Planning and operation of multi-energy systems at district level

Kristina Orehounig(Kristina.orehounig@empa.ch), Bollinger Andrew
Swiss Federal Laboratories for Materials Science and Technology (Empa)

Abstract
Meeting emission reduction targets of the future requires smart urban planning solutions that allow for a significant reduction and decarbonization of the current energy consumption of buildings. To achieve this renewable energy sources have to be integrated in the energy system. However, the increasing penetration of renewable energy sources (e.g. solar, wind) introduces new dynamics into local (e.g. neighborhood and district) energy systems. To ensure an efficient matching of supply and demand of different energy streams, comprehensive simulation and optimization approaches are needed, covering multiple energy streams and the multitude of transformation possibilities. In this presentation, we will show how computational methods can be used, to assess the performance (e.g. sustainability, financial) of multi-energy systems and identify optimal solutions for their design and operation. Methods include topics such as the identification of energy demand and potential measures for improving energy efficiency of the building stock, assessment of various renewable energy sources at building and district scale and the optimal design of multi-energy systems, which take conversion, transmission and storage technologies into account. Thereby multi-criteria optimization are utilized to identify cost and CO2 optimal solutions. The effectiveness of the different modelling strategies are demonstrated by different case studies.

Keywords: *buildings, urban energy systems, multi-energy systems, modelling and optimization*

Biography
Kristina Orehounig is head of the Laboratory of Urban Energy Systems at Empa and lecturer at ETH Zurich. Her research interests include the development of sustainable concepts in building design and operation, the integration of renewable energy systems, and the modelling and optimization of building and urban energy systems. Besides being active in a number of national and international research projects, she currently leads the work package on multi-energy systems in the SCCER FEEB&D.