Competing Perspectives on Demand Charges

Survey of consumer advocates identifies areas of agreement and disagreement

By Ryan Hledik and Ahmad Faruqui

Consider industry developments such as growth in the adoption of distributed generation and the arrival of Wi-Fi thermostats, digital appliances and smart meters. Consider also the growing interest in promoting price-based demand response. Both have recently exposed deficiencies in the standard non-dynamic volumetric residential rate offerings of most electric utilities.

One deficiency in particular has persisted for decades. The under-representation of the cost of generating and delivering power during peak times of day has been exacerbated by these developments. Similarly, off-peak costs have been overstated.

As a result, residential rate reform has emerged as a pivotal issue. There is a challenge facing the industry. Flat and largely volumetric rates do not sufficiently reflect time-differentiation in underlying resource costs. Nor do they sufficiently reflect the peak demand-driven nature of infrastructure investments that the rates are intended to recover.

This leads to under-recovery of costs from some customers who use the power grid heavily, or who otherwise rely on it as a form of backup power. Those costs are recovered from other customers who pay more than their fair share of the grid, raising concerns about fairness and equity.

A variation on the existing residential rate design that could address this issue is the introduction of demand charges. They would recover some portion of the utility's costs through a charge based on a measure of the customer's peak demand for electricity (kilowatts) rather than on the customer's total monthly consumption (kilowatt-hours).[1]

There are potential benefits to this approach. The introduction of well-designed demand charges would help to address the fairness issues described above. They would reduce a cross-subsidy between customers with flat consumption profiles and those with peaky consumption profiles.

Demand charges would also provide customers with an opportunity to reduce their electricity bills. Customers could manage their electricity demand, either through behavioral changes or through the adoption of emerging technologies (such as smart thermostats, automated appliances, energy storage). If the rate is well designed, this should lead to a reduction in system costs for the utility as well.

It is worth recalling that demand charges have been a standard feature of commercial and industrial customers for decades. They provide regulatory precedent for including these rates in future residential offerings.

See the sidebar entitled: Brief History of Demand Charges.

Flat, largely volumetric rates do not sufficiently reflect time-differentiation in underlying resource costs.

Many agree that the current residential rate design is unsustainable. But some industry stakeholders have expressed concerns about the introduction of demand charges as the solution. To fix the problems of today's rates, it will be important to develop a consensus-oriented path forward for residential rate design.

This article summarizes perspectives on both sides of the demand charge issue. Based on this review, it proposes practical initiatives to address key concerns about residential demand charges.

The authors believe that well-designed and carefully implemented demand charges have the potential to significantly improve existing rate designs.[2]

The focus of this article, however, is not on making the case for demand charges. Instead, the focus is on addressing the commonly-voiced concerns of the consumer advocacy community.

The perspectives on demand charges presented in this article, therefore, are an attempt to synthesize the broad range of views on this issue, rather than reflecting only the opinions of the authors.

The industry stakeholders who have been engaging in this issue include consumer advocacy groups, environmental groups, rooftop solar developers, research organizations (such as the national energy research labs), policymakers, regulators. And, of course, the utilities who are proposing the rate changes.

In this article, we have focused on the views of the consumer advocacy community. Expanding the scope to include other stakeholders would be a valuable future research activity.

It is also important to note that this article is focused on views of the general advantages and disadvantages of demand charges,

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FIG. 1 SUMMARY OF PERSPECTIVES

Issue	Demand charge concern	Common response to concern
Bill impact	Low income customers may have peaky load profiles and therefore experience bill increases. We don't know enough about how demand charges will impact customers.	The correlation between peakiness and income is weak at best and varies considerably depending on the characteristics of a given utility's customer base. Demand charges will provide all customers with an opportunity to reduce bills by managing demand.
Bill volatility	Bill volatility will increase due to isolated high-electricity demand events, such as hosting a holiday party.	For individual customers, maximum demand often varies by less than monthly usage on a monthly basis, so a demand charge could lead to reduced bill volatility. Certain rate design options, such as a sixty-minute demand measurement, could help to further reduce volatility.
Customer understanding	Customers will not be able to understand demand charges because they do not know their electricity demand, or the concept is too complicated.	Customers do not need to know their instantaneous demand in order to understand the concept of a demand charge. Simple messages, such as avoid using many electricity intensive appliances at the same time can address this concern.[a]
Customer acceptance	Customers will not be able to manage their demand in response to demand charges, due to lack of understanding or awareness.	Three studies – conducted in Wisconsin, North Carolina, and Norway – found that customers do respond to demand charges.[b] This is consistent with the extensive evidence of customer response to dynamic pricing.[c] Emerging technologies, such as smart thermostats and batteries, will enhance the customer's ability to respond as costs of these technologies decline.
Cost basis for non-coincident demand charges	Demand charges are not cost-based. The system peak drives costs, but non-coincident demand charges do not align with the system peak.[d]	Non-coincident demand charges may be appropriate for recovering distribution system costs, which are very local in nature. Non-coincident demand charges are also a reasonable proxy for a customer's connected load.[e]
Cost basis for peak-constrained demand charges	Peak-constrained demand charges do not account for diversity in residential load and are therefore not cost-based.	Peak-constrained demand charges send a strong economic signal to reduce demand during peak hours. There are many ways to design a demand charge such that it aligns with the actual system peak.
Compatibility with time-varying volumetric charges	A volumetric time-of-use rate is preferable to a demand charge, because it will be easier for customers to understand and better reflects the underlying costs of the system.	Demand charges and time-of-use rates are not necessarily competing options and can both be included in a single rate, with the energy charge varying by time of day and the demand charge collecting some portion of capacity costs. TOU rates are not likely to provide a peak demand-related price signal that is as strong as that of demand charges.

as opposed to specific implementation issues such as how to best design a demand charge.

Competing Perspectives

A path forward for residential rate reform that garners the support of industry stakeholders and regulators will necessarily be preceded by constructive open dialogue on the issue. To this end, we surveyed consumer advocates to identify areas of consensus and disagreement on the merits of demand charges. Specifically, we conducted phone interviews with nine consumer advocates at national and state-level organizations.

Our survey is further informed by participation in more than a dozen industry events. Each addressed residential demand charges over the past two years.

Examples of such industry events includes:

EUCI's Residential Demand Charge Symposium, Denver, Colorado, May 2015. Harvard Electricity Policy Group's 79th Plenary Session, Washington, D.C., June 2015. NARUC's 127th Annual Meeting, Austin, Texas, November 2015. NASUCA's Annual Meeting, Austin, Texas, November 2015.

We also assembled and reviewed a rapidly growing database of media coverage, publications and regulatory filings on demand charges.

We have found that there is significant diversity in familiarity with the concept of residential demand charges. Some have been closely studying the topic and are well acquainted with the details of the rate design. Others have a basic understanding of demand charges based on experience with rates for commercial and industrial customers.

In some cases, there are misconceptions about demand charges.

For instance, demand charges often are confused with fixed monthly customer charges, or with time-varying or dynamic rates. While in some ways demand charges can be conceptually similar to these other rate designs, there are important and distinct

Summary of Perspectives (Continued)

Issue	Demand charge concern	Common response to concern
Relevance to regulated industry	Demand charges do not appear in competitive markets and therefore should not be offered in a heavily regulated industry.	Electric utilities are different than businesses in a competitive market, because they have an obligation to serve all customers. Therefore, cost-reflective rate designs are needed to ensure fairness and equity in cost recovery across the entire customer base.
Cost recovery	Demand charges are simply another form of a fixed monthly charge.	Whereas fixed charges cannot be reduced by the customer unless he or she cancels service entirely, demand charges can be partially avoided through reductions in demand. Unlike fixed charges, demand charges collect revenue based on the customer's size, rather than charging each customer, large or small, the same amount.
Utility profitability	Demand charges are an attempt to increase customer bills, and therefore revenue.	Rates with demand charges are commonly designed to be revenue neutral, with an accompanying offsetting reduction in the volumetric charge (cents/kWh).
Technical constraints	It is too costly to meter demand for each individual customer. Any benefits of the new rate design will be offset by additional metering costs.	Residential demand charges are feasible where smart meters are being deployed. The benefits of reducing large cross-subsidies by offering demand charges to specific sub-segments of customers could justify a modest investment in additional metering for those customers.
Applicability to current system conditions	Demand charges are an outdated concept. They have carried over from a time when metering capabilities did not allow for more sophisticated rate offerings.[f]	With the rollout of smart meters, we have only recently become able to offer demand charges to residential customers. They are an opportunity to tap into the functionality of this new digital infrastructure.
Deployment	Many cross-subsidies are embedded in current rates, so it does not make sense to deploy demand charges just to address the cross-subsidy for customers with "peaky" net load profiles.	Rates are not an appropriate tool for subsidizing electricity. Since a large inequity can be reduced through a new cost-based rate design that will encourage the adoption of beneficial energy management technologies, this rate should be offered to all customers. If social policy objectives do call for intentional subsidies, this should be done outside of rate design to avoid distorted price signals.

a. Georgia Power, which introduced a new optional residential demand charge in 2014, also conveys this theme. For example, the message on Georgia Power's website is: "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!"

b. For further discussion, see Ryan Hledik, "Rediscovering Residential Demand Charges," *The Electricity Journal*, August/September 2014.

c. Ahmad Faruqui and Sanem Sergici, "Arcturus: International Evidence on Dynamic Pricing," *The Electricity Journal*, August/September 2013.

d. Scott J. Rubin, "Moving Toward Demand-Based Residential Rates," *The Electricity Journal*, November 2015.

e. Toby Brown, Ahmad Faruqui, and Lea Grausz, "Efficient Tariff Structures for Distribution Network Services," *Economic Analysis and Policy*, December 2015.

f. Jim Lazar and Wilson Gonzalez, "Smart Rate Design for a Smart Future," The Regulatory Assistance Project, July 2015.

differences that may go unrecognized.

Overall, our survey of consumer advocates identified perspectives that ranged from direct opposition to guarded support for residential demand charges. In many cases, the skepticism can be traced to a perceived lack of experience that the residential class has with these rates.

Where there is support for demand charges, it is generally because the rates are viewed as fair and equitable. And because they are perceived to provide an opportunity for customers to reduce their bills through load shifting, energy efficiency, and other means.

While consumer advocacy groups have generally been skeptical of residential demand charges, the concept has not faced universal opposition.[3] The environmental community has highlighted the potential benefits of demand charges in some instances. One consumer advocate expressed support for the use of demand charges to recover distribution capacity costs.

In recognition of the multiple views on demand charges, we have attempted to summarize the perspectives on both sides of each issue. This is intended to help identify the gap where there is disagreement, in order to determine a productive path forward.

The summary is provided in Figure 1.

Bridging the Gap

At times, the electricity industry appears to be at a stalemate when it comes to residential rate reform. The need to improve

Brief History of Demand Charges

1881: Thomas Edison's first contract for electricity is a charge per lamp installed.

1892: British engineer John Hopkinson differentiates fixed and variable costs but continues to define maximum demand as total connected load. This two-part rate is promoted in the U.S. by Samuel Insull.

Mid-1890s: Controversy over price discrimination in special contracts leads to a search for consistent pricing scheme. Arthur Wright introduces demand charges based on maximum actual demand, while William Barstow proposes to measure demand coincident with the system peak.

Early to mid-20th century: Electrification of the U.S. Demand charges persist for commercial and industrial customers, but billing at the household level is mostly through volumetric rates due to metering constraints.

Middle to late-20th century: A period of relatively little change in residential rate design.

1970s and 1980s: Pilot studies assess the effectiveness of residential time-of-use pricing. Demand charges are often a component of these rates. The Public Utility Regulatory Policies Act of 1978 requires time-of-use rates. But residential demand charges are largely lost in the mix.

Early 21st century: The rediscovery of residential demand charges. Advancements in metering technology remove a technical barrier to offering demand charges and time-varying rates to the mass market. Concerns about equity in an environment of growing adoption of distributed generation lead utilities to file proposals to reform residential rates. Many of these proposals include a demand charge.

residential rate design is recognized by many as an urgent issue. But in many cases regulatory decisions about the best way to move forward are being postponed and delayed.

So how does the industry overcome this paralysis? How can we bridge the gap of disagreement and resolve the opposing views?

We propose eight important activities that will help to address key stakeholder concerns. The activities are designed to facilitate a consensus-oriented approach to the transition to demand charges.

Note that each utility has its own is unique history with rate design. Regulatory and policy objectives vary by state, as do the mix and preferences of customers and local stakeholders.

Therefore, we recommend that utilities tailor these suggestions to their own unique circumstances. These ideas should be considered a menu of options from which utilities can pick and choose, rather than a sequential checklist of activities.

Further, it is not necessary that these activities delay the rollout of demand charges. Several of the activities can be conducted in parallel to the demand charge rollout, as part of ongoing efforts to help customers understand and manage their electricity bills. A "test, learn, and adapt" approach would allow full-scale deployments to be rapidly refined and improved over time.

1. Quantify bill impacts, particularly for low and moderate income customers.

Detailed bill impact analysis will identify the customers whose bills increase or decrease on the new rates. This analysis is also helpful in determining other important but sometimes overlooked factors, such as month-to-month bill volatility. New data from smart meters and big data market research firms can be combined to conduct this distributional analysis across sociodemographic customer groups at a level of detail that was not possible until recently.

2. Assess customer understanding of demand charges through market research.

Research such as focus groups and surveys can be used to test customer acceptance of demand charges. Through survey-based conjoint analysis, the relative attractiveness of different demand charge designs could be measured.

3. Assess customer response to demand charges through empirical analysis.

If customers are able to shift load away from high load hours, they will reduce their bills. Well-designed pilots would offer the advantage of testing demand charges in a live but controlled setting.

4. Establish a national conversation on residential demand charges.

Given the emerging industry interest in this topic and the number of states that are currently reforming residential rates, an organized forum could be established and include facilitated discussions on key issues such as those identified in this article. Participants should include utilities, regulators, and stakeholders.

5. Consider innovative variations on conventional demand charge designs.

Demand charges are typically thought of as either non-coincident, where demand is measured as the maximum at any point in the billing cycle, or as peak-constrained, which typically means that demand is measured only during a window of peak hours of the day during the billing cycle. But there are many other less common variations to be considered.

6. Develop a customer education plan.

At each step in the rate design process, decisions about how to design the rate can be tied back to their implications for customer communications. Linking the two activities in this way will improve the likelihood that the rate is designed to be acceptable to customers.

7. Phase in the rate gradually.

Gradualism is a principle of ratemaking that is sometimes emphasized in regulatory proceedings. Phasing in a demand charge over time will help to reduce the bill impact that would otherwise be experienced by customers. And it will give them time to adjust to the new rate structure. There are several options available for making this gradual transition without excessively delaying the rollout.

8. Consider protections for vulnerable customers.

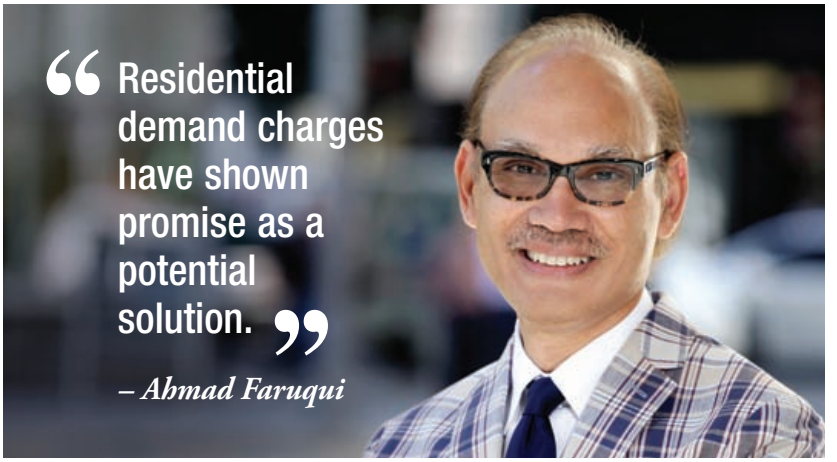
With any rate transition, there is often a policy focus on ensuring that vulnerable customers are not burdened with large bill increases. Many customer protection mechanisms are possible, such as a rate carve-out for very small consumers of electricity.

Conclusions

Ratemaking strategies must be robust. They must be flexible enough to respond to evolving policy goals and changes in the power system and in the customer base.

For example, declining block rates were popular early in the power industry's history. This was when average costs exceeded marginal costs. Growth in electricity consumption would lead to lower rates.

This changed when the industry matured and average costs decreased. Policy focus shifted toward encouraging conservation. Inclining block rates became popular as a result.



More recently, smart meters have been widely deployed. Time-varying and dynamic rates have received increasing attention.

Now, there are emerging concerns about equity and fairness in rate design, particularly as it relates to effects of growing adoption of distributed generation. Rate designs must continue to evolve.

Residential demand charges have shown promise as a potential solution to this issue. But transitioning to this new rate structure will require close coordination with industry stakeholders who present a broad range of perspectives on the topic. An approach to rate reform that is based on primary research, proactive outreach and pragmatic transition planning will greatly improve the effectiveness of the transition. PUF

Endnotes:

1. A demand charge is not based on a truly instantaneous measure of demand, as it is typically averaged over an interval of fifteen, thirty, or sixty minutes. Further, there are a variety of ways in which demand could be defined for the purposes of billing a demand charge (such as maximum demand during a period that is coincident with the system peak, maximum during a period that is coincident with the class peak, or maximum demand based on the customer's own peak over the course of the month). Other alternatives are also possible.
2. See Ahmad Faruqui and Wade Davis, with Josephine Duh and Chris Warner, "Curating the future of rate design for residential customers," *Electricity Policy*, July 18, 2016, and Ryan Hledik, "Rediscovering Residential Demand Charges," *The Electricity Journal*, 27(2), 2014.
3. For instance, the Rocky Mountain Institute acknowledged the opportunities that demand charges provide for automated demand response in its report "The Economics of Demand Flexibility," and identified residential demand charges as one option for introducing greater sophistication into retail rates in "Rate Design for the Distribution Edge."

   The Clean Energy Group and the National Renewable Energy Laboratory have both highlighted the potential synergies between demand charges and behind-the-meter energy storage in recent publications.