

GURUKULA KANGRI (DEEMED TO BE UNIVERSITY)  
HARIDWAR



ENERGY AUDIT REPORT- 2022

GREEN AUDIT CELL  
GURUKULA KANGRI (Deemed to be University)  
(Deemed to be University U/S 3 of UGC Act 1956)  
HARIDWAR - 249404,  
UTTARAKHAND, INDIA

ENERGY AUDIT

2022  
REPORT

Assessing Sustainability



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2022

“ASSESSING SUSTAINABILITY”



GURUKULA KANGRI (DEEMED TO BE UNIVERSITY),  
HARIDWAR, INDIA

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## CITATION

Energy Audit: Report (2022) Published by Green Audit Cell, Gurukula Kangri (Deemed to be University), Haridwar, India

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## Energy Audit - 2022

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# Energy Audit 2022

## CERTIFICATE



This is to certify that  
**GURUKULA KANGRI (DEEMED TO BE UNIVERSITY)**  
Haridwar, Uttarakhand

has achieved the standards for Energy Conservation and Awareness responsibility  
with academic accountability for the Universities during the  
Energy Audit 2020 - 2022

(This certificate is issued after Energy Audit Report and on-site assessment)

Dr. D. P. Uniyal  
Uttarakhand State Council for  
Science & Technology, Dehradun

Mr. Shailendra Kumar  
Pollution Control Research  
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## INTRODUCTION

Green Audit was initiated with the beginning of 1970s with the motive of inspecting the work conducted within the organizations whose exercises can cause risk to the health of inhabitants and the environment. It exposes the authenticity of the proclamations made by multinational companies, armies and national governments with the concern of health issues as the consequences of environmental pollution. It is the duty of organizations to carry out the Green audit of their ongoing processes for various reasons such as; to make sure whether they are performing in accordance with relevant rules and regulations, to improve the procedures and ability of materials, to analyse the potential duties and to determine a which can lower the cost and add to the revenue. Though Green Audit, one gets a direction as how to improve the condition of environment and there are various factors that have determined the growth of carrying out Green Audit. Some of the incidents like Bhopal Gas Tragedy (Bhopal; 1984), Chernobyl Catastrophe (Ukraine; 1986), Exxon-Valdex Oil Spill (Alaska; 1989), have cautioned the industries that setting corporate strategies for environmental security elements have no meaning until they are implemented.

The term “Green” means eco-friendly or not damaging the environment. This can acronymically be called as “Global Readiness in Ensuring Ecological Neutrality” (GREEN). Green Audit can be defined as systematic identification, quantification, recording, reporting and analysis of components of environmental diversity. Green accounting can be defined as systematic identification quantification, recording, reporting & analysis of components of ecological diversity & expressing the same in financial or social terms. The ‘Green Audit’ aims to analyze environmental practices within and outside the college campus, which will have an impact on the eco-friendly ambience. It was initiated with the motive of inspecting the work conducted within the organizations whose exercises can cause risk to the health of inhabitants and the environment. Through Green Audit, one gets a direction as how to improve the condition of environment and there are various factors that have determined the growth of carrying out Green Audit. The green audit is a tool that organizations use to identify their environmental impacts and assess their compliance with applicable laws and regulations, as well as with the expectations of their various stakeholders. It also serves as a means to identify opportunities to save money, enhance work quality, improves employee health, safety and morale, reduce liabilities and achieve other form of business values. This concept has got its origin in recent past and suddenly got acceleration due to growth in population, needs has increased causing the increase in GAP between demand and supply.

Overall “Green Auditing”, is divided into three audits as per the NAAC Guidelines 1. Environmental Audit; 2. Energy Audit and Green Audit. Educational institutions have broad impacts on the world around them, both negative and positive. The activities pursued by campus can create a variety of adverse environmental impacts including conservation of energy and awareness for the same. But they are also in a unique position as educational institutions to be



leaders in pursuing environmentally sustainable solutions. As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher educational institutions in relation to environmental sustainability is more prevalent. The rapid urbanization and economic development at local, regional and global level has led to several environmental and ecological crises. On this background it becomes essential to adopt the system energy conservation under the Green Campus initiatives for the institutes which will lead for sustainable development and at the same time reduce a sizable amount of atmospheric carbon-di-oxide from the environment. The National Assessment and Accreditation Council, New Delhi (NAAC) has made it mandatory that all Higher Educational Institutions should submit an annual Green Audit Report. Moreover, it is part of Corporate Social Responsibility of the Higher Educational Institutions to ensure that they contribute towards the reduction of global warming through Carbon Footprint reduction measures.

On the occasion of **World Environment Day - 2015** an initiative was taken by Gurukula Kangri Vishwavidyalaya and expressed its commitment to sustainability while forming a committee to conduct audit of campus and its facilities. Vishwavidyalaya has taken a number of positive steps for energy conservation and awareness for the same. But many areas remain in which substantial improvements can be made. This report serves to highlight some accomplishments of and to make recommendations for improving the campus for energy conservation and awareness.

### **Phases of Energy Audit**

#### **Phase – I: Pre – Audit**

- Plan the Audit
- Selection of Audit Team (External experts and Members for Current Audit)
- Collect the Background Information
- Start assessing the certain environmental factors required for prior to On – Site Phase

#### **Phase – II: On – Site**

- Understand the significance of Green Audit
- Conduct the Audit and collect the information in prescribed format
- Make an inventory for all the observations during the audit

#### **Phase – III: Post – Audit**

- Prepare the Draft report on the information collected during audit
- Generate a Final Report
- Submit the Report to higher authorities of Institution with action plans to overcome the flaws
- Share all the current status and recommendations with all the Heads and Deans of Institution
- Time to time check the action plan

For the current Energy Audit, the focused was made on following indicators:

#### **1. Energy Audit**

**OBJECTIVES**

Energy Audit is assigned to the Criteria of NAAC, National Assessment and Accreditation council which is a self-governing organization of India that declares the institutions as Grade A, B or C according to the scores assigned are the time of accreditation.

The intention of organizing Energy Audit is to upgrade the energy conservation, initiative for renewable energy and awareness for energy conservation conditions in and around the institutes, colleges, companies and other organizations. It is carried out with the aid of performing tasks like waste management, energy saving and others to turn into a better environmentally friendly institute.

To conduct the Energy Audit, Green Audit Cell, Gurukula Kangri (Deemed to be University) has made a self-inquiry on various parameters of the campus with the following objective:

- To establish a baseline of existing environmental conditions with focus on natural and physical environment.
- To make sure that rules and regulations in terms of environmental laws are taken care of.
- To understand the current practices of sustainability with regard to the use of energy.
- To avoid the interruptions in environment that are more difficult to handle and their correction requires high cost
- To suggest the best protocols for adding to sustainable development
- To promote environmental awareness through participatory auditing process
- To create a report that documents baseline of good practices and provide future strategies and action plans towards improving environmental quality for future.



## Significance of Energy Audit

One of the major threats arising from urbanization and increase in population on earth is over-development and unmanaged utilization of resources. To monitor this there are a number of environmental management techniques that can be used to minimize the effects of development. One of the techniques associated with environmental management programmes is that of Green Audit or Environmental Auditing. The purpose of this management tool is to measure the actual and potential environmental impacts in the ecosystems.

In the present time, the pollution is significantly increasing day-by-day due to the industries and factories. It is causing serious health problems to the human being and also polluting the environment. It can also make an adverse effect on the mental, social, and economic ability of the person. It becomes imperative to save the people from dangerous chemicals and waste of the industries because people have to live in the green environment to lead a healthy life. It is important for the government to regulate rules and regulations for the industries to make the environment neat and clean. For this purpose, there is a strict need to employ environmental inspectors who can perform Green audits to prevent the pollution.

Man has the fundamental right to freedom, equality and adequate conditions of life, in an environment of a quality that permits a life of dignity and well-being and he bears a solemn responsibility to protect and improve the environment for present and future generation." Most countries today face environmental threats due to the increase in pollution of the atmosphere, water and land. Wildlife habitats continue to be threatened. Water contamination and air pollution are critical problems facing most countries. Environment related problems are linked closely to the rapid growth of population, as well as to technological advancements.

Energy auditing is a process of extracting information about a company that provides a realistic assessment of how the institute contribute in energy conservation and using more renewable sources of energy and to set environmental objectives and targets to reduce the effects. This it is very important for each organization to conduct it energy audit to ensure that we are working in the direction of sustainable development.

Energy audits are necessary to evaluate the impact of industries and their manufacturing on the natural resources. The environmental auditing is an important process to make sure continuous development in the environmental management. The environmental auditor appropriately monitors the system for safe disposal of waste in the industries to ensure the safety of the natural resources. It also lessens the interference of the government directly since the Energy auditor can examine the required standards and present the report to the government.

A good energy auditing system needs a constant effort to monitor and analyse the institutional working system to create the analysis on energy uses, management, conservation practices. The major objective of performing **energy audit** is monitoring energy uses, energy conservation and

implementation of more renewable sources of energy. It also provides performance reviews of institutional working facilities and its possible impact on the surroundings.

**While enforcing the Energy Audit effectively,**

- Will help to maintain the energy uses and devices in institution
- Highlight the problems from energy loss (if any).
- Minimize the energy wastage and use the resources efficiently.
- Give the better approach to environmental conditions and its improvisation
- Helps in awareness activities for students.

Can participate in national programmes like SWACHH BHARAT MISSION; SDG and Energy Conservation initiatives by Govt. of India *etc.*





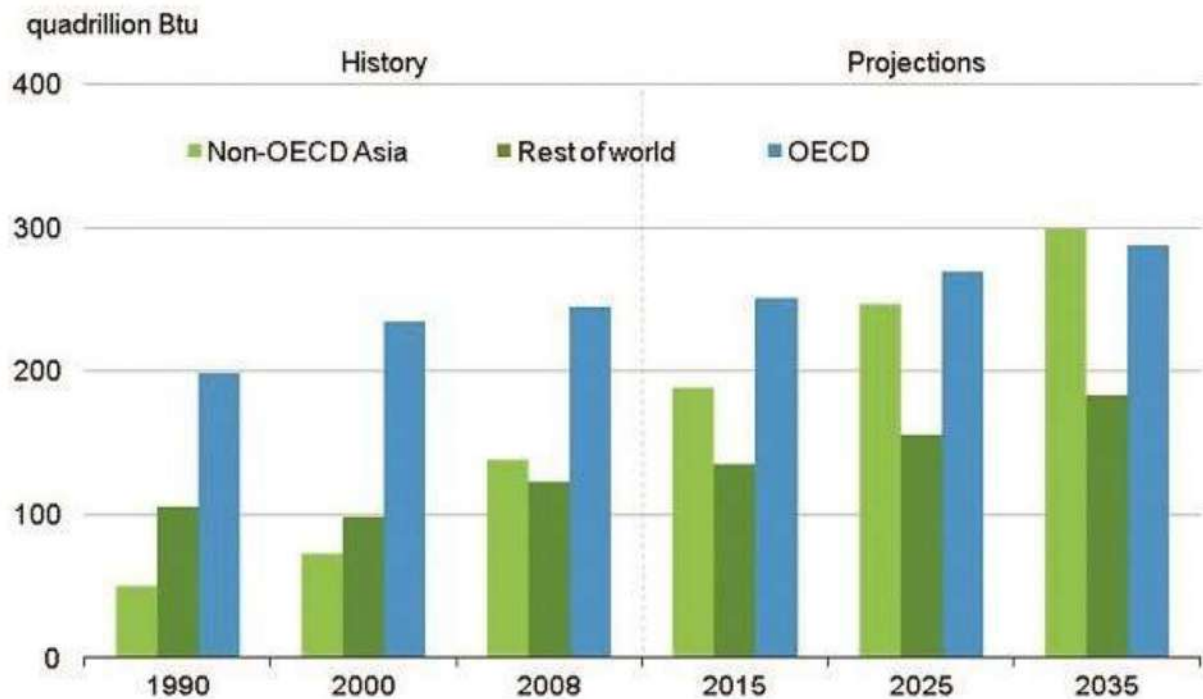
intensity per unit of GDP is higher as compared to Japan, U.S.A. and Asia by 3.7 times, 1.55 times and 1.47 times respectively. This indicates inefficient use of energy but also substantial scope for energy savings. The increasing global trade liberalisation and growing global competition have made productivity improvement, including energy cost reduction, an important benchmark for economic success. Therefore, a paradigm shift in our approach to energy policy issues is needed – a shift from a supply dominated one to an integrated approach. This integrated approach would have to incorporate a judicious mix of investment in the supply side capacity, operational efficiency improvements of existing power generating stations, reduction of losses in transmission and distribution, end-use efficiency and renewable technologies. The policy goals and concepts would have to be shifted from “energy conservation” to “energy efficiency”, and from “energy inputs” to the “effectiveness of energy use” and “energy services”. Creation of new power generation capacity is costly and necessitates long gestation period whereas energy efficiency activities can make available additional power at comparatively low investments within a short period of time.



For the past few decades, energy generation has been shifted to alternative energy sources like renewable energy forms such as solar, wind and biomass energy *etc.* instead of the conventional fossil fuel sources. Apart from the growth in the energy sector, there has been an equivalent increase in businesses and organisations, which has brought tremendous competition in the market in terms of increasing environmental standards and reducing global warming, carbon foot print and greenhouse gas emissions. Energy management is a process by which a sector or an organisation can effectively manage how much energy they produce and how to control, monitor and conserve as much energy as they can while also generating enough energy to meet the demand



of the customers. Apart from protection of climate and conservation of resources, another important factor when dealing with energy conservation is cost savings. The cost should be reduced in a manner such that the work processes are not affected. And thus, profit should be maximised by minimising costs.



**Figure 1: China and India account for about half of the world increase in Energy use**  
**Source: EIA, International Energy Outlook 2011**

According to a study released by the US Energy Information Administration in the year 2011, China and India were the two countries which were least affected by the worldwide recession. In the year 2008, both these nations accounted for 21% of the total world energy consumption. By 2035, both the countries will account for 31% of world energy use in the IEO2011 Reference case. This is shown in the figure 1.

With these rising statistics, it is essential that we not only reduce energy consumption at private and public organisations, but also at homes, to save energy and thus, protect our environment and reduce carbon emissions as well. In 2016, India stood fourth worldwide, as the largest consumer of energy, the figure being double of that in 2000. It is also expected that nearly 315 million more Indians will move to cities in the upcoming 25 years as the economy will grow and this in turn will lead to a rise in the energy demand.

With these rising statistics, it is essential that we not only reduce energy consumption at private and public organisations, but also at homes, to save energy and thus, protect our environment and reduce carbon emissions as well. In 2016, India stood fourth worldwide, as the largest consumer of energy, the figure being double of that in 2000. It is also expected that nearly 315 million more

Indians will move to cities in the upcoming 25 years as the economy will grow and this in turn will lead to a rise in the energy demand.

A large amount of energy and money can be saved in general by employing energy management and the savings in any organisation can follow the profile as shown.

Low Cost Activities (First Year)	5 to 15 %
Moderate Cost, Significant Effort (Three to Five Years)	15 to 30 %
Long Term Potential Higher Cost, More Engineering	3 to 50 %

Table.1. Savings through Energy Management

As shown, huge amount of savings and paybacks can be achieved through energy management. It can also help companies by not only improving productivity but also the quality that they offer using energy efficiency techniques and better materials and manufacturing processes. The grouping of better quality, better products, lesser environmental damage, and lesser costs of energy provides bonus to the companies and in turn helps sustaining the environment and conserving the resources too.

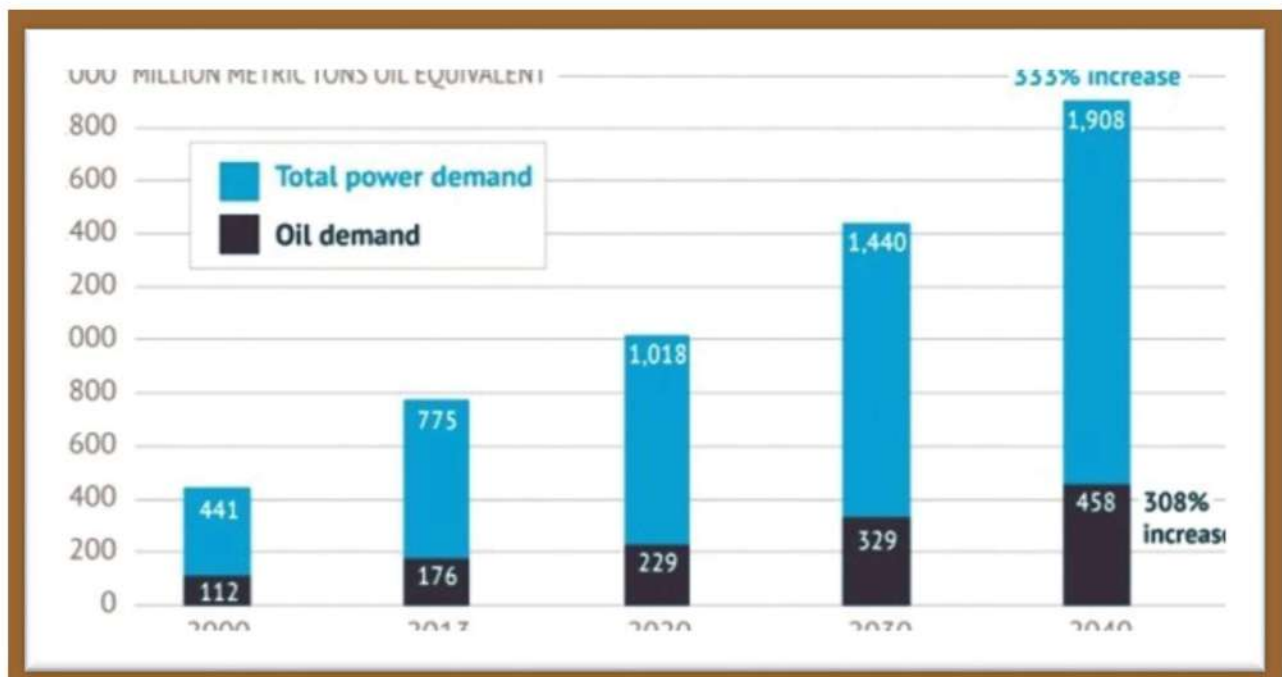


Figure 2: India's Energy Demand

Source: IEA, World Energy Outlook 2015

Principles governing energy management are as follows.

1. Control the costs of the energy function, and not the Btu of energy. Since energy always provides a service, it is converted to a useful function, it is advisable to control the total cost than just the Btu of energy since the total cost is more closely related to the interests of the organisation.



2. The second principle is to control energy functions as a product cost, not as a part of manufacturing or general overhead. The energy functions should be a part of the costing system so that the specific impact of each function can be better judged.
3. The third principle is to control and meter only the main functions – which accounts for only 20% functions which make up 80 percent of the costs.
4. The last principle states that the major effort of an energy management program should be put in to installing controls and achieving results. Each step of the process should be monitored to achieve appropriate results.

With the depletion of natural resources, switching to better options like smart grids and smart metering helps in reducing the amount of energy consumed and to also further increase the efficiency of these power systems, **Energy Management Systems (EMS)** are employed. It consists of a series of policy framework, processes and procedures to manage the energy usage. Therefore, EMS helps in maximising profits by reducing costs and enhancing efficiency of the system.



When energy use is deliberately monitored, controlled, and conserved, decreases in utility consumption and overall costs can be realized without sacrificing facilities operations. Such energy management techniques can take on many shapes and sizes. Following are strategies facility management executives can use to increase efficiency while overcoming potential costly challenges.



**1. Actively manage real-time energy use.** Proactive, real-time data management can expose a wide range of unknown challenges associated with occupancy, building use, and peaks in utility usage. For example, my firm, Southland Energy, installed a comprehensive metering system for a data center customer, monitoring everything from air and water flows, to very specific details of the data



center. The real-time data allowed the building operators to identify potential issues instantaneously, implement corrective actions to prevent critical shutdowns, and manage loads before they affected the entire system.

**2. Actively manage what is measurable.** Use advanced metering and energy management systems (EMS) to capture real-time data, ensure its accuracy and, in turn, address specific issues. For example, a K-12 school installed an energy dashboard that managed the overall facility while actively engaging faculty and students. The customer could view how the systems were operating and how much they were saving based on their actions and system improvements.

In instances where building owners have utility monitoring equipment but no collection or processing software, the meters or monitoring equipment become stranded assets. This is because millions of data points have to be gathered and processed manually, multiple times during the year.

**3. Actively manage energy consumption.** Use collected data to build a strategy that manages costs and consumption on a daily, weekly, monthly, and annual basis. Southland Energy worked with an industrial customer to evaluate multiple peak demand reduction strategies. Load shifting and demand limiting systems were implemented to limit customer loads during peak hours and reduce costs.

Limiting peak demand consumption offers additional benefits that are not always easy to identify or claim. For example, during peak hours, utilities run “peaker plants” to meet demands from the grid. However, these plants are often older and less efficient electricity generation plants, with the sole purpose to run periodically to meet demand. Reducing peak demand during summer months saves electricity costs and overall greenhouse gas emissions per kW.

Managing consumption allows for early detection of improper set points, schedule misalignments, and equipment/system failures. Analysing trends of metered points over days, weeks, months, and years helps to pinpoint irregularities, leaks, and excessive run times. The proper system can flag leaks, changes in occupancy, occupant set point changes, and energy and water waste.

**4. Have a holistic plan.** Without clear direction and an action plan, it is difficult to make a meaningful impact beyond the “low hanging fruit.” A holistic plan is critical to leverage overall savings and provide a mix of improvements for substantial results. Facility leaders often benefit from a holistic plan that bundles low hanging fruit such as lighting and building automation





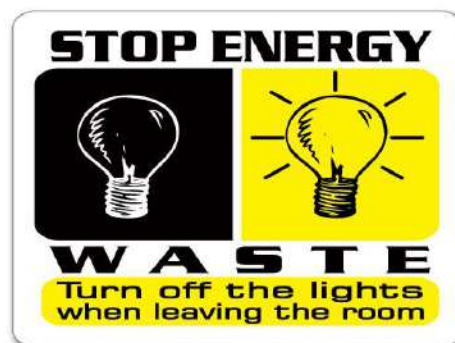
measures with longer paybacks such as renewable energy. This evaluates all possible savings including water, waste, energy, and system/facility reliability to package the appropriate measures for the facility's goals and financial requirements.

**5. Secure leadership buy-in and support.** Real, holistic changes will not be attainable without direct involvement and support from leadership. It is critical to engage leadership and key decision makers that impact the financials of facility operations.



**6. Establish an occupant behavioural awareness program.** Technology implementation and building retrofits are only part of the equation. Occupants have a big impact on a building's efficiency and investments made. Education is key to the behavioural process, and empowering occupants with knowledge and resources will help increase energy savings as they can realize the impact through efficiency or financial gain.

Facility executives that adopt these 10 tips for energy management improvements are closer to ensuring their organizations are able to increase efficiency, while overcoming budget constraints, volatile energy costs, and the hidden expenses of aging equipment.





**Solar Panels installed in different campuses of Gurukula Kangri (Deemed to be University), Haridwar**



S. No.	Name of Department	No. of Tubes + Bulbs	No. of A.C.	No. of LCD Projectors	No. of Photocopiers	Computer + Printers	LEDS	Non-Conventional (Solar)	Energy Management practices	No. of Fans
1.	Sanskrit Department, Kanya Gurukul Parisar, Haridwar	08	02	01	00	02 computers+ 02 printers	00	00		01 exhaust fan, 07 ceiling fans
2.	Kanya Gurukul Campus, Haridwar	354	28	21	02	69+21	76	N/A		302
3.	Hindi Department, Kanya Gurukul Parisar, Haridwar	11+6=17	02	01	01	01	02	-		12
4.	Hindi Department, GK(DU), Haridwar	20	03	01	-	2+2	-	-		18
5.	Department of Mechanical engineering	134	1	2	-	4	-	-		102
6.	Registrar office + Establishment I and II + IT cell	31(Tubes) + 18 (Bulbs)	09	-	03	15 (Computers) + 12 (Printer)	12	-		35
7.	Department of Mathematics and Statistics	52 (Tubes)+17 (Bulbs)	17	03	-	25 (Computers) +7 (Printers)	01	-	Yes	36
8.	Department of Philosophy	03 (Tubes) + 03 (Bulbs)	01	-	-	01 (Computers) +01 (Printers)	-	-		05
9.	Kanya Gurukul Campus, Dehradun	335+110	26	9	3	106 (Computers) +22 (Printers)	3	1		236
10.	Department of Physical Education and Sports (main building) Gyn, Badminton Hall. Squash courts and stores	No anyone	10	4 (LCD)+2 Smart class rooms	05	15 Desktop + 03 laptops + 01 printer	141	NA		98
11.	Department of Microbiology, KGC	08	04	NA	NA	NA	50	NA		46
11.	Department of Microbiology, KGC	55	03	02	-	03+02	30	-		44
12.	Department of Mathematics and Statistics, Kanya Gurukul Campus , Haridwar	-	02	01	-	04 (Laptop) + 01 (printer)	31	-		28

S. No.	Name of Department	No. of Tubes + Bulbs	No. of A.C.	No. of LCD Projectors	No. of Photocopiers	Computer + Printers	LEDS	Non-Conventional (Solar)	Energy Management practices	No. of Fans
13.	Computer Centre, K.G.C. Haridwar	-	02	-	-	37 (Desktop) + 02 (Laptop) + 03 (Printer)	09	-		06
14.	Ancient Indian History, Culture and Archeology	N	13	02	01	05	117	-		75
15.	Accounts Section	48	08	-	01	21	-	-		24
16.	COE	09 BULBS	02	-	-	02 + 02	All	-		06
17.	Exam Section	21	03	-	01	05	-	-		24
18.	Exam Section (Evaluation)	52	10	-	01	09 + 07	14	-		30
19.	Department of Electrical engineering	222	7	01	-	02	-	-		
20.	KGC Library, Haridwar	24+7	-	-	01	02+01	-	-		17
21.	FMS, GK(DU), Haridwar	141+61	35	12	01	68 + 16	2	N		98
22.	Botany and Microbiology	113	32	08	-	11 + 16	65	-		109
23.	Department of Chemistry	142+10	22	04	01	31+18	52	-	Yes	110 including exhaust
24.	Department of Physics	225 tube lights	30	05	-	37 PC + 7 Laptop + 12 Printer	66	-		183
25.	Department of Computer Science	199+20	35	07	01	113+15	02	-		119
26.	Department of Yogic Science	81+12	06	02	N	10+04	92	N		127+10
27.	Department of Philosophy	9+8	03	04	-	5+2	-	-		07
28.	Department of Sanskrit	32	14	03	01	05	53	-		43
29.	Department of Jyotirvigyan and Vedic Karmkand	06	N	-	-	-	N	-		05
30.	Department of Veda	71	02	01	01	2+1	-	-		7
31.	Department of Psychology	35+04	04	01	00	06+06	15	-		17
32.	Pt. Gurudutt Hostel	17+0	-	-	N	1+1	350	N		182
33.	Pandit Lekhran and Swami Shradhanand Hostel	345	N	N	N	Computer 2+ Printer 2	N	N		330
34.	Department of Zoology and Environmental Science	158	28	3	11	16+4	4	N		95

## RECOMMENDATIONS

On the basis of the present audit report, the committee has come to following conclusions/ suggestions:

- ❖ To conserve the energy and use of renewable energy the rooftops of all the buildings must be installed with solar power plants
- ❖ Though efforts are being made by Gurukul Kangri (Deemed to be University) to install solar lights however it needs to be done at larger scale so as to use the solar power in place of electricity.
- ❖ Although the number of LED are found more than the previous year audit but, it is recommended to replace all the tube lights and CFL with LED lights.
- ❖ It is the need of hour to conduct time to time workshops/ lectures to create awareness among the students and staff.
- ❖ Initiation for closing all the electronic devices major AC's during lunch hours.
- ❖ Regular maintenance of all electronic devices including instrumentation through AMC is suggested.