

Customer Driven Rate Design

PRESENTED TO
California Municipal Rates Group
Annual Meeting

PRESENTED BY
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Prepared with Dr. Ahmad Faruqui

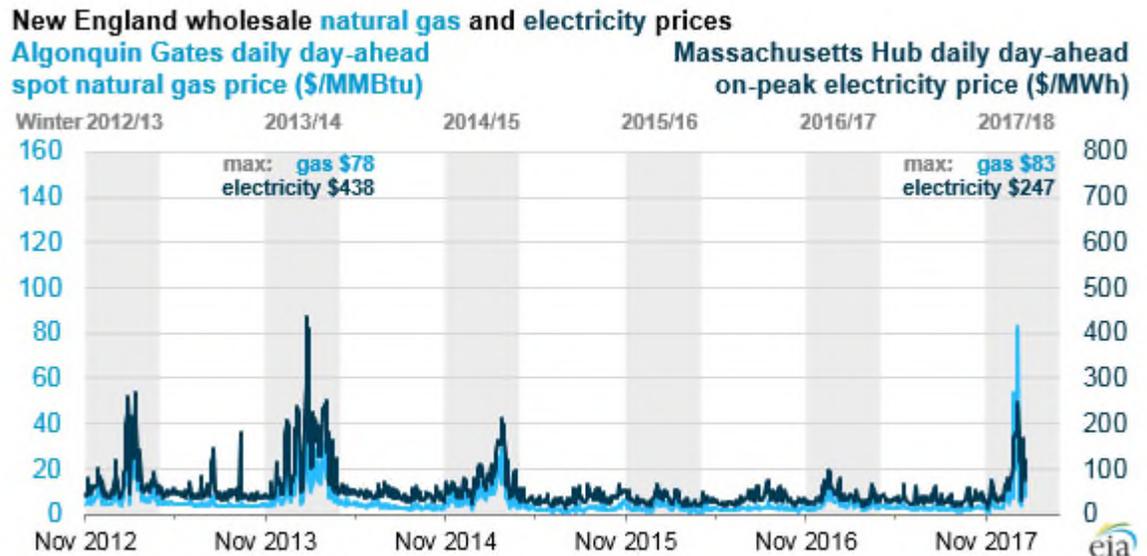
April 9, 2019

THE **Brattle** GROUP



A Customer's Potential

- 2013/14 Polar Vortex
- Record low temperatures
- Fuel supply interruptions
- Electricity demand in New England was met, but at high cost
 - Jan 23 2014: \$78/MMBtu NG
 - DA LMPs: \$400/MWh avg; \$850/MWh hourly max
- **Oil peakers providing 25% of generation**
- 2017/18: similar challenges
- Underlying problem is *complex*, and it will take some time for supply-side solutions to develop



Source: U.S. Energy Information Administration, based on SNL

How many more customers could help in these situations, if they had better awareness of the environmental and/or price impacts?

Value of Customer Flexibility during Extreme Situations

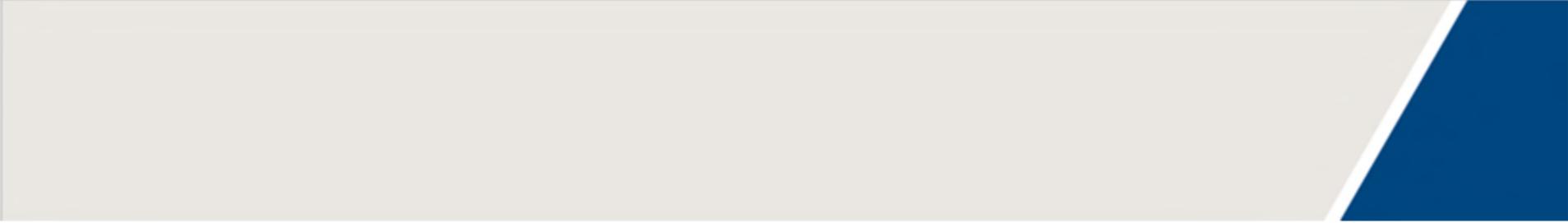
- Interest in connecting customers with price signals surges after times of crisis
 - First big wave of interest in the U.S. after 2000/2001 California power crisis
 - By 2013, more than 30 pilots featuring more than 160 energy-only pricing treatments were carried out around the globe
- In practice, demand response programs have been traditionally focused on reducing consumption during a handful of super-peak hours

Now More Than Just a Resource during Crisis

- The concept of flexible loads is nothing new, but value now recognized in the context of planning for, and operating, a cleaner electricity system
- Attention has turned to **load shift**, to make the best use of low-cost and clean resources when they are available
- And today, **customers** are even pushing for more options to customize power supply and rates
 - Looking for opportunities to save money—and more: improve greenness, support local resources
 - And actively shopping for what they want: smarter homes, Community Choice Aggregations, Direct Access is next

And Today's Technology Enables Customer Responsiveness More than Ever

- About half of all customer meters are advanced
- Big data statistical analysis can be done to better understand customer data and DR opportunities
- Webware and apps can simplify and customize two-way communications with customers
- Many customers are used to using tech to help them make complex choices



What are meaningful
choices and options for
customers?

Customers are Diverse

Going back to the New England example, what works for me won't work for everyone



I'm responsive to phone apps and plugged into energy enough to want to respond to alerts on short notice



But my neighbor relies mostly on a land line, and doesn't have as much last-minute flexibility to adjust consumption



My other neighbor is tech-savvy, but she just wants a stable, simple, predictable bill, and doesn't want to think about electricity at all

And the Basis for Fears in Rate Reform

Unexpected bill impacts

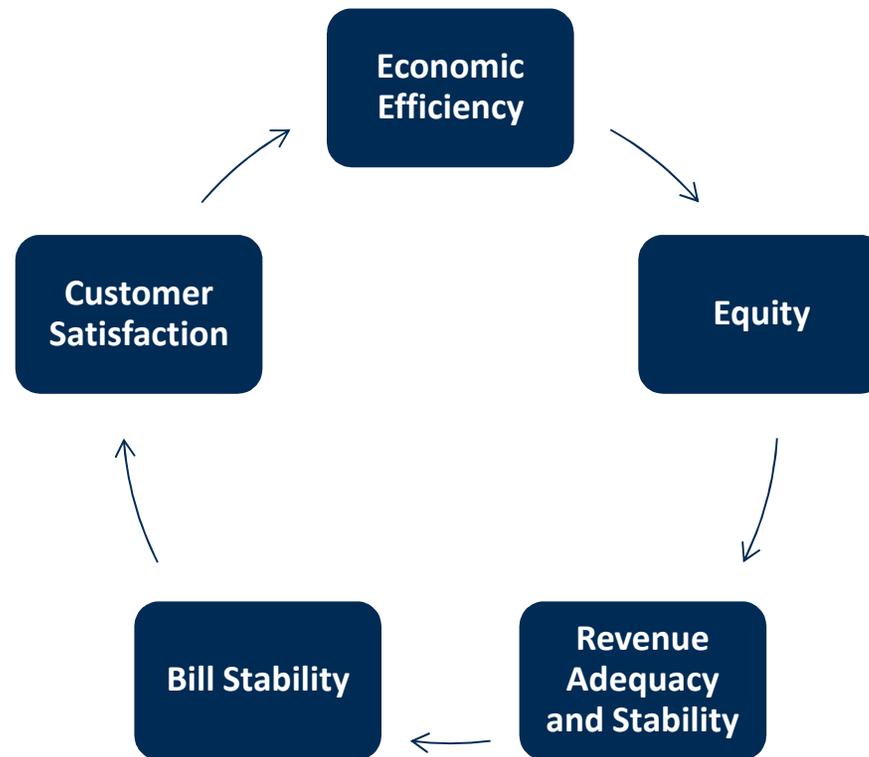
Customer backlash

Failure to realize expected benefits

Impacts on sensitive or disadvantaged customers

What Do We Think Best Serves Customers

In the 1960s, Professor Bonbright laid the foundation for regulated rate design

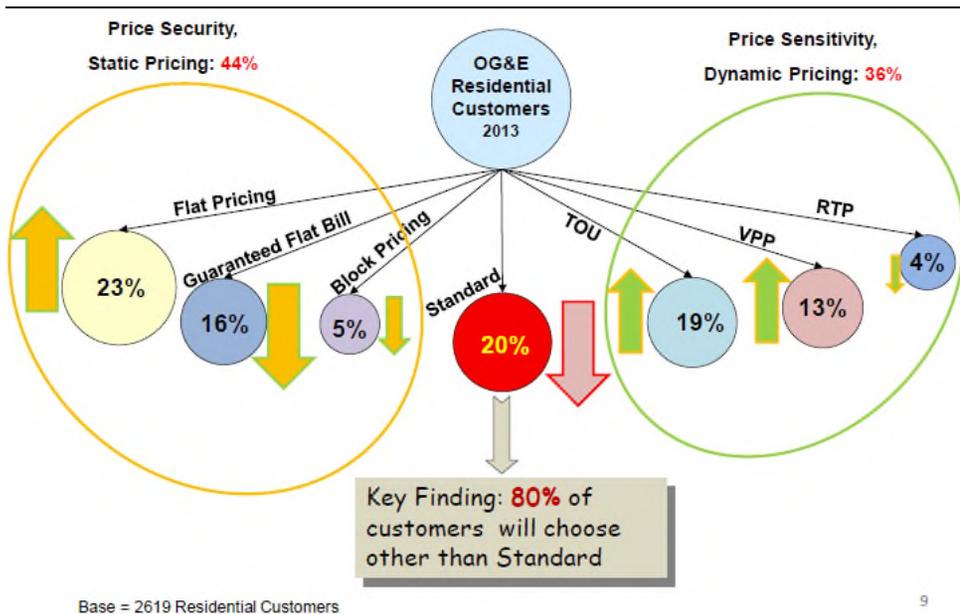


What Do Customers Say They Want

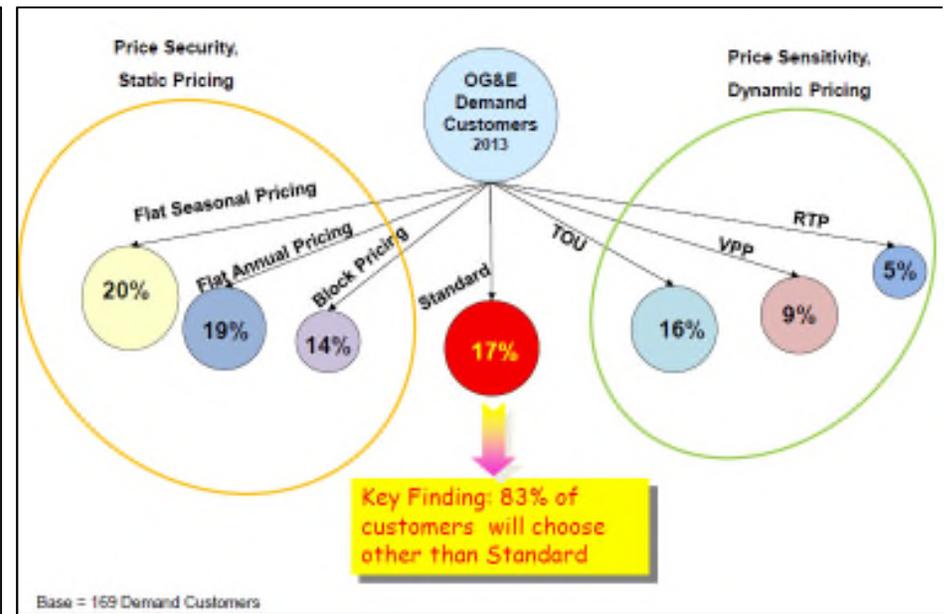
Oklahoma Gas and Electric Company unlocked the mystery: stated preference conjoint analysis

Customer Choices Among Pricing Plans (2013)

Residential Customers



Demand Customers



Source: Scott (2016). Survey responses include both Oklahoma and Arkansas customers. Arrows next to the residential customer results represent changes from an earlier survey conducted in 2010.

But Can We Really Give Customers All of These Options

Yes! Utilities have already amassed broad experience in alternative rate designs

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)

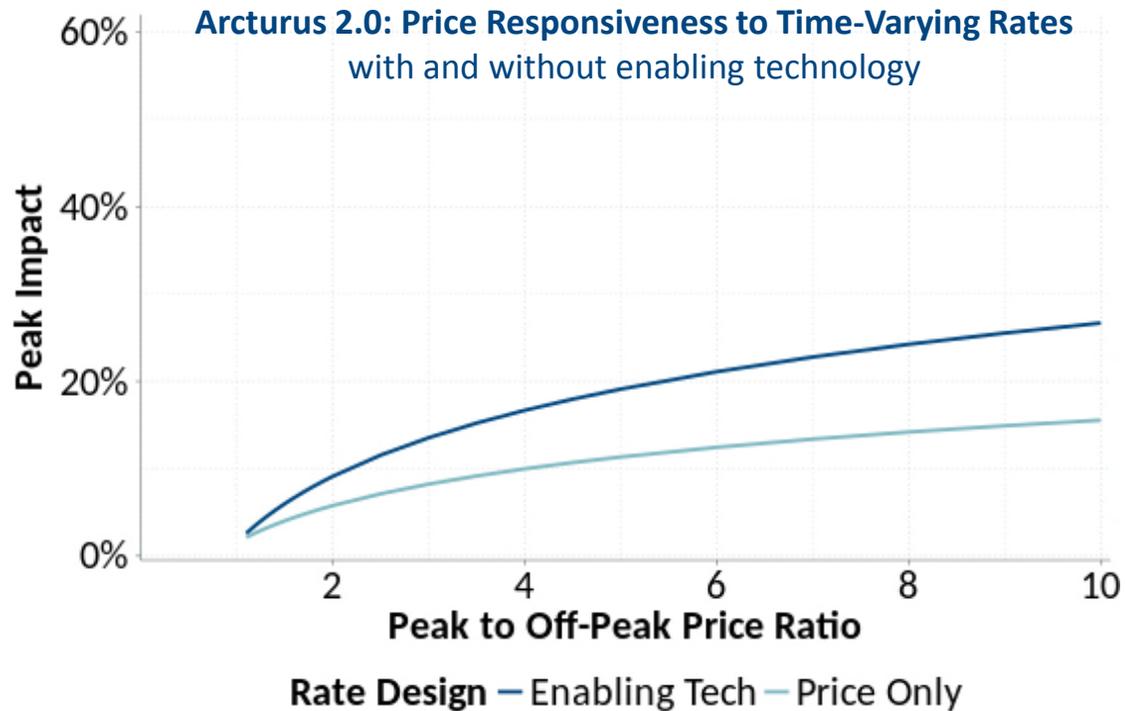
Demand subscription service (DSS)

Transactive energy (TE)

Real-time pricing (RTP)

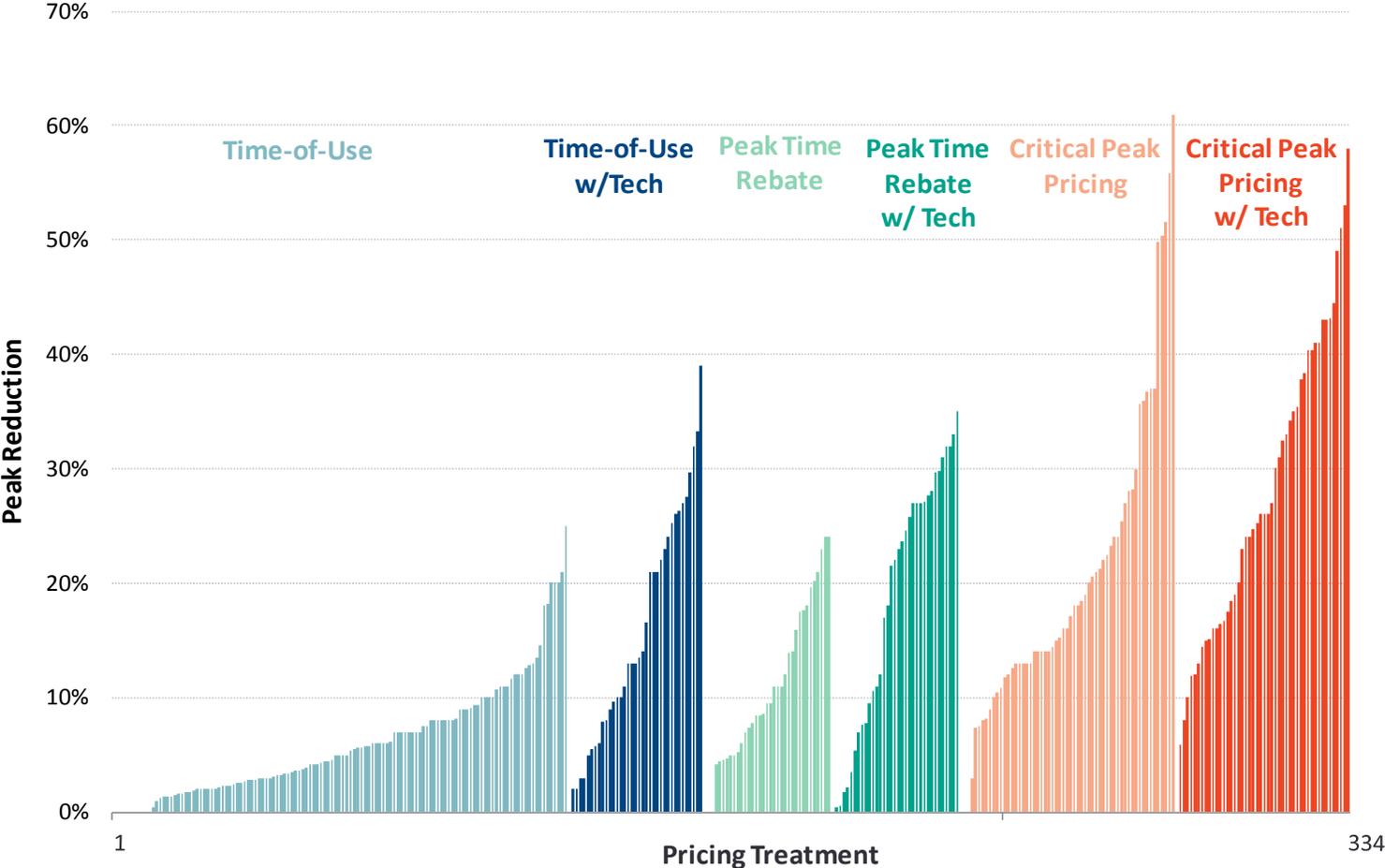
Do Customers Actually Respond?

The industry has much experience in demonstrating customer responsiveness, and technology is shown to help



Source: : (Faruqui et al, 2017). Arcturus 2.0 is a database of 337 treatments from 63 pilots, published in 2017.

Peak Reduction by Pricing Treatment



Source: (Faruqui et al, 2017).

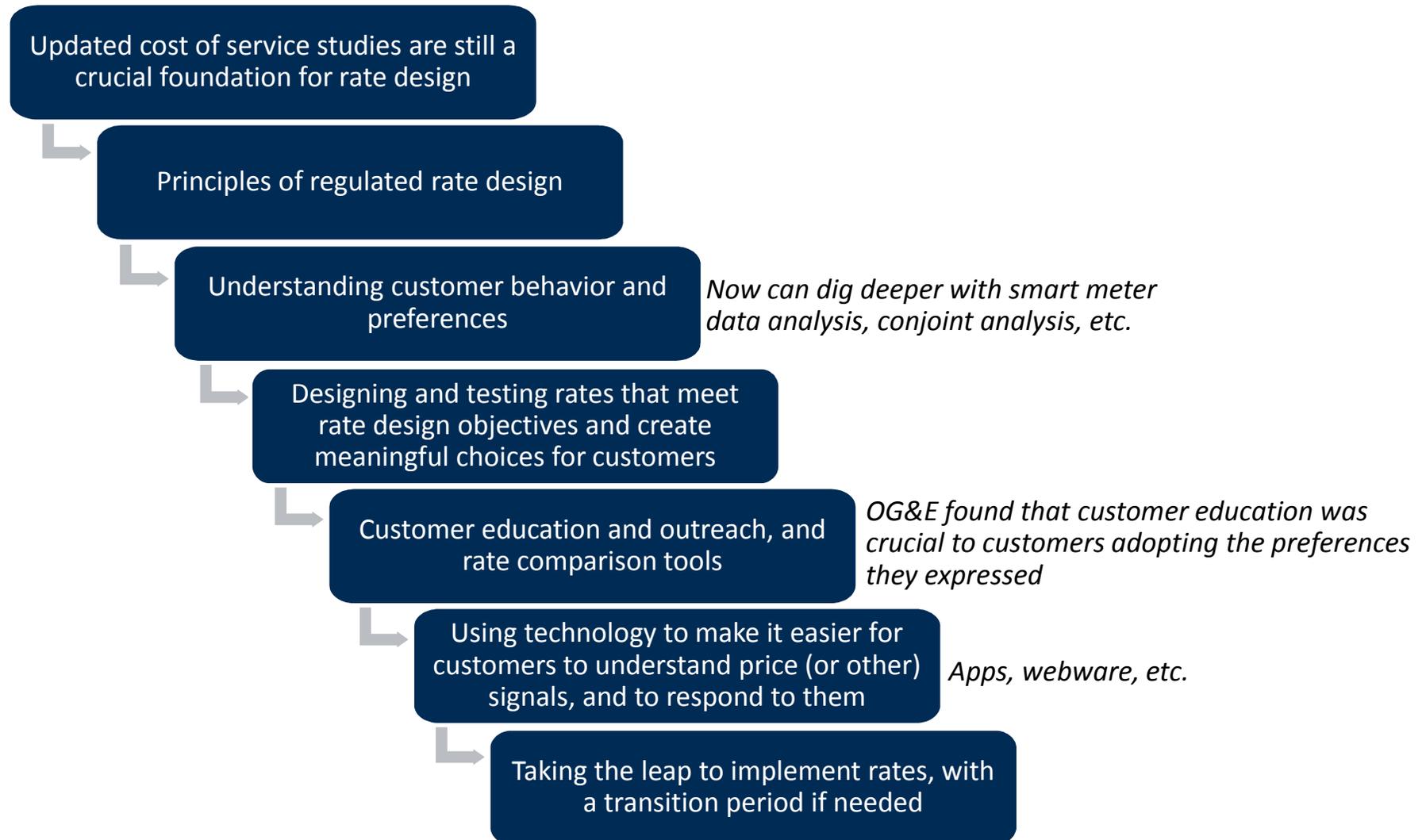
Arizona Public Service's 5 Residential Rate Options

Residential Plan Comparison*

PLANS	BASIC SERVICE CHARGE (PER DAY)	ENERGY CHARGE (PER kWh)	OFF-PEAK PRICING	SUPER OFF-PEAK WINTER PRICING	ON-PEAK SUMMER PRICING	ON-PEAK WINTER PRICING	ON-PEAK SUMMER PEAK USAGE (DEMAND) CHARGE PER kW	ON-PEAK WINTER PEAK USAGE (DEMAND) CHARGE PER kW	OFF-PEAK HOURS	SUPER OFF-PEAK WINTER HOURS	ON-PEAK HOURS	ENERGY USE RESTRICTIONS (12-MONTH AVERAGE)	RENEWABLE ENERGY COMPATIBLE
Saver Choice	42.7¢	-	10.873¢	3.200¢	24.314¢	23.068¢	-	-	8 p.m.–3 p.m. weekdays, all weekend +10 holidays	10 a.m.–3 p.m. weekdays	3 p.m.–8 p.m. weekdays	-	Yes (with grid access charge)
Saver Choice Plus	42.7¢	-	7.798¢	-	13.160¢	11.017¢	\$8.40	\$8.40	8 p.m.–3 p.m. weekdays, all weekend +10 holidays	-	3 p.m.–8 p.m. weekdays	-	Yes
Saver Choice Max	42.7¢	-	5.230¢	-	8.683¢	6.376¢	\$17.44	\$12.24	8 p.m.–3 p.m. weekdays, all weekend +10 holidays	-	3 p.m.–8 p.m. weekdays	-	Yes
Lite Choice	32.9¢	11.672¢	-	-	-	-	-	-	-	-	-	Under 600 kWh per month	No
THE FOLLOWING PLAN IS AVAILABLE TO ELIGIBLE CUSTOMERS AFTER A TRIAL OF 90 DAYS ON ONE OF THE SAVER CHOICE PLANS.													
Premier Choice	49.3¢	12.393¢	-	-	-	-	-	-	-	-	-	601-999 kWh per month	No

Source: (APS, 2019).

Summary of Important Ingredients to Tailoring Rates and Options to Customers



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March 2019

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Ms. Mariko Geronimo Aydin, a Senior Associate in The Brattle Group’s San Francisco office, has almost fifteen 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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