Electric Cost Allocation for a New Era: Principles and Concepts

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Electric Cost Allocation for a New Era

A Manual

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Major Topics for Today

• Purpose of Cost Allocation Studies
• What’s New in the Modern Electric System?
• A Modern Cost Allocation Study
• Accounting Changes Needed For Accurate Cost Allocation
• Links Between Cost Allocation and Rate Design
1 Purpose of Cost Allocation Studies
Simplified rate-making process

1. **Determine revenue requirement**
   - Net rate base
     - (Plant in service – depreciation reserve)
   - Rate of return
   - Depreciation expense
     - (Plant in service \( \times \) depreciation rate)
   - Operating expense
     - (Fuel + purchased power + labor + labor overheads + supplies + services + income taxes)
   - Other taxes

\[ \text{\$ millions} \]

2. **Allocate costs among customer classes**
   - Residential
   - Commercial
   - Industrial
   - Street lighting

3. **Design retail rates**
   - Dollars per month
   - Cents per kWh peak
   - Cents per kWh off-peak
   - Dollars per month
   - Cents per kWh peak
   - Cents per kWh off-peak
   - Dollars per month
   - Cents per kWh peak
   - Cents per light per month
The 1992 Grid

Traditional Embedded Cost of Service Study (ECOSS) Process
What’s New in the Modern Electric System?
Wind and Solar

- Capital intensive
- No fuel
- Capacity value varies by region
Storage

- Capital intensive
- Multiple purposes:
  - Shift energy to high-value periods
  - Location: At wind/solar farms, or to 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 and load shifting 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
- Demand response can be targeted
- 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
3 A Modern Cost Allocation Study
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.
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
Determining Customer Classes

Types:
- Residential
  - Single-Family
  - Multi-Family
  - Urban / Rural
  - Solar?
- Commercial
- Industrial
- Pumping
Residential Subclasses

- What actually causes a different COST to provide service?
  - Power supply costs
    - Amount and time of usage
  - Shared distribution costs
    - Location, density, and load patterns
  - Customer-specific costs
    - Maximum usage (or backfeed)
    - Billing and collection frequency
Low-Income (or Multi-Family) Customers as a Class

- Less AC
- More likely to have electric water heat
  - High NCP demand
  - Controllable
4 Accounting Changes Needed for Accurate Cost Allocation
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
Treatment of Generation Costs – Utility-Owned

FERC Accounts Not Adequate

FERC Categories:
- Steam 310-317
- Nuclear 320 - 326
- Hydraulic 330 - 337
- Other 340 - 348

Needed Subcategories
- Combined-cycle
- Simple-cycle
- Wind
- Solar
- Storage
Treatment of Generation Costs – Purchased Power

FERC Accounts Not Adequate

FERC Categories:
- 555 Purchased power.
- 555.1 Power Purchased for Storage Operations

Needed Subcategories:
- Firm capacity
- Hourly energy
- Wind
- Solar
- Economy
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.
Treatment of Transmission Costs – Utility-owned

FERC Accounts Not Adequate

FERC Categories:
- Transmission 350 - 359
- Regional Transmission 380 – 387
- Associated Expense Accounts 560 - 576

Needed Subcategories
- Baseload integration
- Renewable integration
- Supporting firm transactions
- Supporting economy transactions
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
• Only customer-specific costs are customer-related
• Demand-related costs allocated on usage in broad peak periods
Treatment of Smart Grid Costs

- “Meters” do more than measure kWh
  - Enable phase balancing
  - Enable optimization of storage
  - Transformer right-sizing
- Communications system has multiple uses
- **Bottom line:** These are NOT “customer-related” costs; they also have demand and energy benefits
## Treatment of Smart Grid Costs

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1) Separate accounting for smart meter investment
2) Separate accounting for MDMS costs
3) Data collection system: “installations on customer premises” Account 371?
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
Storage is Now Often A Bulk Power Function
Summary

• Generation accounting
• Transmission accounting
• Distribution / smart grid accounting
• Hourly tracking of power costs and class loads
5 Links To Rate Design
Rate design should make the choices the customer makes to minimize their own bill consistent with the choices they would make to minimize system costs.
Start With Costs By Function

- Billing and Collection
- Site Infrastructure
- A&G Costs
- Distribution Peaking
- Distribution Mid-Peak
- Distribution Backbone
- Network Transmission
- Transmission Backbone
- Demand Response
- Peaking Generation
- Mid-Merit Generation
- All Hours Generation
Build a Cost-Based TOU Rate for Shared Elements of System

- Critical Peak Rate: 75 cents per kWh
- On-Peak Rate: 22 cents per kWh
- Mid-Peak Rate: 14 cents per kWh
- Off-Peak Rate: 8 cents per kWh

Hour of Day:
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
“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

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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