

**Electric Vehicle Integration** with the Power System

Electric Vehicles (EVs) could play a major role in the future intelligent electric power grids to support a large penetration of renewable energy in Denmark, especially from wind turbines. The EVs can operate as flexible demand and generation in the distribution grids by smart charging and discharging of their batteries. However, it is important to verify the electric vehicle penetration levels possible in the electricity grids. In the project, this is analysed on typical Danish residential grids while taking into account its technical and operating bottlenecks.



## Grid Integration of EVs

Three residential grids in Denmark are used in this project to investigate the impact of adding electric vehicle units to the Low Voltage (LV) distribution networks. Fig. 1 depicts the layout of a sub-urban residential area where the three grids are located.



Fig. 1: Layout of the residential area



Fig. 2: LV-II Grid model

Table 1 gives the relevant information of the three low voltage distribution grids. A full circuit model of these distribution grids are developed in this study. The steady state power system analysis is conducted to determine the penetration levels and impacts of electric vehicles in LV grids subjected to voltage, thermal and grid capacity limits.



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