E.ON Energy Research Center | RWTH AACHEN UNIVERSITY

Master-Thesis:

Co-Simulation for Smart Grid Oriented EV Charging

Context:

Electric vehicles (EVs) have already become important elements of the mobility culture in several developed countries. Despite being additional electrical loads, EVs also present some opportunities. In particular, they can be used as flexibility sources by the power system and the stored energy in their batteries can be fed back to grid, i.e. vehicle-to-grid (V2G), to support the system objectives such as peak shaving. Therefore, "smart charging for EVs" is a popular domain of research. In investigations of "the most suitable strategy" for a specific application, one needs simulation tools capable of testing multiple candidate strategies and assessing their impact on the power grid. Simulation tools representing both domains of interest, i.e. the charging strategies as well as the models of the electrical grid and its components, in adequate detail can quickly become complex and difficult to maintain or extend. As an alternative, co-simulation approaches in which multiple simulators that are modelling individual parts of the system in detail are coupled to work cooperatively, have become state-of-the-art in industry and academia.

Tasks:

This thesis aims to combine two simulators to generate a tool for testing alternative operating strategies in complex scenarios involving EVs. The first simulator, EVC-Cluster, is a Python project that provides a portfolio of energy management algorithms that can be used by relevant intelligent entities such as autonomous EVs, charging station operators as well as aggregators. The second one, DistAIX, is an agent based simulator for cyber-physical power distribution systems, written in C++. For coupling, the VILLASnode co-simulation gateway shall be used.

- Literature review of existing co-simulation approaches and techniques
- Definition and implementation of a co-simulation interface between EVCluster and DistAIX
- Testing and evaluation of developed co-simulation

Your Profile:

- Programming experience with Python and/or C++
- Basic understanding of communication protocols
- General interest in (co-)simulation approaches

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