Master Thesis

Scaling of coupled energy system simulations with High-Performance Computing

Motivation:
In order to counteract the effects of climate change, new strategies must be developed to ensure a secure energy supply. An essential way to test these in advance is to carry out simulations. Simulation software therefore plays a major role in designing the energy systems of the future.

The Energy Systems Analysis (ESA) group is conducting research into a software framework for co-simulation, among other things. A co-simulation allows different energy domains (e.g. electricity, heat, gas) to be coupled together in one simulation.

For a high scalability of the co-simulation, the execution on a computing cluster is necessary. For this purpose, the existing software architecture is to be adapted to the HoreKa HPC system as part of this master's thesis.

Tasks:
• Data exchange in a co-simulation with MPI
• Development of a hierarchical co-simulation approach
• Investigation of the scalability of coupled energy system simulation using a generic co-simulation model example
• Analysis of the runtime behavior

Expected knowledge and skills:
• Studies in computer science
• Programming languages: Python, Java
• Knowledge in parallel computing (Unix, Jobs, MPI)
• Basic knowledge of energy systems and corresponding software is an advantage
• Independent and results-oriented way of working

We offer:
• Excellent supervision by the multidisciplinary working group Energy Systems Analysis (ESA) at IAI, KIT-CN
• A training period of up to 2 months is possible
• Thesis language German or English