Smart Meter Data to Analyze Electricity Demand from Single- and Multi-family Consumers in a Diverse Urban Environment

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Abstract

Natural and human-made extreme events can alter residential electricity demand in urban areas and stress the electricity grid. Different types of residential electricity consumers, which in some cases account for more than 30% of customers, can present different consumption patterns. Residential electricity demands have been widely analyzed considering single-family consumers; however, multi-family consumers remain comparatively understudied. The deployment of smart electricity meters enables the identification of single- and multi-family residential electricity consumption patterns at high temporal resolution. Using smart electricity meter data for the greater Chicago area, we compare electricity demand profiles reported by smart meters from single- and multi-family consumers in a large and diverse urban environment. The study provides a comprehensive analysis of daily electricity demand profiles of these two types of residential consumers to identify peak electricity consumption times and magnitudes. The analysis also presents correlations of the electricity demand with socioeconomic data at the zip code level. Preliminary results show that median building age, percent of occupancy, and mean commute time are statistically significant predictors of multi-family electricity consumption. Results suggest that single-family consumers have comparable correlation when using the same socioeconomic data with respect to the multi-family users. Uncovering differences between single- and multi-family electricity demands can assist city planners and utility managers to develop tailored demand management strategies.

Smart meter data to analyze electricity demand from single and multi-family consumers in a diverse urban environment

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