

# Industrial and Systems Engineering Seminar

## *Dynamic Electricity Pricing for Smart Homes*

Wednesday, September 9

3:15 PM – Refreshments before the Seminar

3:30 PM – Graduate Seminar

Mechanical Engineering Room 4125 A & B



### **Professor Dan Adelman**

Professor

Booth School of Business

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The electricity industry is now undergoing a dramatic transformation as computerization is being driven down to the home level through smart meters and smart home technologies. Smart meters enable consumers to more informatively control and manage their energy consumption, and they give retail energy providers the ability to charge real time prices. Currently, retailers face electricity prices which change instantaneously with wholesale markets, but consumers see fixed rates that don't change over time. The main objective of this work is to investigate the conditions under which dynamic pricing to smart homes can improve social welfare, the magnitude of these improvements, and their sensitivity to home characteristics. We develop a mathematical framework for a smart home's optimal response to dynamic price signals, based on models of price-responsive appliances, and we integrate them within a utility's social welfare pricing problem for computing system-wide equilibria. Our framework can be used not only as the basis for a smart home control system, but also as part of an analytical business case for smart grid, and as a methodology retailers can use to set dynamic prices to smart homes. In this talk, we focus on appliances that manage thermal energy stores, in particular air conditioners, and present extensive numerical results demonstrating the potential impact of dynamic pricing on the ComEd utility region during a recent peak summer month.

**BIO:** Daniel Adelman is Charles I. Clough Jr. Professor of Operations Management. Adelman joined the Chicago Booth faculty in 1997 and leads the Healthcare Analytics Laboratory, in which teams of students work on real-world projects to improve healthcare delivery through analysis of large datasets in areas such as population health and hospital readmissions. He also serves on the faculty advisory board of the Harry L. Davis Center for Leadership. Adelman is a leading expert in business analytics, helping firms and institutions use data and decision analysis to build strategic and tactical management capabilities. He conducts research in the foundations of the operations research field, as well as the link between operational performance metrics and financial performance. He is an Area Editor for *Operations Research*. Recently, Adelman's research has included work on the electricity smart grid, gasoline supply chains, and software-release planning.