Green Audit-2019-20

BHARATH INSTITUTE OF HIGHER EDUCATION AND RESEARCH

BHARATH INSTITUTE OF HIGHER EDUCATION & RESEARCH
(Declared as Deemed to be University U/S 3 of UGC Act 1956)
07 FEB 2020
OFFICE OF THE IQAC - BIHER
Selaiyur, Chennai-600 073. INDIA

From

Chairman-Green Audit committee
BIHER
Chennai-73

To

IQAC
BIHER
Chennai-73

Sir,

[Submission of Green Audit-BIHER]

With reference to the office circular the Green audit was conducted in the BIHER premises and the audit findings are submitted as report enclosed herewith.

Thanking you

Chairman- Green Audit committee

Date: 06/02/2020
Place:Chennai-73

Executive Summary

Green audit is **defined** as an official examination of the effects a college has on the environment. It helps to improve the existing practices with the aim of reducing the adverse effects of these on the environment concerned. Several institutions have applied various viewpoints to preserve the environment within the campus such as promotion of energy savings, recycling of waste, water use reduction, water harvesting etc. Green audit visualizes the documentation of all such activities taking stock of the infrastructure of the college, their academic and managerial policies and future plans. A green auditor will study an organization's environmental effects in a systematic and documented manner and will produce an environmental audit report. A clean and healthy environment aids effective learning and provides a conducive learning environment.

Green audit can be a useful tool for a college to determine how and where they are using the most energy or water or resources; the college can then consider how to implement changes and make savings. It can also be used to determine the type and volume of waste which can be used for a recycling project or to improve waste minimization plan. It can create health consciousness and promote environmental awareness, values and ethics. It provides staff and Students better understanding of green impact on campus. Green auditing promotes financial savings through reduction of resource use. It gives an opportunity for the development of ownership, personal and social responsibility for the students and teachers. Thus it is imperative that the college evaluate its own contributions toward a sustainable future. 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 relevant.

Vision

Bharath Institute of Higher Education & Research (BIHER) envisions and constantly strives to provide an excellent academic and research ambience for students and members of the faculties to acquire professional competence along with human dignity, and spearhead the transformation of community through continuous discovery in science and technology.

Missions

- To develop as a Premier University for Teaching, Learning, Research and Innovation on par with leading global universities.
- To impart education and training to students for creating a better society with ethics and morals.
- To foster an interdisciplinary approach in education, research and innovation by supporting lifelong professional development, enriching knowledge banks through scientific research, promoting best practices and innovation, industry-driven and institute-oriented cooperation, globalization and international initiatives.
- To develop as a multi-dimensional institution contributing immensely to the cause of societal advancement through spread of literacy, an ambience that provides the best of international exposures, provide health care, enrich rural development and most importantly impart value-based education.
- To establish benchmark standards in professional practice in the fields of innovative and emerging areas in medicine, dentistry, nursing, physiotherapy, allied sciences, engineering, and management.
- To launch new programmers with innovative curriculum design by provide multi-faceted exposure in various subjects.
- To provide flexibility to students - options / add-ons to core subjects, develop Device Agnostic Technology to access online content
- Funding / incubation entrepreneurial ideas, Flipped class room – Integrated Courses & Need based learning.

Total Campus Area & College Building Spread Area

Campus area	**15081 sq m**
Built up area	**12421 sq.m**

Campus Infrastructure

- Main Block
- JK Block
- SR Block
- KS Block
- SM Block
- SH Block
- MBA block
- SA Block
- GANGA Hostel
- GODAVERI Hostel
- Basketball court

The green audit practically involves energy conservation, use of renewable resources, rain water harvesting, efforts of carbon sequestration methods, planting trees, waste management including hazardous and e-waste. This requires data collection and efforts for clarification of environmental policies. Green auditing includes systematic identification, recording and analysis of components related to sustainable development of an educational institution to preserve for future generations. The process has three important stages such as pre audit stage, audit stage and post audit stage.

Management's Commitment:

The Management of the college has shown the commitment towards the green auditing during the pre-audit meeting. They were ready to encourage all green activities. It was decided to promote all activities that are environment friendly such as awareness programs on environment, campus farming, planting more trees in the campus etc. after the green auditing. The management of the college was willing to formulate policies based on green auditing report.

Scope and Goals of Green Auditing:

A clean and healthy environment aids effective learning and provides a conducive learning environment. There are various efforts around the world to address environmental education issues. Green Audit is the most efficient and ecological way to manage environmental problems. It is a kind of professional care which is the responsibility of each individual who are the part of economical, financial, social and environmental processes. It is necessary to conduct green audit in college campus because students become aware of the green audit, its advantages to save the planet and they become good citizen of our country. Thus Green audit becomes necessary at the college level.

Benefits of the Green Auditing:

- Empower the organizations to frame a better environmental performance
- More efficient resource management
- Benchmarking for environmental protection initiatives
- To provide basis for improved sustainability
- To create a green campus
- To enable waste management through reduction of waste generation, solid-waste and water recycling
- To create plastic free campus and evolve health consciousness among the stakeholders
- Recognize the cost saving methods through waste minimizing and managin
- Point out the prevailing and forthcoming complications
- Authenticate conformity with the implemented laws
- Enhance the alertness for environmental guidelines and duties
- Impart environmental education through systematic environmental management approach and improving environmental standards
- Financial savings through a reduction in resource use
- Development of ownership, personal and social responsibility for the College and its environment
- Enhancement of college profile
- Developing an environmental ethic and value systems in youngsters.

Auditing for Green Campus Management :

Green Campus is an environment which improves energy efficiency, conserving resources and enhancing environmental quality by educating for sustainability and creating healthy, living and learning environments. Green Campus rewards long term commitment to continuous environmental improvement from the campus community. Green colleges make a point to account for sustainable living when designing and operating their buildings. Many of their facilities incorporate natural lighting, improve air quality, and reduce energy and water use. Trees play an important ecological role within the urban environment, as well as support improved public health and provide aesthetic benefits to cities. Planting trees without consideration for their species, location, and maintenance will not result in all of their wished-for benefits. It is essential to plan where the trees are planted and to plan their ongoing maintenance in order to maximize future benefits and to ensure long-term tree survival and growth. Trees in a college yard improve air quality and can reduce temperatures with their cool shade. They are a small environmental investment that will pay dividends for decades to come. In one year, a single mature tree will absorb up to 48 pounds of carbon dioxide from the atmosphere, and release it as oxygen. So while you are busy studying and working on earning those good grades, all the trees on campus are also working hard to make the air cleaner for us. Trees on our campus impact our mental health as well; studies have shown that trees greatly reduce stress, which a huge deal is considering that many students are under some amount of stress.

Auditing for Carbon Footprint:

Microcosms of the world at large, college campuses are great test beds for environmental change, and many students are working hard to get their administrations to take positive action. The initiatives that are emerging are models for the larger society, and the students pushing for them will be taking these lessons with them, too, as they enter the work force after graduation. Foremost on the minds of green-leaning students today is global warming, and many are joining hands to persuade their colleges to update policies and streamline operations so that their campuses can become part of the solution. Commutation of

stakeholders has an impact on the environment through the emission of greenhouse gases into the atmosphere consequent to burning of fossil fuels (such as petrol). The most common greenhouse gases are carbon dioxide, water vapour, methane, nitrous oxide and ozone. Of all the greenhouse gases, carbon dioxide is the most prominent greenhouse gas, comprising 402 ppm of the Earth's atmosphere. The release of carbon dioxide gas into the Earth's atmosphere through human activities is commonly known as carbon emissions. The question is what should be done to reduce carbon emissions. Often the challenge lies in choosing just the right approach that will contribute most to the objective. Naturally, the results of these interventions also have to be monitored and assessed.

Many colleges want to reduce their carbon dioxide (CO2) emissions. But that's not so easy, given that a range of factors determine carbon emissions, including mobility, waste, and energy consumption. So, gaining insight into CO2 emissions is extremely important.

An important aspect of doing an audit is to be able to measure your impact so that we can determine better ways to manage the impact. In addition to the water, waste, energy and biodiversity audits we can also determine what our carbon footprint is, based on the amount of carbon emissions created. One aspect is to consider the distance and method traveled between home and college every day. It undertakes the measure of bulk of carbon dioxide equivalents exhaled by the organization through which the carbon accounting is done. It is necessary to know how much the organization is contributing towards sustainable development.

Methodology of Green Auditing:

The purpose of the audit was to ensure that the practices followed in the campus are in accordance with the Green Policy adopted by the institution. The criteria, methods and recommendations used in the audit were based on the identified risks. The methodology includes: preparation and filling up of questionnaire, physical inspection of the campus, observation and review of the documents, interviewing responsible persons and data analysis, measurements and recommendations. The methodology adopted for this audit was a three step process comprising of:

➢ **Data Collection** – In data collection phase, exhaustive data collection was performed using different tools such as observation, survey communicating with responsible persons and measurements. Data collection was done from the primary sources.

Following steps were taken for data collection:

- The team visited each department, centers, Library, canteen, gardens, campus etc.
- Data on the general information was collected by observation and interview.
- Plants were identified using standard taxonomic books.
- Carbon –di-oxide generated was measured directly at the source of production.

A training program was organized to orient the staff and students to collect the data for green auditing. The green audit began with the teams walking around examining all the different facilities of the college, identifying the different types of appliances and utilities (lights, taps, toilets, fridges, etc.), as well as measuring the usage per item (Watts indicated on the appliance or measuring water from a tap) and identifying the relevant consumption patterns (such as how often an appliance is used) and their impacts. The staff and learners were interviewed to get details of usage, frequency or general characteristics of certain appliances. Data collection was done in the sectors such as Energy, Waste, Greening, Carbon footprint and Water use. College records and documents were verified several times to clarify the data received through survey and discussions.

The base of any green audit is that its findings are supported by documents and verifiable information. The audit process seeks, on a sampled basis, to track past actions, activities, events, and procedures to ensure that they are carried out according to systems requirements and in the correct manner. Although green audits are carried out using policies, procedures, documented systems and objectives as a test, there is always an element of subjectivity in an audit. The essence of any green audit is to find out how well the environmental organization, environmental management and environmental equipment are performing. Each of the three components is crucial in ensuring that the organization's environmental

performance meets the goals set in its green policy.

Key Findings and Observations:

- **Green Campus**

Types of gardens eg:
- Botanical Garden: 8012.77 m^2
- Vegetable garden: 6070.28 m^2
- Mushroom House: 202.34 m^2

Total number of plant species identified – 34

Tree cover of the campus - 2660.14 m^2

Garden area inside the college – 6040.22 m^2

CAMPUS FLORA (Botanical Garden)

Sl.No	Name of plants	No. of plants
1	*Chamaedorea cataractarum*	62
2	*Wodyetia bifurcate*	12
3	*Caryota mitis*	25
4	*Azadirachta indica*	11
5	*Dypsis lutescens*	04
6	*Mangifera indica*	04
7	*Bougainvillea glabra*	09
8	*Pinus nigra*	05
9	*Ixora coccinea*	07
10	*Pongamia pinnata*	05
11	*Peltophorum pterocarpum*	11
12	*Forsythia koreana*	07
13	*Thespesia populnea*	06
15	*Ficus religiosa*	05
16	*Polyalthia longifolia*	07
17	*Phoenix sylvestris*	5
18	*Tectona grandis*	8
19	*Albizia lebbeck*	4
20	*Samanea saman*	3
21	*Terminalia catappa*	6

CAMPUS FLORA (Vegetable Garden)

Sl.No	Name of plants	No. of plants
1	*Mormordica charantia L*	18
2	*Lageneria siceraria*	16
3	*Cucumis sativus*	21
4	*Cucurbita moshcata*	32
5	*Trichosanthes cucumerina*	14
6	*Luffa acutangular*	12
7	*Abelmoschus esculentus*	168
8	*Solanum lycopersicum*	157
9	*Solanum melongena*	146
10	*Beta vulgaris*	198
11	*Raphanus sativus*	212
12	*Amaranthus viridis*	520
13	*Cyamopsis tetragonoloba*	168

Carbon Footprint:

Transportation means of stakeholders:

Stakeholders	Bus	Bike	Car	Autorikshaw	Cycle	pedestrians	Total
Staffs	814	70	35	10	-	21	950
Students	2500	4056	10	100	-	1320	7886
Visitors	30		20	5	-	6	61

- Number of persons using cycles – nil
- Number of persons using cars – 65
- Number of persons uses two wheelers – 4126
- Number of persons uses autorikshaw –115
- Number of persons using other transportations –3344
- Number of visitors per day –61
- Number of Students staying in the hostel –1320

GREEN INITIATIVES DURING THE 2019-2020 YEAR:

Financial Year	Tree plantation	Gardening & lawn	Sewerage Treatment Plant	Solar PV	Waste water treatment center	Transportation	Waste disposal
2019 - 2020	Tree are maintain well	Lawn work maintain well	Done	-	Done	Have to increase the public transport and cycling	Properly maintained

Suggestions to reduce carbon footprint:

(i) College observe "No own vehicle day" every month. The second Tuesday of every month is dedicated for it. Teachers and students are not allowed to take their private vehicles on that day and are supposed to reach college via public transportation methods. The no own vehicle day is widely accepted among students and teachers and is hugely appreciated by the community.

(ii) College also promote car and bike pooling system. Teachers/ students coming from the same area share their vehicles to reach the college. This also reduces the number of private vehicles used in the college campus.

From

Chairman-Environmental Audit committee
BIHER
Chennai-73

To

IQAC
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Chennai-73

Sir,

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With reference to the office circular the Environmental audit was conducted in the BIHER premises and the audit findings are submitted as report enclosed herewith.

Thanking you

Chairman- Environmental Audit committee

Date: 06/02/2020
Place:Chennai-73

Energy Audit 2019-20

From

Chairman-Energy Audit committee
BIHER
Chennai-73

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Chennai-73

Sir,

[Submission of Energy Audit-BIHER]

With reference to the office circular the Energy audit was conducted in the BIHER premises and the audit findings are submitted as report enclosed herewith.

Thanking you

Chairman-Energy Audit committee

Date: 6/2/2020
Place:Chennai

1 CHAPTER

1.1 Pre-Audit Stage

A pre-audit meeting provided an opportunity to reinforce the scope and objectives of the audit and discussions were held on the practicalities associated with the audit. This meeting is an important prerequisite for the green audit because it is the first opportunity to meet the expert and deal with any concerns. It was held at BIHER Deemed to be University, Chennai. The meeting was an opportunity to gather information that the Energy audit team can study before arriving on the site. The audit protocol and audit plan was handed over at this meeting and discussed in advance of the audit itself.

In BIHER Deemed to be University pre-audit meeting was conducted successfully and necessary documents were collected directly from the college before the initiation of the audit processes. Actual planning of audit processes was discussed in the pre-audit meeting. Energy audit Team was also selected in this meeting with the help of staff and the college management. The audit protocol and audit plan were handed over at this meeting and discussed in advance of the audit itself. The Energy audit team worked together, under the leadership of the lead auditor, to ensure completion within the brief and scope of the audit.

1.2 Objectives of Energy Audit

The objective of the audit was to study the energy consumption pattern of the facility, identify the areas where potential for energy/cost saving exists and prepare proposals for energy/cost saving along with investment and payback periods.

The salient observations and recommendations are given below.

BIHER Deemed to be University uses energy in the following forms:

- Electricity from TNEB

- High Speed Diesel (HSD)

Electrical energy is used for various applications, like:

- Computers
- Lighting
- Air-Conditioning
- Fans
- Other Lab Equipment

The average cost of energy is around Rs.2,35,066./month (average of six months)

1.3 Target Auditing for Energy Management

Energy cannot be seen, but we know it is there because we can see its effects in the forms of heat, light and power. This indicator addresses energy consumption, energy sources, energy monitoring, lighting, appliances, and vehicles. Energy use is clearly an important aspect of campus sustainability and thus requires no explanation for its inclusion in the assessment. An old incandescent bulb uses approximately 60W to 100W while an energy efficient light emitting diode (LED) uses only less than 10 W. Energy auditing deals with the conservation and methods to reduce its consumption related to environmental degradation. It is therefore essential that any environmentally responsible institution examine its energy use practices.

1.4 Methodology

The purpose of the audit was to ensure that the practices followed in the campus with the criteria, methods and recommendations used in the audit were based on the identified risks. The methodology includes: preparation and filling up of questionnaire, physical inspection of the campus, observation and review of the document, interviewing responsible persons and data analysis, measurements and recommendations. The methodology adopted for this audit was a three step process comprising of:

1. **Data Collection** – In preliminary data collection phase, exhaustive data collection was performed using different tools such as observation, survey communicating with responsible persons and measurements. Following steps were taken for data collection:

The team went to each department, centers, Library, canteen etc.

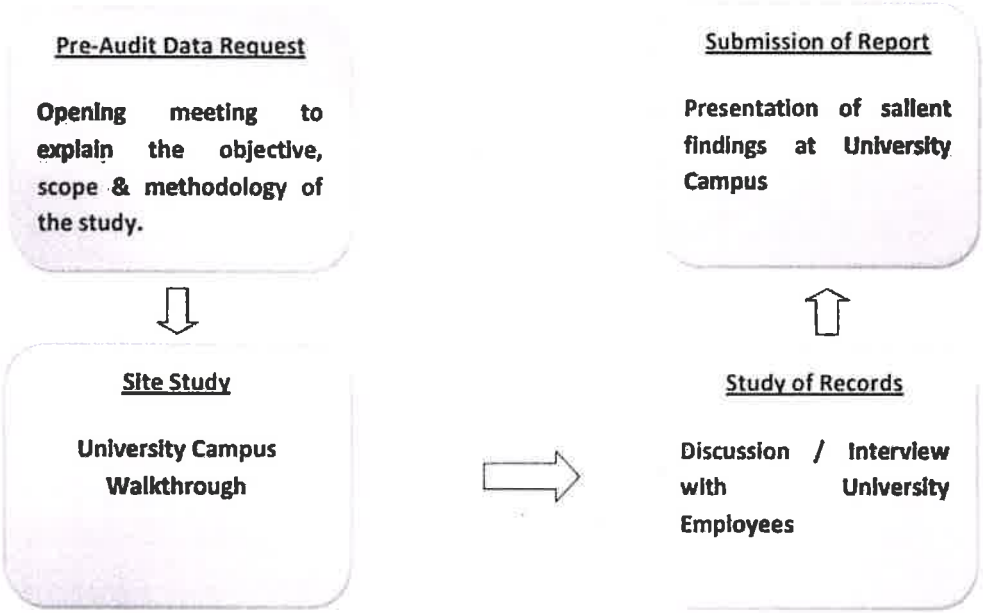
Data about the general information was collected by observation and interview.

The power consumption of appliances was recorded by taking an average value in some cases.

2.Data Analysis - Detailed analysis of data collected include: calculation of energy consumption, analysis of latest electricity bill of the campus, understanding the tariff plan provided by the Tamil Nadu State Electricity Board (TNEB). Data related to water usages were also analyzed using appropriate methodology.

3. Recommendation /Suggestions– On the basis of results of data analysis and observations, some steps for reducing power and water consumption were recommended. Proper treatments for waste were also suggested. Use of fossil fuels has to be reduced for the sake of community health.

The above target areas particular to the college was evaluated through questionnaire circulated among the students for data collection. Five categories of questionnaires were distributed. The formats of these are given below.



AUDIT FLOW CHART

2. CHAPTER

Survey Forms

2.1Auditing for Energy Management

1) List the ways of energy usage in your college. (Electricity, electric stove, kettle, microwave, LPG, firewood, Petrol, diesel and others).
2) Electricity bill amount for the last year
3) Amount paid for LPG cylinders for last one year
4) Weight of firewood used per month and amount of money spent? Also mention the amount spent for petrol/diesel/ others for generators?
5) Are there any energy saving methods employed in your college? If yes, please specify. If no, suggest some.
6) How much money does your college spend on energy such as electricity, gas, firewood, etc. in a month.(Record monthly for the year2016).
7) How many CFL bulbs have your college installed? Mention use (Hours used/day for how many days in a month)
8) Energy used by each bulb per month? (For example- 60 watt bulb x 4 hours x number of bulbs (kwh).
9) How many LED bulbs are used in your college? Mention the use (Hours used/day for how many days in a month)
10) Energy used by each bulb per month? (kwh).
11) How many incandescent (tungsten) bulbs have your college installed? Mentions use (Hours used/day for how many days in a month)
12) Energy used by each bulb per month? (kwh).
13) How many fans are installed in your college? Mention use (Hours used/day for how many days in a month) .

14) Energy used by each fan per month?(kwh)
15) How many air conditioners are installed in your college? Mention use (Hours used/day, for how many days in a month)
16) Energy used by each air conditioner per month? (kwh).
17) How much electrical equipment including weighing balance is installed your college? Mention the use (Hours used/day for how many days in a month)
18) Energy used by each electrical equipment per month? (kwh).
19) How many computers are there in your college? Mention the use (Hours used/day for how many days in a month)
20) Energy used by each computer per month?(kwh)
21) How many photocopiers are installed by your college? Mention use
22) (Hours used/day for how many days in a month).
23) How many cooling apparatus are in installed in your college? Mention use(Hours used/day for how many days in a month)
24) Energy used by each cooling apparatus per month? (kwh) Mention use (Hours used/day for how many days in a month)
25) Energy used by each photocopier per month? (kwh) Mention the use (Hours used/day for how many days in a month) how many inverters your college installed? Mentions use (Hours used/day for how many days in a month)
26) Energy used by each inverter per month?(kwh)
27) How many electrical equipment are used in different labs of your college? Mention the use (Hours used/day for how many days in a month)
28) Energy used by each equipment per month?(kwh)
29) How many heaters are used in the canteen of your college? Mention the

use (Hours used/day for how many days in a month)

30) Energy used by each heater per month?(kwh)

31) No of street lights in your college?

32) Energy used by each street light per month?(kwh)

33) No of TV in your college and hostels?

34) Energy used by each TV per month?(kwh)

35) Any other item that uses energy (Please write the energy used per month) Mention the use (Hours used/day for how many days in a month)

36) Are any alternative energy sources/nonconventional energy sources employed / installed in your college? (photovoltaic cells for solar energy, windmill, energy efficient stoves, etc.,)Specify.

37) Do you run "switch off" drills at college?

38) Are your computers and other equipment put on power-saving mode?

39) Does your machinery (TV, AC, Computer, weighing balance, printers, etc.) run on standby mode most of the time? If yes, how many hours?

40) What are the energy conservation methods adapted by your college?

41) How many boards displayed for saving energy awareness?

42) How much ash is collected after burning fire wood per day in the canteen?

43) Write a note on the methods/practices/adaptations by which you can reduce the energy use in your college campus in future.

44) Calculation of energy for electrical appliances

3.CHAPTER

3.1 Audit Stage

In BIHER Deemed to be University, Chennai Energy auditing was done with the help of Energy audit team involving different student groups, teaching and non-teaching staff. The green audit began with the teams walking through all the different facilities at the college, determining the different types of appliances and utilities (lights, fans, computers, appliances, fridges, etc.) as well as measuring the usage per item (Watts indicated on the appliance or measuring water from a tap) and identifying the relevant consumption patterns (such as how often an appliance is used) and their impacts. The staff and learners were interviewed to get details of usage, frequency or general characteristics of certain appliances. Data collection was done in the sectors Energy and its use. College records and documents were verified several times to clarify the data received through survey and discussions

- **Involvement of Student Clubs and Forums**
- **Site inspection**
- **Interviews**
- **Review of Policies**
- **Review of Documents and Records**

4.CHAPTER

4.1 Source of Energy

BIHER Deemed to be University uses Energy in following forms:

a. Electricity from TNEB
b. High Speed Diesel(HSD)

HSD is used as a fuel for Diesel Generator which is run whenever power supply is not available.

The following are the major consumers of electricity in the facility

- Computers
- Lighting
- Air-Conditioning
- Fans
- Other Lab Equipment

4.2 Specific Energy Consumption (SEC)

Specific Energy Consumption (SEC) is defined as energy usage per Square meter of area. It is calculated total electrical kWh/total area of the campus. By calculating SEC, we can crudely target the factors of energy efficiency or inefficiency.

4.3 Indirect benefits of Energy Audit

Every time the energy audit is carried out it rekindles the interest in Energy Conservation as an important function. Energy Auditors sharing their experience and knowledge with the plant personnel, helps in fuelling the innovative ideas for further action of reduction in Specific Power consumption (SPC). Any loose connections or heating of cables come to timely vision. For an external agency due to unbiased vision, a few points for energy conservation may be visible each time they perform the audit and this would help in achieving further saving. Inform any

irregularities in Energy meter CT connections for rectification

4.4 Energy observations

Anexure-I

4.5 Current saving methods adopted in the college

- ✓ Turn off electrical equipments when not in use
- ✓ Use energy efficient light-emitting diode (LED) bulbs instead of incandescent and CFL bulbs
- ✓ Maintain appliances and replace old appliances.
- ✓ Use computers and electronic equipments in power saving mode.

4.6 Sensor based Energy conservation

BIHER has established standard energy conservation techniques within the college campus by installing regulated power supply throughout the campus; it has installed the tank level indicator with low level switch and high level switch this functions as automatic power supply unit for the bore well motors the circuit get closed when the water level in the tank reaches the bottom of the tank by the low level sensor and the circuit get open disconnecting the power supply to the pump when the water reaches the top level of the tank

4.7 Recommendation /Suggestions– On the basis of results of energy observations as provided in the Annexure, some steps for reducing power and water consumption were recommended for future enhancement of green power consumption.

A	**Name of the commercial Unit**		**BHARATH INSTITUTE OF HIGHER EDUCATION AND RESEARCH-SBDCH**	
A.1	**Address of the Unit**		**CHENNAI**	
A.2	**Year of commencement of the commercial activities**		**1983**	
A.3	**Chief Executive's name & designation with telephone, fax nos., E-Mail and Mobile nos.**		**Mr.Devanathan**	
A.4	**Name, designation, address, telephone, mobile,fax nos. & E-Mail of Energy Manager**		**Dr.Ilampoornan.M.k**	
	Particulars	**Unit**	**Baseline Year (Average of year 1 to year 3)**	**Assessment Year (2019-2020)**
B	**Building Status**	Value	**Stand Alone**	
B.1	Building Class (related to quality)	Value	**NONE**	**0**
B.1	Number of Storeys	Number	**Stand Alone**	**0**
B.3	Climate Zone	Value	**Composite**	
B.4	Total Built up area including parking area	m^2	**7452.6**	**0**
B.5	Air-conditioned area	m^2	**1076.4**	**0**
B.6	Non-Airconditioned area	m^2	**6707.4**	**0**
B.7	Gross Floor area	m^2	**1491**	**0**
B.8	Public area	m^2	**309.6**	**0**
B.9	covered parking area	m^2	**731.592**	**0**
B.10	Service area	m^2	**238.968**	**0**
B.11	Dining area	m^2	**40**	**0**
B.12	Total no. of Class room	Nos	**124**	**0**
B.13	Total electricity consumption	Lakh kWh	**4.60**	**0**
B.14	Total Energy Consumption	Kcal	**3953.0588**	**0**
	EPI	kWh/m^2	**6.168**	**#DIV/0!**
C	**Class Rooms**			
C.1	Total Number of Class rooms	Nos	**124**	**0**
C.2	Yearly Occupancy rate	Hrs.	**7**	**0**
C.3	Total electricity consumption*	kWh	**12.466**	**0**
C.4	Total floor area of Class Rooms	m^2	**5952**	**0**
D	**Dinning Facility (including Residential block)**			
D.1	Total electricity consumption of dinning facilities including kitchen	kWh	**31820.000**	**0**
D.2	Total energy consumption for electricty use of dinning facilities including kitchen	kcal	**27365200**	**0**
D.3	LPG consumption	kg	**46666.67**	**0**
D.4	GCV of LPG	kcal/kg	**3173.33**	**0**
D.5	Total energy consumption through LPG	kcal	**148088888.9**	**0**
D.6	PNG consumption	m3	**0.00**	
D.7	GCV of PNG	kcal/m3	**3466.67**	
D.8	Total energy consumption through PNG	kcal	**0**	
D.9	Total Electricity Consumption/m2 (EPI DF)	kWh/m^2	**217.5000**	**0**
D.10	Total Thermal Energy Consumption of dining facilities	kcal	**20520888.89**	**0**
D.11	Total energy consumption in Kitchen	TOE	**17.54540889**	**0**
E	**Meeting hall**			
E.1	Total Floor area of Meeting Halls	m^2	**150**	**0**
E.2	Total electricity consumption of Meeting Halls	kWh	**11600**	**0**
E.3	Total Electricity Consumption/m2 (EPI RF)	kWh/m^2	**77.33**	
F	**Recreational Facilities**			
F.1	Floor area of facilities	m^2	**120**	**0**
F.2	Total electricity consumption of facilities	kWh	**450.000**	**0**
F.3	Total Electricity Consumption/m2 (EPI RF)	kWh/m^2	**3.750**	**0**
G	**Common Areas**			
G.1	Electricity consumption of Lighting	kWh	**1210.000**	**0**
G.2	Total Electricity Consumption/m2 (EPI CA)	kWh/m^2	**0.070**	**0**
H	**Residential Block**			
H.1	Total electricity consumption of facilities	kWh	**607173.000**	
	Total Electricity Consumption/m2 (EPI RB)	kWh/m^2	**106.522**	
H	**Engineering and Services**			
H.1	**Water Pumping system**			
H.1.1	Total energy consumption	kWh	**9666.666667**	**0**
H.2	**Lighting system**			
H.2.1	Total Lighting consumption	kWh	**6424**	**0**

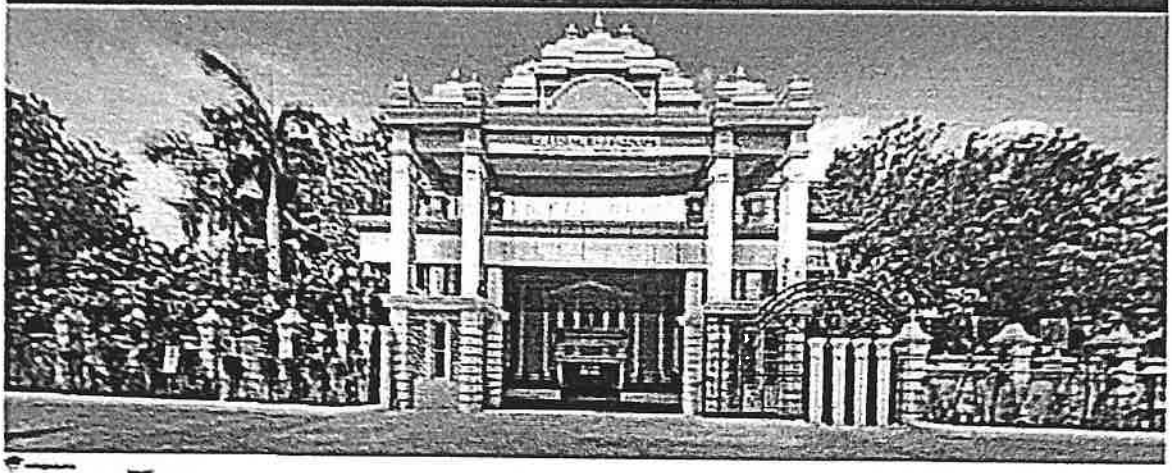
A	Name of the commercial Unit		BHARATH INSTITUTE OF HIGHER EDUCATION AND RESEARCH-SBDCH	
H.3	**Lifts**			
H.3.1	Total energy consumption	kWh	2427.25	0
H.4	**NA**			
H.4.1	NA	kWh	0	0
H.5	**Effluent Treatment Plant (ETP)**			
H.5.1	Total Energy Consumption	kWh	0	0
I	**Electricity Consumption***			
I.1	**Electricity through Grid / Other**			
I.1.1	Purchased Electricity from grid (SEB)	kWh	435658.00	0
I.1.2	Total Connected Load of Unit	Kw	0	0
I.1.3	Contract Demand with utility	kVA	155	0
J	**On-site Generation***			
J.1	**Through DG sets**			
J.1.1	Annual generation	kWh	24000.000	0
J.2	**Through GG sets/Gas turbines (GT)**			
J.2.1	Annual generation	kWh	0	#REF!
J.3	**Through Renewable Sources**			
J.3.1	Annual generation	kWh	6000	0
J.4	**Total onsite generation excluding renewable sources**	kWh	24000	0
K	**Fuel Consumption**			
K.1	**Liquid Fuel Consumption***			
K.1.4	**High Speed Diesel (HSD)**			
K.1.4.1	Total HSD Consumption as fuel	Tonne	80.8	0
K.1.4.2	Gross calorific value	kcal/kg	10800	0
K.1.4.3	Total energy consumption through HSD	kcal	872100000	0
K.1.4.3	Total energy consumption through HSD	Million kcal	872.1	0
K.2	**Gaseous Fuel***			
K.2.1	**Compressed Natural Gas (CNG/NG/PNG/LNG)**			
K.2.1.1	Total NG Consumption as fuel	Million SCM	0	0
K.2.1.2	GCV of NG	Kcal/kg	8393.8	0
K.2.1.3	Total energy consumption through NG	kcal	0	0
K.2.2	**Liquified Petroleum Gas (LPG)**			
K.2.2.1	Total LPG Consumption as fuel	Kg	6466.666667	0
K.2.2.2	GCV of LPG	kcal/kg	0	0
K.2.2.3	Total energy consumption through LPG	kcal	0	0
K.2.2.4	Total energy consumption through gaseous fuel	Million Kcal	0	0
L	**Gross Heat Rate**			
L.1	Weighted Heat Rate	kcal/kWh	815.1	0
M	**GtG Energy Performance Index**			
M.1	Total Electrical input	Lakh kWh	4.4	0
M.2	Total Electrical consumption	Lakh kWh	4.6	0
M.3	Total Built up area	m^2	13152.6	0
M.4	Gate to Gate EPI with Kitchen	kWh/m^2	34.9	0
N	**Total Energy Consumption**			
N.1	Total Thermal Energy Used in Power Generation	Million kcal	21.1	
N.2	Total Thermal Energy Input through all Fuels	Million kcal	21.1	
N.3	Total Thermal Energy Input through all Fuels excluding food preparation	Million kcal	21.1	
N.4	Total Electrical consumption from Grid	Million kcal	374.7	
N.5	Total Energy Consumption with Kitchen	Million kcal	1246.8	
N.6	Total Energy Consumption without Kitchen	Million kcal	1246.8	
O	Total Energy Consumption with kitchen	TOE	124.7	
P	Total Energy Consumption without kitchen	TOE	124.7	
Q	Total built up Area excluding covered Parking area	1000 m2	6.7	0
R	Total Energy Consumption with kitchen per 1000m²	TOE/1000 m²	18.6	0
S	Total Energy Consumption without kitchen per 1000m²	TOE/1000 m²	18.6	0

A	Name of the commercial Unit		BHARATH INSTITUTE OF HIGHER EDUCATION AND RESEARCH-SIHMCH	
A.1	Address of the Unit		CHENNAI	
A.2	Year of commencement of the commercial activities		1983	
A.3	Chief Executive's name & designation with telephone, fax nos., E-Mail and Mobile nos.		Mr.Rajasekaran	
A.4	Name, designation, address, telephone, mobile,fax nos. & E-Mail of Energy Manager		Dr.Ilampoornan.M.K	
	Particulars	Unit	Baseline Year (Average of year 1 to year 3)	Assessment Year (2019-2020)
B	Building Status	Value	Stand Alone	
B.1	Building Class (related to qualty)	Value	NONE	0
B.1	Number of Storeys	Number	Stand Alone	0
B.3	Climate Zone	Value	Composite	
B.4	Total Built up area including parking area	m^2	130054	0
B.5	Air-conditioned area	m^2	84610	0
B.6	Non-Airconditioned area	m^2	45460.66667	0
B.7	Gross Floor area	m^2	104860	0
B.8	Public area	m^2	1002	0
B.9	covered parking area	m^2	1219.32	0
B.10	Service area	m^2	398.28	0
B.11	Dining area	m^2	40	0
B.12	Total no. of Class room	Nos	54	0
B.13	Total electricity consumption	Lakh kWh	5.28	0
B.14	Total Energy Consumption	Kcal	4538.002133	0
	EPI	kWh/m	4.06	#DIV/0!
C	Class Rooms			
C.1	Total Number of Class rooms	Nos	54	0
C.2	Yearly Occupancy rate	Hrs.	7	0
C.3	Total electricity consumption*	kWh	12.466	0
C.4	Total floor area of Class Rooms	m^2	2592	0
D	Dinning Facility (including Residential block)			
D.1	Total electricity consumption of dinning facilities including kitchen	kWh	31820.000	0
D.2	Total energy consumption for electricty use of dinning facilities including kitchen	kcal	27365200	0
D.3	LPG consumption	kg	71133.33	0
D.4	GCV of LPG	kcal/kg	3173.33	0
D.5	Total energy consumption through LPG	kcal	225729777.8	0
D.6	PNG consumption	m3	0.00	
D.7	GCV of PNG	kcal/m3	3466.67	
D.8	Total energy consumption through PNG	kcal	0	
D.9	Total Electricity Consumption/m2 (EPI DF)	kWh/m^2	217.5000	0
D.10	Total Thermal Energy Consumption of dining facilities	kcal	20520888.89	0
D.11	Total energy consumption in Kitchen	TOE	25.30949778	0
E	Meeting hall			
E.1	Total Floor area of Meeting Halls	m^2	150	0
E.2	Total electricity consumption of Meeting Halls	kWh	11600	0
E.3	Total Electricity Consumption/m2 (EPI RF)	kWh/m^2	77.33	
F	Recreational Facilities			
F.1	Floor area of facilities	m^2	120	0

A	Name of the commercial Unit		BHARATH INSTITUTE OF HIGHER EDUCATION AND RESEARCH-SBMCH	
F.2	Total electricity consumption of facilities	kWh	450.000	0
F.3	Total Electricity Consumption/m2 (EPI RF)	kWh/m^2	3.750	0
G	**Common Areas**			
G.1	Electricity consumption of Lighting	kWh	1983.333	0
G.2	Total Electricity Consumption/m2 (EPI CA)	kWh/m^2	0.072	0
H	**Residential Block**			
H.1	Total electricity consumption of facilities	kWh	1722099.200	
	Total Electricity Consumption/m2 (EPI RB)	kWh/m^2	177.536	
H	**Engineering and Services**			
H.1	**Water Pumping system**			
H.1.1	Total energy consumption	kWh	9666.666667	0
H.2	**Lighting system**			
H.2.1	Total Lighting consumption	kWh	6424	0
H.3	**Lifts**			
H.3.1	Total energy consumption	kWh	2427.25	0
H.4	**NA**			
H.4.1	NA	kWh	0	0
H.5	**Effluent Treatment Plant (ETP)**			
H.5.1	Total Energy Consumption	kWh	0	0
I	**Electricity Consumption***			
I.1	**Electricity through Grid / Other**			
I.1.1	Purchased Electricity from grid (SEB)	kWh	503674.67	0
I.1.2	Total Connected Load of Unit	Kw	0	0
I.1.3	Contract Demand with utility	kVA	0	0
J	**On-site Generation***			
J.1	**Through DG sets**			
J.1.1	Annual generation	kWh	24000.000	0
J.2	**Through GG sets/Gas turbines (GT)**			
J.2.1	Annual generation	kWh	0	#REF!
J.3	**Through Renewable Sources**			
J.3.1	Annual generation	kWh	6000	0
J.4	**Total onsite generation excluding renewable sources**	kWh	24000	0
K	**Fuel Consumption**			
K.1	**Liquid Fuel Consumption***			
K.1.4	**High Speed Diesel (HSD)**			
K.1.4.1	Total HSD Consumption as fuel	Tonne	80.1	0
K.1.4.2	Gross calorific value	kcal/kg	10800	0
K.1.4.3	Total energy consumption through HSD	kcal	865368000	0
K.1.4.3	Total energy consumption through HSD	Million kcal	865.368	0
K.2	**Gaseous Fuel***			
K.2.1	**Compressed Natural Gas (CNG/NG/PNG/LNG)**			
K.2.1.1	Total NG Consumption as fuel	Million SCM	0	0
K.2.1.2	GCV of NG	Kcal/kg	8393.8	0
K.2.1.3	Total energy consumption through NG	kcal	0	0
K.2.2	**Liquified Petroleum Gas (LPG)**			
K.2.2.1	Total LPG Consumption as fuel	Kg	6466.666667	0
K.2.2.2	GCV of LPG	kcal/kg	0	0
K.2.2.3	Total energy consumption through LPG	kcal	0	0
K.2.2.4	Total energy consumption through gaseous fuel	Million Kcal	0	0
L	**Gross Heat Rate**			
L.1	Weighted Heat Rate	kcal/kWh	820.9	0
M	**GtG Energy Performance Index**			
M.1	Total Electrical input	Lakh kWh	5.0	0
M.2	Total Electrical consumption	Lakh kWh	5.3	0
M.3	Total Built up area	m^2	139754.0	0
M.4	Gate to Gate EPI with Kitchen	kWh/m^2	3.8	0
N	**Total Energy Consumption**			
N.1	Total Thermal Energy Used in Power Generation	Million kcal	14.4	
N.2	Total Thermal Energy Input through all Fuels	Million kcal	14.4	
N.3	Total Thermal Energy Input through all Fuels excluding food preparation	Million kcal	14.4	
N.4	Total Electrical consumption from Grid	Million kcal	433.2	
N.5	Total Energy Consumption with Kitchen	Million kcal	1298.5	
N.6	Total Energy Consumption without Kitchen	Million kcal	1298.5	
O	Total Energy Consumption with Kitchen	TOE	129.9	
P	Total Energy Consumption without Kitchen	TOE	129.9	
Q	Total built up Area excluding covered Parking area	1000 m2	128.8	0
R	Total Energy Consumption with kitchen per 1000m^2	TOE/1000 m^2	1.0	0
S	Total Energy Consumption without kitchen per 1000m^2	TOE/1000 m^2	1.0	0

BUREAU OF ENERGY

Baseline Data Collection & Verification for commercial buildings (Universities) under PAT Scheme.



Bharath Institute of Higher Education and research

Submitted to
BUREAU OF ENERGY EFFICIENCY

Presented by
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Acknowledgement

Katyani Energy Solution Pvt Ltd. places on record its sincere thanks to the management of Bureau of Energy Efficiency (BEE), Ministry of Power (MOP), Govt. of India for giving this opportunity to become a part of baseline data collection & verification audit of the new designated consumers (commercial buildings –Universities) for PAT Scheme.

BEE:

- Shri Saurabh Diddi – Director
- Shri Vineet Mall- Sector Expert Building

Katyani Energy Solution Pvt Ltd. would also like to thank the management of **BHARATH INSTITUTE OF HIGHER EDUCATION AND RESEARCH** for their continuous support to carry out the baseline data collection & verification audit. Our sincere thanks to the following members of **BHARATH INSTITUTE OF HIGHER EDUCATION AND RESEARCH.**
and its Engineering department team, whose support during the study was enormous:

- **Mr. J Rajasekar** — **Administrative officer**
- **Dr. Ilam Pooran M.K.** — **EEE DEAN**

Place-Delhi

Katyani Energy Solution Pvt. Ltd.

A	Name of the commercial Unit		BHARATH INSTITUTE OF HIGHER EDUCATION AND RESEARCH	
A.1	Address of the Unit		CHENNAI	
A.2	Year of commencement of the commercial activities		1983	
A.3	Chief Executive's name & designation with telephone, fax nos., E-Mail		Mr.Rajasekar	
A.4	Name, designation, address, telephone, mobile,fax nos. & E-Mail of		Dr.Ilampoornan.M.k	
	Particulars	**Unit**	**Baseline Year (Average of year 1 to year 3)**	**Assessment Year (2019-2020)**
B	**Building Status**	Value	**Stand Alone**	
B.1	Building Class (related to qualty)	Value	**NONE**	**0**
B.1	Number of Storeys	Number	**Stand Alone**	**0**
B.3	Climate Zone	Value	**Composite**	
B.4	Total Built up area including parking area	m^2	**12421**	**0**
B.5	Air-conditioned area	m^2	**1242**	**0**
B.6	Non-Airconditioned area	m^2	**11179**	**0**
B.7	Gross Floor area	m^2	**2485**	**0**
B.8	Public area	m^2	**516**	**0**
B.9	covered parking area	m^2	**1219.32**	**0**
B.10	Service area	m^2	**398.28**	**0**
B.11	Dining area	m^2	**40**	**0**
B.12	Total no. of Class room	Nos	204	0
B.13	Total electricity consumption	Lakh kWh	**4.60**	0
B.14	Total Energy Consumption	Kcal	**3953.0588**	0
	EPI	kWh/m^2	**37.01**	#DIV/0!
C	**Class Rooms**			
C.1	Total Number of Class rooms	Nos	**204**	0
C.2	Yearly Occupancy rate	Hrs.	**7**	0
C.3	Total electricity consumption*	kWh	**12.466**	0
C.4	Total floor area of Class Rooms	m^2	**9792**	0
D	**Dinning Facility (including Residential block)**			
D.1	Total electricity consumption of dinning facilities including kitchen	kWh	**31820.000**	0
D.2	Total energy consumption for electricty use of dinning facilities including kitchen	kcal	**27365200**	0
D.3	LPG consmuption	kg	**71133.33**	0
D.4	GCV of LPG	kcal/kg	**3173.33**	0
D.5	Total energy conumption through LPG	kcal	**225729777.8**	0
D.6	PNG consumption	m3	**0.00**	

Internal Quality Assurance Cell IQAC Selaiyur Chennai-79. BIHER

A	Name of the commercial Unit		BHARATH INSTITUTE OF HIGHER EDUCATION AND RESEARCH	
D.7	GCV of PNG	kcal/m3	**3466.67**	
D.8	Total energy consupmption through PNG	kcal	**0**	
D.9	Total Electricity Consumption/m2 (EPI DF)	kWh/m^2	**217.5000**	0
D.10	Total Thermal Energy Consumption of dining facilities	kcal	**20520888.89**	0
D.11	Total energy consumption in Kitchen	TOE	**25.30949778**	0
E	**Meeting hall**			
E.1	Total Floor area of Meeting Halls	m^2	**150**	0
E.2	Total electricity consumption of Meeting Halls	kWh	**11600**	0
E.3	Total Electricity Consumption/m2 (EPI RF)	kWh/m^2	**77.33**	
F	**Recreational Facilities**			
F.1	Floor area of facilities	m^2	**120**	0
F.2	Total electricity consumption of facilities	kWh	**450.000**	0
F.3	Total Electricity Consumption/m2 (EPI RF)	kWh/m^2	**3.750**	0
G	**Common Areas**			
G.1	Electricity consumption of Lighting	kWh	**1983.333**	0
G.2	Total Electricity Consumption/m2 (EPI CA)	kWh/m^2	**0.072**	0
H	**Residential Block**			
H.1	Total electricity consumption of facilities	kWh	**1668838.400**	
	Total Electricity Consumption/m2 (EPI RB)	kWh/m^2	**177.536**	
H	**Engineering and Services**			
H.1	**Water Pumping system**			
H.1.1	Total energy consumption	kWh	**9666.666667**	0
H.2	**Lighting system**			
H.2.1	Total Lighting consumption	kWh	**6424**	0
H.3	**Lifts**			
H.3.1	Total energy consumption	kWh	**2427.25**	0
H.4	**NA**			
H.4.1	NA	kWh	**0**	0
H.5	**Effluent Treatment Plant (ETP)**			
H.5.1	Total Energy Consumption	kWh	**0**	0
I	**Electricity Consumption***			
I.1	**Electricity through Grid / Other**			

A	Name of the commercial Unit		BHARATH INSTITUTE OF HIGHER EDUCATION AND RESEARCH	
I.1.1	Purchased Electricity from grid (SEB)	kWh	**435658.00**	0
I.1.2	Total Connected Load of Unit	Kw	**0**	0
I.1.3	Contract Demand with utility	kVA	**155**	0
J	**On-site Generation***			
J.1	**Through DG sets**			
J.1.1	Annual generation	kWh	**24000.000**	0
J.2	**Through GG sets/Gas turbines (GT)**			
J.2.1	Annual generation	kWh	**0**	#REF!
J.3	**Through Renewable Sources**			
J.3.1	Annual generation	kWh	**6000**	0
J.4	**Total onsite generation excluding renewable sources**	kWh	**24000**	**0**
K	**Fuel Consumption**			
K.1	**Liquid Fuel Consumption***			
K.1.4	**High Speed Diesel (HSD)**			
K.1.4.1	Total HSD Consumption as fuel	Tonne	**80.8**	0
K.1.4.2	Gross calorific value	kcal/ kg	**10800**	0
K.1.4.3	Total energy consumption through HSD	kcal	**872100000**	0
K.1.4.3	Total energy consumption through HSD	Million kcal	**872.1**	0
K.2	**Gaseous Fuel***			
K.2.1	**Compressed Natural Gas (CNG/NG/PNG/LNG)**			
K.2.1.1	Total NG Consumption as fuel	Million SCM	**0**	0
K.2.1.2	GCV of NG	Kcal/kg	**8393.8**	0
K.2.1.3	Total energy consumption through NG	kcal	**0**	0
K.2.2	**Liquified Petroleum Gas (LPG)**			
K.2.2.1	Total LPG Consumption as fuel	Kg	**6466.666667**	0
K.2.2.2	GCV of LPG	kcal/kg	**0**	0
K.2.2.3	Total energy conumption through LPG	kcal	**0**	0
K.2.2.4	Total energy consumption through gaseous fuel	Million Kcal	**0**	0
L	**Gross Heat Rate**			
L.1	Weighted Heat Rate	kcal/kWh	**815.1**	0
M	**GtG Energy Performance Index**			
M 1	Total Electrical input	Lakh kWh	**4.4**	0
M 2	Total Electrical consumption	Lakh kWh	**4.6**	0
M 3	Total Built up area	m^2	**21821.0**	0
M 4	Gate to Gate EPI with Kitchen	kWh/m^2	**21.1**	0

A	Name of the commercial Unit		BHARATH INSTITUTE OF HIGHER EDUCATION AND RESEARCH	
N	**Total Energy Consumption**			
N.1	Total Thermal Energy Used in Power Generation	Million kcal	**21.1**	
N.2	Total Thermal Energy Input through all Fuels	Million kcal	**21.1**	
N.3	Total Thermal Energy Input through all Fuels excluding food preparation	Million kcal	**21.1**	
N.4	Total Electrical consumption from Grid	Million kcal	**374.7**	
N.5	Total Energy Consumption with Kitchen	Million kcal	**1246.8**	
N.6	Total Energy Consumption without Kitchen	Million kcal	**1246.8**	
O	Total Energy Consumption with kitchen	TOE	124.7	
P	Total Energy Consumption without kitchen	TOE	124.7	
Q	**Total built up Area excluding covered Parking area**	1000 m2	**11.2**	0
R	**Total Energy Consumption with kitchen per 1000m²**	TOE/1000 m²	**11.1**	0
S	**Total Energy Consumption without kitchen per 1000m²**	TOE/1000 m²	**11.1**	0

Internal Quality Assurance Cell
IQAC
Selaiyur
Chennai-73
BIHER

ENERGY AUDIT REPORT

for

Sri Lakshmi Narayana Institute of Medical Sciences

OSUDU, AGRAM VILLAGE, VILLIYANUR COMMUNE, KUDAPAKKAM POST,

PUDUCHERRY – 605 502.

FY: (2019 – 2020)

Audited by,

V.Thirunavukkarasu BE, MBA

Certificate No.:4056
Reg No.: EA 6397

SRI GURU ENGINEERS

Plot No.6, Elangoadigal Street, Shanthi Nagar, Lawspet, Puducherry – 605 008.

Ph : 0413 – 2250895 / Cell : 9655828895

ENERGY AUDIT SEQUENCE

TRANSFORMER AND LOAD FACTOR

Transformer Efficiency

Transformer capacity	=	630 KVA
Load Loss (or copper Loss)	=	8034W
No Load Loss (or iron Loss)	=	1200W

Total Loss = No Load Loss + (KVA Load/rated KVA) X Full Load Loss

Total Loss	=	4.1 KW
Efficiency	=	98%

Average KWH/MD/PF 19-20

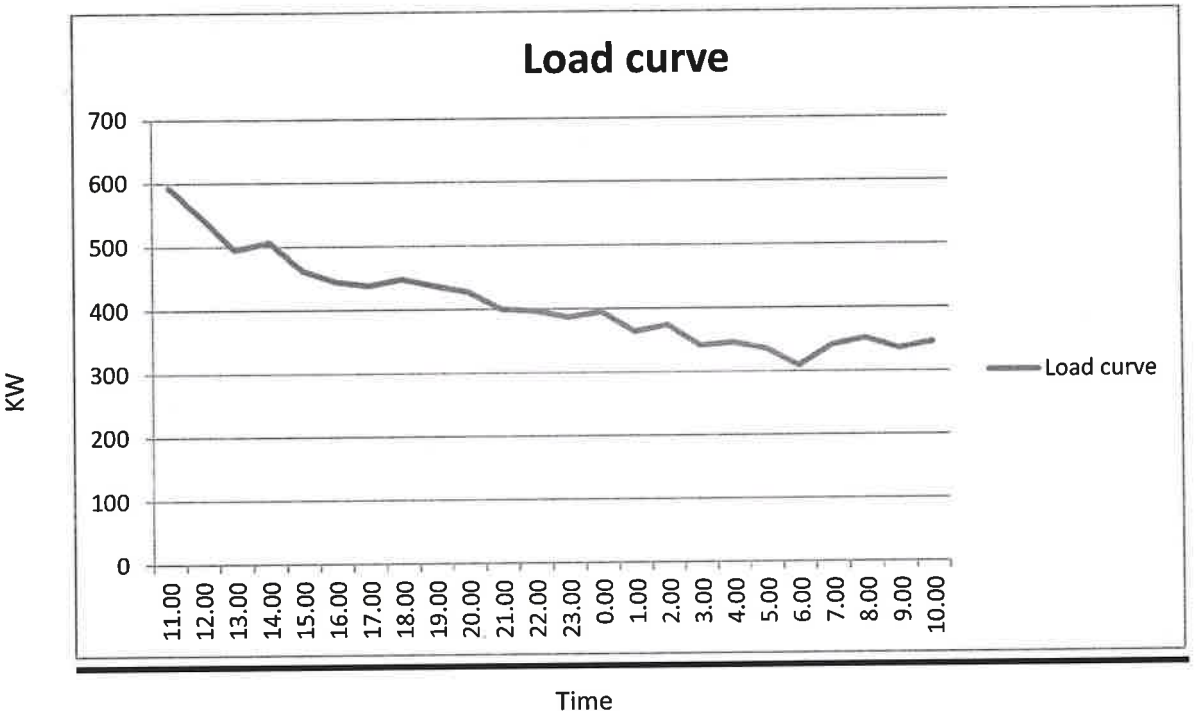
- Transformer capacity = 630 KVA
- Sectioned KVA Demand = 500 KVA
- Recorded Demand Average = 485 KVA
- Recorded KWH Average = 198407
- Recorded PF Average = 0.93

Components of Electricy Billing

- Energy charges (unit. kwh) = 5.45/Kwh
- Maximum Demand Charges = 420/KVA
- Electricity tax 2% on total amount

Daily Load Pattern in Amps. - 24 Hrs (19-20)

Time, Hrs.	KW
11.00	593
12.00	545
13.00	495
14.00	507
15.00	462
16.00	445
17.00	438
18.00	448
19.00	437
20.00	428
21.00	400
22.00	397
23.00	387
00.00	395
01.00	364
02.00	374
03.00	341
04.00	346
05.00	336
06.00	309
07.00	341
08.00	352
09.00	336
10.00	346



POWER FACTOR IMPROVEMENT

Automatic Power Factor Controller installed

Power Factor Setting = 0.99 Lag

50 KVAr Capacitor = 6 Nos.

25 KVAr Capacitor = 4 Nos.

Note: All Capacitors have Individual Control

Total Capacitor Installed = 400 KVAr.

PF should improve from 0.96 to 0.99 for save maximum demand 40kVA/Month, Monthly cost saving is Rs. 16,800 in monthly EB Bill.

MONTHLY POWER CONSUMPTION FY 19-20

MONTH	KWH	KVAH	P.F	M.D, KVA
April-19	208740	221700	0.94	544
May-19	199960	210950	0.95	500
June-19	213720	224360	0.95	494
July-19	218020	231700	0.94	508
August-19	218040	232860	0.94	518
September-19	197260	211520	0.93	530
October-19	202400	221710	0.92	540
November-19	211540	230660	0.92	474
December-19	171240	185900	0.92	414
January-20	183020	199200	0.92	418
February-20	182040	196280	0.93	440
March-20	174900	189540	0.92	442
AVERAGE	**198407**	**213032**	**0.93**	**485**

HARMONICS STUDY

- Harmonics are created by various device like diodes, silicon controlled rectifiers, PWN systems, thyristors, voltage and current chopping, Saturated and core reactors, induction and arc Furnaces are also deployed for various requirements and due to their varying impedance characteristics the NON LINEAR device can cause distortion in voltage and current wave forms.

- The above devices are not used in our system so that harmonics Frequency may be vary negligible.

HVAC AND REFRIGERATION SYSTEM

- 5 x 5 = 25 TR refrigeration system is running for cooling system.
- Energy saving is possible by VFD system fix in AHU 5 nos.
- In AHU will be running by VFD save energy by 40%.
- All AHU coil and room cooling coil will be cleaning periodically for improve the performance.

LIGHTING SYSTEM(19-20)

Sub.: we have changed old type focus lamp and tube light fittings replaced by LED Lamps/fittings

Sl. No.	Type of Light Fittings	Area	Qty. Nos.	T. Power, W
1	LED Down lamp fittings 36W	Ground floor	100	3600W
2	LED Light fittings 22W	Ground floor	50	1100W
3	LED 24W Fittings	Hospital	50	1200W
4	2 x 20W Tube Light LED fittings	Hospital & Hostel	500	20000W
5	20W LED Single Fittings	Hospital & Hostel	200	4000W
TOTAL				29900W
				29.9KW

LED Focus and LED Fitting installed in Hospital and hostel. We have saved energy in 613 units per day by running time of 12 hrs per day

Energy savings per year = 2,20,752 units

Cost savings per year = Rs. 11,58,948.00

DG SET PERFORMANCE

DG set 250 KVA 2nos

- 250kva DG Set –I Generate 3.5 units/Ltr diesel.
- 250kva DG Set –II Generate 3.3 units/Ltr diesel.
- At max load of 160 KW eneration, the efficiency should be 3.8-4 Units/Ltr.
- By service the DG set, Engine can improve in fuel savings.

SOLAR POWER

Proposal Stage – I

- Use 10kW Solar Power for lighting circuit in the office and Hospital area.

Energy Production from Solar in 10kW	=	40 kwh /day
	=	1200 kwh/mth
Cost saving per year	=	Rs. 2,88,000.00
Initial Investment	=	Rs.5,00,000
Payback period	=	1.7 years

RECOMADATION & COMENTS

Sl. No.	Description	RECOMADATION & COMENTS
1	Sanction Load / Connected Load / Maximum Demand	Within Standard Limits
2	Power Factor	To improve 0.96 to 0.99
3	Lighting System	To be Replace By LED Lamps.
4	HVAC	By Cleaning of cooling coil and evaporator coil.
5	Automatic Power Factor Control	to set power factor in controller to be 0.99 Lag
6	Lighting ON / OFF	Timer Relay to be provide
7	AHU and FCU	Running by VFD drive
8	Solar Power	10kW for Light and Fan Load for Stage - 1

SRI GURU ENGINEERS

Certificate

This is to Certify that Energy Audit at **Sri Lakshmi Narayana Institute of Medical Sciences OSUDU, Agram Village, Villiyanur Commune, Kudapakkam Post, Puducherry – 605 502,** was conducted on 28th July 2017.

It is found that sustainable measure are taken by the Medical College in reduction in energy consumption.

VALID TILL
30th July, 2018

V. THIRUNAVUKKARASU, B.E., MBA,
Electrical Consultant & Energy Auditor
Certificate No. 4056 Reg. No. EA 6397
Audit officer

Certificate Number
EA/2017/111
30th July,2017

SRI GURU ENGINEERS

Certificate

This is to Certify that Energy Audit at **Sri Lakshmi Narayana Institute of Medical Sciences OSUDU, Agram Village, Villiyanur Commune, Kudapakkam Post, Puducherry – 605 502,** was conducted on 24th July 2018.

It is found that sustainable measure are taken by the Medical college in reduction in energy consumption.

V. THIRUNAVUKKARASU, B.E., MBA,
Electrical Consultant & Energy Auditor
Certificate No. 4056 Reg. No. EA [illegible]

VALID TILL
30th July, 2019

Audit officer

Certificate Number
EA/2018/109
30th July,2018

SRI GURU ENGINEERS

Certificate

This is to Certify that Energy Audit at **Sri Lakshmi Narayanan Institute of Medical Sciences** **OSUDU, Agram Village, Villiyanur Commune, Kudapakkam Post, Puducherry – 605 502,** was conducted on 27th July 2019.

It is found that sustainable measure are taken by the Medical college in reduction in energy consumption.

VALID TILL
30th July, 2020

V. THIRUNAVUKKARASU, B.E., MBA,
Electrical Consultant & Energy Auditor
Certificate No. 4056 Reg. No. EA 6397
Audit officer

Certificate Number
EA/2019/106
30th July,2019

SRI GURU ENGINEERS

Certificate

This is to Certify that Energy Audit at **Sri Lakshmi Narayana Institute of Medical Sciences OSUDU, Agram Village, Villiyanur Commune, Kudapakkam Post, Puducherry – 605 502,** was conducted on 21th July 2020.

It is found that sustainable measure are taken by the Medical college in reduction in energy consumption.

VALID TILL
30th July, 2021

V. THIRUNAVUKKARASU, B.E., MBA,
Electrical Consultant & Energy Auditor
Certificate No. 4056 Reg. No. EA 6397
Audit officer

Certificate Number
EA/2020/105
30th July,2020

SRI GURU ENGINEERS

Certificate

This is to Certify that Energy Audit at **Sri Lakshmi Narayana Institute of Medical Sciences OSUDU, Agram Village, Villiyanur Commune, Kudapakkam Post, Puducherry – 605 502,** was conducted on 23th July 2021.

It is found that sustainable measure are taken by the Medical College in reduction in energy consumption.

V. THIRUNAVUKKARASU, B.E., MBA,
Electrical Consultant & Energy Auditor
Certificate No. 4056 Reg. No. EA 6397

VALID TILL
30th July, 2022

Audit officer

Certificate Number
EA/2021/101
30th July,2021

ENERGY AUDIT REPORT

for

Sri Lakshmi Narayana Institute of Medical Sciences

OSUDU, AGRAM VILLAGE, VILLIYANUR COMMUNE, KUDAPAKKAM POST,

PUDUCHERRY – 605 502.

FY: (2016 – 2017)

Audited by,

V.Thirunavukkarasu BE, MBA

Certificate No.:4056
Reg No.: EA 6397

SRI GURU ENGINEERS

Plot No.6, Elangoadigal Street, Shanthi Nagar, Lawspet, Puducherry – 605 008.

Ph : 0413 – 2250895 / Cell : 9655828895

ENERGY AUDIT SEQUENCE

TRANSFORMER AND LOAD FACTOR

Transformer Efficiency

Transformer capacity	=	630 KVA
Load Loss (or copper Loss)	=	8034W
No Load Loss (or iron Loss)	=	1200W

Total Loss = No Load Loss + (KVA Load/rated KVA) X Full Load Loss

Total Loss	=	4.1 KW
Efficiency	=	98%

Average KWH/MD/PF 16-17

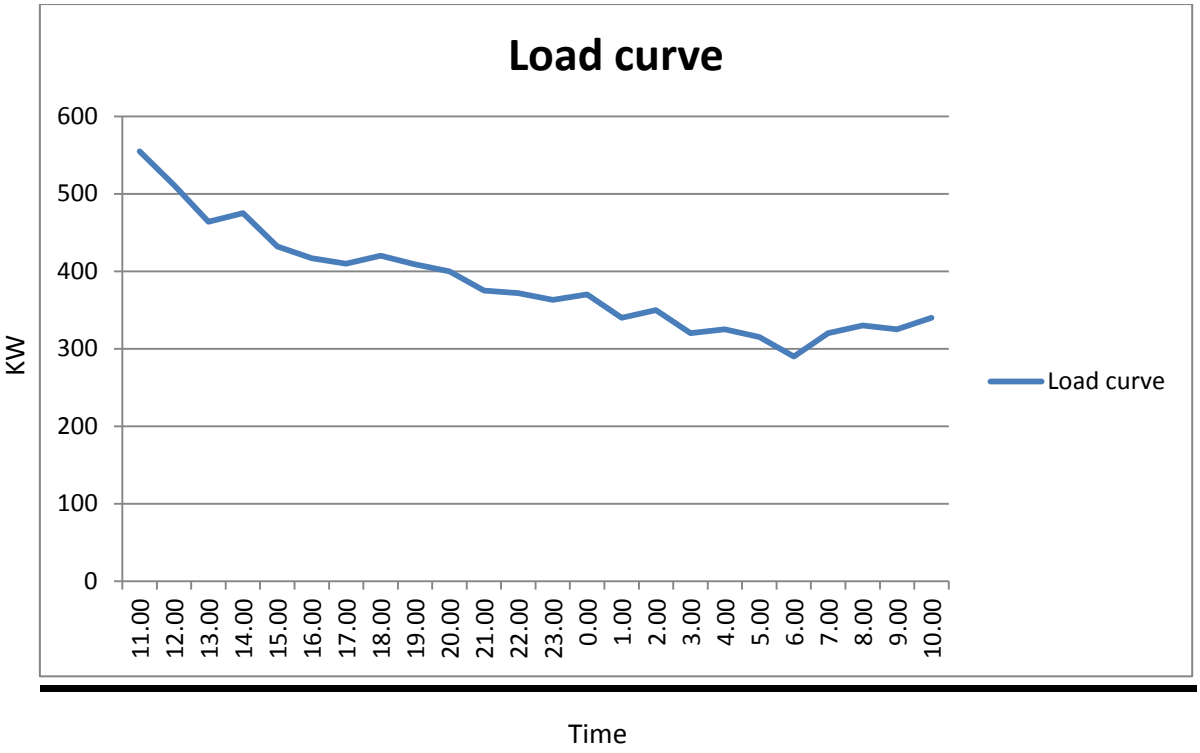
- Transformer capacity = 630 KVA
- Sectioned KVA Demand = 500 KVA
- Recorded Demand Average = 475 KVA
- Recorded KWH Average = 182332
- Recorded PF Average = 0.93

Components of Electricy Billing

- Energy charges (unit. kwh) = 5.25/Kwh
- Maximum Demand Charges = 250/KVA
- Electricity tax 2% on total amount

Daily Load Pattern in Amps. - 24 Hrs (16-17)

Time, Hrs.	KW
11.00	555
12.00	511
13.00	464
14.00	475
15.00	432
16.00	417
17.00	410
18.00	420
19.00	409
20.00	400
21.00	375
22.00	372
23.00	363
00.00	370
01.00	340
02.00	350
03.00	320
04.00	325
05.00	315
06.00	290
07.00	320
08.00	330
09.00	325
10.00	340


Load curve
600
500
400
300
200
100
0
KW
11.00
12.00
13.00
14.00
15.00
16.00
17.00
18.00
19.00
20.00
21.00
22.00
23.00
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
Time
Load curve

POWER FACTOR IMPROVEMENT

Automatic Power Factor Controller installed

Power Factor Setting = 0.99 Lag

50 KVAr Capacitor = 6 Nos.

25 KVAr Capacitor = 4 Nos.

Note: All Capacitors have Individual Control

Total Capacitor Installed = 400 KVAr.

PF should improve from 0.92 to 0.99 for save maximum demand 40kVA/Month, Monthly cost saving is Rs. 16,800 in monthly EB Bill.

Comments:

The performance of the capacitor should monitor – monthly once, by Record the current reading of individual capacitor unit. If below 50 % of actual current, it should replace by New.

MONTHLY POWER CONSUMPTION FY 16-17

MONTH	KWH	KVAH	P.F	M.D, KVA
April-16	216300	228600	0.95	536.8
May-16	194800	207500	0.94	572.6
June-16	207300	220880	0.94	516.4
July-16	200500	215400	0.93	500.6
August-16	192680	208020	0.93	493.2
September-16	175720	190630	0.92	455
October-16	182380	196840	0.93	480
November-16	179220	192260	0.93	434.8
December-16	134560	147300	0.93	397.4
January-17	145380	159000	0.91	388
February-17	148100	161420	0.92	396
March-17	211040	227250	0.93	533
AVERAGE	**182332**	**196258**	**0.93**	**475**

HARMONICS STUDY

- Harmonics are created by various device like diodes, silicon controlled rectifiers, PWN systems, thyristors, voltage and current chopping, Saturated and core reactors, induction and arc Furnaces are also deployed for various requirements and due to their varying impedance characteristics the NON LINEAR device can cause distortion in voltage and current wave forms.

- The above devices are not used in our system so that harmonics Frequency may be vary negligible.

HVAC AND REFRIGERATION SYSTEM

- 120 TR vapor absorption system is running for Energy conservation. The old Voltas reciprocating chiller compressor is not in use.

- Energy saving is possible by VFD system fix in cooling tower pump and chilled water pump by replacing Y-Δ starter

- In chiller evaporator and condenser, shell and tube should be chemical cleaning periodically depend up on ΔT Temperature

- In the process Area, Heat exchange tube should be clean yearly once to maintain better efficiency and save energy.

LIGHTING SYSTEM(16-17)

Sub.: we have changed old type focus lamp and tube light fittings replaced by LED Lamps/fittings

Sl. No.	Type of Light Fittings	Area	Qty. Nos.	T. Power, W
1	LED Down lamp fittings 36W	Ground floor	50	1800W
2	LED Light fittings 22W	Ground floor	25	550W
3	LED 24W Fittings	Hospital	50	1200W
4	2 x 20W Tube Light LED fittings	Hospital & Hostel	100	4000W
5	20W LED Single Fittings	Hospital & Hostel	100	2000W
TOTAL				9550W
				9.55KW

LED Focus and LED Fitting installed in Hospital and hostel. We have saved energy in 216 units per day by running time of 12 hrs per day

Energy savings per year = 77,760 units

Cost savings per year = Rs. 4,08,240.00

DG SET PERFORMANCE

DG set 250 KVA 2nos

- 250kva DG Set –I Generate 3.5 units/Ltr diesel.

- 250kva DG Set –II Generate 3.3 units/Ltr diesel.

- At max load of 160 KW eneration, the efficiency should be 3.8-4 Units/Ltr.

- By service the DG set, Engine can improve in fuel savings.

SOLAR POWER

Proposal Stage – I

- Use 10kW Solar Power for lighting circuit in the office and Hospital area.

Energy Production from Solar in 10kW	=	40 kwh /day
	=	1200 kwh/mth
Cost saving per year	=	Rs. 2,88,000.00
Initial Investment	=	Rs.5,00,000
Payback period	=	1.7 years

RECOMADATION & COMENTS

Sl. No.	Description	RECOMADATION & COMENTS
1	Sanction Load / Connected Load / Maximum Demand	Within Standard Limits
2	Power Factor	To improve 0.96 to 0.99
3	Lighting System	To be Replace By LED Lamps.
4	HVAC	By Cleaning of cooling coil and evaporator coil.
5	Automatic Power Factor Control	to set power factor in controller to be 0.99 Lag
6	Lighting ON / OFF	Timer Relay to be provide
7	AHU and FCU	Running by VFD drive
8	Solar Power	10kW for Light and Fan Load for Stage - 1

ENERGY AUDIT REPORT

for

Sri Lakshmi Narayana Institute of Medical Sciences

OSUDU, AGRAM VILLAGE, VILLIYANUR COMMUNE, KUDAPAKKAM POST,

PUDUCHERRY – 605 502.

FY: (2017 – 2018)

Audited by,

V.Thirunavukkarasu BE, MBA

Certificate No.:4056
Reg No.: EA 6397

SRI GURU ENGINEERS

Plot No.6, Elangoadigal Street, Shanthi Nagar, Lawspet, Puducherry – 605 008.

Ph : 0413 – 2250895 / Cell : 9655828895

ENERGY AUDIT SEQUENCE

TRANSFORMER AND LOAD FACTOR

Transformer Efficiency

Load Loss (or copper Loss) = 2929W

No Load Loss (or iron Loss) = 1586W

Total Loss = No Load Loss + (KVA Load/rated KVA) X Full Load Loss

Total Loss = 4.55 KW

Efficiency = 98%

Average KWH/MD/PF 17-18

- Transformer capacity = 630 KVA
- Sectioned KVA Demand = 500 KVA
- Recorded Demand Average = 489 KVA
- Recorded KWH Average = 187801
- Recorded PF Average = 0.93

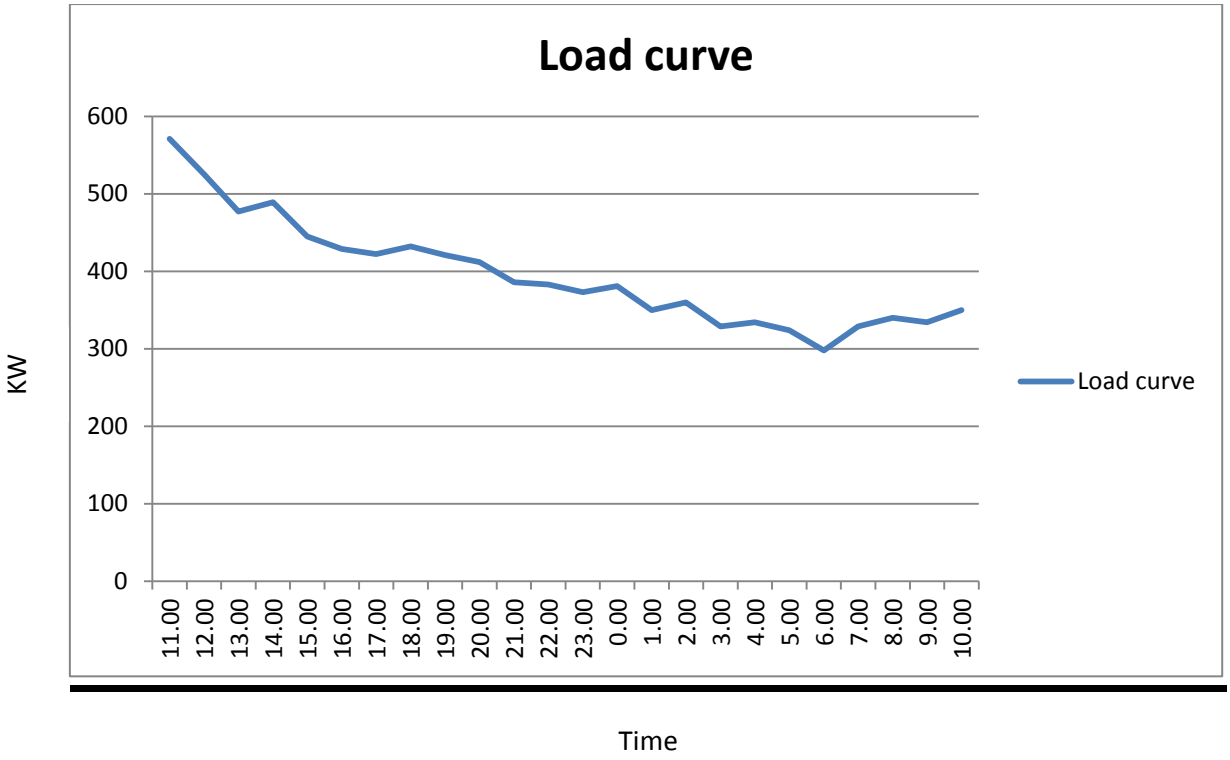
Components of Electricy Billing

- Energy charges (unit. kwh) = 5.25/Kwh
- Maximum Demand Charges = 250/KVA

Electricity tax 2% on total amount

Daily Load Pattern in Amps. - 24 Hrs (17-18)

Time, Hrs.	KW
11.00	571
12.00	525
13.00	477
14.00	489
15.00	445
16.00	429
17.00	422
18.00	432
19.00	421
20.00	412
21.00	386
22.00	383
23.00	373
00.00	381
01.00	350
02.00	360
03.00	329
04.00	334
05.00	324
06.00	298
07.00	329
08.00	340
09.00	334
10.00	350


Load curve
600
500
400
300
200
100
0
11.00
12.00
13.00
14.00
15.00
16.00
17.00
18.00
19.00
20.00
21.00
22.00
23.00
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
Load curve
KW
Time

POWER FACTOR IMPROVEMENT

Automatic Power Factor Controller installed

Power Factor Setting	=	0.99 Lag
5 KVAr Capacitor	=	3 Nos.
10 KVAr Capacitor	=	3 Nos.
25 KVAr Capacitor	=	6 Nos.

Note: All Capacitors have Individual Control

Total Capacitor Installed	=	195 KVAr.

PF should improve from 0.96 to 0.99 for save maximum demand 20kVA/Month, Monthly cost saving is Rs. 7000 in monthly EB Bill.

Comments:

The performance of the capacitor should monitor – monthly once, by Record the current reading of individual capacitor unit. If below 50 % of actual current, it should replace by New.

MONTHLY POWER CONSUMPTION FY 17-18

MONTH	KWH	KVAH	P.F	M.D, KVA
April-17	222789	235458	0.95	552
May-17	200644	213725	0.94	589
June-17	213519	227504	0.94	531
July-17	206515	221862	0.93	515
August-17	198460	214260	0.92	507
September-17	180991	196348	0.92	468
October-17	187851	202745	0.93	494
November-17	184596	198027	0.93	447
December-17	138596	151719	0.93	408
January-18	149741	163720	0.91	399
February-18	152543	166262	0.92	407
March-18	217371	234067	0.93	549
AVERAGE	**187801**	**202141**	**0.93**	**489**

HARMONICS STUDY

- Harmonics are created by various device like diodes, silicon controlled rectifiers, PWN systems, thyristors, voltage and current chopping, Saturated and core reactors, induction and arc Furnaces are also deployed for various requirements and due to their varying impedance characteristics the NON LINEAR device can cause distortion in voltage and current wave forms.

- The above devices are not used in our system so that harmonics Frequency may be vary negligible.

HVAC AND REFRIGERATION SYSTEM

- 120 TR vapor absorption system is running for Energy conservation. The old Voltas reciprocating chiller compressor is not in use.

- Energy saving is possible by VFD system fix in cooling tower pump and chilled water pump by replacing Y-Δ starter

- In chiller evaporator and condenser, shell and tube should be chemical cleaning periodically depend up on ΔT Temperature

- In the process Area, Heat exchange tube should be clean yearly once to maintain better efficiency and save energy.

LIGHTING SYSTEM(17-18)

Sub.: we have changed old type focus lamp and tube light fittings replaced by LED Lamps/fittings

Sl. No.	Type of Light Fittings	Area	Qty. Nos.	T. Power, W
1	LED Down lamp fittings 36W	Ground floor	50	1800W
2	LED Light fittings 22W	Ground floor	30	660W
3	LED 24W Fittings	Hospital	60	1440W
4	2 x 20W Tube Light LED fittings	Hospital & Hostel	200	8000W
5	20W LED Single Fittings	Hospital & Hostel	200	4000W
TOTAL				15900W
				15.9KW

LED Focus and LED Fitting installed in Hospital and hostel. We have saved energy in 265 units per day by running time of 12 hrs per day

Energy savings per year = 95,472 units

Cost savings per year = Rs. 5,01,228.00

DG SET PERFORMANCE

DG set 250 KVA 2nos

- 250kva DG Set –I Generate 3.5 units/Ltr diesel.

- 250kva DG Set –II Generate 3.3 units/Ltr diesel.

- At max load of 160 KW eneration, the efficiency should be 3.8-4 Units/Ltr.

- By service the DG set, Engine can improve in fuel savings.

SOLAR POWER

Proposal Stage – I

- Use 10kW Solar Power for lighting circuit in the office and Hospital area.

Energy Production from Solar in 10kW	=	40 kwh /day
	=	1200 kwh/mth
Cost saving per year	=	Rs. 2,88,000.00
Initial Investment	=	Rs.5,00,000
Payback period	=	1.7 years

RECOMADATION & COMENTS

Sl. No.	Description	RECOMADATION & COMENTS
1	Sanction Load / Connected Load / Maximum Demand	Within Standard Limits
2	Power Factor	To improve 0.96 to 0.99
3	Lighting System	To be Replace By LED Lamps.
4	HVAC	By Cleaning of cooling coil and evaporator coil.
5	Automatic Power Factor Control	to set power factor in controller to be 0.99 Lag
6	Lighting ON / OFF	Timer Relay to be provide
7	AHU and FCU	Running by VFD drive
8	Solar Power	10kW for Light and Fan Load for Stage - 1

ENERGY AUDIT REPORT

for

Sri Lakshmi Narayana Institute of Medical Sciences

OSUDU, AGRAM VILLAGE, VILLIYANUR COMMUNE, KUDAPAKKAM POST,

PUDUCHERRY – 605 502.

FY: (2018 – 2019)

Audited by,

V.Thirunavukkarasu BE, MBA

Certificate No.:4056
Reg No.: EA 6397

SRI GURU ENGINEERS

Plot No.6, Elangoadigal Street, Shanthi Nagar, Lawspet, Puducherry – 605 008.

Ph : 0413 – 2250895 / Cell : 9655828895

ENERGY AUDIT SEQUENCE

TRANSFORMER AND LOAD FACTOR

Transformer Efficiency

Transformer capacity	=	630 KVA
Load Loss (or copper Loss)	=	8034W
No Load Loss (or iron Loss)	=	1200W

Total Loss = No Load Loss + (KVA Load/rated KVA) X Full Load Loss

Total Loss	=	4.1 KW
Efficiency	=	98%

Average KWH/MD/PF 18-19

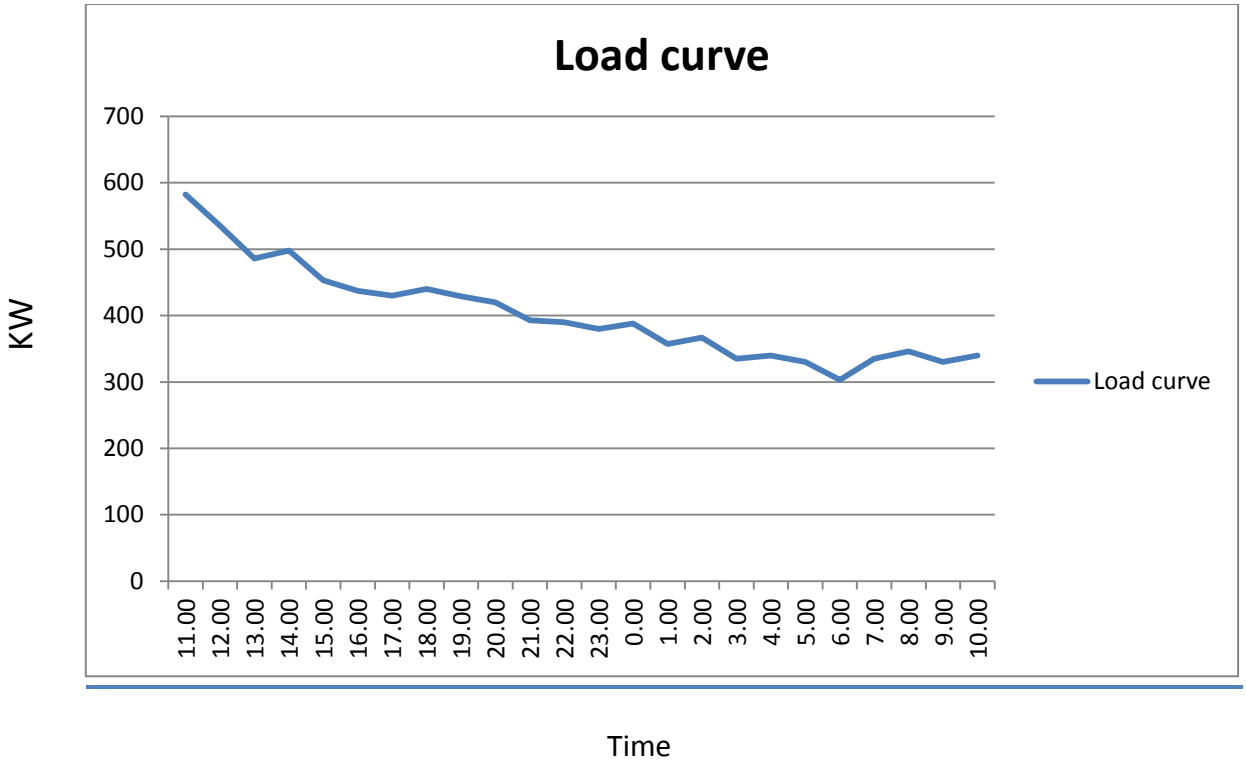
- Transformer capacity = 630 KVA
- Sectioned KVA Demand = 500 KVA
- Recorded Demand Average = 485 KVA
- Recorded KWH Average = 192455
- Recorded PF Average = 0.93

Components of Electricy Billing

- Energy charges (unit. kwh) = 5.25/Kwh
- Maximum Demand Charges = 250/KVA
- Electricity tax 2% on total amount

Daily Load Pattern in Amps. - 24 Hrs (18-19)

Time, Hrs.	KW
11.00	582
12.00	535
13.00	486
14.00	498
15.00	453
16.00	437
17.00	430
18.00	440
19.00	429
20.00	420
21.00	393
22.00	390
23.00	380
00.00	388
01.00	357
02.00	367
03.00	335
04.00	340
05.00	330
06.00	303
07.00	335
08.00	346
09.00	330
10.00	340


Load curve
700
600
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400
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0
11.00
12.00
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18.00
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21.00
22.00
23.00
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
Load curve
KW
Time

POWER FACTOR IMPROVEMENT

Automatic Power Factor Controller installed

Power Factor Setting	=	0.99 Lag
50 KVAr Capacitor	=	6 Nos.
25 KVAr Capacitor	=	4 Nos.

Note: All Capacitors have Individual Control

Total Capacitor Installed	=	400 KVAr.

PF should improve from 0.92 to 0.99 for save maximum demand 40kVA/Month, Monthly cost saving is Rs. 16,800 in monthly EB Bill.

Comments:

The performance of the capacitor should monitor – monthly once, by Record the current reading of individual capacitor unit. If below 50 % of actual current, it should replace by New.

MONTHLY POWER CONSUMPTION FY 18-19

MONTH	KWH	KVAH	P.F	M.D, KVA
April-18	202478	215049	0.94	544
May-18	193962	204622	0.95	500
June-18	207309	217630	0.95	494
July-18	211479	225159	0.94	508
August-18	211499	225880	0.94	518
September-18	191343	205175	0.93	530
October-18	196328	215359	0.92	540
November-18	205194	223741	0.92	475
December-18	166103	180323	0.92	414
January-19	177530	193224	0.92	418
February-19	176579	190392	0.93	440
March-19	169653	199653	0.92	442
AVERAGE	**192455**	**208017**	**0.93**	**485**

HARMONICS STUDY

- Harmonics are created by various device like diodes, silicon controlled rectifiers, PWN systems, thyristors, voltage and current chopping, Saturated and core reactors, induction and arc Furnaces are also deployed for various requirements and due to their varying impedance characteristics the NON LINEAR device can cause distortion in voltage and current wave forms.

- The above devices are not used in our system so that harmonics Frequency may be vary negligible.

HVAC AND REFRIGERATION SYSTEM

- 5 x 5 = 25 TR refrigeration system is running for cooling system.

- Energy saving is possible by VFD system fix in AHU 5 nos.

- In AHU will be running by VFD save energy by 40%.

- All AHU coil and room cooling coil will be cleaning periodically for improve the performance.

LIGHTING SYSTEM(18-19)

Sub.: we have changed old type focus lamp and tube light fittings replaced by LED Lamps/fittings

Sl. No.	Type of Light Fittings	Area	Qty. Nos.	T. Power, W
1	LED Down lamp fittings 36W	Ground floor	60	2160W
2	LED Light fittings 22W	Ground floor	30	660W
3	LED 24W Fittings	Hospital	70	1680W
4	2 x 20W Tube Light LED fittings	Hospital & Hostel	500	20000W
5	20W LED Single Fittings	Hospital & Hostel	200	4000W
TOTAL				28500W
				28.5KW

LED Focus and LED Fitting installed in Hospital and hostel. We have saved energy in 564 units per day by running time of 12 hrs per day

Energy savings per year = 2,03,040 units

Cost savings per year = Rs. 10,65,960.00

DG SET PERFORMANCE

DG set 250 KVA 2nos

- 250kva DG Set –I Generate 3.5 units/Ltr diesel.

- 250kva DG Set –II Generate 3.3 units/Ltr diesel.

- At max load of 160 KW eneration, the efficiency should be 3.8-4 Units/Ltr.

- By service the DG set, Engine can improve in fuel savings.

SOLAR POWER

Proposal Stage – I

- Use 10kW Solar Power for lighting circuit in the office and Hospital area.

Energy Production from Solar in 10kW	=	40 kwh /day
	=	1200 kwh/mth
Cost saving per year	=	Rs. 2,88,000.00
Initial Investment	=	Rs.5,00,000
Payback period	=	1.7 years

RECOMADATION & COMENTS

Sl. No.	Description	RECOMADATION & COMENTS
1	Sanction Load / Connected Load / Maximum Demand	Within Standard Limits
2	Power Factor	To improve 0.96 to 0.99
3	Lighting System	To be Replace By LED Lamps.
4	HVAC	By Cleaning of cooling coil and evaporator coil.
5	Automatic Power Factor Control	to set power factor in controller to be 0.99 Lag
6	Lighting ON / OFF	Timer Relay to be provide
7	AHU and FCU	Running by VFD drive
8	Solar Power	10kW for Light and Fan Load for Stage - 1

ENERGY AUDIT REPORT

for

Sri Lakshmi Narayana Institute of Medical Sciences

OSUDU, AGRAM VILLAGE, VILLIYANUR COMMUNE, KUDAPAKKAM POST,

PUDUCHERRY – 605 502.

FY: (2019 – 2020)

Audited by,

V.Thirunavukkarasu BE, MBA

Certificate No.:4056
Reg No.: EA 6397

SRI GURU ENGINEERS

Plot No.6, Elangoadigal Street, Shanthi Nagar, Lawspet, Puducherry – 605 008.

Ph : 0413 – 2250895 / Cell : 9655828895

ENERGY AUDIT SEQUENCE

TRANSFORMER AND LOAD FACTOR

Transformer Efficiency

Transformer capacity	=	630 KVA
Load Loss (or copper Loss)	=	8034W
No Load Loss (or iron Loss)	=	1200W

Total Loss = No Load Loss + (KVA Load/rated KVA) X Full Load Loss

Total Loss	=	4.1 KW
Efficiency	=	98%

Average KWH/MD/PF 19-20

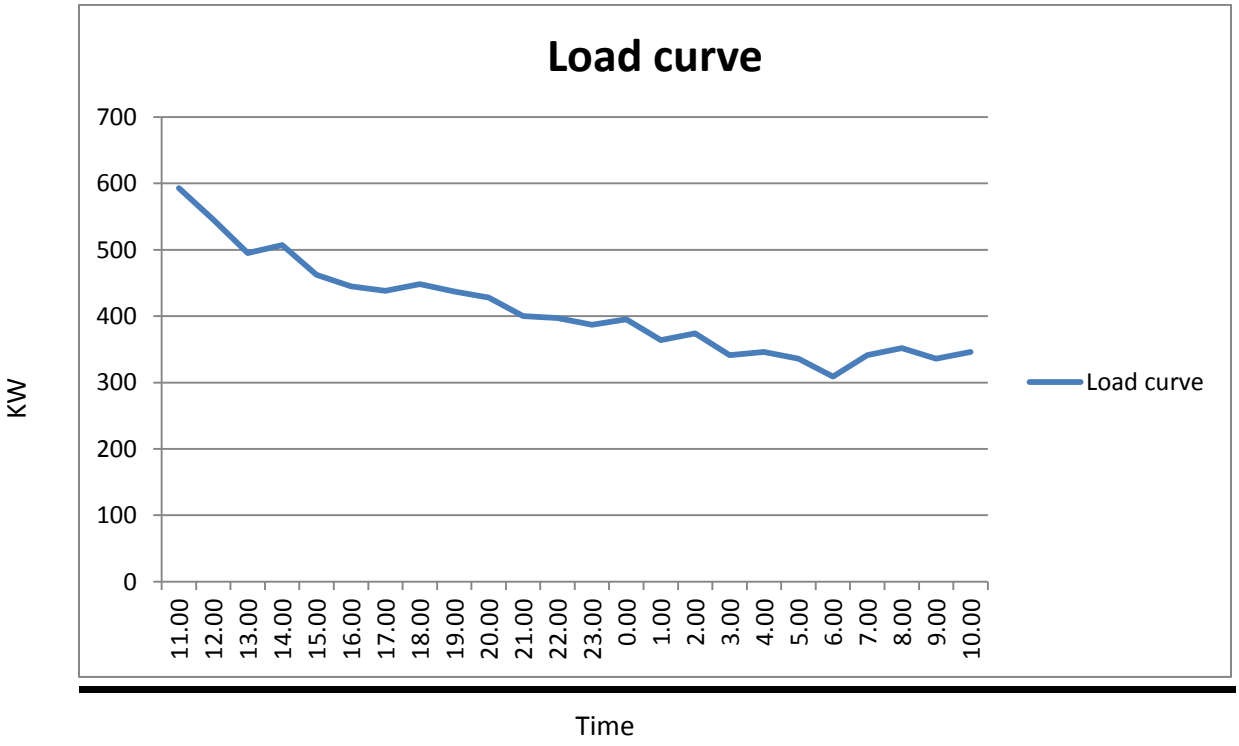
- Transformer capacity = 630 KVA
- Sectioned KVA Demand = 500 KVA
- Recorded Demand Average = 485 KVA
- Recorded KWH Average = 198407
- Recorded PF Average = 0.93

Components of Electricy Billing

- Energy charges (unit. kwh) = 5.45/Kwh
- Maximum Demand Charges = 420/KVA
- Electricity tax 2% on total amount

Daily Load Pattern in Amps. - 24 Hrs (19-20)

Time, Hrs.	KW
11.00	593
12.00	545
13.00	495
14.00	507
15.00	462
16.00	445
17.00	438
18.00	448
19.00	437
20.00	428
21.00	400
22.00	397
23.00	387
00.00	395
01.00	364
02.00	374
03.00	341
04.00	346
05.00	336
06.00	309
07.00	341
08.00	352
09.00	336
10.00	346


Load curve
700
600
500
400
300
200
100
0
KW
11.00
12.00
13.00
14.00
15.00
16.00
17.00
18.00
19.00
20.00
21.00
22.00
23.00
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
Time
Load curve

POWER FACTOR IMPROVEMENT

Automatic Power Factor Controller installed

Power Factor Setting	=	0.99 Lag
50 KVAr Capacitor	=	6 Nos.
25 KVAr Capacitor	=	4 Nos.

Note: All Capacitors have Individual Control

Total Capacitor Installed	=	400 KVAr.

PF should improve from 0.96 to 0.99 for save maximum demand 40kVA/Month, Monthly cost saving is Rs. 16,800 in monthly EB Bill.

MONTHLY POWER CONSUMPTION FY 19-20

MONTH	KWH	KVAH	P.F	M.D, KVA
April-19	208740	221700	0.94	544
May-19	199960	210950	0.95	500
June-19	213720	224360	0.95	494
July-19	218020	231700	0.94	508
August-19	218040	232860	0.94	518
September-19	197260	211520	0.93	530
October-19	202400	221710	0.92	540
November-19	211540	230660	0.92	474
December-19	171240	185900	0.92	414
January-20	183020	199200	0.92	418
February-20	182040	196280	0.93	440
March-20	174900	189540	0.92	442
AVERAGE	**198407**	**213032**	**0.93**	**485**

HARMONICS STUDY

- Harmonics are created by various device like diodes, silicon controlled rectifiers, PWN systems, thyristors, voltage and current chopping, Saturated and core reactors, induction and arc Furnaces are also deployed for various requirements and due to their varying impedance characteristics the NON LINEAR device can cause distortion in voltage and current wave forms.

- The above devices are not used in our system so that harmonics Frequency may be vary negligible.

HVAC AND REFRIGERATION SYSTEM

- 5 x 5 = 25 TR refrigeration system is running for cooling system.

- Energy saving is possible by VFD system fix in AHU 5 nos.

- In AHU will be running by VFD save energy by 40%.

- All AHU coil and room cooling coil will be cleaning periodically for improve the performance.

LIGHTING SYSTEM(19-20)

Sub.: we have changed old type focus lamp and tube light fittings replaced by LED Lamps/fittings

Sl. No.	Type of Light Fittings	Area	Qty. Nos.	T. Power, W
1	LED Down lamp fittings 36W	Ground floor	100	3600W
2	LED Light fittings 22W	Ground floor	50	1100W
3	LED 24W Fittings	Hospital	50	1200W
4	2 x 20W Tube Light LED fittings	Hospital & Hostel	500	20000W
5	20W LED Single Fittings	Hospital & Hostel	200	4000W
TOTAL				29900W
				29.9KW

LED Focus and LED Fitting installed in Hospital and hostel. We have saved energy in 613 units per day by running time of 12 hrs per day

Energy savings per year = 2,20,752 units

Cost savings per year = Rs. 11,58,948.00

DG SET PERFORMANCE

DG set 250 KVA 2nos

- 250kva DG Set –I Generate 3.5 units/Ltr diesel.

- 250kva DG Set –II Generate 3.3 units/Ltr diesel.

- At max load of 160 KW eneration, the efficiency should be 3.8-4 Units/Ltr.

- By service the DG set, Engine can improve in fuel savings.

SOLAR POWER

Proposal Stage – I

- Use 10kW Solar Power for lighting circuit in the office and Hospital area.

Energy Production from Solar in 10kW	=	40 kwh /day
	=	1200 kwh/mth
Cost saving per year	=	Rs. 2,88,000.00
Initial Investment	=	Rs.5,00,000
Payback period	=	1.7 years

RECOMADATION & COMENTS

Sl. No.	Description	RECOMADATION & COMENTS
1	Sanction Load / Connected Load / Maximum Demand	Within Standard Limits
2	Power Factor	To improve 0.96 to 0.99
3	Lighting System	To be Replace By LED Lamps.
4	HVAC	By Cleaning of cooling coil and evaporator coil.
5	Automatic Power Factor Control	to set power factor in controller to be 0.99 Lag
6	Lighting ON / OFF	Timer Relay to be provide
7	AHU and FCU	Running by VFD drive
8	Solar Power	10kW for Light and Fan Load for Stage - 1

ENERGY ADUIT REPORT

for

Sri Lakshmi Narayana Institute of Medical Sciences

OSUDU, AGARAM VILLAGE,VILLIANUR COMMUNE,KUDAPAKKAM POST,

PUDUCHERRY – 605 502.

Dated on

23 JULY 2021

Audited by,

V. Thirunavukkarasu BE, MBA

Certificate No.: 4056
Reg. No.: EA 6397

SRI GURU ENGINEERS

Plot No.6, Elangoadigal Street, Santhi Nagar, Lawspet,Puducherry – 605 008.

Ph : 0413-2250895 / Cell : 9655828895

ENERGY AUDIT SEQUENCE

TRANSFORMER AND LOAD FACTOR

Transformer Efficiency

Total Loss at 50% Load	=	5302W
Total Loss at 100% Load	=	15750W
Transformer Efficiency at 50%	=	99%

Average KWH/MD/PF

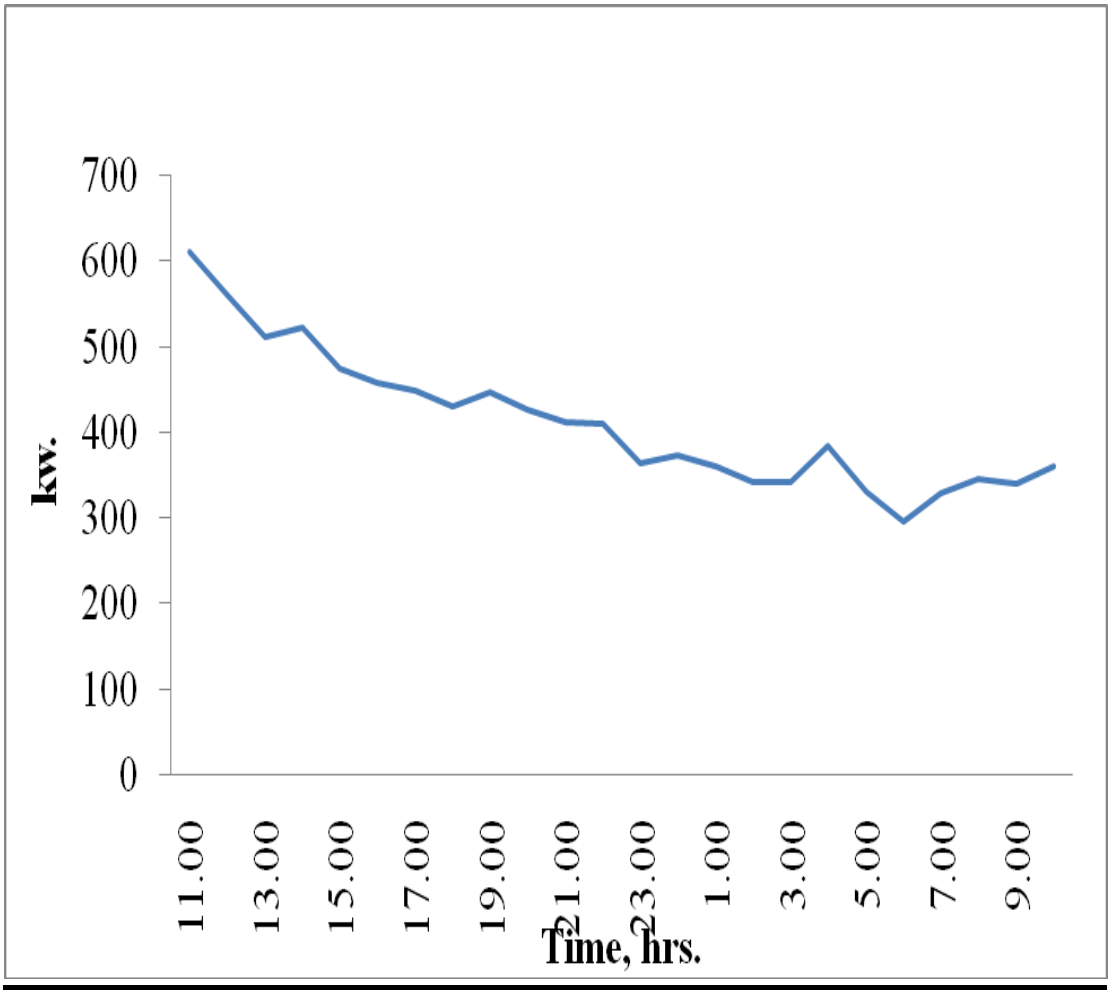
Transformer capacity	=	2000 KVA
Sanctioned KVA Demand	=	1250 KVA
Recorded Demand Average	=	472 KVA
Recorded KWH Average	=	189921
Recorded PF Average	=	0.92 Lag

Component of Electricity Billing

Energy charges (unit.kwh) Billing)	=	Rs.5.45/KWH (As per
Max Demand Charges	=	Rs.420/KVA
BPSC Charge 2%	=	Bill Amount X 2% X no of days / 30

Daily Load Pattern in kw - 24 Hrs	
Time	**KW**
11.00	610
12.00	561
13.00	510
14.00	522
15.00	474
16.00	457
17.00	447
18.00	430
19.00	446
20.00	426
21.00	411
22.00	410
23.00	363
0.00	373
1.00	359
2.00	341
3.00	341
4.00	384
5.00	330
6.00	295
7.00	329
8.00	344
9.00	340
10.00	360

LOAD CURVE


700
600
500
400
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200
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0
kw.
11.00
13.00
15.00
17.00
19.00
21.00
23.00
1.00
3.00
5.00
7.00
9.00
Time, hrs.

POWER FACTOR IMPROVEMENT

Automatic Power Factor Controller installed

Power Factor Setting	=	0.99 Lag
50 KVAr Capacitor	=	6 Nos.
25 KVAr Capacitor	=	4 Nos.

Note: All Capacitors have Individual Control

Total Capacitor Installed = 400 KVAr.

PF should improve from 0.92 to 0.99 for save maximum demand 40kVA/Month, Monthly cost saving is Rs. 16800 in monthly EB Bill.

Comments:

The performance of the capacitor should monitor – monthly once, by Record the current reading of individual capacitor unit. If below 50 % of actual current, it should replace by New.

Monthly Power Consumption F.Y. 20-21

MONTH	KWH	KVAH	P.F	M.D, KVA
April-20	153120	164420	0.93	414
May-20	172500	184780	0.93	408
June-20	160680	173580	0.93	416
July-20	150700	164180	0.92	380
August-20	152500	164800	0.93	386
September-20	182960	199720	0.92	512
October-20	229440	252140	0.91	506
November-20	160120	178020	0.9	492
December-20	219060	242540	0.9	428
January-21	219720	240880	0.91	514
February-21	207620	224460	0.92	576
March-21	270640	290080	0.93	636
AVERAGE	**189921**	**206633**	**0.92**	**472**

HARMONICS STUDY

- Harmonics are created by various device like diodes, silicon controlled rectifiers, PWN systems, thyristors, voltage and current chopping, Saturated and core reactors, induction and arc Furnaces are also deployed for various requirements and due to their varying impedance characteristics the NON LINEAR device can cause distortion in voltage and current wave forms.

- The above devices are not used in our system so that harmonics Frequency may be vary negligible.

HVAC AND REFRIGERATION SYSTEM

- 5 x 5 = 25 TR refrigeration system is running for cooling system
- Energy saving is possible by VFD system fix in AHU 5 nos.
- In AHU will be running by VFD save energy,

LIGHTING SYSTEM

Sub.: we have changed old type CFL/FOCUS lamp and tube light fittings replaced by LED Lamps/fittings

Sl. No.	Type of Light Fittings	Area	Qty. Nos.	T. Power, W
1	LED Down Lamp fittings 36W	Ground floor	380	1368W
2	LED Light fittings 22W	Ground floor	133	2926W
3	LED 24W Fittings	Hospital	295	7080W
4	2 x 20W Tube Light LED fittings	Hospital & Hostel	3000	120000W
5	20W LED Single Fittings	Hospital & Hostel	1100	22000W
6	10W LED Bulb	Hospital & Hostel	60	600W

Total KW = 264

LED Focus and LED tube light fittings installed in Hospital & College Hostel area. We have saved energy in 167 units per day.

Energy savings per year = 60,120 units

Cost savings per year = Rs.300600

DG SET PERFORMANCE

DG set 250 KVA 2nos

- 250kva DG Set-I Generate 3.5 units/Ltr diesel.

- 250kva DG set –II Generate 3.3 units/Ltr diesel.

- At max Load of 160 KW generation, the efficiency should be 3.8-4 Units/Ltr.

- By service the DG set, Engine can improve in fuel savings.

SOLAR POWER

Proposal Stage – I

1. Use 10kW Solar Power for lighting circuit in the office and Hospital

Energy Production from Solar in 10kw	=	80 kwh /day
	=	2400 kwh/mth
Cost saving per year	=	Rs. 156960
Initial Investment	=	Rs.5,00,000
Pay back period	=	3 years

2. Solar Heater Installed 50LPH capacity 10 Nos

The replacement of electrical heaters.

The saving of 70 Kwh/day

Monthly saving = 70 x 30 = 2100 Units.

Yearly power saving = 25200 Units

Cost Saving = 137340/-

3. Solar street Light 24W Installed 30 nos for the replacement of 150w Focus Lamps.

The energy saving = 37.8 Units per day x 30 days = 1134 Units

Yearly savings = 13608 Units

Yearly Cost savings = Rs.73483

RECOMADATION & COMENTS

Sl. No.	Description	RECOMADATION & COMENTS
1	Sanction Load / Connected Load / Maximum Demand	With in Standard Limits
2	Power Factor	To improve 0.96 to 0.99
3	Lighting System	To be Replace By LED
4	HVAC	By Cleaning of Heart Exchanger Yearly Once.
5	Automatic Power Factor Control	to set power factor in controller to be 0.99 Lag
6	Lighting ON / OFF	Timer Relay to be provide
7	Solar Power	10kW for Light and Fan Load for Stage - 1

Environmental audit Report 2019-2020

A Nation's growth starts from its educational institutions, where the ecology is taught as a prime factor of development associated with environment. A clean and healthy environment aids effective learning and provides a conducive learning environment. Educational institutions now a day are becoming more sensitive to environmental factors and more concepts are being introduced to make them eco-friendly. To preserve the environment within the campus, various viewpoints are applied by the several educational institutes to solve their environmental problems such as promotion of the energy savings, recycle of waste, water reduction, water harvesting etc...

The activities pursued by colleges can also create a variety of adverse environmental impacts. Environmental auditing is a process whereby an organization's environmental performance is tested against its environmental policies and objectives. Environmental Green audit is defined as an examination of the effects a college has on the environment. As a part of such practice, internal Environmental audit (Green Audit) is conducted to evaluate the actual scenario at the campus.

Environmental audit can be a useful tool for a college to determine how and where they are using the most energy or water or resources; the college can then consider how to implement changes and make savings. It can also be used to determine the type and volume of waste, which can be used for a recycling project or to improve waste minimization plan. Environmental auditing and the implementation of mitigation measures is a win-win situation for the college, the learners and the planet. It can also create health consciousness and promote environmental awareness, values and ethics. It provides staff and students better understanding of Green impact on campus. Environmental auditing promote financial savings through reduction of resource use. It gives an opportunity for the development of ownership, personal and social responsibility for the students and teachers. If self-enquiry is a natural and necessary outgrowth of a quality education, it could also be stated that institutional self-enquiry is a natural and necessary outgrowth of a quality educational institution. Thus it is imperative that the college evaluate its own contributions toward a sustainable future. 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.

In BIHER Deemed to be University, the audit process involved initial interviews with management to clarify policies, activities, records and the co-operation of staff and students in the implementation of mitigation measures. This was followed by staff and student interviews, collection of data through the questionnaire, review of records, observation of practices and observable outcomes. In addition, the approach ensured that the management and staff are active participants in the green auditing process in the college.

The baseline data prepared for the BIHER Deemed to be University will be a useful tool for campus overall improvement, resource management, planning of future projects, and a document for implementation of sustainable development of the college. Existing data will allow the college to compare its programs and operations with those of peer institutions, identify areas in need of improvement, and prioritize the implementation of future projects. We expect that the management will be committed to implement the green audit recommendations.

We are happy to submit this Environmental audit report to the IQAC- BIHER

Contents

List of Tables:

List of Abbreviations:

QMS	-	Quality Management System
NAAC	-	National Assessment and Accreditation Council
KLD	-	Kilo Liters per Day
OHT	-	Over Head Tank
LTR	-	Liter
STP	-	Sewage Treatment Plant
TNPCB	-	Tamil Nadu Pollution Control Board

1 CHAPTER

1.1 Introduction

BIHER had a humble beginning in the year 1992 .The National Assessment and Accreditation Council (NAAC) an autonomous institution of the University Grants Commission has assessed BIHER and accredited with A Grade during 2015. The accreditation is an indication of standards of quality as set by the NAAC and valid for a period of five years. Education at BIHER caters to the comprehensive development of all its students so as to make them better educated, more articulate and demanding. To that end is enabled and inculcated by modern teaching aids, well equipped workshops for practical training, Engineering workshop for hands on training on auxiliaries, , well furnished hostel, canteen facilities, indoor and outdoor games, swimming pool, medical facilities backed by an overall conducive learning environment.

For over two decades BIHER is remaining as the favourite destination for campus interviews by many tech giants such as Infosys, TCS, BOSCH, L&T ,ABB, and so goes a list of over 100 companies. Besides positions onboard,BIHER Business school graduates have secured lucrative jobs in commercial sectors. They also glow in their career swiftly. Needless to say about the entrepreneurship development activities nurtured into BIHER'ians has been found rewarding by students who are chief executive officers of their own organization.

12 Vision

- Bharath Institute of Higher Education & Research (BIHER) envisions and constantly strives to provide an excellent academic and research ambience for students and members of the faculties to acquire professional competence along with human dignity, and spearhead the transformation of community through continuous discovery in science and technology.

13 Mission

- To develop as a Premier University for Teaching, Learning, Research and Innovation on par with leading global universities.

- To impart education and training to students for creating a better society with ethics and morals.
- To foster an interdisciplinary approach in education, research and innovation by supporting lifelong professional development, enriching knowledge banks through scientific research, promoting best practices and innovation, industry-driven and institute-oriented cooperation, globalization and international initiatives.
- To develop as a multi-dimensional institution contributing immensely to the cause of societal advancement through spread of literacy, an ambience that provides the best of international exposures, provide health care, enrich rural development and most importantly impart value-based education.
- To establish benchmark standards in professional practice in the fields of innovative and emerging areas in medicine, dentistry, nursing, physiotherapy, allied sciences, engineering, and management.
- To launch new programmes with innovative curriculum design by provide multi-faceted exposure in various subjects.
- To provide flexibility to students - options / add-ons to core subjects, develop Device Agnostic Technology to access online content

1.4 Funding / incubation entrepreneurial ideas, Flipped class room – Integrated Courses & Need based learning

1.5 .Mission

To deliver technical knowledge and ethical values with uncompromising strides of excellence that will make our students employable, our faculty advance their knowledge, our staff achieve excellence and our alumni become global leaders.

1.6 Quality Policy

BIHER is committed to provide highest quality in education and be the most preferred institution for pursuing Engineering related Programmes.

This will be achieved by consistent focus on:

1. Providing a conducive, vibrant, progressive and enriching learning environment.

2. Teaching Excellence and Research output
3. Global outlook and engaging with the world through learning, teaching and research
4. Attracting the best and the brightest students.
5. Providing competitive advantage in gaining employment or further academic opportunities.
6. Maintaining excellent links with commerce and industry both nationally and internationally.
7. Complying with all applicable requirements and continually improving the effectiveness of the Quality Management system.

1.6 The advice rendered by audit on Environmental Solution is in the nature of guidelines based on good engineering practices and generally accepted safety procedures

- Secure the environment and reduce the potential threats to human health
- To ensure the rules and regulations are followed as per requirement/ university guidelines.
- To avoid the interruptions in environment that are more difficult to handle and their correction requires high cost
- To create and maintain best practices for sustainable development.
- To promote eco-friendly initiatives.
- To comply the provisions of Environment Protection Act,1986 that every establishment shall have the environmental audit

1.9 Core Environmental Compliance & Remediation Services

Environmental audit helps our university to advance environmental sustainability, maintain environmental compliance, and reduce environmental risk and cleanup sites by providing a diverse set of core services including:

- Environmental Compliance
- Air Emission Inventories and Reporting
- Air Quality and Clean Air Act Compliance
- Environmental Due Diligence
- Environmental Impact Assessment
- Site Investigation and Feasibility Studies
- EHS Audits & Training Environmental Management System and Compliance Auditing
- Environmental Monitoring
- Groundwater and Subsurface Investigations
- Green Audit
- Soil Management Plans
- Hazardous and Solid Waste Management Plans
- Remedial Design and Monitoring
- Brownfield Cleanup
- Pollution Prevention Plans
- Environmental, Health and Safety Plans
- Hydro geological studies

2 CHAPTER

2.1 Pre-Audit Stage

A pre-audit meeting provided an opportunity to reinforce the scope and objectives of the audit and discussions were held on the practicalities associated with the audit. This meeting is an important prerequisite for the green audit because it is the first opportunity to meet the expert and deal with any concerns. It was held at BIHER Deemed to be University, Chennai. The meeting was an opportunity to gather information that the Environment audit team can study before arriving on the site. The audit protocol and audit plan was handed over at this meeting and discussed in advance of the audit itself.

In BIHER Deemed to be University pre-audit meeting was conducted successfully and necessary documents were collected directly from the college before the initiation of the audit processes. Actual planning of audit processes was discussed in the pre-audit meeting. Environment audit Team was also selected in this meeting with the help of staff and the college management. The audit protocol and audit plan were handed over at this meeting and discussed in advance of the audit itself. The Environment audit team team worked together, under the leadership of the lead auditor, to ensure completion within the brief and scope of the audit.

2.2 Scope and Goals of Environmental Auditing

A clean and healthy environment aids effective learning and provides a conducive learning environment. There are various efforts around the world to address environmental education issues. **Environmental** Audit is the most efficient and ecological way to manage environmental problems. It is a kind of professional care which is the responsibility of each individual who are the part of economic, financial, social, environmental factor. It is necessary to conduct green audit in college campus because students become aware of the **Environmental** audit, its advantages to save the planet and they become good citizen of our country. Thus

Green audit becomes necessary at the college level.

A very simple indigenized system has been devised to monitor the environmental performance of BIHER Deemed to be University. It comes with a series of questions to be answered on a regular basis. This innovative scheme is user friendly and totally voluntary.

The aim of this is to help the Institution to set environmental examples for the community, and to educate the young learners.

2.3 Benefits of the Environmental Auditing

- ✓ More efficient resource management
- ✓ To provide basis for improved sustainability
- ✓ To create a green campus
- ✓ To educate sustainable goals
- ✓ To enable waste management through reduction of waste generation, E-Waste management, solid- waste and water recycling
- ✓ To create plastic free campus and evolve health consciousness among the stakeholders
- ✓ Recognize the cost saving methods through waste minimizing and managing
- ✓ Point out the prevailing and forthcoming complications
- ✓ Authenticate conformity with the implemented laws
- ✓ Empower the organizations to frame a better environmental performance
- ✓ Enhance the alertness for environmental guidelines and duties
- ✓ Impart environmental education through systematic environmental management approach and Improving environmental standards
- ✓ Benchmarking for environmental protection initiatives
- ✓ Financial savings through a reduction in resource use
- ✓ Development of ownership, personal and social responsibility for the College and its environment

- ✓ Enhancement of college profile
- ✓ Developing an environmental ethic and value systems in youngsters.
- ✓ Green auditing should become a valuable tool in the management and monitoring of environmental and sustainable development programs of the college.

1. Data Collection – In preliminary data collection phase, exhaustive data collection was performed using different tools such as observation, survey communicating with responsible persons and measurements. Following steps were taken for data collection:

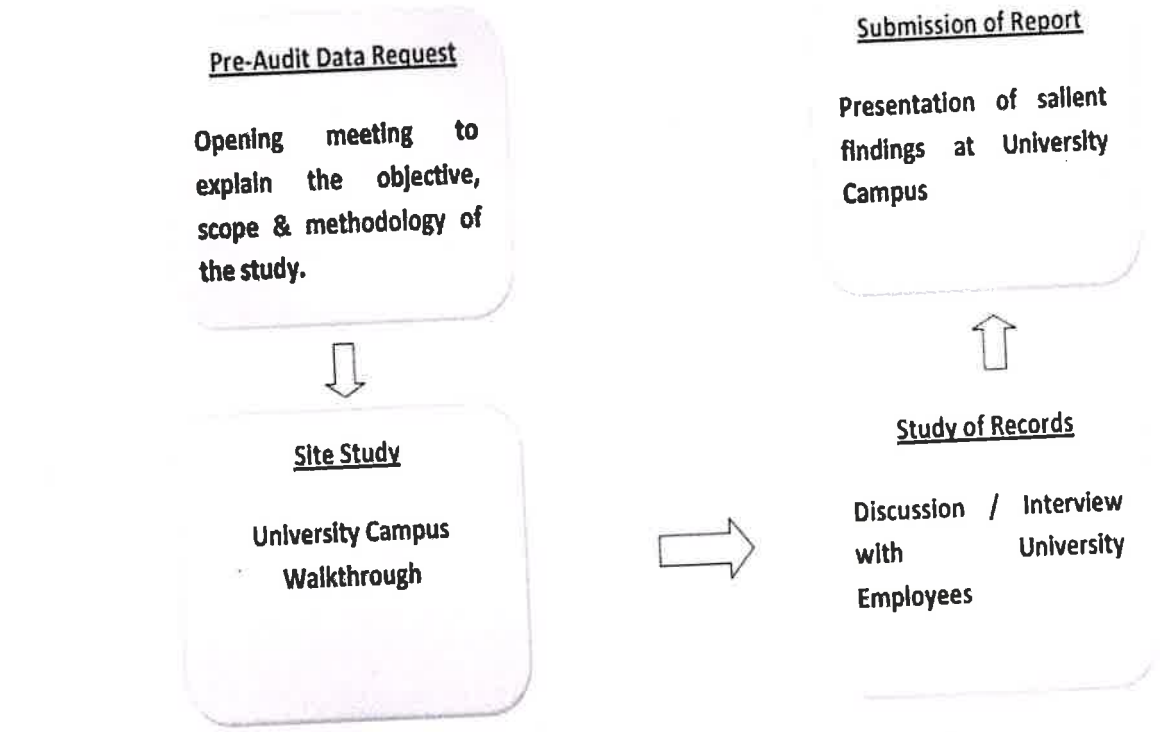
The team went to each department, centers, Library, canteen etc.

Data about the general information was collected by observation and interview.

The power consumption of appliances was recorded by taking an average value in some cases.

2. Data Analysis - Data related to water usages,wastages and pollution were also analyzed using appropriate methodology.

3. Recommendation/Suggestions– On the basis of results of data analysis and observations, some steps for reducing water consumption were recommended. Proper treatments for waste were also suggested. Use of fossil fuels has to be reduced for the sake of community health. The above target areas particular to the college was evaluated through questionnaire circulated among the students for data collection. Five categories of questionnaires were distributed. The formats of these are given below



3 CHAPTER
Survey Forms

3.1 Auditing for Water Management

1) List uses of water in your college.
2) What are the sources of water in your college?
3) How many wells are there in your college?
4) No. of motors used for pumping water from each well?
5) What is the total horse power of each motor?
6) What is the depth of each well?
7) What is the present depth of water in each well?
8) How does your college store water?
9) Quantity of water stored in your overhead water tank? (in liters)
10) Quantity of water pumped every day? (in liters)
11) If there is water wastage, specify why.
12) How can the wastage be prevented /stopped?
13) Locate the point of entry of water and point of exit of waste water in your college.
14) Where does waste water come from?
15) Where does the waste water go?
16) What are the uses of waste water in your college?
17) What happens to the water used in your labs? Whether it gets mixed with groundwater?
18) Is there any treatment for the lab water?
19) Whether green chemistry methods are practiced in your labs?
20) Write down four ways that could reduce the amount of water used in your college.
21) Record water use from the college water meter for six months.
22) Bimonthly water charges paid to water connections if any,

23) No. of water coolers. Amount of water used per day? (in liters)

25) No. of water taps. Amount of water used per day? No. of bath rooms in staff rooms, common, hostels amount of water used per day?

26) No. of toilet, urinals. Amount of water used per day?

27) No. of water taps in the canteen. Amount of water used per day?

28) Amount of water used per day for garden use.

29) No. of water taps in laboratories. Amount of water used per day in each lab?

30) Total use of water in each hostel?

31) At the end of the period, compile a table to show how many liters of water have been used in the college for each purpose

32) Is there any water used for agricultural purposes?

33) Does your college harvest rainwater?

34) If yes, how many rain water harvesting units are there? (Approx. amount)

35) How many of the taps are leaky? Amount of water lost per day?

36) Are there signs reminding people to turn off the water? Yes /No

37) Is there any water less toilets?

38) How many water fountains are there?

39) How many water fountains are leaky?

40) Is drip irrigation used to water plants outside? YES/NO

41) How often is the garden watered?

42) Quantity of water used to watering the ground?

43) Quantity of water used for bus cleaning? (liters per day)

44) Amount of water for other uses? (items not mentioned above)

45) Area of the college land without tree/building canopy.

46) Is there any water management plan in the college?

47) Are there any water saving techniques followed in your college? What are they?

48) Please share some idea for how your college could save more water.

3.2 Auditing for Waste Management

1) What is the total strength of students, teachers and Non teaching staff in your

college?

2) Does your college generate any waste?

3) If so, what are they? How much quantity? Number or weight

- E-waste
- Solid waste
- Dry leaves
- Canteen waste
- Liquid waste
- Glass
- Unused equipment
- Medical waste if any Napkins

Others (Specify)

4) Is there any waste treatment system in the college?

5) Is there any treatment for toilet/urinal/sanitary napkin waste?

6) What is the approximate quantity of waste generated per day? (In Kilograms)

7) Why waste is a problem?

8) Whether waste is polluting ground/surface water? How?

9) Whether waste is polluting the air of the college? How?

10) How is the waste generated in the college managed? Methods

- Composting
- Recycling
- Reusing
- Others (specify)

11) waste segregation and recycling campaign?

12) What should be the use for each box? (Develop a color code with reasons)

11) How many separate boxes do you think you would need to put into a classroom to start a

1) Who is in charge of gardens in your college?

2) Are you using any type of recycled water in your garden?

13) List the name and quantity of pesticides and fertilizers used in your gardens Do you use recycled paper in College?

14) Is there any waste wealth program practiced in the college?

15) How would you spread the message of recycling to others in the community? Have you taken any initiatives? If yes, please specify.

16) Can you achieve zero garbage in your college? (Reduce ,Recycle, Reuse, Refuse) If yes, how?

4 CHAPTER

4.1 Audit Stage

In BIHER Deemed to be University, Chennai green auditing was done with the help of Environment audit team Environmental Solutions LLP involving different student groups, teaching and non- teaching staff. The green audit began with the teams walking through all the different facilities at the college, determining the different types of appliances and utilities (lights, taps, toilets, fridges, etc.) as well as measuring the usage per item (Watts indicated on the appliance or measuring water from a tap) and identifying the relevant consumption patterns (such as how often an appliance is used) and their impacts. The staff and learners were interviewed to get details of usage, frequency or general characteristics of certain appliances. Data collection was done in the sectors such as, Waste, Greening, Carbon footprint and Water use. College records and documents were verified several times to clarify the data received through survey and discussions

- **Involvement of Student Clubs and Forums**
- **Site inspection**
- **Interviews**
- **Review of Documents and Records**
- **Review of Policies**

5 CHAPTER

OBSERVATIONS AND RECOMMENDATIONS

5.1 Water Management

A water audit is a systematic review of a site that identifies the quantities and characteristics of all water uses. The overall objective of conducting a water audit is to identify opportunities to preserve and save water more efficiently. Water audit for water utility refers to tracking, assessing and validating all components of flow from the site of withdrawal or treatment through the water distribution system and into the consumer's properties. The principles of circular economy defined to have better water usage, treatment, Recycling and Conservation. The institutional awareness on establishing water quality and effluent standards, as well as monitoring waste water quality, prosecuting offenders are part of the implementation. Data related the water audit is collected by circulating questionnaires, to the management. It includes Bathroom, Toilet, Laboratory, Kitchen, Garden, Shower, Drinking, Washing, etc. sites in college campus and water consumption on these sites were studied. According to Water Quality measurements the water Quality parameterss were found within the prescribed limit of BIS. So the water is safe and suitable for drinking purpose. RO plants are also installed for purification of water.

WATER QUALITY MEASUREMENT-BIST

Sl.no	Parameters	Acceptable limits	Open Well water	Bore well water
1	pH	6.5-8.5	7.2	7.1
2	Alkalinity(mg/l)	200	185	180
3	Hardness(mg/l)	200	250	220
4	TDS(mg/l)	500	550	600
5	Flouride(mg/l)	1.0	1.5	0.6
6	Iron(mg/l)	0.3	1	35
7	Nitrate(mg/l)	45	37	42
8	Ammonia(mg/l)	0.5	0.6	0.8
9	Nitrite(mg/l)	10	0.5	0.5
10	Phosphate(mg/l)	0.1	0.2	0.5

WATER QUALITY MEASUREMENT-SBDCH

Sl.no	Parameters	Acceptable limits	Open Well water	Bore well water
1	pH	6.5-8.5	7.2	7.1
2	Alkalinity(mg/l)	200	185	180
3	Hardness(mg/l)	200	250	220
4	TDS(mg/l)	500	550	600
5	Flouride(mg/l)	1.0	1.5	0.6
6	Iron(mg/l)	0.3	1	35
7	Nitrate(mg/l)	45	37	42
8	Ammonia(mg/l)	0.5	0.6	0.8
9	Nitrite(mg/l)	10	0.5	0.5
10	Phosphate(mg/l)	0.1	0.2	0.5
11	Electrical conductivity(µs /cm)	0.5	0.5	0.4

WATER QUALITY MEASUREMENT-BIHER NURSING

Sl.no	Parameters	Acceptable limits	Open Well water	Bore well water
1	pH	6.5-8.5	7.4	7.1
2	Alkalinity(mg/l)	200	210	180
3	Hardness(mg/l)	200	260	230
4	TDS(mg/l)	500	580	620
5	Flouride(mg/l)	1.0	1.9	0.7
6	Iron(mg/l)	0.3	2	2.4
7	Nitrate(mg/l)	45	38	43
8	Ammonia(mg/l)	0.5	0.4	0.7
9	Nitrite(mg/l)	10	0.4	0.6
10	Phosphate(mg/l)	0.1	0.3	0.7
11	Electrical conductivity(µs /cm)	0.5	0.6	0.5

WATER QUALITY MEASUREMENT-BIHER SLIMS

Sl.no	Parameters	Acceptable limits	Open Well water	Bore well water
1	pH	6.5-8.5	7.4	7.1
2	Alkalinity(mg/l)	200	210	180
3	Hardness(mg/l)	200	260	230
4	TDS(mg/l)	500	580	620
5	Flouride(mg/l)	1.0	1.9	0.7
6	Iron(mg/l)	0.3	2	2.4
7	Nitrate(mg/l)	45	38	43
8	Ammonia(mg/l)	0.5	0.4	0.7
9	Nitrite(mg/l)	10	0.4	0.6
10	Phosphate(mg/l)	0.1	0.3	0.7
11	Electrical conductivity(µs /cm)	0.5	0.6	0.5

WATER QUALITY MEASUREMENT-BIHER Balaji medical college

Sl.no	Parameters	Acceptable limits	Open Well water	Bore well water
1	pH	6.5-8.5	7.4	7.1
2	Alkalinity(mg/l)	200	210	180
3	Hardness(mg/l)	200	260	230
4	TDS(mg/l)	500	580	620
5	Flouride(mg/l)	1.0	1.9	0.7
6	Iron(mg/l)	0.3	2	2.4
7	Nitrate(mg/l)	45	38	43
8	Ammonia(mg/l)	0.5	0.4	0.7
9	Nitrite(mg/l)	10	0.4	0.6
10	Phosphate(mg/l)	0.1	0.3	0.7
11	Electrical conductivity(µs /cm)	0.5	0.6	0.5

Table 4: OHT/SUMP Details

Sl. NO	BLOCK	CAPACITY in LTR
1	Main Block	200000
2		20000 R.0
3	SR Block	20,000
4	KS Block	5000
5	SM Block	5000 R0
6		5000 R0
7	JK Block	20,000
8		20,000
9	MBA block	20,000
10		20,000
11	SA Block	5,000
12		2000 R.0
13	Ganga - Hostel	20,000
14		20,000
15		5000 STP
16	GODAVERI Hostel	80000
17		40000
18		5000 R.0
19		5000 R.0
26	Swimming Pool	5,000

5.1.3 Water cooler

Table 5: Number of Water Cooler Details

SL.NO	Location	No's
1	❖ Main Block	6
2	❖ JK Block	5
3	❖ SR Block	5
4	❖ KS Block	4
5	❖ SM Block	5
6	❖ SH Block	7
7	❖ MBA block	7
8	❖ SA Block	2
9	❖ GANGA Hostel	10
10	❖ GODAVERI Hostel	10
	Grand Total	61

Restrooms, Urinals, Bath rooms, Wash basin

Academic Block

Table 6: List of Restrooms, Urinals, Bath Rooms and Wash Basin

SL. No	BLOCK	GENTS	LADIES	WASH BASIN	URINALS
1	❖ Main Block	6	2	33	4
2	❖ JK Block	6	1		4
3		6	1		5
4		6	2		5
5	❖ SM Block	3		17	4
6	❖ SH Block	2	1		7
7		1	1		6
8		2	1		6
9		2	1		5
10	❖ SR Block	8		15	4
11	❖ KS Block	5	1		5
12		5	2		5
13	❖ MBA block	3	1	15	5
14		2	1		4
15	❖ GANGA Hostel	10	2		4
16	❖ GODAVERI Hostel	2	2		5
17		2	1		3
18		2	1		4

Table 7: Treated Water Test Result

5 SL.NO	Parameters	Results	TNPCB Limits
1	pH	7.44	5.5-9
2	TSS	10	30
3	TDS	1380	2100
4	COD	64	250
5	BOD	7	20
6	Chlorides	358	1000
7	Sulphates	118	1000
8	Oil and Grease	<1.0	10

Rain Water Harvesting

Water conservation is implemented on different levels in the college from rain water harvesting, tree plantation to maintain the underground water levels to recycling the water for gardening purposes and many more. Rainwater harvesting is a conservation process used for many drives and for the future needs. The college has set-up the rain harvesting unit in all the blocks within the college campus and hostels. The conserved rain water serves as a secondary source of water. The college adapted several rain water harvesting methods according to the government norms and terms which include rainwater barrels, roof-top harvesting units and surface run-off rainwater harvesting. The rainwater that flows off in the college areas are collected and stored to recharge the groundwater level.

Air Quality Management

The air pollution problem inside the College campus has different sources, including the traffic movement inside the campus, scientific activities in different laboratories and transportation of air pollutants from the near traffic roads or other human activities. Several procedures have been considered to reduce level of air pollutants inside the university campus. These include increasing the efficiency of ventilation systems and banning smoking inside the campus, reducing emission sources of air pollution from the university laboratories, traffic movement, increasing awareness of all university members (students, staff and laborers) and increasing green space within the campus, which is considered a good trap of air pollutants along with continuous of Air pollutant monitoring system to ensure that air quality is within the permissible levels suggested by the Pollution Control Boards.

AIR SAMPLES ASSESSED ACROSS CAMPUS AT SIGNIFICANT AREAS-BIST

Sample No	Air quality parameter	Unit	Value	National Ambient Standards	Remarks (Air Quality)
1 (College Entrance)	Rspm	mg/m^3	25	60	Good
	SO2	mg/m^3	28	80	Good
	NOx	mg/m^3	32	80	Good
2 (Inside College Campus)	Rspm	mg/m^3	19	60	Good
	SO2	mg/m^3	12	80	Good
	NOX	mg/m^3	21	80	Good

AIR SAMPLES ASSESSED ACROSS CAMPUS AT SIGNIFICANT AREAS-SBDCH

Sample No	Air quality parameter	Unit	Value	National Ambient Standards	Remarks (Air Quality)
1 (College Entrance)	Rspm	mg/m^3	22	60	Good
	SO2	mg/m^3	30	80	Good
	NO_X	mg/m^3	35	80	Good
2 (Inside College Campus)	Rspm	mg/m^3	22	60	Good
	SO2	mg/m^3	12	80	Good
	NOX	mg/m^3	21	80	Good

AIR SAMPLES ASSESSED ACROSS CAMPUS AT SIGNIFICANT AREAS-BALAJI MEDICAL

Sample No	Air quality parameter	Unit	Value	National Ambient Standards	Remarks (Air Quality)
1 (College Entrance)	Rspm	mg/m^3	25	60	Good
	SO2	mg/m^3	28	80	Good
	NO_X	mg/m^3	32	80	Good
2 (Inside College Campus)	Rspm	mg/m^3	21	60	Good
	SO2	mg/m^3	18	80	Good
	NOX	mg/m^3	22	80	Good

AIR SAMPLES ASSESSED ACROSS CAMPUS AT SIGNIFICANT AREAS-BIHER NURSING

Sample No	Air quality parameter	Unit	Value	National Ambient Standards	Remarks (Air Quality)
1 (College Entrance)	Rspm	mg/m^3	21	60	Good
	SO2	mg/m^3	30	80	Good
	NO_X	mg/m^3	36	80	Good
2 (Inside College Campus)	Rspm	mg/m^3	21	60	Good
	SO2	mg/m^3	15	80	Good
	NOX	mg/m^3	23	80	Good

AIR SAMPLES ASSESSED ACROSS CAMPUS AT SIGNIFICANT AREAS-SLIMS

Sample No	Air quality parameter	Unit	Value	National Ambient Standards	Remarks (Air Quality)
1 (College Entrance)	Rspm	mg/m^3	26	60	Good
	SO2	mg/m^3	29	80	Good
	NO_X	mg/m^3	33	80	Good
2 (Inside College Campus)	Rspm	mg/m^3	21	60	Good
	SO2	mg/m^3	14	80	Good
	NOX	mg/m^3	22	80	Good

Internal Quality Assurance Cell IQAC Selaiyur Chennai-73 BIHER

Noise Quality Management

Noise levels are monitored to check Ambient Noise Quality, and to maintain peaceful Environment for the students. Vehicles used by the students and staff are the main source of noise in the campus. The noise quality is continuously monitored using a Sound Level Meter. The noise levels are compared with Pollution Control Board Standards.

NOISE DATA- BIST

Sample No	Noise levels (Limits in dB(A) Leq*)	National Ambient Standards(Limits in dB(A) Leq*)	Remarks
1 (College Entrance)	50	55	Within the limits
2 (Inside College Campus)	47	55	Within the limits
3 (Near civil block)	40	55	Within the limits

5.2 NOISE DATA- SBDCH

NOISE DATA- BIHER NURSING

Sample No	Noise levels (Limits in dB(A) Leq*)	National Ambient Standards(Limits in dB(A) Leq*)	Remarks
1 (College Entrance)	50	55	Within the limits
2 (Inside College Campus)	55	55	Within the limits
3 (Near civil block)	40	55	Within the limits

Sample No	Noise levels (Limits in dB(A) Leq*)	National Ambient Standards(Limits in dB(A) Leq*)	Remarks
1 (College Entrance)	53	55	Within the limits
2 (Inside College Campus)	53	55	Within the limits
3 (Near civil block)	40	55	Within the limits

NOISE DATA- BALAJI MEDICAL

Sample No	Noise levels (Limits in dB(A) Leq*)	National Ambient Standards(Limits in dB(A) Leq*)	Remarks
1 (College Entrance)	52	55	Within the limits
2 (Inside College Campus)	49	55	Within the limits
3 (Near civil block)	41	55	Within the limits

NOISE DATA- SLIMS

Sample No	Noise levels (Limits in dB(A) Leq*)	National Ambient Standards(Limits in dB(A) Leq*)	Remarks
1 (College Entrance)	40	55	Within the limits
2 (Inside College Campus)	48	55	Within the limits
3 (Near civil block)	42	55	Within the limits

Waste Audit

- E-wastes- computers, electrical and electronic parts – Disposal by selling/Exchange (Vendors)
- Plastic waste –Disposal by selling (milk covers, Plastic covers – Source segregation)
- Solid wastes – Disposal to Pig farm (Canteen and Mess waste) – as per the Solid Waste Management Hierarchy.
- Paper Waste- Recycling
- Chemical wastes – Laboratory waste – STP
- Waste water – STP
- Glass waste – Recycling

At present wastes are generated from the Garden, Mess, College, Hostel, Sweeping areas and Stores sections .The source Segregation of the waste from the entry level at each stage was done. The Food waste generated at the Mess was given to the pig farms in the daily basis. The garden waste was collected by the sweepers in the daily basis and disposed. Bottles, plastic covers & Plastic materials, cans, broken glass wares, tins etc., may be recycled or sold out. For both the boys and girls hostel provided with the bin. In the campus verandah, all blocks, Parking etc.., are located for the collection of waste. Large trolleys are operated by management for the collection of waste from their source. This waste production and disposal of different wastes like paper, food, plastic, biodegradable, construction, glass, dust etc and recycling. Solid waste often includes wasted material resources that could otherwise be channeled into better service through recycling, repair, and reuse. Solid waste generation and management is a need of the hour issue. Unscientific handling of solid waste can create threats to everyone. The survey focused on volume, type and current management practice of solid waste generated in the campus. The different solid wastes collected as mentioned above. Letter of Appreciation from ITC on recycling of Paper is attached in the annexure.

The total solid waste generated is estimated to be 1250 Kg per day. Out of which the quantity of food waste is 40% of total waste i.e 500 Kg per day. From this food waste is offered as a donation to Pig farm. The main dry waste is Paper waste, glass, cardboards, etc. Others are E-waste, tree droppings and lawn management. The waste is segregated at source by providing separate dustbins for Biodegradable and Plastic waste. Segregation of chemical waste generated from the laboratories is spent chemicals, chemicals that are out of date of expiry which were sent to the supplier back. Single sided used papers reused for writing and printing in all departments. Important and confidential reports/ papers are sent for pulping and recycling after completion of their preservation period. Very less plastic waste (0.1Kg/day) is generated by some departments, office, garden etc., but it is neither categorized at point source nor sent for recycling. Metal waste and wooden waste is stored and given to authorized scrap agents for further processing. Few glass bottles are reused in the laboratories.

5.2.1 Paper Waste management

Paper Waste Management Was carried out by signing an MOU with WOW (Wellbeing out of Waste) an ITC initiative. Paper waste generated by the institution was source segregated throughout the campus and handed over to the WOW program. During the financial year 2019- 2020 AMET has contributed for recycling 12336 Kg of dry recyclable waste through WOW program and obtained a certificate of Appreciation from ITC.

5.2.2 Compost unit

Organic Waste such as kitchen waste and dry yard waste are collected and sorted at source of generation throughout the institution. The segregated kitchen and Yard waste are collected and transported to the composting pit. There are three composting pit each of 50 kg capacity, the waste dumped in the compost pit are turned at a frequency of three days to keep the compost aerated after the period of maturation and curing the compost is used as manure for the development of green belt.After the period of maturation and curing the compost is used as manure for the development of green belt. done in batch mode.

Limiting Factors: Preparation of Feedstock:

After receiving the waste to the treatment plant through conveyance, the presence of any other non-biodegradable wastes are present that will be remove by using sized meshes. After Screening for non biodegradables the biodegradable wastes were shredded and grinded well; using a mixer and it is made into a homogenous mixture in a container. The feedstock included homogenization in a blender, diluting with water and feeding inside the digester tank. The food wastes were grinded and mixed thoroughly with inoculum. The mixture is then thoroughly mix with water and this will be used as a feedstock

Feeding of the Digester:

The digester is filled with two third of its capacity with food waste and inoculum in definite proportion. The digester was operated in batch mode where the feeding was

Anaerobic bacteria ferment biodegradable matter into methane (40-70%), carbon dioxide (30- 60%), hydrogen (0-1%) and hydrogen Sulphide (0-3%). The ideal process temperature for the fermentation process is at about 35°C, which might require additional heat or insulation of the digester in regions with daily or seasonal temperature fluctuations.

Biogas production depends on the availability of sufficient biomass feedstock, water and space for the digester. As the biogas cannot be transported over long distances, the digester has to be placed close to the user, which requires sufficient space.

The biogas accumulates at the top of the tank where it is collected and taken by pipe to the user. The slurry has to be removed regularly from the tank. It can be used further, e.g. as agricultural fertilizer.

The complex fermentation process in the biogas plant needs a continuous supply of suitable feedstock. It requires a continuous supply of water all year round, which can be a limiting factor. Once gas formation starts, to feed the food waste to the digester is important at regularly. But the big question is how much waste can feed? Here, the capacity of digester is 1000 litres. So the feed about nearly 50 L of

homogenised waste in this plant daily.

AREA REQUIRED FOR SETTING UP THE BIOGAS PLANT 5.0 M3

8.0 Ft (Length) x 7.0 Ft (Breadth) x 7.0 Ft Height

(b) DETAILED LIST OF EQUIPMENTS PER PLANT [5.0M3 / DAY]
RETURN ON INVESTMENT (R O I):

Biogas Plant

- ✓ $5.0M^3$ X 30 days = $150M^3$/Month
- ✓ $150M^3$ = 67.5KG of LPG
- ✓ Domestic Cylinder Weight 14.5Kg,
- ✓ So, 67.5Kg/14.5Kg= 4.6 Cylinder Saving per Month
- ✓ Generation of E-waste is apparent at every college. In academic colleges there are several equipment's and instruments running in administrative as well as in various departments used for educational activities. Computers, Printers, Scanners, Xerox machines are mostly used for administrative work. At time of teaching, learning and evaluation in academic Domestic Cylinder cost (Rs) = 1000
- ✓ 4.6 X Rs.1000 = Rs.4600 savings per month
- ✓ Total Savings per year [Rs.4600/- X 12) = Rs.55,200

5.2.4 E-waste

5.2.5 college we deal with electric material, electric equipment's/ instruments ,measuring instruments, different electric circuits, wires, ICs, Microprocessors, PCBs, electronic components(like resistors, diodes, transistors, transformers, inductances, relays, etc.),damages instruments, hardware's and peripherals of computer system, lighting equipment's (like Bulbs, tube, fans) all these include in E-wastes. The E-Waste generated from the college premises from the above said items is disposed through government authorized E-waste unit- *commercial TRADERS*. Maximum amount of E-Waste is not generated; all the products are bought by Buy-Back Process

5.2.6 Recommendations

- The waste should be reused or recycled at maximum possible places.
- Glass waste should be disposed properly and sent for recycle.
- Provide sufficient, accessible and well-publicized collection points for recyclable waste, with responsibility for recycling clearly allocated.
- Segregation of waste at the source is to be implemented. Source segregation prevents the maximum accumulation of mixed wastes.
- The E-Waste is disposed through government authorized E-waste unit-*commercial TRADERS.*

5.3 Human Factor

Carbon dioxide emitted by a person per day is not negligible. It is equivalent to the emission of a car in a 5km stretch. Humans emit 26 giga tons of carbon dioxide per year while CO2 in the atmosphere is rising by only 15 giga tones per year. Just. Just for breathing, humans emit per person each day 1140 grams of CO2, assuming that they eat normally and follow a mean diet of 2800kcal.

The population details of each zone include the total number of teaching faculty, non-teaching staff and students. The carbon dioxide emissions will be larger in the Zone having highest population.

2 Transportation

Fossil fuels are used for transportation. The carbon dioxide emitted by different fuels is in different amounts. The engine of the vehicle burns fuel and creates a certain amount of CO2, depending upon its fuel type, fuel consumption and the driving distances. One liter of petrol and diesel emits 2.3kg and 2.7kg of carbon dioxide, respectively. Travelling by car for 1000km can produce about 200-230kg of carbon dioxide into the atmosphere. If a person travels by a bus for 1000km, it can add 1075kg of CO2 to his/her Carbon footprint. Worldwide, the fossil fuels used for transportation contribute over 13% of GHG emissions.

The transportation details for the college campus include the type of vehicle, No. of vehicles and the fuel used. The details give us the idea that the vehicles' using petrol or diesel as the fuel is more in the college premises. The carbon dioxide emitted from petrol is less compared to that of diesel. The Carbon footprint by the emission inventory transportation will be quite high. Zone- wise details of transportation are to be surveyed.

5.4.3 Conventional Transport system within the campus

The institution has arranged for conventional transport system facility to be used by the teaching and non teaching staff within the campus. This facility includes 30 numbers of Bi-Cycles and one battery operated vehicle of six feet length with 6 seater capacity.

5.4.4 No vehicle day

BIHER Deemed to be university observing no vehicle day yearly once to develop awareness among the student and the staff about the carbon foot print and green house gas emissions from the vehicles. On this day the management instructed the student and staff to use the common transport arranged by the Institution and also they can use only cycles as private mode of transport on the particular day. This has gained a mass momentum from the students eagerly participating the program with the bicycles.

5.4.4 Solid Waste

Generally, 1kg of solid waste is generated per capita per day. For high income countries, the solid waste generation is 1.1-5kg per capita per day. For middle income countries, it is 0.52-1kg and

5.4.6 LPG and Natural Gas

6 for low income countries the value is 0.45-0.89kg/capita/day. One kilogram of solid waste can emit about 0.125kg of carbon. The details regarding the solid waste generated in each zone is collected including the

waste produced in canteen and hostels.

7 The solid waste generated in the canteen and hostel which is taken out of the campus comes under other indirect emissions. Solid Waste emits less amount of carbon dioxide compared to other emission inventories considered.

7.4.6 Food Production and Consumption

Food is one of the consumption categories which cause the highest environmental impact on the climate. According to the study conducted by the European commission (2006), the food and drink category causes 20-30% of the various environmental impacts of total consumption. Worldwide, agriculture contributes to nearly 14% of total GHG emissions.

The Carbon footprint of an average diet is 0.75 tons CO2-eq, without accounting for food transportation. The amount of GHGs produced by the production of food differs much from one food type to other. Meat products have a larger Carbon footprint than fruits, vegetables and grains. The Carbon footprint of an average meat eater is about 1.5 tons CO_2-eq larger than that of a vegetarian.

The consumption of one liter of LPG can release 1.5kg of carbon dioxide to the atmosphere. Also burning of wood (250kg) can add 33kg of carbon dioxide to the Carbon footprint. The consumption details of LPG and Natural Gas in canteen and hostels are surveyed.

7.4.7 Carbon Footprint Analysis

Carbon footprint analysis can be done by suitably combining data collected with respective emission factor of the selected emission inventories. Table represents emission factors of the selected inventories.

Human Factor- 3690(Students) +729(staffs) +150(Visitors

Approx) = 4569 Diesel & Petrol – 2853.9 L/d (Approx)

Solid waste -1300 -1500 kg/d (Approx)

LPG - 19.5 * (15- 17) no's = 292.5kg/d

5.4.9 Carbon Offsetting

The following effective measures can be suggested to reduce the present carbon footprint value in

the next academic year.

5.4.10 Human Factor

Avoid rampant consumerism.

5.4.11 Transportation

- Use energy efficient fuels for transportation, especially in the case of college & school buses.
- Use vehicles adhering to emission norms.
- Purchase vehicles with competitive mileage & fuel efficiency.
- Parking of college bus, staff vehicle, student vehicle is inside the campus. Movement of vehicle during morning and evening inside the campus is high and so is the pollution.
- Encourage use of public transport facilities.
- Car pooling can be encouraged.
- Ensure proper inflation of vehicle tyres.
- Use of Bicycles can be encouraged.
- Encourage walking when it comes to short distances.
- Remove unnecessary weight from vehicles.
- Use unleaded petrol in vehicles..

5.4.12 Solid Waste

- Avoid wasting paper.
- Avoid burning of paper waste.
- Recycle waste if possible.

- Reuse resources whenever possible.
- Adopt proper waste management techniques

5.4.13 Production & Consumption of Food

- Do not waste food items.
- Avoid wastage in kitchen.
- Use local and seasonal fruits & vegetables.
- Reduce use of non-vegetarian food.
- Encourage use of organic food

5.4.14 LPG

- Use LPG efficiently.

5.4.15 Natural Gas

- Use of Biogas made from waste can be encouraged.
- Use Natural Gas efficiently.

5.4.16 Conclusion

Analysis of the Carbon footprint is basically a fair evaluation of the Carbon dioxide potency in the region under study. This gave us an idea as to how contaminated our environment is. It also provided us with the details regarding the amount up to which the inventories affect emission levels, helping us to know how and up to what extent each of our actions effect changes in the environment. This study is a sure shot that would help us realize and look back at each of our activities, and how exactly it have changed the very world we inhabit. The scope of such a study is very much relevant in the current scenario of rising CO_2 levels in our very own ecosystem.

The Carbon footprint is to be treated seriously as a quantitative yield of the quality of our very own surroundings. Necessary activity monitoring can be followed to contribute to the wellness of the planet in our own little ways.

Awareness and Commitment can go a long way in keeping our environment clean. This study was undertaken with the sole motive to identify those factors that contribute to the excessive CO_2 emission, and to suggest measures that are to be put into practice for a cleaner, greener tomorrow.

5.5 Preparation of Action Plan

Policies referring to college's management and approaches towards the use of resources need to be considered. The college should have a green policy/environmental policy for its sustainable development. The environmental policy formulated by the management of the college should be implemented meticulously. The college should have a policy on awareness rising or training programs and college also should have a procurement policy.

5.6 Follow Up Action and Plans

Green Audits are exercises which generate considerable quantities of valuable management information. The time and effort and cost involved in this exercise is often considerable and in order to be able to justify this expenditure, it is important to ensure that the findings and recommendations of the audit are considered at the correct level within the organization and that action plans and implementation programs result from the findings.

Audit follow up is part of the wider process of continuous improvement. Without follow-up, the audit becomes an isolated event which soon becomes forgotten in the pressures of organizational priorities and the passing of time.

5.7 Environmental Education

The following environmental education program may be implemented in the college before the next green auditing:-

- Training programs in solid waste management, liquid waste management, setting up of medicinal plant nursery, water management, tree planting, energy management, landscape management, pollution monitoring methods, and rain water harvesting methods.

- Increase the number of display boards on environmental awareness such as – save water, save electricity, no wastage of food/water, no smoking, switch off light and fan after use, plastic free campus etc.
- Activate the environmental clubs
- Set up model rainwater harvesting system, rainwater pits, vegetable garden, medicinal plant garden etc. for providing proper training to the students.
- Conduct exhibition of recyclable waste products.

6 CHAPTER

6.1 Audit Conclusion

The green audit for BIHER Deemed to be University, Selaiyur, brings out the commitment on Environment with a greater notification by the management and teaching professionals and student community. The audit has show a significance in micro water management with proper water usage and key areas of the hostels, classrooms and laboratory and the waste water treatment and reuse has shown the way for the institution for its environmental and social responsibility to the greater extend. The green campus motivation with different plant species with a large and micro level of tress helps to reduce the impact of carbon and other pollutant specific absorption through the plantation is significant initiatives. The carbon foot print also balanced from the green plantation to absorb CO_2 and reduction through bicycle usage within the campus.

I would like to appreciate the team effort and the commitment by the management for such a great campus activity.

7.1.6 5. Beyond the Campus Environmental Promotional Activities

The Pollution Awareness Rally Notice Cards Issued by the Honourable Pro Vice-Chancellor Academics

PRO VICE-CHANCELLOR (Academics).Dr. M.Sundararajan initiated a plastic awareness Rally by flag on the Rally and handed over the pamphlets to the Cadets

GREEN CAMPUS CLUB & Environmental ECO Friendly CLUB

Environmental Consciousness and Sustainability

7.1.6 Green Campus Initiatives Include

4. Clean and Green Campus Recognitions

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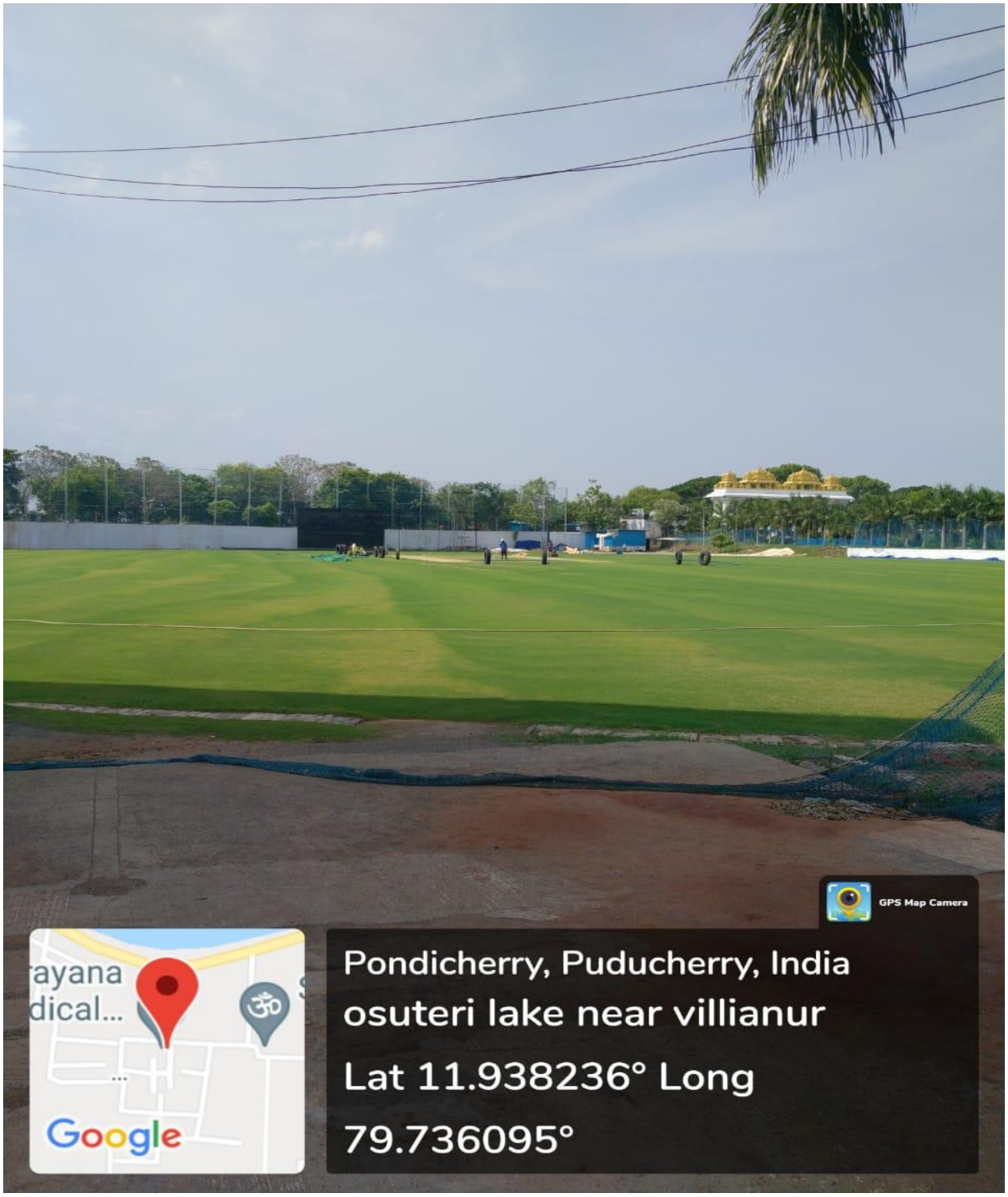
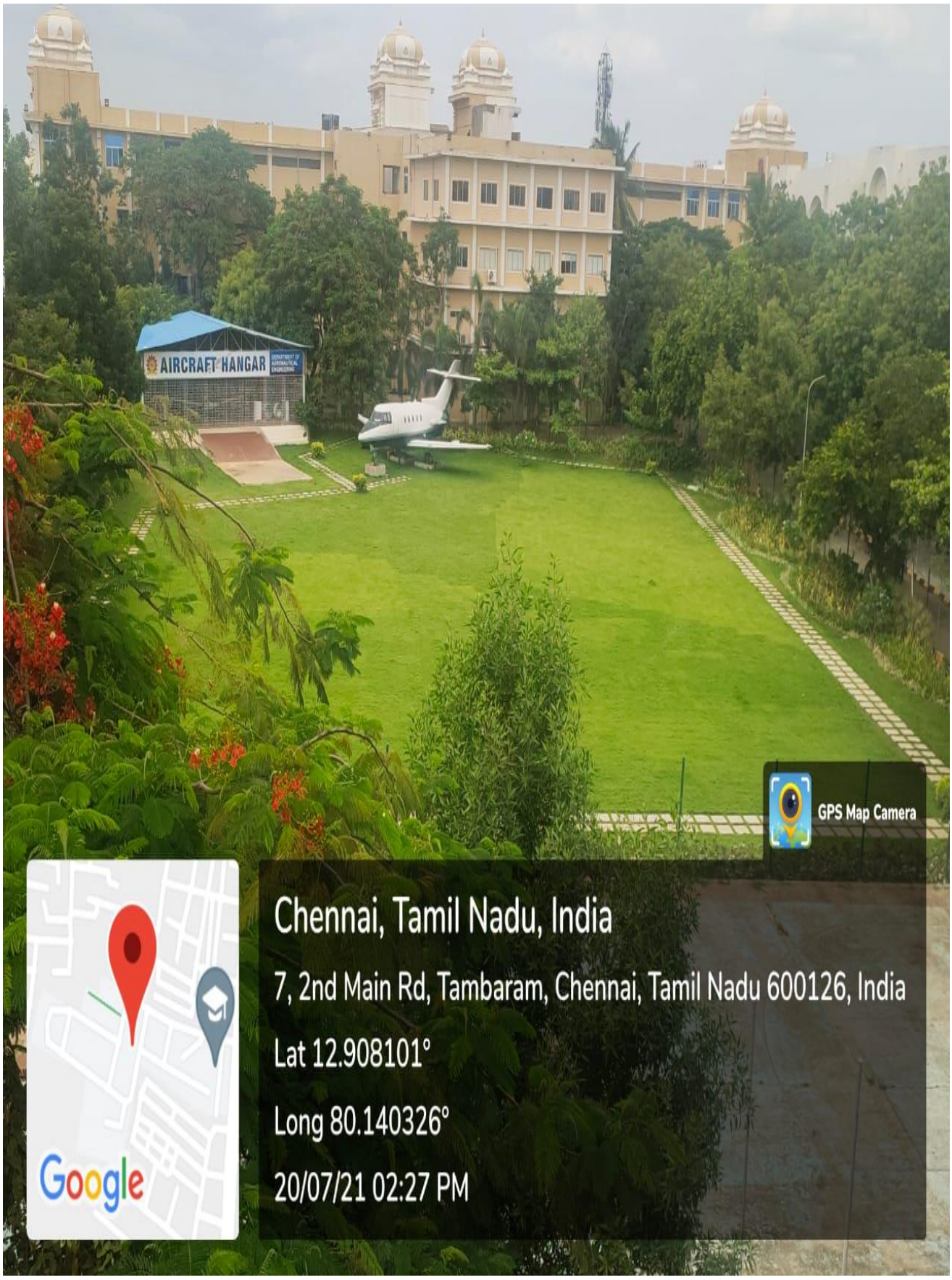


SLIMS - Sri Lakshmi Narayana Institute of Medical Sciences

BIST - Bharath Institute of Science & Technology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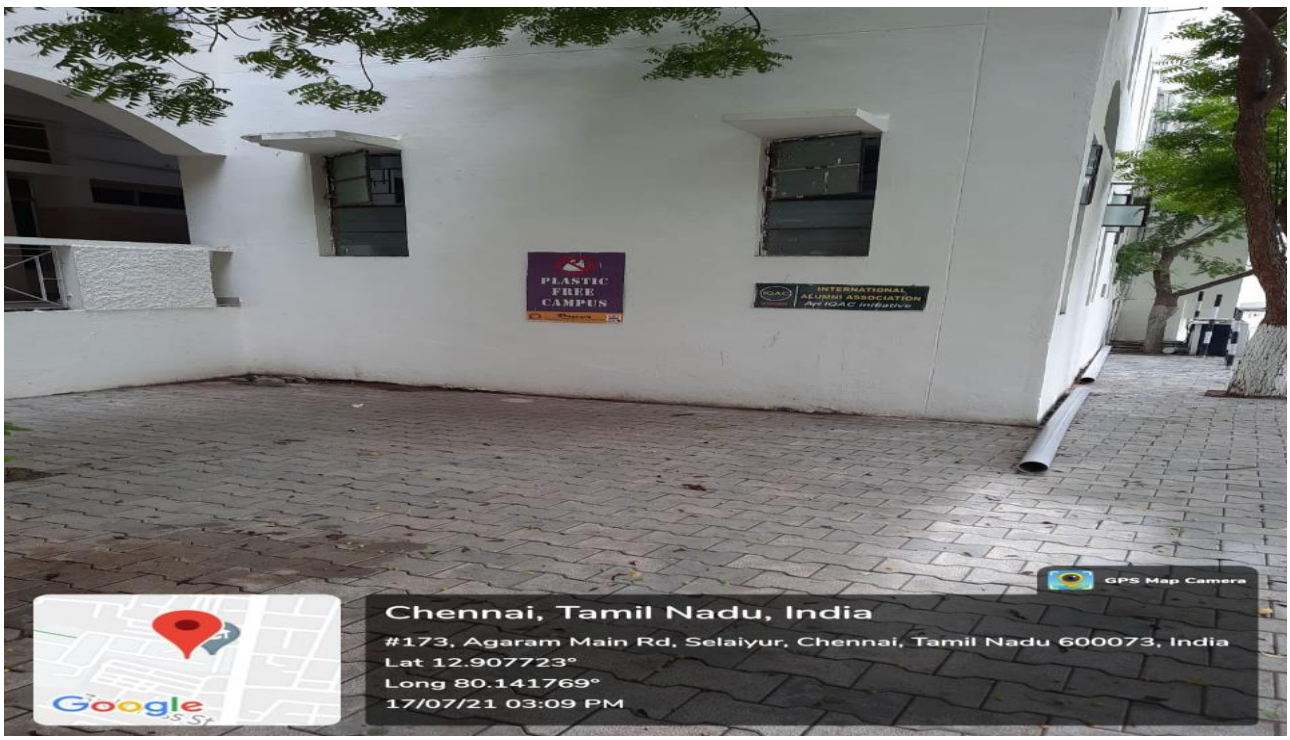
PLASTIC FREE CAMPUS
INTERNATIONAL ALUMNI ASSOCIATION
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School Of Arts And Science

Environmental ECO Friendly - Battery Operated Vehicle @ SBMCH- Sree Balaji Medical College & Hospital

SBMCH - Sree Balaji Medical College & Hospital