



RENEWABLE ENERGY SOURCES

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Solar Energy, renewable energy, solar water heater, dish solar cooker.

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ABSTRACT

India is endowed with abundant of solar radiation. The country receives solar radiation equivalent to more than 5,000 trillion kWh/year, which is far more than its total annual energy requirement. The radiation available could be utilized for thermal as well as for photovoltaic applications. Solar thermal technologies have already found ready acceptance for a variety of decentralized applications in domestic, industrial and commercial sectors of the country. The most widely acceptable application is the solar water heating technology. However, solar steam generating and air heating technologies and energy efficient solar buildings are also attracting attention in urban and industrial areas. Among solar photovoltaic technologies, there are some devices/ systems such as solar lanterns, solar home systems, solar street lights, solar pumps, solar power packs, roof top SPV systems etc., which could be useful both in rural and urban areas for the purpose of reducing burden on conventional fuels.

INTRODUCTION

Solar power is energy from the sun. Solar is the latin word for "Sun". Solar energy is considered as a serious source of energy for many years because of vast amounts of energy that is made freely available.

Solar energy is energy from sun that is converted into thermal or electrical energy. A very little amount of solar energy has been used. Solar energy is a radiant light and heat from Sun harnessed using technologies such as solar heating, photo-voltaic, solar thermal energy, solar architecture and artificial photo synthesis.

It is an important source of renewable energy and its technologies are broadly characterized into two: active solar & passive solar, depending on the way they capture and distributes solar energy of convert it into solar power.

It is considered "Renewable Energy" because:

The technology used to convert Sun's power into electricity does not produce smoke, carbon dioxide and other air pollutants.

Extracting energy from Sun does not usually destroy or harm environment.

Advantages of Solar Energy

- 1. Renewable Energy Source:** Solar energy is a truly renewable energy source. It can be harnessed in all areas of the world and is available every day. We cannot run out of solar energy, unlike some of the other sources of energy.
- 2. Reduces Electricity Bills:** Electricity bills will drop, as the electricity generated from solar system can meet our daily needs. Savings can further grow if you sell excess electricity.
- 3. Low Maintenance Costs:** Maintenance cost is low as the solar energy system does not require lot of maintenance. Maintenance means cleaning of the system for couple of times per year. As there are no moving

parts, there is no wear and tear.

- 4. Technology Development:** Technology in solar energy system is constantly advancing and improvements will intensify in future. Innovations in quantum physics and nanotechnology can potentially increase the effectiveness of solar panels.

Disadvantages of Solar Energy

Cost: The initial cost of Solar system is fairly high. The Government has introduced some schemes and subsidy for the encouragement of adoption of renewable energy sources, but then also it is a costly affair. Nevertheless, solar technologies are constantly developing, so it is safe to assume that prices will go down in future.

Weather Dependent: Solar panels are dependent on sun light to gather solar energy effectively. The efficiency of the solar system drops, when solar energy is collected during cloudy and rainy days. Therefore, cloudy and rainy days will affect the energy system. Solar energy cannot be collected during the night.

Storage of Solar Energy is Expensive: Solar energy has to be stored in large batteries. These batteries can be charged during the day time so that the same energy can be used at night. This is a good solution for using solar energy for full day, but it is quite expensive. As the energy demand is usually higher during the day, it is a good idea to use solar energy during the day and take energy from the grid during the night.

Uses a lot of space: The production of more electricity will require more solar panels, in order to collect as much light as possible. Solar panels require lot of space and roof tops are not always big enough to fit as many number of panels as it is required. We can also install some of the panels in yard, if it has access to sunlight.

Associated with Pollution: Although pollution related to solar energy systems is far less compared to other sources of energy, solar energy can be associated with pollution.

Transportation and installation of solar systems is associated with the emission of greenhouse gases. There are some toxic materials and hazardous products used during the manufacturing process of solar photo-voltaics, which can be indirectly affect the environment. Solar energy pollutes far less than the other alternative energy sources.

GREEN/SOLAR CITIES

Urbanization and economic development are leading to a rapid rise in energy demand in urban areas in our country leading to enhanced Green House Gas (GHG) emissions.

Several Indian cities and towns are experiencing rapid growth in the peak electricity demand. The local governments and the electricity utilities are finding it difficult to cope with this rapid rise in demand and as a result most of the cities/towns are facing electricity shortages. In this context, the "Development of Solar Cities" programme is designed to support/encourage Urban Local Bodies to prepare a Road Map to guide their cities in becoming 'renewable energy cities' or 'solar cities'.

Objectives of the Solar City programme

The Solar City programme aims:

- To enable and empower Urban Local Governments to address energy challenges at City - level.
- To provide a framework and support to prepare a Master Plan including assessment of current energy situation, future demand and action plans.
- To build capacity in the Urban Local Bodies and create awareness among all sections of civil society.
- To involve various stakeholders in the planning process.
- To oversee the implementation of sustainable energy options through public - private partnerships.

SOLAR WATER HEATING SYSTEMS

We are blessed with Solar Energy in abundance at no cost. The solar radiation incident on the surface of the earth can be conveniently utilized for the benefit of human society. One of the popular devices that harness the solar energy is solar hot water system (SHWS).

A solar water heater consists of a collector to collect solar energy and an insulated storage tank to store hot water. The solar energy incident on the absorber panel coated with selected coating transfers the heat to the riser pipes underneath the absorber panel. The water passing through the risers get heated up and are delivered to the storage tank. The re-circulation of the same water through absorber panel in the collector raises the temperature to 80 C (Maximum) in a good sunny day. The total system with solar collector, storage tank and pipelines is called solar hot water system.

Broadly, the solar water heating systems are of two categories. They are: closed loop system and open loop system. In the first one, heat exchangers are installed to protect the system from hard water obtained from bore wells or from freezing temperatures in the cold regions. In the other type, either thermo syphon or forced circulation system, the water in the system is open to the atmosphere at one point or other. The thermo syphon systems are simple and relatively inexpensive. They are suitable for domestic and small institutional systems, provided the water is treated and potable in quality. The forced circulation systems employ electrical pumps to circulate the water through collectors and storage tanks.

The choice of system depends on heat requirement, weather conditions, heat transfer fluid quality, space availability, annual solar radiation, etc. The SHW systems are economical, pollution free and easy for operation in warm countries like ours.

Based on the collector system, solar water heaters can be of two types.

Flat Plate Collectors (FPC) based Solar Water Heaters Evacuated Tube Collectors (ETC) based Solar Water Heaters Solar water heating is now a mature technology. Wide spread utilization of solar water heaters can reduce a significant portion of the conventional energy being used for heating water in homes, factories and other commercial and institutional establishments.

Salient Features of Solar Water Heating System

Solar Hot Water System turns cold water into hot water with the help of sun's rays.

Around 60 deg. – 80 deg. C temperatures can be attained depending on solar radiation, weather conditions and solar collector system efficiency.

Hot water for homes, hostels, hotels, hospitals, restaurants, dairies, industries etc.

Can be installed on roof-tops, building terrace and open ground where there is no shading, south orientation of collectors and over-head tank above SWH system.

SWH system generates hot water on clear sunny days (maximum), partially clouded (moderate) but not in rainy or heavy overcast day.

Only soft and potable water can be used.

Stainless Steel is used for small tanks whereas Mild Steel tanks with anti-corrosion coating inside are used for large tanks.

Solar water heaters (SWHs) of 100-300 litres capacity are suited for domestic application.

Larger systems can be used in restaurants, guest houses, hotels, hospitals, industries etc.

Fuel Savings: A 100 litres capacity SWH can replace an electric geyser for residential use and saves 1500 units of electricity annually.

Environmental benefits: A SWH of 100 litres capacity can prevent emission of 1.5 tonnes of carbon-dioxide per year.

Life: 15-20 years

Approximate cost: Rs.15000- 20,000 for a 100 litres capacity system and Rs.110-150 per installed litre for higher capacity systems

DISH SOLAR COOKER

It is a concentrating type parabolic dish solar cooker with aperture diameter of 1.4 meter and focal length 0.28 meter. The reflecting material used for fabrication of this cooker is anodized aluminium sheet which has a reflectivity of over 75%.

The tracking of the cooker is manual and thus has to be adjusted in 15 to 20 minutes during cooking time. It has

a delivering power of about 0.6 KW which can boil 2 to 3 litres of water in half an hour. The temperature achieved at the bottom of the vessel could be around 350 to 400o C which is sufficient for roasting, frying and boiling. The cooker having a thermal efficiency of around 40% can meet the needs of 10 to 15 people and can be used from one hour after sunrise to one hour before sunset on clear days.

Dish solar cooker is being fabricated and promoted in the country by a few manufacturers/ suppliers. The cooker can be easily dismantled and assembled by anybody and thus may be nicely packed and transported anywhere in the country. The cooker is user friendly as the place of vessel to be kept for cooking is at a level which is convenient for the people to use. The cooker could be useful for individuals in rural as well as urban areas and also for small establishments like dhabas, tea shops, etc. on road sides.

The cost of the cooker is Rs. 6000- 7000/- and it can save up to 10 LPG cylinders/year on full use at small establishments.

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