



# ETERNAL UNIVERSITY

BARU SAHIB, DISTT SIRMAUR, NEAR RAJGARH,  
HIMACHAL PRADESH 173101

# ENERGY AUDIT REPORT

PREPARED BY  
EHS ALLIANCE SERVICES

# CONTENTS

AUDIT CERTIFICATE	2
ACKNOWLEDGEMENT	3
DISCLAIMER	4
ABBREVIATION	5
INTRODUCTION OF UNIVERSITY	6
AUDIT PARTICIPANTS	10
EXECUTIVE SUMMARY	10
ENERGY AUDIT ANALYSIS	11
1. ENERGY CONSUMPTION	11
2. DIESEL CONSUMPTION	13
3. ANALYSIS OF DG SETS	14
4. AC SYSTEMS	15
5. CEILING FANS ANALYSIS	16
6. ANALYSIS OF LIGHTING SYSTEM	17
7. OTHER POWER CONSUMPTION	19

# CERTIFICATE



CERTIFICATE NO. EHSAC48C

# CERTIFICATE

PRESENTED TO

## M/S ETERNAL UNIVERSITY

Baru Sahib, Distt Sirmaur, near Rajgarh, Himachal Pradesh, 173101

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

## ENERGY AUDIT

The energy saving initiatives carried out by the university has been verified on the report submitted and was found to be satisfactory.

The efforts taken by management and faculty towards all type of energy used in three buildings of university and sustainability are highly appreciated and noteworthy.

A handwritten signature in blue ink, appearing to read "H. Singh".

SIGNATURE

27.10.2021  
DATE OF AUDIT

EHS ALLIANCE SERVICES, PLOT A-72, SURYA VIHAR, GURUGRAM, 122001  
WWW.EHSALL.IN | BUSINESS@EHSALL.IN | EHSALLIANCE@GMAIL.COM

## ACKNOWLEDGEMENT

EHS Alliance Services Audit Team thanks the management of Eternal University for assigning this important work of Energy Audit of the university. We appreciate the co-operation to our team for completion of study.

Our special thanks are due to

***Dr. Narinder Pal Singh, Dean Research (Volunteering)***

Teaching & Supporting Staff of campus for giving us necessary inputs to carry out this very vital exercise of Environment & Green Audit. We are also thankful to other staff members who were actively involved while collecting the data and conducting field measurements.



## DISCLAIMER

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

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

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

If you wish to distribute copies of this report external to your organisation, then all pages must be included.

EHS Alliance, its staff and agents shall keep confidential all information relating to your organisation and shall not disclose any such information to any third party, except that in the public domain or required by law or relevant accreditation bodies. EHS Alliance staff, agents and accreditation bodies have signed individual confidentiality undertakings and will only receive confidential information on a 'need to know' basis.



**Vijay Singh**  
**Lead Auditor EMS & Energy**



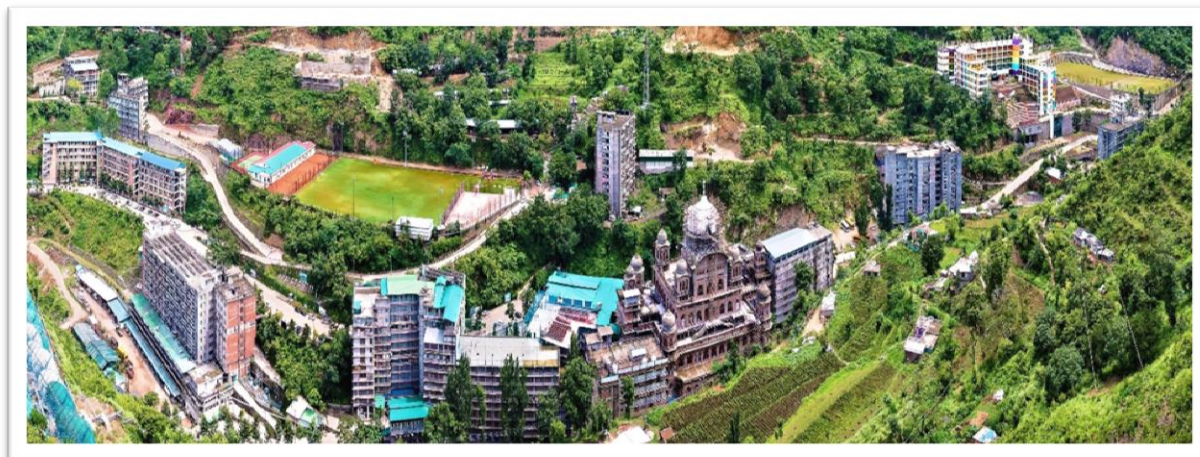
**Dr. Uday Pratap**  
**Co-Auditor EMS & Energy**

## ABBREVIATION

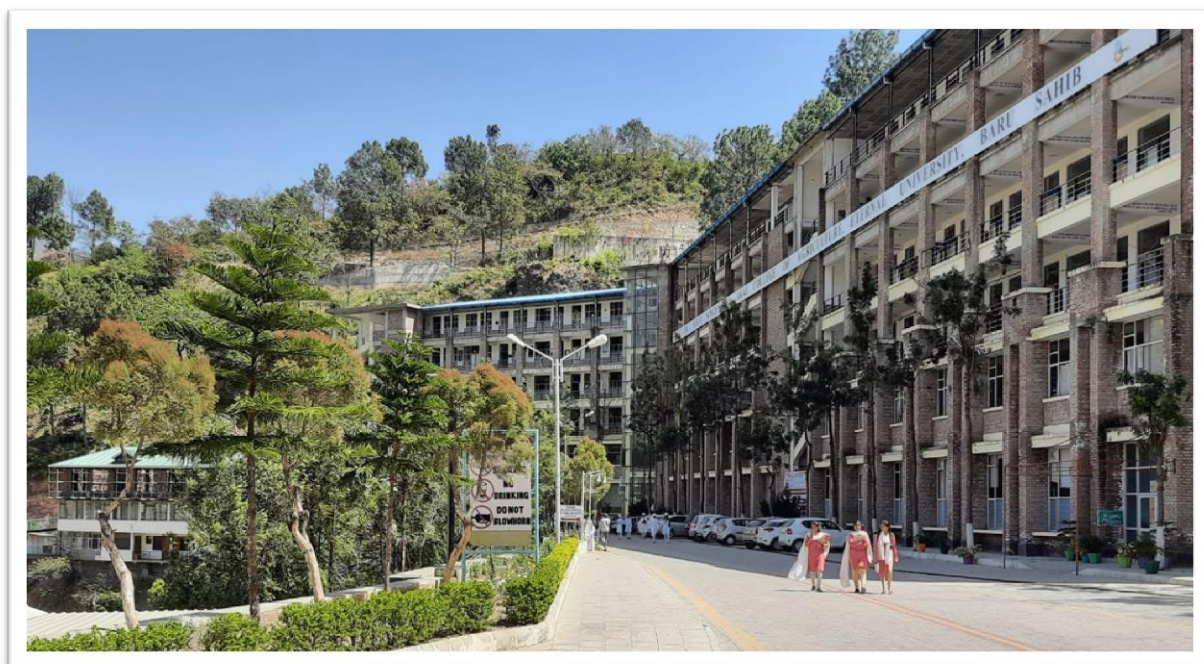
<b>A</b>	<b>Amps</b>
<b>AC</b>	<b>Air Conditioner</b>
<b>AC</b>	<b>Alternating Current</b>
<b>AMET</b>	<b>Academy of Maritime Education and Training</b>
<b>CFL</b>	<b>Compact fluorescent lamp</b>
<b>CIP</b>	<b>Comprehensive Inspection Programme</b>
<b>DC</b>	<b>Direct Current</b>
<b>HSD</b>	<b>High Speed Diesel</b>
<b>Hz</b>	<b>Hertz</b>
<b>kg</b>	<b>Kilogram</b>
<b>kVA</b>	<b>kilo-volt-ampere</b>
<b>kW</b>	<b>kilo Watts</b>
<b>kWh</b>	<b>kilowatt hour</b>
<b>kWp</b>	<b>Kilowatt peak</b>
<b>LED</b>	<b>Light Emitting Diode</b>
<b>LPG</b>	<b>Liquefied Petroleum Gas</b>
<b>MMS</b>	<b>Module mounting structure</b>
<b>MPPT</b>	<b>Maximum Power Point Tracker</b>
<b>NAAC</b>	<b>The National Assessment and Accreditation Council</b>
<b>SEC</b>	<b>Specific Energy Consumption</b>
<b>SPV</b>	<b>Solar Photovoltaic</b>
<b>STC</b>	<b>Standard Test Condition</b>
<b>TV</b>	<b>Television</b>
<b>V</b>	<b>Volts</b>
<b>W</b>	<b>Watts</b>
<b>W/m<sup>2</sup></b>	<b>watt per square metre</b>

## INTRODUCTION OF UNIVERSITY

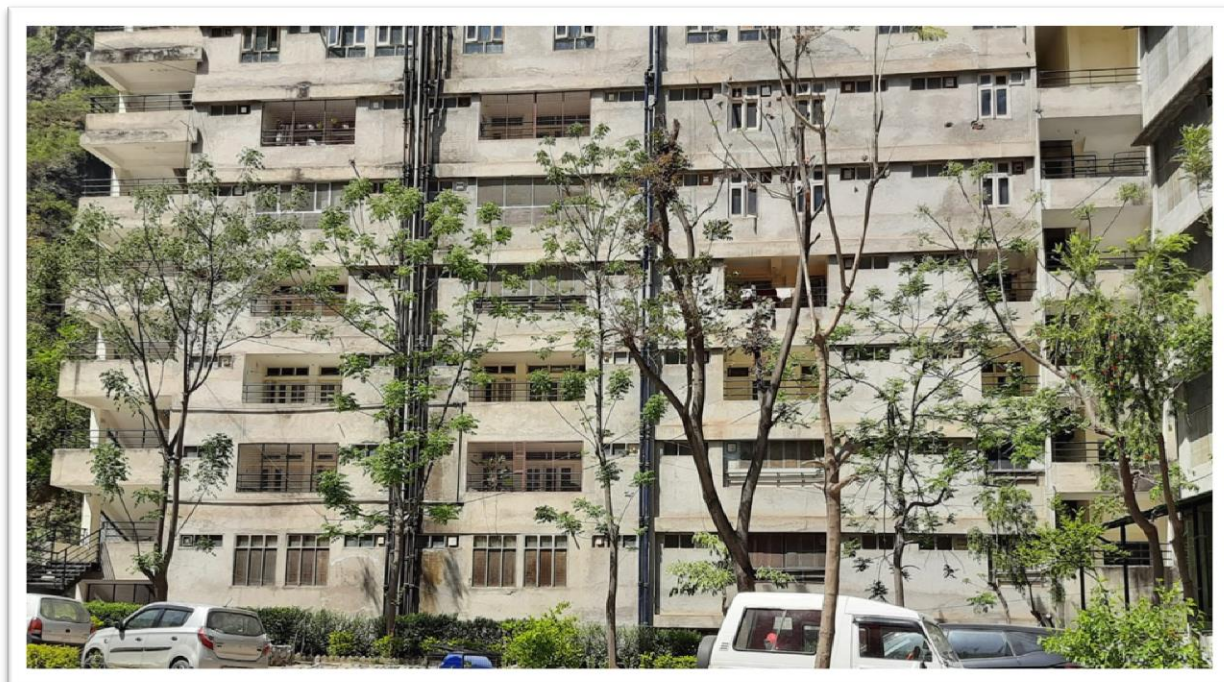
Eternal university is NAAC Accredited & ISO 9001: 2015 Certified University established under the Himachal Pradesh Private University (Establishment & Regulation) Act 2006 & Himachal Pradesh Government Act.no. 3 of 2009, with the right to confer degree as per the UGC public notice on private Universities dated April 18, 2011.



The great visionary of 20th century (Sant Attar Singh Ji) had a vision that modern scientific education alone will not serve the humanity well, until and unless it is amalgamated with Brahm Vidya (Spiritual Education). The graduates of this unique education system will not only be outstanding in academics, but also will have high moral values (i.e. they will have love for humanity, compassion for the weak and the underdog, and sense of selfless service for the community). These graduates will work towards establishing permanent peace in the world. They will act as Ambassadors of Peace wherever they live, work and raise their families.



Eternal University with its seven constituent colleges is unique in imparting value based education to girl students and is the first private university of Himachal Pradesh to start College of Nursing, School of Public Health and College of Agriculture. Among several previous recognitions the Eternal University has been recently recognized as “The 20th Best Higher Education Institution in India, 2019 which are providing a broader perspective and cutting edge higher education with a focal point on fostering skills and innovation” by EDUCATION BRAINIAC magazine.



In a largely residential campus the day-scholar girl students from nearby areas of Sirmour district who could commute from home can now also pursue their studies in the Eternal University. Situated in the Valley of Divine Peace the Modern Gurukul is providing safest, drug and pollution free environment with facilities such as sports complex, gymnasium, NSS and NCC units, experimental farms, poly houses, modern dairy complex, solar power utilization systems and support for holistic development of its students. The Eternal University has organized several conferences, workshops, camps and Kisan Melas with emphasis to address the crucial problems of farmers of Sirmour and adjoining districts of Himachal Pradesh for their inclusive development.

University offers 17 Bachelor programmes, 27 Master Programmes and 19 Doctorate Programmes.

### Bachelors Programme

B.Sc. (Hons) Agriculture B.Tech. Food Technology B.Tech. CSE	B.Sc. (Hon.) Mathematics B.Sc. (Hons.) Microbiology	B.B.A. B.A. (Hons.) Music B.A. Humanities B.Sc. (Hons.) Psychology
---	--	---

B.Sc. Information Technology B.Sc. Non-Medical	B.Sc. (Hons.) Economics B. Ed B.Com (Hons.)	B. Lib B.Sc. Medical B.Tech. CSE Lateral/Migrated
<b>Masters Programme</b>		
M.Sc. Biotechnology M.Sc. Agronomy M.Sc. Ag. Genetics & Plant Breeding M.Sc. Ag. (Entomology) M.Sc. Ag. (Horticulture) Vegetable Science M.Sc. Ag. (Horticulture) Fruit Science M.Sc. Ag. Horticulture (Floriculture & Landscape Architecture)	M.Sc. Ag. Plant Pathology M.Sc. Agricultural Economics Technology M.Tech. CSE M.Sc. Botany M.Sc. Chemistry M.Sc. Mathematics M.Sc. Microbiology M.Sc. Physics M.Sc. Zoology M.P.H	M.Sc. Food Science & Technology M.Tech. Food M.Sc. Economics M.Com. Master of Business Administration M.A. Music M.A. (Hons.) Punjabi M.Sc. Psychology M.A. English M.A. Education
<b>Doctorate Programme</b>		
Ph.D. Biotechnology Ph.D. Food Technology Ph.D. CSE Ph.D. Botany Ph.D. Chemistry Ph.D. Microbiology Ph.D. Mathematics	Ph.D. Physics Ph.D. Zoology Ph.D. Economics Ph.D. Management Ph.D. English Ph.D. Music Ph.D. Commerce	Ph.D. Public Health Ph.D. Horticulture(Veg Science) Ph.D. Agronomy Ph.D. Entomology Ph.D. Punjabi

The University has drawn its Vision and Mission which has been defined keeping in view the objectives of the University.

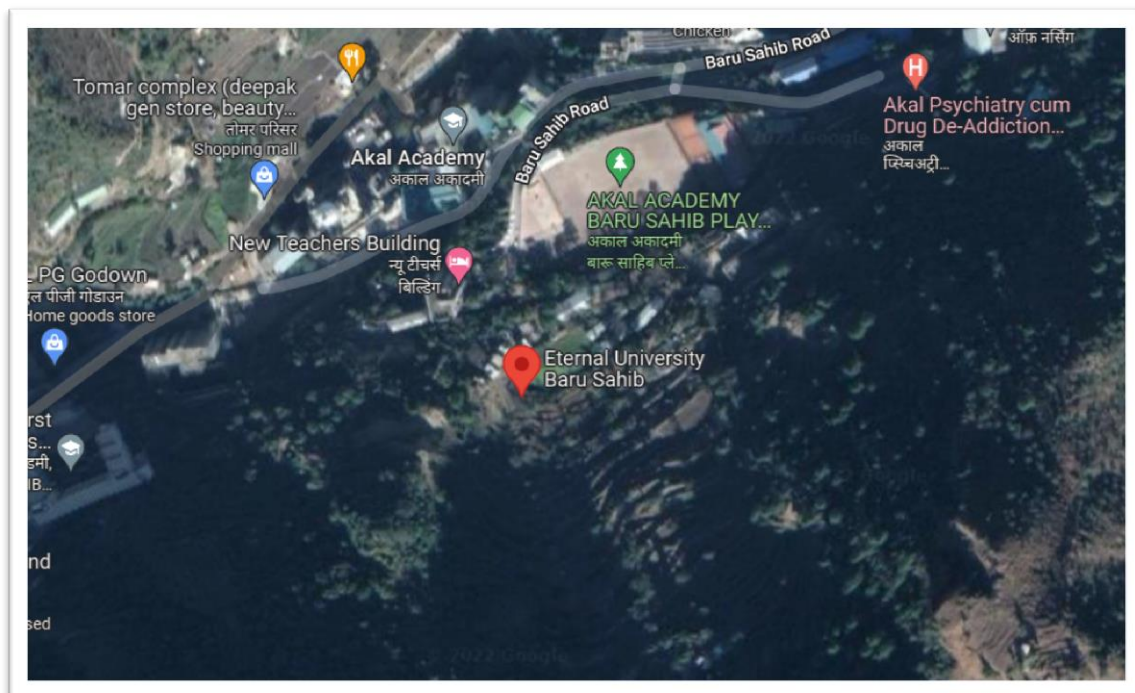
## MISSION

"To transform and empower young women talent through cutting edge education in science, technology, arts and management amalgamated with spiritual rejuvenation for their holistic development to serve the mankind with compassion and love."

## VISION

"The relatively young Eternal University with its diverse programmes, priorities, commitments, values and efforts strives to emerge as a world-class women university with its centers of excellence in science, technology, arts and management. Major emphases will be focused on developing and strengthening industrial-institution linkages and harnessing strength of its alumni for skill development, technology transfer, resources generation and employment opportunities. Its graduates engrossed with holistic development, human values, professional ethics and skills and entrepreneurship will adapt and earn comfortable livelihood and serve the mankind with love and devotion for its inclusive and sustainable development as our ambassadors of universal brotherhood for world peace."

### Google Map – Satellite View of Campus



**Geo-tagging Coordinates: 30.753674, 77.296542**

## Audit Participants

On behalf of University

Name & Designation
<i>Dr. Narinder Pal Singh – Dean Research</i>
<i>Dr. B. S. Sohal - Dean PGS</i>
<i>Dr. A. S. Ahluwalia – Pro Vice Chancellor</i>
<i>Mr. Santosh Shukla – In-charge AHKS</i>

On behalf of EHS Alliance Services

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

## EXECUTIVE SUMMARY

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

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

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

## ENERGY AUDIT ANALYSIS

### 1. ENERGY CONSUMPTION

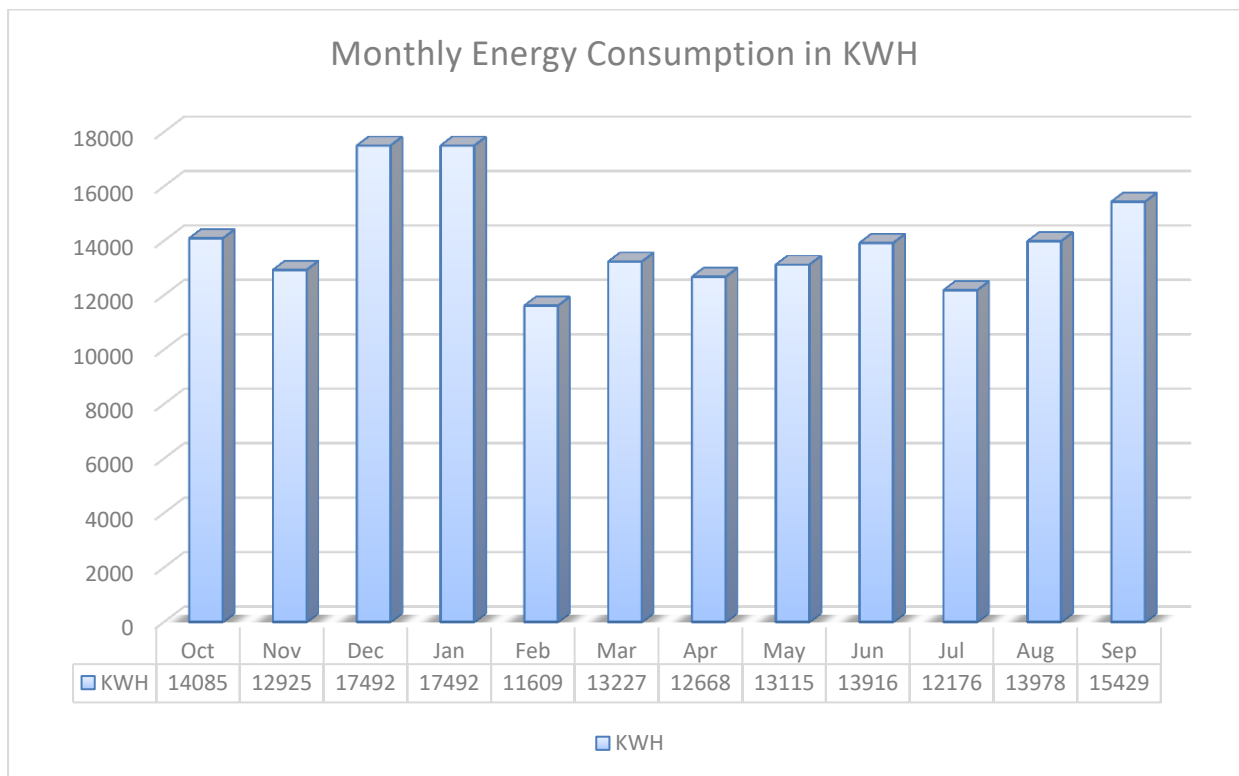
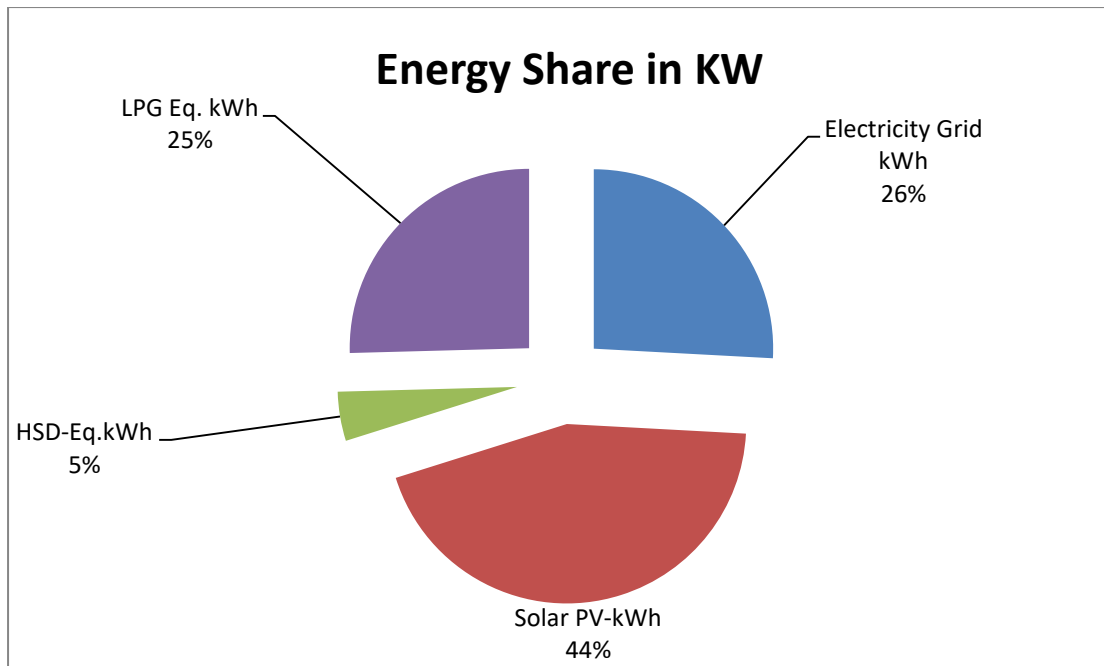
#### 1.1 Summary of Monthly Electricity Consumption and Total Bill Amount

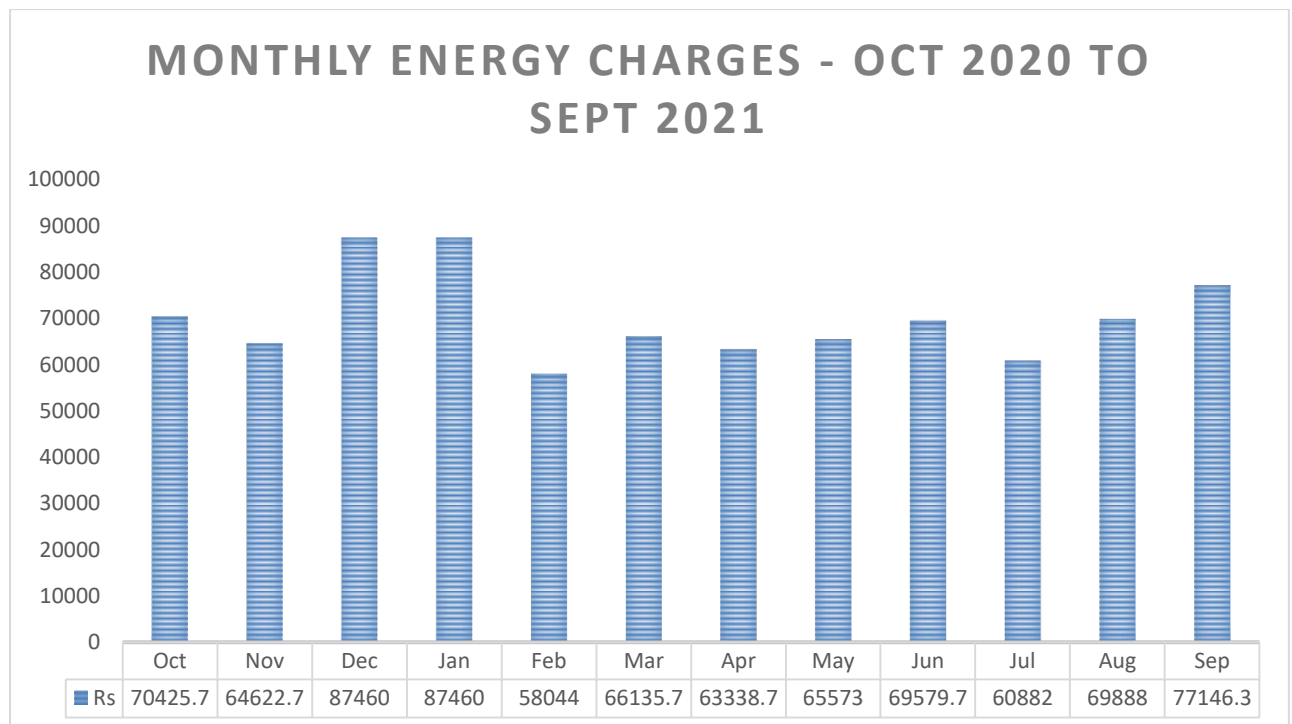
To understand the Energy consumption trend and for developing the baseline parameter we have collected monthly energy bill for the 12 months i.e. from October 2020 to September 2021.

Duration 2020-2021	Total Units of the Campus (kWH)	Units consumed by Eternal University (kWH)	Total Amount (INR) of the Campus	Amount (INR) of the Eternal University
Oct	42255	14085	211277.00	70425.67
Nov	38774	12925	193868.00	64622.67
Dec	52476	17492	262380.00	87460.00
Jan	52476	17492	262380.00	87460.00
Feb	34826	11609	174132.00	58044.00
Mar	39681	13227	198407.00	66135.67
Apr	38003	12668	190016.00	63338.67
May	39344	13115	196719.00	65573.00
Jun	41748	13916	208739.00	69579.67
Jul	36529	12176	182646.00	60882.00
Aug	41933	13978	209664.00	69888.00
Sep	46288	15429	231439.00	77146.33
<b>Total</b>	<b>504333</b>	<b>168112</b>	<b>2521667.00</b>	<b>840555.67</b>

#### 1.2 Overall annual energy consumption and energy sources

Energy Share	kWh	Percentage
<b>Electricity Grid kWh</b>	168,111.07	25.85%
<b>Solar PV-kWh</b>	288,000.00	44.29%
<b>HSD-Eq. kWh</b>	28,811.36	4.43%
<b>LPG Eq. kWh</b>	165,325.49	25.42%
<b>Total -kWh</b>	<b>650,247.91</b>	<b>100%</b>

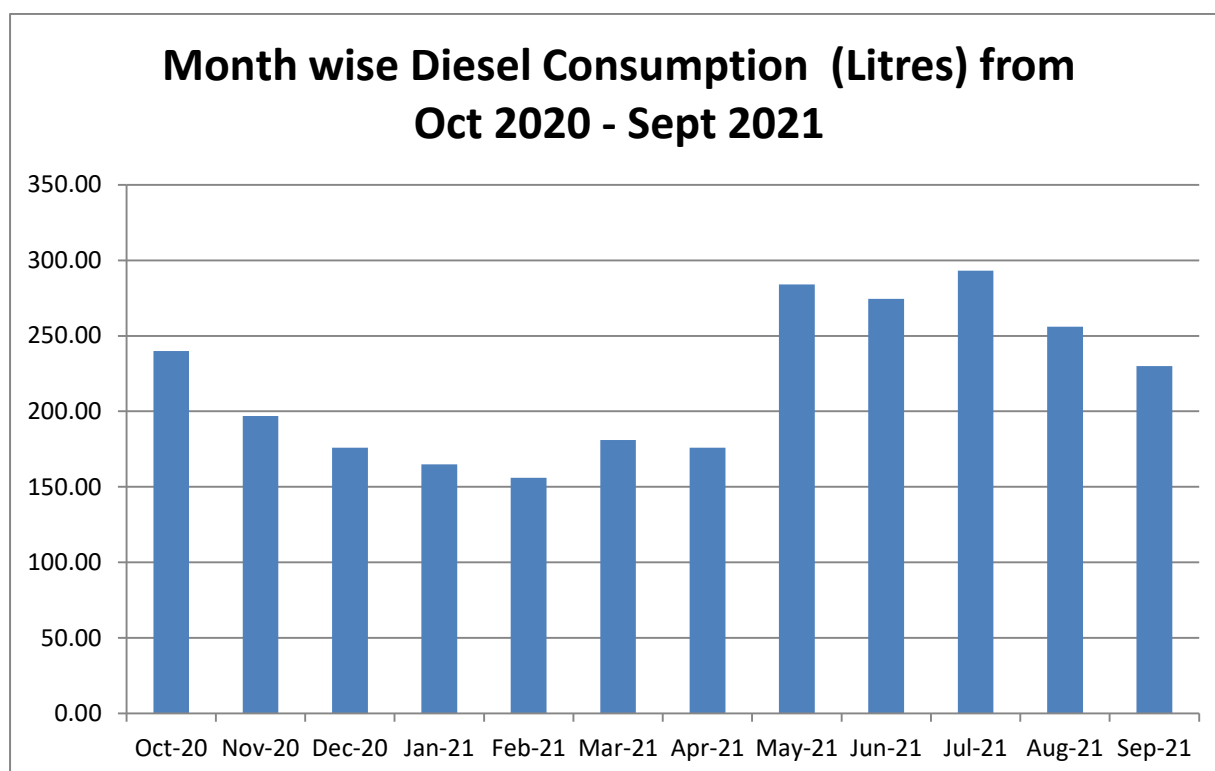




## 2. DIESEL CONSUMPTION

Below is the diesel consumption detail in litres from October 2020 to September 2021.

Month wise Diesel Consumption (Litres) of one year	
Period	Diesel Consumption (Litres)
Oct-20	240.00
Nov-20	197.00
Dec-20	176.00
Jan-21	165.00
Feb-21	156.00
Mar-21	181.00
Apr-21	176.00
May-21	284.00
Jun-21	274.54
Jul-21	293.23
Aug-21	256.00
Sep-21	230.00
<b>Total</b>	<b>2628.77</b>



### 3. ANALYSIS OF DG SETS

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

DG Set Performance		
Description	Unit	DG at Station 1
<b>Design details:</b>		
Description	Unit	DG
Rated capacity	kVA	250
Hz	Hz	50
Volts	Volts	415
PF	PF	0.8
Phase	Phase	3
RPM	RPM	1500

Operating details:	Hours	8
Operating hours during testing	Hours	0.50
<b>Operational details:</b>		
Operating hours during testing	Hours	0.50
% Loading	%	67.51
Energy Generation	kWh	33.35
Load	KVA	84.4
Fuel consumption during testing	Litre	10.80
Specific energy generation	kWh/litre	3.09

**Observation and Suggestions:-** As per the trial taken during the energy audit the percentage loading of DG set is 67.51% which is ok and specific energy consumption of DG Sets 3.09 KWH/Litre which is satisfactory because as per manufacturer recommendation, best practices for SEC in DG sets range from 3.0 to 3.5 kWh/litre and above.

## 4. AC SYSTEM

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



There are Split ACs installed in Eternal University in various areas of various capacity which detail is given below:-

S. No.	Type of AC	Rated capacity (TR)	Room Temp. (°C)	AC-Tout (°C)	AC-Tin (°C)	Room-RH (%)	Area (m <sup>2</sup> )	Air velocity (m/s)	Enthalpy Hout	Enthalpy Hin	Heat Load in TR	KW supplied	(Eff.) Power per Ton (KW/TON)	EER
1	Split-1	1.5	24	11	20	52	0.03	2.2	22	38	0.39	0.63	1.61	2.18
2	Split-2	1.5	24	12	20	52	0.03	2.2	25	38	0.32	0.55	1.72	2.04
3	Split-3	1.5	24	11	19	52	0.03	2.6	24	37	0.38	0.57	1.52	2.31
4	Split-4	1.5	24	10	18	52	0.03	2.4	24	37	0.35	0.53	1.53	2.3

Remarks: - We have checked Energy Efficiency Ratio of all AC's and EER of all AC's is quite OK. But in future we recommend to purchase 5-Star rated inverter based split AC's because power consumption of Inverter based BEE 5-Star rated AC's is less than non-star rated AC's.

## 5. CEILING FANS ANALYSIS

In the university, 462 nos. Ceiling Fans are installed and observation and suggestion are given below.

S.No.	Location/Identification	Ceiling Fan-70W/80W
1	Ground Floor	39
2	First Floor	90
3	Second Floor	78
4	Third Floor	75
5	Fourth Floor	85
6	Fifth Floor	95
	<b>Total Count</b>	<b>462</b>

### Observation and Suggestions:-

In the university, old ceiling fans of 70/80 W are installed but BEE 5 Star Rated of 30W Ceiling Fans are present in the market. Therefore we suggest to replace BEE 5 Star rated fans of 30W.

### *ECRM-1-Energy saving by replacing 70/80 W fans with energy efficient 30W ceiling fans*

Total no of Ceiling Fans (70/80W)	?	462	Nos.
Total wattage of 60W Ceiling Fans	?	32340	Watt
Total wattage of BEE 5 Star rated Fans (30W)	?	13860	Watt
Total saving in Wattage after replacement	?	18480	Watt
Operating hours per day	?	8	Hours
Operating days per annum	?	220	Days
Energy charges per unit in Rs.	?	5	INR
Saving in Rs./annum	?	162624	INR
Investment INR	?	1386000	INR
Payback period:- Months	?	<b>8.52</b>	YEARS

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

## 6. ANALYSIS OF LIGHTING SYSTEM

### 6.1 Brief description of existing system

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

### 6.2 Inventory of Lighting

S.No.	Location/Identification	18W LED Light	36W LED	50W LED Flood
1	University Computer center		261	7
2	Teaching Blocks	270	170	6

### 6.3 Lux Measurement

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

### Observation

University have efficient lighting solution. LEDs saves energy, the life span is much greater and emit virtually no heat. We recommend to install the sensor based lights for common areas like corridors, washrooms, library, canteen, common rooms, faculty rooms, etc.

We also recommend to use solar lights for open areas like parking, ground, street lights, etc.

Table below shows the performance characteristics comparison of all luminaries.

<b>Table 8.1 Luminous Performance Characteristics of Commonly Used Luminaries</b>					
Type of Lamp	Lumens / Watt		Colour Rendering Index	Typical Application	Typical Life (hours)
	Range	Avg.			
Incandescent	8-18	14	Excellent (100)	Homes, restaurants, general lighting, emergency lighting	1000
Fluorescent lamps	46-60	50	Good w.r.t. coating (67-77)	Offices, shops, hospitals, homes	5000
Compact fluorescent lamps (CFL)	40-70	60	Very good (85)	Hotels, shops, homes, offices	8000-10000
High pressure mercury (HPMV)	44-57	50	Fair (45)	General lighting in factories, garages, car parking, flood lighting	5000

Halogen lamps	18-24	20	Excellent (100)	Display, flood lighting, stadium exhibition grounds, construction areas	2000-4000
High pressure sodium (HPSV) SON	67-121	90	Fair (22)	General lighting in factories, warehouses, street lighting	6000-12000
Low pressure sodium (LPSV) SOX	101-175	150	Poor (10)	Roadways, tunnels, canals, street lighting	6000-12000
Metal halide lamps	75-125	100	Good (70)	Industrial bays, spot lighting, flood lighting, retail stores	8000
LED lamps	30-50	40	Good (70)	Reading lights, desk lamps, night lights, spotlights, security lights, signage lighting, etc.	40,000-1,00,000

## 7. OTHER POWER CONSUMPTION

S No.	Location/Identification	Computers/ Laptops	60W Exhaust Fan	160W Exhaust Fan	Water Cooler-200W	180W-Desert Cooler	180W-Circulating Fan	Fridge	Geyser	Total
1	University Computer center	95								
2	CIL Lab				1			7	4	12
5	Teaching Block -8									

## ANALYSIS

There should be regular maintenance schedule of Geyser and water coolers. University should install solar water heater instead of electric geysers. Solar geysers are convenient to use and cost effective as well as environment friendly. Computers, more than 5 years should be replaced with new computers/laptops.

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