RWTH AACHEN UNIVERSITY

E.ON Energy Research Center
ACS | Institute for Automation of Complex Power Systems

Bachelor Thesis:

Techno-Economic Analysis of Alternative Microgrid Configurations and Domains for V2X Applications

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 as the EV batteries can be used as flexible energy resources. EV batteries can transfer energy to grid (vehicle-to-grid; V2G), home (vehicle-to-home; V2H) and another vehicle (vehicle-to-vehicle; V2V).

Objective:
Microgrids can be seen as ideal interfaces for vehicle-to-everything (V2X) applications due to their advantages in terms of controllability. Electrical system of the microgrids can be configured in alternative ways such as 1) AC charging in an AC network, 2) DC charging in an AC network, 3) DC charging in a DC network. Furthermore, depending on the application domain (e.g., residential, workplace, (semi)public parking lots), different control perspectives/business models could be suitable for the considered microgirds. With this thesis, it is aimed to identify and compare alternative configurations/domains and perform a detailed techno-economic analysis.

Student profile:

We are looking for Bachelor's thesis students motivated to perform independent research and to produce high-quality scientific reports.

Relevant references

F. Zhang et al., "Advantages and challenges of DC microgrid for commercial building a case study from Xiamen university DC microgrid," 2015 IEEE First International Conference on DC Microgrids (ICDCM), 2015, pp. 355-358, doi: 10.1109/ICDCM.2015.7152068.

T. He, J. Zhu, D. Dah-Chuan Lu, L. Zheng, M. M. Aghdam and J. Zhang, "Comparison study of electric vehicles charging stations with AC and DC buses for bidirectional power flow in smart car parks," IECON 2017 - 43rd Annual Conference of the IEEE Industrial Electronics Society, 2017, pp. 4609-4614, doi: 10.1109/IECON.2017.8216794.

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