
The Arrow of Energy

Farkad Al Wattar

New Middle East Pty Ltd, Australia. E-mail: contact@the-fifth-law.com

The Second Law of Thermodynamics does not specify when a system, such as that epitomised in 1824 by the French military engineer and physicist Sadi Carnot as a 'heat engine', will cease functioning at the end of its useful life. Carnot's formulation of the Second Law allowed for a heat engine to run indefinitely when provided with sufficient fuel. The Arrow of Energy¹ postulates that, as a result of wear and tear, a system of energy will cease functioning as the sum of all the useful energy produced approaches the total energy expended in its construction. Therefore, the energy expended in constructing the system and the sum useful energy produced by the system must be one-way entangled, forming an Arrow, similar to the Arrow of Time.

1 A proposal

No energy system can produce sum useful energy in excess of the total energy put into constructing it. Energy, like time, flows from past to future. Secondly, the time taken in stocking energy to build an energy system added to the time taken to build the system will always be longer than the entire useful working lifetime of the system.

2 Experiment

Take two backup generators of the same grade and quality – one rated at 5 kW, and the other 30 kW. An unlimited fuel supply is provided for both generators. The 5 kW generator will cease functioning well before the sum total of useful work it produces matches the total energy generated by the 30 kW unit during its lifetime. Why so, given the unlimited fuel supply available to both generators, which makes them truly open systems? It is not the fuel supplied to an energy system that limits the sum useful energy produced, but rather the total energy expended in constructing it. As the 30 kW generator consumed more energy in its construction than the smaller 5 kW unit, the smaller generator cannot match the sum useful work of the larger device.

3 Thought experiment

Entirely unassisted by any product made during our age, start planting for wood, food and well-being until a steam engine is built, a process that is likely to take more than a few thousand years. Earlier in the journey, your descendants, now a nation governed by a fully working social contract, will be able to construct another Great Pyramid well before they are able to construct the steam engine intended. Constructing the Great Pyramid proves less energy-intensive than the engine. Run the engine and it will soon fail owing to wear and tear, far before the sum useful energy produced matches the total solar and other energies expended since the experiment started.

4 Equation

$$E_m > E_u \quad (1)$$

where E_u , which is defined as the total useful energy produced by an energy system over its lifetime, will always be less than E_m , the energy consumed in making it. Wear and tear (Entropy) constrains the energy system from lasting long enough to re-create itself end-to-end.

References

1. Al Wattar F. The Fifth Law, 2017. ISBN 978-0-6481261-0-2