technische universität dortmund

Fakultät für Elektrotechnik und Informationstechnik

SmartGridTecLab Dortmund

Institute of Energy Systems, Energy Efficiency and Energy Economics

Bachelor Thesis | Published on 06.05.2026

Development and Implementation of a Coordination Platform for Automated Testing of Real-Time EV/EVSE Systems in Smart Grids

The rapid growth of electric mobility is transforming modern power systems and introducing new challenges for grid stability, interoperability, and testing procedures. Electric Vehicles (EVs) and Electric Vehicle Supply Equipment (EVSE) must be thoroughly validated under realistic and dynamic operating conditions to ensure reliable integration into smart grids. Real-time simulation environments combined with hardware-based emulators offer a powerful approach for testing such systems.

The primary objective of this thesis is to design and implement a coordination platform that facilitates automated test execution using a real-time EV/EVSE emulator. The platform should include a simple model for EV battery as well as a robust, scalable, and efficient communication interface between the real-time simulation environment and the physical emulator, ensuring synchronized operation and reliable data exchange. Furthermore, the platform is expected to support flexible test configuration, monitoring, and result collection, thereby improving the overall efficiency and reproducibility of experimental procedures. As an optional task, this work may also include the expansion of the existing hardware setup to meet the increased power and configuration capabilities of the current emulation system, enabling more advanced testing scenarios.

Project Tasks:

- Comprehensive literature review on the main topic
- Development of a Python-based automation platform for coordinating and managing test execution
- Modelling of an elemental EV battery system
- Enabling communication between real-time simulator and EV/EVSE emulator
- Design and execution of experimental functional tests under different operating conditions
- Validation of the principal use cases relevant to smart grid and e-mobility applications
- Expansion of the existing HW setup (optional)

Upon completion of the thesis, the results shall be presented in an oral presentation.

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