Residential Demand Charges: An Overview

PRESENTED TO

EEI Rate Committee Meeting
Charlotte, North Carolina

PRESENTED BY

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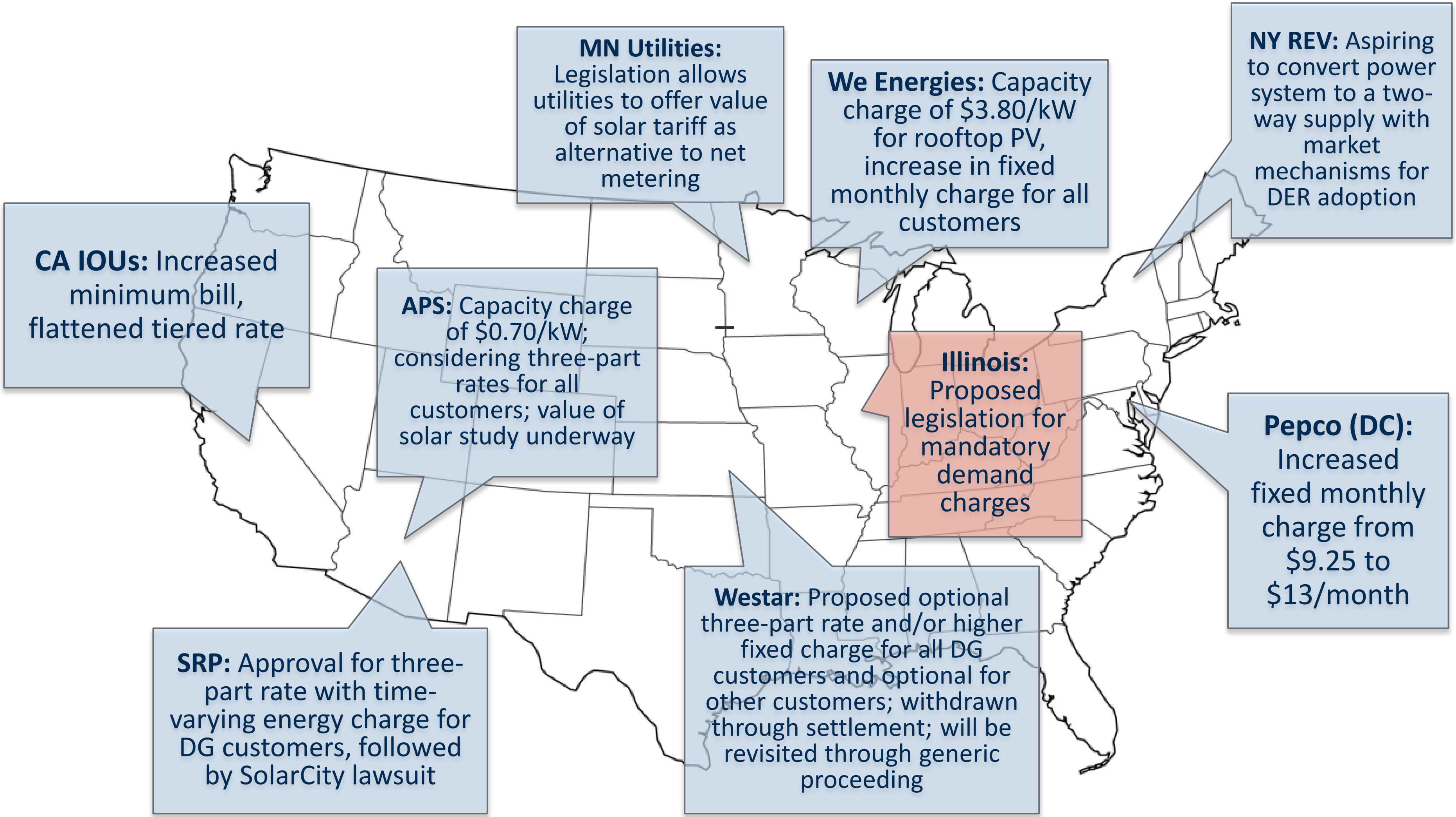
THE Brattle GROUP

A snapshot of rate design activity



Bonbright's Ten Commandments

1. Effectiveness in yielding total revenue requirements under the fair-return standard
2. Revenue stability and predictability
3. Stability and predictability of the rates themselves
4. Static efficiency, *i.e.,* discouraging wasteful use of electricity in the aggregate as well as by time of use
5. Reflect all present and future private and social costs in the provision of electricity (*i.e.,* the internalization of all externalities)
6. Fairness in the allocation of costs among customers so that equals are treated equally
7. Avoidance of undue discrimination in rate relationships so as to be, if possible, compensatory (free of subsidies)
8. Dynamic efficiency in promoting innovation and responding to changing demand-supply patterns
9. Simplicity, certainty, convenience of payment, economy in collection, understandability, public acceptability, and feasibility of application
10. Freedom from controversies as to proper interpretation

The "ideal" rate design

Distribution-only utilities should use a three-part rate

- Monthly service charge
- Charge for connected load (or maximum customer demand)
- Maximum demand charge (coincident with the distribution peak)

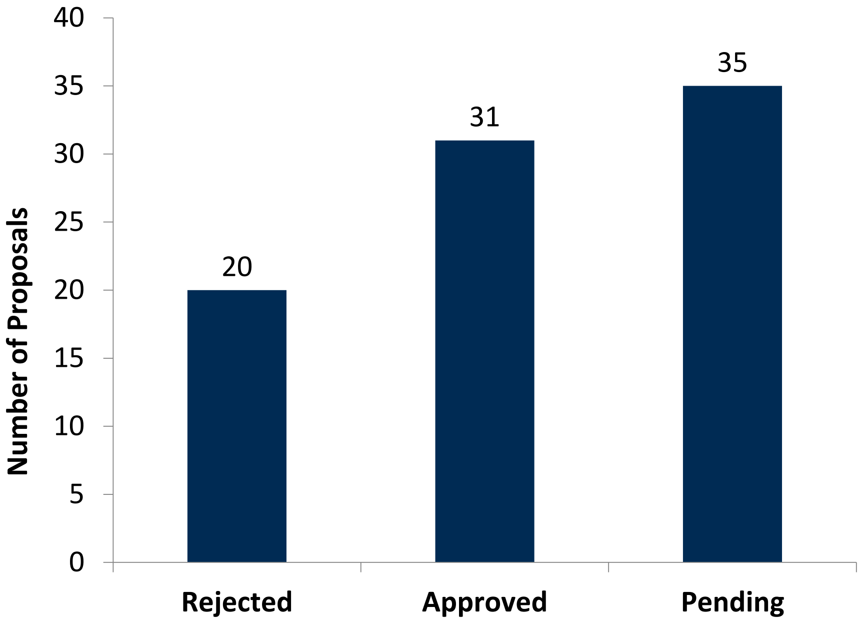
Utilities that also supply energy should use a five-part rate

- Monthly service charge
- Charge for connected load (or maximum customer demand)
- Maximum demand charge (coincident with the distribution peak)
- Charge for generation capacity
- Time-varying energy charge

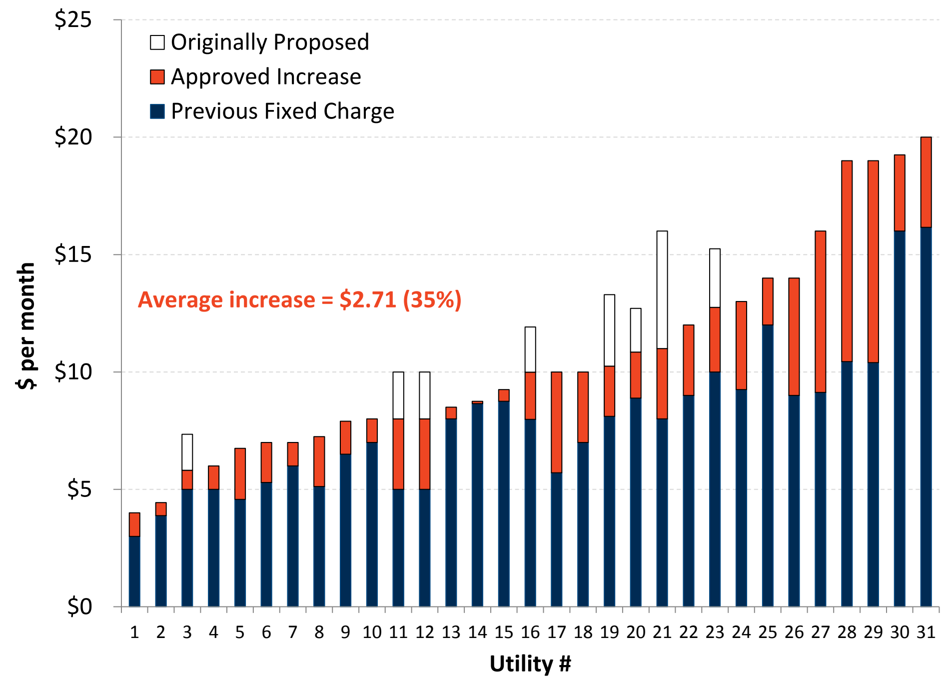
Can Fixed Charges be a proxy for Demand Charges?

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

Recent 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.

Fixed charges can help to address the "cost shift" problem

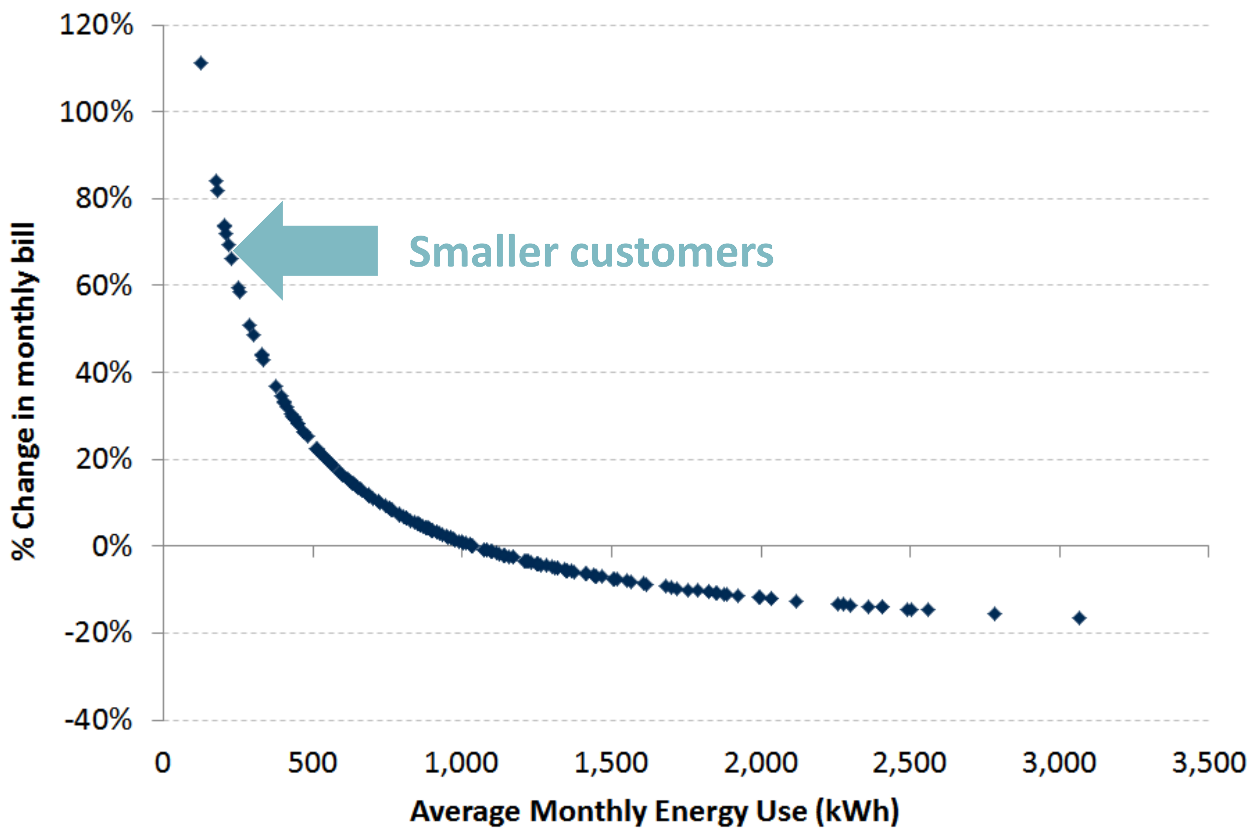
In the absence of AMI, rate design options for addressing the cost-shift issues associated with DG adoption and volumetric rates are somewhat limited

Fixed charges are one option for addressing the cost-shift issue that does not require metering upgrades

Some costs, such as metering, billing, and general overhead are clearly fixed and vary with the number of customers, not with the amount of electricity consumed

But increasing the fixed charge is difficult

Change in Bill with Revenue Neutral Increase in Fixed Charge



Notes:
Old rate assumes $10/month fixed charge and 11.2 cents/kWh volumetric charge.
New rate assumes $40/month fixed charge and 8.3 cents/kWh volumetric charge.

Stakeholders are strongly opposing an increase in fixed charges

"Utilities don't need higher fixed charges when they have decoupling"

"An increase in the fixed charge will automatically penalize low income customers, because they are small customers"

"Long-run marginal costs are almost all variable, so fixed charges are not cost-based"

"Fixed charges do not appear in competitive markets, so utilities should not be allowed to offer them"

"Fixed charges will reduce the incentive for energy efficiency"

Stakeholder opposition to fixed charges (concluded)

"Fixed charges are a 'tax on the sun'; utility scale generators are not charged for distribution costs, so neither should we charge owners of distributed generation"

"Increasing fixed charges only for DG customers is discrimination and an unfair exercise of the utility's monopoly power"

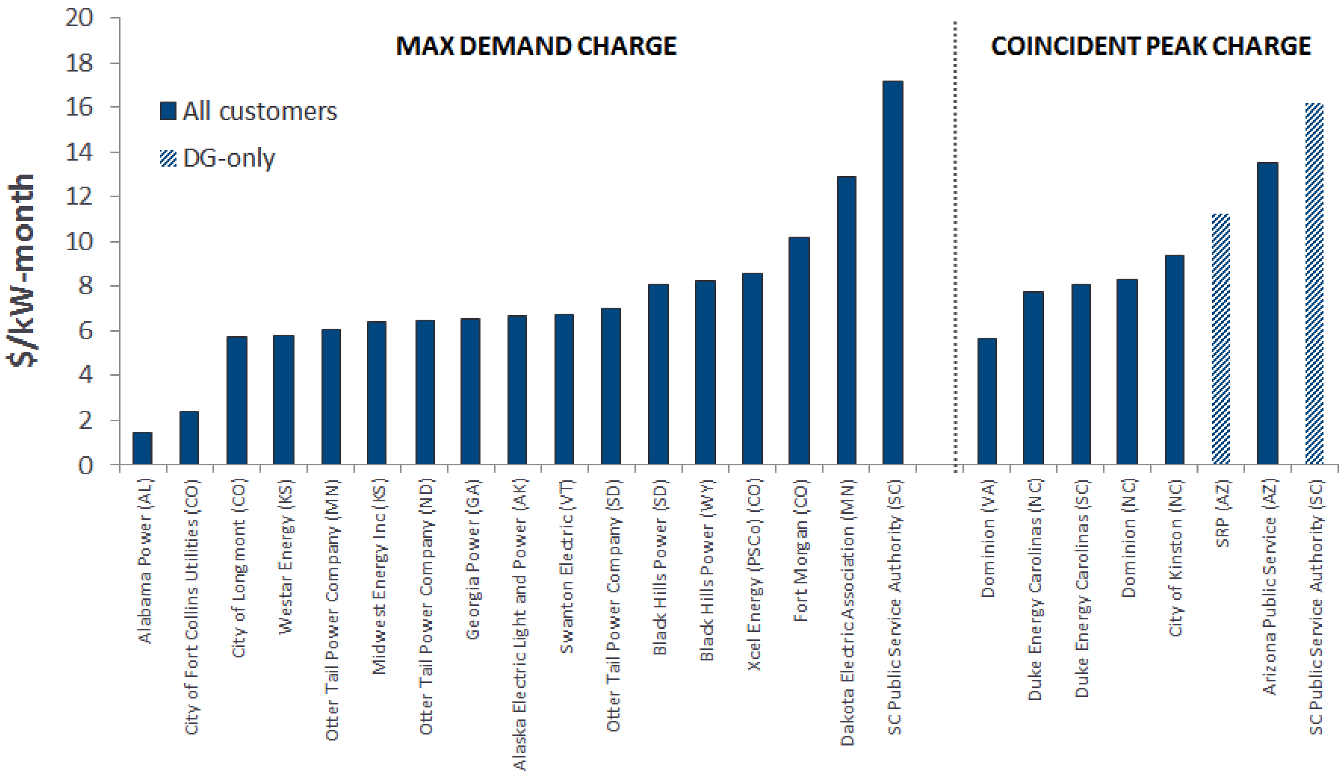
"The DG subsidy provided through net metering is just one of many embedded in today's rates and should not be addressed in isolation"

"Fixed charges are a short-sighted fix; in the long-run they will just encourage customers to disconnect from the grid entirely"

The Case for Demand Charges

Some utilities already offer residential demand charges

Summer Demand Charges in Existing Rates



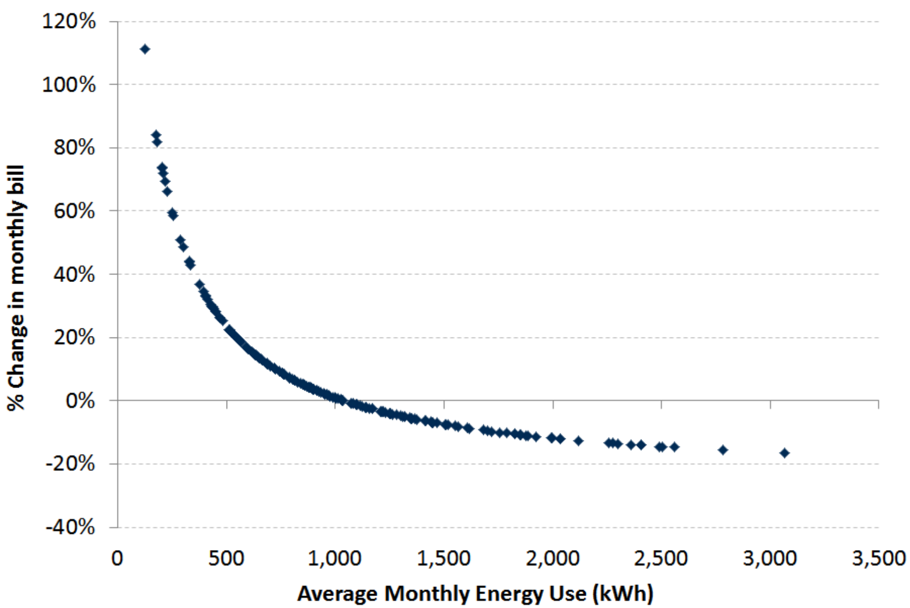
Notes:
1) All rates are drawn from their respective utility tariff sheets, valid as of July 2015.
2) The SRP rate is tiered and varies by season and amount of demand; we show the average summer demand charge for a 10 kW customer for illustrative purposes.
3) The SC Public Service Authority DG rate includes a peak rate of $11.34/kW-mo and an off-peak rate of $4.85/kW-mo. We present the sum for simplicity.

Comments

- 19 utilities offer residential demand charges, 10 of which are IOUs
- They were proposed by Westar, NV Energy, ComEd and are being considered by other utilities

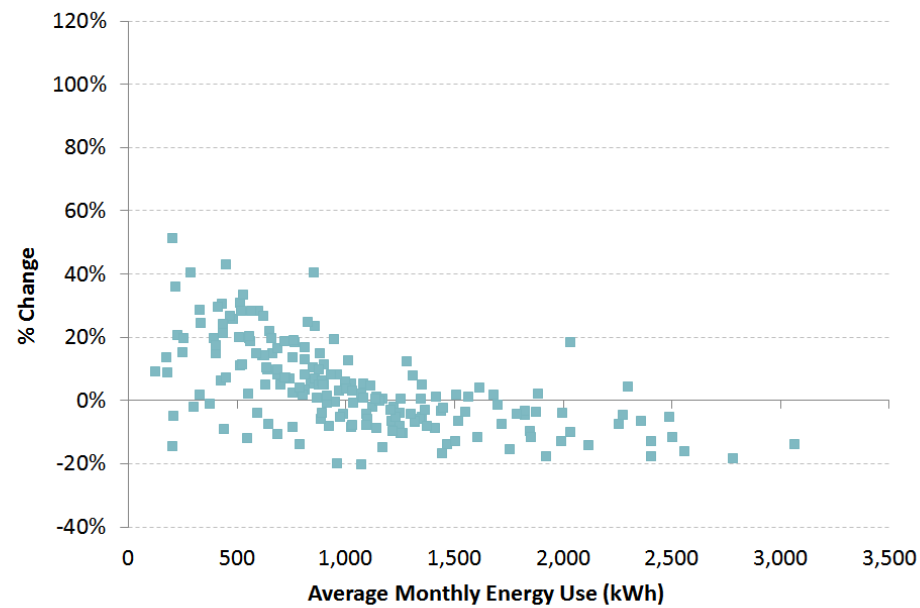
Demand charges do not automatically increase bills for small customers

With Increased Fixed Charge



Note: The three-part rate includes a monthly fixed charge of $10, an energy charge of $0.077/kWh, and a demand charge of $6/kW. The revenue-neutral two-part rate includes a monthly fixed charge of $40 and an energy charge of $0.083/kWh.

With New Demand Charge



Note: The three-part rate includes a monthly fixed charge of $10, an energy charge of $0.060/kWh, and a demand charge of $9/kW. The revenue-neutral two-part rate includes a monthly fixed charge of $40 and an energy charge of $0.083/kWh.

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

Can residential customers understand demand charges?

Anyone who has purchased a light bulb has encountered watts; ditto for anyone who has purchased a hair dryer or an electric iron

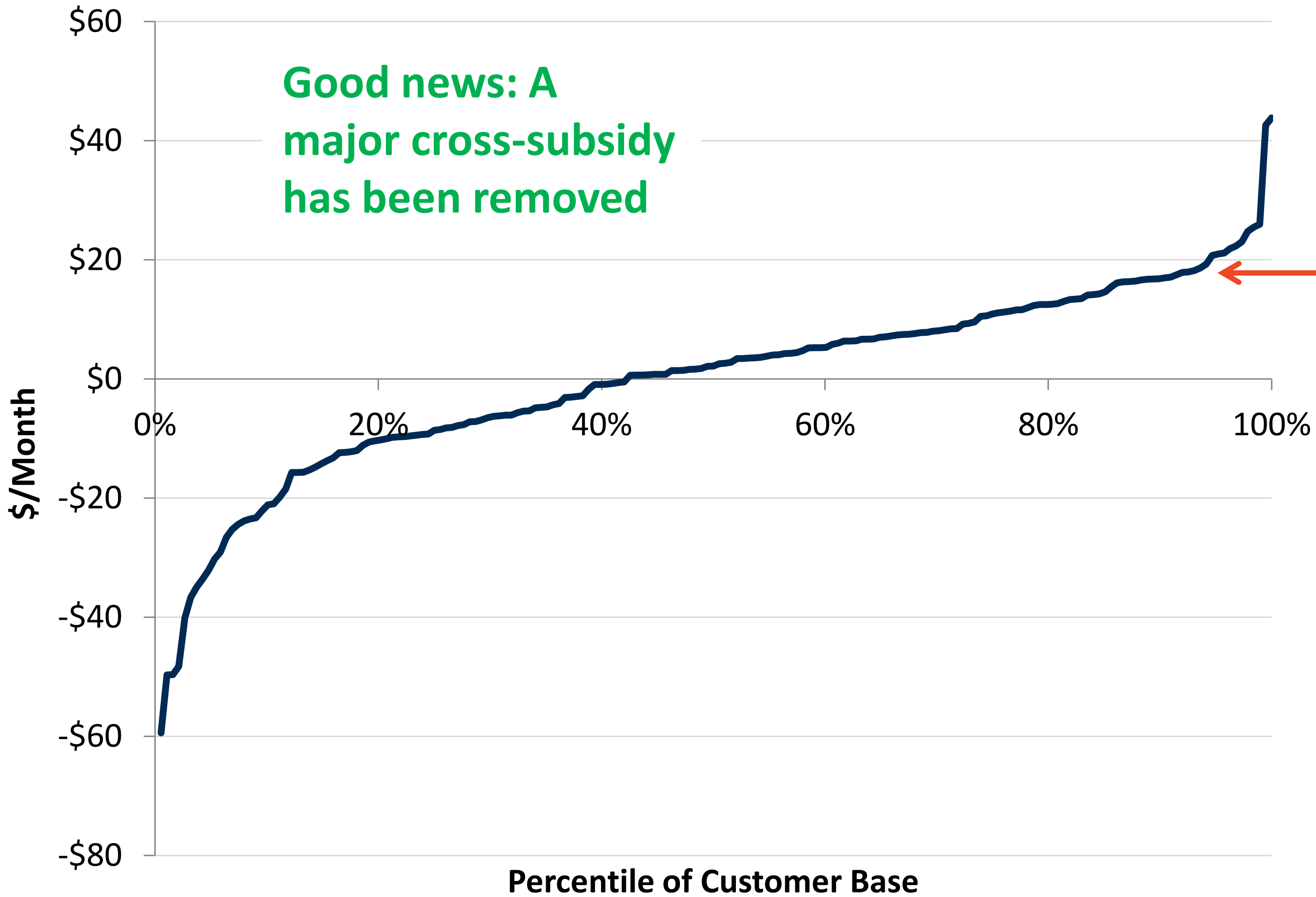
Customers often introduced to kWh's by way of kWs; e.g., if you leave on a 100 watt bulb for 10 hours, it will use 1,000 watt-hours, or one kWh

Similarly, if you run your hair dryer at the same time that someone else is ironing their clothes and lights are on in both bathrooms, the circuit breaker may trip on you since you have exceeded its capacity, expressed in kVA's or kW's

Making the Transition

The rate change will affect each customer's bill differently

Distribution of Bill Changes



Bad news: Some customers will experience bill increases

More good news: Transition plans help facilitate the change for these customers

Stakeholder concerns can be addressed through some new initiatives - I

Codify and learn from the experience of utilities that have deployed new rates in the US and in Europe

Quantify bill impacts, particularly for low- and moderate income customers

Assess customer understanding of the new rates through market research (interviews, focus groups and surveys) and identify the best way to communicate the concept and to design the rates

Stakeholder concerns can be addressed through some new initiatives - II

Assess customer response to new rates through a new generation of experiments whose design builds on insights gleaned from prior work on time-of-use pricing experiments

Study ways in which to mitigate financial impact on vulnerable customers, maybe by excluding them initially from the new rates, or by phasing in the rates, or by providing them financial assistance for installing energy efficiency measures

The transition to new rates will take time and require careful planning

Rate Design	Pilots	Impact Analysis	Transition Plans	Regulatory Activity
Rate benchmarking	Pilot design	Load impacts	Multi-year rate rollout strategies	Rate case testimony
Cost structure review	Sample selection	Bill impacts	Protections for vulnerable customers	Stakeholder outreach and education
Formation of ratemaking objectives	Process evaluation	Revenue impacts	Customer education	Conferences, whitepapers, webinars, etc.
Rate development	Customer satisfaction surveys	Conservation impacts		
	Load impact analysis	Societal costs & benefits		

Further readings

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Further readings (concluded)

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Appendix

Customers don't need to be electricity experts to understand a demand charge

Responding to a demand charge does <u>not</u> require that the customers know exactly when their maximum demand will occur

If customers know to avoid the simultaneous use of electricity-intensive appliances, they could easily reduce their maximum demand without ever knowing when it occurs

This simple message should be stressed in customer marketing and outreach initiatives associated with the demand rate

Examples from utility websites

- APS: "Limit the number of appliances you use at once during on-peak hours"
- Georgia Power: "Avoid simultaneous use of major appliances. If you can avoid running appliances at the same time, then your peak demand would be lower. This translates to less demand on Georgia Power Company, and savings for you!

Staggering the use of a few key appliances could lead to significant demand reductions

Avg. Demand Over 15 min

Appliance	Avg. Demand (kW)
Dryer	4.0
Oven	2.0
Stove	1.0
Hand iron	0.5
Misc. plug loads	0.2
Lighting	0.3
Refrigerator	0.5
Total	**8.5**

Flexible Load (7.5 kW): Dryer, Oven, Stove, Hand iron

Inflexible Load (1 kW): Misc. plug loads, Lighting, Refrigerator

Comments

- Use of some of the appliances is inflexible (1 kW)
- Use of other appliances could be easily staggered to reduce demand
- Simply delaying use of the dryer until after the oven, stove, and hand iron had been turned off would reduce the customer's maximum demand by 3.5 kW
- This would bring the customer's maximum demand down to 5 kW, **a roughly 40% reduction in demand**

Presenter Information

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Ahmad Faruqui is an economist whose consulting practice is focused on the efficient use of energy. His areas of expertise include rate design, demand response, energy efficiency, distributed energy resources, advanced metering infrastructure, plug-in electric vehicles, energy storage, inter-fuel substitution, combined heat and power, microgrids, and demand forecasting. He has worked for more than a hundred clients on five continents. These include electric and gas utilities, state and federal commissions, independent system operators, government agencies, trade associations, research institutes, and manufacturing companies. Ahmad has testified or appeared before commissions in Alberta (Canada), Arizona, Arkansas, California, Colorado, Connecticut, Delaware, the District of Columbia, FERC, Illinois, Indiana, Kansas, Maryland, Minnesota, Nevada, Ohio, Oklahoma, Ontario (Canada), Pennsylvania, ECRA (Saudi Arabia), and Texas. He has presented to governments in Australia, Egypt, Ireland, the Philippines, Thailand and the United Kingdom and spoken at energy seminars on all six continents. His research on the energy behavior of consumers has been cited in Business Week, The Economist, Forbes, National Geographic, The New York Times, the San Francisco Chronicle, the San Jose Mercury News, the Wall Street Journal and USA Today. He has appeared on Fox Business News, National Public Radio and Voice of America. He is the author, co-author or editor of four books and more than 150 articles, papers and reports on energy matters. His work has appeared in peer-reviewed journals such as Energy Economics, Energy Journal, Energy Efficiency, and the Journal of Regulatory Economics and trade journals such as The Electricity Journal and the Public Utilities Fortnightly. He holds bachelors and masters degrees from the University of Karachi and a doctorate in economics from The University of California at Davis.