2SC7890 – Insular carbon-free micro grid

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Language of instruction: ANGLAIS
Campus: CAMPUS DE RENNES
Workload (HEE): 80
On-site hours (HPE): 48,00

Description
Nearly 800 million people are still without access to electricity (IEA 2021). These populations are often found in isolated regions in rural or insular areas. Thus, for 3/4 of them, it is not economically efficient to bring them electricity by expanding the existing large electricity networks. Electrification must therefore be done at the local level, through microgrids.

The generation of electricity in a microgrid can be done using fossil fuels (diesel generators) or renewable energies (solar panels...). Thanks to technological advances, the latter are generally cheaper. However, their intermittency pushes to supplement them with more expensive but controllable means (diesel, battery storage...). The size of each of the components of a microgrid (called its "sizing") must therefore be optimized according to different criteria: the economic cost of course, but also the quality of service, energy independence or greenhouse gas emissions. The management of energy flows (e.g.: arbitrage between diesel and battery) also needs to be optimized. This project proposes to address these different optimization challenges in the real case of an isolated island site.

Quarter number
ST7

Prerequisites (in terms of CS courses)
Optimization course.

Syllabus

Problem definition :

Input data:

- collection of production and consumption data
- data analysis and normalization

Modeling and formalization:

- definition of optimization criteria
- formalization of the optimization problem

Resolution:

- choice of resolution method
- sensitivity analysis

Class components (lecture, labs, etc.)

Project 80h

Grading

project reports and presentations (intermediate and final)

Resources

project in groups

Learning outcomes covered on the course

By the end of this course students will be able :

- Understand the economic, ecological and societal context and challenges of microgrids.
- Formalize an optimization problem
- Select the appropriate resolution method.
- Trade-off analysis
- Work in groups and results present

Description of the skills acquired at the end of the course

- Understand the economic, ecological and societal context and challenges of microgrids. C1.1, C.4.2
- economical et technical microgrid modelling C2.1, C6.2
- Formalize an optimization problem. C1.2, C1.3, C2.1
- Select the appropriate resolution method. C2.1, C2.3, C6.1, C6.2
- presentation of the results. C7.1
- Work in groups. C8.1, C8.4