

Student Assistants (HiWi Job) at Energy Lab 2.0

Real-Time Implementation and Enhancement of the CERN Electrical Network Electromagnetic Transients (EMT) Model

About Energy Lab:

In the search for new and advanced technologies for the energy transition, the Energy Lab 2.0 offers a Power Hardware-in-the-Loop environment, in which new developments can be tested under realistic conditions. These conditions need to be simulated by real-time digital simulator running sophisticated models of grids or power devices. You will be part of a team, developing and testing such models, especially concerning the investigation of power electronic devices in the modern power system. This job can pose challenges exploring uncharted waters, but also offer a great chance in gaining new insights into the world of electrical power systems and the research landscape in general.

Job Description:

The objective of this project is to support the enhancement and real-time implementation of the EMT model of the CERN electrical network in the HYPERSIM environment. The primary responsibility will be to convert the developed offline EMT model into a real-time compatible model by optimizing its computational performance while preserving simulation accuracy. The work includes implementing minor enhancements to improve model fidelity, updating selected network components when necessary, and validating the real-time model against the reference offline model under steady-state and transient operating conditions. The student will also perform simulation studies involving network disturbances, document the modelling and validation procedures, and contribute to the development of a robust real-time simulation platform for future power system analysis, hardware-in-the-loop (HIL) and power hardware-in-the-loop (PHIL) testing, and digital twin applications.

Your Tasks:

- Review and understand the existing EMT model of CERN electrical network and its implementation in the simulation environment
- Convert the developed EMT model into a real-time compatible model by adapting and optimizing the network components and simulation parameters for real-time execution
- Identify and implement minor enhancements to improve model accuracy, functionality, and computational performance while maintaining real-time constraints
- Validate the real-time model by comparing its steady-state and transient responses with the reference offline EMT model and available benchmark results.
- Document the modeling methodology, optimization process, validation results, and technical findings to support future development and maintenance of the real-time simulation model

Your Profile:

- Finished Bachelor in Electrical Engineering
- Experience with Matlab/Simulink
- Basic knowledge of EMT modelling
- Basic knowledge of power systems, power electronics, and control theory
- Experience with DlgSILENT PowerFactory and HYPERSIM software and OPAL-RT real-time simulators are a plus

You will learn:

- Hands-on experience on various EMT software
- Developing EMT model for power system studies
- Simulating scenarios and analyzing data
- Knowledge and hands-on experience on real-time simulators

Contact:



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Workload: 20-40h per month

Start: From now on

Duration: 6 months

