Electric vehicle fleet management in smart grids: A review of services, optimization and control aspects - DTU Orbit (08/11/2017)

Electric vehicle fleet management in smart grids: A review of services, optimization and control aspects

Electric vehicles can become integral parts of a smart grid, since they are capable of providing valuable services to power systems other than just consuming power. On the transmission system level, electric vehicles are regarded as an important means of balancing the intermittent renewable energy resources such as wind power. This is because electric vehicles can be used to absorb the energy during the period of high electricity penetration and feed the electricity back into the grid when the demand is high or in situations of insufficient electricity generation. However, on the distribution system level, the extra loads created by the increasing number of electric vehicles may have adverse impacts on grid. These factors bring new challenges to the power system operators. To coordinate the interests and solve the conflicts, electric vehicle fleet operators are proposed both by academics and industries. This paper presents a review and classification of methods for smart charging (including power to vehicle and vehicle-to-grid) of electric vehicles for fleet operators. The study firstly presents service relationships between fleet operators and other four actors in smart grids; then, modeling of battery dynamics and driving patterns of electric vehicles, charging and communications standards are introduced; after that, three control strategies and their commonly used algorithms are described; finally, conclusion and recommendations are made.

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