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

RATE DESIGN TO ENABLE FLEXIBLE LOADS

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and prepared with
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THE Brattle GROUP
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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.
Introduction

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
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.

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<tr>
<th>Cost Categories</th>
<th>Utility Costs</th>
<th>Customer Bill</th>
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<tbody>
<tr>
<td>Variable (¢/kWh)</td>
<td>Variable = $45</td>
<td>Variable = $115</td>
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<td>— Fuel</td>
<td>Demand = $50</td>
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<tr>
<td>— Operations &amp; Maintenance</td>
<td>Fixed = $25</td>
<td>Fixed = $5</td>
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<tr>
<td>Demand (¢/kW)</td>
<td></td>
<td></td>
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<tr>
<td>— Transmission &amp; distribution wires capacity</td>
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<tr>
<td>— Generation capacity</td>
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<tr>
<td>Fixed ($/customer)</td>
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<tr>
<td>— Metering &amp; billing</td>
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<td>— Overhead</td>
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Principles of Efficient Rate Design

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.

**Utility Costs**
- Variable = $45
- Demand = $50
- Fixed = $25

**Traditional Bill**

**3-Part Rates**
- Time-Based Variable
  - Off-Peak Production
  - Peak Production

**Time-Based Demand**
- Potentially reducible costs, by reducing or shifting time of actual consumption
Bonbright’s 10 criteria can be distilled into 5 core principles
Principles of Efficient Rate Design

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
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
Empirical Evidence of Customer Responsiveness

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)
Empirical Evidence of Customer Responsiveness

Risk Versus Reward

These rates present choices to customers along a risk-reward frontier
Empirical Evidence of Customer Responsiveness

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
Empirical Evidence of Customer Responsiveness

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

*Price only treatments*

Note: Chart includes 120 data points, 11 have price ratios greater than 12:1.
Empirical Evidence of Customer Responsiveness

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

Note: Chart includes 204 data points, 26 have price ratios greater than 12:1.
Empirical Evidence of Customer Responsiveness

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

Regressing peak impacts on log of price ratio, we observe an arc of price responsiveness.
Actual Innovations in Customer Pricing
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**

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<th>Rejected</th>
<th>Approved</th>
<th>Pending</th>
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<td>20</td>
<td>31</td>
<td>35</td>
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**Amount of Approved Increase**

- Originally Proposed
- Approved Increase
- Previous Fixed Charge

![Graph showing the number of proposals and amount of approved increase](image)

Average increase = $2.71 (35%)

Actual Innovations in Customer Pricing

New Residential Demand Charges

22 states are offering demand charges to residential customers

Source: The Brattle Group research.
Actual Innovations in Customer Pricing

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
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.
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
Practical Considerations for Rate Design

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
Practical Considerations for Rate Design

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

Customer behavior and consumption insights from rate-related studies can help with:
- Better load forecasts
- Better understanding of DER adoption and usage
- Better understanding of long-term uncertainties

Efficient and flexible rate design can be a lever for:
- Finding new and cost efficient EE/DR
- Incentivizing customer to adopt and operate DERs efficiently
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!
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.

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