World Academy of Science, Engineering and Technology
International Journal of Mathematical and Computational Sciences
Vol:14, No:12, 2020

Reactive Power Control with Plug-In Electric Vehicles

Authors : Mostafa Dastori, Sirus Mohammadi

Abstract : While plug-in electric vehicles (PEVs) potentially have the capability to fulfill the energy storage needs of the electric grid, the degradation on the battery during this operation makes it less preferable by the auto manufacturers and consumers. On the other hand, the on-board chargers can also supply energy storage system applications such as reactive power compensation, voltage regulation, and power factor correction without the need of engaging the battery with the grid and thereby preserving its lifetime. It presents the design motives of single-phase on-board chargers in detail and makes a classification of the chargers based on their future vehicle-to-grid usage. The pros and cons of each different ac–dc topology are discussed to shed light on their suit- ability for reactive power support. This paper also presents and analyzes the differences between charging-only operation and capacitive reactive power operation that results in increased demand from the dc-link capacitor (more charge/discharge cycles and in- creased second harmonic ripple current). Moreover, battery state of charge is spared from losses during reactive power operation, but converter output power must be limited below its rated power rating to have the same stress on the dc-link capacitor.

Keywords : energy storage system, battery unit, cost, optimal sizing, plug-in electric vehicles (PEVs), smart grid
Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development
Conference Location : Chicago, United States
Conference Dates : December 12-13, 2020