Rate Design Primer: Who Wants What Changes and Why?

Historically, utility rates for residential customers have had two components: (1) a fixed customer charge; and (2) a volumetric rate (expressed in $/kWh) which utilities use to recover their capital and operations costs associated with electricity distribution services. In recent years, however, utilities have proposed to modify this standard two-part rate in response to recent trends in the electric utility industry. Because rate design is a critical component of utility and customer decision-making, such proposals have become a key debate topic among a variety of stakeholders, including utilities, consumer advocates, environmental and energy efficiency advocates, industrial and trade interests, and utility regulators.[1] This memo provides an overview of the drivers behind new rate design proposals, the competing objectives that rate design can promote, commonly proposed rate modifications, and key questions moving forward.

Drivers of Rate Design Proposals

Declining Energy Usage and Rising Utility Costs: Historically, utilities have recovered their costs for grid investments, which they view as fixed costs, through volumetric charges. But in recent decades, as electrical devices and appliances have become more efficient and distributed energy resources (DERs)[2] have risen in popularity, demand growth has fallen dramatically, eroding many utilities' revenue. At the same time, utility costs are rising due to aging infrastructure and increasing peak-to-average demand ratios. Utilities thus seek to correct what they view as a pricing "mismatch" by proposing rate design changes that would allow them to recover their infrastructure-related costs as fixed costs.

Smart Grid Technologies: Smart meters, "intelligent" appliances, storage technology, and increased deployment of advanced metering infrastructure have expanded the ability of both consumers and utilities to monitor and respond to energy usage data in real time. More sophisticated rate designs may be necessary to capture the full potential of these technologies.[3]

Rate Design Objectives

Rate design may be used to promote a variety of (often competing) economic and public policy objectives. As a result, rate design necessarily requires trade-offs between these competing objectives and priorities. The following is a list of commonly cited objectives and principles for rate design:[4]

Economic	Consumer Protection	Environmental and Social
• Assuring recovery of prudent utility costs • Providing accurate and actionable price signals • Setting forward-looking and adaptable rates to enable utilities and customers to make smart investment decisions	• Protecting electricity affordability and access for consumers (especially low-income consumers) • Ensuring that rates are simple and understandable • Maintaining bill stability and preventing sudden bill increases	• Maintaining/improving grid reliability and resiliency • Reducing negative public health and environmental impacts • Encouraging energy efficiency and/or renewable energy

[1] A recent survey of utility officials identified rate design as one of the top five issues facing utilities in 2017.
[2] For the purposes of this memo, DERs include distributed generation resources, energy efficiency, demand response measures, and storage.
[3] Regulatory Assistance Project (RAP), Smart Rate Design for a Smart Future, p. 7.
[4] RAP, Smart Rate Design for a Smart Future, p. 8.

Commonly Proposed Rate Design Changes

Utilities and advocates have commonly proposed four types of changes as potential near-term solutions.

1. Fixed Charge Increases	
Description	Utilities propose to increase the fixed charge portion of residential utility bills, usually to recover infrastructure-related costs in service areas with declining or stagnant demand growth.
Rationale	• Utilities want to ensure that they are adequately compensated for grid services. • Fixed charges provide greater revenue stability. • An alternative to fixed charges, raising rates, imposes greater costs on non-DER customers than on DER customers, which may be viewed as inequitable. • Compared with other rate proposals, fixed charges are relatively simple to administer.
Criticisms	• Fixed charges can disproportionately impact low- or fixed-income customers because customers have no way to reduce or control such charges. • Because energy customers do not reduce fixed charges by reducing energy usage, they act as a disincentive for customers to pursue energy efficiency or other DERs. • EE and consumer advocates argue that "fixed charges" often are not "fixed" except perhaps over short time-frames.
Outlook	Utility fixed charge proposals have faced significant opposition from consumer, renewable, and EE advocates from across the country. PSCs have rejected most such proposals in part or in full. In some cases, PSCs have even decreased utility fixed charges where the utility asked to increase them. As such, utilities have begun to consider other rate changes, particularly demand charges and time-of-use rates, or minimum bills.

2. Demand Charges	
Description	Demand charges are monthly fees based on a customer's highest period of usage[5] during a given billing period. Demand charges are typically based on the customer's individual peak demand (non-coincident peak, or NCP), regardless of whether that occurs during system peak periods. Some proposals charge customers based on their contribution to system peak demand (coincident peak). A customer's peak demand charge may apply over a several-month period, not in the month in which the peak occurs.
Rationale	• Demand charges assign higher costs to those who use energy more intensively, which may be more equitable. • May send customers a price signal to reduce their maximum demand.
Criticisms	• While demand charges have been commonly used for commercial and industrial customers, they have rarely been imposed on residential customers in the past, and there is little evidence that residential customers can respond appropriately to NCP demand charge price signals. • Utility costs are primarily associated with system peak demand rather than individual customer peak demand; thus, demand charges may not send efficient price signals to consumers that reduce system peak demand.

[5] For instance, demand charges are often based on the 15-minute period over which a consumer had the highest average usage during a billing period. The time period used can vary.

2. Demand Charges (continued)	
Criticisms	• Demand charges impose greater costs on customers that use energy in relatively intense "bursts", even if such bursts occur infrequently and/or the customer's total energy use is low.
Outlook	Considering the generally negative PSC response to fixed charge proposals, utilities seem to be looking at demand charges, time-based rates, or other alternative rate proposals. Demand charge proposals seem to be largely supported by utilities, but are not usually supported by advocacy and consumer protection groups, who prefer time-based rates.

3. Time-Based Rates	
Description	Time-based pricing charges customers higher or lower rates based on when they use energy use and the simultaneous level of demand on the grid. Time-based rates can be simple (such as time-of-use or seasonal rates) or more granular and complex (such as dynamic or real-time pricing).[6]
Rationale	• Time-varying rates send more accurate price signals to customers, which could lead customers to change their consumption patterns to reduce peak and total consumption. Utilities pay more for generation at higher peaks, so it is reasonable that customers should too. • If combined with smart meters, time-based rates can also enable locational marginal pricing and attribute pricing. • Research suggests that time-based rates are easier for residential customers to understand than demand charges.
Criticisms	• Time-based rates may be more difficult or costly to administer; advanced metering is required for more granular time-based rate structures. • Consumer advocates stress the need for certain safeguards, such as customer education and advance notice of changes in billing structures. • Vulnerable customers may be unable to shift their energy usage to benefit from time-varying rates.
Outlook	Time-varying rates are largely supported by environmental and energy advocates, and supported by consumer advocates provided consumer safeguards are in place.[7] Utilities are generally supportive of time-varying rates if imposed in conjunction with other mechanisms to recover fixed costs.[8]

4. Minimum Bills	
Description	Minimum bills guarantee a utility a minimum annual revenue from each customer, even if their usage is zero. From the utility's perspective, the typical minimum billing process goes as follows: • Utility calculates the customer's monthly net energy use.

[6] For more detail on specific time-based rate schemes, see RAP, Smart Rate Design for a Smart Future, p. 44-45.
[7] Lawrence Berkeley National Lab, Recovery of Utility Fixed Costs: Utility, Consumer, Environmental, and Economist Perspectives (June 2016), p. 27-28.
[8] Lawrence Berkeley National Lab, Recovery of Utility Fixed Costs: Utility, Consumer, Environmental, and Economist Perspectives (June 2016), p. 9-10.

4. Minimum Bills (Continued)	
Description	• If the customer's net energy use results in a bill higher than the minimum bill amount, the utility bills for the customer's net energy use at the volumetric electricity rate. • If the customer's energy use is lower than the minimum bill amount, the customer pays the minimum bill charge for the month. In states with net metering, if the customer's net energy use is negative, the utility bills the customer for zero kWh used and calculates any excess net metering credit. For the next month where net energy use is positive, the utility applies any net metering credits down to the minimum bill charge, then carries over any remaining net metering credits.[9]
Rationale	• Minimum bills do not disproportionally impact low- or fixed-income customers. • Except for the lowest-usage customers, minimum bills do not encourage greater energy consumption. • Minimum bills ensure that customers with second homes, where energy usage is seasonal, contribute appropriately to distribution costs.
Criticisms	• Minimum bills are not an effective long-term rate solution except for utilities with high numbers of seasonal customers. • Minimum bills discourage efficiency and distributed generation that could reduce consumption below the minimum threshold.
Outlook	Minimum bills seem to be generally supported by all stakeholders, but only as a short-term option (e.g., as an alternative to fixed charge increases). But, minimum bills still discourage levels of distributed generation or efficiency that would reduce consumption below the minimum threshold. And, minimum bills must be set at a level that is sufficient to recover utility costs but low enough that they do not penalize most customers. As one report recently concluded, "minimum bills are superior to fixed charges, but they still operate as a relatively blunt instrument for balancing ratepayer and utility interests."

Key Issues and Questions Moving Forward

Most utility fixed charge proposals have been rejected in part or full by PSCs. As a result, rate design debates seem to be shifting to other potential near-term options, such as residential demand charges, time-of-use rates, and minimum bills. But critical questions remain about the application of each of these alternative rate designs and the impacts they may have on customers, energy demand, and other policy objectives. In addition, rate design is likely to remain a volatile and controversial subject for the near future, due to the transformative impacts on today's utility business model of rapidly emerging technologies, including wide-scale deployment of advanced metering and smart grid infrastructure, smart devices (e.g., thermostats), energy storage, electric vehicles, and more. The following resources go into further detail about specific rate design questions and issues:

- Time-Based Rates and Demand Charges: Rocky Mountain Institute, Review of Alternative Rate Designs (2016), pp. 79-81.
- Time-Based Rates: RAP, Time-Varying and Dynamic Rate Design, pp. 32-33.
- Rate Design for Smart Technologies: RAP, Smart Rate Design for a Smart Future, pp. 56-69.

[9] RAP, Electric Utility Residential Customer Charges and Minimum Bills.