

Presentation on

SOLAR VS NUCLEAR VS WIND ENERGY

SOLAR ENERGY

- **Solar power** is the technology of obtaining usable energy from the sunlight.

Technologies :

- 1) **Solar Design**:- Solar design can be used to achieve comfortable temperature and light levels with little or no additional energy.
- 2) **Heating Systems**:- Heating water using sunlight.
- 3) **Solar cooking**
- 4) **Photovoltaic** :-Photovoltaic effect of semiconductor to generate electricity directly from sunlight.

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5) Solar Thermal Electric Power Plant : -

Solar thermal energy can be used to heat a heat exchanger to high temperature and the heat used to produce electric power or for other industrial purposes.

Advantages :-

- 1) Pollution Free .
- 2) No fuel needed .
- 3) Operation and maintenance cost very low.
- 4) Energy generation possible even in the space.

Disadvantages :-

- 1) Not available in night .
- 2) At high altitudes with substantial cloud cover, efficiency decreases.
- 3) It produces DC , to convert it in to AC ,there is a energy loss of 4-12% .

Achievements in India :-

Photovoltaic systems of about 83 MW aggregate capacity have been installed. Including 3,85,000 solar lanterns ; 1,80,000 home lighting systems ; 41,000 street lighting systems ,4204 water pumping systems.

A total of about 5.5 lakh nos. of box solar cookers, 630 concentrating solar cookers and 6 solar cooking systems have been installed .

NUCLEAR ENERGY

- **Nuclear power** is the controlled use of nuclear reactions to release energy for work including propulsion, heat, and the generation of electricity.

PROCESS :

- When a nucleus fissions, it splits into several smaller fragments. These fragments, or fission products, are about equal to half the original mass. Two or three neutrons are also emitted. A chain reaction refers to a process in which neutrons released in fission produce an additional fission in at least one further nucleus. This nucleus in turn produces neutrons, and the process repeats. The process may be controlled (nuclear power) or uncontrolled (nuclear weapons).

Types of reactors :

1) Pressurized water reactors(PWR)

These are reactors cooled ,moderated by high pressure, liquid (even at extreme temperatures) water .

2) Boiling water reactors(BWR)

These are reactors cooled ,moderated by water, under slightly lower pressure. The water is allowed to boil in the reactor.

3) Pressurised Heavy Water Reactor (PHWR)

These reactors are heavy-water-cooled and -moderated Pressurized-Water reactors

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4) Gas Cooled Reactor (GCR)

These are generally graphite moderated and CO₂ cooled. They have a high thermal efficiency compared with PWRs and an excellent safety record.

5) Liquid Metal Fast Breeder Reactor(LMFBR)

This is a reactor design that is cooled by liquid metal, and totally unmoderated. These reactors can function much like a PWR in terms of efficiency, and don't require much high pressure containment

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The Nuclear Fuel Cycle begins when uranium is mined, enriched, and manufactured into nuclear fuel, which is delivered to a nuclear power plant. After usage in the power plant, the spent fuel is delivered to a reprocessing plant or to a final repository for geological disposition. In reprocessing 95% of spent fuel can be recycled to be returned to usage in a power plant .

Achievements in India :-

Location	Type	Capacity(MW)	Starts
Tarapur 1 & 2	BWR	150	1969
Kaiga 1 & 2	PHWR	202	1999-00
Kakrapar 1 & 2	PHWR	202	1993-95
Kalpakkam 1 & 2 (MAPS)	PHWR	202	1984-86
Narora 1 & 2	PHWR	202	1991-92
Rawatbhata 1	PHWR	90	1973
Rawatbhata 2	PHWR	187	1981
Rawatbhata 3 & 4	PHWR	202	1999- 2000
Tarapur 3 & 4	PHWR	490	2005, (07)
Total (16)		3577	

WIND ENERGY

- A wind energy system transforms the kinetic energy of the wind into mechanical or electrical energy that can be harnessed for practical use.

PROCESS :

The power in the wind can be extracted by allowing it to blow past moving wings that exert torque on a rotor.

The power P available in the wind is given by:

$$P = \frac{1}{2} \rho \pi D^2 v^3.$$

where P is in watts, ρ (density of air) is measured in kg/m^3 , D (turbine blade length) is in m, and v (velocity of wind) is in m/s.

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From above we can see wind energy mainly depends on the wind speed .The wind blows faster at higher altitudes because of the reduced influence of drag of the surface (sea or land). The increase in velocity with altitude is most dramatic near the surface and is affected by topography, surface roughness, and upwind obstacles such as trees or buildings .

Therefore, Onshore turbine installations tend to be on ridgelines. The hill or ridge causes the wind to accerate as it is forced over it. The additial wind speeds gained in this way make large differences to the amount of energy that produced. Sea shores also tend to be windy areas and good sites for turbine installation .

Advantages :-

- 1) Pollution Free .
- 2) No fuel needed .
- 3) Operation and maintenance cost very low.
- 4) **Energy payback ratio** :The ratio of energy produced compared to energy expended in construction and operation for wind turbines has been estimated to be between 17 and 39 .
- 5) Wind turbines do not need water to generate electricity.

Disadvantages :-

- 1) Loss of aesthetics
- 2) Killing of birds
- 3) To meet the energy demands worldwide in the future in a sustainable way, a much larger number of turbines than we have today will be required. Naturally this will affect more people and wildlife habitat .

Achievment in India :

Wind power installed in India is about 1870 MW .About 1.8 billion units of electricity have been fed to various state grids from wind power projects.In which 770 MW capacity is contributed by Tamil Nadu ,Gujarat has 167 MW followed by Andhra Pradesh which 88 MW instaled wind farms.

COMPARISION

Economy

The capital cost of wind power projects range between Rs. 4 to 5 crores per MW. This gives a cost of energy generation in the range of Rs. 2.00 to Rs. 2.50 KWh. Operation and maintenance costs are low and zero input fuel cost .Its efficiency is low as wind speed varies from time to time.

The main problem of solar power generation is that the large scale production is very costly .Operation and maintenance costs are low and zero fuel cost .In case also efficiency is not so high.

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In case of nuclear energy the initial cost is very high, especially the construction cost of the nuclear building where the nuclear reactor is present, it is made earthquake proof and also crack proof so the cost rises very high .But the operation cost gradually decreases as the fuel used can reused .So a very big energy production will suit the cost and benefit analysis. Very skilled workers are needed to operate the nuclear reactors because a small lapse can lead to high damage.

Environmental effects:

The wind energy and solar energy do not have any waste products they are clean energy production sources, so they do not contribute to any kind of pollution .

Whereas in case of nuclear energy, emission comes into picture when mining of the uranium ore is done .Also the waste products are radioactive so they are highly dangerous but nowadays efforts are going on to make a proper disposal of this radioactive wastes.

But Nuclear generation does not directly produce sulphur dioxide, nitrogen oxides, mercury or other pollutants associated with the combustion of fossil fuels. It also does not directly produce carbon dioxide.

Location :

For the production of solar energy the location is not so important because sunlight is available everywhere. In case of wind energy ,the location should specific as wind velocities is different in different places ,so we have to select as a location where the wind speed is relatively high and consistent like sea shores. And in case of nuclear energy the location is most important , for eg location should be in the earthquake zone also it should be nearer to the uranium mines .Also the location should strategically safe in case of war

Our Perspective :

In our view wind energy is the India's future source of energy because as India has developing economy but the population is very high the energy need is also very high .So as the cost is not so high in the production of wind energy, it is suitable .Also the location of its production is very suitable in India as it has large coast line of about 2400 Km and also have the high altitudes in the north and east ,where wind speed is usually very high .So the topography is suitable for India for the production of wind energy .

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