https://doi.org/10.7250/CONECT.2023.041

IMPACT OF ELECTRIC VEHICLE CHARGING INFRASTRUCTURE ON THE ELECTRIC LOAD PROFILE OF POWER SYSTEM: THE CASE OF LATVIA

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Abstract – The number of electric vehicles (EVs) is increasing rapidly, and charging infrastructure must keep up with that pace. With increasing charging load, a power system must adapt to the increasing power demand. The research question of this study is: what impact of EV charging on electric load profile is depending on the number of EVs and the mix of charging units (slow, medium, fast)? How much of the total power demand of EVs can be supplied from renewables, i.e., wind and solar power, considering the installed capacities of these technologies, and the match between power production and consumption. Energy system modeling on an hourly basis for different scenarios of the mix of charging units, number of EVs, and installed capacities of wind power plants and solar PVs was used as the method. EnergyPLAN software was used as the modeling tool. The results show the total power demand, peak load, and share of EV charging power demand that can be covered by renewable power technologies for Latvia's power system in the year 2050. The results are obtained for scenarios of different combinations of EV charging units.

Keywords – Electric vehicles; EnergyPLAN; mobility; renewable energy; solar PV; transport; wind power