MADAN MOHAN MALAVIYA UNIVERSITY OF TECHNOLOGY, GORAKHPUR, UTTAR PRADESH, 273010, INDIA

ENERGY AUDIT REPORT 2019-20

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EXECUTIVE SUMMARY OF SAVINGS

The preliminary energy analysis was entrusted at Madan Mohan Malaviya University of Technology, Gorakhpur, Uttar Pradesh, 273010, India for the year 2019-2020. Following points for the major energy saving potential, identified during the study are considered and given below,

1. LIGHTING AND COOLING FANS SYSTEM

There are different types of departments and buildings where lighting points and fans are provided. Depending upon category of load, monthly billing is done by UPPCL as per applicable tariff. The assessment of monthly bill is done in two-part tariff in which fix charges depend on sanctioned load and variable charges as per consumption. For higher consumption greater 2500 KVAH, rates are 7.90 Rs/ KVAH in place of 7.70 Rs/ KVAH for first charge. It is always advisable to limit the consumption at lower billing slab and utilize the optimum sanction load.

For commercial category connection, unit rate is highest. We need to focus on such connections, viz, Admin building, Auditorium, Canteen, Society etc.

Analysis of connected Load in Campus

Type	No	Total KW	% Load
Lighting Load	—	128.81	
Fan Load		221.7	
Computer Load	—	—	
AC & fridge		847.2	
Geyser		418.0	
Printer & Xerox			

Total Power Requirement of all Instrument is categorised as above Table= (128.81 + 221.7 + 847.2 + 418= 1614) KW.

2. WATER PUMPING SYSTEM

There are 5 No. of water pump connection at various locations. Existing water pumps are high speed mono block, and their condition is normal. Total Pump Load is 48.44 kW. Detailed description is given below.

Motor Pump Set Load Study

Sr No	Pump Location	Motor Type	KW
1-	Pump No 2	15 HP	11.18
2-	Pump NO 3	15 HP	11.18
3-	Pump No 4	20 HP	14.91
4-	S.K. Hesdal	5 HP	3.72
5-	Sevrej Pump	10 HP	7.45
			= 48.44

3. SUMMARY OF ENERGY SAVING THROUGH LED LIGHTS:

The energy audit recommends avoiding the use of more energy consuming electrical appliances and to replace with more environment friendly and energy efficient appliances (for example five stars rated Air conditioner) in the University. The potential of renewable energy sources must be explored. As the University has a very large roof area for installing solar panels so that it can be effectively used for generating power. The University has started steps in installing the solar panels for office.

Session	Total Lightning requirement (A)	% Lightning through Led Lights (B)	Consumption (C)	Total Lightening Production saving by previous Year	Production saving by previous Year	Production saving by previous Year
2017-2018	8.60 Lac kW	49.50 %	50.50 %	------	----------	
2018-2019	7.25 Lac kW	54.00 %	46.00 %	17 % reduction of lightening	by increasing 5 % LED light	Decreasing 4.50 % other resources by previous year
2019-2020	7.01 Lac kW	56.01 %	43.99 %	3 % reduction of lightening	by increasing 2 % LED light and	decreasing 2 % other resources by previous year

By optimizing the locating pattern and operational times of hostels substantial energy consumption can be reduced. Also, by replacing the traditional lamps with low consumption LED lamps, effective energy saving and thereby reducing the energy bills strongly recommended.

4. PREAMBLE

The organization have decided to bring down the energy consumption by 30% during 5 years by conducting comprehensive energy audit studies in their premises and by 20% in private premises followed by implementation of suggestion / Recommendation arising out of the study.

5. INTRODUCTION

Madan Mohan Malaviya University of Technology, Gorakhpur, Uttar Pradesh, 273010, India is the oldest university in the region and established in a big campus with different faculties, admin building, MPH, Library building, Boys' and girls' hostels, Mess arrangements, Water wells and Pumping systems, Canteen, Banking, Student waiting house, Printing press, Gymkhana etc. The internal roads are provided with street lighting and area lighting arrangements. Adequate plantation and gardening at open loads are provided buildings are constructed in such a way that ample ventilation and sunlight is easily accessible hence the power requirement in classrooms and offices in day hours is reduced.

6. ENERGY SOURCE AND DISTRIBUTION

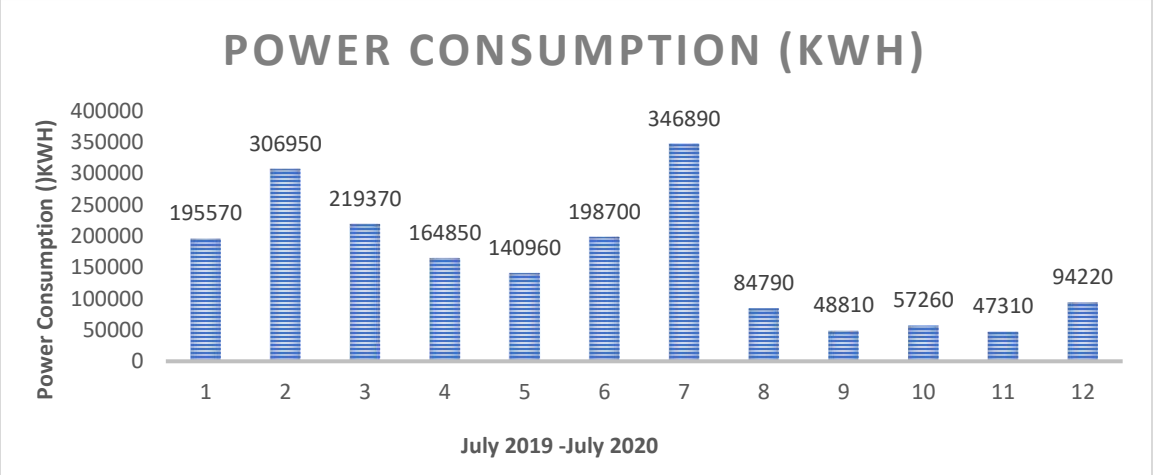
The energy demands for different faculty and activities are met through various single phase and three phase electrical connections. Monthly bills are charged by UPPCL authorities and are regularly paid by concerned depts. The bills of constructions activities are paid by civil contractor and canteen meter bills by canteen manager.

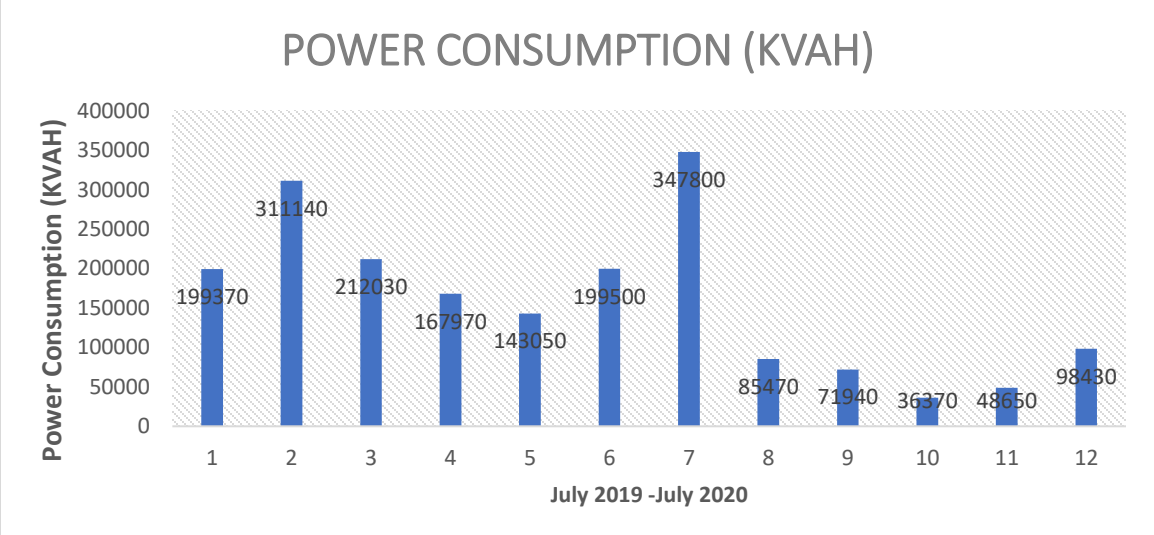
ANNEXURE-1

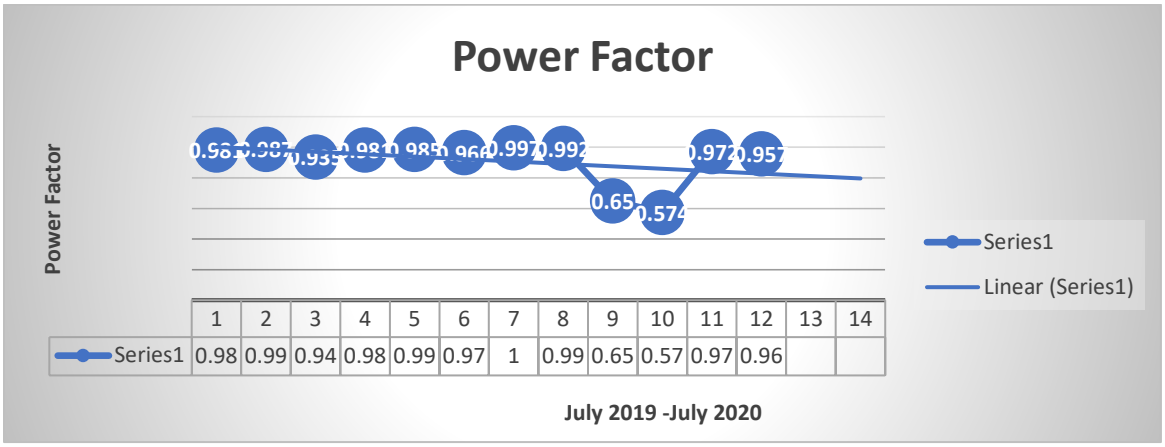
Power Consumption of Electricity Board
Tarif HV-1
Connected Load 700 KVA
Billable Demand 550 KVA

S.N.		TOTAL CONSUMPTION (KWH)	TOTAL CONSUMPTION (KVAH)	POWER FACTOR	MD (KVA)
1.	July 2019	195570	199370	0.981	303
2.	August 2019	306950	311140	0.987	782
3.	Sep 2019	219370	212030	1.035	436
4.	Oct 2019	164850	167970	0.981	573

5.	Nov 2019	140960	143050	0.985	353
6.	Jan 2020	198700	199500	0.966	693
7.	February 2020	346890	347800	0.997	564
8.	March 2020	84790	85470	0.992	450
9.	April 2020	48810	71940	0.65	356
10.	May 2020	57260	36370	1.574	250.80
11.	June 2020	47310	48650	0.972	227.20
12.	July 2020	94220	98430	0.957	290
	Total	1905680	1921720		5278



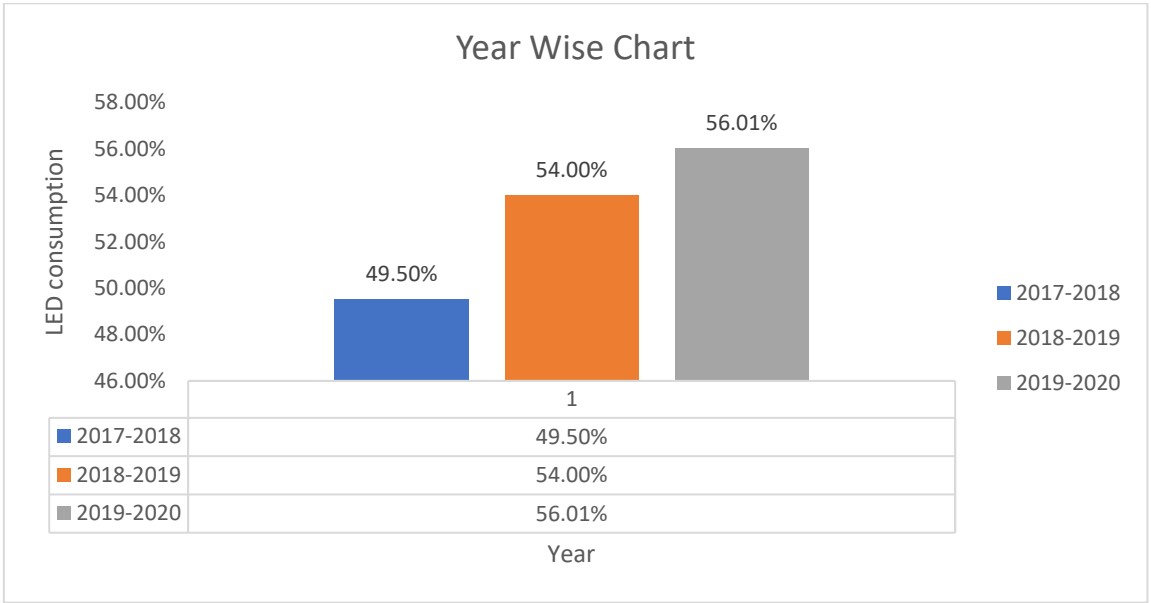




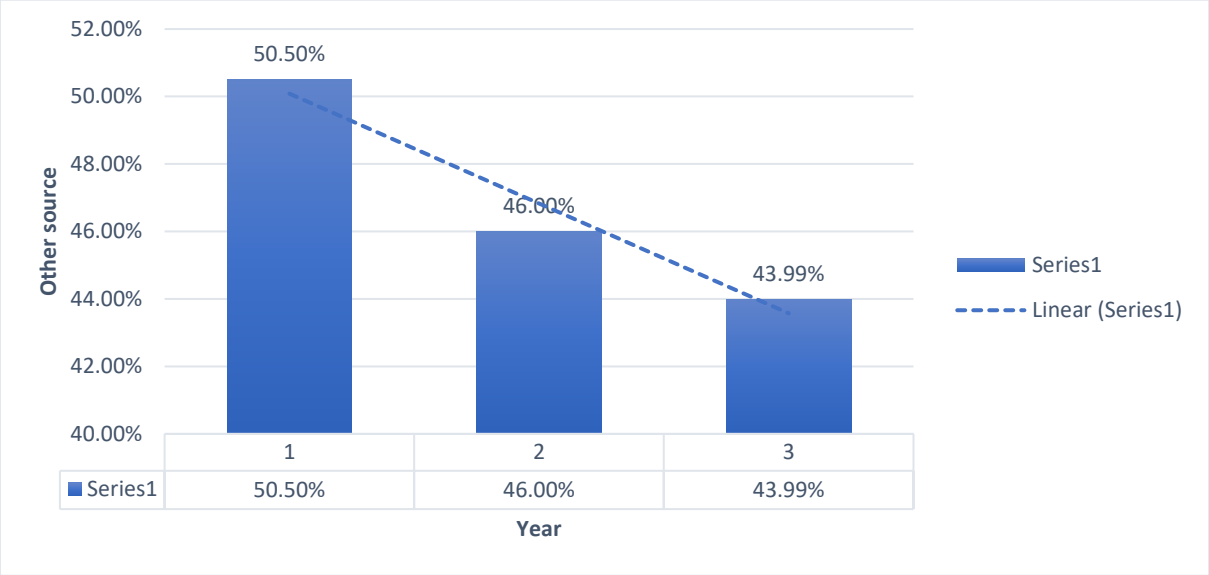
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Series1	0.98	0.99	0.94	0.98	0.99	0.97	1	0.99	0.65	0.57	0.97	0.96		

7. STUDY RESULTS

The existing billing tariff reveals that, the power consumption of commercial units is charged at higher rate as compared with other categories of power consumption, however, for higher consumption in all categories, the rate per unit increases. Hence it is advisable to restrict the consumption at lower slab. In existing scenario, wherever the rate of unit is more than previous year consumption, the immediate action is needed to reduce the consumption by way of replacing the high-power lamps by LEDs and restrict the use of power by proper operational measures. Such locations are identified and mentioned in energy saving calculation sheet.



	1
2017-2018	49.50%
2018-2019	54.00%
2019-2020	56.01%



Adequate and proper lighting contributes both directly and indirectly towards productivity safety and towards providing and improved work atmosphere. In fact, all these are entering related and complementary to each other. To study, analyse and identify energy conservation option in lighting, a study of lighting loads of all buildings and area was conducted. The purpose of study was to determine the lighting load and its distribution in various sections of buildings, determine the quality of illumination provided and recommend measures to improve illumination and reduce electricity consumption. To determine total lighting load, a physical count of the number of light fixtures provided in different floors of different buildings was carried out.

8. OPTIONS FOR IMPROVEMENTS IN LIGHTING SYSTEMS:

Based on the measurements and observations made during energy audit, the following option have been evolved for producing energy consumption as well as improvement in lux levels in lighting system.

a. The tube lights and CFLs energized at other windows may be put off when sufficient day light is available.

b. Although a smaller number of fluorescent tube lights are provided, while chock type CFLs are provided at some places. (e.s. Bathroom etc.). These tubes and CFLs can be replaced with high

lumen LEDs to minimize the lighting consumption and to reduce the amount of monthly bills. The net affects it various locations is shown in energy saving calculation sheet with net saving in monthly bills.

9. GRID-TIED SOLAR :::::::: THE BEST OPTION FOR REDUCING THE EXISTING ENERGY BILLS.

In this scheme any consumer of UPPCL can apply for grid connected solar system as per the sanctioned load and monthly requirement units in prescribed format along with relevant document and can get installed the solar. That power plant on roof top of his building such that the AC output of solar plant can be connected to grid through net meter.

The un-utilized or balance power of solar plant is exported to grid during day hours. The units exported to grid are recorded in net meter every day and during night hours the power is taken or imported from the grid. This imported power is also recorded in net meter. At the end of every month the energy bill is generated considering export/import power during the month. If export is more than import the excess units are carried forward for next month. If the import is more than export the difference unit will be charged as per appropriate tariff. The final account of export / import units is closed at the end of year. The benefits of this scheme are (i) We can utilize full capacity of solar plant (ii) There is no need to store the power in batteries. (iii) Cost of storage devices and routing maintenance is saved (iv) When there is no local load for consumption of power the total power is sent to grid and the units exported remain to the credit for future use.

1. Solar Energy: The main fetcher of the system is that the solar plant works only when grid power is available. In absence of grid power, the solar plant immediately shuts down, to avoid back feed on grid and mishap power grid of 550 KWH was installed.

2. Wheeling to grid: Institute has well established network for supply for the entire campus including hostels, Lab, and residential premises. Process of transmission of electricity through the transmission lines have been completed in the entire campus.

3. Sensor based energy conversation: All the streetlights in the university campus are sensor-based energy conversion. Hence loss off power has been controlled effectively. All the streetlight in the campus is fully automated.

Facilities for alternate source of energy and energy conservation measures:

Session	Solar Energy	Wheeling to Grid	Sensor Based Energy conservation
2016-2017	0.065	YES	-
2017-2018	0.85	YES	-
2018-2019	1.51	YES	Partially Street Light
2019-2020	6.47	YES	Partially Street Light

Photograph:

10. CONCLUSION

During Energy Audit Study of the university campus, following points are noted for immediate action in phases.

1. First action will be taken to reduce the excess section load of connection to save the excess payment against fix charges of excess demand.

2. Second action shall be taken to monitor the undue use of light and fans. Especially in boys and girls' hostels, the power cut can be implemented in university working hours. The use of fans for soaking of clothes should be watched. Every person in the campus should take care to switch off the light, fans, computers, A/c etc wherever not needed.

3. Where the rate of unit in bill is high at such identified location the replacement should be done in first phase and likewise depending upon availability of funds.

METER WISE ABSTRACT OF PROPOSED LOAD REDUCTION BY REPLACING FLUO. TUBES AND HIGH WATTAGE CFLS BY LED

Annexure-1

The University has started steps in installing the LED panels for office.

SESSION	TOTAL LIGHTNING REQUIREMENT	% LIGHTNING THROUGH LED LIGHTS	% OTHER RESOURCE	LOAD REDUCTION BY LED & OTHER RESOURCE CONSUMPTION
2017-2018	8.60 Lac kW	49.50 %	50.50 %	-----
2018-2019	7.25 Lac kW	54.00 %	46.00 %	1.25 Lac kW
2019-2020	7.01 Lac kW	56.01 %	43.99 %	0.24 Lac kW

SUGGESTIONS:

Considering daily 12 Hours consumption and present billing rate following suggestion are made for savings in monthly energy bills.

1. To improve the power factor, the new capacitors to be provided as mentioned water pumps this will reduce the consumption.

2. The bills charged at commercial rates should be considered for reduction of load on priority by arranging the load consumption by LED lights.

3. Use 5 Star rating equipment (AC, geyser and so on etc.) in place old equipment in university campus.

4. Use solar light for reduction of power consumption.

5. The A.C. should be operated in temperature range 22 to 26 degree centigrade for low power consumption.