

Eco-Friendly projects

(A)TIDAL POWER PLANTS

Tidal power, also called tidal energy, is a form of hydropower that converts the energy obtained from tides into useful forms of power, mainly **electricity**.

Tides are more **predictable** than **wind energy** and **solar power**.

The world's first large-scale tidal power plant was the **Rance Tidal Power Station** in **France**, which became operational in 1966. It was the largest tidal power station in terms of output until **Sihwa Lake Tidal Power Station** opened in South Korea in August, 2011. The Sihwa station uses sea wall barriers complete with 10 turbines generating **254 MW**.

Tidal power is taken from the Earth's **oceanic tides**. Tidal forces are periodic variations in **gravitational attraction** exerted by celestial bodies. These forces create corresponding motions or currents in the world's oceans. Due to the strong attraction to the oceans, a **bulge** in the water level is created, causing a temporary increase in sea level. When the sea level is raised, water from the middle of the ocean is forced to move toward the shorelines, creating a tide

A **tidal generator** converts the energy of tidal flows into electricity. Greater tidal variation and higher tidal current velocities can dramatically increase the potential of a site for tidal electricity generation.(**see figures**)

Earth's tides are ultimately due to gravitational interaction with the Moon and Sun and the Earth's rotation, hence tidal power is practically **inexhaustible** and classified as a **renewable** energy resource.

L16-L17

Tidal stream generators (or TSGs) make use of the **kinetic energy** of moving water to power turbines, in a similar way to wind turbines that use wind to power turbines. Total **identified potential in India** is about **9000 MW** with the following breakup:

Gulf of Cambay (**7000 MW**)
Gulf of Kutch (**1200 MW**)
Sunderbans in West Bengal (**100 MW**)

Advantages of tidal Energy:-

- 1. Very Predictable Energy Source**
- 2. Inexhaustible Source of Energy**
- 3. Very Low Operating cost**
- 4. Effective Even At Low Speeds**
- 5. Can Last Forever**
- 6. Eco Friendly**

Disadvantages of Tidal Energy

- 1. Effects Marine Life**
- 2. Has A High Construction Costs**
- 3. Creates Changes In Tidal Movement**
- 4. Difficult Sea Usage**
- 5. Has Location Limits**

There are very **few ocean shores** that are suitable for the construction of a tidal energy plant.

L16- L17

B. Solar power plants

Solar power is harnessing the **suns** energy to produce **electricity**. It is one of the fastest growing energy sources, where new technologies are developing at a rapid pace. Solar cells are becoming more efficient, transportable and even flexible, allowing for easy installation. Photo voltaic(**PV**) has mainly been used to power small and medium-sized applications, from the calculator powered by a single solar cell to off-grid homes powered by a photo voltaic array.(**Combination of cells**)

Due to the 1973 oil crisis a rapid rise in the production of PV during the 1970s and early 1980s was seen. Steadily falling oil prices during the early 1980s, however, led to a reduction in funding for photovoltaic R&D. These factors moderated growth to approximately **15%** per year from 1984 through 1996. Since the mid-1990s, in the PV sector has shifted from the US to Japan and Germany.

Japan introduced a **subsidy** program to encourage the installation of residential PV systems. Solar installations in recent years have also largely begun to expand into residential areas, with governments offering **incentive** programs to make “green” energy a more **economically viable option**. In Canada the government offers the RESOP (Renewable Energy Standard Offer Program). In India the following are some major solar projects

Tamil Nadu --**1,555.41MW**

Rajasthan --**1,294.60 MW**

Gujarat --**1,136.32 MW**

Madhya Pradesh --**810.37 MW**

Punjab --**571.20 MW**

Advantages of Solar Energy

- 1. Renewable Energy Source**
- 2. Reduces Electricity Bills**
- 3. Diverse Applications**

L16-L17

4. Low Maintenance Costs

5. Technology Development

Technology in the solar power industry is constantly advancing

DISADVANTAGES OF SOLAR ENERGY

1. High initial Cost

2. Weather Dependent

3. Solar Energy Storage Is Expensive

4. Uses a Lot of Space

5. Associated with Pollution

C. Wind power Projects

Wind power is the conversion of **wind energy** by wind turbines into a useful form, such as **electricity or mechanical** energy. Large-scale wind farms are typically connected to the local power transmission network with small turbines used to provide electricity **to isolated** areas. Residential units are entering production and are capable of powering large appliances to entire houses depending on the size. Wind farms installed on **agricultural** land or grazing areas, have one of the **lowest environmental** impacts of all energy sources. Although wind produces only about **1.5%** of worldwide electricity use, it is growing rapidly, having doubled in the three years between 2005 and 2008.

In several countries it has achieved relatively high levels of development, accounting for approximately **19%** of electricity production in Denmark, **11%** in Spain and Portugal, and **7%** in Germany and the Republic of Ireland . Wind energy has historically been used directly to propel **sailing ships** or converted into mechanical energy for pumping water or grinding grain, but the principal application of wind power today is the **generation of electricity**.

L16-L17

Europe leads the world in development of **offshore wind power**, due to strong wind resources and shallow water in the North Sea. Denmark installed the first offshore wind farms, and for years was the world leader in offshore wind power until the United Kingdom gained the lead in October, 2008.

Other countries utilizing wind power, are the United States and China. (such as in the Great Plains of the U.S., and the similarly wind-swept steppes of Xinjiang and Inner Mongolia in China) On the other hand, population centers along coastlines in many parts of the world are close to **offshore** wind resources, which would reduce **transmission costs**. As of 31 Aug 2016 the installed capacity of wind power in India was 27,676.55 MW, mainly spread across the South, West and North. Following are some important wind projects in India:-

Muppandal windfarm Tamil Nadu---1500 MW

Jaisalmer Wind Park Rajasthan---1064 MW

Brahmanvel windfarm Maharashtra--528 MW

Dhalgaon windfarm Maharashtra--278 MW

ADVANTAGES OF WIND POWER

- 1. It's a clean fuel source.**
- 2. It is a domestic source of energy. The nation's wind supply is abundant.**
- 3. It's sustainable. Wind is actually a form of solar energy.**
- 4. Wind power is cost-effective. It is one of the lowest-priced renewable energy technologies available today**
- 5. Wind turbines can be built on existing farms or ranches.**
- 6. Wind creates jobs. In 2014, the wind sector invested more than \$8 billion of private capital in the U.S. economy to build projects and employed more than 73,000 workers.**

L16-L17

DISADVANTAGES OF WIND POWER

- 1. Wind power must still compete with conventional generation sources on a cost basis.**
- 2. Good wind sites are often located in remote locations**
- 3. Wind resource development might not be the most profitable use of the land.**
- 4. Turbines might cause noise and aesthetic pollution.**

D. Hydroelectric Projects

Hydroelectricity is electricity generated by **hydropower**, i.e., the production of power through use of the **gravitational force** of falling or flowing water. It is the most widely used form of renewable energy. Once a hydroelectric complex is constructed, the project does not produce any **direct waste**, which could have any adverse effect **on Environment**.

Small scale hydro or micro-hydro power has been an increasingly popular alternative energy source, especially in remote areas where other power sources are not viable. **Small scale** hydro power systems can be installed in small rivers or streams with little **or no adverse environmental** effect or disruption to fish migration. Most small scale hydro power systems make no use of a dam or major water diversion, but rather use **water wheels** to generate energy. This was approximately **19%** of the world's electricity (up from 16% in 2003), and accounted for over **63%** of electricity from **renewable sources**.

While many hydroelectric projects supply public electricity networks, some are created to serve **specific industrial enterprises**. Dedicated hydroelectric projects are often built to provide the substantial amounts of electricity needed for aluminium electrolytic plants, for example, In the Scottish Highlands.

In Suriname, the Brokopondo Reservoir was constructed to provide electricity for the Alcoa aluminium industry. New Zealand's Manapouri

L16-L17

Power Station was constructed to supply electricity to the aluminium smelter at Tiwai . The **Koyna** Hydroelectric Project in India produces **1960 MW** of power. Other major examples of Hydroelectric power plants in **India** are:-

Tehri Dam Uttarakhand -- **2400 MW**

Koyna dam Maharashtra -- **1920 MW**

Srisaillam Dam Andhra Pradesh-- **1670 MW**

Sardar Sarovar Gujarat --**1450 MW**

Indira Sagar Madhya Pradesh --**1000 MW**

E.Geothermal Power Projects

Geothermal energy is a very powerful and efficient way to extract a renewable energy from the **earth** through natural processes. This can be performed on a small scale to provide **heat** for a residential unit., or on a very large scale for energy production through a geothermal power plant. It has been used for space heating and bathing since ancient roman times, but is now better known for generating **electricity**.

Geothermal power is **cost effective, reliable, and environmentally friendly**, but has previously been geographically limited to areas near **tectonic plate** boundaries. Recent technology has expanded the range and size of this resources, for direct applications such as **home heating**.

The largest group of geothermal power plants in the world is located at The **Geysers**, a geothermal field in California, United States. Geothermal power requires no fuel, and is therefore immune to fluctuations in fuel cost, but capital costs tend to be **high**. **Drilling** accounts for most of the costs of electrical plants, and exploration of deep resources involves very high financial risks.

L16-L17

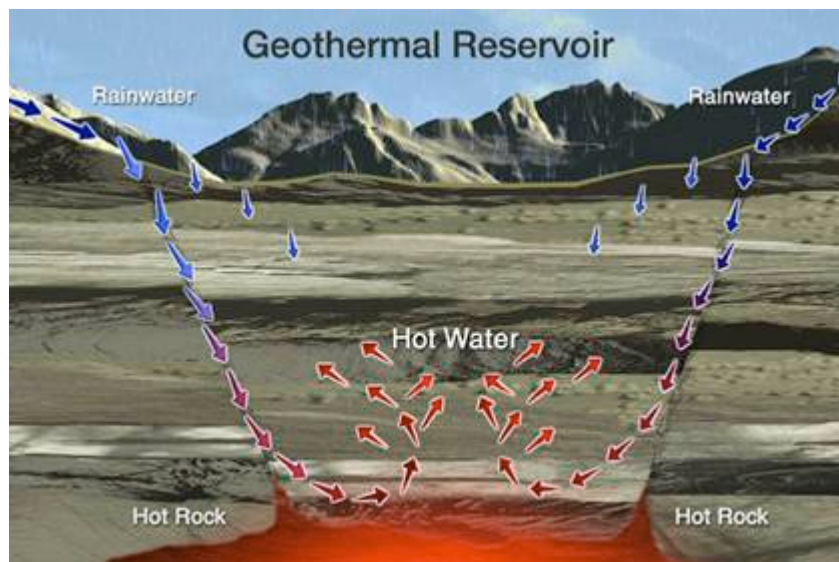
Geothermal power offers a degree of scalability: a large geothermal plant can power entire cities while smaller power plants can supply rural villages or heat individual homes. Geothermal electricity is generated in 24 countries around the world and a number of potential sites are being developed or evaluated. India is estimated to have **10,000 MW** geothermal potential.

Examples of some geothermal Power plants.

Cerro Prieto Geothermal Power Station III Mexico--**220 MW**

Darajat Power Station II, III Indonesia-----**200 MW**

Kawerau Power Station New Zealand--- **100 MW**



L16-L17

ADVANTAGES OF GEOTHERMAL ENERGY

- 1) It is a renewable source of energy.
- 2) It is a non-polluting and environment friendly.
- 3) There is no wastage or generation of by-products.
- 4) Geothermal energy can be used directly. In ancient times, people used this source of energy for heating homes, cooking, etc.
- 5) Maintenance cost of geothermal power plants is very less.
- 6) Geothermal power plants don't occupy too much space and thus help in protecting natural environment.
- 7) Unlike solar energy, it is not dependent on the weather conditions.

Disadvantages of Geothermal Energy

- 1) Only few sites have the potential of Geothermal Energy.
- 2) Most of the sites, where geothermal energy is produced, are far from markets or cities, where it needs to be consumed.
- 3) Total generation potential of this source is too small.
- 4) There is always a danger of eruption of volcano.
- 5) Installation cost of steam power plant is very high.
- 6) There is no guarantee that the amount of energy which is produced will justify the capital expenditure and operations costs.
- 7) It may release some harmful, poisonous gases into atmosphere.

F.Bio gas Projects

Biomass, as a **renewable** energy source, refers to living and recently dead biological material that can be used as fuel or for industrial production. In this context, biomass refers to plant matter grown to generate electricity or produce for example trash such as **dead trees** and branches, yard clippings and **wood chips** biofuel, and it also includes plant or animal matter used for production of fibers, chemicals or heat. Biomass may also include **biodegradable** wastes that can be burnt as fuel. Industrial biomass can be

L16-L17

grown from numerous types of plants, including **miscanthus, switchgrass, hemp, corn, poplar, willow, sorghum, sugarcane**, and a variety of tree species, ranging from **eucalyptus to oil palm**

The particular plant used is usually not important to the end products, but it does affect the processing of the raw material. Production of biomass is a growing industry as interest in sustainable fuel sources is growing. The existing commercial biomass power generating industry in the United States produces about **0.5** percent of the U.S. electricity supply. Currently, the New Hope Power Partnership is the largest biomass power plant in North America. The facility reduces dependence on oil by more than one million barrels per year, and by recycling **sugar cane and wood waste**, preserves landfill space in urban communities in Florida.

India has a large bio gas plant in Methan village in **Sidhpur** tehsil saving **500 metric tonnes** of fuelwood annually.

ADVANTAGES OF BIO GAS PROJECTS

- 1. It is a Renewable Source of Energy**
- 2. Non-Polluting source**
- 3. Reduces Landfills**
- 4. Cheaper Technology**
- 5. Creates Large number of Jobs**
- 6. Little Capital Investment**
- 7. Reduces Greenhouse Effect**

DISADVANTAGES OF BIO GAS

- 1. Little Technology Advancements .**
- 2. Generates Impurities**
- 3. Not Attractive on Large Scale**
- 4. Unstable due to presence of Methane**

L16-L17

G. Compressed Natural Gas Projects

Compressed Natural Gas (CNG) is a **fossil fuel** substitute for gasoline, diesel, or propane fuel. Although its combustion does produce greenhouse gases, it is a more **environmentally** clean alternative to those fuels, and it is much safer than other fuels in the event of a spill (natural gas is lighter than air, and disperses quickly when released). CNG is used in traditional gasoline internal combustion engine cars that have been converted into bi-fuel vehicles (gasoline/CNG). Natural gas vehicles are increasingly used in Europe and South America due to rising gasoline prices.

In response to high fuel prices and environmental concerns, CNG is starting to be used also in light-duty passenger vehicles and pickup trucks, medium-duty delivery trucks, transit and school buses, and trains. Italy currently has the largest number of CNG vehicles in Europe and is the 4th country in the world for number of CNG-powered vehicles in circulation. Canada is a large producer of natural gas, so it follows that CNG is used in Canada as an economical motor fuel. Canadian industry has developed CNG-fueled truck and bus engines, CNG-fueled transit buses, and light trucks and taxis.

In India at Chennai, a CNG plant uses **8 tons of food and kitchen waste** to generate **400kg/day** of purified **CNG** grade fuel which is equivalent to a **200kW** power plant. As a byproduct **4 tons** of organic fertilizer will be produced per day.

Environmental Impact Assessment:- EIA

It is a study of probable changes in socio-economic and bio physical characteristics of the Environment that may result from proposed action. EIA represents a means of evaluating and simultaneously controlling the quality of human Environment. It is a link between Environment and Economic growth and helps in averting subsequent adverse effects on the Environment.

For effective Environment management, EIA must be done for a wide range of projects and activities such as highways, airports, canals, dams etc, pesticide application, clearing forests. The analysis must take place before the project is started. EIA consists of identification and evaluation of the Environmental factors that are likely affected by the proposed action. It is a valuable decision making tool indicating the;

- * alternate routes of development.
- * alternate process Technology.
- * carrying capacity of the ecosystem.
- * quality of Environment before, during and after the works.

Goals:- The goals of EIA are:-

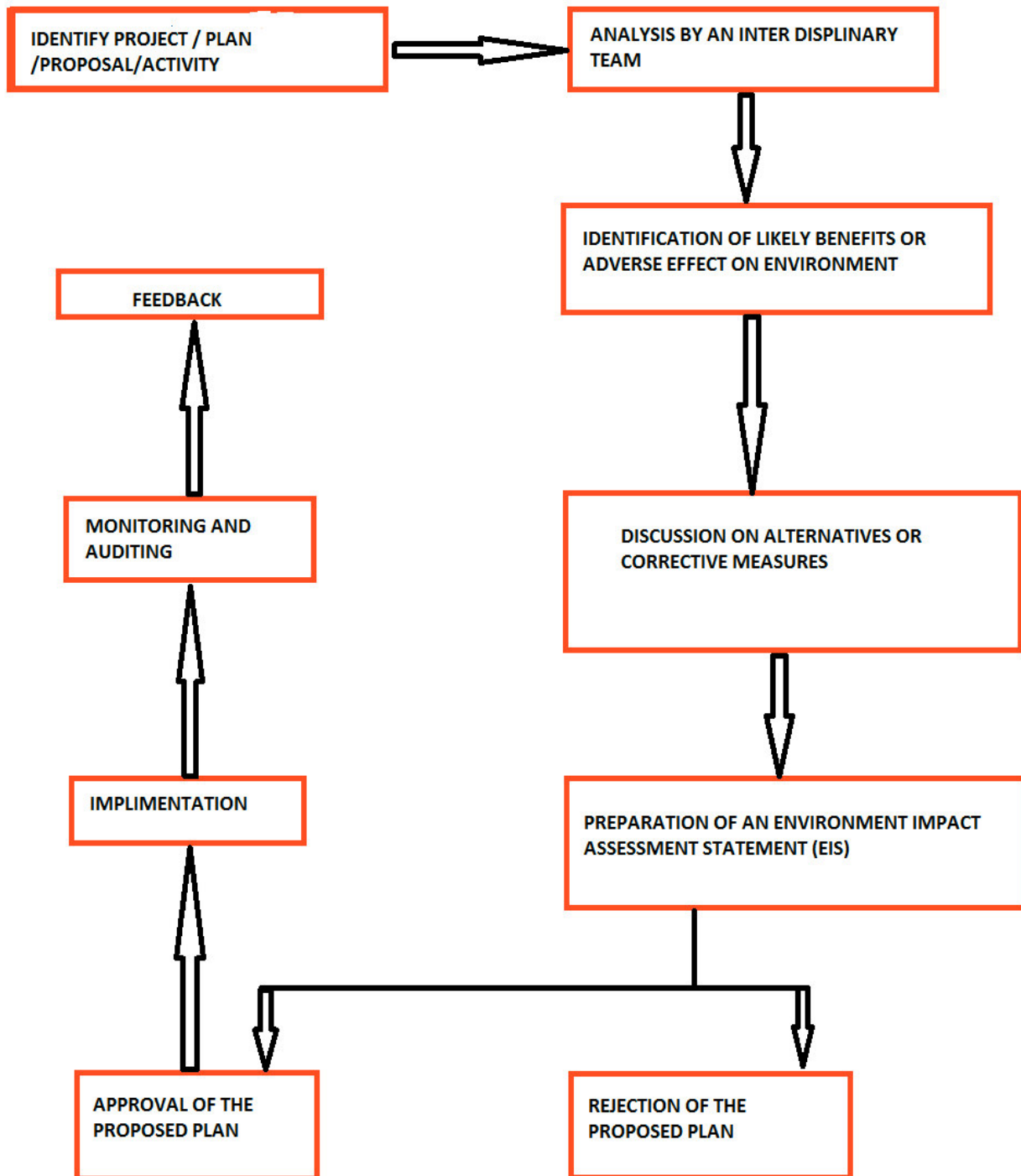
- * Resource conservation
- * Waste minimization
- * Recovery of by-product
- * Efficient Equipment.

Types of EIA

The various types of EIA are:-

1. Rapid EIA:- It is a widely used methodology, which would mainly use available data along with baseline environment data collected for one season, preferably the winter season. It is for evaluating all possible impacts on the components of the Environment.
2. Strategic EIA:- It is used to refer to EIA process applied to the policies, plans and programs. It enables decision makers to overcome limitations of the project at decision making level.
3. Comprehensive EIA:- It is required if assessment area, period and parameters are insufficient for a well defined decision on the establishment of the project.
4. Sectorial EIA:- It is used for the design of sector investment programme. It takes into account the institutional capacities and requirement for ensuring Environmental review implementation and monitoring at a sector.
- (5) Regional EIA:- It is basically a comprehensive EIA conducted for a particular region to establish the baseline Environment status and also to assess the assimilative capacity of the region.

THE EIA PROCESS CAN BE EXPLAINED BY THE BELOW GIVEN BLOCK DIAGRAM



Performing the assessment:-

This phase of EIA consists of the following steps.

- (a) A site visit by interdisciplinary team to determine the possible environmental impacts of the proposed project and record the description of the Environment as it exists prior to the proposed action.
- (b) Identification and evaluation of the likely beneficial or adverse environmental effects of the project.
- (c) Discussion of the alternatives i.e.
 - * What are the alternate uses of the site where the project is proposed to be set.
 - * Are there any alternative means of obtaining the objectives of the proposed project.
- (d) Preparation of a checklist for EIA to ensure complete coverage of all the possible consequences of the proposed activity so that it can be determined as to what administrative action can be taken as a result of this activity.