Building Energy Modeling with EnergyPlus and Ladybug Tools (Grasshopper for Rhino): a practical case study

Description of the project

The NEST SolAce unit is a mixed living and working space designed by EPFL researchers, characterized by a positive annual energy balance and very low CO2 emissions. The goal of the project, realized in October 2018 at the EMPA Campus in Duebendorf (ZH), was to meet the highest standards of luminous, thermal, acoustic and air quality comfort, with a unitary and appealing aesthetic appearance. A large use of renewable energy conversion technologies and building automation is made to reach these goals, together with the most advanced envelope technologies and energy systems.

To optimize the operation of the unit, the gap between simulated energy performance and monitored data from sensors in the unit must be assessed. A master student in the field of Energy Management or Mechanical Engineering is invited to carry out the dynamic hourly energy simulation of the unit, including the details of renewables output, the thermal and electrical energy consumptions through the building energy systems. As such, the exchange energy flows with the energy hub in the backbone of the NEST building will be modeled. The student will be provided with a baseline model of the dynamic hourly energy needs, all the details of the envelope and the energy systems equipment. The simulation platform is EnergyPlus and OpenStudio: previous experience with this software is required for candidates.

Objectives

- Carry out a dynamic hourly simulation of heating, cooling, domestic hot water, electricity consumption of the NEST SolAce Unit;
- Compare simulated data with monitored data.

Requirements

- Previous experience with EnergyPlus and/or OpenStudio
- Experience with Ladybug Tools, Grasshopper for Rhino and LESOSAI would be an asset
- Experience with Energy Management Systems, Building Automation, Matlab and Simulink would be an asset

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