Pricing & Market Analysis: Flex Your Rate Muscles, Shape Your Load

RATE DESIGN TO ENABLE FLEXIBLE LOADS

PRESENTED TO

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PRESENTED BY

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and prepared with

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THE Brattle GROUP

Agenda

1. Introduction

2. **Principles** of Efficient Rate Design

3. **Empirical Evidence** of Customer Responsiveness

4. **Actual Innovations** in Customer Pricing

5. **Practical Considerations** for Rate Design

6. Summary of Key Takeaways

Introduction

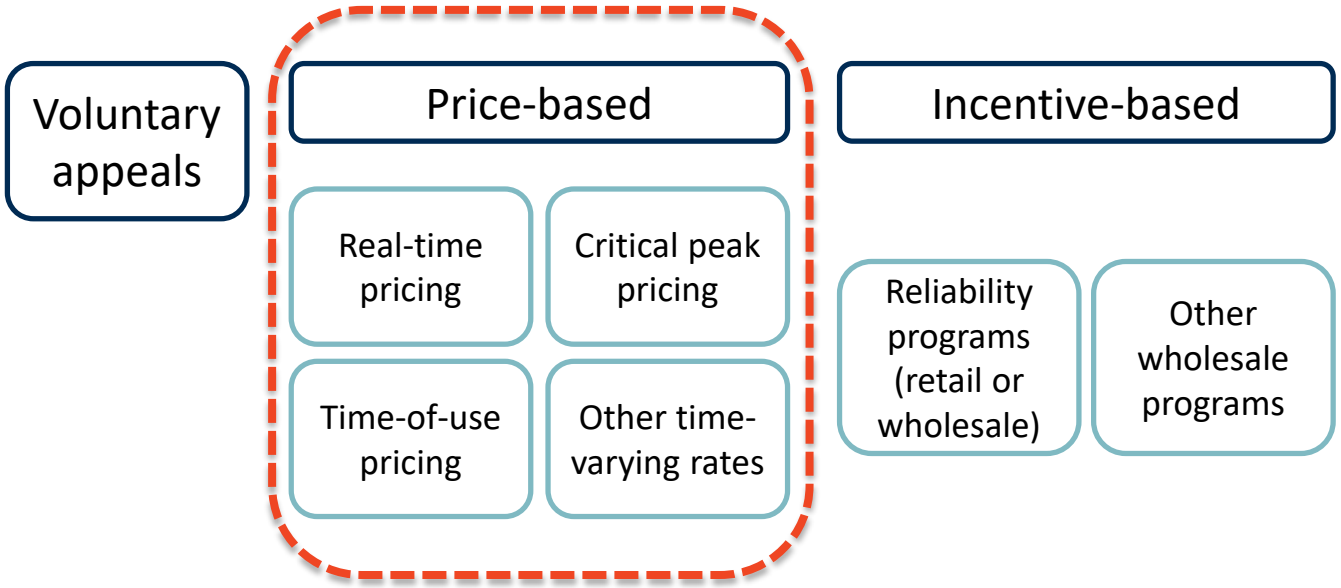
What does it mean to move towards the efficient frontier of customer rates?

Efficient rates allow customers to engage in improving the cost-effectiveness of reliable power supply

Efficient rates capture efficient customer behavior through transparency, technology, and fairness

Methods for Enabling Load Flexibility

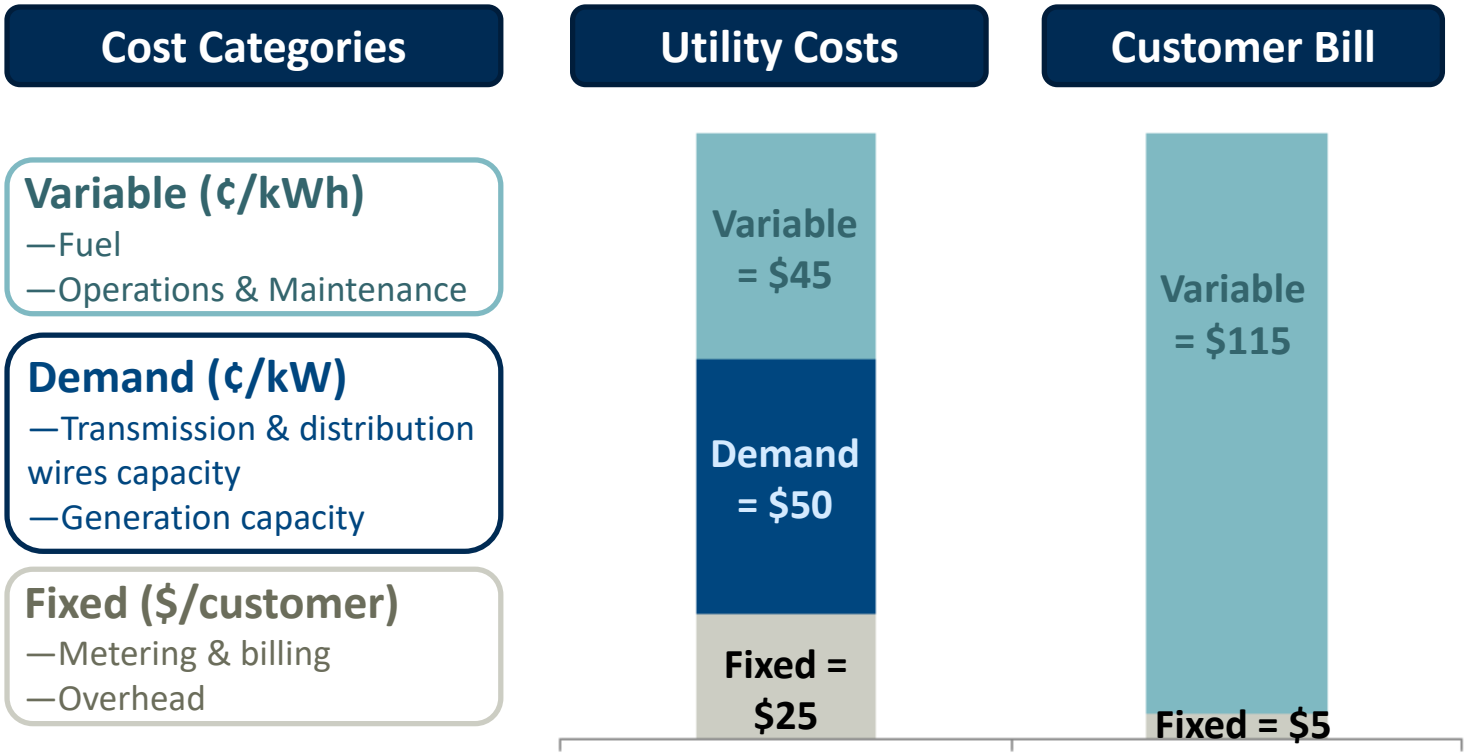
Time-varying retail rates (price-based) are one of many methods for enabling load flexibility



Principles of Efficient Rate Design

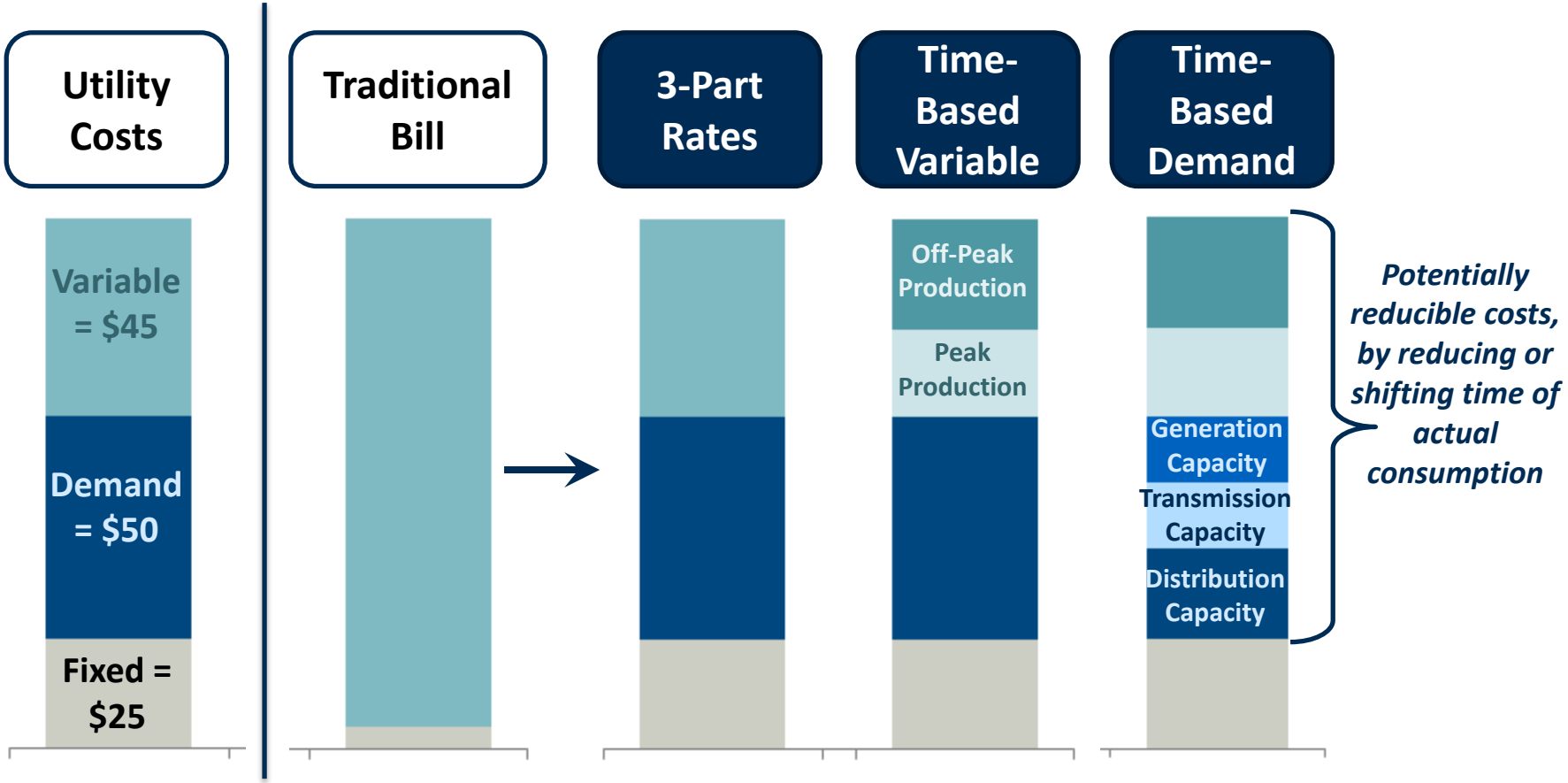
The Importance of Cost-Reflective Rates

Customers of a regulated utility need to see the cost implications of their behavior, but, for many utilities, residential rates and costs are grossly misaligned



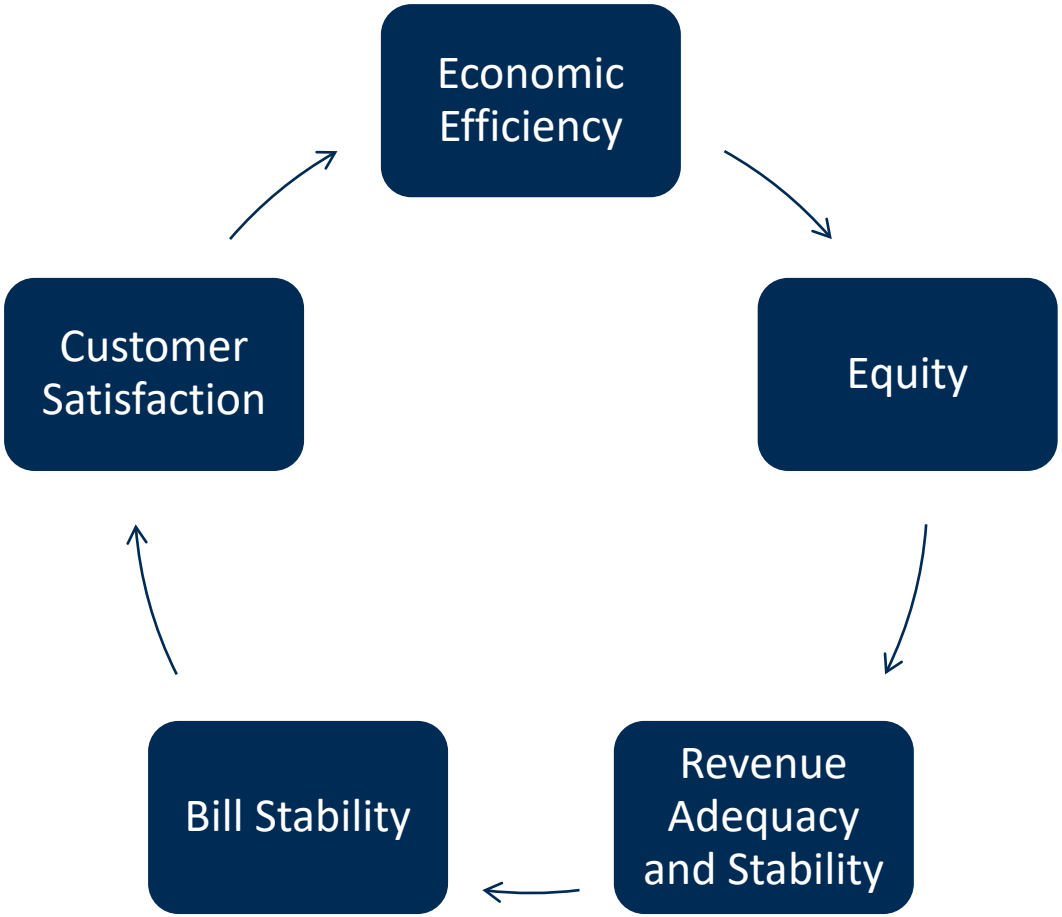
Example of Increasingly Cost-Based Rates

Customer pricing should reflect (a) ***what*** cost categories they have control over, and (b) ***how*** their usage patterns impact those costs



Professor Bonbright of Columbia U.

Bonbright's 10 criteria can be distilled into 5 core principles



Cost-Based Rates vs. Public Policy

Customer rates should not be used as a direct lever to accomplish public policy goals

- Cost-reflective prices incentivize efficient use of resources
- Policy goals can be achieved with direct subsidies, without distorting the price
- Subsidies should be based on customer attributes, not usage
- If public policy goals can be internalized in markets, they can help to incentivize efficient behavior through prices

Empirical Evidence of Customer Responsiveness

Customer Preferences

Behavioral economics informs us that customers have diverse preferences

Some want the lowest price

- They are willing to be flexible in the manner in which they use electricity

Some want to lock in a guaranteed bill

- They are willing to pay a premium for peace of mind

Many others are in between these two bookends

- Some might want a guaranteed bill, but may be willing to lower it if rebates are offered for reducing demand during peak periods
- Others may wish to subscribe to a given level of demand

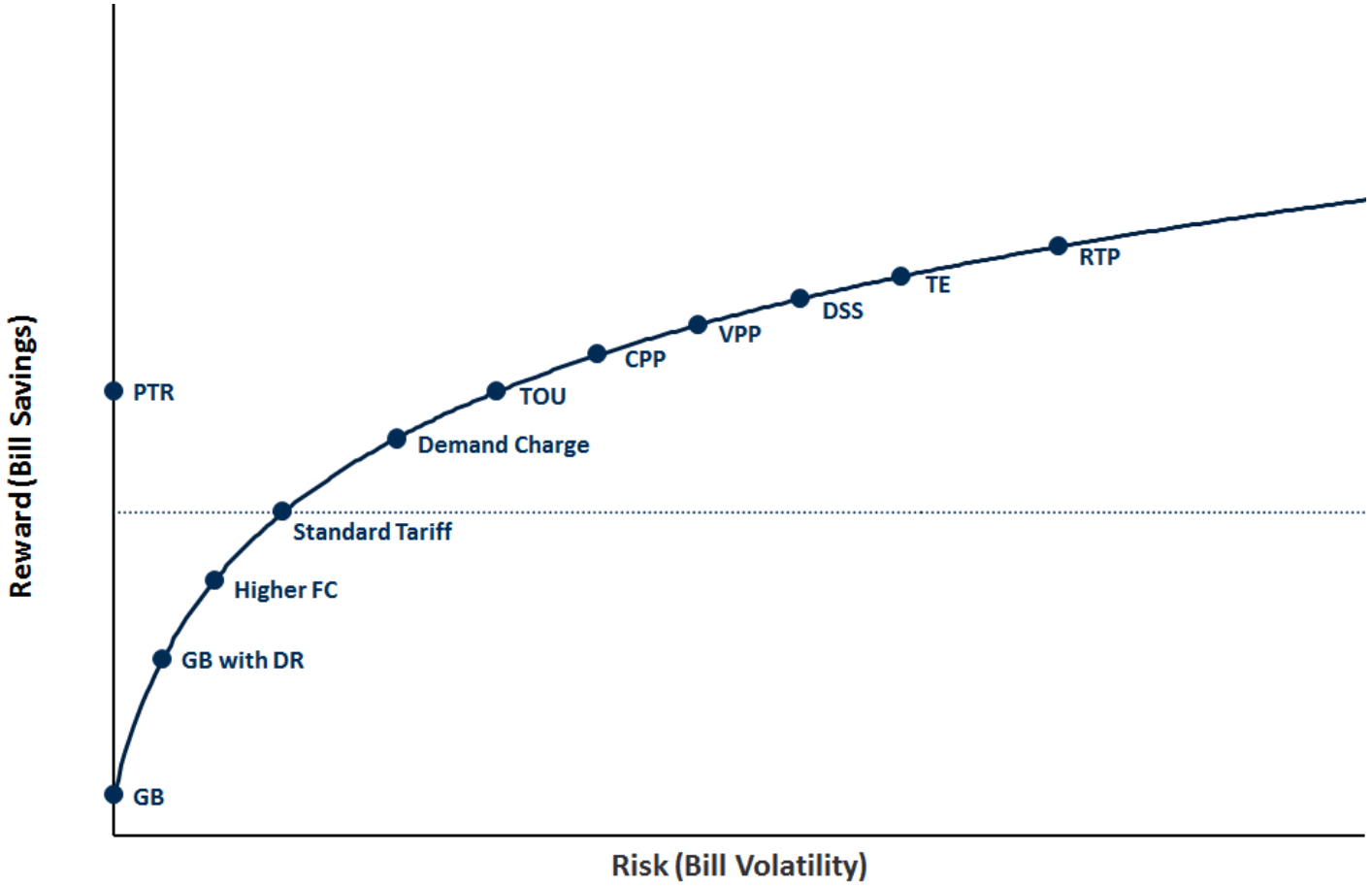
All customers want choice, but they only want what they want

All the Panoply of Rate Options

- Guaranteed bill (GB)
- GB with discounts for demand response (DR)
- Higher fixed charge (FC)
- Standard tariff
- Demand charge
- Time-of-Use (TOU)
- Critical peak pricing (CPP)
- Peak time rebates (PTR)
- Variable peak pricing (VPP)
- Demand subscription service (DSS)
- Transactive energy (TE)
- Real-time pricing (RTP)

Risk Versus Reward

These rates present choices to customers along a risk-reward frontier



Complementary Tools

Rate design can be complemented with tools that improve customer engagement and customer satisfaction

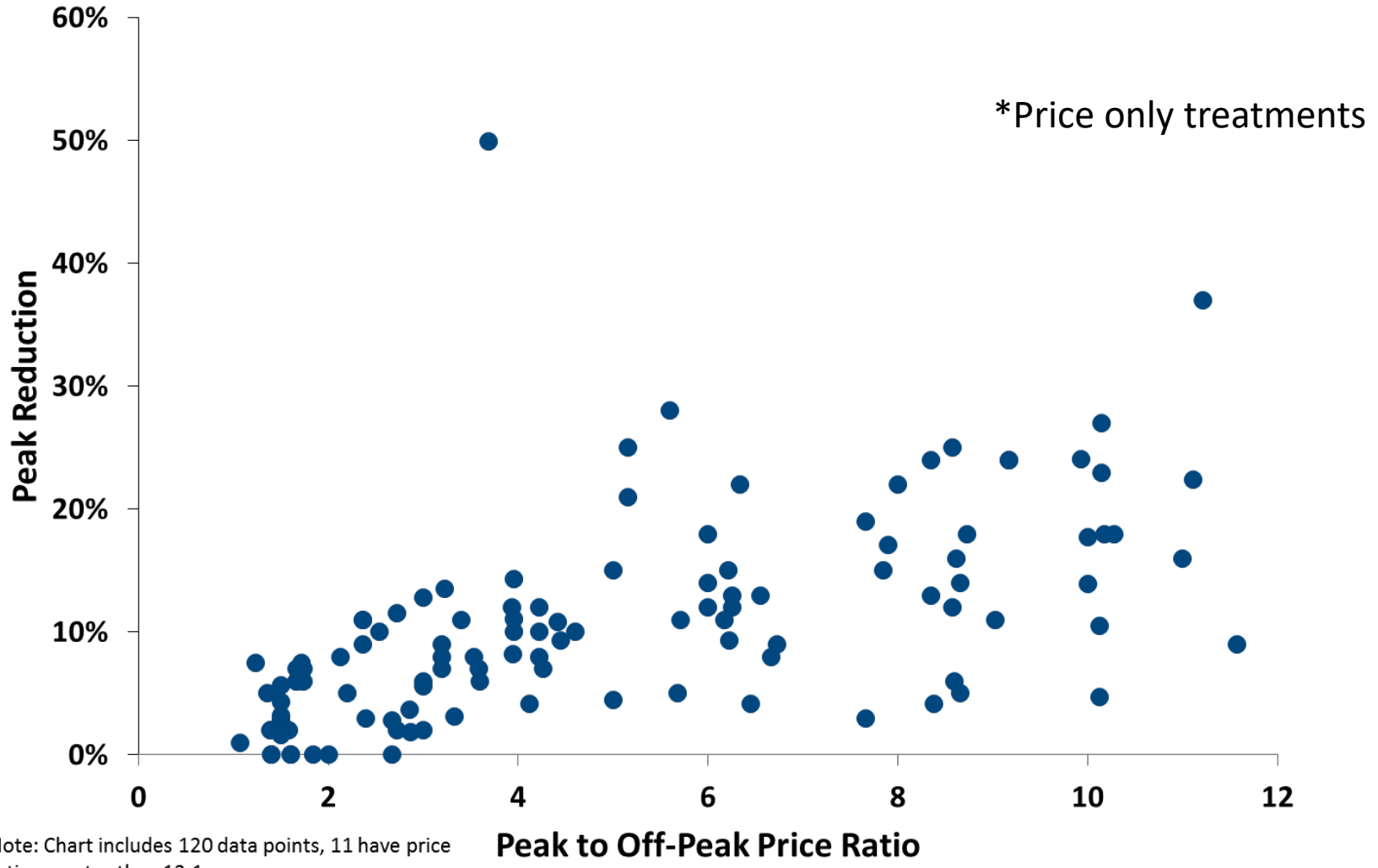
Transparency and Fairness. As rates increase in complexity, customer understandability (and thus ability to react efficiently) may decrease

- E.g., customer education, bill design, rate comparison tools

Technology. Increasingly complex rates require smarter tech for more sophisticated price signals to reach the customer and for more sophisticated customer behavior

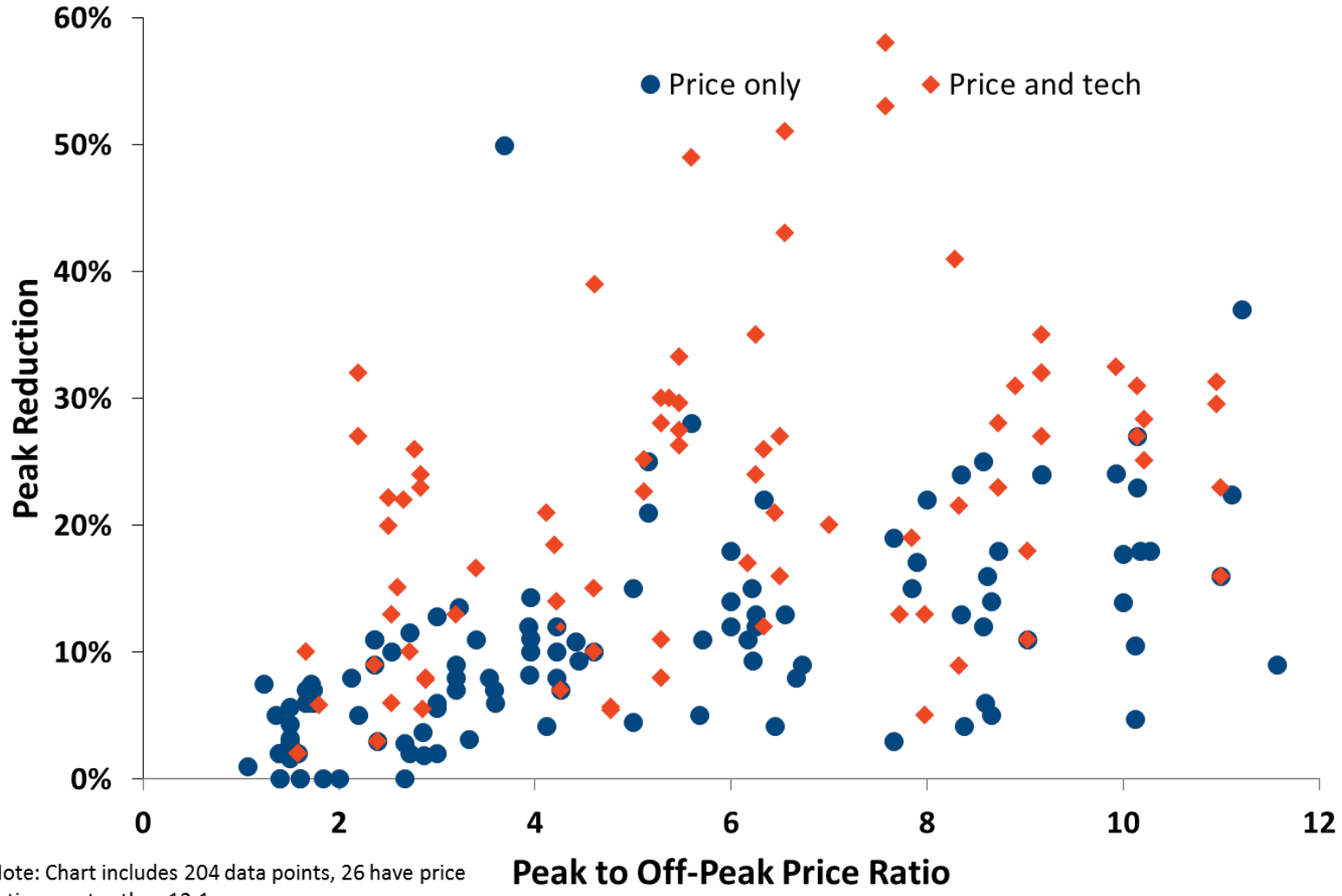
- E.g., AMI, information apps, smart appliances, home management systems

Arcturus (Faruqui, et al): Peak Impacts Increase with Increasing Price Ratios



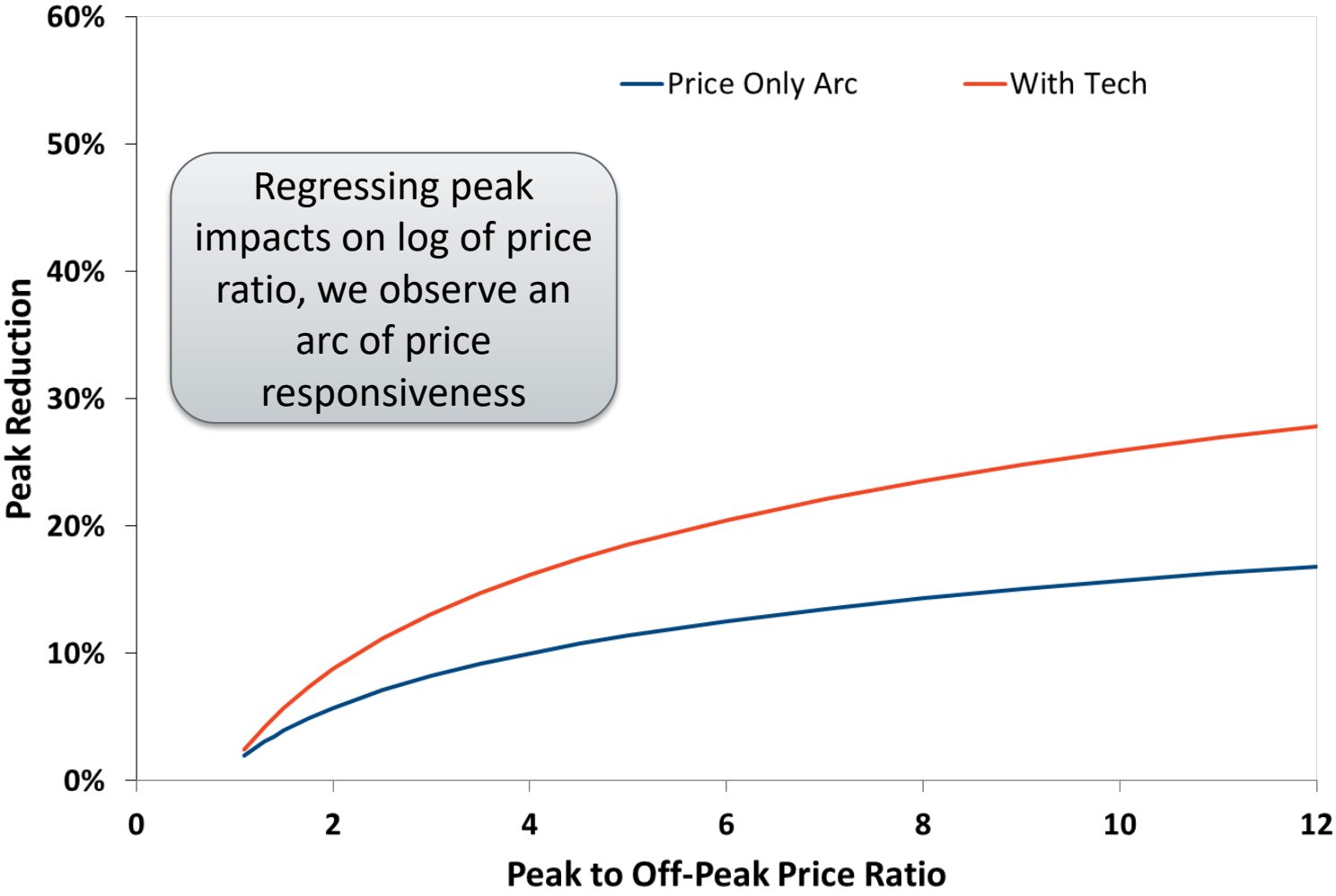
Note: Chart includes 120 data points, 11 have price ratios greater than 12:1.

Arcturus (Faruqui, et al): Technology Improves Price Responsiveness



Note: Chart includes 204 data points, 26 have price ratios greater than 12:1.

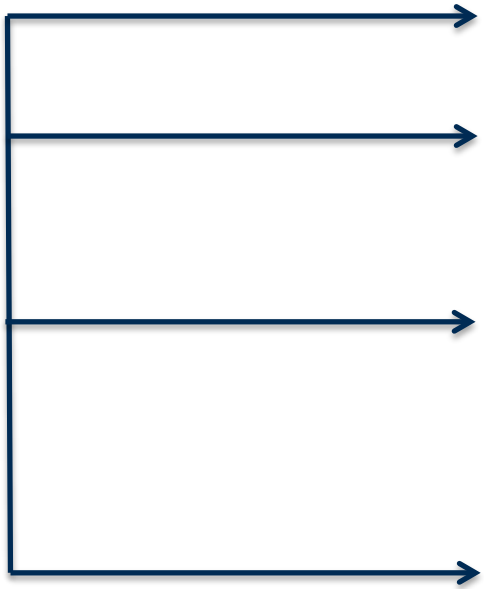
Arcturus (Faruqui, et al): The Arc of Price Responsiveness



Actual Innovations in Customer Pricing

Paths from the 2-Part Rate

Utilities have generally chosen one of four options to transition away from the 2-part rate:



Do nothing, sit tight and hope all of this is just a bad dream

Increase fixed charges

- NV Energy (DG customers), Omaha PPD, SMUD, and Texas*

Introduce TOU energy charges

- E.g., CPUC directive to California IOUs by 2019, OG&E, and Ontario* (default)

Introduce demand charges

- E.g., APS, ComEd*, OG&E, SRP (DG customers), and Westar (DG customers)

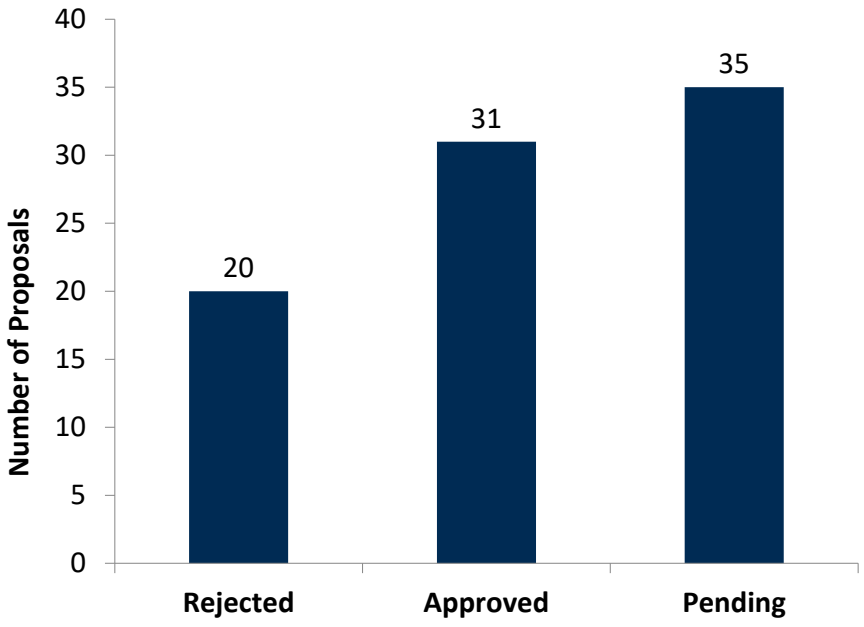
*indicates restructured utilities

Actual Innovations in Customer Pricing

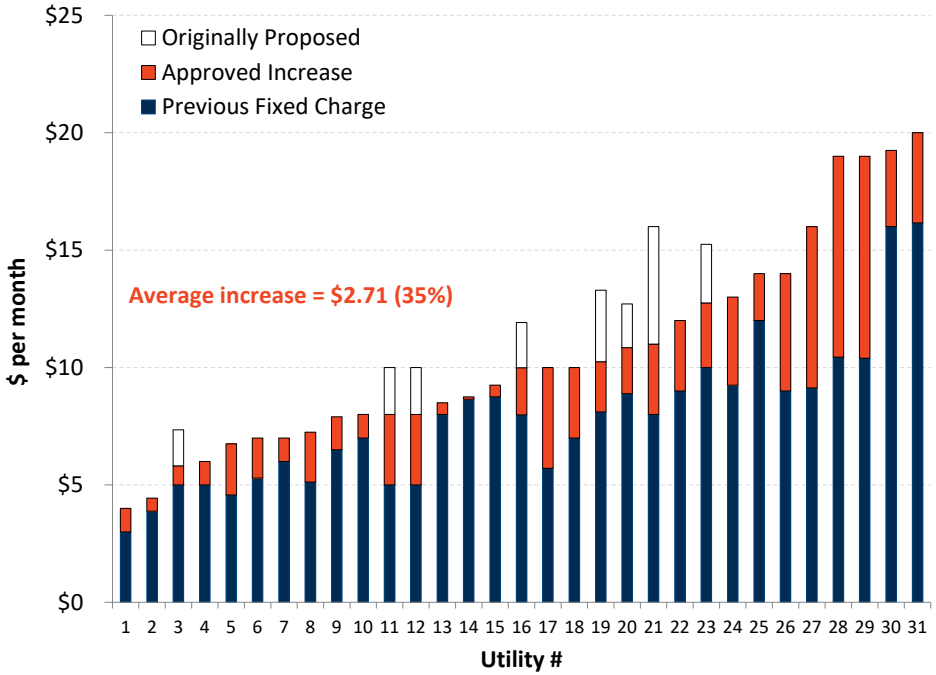
Increased Fixed Charges

Many utilities have proposed to increase the fixed charge, with varying degrees of success

Proposals to Increase Fixed Charge



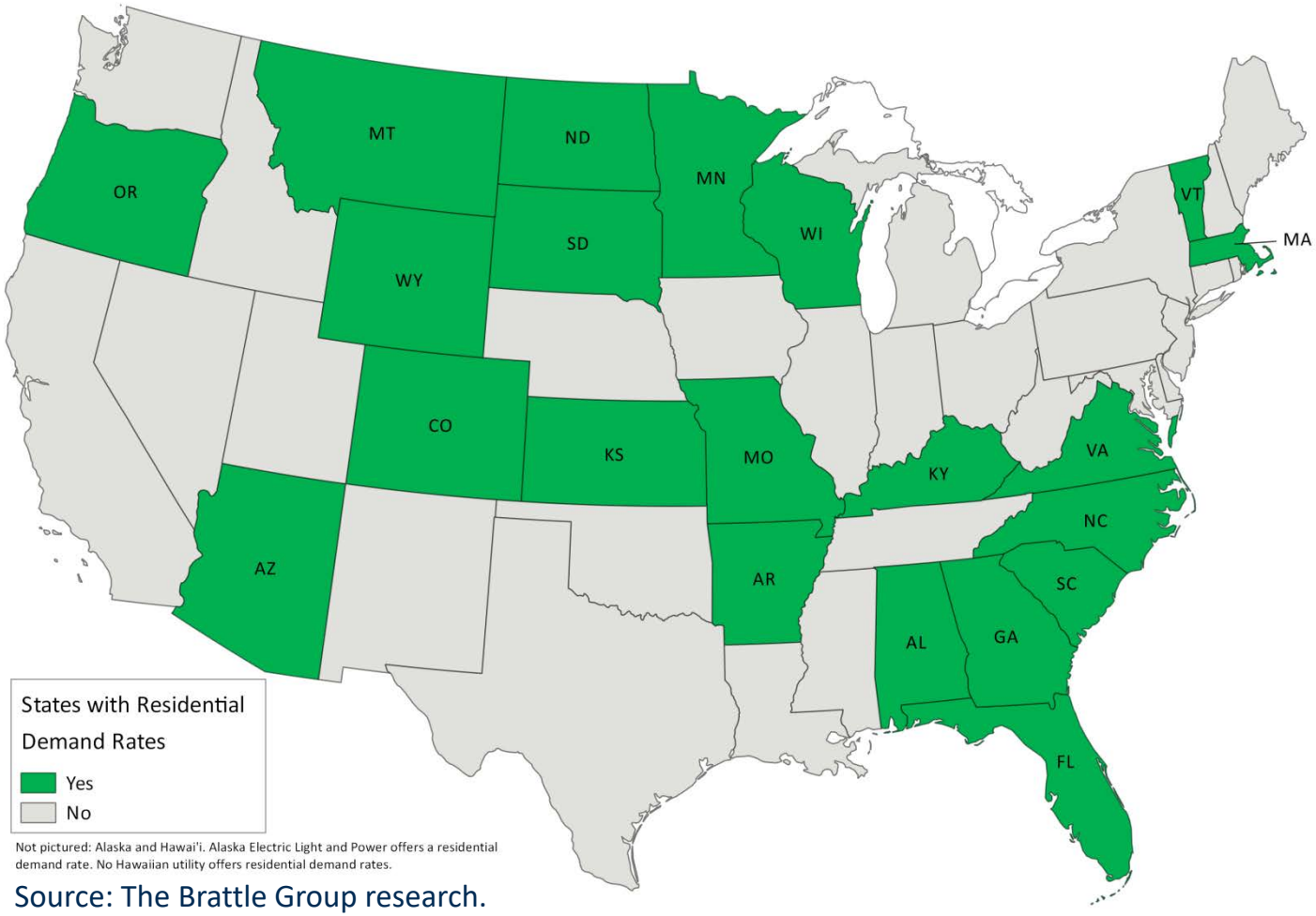
Amount of Approved Increase



Data sources: NC Clean Energy, "The 50 States of Solar," Q2 2015. Supplemented with review of additional utility rate filings.

New Residential Demand Charges

22 states are offering demand charges to residential customers



Not pictured: Alaska and Hawai'i. Alaska Electric Light and Power offers a residential demand rate. No Hawaiian utility offers residential demand rates.

Source: The Brattle Group research.

Some Utilities are Just Focusing on DG Customers

Mandating demand charges or raising the fixed charge for distributed generation customers, arguing that they constitute a class by themselves

- Eversource (in MA, 3-part rate and mandatory demand charge for residential DG owners)
- NV Energy (raising the fixed charge)
- Salt River Project (3-part rate)

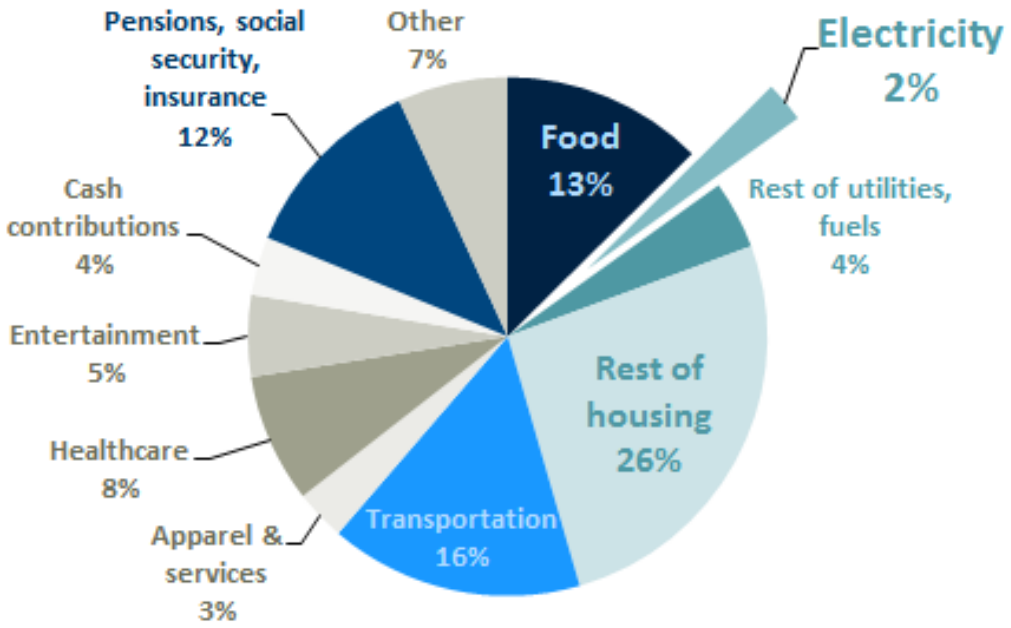
Giving distributed generation customers a choice between (a) paying a higher fixed charge or (b) paying standard fixed charge along with a demand charge

- In Kansas, Westar Energy proposed this path last year

Practical Considerations for Rate Design

Household Electricity Costs in Perspective

U.S. household electricity costs are only 2% of total expenditures; residential customers are difficult to engage



A cost-conscious household is more likely to focus on reducing other housing-related, food, and transportation costs

Source: U.S. Bureau of Labor Statistics, Consumer Expenditures Survey, 2016

The Importance of a Cost of Service (COS) Study

COS studies are necessary to allow for the proper allocation of costs of shared facilities to different customer classes

COS studies provide insight into:

- Cost vs. allocation to customer classes
- Composition of cost vs. rates (fixed vs. variable)
- Drivers of costs and revenues
- Appropriateness of rate class groupings

For example, as DERs increase COS can show:

- How costs may increase (additional investment) or decrease (avoided capacity)
- How revenues may increase (charges) or decrease (reduced net consumption)
- Projection of impact on cost recovery for each class, financials, risk

Not All Rate Design Objectives Can be Achieved at Once

Sustainable

Fair across customers

Transparent

Green

Cost-effective

A **scorecard** approach can help with evaluating different rate design options

- Define and rank overall rate design goals (using Bonbright criteria as a foundation)
- Develop qualitative metrics to evaluate rate options; assign relative importance of each metric
- Score each rate option

Concerns Over Impacts of Smart Rates

Some stakeholder concerns with smart rates are difficult to quell, but not insurmountable with scientific evidence

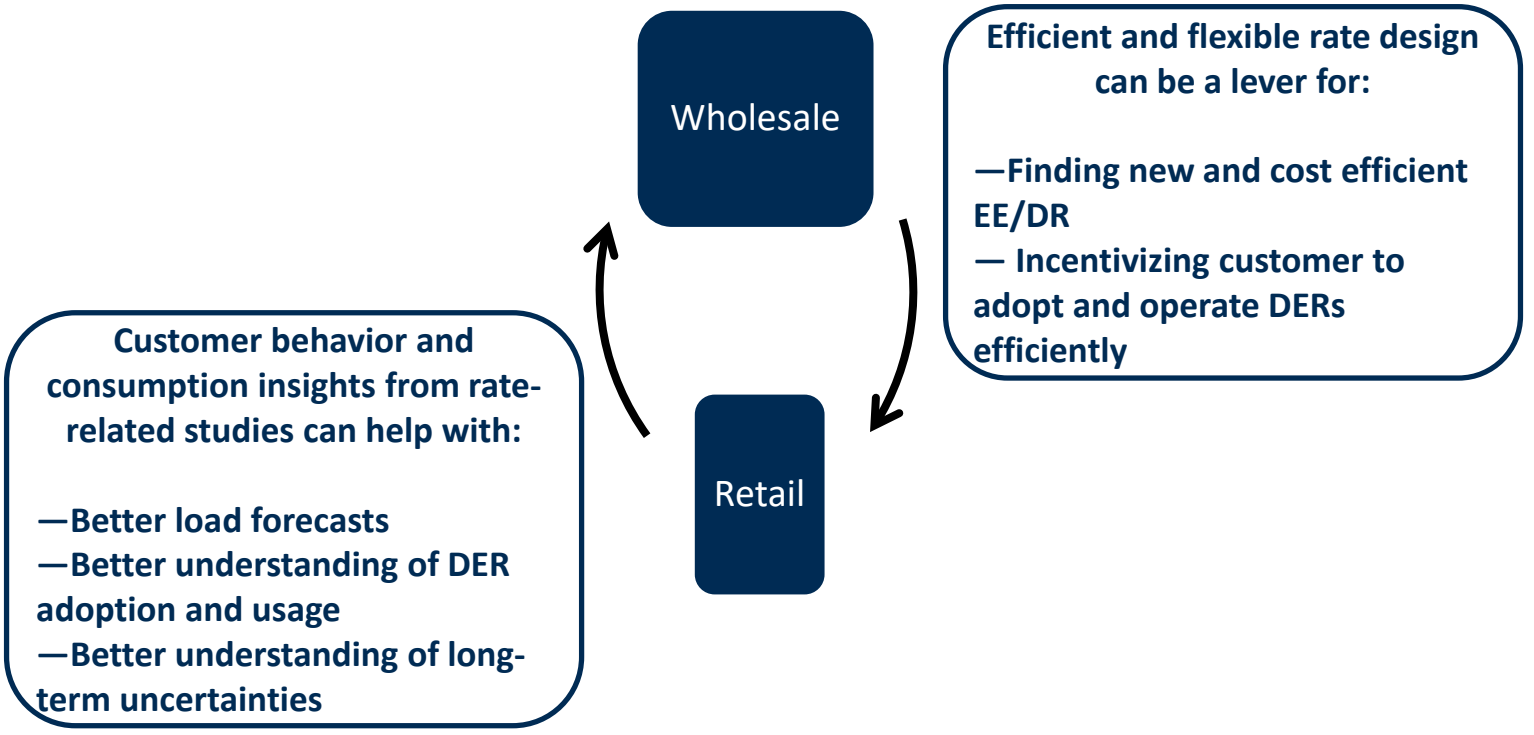
- Insufficient evidence of benefits
- Fear of customer dissatisfaction and backlash
- Uncertain impacts on sensitive or disadvantaged customers

Some scientific methods that can help:

- Customer bill impact studies
- Customer behavior studies
- Customer outreach and education
- Transition or relief mechanisms for disadvantaged customers

Rate Design in Resource Planning?

Resource development has traditionally fallen in the domain of bulk grid planning, but the retail and wholesale planning realms are now colliding



Summary of Key Takeaways

Rates that better reflect the actual cost structure of serving customers…

- Are both theoretically and empirically shown to improve the efficiency of electricity use
- Provide a more sustainable revenue structure for today's utilities
- Are gaining some traction across the U.S.

However, many challenges remain to smart rate implementation

- Residential customer engagement is difficult
- Stakeholder & policymaker appetites for mandatory time-varying and/or 3-part rates are limited
- Linkages to broader resource planning will be difficult to forge

Thank You!

PRESENTED BY

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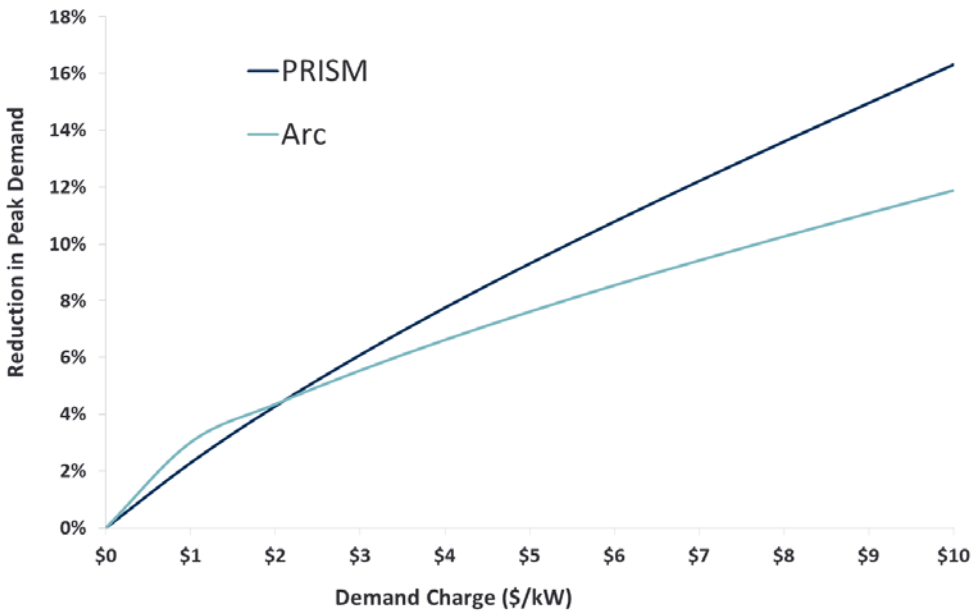
Ms. Mariko Geronimo Aydin, a Senior Associate in The Brattle Group's San Francisco office, has thirteen years of experience in analyzing the policies and economics of electricity system planning, regulation and de-regulation of electricity supply, and wholesale electricity markets across the U.S. Her more recent work has focused on finding sustainable and creative ways to adapt traditional planning processes and analytical tools to an industry rapidly shifting towards cleaner and more scalable supply technologies. Today's electricity industry still has untapped potential to meet goals of clean energy, cost-effectiveness, and operational and planning flexibility through greater electricity customer engagement, cutting-edge data analysis, and new technologies. To reach this potential with a robust and modern grid, Mariko works with clients to explore options for evolving utility business models, customer choice, and wholesale market refinements that can make the best use of distributed and customer-driven power supply resources, in synergy with more traditional resources.

Mariko holds a B.S. in Economics and an M.A. in Applied Economics from Northeastern University in Boston, Massachusetts.

Appendix

Responsiveness to Demand Charges

Demand Charge Price Responsiveness

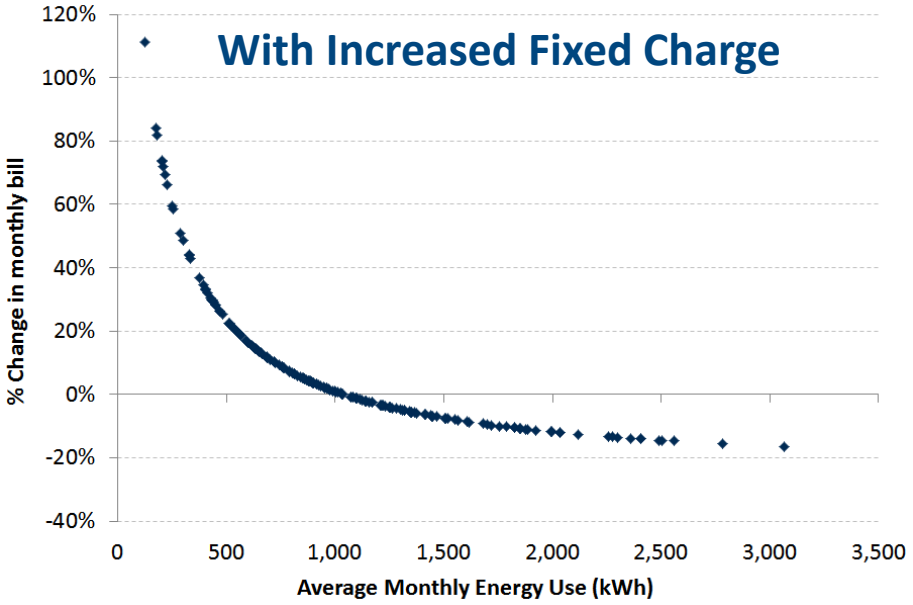


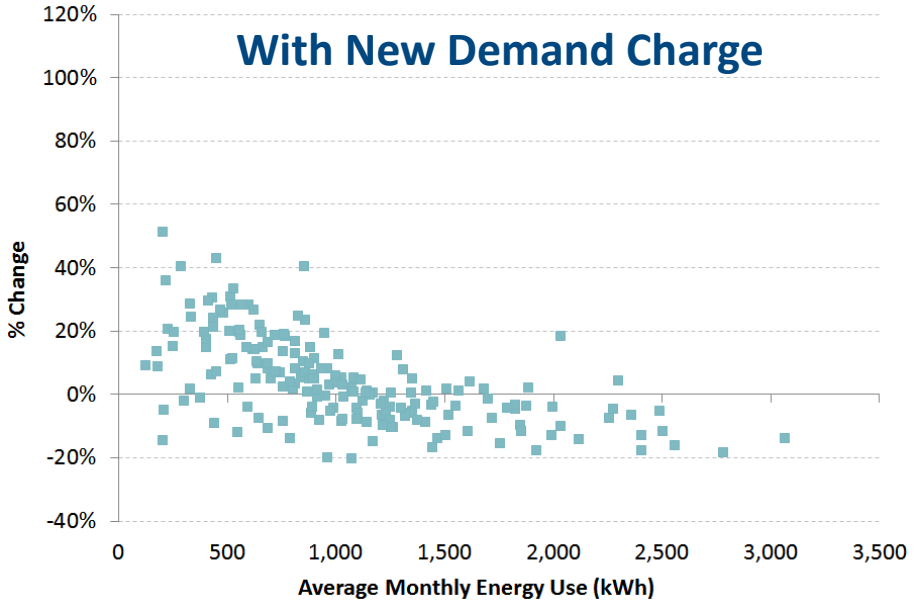
Comments

- Estimates based on PRISM and the Arcturus database
- This example is for a stylized customer using 1,000 kWh/month
- Old rate consists of:
  - $10/month customer charge
  - $0.10/kWh volumetric charge
- New rate is a revenue neutral three part rate with various levels of demand charges

Bill Impacts: Fixed and Demand Charges

While increased fixed charges raise bills for small customers, demand charges do not necessarily do so





- Correlation between bill impact and customer size is stronger with increased fixed charge.
- Whether small customers are low income customers is another question entirely…

The Long-Term Outlook for Electric Sales

Growth is likely to be <1% per year, about half of the 2% rate that was observed prior to the recession and significantly lower than the 7% a year growth rate that was the norm prior to the first oil shock of 1974

In some parts of the country, electricity sales growth may be higher while in other parts of the country it may be lower

Utility Strategies

Stay the course

- Assume that the slowdown will go away

Push electrification

- Hope that heat pumps, electric cars and electric storage will be adopted by customers rapidly

Becomes a wires company

- Focus on the transmission and distribution business

Become an energy services company

- Begin selling heating, cooling and lighting rather than kilowatt-hours

The Utility Toolkit for Survival

Regardless of which strategy utilities pick, they must reinvent their tactical toolkit

Upgrade rate design

- Align rates with the principal of cost causation by introducing demand charges, raising fixed charges and time-varying volumetric charges

Repurpose load and market research

- Gain insights into changing customer preferences and behavior

Refocus sales forecasting

- Capture the effects of new technologies, impact of utility programs and governmental codes and standards

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