June 4, 2020

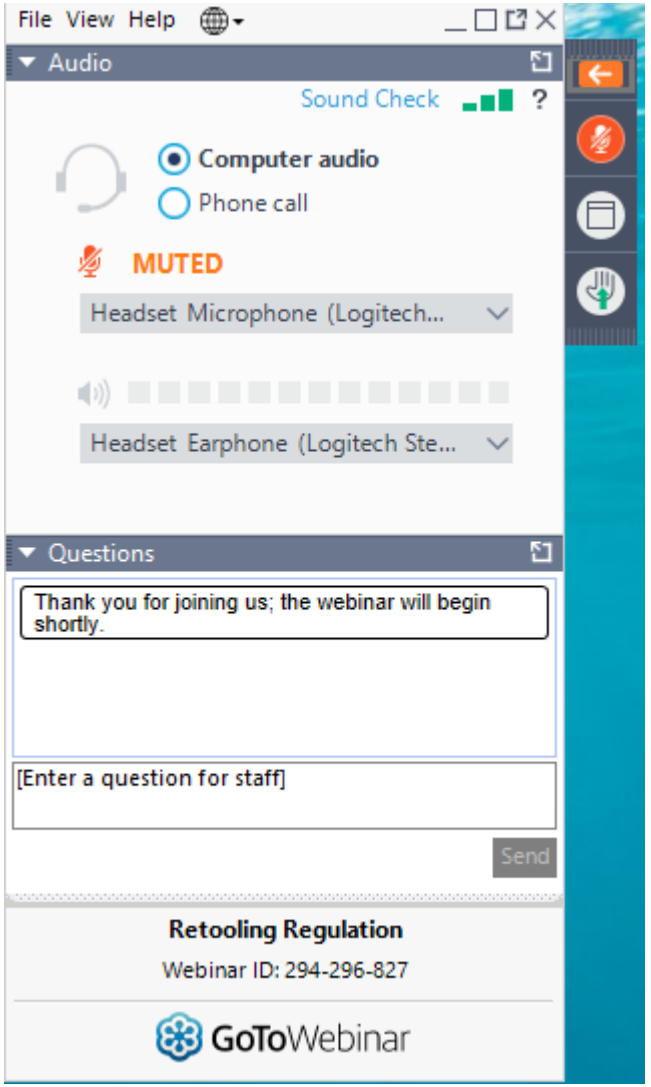
Electric Cost Allocation For A New Era: Technical Topics

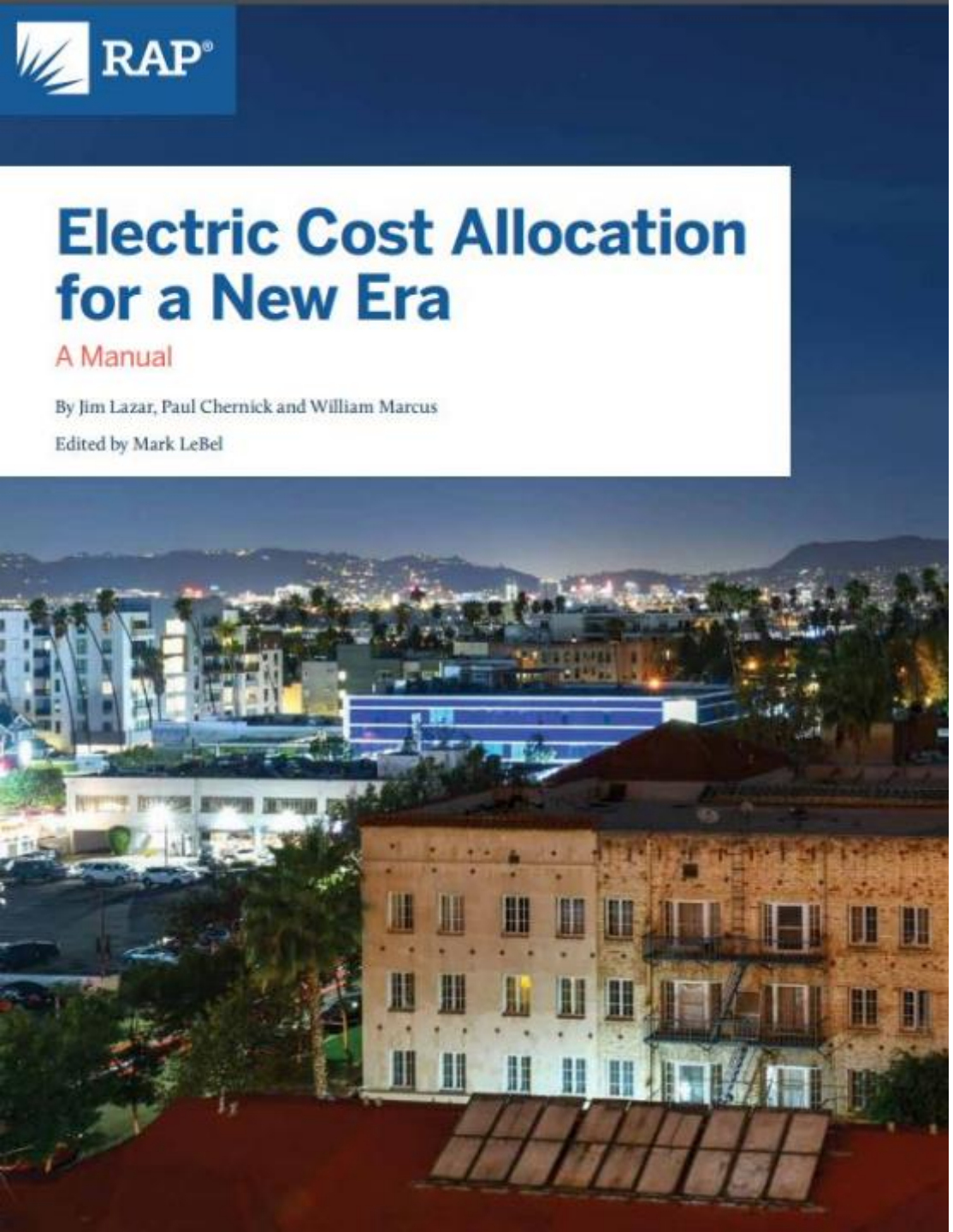
Webinar

Jim Lazar, Senior Advisor
Mark LeBel, Associate
Paul Chernick, President
The Regulatory Assistance Project (RAP)®
Resource Insight, Inc.

Questions?

Please send questions through the Questions pane





First webinar was on principles and concepts.

Available at www.raponline.org

This webinar is a little more technical.

Major Topics for Today

- Principles
- Generation
- Transmission
- Distribution
- Storage
- Metering and Billing
- Marginal Cost Studies

About the Authors

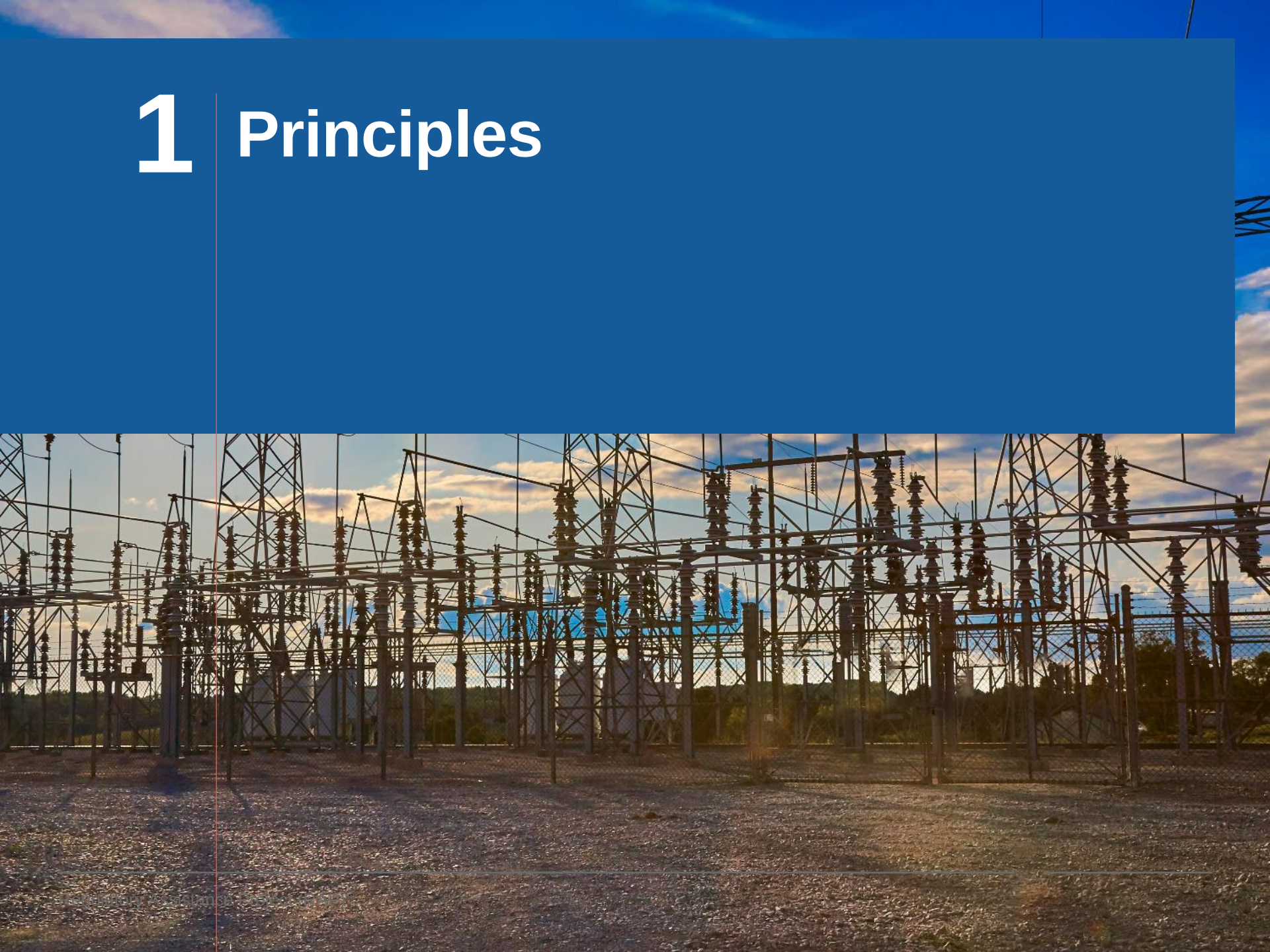
Author	First Rate Case	Dockets
Jim Lazar	1974	>100
Paul Chernick	1977	>350
Bill Marcus	1978	>300

Collective experience:

43 states, 8 provinces

Mark LeBel, Editor

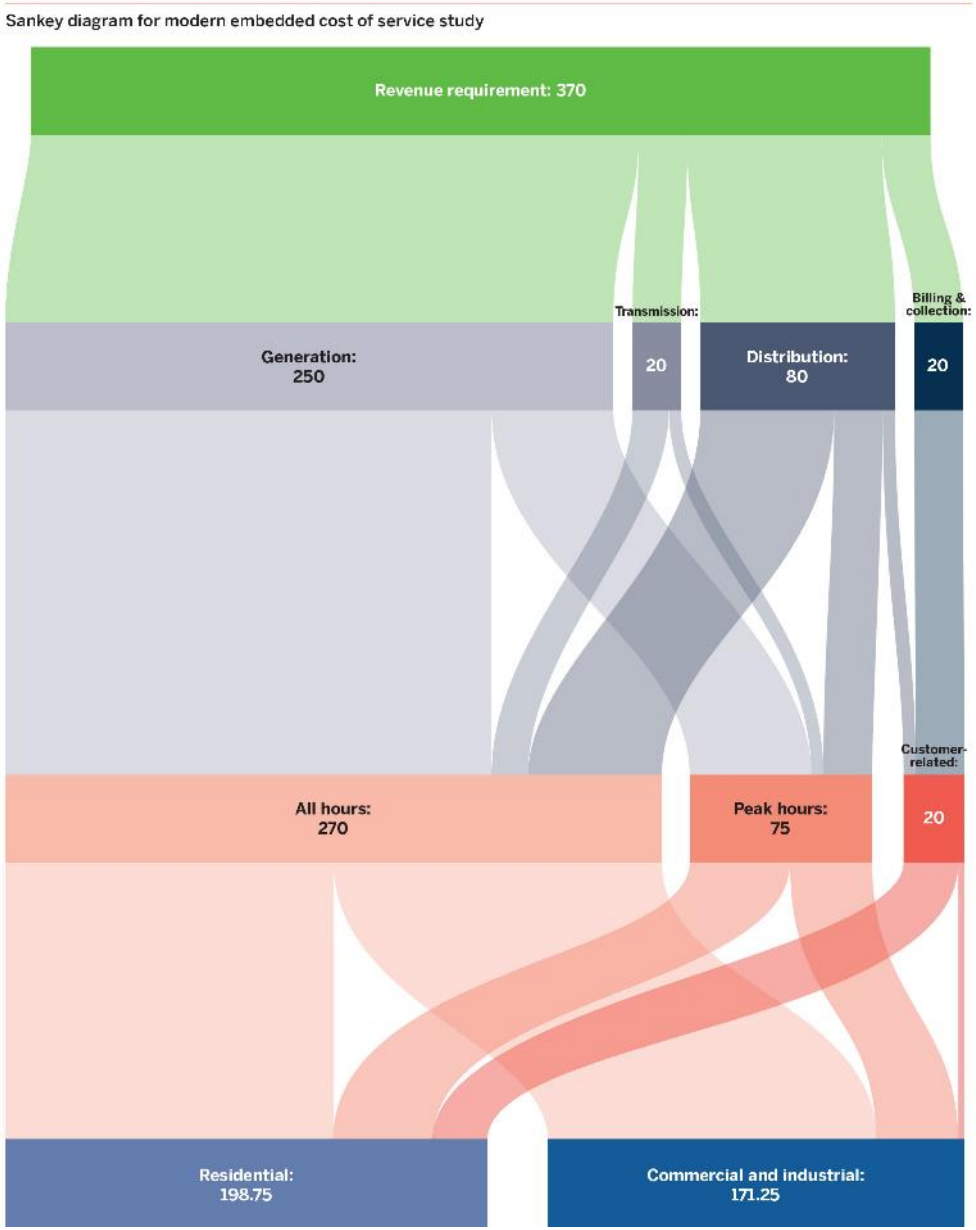
1 Principles



What's New In Cost Allocation?

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

Basic Thesis:
Costs are assigned to time periods



2 Generation Costs

Generation Methods

(*Electric Cost Allocation for a New Era*, Table 19)

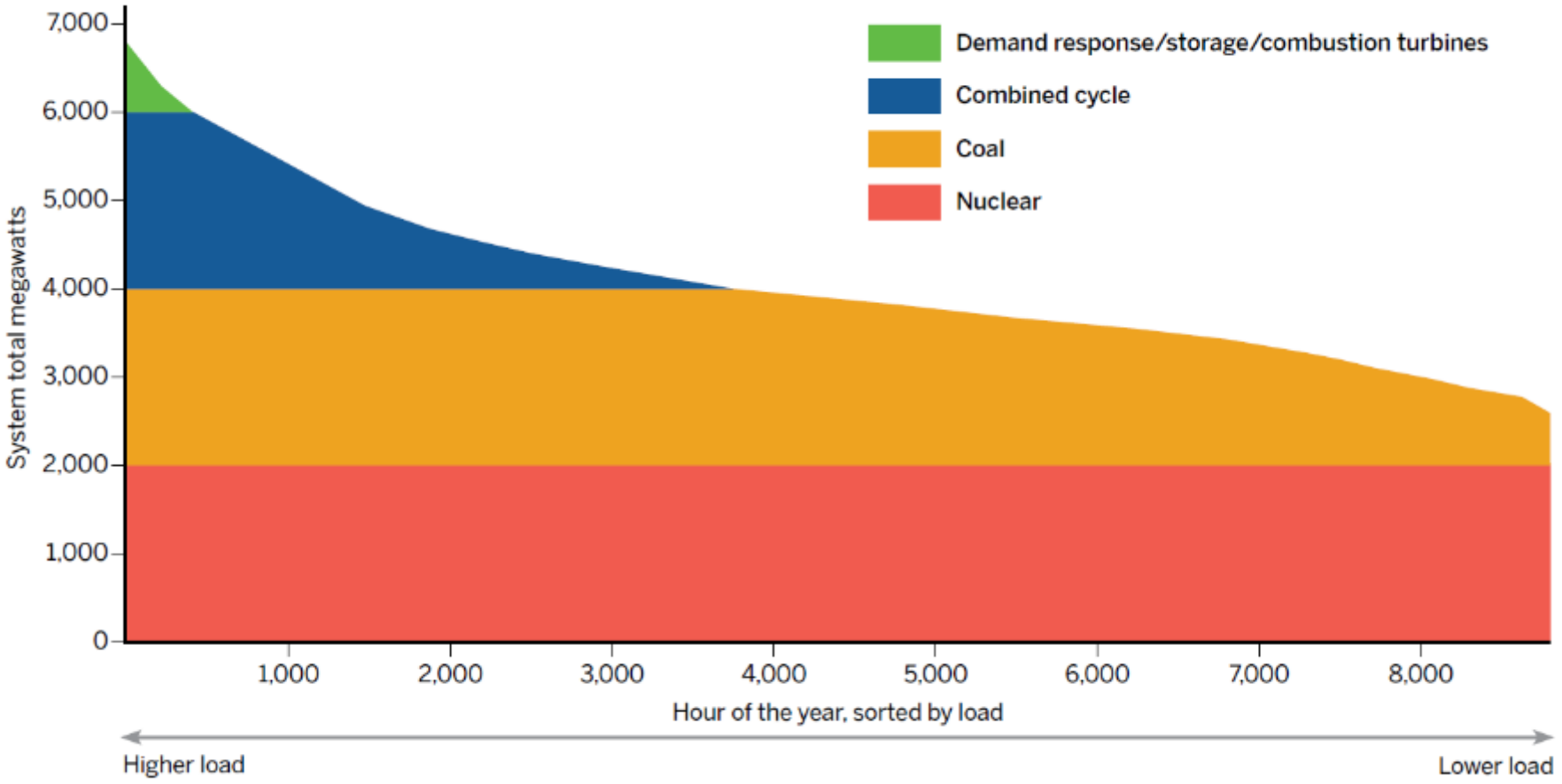
Method	Computation and Data Intensity	Accuracy of Cost Causality
Straight fixed/variable	Very low	Very low
Simple base – intermediate – peak	Low to medium	Medium
Equivalent peaker	Low	High
Probability of dispatch	Medium to high	Highest

Equivalent Peaker

Table 14. Equivalent peaker method analysis using replacement cost estimates

Resource type	Cost per kW	Capacity-related share of cost	Energy-related share of cost
Peaking	$770	100%	0%
Nuclear	$3,689	20.9%	79.1%
Fossil*	$1,976	39.0%	61.0%
Combined cycle	$1,020	75.4%	24.6%
Hydro	$4,519	17.0%	83.0%

Base – Intermediate – Peak

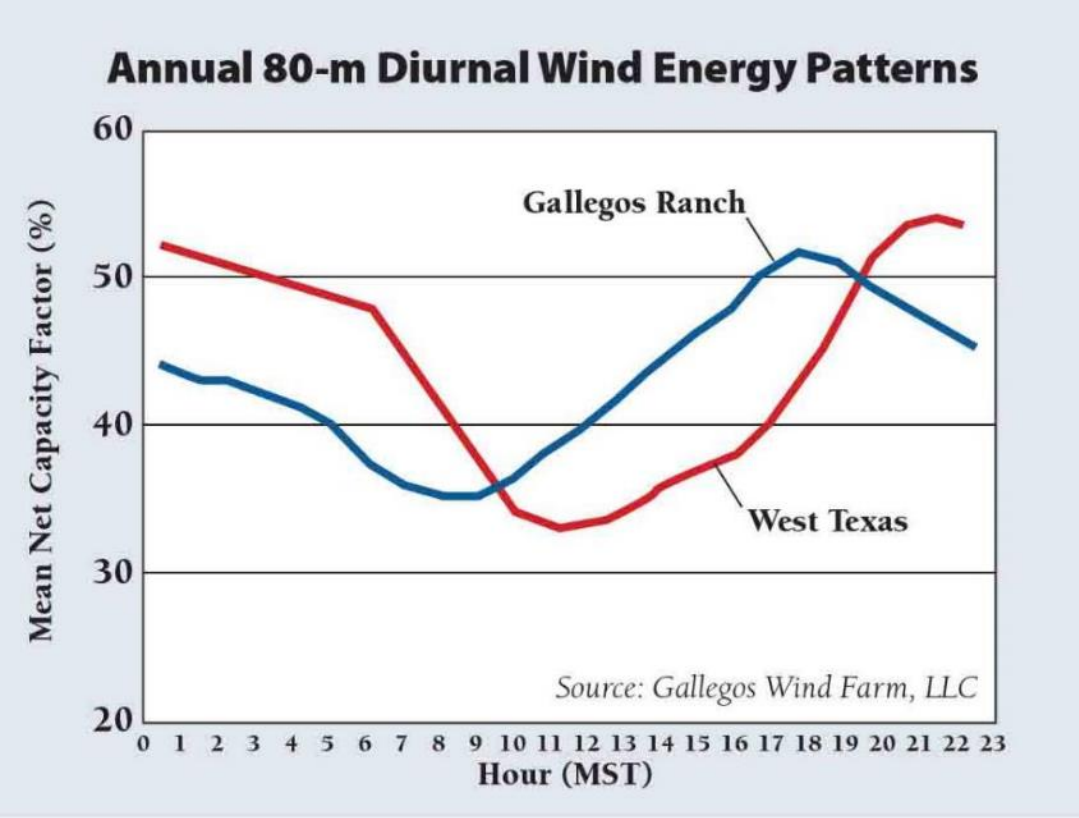


Hourly Allocation Methods: Probability of Dispatch

Table 17. Class share of each generation type under probability-of-dispatch allocation

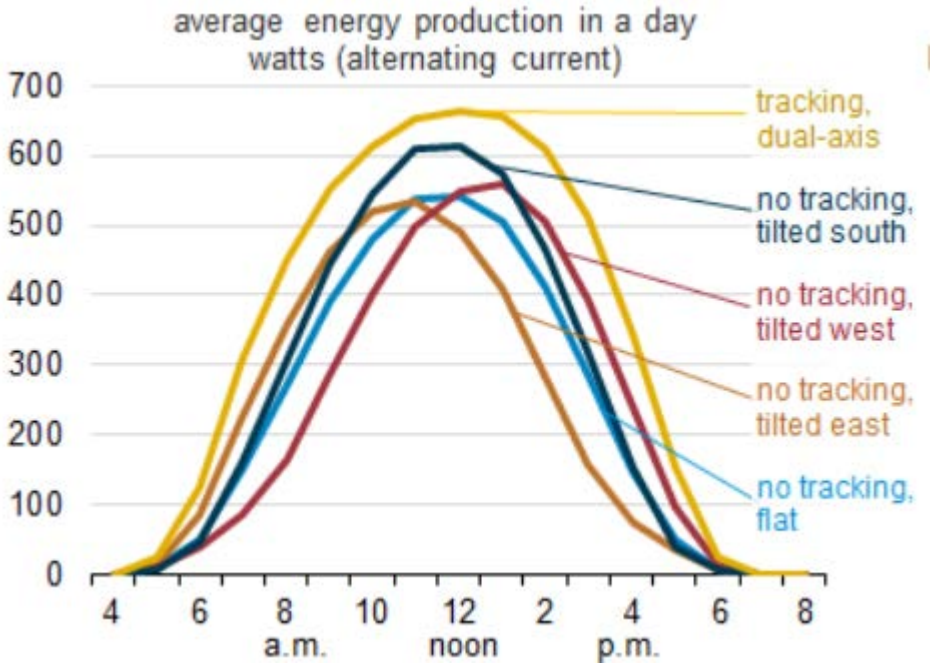
Customer class	Generation source			
	Nuclear	Coal	Combined cycle	Peaking resources
Residential	34%	34%	32%	31%
Secondary commercial	28%	29%	39%	42%
Primary industrial	38%	37%	29%	27%

Wind: Windy Hours



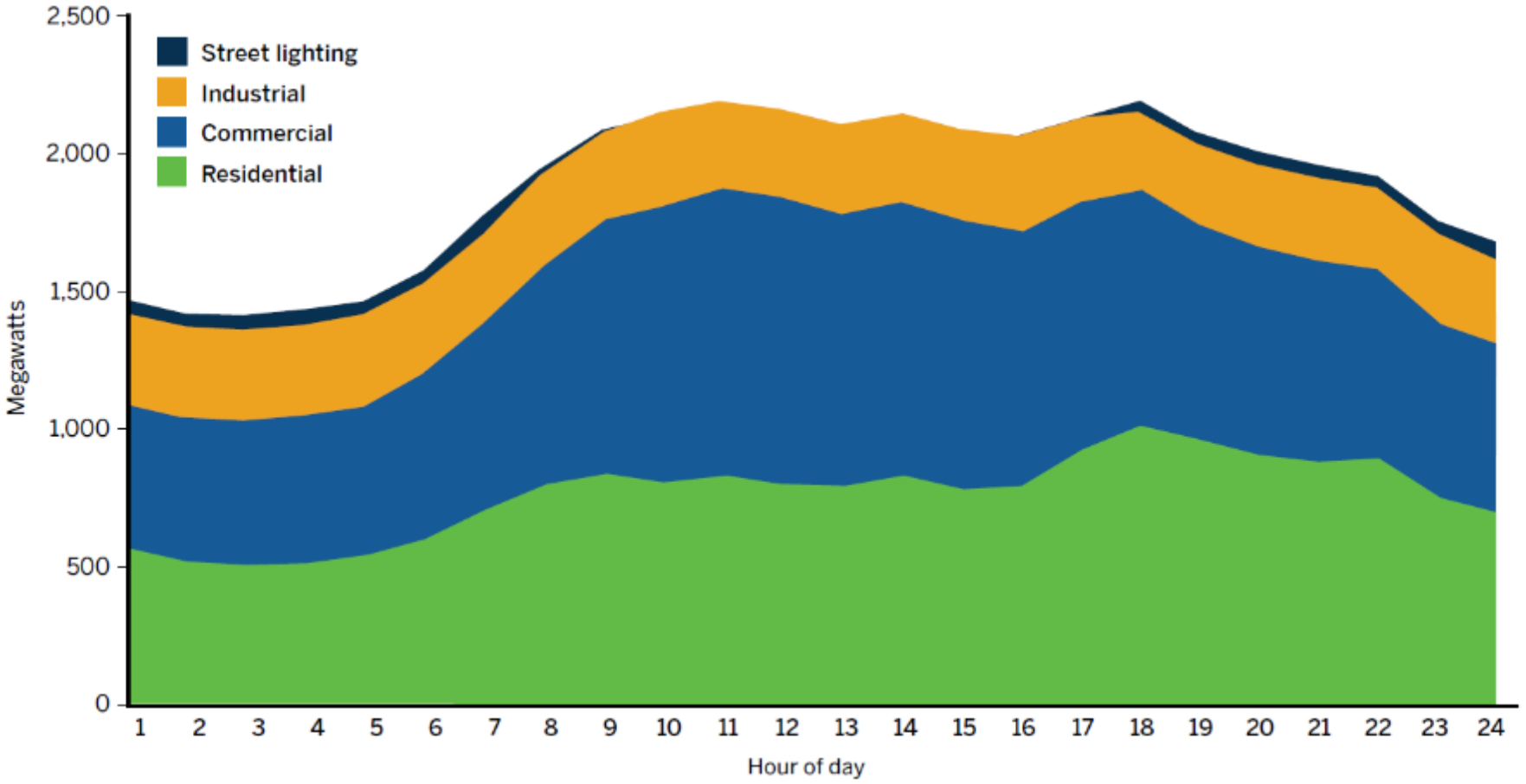
Solar: Sunny Hours

Source: Southern California Public Power Agency

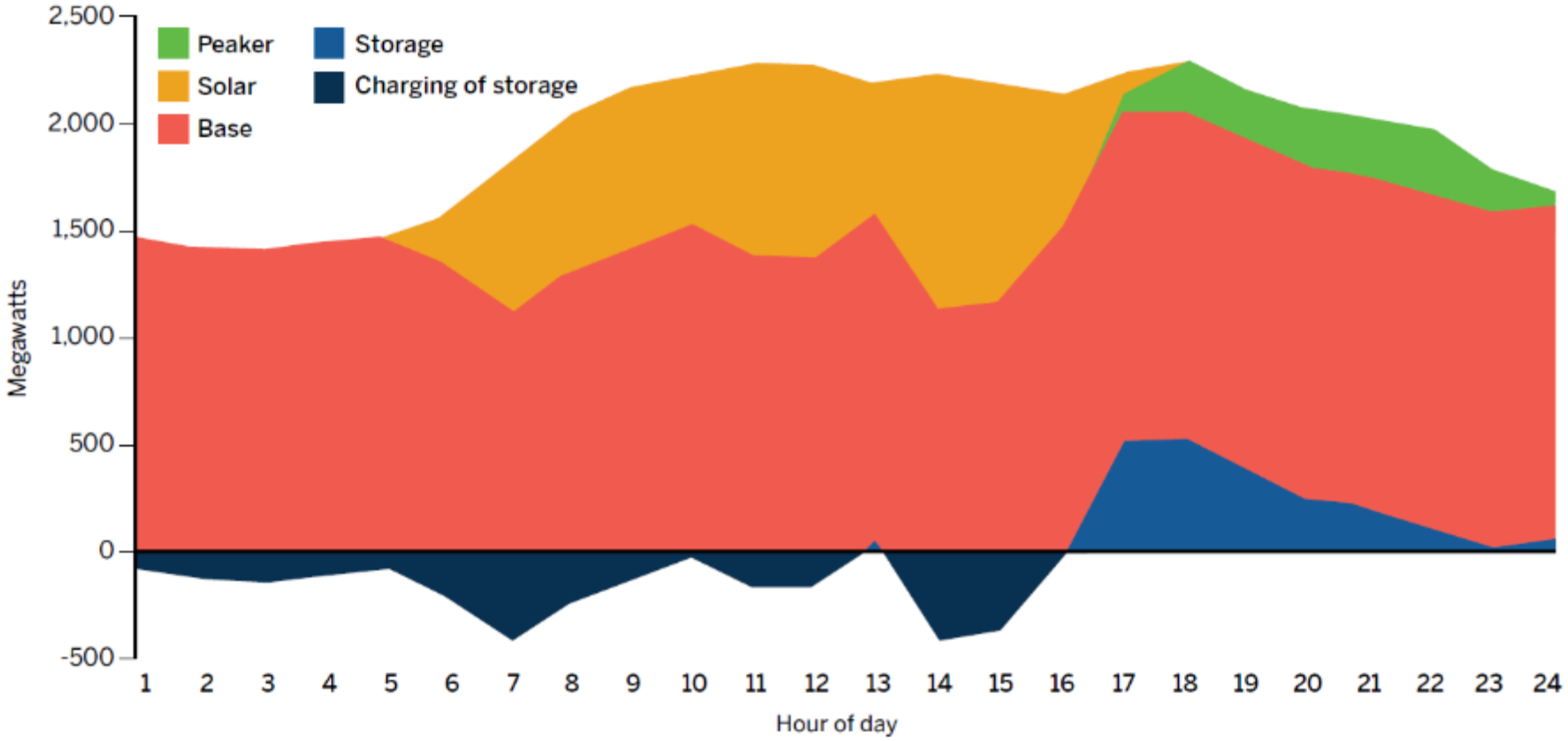


Source: US Energy Information Administration

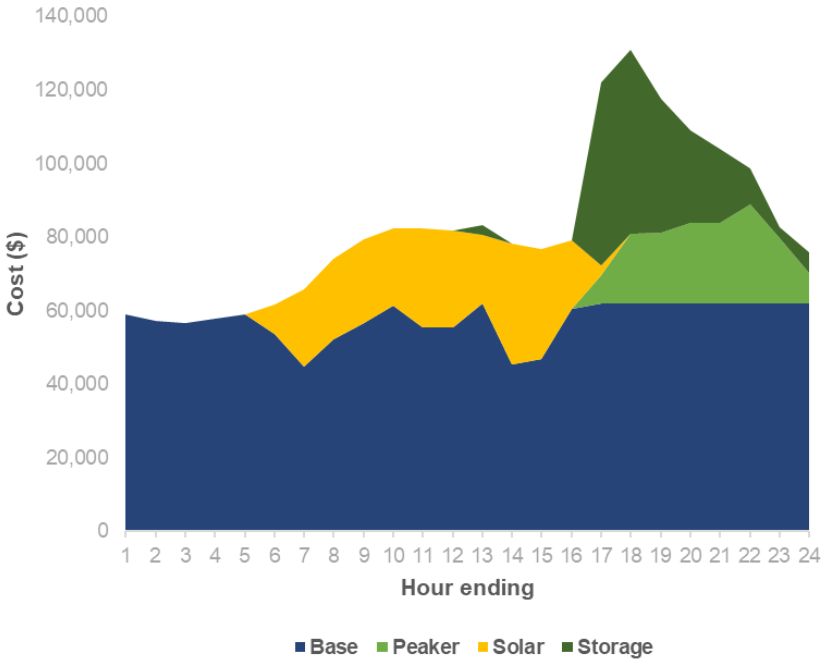
Class Load in Each Hour

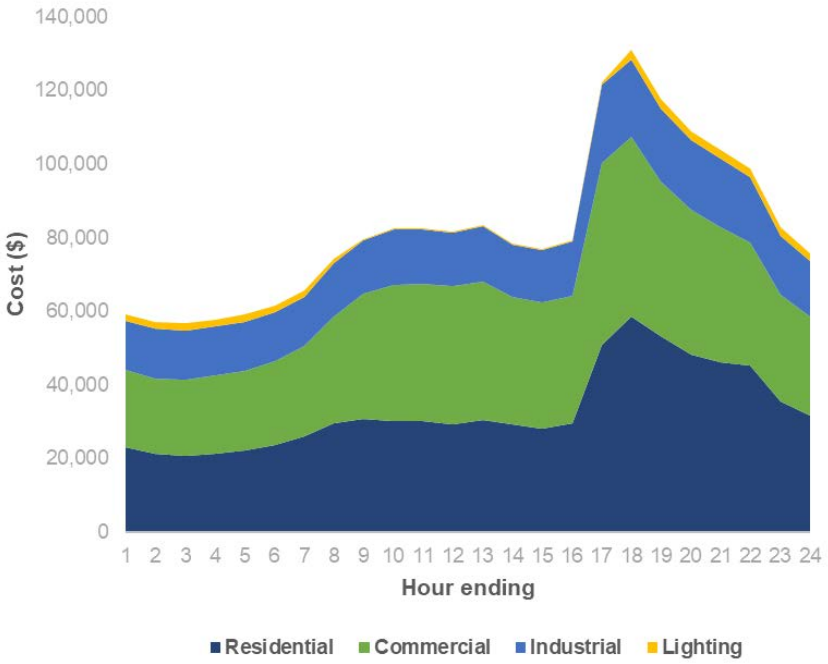


Generation in Each Hour



Cost Allocation by Hours

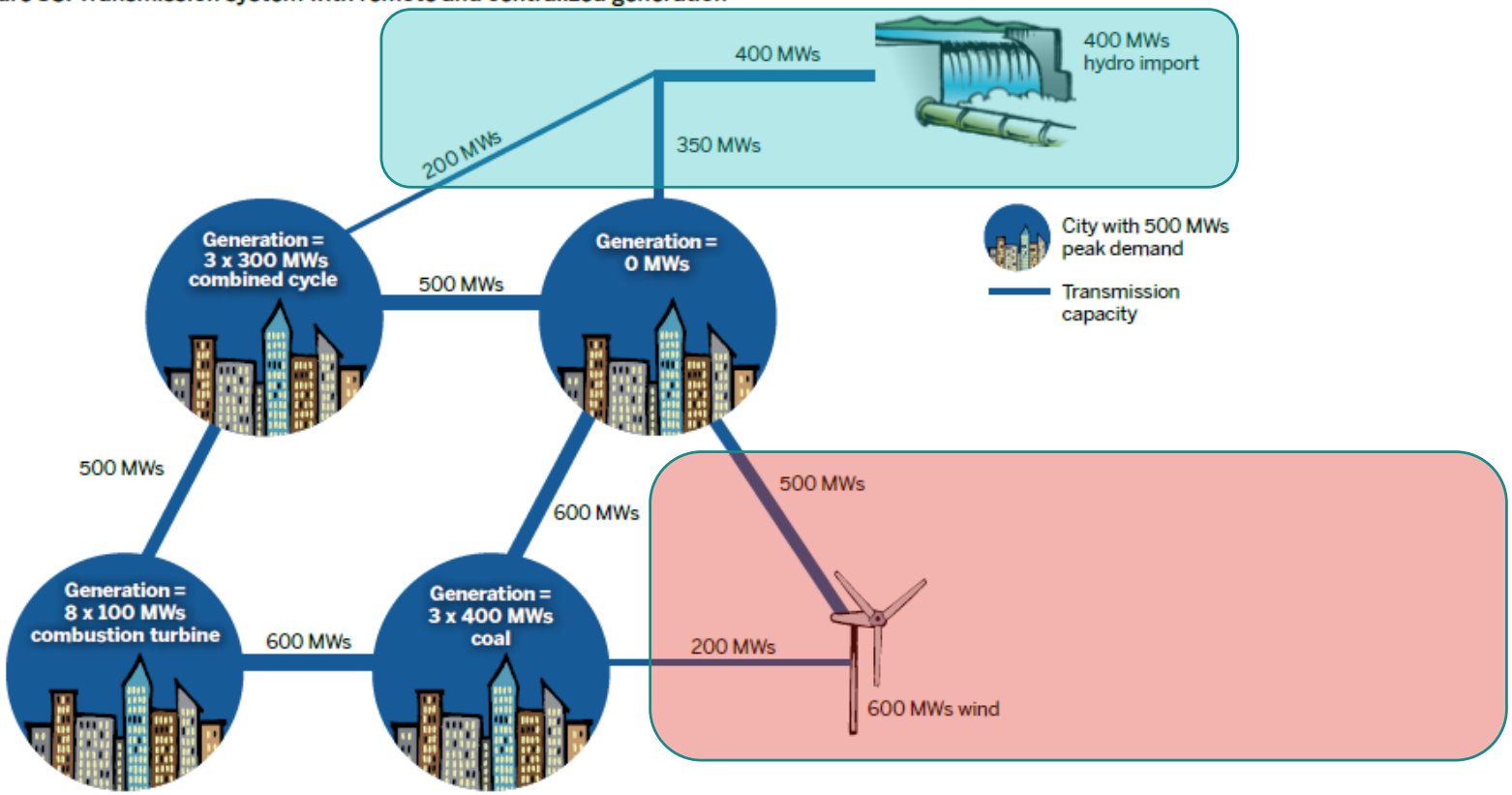




3 Transmission Costs

Some Transmission Assets Connect Specific Resources

Figure 38. Transmission system with remote and centralized generation



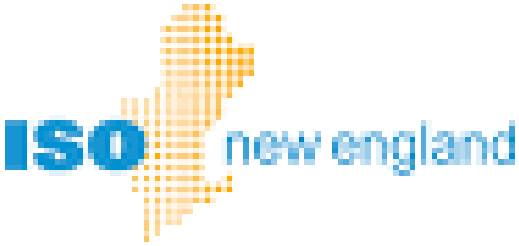
Many Types of Transmission

Electric Cost Allocation for a New Era, Table 28

Element	Demand/Energy Methods	Hourly Allocation
Bulk transmission	All energy / 100 highest hours	Hours used or needed
Remote generation	All energy / 100 highest hours	As remote generation
Economy interconnection	Energy and demand	Reliability value + all hours
Local network	High-load hours / 4CP or 12CP	Hours used or needed
Substations	As lines	As lines

Treating ISO and FERC-Priced Transmission

- Consider how transmission is used
- Do not be bound to FERC methods
- If storage is cheaper, avoid transmission



4 Distribution Costs

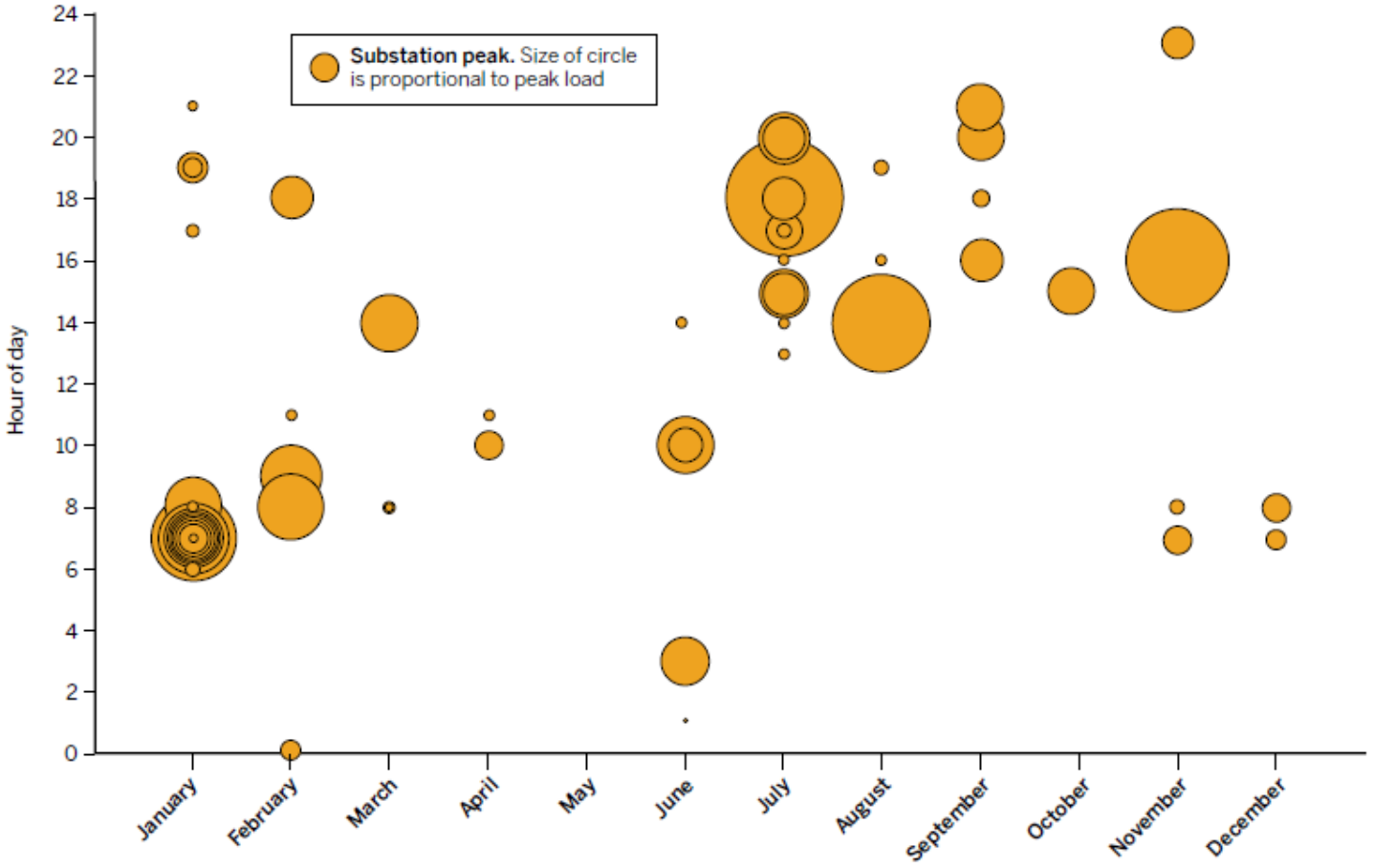
Distribution is Built to Supply Customer Needs

Minimum System Fallacy

- Shared distribution system expenses, such as primary conductors, poles and substations, do not meaningfully depend on the **number** of customers
  - A residential building can be one hotel or 100 apartments.

Substations Have Diversity

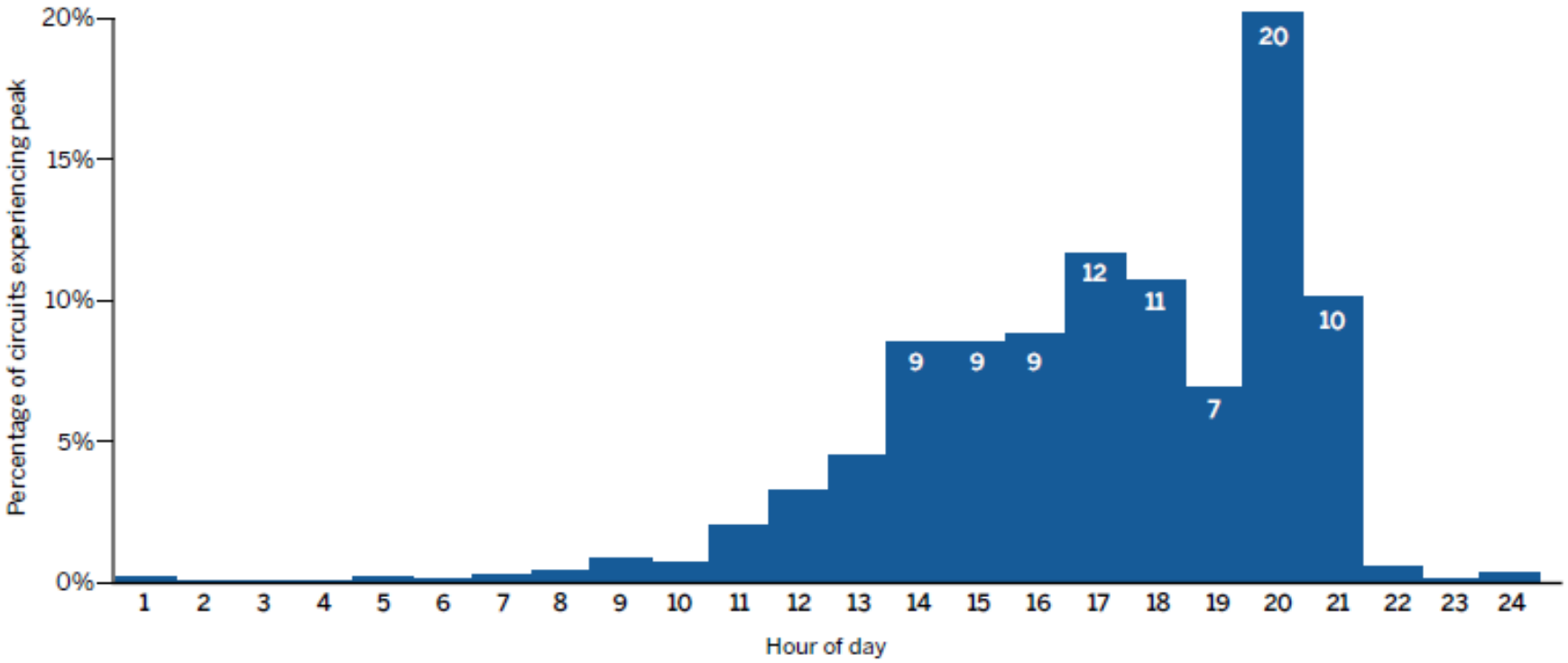
Figure 41. Month and hour of Delmarva Power & Light substation peaks in 2014



Source: Delmarva Power & Light. (2016, August 15). Response to the Office of the People's Counsel data request 5-11, Attachment D. Maryland Public Service Commission Case No. 9424

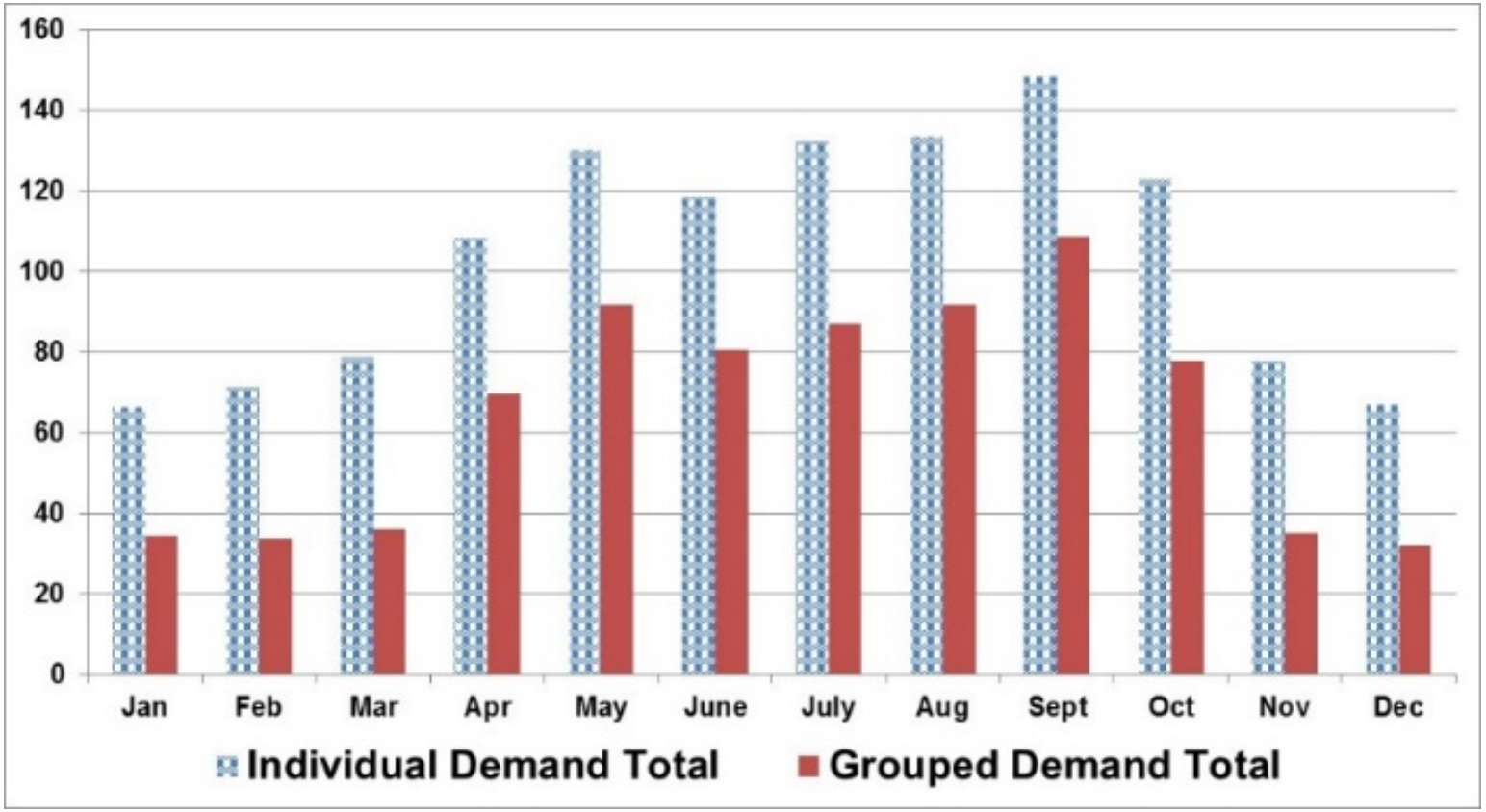
Circuits Have Diversity

Figure 40. San Diego Gas & Electric circuit peaks



Source: Fang, C. (2017, January 20). Direct testimony on behalf of San Diego Gas & Electric. California Public Utilities Commission Application No. 17-01-020

Within an Apartment Building, Customers Have Diversity



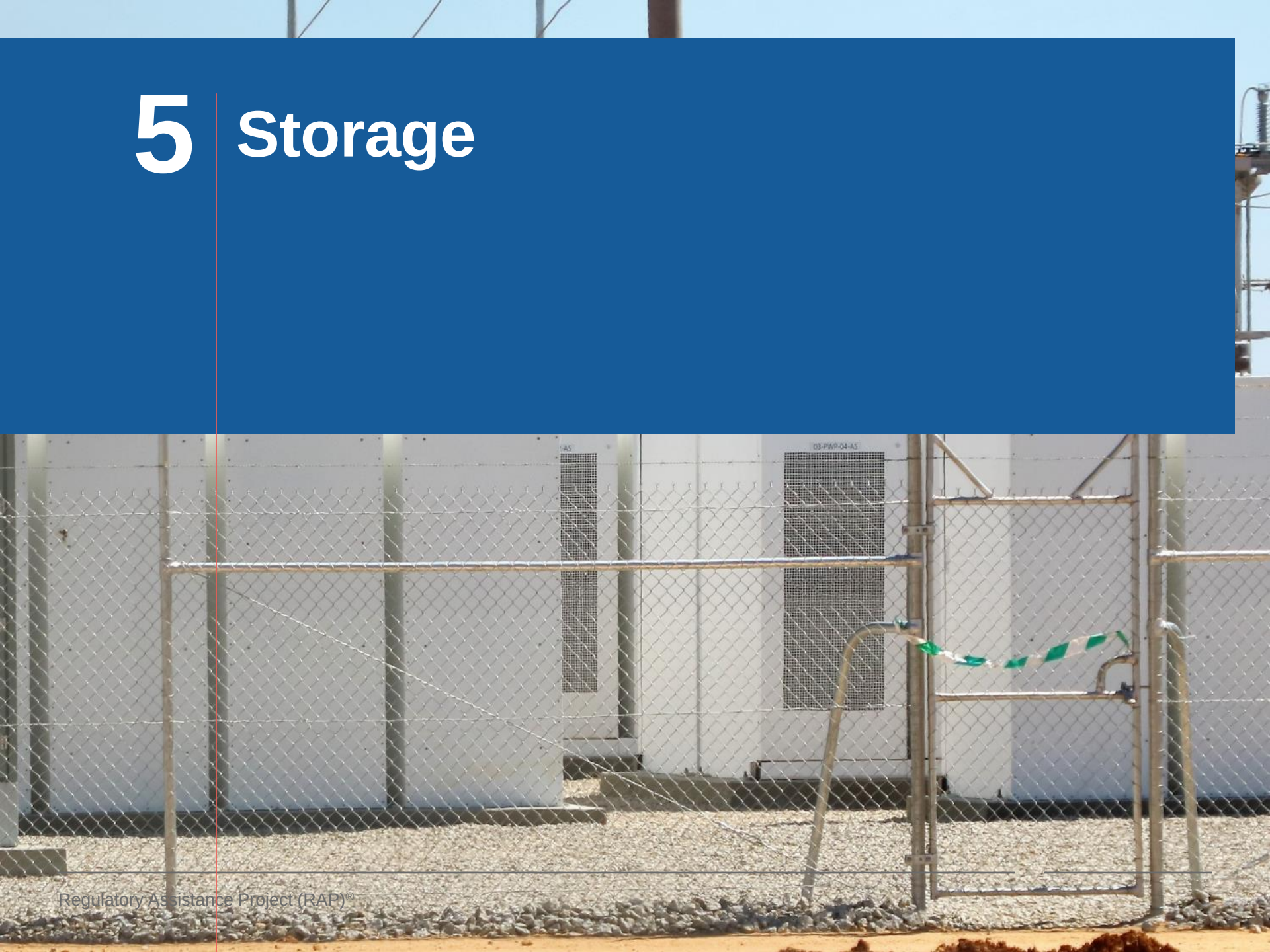
Distribution Cost Methods: Shared System Elements

Element	Demand/Energy Method	Hourly Allocation Method
Substations Poles Primary conductors	**Functionalization**: Entirely primary **Classification:** Demand and energy **Demand allocator:** Hours at and near peaks	Allocate to all hours, with emphasis on high-load hours Revenue-driven line extension costs allocated on a revenue basis

Distribution Cost Methods: Site-Specific Elements

Element	Method	Hourly Allocation
Line transformers	Secondary demand and energy	Transformer peaks and high-load hours
Secondary conductors	Secondary demand and energy	Line peaks and high-load hours

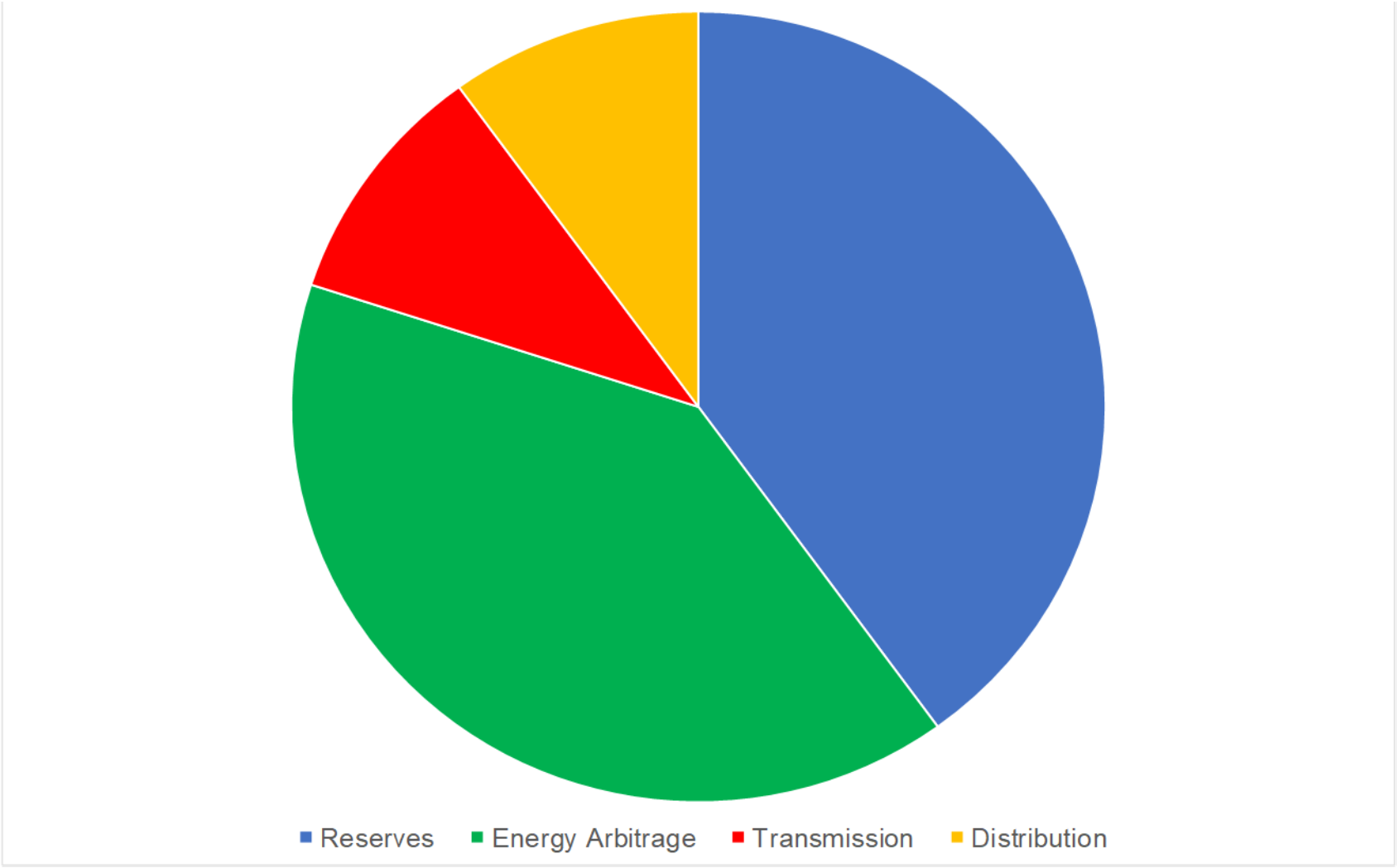
5 Storage



Storage: Performs Many Functions

Source: Tesla

Storage Functionalization

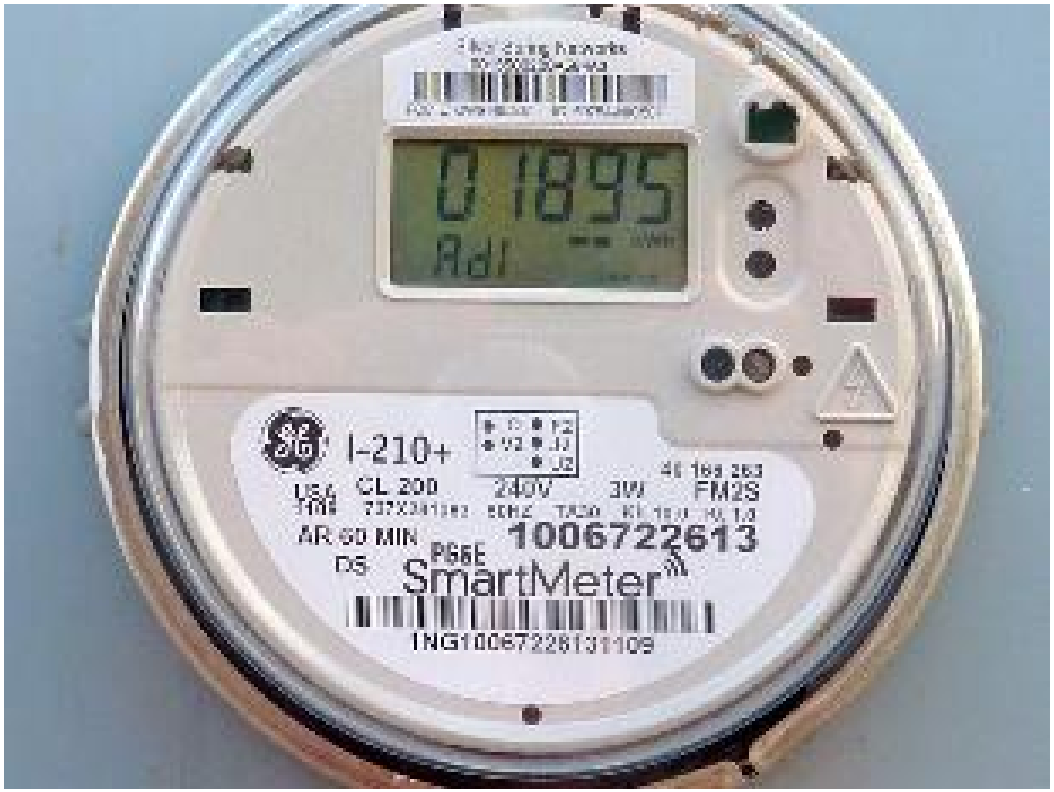


Storage: Where the FERC System Of Accounts Is Weird

- 363 Energy Storage Equipment – Distribution
- 584 Underground Line Expenses (major only)
- 584.1 Operation of Energy Storage Equipment
- Why is “Operation of Energy Storage Equipment” not in the power supply accounts 560-576?
- Much storage is now owned by wind and solar producers – in Account 555, Purchased Power

6 Metering and Billing

Traditional vs. AMI Metering



Advanced Metering Costs

- "Smart meters" do more than measure kWh
  - Enables new rate designs and demand response programs
  - Enables volt/VAR optimization
  - Data improves system planning
  - Communications system has multiple uses
- **City of Burbank:** using AMI data, transformer right-sizing lowered line losses by 1%, saving $1 million per year

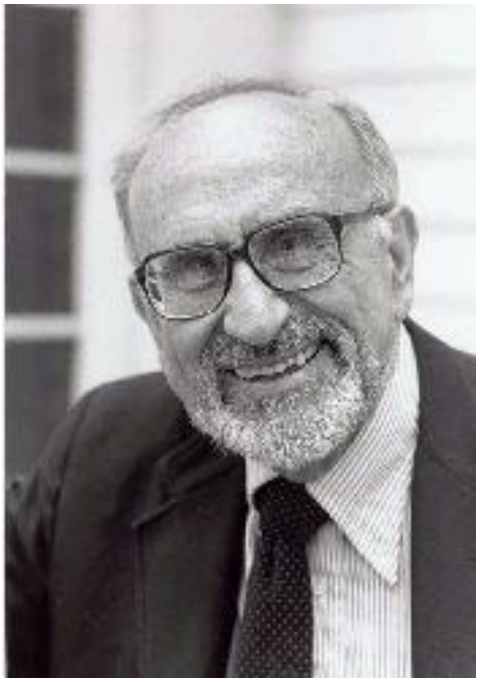
Advanced Metering Infrastructure

Smart Grid Element	Legacy Account	Smart Grid Classification
Smart meters	370	Demand, energy and customer
Distribution control devices	362, 365, 367	Demand and energy
Data collection	902	Demand, energy and customer
Meter data management system	391, 903, 905	Demand, energy and customer

7 Marginal Cost Studies

Marginal Cost

- Short-run marginal cost
- Long-run marginal cost
- Hybrid mechanisms
- Total Service Long-Run Incremental Cost



Alfred Kahn

Short-Run Marginal Cost

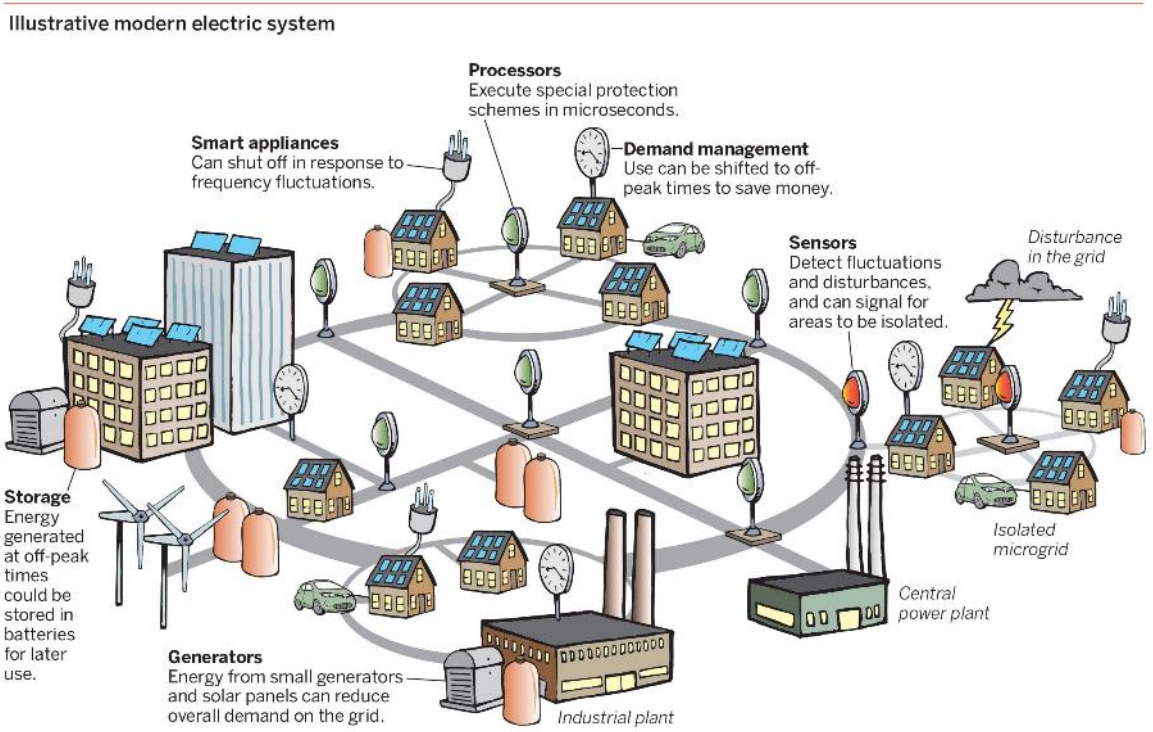
- Variable operating costs only
- Relevant to system operation
- Very little T&D short-run variable cost
- Will not recover revenue requirement
- Argued to be relevant to economic efficiency by some economists

NERA Methodology: Often Applied With a Flawed Mix of Costs

- Long-run marginal cost of generation capacity
- Short-run marginal cost of energy
- Intermediate marginal cost for transmission
- Long-run marginal cost for customer connections
- Total service long-run marginal cost for billing and collection
- Inequitable if system is excess capacity or deficient

Total Service Long-Run Incremental Cost

- Cost of a new system
- Serving today's loads
- Optimally configured
- No excess capacity
- Using today's technologies
- May be cheaper or more expensive than the existing system.



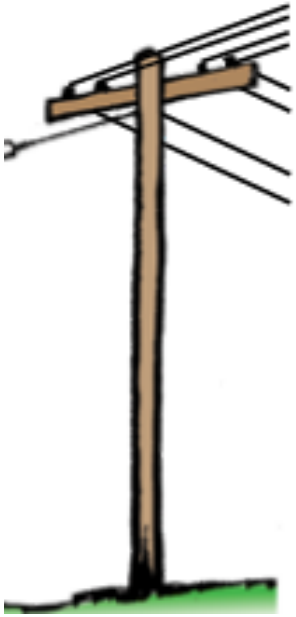
Source: Adapted from U.S. Department of Energy. (2015). *United States Electricity Industry Primer*

Marginal Generation Cost

- Need to consider long-run capital and operating costs to equitably treat renewables vs. fossil generation.
- Should use economic carrying charge rate, not utility cost of capital

Marginal Distribution Cost

- NERA method: intermediate term for primary distribution, TSLRIC for customer connection
- Better alternatives:
  - TSLRIC for all components
  - New customer only



8 Summary

Summary

- Assign costs to hours
- Distinction between “demand-related” and “energy-related” may be obsolete
- Consider investment-related costs and operating costs together, to avoid bias
- Distribution costs are associated with service in particular hours
- Customer-specific costs are very limited
- Marginal cost studies must use consistent time periods for analysis

“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

Contact us at:
jlazar@raponline.org
mlebel@raponline.org