CYPRUS UNIVERSITY OF TECHNOLOGY

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL ENGINEERING, COMPUTER ENGINERING AND INFORMATICS

The Impact of Electric Vehicles in an Unbalanced Distribution Network with Renewables

Bachelor Thesis

by

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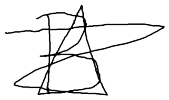
Solemn Declaration

I confirm that I am the author of this thesis, and that any assistance we have had for its preparation is fully recognized and refers to the thesis. I have also mentioned sources from which we have used data, ideas or words, whether they are mentioned exactly or paraphrased. I also confirm that this thesis was prepared personally specifically for the requirements of the curriculum of the Department of Electrical, Computer Engineering and Informatics of the Cyprus University of Technology.

X 

Abstract

The continuous rise of Greenhouse Gases (GHG) has set the established goals of climate neutrality into an accelerative mode. Rigorous transition into cleaner and greener energy is a must. Starting with the electrification of the transportation sector, which is eminent for this energy transition. Consequently, the spotlight is on the integration and wider commercialization of electric vehicles. In order for the transition to be successful effective and accurate research has to be further developed regarding this matter and its possible negative effects on the power grid. With this in mind, the thesis covers the topic of the impact of electric vehicles in the distribution network with penetration of renewable energies. Different models of variable parameters such as driver behavior, charger capabilities, and photovoltaic generation have been simulated via an algorithm to observe the differences in sensitivity in the behavior of the distribution network after each proposed scenario. The two scenarios include, a fixed residential load with EV penetration with and without the utilization of residential photovoltaic loads. The Monte-Carlo method is used in order to account for the variability in the simulated models.

Keywords: electric vehicles, renewable energy sources, LV distribution network, charging profiles, Monte-Carlo simulation