UE Optimization of Energy Systems

ECTS
3 credits

Component
UFR PhITEM (physique, ingénierie, terre, environnement, mécanique)

Semester
Automne

- **Teaching language(s):** English
- **Open to exchange students:** Yes

Presentation

Description

Many applications in the field of power and energy systems rely on optimal decisions making on many types of systems ranging from building, to microgrid, regional/national grid. The encountered case studies can be classified into two categories:

1. the operational planning of the systems – i.e. the management.
2. the long-term planning of the systems – i.e. the design/sizing of the system coupled with their management.

After an overview of the typical case studies, the module gives the students insights on how to translate them into optimization problems. A basic problem of unit commitment will be given in class as a running example (i.e. supply an electrical load from a set of generators with the minimum generation cost). Traducing the applications into an optimization problem requires to define sets of equation to account for the system objectives and operating limits. Specific constraints also need to be implemented in order to account for the model equations of the systems. Different families of formulations and solving algorithms will be introduced in class. Then three 4-hours labs will complete the module:

- Energy management strategy based on optimization for a microgrid – solar + storage
- Optimal design of a microgrid – solar + storage – under various assumption (Fig1.)
- Optimal operation of a simplified electrical grid.

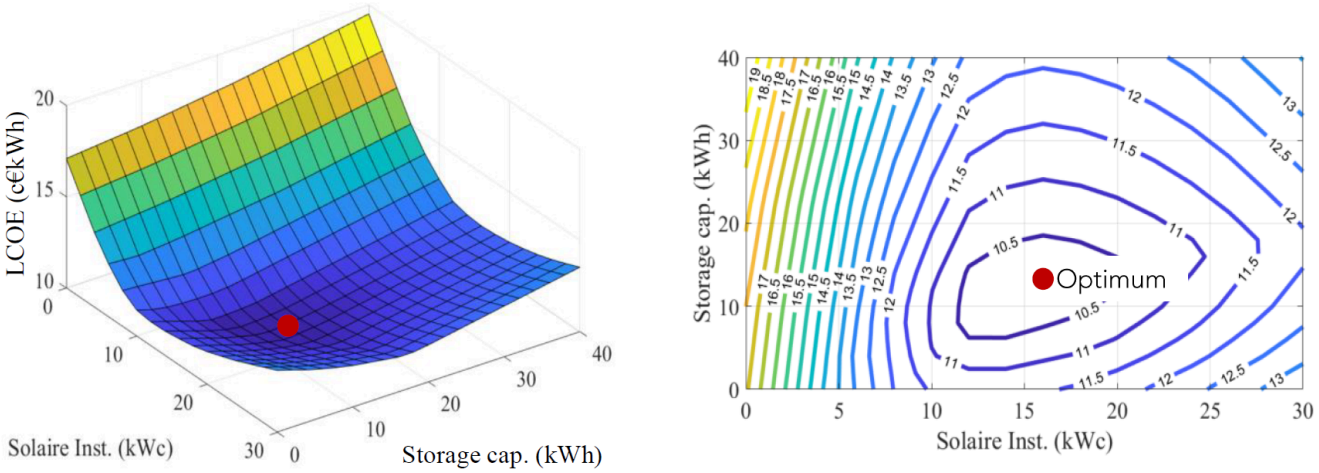

Figure 1. Example of Results for the optima sizing of a microgrid (solar and storage sizes)

Students learn the methodical procedures that are necessary for successfully modeling and solving problems in the area of power and energy systems. They will learn how to handle Mathematical Programming Language with an example of package in Matlab. By the end of the course, students will be able to understand how any typical decision making applications can be translated into an optimization problem, beyond the scope of energy systems.

Assessment: The grading policy comprises lab assessments. The grade of the module is the weighted average of the marks of each assessment.

Course parts

CM	Lectures (CM)	8h
TD	Tutorials (TD)	12h

Recommended prerequisites

Electrical Engineering, Power System Analysis

Knowledge check

The grading policy comprises lab assessments. The grade of the module is the weighted average of the marks of each assessment.

Bibliography

A. Soroudi, Power System Optimization Modeling in GAMS, Springer 2017

Useful info

Campus

- Grenoble - Scientific Polygon