

On the integration of electric vehicles into the energy system

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Abstract—Currently, the transport sector is responsible for about 23,5% of the total greenhouse gas emissions in the EU. Largest amount of these emissions is caused by road transport, especially passenger cars. Due to the increasing emissions and local air pollution, interest in electrification of mobility is rapidly growing. Since the full environmental benefits of electric vehicles could be reached only in combination with electricity produced from renewable energy sources (RES), the transport and the power sector are becoming more connected. Electric vehicles have been often discussed as an balancing measure between energy supply and demand. Vehicle to grid technology is in the very early stage of developments and there are many challenges to be solved. In this paper, we are discussing economic and environmental aspects of the integration of electric vehicles into the energy system. One aspect is the storage option. Since batteries used in electric vehicles have a limited number of charge/discharge cycles before they start to decline in their capacity and consequently in driving range. More frequent use of batteries will lead to the reduction of their lifetime, and caused higher car ownership costs. Moreover, replacement of battery is not just related with the higher costs of ownership, but also with higher negative impacts on the environment. The potential battery degradation will finally affect consumer's acceptance of electric vehicles and willingness to participate in vehicle to grid systems.

Keywords – passenger cars, emissions, costs, renewables, battery, embedded energy, vehicle to grid

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