Dividing the Pie: New Concepts in Electric Cost Allocation

Staff Subcommittee on Rate Design

Winter Policy Summit 2020

February 9, 2020

Electric Cost Allocation for a New Era

NARUC Staff Subcommittee on Rate Design

Winter Policy Summit 2020

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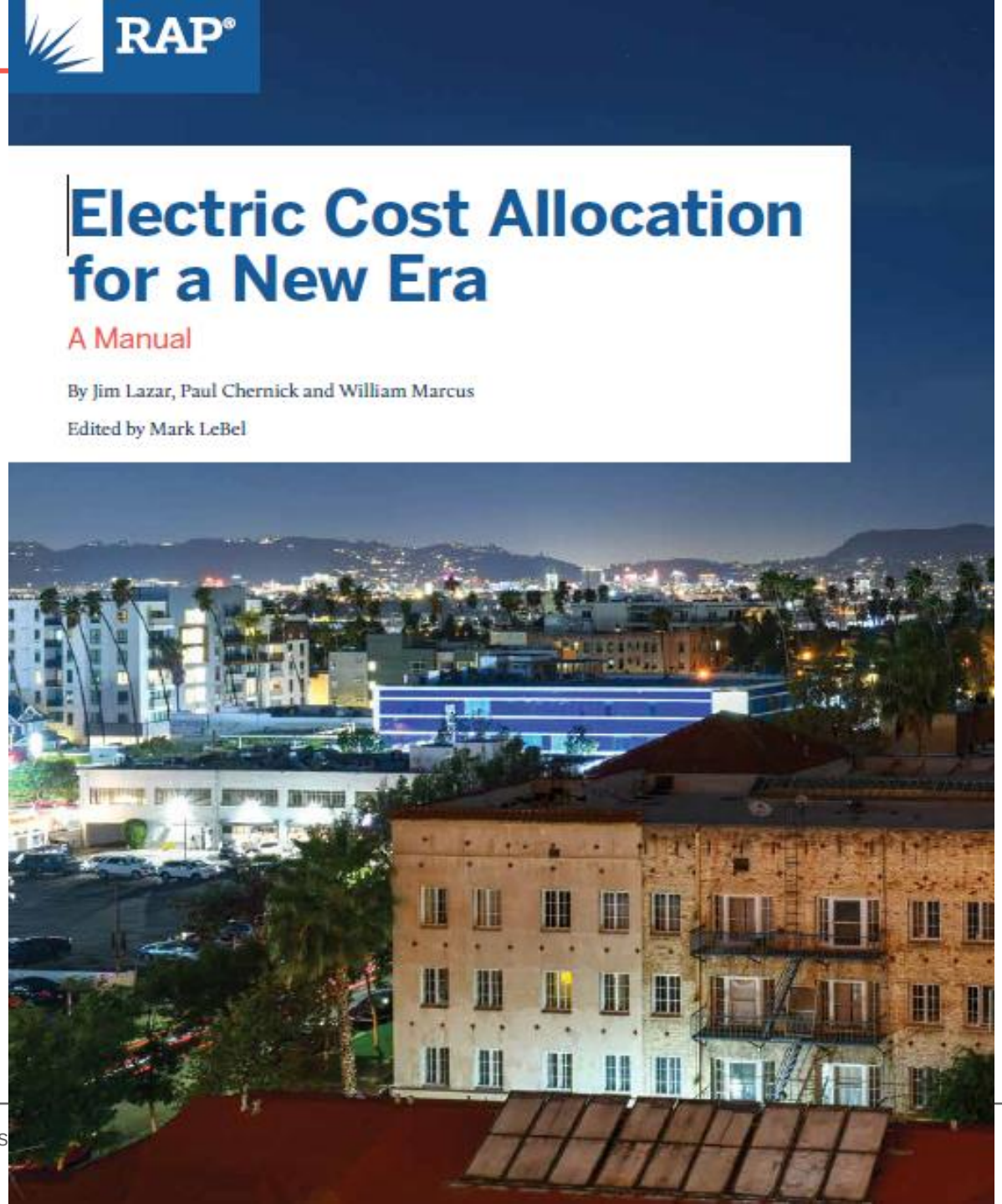


Major Topics

- Principles
- Technology and Regulatory Change
- Overarching Issues
- Embedded and Marginal Cost
- Using Cost Studies
- Key Takeaways

About the Authors

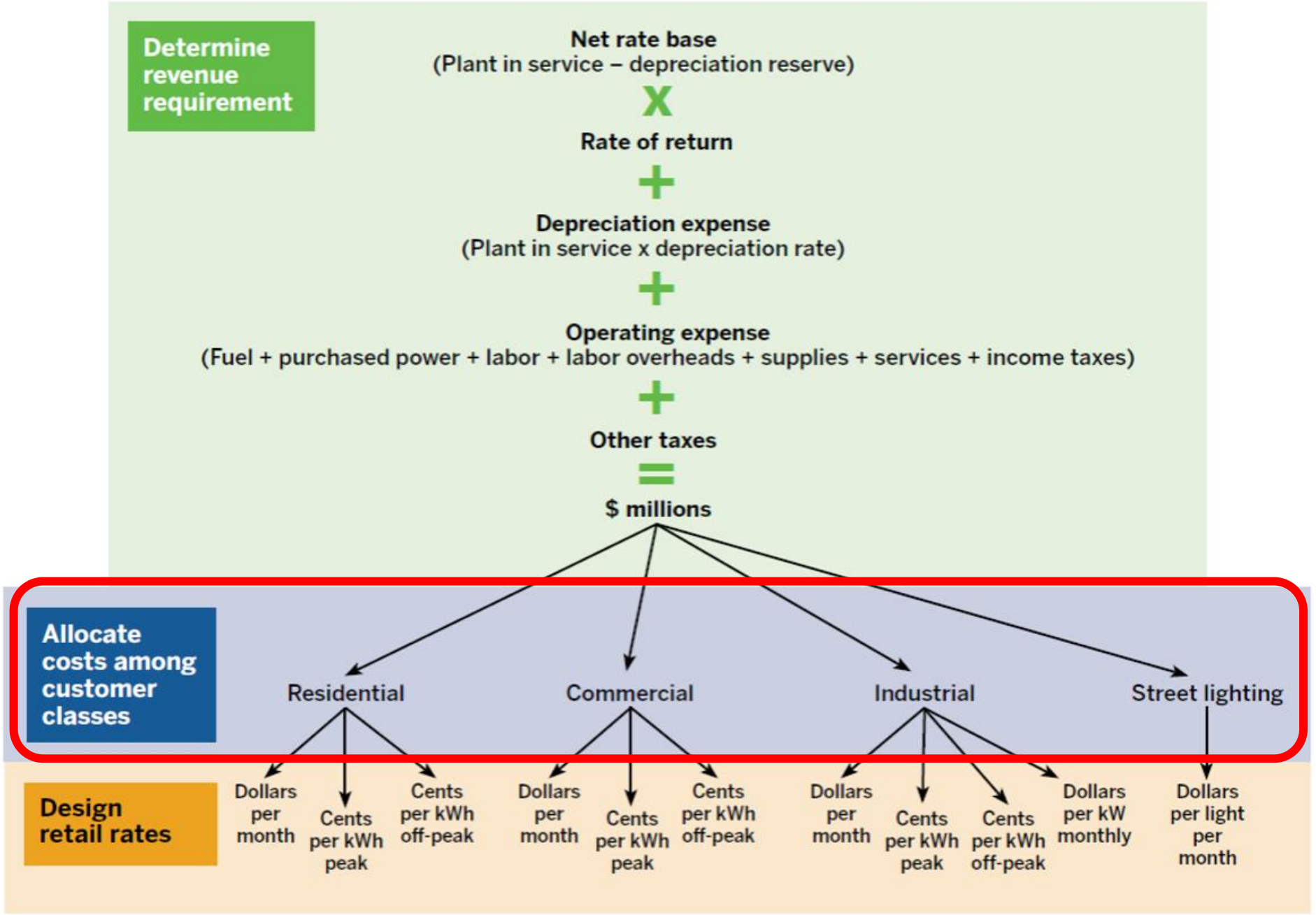
- **Jim Lazar:** First rate case: 1974; >100 dockets
- **Paul Chernick:** First rate case: 1977; >300 dockets
- **Bill Marcus:** First rate case: 1978; >300 dockets

Collectively: 43 states and 8 provinces

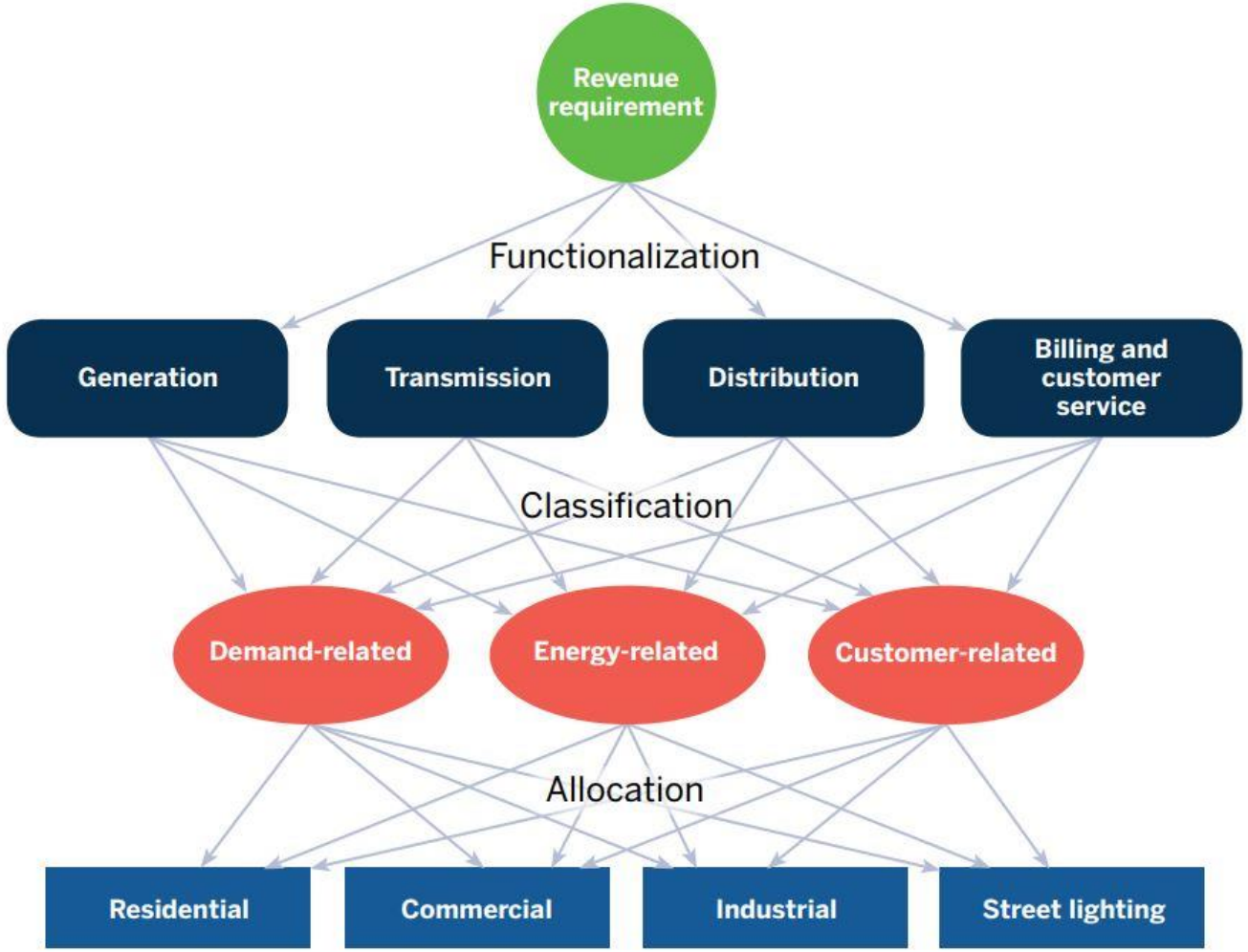
Mark LeBel, Editor

1 Principles and Background

Simplified rate-making process



Traditional ECOSS Process



The 1992 NARUC Manual

Typical cost classifications used in cost allocation studies are summarized below.

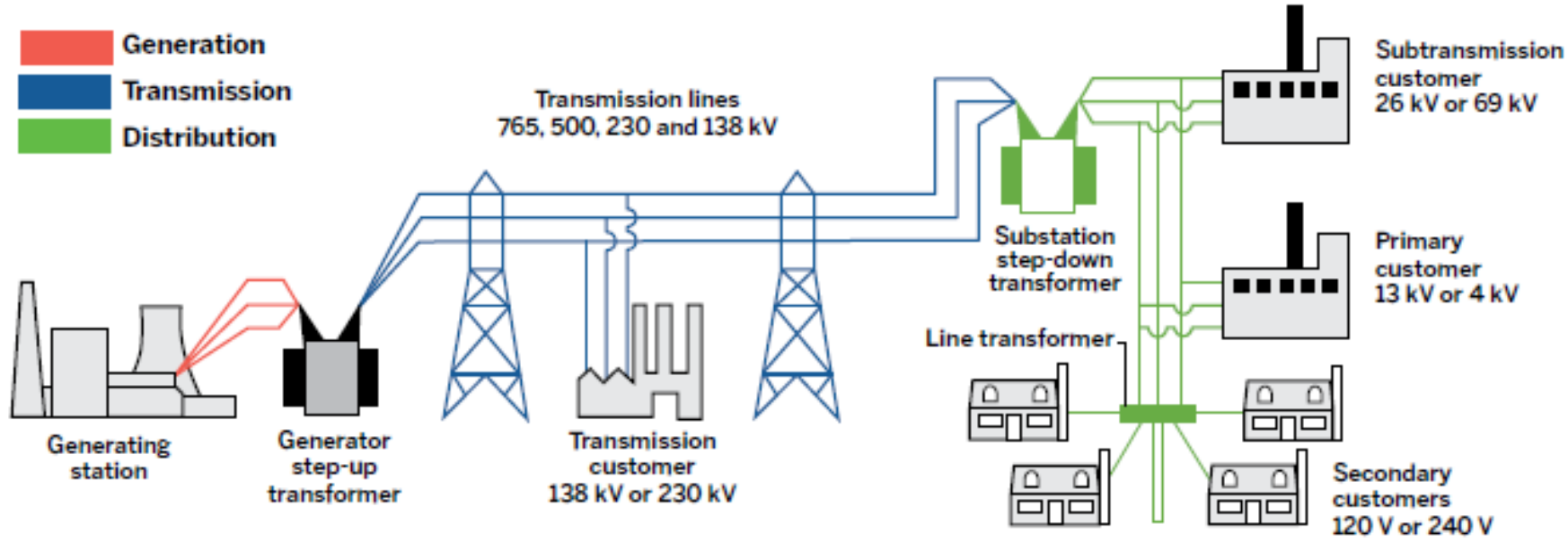
Typical Cost Function	Typical Cost Classification
Production	Demand Related Energy Related
Transmission	Demand Related Energy Related
Distribution	Demand Related Energy Related Customer Related

1992: NARUC Electric Utility Cost Allocation Manual, p. 21

2 Technology and Regulatory Change

The 1992 Grid

Figure 7. Illustrative traditional electric system



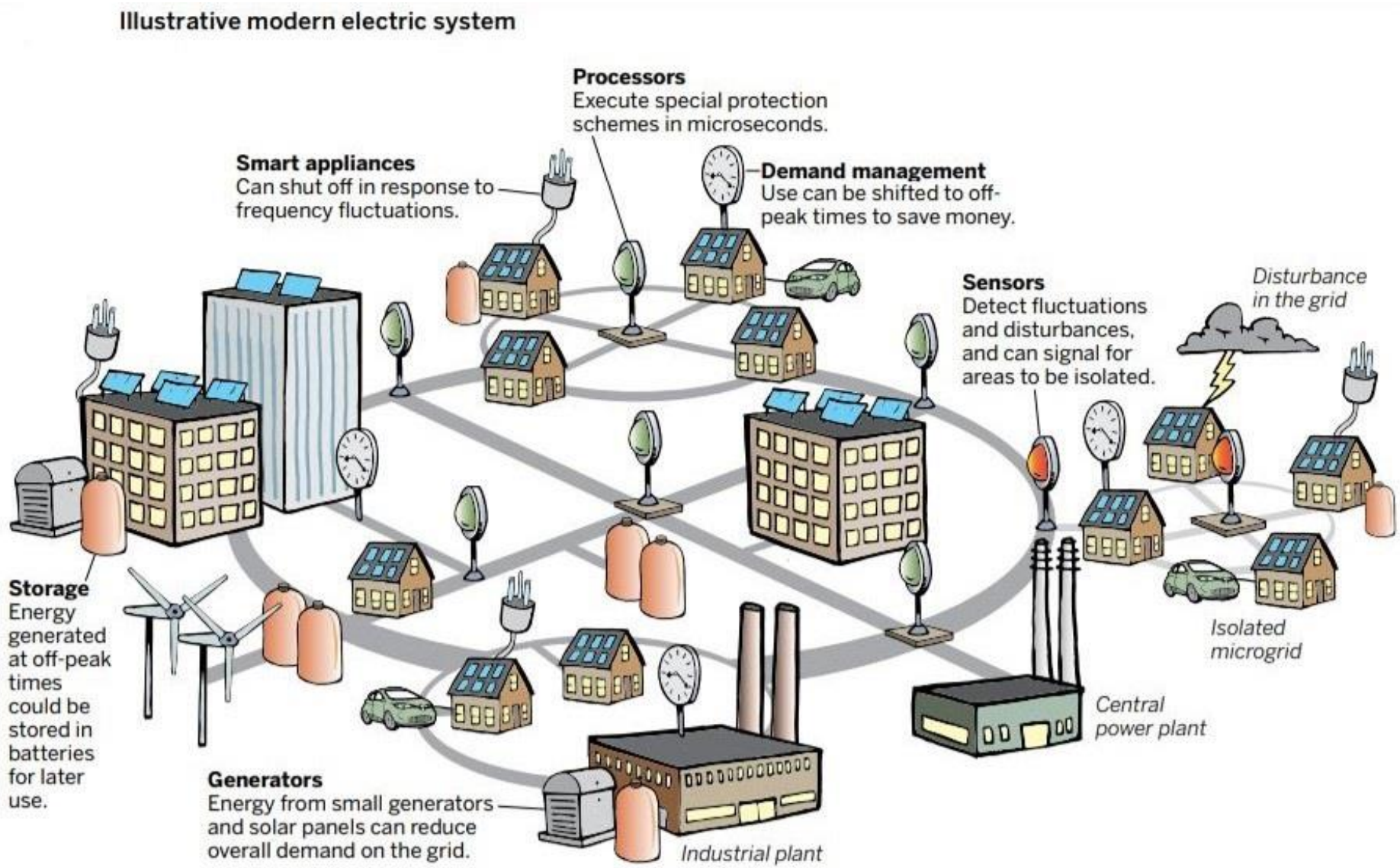
Source: Adapted from U.S.-Canada Power System Outage Task Force. (2004). *Final Report on the August 14, 2003 Blackout in the United States and Canada: Causes and Recommendations*

The Evolving Electric System

- Most current methods pre-date the 1990's
- Numerous changes since then need to be accounted for:
  - Technology changes
  - Regulatory changes

Technology Changes

- Wind, solar and storage
- Customer-sited generation
- Energy efficiency
- Demand response
- Smart grid
- Electric vehicles



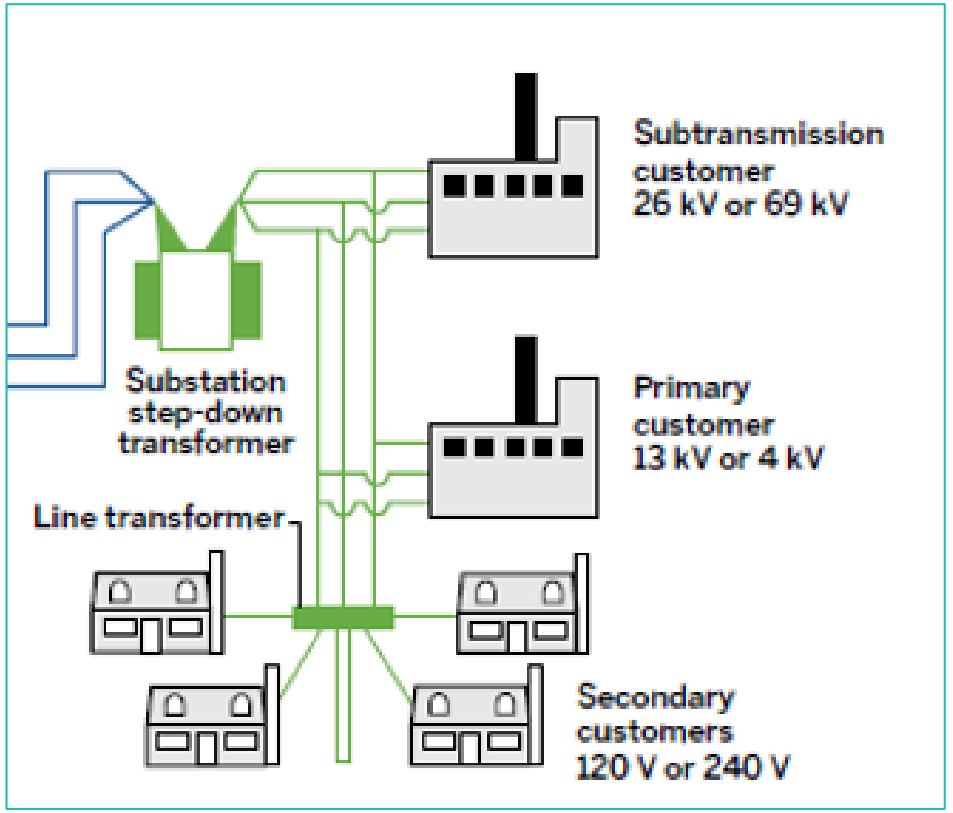
Source: Adapted from U.S. Department of Energy. (2015). *United States Electricity Industry Primer*

Regulatory Changes

- Restructuring and new markets
- Energy imbalance market (EIM)
- Performance-based regulation
- New trackers
- Public policy programs
- New stranded cost risks

3 Overarching Issues

Determining Customer Classes: Voltage or End Uses?



- **Residential**
  - **Single-Family**
  - **Multi-Family**
  - **Urban**
  - **Rural**
  - **Solar**
- **Commercial**
- **Industrial**
- **Irrigation**
- **Street Lighting**

Load Research & Data Collection

Then

- Sampling
- 10% Error Band

Now

- All Customers
- Time of Use
- Location-Specific

4 Embedded and Marginal Cost Frameworks

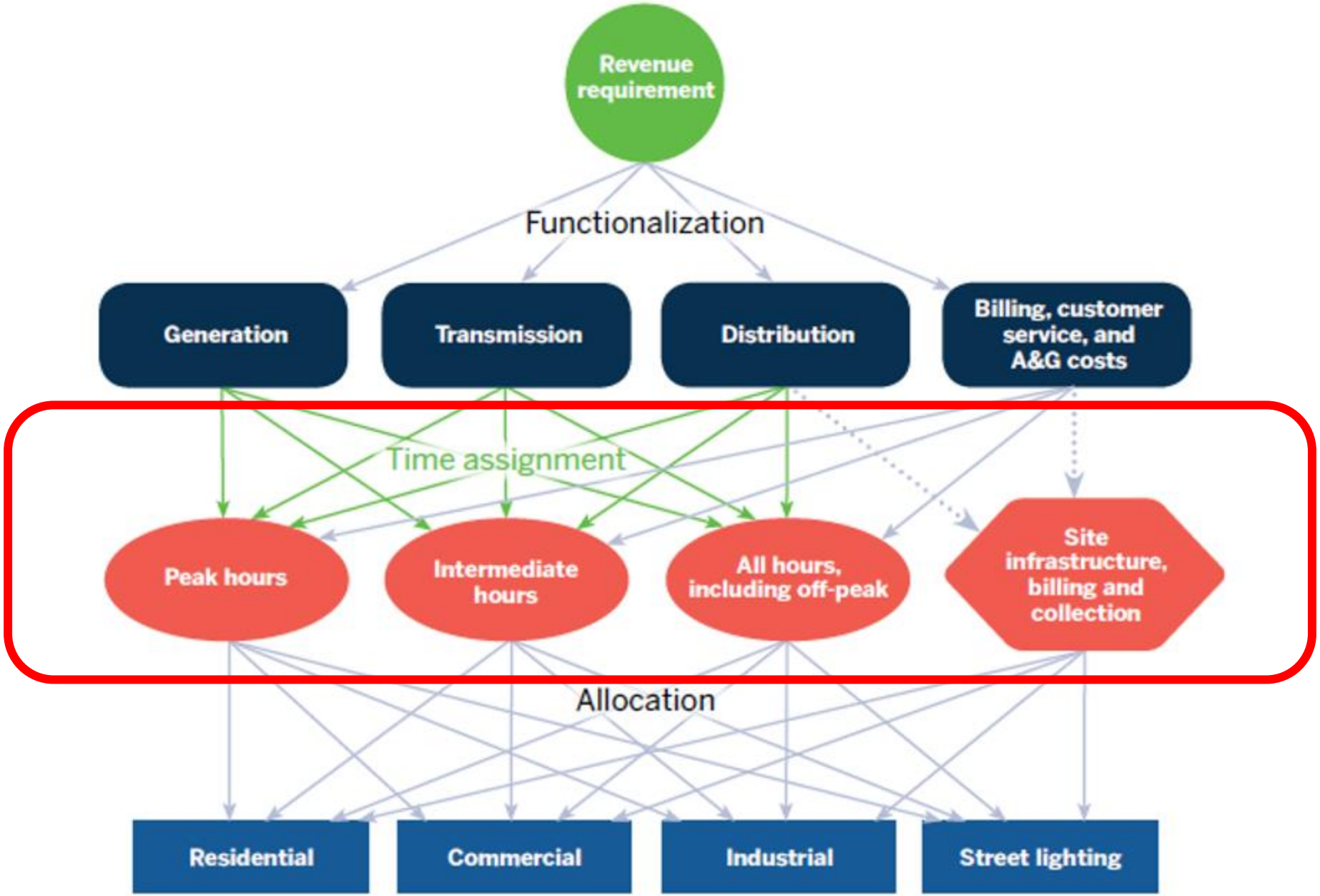
High-Level Frameworks

- Embedded cost of service studies
- Marginal cost of service studies
- Other approaches do exist
  - Incremental cost of service studies
  - Hybrids

Best Practices for All Frameworks

- Apportion shared assets on measures of usage
- Ensure broad sharing of administrative and general costs
- Eliminate distinction between “fixed” and “variable” costs
- Only customer-specific costs are “customer” related.

Modern embedded cost of service study flowchart



Old Ways vs. New Methods

Generation

The “Old” Way

- Fixed costs classified as demand-related
- Allocated on a single measure of “peak” demand (1CP, 12CP)

Modern Methods

- Fixed and variable costs assigned to hours when units operate
- Allocated based on class usage in each hour.

Old Ways vs. New Methods

Transmission

The "Old" Way

- All costs classified as demand-related;
- Allocated on a single measure of "peak" demand (1CP, 12CP).

Modern Methods

- Each segment analyzed individually;
- Allocated based on the how the segment is used.

5 Presenting and Using Results

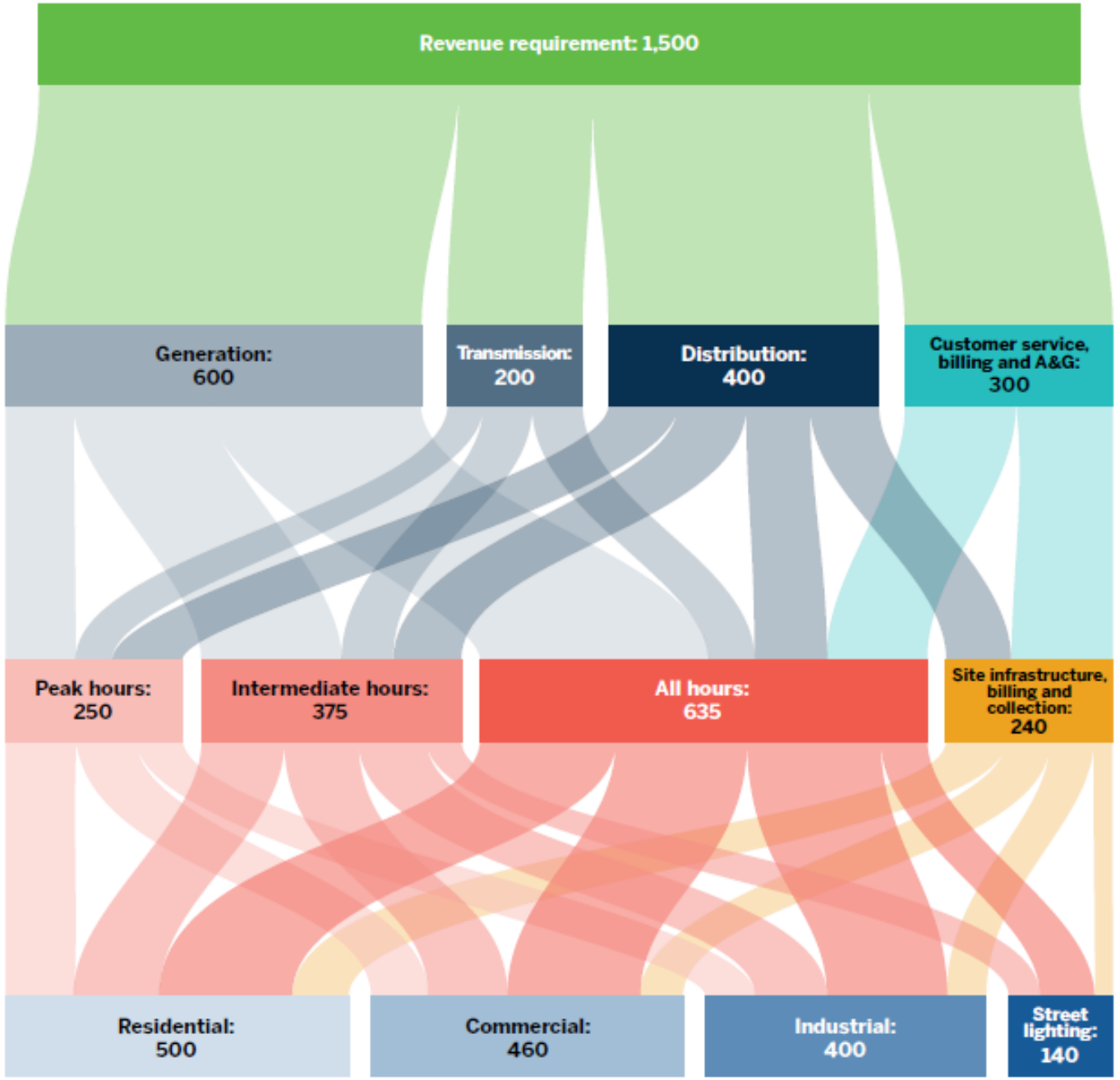
Presentation of Results

Computing class rate of return in a embedded cost study

	Total	Residential	Small (up to 20 kWs)	Medium (20 to 250 kWs)	Large (more than 250 kWs)	Large primary	Other
Revenues	$117,760,688	$28,116,419	$8,342,138	$26,156,458	$38,730,796	$15,134,759	$1,280,117
Allocated expenses	$112,438,805	$28,297,246	$8,997,362	$23,807,377	$35,927,265	$14,280,041	$1,129,515
Operating income	$5,321,883	-$180,827	-$655,223	$2,349,081	$2,803,532	$854,718	$150,603
Allocated rate base	$87,878,094	$24,935,855	$8,339,503	$18,481,728	$26,069,711	$9,399,629	$651,667
Allocated return	**$5,321,883**	**$1,510,111**	**$505,039**	**$1,119,251**	**$1,578,778**	**$569,240**	**$39,465**
Rate of return	6.06%	-0.73%	-7.86%	12.71%	10.75%	9.09%	23.11%
Profit margin	4.52%	-0.65%	-7.82%	8.94%	7.21%	5.62%	13.33%
Revenue-cost ratio	100.00%	94.33%	87.79%	104.93%	103.27%	101.92%	109.51%
Revenue shortfall (or surplus)		$1,690,938	$1,160,262	($1,229,831)	($1,224,754)	($285,478)	($111,138)
Percentage increase for equal rate of return		6.01%	13.91%	-4.70%	-3.16%	-1.89%	-8.68%

Note: Independent rounding may affect results of calculations.

Figure 6. Sankey diagram for modern embedded cost of service study



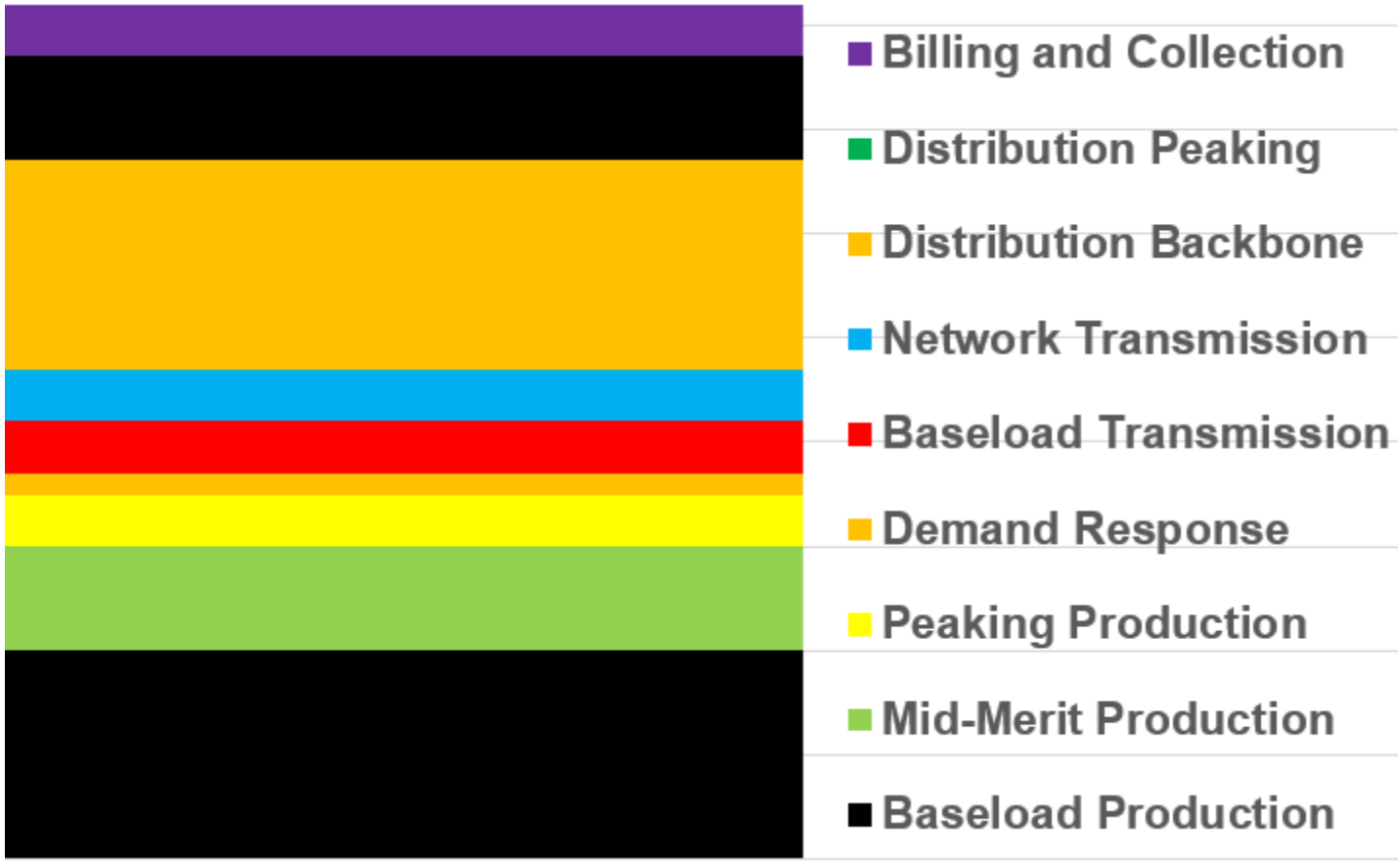
Using The Results of Studies

- Multiple studies
- Define a “range of reasonableness”
- Apply judgement
- Gradualism

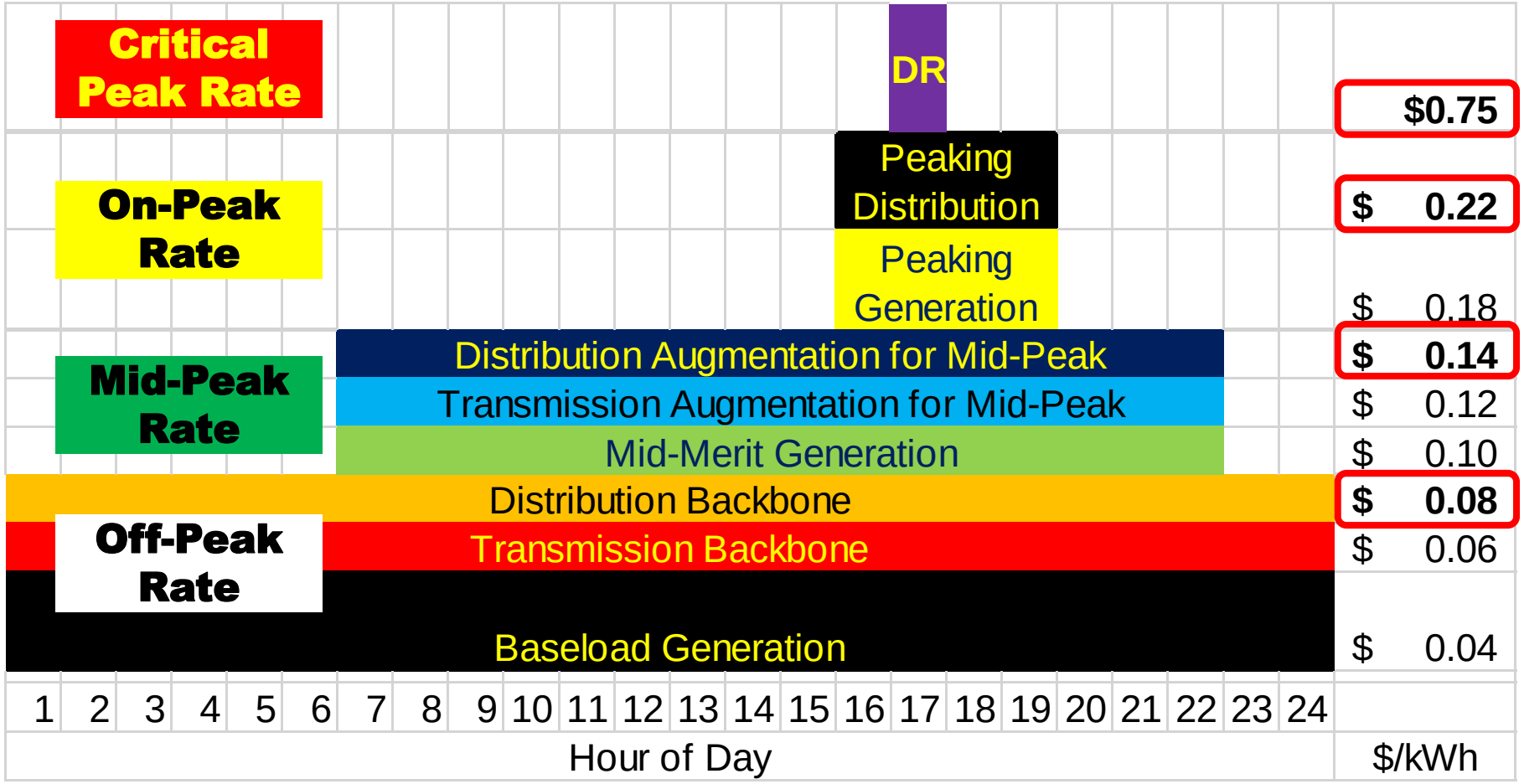
Relationship Between Cost Allocation and Rate Design

- Cost allocation and rate design have different purposes:
  - Cost allocation: primarily about equity
  - Rate design: primarily about customer understanding
- Bad allocation techniques drive bad rate design
- Good cost allocation techniques can be used as a foundation for modern rate design

Start With Costs By Function



Build a Cost-Based TOU Rate



6 Important Takeaways

Key Concepts

- Consider cost causation and benefits
- Technology and regulatory changes
- Newly available data from smart meters
- Smart grid investments provide benefits across the entire electric system

Key Reforms

- New customer classes
- Time-based methods
- Shared assets and customer-specific assets
- Equitable apportionment of A&G costs

“Allocation of costs is not a matter for the slide rule. It involves judgment of a myriad of facts. It has no claim to an exact science.”

Justice William O. Douglas, U.S. Supreme Court

Colorado Interstate Gas Co. v. Federal Power Commission, 324 US 581, 589 (1945)

About RAP

The Regulatory Assistance Project (RAP)® is an independent, non-partisan, non-governmental organization dedicated to accelerating the transition to a clean, reliable, and efficient energy future.

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Staff Subcommittee on Rate Design

Winter Policy Summit 2020

Cost of Service Allocation in a New Era

INITIAL CONSIDERATIONS

PRESENTED TO
NARUC Winter Meeting

PRESENTED BY
Agustin J. Ros

February 9, 2020

THE Brattle GROUP

Key takeaways

Motivated by *Electric Cost Allocation for a New Era*

Appropriate that changes in electricity technology, competition and regulation motivate an examination into potential changes to cost allocation principles and practices

At same time, important to remember that: "In the end, cost allocation may be more of an art than a science, since fairness and equity are often in the eye of the beholder" (*Electric Cost Allocation for a New Era: A Manual* p. 18)

Fundamental problem of allocating joint costs remains, no COS methodology is superior in all dimensions, tradeoffs will continue to be important

Increased level of competitive alternatives to utility technologies and services are an important element to consider and creates the conditions for a merging/blending of the allocation/classification and rate design exercises

What may be driving change?

Key Industry Developments

Technological Developments

- Strong Growth of Distributed Energy Resources (DERs)
- Large-scale Renewable + Storage, EE and DR
- AMI + smart grid

Competition

- Evolution of Wholesale Markets
- Continued Uncertainty with Retail Competition
- **Self-supply and Bypass of Utility Energy Services**

What impact may these developments have on cost allocation?

Very high-level principles/observations

Electric Cost Allocation for a New Era: A Manual

Cost causation vs. costs follow benefits	• Believe that "costs follow benefits is usually, but not always the superior principle" (p. 18)
Cost characteristics	• Believe that distinction between "fixed" costs and variable costs should be eliminated (p. 19)
Example	• Distribution costs apportioned based on time periods…assign distribution costs volumetrically to all hours across the year (pp. 21)

At the risk of significant oversimplification, a theme in the RAP Manual seems to be increasingly greater costs classified/allocated on the basis of energy as compared to demand/customer especially on transmission/distribution side

Some Initial Reflections

Eliminate fixed vs. variable cost distinction?

- Distinction still plays an important role in identifying economy's scarce-resource requirement and importantly the opportunity cost when producing/avoiding incremental energy and demand
- Implication for zero marginal cost resources like solar and wind

Significant portion of the distribution system cost should be assigned volumetrically to all hours?

- Is it consistent:
  - with underlying reason why distribution investments made (embedded cost perspective)? with how distribution costs change at the margin (forward-looking/marginal cost perspective) and
  - consistency of approach from the demand side of the market (is this what a competitive market would do and impact on competition with alternative technologies)?

Use of total service long-run incremental cost?

- Telecommunications experience urges caution

Some Principle Observations

COS allocation deals with the joint cost "problem" in electricity production

- No "correct" way to allocate among customers based upon supply considerations only. Allocation of joint costs is fundamentally a market/competitive function
- Instead, we allocate based upon "usage" (*e.g.*, energy, peak) of the joint asset. Original aim was to allocate joint investment costs and expenses in direct proportion to the customer causing those costs to whatever degree possible
- Also, usage of the system can be viewed as roughly proportional to the benefits a customer receives so arguably, cost of service based on cost causality is a form of beneficiary pays
- If we had some amount of competitive information, can we use that to inform cost allocation?

DER implies increased competition

- DERs bypass utility energy and (possibly) demand services, but not customer connection services (*i.e.*, no "cutting the circuit" at least not yet not in a meaningful way for smaller consumers)
- As such, it is a form of competition
- How can that information inform allocation?

How are joint costs "allocated" under competition?

- Allocation and rate design are not separate exercises in competitive markets. In fact, it is through the rate design (*i.e.,* the price setting) that costs are "allocated"
- The competitive allocation takes into account cost causation, who uses the assets and how and importantly the impact on the competitive position of the product or service
- The celebrated Alfred Kahn discussion on joint costs in *The Economics of Regulation*

Implications for COS Allocation

DERs are competing with utility-scale energy and other forms of energy

- Allocation of costs between energy, demand and customer can be aided in part by the allocation process we would observe in competitive markets, as this is a fundamental objective of cost of service regulation, to attempt to mimic competitive markets

- Need to examine which of the utility services (energy, demand, customer) are more exposed to competitive pressures and use that information in the allocation/rate design process

- Judgement has always played an important role in cost of service allocation, this would add one additional element to consider

- The result would be to attempt to provide a link between the cost of service allocation step and the rate design step to provide a *competitively neutral cost allocation methodology* that does not advantage or disadvantage utility-scale energy vs. DERs vs. other technologies

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Rick Gilliam
Senior Program Director

What's New in the New Era?

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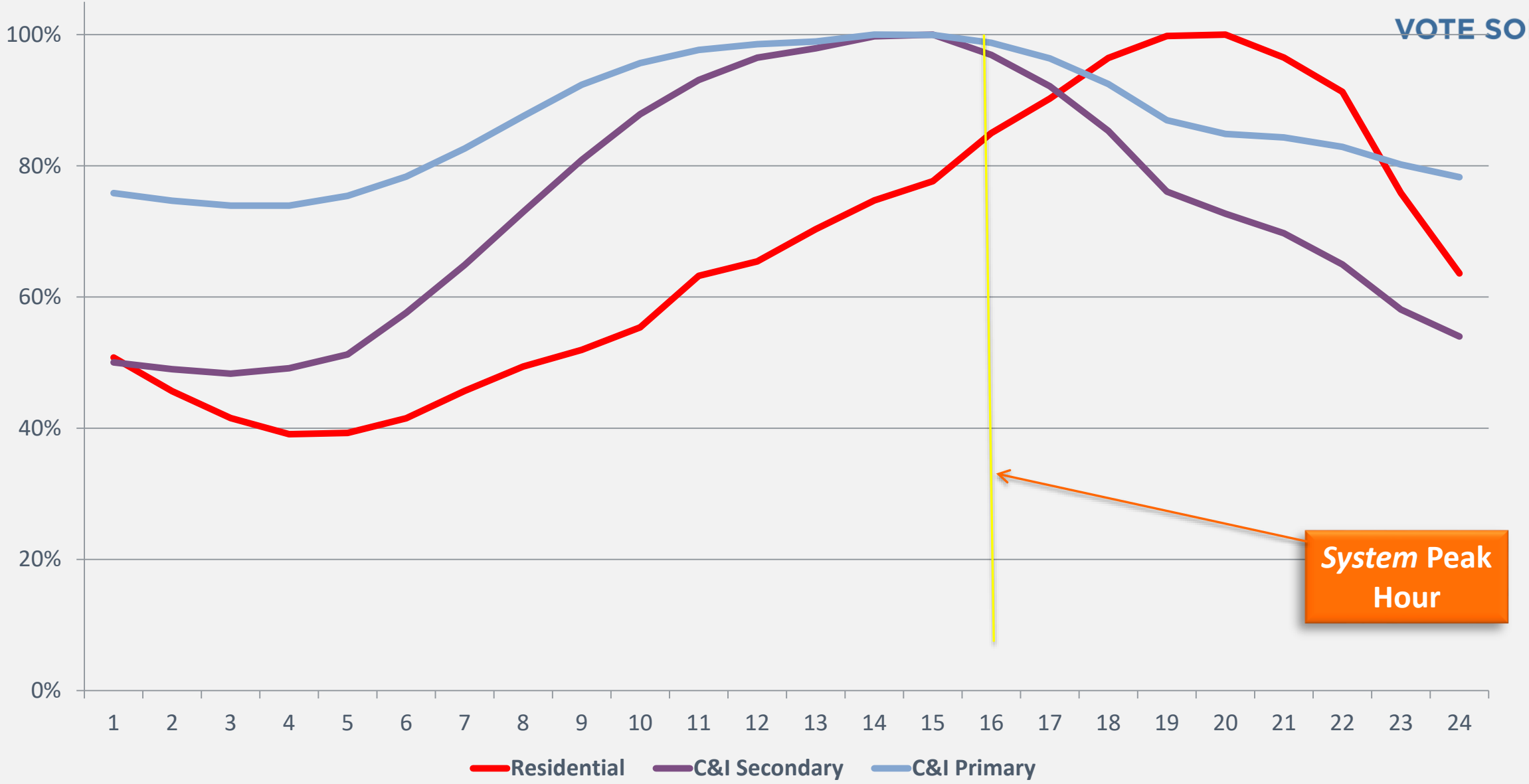
Technologies

» Cheap Wind & Solar
» Practical Storage
» AMI & Data
» Broad Electrification
» Smart Homes

Operations

» Low cost electricity
» Steel for fuel
» Flexible load
» Grid modernization
» Customer as energy partner

Load Patterns - Macro



Subclass Differentiation

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- Multi-family customers impose lower distribution costs than single family;
- More dense urban populations have lower distribution costs than rural;
- Overhead distribution service is lower cost than underground;
- Space heating (and evaporative cooling) customers tend to have flatter load curves;
- Customers with other behind the meter technologies, e.g. solar, EVs, and storage, have different load patterns; and
- Lifestyle differences, number of family members, amount of time in the home, and so on, lead to different load patterns.

Some customers will exhibit a number of these characteristics.

Load Patterns - Micro

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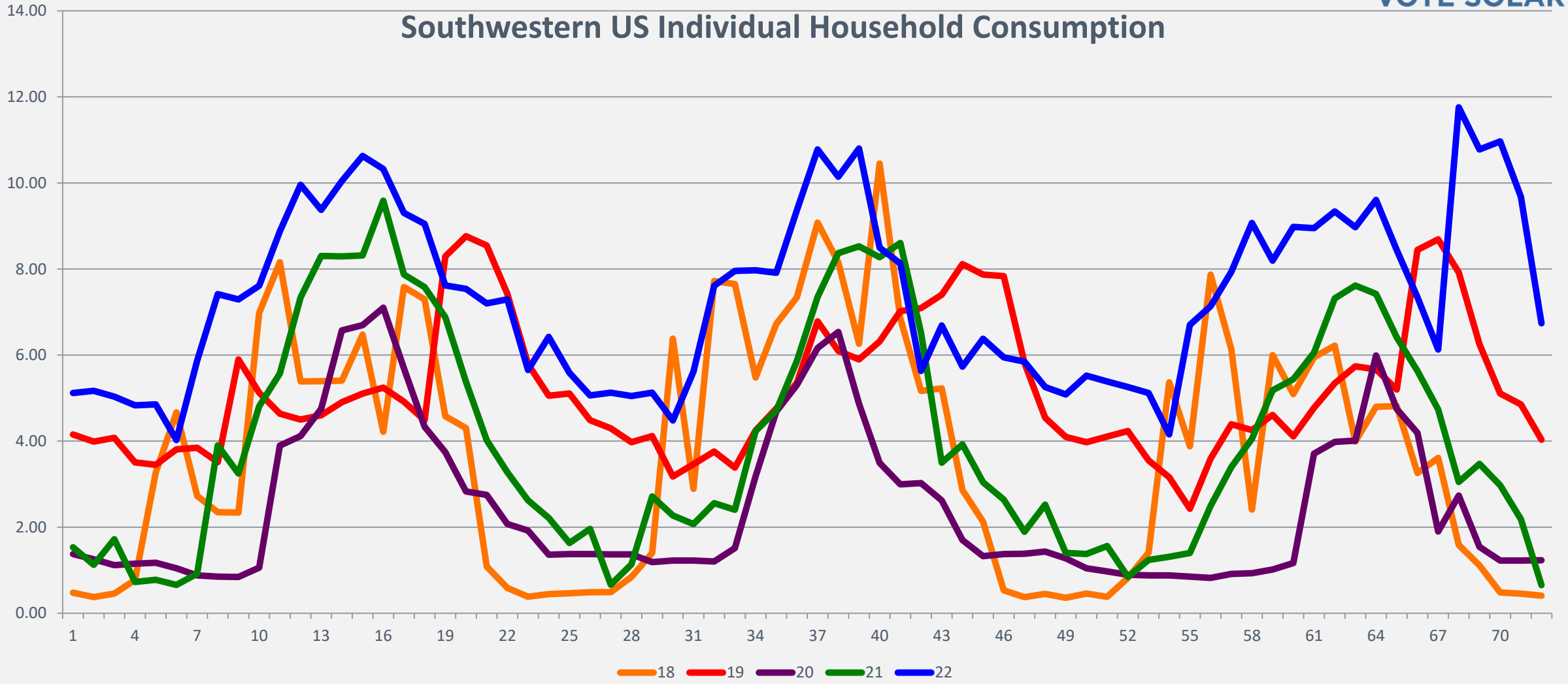

July 21-23, 2014

Load Patterns - Micro

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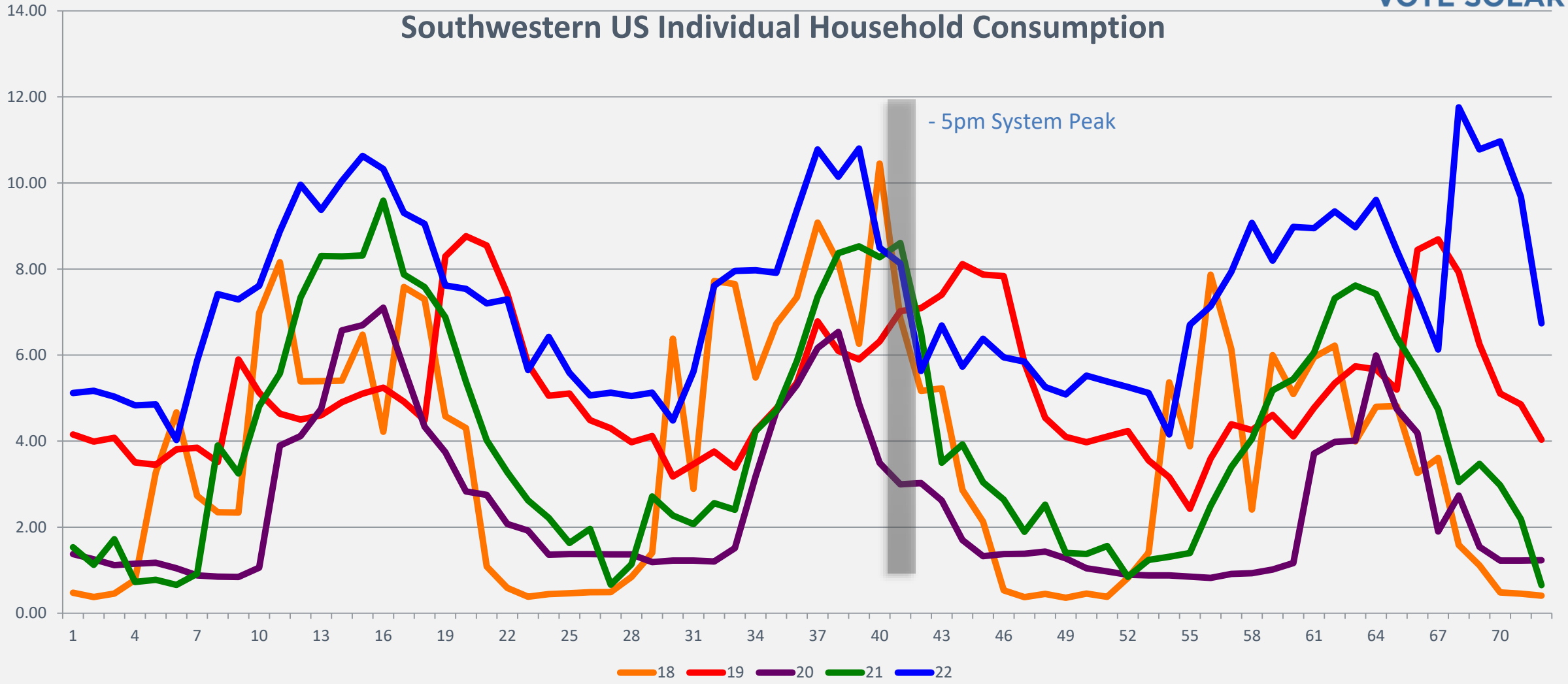

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New Analytical Views

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Q. Between macro and micro perspectives, do significant subsets of customers have similar load patterns?

A. Yes. With sufficient data and tools, subgroups emerge.

Load Patterns - Clustered

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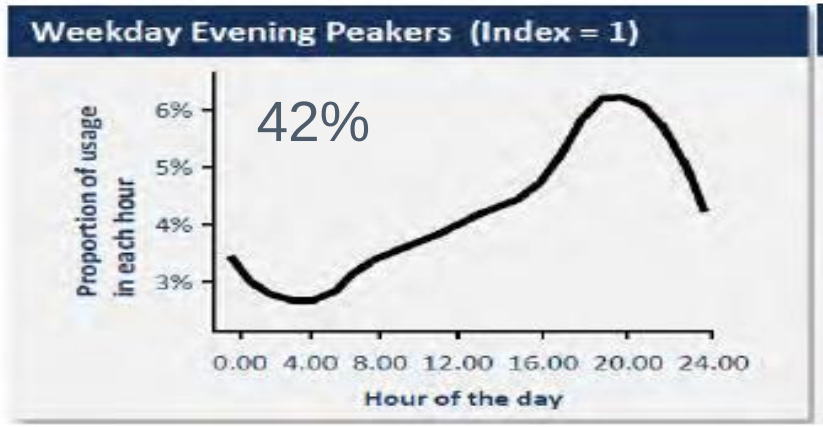
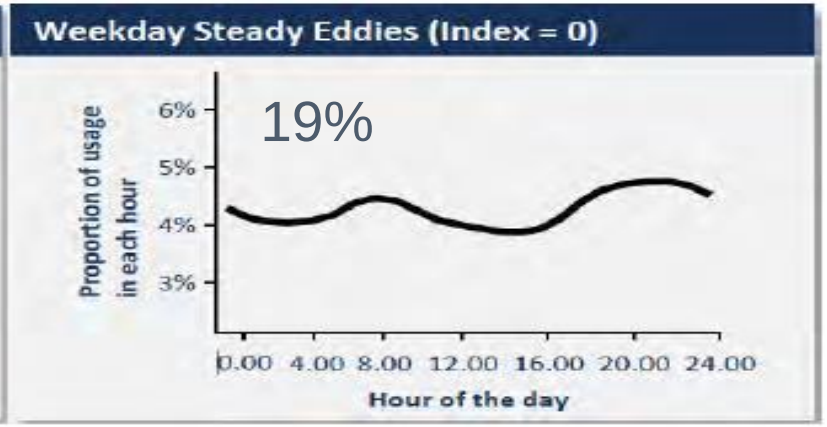
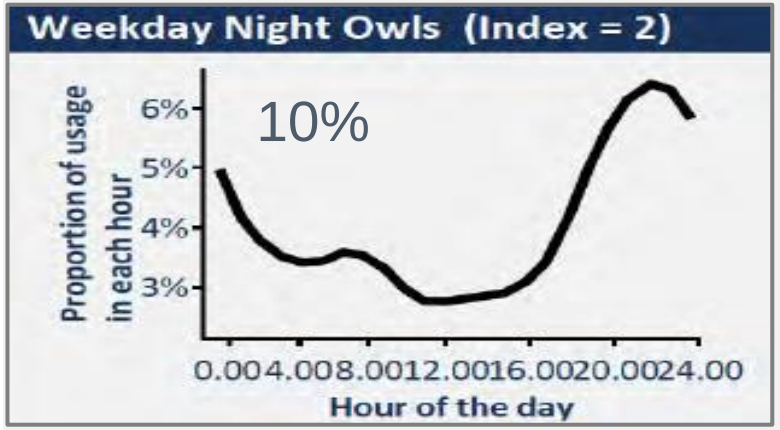
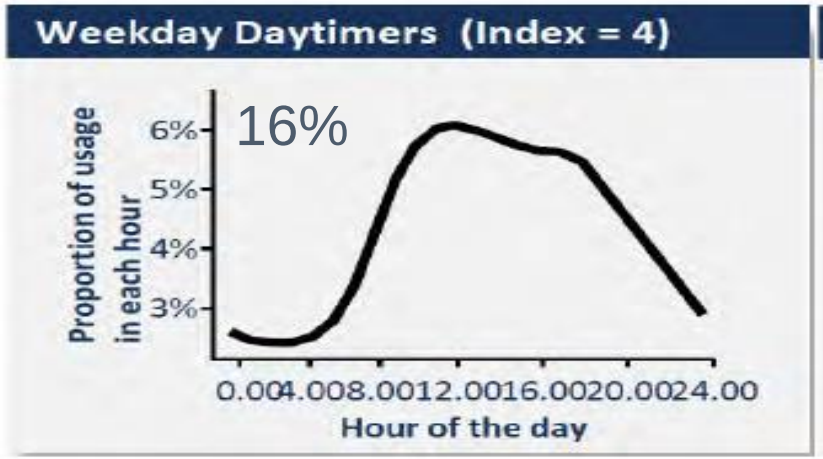
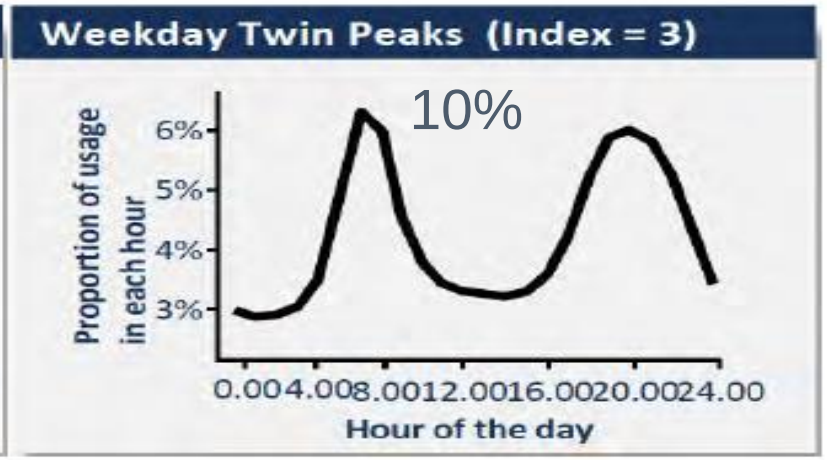
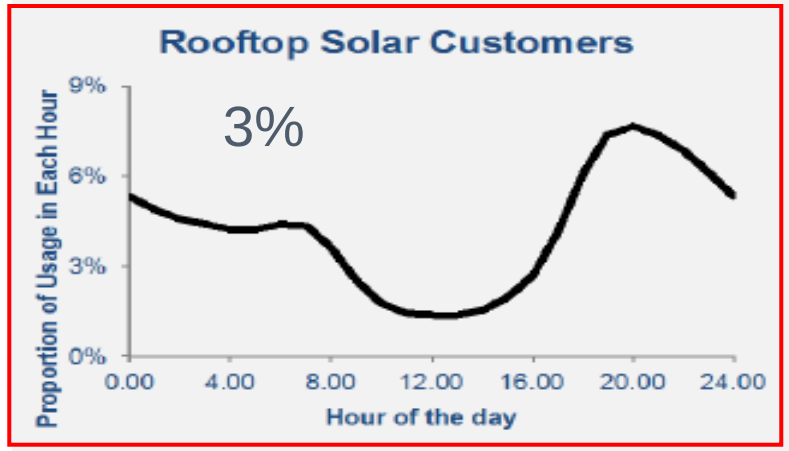






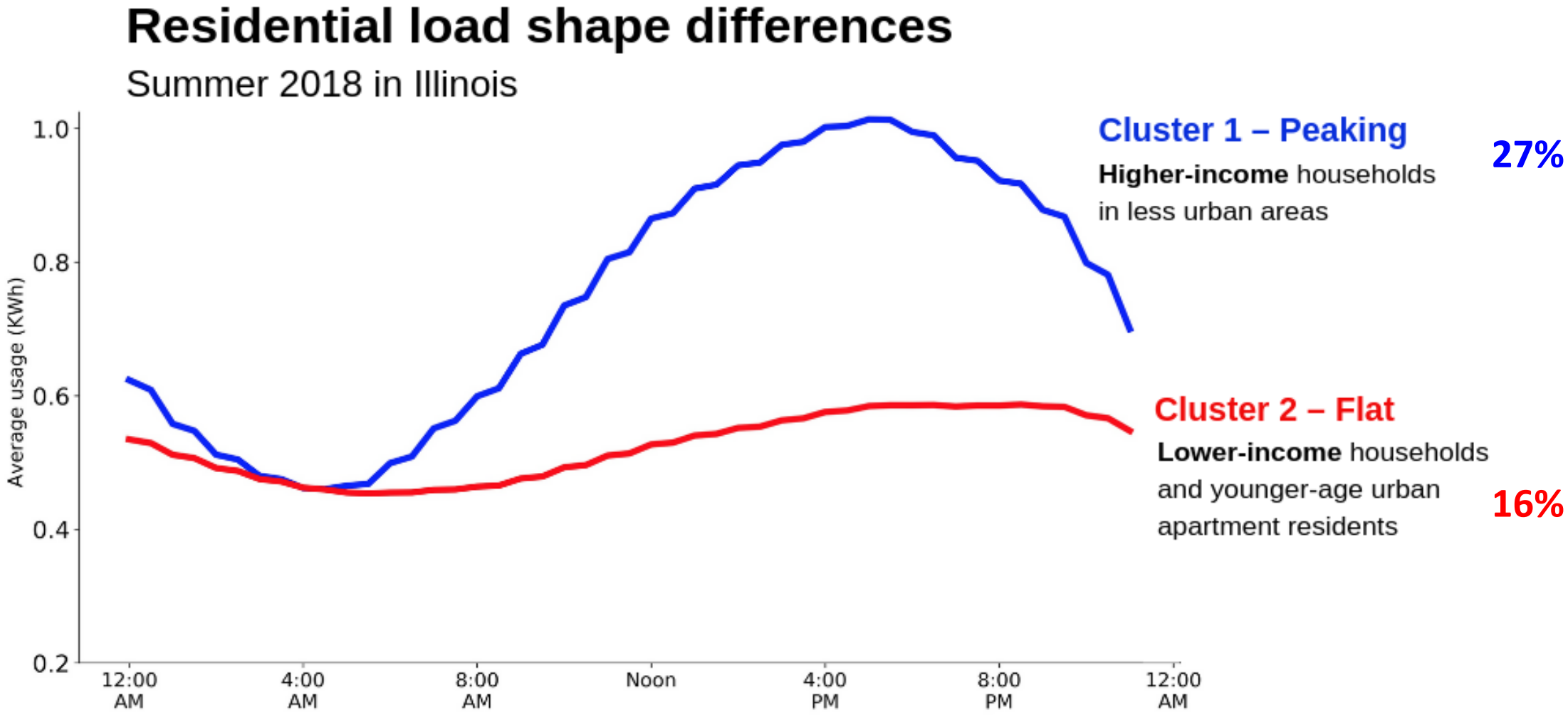






Source: APS and Vote Solar

Load Patterns - Clustered



Source: IL CUB

Cost Allocation

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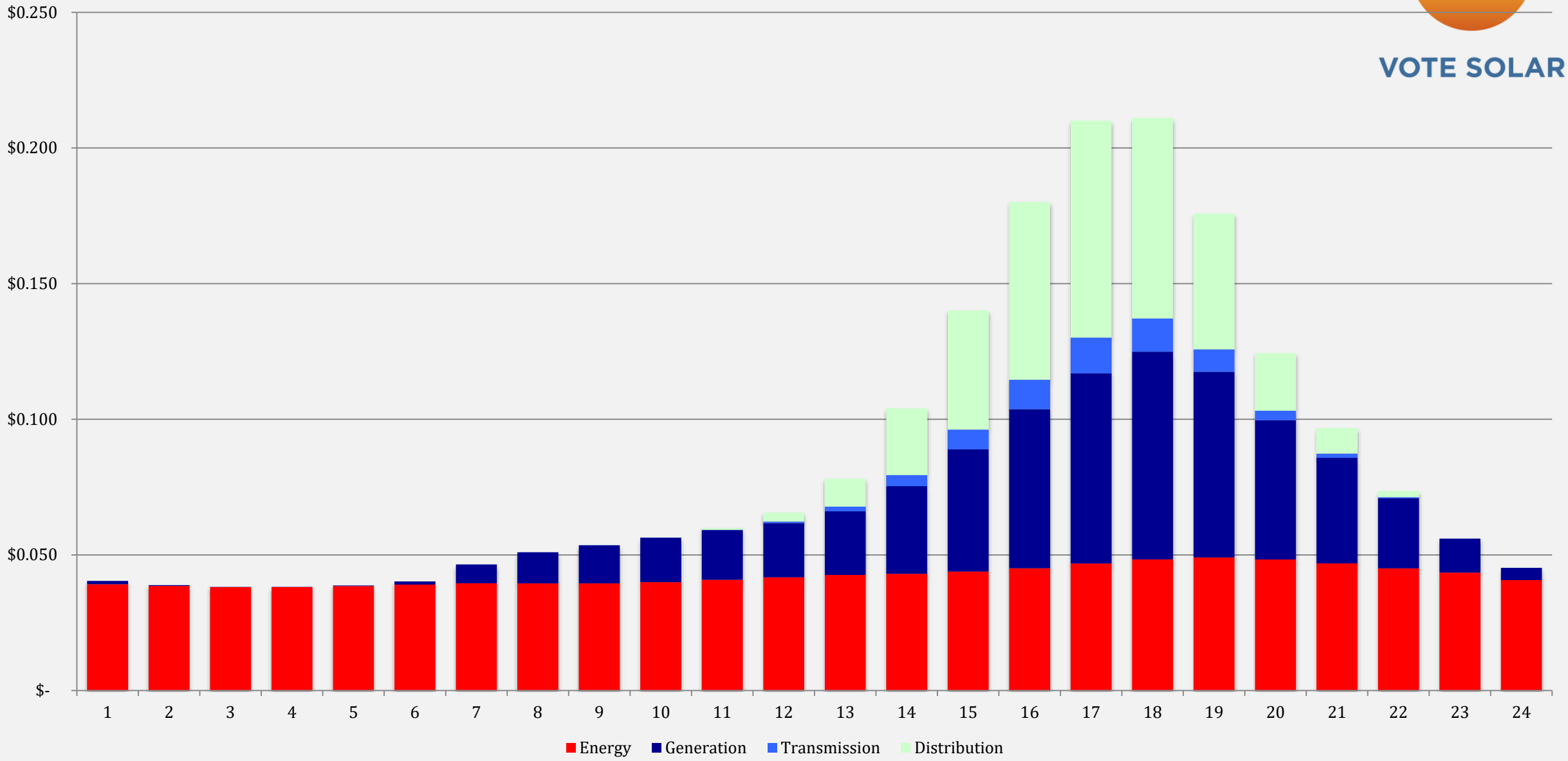
- Do more subclasses improve the division of cost responsibility?
- If so, what would be the bases for subdivision?
  - BTM technologies?
  - Lifestyle?
  - Household size and location?
  - Clustered load patterns?
- Manual section 5.2 suggests assigning costs to hours, creating a rate design reflective of the cost of utility service that can be applicable to all patterns.

Marginal Costs: Annual Average by Hour



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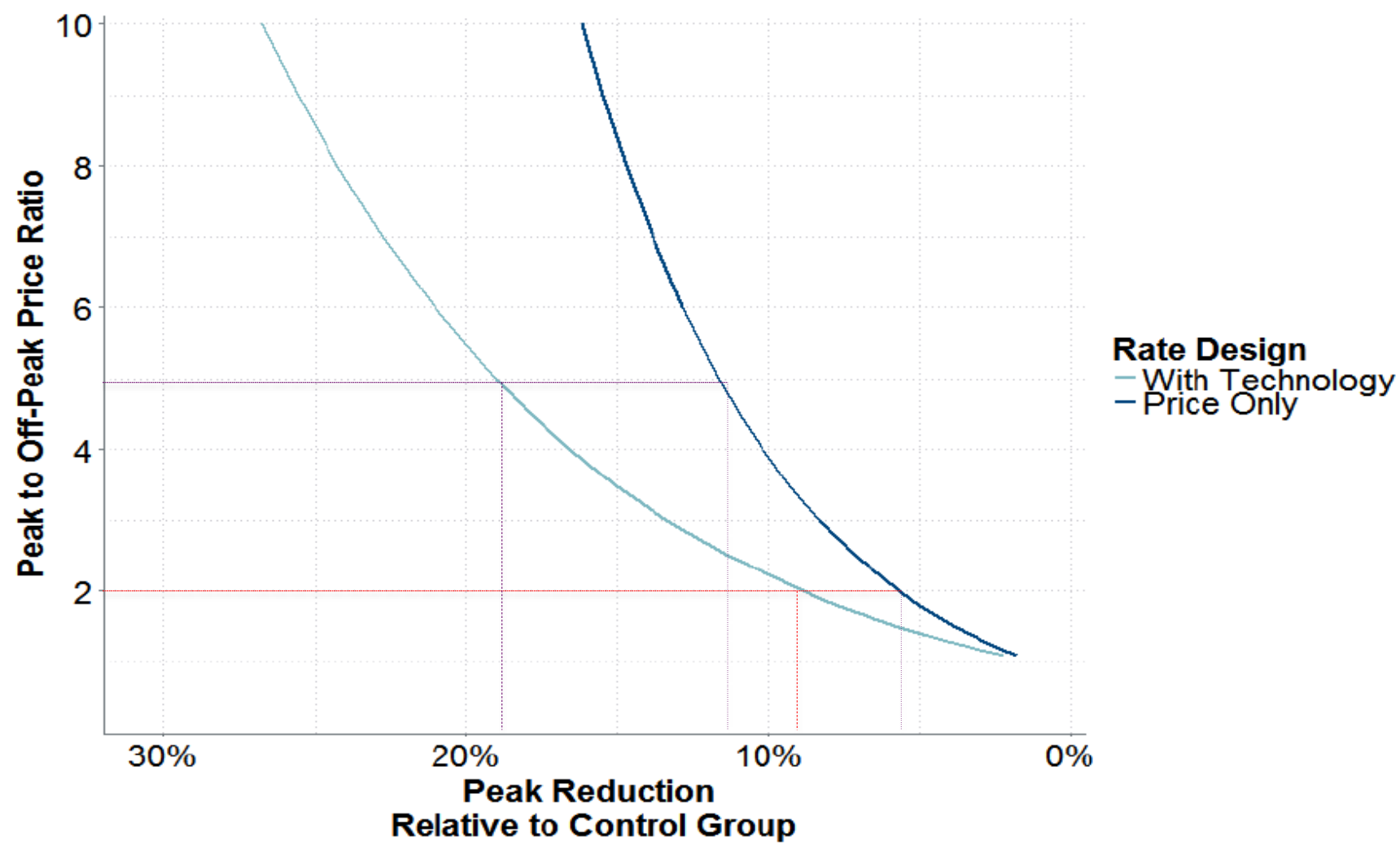
Source: NV Energy

TOU Price Responsiveness



Source: Brattle Group, *Arcturus 2.0: A meta-analysis of time-varying rates for electricity,* 2017.

Thanks!

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