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Analysis of Solar Energy in India

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ABSTRACT-
In this paper analysis of solar energy in India is done. Explains the basic meaning of solar energy and types of receivers. Solar energy is not widely used in India but it is beneficial for environment.

Key words- Solar energy, solar energy receiver

I. INTRODUCTION

India has a vast supply of renewable energy resources, and it has one of the largest programs in the world for deploying renewable energy products and systems. Indeed, it is the only country in the world to have an exclusive ministry for renewable energy development, the Ministry of Non-Conventional Energy Sources (MNES).Since its formation, the Ministry has launched one of the world's largest and most ambitious programs on renewable energy. Based on various promotional efforts put in place by MNES, significant progress is being made in power generation from renewable energy sources. In October, MNES was renamed the Ministry of New and Renewable Energy.

he Indian solar energy sector has been growing rapidly, in the past few years, majorly due to Government's initiatives such as tax exemptions and subsidies. Due to technical potential of 5,000 trillion kWh per year and minimum operating cost, Solar Power is considered the best suited energy source for India. Today the Solar power, has an installed capacity of 9.84 MW which is about less than 0.1 percent of the total installed renewable energy of India's~ currently total installed renewable energy stands at 13,242.41 MW as per MNRE.

India is blessed with the potential for a significant amount of solar energy generation. At 300 to 330 days of sun per year, the country plans to establish mega solar power plants to capitalize on this important domestic resource. As in many other sectors, India's states seek to drive change and attract investment in solar power, too (the top five states in solar power generation added in the last three years are shown in Figure 6). MNRE has finalized plans to set up the world's largest solar power project in Rajasthan, with a capacity of 4,000 MW. The first phase of the project is anticipated to be complete by 2016.

II. SOLAR TECHNOLOGY

A. Solar Irradiance

The Sun is the fundamental driving force for energy in the Earth's climate system. It is of crucial importance to understand fully the conditions of its arrival atthe top of the atmosphere and its transformation through the

earth. The amount of solar power available per unit area is known as irradiance is a radiometric term for the power of electromagnetic radiation at a surface, per unit area. It is used when the electromagnetic radiation is incident on the surface

B. Solar Constant

The solar constant is the amount of incoming solar electromagnetic radiation per unit area, measured on the outer surface of Earth's atmosphere on a plane perpendicular to the rays. The solar constant includes all types of solar radiation, not just the visible light.

C. Solar Window

The solar window represents the effective area through which useful levels of sunlight pass throughout the year for a specific location. It is used to determine potential shading problems when designing a photovoltaic system

D. Solar Spectrum

The sun radiates power over a continuous band or spectrum of electromagnetic wavelengths. The power levels of the various wavelengths in the solar spectrum are not the same.

III. SOLAR RECEIVER

The types of receivers used for collecting solar energy are classified as follow

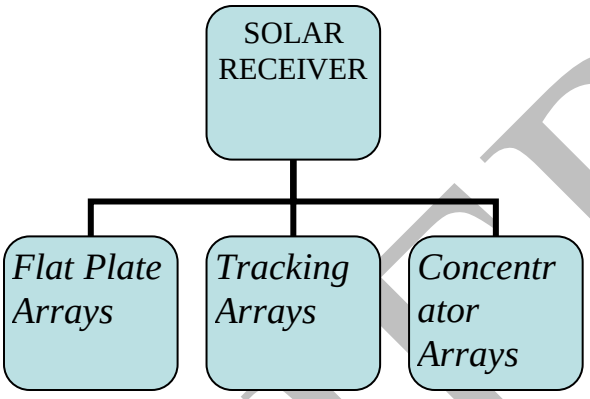

Fig.1 Classification solar receiver

A. Flat Plate Arrays

Flat plate arrays use both diffused and direct sunlight. They can operate in either fixed orientation or in a sun-tracking mode. For most applications, flat plate arrays are in fixed orientation. However, with the advent of low-cost passive sun-trackers, flat plate tracking arrays are becoming more popular

B. Tracking Arrays

In this case, solar array follows the path of the sun and maximizes the solar radiation incident on the photovoltaic surface. The two most common orientations are:

One-axis tracking: In this tracking mechanism, the array tracks the sun east to west. It is used mostly with flat-plate systems and occasionally with concentrator systems.

Two-axis tracking: In this tracking mechanism, the array points directly at the sun at all time. It is used primarily with PV concentrator systems

C. Concentrator Arrays

Concentrator arrays use optical lenses and mirrors to focus sunlight onto high-efficiency cells. three forms of concentrator devices. The major advantage of concentrating device is that they use relatively small areas of expensive photovoltaic material. The larger aperture areas are made up of less expensive plastic lenses or other materials.

The heart of the Solar energy generation system is the Solar cell. It consists of three major elements, namely:
The semiconductor material which absorbs light and converts it into electron-hole pairs.
The junction formed within the semiconductor, which separates the photo-generated carriers (electrons and holes)
The contacts on the front and back of the cell that allow the current to flow to the external circuit.

IV. APPLICATIONS OF SOLAR ENERGY

Three most important and widely used applications of Solar PV have been considered here. These are
Solar home lighting systems
Solar water pumping systems
Solar power plant

A. Solar home lighting system

Home lighting systems are powered by solar energy using solar modules. The generated electricity is stored in batteries and used for the purpose of lighting whenever required. These systems are most widely used in non-electrified rural areas and as reliable emergency lighting system for important domestic, commercial and industrial applications. The Solar Home Lighting system is a fixed installation designed for domestic application. The system comprises of Solar PV Module (Solar Cells), charge controller, battery and lighting system (lamps & fans)

B. Solar water pumping system

These water pumping systems are powered by solar energy. It is a stand-alone system. The power generated by solar module is used for operating DC surface centrifugal mono-block pump set for lifting water from bore / open well or water reservoir for Min or irrigation and drinking water purpose.

C. Solar Power Plants

Power supply in most of the cities and towns is unreliable, which has forced the people to use small generators. These generators are operated with fossil fuels like kerosene, petrol or diesel cause pollution. It also leads to increase dependence on oil imports. A solar power plant is a good option for electrification in areas that are located away from the grid line or where other sources are neither available nor can be harnessed in a techno economically viable manner. A solar power plant of the size 10–100 kW (kilowatt), depending on the load demand is preferable particularly with a liberal subsidy and low-interest soft loan from financial institutions. The idea is to raise the quality of life of the people subjected to poverty in these areas. This coupled with low-gestation remote areas of many states that need electrification. Typical Stand alone solar power plant for the power generation comprises of Solar PV module array, Module mounting structures, Charge controller, Battery bank, Inverter and Load circuitry.

V. RESULT

Basic concept of solar energy is explained and which types of receiver are used. Solar system are used in water pumping system and home lighting.

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