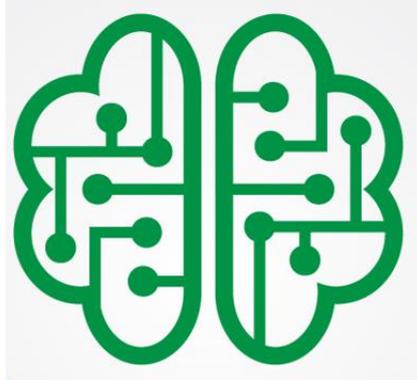


Next generation optimization-based energy management system for small energy networks



Logo vector created by maestro99 - www.freepik.com

Houses are commonly equipped with PV panels, electric batteries, variable power heat pump and electric vehicles. This means single homes are becoming complex energy hubs which require an efficient energy management system (EMS) that can be configured in a simple way while satisfying complex needs such as improving self-consumption and reducing cost.

The energy systems group at CSEM is actively developing a next-generation energy management system that is based on Model Predictive Control and which can be easily reconfigured through an automated controller synthesis process. A first internship successfully contributed to this project with work focused on forecasting. In this context, we are offering an internship to improve the operation of this EMS by extending its functionalities, focusing on two aspects:

- The refinement of the predictive control algorithm with specification of complex objective such as peak shaving in the EMS algorithm, and the scale-up to multi-home systems.
- The buildup of a simulation environment that allows to testbench the controller. The simulation will rely on the versatile physical simulation environment Modelica, for which a collection of house models has already been developed. It will be used to assess the controller performance over long periods of time.

While the objective of the work is clearly industrial, there will be scope to present the results in scientific journals or at conferences. The student will be part of a team of twelve experienced

engineers and researchers, and have the opportunity to use real data from test sites and face actual practical challenges of software deployment for energy applications.

Requirements:

- An strong interest for energy systems and energy management problematics.
- Good programming experience, preferably with exposure to Python; and an interest in good coding practices (object-oriented programming, unit testing, version tracking with Git).
- Familiarity with MPC or numerical optimization preferred, knowledge of Kalman filtering and/or machine learning a plus.

Type of project: Master in industry or internship, minimum 4 months. Location: Neuchatel

Contact: Tomasz Gorecki, tomasz.gorecki@csem.ch