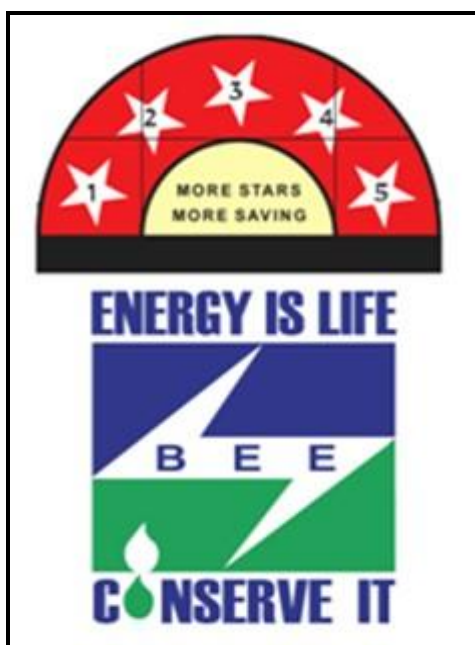


ENERGY AUDIT REPORT (2020 – 2021)

Audited by

DEPARTMENT OF PHYSICS



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PRINCIPAL

OBJECTIVES OF ENERGY AUDIT

The primary objectives of energy audit are to identify and evaluate opportunities to reduce energy consumption per unit of product output and reduce operating costs through energy conservation and planning. Energy audit produces a bench-mark for managing energy in the organization and also provides the basis for planning a more effective use of energy throughout the organization. This auditing is an attempt to consume electrical power in our campus. Department of Physics is effectively performing this auditing every year, which was initiated from June 2017.

SCOPE OF THE ENERGY AUDIT

The scope of the energy audit includes an examination of the following areas,

- Energy distribution network of electricity, water, Air Conditioners, fans, lights (LED and CFL), Xerox machines, computers, projectors, cameras, bore-well motors and fridge.
- Energy utilization efficiency of all equipments and buildings
- Efficient planning, operation, maintenance and housekeeping.

PREFACE

Data collection for energy audit of the Thiruthangal Nadar College Campus was conceded by Physics Department team from 01/6/2020 to 31/5/2021. This audit was over sighted to inquire about convenience to progress the energy competence of the campus. To drop the energy utilization whilst cultivate or humanizing comfort, health and safety were of prime anxiety. This audit required to recognize mainly energy proficient appliances. Besides, many each day processes concerning common appliances have been provided which facilitate sinking the energy expenditure. Students of Physics department were very helpful in completing the energy audit survey, which included all data that was collected from each classroom, laboratory and other miscellaneous rooms as well. The electrical equipment's and appliances that were taken under consideration included total no. of lights, fans, A.Cs, electronic instruments, and etc. in each room, chamber, corridor area and etc., together with the unit of electrical power that would be consumed by each of the component in the total electricity consumption.

ACKNOWLEDGEMENT

We are very thankful for Hon. Secretary & Correspondent M.G.E. Selapalam & Principal Dr. S. Murugesan for this opportunity to conduct Energy audit of various facilities in college campus. We are also thankful for Vice Principals, various HODs, Staff members, Electrician Mr. Kamaraj & their respective subordinate staffs Mr. Ganeshan & Mrs. Kavitha, who have given their valuable contribution in guiding & supporting us during campus survey for data collection, network study & measurement for accomplishing successful Energy audit.

This report made with sincere efforts gives details of the relevant data collected during energy audit study, observation, analysis & recommendations made pertaining to different facilities in our campus. Several Energy Conservation Opportunities (Measures) have been identified & proposed in course of our study & these options when implemented, are expected to bring in lasting benefits (saving) in terms of energy as well as cost saving to the management.

We are very much delighted in submitting this Detailed Energy Audit Report to our Hon. Principal, Dr. S. Murugesan, and thanking him for the implementation of identified Energy Conservation Opportunity as well as recommendations, after sincere study & observations.

ABOUT THE COLLEGE

Thiruthangal Nadar College was established in the year 1997 as a college for men and was upgraded as a co-educational institution in 2002 to cater to the needs of women in North Chennai thus empowering them. It is a Self-Financing institution affiliated to the University of Madras. It was instituted by the magnanimous members of Chennaivazh Hindu Nadar Uravinmurai Dharma Fund with a deep sense of generosity and compassion to the under-privileged student community. The benevolent members of the management have extended their exemplary services in the field of education with an exuberant spirit of facilitating and providing wider opportunities to the youth from different backgrounds. The motto of the institution “Knowledge is Power” is pre-eminently enshrined to ignite and enlighten the minds of the youngsters through education by dispelling the darkness of ignorance.

TNC offers 21 courses across 8 streams. TNC campus is spread over 8 Acres. Additional campus facilities such as Auditorium, Canteen, and Computer Lab, Counseling, Library, Placement, Sports, Grounds, NSS, NCC, Conference Room and Placement Office are also available.

ENERGY AUDIT TEAM

Name	Designation	Department	College
Dr. R. Vijayalakshmi	HOD & Assistant Professor	Physics	TNC
Dr. M. Leena	Assistant Professor		
Dr. P. Sanjay	Assistant Professor		
Dr. P. Sasi Rekha	Assistant Professor		
Mrs. V. Srimathi	Laboratory Assistant		

NEED OF ENERGY AUDIT

Natural resources on earth are limited and consuming very sharply. It can be saved by employing energy efficiency and it is very necessary to prevent depletion of natural resources. The Electrical Audit of college buildings showed that the load of electrical equipment's been significant and should be taken some necessary step for reducing energy conservation. Today, energy conservation plays a very important role for energy conserving because energy consumption is increasing day by day but the natural resources are not increasing and also production is cannot meet the consumption. People should aware about energy conservation and reduce energy consumption by adopting modern technologies.

An energy audit is an inspection, survey and analysis of energy flows, for energy conservation in a building, process or system to reduce the amount of energy input into the system without negatively affecting the output(s). The task of energy audit undertaken by Thiruthangal Nadar College has objective to identify energy saving & conservation opportunity with electrical network & equipment load study with measurement & conservation opportunity to save input energy cost.

EXPERIMENTAL AND DATA COLLECTION:

The energy audit was conducted from 01.06.2020 to 31.05.2021 & reviewed implementation of energy saving & conservation opportunity already identified as well as quantified it.

- 1) Inventory of various electrical load.
- 2) TNEB bill study & working out average cost of power.
- 3) Identification of various energy conservation measures & saving opportunity.

In this present report, college electricity audit has been executed and verified. Physics department student teams headed by a Faculty was formed and allotted for data collection and the entire campus was surveyed in the same way for the audit. In this survey, Main Block, Science Block, Commerce Block, Corporate Block and Common Areas were involved. In all building, each and every room was examined to note, the no. of fans, tube lights, computer, instrument AC, etc. The electrical equipments that were put forth for the energy audit include practical laboratory, instrument, fans, air conditioners, Computers and etc., for this study.

We've calculated the exact contribution of energy consumption with respect to units consumed by each of the equipment such as, lights, fans, computers, instruments and etc., in comparison with the total requirement of electricity. We've studied all these above mentioned electrical equipments by collecting exact data from our survey. The Survey details are given elaborately, as below.

Calculation of Energy Consumption in kWh

Electric energy or power consumption can be calculated using the following basic formula.

Energy Consumption in Watt-hours = Power Rating in Wattage x Time in Hours

$$E = P \times t \quad \dots \quad (\text{Wh})$$

“Wh” is a small unit to measure the energy usage. To convert it to the basic electricity unit i.e. 1000 Watts per hour = 1kWh = 1 Unit of electricity, we divide it by 1000 i.e.

$$E = P \times t \div 1000 \quad \dots \quad (\text{kWh})$$

Where:

- E = Electric Energy (Consumed power in kWh)
- P = Power in Watts
- t = Time in hours per day

Daily Energy Consumption

$$\text{Power Consumption}_{(\text{Daily})} = \text{Power Usage}_{(\text{Watts})} \times \text{Time}_{(\text{Hours})}$$

Example: A 70 watts fan used for 5 hours daily. The daily watt hour and kilowatt hour consumption is as follows.

- Daily power usage in Wh = 70W x 5 Hours = 350 Wh / day
- Daily power usage in kWh = 350 Wh /1000 = 0.35 kWh / day



Room No	Fan	LED Tube light (20 W)	CFL Tube light (36 W)	Camera	A.C			Fridge	Computer	Printer	Xerox Machine	Projector	Bore well motor	Focus & LED Light	Camera monitor
	(70 W)				Split (1.5 ton)	Chiller (8 ton)	Split (2 ton)								
Principal Office	2	6		7	1			1						10	
Secretary room	1	4			1										
Physics Lab.	20	22		2											
Chemistry Lab.	16	24		3				1							
Office	6		10						7	2	2				
Computer Lab	1			12	20				330	1		2		130	
Microprocessor Lab	5	4													
Exam.Dept.	5		3	2					1						
Library	24		21	6					6	1					
Sport room	10		10	2					1	1					
Power House	2		6												
Seminar Hall	30	14	22	2		1	3		1						
Washroom			36												
Staff room	55		42	2					16	5					3
Placement office room	2		4		1				4	1		3			
Language Lab									71					35	
Indoor Auditorium	30	14	22	2											
Main Block Class Rooms	136		145									1			
Commerce Block Class Rooms	105		130									4			1
Canteen Block Class Rooms	117	49	55	6								1			
Open Auditorium	12		12												
Corp. Block Class Rooms	58		54									1			1



Thiruthangal Nadar College
Knowledge is Power

NAAC –SSR Cycle-II

7.1.6. Quality Audits on Environment and Energy

7.1 Institutional values and Social Responsibilities

Year: 2016 -2021

Total Quantity	637	137	572	46	23	1	3	2	437	11	2	12	7	175	5
Total power consume in 1 hr (W)	44590	2740	20592	960	34500	8000	6000	84	3714.5	275	2800	975	10444	2625	425
Total power consume in 5 hr (W)	222950	13700	102960	4800	172500	40000	30000	420	11143.5	1375	14000	1950	10444	13125	2125
Consumption in 1 month (W h)	4459000	274000	2059200	96000	1207500	280000	180000	8400	222870	27500	280000	39000	104440	131250	42500
Consumption in 12 month (W h)	53508000	3288000	24710400	1152000	14490000	3360000	2160000	100800	2674440	330000	3360000	468000	1253280	1575000	510000

Total Power Requirement of All Instrument per month = 9,411.660 KW

Total Power Requirement of All Instrument per year (June - May) = 1,12939.920 KW

EB POWER CONSUMPTION:

Total electricity units utilizes by college (All data collected in between 01 June 2020 to 31 May 2021)

POWER CONSUMPTION OF ELECTRICITY BOARD (2020 – 2021)

S.No.	Month	Consumption Unit (KW)
1.	June - July (2020)	21687
2.	Aug - Sep (2020)	22214
3.	Oct - Nov (2020)	24276
4.	Dec - Jan (2021)	16899
5.	Feb - March (2021)	14970
6.	April - May (2021)	12830
Total Power Consumption in Yearly		1,12,876
Average Power Consumption in monthly		9,406

RESULTS AND DISCUSSION:

An energy audit is an analysis of a facility, indicating how and where that facility can reduce energy consumption and save energy costs. Its insight to energy efficiency and conservation can lead to significant savings on the Institution’s utility bill. In an attempt of this, we have collected data by considering the total no. of tube lights, fans, computers, printers, A.C’s and other electrical instruments together with the electrical unit that each of the equipment would consume.

In our college, most of the instruments required 2% out off the total energy, that is, AC required 1%, Camera + monitor consumes 2%, while some other equipment’s like the computer required 21%, Fans required 31% and tube light required 43%. The total required energy for our entire Institution was **9,406 KW**, and the Fig. 1 predicts the contribution of tube lights, fans, computers, printers, AC’s, Camera Monitors and other instruments in total use of energy allocation percentage wise.

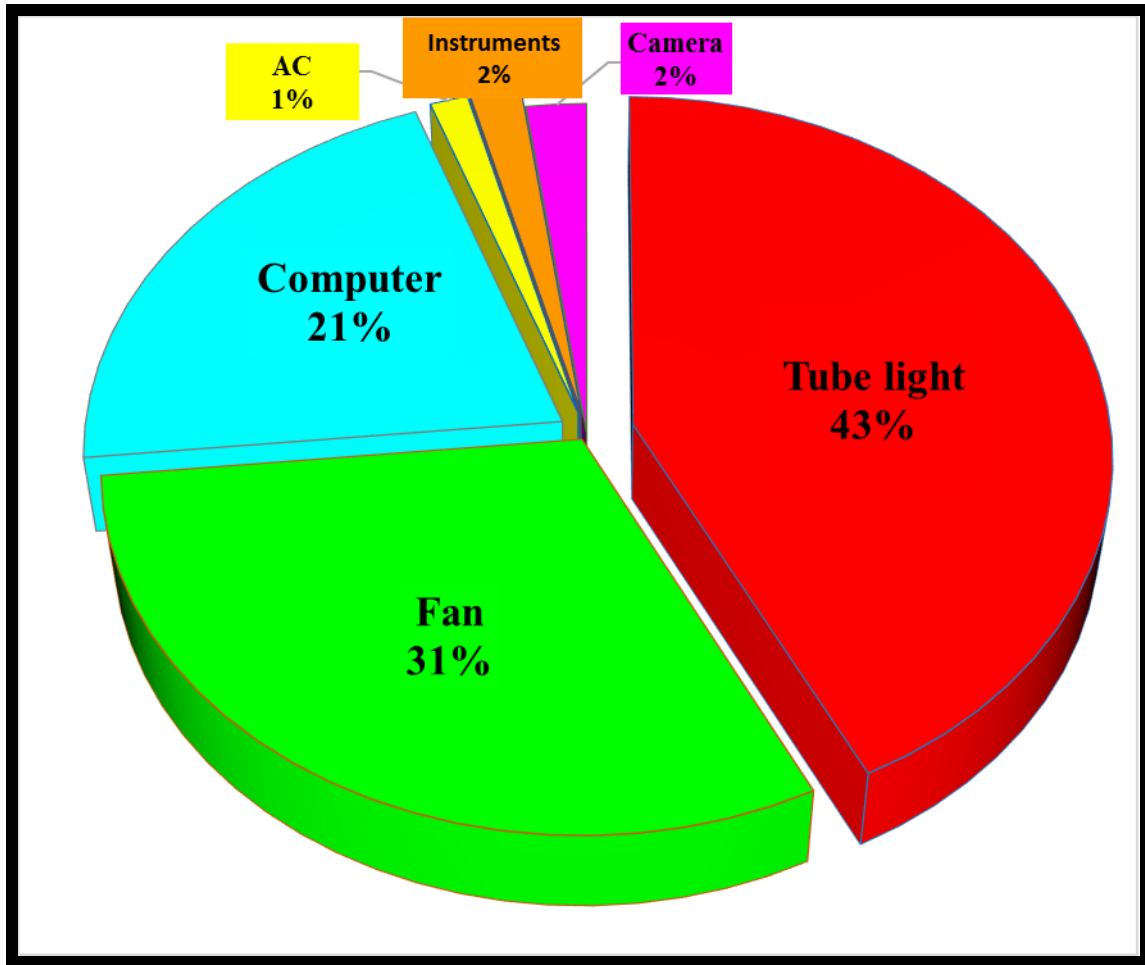


Fig. 1 Contribution of tube light, fan, computer, AC, Camera Monitor and instrument in total use of energy

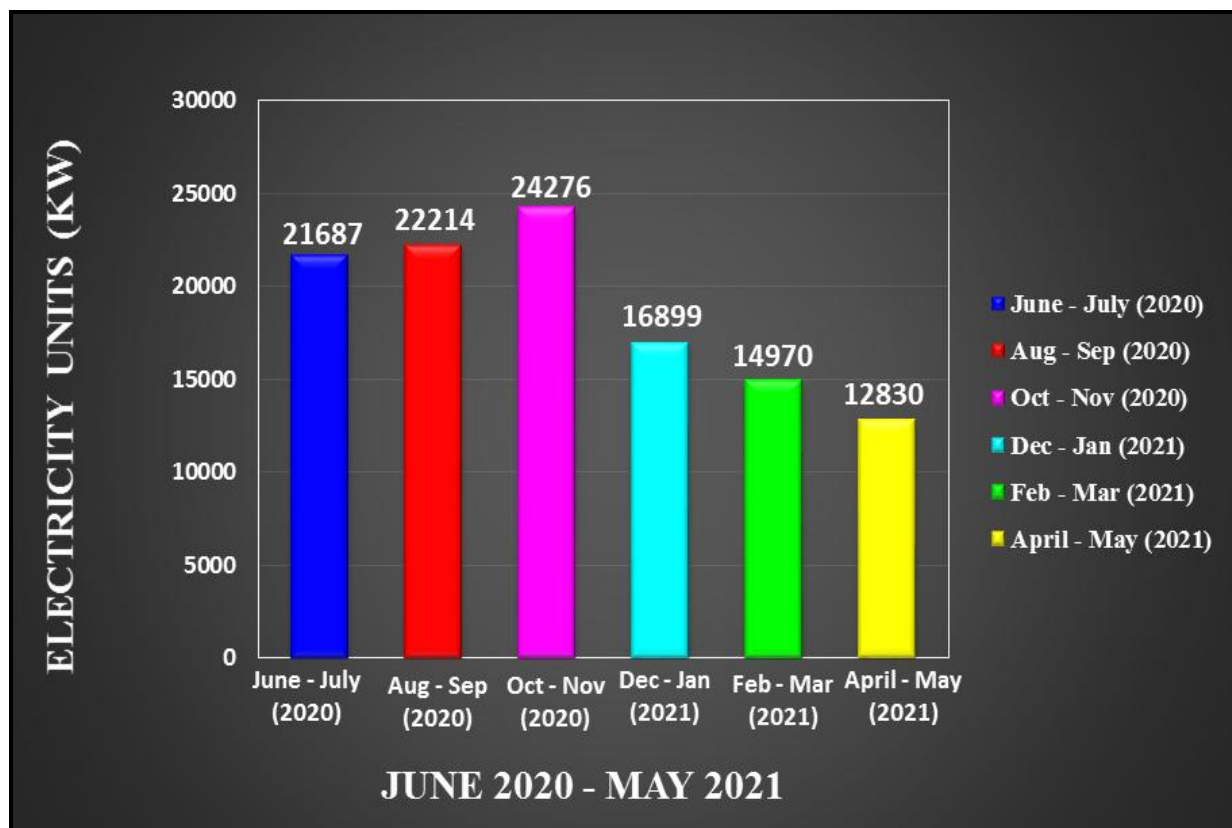


Fig. 2 Electricity units for two months (June 2020 – May 2021)

Variation in electricity units is due to different programs, local environment, functions. Fig. 2 predicts the variations of the Electricity units for two months (June 2020 – May 2021).

Energy Saving through LED:

Total No. of conventional Tube Lights in Campus = 712

Conventional Tube Light average power = 36 W.

LED Tube Light average power = 20 W.

Difference in power saved per Tube Light = (36-20) W =16 W.

Total Power saving = 712*16W = 11392W = 11.4 kW.

Average Use of Tube Light per year = 270*8h=2160h.

Energy saved per year = 11.4*2160 kWh = 24,624 kWh.

Saving in Rs. per year = 24,624 * 9.5 = Rs.2,33,928

LED tube light average cost = Rs. 450

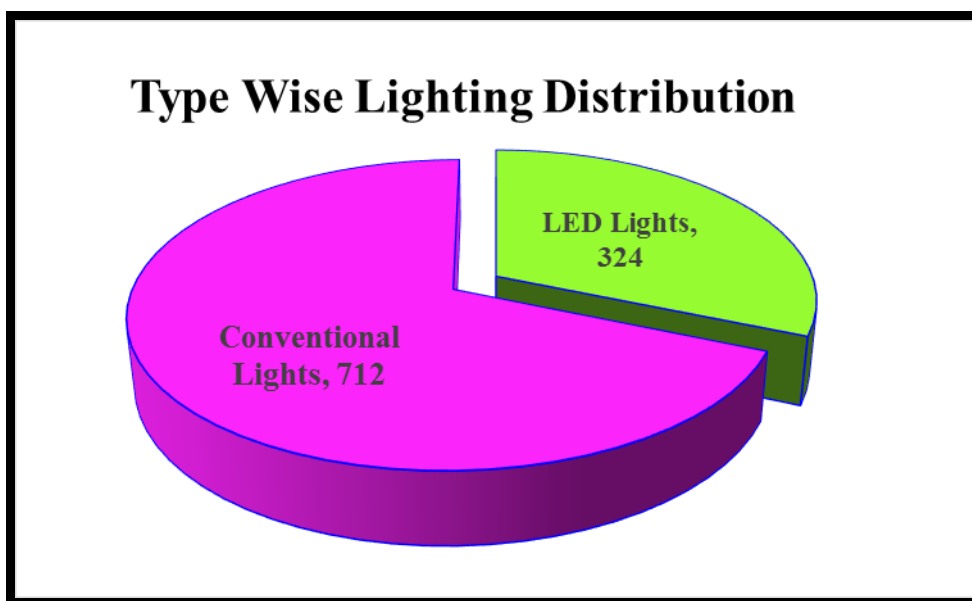
Total cost of replacing all conventional tube lights = 712*450 = Rs. 3,20,400.

Payback time = (320400/233928) = 1.3 yrs.

Hence, the payback time for replacing all conventional tube lights of the campus with LEDs is around 1.3yrs

Type Wise Lighting Distribution:

Type	Quantity	kW Load	% Load
LED Lights	324	8301	21.3 %
Conventional Lights	712	30758.4	78.7 %
Total	1036	39059.4	



SUGGESTIONS:

We can use LED bulbs to save more electricity. The electrical devices which are connected in college campus are not energy saving devices. These devices can be replaced by electrical efficient appliances. The appliances are of high watt equipments so the electrical consumption is high in our TNC college campus. Now-a-days, low wattage appliances are used in building; they are productive in saving electricity. Some appliances are replaced by energy saving appliance which are as follows.

- Tubes and CFL’s were replaced by LEDs.
- Normal Fans and Wall fans were replaced by 5-star Fans.
- Outdoor lights were replaced by Led lights.
- Normal PC’s were replaced by 7 gen PC’s.
- CRT monitors are replaced with LCD/LED Monitors.
- Separate electrical connection of Administrative office, Computer Labs and classrooms were undertaken.
- Master switches for each Room to shut down power of entire room when not in use.



INFERENCE:

Ultimately, the data generated in energy audit gave a clear picture of the energy distribution and utilization of power in the college. On the whole, our college needs maximum of **9,411.660 KW** of (equivalent to **9,406 Units/month**) of electrical energy.

THANK YOU

“Everything is
energy
& that's all there is to it.

Match the frequency of the
reality you want and you cannot
help but get that reality. It can
be no other way. This is not
philosophy. This is physics. ”

— Darryl Anka