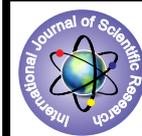


A Case Study To Fulfill The Requirement Of Low Income Group (L I G) House By Installing Pv Panel



Engineering

KEYWORDS : Solar radiation, Photovoltaic cell, Electrical loads

Badshah Alam	Mechanical Engg section, University Polytechnic, Faculty of Engg & Tech. Jamia Millia Islamia New Delhi, India
Emran Khan	Mechanical Engg section, University Polytechnic, Faculty of Engg & Tech. Jamia Millia Islamia New Delhi, India
Shah Alam	Mechanical Engg section, University Polytechnic, Faculty of Engg & Tech. Jamia Millia Islamia New Delhi, India

ABSTRACT

The paper deals with the use of photovoltaic (PV) panel to generate the electrical energy to support the electrical appliances installed in the premises of a low income group (LIG) flat. For the purpose of study the LIG flat has been selected in New Delhi. The family members of this flat are using two bed rooms, one hall, one kitchen and a bathroom. The electrical load of the house has been estimated. It is found that the family has maximum demand of 3.620 kwh in a day during summer season, 2.644 kwh during rainy season and 1.044 kwh during winter season. To fulfill these requirements PV panel is installed in the premises. The cost of electrical energy saved has been estimated. The case study shows that by installing PV panel the family can save the electrical energy.

1.0 Introduction:

The sun releases energy at the mass-energy conversion rate of 4.26 Million metric tons per second. The utilization of solar energy can be consistent to the sustainable development and environment protection, and can be carried out jointly to realize the development strategy in the world. Solar photovoltaic system is one of the renewable energy systems which use PV modules to convert sunlight into electricity by photovoltaic effect. Sunlight is composed of photon. When photons strike a photovoltaic cell some are absorbed producing electricity. The photons energy is transferred to an electron in an atom of the solar cell. The electron can now escape the atom and flow as current in an electric circuit. The electricity generated can be stored or used directly, fed back into grid line solar photovoltaic system is very reliable and clean source of electricity that can suit a wide range of applications such as residence, industry, agriculture etc. The solar PV panels deliver DC electric power. This DC power supplied by PV panel and the storage battery should be converted to single phase or 3 phase, 50 Hz, AC power by means of static inverter.

Omer et. al [1] have monitored two example of building integrated PV system in U K and they have studied the similarities and differences in design, installation, performance and economics of these two systems. Olympia and Herricos [2] have studied the effect of solar insolation on PV panel installed in an official building during different season of year. Roman et. al [3] have considered the different losses such as PV inverter losses, thermal losses, mismatching losses etc. while studying the performance of building integrated PV system. Kivaisiv [4] has installed 3 kWp PV panel to supply power for a village school, health centre, school staff quarters and mosques. They found that the lights and other appliances which are used in connection with the PV system are the most efficient and cost effective. Salaymeh et. al [5] have concluded that the PV systems installed far from electric grid in remote areas are more economical. Sayigh [6] has demonstrated the application of PV panel in buildings of large cities with or without storage systems. India is in the northern hemisphere with in latitude of 7o N to 37.5o N. The average solar radiation value for India lies between 12.5 to 22.7 MJ/m²/day. The peak solar radiation in India occurs in some part of Rajasthan and Gujrat and is equal to 25 MJ/m²/day.

2. Methodology:

India is a large country with huge population. Most of them are belongs to lower middle class. India also approaches the tradition of small or nuclear family. Instead of huge available natural resources, majority of the population lives without electricity. Those who are availing the facility of electricity, feel their electricity bill a scare. Keeping the point of running cost of solar PV system, it is better to use solar PV system to support their electrical needs.

For the purpose of analysis we have selected a low income grade family house located in Jasola, New Delhi (latitude of 28.58o N and longitude of 77.19o E). This family house consists of two bedrooms, one hall, kitchen and bathroom. The electric load of appliances installed in the premises has been calculated in different season of a year. Against these load PV panel has been selected, installed and its economical aspects has been studied.

3. Configuration of PV panel:

and applications. The majority components for solar PV system are solar PV panel, charge controller, inverter battery, DC to AC inverter and Ac loads. The following figure 1.0 shows the Solar PV system includes different components that should be selected according to system type, site location normal connection diagram of PV system.

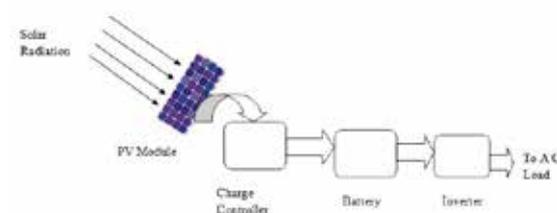


Fig.1: Normal connection diagram of PV system

4. Discussion:

Energy consumption by the appliances can be categorized based on use during the different seasons across the year. Three seasons of the year are namely winter (November to February), summer (March to June) and rain (July to October). The consumption of maximum energy during these seasons are shown in Fig. 2 The figure shows that the daily energy consumption is 1.044 kwh during winter and 3.620 kwh during summer and 2.644 kwh during rainy seasons. The Fig. 3 shows the monthly electrical energy consumption during a year. The total energy consumption during a year a 892.11 kwh.

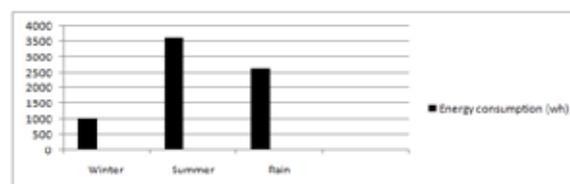


Fig. 2: Maximum daily energy consumption during three seasons

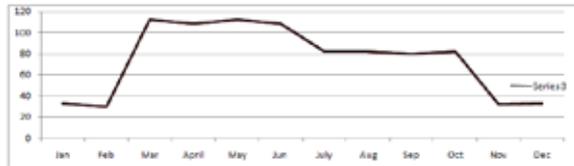


Fig. 3: Energy consumption during different months of year
 The energy consumption graphs show that the maximum demand is during summer season. So the solar panel should be enough to supply the needed energy in this season. Considering loss factor as 1.3, we found that the total PV panel energy needed are 4706 Wh/day. To fulfill the requirement of energy we have selected the size on panel, inverter, batter etc. as:

Solar panel specification:

Number of modules 10

Maximum power 83 Wp

Maximum power voltage 17.2 V

Maximum power current 4.65 A

Open circuit voltage 21.6 V

Short circuit current 4.97 A

Solar regulator rating = 4strings*4.97 A * 1.3 = 25.84 A

So the solar regulator should be rated 30 A at 12 V or greater.

Size of battery: 12 volts, 2000 Ah for 3 days autonomy, Inverter of 640 watts or greater.

5. Conclusions:

This small family house consumes 892.11 kWh per year. By installing the solar PV panel the family is saving this much power annually and equivalent cost of electrical energy. On market survey we have found that PV cell manufacturing company Zedfabric is supplying 83 Wp panel in the market.

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