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Electric Cost Allocation for a New Era: Principles and Concepts

Webinar

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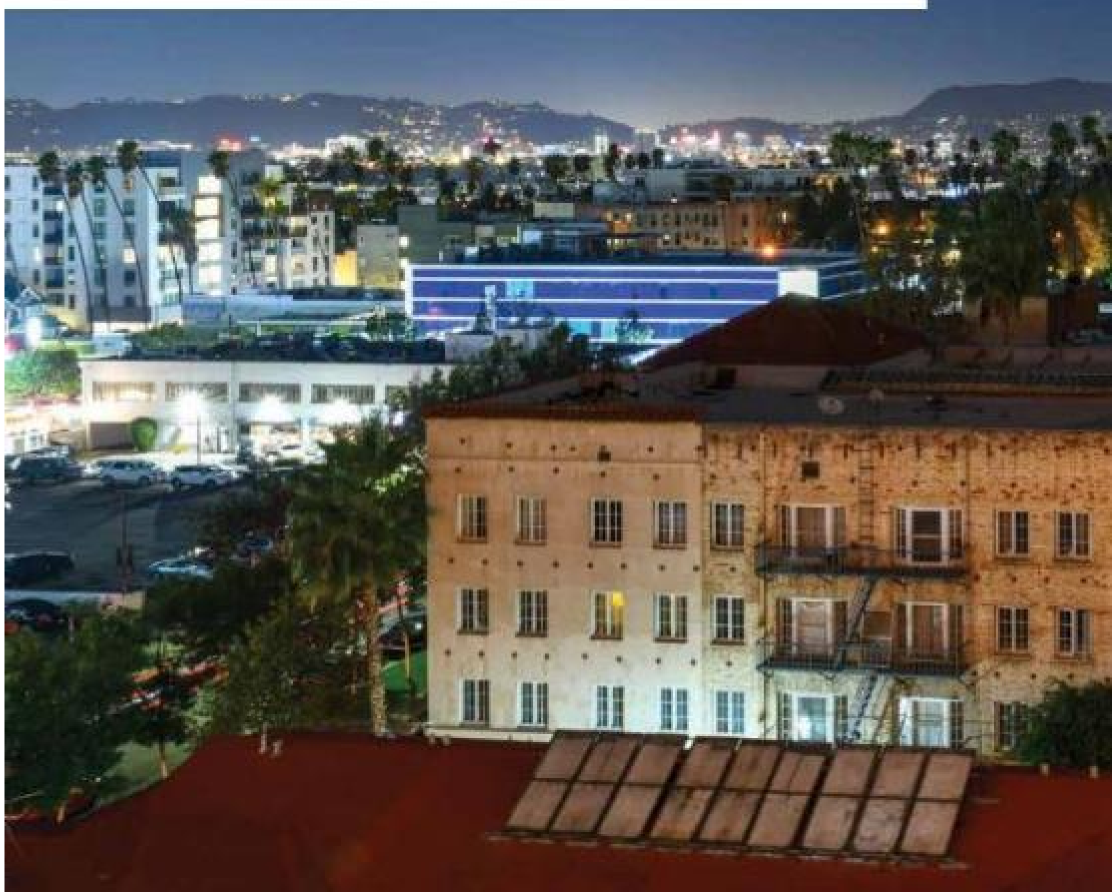
Electric Cost Allocation for a New Era

A Manual

By Jim Lazar, Paul Chernick and William Marcus

Edited by Mark LeBel



Major Topics

- Principles and Background
- Technology and Regulatory Change
- Overarching Issues for All Frameworks
- Embedded and Marginal Cost Frameworks
- Using Cost Studies
- Key Takeaways

About the Authors

Author	First Rate Case	Dockets
Jim Lazar	1974	>100
Paul Chernick	1977	>350
Bill Marcus	1978	>300

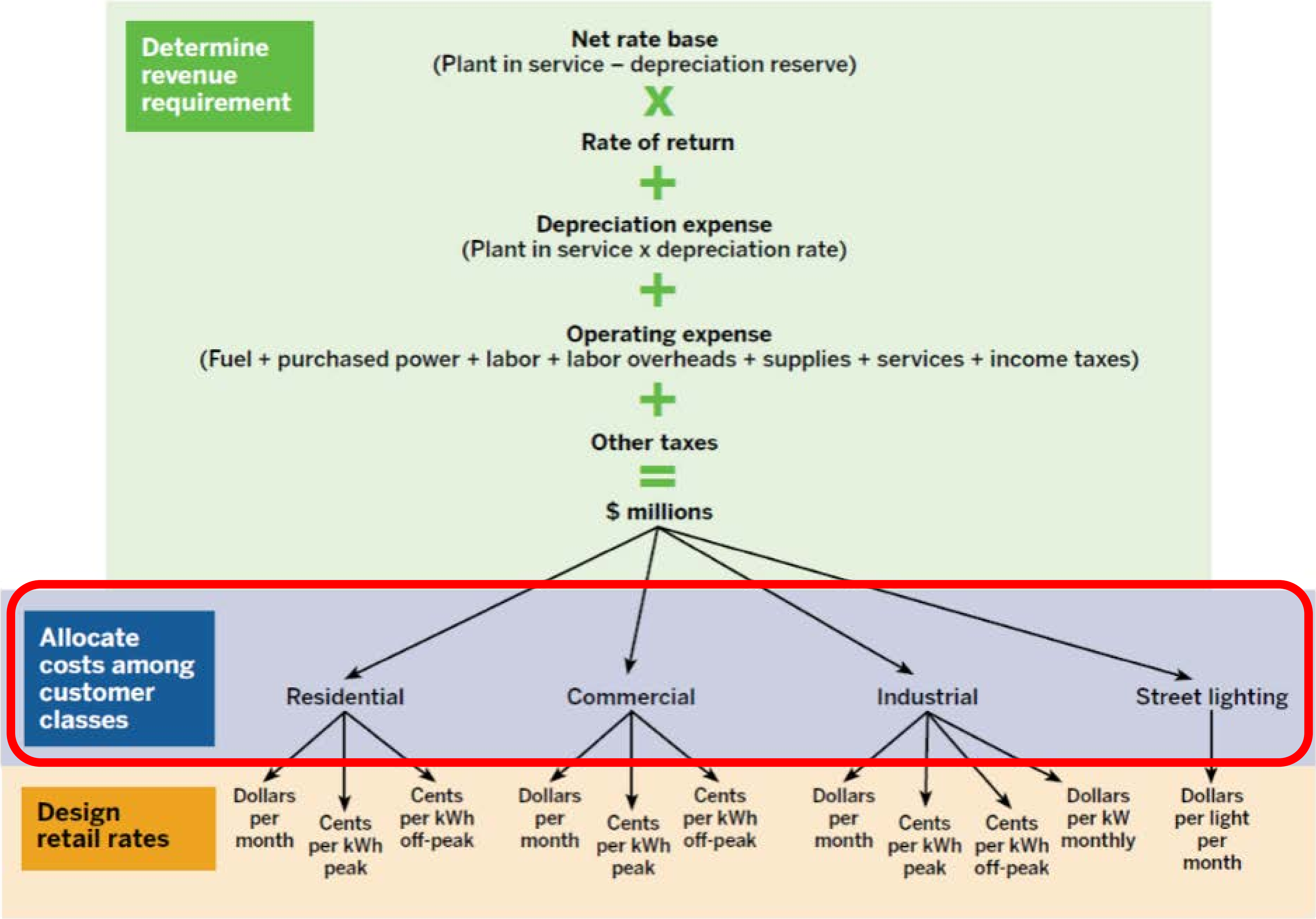
Collective experience:

43 states, 8 provinces

Mark LeBel, Editor

1 Principles and Background

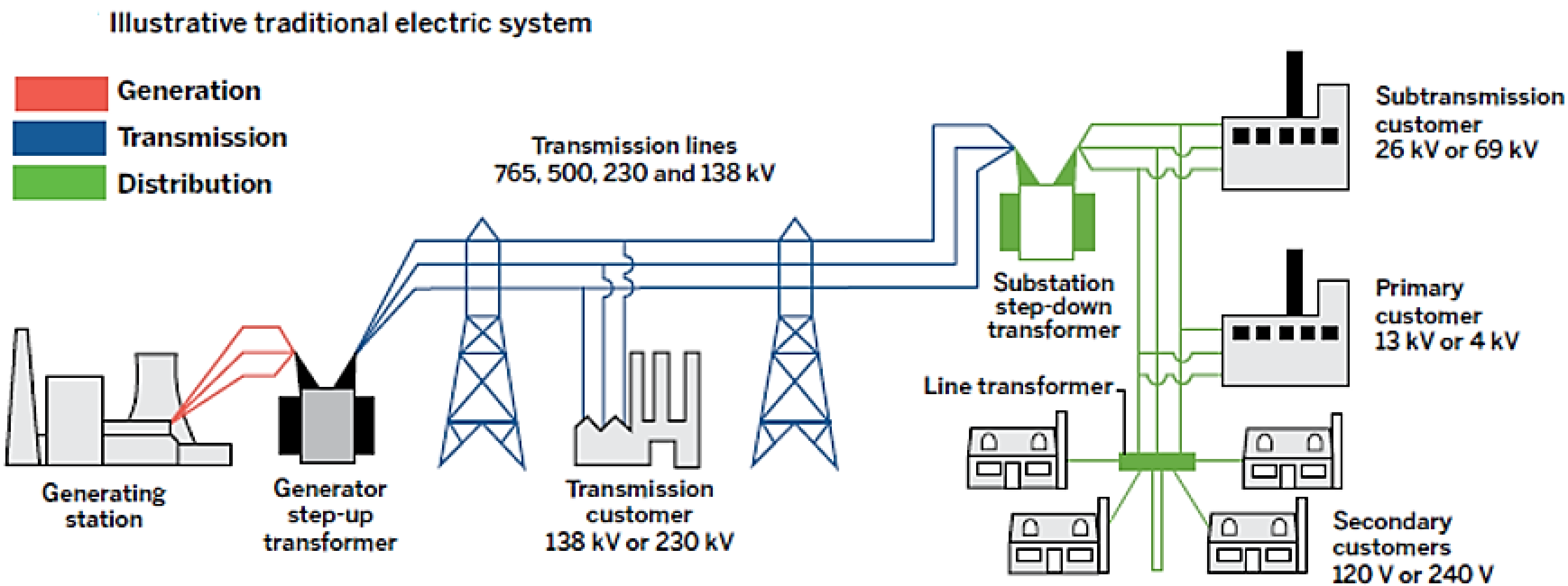
Simplified rate-making process



Why Does Cost Allocation Matter?

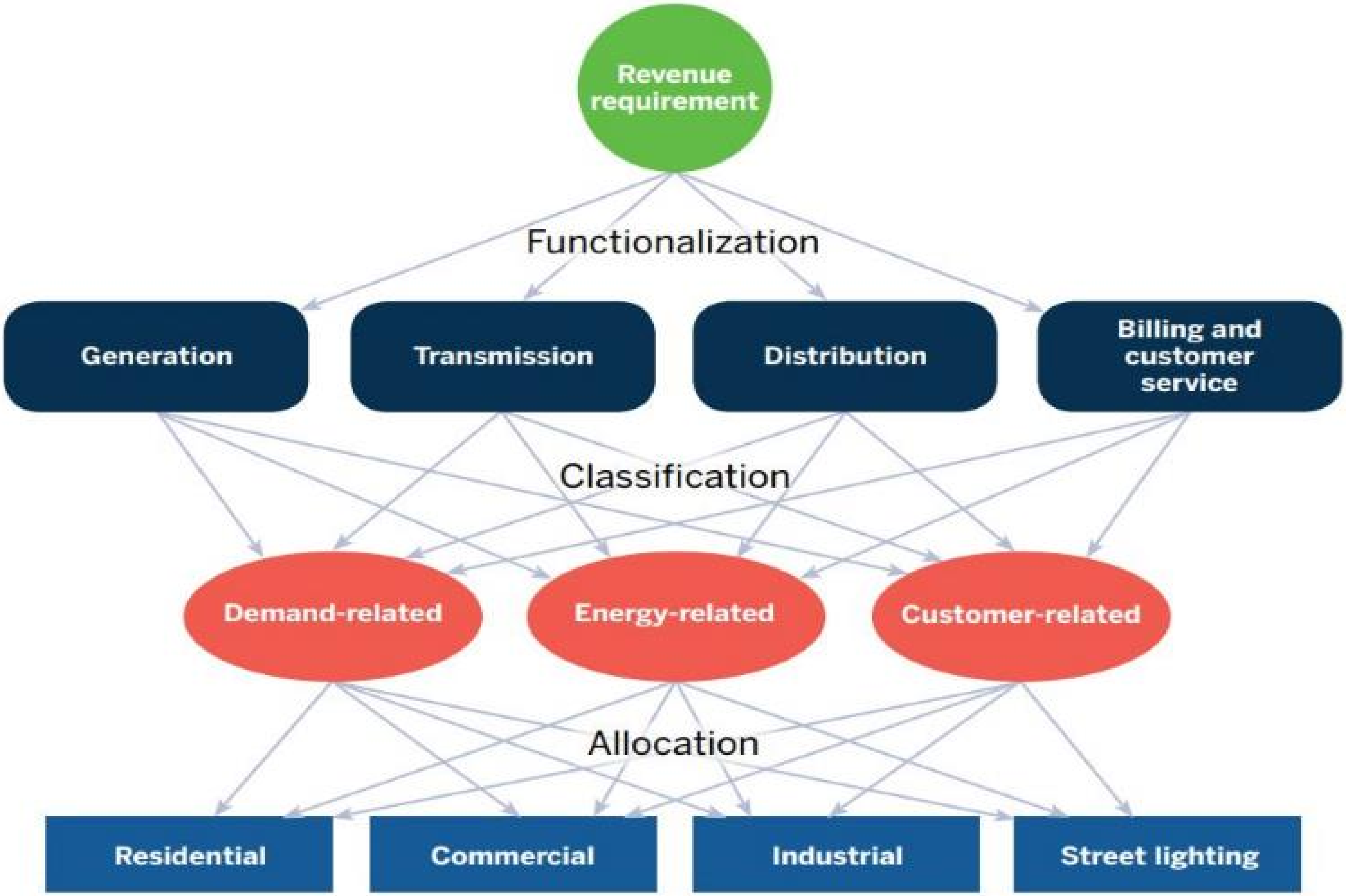
- Cost allocation matters to customers: the allocated costs are used to set rates for each class
- Two key analytical perspectives
  - Cost causation
  - Costs follow benefits
- Data and analysis from cost allocation process often informs rate design
- Older techniques have trouble accounting for the features of the modern grid

The 1992 Grid



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*

Traditional Embedded Cost of Service Study (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

Traditional MCOSS Process

- Created in the 1970s
  - Adopted in a handful of states
- The basics
  - Functionalize, like ECOSS
  - Estimate marginal unit costs for each function
  - Compute sum of marginal costs by class
  - Reconcile to total revenue requirement
- Theory that efficient pricing should be better linked to marginal costs at all points in the process
- Will be addressed in more detail in future technical webinar

2 Technology and Regulatory Change

The Evolving Electric System

- Most current methods pre-date 1990s; many pre-date 1950s
- Numerous changes since then need to be accounted for:
  - Technology changes
  - Regulatory changes

Wind and Solar

- Capital intensive
- No fuel
- Peak reliability benefit may be limited in some regions

Storage

- Capital intensive
- Multiple purposes:
  - Shift energy to high-value periods
  - Support T&D
  - Very reliable capacity
  - Ancillary services
  - Resilience

Customer-Sited Resources

- Shift net peak hours for both generation and delivery

- Distribution system provides upstream benefits

Energy Efficiency

- Implemented at customer level
- Saves generation, transmission & distribution
- Often booked as customer service

Demand Response

- Peaking resource with little utility investment
- Substitution of data and controls for both capital and fuel
- Cheap compared to any supply option

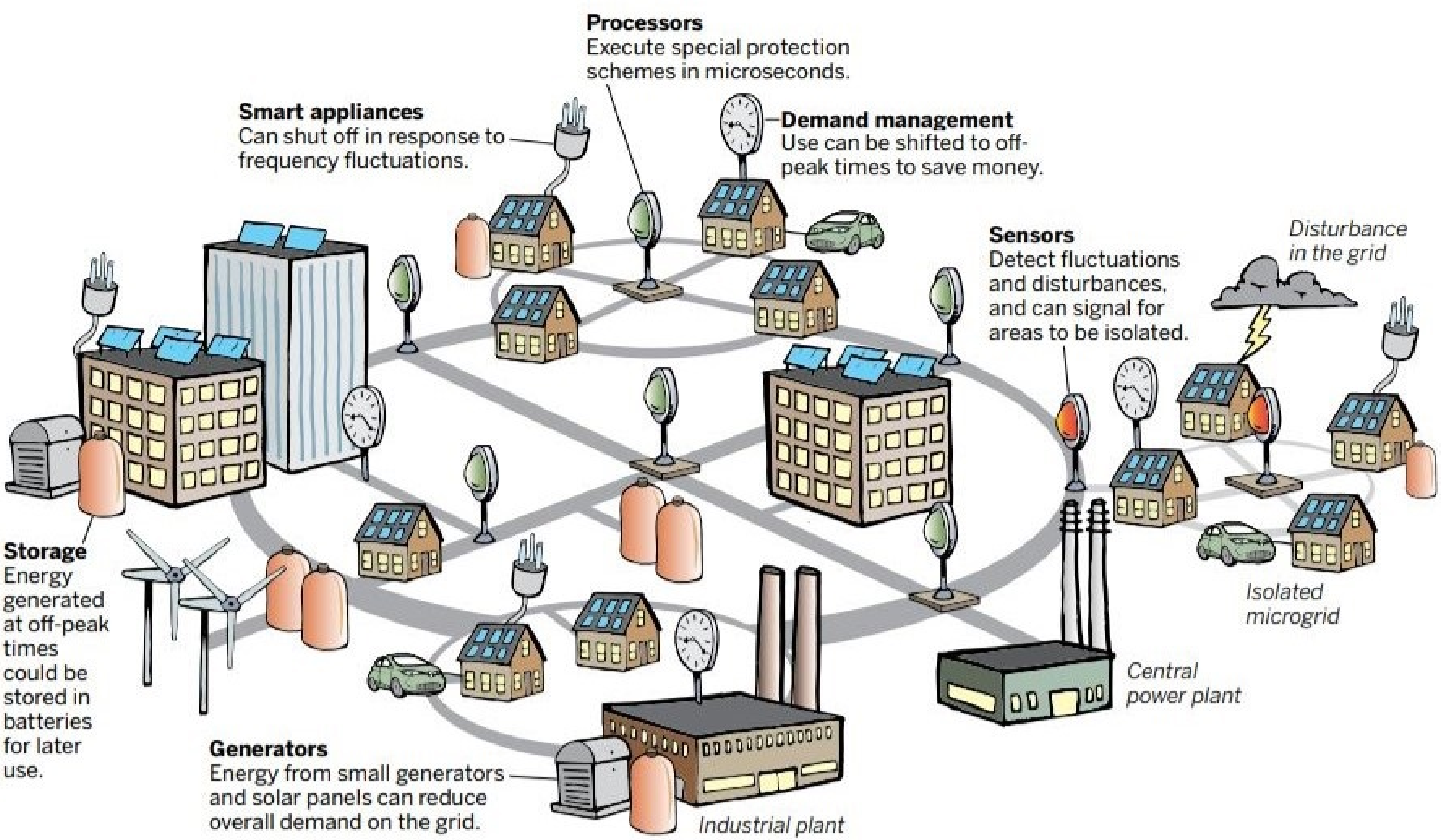
Smart Grid and Big Data

- Reduce system costs and lower losses
- Granular customer and distribution system data
- Storage locations can be optimized

Electric Vehicles

- Potential very large additional load
- High incremental costs if done wrong
- But can be almost all off-peak, or even flatten net load

Illustrative modern electric system



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

Regulatory Changes Since 1990

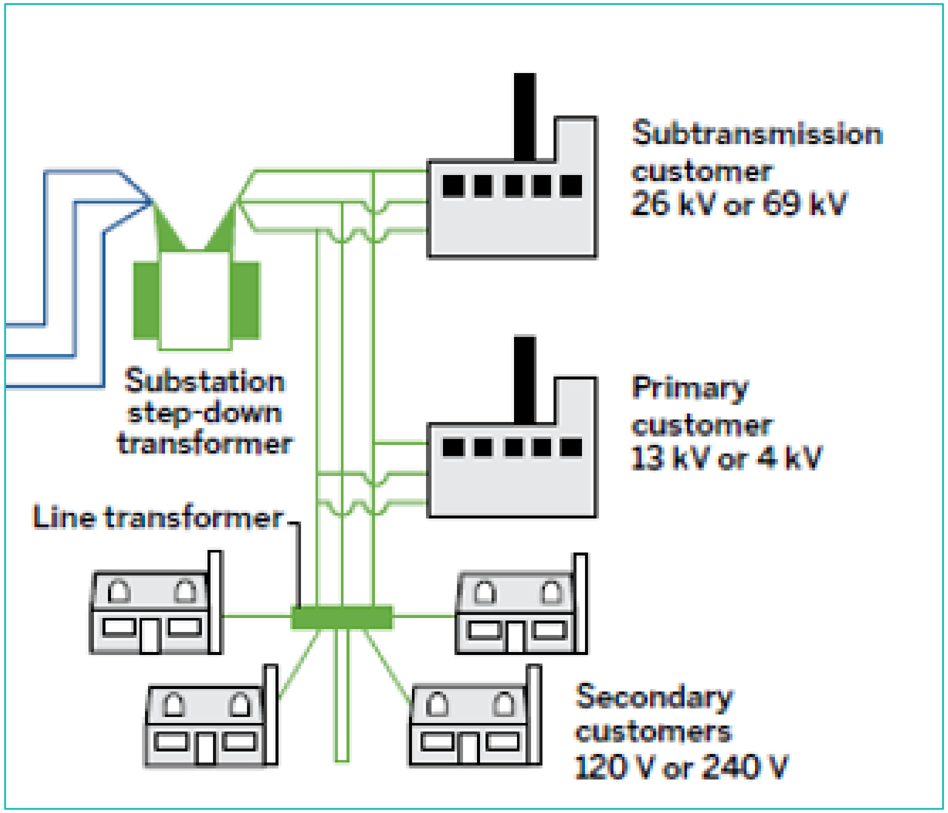
- Restructuring and new wholesale and retail markets
- Performance-based regulation
- Public policy costs for efficiency, environment, equity, etc.
- New stranded cost risks

3 Overarching Issues

Cost Causation for Electric System

- System serves joint needs of all customers across all hours of the year
- Each function has distinct cost drivers
  - Energy supply costs are time-differentiated
  - Transmission lines serve multiple purposes
  - Distribution is built only where there is load to support it
  - Basic meters are for billing, but the costs of AMI are incurred for a broad array of purposes

Determining Customer Classes



Types:

Residential

- Single-Family
- Multi-Family
- Solar?
- Heating?

Commercial

Industrial

Irrigation

Street Lighting

4 Embedded Cost Frameworks

Best Practices for All Frameworks

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

Fixed Costs Generally

- All enterprises incur costs that are fixed in the short run
- Most fixed costs are spread over the units that are sold
- As businesses grow, they incur additional fixed costs.

Source: www.alexslemonade.org

Fixed Costs in the Electric System

- Equipment type and cost depend on expected use
  - Generation mix
  - Transmission lines added to connect remote resources
  - Line and transformer sizing
- Wear and tear drives continuing costs
  - Generator usage
  - T&D equipment ages from repeated high loads

Fixed versus Variable Example

- Multiple ways to serve an increase in peak demand
  - Peaker – mix of fixed and variable
  - Battery storage – almost entirely fixed costs
  - Demand response – variable costs

Reforms to Traditional ECOSS

- Energy drives significant portions of transmission, shared distribution, and generation capacity costs
  - These costs are not entirely caused by peak demand
- Some energy-related costs vary by time
  - E.g., fuel and purchased power
- Use broad peak measures for demand-related costs
  - Eliminate 1CP/4CP/12CP for transmission and generation capacity
- Use basic customer method for customer connection costs
  - Minimum system and zero intercept methods are unreasonable
- Functionalize and classify AMI and distributed energy resources across all elements of electric system that they benefit

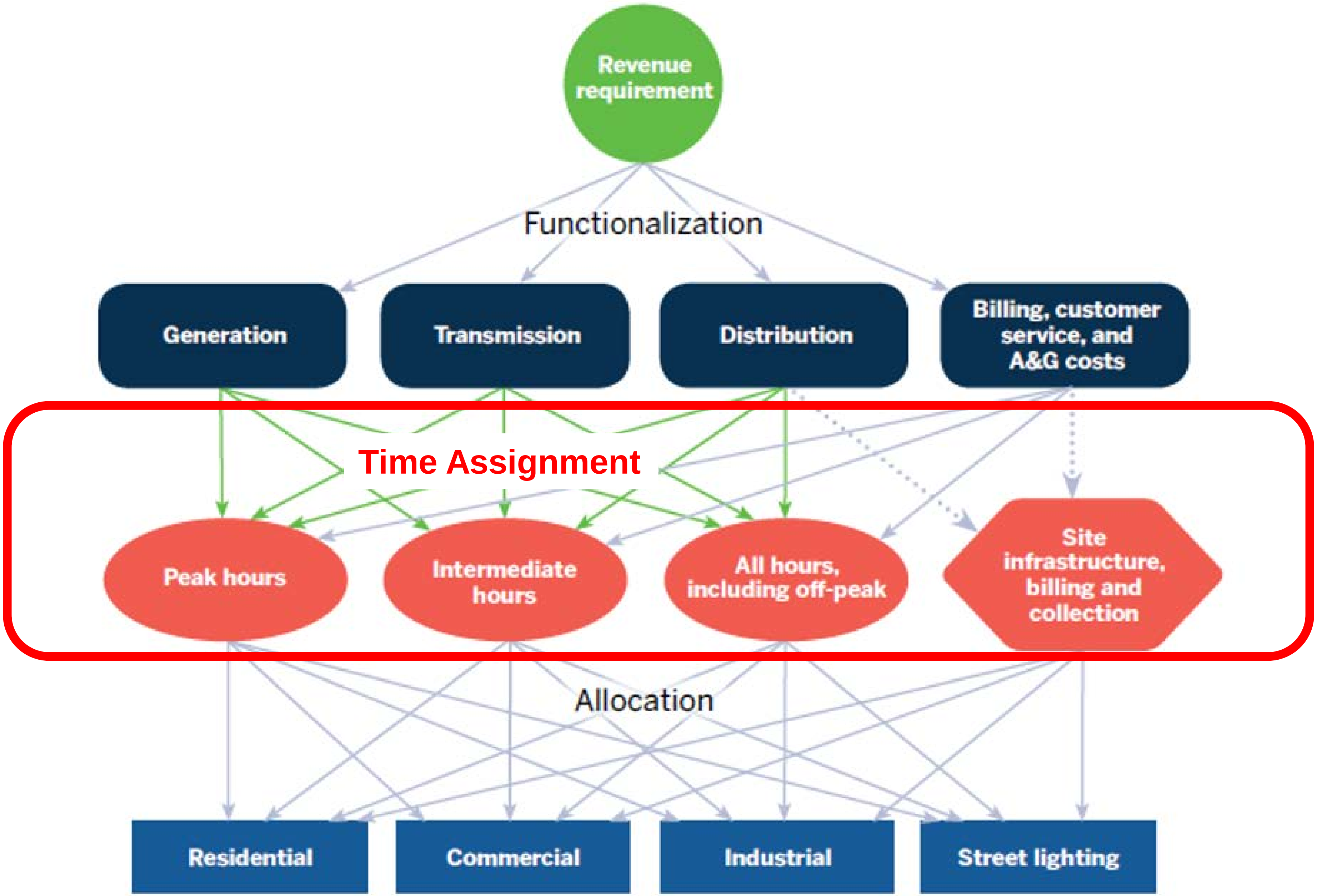
Issues with Traditional Demand & Energy Allocators

- Demand at what hours?
  - System peak, equipment peak, or class peak?
  - Demand allocators typically only use a subset of the relevant hours
- Energy-classified costs are usually allocated using <u>annual</u> kWh usage
  - Fails to reflect time-varying costs
- Time-based allocation addresses these issues

Creating a Modern ECOSS

- Smarter customer classes;
- New and more granular functions;
- Classification and allocation should reflect time-varying loads;
- Clear division between shared distribution plant and the equipment that connects individual customers.

Modern embedded cost of service study flowchart



Old Ways vs. New Methods

Generation

The Old Way

- Fixed costs classified to demand
- Allocated on narrow measures of peak demand (1CP, 12CP)

Modern Methods

- Fixed and variable costs assigned to relevant hours.
- Costs allocated on class hourly usage

Old Ways vs. New Methods

Transmission

The Old Way

- All costs classified as demand-related
- Allocated on narrow measures of peak

Modern Methods

- Each component is allocated based on its use and need.

Old Ways vs. New Methods

Distribution

The Old Way

- Many shared costs classified as customer-related
- Demand costs allocated on non-coincident load

New Methods

- No shared costs are customer-related
- Demand costs allocated on usage in broad peak periods

5 Presenting and Using Results

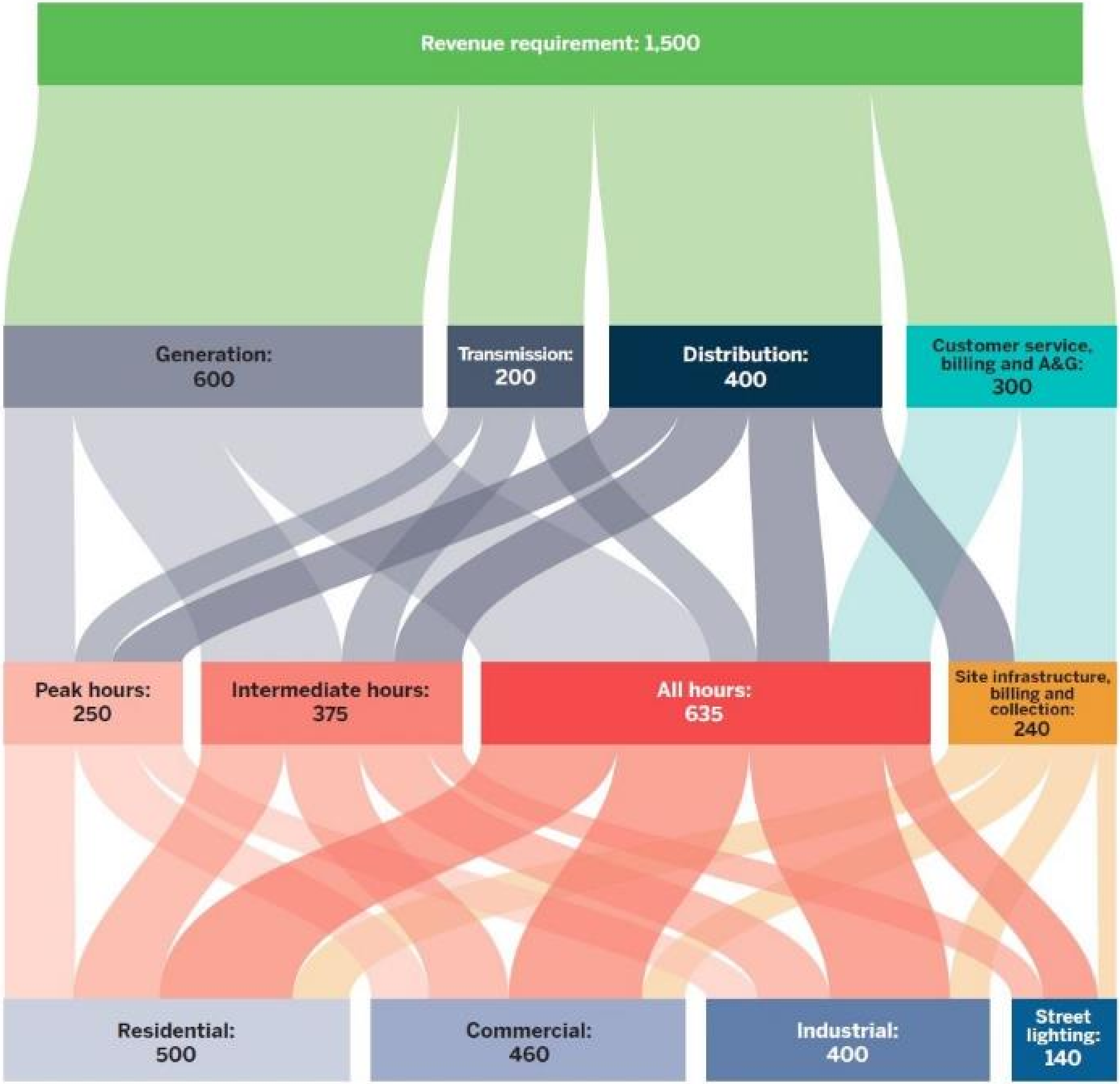
Presentation of Results

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.

Sankey diagram for modern embedded cost of service study



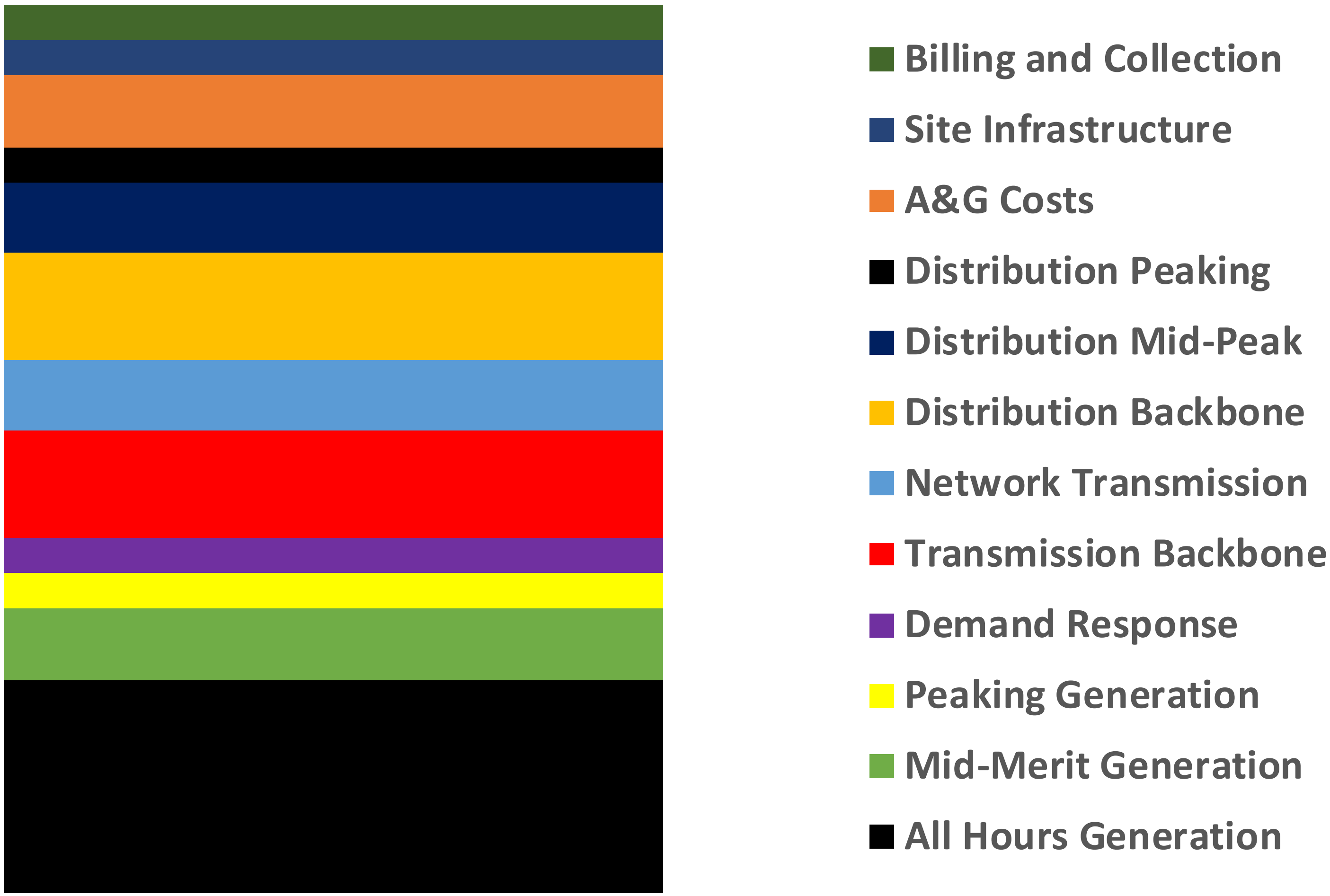
Using The Results of Studies

- Examine multiple reasonable approaches
- Define a range of reasonableness
- Apply judgment
- Change allocation of costs (and rates) gradually

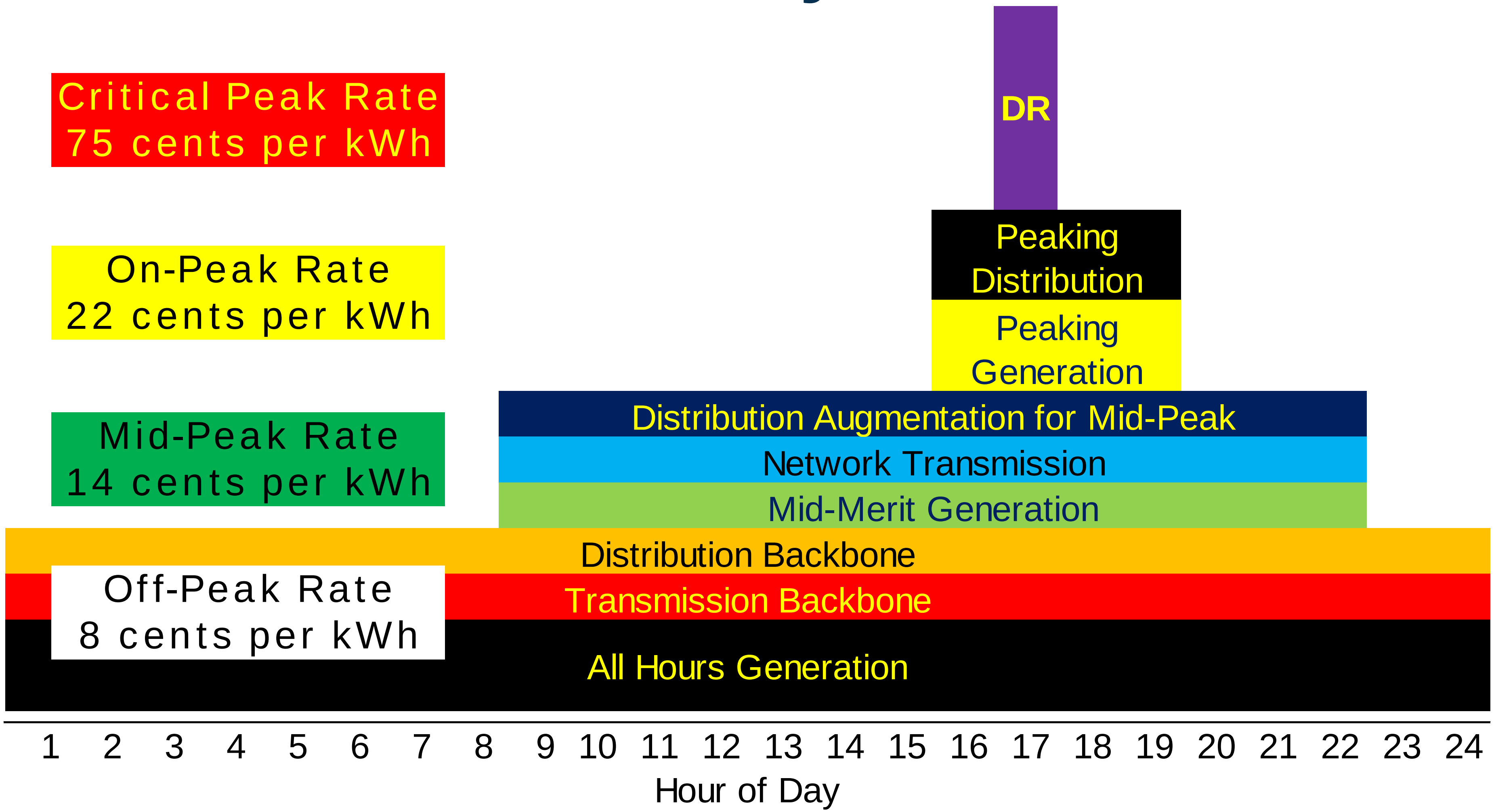
Relationship Between Cost Allocation and Rate Design

- Cost allocation and rate design have different purposes:
  - Cost allocation = group equity
  - Rate design= customer understanding and efficient incentives
- Bad allocation techniques encourage bad rate design
- Good cost allocation techniques can inform modern rate design

Start With Costs By Function



Build a Cost-Based TOU Rate for Shared Elements of System



Important Takeaways

Key Concepts

- Consider both cost causation and benefits of all types of costs
- Technology and regulation have changed
- Use newly available load and system data
- Smart-grid costs provide benefits for multiple functions

Key Reforms

- Smarter customer classes based on real cost distinctions
- Time-based methods for classification/allocation
- Shared assets are NOT customer costs
- Thoughtful 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.

Learn more about our work at raponline.org

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