

ENERGY OPTIONS FOR THE FUTURE

The availability of energy for everybody is a necessary prerequisite for the well-being of humankind, world-wide peace, social justice and economic prosperity. The driving forces for changes in future energy demand are population, economy, technology, energy and global warming. New and carbon-free energy sources, respectively, will be important. Some of the eco-friendly sources and methods are explained below.

Solar Energy

Most of the Earth's energy comes from the Sun. The amount of energy from the Sun that reaches the Earth is vast. It has been calculated that the energy that reaches the surface of the Earth (after absorption by the atmosphere) averages to about 1,000 watts per square meter on a cloudless day. Some arid and desert areas receive more. This means that on a 24-hour day the energy that reaches the Earth is equivalent to one barrel of oil every year per square meter.

India is one of the few countries with long days and plenty of sunshine – is suitable for harnessing solar energy for a number of applications.



India receives solar energy equivalent to over 5,000 trillion kWh/year, which is far more than the total energy consumption of the country.

Let us Save the Planet

Solar energy is available free of cost and is absolutely non-polluting. It has been available to mankind for centuries but it is only recently that technological advancements have been made to trap and effectively utilize this energy. Some of the ways in which solar energy is being used today are briefed below:

Solar Electricity: Sunlight is transformed into electrical energy with the help of solar cells. These solar cells (photovoltaic cells) produce electricity, according to the amount of sunlight falling on them. Storage batteries are used along with these solar cells to store the electricity produced for later use.

Figure: Solar Powered Street Light



How it Works? – Photovoltaic cells are made from layers of semi-conducting material, usually silicon.

When light shines on the cell it creates an electric field across the layers. The stronger

the sunshine, the more electricity is produced. Through Solar Photovoltaic (SPV) cells, solar radiation gets converted into DC electricity directly. This electricity can either be used as it is or can be stored in batteries. This stored electrical energy can be used at night. Groups of cells are mounted together in panels or modules that can be mounted on your house roof.

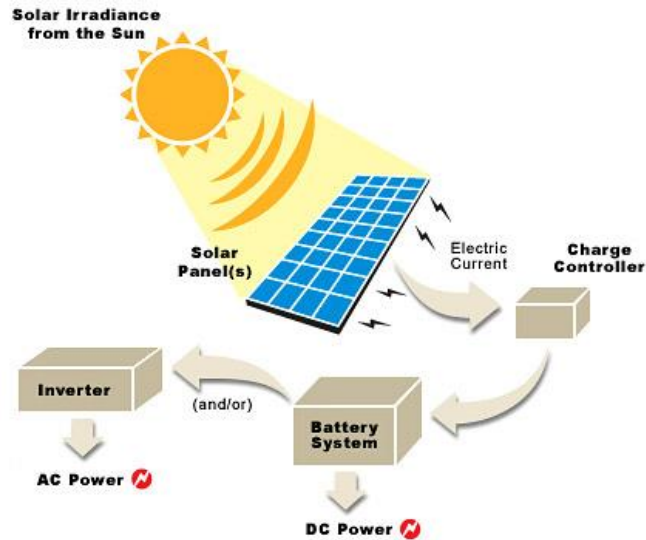


Figure: Principle of Solar Photovoltaic (PV) System

SOLAR ENERGY - CLEAN ENERGY

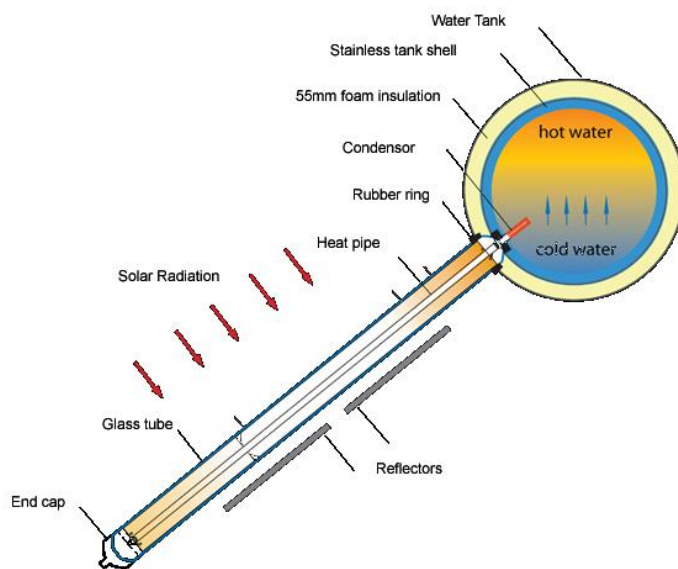
- Does not produce any greenhouse gases.
- The energy from the Sun is free.
- A subsidy of up to 50% of the cost can be availed from the MNRE (Ministry of New and Renewable Energy). Solar electricity is green, renewable energy and does not release any harmful carbon dioxide (CO₂) or other pollutants.
- A typical solar PV system could save over a ton of CO₂ per year - that's more than 30 tonnes over its lifetime.
- Reduces electricity bill.
- No noise or smell.

Solar Water Heaters: Solar heaters use the heat that is contained in sunlight, mainly in the infrared band.



Figure: Solar Water Heater

How it Works? – Solar water heating systems consist of a solar collector and a storage tank connected by pipes. In the solar collector, the Sun's energy is converted to heat which heats up the water in the solar collector panels. While the heated water moves up, colder water comes in and it goes on.



ADVANTAGES OF SOLAR WATER HEATER

- A domestic solar water heater, with a capacity of 100 LPD (litres per day) is sufficient for a family of 4 or 5 members.
- It can replace a 2 KW geyser and can save up to 1,500 units of electricity per year.
- It pays back the cost in 3 to 5 years.
- It works automatically and one does not have to operate any part of the system.
- A 100 litre solar water heater can save around 1,500 units of electricity

every year.

Solar Cooker: Solar cooker is a device that uses heat energy from the Sun to cook food. Two types of solar cookers are available viz. 'box' and 'dish' type. Box type solar cooker is a shallow, square box with black sides and bottom and a glass top. When the black bottom is hit by sunlight passing through the glass top, it gets heated up. Food, kept inside the box, gets cooked by this heat. A dish solar cooker can cook food in lesser time than a box cooker.

Figure: Box-type Solar Cooker

How it Works?- A box cooker has a transparent glass top. The UV rays are not able to pass back out through the transparent glass top and are thus retained inside the box enclosure, creating a buildup of heat. The box has insulated sides. Cooking containers and the inside bottom of the cooker is dark-coloured. The solar box cooker reaches a temperature of 150° C.



ADVANTAGES OF SOLAR COOKER

- Two billion people rely on wood and charcoal for cooking as fuel. Solar cooking helps preserving the Earth's dwindling forests.
- Fuel cost is reduced. Regular use preserves an average of 2kg of combustible firewood per day.
- It is totally safe to use - there is no fire, no leaking gas and no electric shocks.
- It does not require constant attention.
- It can cook up to four dishes at a time.
- It is very easy to use.
- It can save up to 4 LPG cylinders a year.
- Interest free loan is available for bulk users.

Wind Energy

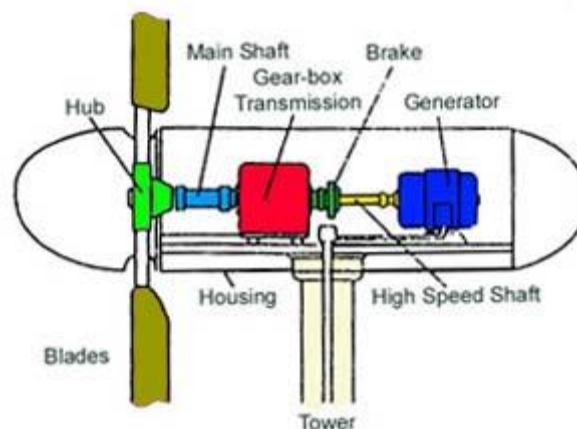
Growing technological advancement has made it possible to generate electricity by using wind power. The force of the wind rotates the propellers of the wind machine, which in

turn, rotates the electricity generator attached to it. The amount of energy generated depends upon the wind speed.



Figure: Wind Energy

How it Works?- The origin for wind energy is Sun. When Sun's rays fall on the Earth, its surface gets heated up and as a consequence unevenly winds are formed. Wind turbines convert wind movement into mechanical energy, which rotates the attached generator and the generator produces electricity.



- ✓ India now has the 5th largest wind power installed capacity of 3,595 MW in the world.
- ✓ The estimated gross wind potentials in India is 45,000 MW.

AD

Let us Save the Planet

- Mitigates climate change.
- Limits impact of energy production on local environment.
- No localized water or air pollution.
- Wind power generation does not create greenhouse gases.
- It is absolutely free of running cost.
- Can be used to generate and supply electricity in geographically isolated or hilly areas.
- There are very few safety risks with wind turbines.
- It is easy to install and maintain.

Hydro (water) Energy

Energy produced using water is known as hydro energy. The force of water is used to rotate an electricity generator. It is realized that a small quantity of water falling from a great height can also produce as much power as large quantity of water falling from a much shorter height. Thus, smaller rivers too have potential to set up micro hydro projects.

ADVANTAGES OF HYDRO ENERGY

- Reduces the dependence on fossil fuels.
- It produces clean electricity, with no production of greenhouse gas or pollution.
- They do not require heavy investment on installation.
- They are comparatively easy to maintain.
- They can be set up to supply electricity locally to geographically far flung areas which are not covered by the national grid system.
- Local supply of electricity reduces cost of distribution.

Tidal Energy: Tidal power comes from the movement of the tides. Tidal energy conversion techniques use the natural rise and fall of the level of the oceans. Although not yet widely used, tidal power has potential for future electricity generation.

How it Works? The first requirement is a dam or “barrage” across tidal bay or estuary. At certain points along the dam, gates and turbines are installed. When there is an adequate difference in the elevation of the water on the different sides of the barrage, the gates are opened. The “hydrostatic head” that is created, causes water to flow through the turbines, turning an electric generator to produce electricity.

ADVANTAGES OF TIDAL ENERGY

- Tidal power is a renewable source of energy.
- The energy source is free and will not run out.
- No environmental pollution.
- Reduces the dependence upon fossil fuels.
- Tides are active 24 hours a day, 365 days a year.
- It produces clean electricity, with no production of greenhouse gas or pollution.
- Highly efficient resource (compared with coal and oil at 30%, tidal power efficiency is about 80%).

- ✓ The estimated potential of small hydro power in India is about 15,000 MW.

A

Let us Save the Planet

Alternative fuels are also known as non-conventional fuels. Some of the well-known alternative fuels include biodiesel, chemically stored electricity, hydrogen, methane and other biomass sources.

ADVANTAGES OF NON-CONVENTIONAL ENERGY SOURCES

- There is a never-ending supply.
- These are easily available.
- Production and use of non-conventional energy is always pollution free and leaves the environment clean.
- These are locally produced. Hence there is low cost of distribution.
- Energy production units can be started on a small scale. Hence, heavy investment is not required.
- Job opportunities for the local people.

Bio-Diesel

Bio-diesel is bio-friendly as it is made from oilseeds or vegetable oils. Most commonly is produced from biological materials or biomass, such as sugarcane, corn, cellulose or vegetable oils. Nowadays, the second and even third generation bio-fuels are being under development. These brand-new types of bio-fuel aim at generating energy from non-food crops.



Biogas

Biogas is a product of fermentation of animal manure in the absence of air. It chiefly consists of methane gas, which can safely be used as fuel for cooking as well as lighting. Ordinarily, a small biogas plant fed by the manure of 2-3 animals can produce enough gas for the daily cooking and lighting needs of a family of four persons.

ADVANTAGES OF BIOFUELS

- The sludge or digested waste from the biogas plant is an excellent fertilizer and increases the yield of crops and vegetables.
- It keeps the environment around the house clean since all animal manure is fed into the biogas plant.
- It prevents eye and lung diseases caused due to smoke from firewood burnt as fuel.
- It conserves forests because wood is no longer used as fuel.
- It generates employment to masons and labourers needed to set up more biogas plants.

**THE WORLD IS ADDICTED TO OIL.
IT'S TIME FOR AN INTERVENTION.**



FUEL

CHANGE YOUR FUEL...CHANGE THE WORLD

