RAP® Energy solutions for a changing world

Electric Rate Design as Though the Future Matters

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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.

Jim Lazar

Jim Lazar, Senior Advisor

- Economist
  - Consulting practice in rate design and resource planning beginning 1979.
  - Based in Olympia, Washington
  - RAP since 1998

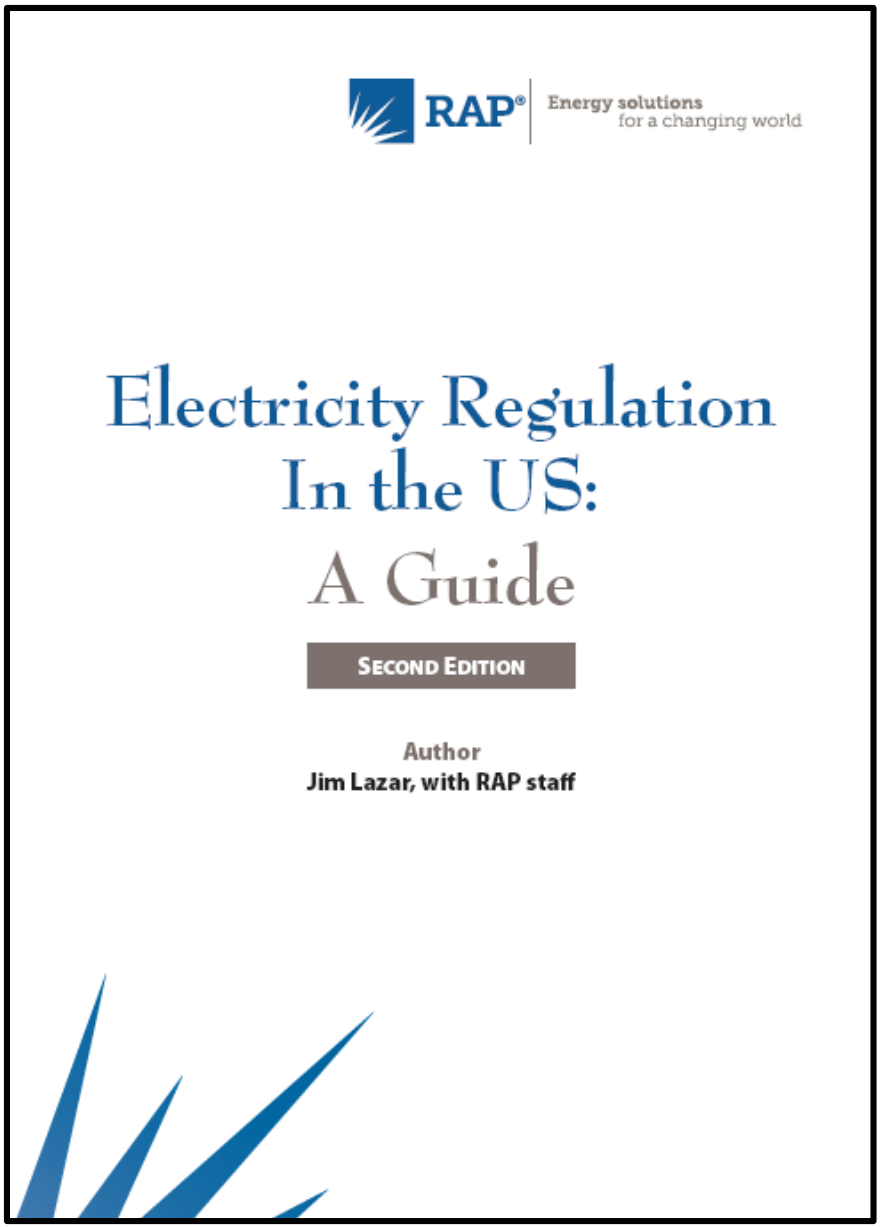
Overview

- Some Rate Design Essentials
- Residential Rates
- Commercial and Large User Rates
- Emerging Issues in Rate Design

A Few Highlights From the RAP Publication Collection

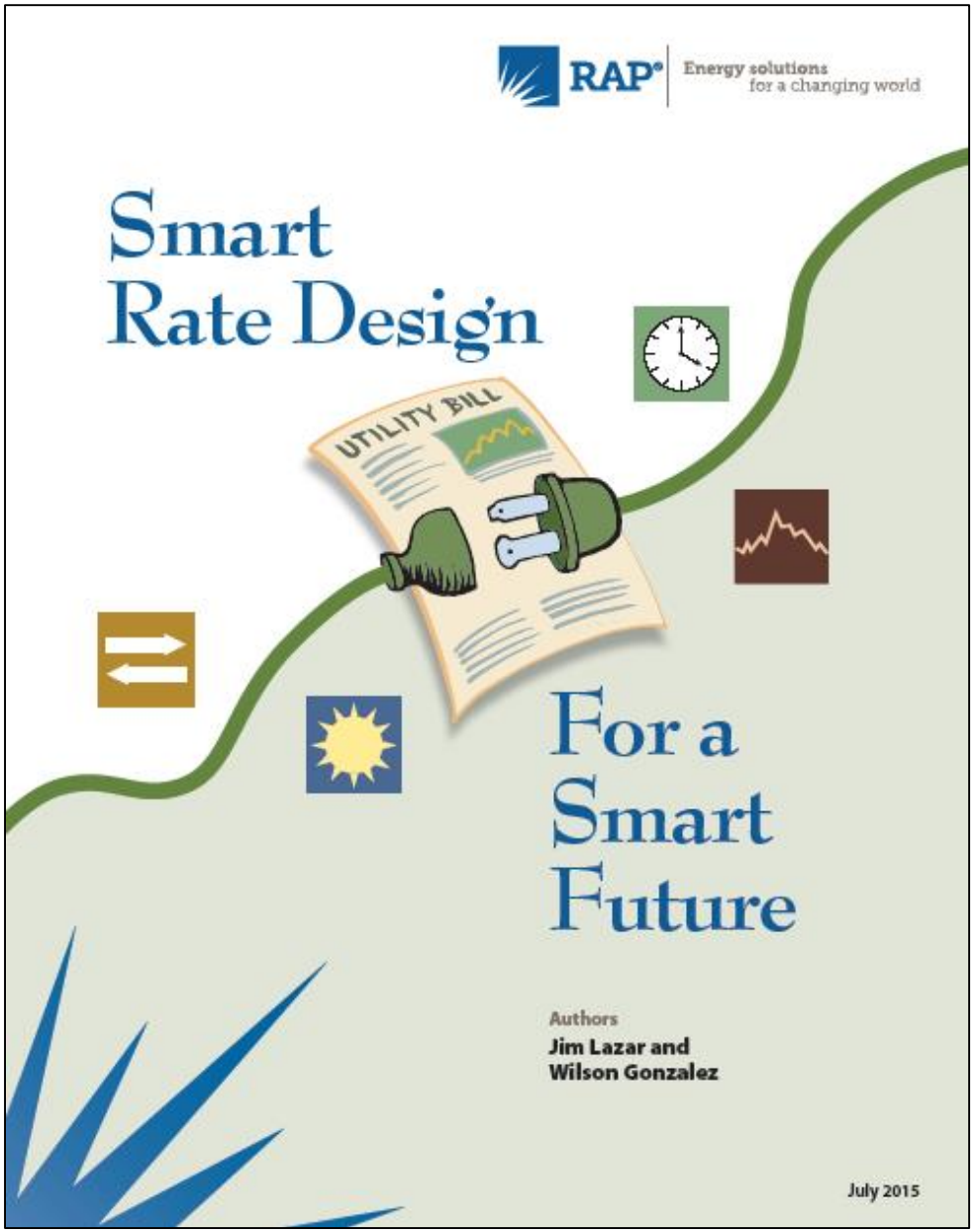
Available for Free Download
www.raponline.org

The basics of regulation.



Smart Rate Design:

Rate design as though the future is important.

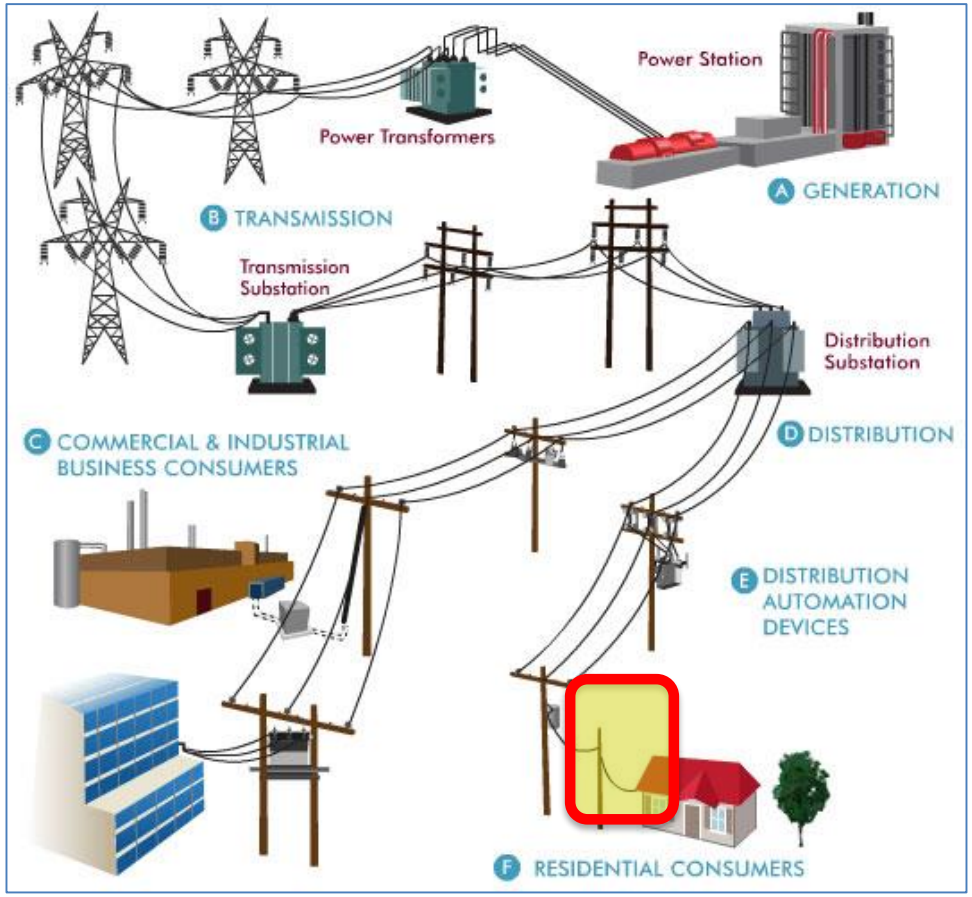


People DO Understand Rate Design

Three Guiding Principles for Rate Design

Principle #1:

A customer should be allowed to connect to the grid for no more than the cost of connecting to the grid.



Principle #2

Customers should pay for the grid and power supply in proportion to **how much they use,** and when they use it.

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Customers should pay for the grid and power supply in proportion to how much they use, and **when they use it.**

Principle #3

Customers delivering services to the grid should receive full and fair value –- no more and no less.

Bottom Line: Smart Rates

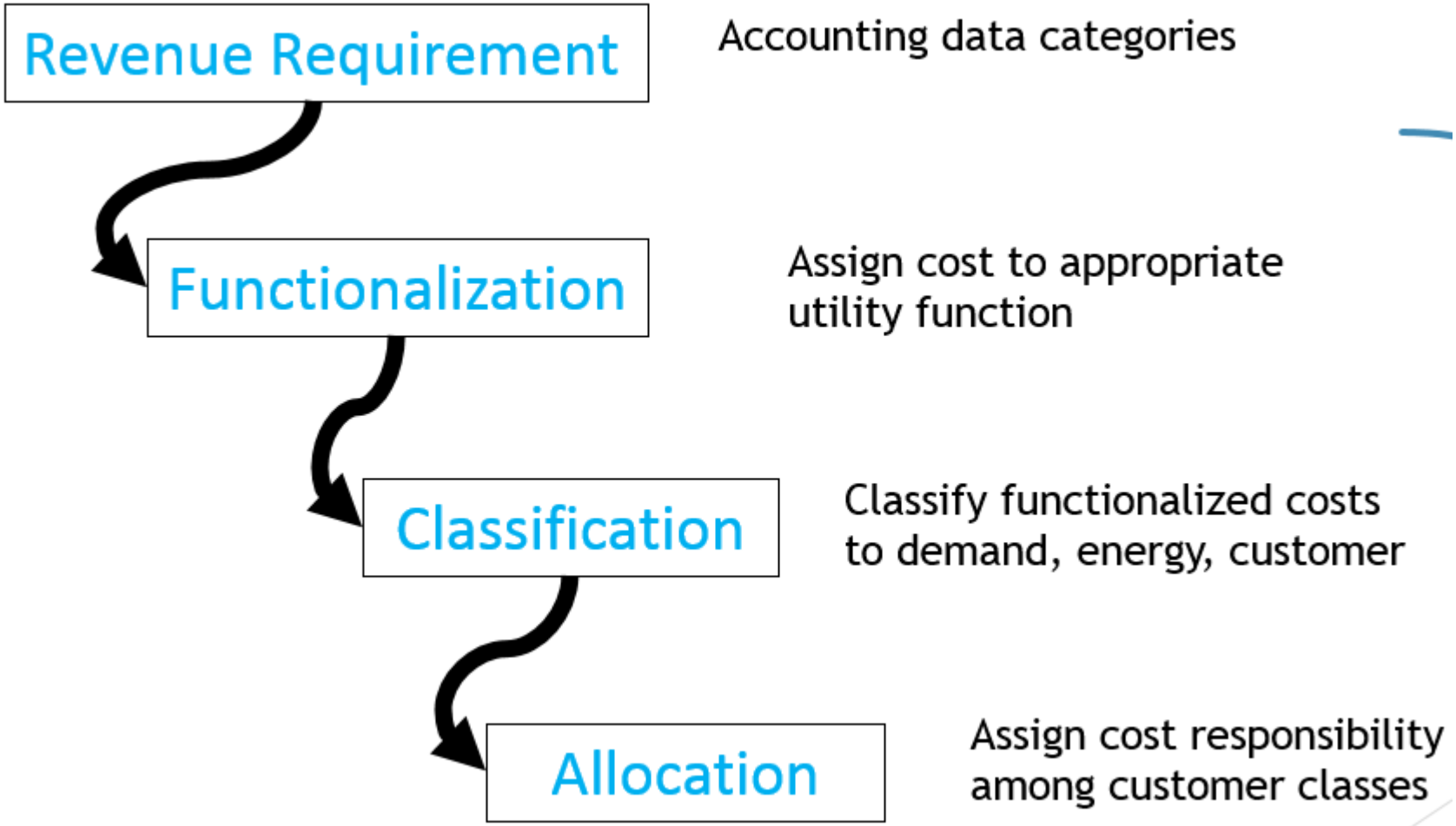
Customer-Specific Charges		
Customer Charge	$/Month	$ 3.00
Transformer:	$/kVA/Mo	$ 1.00

Bi-Directional Energy Charges		
Off-Peak	$/kWh	$ 0.08
Mid-Peak	$/kWh	$ 0.12
On-Peak	$/kWh	$ 0.18
Critical Peak	$/kWh	$ 0.75

Fixed or "Customer" Charges

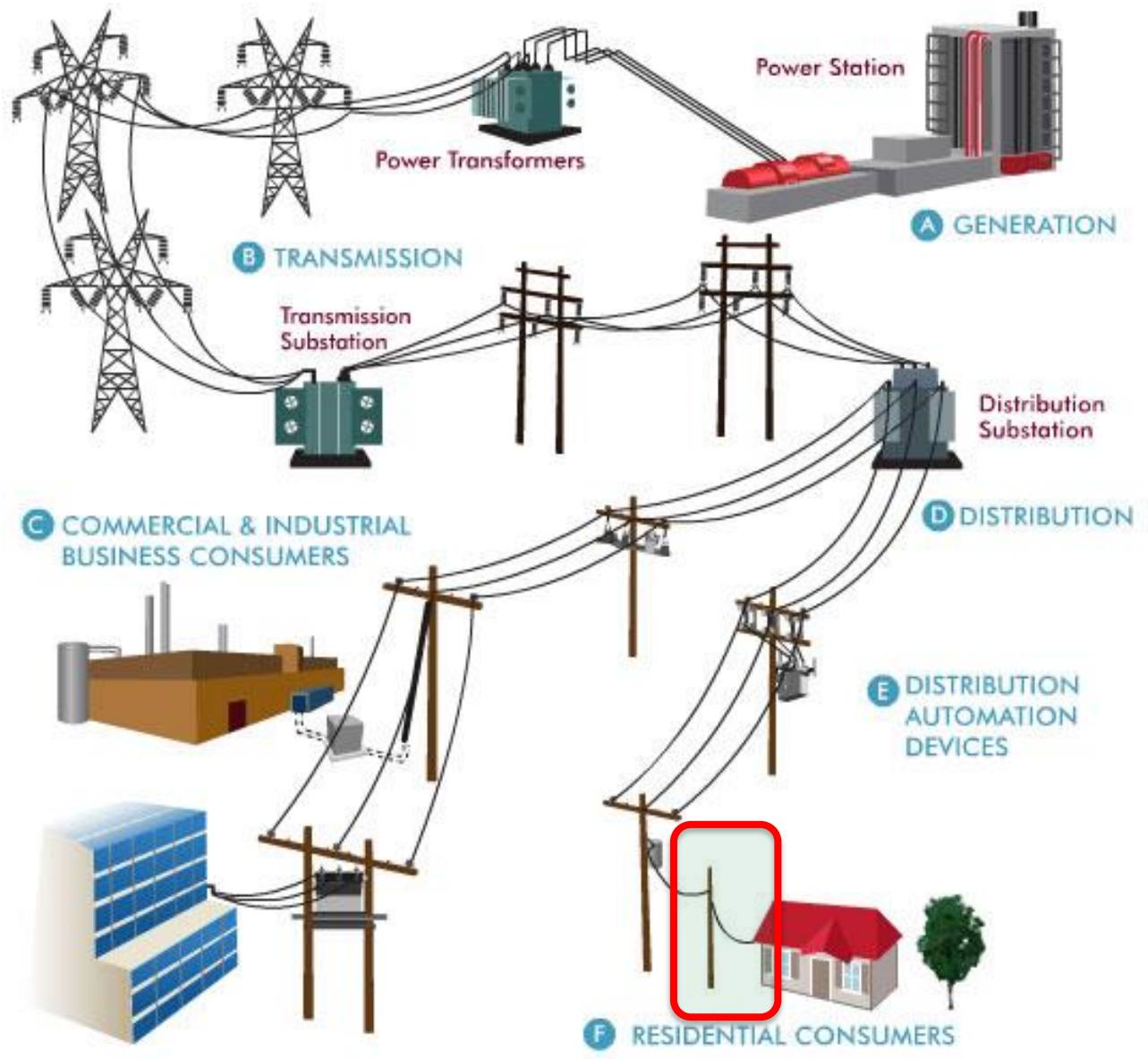
- Monthly Fee to "be a customer."
- Typically $5 - $10/month, covering billing and collection **only.**
- Utilities often seeking to include distribution system infrastructure costs in the fixed charge. $15 - $50/month.

The Cost of Service Study



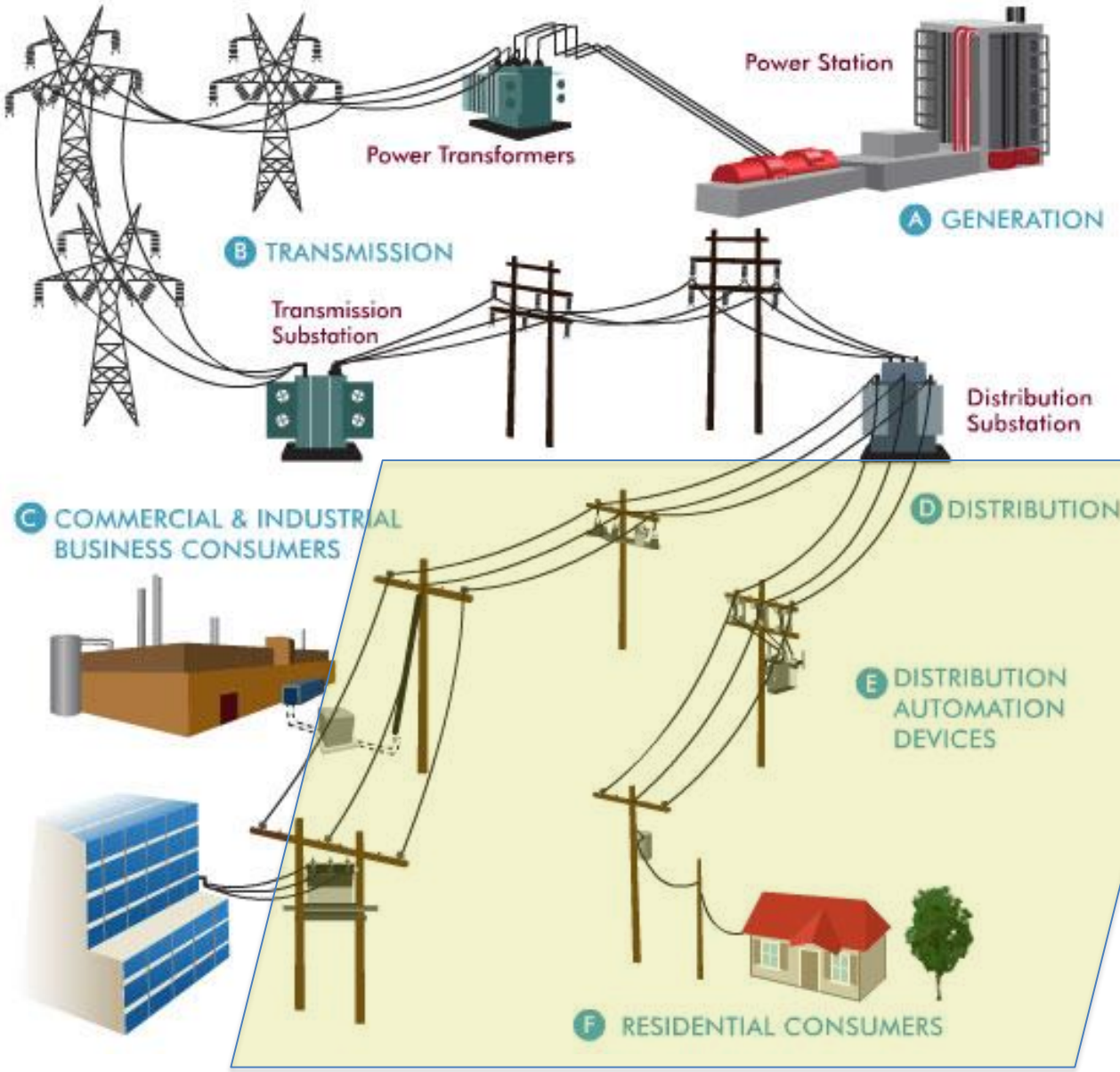
Basic Customer Method

ONLY customer-specific facilities classified as customer-related



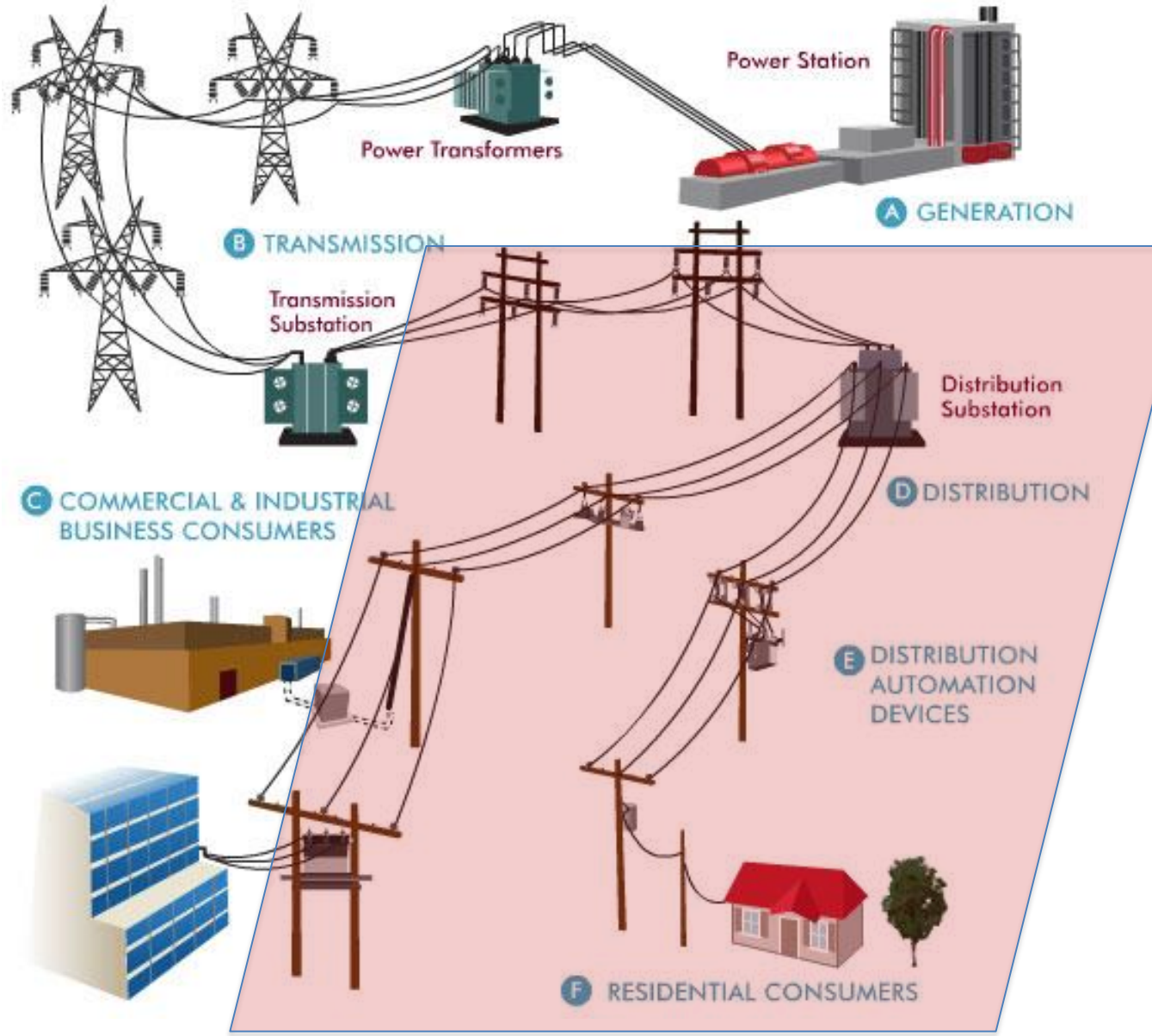
Minimum System Method:

~50% of Distribution System Classified as Customer-related



Straight Fixed / Variable:

100% of Distribution System Classified as Customer-related



Comparing Methods

Cost Category	Basic Customer	Minimum System Method	Straight Fixed / Variable
	$/month/customer		
Poles	$ -	$5	$10
Wires	$ -	$10	$20
Transformers	$ -	$5	$10
Services	$1	$1	$1
Meters	$1	$1	$1
Billing	$2	$2	$2
Customer Service	$2	$2	$2
Total	$ 6	$ 26	$ 46

Illustrative Customer Charges (2016)

Customer Charges: Largest U.S. Utilities		
Pacific Gas & Electric Co.	CA	None
So Cal Edison	CA	$0.87
Public Service E&G	NJ	$2.43
Detroit Edison Co	MI	$6.00
Virginia Electric Power	VA	$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

These utilities serve one in six Americans.

Questions to Ask on Customer Charges

- Do the costs really vary with the number of customers?
- Are the costs affected by usage?
- If customers used only a tiny bit of power each month, would these costs be incurred?
- Do these costs vary between customers within a customer class?
- How will it affect customer bills?

Residential Rate Forms

Flat Rate

Inclining Block Rate

Seasonal Rate

Time of Use Rate

Combination Rate Forms

Example Inclining Block Minnesota P&L (2015)

Customer Charge	$/month	$8.00
Energy Charge	$/kWh	
First 300 kWh		$0.0510
301 - 500 kWh		$0.0674
501 - 750 kWh		$0.0817
751 - 1,000 kWh		$0.0845
Over 1,000 kWh		$0.0894

Logic of Inclining Block Rates

- Load factor differences:
  - Large users have peak-oriented uses like AC
  - Higher rate reflects capacity costs
- Limited low-cost resource
  - Example: Hydro
- Reflect Long-Run Marginal Costs
  - If average rates are < long run marginal costs
- Encourage conservation and customer generation.

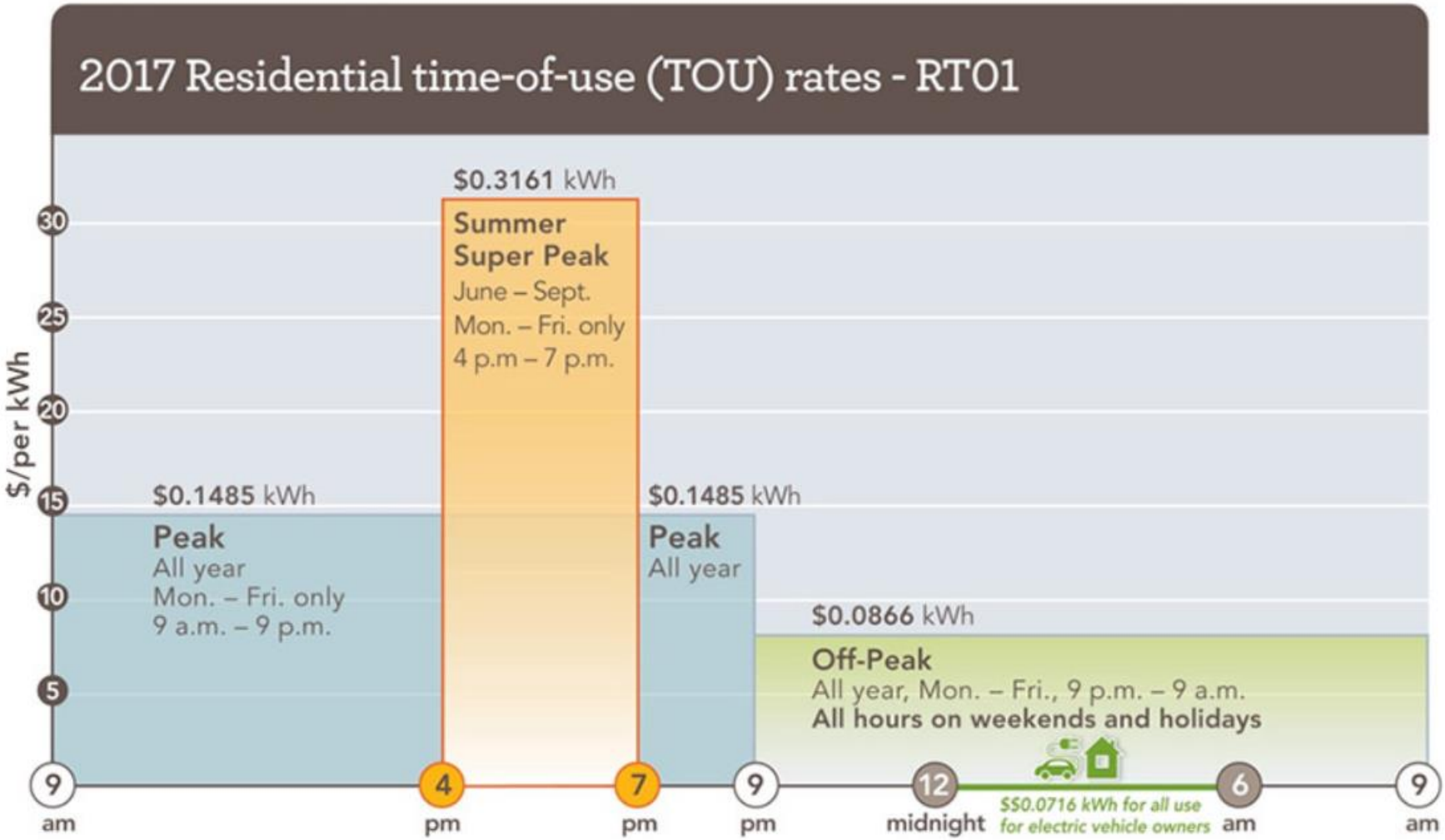
Example: Xcel Colorado (2015) Combination Inclining Block / Seasonal

Customer Charge	$/month	$7.63
Energy Charge	$/kWh	
Winter		$0.099
Summer		
First 500 kWh		$0.099
Over 500 kWh		$0.149

Example TOU Rate
City of Tallahassee, Florida

		Standard	Optional TOU
Customer Charge	$/month	$7.34	$7.34
Energy Charge	$/kWh		
On-Peak		$0.1072	$0.0628
Off-Peak		$0.1072	$0.2156

Sacramento, California TOU Rate



Hawaii TOU Rates (Optional)

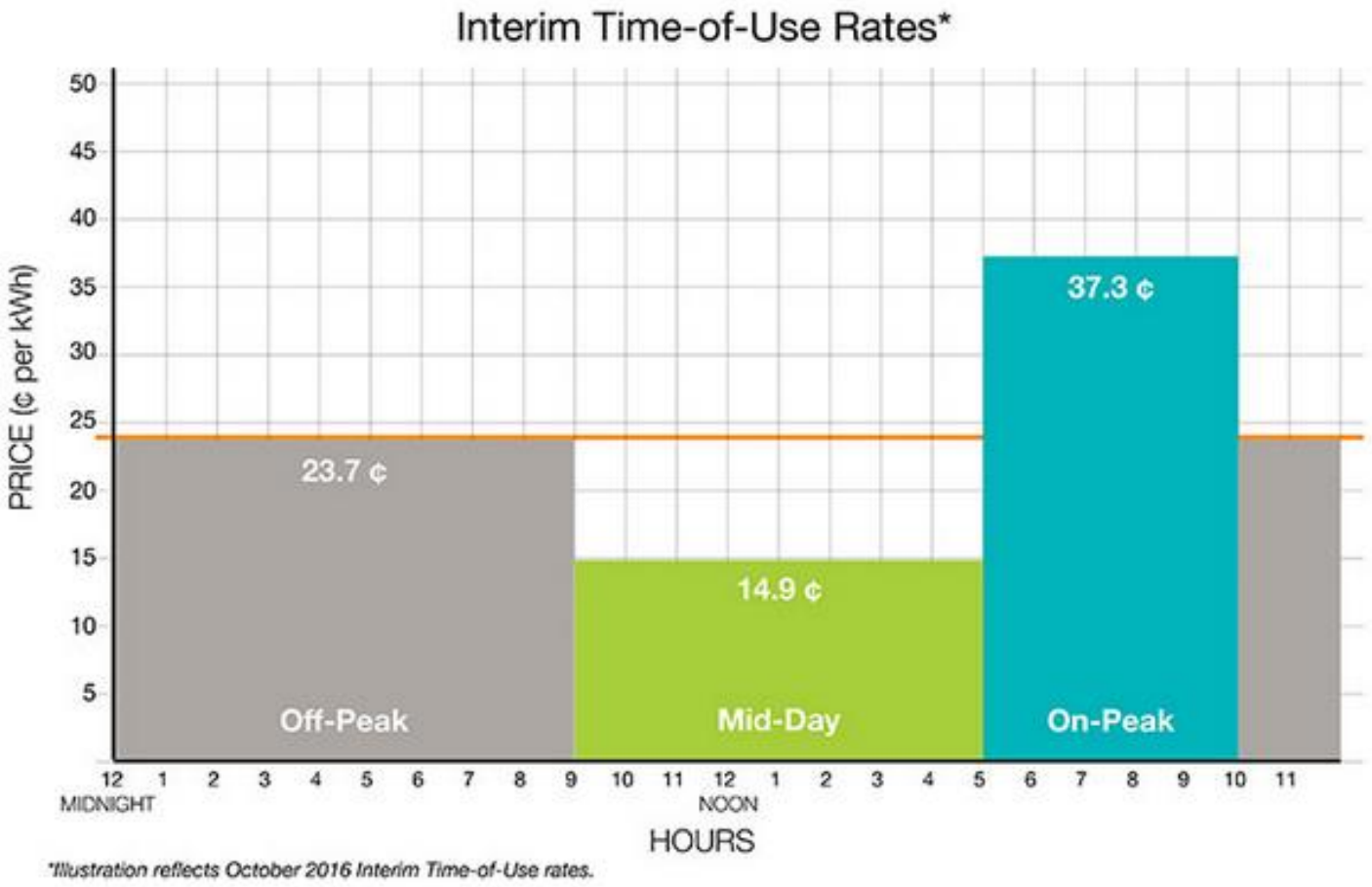


*Illustration reflects October 2016 Interim Time-of-Use rates.

Critical Peak Pricing

Very high prices during severe system stress.

Limited number of times per year.

Day-ahead notification

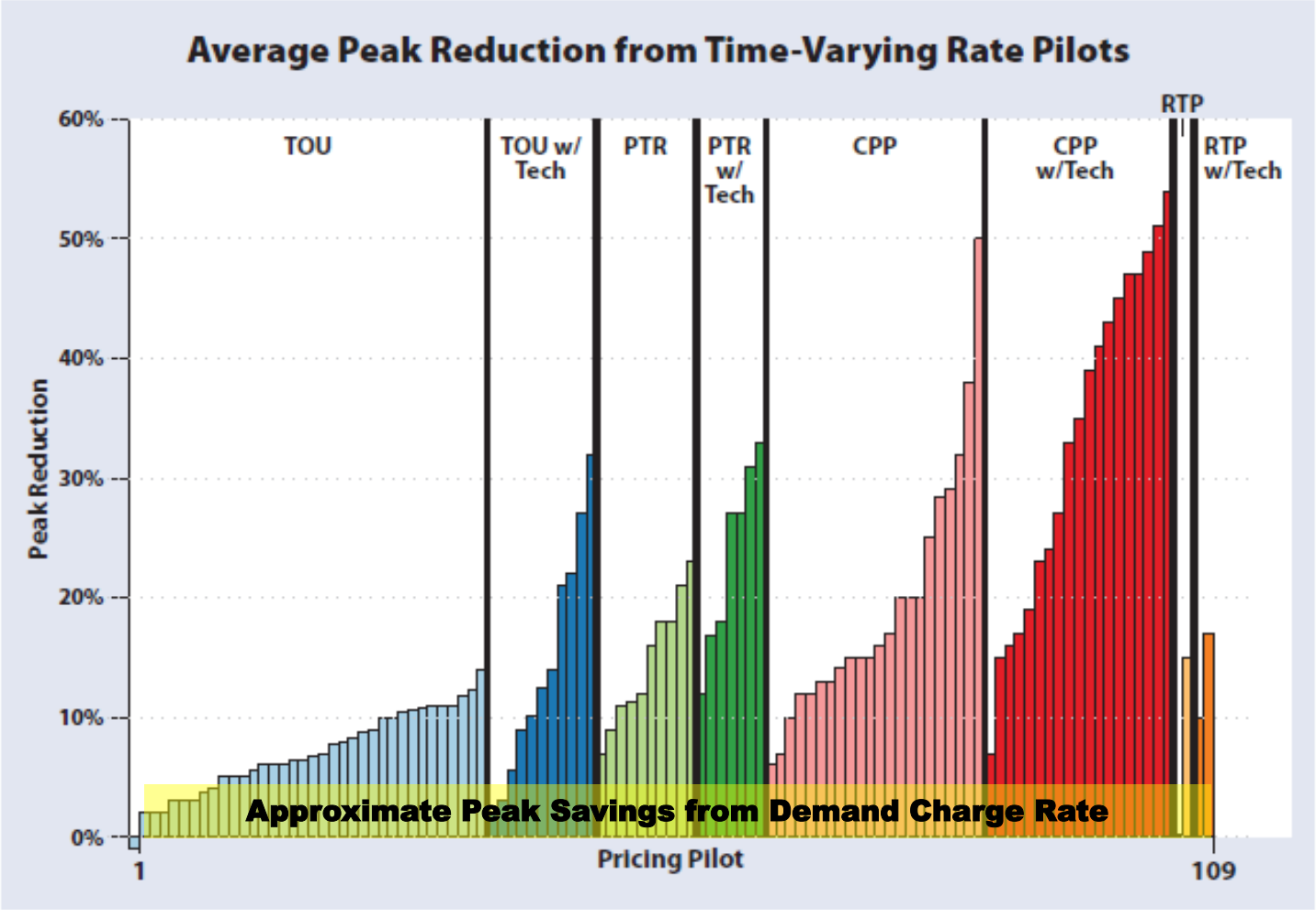
Electricite de France
"Tempo" Rate

Circuit Breaker Rating (kVA)	Monthly Subscription $		Rate Period		Rate
9	$ 12.28		Low-Day Off-Peak		$ 0.108
12	$ 19.67		Low-Day On-Peak		$ 0.129
15	$ 22.76		Mid-Day Off-Peak		$ 0.150
18	$ 24.97		Mid-Day On-Peak		$ 0.178
30	$ 62.43		Critical Day Off-Peak		$ 0.270
36	$ 76.63		Critical Day On-Peak		$ 0.696

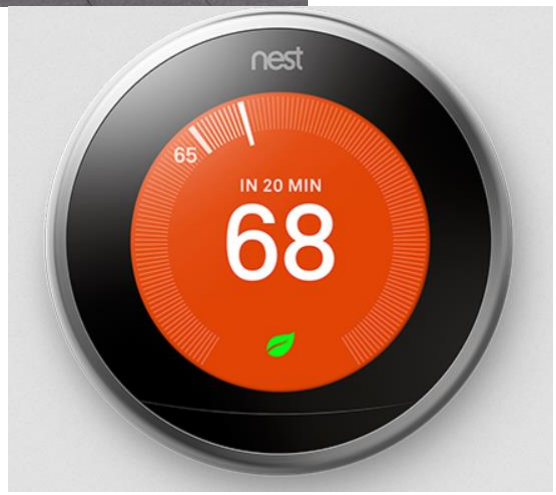
Maximum of 17 "RED" days per year

The EdF Display Unit

TOU and Critical Peak Pricing Works



Technology Can Help



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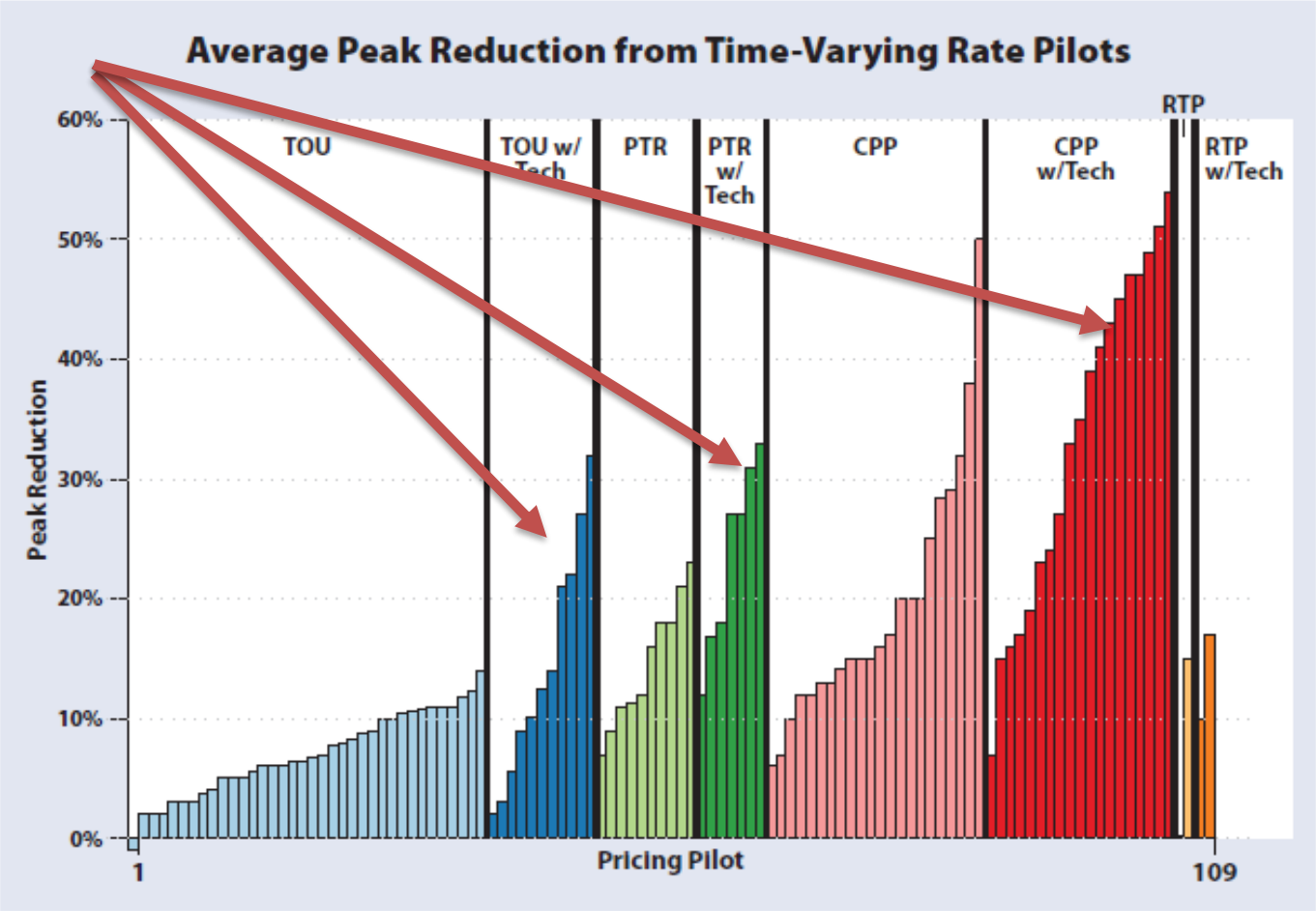


Issues with TOU and Critical Peak Rates

- Customer understanding
- Customer impact
- Cost of advanced metering and billing

- Shadow Billing
- First year “guarantee”
- Start with large customers

Cost Shifting

Urban vs. Suburban vs. Rural

Multi-family vs. Single Family

Overhead vs. Underground

And now,

Non-solar vs. Solar

Commercial Rates

Simple Small Commercial Tariff

Rate Element	Price
Customer Charge $/month	$10.00
Energy Charge $/kWh	$0.11

Basic Tariff For Large Commercial Customer

Rate Element	Price
Customer Charge $/month	$20.00
Demand Charge $/kW/month	$10.00
Energy Charge $/kWh	$0.08

Genesis of Demand Charges

1890's: Charged by connected load. No meters.

1920's: Metering for kWh and maximum demand became common for large users.

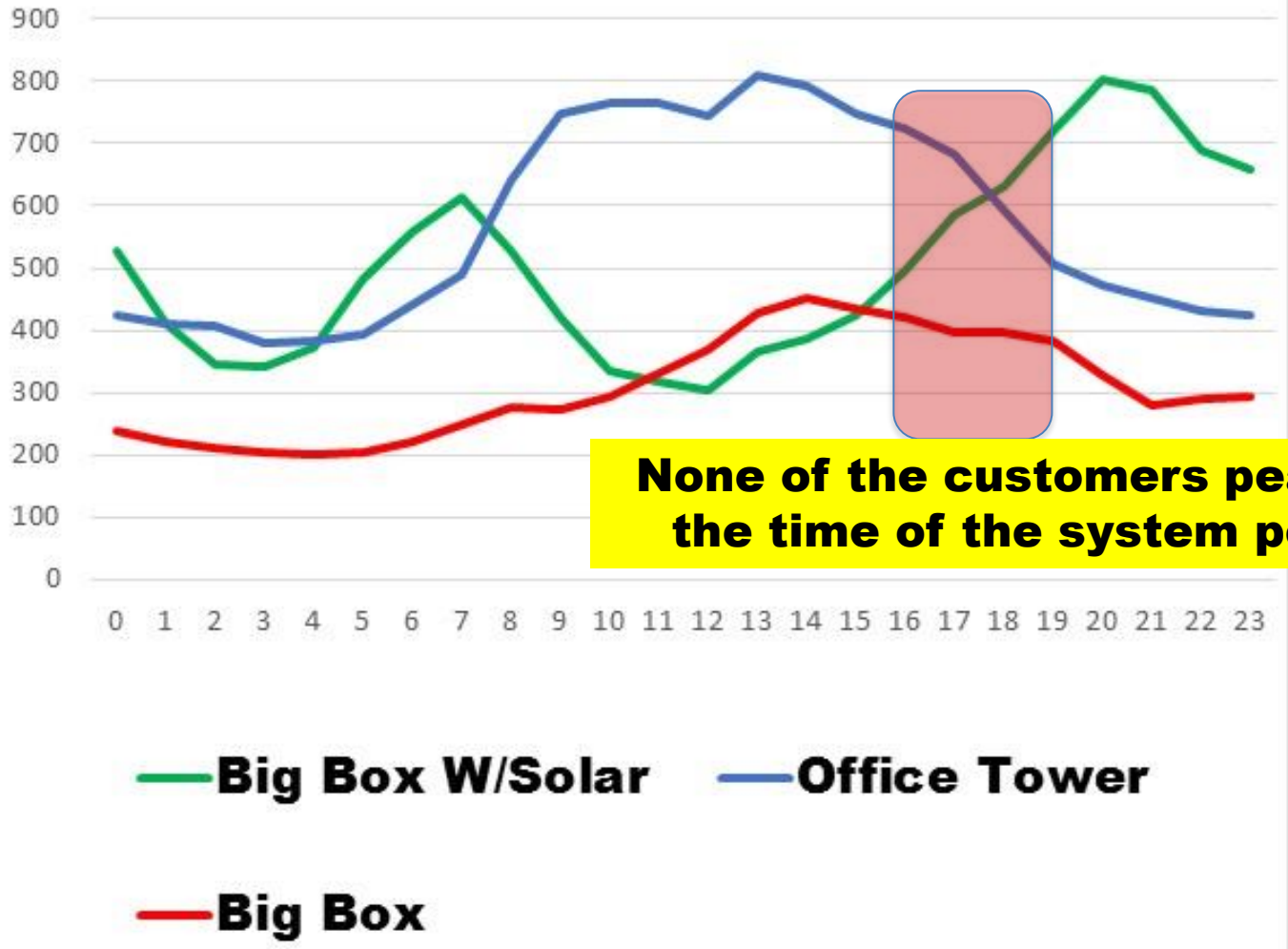
Metering for TOU was **much more expensive** until the smart meter.

Coincident and Non-Coincident Demand

Coincident Demand: A customer's usage at the time of the system maximum usage.

Non-Coincident Demand: A customer's highest usage during the month.

Every Commercial Customer Is Different



None of the customers peak at the time of the system peak

Whose Valley Do You Want to Fill?

The customer's?

The System?

Peak Loads On Circuits Are Concentrated

Hour	1	2	3	4	5	6	7	8	9	10	11	12
1	-	-	1	-	-	1	-	1	-	-	-	4
2	-	-	1	-	-	-	-	-	-	-	1	4
3	-	-	1	-	-	1	-	1	-	-	-	5
4	-	-	1	-	-	-	-	-	-	-	1	5
5	1	1	1	-	-	1	-	-	-	-	1	-
6	2	-	-	-	-	-	-	3	-	-	3	4
7	3	6	1	1	1	2	-	7	1	2	2	4
8	2	2	3	4	2	3	5	7	2	3	-	4
9	11	5	1	2	2	2	14	9	4	2	1	9
10	9	1	3	3	-	12	26	19	19	3	4	8
11	5	6	2	2	1	3	64	50	47	3	4	3
12	2	2	2	7	13	3	89	78	75	5	5	3
13	4	4	4	11	8	3	114	86	82	8	6	-
14	3	6	4	2	1	2	112	59	91	5	5	-
15	1	2	3	2	2	13	48	23	36	5	5	-
16	3	1	2	2	-	2	22	9	19	4	7	2
17	2	1	2	-	-	-	7	2	7	1	2	-
18	2	5	2	2	-	-	7	6	6	1	4	4
19	1	5	1	2	-	-	2	4	2	2	3	11
20	2	3	1	2	3	1	8	5	-	1	2	4
21	3	-	-	-	-	-	4	-	-	-	4	4
22	2	-	1	1	-	1	1	1	-	-	3	-
23	3	-	1	-	-	2	-	2	1	1	-	-
24	2	1	1	-	-	-	-	1	-	1	-	2

Example: Sacramento Coincident Peak Demand Rate

Sacramento Municipal Utility District				
Fixed Charge	$/month	$106.85		
Demand Charges		Summer		Winter
Distribution Capacity	**$/kW**	**$ 2.82**		**$ 2.82**
2PM - 8 PM Surcharge	$/kW	$ 6.91		$ -
Energy Charges				
Super-Peak 2 - 8 PM	$/kWh	$0.1929		n/a
On-Peak	$/kWh	$0.1328		$0.1017
Off-Peak	$/kWh	$0.1022		$0.0806

Example:
Pure Commercial TOU Energy Rate
Burbank Water and Power

		Schedule C
Demand		None
4 - 7 PM Mon-Fri		$ 0.260
Mid-Peak		$ 0.1625
Off-Peak		$ 0.130

Bottom Line: Smart Rates

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Customer Charge	$/Month	$ 3.00
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About RAP

that power

The Regulatory Assistance Project (RAP) is a global, non-profit team of experts focuses on the long-term economic and environmental sustainability of the sector. 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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