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When Time-of-Use Periods Change: An Event Study of Load Responses by Large Electricity Consumers in Jeju, Korea

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Extended Abstract

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Abstract Summary

This paper studies how large commercial customers in Jeju, Korea responded to the September 2021 reform of time-of-use (TOU) periods. Whereas most TOU research focuses on tariff adoption or opt-in enrollment, this study examines how redefining TOU time blocks themselves changes within-day electricity use. The reform replaced fragmented seasonal schedules with year-round periods—off-peak 22:00–08:00, mid-peak 08:00–16:00, and peak 16:00–22:00—to reflect the shift in system stress from daytime to evening hours under growing renewable generation.

Using hourly panel data for 1,504 customers from September 2020 to August 2022, we estimate post-reform changes in the 168-hour weekly load profile in an event-study framework with multiple fixed effects. Load-share regressions distinguish within-day reallocation from changes in total daily consumption and reveal substantial heterogeneity across sectors.

The results show that customers increased electricity consumption during mid-peak hours (08:00–16:00), when energy charges became relatively lower, while reducing or limiting usage during more expensive periods. Demand did not shift uniformly to the cheapest nighttime hours. Instead, customers reallocated electricity usage toward periods that were both less costly and operationally feasible. Responses varied markedly by sector: real estate and wholesale/retail customers mainly shifted within daytime business hours, whereas information and communications customers showed stronger off-peak responses.

Overall, the findings show that TOU period reforms can materially reshape commercial load patterns and should be evaluated through hourly reallocation, not only total electricity use. By showing how a system-wide redefinition of TOU periods altered hourly load allocation among large commercial customers, this paper extends the literature that has focused mainly on residential settings and tariff adoption decisions.

Presenting Author Biography

Kyubin Oh is a master's student in the Graduate School of Green Growth and Sustainability at KAIST. His research focuses on electricity demand, time-of-use pricing, and empirical analysis of energy transition policies. His current work examines how large commercial customers in Jeju, Korea, reallocated electricity consumption after the 2021 redefinition of TOU time periods.