

KNOWLEDGE EXPANDER

ENERGY



Shell
NXplorers



WHAT IS THE DIFFERENCE BETWEEN ENERGY CONSERVATION AND ENERGY EFFICIENCY?

ENERGY CONSERVATION involves reducing energy consumption, largely through behavioural change.

ENERGY EFFICIENCY involves using less energy to provide the same service or product. Improvements in energy efficiency are largely based on technological developments.

The energy efficiency of a system or process can be defined as:

$$\text{ENERGY EFFICIENCY} = \frac{\text{USEFUL ENERGY OUTPUT}}{\text{ENERGY INPUT}}$$

The energy efficiency of electrical devices and domestic or commercial settings can be compared using energy efficiency labels and certificates.



WHAT ARE NON-RENEWABLE AND RENEWABLE ENERGY RESOURCES?

NON-RENEWABLE ENERGY RESOURCES ARE FINITE

They are being depleted at a rate far greater than the rate at which they form and will therefore run out. Non-renewable energy resources include fossil fuels such as coal, oil and natural gas, and nuclear fuels.

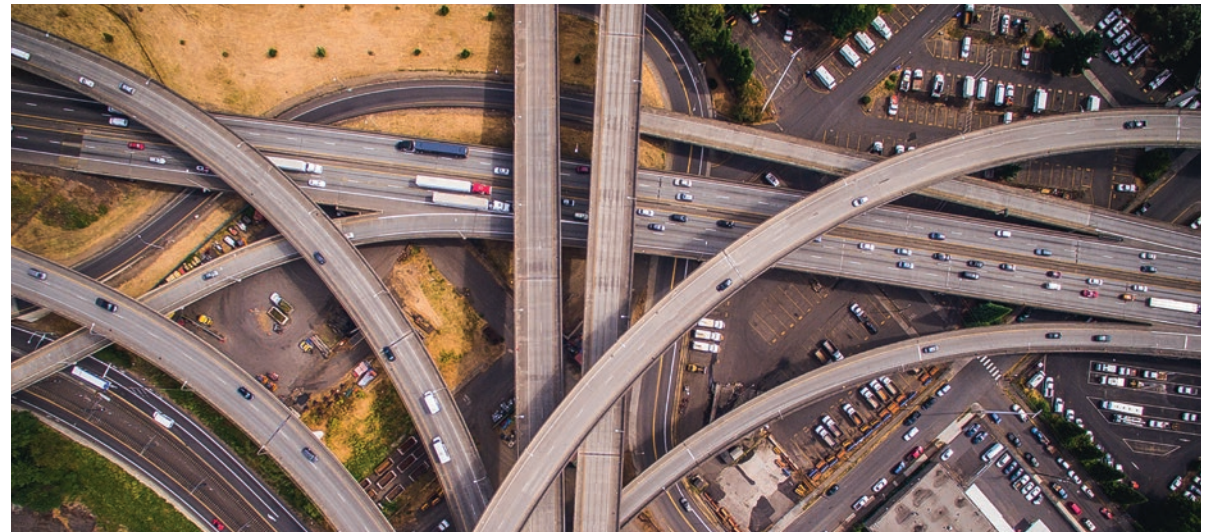
RENEWABLE ENERGY RESOURCES ARE NOT FINITE

They are regenerated naturally over a short time scale. Renewable energy resources include wind, solar, hydroelectric, geothermal, marine and tidal power, and biomass.

Energy resources are primarily used to power and heat domestic, commercial and industrial settings, for product manufacture and the production of food and potable water, and for transport.

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WHAT ARE THE CONCERNS WITH THE USE OF NON-RENEWABLE ENERGY RESOURCES?

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The combustion of fossil fuels produces carbon dioxide, which is a greenhouse gas contributing to global climate change. Other pollutants including acidic gases and particulate matter can be produced. There are environmental concerns over the extraction of existing and newly discovered resources.

The global distribution of non-renewable energy resources means that many countries rely on imports from other nations and are therefore subject to political and economic factors. Natural and man-made disasters can lead to damage to non-renewable energy infrastructures, resulting in catastrophic environmental and health consequences.



WHAT IS THE DIFFERENCE BETWEEN ENERGY, WORK AND POWER?

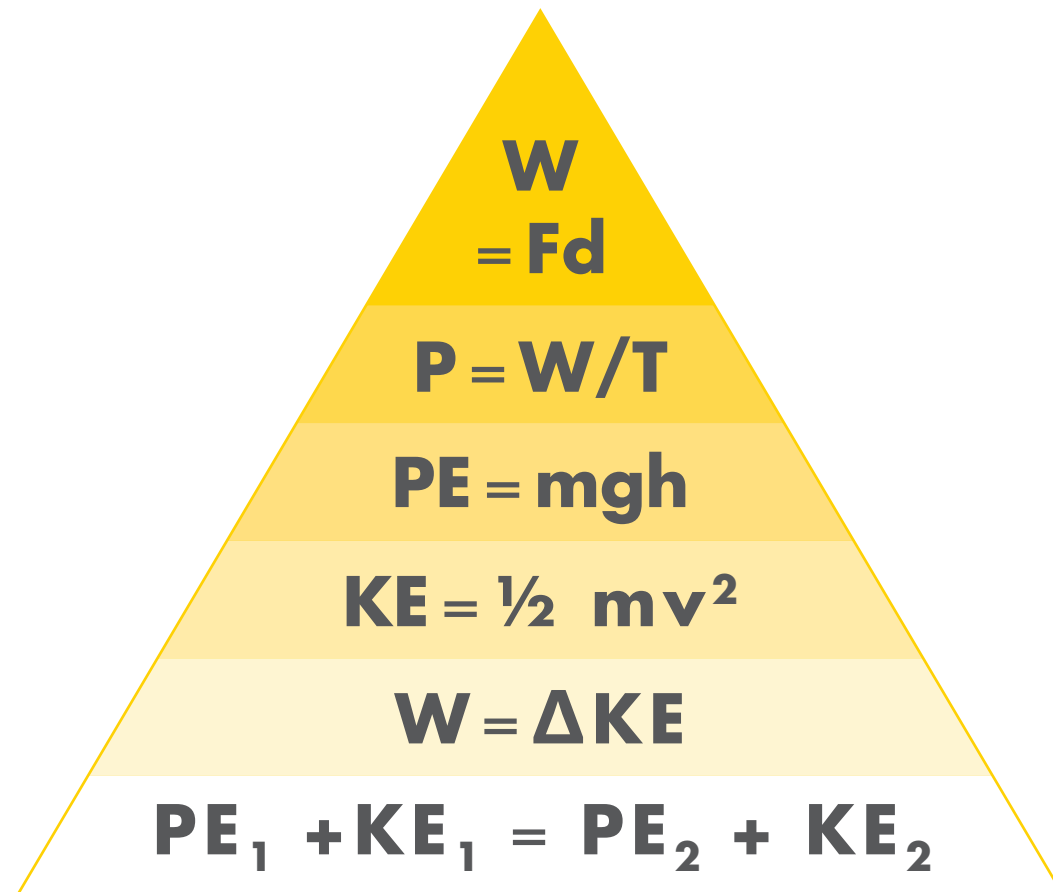
THE ENERGY OF A SYSTEM IS A MEASURE OF ITS CAPACITY TO DO WORK

Work is done when a force is applied to an object and the object is moved through a distance. When work is done, an energy transfer takes place, and the energy of the system changes.

Power is the rate at which energy is transferred (which equals the rate at which work is done).

The SI unit of energy is the joule (J): 1 joule equals the work done by a force of 1 Newton in moving a distance of 1 metre (in the direction of the force).

The SI unit of power is the watt (W): 1 watt equals an energy transfer of 1 joule per second.



HOW IS ENERGY STORED AND TRANSFERRED?

ENERGY CAN BE CATEGORISED AS POTENTIAL ENERGY (ENERGY OF AN OBJECT DUE TO ITS POSITION) OR KINETIC ENERGY (ENERGY OF AN OBJECT DUE TO ITS MOTION)

Energy can be stored in different ways (for example chemical, kinetic, gravitational, elastic, thermal, magnetic, electrostatic, or nuclear). These different energy stores are commonly referred to as 'types' or 'forms' of energy.

The law of conservation of energy states that energy cannot be created or destroyed, but can be transferred from one energy store to another, mechanically, electrically, thermally or radiatively.

Changes in a system lead can result in energy transfers and changes in the way the energy is stored.

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WHAT ARE THE CONCERNS WITH THE USE OF RENEWABLE ENERGY RESOURCES?

Renewable energy resources are not as reliable as non-renewable energy resources.

Large wind and solar power installations are required to produce comparable power outputs to fossil or nuclear power stations. Considerable investment is required to build new renewable energy infrastructure. There are concerns about the aesthetics of building new renewable energy infrastructure.

There are noise pollution and environmental concerns in relation to wind power installations.

HOW IS ELECTRICITY GENERATED AND TRANSMITTED?

MOST POWER GENERATION INVOLVES A SPINNING TURBINE GENERATING ELECTRICITY. THE TURBINE IS SPUN BY:

- Steam generated by the combustion of a fuel (fossil fuel or biomass power)
- Steam generated by nuclear fission in nuclear fuel (nuclear power)
- Steam generated by hot underground rocks (geothermal power) flowing water (hydropower) wind (wind power)

Solar power involves the use of photovoltaic cells, which transfer the energy from sunlight directly into electricity.

Electricity is transmitted through a network of cables to industrial, commercial and domestic settings. National electricity grid systems allow power generation to be controlled, with supply matched to demand.

There are various capital and operational cost factors associated with electricity generation. Energy storage technologies decouple energy supply and demand, and provide a means to reduce waste energy.

