PRIC E-ENABLED
DEMAND RESPONSE

PRESENTED TO
THAI ENERGY REGULATORY COMMISSION, OERC, AND
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In the U.S., Flat Rate Pricing Imposes a Cost of $10 Billion Each Year

33% of the nation’s 114 million households are on smart meters

But only 2% are on time-based rates
  - And only 1% of these are on dynamic pricing rates

That prevents us from harnessing the benefits of universal dynamic pricing
  - $7B/year in lower energy costs
  - $3B/year in reduced cross-subsidies
Progress Toward Dynamic Pricing Is Stymied by Seven Widely-Held Myths

Myth #1
Customers do not respond to dynamic pricing

Myth #2
Customer response does not vary with the magnitude of the price signal

Myth #3
Enabling technologies do not boost demand response

Myth #4
Customer response does not persist over time

Myth #5
Dynamic pricing will hurt low-income customers

Myth #6
Customers have never encountered dynamic pricing

Myth #7
Customers do not want dynamic pricing
Myth #1

Customers Do Not Respond to Dynamic Pricing

Because results vary widely, some conclude that we have learned nothing about customer response.

60% of the Tests Have Produced Peak Reductions of 10% or Greater

Grouping Results by Tariff Design Helps Explain Some of the Variation in Impacts

Myth #2
Customer Response Does Not Vary With the Magnitude of the Price Signal

Not only do customers respond, but the magnitude of their response varies with the price incentive. The higher the incentive, the greater their demand response.

To study this relationship between price incentive and peak energy reduction, we have estimated the Arc of Price Responsiveness. The Arc is based on 210 time-varying pricing treatments from around the world.
We Plot Demand Response Against the Peak to Off-Peak Price Ratio

**TOU Impacts (price only)**

![Graph showing TOU Impacts](image1)

**Dynamic Pricing Impacts (price only)**

![Graph showing Dynamic Pricing Impacts](image2)

Note: 65 points.

Note: 58 points.
Myth #3
Enabling Technologies Do Not Boost Demand Response

The data shows that enabling technologies boost price responsiveness

TOU Impacts

Dynamic Pricing Impacts

Note: 92 points.

Note: 118 points.
Myth #4

Customer Response Does Not Persist Over Time

We observe that customer response has persisted in long-lived pilots

- California, Washington, DC, Oklahoma for 2 years
- Maryland for 4 years

TOU programs have been in place for decades

- The French tempo tariff goes back to 1965
- Arizona’s TOU rates go back to 1980
Myth #5

Dynamic Pricing Will Hurt Low-Income Customers

Nearly 80% of low income customers are paying more under flat rates
Low Income Customers Are Price Responsive, So They Will Save More with Dynamic Pricing

Note: For the PepcoDC pilot, the average residential response excludes low income customers that qualify for the RAD program.
Myth #6

Customers Have Never Encountered Dynamic Pricing

Consumers experience dynamic pricing in everyday purchases

In the 1990s, Robert Cross highlighted the trend toward setting prices dynamically to maximize profit*

Today, dynamic prices are used by a variety of capital-intensive industries such as airlines, hotels, rental car firms, and railroads

Since 2009, tickets for San Francisco Giants baseball games have varied according to the value of the game

Myth #7

Customers Do Not Want Dynamic Pricing

In Connecticut Light and Power’s Plan-it Wise pilot, post-pilot surveys and focus groups were carried out to examine how customers felt about their participation in the pilot. Residential customers who participated in the survey had an overall satisfaction rating of 5.1 out of a possible 6, with 92 percent saying they would participate again.

Customers showed similarly high levels of satisfaction with pilots at Consumers Energy, Baltimore Gas and Electric, Hydro One and California utilities.
Customers Are Not Inconvenienced by Time-Varying Pricing

Related to the myth that customers do not want dynamic pricing is the idea that customers will have to resort to extreme measures to save money on dynamic rates, such as getting up at 2 AM to do the laundry.

In a recent survey of customers who participated in the Hydro One TOU pilot, only 4 percent found the changes in their daily activities to be inconvenient.

Most customers value the opportunity to save money by making small adjustments in their energy consumption schedules.
Residential Dynamic Pricing Is Transitioning to a New Phase: Full-scale Deployment

Several utilities are achieving significant participation through aggressive opt-in programs

- Time-of-use (TOU) rates at APS and SRP in Arizona
- Variable peak pricing (VPP) at OG&E in Oklahoma

Others are rolling out default programs for the mass market

- Pepco in Delaware and Maryland
- BGE in Maryland
- Sacramento Municipal Utility District (SMUD) in California
- The Province of Ontario, Canada
Ontario’s Residential TOU Program

Besides Italy, Ontario is the only region in the world to deploy Time-of-Use (TOU) rates for generation charges to all customers who stay with regulated supply.

TOU rates were deployed in Ontario to incentivize customers to curtail electricity usage during the peak period and possibly to reduce overall electricity usage.

The Brattle Group was retained by Ontario Power Authority to undertake the impact evolution of the TOU program:

- Three year assignment; the 1st Year Impact Evaluation results are presented here, the 2nd year study is underway.
Overview of Residential Class Results

There is significant evidence of load shifting across all LDCs

- Reduction in usage in the peak and mid-peak periods (generally highest in the peak periods), increase in usage in the off-peak periods

Load shifting is higher in the summer rate period than the winter

- Summer peak period impacts range from -2.6% to -5.7%
- Winter peak period impacts range from -1.6% to -3.2%

Peak period substitution elasticities range from -0.12 to -0.27

Evidence on energy conservation was inconclusive
Should TOU Rates Be Rolled Out as the Default Tariff?

The average TOU enrollment level is 28% under default flat rates. When TOUs are the default, the average enrollment rate rises to 85%
Dynamic Pricing Enrollment Levels Are Similar to Those of the TOU Offerings

The average dynamic pricing enrollment is 20% under default flat rates and 84% when dynamic prices are the default.
Transitioning to Dynamic Pricing

1. Pilot Dynamic Pricing
2. AMI Business Case
3. Deploy AMI

- Opt-in Rate
  - Leave Flat Rate Unchanged
  - Provide Shadow Bills
  - Change Flat Rate
  - Don’t Provide Shadow Bills

- Opt-out Rate
  - Offer Two-Part Rate
    - Set First Part Equal to Historic Load Shape
    - Customer Buys First Part as a Forward Market Transaction
  - Offer Single-Part Rate
    - Offer Bill Protection
    - Don’t Offer Bill Protection

Conduct Measurement and Verification

Understand Customer Preferences → Segment the Market → Create Segment-Specific Messages → Get the Word Out → Educate and Answer Questions
Dr. Ahmad Faruqui is a Principal with The Brattle Group. His consulting practice is focused on the full spectrum of customer strategy issues involving innovative pricing, energy efficiency, demand response, demand forecasting and cost-benefit analysis of smart grid investments. He has worked for more than 50 utilities, regulatory bodies, governments and financial institutions around the globe. He has also appeared before and testified before several state and provincial commissions and legislative bodies. His work has been cited in The Economist, The New York Times, the Washington Post and USA Today. He has appeared on Fox Business News and National Public Radio. The author, co-author or editor of four books and more than 150 articles on energy economics, he has held teaching positions at the University of Karachi, the University of California at Davis and San Jose State University. He holds B.A. and M.A. degrees in economics from The University of Karachi, Pakistan, and M.A. in agricultural economics and Ph. D. in economics from the University of California at Davis.
Additional Resources


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