

Energy resource

1. Types of energy resource

Energy resources are those resources which are converted into heat and other forms of energy. They are in clear distinction with the mineral resources which are utilized as part of the physical constituency of the commodity. Coal, oil, solar energy are typically examples of energy resources. However, there is a clear distinction between coal and solar energy per say in terms of their potential to natural growth. The first one does not have any natural growth rate over a finite period of time. Thus, resources like coal, oil etc are examples of non renewable energy resources. On the other hand, solar energy, forest etc are examples of renewable resources. Interesting to note, while all non renewable resources are exhaustible, a renewable resource can be both – exhaustible or non exhaustible depending on the rate of growth and depletion.

2. Role of energy in the process of growth

Along the increasing growth path of GDP energy demand of the whole world has also risen significantly. Between 1950 and 1990 world energy needs increased four folds. The world demand for electricity has doubled over last 22 years. Electricity is at present the fastest growing form of end use energy. Global demand for other primary fuels has also increased manifold. Demand for oil, natural gas, and coal is expected to expand by 45% between 2006 and 2030 with an average rate of growth of 1.6% per year.

3. Developed and developing countries

Vast majority of this growth will occur in developing countries, notably China global demand for oil will raise an average of 1% per year from 85 million barrels per day (mb/d) in 2007 to 106 mb/d in 2030. If India hopes to maintain GDP growth rate above 8% per annum over next quarter century it will require atleast tripling of current primary energy supply and quintuple of current electric capacity, energy resource is the lifeline of industrial, transport and other sector such as household and agriculture etc. Key energy Statistics, 2008 IEA exhibits maximum use of coal by industrial sector, maximum amount of oil in transport sector, natural gas in both industry and household sectors.

4. Energy resource use and climate change

In the historical process of development of technology, embedded in a number of pervasive changes in the energy system, has taken the direction where the world moved along a low energy density fuel (steam engine) to high energy density fuel (oil) path. Significant growth in fossil fuel consumption resulted in CO₂ concentration of 430 ppm

in the atmosphere as compared to 270 ppm in the pre industrial era. This increase in the stock of GHGs led to an increase in world mean temperature. So, there is now an urgent need to device global cooperative policies in order to restrict the use of fossil fuel and hence to stabilize the concentration of GHGs. Here comes the importance of use of renewable resources, many of which are less polluting in nature.

5. Use of alternative energy resource

Renewable energy systems use resources that are constantly reproduced and are usually less polluting (less carbon content). There are five principal renewable sources of energy: the sun, the wind, flowing water, biomass and heat from within the earth.

- **Sun**
Solar energy is energy that comes directly from the sun. The sun is a constant natural source of heat and light, and its radiation can be converted to electricity.
- **Wind**
Natural conditions of climate and geography produce the winds that blow across the landscape. Historically, windmills were used to supply mechanical energy, for example to pump water or grind grain. Modern day wind turbines produce electricity.
- **Water**
Like the winds, flowing water is a product of the earth's climate. Snowmelt and runoff from precipitation at higher elevations flow toward sea level in streams and rivers. In an earlier era, water wheels used the power of flowing water to turn grinding stones and to run mechanical equipment. Modern hydro-turbines use water power to generate hydroelectricity.
- **Biomass**
"Biomass" describes, in one word, all plants, trees and organic matter on the earth. Biomass is a renewable source of energy because the natural process of photosynthesis constantly produces new organic matter in the growth of trees and plants. Photosynthesis stores the sun's energy in organic matter. Biomass is used to make heat, electricity and liquid fuels.
- **Earth**
Heat from deep within the earth is called "geothermal energy." In some locations, geothermal energy is close enough to the surface that, by drilling a well to reach the heat source, the energy can be extracted and used for heating buildings and other purposes. Where the temperatures are hot enough, geothermal energy can be used to generate electricity.

Heat, electricity and vehicle fuel are the main forms of energy that people use every day. All renewable energy sources can be used to produce electricity. Solar energy and

geothermal energy can supply both electricity and heat. Biomass can supply all three forms of useful energy.

6. Case studies

During Gulf war oil installation was burned for weeks polluting the air with poisonous gases. The fires wasted 5 million barrels of oil and produced over one million ton of air borne pollutants, including SO₂, a major cause of acid rain. The gases moved to a height of 3 kilometers and spread as far as India. It also polluted coastline, killing birds and fish.

In 1882, the first hydroelectric power dam was built in Appelton, Wisconsin. In India the first such dam was built in late 1980s in Western Ghats with an eye to reduce respiratory infections from coal driven cotton and textile mills in Bombay.

In 1981, a plane called 'The Solar Challenger' flew from Paris to England in 5 hours, 20 minutes. It had 16,000 solar cells glued to the wing and tail of the plane and they produced enough power to drive a small electric motor and propeller. Since 1987, every three years there is a World Solar Challenges for solar operated vehicles in Australia as well.