Smart Charging of Electric Vehicles in Energy Systems with high Shares of Renewable Energies

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The increased use of electric vehicles puts additional pressure on the energy system. In an energy system based on high shares of renewable energy, charging of electric vehicles should occur when there is enough energy from renewable energy sources. For this analysis a set of models is used in an iterative approach. The energy optimization model REMix calculates the utilization of renewable power sources and stationary storage on an hourly basis based on meteorological input data and passes the marginals of the energy generation cost as a charging price to the charging demand model CURRENT. Based on a utility function the model CURRENT can decide if a user will charge the car now or later based on the current state of charge of the battery and the expected charging prices. The charging pattern is passed back to the energy systems model to remodel power production and energy costs. The price signal from the energy system can give incentives to charge at times with high availability of renewable energy sources. We will show some results of this iterative approach which show that with the right tariffs charging can be optimized according to the weather patterns and the demand of stationary storage and peak power can be reduced by generating price signals based on weather data.