

Energy is the ability to do a work. Its unit is Joule (J)

Power is defined as the rate of doing work. Its unit is watt (W)

Relation between Energy and Power

Example 1.

A portable machine requires a force of 200N to move it. How much work is done if the machine is moved 20m and what average power is utilized if the movement takes 25s?

Solution

Work done = force * distance

$$= 200\text{N} * 20\text{m}$$

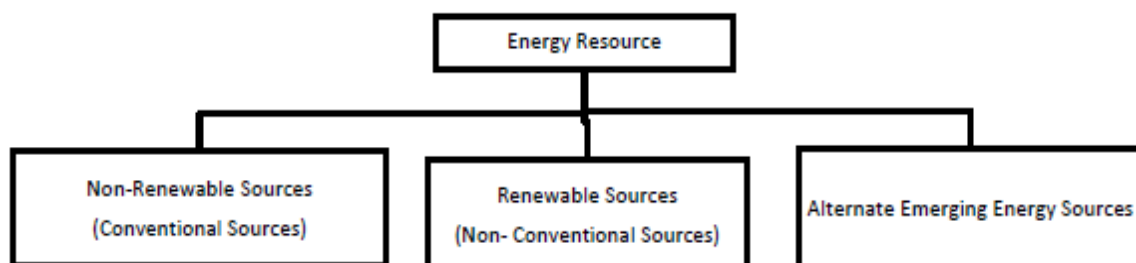
$$= 4000 \text{ Nm or } 4 \text{ kJ}$$

Power = work done / time taken

$$= 4000 \text{ J} / 25 \text{ s}$$

$$= 160 \text{ J/s} = 160 \text{ W}$$

Energy resources can be roughly classified in three categories:



Non-Renewable Sources:

sources of energy are only available in limited amounts and develop over a longer period of time. These are also known as “dirty” or “Conventional Source” because they can endanger the environment or human health and which are being traditionally used for many decades. These resources are found in specific parts of the world, making them more plentiful in some nations than others. The generation of energy from these resources is relatively less expensive.

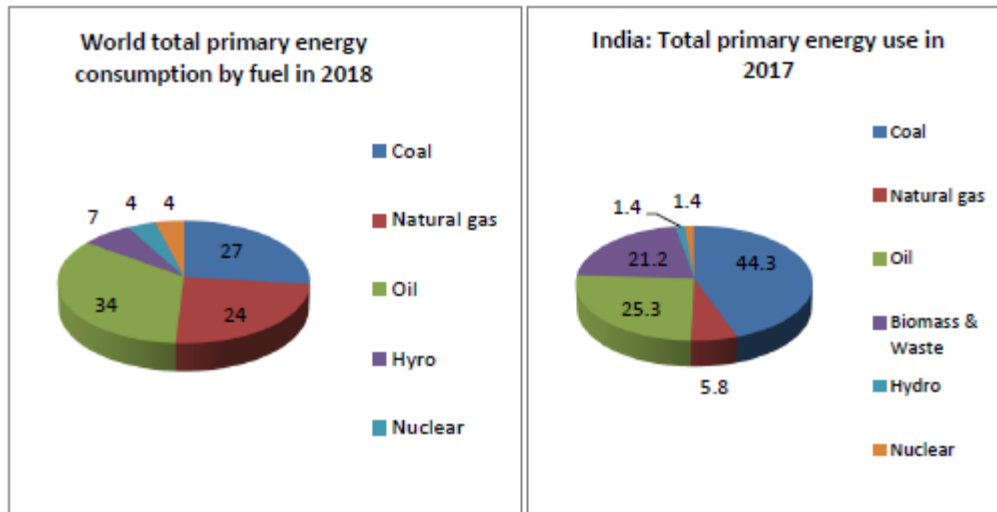
Examples: Coal, Petroleum, Natural Gases, Oil, Nuclear Energy etc.

Disadvantages:

- Highly polluting.
- Available only in few places.
- High running cost.
- Limited supply and will one day get exhausted.

Global variations in energy use

Energy consumption per head is a reliable indicator of a country’s level of economic development. In Canada and the USA consumption per head is double that of Europe and more than 800 times that of developing countries. A person in a rich country consumes almost as much energy in a single day as one person does in a whole year in a poor country.



Current state of Iraq energy

Oil dependency: Iraq's economy is heavily dependent on oil, which accounts for over two-thirds of its GDP.

Infrastructure: The energy sector suffers from aging infrastructure for both oil and electricity, with grids struggling to meet demand.

Energy shortages: Chronic electricity shortages, grid instability, and reliance on diesel generators are widespread issues, leading to inefficiencies where over 50% of the energy supply is lost.

Fossil fuel reliance: Over 98% of Iraq's electricity came from fossil fuels in 2023, with renewable energy (solar, wind, and hydro) making up a tiny fraction of the total.

Environmental Impacts of Energy Use

- Air and water pollution from fossil fuel combustion.
- Global warming due to carbon dioxide emissions.
- Habitat destruction caused by mining and dam construction.
- Nuclear waste that remains hazardous for thousands of years

Energy Conservation

Energy conservation means using energy efficiently to reduce waste without affecting quality of life.

Methods include:

- Using energy-saving light bulbs.
- Turning off unused appliances.
- Improving insulation in buildings.
- Promoting public transportation and carpooling

The Future of Energy

The future of global energy lies in clean and renewable technologies, such as:

- Expanding solar and wind energy projects.
- Developing energy storage systems and advanced batteries.
- Increasing use of green hydrogen as a fuel.

- Applying artificial intelligence for smart energy management

Future plans and challenges of energy sector in Iraq

Renewable energy goals

Iraq has a goal to generate 12,000 MW of solar power by 2030.

Energy efficiency

There are efforts to encourage energy efficiency and the installation of solar home systems, with a focus on solar energy to help preserve the environment.

Modernization and investment:

Agreements with companies like Siemens and General Electric aim to modernize the electricity sector.

Regulatory and governance challenges:

Key barriers to renewable energy include a lack of project finance schemes, outdated policy frameworks, fragmented governance between federal and regional authorities, and bureaucratic hurdles.

Integration:

Significant investment is needed to build the advanced infrastructure required to integrate intermittent renewable sources like solar and wind into the national grid.