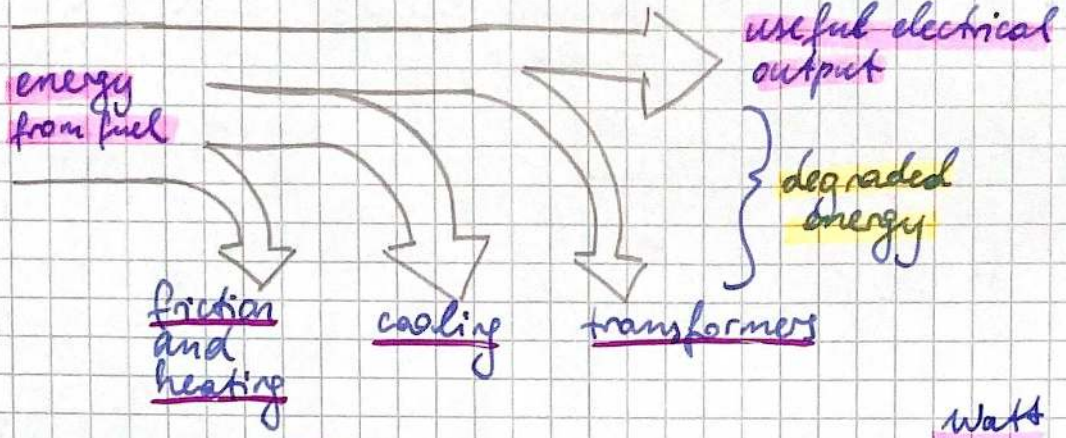
Energy production

Sankey diagram:



power: $P = \frac{W}{t}$ ("energy per time") $[P] = \dot{W} = J/s$ (Watt)

specific energy $e = \frac{W_{released}}{m_{fuel}}$ $[e] = J/kg$

energy density $\rho_{en.} = \frac{W_{released}}{V_{fuel}}$ $[\rho_{en.}] = J/m^3$

nuclear power

moderator: substance slowing the neutrons

control rods: movable rods that can absorb neutrons

heat exchanger: transfer thermal energy do heat water

$$^{238}_{92}U + ^{1}_{0}n \rightarrow ^{239}_{92}U \rightarrow ^{239}_{93}Np + ^{0}_{-1}\beta + \bar{\nu}$$

$$^{239}_{93}Np \rightarrow ^{239}_{94}Pu + ^{0}_{-1}\beta + \bar{\nu}$$

uranium-238

plutonium-239

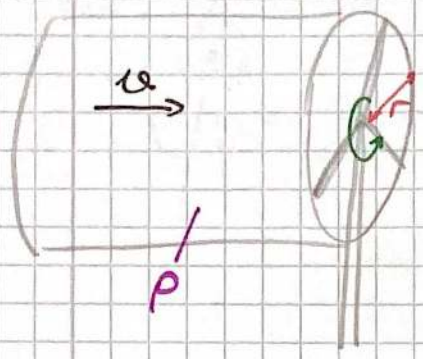
solar power

photovoltaic cell
- semiconductor
- solar radiation → voltage

vs.

active solar heater
- heat water directly

wind power



area $A = \pi \cdot r^2$

volume per second $V = A \cdot v = \pi \cdot r^2 \cdot v$

mass per second $m = V \cdot \rho = \pi \cdot r^2 \cdot v \cdot \rho$

energy per second

$$W = \frac{1}{2} \cdot m \cdot v^2$$

$$W = \frac{1}{2} \cdot \pi \cdot r^2 \cdot v \cdot \rho \cdot v^2$$

$$W = \frac{1}{2} \cdot (\pi \cdot r^2) \cdot \rho \cdot v^3$$