GLOBAL ACADEMIC ASSESSMENT CONSORTIUM
"Academic Assessment Towards Excellence"

ENERGY AUDIT REPORT

For SRM University Delhi-NCR, Sonepat

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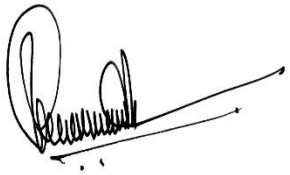
To whomsoever it may concern

This is to certify that Global Academic Assessment Consortium has conducted detailed "Energy Audit" of SRM University Delhi-NCR, Sonepat for the academic year 2021-22 on 22.12.2021. The Green audit was conducted in accordance with government regulations. The audit covers the parameter such as energy usage and suggested conservations measures. In our opinion and to the best of information provided to us, set energy audit gives the true and fair view in conformity with the auditing principles accepting in India



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1. ACKNOWLEDGEMENT

Global Academic Assessment Consortium (GAAC) appreciates and expresses sincere thanks to the Management and Employees of **SRM University, Delhi-NCR, Sonepat** for their help without which the "Energy Audit" could not have been possible. The courtesy extended to our Audit Team is highly appreciated.

The audit team were assisted and guided by the personnel SRM University Delhi-NCR, Sonepat during the audit. Following were the key coordinating personnel from **SRM University, Delhi-NCR, Sonepat.**

1. Prof. (Dr.) Ajay Sharma, Dept. of Computer Science
2. Prof. (Dr.) Vineet Bajaj, Dept. of Civil Engineering
3. Prof. (Dr.) R.B. Dubey, Prof., Dept. of Electrical and Electronics Engineering
4. Dr. Neeti Keswani, Assistant Prof., Dept. of Physics
5. M. Anbazhagan, AGM Projects

2. SUMMARY

M/s Global Academic Assessment Consortium (GAAC) Energy Audit Team was engaged in performing Energy Audit for SRM University Delhi-NCR, Sonepat on 22nd December 2021.

Energy Audit was conducted in an interactive manner with the management and employees of the University and based on the reviewed documentation, site visits, other evidence and data generated by observations were drawn. The Energy audit was carried out with the scope to seek opportunities to improve the energy efficiency of the campus.

Objective of the audit covered the GAP's associated with the implementation of compliance and other relevant systems within the facilities.

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4. PREAMBLE

Even though energy wastage is a common phenomenon in small residential areas, the wastage can be considered comparatively low, but in the case of huge buildings like educational institutions the wastage amounts to notable figure. Energy audit has been conducted at SRM University Delhi-NCR, Sonepat, one of the largest energy consuming hub, to estimate and analyse the energy consumption and also to propose energy conservation measures.

The audit is aimed to make the University more energy efficient by balancing it's load, identifying the wastage areas etc. This audit was conducted to seek opportunities to improve the energy efficiency of the campus. The reduction of energy consumption while maintaining or improving human comfort, health and safety were of primary concern. Beyond simply identifying the energy consumption pattern, this audit sought to identify the most energy inefficient appliances that were in the premises. Moreover, some improvements to some daily practices relating to common appliances are also to be provided which may help in reducing the energy consumption. The report is based on certain generalizations and approximations wherever necessary. The views expressed may or may not reflect the general opinion.

The major motivation behind conducting energy audit is to identify energy wastage and to suggest recommendations to reduce energy wastage thereby help in reducing the monthly energy consumption and thus reduce the monthly electricity bill.

5. OBSERVATIONS

I. INSTITUTIONAL BRIEF DESCRIPTION

SRM University Delhi-NCR Haryana (SRMUH) carries forward the legacy of SRM Group of Institutions. SRM's initiative towards the cause of quality education began in 1969 with the establishment of a primary school and today after five decades of its existence it has 22 institutions and 4 Universities. SRMUH was established as a State Private University under the Haryana Private Universities Act, 2006 (as amended by Haryana Act No. 8 of 2013), in furtherance of the objective of the SRM group to reach out to a greater number of stakeholders in Northern India. The University aims to emerge as a leading world-class educational institution that disseminates knowledge upholding the highest standards of instruction in all fields of study. Along with academic excellence and skills, the University curriculum is developed in a manner to impart experiential learning & life-skills, and, ensures that learners are exposed to various activities, which instill in them social sensitivity, compassion, patriotism, moral, and ethical integrity. Accordingly, when the learners graduate, they merge as citizens who are best suited to serve society and also undertake various leadership duties.

It is a multidisciplinary University with all the privileges and pride to exist and expand as a world-class educational institution. SRMUH is developed in sylvan surroundings amidst lush green fields. The University campus is spread over 47.38 acres of land and has a well-designed architectural layout. Students from over twenty-five different States and UTs of India and various parts of the world study here. At present, the University is offering sixty-eight programmes. The campus is well-equipped with a state-of-the-art infrastructure, laboratories, sports, transport, healthcare, and other educational & recreational facilities. Hostel facility is provided inside the University campus for students (Boys and Girls) as well as staff.

The hostels with the state-of-the-art infrastructure provide an ambience of home away from home. The hostels are spacious, centrally air-conditioned, and well-furnished with attached bathrooms. The hostels are supported by spacious mess where staff and students dine together and it also has recreational amenities like a gymnasium, indoor sports, and cafés.

II. OBJECTIVE

The objective is to conduct Energy Audit to address the status of the Electricalsystems, Energy uses, performance assessment of various facilities like A.C. system, Fans, lighting system, Pumps etc.

III. SCOPE OF WORK

The scope of the study is to assess overall efficiency of the various systems and defined energy consumption of the buildings and make recommendations about potential energy saving opportunities, based on the observation of energy audit

- Electrical Structural details
- Use & occupancy of the building.
- Energy supply features
- Details of systems/equipment's/appliance etc.
- Quality of power

IV. CRITICAL COMMENTS

- Main incomer supply panel must be located in a separate area/ room with appropriate ventilation and warning symbol.
- The fire extinguisher system need to be checked periodically.
- The power availability in building is fairly regular with minimum interval of power cuts. Thus, the DG set is used during the power interruption, the Log Book maintains only to show the Diesel consumption record. Separate sub meter is required to be installed to record output of the DG set and maintain the power generation in Log Book.
- Isolation switches to cut-off the supply at the main input panel and each of the rooms (staffroom, per floor wise all class room, per floor wise corridor etc.) for switching off electrical supply.
- Regular earth testing is required to be carried out. It is required to ensure safety of the electrical circuits and use of the appliances.
- Water Tank Overflow Alarm Wired Sensor Security System is required for all water supplytank.
- Switch off the light in all washroom, when not in use; occupancysensors should be installed.

V. Background

Availability and utilization of energy drives the growth of economy and advancement of any country and thus, the demand of energy is increasing day by day. The worldwide mounting energy crisis with galloping cost hike, concern for environmental protection and open market competitive economy possesses serious challenge to Indian Institution to survive and grow.

One of the easier available options for survival is '**Energy Conservation**' thereby saving environment and cost reduction through strategic energy management. It also gives a positive orientation to energy cost reduction, preventive maintenance and quality control programs. This is the translation of conservation ideas into reality by blending techno-economically feasible solutions within a specified time frame.

Energy conservation is a worldwide objective. The energy policy of the Government of India calls for conservation of energy. With the enactment of Energy Conservation Act- 2001 amongst others has emphasized upon the power of the appropriate Govt. to enforce efficient use of energy and its conservation.

This study has mapped power system parameters at the source, Distribution Panels and various equipment's. It has also mapped illumination level at various activity areas in the SRM University Delhi-NCR, Sonepat where the team was permitted to enter for the study. The study couldidentify concerned problem areas, barriers towards maintaining right use of available facilities and come out with cost effective solutions. It also recommends cost effective and fast pay back solutions for performance improvement of all the systems.

VI. Methodology for Energy Audit

Detail energy audit consists of evaluation of the present trend of energy consumption. EnergyAudit activities, in general, include.

- The activity starts with collection of basic information and general overview of the – SRM University Delhi-NCR, Sonepat.
- The University was requested to provide the electricity bills for last three years.
- At incomer panel, locating all energy sources coming into a facility.
- Identification of energy streams.
- Quantification of energy streams into discrete functions (system/ equipment's/ appliances etc.)
- Identification of energy and cost savings opportunities.
- Establish measurement and verification protocol i.e., objective measurement through meters by identifying measurement points.
- Required data collection, field measurements and analysis of data, etc.

The deliverables are a report consisting of following:

a) Performance of major energy consuming equipment

b) Energy saving measures recommendation.

c) The financial calculation for the investment involved and the return on investment.

a) Evaluate the use and occupancy of the building and the condition of the building and buildingsystems equipment.

VII. Electricity Bill Analysis

A detailed study was carried out on the monthly electricity bill for the period January 2021 to December 2021.

Month	KWH	KVAH	Power Factor
January	103280	103320	0.999613
February	74400	74480	0.998926
March	135740	143160	0.948170
April	237800	262500	0.905905
May	254300	264214	0.962477
June	268020	299280	0.895549
July	267823	276000	0.970373
August	264321	266400	0.992196
September	264216	265200	0.996290
October	162100	163200	0.993260
November	150480	163020	0.923077
December	107480	110620	0.971615

The average power factor for the main supply is 0.963 which is reasonably good, but needs improvement.

VIII. Power Quality Measurements

Different power quality parameters of the power supply are measured with the help of Power Analyzer and other measuring instruments along with various electricalparameters were measured at the main incomer panel. Their data analyses and the related interpretation with respect to power quality are summarized.

A. Voltage Trend:

- It was seen that the voltage distribution is fairly uniform and reflects that supply transformer are functioning properly. However, the voltage drops between 01:30 PM and 01:58 PM is due to power failure from the side of utility service provider. This voltage is fine as per IS standard.

B. Current Trend:

- It was observed that average current deviation was 25 A between the three phases.
- Load balancing can be adopted for low harmonics development which can give significant amount of energy saving.

B. Power Factor Trend:

- It was observed that average Power factor was 0.963 and not showingsignificant deviation over time.
- There are certain period when the power factor is below 0.90.
- It is possible to avail full power factor incentive and also optimized KVAH billing by installing proper Real Time Power Factor Correction (RTPFC) panels.

IX. AUDIT RECOMMENDATIONS

This audit recommends energy saving opportunities in following areas:-

- It is observed that the single-phase voltage remains at 240V and above throughout 24 hours. This contributes in increasing consumption of fans, lights and other resistive loads. Operating at higher voltage affects life of these gadgets. If there are no built in arrangements like OLTC at institute end or at UHBVN end, it is recommended to install a servo stabilizer of adequate rating at transformer secondary so that all loads will receive regulated voltage. It is expected that this will save about 5 KW from running load resulting into 5 x 10 hrs = 50 Kwh saving per day.

  Expected saving: 1500 KWh per month or Rs. 9, 975 per month.

- It is observed that power factor incentives are not availed fully. Local utility company UHBVN is making KVAH billing mandatory to all Industrial and commercial consumers. This may require a relook towards reactive power compensation installed at facility. The loss in power factor incentive in last 12 months is significant. It is possible to avail full power factor incentive and also optimized KVAH billing by installing proper RTPFC panels.

  Expected saving: Rs.9000 per month.

- It is observed that during audit most of the UPS in premises are under loaded. At this loading the UPS is working at 75% over all AC to AC efficiency. These are typical academic computer labs and all computers are ON for limited period. Feasibility of shifting light load condition on smaller UPS may be explored.

  Expected saving: Rs.5000 per month.

- The lighting in common area i.e. lobbies, outdoor area etc. may be controlled using ACTIVE lighting controls so that they will not remain ON when they are not required. Ambient light sensing switches, Occupancy sensing switches are available which can be used to achieve this. It is observed that most of the classrooms have windows

exposed to direct ambient light. Whenever these classrooms are not used with air conditioning, it is advised that maximum use of ambient light with proper control of air-conditioning may be done which will save energy. We are not quantifying these savings.

- It is advised that all water pumping systems should be operated with maximum automation. Wherever possible and justified, Hydro pneumatic pumping system should be used so that optimized energy consumption can be achieved. We are not quantifying the saving due to this.

- It is observed that 205 X 2=615 TR capacity of HVAC system is installed in the University.

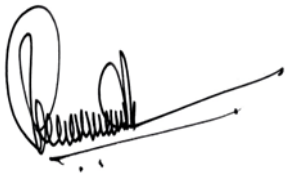
The following suggestions are recommended to optimize energy consumption in HVAC:-

- Wherever possible and justified, occupancy sensing switches should be used.
- A mini building management system (BMS) should be used to control use of HVAC for areas like conference room.
- Time scheduling can be done automatically. By doing this, modularity can be exploited fully.
- Check position of outdoor units (ODUs) for these split units they should get minimum exposure to sunlight especially between 10AM to 4 PM.
- If they are in AMC, filter cleaning and Refrigerant gas pressure should be checked sincerely during every preventive check.
- Inadequate gas keeps compressor running for more time to maintain required temperatures.

- It is observed that about 1850 ceiling fans are installed within the institute. With 65% diversity, it will consume = 0.08 x 1850 x 0.65 = 96.2 KW. If these fans work for 10 hours a day, the actual energy consumption would be 962 units a day. The use of BLDC fans (Brush Less DC fans) are recommended in place of the existing to save energy. It is possible to save at least 30% energy without compromising comfort levels.

Expected saving: Rs. 191919 per month.

- Institute should install roof top solar PV system which will save electricity bill to a great extent.
- "Inverter based" and BEE star rated equipment should be bought – 10 to 15% additional initial investment would have payback of less than 6 months.
- Solar based Street lighting system should be installed within the campus.
- A smart power strip (also called a smart power bar) looks similar to a traditional power bar, however circuitry is designed to monitor and control power to each electrical outlet in the strip to improve energy efficiency and prevent household electronics from wasting power. Experts say standby power consumption is approximately 10 percent of total energy consumption.



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