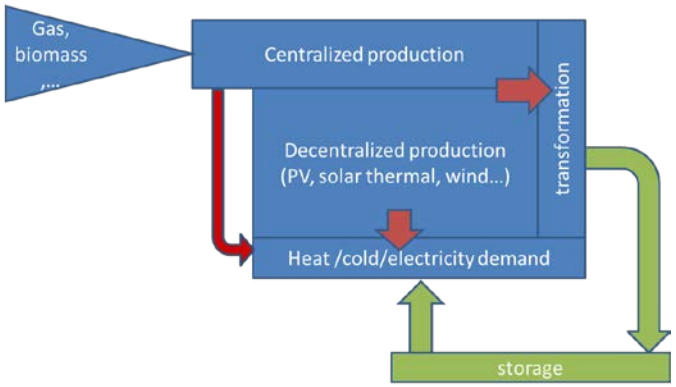
Assessment of decentralized urban energy systems models

Background

Energy requirements in urban areas are rising very fast and this trend is expected to continue with the increase in the urban population (70% by 2050). New buildings are built according to more and more stringent norms which can make them either net-zero or energy positive buildings. However the core of the existing buildings is still old and renovation strategies and scenarios will not be able to make neighbourhoods or buildings in urban areas fully autonomous. Decentralized urban energy systems are hence drawing a lot of attention from the research and industrial community as a possibility towards more sustainable urban areas. Thus the integration of renewable energy as well as the energy storage potential needs to be addressed and evaluated. The energy hub concept has been proposed a solution to optimize energy flow in energy systems.



Objectives

- Each of the components in the figure above can be simulated with different programs and an energy hub software can be used to simulate the flow. It is proposed to apply these different models on two study cases one at the building scale (LESO building) and one at the neighbourhood scale (Quartier Nord) and if possible at the urban scale (Geneva). It is expected that by the end of the work a complete understanding and a comprehensive overview of the used models is done. Besides this work should point out the advantages and drawback of the decentralized energy systems when applied to the study cases.

Desired profile

We are looking for a motivated Master student having a strong interest in building physics, mathematics and sustainability. A good knowledge of energy flows at the urban scale is preferred. English is mandatory. The candidate should be willing to work with software such as EnergyPlus, CitySim and Matlab. Programming skills (C++, Python…) can be seen as an advantage.

The candidate will thrive in an exciting international research environment at the LESO-PB, where researchers work on various topics related to building physics and solar energy from the urban to the nano scale. This work will also be part of the SCCER FEEB&D (*www.**sccer**-feebd.ch/*)

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