Differentiated long term projections of the hourly electricity consumption in local areas. The case of Denmark West - DTU Orbit (01/04/2019)

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Assessing grid developments the spatial distribution of the electricity consumption is important. In Denmark the electricity grid consists of transmission – and local distribution grids with different voltages that are connected via transformer stations each covering a local area with between 10,000 and 100,000 customers. Data for the hourly electricity consumption at transformer stations shows that the profile of consumption differs considerably between local areas, and this is partly due to a different weight of categories of customers in the different areas. Categories of customers have quite distinct consumption profiles and contribute quite differently to the aggregated load profile. In forecasts, demand by categories of customers is expected to develop differently implying that both the level and the profile of consumption at each transformer stations are expected to change differently. Still, in the previous planning of the transmission grid in Denmark specific local conditions have not been considered. As a first step towards differentiated local load forecasts, the paper presents a new model for long term projections of consumption in local areas and illustrates a first use of the model related to the transmission grid planning by the Danish TSO Energinet.dk.

The model is a distribution system that distributes hourly consumption in an aggregated area to hourly consumption at each transformer station. Using econometrics, the model is estimated on national statistics for the hourly consumption by categories of customers and data for the hourly consumption at each transformer station for the years 2009–2011. Applying the model for load forecasts, a major conclusion is that different transformer stations will experience different changes both in the level - and in the hourly profile of load.

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