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CLEAN ENERGY TRANSITION: THE SOLAR MILESTONE

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Abstract

Due to continuous increase in population and increasing demand for electricity, the conventional sources of electricity based on fossil fuels are not found to be sufficient and they cause pollution. Thus, it is essential to diversify our energy sources. One need to take concrete steps such as investing for renewable energy, promote environment friendly practices and reduce waste of fossil fuel plants. In our country potential of solar energy remains untapped just without any satisfactory reason. The need is to focus on the use of solar energy sources so as to gain maximum efficiency and in this way highly efficient and economically cheap solar cells should be developed. In the arca where solar intensity is very high, solar thermal power plant should be installed more and more. It will be well accepted in the country. However, the practicality of this source should be examined and its benefits and drawbacks should be considered.

Keywords: *Electricity, Thermal Power, Grid, Radiation.*

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Introduction

Energy is one of the most important factors for the development of a country'". There is a direct and close relation between the availability of energy and the growth of a country. Energy is consumed by all sectors of economy and all sections of society in India. The demand for energy is increasing day by day, but production of electricity is not adequate. In spite of 42-fold increase in generation of electricity, 6-fold increase in coal- production and 130-fold increase in production of crude in India during the last four decades, there is a major shortage of energy. The gap between availability and demand is widening. Thus, at present the power crisis has become an acute problem throughout the country. Some of the area receives only an hour of electricity every day. The peak power deficit, that is, the gap between demand and supply in the summer is about 10.8%. Losses in distribution average over 30% across India. Energy crisis is not confined to India alone. Even the developed countries like the U.S., Russia, Germany, and Japan, etc. are facing this problem. There are a number of sources of energy available in India, such as fossil fuel,

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wind, water and the sun. Fossil fuel has been the conventional source of our energy needs and it includes coal, lignite, petroleum and natural gas. Another source of traditional energy is fuel wood, animal waste and agricultural residues. These are known as non-commercial fuels.

Solar radiation on earth is the indirect source of nearly every type of energy used by us. The exceptions are geothermal energy, nuclear fission and fusion. Even fossil fuels owe their origins to the sun; they were once living plants and animals whose life was dependent upon the sun energy is the energy produced directly by the sun. The sun creates its energy through a thermonuclear process that converts about 650 million tons of hydrogen to helium every second. The process creates heat and electromagnetic radiation of spectral range of 2000- 20000A°. The electromagnetic radiation includes 45% in visible light, 52% in the near infra-red rest in ultra violet and far infra-red radiation. The radiation streams out into space in all directions. However, this spectral distribution of sunlight reaching the earth surface is modified due to atmospheric extinction and selective absorption by CO_2, O_2, water vapour and scattering due to clouds dust and water droplets. Although only a very small fraction of the total radiation produced in the Sun, reaches the earth but this much radiation is much larger than the global need of energy"

Solar Thermal Energy is the heat energy derived from the incident solar energy. This is used by solar heating panels. Solar thermal energy does have advantages like other forms of solar energy. It is used for solar water heating, solar pool heating, solar space heating etc. Solar Thermal Energy is the heat energy derived from the incident solar energy. This is used by solar heating panels. Solar thermal energy does have advantages like other forms of solar energy. It is used for solar water heating, solar pool heating, solar space heating etc.

A solar thermal power plant in principle works same as conventional steam power plant. However, there is one important difference; it is produced solely by the energy that comes from the sun. In order to achieve the high temperatures required, solar radiation must be concentrated. Parabolic trough collectors represent the most advanced technology for use in doing this. These troughs are more than 1300 feet (400 meters) in length and are made up of parabolic shaped mirror segments. The troughs track the sun over the course of the day and focus the resulting radiation along the caustic line of the mirrors onto specially coated, evacuated absorber tube receivers.

Solar radiation heats up the thermo-coil that flows through the receiver to a temperature of 400°C so that a downstream heat exchanger is able to generate steam. As in a conventional power plant, the steam is pressurized inside the turbine that drives the generator. Heat storage systems can

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allow electricity output even if the sun is not shining. Solar power systems are of the following types.

a) On Grid Solar Power Systems

This is most common power system used often in cities20, suburbs and industrial areas where access to utility generated power is available. Solar powered electricity can be supplemented with utility generated energy if one uses more electricity than the solar power system supplies.

b) On Grid with battery backup Solar Power Systems

Solar energy panels combined with batteries and generators for grid-tie applications couple the clean power supplied by solar panels with the assurance that one will have electricity even during power outages that last for extended periods. During the day, the solar panels generate as needed and charge batteries. If more power is required, or the batteries begin to run low, the natural gas or propane generator kicks in to recharge the batteries. It automatically shuts off when the batteries are fully charged.

c) Off grid Solar Power Systems

Standalone, or off-grid, solar power systems consist of solar panels and a battery bank. They are typically used in rural areas and regions where there is no access to the utility grid. They may also be appropriate where the grid is somewhat close to the site, but expensive to bring in. When off-grid solar power systems produce excess electricity during the day, it is used to charge the batteries. When the sun is not shining, electricity is drawn from the batteries. The advantage is greater independence but the disadvantage is its greater complexity and cost.

d) Direct DC Solar Power Systems

Simple, direct DC solar power systems produce energy where and when it is needed. Common uses include powering water pumps and fans. There is no complex wiring, so storage and control systems are not required. Small systems are easy to transport and install.

e) Hybrid Solar Power Systems

Hybrid power systems combine various sources of electrical generation, and are well suited for electrification. Solar and wind technologies are modular, and seasonal variation of sun and wind often complement each other.

STRUCTURE OF A SOLAR PANEL

Assemblies of photovoltaic cells are used to make solar modules which generate electrical power from sunlight. Multiple cells in an integrated group, all oriented in one plane, constitute a solar photovoltaic panel or solar photovoltaic module, as distinguished from a solar thermal module or solar hot water panel. A group of connected solar modules is called an array. Photovoltaic cells

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electrically connected and encapsulated as a module often have a sheet of glass on the front (sun up) side, allowing light to pass while protecting the semiconductor wafers from abrasion and impact due to wind driven debris, rain, hail, etc. Solar cells are also usually connected in series in modules, creating an additive voltage. Connecting cells in parallel will yield a higher current; however, very significant problems exist with parallel connections. For example, shadow effects can shut down the weaker or less illuminated parallel string causing substantial power loss and even damaging the weaker string because of the excessive reverse bias applied to the shadowed cells by their illuminated partners. Strings of series cells are usually handled independently and not connected in parallel, special paralleling circuits are the exceptions. Although modules can be interconnected to create an array with the desired peak DC voltage and loading current capacity, using independent MPPTs (maximum power point trackers) provides a better solution. In the absence of paralleling circuits, shunt diodes can be used to reduce the power loss due to shadowing in arrays with series/parallel connected cells. To make practical use of the solar-generated energy, the electricity is most often fed into the electricity grid using inverters (grid-connected photovoltaic systems); in stand-alone systems, batteries are used to store the energy that is not needed immediately. Solar panels can be used to power or recharge portable devices.

MERITS OF SOLAR ENERGY

The solar power has following advantages-

a) The first commercial use of photovoltaic cells nearly 50 years ago was powering communication satellites in near earth orbit. The declining cost and increasing efficiency of solar energy technology has given rise to practical applications on from powering personnel electronic devices, home and factories to generate utility scale power.

b) Solar energy provides a huge advantage for satellites because they can be launched into orbit without the added weight of a fuel supply. But the advantages on earth are even dependent on fuel delivery infrastructures, foreign relations or the price machinations of energy brokers and big business.

c) Moreover, solar power generation provides energy where and when it is needed, and is highly scalable to match the electrical demand. Since solar energy cells have no moving parts, they are reliable and easy to maintain.

CONCLUSION

On account of growing energy needs and increasing environmental concern, alternatives of polluting fossil fuels have to be investigated. The most promising alternative is use of solar energy. This includes solar heating, solar photovoltaics, solar thermal electricity and solar architecture.

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This form of energy holds out energy, energy is power a major promise to overcome energy crisis in the country. To promote, further research over solar a review article is presented in which growing concern on upgrading technology for the capture and conversion of solar energy is emphasised. In this article different means of utilization of solar explained briefly. The review explains a brief idea about the photovoltaic cells and solar thermal system. Solar technologies are broadly characterized as passive or active depending on the way they are captured, converted and distributed. Active solar techniques include the use of photovoltaic panels and solar thermal collectors to harness the energy. Passive solar techniques include orienting a building to the sun, selecting materials with favourable thermal mass or light dispersing properties, and designing spaces that naturally circulate air. The different types of solar power system have also been reviewed. Further the advantages of solar power are outlined.

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