# Forms of energy

The first step in our classification scheme is to define forms of energy that can be stored. The definition of energy and its various forms has long confused scientists.1. We utilize the first law of thermodynamics to define terms that can be tied to concreate physical meaning. Consider the changes internal energy of an arbitrary energy storage medium from heat flows or work done by the system. can in general can be written in terms of so-called generalized forces and generalized displacements 2,3

In Table 1 some combinations of and are listed, which help us to define forms of energy. We restrict our analysis to the forms of energy where a viable method exists of conversion both to and from grid electricity (i.e. no nuclear energy).

|  |  |  |
| --- | --- | --- |
|  |  | Name |
| Temperature () | Entropy () | Thermal energy |
| Pressure () | Volume () | Pressure energy |
| Chemical potential () | Species number () | Chemical Energy |
| Electric Field () | Electric Displacement () | Electrostatic Energy |
| Magnetic “H” Field () | Magnetic “B” Field () | Magnetostatic Energy |
| Gravitational Field () | Height () | Gravitational Energy |
| Macroscopic momentum () | Macroscopic velocity () | Kinetic Energy |

Table : Generalized forces and displacements of the First Law, leading to a definition of different forms of energy. The colors correspond to the colors in the energy classification chart (Figure 6).

For electrostatic energy, the energy can be expressed equivalently in terms of changes in the charge and electrostatic potential . This is justified In the case of linear dielectric media where the equation is valid4 The form of magnetic energy as a thermodynamic potential is controversial. 5