Controlling Electricity Consumption by Forecasting its Response to Varying Prices

In a real-time electricity pricing context where consumers are sensitive to varying prices, having the ability to anticipate their response to a price change is valuable. This paper proposes models for the dynamics of such price-response, and shows how these dynamics can be used to control electricity consumption using a one-way price signal. Estimation of the price-response is based on data measurable at grid level, removing the need to install sensors and communication devices between each individual consumer and the price-generating entity. An application for price-responsive heating systems is studied based on real data, before conducting a control by price experiment using a mixture of real and synthetic data. With the control objective of following a constant consumption reference, peak heating consumption is reduced by nearly 5%, and 11% of the mean daily heating consumption is shifted.

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