

	FORM FOR PROPOSING A TOPIC IN THE SECOND CYCLE OF STUDIES	Oznaka	SAO-FENS.4.24.0-ENG
		Datum usvajanja	10.03.2021
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		Stranica	1/1

Department	EEE
Master thesis title:	Electric Vehicle Charger with PV and Energy Storage Systems
Mentor/professor - contact:	Assist.Prof.Dr. Mirza Šarić

Thesis background:	<p>In order to make replacement of conventional vehicles with electric vehicles as acceptable as possible it is necessary to provide necessary conditions and simultaneously enable smooth operation within the limits of power grid's capabilities. For accomplishing this goal it is required to confront issues of the electric vehicle charging management. Task of electric vehicle charging is done by construction of the capable battery chargers. Also, big challenge is to provide the required amount of electric energy for smooth operation of the fast chargers by not overloading the power grid. Overloading can easily happen if for example a dozen electric vehicles are charging from the distribution grid in close distance at the same time. In this case, the results are disturbances in the local power distribution and strains on the equipment which can cause failures and even outages. To enable broader integration of electric vehicle charger infrastructure in this Thesis, some applicable solutions are explored.</p>
Thesis objective:	<p>The purpose of this work is to describe challenges regarding electric vehicles integration into the current infrastructure using new sustainable solutions and to provide a Matlab simulation model of one currently applied solution. The modeled system for electric vehicle charging is composed of electric vehicle battery charger segment with its controlled DC-DC converter, photovoltaic solar system with its DC-DC converter controlled by its MPPT controller, battery storage system with its own battery and controlled DC-DC controller with function of charger, inverter segment with its own control and with its connections to the power grid. All of the described segments are connected to each other by the common DC bus. In the case that the electric vehicle battery is not charged, the photovoltaic solar system is generating electric energy from solar irradiance. The energy generated is stored in the battery storage system and excess energy is transferred to the power grid via inverter. In the other case, where the electric vehicle battery is charged, the electric energy flows from all other segments to the electric vehicle</p>

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	<p>battery charger if it is needed. The electric vehicle charger segment is providing charge to the electric vehicle battery by converting input DC voltage and current from common DC bus via DC-DC converter to the other value DC voltage and current on its output to the electric vehicle battery. Using this system it is ensured that solar PV generation and energy storage are helping to decrease load from the power grid, especially sudden load peaks. Also, this design enables renewable energy generation from PV system and even transfers excess energy to the power grid. The aim of this project is to analyse problems that electric vehicle charger can cause, also to discuss possible solutions and provide a simulation model of one applicable solution.</p>
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