

PRICE-ENABLED DEMAND RESPONSE

PRESENTED TO

THAI ENERGY REGULATORY COMMISSION, OERC, AND
UTILITIES DELEGATION

Boston, Massachusetts

PRESENTED BY

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THE **Brattle** GROUP

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

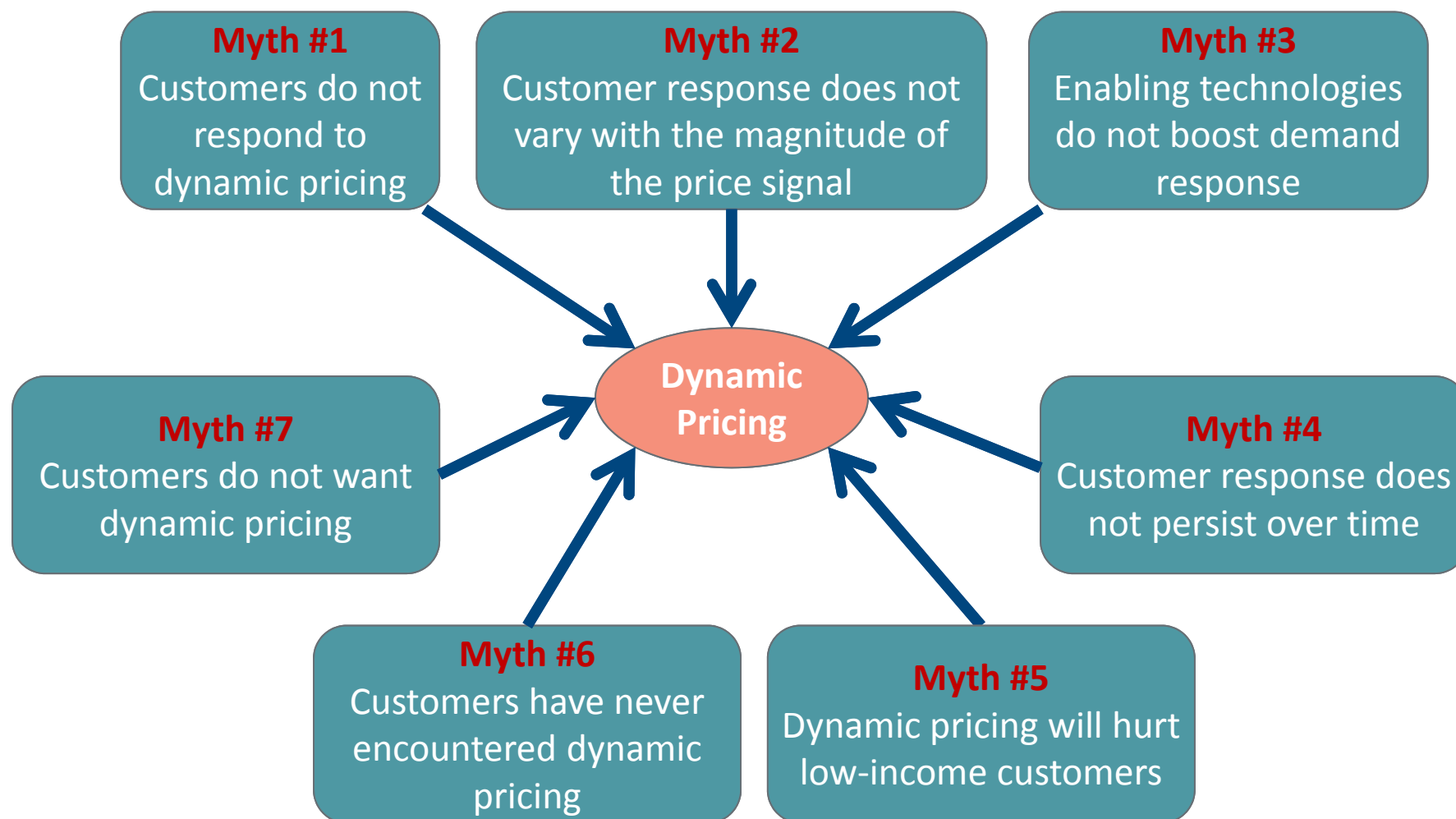
But only 2% are on time-based rates

- 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

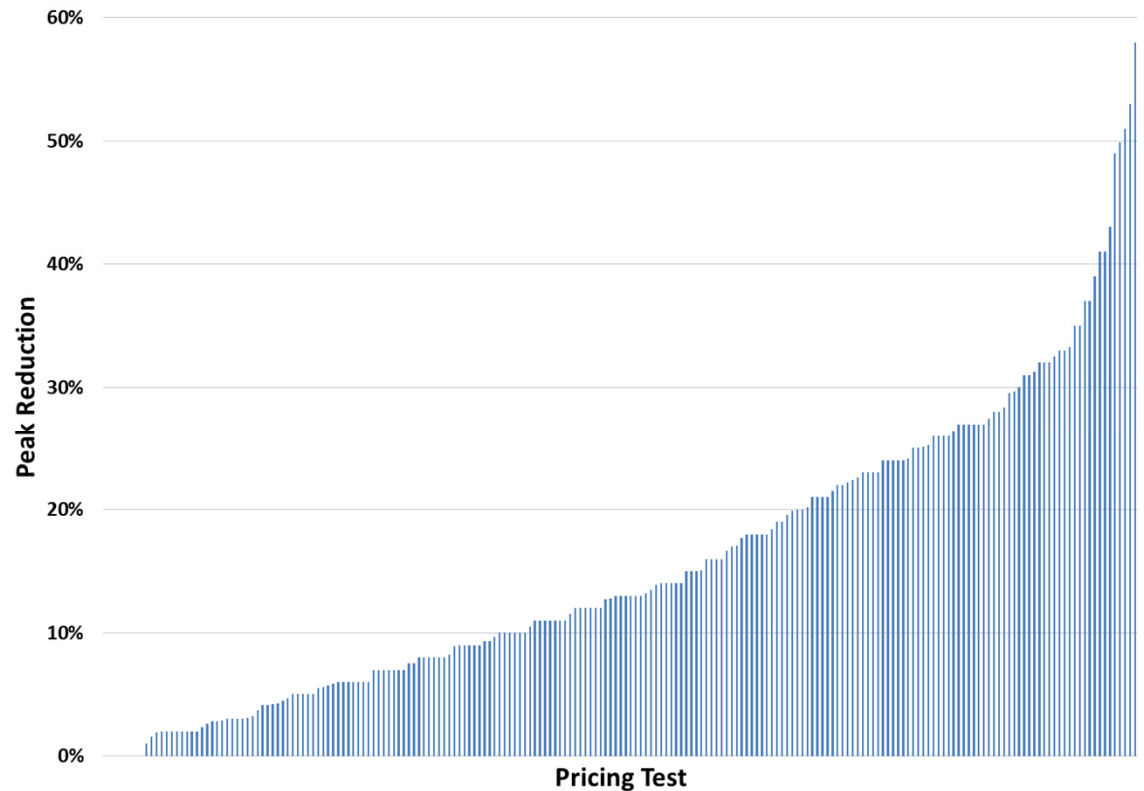
Progress Toward Dynamic Pricing Is Stymied by Seven Widely-Held Myths



Myth #1

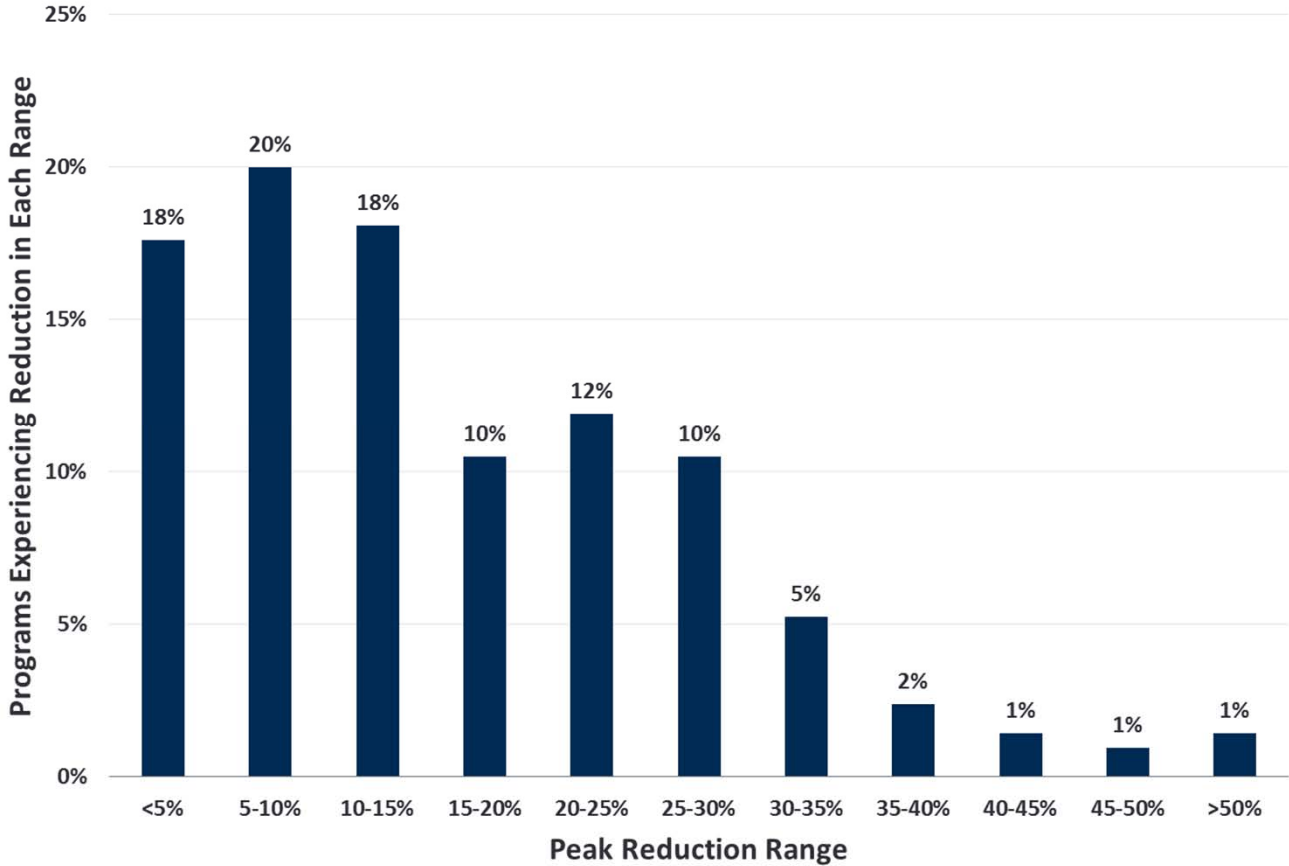
Customers Do Not Respond to Dynamic Pricing

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



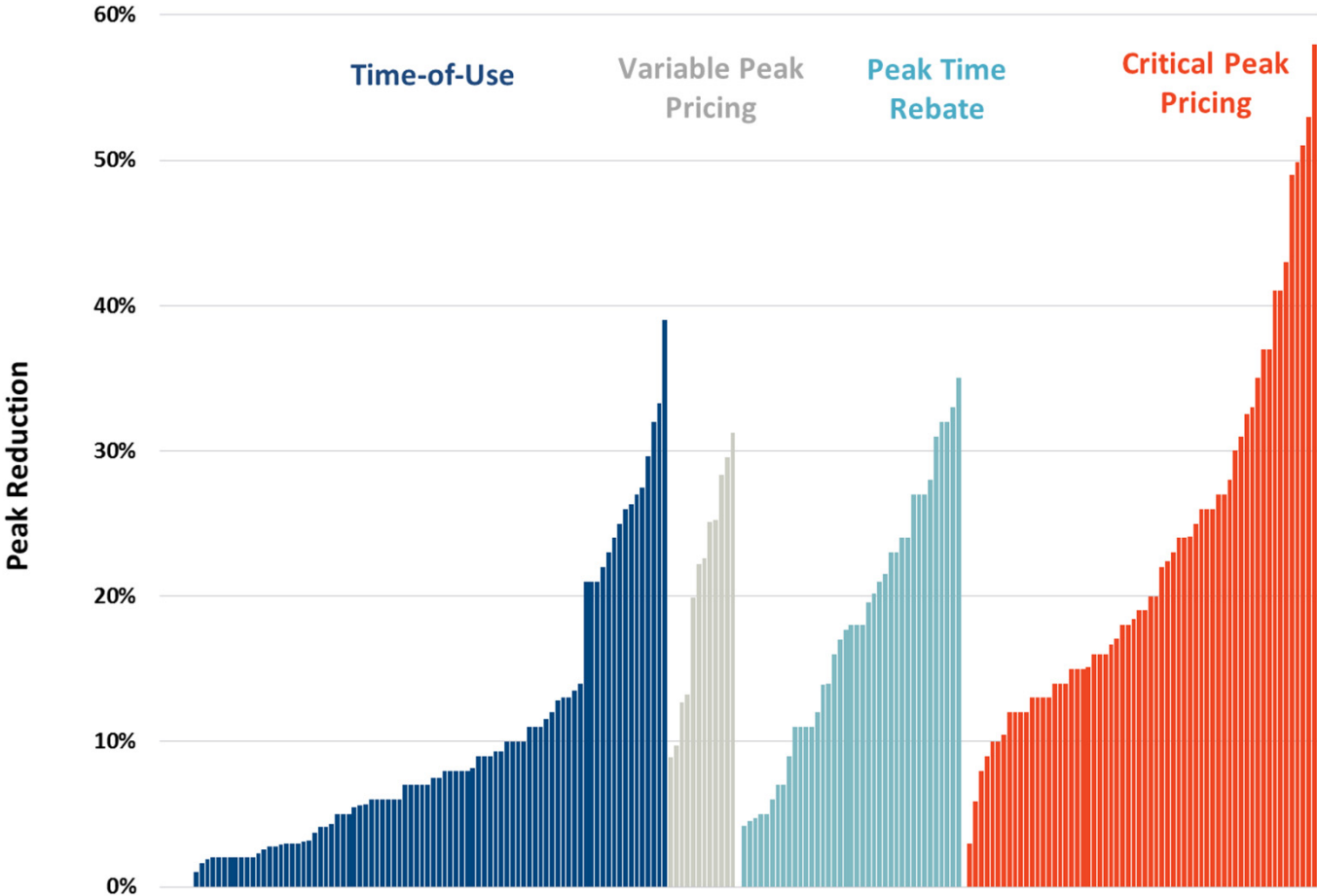
Source: Faruqi, Ahmad. "Arcturus." The Brattle Group.

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



Source: Faruqi, Ahmad. "Arcturus." The Brattle Group.

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



Source: Faruqi, Ahmad. "Arcturus." The Brattle Group.

Myth #2

Customer Response Does Not Vary With the Magnitude of the Price Signal

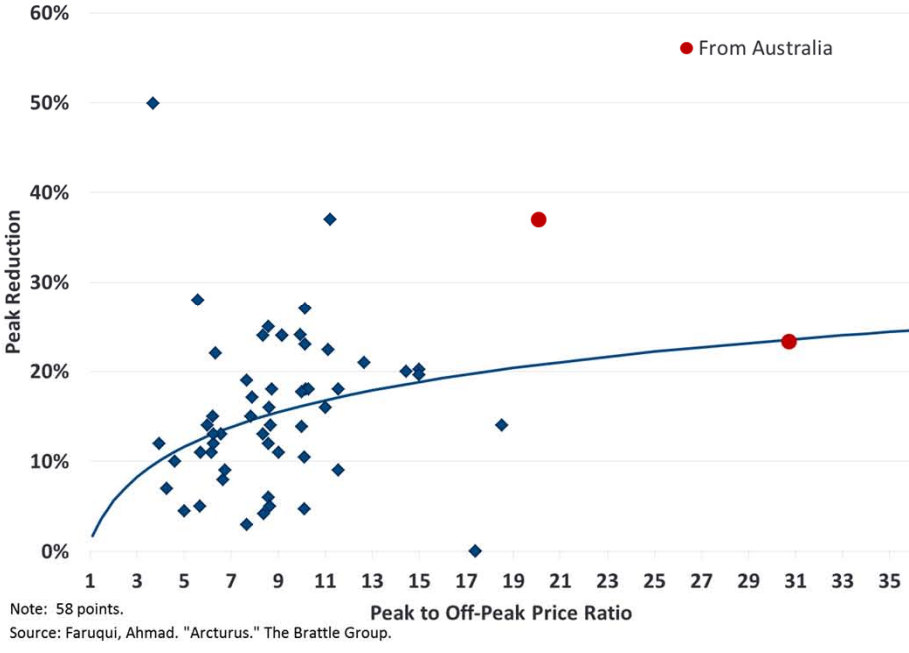
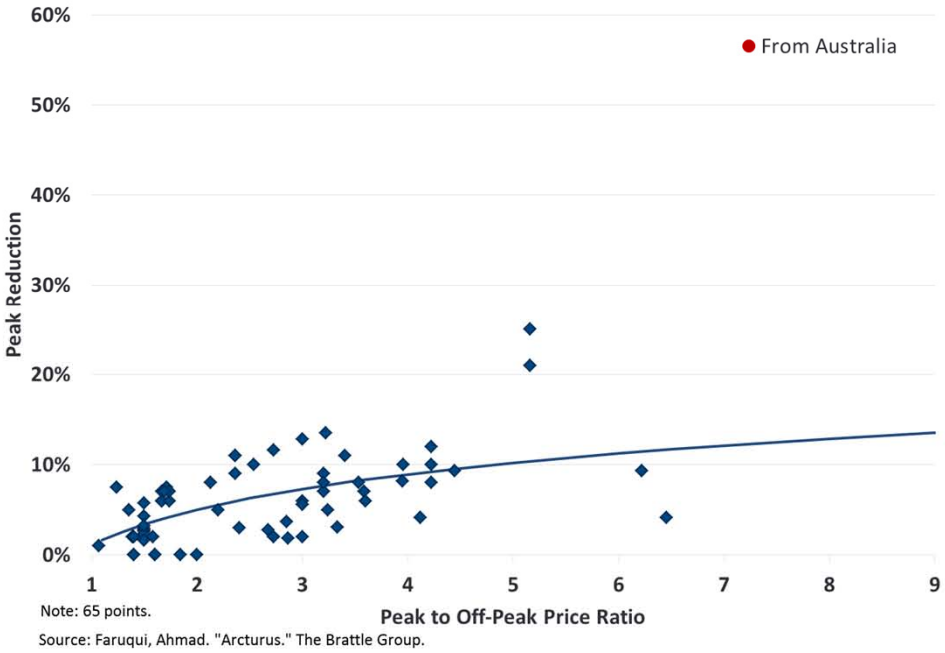
Not only do customers respond, but the magnitude of their response varies with the price incentive. The higher the incentive, the greater their demand response.

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)

Dynamic Pricing Impacts (price only)

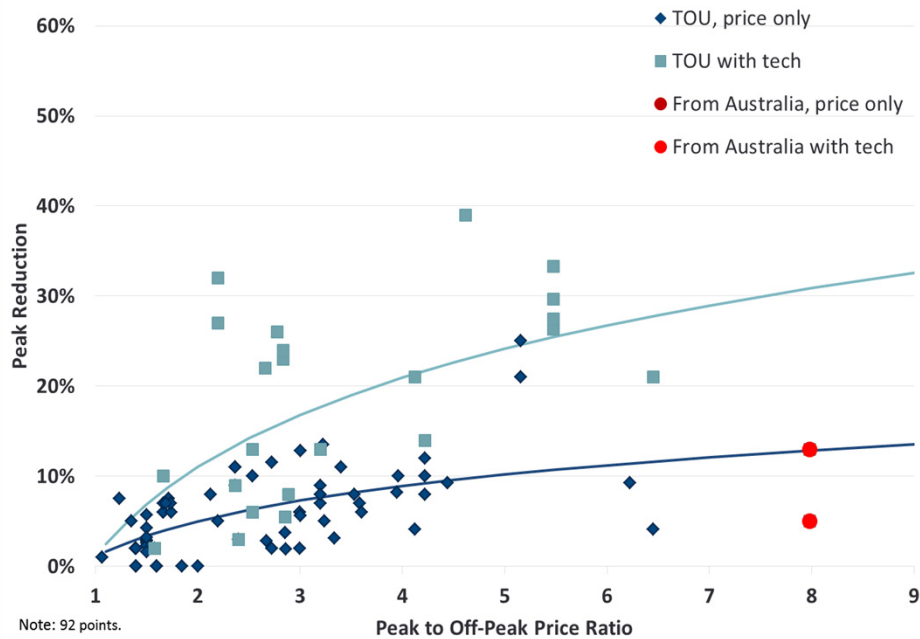


Myth #3

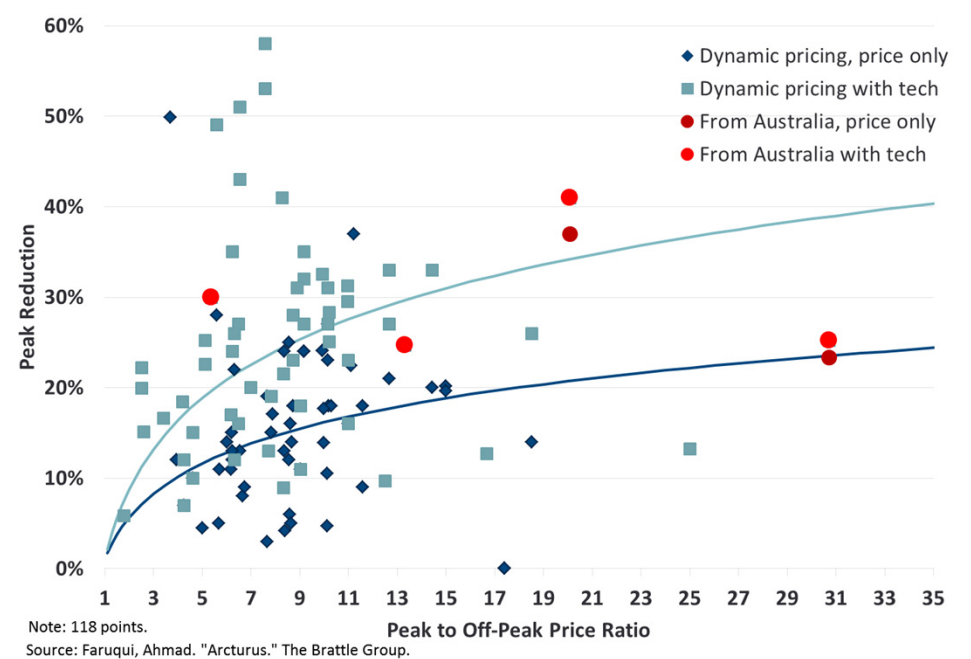
Enabling Technologies Do Not Boost Demand Response

The data shows that enabling technologies boost price responsiveness

TOU Impacts



Dynamic Pricing Impacts



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

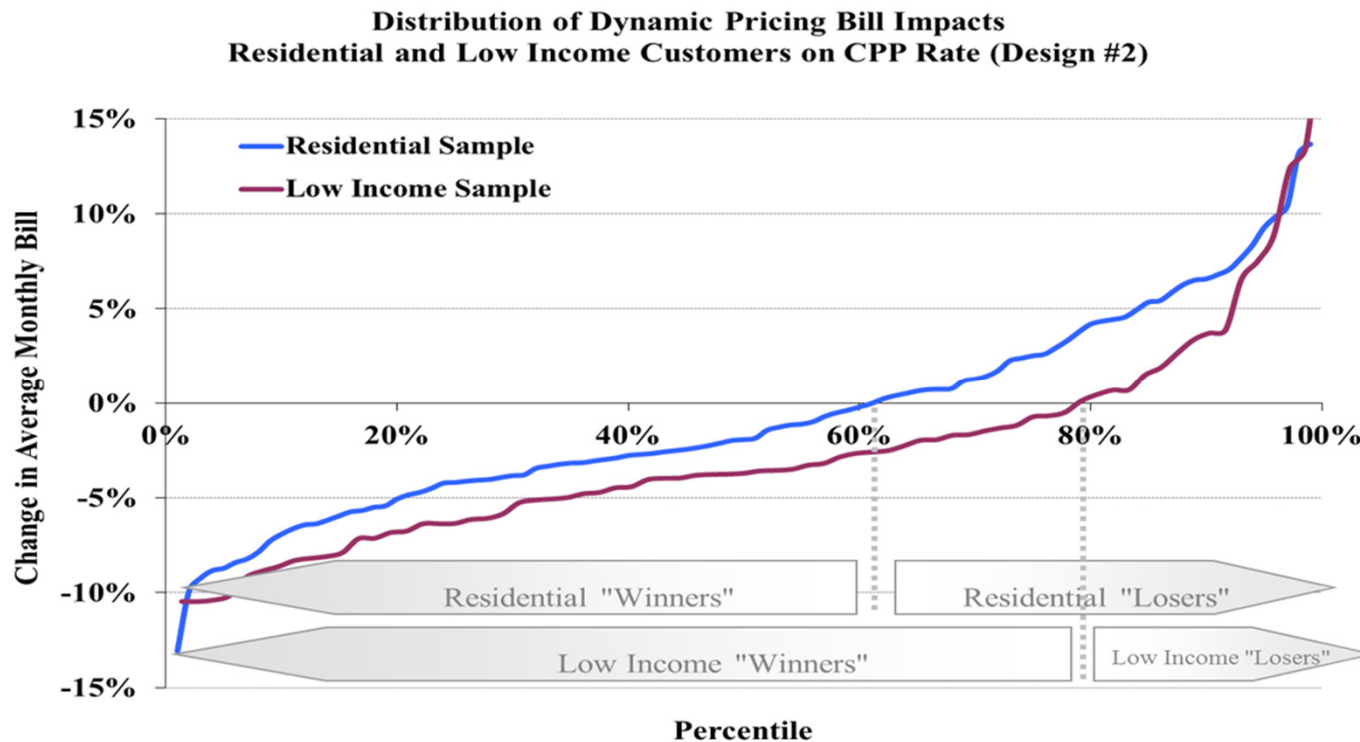
TOU programs have been in place for decades

- The French tempo tariff goes back to 1965
- Arizona's TOU rates go back to 1980

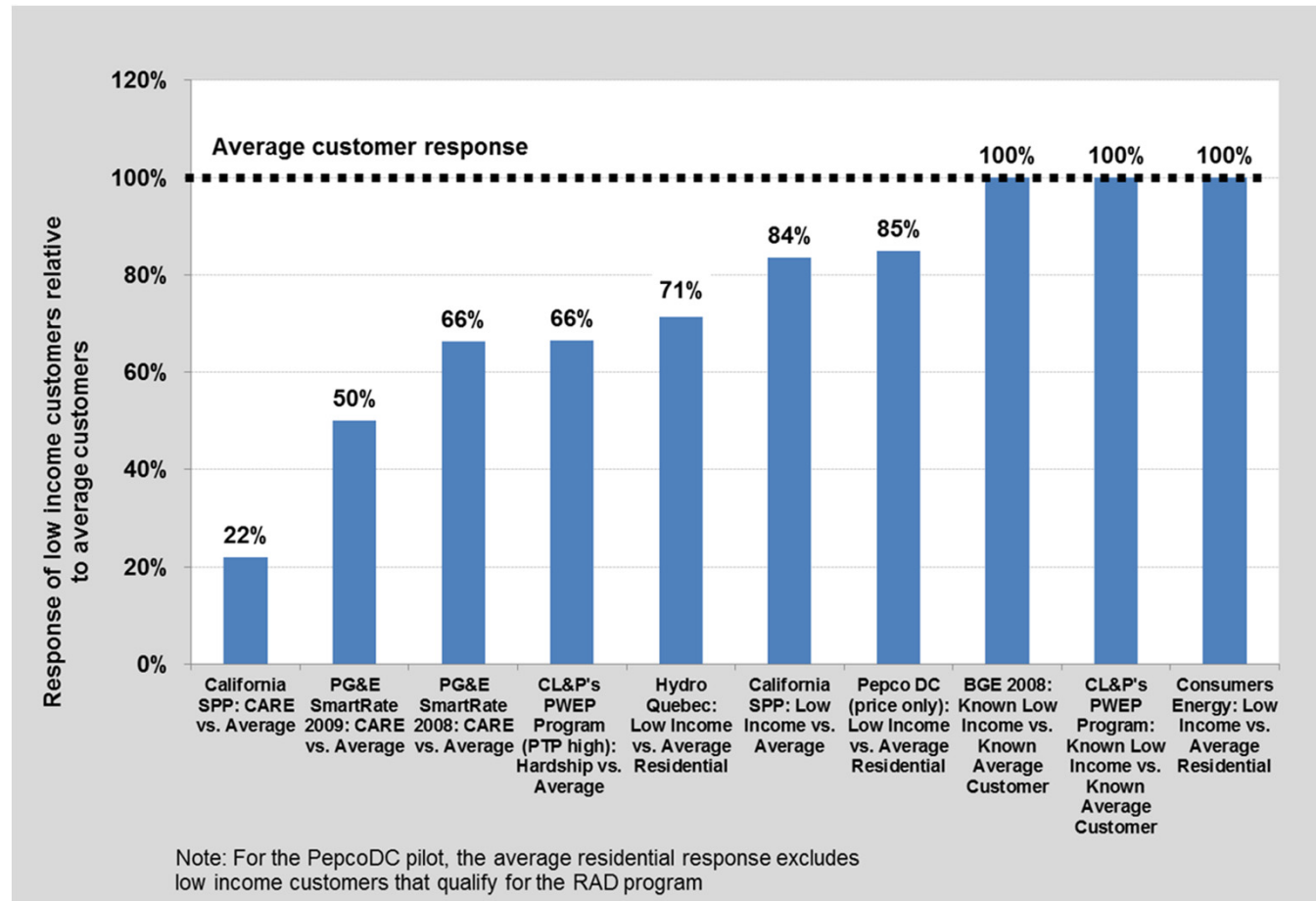
Myth #5

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



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

*Source: Cross, Robert. *Revenue Management: Hard Core Tactics for Market Domination*, Broadway Books, 1997.

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

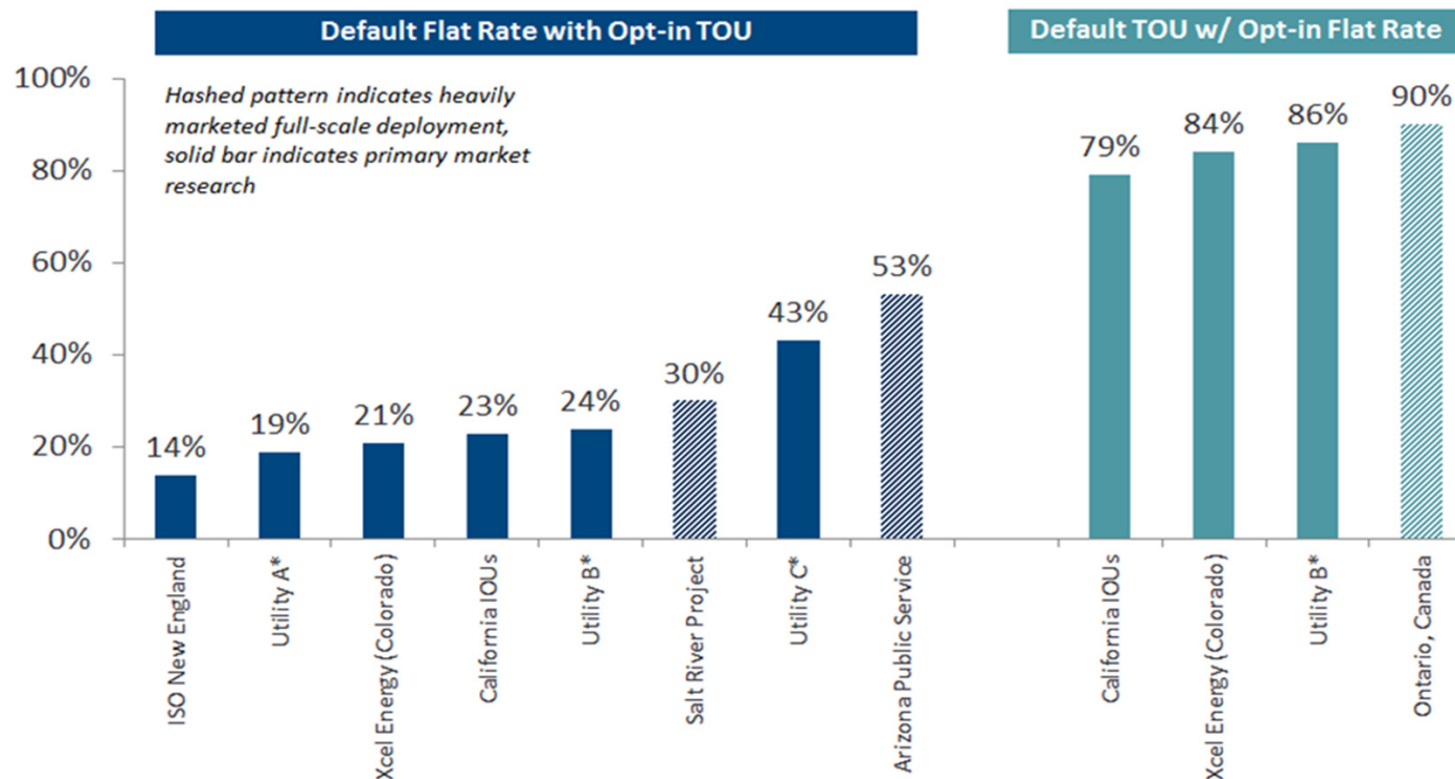
- Summer peak period impacts range from -2.6% to -5.7%
- Winter peak period impacts range from -1.6% to -3.2%

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?

Residential TOU Enrollment Rates

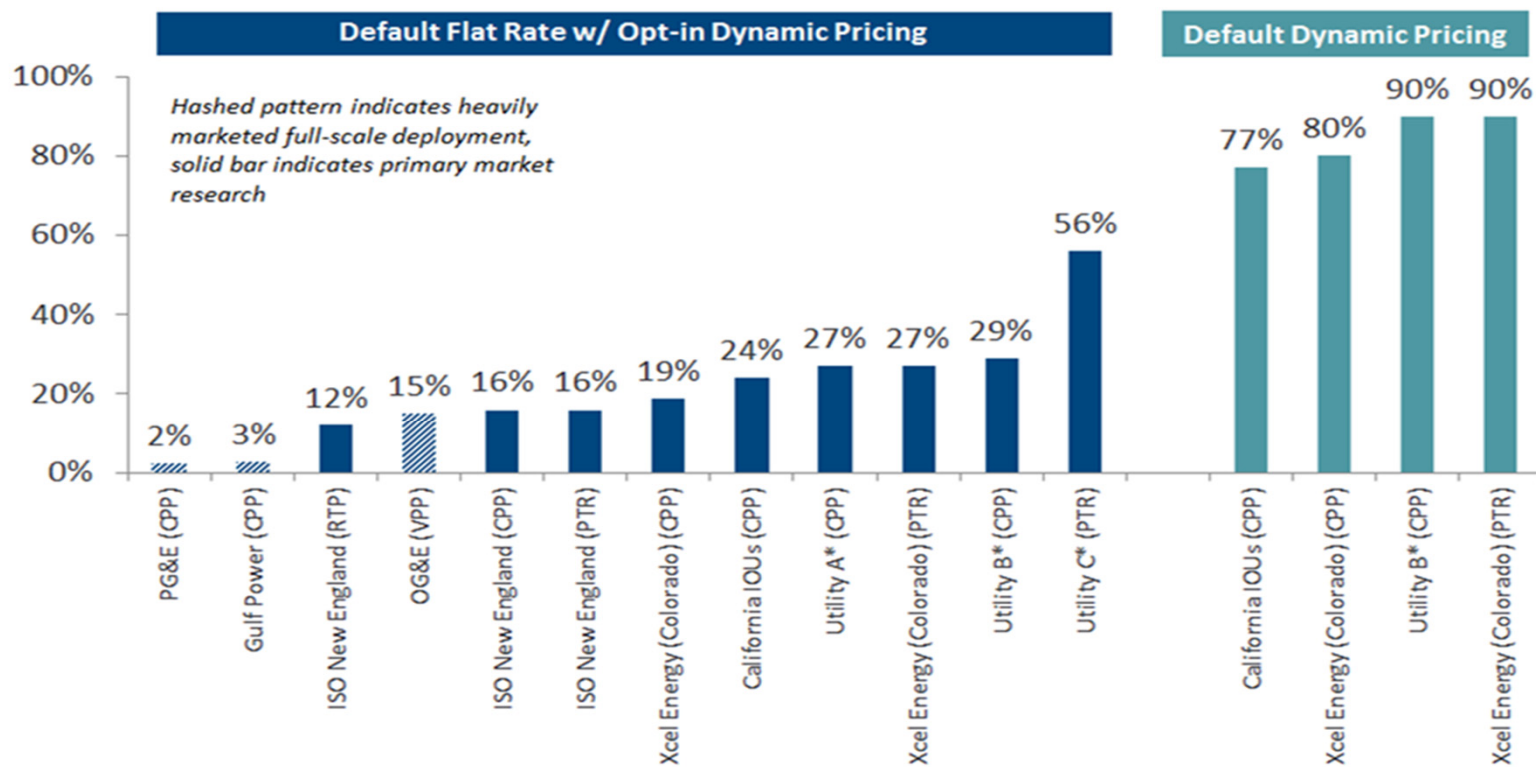


* Utility identity is concealed because study results have not yet been made public

The average TOU enrollment level is 28% under default flat rates. When TOUs are the default, the average enrollment rate rises to 85%

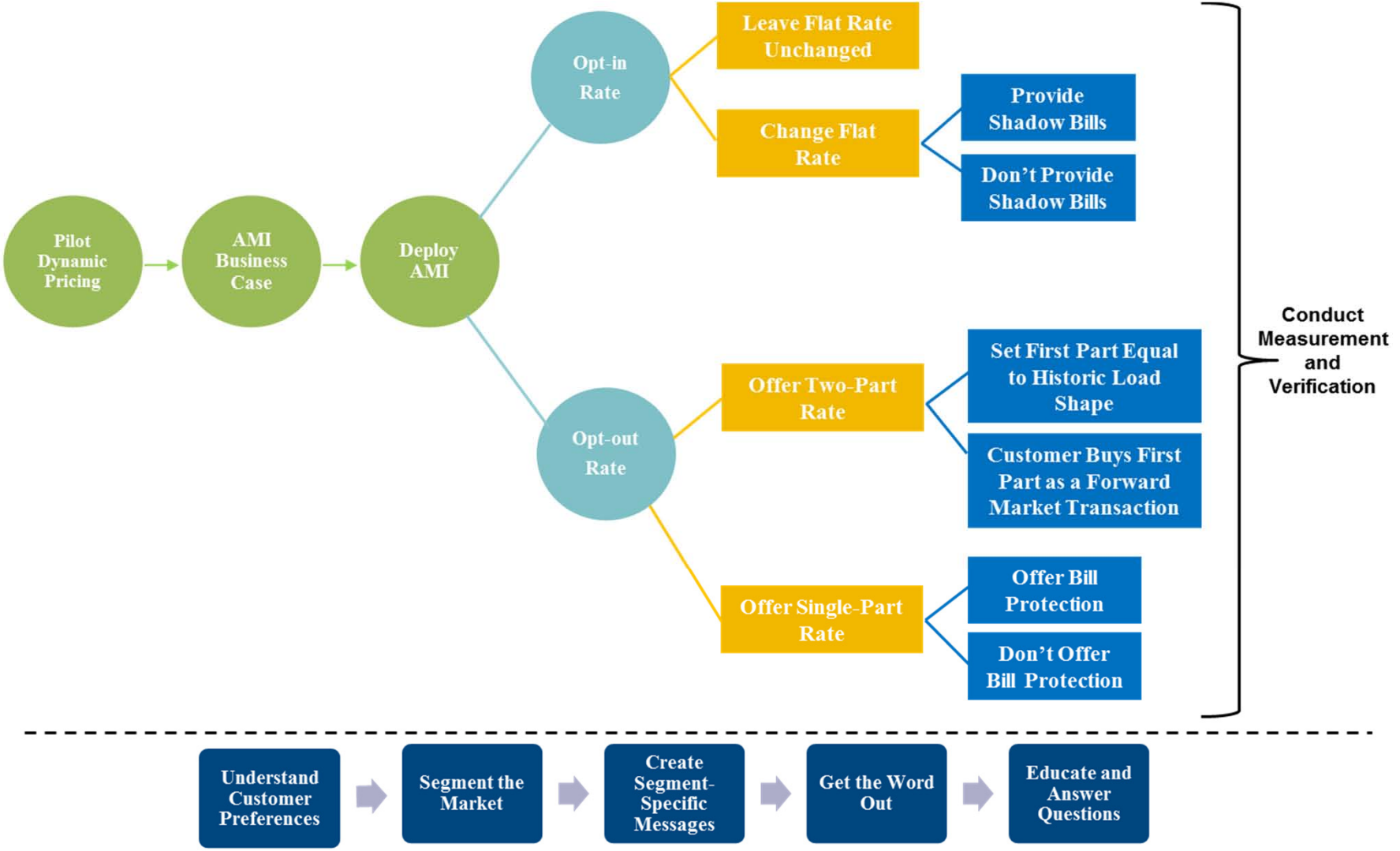
Dynamic Pricing Enrollment Levels Are Similar to Those of the TOU Offerings

Residential Dynamic Pricing Enrollment Rates



The average dynamic pricing enrollment is 20% under default flat rates and 84% when dynamic prices are the default

Transitioning to Dynamic Pricing



Presenter Information



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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.

The views expressed in this presentation are strictly those of the presenter and do not necessarily state or reflect the views of The Brattle Group, Inc.

Additional Resources

Faruqui, Ahmad and Sanem Sergici, “Arcturus: International Evidence on Dynamic Pricing,” *The Electricity Journal*, August-September, 2013.

Faruqui, Ahmad, Ryan Hledik and Jennifer Palmer. *Time-Varying and Dynamic Rate Design*. Global Power Best Practice Series, Volume 4. Regulatory Assistance Project, 2012.

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Faruqui, Ahmad, Ryan Hledik, and Neil Lessem. “The ABC’s of Default Time-Varying Rates.” *Public Utilities Fortnightly*, Forthcoming, August, 2014.

Faruqui, Ahmad, and Jennifer Palmer. “Dynamic Pricing and its Discontents.” *Regulation*: Fall 2011, pp. 16-22.

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