Johannes Hofer: Renewable Energy Technologies and Systems Integration – Challenges and Solutions

Energy strategies aim at limiting global warming and air pollution by moving away from fossil fuels towards a low-carbon economy. The realization of this target requires both improvements in energy efficiency together with increased use of renewable energy sources. The large scale adoption of renewable energies poses several challenges, such as the variability and uncertainty in renewable generation. This is expected to affect both the technical and economical operation of energy systems. In my research, I address these challenges by modeling and analysis of renewable energy technologies and energy system integration, involving multiple disciplines, scales, and dimensions. In particular, this concerns the improved design and operation of building integrated renewables, such as photovoltaic and hybrid photovoltaic/thermal systems, as well as efficient heating and cooling systems using renewable sources like geothermal and solar energy. Furthermore, it relates to the implementation of distributed renewable generation and storage in the context of smart buildings and multi-energy networks. This presentation will discuss these research topics in more detail, including several real examples. The presentation will finish with an outlook on ongoing and potential future research.