Preface to the first edition

Transport, industry, housing and services sector: the “drivers” of these activities are the energies necessary to move, produce, heat or light, distract, for example. Electricity (which is not an energy source but an energy vector) plays an increasing role.

This trend, on the one hand, is due to the increase in requests of standards for buildings (both residential and commercial), leading to a reduction in heat requirements. On the other hand, development and extensive use of the Internet, computer and multimedia technologies, including office automation, have increased the number of equipment used and electricity consumption in some sectors.

Generation of electricity began in the nineteenth century and relied on hydro-power, coal and natural gas. In the twentieth century, this generation was extended to other technologies such as nuclear technology. Consequently, there have been increased atmospheric pollution (CO₂, particulates etc.) and nuclear risks (not only at the plant level but also with regard to storage of radioactive waste).

The need to reduce CO₂ emissions has pushed towards creation of new “clean” electricity production paths, such as photovoltaic or wind power, with hydropower still in use. Although the number of facilities has exploded mostly because of subsidies, these facilities now allow for a significant production of renewable electricity, which can reach more than 50% of total electricity production, depending on the country and weather conditions.

Electricity production unfortunately has a major drawback: variability. This mainly depends on meteorological conditions such as wind and sunshine. Even if forecasts are fairly accurate, production maxima do not always coincide with consumption, resulting in higher than demand production; hence, there arises the need to be able to store this excess electricity for later use, regardless of its form.

Among the many technologies available, and depending on the country and the current or expected surplus volumes, which are sometimes large, the one that is going to emerge should allow the maximum of this surplus to be stored.