

Energy transformation and power (Issue #737)

OEO DEV meeting 22

29 July 2021

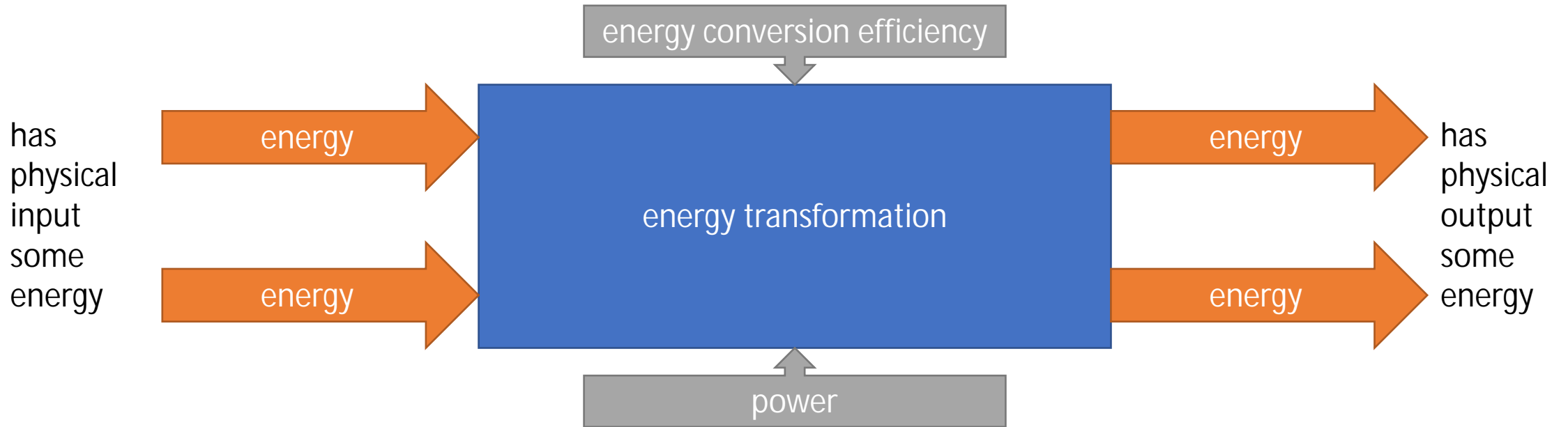
Current definitions and axioms

- Energy transformation is a process in which one or more certain types of energy as input result in certain types of energy as output.
 - 'has physical input' some energy
 - 'has physical output' some energy
- Power is the process attribute that is the amount of energy transformed or transferred per time unit.
 - 'process attribute of' some 'energy transformation'
 - 'has unit' some 'power unit' (axiom missing)
- Power unit: A unit which is a standard measure power or the rate of doing work.

Power

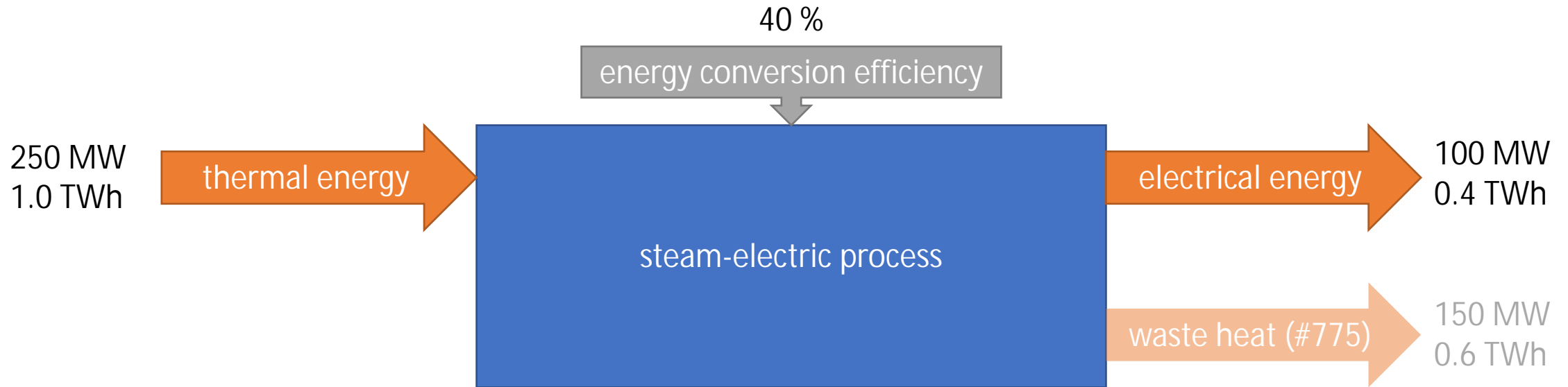
- In physics, power is the time derivative of energy/work: $P = \frac{dW}{dt}$
 - Modelling in energy systems in time steps: $P = \frac{\Delta W}{\Delta t}$
 - Commonly used in energy systems modelling:
 - timestep length: 1 h
 - power unit: MW
 - energy unit: MWh
- => Difference between power unit and energy unit gets fuzzy as power value and energy value are identical!

Current energy transformation structure



Real example

- Modelling one year with 8760 timesteps of 1 hour length
- Powerplant is running in 4000 of these 8760 timesteps



A steam-electric process is an energy transformation that converts thermal energy to electrical energy. A steam turbine and an electro motive generator are participating in a steam-electric process.