Enhancing the Role of Electric Vehicles in the Power Grid: Field Validation of Multiple Ancillary Services - DTU Orbit (22/12/2018)

With increased penetration of distributed energy resources and electric vehicles (EVs), different EV integration strategies can be used for mitigating various adverse effects, and supporting the grid. However, the research regarding EV smart charging has mostly remained on simulations, whereas the experimental validation has rarely been touched upon. This paper focuses mainly on evaluating the technical feasibility of a series-produced EV to provide flexibility in real distribution grids. The implemented controller uses contemporary and widely supported standards for limiting the EV charging rate, which essentially means it is applicable to any EV complying with IEC 61851 and SAE J1772 standards. The field test validation is conducted in a real Danish distribution grid with a Nissan Leaf providing three ancillary services through unidirectional AC charging, namely congestion management, local voltage support, and primary frequency regulation. Several performance parameters, such as EV response time and accuracy, are assessed and benchmarked with current requirements. Ultimately, the paper aims to strengthen the applied research within the EV integration domain through validating smart grid concepts on original standard-compliant equipment.

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