

Energy Production

Primary Energy Source

- A primary energy source is one found in nature that has not yet been subject to processing of any kind
 - Crude oil
 - Natural gas
 - Coal
 - Solar
 - Wind
 - Water

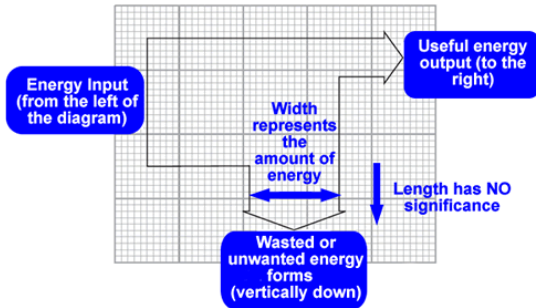
Secondary Energy Source

- When the primary energy is processed or used, secondary energy is produced
- Secondary energy must be suitable for use in machines which perform mechanical work
 - Electricity
 - Fuel for vehicles

Sankey Diagram

- Arrow block diagram representing energy flows
- The width of the arrows is proportional to the amount of energy being transferred

A Sankey Diagram - a 'to scale' diagram representing energy transfers



Energy Density

- The energy density of a fuel is the energy that can be obtained from a unit mass of the fuel.
- Energy density is measured in Jkg^{-1}
- The higher the energy density the more desirable the fuel

Some Energy Densities

Substance	Heat of Combustion
Coal	30 MJ kg ⁻¹
Wood	16 MJ kg ⁻¹
Diesel oil	45 MJ kg ⁻¹
Gasoline	47 MJ kg ⁻¹
Kerosene	46 MJ kg ⁻¹
Natural gas	39 MJ m ⁻³ (at stp)
Ethanol	26.8 MJ kg ⁻¹
