

Study of Rooftop Solar PV system in India

Sonam Dubey, Pushpendra Kushwaha

Department of Energy Technology, RGPV, Aditya college of Technology and Sciences, Satna, Madhya Pradesh, India

ABSTRACT

With the rapid increase in the demand of electrical power and shortage of present energy resources, Indian power sector is facing unprecedented challenge. Providing energy security and energy independence to billion plus population is also on the government agenda. It has been established that to meet power demand, India needs to develop a basket of energy from naturally abundant resources. Since, solar energy is extensively available across the country. Thus, utilizing solar energy is a logical choice. In recent years, Solar Energy has been increasingly used to generate power. The use of solar energy is attractive for rooftop solar system application also. Rooftop Solar systems are quite needing no fuel and require very little maintenance. PV systems have an added advantage of reliable power, flexibility and quick installation. Hence, roof mounted solar PV systems can play an important role in augmenting the power generation capacity. In the present work, the study of the Rooftop Solar PV System in India has been done. Solar home system and rooftop solar power system has been broadly discussed. Rooftop solar power PV system has been explained in the later sections along with its connection and metering arrangements. The important part of the thesis is to have an idea about the total installed capacity in rooftop PV Power System in India and its nearby future in the Indian Market.

Keywords : PV systems, AC power, DC power, Inverter, RPV system

I. INTRODUCTION

Currently, Global warming and climate changes effect is the burning issue all over the world. India is estimated to be amongst the most affected country in the climate changes effect round the world. There are several causes of global warming but among all of them the power generation is the most remarkable one. Any development without power (Electricity) is not possible. Generating power from sources of conventional energy like Fossil fuel, Natural gas and Coal is practically not possible as the resources are limited. If the present rate of using these resources is followed then it would be finished within the short time. So, there is no other alternative but to think about environmental friendly production of energy from renewable sources.

In Indian context the solar energy is the most effective source for renewable energy production. The use of renewable energy is attractive for solar energy application in many developing countries. The technology being referred to as photovoltaic (PV), converts the sun energy into electricity through electromagnetic means when PV module is exposed to

sunlight. The solar radiation energy is converted into DC power and requires an inverter it into AC power.

II. Working & Construction of Rooftop Solar PV system

Solar PV system is a collection of several electrical components, which are utilized for generation of electricity from sun light and satisfying our daily energy requirement without any hassles about any interval when the sunlight won't be available. These kind of systems are helpful only when there is requirement of load to run in night time or during unavailability of sunlight. The components of such a system are: 1) Solar PV array, 2) Charge Controller, 3) Inverter, 4) Battery, 5) Cables and 6) Protection devices. Depending upon the load requirement and solar radiation intensity at the location, the components of the system needs to be specified.

Figure 2.1 Schematic diagram of interconnection of components of a typical Solar Photovoltaic Power System.

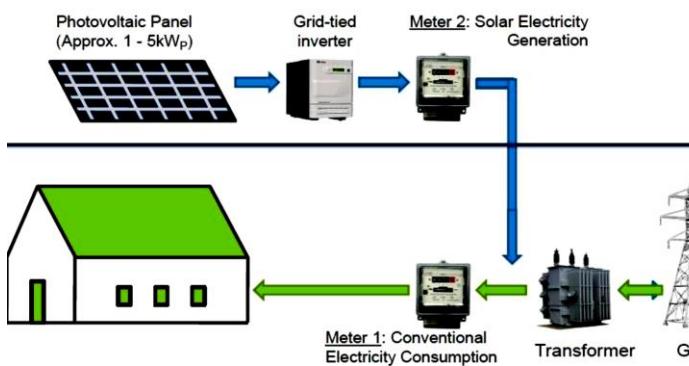
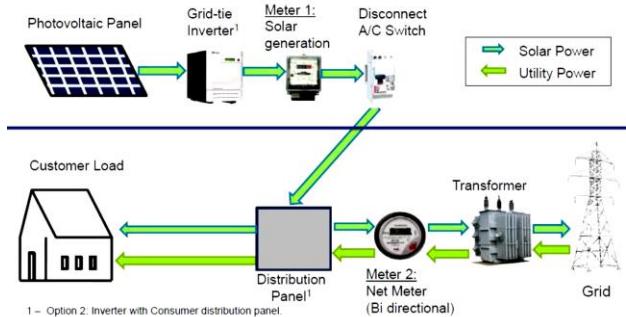


Figure 2.2 : Net Metered Rooftop Solar
Figure shows the utility based Rooftop Solar Power System installation for a locality



III. RESULT AND DISCUSSION

Rooftop System In this system, solar power plant is installed on the roof for the production of electricity during the day time and directly converting them into AC power and employing for fulfilling load demands during day time or for exporting to Grid and saving on EB Bills. This system is most commonly used for applications above 100 KW upto MW size. This system can use solar power when produced and not stored at all.

Off-grid System In this system, solar power plant is installed on the roof top for the electricity generation and to store the energy in the battery. The system operates such that the battery is charged on priority by solar power. When the battery is fully charged and if the solar power is available, then the load is automatically connected to solar power .When solar power is unavailable, the load requirement is fulfilled by the battery power.

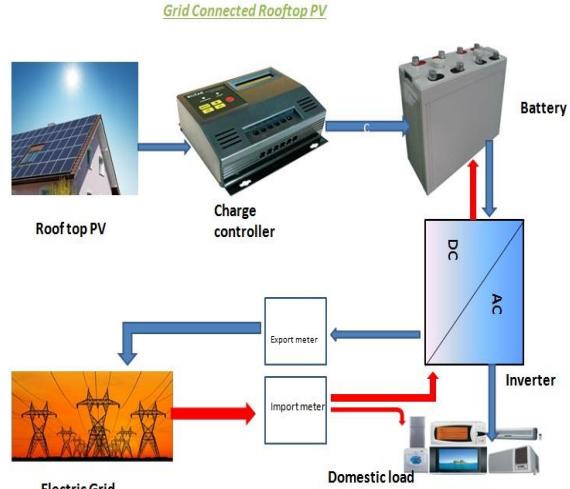


Figure 3.1: Grid Solar PV power system

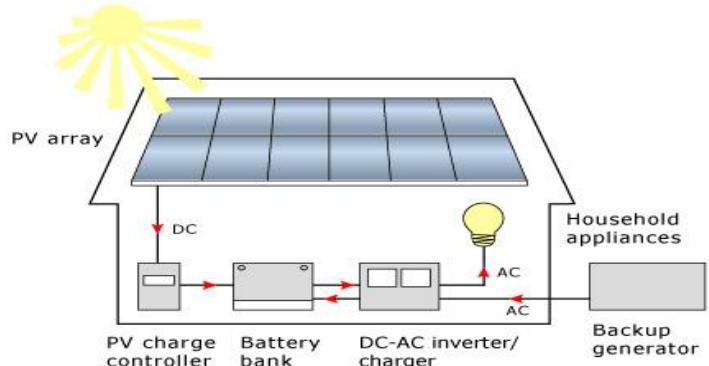


Figure 3.2: Off grid Solar PV Power System

Grid Tide System Vs Off-Grid Tide System

PV systems for the home can be classified as the ones that are designed to make use of an existing electric grid(grid-tied system) or ones that are designed for rural use where no electric grid is available(off-the-grid system). In a grid-tied system no battery system is required for storage of the energy that has been generated from the solar panels instead the grid power itself acts in a sense as a giant battery that uses any excess electricity that the solar panels could have generated, and which it can be drawn from on cloudy days when there is insufficient sunlight for fulfilling the power demands.

Grid-tied systems offer a numerous advantages over off-the-grid PV systems. Firstly, they are less expensive compared to the off-grid system as they do not require either batteries or battery charging controllers. Hence, they lesser equipment requirement makes the systems simpler to set up and use. Lesser installation time and little maintenance is required. Grid-tied systems are far more efficient and environmentally friendly than off-grid systems. While using a grid-tied system none of the energy that is generated by the PV Panels is wasted.

During the sunny days when the panels produce more electricity than the one which is consumed, the energy is transferred to the grid where it can immediately be used by other users. In an off-the-grid system, once the batteries are fully charged, any excess electricity that the system generates is dumped to prevent the batteries from being overcharged.

IV. CONCLUSION

The objective of this was to study about the various kind of solar RPV systems and their viability with respect to Indian market. The study shows that solar RPV systems have best performance with respect to the environment. They contribute in the sustainable development too. Various limiting factors of the RPV system were examined using studies from the literature. Suitable array size, influences of weather and solar panel efficiency were the areas which have not been examined using examples from the literature. These variables were intended to be addressed in this research however each of these topics are large and complex enough on their own to warrant individual examination as they relate to rooftop solar power potential. These topics should be examined in future studies.

V. REFERENCES

- [1]. http://wiki.answers.com/q/do_nuclear_power_plants_cause_any_type_of_pollution
- [2]. Environmental protection agency
- [3]. http://en.wikipedia.org/wiki/world_energy_resources_and_consumption
- [4]. <http://www.energybangla.com>
- [5]. http://en.wikipedia.org/wiki/world_energy_resources_and_consumption
- [6]. http://en.wikipedia.org/wiki/solar_energy
- [7]. http://en.wikipedia.org/wiki/solar_power_by_country
- [8]. <http://www.solarika.org/blog/-/blogs/top10-solar-pv-countries-world-overview>
- [9]. Photovoltaics in Buildings, A Design Handbook for Architects and Engineers. Editors Friedrich Sick and Thomas Erge, Fraunhofer Institute for Solar Energy Systems ISE Freiburg, Germany.
- [10]. International journal of Renewable energy research Nahid-ur-Rahman Chowdhury et al., Vol.2, No.2, 2012
- [11]. India's Solar Energy by Gordon Feller, urban Age Institute, January 18
- [12]. Wind and Solar power System. Writer : Mukund R.Patel U.S Merchant Marine academyking's point' New York. CRC Press Boca Raton London New York Washington, D.C
- [13]. Kazy Fayeen Shariar, Enaiyat Ghani Ovy, Kazi Tabassum Aziz Hossainy, "Closed Environment Design of Solar Collector Trough using lenss and reflectors," World Renewable Energy Congress 2011, Sweden.
- [14]. Fahim Hasan, Zakir Hossain, Maria Rahman, Sazzad Ar Rahman, "Design and Development of a Cost Effective Urban Residential Solar PV System," December2010.
- [15]. Renewable energy projects, IDCOL solar energy program, (2012, March). URL: <http://www.idcol.org/prjshsm2004.php>
- [16]. [www.iitk.ac.in/Rooftop Solar PV Power : Potential,Growth and Issues related connectivity and metering](http://www.iitk.ac.in/Rooftop_Solar_PV_Power : Potential,Growth and Issues related connectivity and metering).
- [17]. <http://www.freesunpower.com>
- [18]. <http://blogs.worldbank.org/climatechange/lighting -rural-india-rooftop-solar-carboncredits>
- [19]. http://www.china.org.cn/environment/2010-04/02/content_19735875.htm
- [20]. www.rahimafrooz-solar.com/index.php...solar/109-india-bank
- [21]. <http://archive.thedailystar.net/beta2/news/biggest-solar-power-plant-on-bbs-rooftop>
- [22]. www.bpdb.gov.bd
- [23]. <http://cleantechnica.com/2014/07/14/480000-new-solar-home-systems-bangladesh>
- [24]. <http://in.reuters.com/article/bangladesh-solar-idINKBN0KY0O220150125>
- [25]. www.thedailystar.net/city/2000mw-power-2020-203458
- [26]. <http://www.indiatribune.com/india/2015/nov/18/roof-top-solar-plants-planned-allgovt-buildings>
- [27]. <http://print.thefinancialexpress-bd.com/2014/10/03/59536>
- [28]. <http://energybangla.com/public-offices-under-roof-top-solar-coverage-by-two-years>