

## INTRODUCTION

Any physical activity in this world, whether carried out by human beings or by nature, is caused due to flow of energy in one form or the other. The word 'energy' itself is derived from the Greek word 'en-ergon', which means 'in-work' or 'work content'. The work output depends on the energy input.

Energy is one of the major inputs for the economic development of any country. In the case of the developing countries, the energy sector assumes a critical importance in view of the ever increasing energy needs requiring huge investments to meet them.

### Energy sources

There are five ultimate primary sources of useful energy:

1. The Sun.
2. The motion and gravitational potential of the Sun, Moon and Earth.
3. Geothermal energy from cooling, chemical reactions and radioactive decay in the Earth.
4. Human-induced nuclear reactions.
5. Chemical reactions from mineral sources.

Renewable energy derives continuously from sources 1, 2 and 3 (aquifers).

Finite energy derives from sources 1 (fossil fuels), 3 (hot rocks), 4 and 5.

The sources of most significance for global energy supplies are 1 and 4. The fifth category is relatively minor, but useful for primary batteries, e.g. dry cells.

Renewable energy sources derive their energy from existing flows of energy from ongoing natural processes, such as sunshine, wind, flowing water, biological processes, and geothermal heat flows. A general definition of renewable energy sources is that renewable energy is captured from an energy resource that is replaced rapidly by a natural process such as power generated from the sun or from the wind. Currently, the most promising (aka economically most feasible) alternative energy sources include wind power, solar power, and hydroelectric power. Other renewable sources include geothermal and ocean energies, as well as biomass and ethanol as renewable fuels.

### Definitions

For all practical purposes energy supplies can be divided into two classes:

1. Renewable energy. 'Energy obtained from natural and persistent flows of energy occurring in the immediate environment'. An obvious example is solar (sunshine) energy, where 'repetitive' refers to the 24-

hour major period. Note that the energy is already passing through the environment as a current or flow, irrespective of there being a device to intercept and harness this power. Such energy may also be called Green Energy or Sustainable Energy.

2. Non-renewable energy. 'Energy obtained from static stores of energy that remain underground unless released by human interaction'. Examples are nuclear fuels and fossil fuels of coal, oil and natural gas. Note that the energy is initially an isolated energy potential, and external action is required to initiate the supply of energy for practical purposes.

To avoid using the ungainly word 'non-renewable', such energy supplies are called finite supplies or Brown Energy.

summarize the reasons for the trend to renewable In another words we can energy

Economic reasons include -

Instability of oil and gas prices

Stockpiles of fossil fuel sources of exhaustible

Increasing demand by consumers for energy

Environmental reasons include -

Increase of environmental pollution

Global Warming

Climate Change

The different between Renewable energy and Alternative Energy

<b>Renewable energy</b>	<b>Alternative Energy</b>
Renewable energies and non-depleted	Energies available
Zero emission energy Green energy	Energies are less harmful to the environment
High construction cost and you need the experience and qualifications of high scientific	Cost to build a cheap weapon systems do not need to experience high

Forms of Renewable Energy:

**Solar:** Advantages: Always there; no pollution

Disadvantages: Low efficiency (5-15%); Very high initial costs; lack of adequate storage materials (batteries); High cost to the consumer

**Hydro:** Advantages: No pollution; Very high efficiency (80%); little waste heat; low cost per KWH.

Disadvantages: Fish are endangered species; Sediment buildup and dam failure; changes hydrological cycle

**Wind:** Advantages: supplemental power in windy areas; best alternative for individual homeowner

Disadvantages: Highly variable source; relatively low efficiency (30%); more power than is needed is produced when the wind blows; efficient energy storage is thus required

**Geothermal:** Advantages: very high efficiency; low initial costs since you already got steam

Disadvantages: non-renewable (more is taken out than can be put in by nature)

**Ocean Thermal Energy Conversion:** Advantages: can be used on large scale; exploits natural temperature gradients in the ocean

Disadvantages: extremely high cost; Damage to coastal environments

**Tidal Energy :** Advantages: Steady source; energy extracted from the potential and kinetic energy of the earth-sun-moon system; can exploit bore tides for maximum efficiency

Disadvantages: low duty cycle due to intermittent tidal flow; huge modification of coastal environment; very high costs for low duty cycle source

Some Forms of Alternative Energy

**Hydrogen Burning:** Advantages: very high energy density; good for space heating

Disadvantages: No naturally occurring sources of Hydrogen; needs to be separated from water via electrolysis which takes a lot of energy; Hydrogen needs to be liquefied for transport - takes more energy.

**Biomass Burning:** Advantages: Biomass waste (wood products, sewage, paper, etc) are natural by products of our society

Disadvantages: Particulate pollution from biomass burners