

Transitioning to Modern Residential Rate Designs

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THE **Brattle** GROUP

Today's residential rate designs have outlived their usefulness

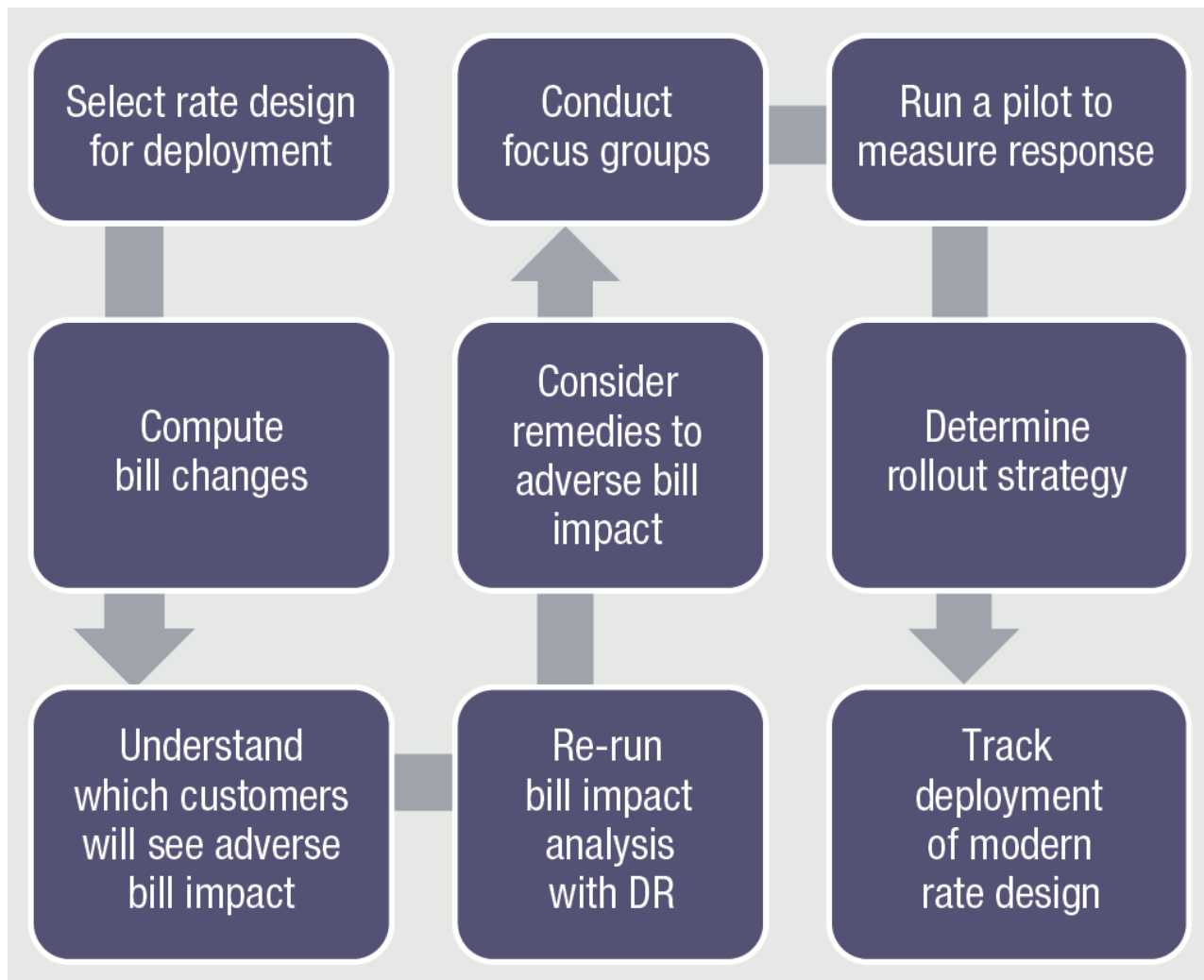
- Today's residential rates are largely volumetric, insignificant fixed charges, no demand charge.
- Residential rates need to be modernized to meet the challenge of integrating renewable resources into the grid.
- Modern retail rates facilitate renewable integration through cost reflectivity, which is most effectively achieved through a combination of:
 - A time-varying energy rate (e.g. time-of-use or dynamic pricing)
 - A demand charge (either coincident peak, non-coincident peak or some combination of the two)
 - A fixed charge large enough to recover fixed costs (billing, metering, and customer service)

Three misperceptions have prevented modern rates from being deployed at scale:

1. Customers don't spend more than a few minutes each year thinking about their electricity bill.
2. Modern rate designs will be too complex for customers to understand.
3. Modern rate designs will cause some customers to instantly see higher bills, leading to strong objections.

A strategic implementation plan can help mitigate the barriers to modern rates

Nine steps for a seamless transition to modern rate design:



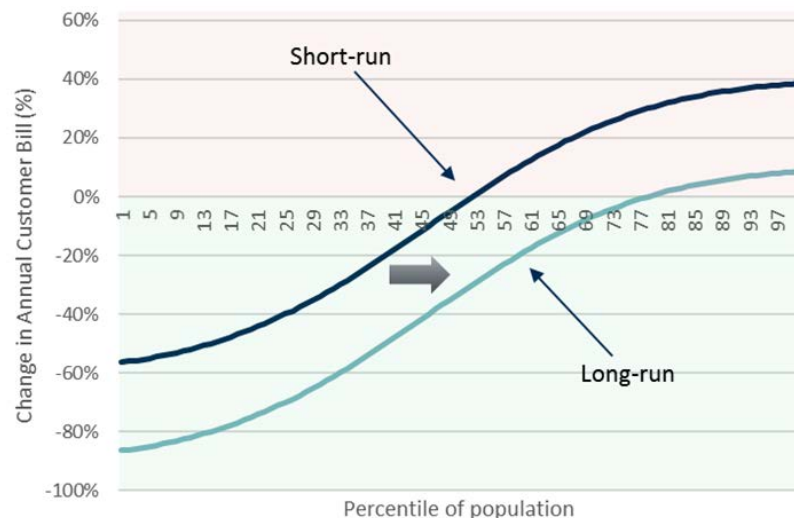
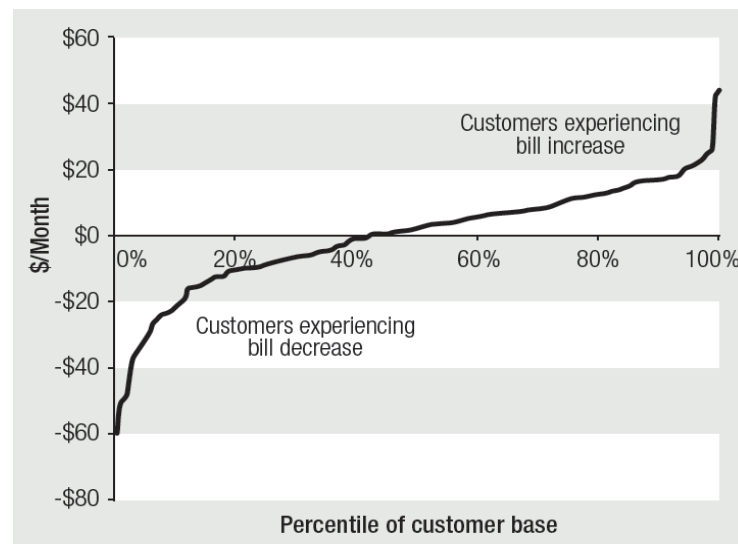
1. Pick the specific rate design for deployment

Examples of modern rate designs:

Rate Design	Definition
Critical Peak Pricing (CPP)	Customers pay higher prices during critical events when system costs are highest or when the power grid is severely stressed.
Demand Charges	Customers are charged based on peak electricity consumption, typically over a span of 15, 30, or 60 minutes.
Peak Time Rebates (PTR)	Customers are paid for load reductions on critical days, estimated relative to a forecast of what the customer would have otherwise consumed (their “baseline”)
Real-Time Pricing (RTP)	Customers pay prices that vary by the hour to reflect the actual cost of electricity
Seasonal Rates	The year is divided into different seasons, commonly winter and summer, each of which have distinct rates. Prices are higher in peak seasons to reflect seasonal variation in the cost of supplying energy.
Time-of-Use (TOU)	The day is divided into peak and off-peak time periods. Prices are higher during the peak period hours to reflect the higher cost of supplying energy during that period.
Variable Peak Pricing (VPP)	During alternative peak days, customers pay a rate that varies by day to reflect dynamic variations in the cost of electricity.
Fixed bill	Customers pay a fixed monthly bill accompanied with tools for lowering the bill (such as incentives for lowering peak usage)

Rate changes will create winners and losers. It is essential to understand the extent of those impacts.

2. Compute the bill impacts of the new rate for a representative sample of customers.
3. Understand the regional and socio-economic characteristics of those customers experiencing rate increases. Use rebates or low-income pricing to mitigate the impacts on vulnerable customers.
4. Re-run the bill impact analysis, this time allowing for a certain amount of demand response.



5. If bill impacts are still significant for a certain group of customers, consider additional remedies

Remedy	Implementation
Gradualism	Roll out the new rates gradually for each rate design element. For example, to introduce a TOU rate, if the peak price will be 25 ¢/kWh and the current tariff is 15 ¢/kWh, implement a peak price of 17 ¢/kWh in the first year and increase it annually by 2 ¢/kWh until it reaches 25 ¢/kWh.
Bill Protection	Provide customers with bill protection for a limited period of time so that they pay the lower of their old and new bill.
Optional Rates	Make the new rate design optional for vulnerable customers, mandatory for the largest customers, and the default for all other customers.
Financial Assistance	Provide customers with adverse bill impacts financial assistance for a limited period of time.
Enabling Technologies	Install enabling technologies such as smart thermostats on customer premises.
Two-staged Rollout	Structure the rate into two stages, where the first stage charges customers the current rate if their usage resembles a historical reference period, and the second stage exposes them to the new rate.

Testing the design and rollout strategy

6. Conduct focus groups with customers to communicate the rationale behind the selected rates and see if they would be comfortable with the modern rate designs.

Make appropriate modifications in the language and possibly in the rate design parameters.

7. Conduct a pilot to measure the amount of demand response.

The pilot should uphold the principles of experimental design to ensure statistical validity and allow for extrapolation to the target customer class.

Rolling out the rate

8. Determine the final rollout strategy.
9. Track the deployment on an ongoing basis. Survey customers for feedback, and make necessary modifications in the rate design on a regular basis.

Ongoing deployments of modern rates prove that with strategic planning, these new and innovative tariffs can be implemented successfully

Utility or Location	Type of Rate	Applicability	Participating Customers
Oklahoma Gas & Electric	Variable Peak Pricing (VPP)	Opt-in	20% (130,000)
Maryland (BGE, Pepco, Delmarva)	Dynamic Peak Time Rebate (PTR)	Default	80%
Ontario	Time-of-Use (TOU)	Default	90% (3.6 million)
United Kingdom	Time-of-Use (TOU)	Opt-in	13%
Hong Kong (CLP Power Limited)	Dynamic Peak Time Rebate (PTR)	Opt-in	27,000
Arizona (APS, SRP)	Time-of-Use (TOU)	Opt-in	57% of APS' residential customers (20% of which are also on a demand charge), 36% of SRP's
California (PG&E, SCE, SDG&E)	Time-of-Use (TOU)	Default (2019)	TBD – 75-90%*
California (SMUD)	Time-of-Use (TOU)	Default	75-90%*
Colorado (Fort Collins)	Time-of-Use (TOU)	Mandatory (for residential)	100%
Illinois (ComEd, Ameren Illinois)	Real Time Pricing (RTP)	Opt-in	50,000
France	Time-of-Use (TOU)	Opt-in	50%
Spain	Real Time Pricing (RTP)	Default	50%
Italy	Time-of-Use (TOU)	Default	75-90%*

*Estimated participation based on historical trends

Looking to the future

Smart meters have been installed in the homes of half of all residential customers in the U.S.

Emerging customer technologies such as smart thermostats, digital appliances, rooftop solar, battery storage, and electric vehicles offer new pathways for efficient rate design.

The time has come for electric utilities to begin modernizing their century-old rate designs.

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He has worked for nearly 150 clients on 5 continents, including 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 given seminars on all 6 continents.

His research has been cited in Business Week, The Economist, Forbes, National Geographic, The New York Times, San Francisco Chronicle, San Jose Mercury News, Wall Street Journal and USA Today. Ahmad has appeared on Fox Business News, National Public Radio and Voice of America. He is the author, co-author, or editor of 4 books and more than 150 articles, papers, and reports on energy matters. He has published in peer-reviewed journals such as Energy Economics, Energy Journal, Energy Efficiency, Energy Policy, Journal of Regulatory Economics and Utilities Policy and trade journals such as The Electricity Journal and the Public Utilities Fortnightly. He is on the editorial board of The Electricity Journal.

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