ISSN2394-3777 (Print)
ISSN2394-3785 (Online)
Available online atwww.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology
(IJARTET) Vol. 5, Special Issue 14, April 2018

CASE STUDY OF ELECTRICAL POWER DISTRIBUTION SYSTEM AND PROPOSAL OF ALTERNATIVE ENERGY SOURCE IN JIT CAMPUS

ANUSHA V[1], BANUSHREE J[2], KARTHIK KT[3], PRUTHVIRAJA L[4]
[1, 2, 3]Students, [4] Assistant. Professor
Department of Electrical & Electronics
Jain Institute of Technology, Davangere

ABSTRACT

This project gives an overview of electrical power distribution process in J.I.T campus. In regarding to this we are doing survey on total connected load and maximum load demand. The main objective of this project is to give a proposal on solar roof top system on J.I.T campus, based on available shadow free area .In regarding to this we have made survey of terrace area available on J.I.T campus. With available details of survey and with standard ratings of equipment's calculations are performed for estimating various components required, total cost investment on campus. This project is helpful in utilizing the available free solar energy, hence reducing the power consumption from grid and with economic benefits. This encourages use of renewable solar energy for generation of power and helps in development of our country.

1. INTRODUCTION

An electric power system is a network of electrical components which is used to supply, transfer, and use electric power. An example of an electric power system is the network that supplies a region's homes and industry with power for sizeable regions, this power system is known as the grid and can be broadly classified into the generators that supply the power, the transmission system that carries the power from the generating centres to the load centres and the distribution system that feeds the power to nearby homes and industries.
The electrical power distributed from the substations with the help of distributors. The distributors can have number of tappings.

Engineering institutions being the nursery for future nation builders can use the solar rooftop system. So in promoting to utilize the existing solar energy its harvesting is a necessary part and since it can be used to generate power with available shadow free area at commercial and educational sectors. We can have this solar roof top system in our institution over available area and hence we are presenting a proposal over it and by this we can set an example to other educational institutions and as well as to society for the use of renewable energy sources.

2. METHODOLOGY

A typical low voltage power distribution system with essential components is shown below in the form of block diagram.

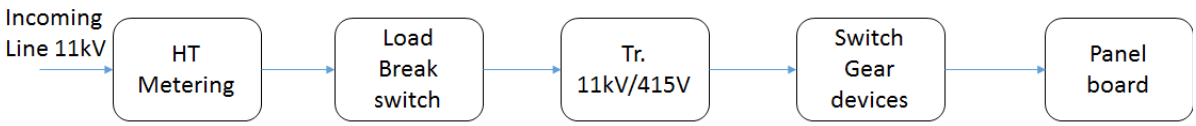

Figure: Typical low voltage electrical power distribution

The essential components of a typical low voltage power distribution system are metering devices; load break switches (LBS), distribution transformers, switch gear section etc.

The 11kV distribution line is first fed to the HT metering devices. Voltages, currents, frequency, power are measured using HT metering devices. A current transformer (CT) is a type of transformer that is used to

ISSN2394-3777 (Print)
ISSN2394-3785 (Online)
Available online atwww.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology
(IJARTET) Vol. 5, Special Issue 14, April 2018

measure AC Current. It produces an alternating current (AC) in its secondary which is proportional to the AC current in its primary. They are designed to present negligible load to the supply being measured and have an accurate voltage ratio and phase relationship to enable accurate secondary connected metering.

From the metering devices the power is then fed to load break switches. These load break switches are operated manually during any repair work in the-transformer or in the loads. Further the power is fed to the transformer (11kV/440 V). Transformer is a static device which transfers electrical energy from one circuit to another circuit does without change in frequency through electromagnetic induction. The transformer used here step down the voltage (11kV) to consumer voltage (415V). In our collage two ratings of transformers are used that is 250kVA which are used to step-downs the voltage from 11kV to 415V with current from 13.12A to 333.33A. Practically HV side is delta connected and LV side is star connected. The power at consumer voltage is fed to the switch gear section. Switchgear section consists of several safety devices like circuit breakers, isolators, and high capacity fuses etc. Circuit breaker is a device which makes the circuit when the operator intends it and which breaks the circuit based on operator intention as well as for any fault in the circuit. The protective devices used in the switchgear section operate during faults or when the load exceeds the normal value. The power is finally fed to the various loads through distribution boards.

2.1 COMPONENTS LIST OF 11kV LOW VOLTAGE ELECTRICAL POWER DISTRIBUTION

1. Diesel Generator
2. Transformer
3. Automatic Mains Failure (AMF)
4. Distribution Board
5. Bus bar
6. Capacitive Coupling
7. Earth Leakage Circuit Breaker (ELCB)
8. Moulded Case Circuit Breaker (MCCB)
9. Circuit Breaker
10. Switch Gear
11. Earthing Switch
12. Lightning Arrester

2.2 SOLAR ROOF TOP RESULT TABULATION OF J.I.T. CAMPUS

Total available roof top area	2318sq.m 24909.22sq.ft
Total power that can be generated	249.8kW
Number of inverters required of 50kw rating	6 inverters
Load energy usage per day(9hrs)	2241.81kwh/day
Each 320w solar panel generates	1.7632kwh/day
Total solar hours in Davanagere	5.51 kwh/sq.m/day or solar hours
Number of solar panels of 320w rating required	1272 solar panels
Cost per watt power generation	Rs.60/watt
Cost required for 249.8kW generation	Rs.14,988,000.

ISSN2394-3777 (Print)
ISSN2394-3785 (Online)
Available online atwww.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology
(IJARTET) Vol. 5, Special Issue 14, April 2018

2.3 RETURN ON INVESTMENT

1. Total cost of plant
As per MNRE standard total cost Rs 60/watt
Total cost of 249.8 kw = 14988000/-
2. Total units generated =249.8*10^3*5.51hrs/day*365
= 5, 02,385.27 kwh/year
Energy consumed = 91,447.5, kwh/year
Units fed to grid = 410937.77kwh/year
Tariff = 4.51rs/units
Total annualearnings from grid = Rs.1,853,329.343/-
Total annual earnings = 1123763.657+1853329.343
=Rs.2, 977,093/-

3. RESULT

Study of various electrical equipment's used in the distribution of power, their construction and working has also been carried out. This proposal of alternative energy source (Solar) could be helpful in future for the institution and gives a detailed report for installation of the system in JIT campus.

4. CONCLUSION

In this project, an attempt has been made to study the existing low voltage electrical power distribution system in our J.I.T campus and to collect load data of various feeders Connected to the system J.I.T campus has shadow free terrace area of approximately 2318 sq.m and hence total power generation of 249.8kw can be generated, with the total investment of Rs 14,988,000. This project encourages the use of renewable source of energy and also helps in creating awareness to demonstrate effective and innovative use of solar roof top systems for Institution and industries. This system overcomes the problems of power shortages,load shedding and has economic benefits. By having this project in our campus we can set a good example for the society and for the other institutions.

The solar panels have a good life span and hence for the next 25 years the project would successfully works with approximate power generation of 249.8kw and thus we get independent from the grid. This project also helps in earning profit by selling the power to grid. .So, we can have an annual savings of Rs. 2,977,093 from the grid itself. The total investment made for this project can be re obtained with the payback period of 5years. For this kind of project even the state government encourages by providing subsidy.

REFERENCES

1. A. T. Davda, M. D. Desai, and B. R. Parekh,2011, "Integration of Renewable Distributed Generation in Distribution System for Loss Reduction: A Case Study", International Journal of Computer and Electrical Engineering, Vol. 3, No. 3,India
2. R.M. Kamel., B. Kermanshahi, 2009,"Optimal Size and Location of Distributed Generations for Minimizing Power Losses in a Primary Distribution Network, Computer Science & Engineering and Electrical Engineering Vol. 16, No. 2, pp. 137-144
3. Fracisco M. González-Longatt, 2007,"Impact of Distributed Generation over Power Losses on Distribution System, Conference Electrical Power and Quality and Utilisation. Barcelona
4. Knazkins, V., 2004, "Stability of Power Systems with Large Amounts of Distributed Generation", KTH Institution, Stockholm, Sweden. H.L Willis," Analytical Methods and Rules of Thumb for Modelling DG- Distribution Interaction," IEEE Proceeding winter meeting, Vol 2. pp 1643-1644, 2000
5. Angelopoulos, K., 2004," Integration of Distributed Generation in Low Voltage Network: Power Quality and Economics", University of Strathclyde in Glasgow Department of Mechanical Engineering, Glasgow
6. Reza.M.,2004," Analyzing the Impacts of Distributed Generation on the Reduction of Energy Losses and Carbon Emission: A Case Study on Electrical Power Systems. Journal of the Indonesian Oil and Gas Community, Indonesia"
7. Thong,V.V., Driesen,J., Belmans,R., 2005,"Interconnection of Distributed Generators and Their Influences on Power Sytem",International Energy Journal Vol.6,No.1 Part 3, Belgium.

