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Role of solar energy technologies for development of rural area

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Abstract
This paper presents the solar energy current production in India from different stats and needs of solar energy for rural area development in India. The solar energy could supply all the present and future energy needs of the world. The most explored renewable energy technologies for power generation in India, namely, Solar pond, and Solar Photovoltaic systems need more sophistication for long-term benefits.

Keywords: Solar Energy and Rural Area

Introductions
Solar energy is defined as the sun's radiation that reaches the earth. It is the most readily available source of energy. The sun is the earth's power station and the source of all energy on our planet. The ways capturing of the solar energy for many applications have become an important research area in recent days. In developing countries like India where the energy problems is very serious, in spite of discoveries of oil and gas off the west coast, the important of crude oil continuous to increase and the price paid for all other expenditure. India being leader in wind power generation in the sector of solar energy few more developments is needed. One of them are 35000 km^2 area of Thar Desert has been set aside for solar power projects, sufficient to generate 700 GW to 21000 GW [1]. Solar energy is widely utilized in the form of Solar Lamps, Solar Water heater, Solar Cooker and also solar pumps and solar energy is used for heat buildings and to provide low temperature heat for Industry and Agriculture is a well-known technology [2-3]. India has large area in the form of a deserts, lakes and rivers for installation of solar plants. The amount of solar energy produced in India 2007 was less than 1% of total energy demand. The grid interactive solar powers as of December 2010 were 10 MW. Solar energy is widely used in India. Solar energy is a exhaustible source of renewable energy. It is used in the form of solar water pumps, solar lamps, solar water heaters and cooking purpose [4].
Solar energy can be tapped directly (e.g., PV); indirectly as with wind, biomass, and hydropower; or as fossil biomass fuels such as coal, natural gas, and oil. Sunlight is by far the largest carbon-free energy source on the planet. More energy from sunlight strikes the Earth in 1 hour (4.3 × 1020 J) than all the energy consumed on the planet in a year (4.1 × 1020 J).

Solar Energy for Development in India
The need for power grows much faster for less developed nations than for those that already industrialized. The three decades of major investments by less developed nations and multilaterals on electrification projects, nearly 2 billion people in developing regions around the globe still lack electricity [5, 6]. Millions of people rely solely on kerosene lamps for lighting and disposable batteries for radios. For most of these people, there is little likelihood of ever receiving electricity from conventional grid sources. However, there is growing momentum is supplying electricity to developing regions using solar energy resource. The solar energy technologies offer energy independence and sustainable development by using renewable energy resources. The cost of bringing utility power via transmission and distribution lines to non electrified villages is great [7]. This is largely due to small household electrical loads and the fact that many villages are located at great distances over difficult terrain from the existing grid. Stand-alone solar and wind energy systems can provide cost-effective, modest levels of power for lighting, communication, fans,

refrigerators, water pumping, etc. Using a least-cost model, development tool for electrification planning as either centralized or distributed solutions. Two decades ago, PV technology was relatively unknown.

Gradually throughout the developing world, small solar companies began to form as PV module manufacturers began to establish distributor networks to serve remote, non-electrified areas.

More total kilowatts of grid-tie PV systems are installed each year; however, numerically more small, off-gird systems are installed annually. Installation of PV systems solely for remote sites has expanded to include the promotion of rural economic development through Photovoltaic system. PV provides power for remote water pumping, refrigeration, and water treatment of community water supplies [8-9].

Solar thermal energy represents the most competitive but often overlooked solar technology option. Domestic solar hot water heating systems typically have cost paybacks from 5 to 7 years much better than grid-tied PV systems, where payback may take decades, if ever. Additionally, large-scale solar thermal concentrating solar power (CSP) plants have better economies of scale than PV for utility power generation at almost half the kilowatt-hour cost.

Fig 1: Remote areas PV power production

Solar energy often provide least-cost options for economic and community development in rural regions around the globe, while supplying electricity, creating local jobs, and promoting economic development with clean energy resources. PV projects in developing nations have provided positive change in the lives of the rural people. Yet there is still much to do to educate, institutionalize, and integrate renewable technologies for maximum benefit for all. One of the greatest challenges is to work on reforming energy policies and legal frameworks to create a context that permits the sustainable development of renewable energy technologies [10].

Renewable energy solutions for day to day life

Approximately one-third of the world's population lives in rural regions without access to the electric grid, and about half of these same people live without access to safe and clean water. Solar energy is unique in that it can easily provide electricity and purified water for these people today with minimal infrastructure requirements by using local energy resources that promote local economic development.

Concentrating Collectors

There are two ways of classifying solar thermal collectors according to their concentration ratio (C). In the most general terms, solar collectors are classified as flat-plate collectors with a concentration ratio C = 1 and as concentrating collectors with C > 1. The existing types of concentrating collectors are parabolic-compound, parabolic-trough, parabolic-dish, Fresnel, and central tower concentrators, among others [11]. Two definitions of concentration ratio for these systems are used. In the first, the concentration ratio depends on geometric characteristics, and it is given by

$$C = \frac{A_a}{A_r}$$

Where, $A_a$is the area of the collector aperture, and $A_r$is the energy absorber or receiver area.

The parabola is found in numerous situations in the physical world. In three dimensions, a parabola traces out a shape known as a paraboloid of revolution when it is rotated about its axis and as a parabolic cylinder, when it moves along the axis normal to its plane. Solar collectors whose reflecting surfaces follow such geometrics are called parabolic dish concentrators and parabolic troughs, respectively. If a receiver is mounted at the focus of a parabolic reflector, the reflected light will be absorbed and converted into a useful form of energy. The reflection to a point or a line and subsequent absorption by a receiver constitute the basic functions of a parabolic concentrating collector.

Solar drying

Annually in India, about 35% of all agricultural produce worth roughly `500,000 million goes to waste during the post-harvest period [12]. The loss is anywhere from 10% for durables (cereals and pulses) to about 40% for perishables (fruits and vegetables). Proper drying techniques for grains, cereals and pulses can ensure effective storage and reduce losses. Controlled drying is required for various crops and products, such as grain, coffee, tobacco, fruits vegetables and fish. Solar thermal technology can be used for this purpose.

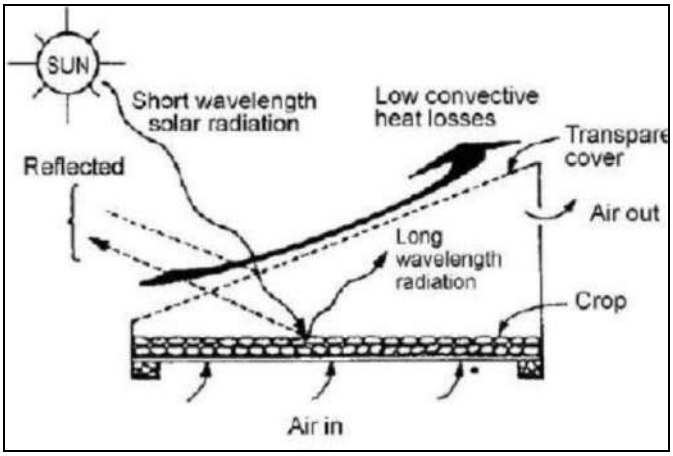

Fig 2: Figure shows working of Solar Dryer

The main principle of operation is to raise the heat of the product, which is usually held within a compartment or box, while at the same time passing air through the compartment to remove moisture. The flow of air is often promoted using the "stack" effect which takes advantage of the fact that hot air rises and can therefore be drawn upwards through a

chimney, while drawing in cooler air from below [13]. Alternatively a fan can be used. Solar crop drying technologies can help reduce environmental degradation caused by the use of fuel wood or fossil fuels for crop drying and can also help to reduce the costs associated with these fuels and hence the cost of the product.

Conclusion

The usage of renewable energy sources can cut the pollutant emissions into the atmosphere. The sun is about 1.4 million km in diameter and 150 million km from the earth. It is close to 5500°C at its surface and emits radiation at a rate of 3.8 × 1023kW. This power is due to nuclear fusion reactions near its core going to continue for several billion years.

Exploration of solar energy plays a vital role in developed and developing countries like India where the energy problem is very serious, despite of discoveries of oil and gas off the west coast.

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