

APPLICATIONS OF SOLAR POWER AS A MEANS OF RENEWABLE ENERGY

AHMAD ASHFAQ* AND ANSHUL MITTAL**

* Faculty of Engineering & Technology, AMU, Aligarh,

** Department of Chemistry, AMU, Aligarh, U.P., India.

Key words : Alarming, Alternative energy, Solar applications.

ABSTRACT

In India energy problem is alarming and main objective is now to find solution to match demand and supply of energy sources. Therefore the need for conserving energy and developing alternative energy is a must. Solar thermal power generation systems also known as Solar Thermal Electricity (STE) generating systems are emerging renewable energy technologies and can be developed as viable options for electricity generation in future. The energy source estimated potential of solar energy is 20 MW/ sq.km. The types of solar systems, solar-thermal energy applications, solar devices and the practical applications of solar energy and the present scenario of solar energy program in India are discussed in this paper.

INTRODUCTION

Energy has always been the key to the Man's greatest goals and to his dreams of a better world. The primary energy comes from non-renewable and fossil sources. These reserves are continuously diminishing with increase in consumption and will not exist for future generation. One of the options is to make more extensive use of the renewable sources like sun, wind, biomass etc. Solar energy is one of the main renewable energy sources. It is abundantly available in India and a free source of energy. Solar energy plays a very important role in providing requirement of electrical power for various utilities. In winter days, storage water heaters/ geysers / immersion water heaters or LPG are generally used by the 80% of medium class families in India, to heat the water.

It is observed that the electricity consumption is increased due to conventional water heating system used by the people (Ganechari *et al.* 2005)

India's power scenario

India's current electricity installed capacity is 135 401.63MW. Currently there is peak power shortage of about 10 % and overall power shortage of 7.5 %. The 11th plan target is to add 100 000 MW by 2012 and MNRE has set up target to add 14500 MW by 2012 from new and renewable energy resources out of which 50 MW would be from solar energy. The Integrated Energy Policy of India envisages electricity generation installed capacity of 800 000 MW by 2030 and a substantial contribution would be from renewable energy. This indicates that India's future energy requirements are going to be very high and solar en-

*Address for correspondence - Email : ahmad_asfaq76@yahoo.com

ergy can be one of the efficient and eco-friendly ways to meet the same (Ministry of New and Renewable Energy Sources).

Opportunities for solar thermal power generation in India

Solar thermal power generation can play a significant role in meeting the demand supply gap for electricity. Three types of applications are possible:

- Rural electrification using solar dish collector technology:
- Integration of solar thermal power plants with existing industries such as paper, dairy or sugar industry, which has cogeneration units.
- Integration of solar thermal power generation unit with existing coal thermal power plants (Garud, Kalogirou, 2007)

Concentrating solar collectors

Solar collectors are used to produce heat from solar radiation. High temperature solar energy collectors are basically of three types:

a. Parabolic trough system: at the receiver can reach 400 °C and produce steam for generating electricity.

b. Power tower system: The reflected rays of the sun are always aimed at the receiver, where temperatures well above 1000 °C can be reached.

c. Parabolic dish systems: Parabolic dish systems can reach 1000 °C at the receiver, and achieve the highest efficiencies for converting solar energy to electricity. (Garud and Kalogirou, 2007)

Classification of collection and storage devices (Energy Report, 2008)

Methods of collecting and storing solar energy vary depending on the uses planned for the solar generator. In general, there are three types of collectors and many forms of storage units. The three types of collectors are;

- Flat-plate collectors,
- Focusing collectors, and
- Passive collectors.

Solar devices

1. Solar Photovoltaic (PV) : Photovoltaic solar cells, which directly convert sunlight into electricity, are made up of semi conducting materials. The simplest PV cells-power are watches and calculators, while

more complex systems can light houses and provide power to the electrical grid. Some applications for PV systems are lighting for commercial buildings, outdoor (street) lighting, rural and village lighting etc. Solar electric power systems can offer independence from the utility grid and offer protection during extended power failures.

2. Solar Water Pumps : In solar water pumping system, the pump is driven by motor run by solar electricity instead of conventional electricity drawn from utility grid. The pumping system draws water from the open well, bore well, stream, pond, canal etc.

Benefits of solar energy

Following are some benefits of solar energy:

- Using the power of the sun to heat and light our houses is a very clean and environmentally friendly way of generating power.
- Installing solar power in your home will guarantee that you have much lower fuel bills almost instantly.
- These systems can fit into existing buildings and it does not affect land use (Beerbaum 2000).

Applications of solar energy

- Larger solar power plants that collect the heat from the sun, which is subsequently used to produce steam for powering a generator
- Solar energy is harnessed to pump water in remote areas
- Solar cookers
- Solar cars, solar trams, solar buses and even satellites are also seen to operate with the help of solar energy.
- Solar energy can be used to heat residential homes
- Many people use solar energy to heat their water supply and their swimming pools as well
- Recreational vehicles and some boats may also run on solar energy.
- Small gadgets that involve little energy, such as calculators and watches, often use solar energy (Beerbaum, 2000).

Technological trends in the area

The greatest advancement in Photovoltaic research has been nanotechnology (Thin cell solar research).

Very tiny cells are created through silicon and other minerals to collect solar energy. The creation of nano-particles has also helped developers to create solar shingles coated in these cells as well as to develop a spray-on coating that could be sprayed onto another material, such as the roof. This spray-on coating contains the nano-particles that enable other items also to collect solar energy and convert it into electricity. Thin cells make the solar panels smaller ensuring availability to the common consumer because many houses in cities have to conform to specific city codes that may not allow the use of solar panels because they are large, visually unappealing, and also obstruct the view. But by using thin cells, these problems could be sorted out.

CONCLUSION

Increased use of renewable energy sources for energy generation will not only meet the energy demand

but also result in substantial environmental benefits. Solar energy is presently being used on a smaller scale in furnaces for homes and to heat up swimming pools. On a larger scale, solar energy could be used to run cars, power plants, and space ships. Solar energy means a fossil fuel saving, emission free environment, contribution to energy conservation, better economy and modern life style with clean and cheap renewable energy.

REFERENCES

Annual Report, Ministry of New and Renewable Energy Sources, 2005-2006.

Beerbaum, B. and G. Weinrebe, 2000. Solar thermal power generation in India: a techno-economic analysis. *Renewable Energy*. 21 (2) : 153-174.

Ganechari, S.M. and Kate, S. 2005. Alternative Energy sources. *National Seminar on Alternative Energy Sources*, pp. 5-14

Kalogirou, S.A. 2004. Solar thermal collectors and applications. *Progress in Energy and Combustion Science*. 30 (3) : 231-295.

Solar energy, 2008. *The Energy Report*, pp. 137-138.



