Rate Design

Steve Olea
Special Advisor
Arizona Corporation Commission

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Disclaimer

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Basic Electric Example

- Test Year ending December 31, 2025 (i.e., Test Year is calendar year 2025)

- Utility installs $1,000,000 of plant in 2020, therefore, Original Cost = $1,000,000

- Depreciation rate is 2% per year

- In 2025, Original Cost Less (Accumulated) Depreciation = $900,000
- 1,000,000 x 0.02 = 20,000 = Depreciation Expense for one year
- Accumulated Depreciation = 5 x 20,000 = 100,000
- 1,000,000 – 100,000 = 900,000
- Therefore, OCLD = $900,000
- OCLD Rate Base = $900,000

- Total Rate Base = OCLD Rate Base + Inventory + Working Capital

Basic Electric Example (cont.)

- Total Rate Base = OCLD Rate Base + Inventory + Working Capital
- Working Capital = $50,000
- Inventory = $50,000
- Therefore, Total Rate Base = $1,000,000

Basic Electric Example (cont.)

- Capital Structure is 55% Equity and 45% Debt
- Cost of Debt is 5%
- Return on Equity (aka Cost of Equity) is 10%
- Weighted Cost of Debt = 0.45 x 5% = 2.25%
- Weighted Cost of Equity = 0.55 x 10% = 5.5%
- Weighted Average Cost of Capital = Weighted Cost of Debt + Weighted Cost of Equity

  Therefore, WACC = 2.25 + 5.5 = 7.75%

Revenue Requirement = (WACC x TRB) + Expenses + Depreciation Expense

- Expenses are $150,000
- Revenue Requirement = (0.0775 x 1,000,000) + 150,000 + 20,000

  = 247,500

Basic Electric Example (cont.)

- *__NOTE__: Electric Utility Company operates in a country with no income taxes. Therefore, there is no Gross Revenue Conversion Factor necessary.

- Determining the Revenue Requirement is basically Step #1 in the rate case process.

- Step #2 in the rate case process is determining how to collect the Revenue Requirement, i.e., Rate Design.

- A basic rate design is comprised of a Basic Service Charge aka Monthly Minimum Charge and a commodity charge.

- The BSC usually covers the monthly customer expenses (e.g., monthly billing, meter reading, etc.) and maybe a small portion of the utility's fixed costs.

Basic Electric Example (cont.)

- Utility has 1,000 residential customers and annually these customers use 2,000,000 kWh

- If we make the BSC five dollars, Utility will collect $60,000 from the BSC:
  $5 x 1,000 customers x 12 months = $60,000

- Therefore, Electric Utility must earn $187,500 from the commodity charge:
  $247,500 - $60,000 = $187,500

- Therefore, commodity charge is 9.375 cents per kWh:
  $187,500 / 2,000,000 kWh = $0.09375/kWh

- Other rate designs for electric utilities include Tiered rates, Time-of-Use rates, Demand rates, TOU rates with Demand charges, and combination of all.

Rate Design: Price Signals

- Inclining Block Rates, i.e., Tiered Rates
- Time of Use (TOU) Rates
- Demand Rates
- Any Combination of Above

Billing Determinants

- Billing Determinants = the data necessary for proper rate design

- In Basic Electric Example the billing determinants used:
  - Number of customers = 1,000 customers
  - Type of customers = all residential
  - Total consumption = 2,000,000 kWh per year

- Basic Electric Example is **VERY BASIC**

- Only price signal is that electricity is not free

Inclining Block Rates

- Price signal = Encourages conservation
- Divide usage into Blocks or Tiers

    Water example:

        First Block = First 3,000 gallons

        Second Block = next 7,000 gallons

        Third Block = all usage over 10,000 gallons

- Price per gallon increases with each Block

    Price for First Block = $1.50 per 1,000 gallons

    Price for Second Block = $2.75 per 1,000 gallons

    Price for Third Block = $5.00 per 1,000 gallons

Billing Determinants for Inclining Block Rates

- Customer Type/Class –
  - Residential, Commercial, Industrial, etc.
- Number of customers in each class
- Commodity usage patterns in each class –
  - Median, Average, Maximum, Minimum, Total

Need to determine breakover points and price for each block/tier

Time of Use Rates

- Price signal = Encourage customer to use most commodity during certain time(s) of the day
- Set different commodity prices for different hours of the day
  - Peak hours priced higher than off-peak hours
- Peak Hours – Those hours of the day that utility desires to reduce/discourage usage

May not provide conservation, may even increase total usage

Primarily used to reduce usage during peak use hours

Billing Determinants for Time of Use Rates

- Customer Type/Class –
  - Residential, Commercial, Industrial, etc.
- Number of customers in each class
- Commodity usage patterns in each class –
  - Median, Average, Maximum, Minimum, Total

May seem to be the same as for Inclining Block Rates, however, an additional determinant is:
Commodity usage patterns must be broken down by time of day

Demand* Rates

- Price signal = Reduce peak demand

- Impose a charge based on demand (preferably during peak hours), e.g., $$/kW

May not provide conservation, could even increase total overall usage

Primarily used to reduce a utility's peak demand

*Demand = Amount of commodity used during a specific time

For example: kW during a 15-minute period

kW during a one-hour period

Billing Determinants for Demand Rates

- Customer Type/Classes
- Number of customers in each class
- Commodity usage patterns by time of day
- Demand over specific time periods

Combination of Tiered, TOU, & Demand Rates

- Most common combination is TOU with Demand charges

- Purpose: To reduce peak demand
- Why: To avoid building peaker plants and/or buying electricity during peak demand times when prices are high

- Complicated rate design-

  Choose on-peak hours and price for on-peak TOU hours ($/kWh)
  Choose off-peak hours and price for off-peak TOU hours ($/kWh)
  Price for Demand charge ($/kW)

Do Different Rate Designs Accomplish Their Intended Goals?

NOT WITHOUT PROPER CUSTOMER EDUCATION

- Customers **MUST** be taught how to use these rate designs
- How? – Teach customers how to **shop** for electricity
- If customers know how to shop for electricity, they will know when and how to use electricity, i.e., when to buy electricity
- BUY ELECTRICITY WHEN IT IS ON-SALE (OFF-PEAK)
- BUY AS LITTLE ELECTRICITY AS POSSIBLE WHEN IT'S NOT ON-SALE (ON-PEAK)
- DO NOT USE ALL APPLIANCES AT THE SAME TIME

Primary Purpose of Rate Design

Produce revenue that was determined in a rate case; while considering Cost of Service Study

Fairly simple in a Basic Case

Extremely complicated when different price signals are desired, e.g., conservation, peak shaving, etc.

What if customers do not respond to price signals?

What if too many customers respond to price signals?

Incorporating Distributed Energy Resources, Storage, EV Charging, Demand Response

- Distributed Energy Resources:
  - Need Interconnection Requirements
  - Need to set buy-back rate; either net-metering or net-billing
- Storage:
  - Need Interconnection Requirement
  - Need to establish use requirements, e.g., total customer control, total utility control, combination of control, buy-back rate, etc.
- Electric Vehicle Charging:
  - Need to establish goal for utility, e.g., encourage EVs, managed charging
- Demand Response – All the above can be used

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QUESTIONS

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Steve Olea
Special Advisor
Arizona Corporation Commission

smolea@azcc.gov