

Optimal Planning of the Nordic Transmission System with 100% Electric Vehicle Penetration of passenger cars by 2050 - DTU Orbit (09/11/2017)

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This paper presents the optimal planning of the Nordic backbone transmission system with 100% electric vehicle penetration of passenger cars by 2050. Electric vehicles will play an important role in the future energy systems and can reduce the greenhouse gas emission from the transport sector. However, the electric vehicles will increase the electricity consumption and might induce congestions in the transmission systems. In order to deal with the electricity consumption increase from the electric vehicle integration into the power system and maximize the social welfare, the optimal investments of the Nordic transmission system are studied. Case studies were conducted using the market simulation model EMPS and two electric vehicle charging scenarios: a spot price based scenario and a dumb charging scenario. The electric vehicle charging power is assumed to be 3.68 kW with 1 phase 16A. The complete electrification of the private passenger fleet increases the yearly power demand in the Nordic region with ca 7.5%. The profitable increases in transmission capacities are highest for dumb charging, but are very low for both dumb and spot price based charging compared to a Reference case.

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