

**Toshiya Iwamatsu, Central Research Institute of Electric Power Industry**

**Title:** Empirical experiments for smartphone app energy conservation services targeting residential sectors: An overview of initial findings

**Abstract:** This presentation will provide an overview of the initial findings of the empirical experiments regarding smartphone app-based energy conservation services targeting residential sectors. The impact of information provision via smartphone apps is expected to be higher than that of a conventional home energy management system (HEMS) because it enables utilities to provide information in a more personal and timely manner. The smartphone app in this study was developed not only as a simplified HEMS but also as a tool that aims to gently promote households' energy conservation behavior leveraging behavioral sciences theories such as "nudge," which was proposed in the field of behavioral economics and is drawing attention in energy conservation. The app was provided to approximately 2,000 households, who were recruited via the opt-in method. The current version of the app has five key functions: feedback of each household's electricity consumption, remote control of home appliances, push notification of electricity consumption, energy conservation advice regarding the use of electric appliances, and gamification designed to motivate behavior changes. The impacts of each intervention are evaluated through randomized controlled trials (RCTs). In the winter of the first year, we conducted three RCTs: push notification of electricity consumption report and alert, energy conservation advice targeting the temperature setting of air conditioners, and the feedback of electricity consumption by minutes in graph to enable subjects to review immediately their behavior regarding the use of appliances. In the summer, based on the findings obtained in the winter, we tried to find out more appropriate time of notification about subjects' electricity consumption and more effective notifications or advice from the viewpoint of behavioral sciences such as social norms and personalization. Moreover, in the winter of the second year, we conducted RCT of gamification with such elements as mission setting and ranking. In the first year after the smartphone app was provided, an average energy-efficiency improvement of 1.8 percent was observed in the households using the app. Furthermore, an additional 1.2 percent energy-efficiency improvement was observed in the households who received energy conservation advice. The push notification was sent when individual household's hourly consumption exceeded the maximum of those during previous 30 days encouraged subjects to look at the minutes graph screen. The personalized notifications contributed to improving the rate of opening them. The gamification contributed to improving the rate of checking the electricity consumption graph screen of the smartphone app.