 4251329
This Certificate can be verified at www.iafcertsearch.org

c) Certificate ISO 14001:2015 (Environmental Management System)

MANAGEMENT SYSTEM CERTIFICATE

ROYAL ASSESSMENTS PVT. LTD.

VERIFIED

www.royalapl.com

This is to certify that

R.K. ELECTRICALS & ENERGY AUDIT SERVICES

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

has been assessed by RAPL and found to comply with the requirements of

ISO 14001 : 2015

Environmental Management Systems

For the following activities:

DEALS OF ELECTRICAL AND MECHANICAL EQUIPMENT OF INDUSTRIES AND SOLAR PANELS AND SERVICE PROVIDER OF THERMOGRAPHY, ENERGY AUDIT, ENERGY MANAGEMENT, ENVIRONMENT AUDIT, GREEN AUDIT, ELECTRICAL SAFETY AUDIT OF BUILDINGS, COLLEGE, UNIVERSITY, HOSPITALS, INDUSTRIES, SOLAR PLANTS.

Certificate Number: E20240913515
Date of certification: 10/09/2024
Ist Surveillance on or before: 09/09/2025
IInd Surveillance on or before: 09/09/2026
Certification Valid Until: 09/09/2027

MEMBER OF MULTILATERAL RECOGNITION ARRANGEMENT IAF

EGAC

Accredited
EMS Certification CAB# 119012

Director (Certification)
Royal Assessments Pvt. Ltd.

623 A, Tower-B, iThum, Plot No. A-40, Sector-62, Noida 201301, India.
www.royalapl.com, info@royalapl.com
Phone: +91 120 4251329
This Certificate can be verified at www.iafcertsearch.org

This Certificate is an endorsement of certified clients certification status but remains the property of Royal Assessments Pvt. Ltd. Certificate must be returned on RAPL's request or if certificate is withdrawn. Validity of certificate is subject to successful completion of surveillance audits. RAPL is accredited by EGAC, Egypt. EGAC is member of International Accreditation Forum (IAF) and signatory of MLA.

d) Certificate ISO 45001:2018 (Occupational Health and Safety Management System)

MANAGEMENT SYSTEM CERTIFICATE

ROYAL ASSESSMENTS PVT. LTD.

VERIFIED

www.royalapl.com

This is to certify that

R.K. ELECTRICALS & ENERGY AUDIT SERVICES

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

has been assessed by RAPL and found to comply with the requirements of

ISO 45001 : 2018

Occupational Health and Safety Management Systems

For the following activities:

DEALS IN PRODUCTS / SERVICE PROVIDER, ENERGY AUDIT, ENERGY MANAGEMENT, ENVIRONMENT AUDIT GREEN AUDIT, ELECTRICAL SAFETY AUDIT OF BUILDINGS, COLLEGE UNIVERSITY, HOSPITALS, INDUSTRIES, SOLAR PLANTS, THERMOGRAPHY OF ELECTRICAL AND MECHANICAL EQUIPMENT OF INDUSTRIES AND SOLAR PANELS AND ELECTRICAL INSTALLATIONS.

Certificate Number: E20240913825
Date of certification: 26/09/2024
Ist Surveillance on or before: 25/09/2025
IInd Surveillance on or before: 25/09/2026
Certification Valid Until: 25/09/2027

MEMBER OF MULTILATERAL RECOGNITION ARRANGEMENT IAF

EGAC

Accredited
OHSMS Certification CAB# 119012

Director (Certification)
Royal Assessments Pvt. Ltd.

623 A, Tower-B, iThum, Plot No. A - 40, Sector - 62, Noida 201301, India.
www.royalapl.com, info@royalapl.com
Phone : +91 120 4251329
This Certificate can be verified at www.iafcertsearch.org

This Certificate is an endorsement of certified clients certification status but remains the property of Royal Ass... Pvt. Ltd. Certificate must be returned on RAPL's request or if certificate is withdrawn. Validity of certificate is subject to su... tion of

e) Certificate of Energy Auditor 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

f) Certificate of Energy Auditor MoP GoI

Regn. No. EA-19322 Certificate No. 7889

National Productivity Council
(National Certifying Agency)

PROVISIONAL CERTIFICATE

This is to certify that Mr. / Mrs./ Ms. Paramjeet Singh
son / daughter of Mr. Barkha Ram
has passed the National Certification Examination for Energy Auditors held in August - 2013, 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 : 6th January, 2014

Controller of Examination

g) Certificate of IGBC Accredited 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

i) Certificate of Electrical Engg.

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

j) Award certificate from Govt. of Punjab

Government of Punjab
Department of New & Renewable Energy Sources

Award for Outstanding Contribution

Presented to

M/s. R.K Electricals & Energy Audit Services, Chandigarh
(Sector: Energy Auditing Agencies)
participated in the State Level Energy Conservation Award Competition
organized by Punjab Energy Development Agency, Chandigarh
(State Designated Agency-Punjab) and secured the
Second Position
under the category of
BEE Certified Energy Auditors & Energy Auditing Agencies
for their efforts made in the field of
Energy Conservation during the last two years 2021-22 & 2022-23

December 2023
Chandigarh

Dr. Ashwani K Singh, IAS
Chief Executive Officer
Punjab Energy Development Agency

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