Energy systems analysis

Research in the field of energy systems analysis draws on the competencies of the laboratory in heat transfer and energy. The main scientific competencies at play include: the modeling of thermal and thermodynamic systems (generation of heat, cold or work and consequently of electricity), the simulation of these systems, in particular in transient or non-steady-state phases (from a few minutes to a full year) and their analysis (calculation of instantaneous or integrated performances, energy, exergy or thermoeconomics). Objectives include performance analysis (either based on simulations or experience) and the search for optimum efficiency according to purely scientific, economic or mixed criteria. The analysis of energy systems has a natural and obvious cross-functional dimension. In most studies, the first step is to understand the phenomena involved before modeling them and building a simulation tool. The second step consists in validating the model by comparing it with experimental results. The validated model can then be used with two different aims depending on the purpose of the study:

* For predictions, to study the behavior of the modeled system in specific conditions. In this case, the goal is usually improvement or optimization.

* For estimations, in which the aim is to obtain information that cannot be directly accessed through measuring. In this case, we are in the broad context of inversion and estimation methods.

Energy systems analysis has a wide-ranging scope, and the main projects of the laboratory are listed below:

**Functional analysis of absorption and absorption-diffusion refrigeration machines**

**Capillary pumped loops**

**Solar energy conversion**

**Internal flow with heat and mass transfer**

**Modeling, simulation and optimization of a solar air conditioning solution**

**Thermoelectricity**