RAP Energy solutions for a changing world

Electric Rate Design

Introductory Principles
Residential Rate Design

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Regulatory Assistance Project (RAP)

RAP is a global, non-profit team of experts focused on the long-term economic and environmental sustainability of the power sector.

We provide assistance to government officials on a broad range of energy and environmental issues.

Our Rate Design Experts

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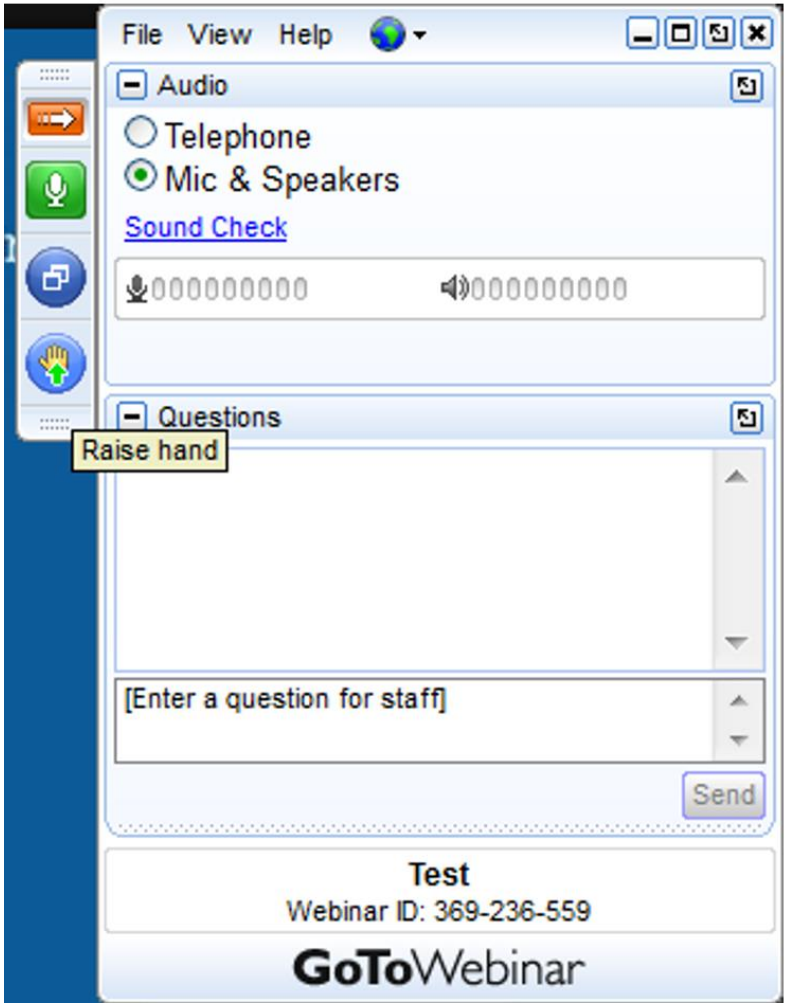
Overview

- Rate Design "101" (today)
  - Overview of cost allocation
  - Current residential rate design
- Rate Design "201" (November 14)
  - In the weeds: Cost allocation and the transition from costs to rates
  - Time-varying and dynamic rates
  - Net-metering and alternatives

Housekeeping

Please send questions through the chat box.

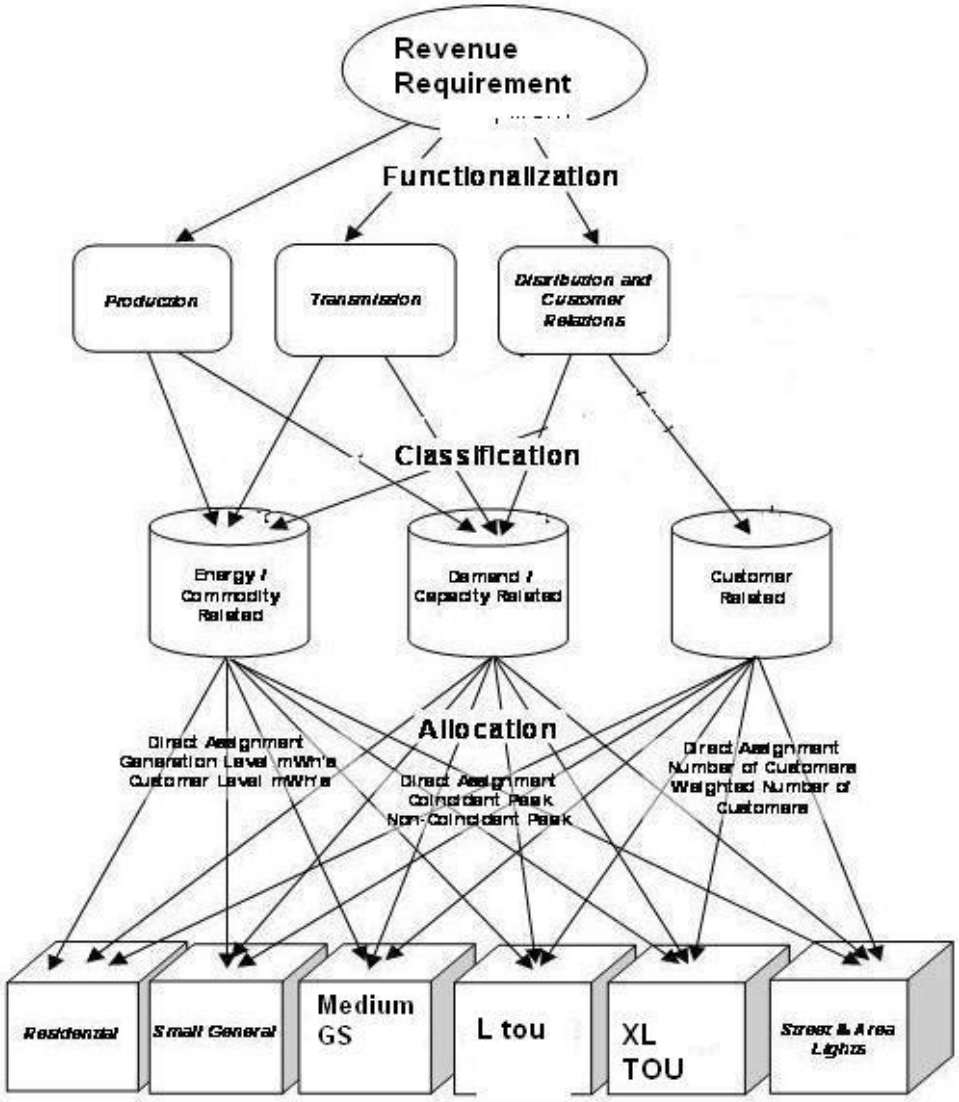


Dividing Up the Revenue Requirement

Embedded Cost Studies: Looking Back

Marginal Cost Studies: Looking Forward

Embedded Cost Study



Costs are **FUNCTIONALIZED** between Production, Transmission, and Distribution.

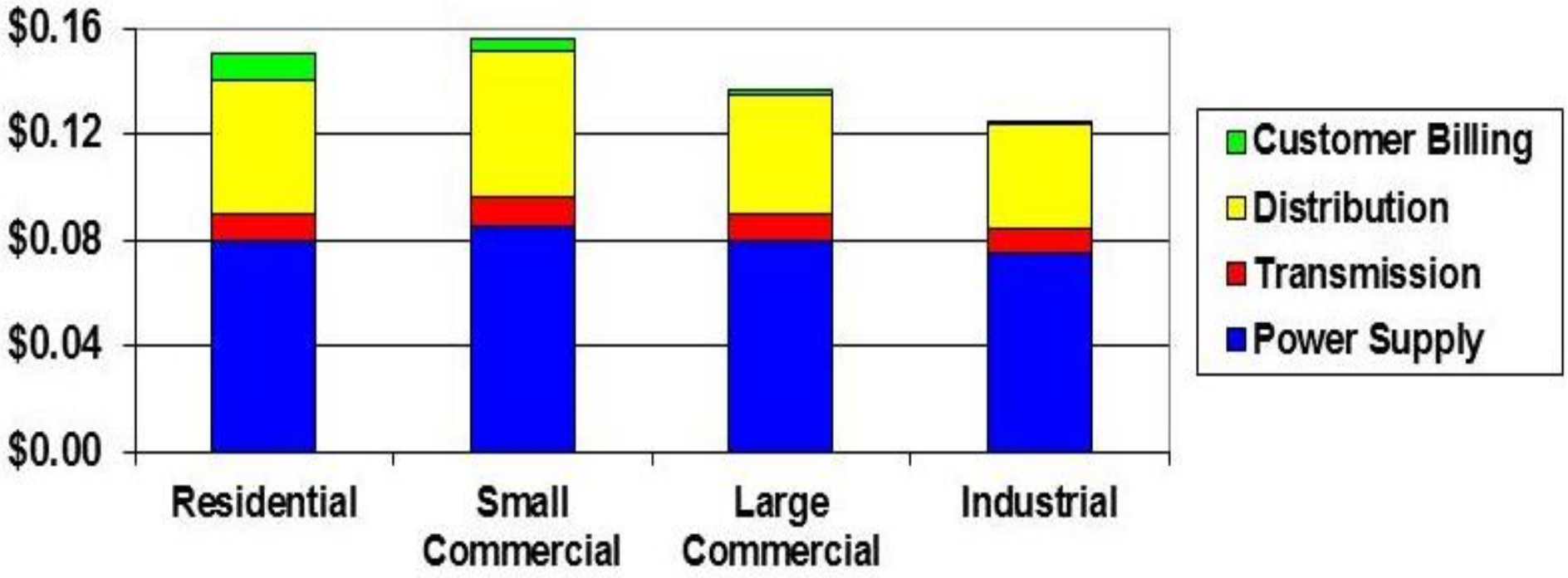
Costs are **CLASSIFIED** between Energy, Demand, and Customer related.

Costs are **ALLOCATED** between customer classes.

Classification Matters

- Generation and Distribution are the BIG cost categories.
- Demand-related costs fall heavily on residential/small commercial
- Customer-related costs fall heavily on residential/small commercial
- Interested: Come back for Rates 201

Approximate Components of Electric Rates



Basic Rate Design Terminology

- **Customer Charge**: A monthly charge that applies independent of consumption. Also called a Basic Charge, Standing Charge, Meter Charge.
- **Energy Charge**: A price per kWh; may be in more than one time period, or more than one block. May be seasonal, or time-varying.
- **Demand Charge**: A monthly fee based on the highest instantaneous usage rate (usually highest hour) during the month or year.

Residential Rate Types
From Simple to Complex

- **Declining Block**: Lower price for increase usage
- **Flat Rate**: Uniform rate per kWh for all usage
- **Inclining Block**: Higher price for increased usage
- **Seasonal**: Higher price in peak season
- **TOU**: Higher price for on-peak hours.
- **TOU with Inclining Block**
- **Critical Peak**: A TOU price that has a much higher price for a limited number of hours. [Requires AMI]
- **Real-Time Price (RTP)**: A price that changes frequently with market conditions. [Requires AMI]

(Archaic) Residential Rate Declining Block Rate

Dayton Power and Light (Ohio)	
Customer Charge	$4.25/month
First 800 kWh	$0.0707/kWh
Additional kWh	$0.0585/kWh

NOTE: Many rates shown have extensive riders that add significant costs to the base tariffs.

Declining Seasonal Block Rate

Mid-American (Iowa)	
Customer Charge	$8.50/month
Summer	$0.10575/kWh
Winter: First 1,000 kWh	$0.08044/kWh
Winter: Over 1,000 kWh	$0.04536/kWh

Flat Rate

Indiana–Michigan Power (Indiana)	
Customer Charge	$7.30/month
Energy Charge	$0.08634/kWh

Unbundled Flat Rate (Typical in Restructured Regions)

Northwestern Utilities (Montana)	
Customer Charge	$5.25/month
Delivery Charge	$0.0285/kWh
Power Charge	$0.0645/kWh

Flat Rate/Seasonal

Xcel Energy (Minnesota)	
Customer Charge	$ 8.00/month
Summer Energy	$0.0867/kWh
Winter Energy	$.0739/kWh

Newfoundland Power		
	Summer	Winter
Per kWh	$0.0965/kWh	$0.1190/kWh

The Most Common Residential Rate Design: Inclining Block

- Goals include:
  - Allocation of low-cost resources
  - Recognition of load
  - Encouragement of conservation
  - Essential needs at affordable cost
  - Low-income benefits

Residential Inclining Block Rate

City of Palo Alto (California)	
Customer Charge	None
First 300 kWh	$0.096/kWh
Next 300 kWh	$0.130/kWh
Over 600 kWh	$0.174/kWh

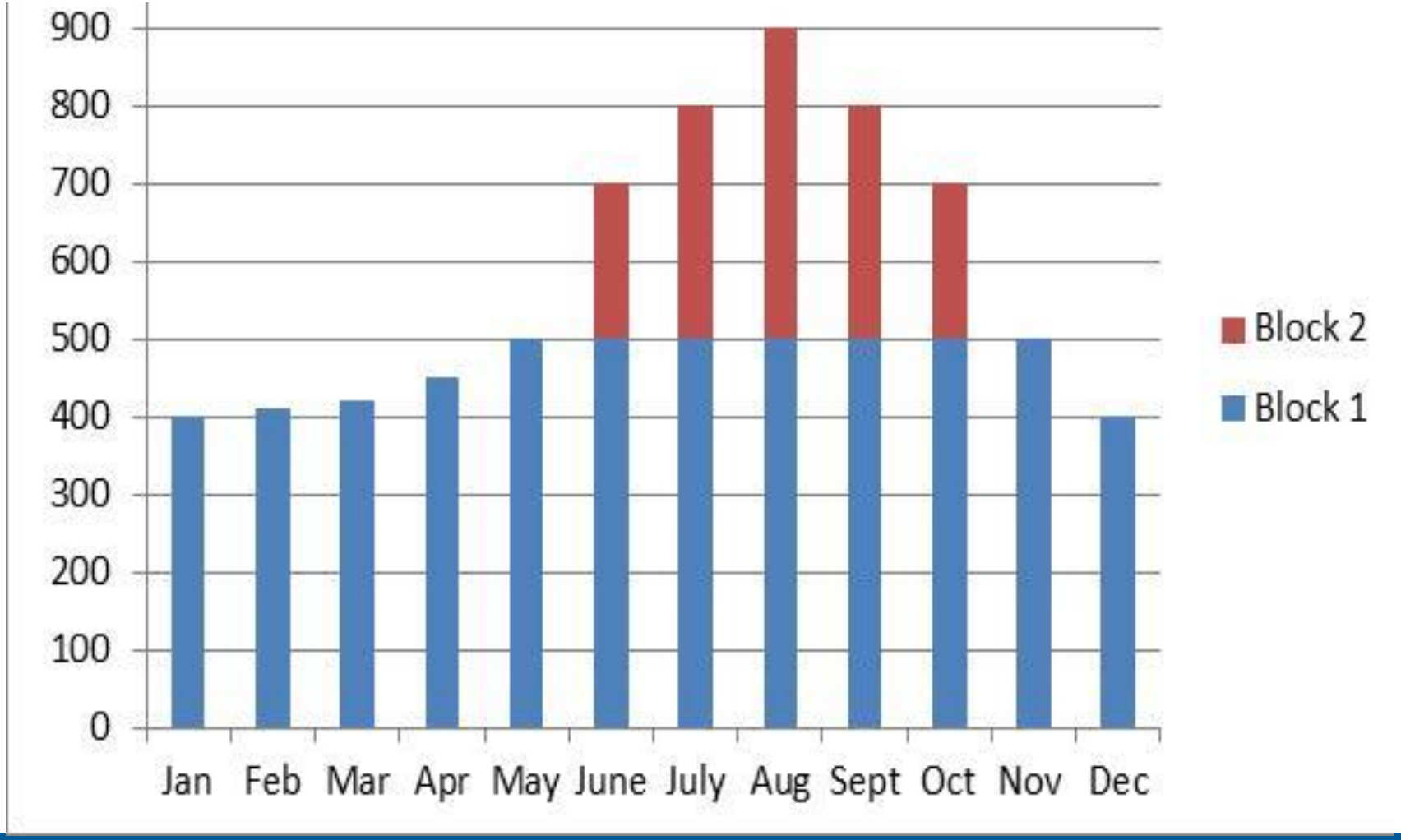
How an Inclining Block Rate Affects Most Consumption

Usage Block	% of Customers Whose Usage Ends In This Block	% of kWh Sales To Customers Whose Usage Ends in This Block	% of kWh Sales to Customers Whose Usage Exceeds This Block
0 - 250	29%	8%	92%
251 - 500	33%	23%	69%
501 - 750	17%	20%	51%
751 - 1,000	9%	15%	34%
>1,000	12%	34%	
Average Monthly kWh Usage:			526

Seasonal + Inclining Block

Arizona Public Service Company (Arizona) Optional TOU Available		
	Winter	Summer
0 – 400 kWh	$0.0942	$0.0969
401 – 800 kWh	$0.0942	$0.1382
801 – 3,000 kWh	$0.0942	$0.1617
Over 3,000 kWh	$0.0942	$0.1726

An Inclining Block Rate CAN BE a Seasonal Rate



Time of Use (TOU) Rate

Georgia Power (Georgia)	
Customer Charge	$10.00/month
On-Peak (2 – 7 PM, Mon-Fri, June – September)	$0.2032/kWh
Off-Peak	$0.0464/ kWh

Plus $0.04 fuel and other tariff riders.

TOU / Seasonal Rate

Tucson Electric (Arizona)		
Customer Charge		$11.50/month
	Summer	Winter
On-Peak	$0.1175/kWh	$0.0897/kWh
Off-Peak	$0.0785/kWh	$0.0689/kWh

Fixed-Period TOU Rates With Inclining Block Design

Fixed-Period TOU with Inclining Block	
Customer Charge	$5.00/month
Off-Peak	$0.10/kWh
On-Peak	$0.20/kWh
Baseline Credit, First 500 kWh	($0.04)/kWh

Rates 201: November 14

- Cost allocation principles and how they drive rate design
- Critical peak pricing
- Real-time pricing
- Net-metering and alternatives

Current Trend: Seeking Higher Customer Charges

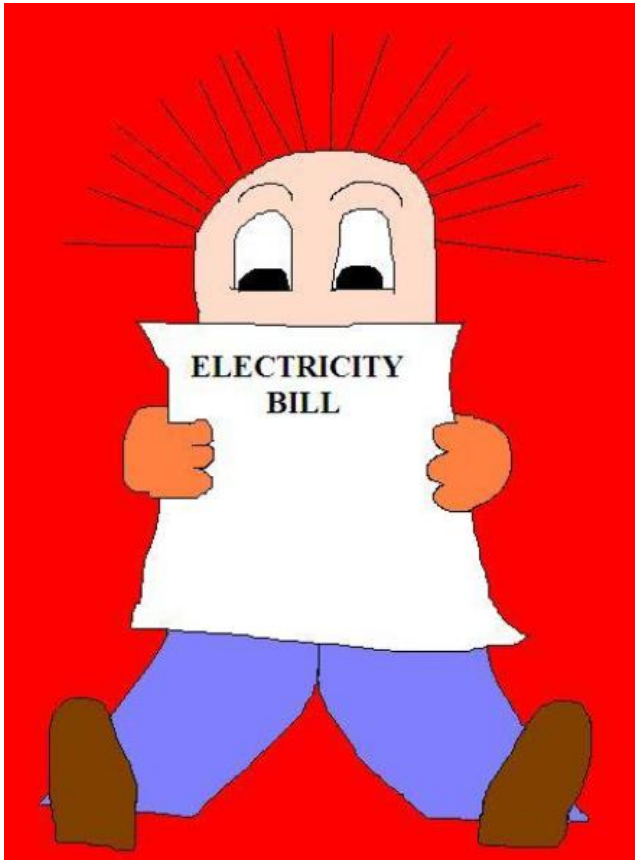
Customer Charges: Largest U.S. Utilities		
Pacific Gas & Electric Co.	CA	None
So Cal Edison	CA	$0.87
Public Servi…	NJ	$2.43
Detroit Edi…		$6.00
Virginia Ele…		$7.00
Florida Power & Light Co	FL	$7.24
Georgia Power Co	GA	$9.00
Commonwealth Edison Co	IL	$15.06
Consolidated Edison	NY	$15.76

Madison Gas and Electric Filing: $69/month

These utilities serve one in six Americans.

Adverse Impacts of High Fixed Charges

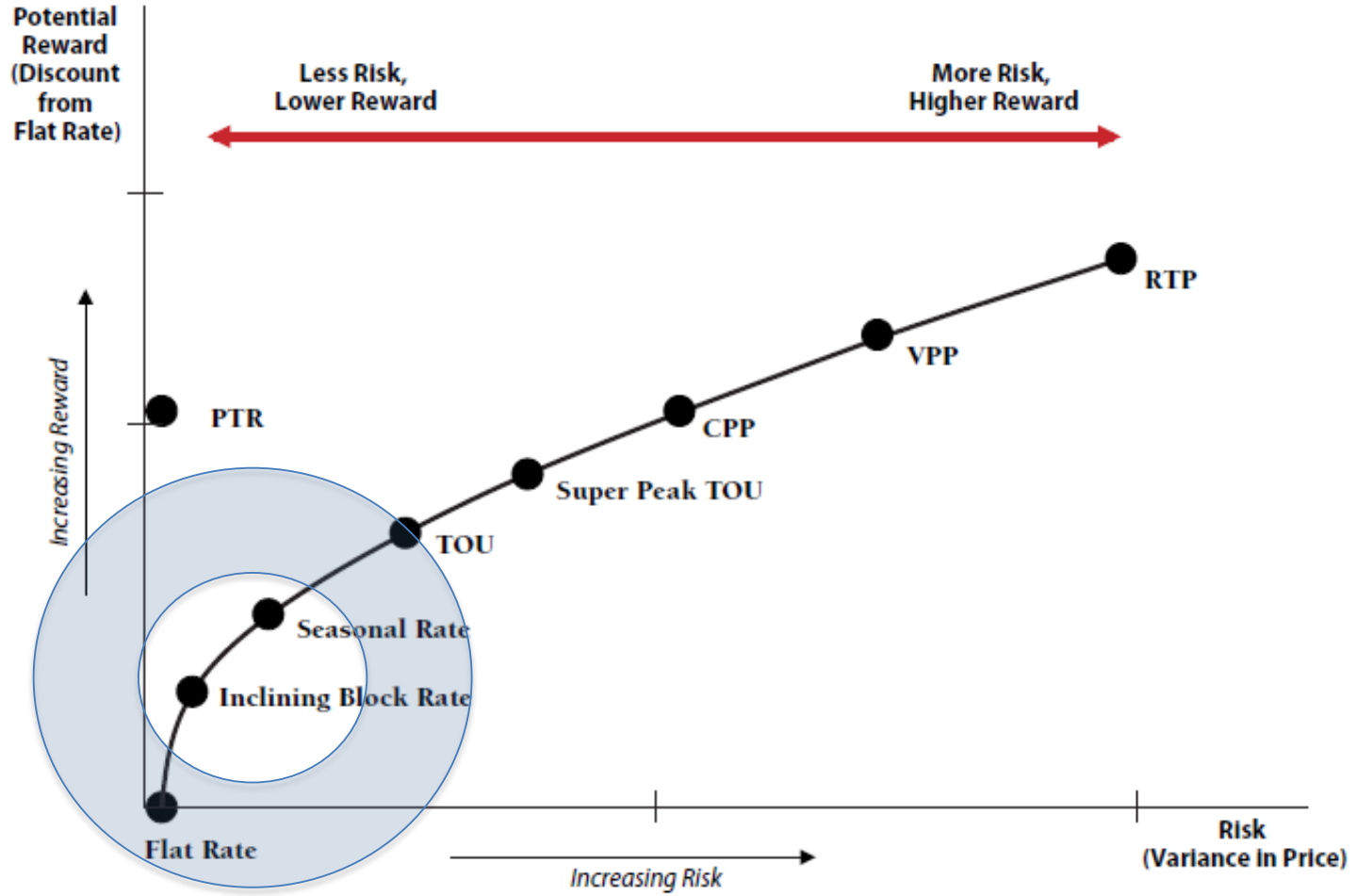
- Urban and apartment dwellers
- Low-income consumers
- Energy efficiency



Effect on Usage of Alternative Rate Designs

	Flat Rate	Inclining Block Rate	High Customer Charge
Customer Charge	$ -	$ -	$ 25.00
First 250 kWh	$ 0.15	$ 0.1160	$ 0.1025
Over 250 kwh	$ 0.15	$ 0.1740	$ 0.1025
Usage Change With Elasticity of -0.2		-2.6%	+6.3%

Peak Load Benefits of Different Residential Rate Designs



TOU and Inclining Block Rates Have Similar Peak Demand Effects

TOU Rate		Inclining Block Rate	
Customer Charge	$5.00	Customer Charge	$5.00
Off-Peak	$0.08	First 500 kWh	$0.08
On-Peak	$0.15	Additional kWh	$0.15

- ~80% of usage in peak months is by customers using over 500 kWh/month
- **This IBR will achieve about 80% of the peak load benefits of this TOU rate.**

Bill Simplification

Which Pricing Approach is More Useful to You as a Consumer?

Crude Oil		$2.237
Tanker to Refinery		$0.114
Refinery Capital		$0.213
Refinery Operating		$0.235
Product Pipeline		$0.113
Terminal Rack		$0.023
Truck to MiniMart		$0.114
Mini-Mart Profit		$0.217
State Taxes		$0.349
Federal Taxes		$0.184

So Why Confuse Consumers?

Your Usage:		1,266 kWh		
Base Rate		**Rate**	**Usage**	**Amount**
First 500 kWh		$ 0.04000	500	$ 20.00
Next 500 kWh		$ 0.06000	500	$ 30.00
Over 1,000 kwh		$ 0.08000	266	$ 21.28
Fuel Adjustment Charge		$ 0.03456	1,266	$ 43.75
Infrastructure Tracker		$ 0.00789	1,266	$ 9.99
Decoupling Adjustment		$ (0.00057)	1,266	$ (0.72)
Conservation Program Charge		$ 0.00123	1,266	$ 1.56
Nuclear Decommissioning		$ 0.00037	1,266	$ 0.47
Subtotal:				$126.33
State Tax		5%		$ 6.32
City Tax		6%		$ 7.96
Total Due				$140.60

When This is What It Really Means

EFFECTIVE RATE INCLUDING ALL ADJUSTMENTS				
First 500 kWh		$ 0.09291	500	$ 46.46
Next 500 kWh		$ 0.11517	500	$ 57.59
Over 1,000 kwh		$ 0.13743	266	$ 36.56
Total Due:				$140.60

If you want customers to respond to the rate, simplify the bill

New Frontiers in Rate Design

DERs impact traditional rate designs:

- Utility concerns about recovering revenues
- Policymakers and DER customers want economic rates and incentives to continue to engage in DER
- Consumer advocates concerned about the impact on non-DER customers

Questions?

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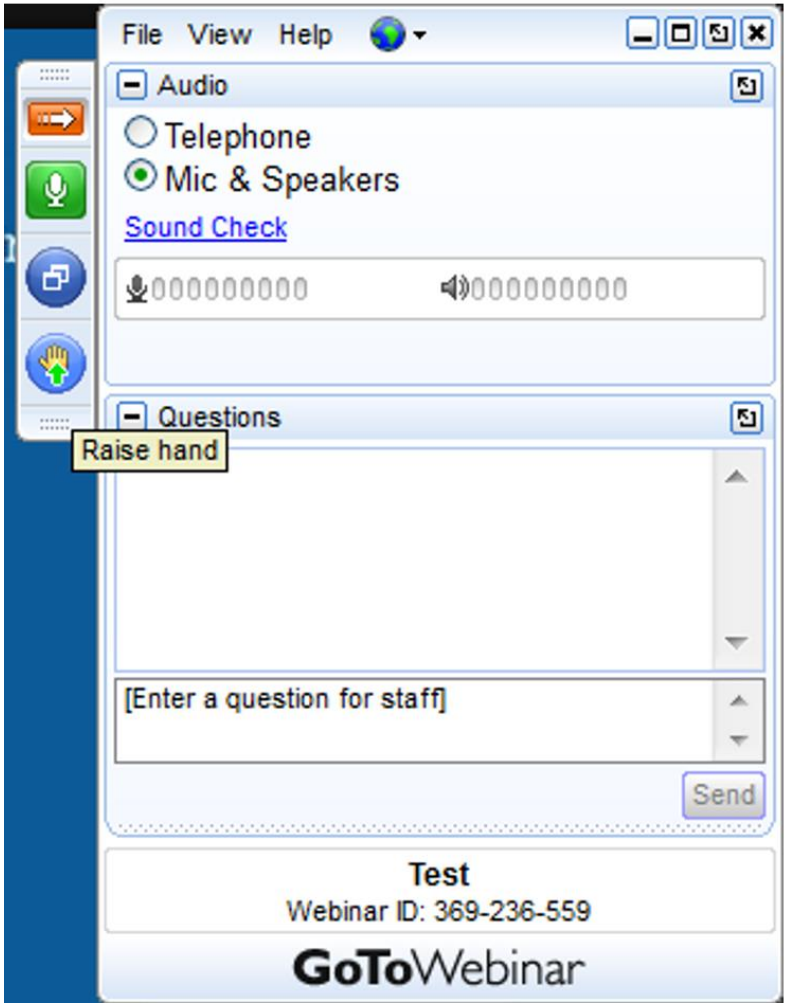

Key Themes
For Modern Rate Design

- Focus on long-run costs, as these drive investment in efficiency and load management equipment.
- Recover costs in usage sensitive elements of the rate design.
- Manage utility revenue stability concerns separately.

RAP Publications on Rate Design

- Charging for Distribution Utility Services: Issues in Rate Design
- Revenue Regulation and Decoupling
- Rate Structures for Customers with Onsite Generation
- Pricing Do's and Don'ts
- Standby Rates for Customer-Sited Resources
- Time-Varying and Dynamic Rate Design
- Rate Design Where AMI Has Not Been Fully Deployed
- Designing Distributed Generation Tariffs Well

RAP Publications on Rate Design in 2015

- Rate Design for the Utility of the Future
- MADRI Partial Service Tariffs
- Designing Standby Tariffs

About RAP

The Regulatory Assistance Project (RAP) is a global, non-profit team of experts that focuses on the long-term economic and environmental sustainability of the power and natural gas sectors. RAP has deep expertise in regulatory and market policies that:

- Promote economic efficiency
- Protect the environment
- Ensure system reliability
- Allocate system benefits fairly among all consumers

Learn more about RAP at www.raponline.org

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