2 Power

Subject:

The name “power” for the physical quantity P appearing in the equation $P = dW/dt$

Deficiencies:

The equation $P = dW/dt$ refers to a given area or surface. dW is the energy transmitted through this surface. Usually it is called “the work done” by the system at one side of the surface on that at the other side. As a consequence, P is the energy transported through the surface per time interval, or in other words, the energy flow rate, or energy flow for short. If the energy is flowing along a well defined path, and if the energy flow is the same at any cross section of this path, then P can also be attributed to the whole path or conductor.

Thus, P has a simple meaning. However, the denomination “power” does not clearly express this meaning. The word suggests attributing the word “power” to an entire device – an electric motor for instance – instead of to the cable leading to the device. In order to point out that a transport process is meant, sometimes one speaks about the “transmitted power”. This way of speaking is particularly awkward, since what is transmitted is energy, not energy per time.

Origin:

The word “power” for the above mentioned quantity came into being at a time when physics was not yet able to localize either the energy itself, or energy flows. One was aware that the decrease of the energy in one system was related to its increase in another system. However, for one of the most important energy transport processes a distribution of the flow could not be defined, i.e. for the transport of electric energy. That is why the quantity P was used to describe the change of the amount of energy in a system, i.e. in some fixed location. Thus, P was attributed to a body or a device, and not to a cross section.

Disposal:

Don't call the quantity P “power” but “energy flow rate” or “energy current.”

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