



PhD: Implicit demand side flexibility as an alternative to investments in the transmission grid

Matthias Hofmann

Statnett

Electricity Markets and Energy System Planning, Dept. of Electric Power Engineering, NTNU

Challenge and objectives

The correct socio-economic choice between grid investment and the use of demand flexibility is dependent on good knowledge about how end users will react to price signals in the future.

The objective is to provide estimates for the price elasticity of end users in urban areas, how this will affect the peak load, and how it can be included in long term demand forecasts.

Research tasks

The research focuses on the price elasticity of households, commercial and public buildings. It will also analyse variable grid tariffs, as proposed by NVE for the distribution grid, as an instrument to utilize demand flexibility and if it could also to a reduced peak demand in the transmission grid.

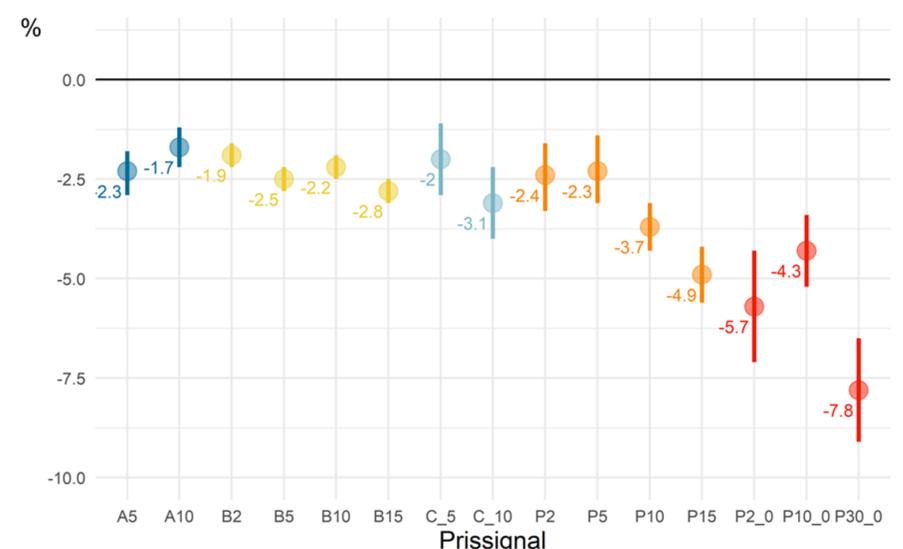
Approach

The research is based on the statistical analysis of empirical data from end users and how they react to price signals. A main source for the data is Statnett's research project iFleks, which this PhD is closely connected to. In iFleks, end users are exposed to different price signals in randomized controlled trials. In addition, surveys are performed to collect information about the characteristics of these end users.

Significant results

The results from the iFleks price experiment with households in major Norwegian cities show that 50 % of the households are price elastic. The reduction in electricity demand in peak price hours is between 2 and 11 %.

A statistical analysis of historical electricity consumption data from Oslo revealed that end users are price elastic in winter times in average. However, they are not price elastic on the coldest days, and therewith days with highest peak demand for electricity.



Change of electricity consumption in peak price hours for different price profiles and price levels (number in each price signal is the price level in NOK/kWh)

Publication

M. Hofmann and K. B. Lindberg, 'Price elasticity of electricity demand in metropolitan areas – Case of Oslo', in *2019 16th International Conference on the European Energy Market (EEM)*, Sep. 2019, pp. 1–6
 M. Hofmann and K. B. Lindberg, 'Do households react to variable power prices? – Results from a Norwegian pricing experiment', in *IEEE PES Innovative Smartgrid Technology Conference (ISGT Europe 2021)*, Oct. 2021