

# Energy Audit, Management in Distribution System with and without Renewable Energy

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*Received: 6 December 2018 Accepted: 3 January 2019 Published: 15 January 2019*

## Abstract

In this paper we have audited our collage Sardar Vallabhbhai Patel Institute of Technology (SVIT), Vasad. The total connected load of the institute is about 650KW which itself considered as a one of the major consumers of power. In order to reduce power consumption and conserve, energy audit has been taken place. A detail calculation is carried out with and without renewable energy source in the way that energy savings and financial benefit is achieved.

## Index terms—

Introduction n 21st century energy saving is one of most important things because in human life after food, shelter & clothing another most important thing is energy. Industries, college, school, malls, restaurants etc. are major load consuming components in electrical system. The demand of electricity is increases day by day but we have limited source for power generation. So, it becomes necessary to save energy and use it where is required.

Audit help us to find energy losses and proper solution for energy conservation of any energy related system. Hence, we have taken initiative to study the same for our institute named as Sardar Vallabhbhai Patel Institute of Technology-Vasad (SVIT-Vasad).

The SVIT is organized by The New English School trust (NEST), and it was established in 1997 on the banks of the river Mahi at Vasad-Gujarat. As on date, SVIT Vasad has technical courses i.e. engineering, Computer applications and architecture. It is observed that, this campus was facing over loading condition during peak hours, due to that the main switch at distribution panel was tripping frequently since from june-2017. Hence this energy audit was aimed at obtaining a detailed idea about the various end use energy consumption activities and detecting, computing and evaluating the possible energy saving opportunities.

## 1 II.

## 2 System Discription

The SVIT purchase power supply from GEB situated at Jarod Substation (11kV). This power is utilizing at a supply voltage of 440V, which is step down with a distribution transformer. The contract demand of collage is 350KVA and average power consumption of 28,000KW per month. This institute implemented a tariff plan name as HTP-I. SVIT has also its own DG set, which is rated as 125 KVA, 415 V. During normal use, the power is consumed from GEB supply however during meetings, seminars and events DG set is switched on to avoid any kind of disturbance due to power cut-off. Hence, the distribution system of college run on GEB supply and DG set.

## 3 III.

## 4 Procedure a) Initiative

The initiative of audit starts with an idea and the aim for energy saving. With proper guidance of faculties, the audit starts. Permission should be taken of either head of department or principal for further procedure of audit.

## 5 b) Preparation Data sheet

Audit starts with collecting data. The data should be collected is like This all data will be prepared on excel sheet. After preparing data sheet analysis of that data starts.

## 6 c) Analysis of data

The data sheet that we have prepared will give the total load and power consumption of every department, every equipment, every floor, every class and laboratory independently. So, we can find load or power consumption of any class or floor or department easily.

So, in the analysis we find total connected load of every department and every equipment. We make different bar chart and pie chart for the better interpretation of load distribution.

All charts will help us to understand where the more energy is going and which equipment is using more energy. So that we can find better replacement of it.

## 7 I

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## 8 Global Journal of Researches in Engineering ( ) Volume XIX Issue II Version I d) Calculation for equipment replacement

When the more energy used equipment is found. The calculation for more energy efficient equipment is done for same. The energy saving, payback period and financial benefit is found for every equipment.

## 9 e) Calculation for Renewable energy source replacement

Which renewable sources are efficient, easily available and cost effective is to be found out? The energy saving, pay-back period and financial benefit is estimated to fulfil the energy demand of college by renewable energy sources.

## 10 f) Recommendations

The proper recommendations will be given to authorities or trustees about replacement, maintenance and green energy advantages with energy saving and financial benefit data.

IV.

## 11 Analysis of Data

Once audit is completed, analysis of data sheet starts. Using data, we create pie chart and bar chart for proper understanding of load distribution, energy flow and power consumption.

Here we have made different pie chart and bar chart for understanding our audited data. In Fig. 2 we have shown actual power consumption of every department. The purpose of this pie chart is to interpret how much power is consumed by every department throughout a year and how much it is in percentage from total power consumption of college. The aside calculated data will help to determine which department is consuming more power and how we can reduce them. After analysing all the data and graphs we can know how we will reduce power consumption with minimum capital cost, more energy saving and for longer period. Now the calculation is made for power savings by replacing aged equipment with new and energy efficient equipment for example replacing old Tube light and CFL with LED tube light effectively reduces power consumption and saves light bill cost. The same calculation is made for all the equipment who has higher power consumption.

As an example, the calculation for replacing Tube light with LED is shown further down V.

## 12 CALCULATION FOR EQUIPMENT REPLACEMENT

In this portion we calculate exactly how much energy we can save and how much financial profit will Also Fig. ?? will helps to determine which equipment is using more power and how can we reduce them. The above calculation shows us how much energy we can save by just replacing Tube lights with LED. It also shows us the amount we can save in the period of five years.

The same calculation is done for all other equipment replacement like 3-star air conditioner to 5star air conditioner, large power using computers to less energy using and compact computers or laptops etc.

## 13 VI.

## 14 Calculation for Renewable Energy Source Replacement

There are many renewable energies sources are available in present but for college solar source is most efficient way for energy generation Then any other renewable energy source.

In order to generate renewable energy for college some parameters should be known like,  
 ? Area available for solar panel implementation ? Maximum power demand of college per day and per month  
 ? Minimum power demand of college per day and per month.

## 15 ? Average Solar power generation in that area in every season

The below shown table is a calculation of 1 KW solar panel Here we took tube light replacement example for understanding.

? Comparison Between Conventional light and LED light = 3.5 years Return on investment = 28.5 % The above calculation is made base upon to fulfil maximum demand of college.

College don't get use the generated power. the generated power directly goes to GEB. The Gujarat Electric Board gives reduction in tariff of light bill.

The GEB gives reduction of 3 per unit generated.

The power generation capacity of whole campus is 600KW.

Here the solar panel is mounted on the roof top of all department and admin building.

## 16 Conclusion

From our comparative study, it can be proven that with the use of LED in place of tube light, the energy is saved up to 28,000KW which in turn a saving of 1.1 lakh per year is achieved. Another study shown that, with the penetration of renewable energy can also save energy up to 96,000KW per year which plays the major role in energy conservation. Hence, by reducing contract demand a saving of 2.16 lakh per year is gained. Installing an automatic power factor control panel will also reduce tariff.

The analysis brings an entry point of new energy planner. It is also significant to reduce energy consumption and power losses. With time load will increase, so does demand and power consumption. So, with the consideration of future demand the solar panels that should be install have capacity of at list 350KW.

The 1KW solar panel cost around 40,000. So, Cost of 350KW solar panel =  $350 \times 4000 = 1,40,00,000$  The annual cost of power consumption = 40,00,000 Above cost of power consumption of college if referred using college light bills.

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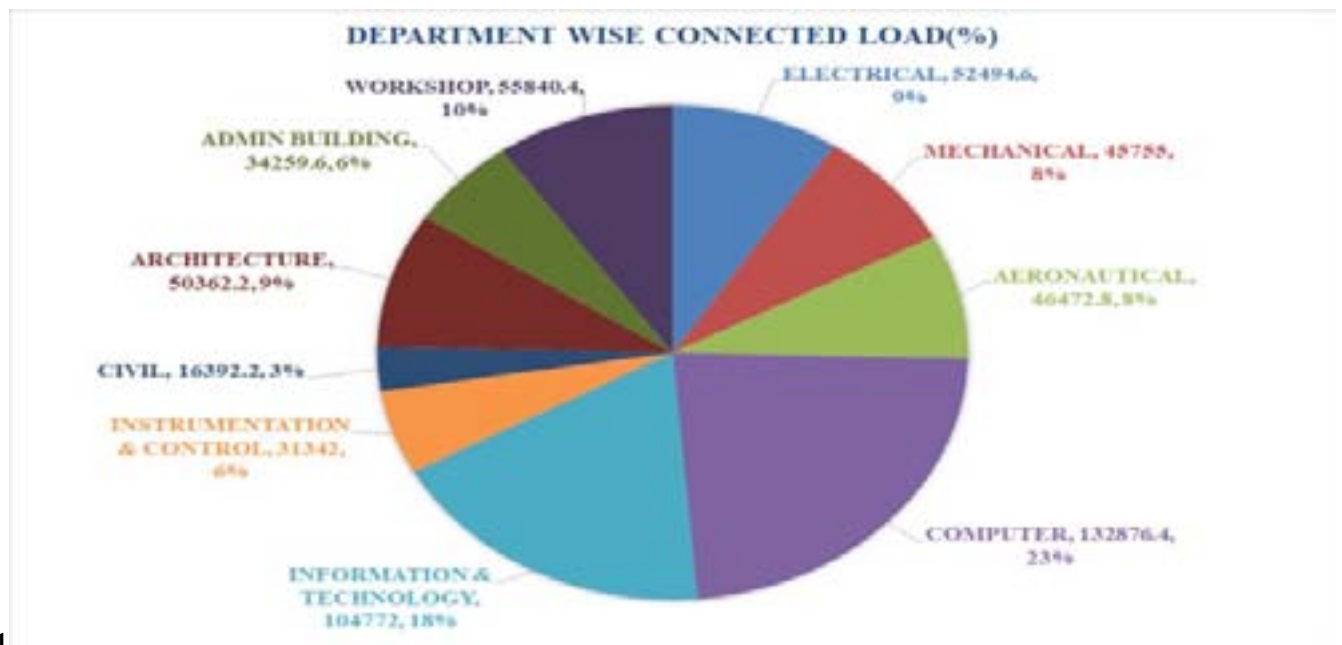


Figure 1: Fig. 1 :

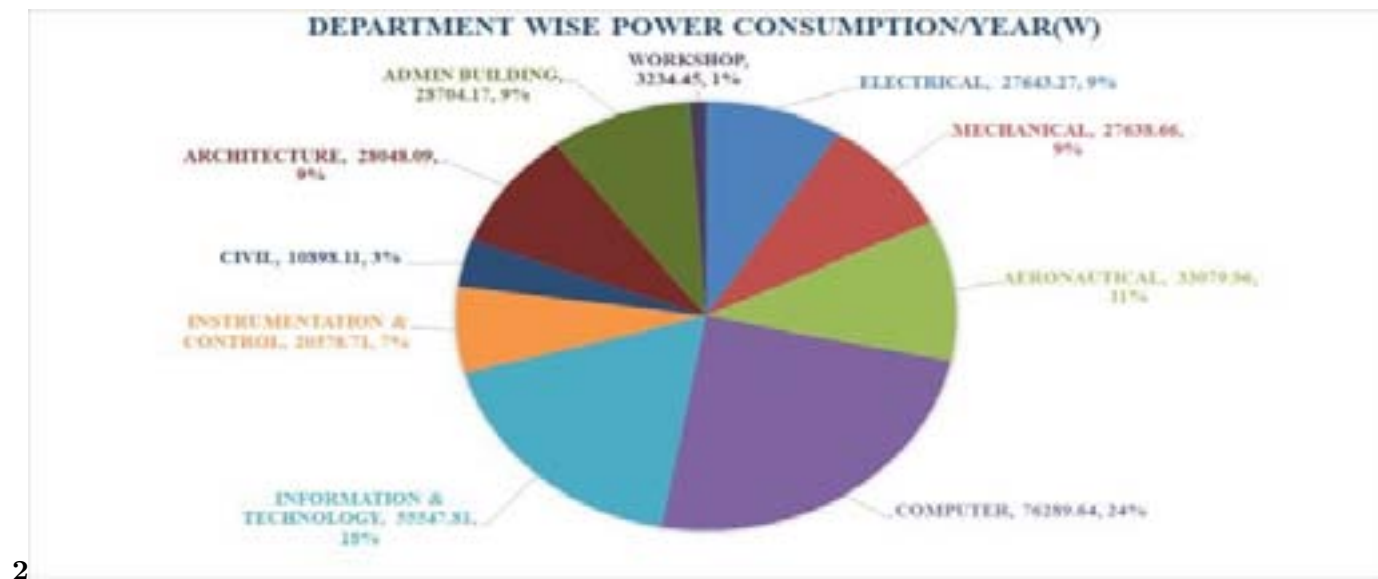


Figure 2: Fig. 2 :

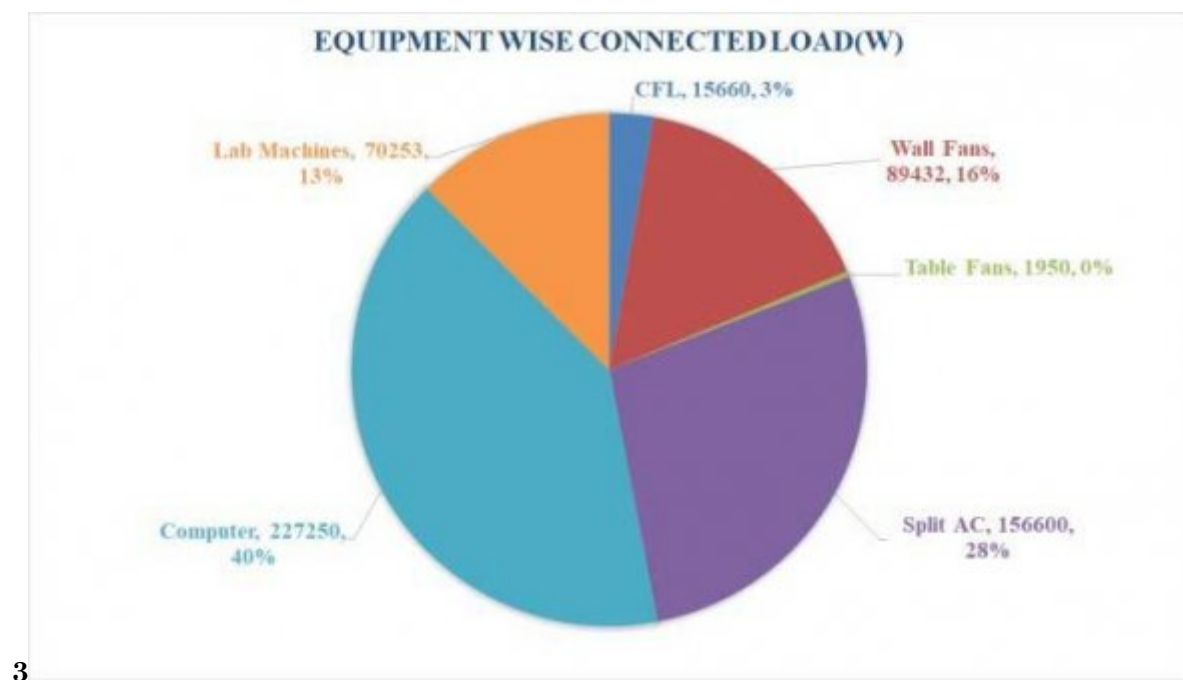


Figure 3: Fig. 3 :

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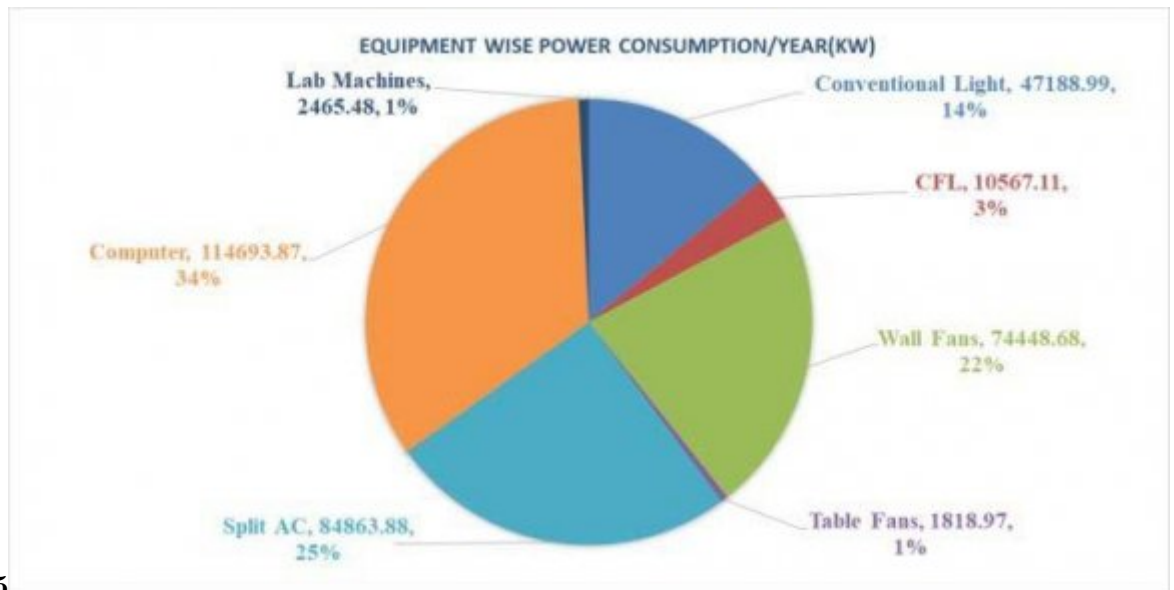


Figure 4: Fig. 4 :Fig. 5 : 2 2019 FFig. 5 :

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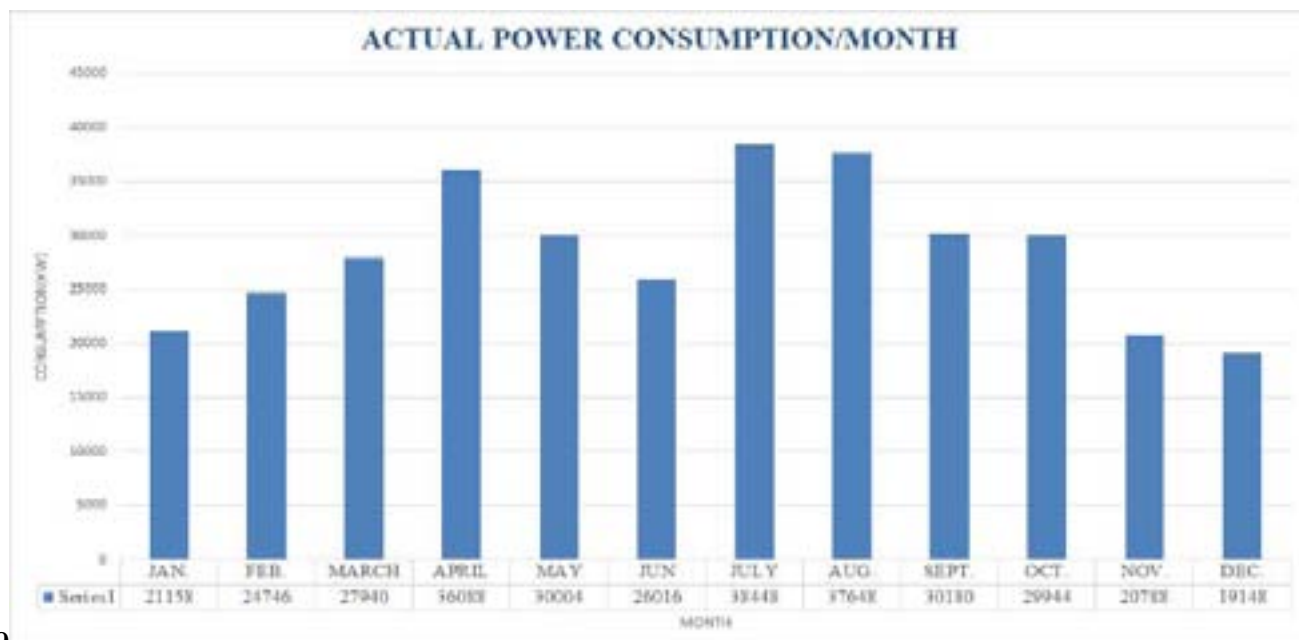


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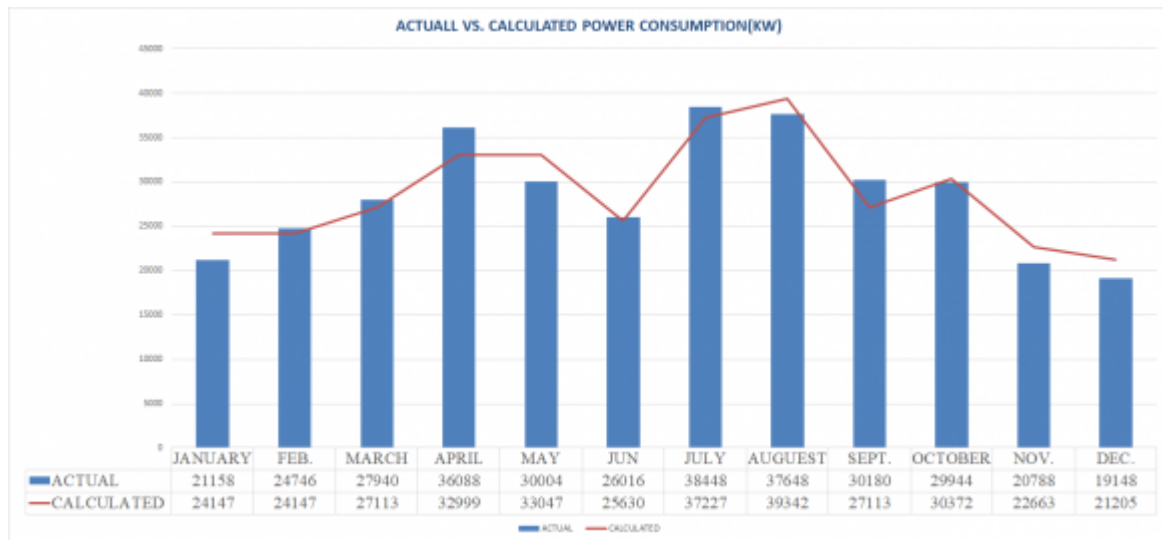
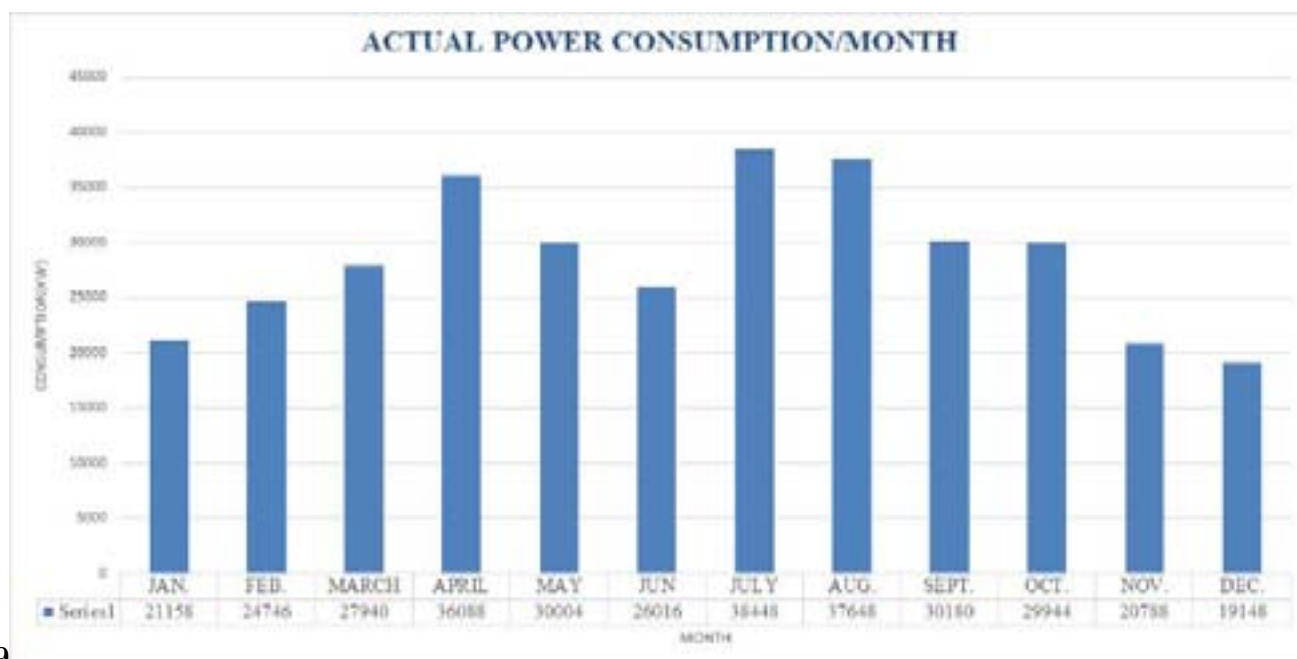


Figure 6: ?



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Minimum demand/day	1000KW
Maximum demand/day	1900KW
Maximum demand/month	20,000 KW
Maximum demand/month	38,500 KW
Year 2019	
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*[Note: F© 2019 Global Journals]*

Figure 8:





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- 120 [Bureau of energy efficiency, Ministry of power, Govt] *Bureau of energy efficiency, Ministry of power, Govt*, (of  
121 India)
- 122 [Electricity Bills of SVIT] *Electricity Bills of SVIT*, Vasad.
- 123 [Energy Audit: A Case Study by Sanjay Kumar] *Energy Audit: A Case Study by Sanjay Kumar*, Tarlatan Kaur.
- 124 [Manual of Equipment's Name Plate Of Machines] *Manual of Equipment's & Name Plate Of Machines*,