Electric Rate Design Modifications Associated with Demand-Side Cost Recovery

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The Rate Making Process

Cost of Service Regulation

- Cost of service regulation ("COSR") is still the primary form of energy utility regulation in North America
- Paradigm: Rates recover the prudently incurred cost of service

Typical Ratemaking Process

- Determine Cost of Service (Revenue Requirement)
- Allocate Cost of Service to Customer Classes
- Recover Cost of Service from each Customer Class – **Rate design**

The Goals of Rate Design

- Recover the cost to serve each class
- Encourage/discourage usage during specific time periods (peak/off-peak)
- Promote certain types of usage (special rates for electric heating/water heating)
- Provide discounts to certain customers (i.e., low income, economic development)
- Track cost of service (i.e., recover fixed costs at lower usage levels, and track variable costs at higher levels)
- Improve load factor/revenue stability/reduce cost of capital(?)

Rate Design Components

- Customer charges
  - Recovers costs associated with just serving the customer – Cover fixed costs related to serving the customer (i.e., minimum system, customer services, metering and billing)
- Advantages
  - Guaranteed revenue – revenue stability
  - Reduces risk
  - Covers a portion of fixed costs
- Disadvantages
  - Higher per unit charges to low users
  - Customer misunderstanding

Rate Design Components

- Facilities charges
  - Recovers the cost of special facilities just to service one customer
  - Like a rental charge for specific equipment
  - Applicable to larger commercial industrial customers with special needs
    - Only that customer pays for the special equipment needed to serve that customer
    - Fixed monthly charge

Rate Design Components

- Commodity charges (variable)
  - Recovers costs associated with consumption – kWh, therms, gallons
  - Can be blocked or flat
- Demand charges (fixed)
  - Recovers costs associated with capacity – kW, pipe size
  - Maximum 15 min. demand during the month
  - Associated with the recovery of capacity costs – generally **fixed** in nature
  - Can be blocked or flat
  - Insensitive to system outages – i.e., no loss of revenue with system outages (i.e., storms)
    - Example – hurricane in the Gulf
  - Reduce risk – aide to revenue stability

RATE DESIGN AND COST OF CAPITAL

Modeling the Cost of Capital

- Risk and cost of equity capital
- The discounted cash flow model
- Effect of revenue stability on the cost of equity capital
- Presenting the evidence of the effect on cost of equity capital
- Quantifying risk

The DCF Model

- The value of a firm's common stock to the investor is equal to the discounted present value of the expected future dividend (earnings) stream.

Working with the DCF Model

- **Expected return**
- The expected return (or required rate of return for investors) can be calculated with the "dividend capitalization model", which is

$$K_{cs} = \frac{Dividend_{Payment/Share}}{Price_{Market}} + Growth_{rate}.$$

Theoretical Impact of Change in Cash flows (earnings)

- Assume constant sales level(s)
- Assume no elasticity changes
- Change revenue recovery in response to change in rate design
- Plug earnings changes into DCF model
- The closer the revenues to cost of service, the lower the risk

Challenges

- Utilities often lumped together by investors
- The key is to seek rate designs that will stabilize revenues to assist in meeting the revenue requirement
- Cost of equity usually provided as a range
  - Rate design can be used to argue the lower end of the range

RATE DESIGNS

Flat Block Rates

- Simple
- Divide cost of service by billing determinates
- Billing determinates include:
  - kWhs, therms, gallons, etc
  - Number of customers

Flat Rate Example

- Consumption = 350,000 kWh
- Allocated cost of service = $200,000
- Flat rate = $200,000/3,500,000 = $0.05713 per kWh
- Example – San Diego Gas and Electric pre-2000

Flat rate example with customer charge

- Allocated cost of service $200,000
  - Customer related costs $50,000
  - Commodity related costs $150,000
- Consumption = 3,500,000 kWh
- Number of customers = 10,000
- Energy charge = $150,000/3,500,000=$0.042857
- Customer charge = $50,000 /10,000= $5

Advantages/Disadvantages of Flat Rate

- Advantages
  - Simple to calculate
  - Data needs are simple
  - All types of usage get the same rate
- Disadvantages
  - Does not track cost at higher usage levels
  - Revenue stability issues

Straight fixed variable

- All fixed charges (i.e., for fixed capacity covered up front)
- All variable charges (i.e., for commodity covered in a separate charged – blocked or unblocked
- Advantages
  - Revenue stability – more assurance that fixed costs will be recovered
  - Tracks cost to serve – assigns costs to customers who are responsible for those costs being incurred
  - Reduces risk of cost recovery

Straight Fixed Variable

- Disadvantages
  - Reduced incentive for conservation/energy efficiency
  - Low users pay substantially higher per unit costs

Examples of Straight Fixed/Variable

- North Dakota - $28 customer charge for residential gas customers (covers all fixed costs)
- Common in interstate pipeline charges

Example of the need for Higher Fixed Charges

- Louisiana
  - Large number of rural hunting shacks, lake cabins
  - KWh charges do not cover all costs
  - Low customer charges prevent full cost recovery
- SDG&E – California
  - No customer charge
  - A bargain for condos

Fixed Cost Recovery Charge

- Customers pay both a monthly fee and a usage-based rate for delivering energy to their homes
- Customer pays a fixed charge plus variable commodity charges per month ($ for $)
- All the company's fixed costs (including ROR) are recovered on a per customer bases
- The rate is simply total allocated costs divided by number of customers
- Thus, weather, DSM, reduced customer usage, etc. do not affect full cost recovery.

Fixed Cost Recovery Examples

- Xcel Energy
  - June 1, 2005, the North Dakota Public Services Commission authorized a flat $15.69 per month for Xcel Energy's Northern States Power
    - Most customers did not see much change in their total bill
    - Reduced monthly bill fluctuations
    - Conservation does not affect company financials
    - The charge is the same for ALL residential customers.

Fixed Cost Recovery Examples

- Mississippi - $21 customer charge for residential electric customers
- Atmos Gas – Proposed $19 residential customer charge in Kansas

Straight fixed variable and Risk

- Effect on risk
  - Fixed charge recovery including cost of capital, depreciation is almost assured
  - Benefit to shareholders in recovery of depreciation/fixed o&m, cost of capital
  - Shifts some (all) of the risk of cost recovery to customers
- It is reasonable to argue that the cost of equity is reduced – at least argue for the lower end of the range

Straight Fixed Variable and Risk

- Reduces the cost of capital – in my opinion –
  - Demonstrate with discounted cash flow model – less risk of unrecovered fixed costs
  - Reduction in capital costs only a theoretical construct at this point
    - » I.e., my own dissertation – demonstrated that as variability in revenue recovery is reduced, the cost of equity capital falls
    - » Almost impossible to find comparables since there are very few (if any) companies using straight fixed variable
    - » ***But assured revenue makes the stock look more like a bond and the return on that stock should move toward the return on a bond***

Straight Fixed/Variable Pros and Cons

Advantages

- Assures fixed cost recovery
- Reduces risk

Disadvantages

- Higher rates to low users
- Discourages DSM

Inclining Block Rates and Declining Block Rates

- Overview of inclining block rates and declining block rates
  - Prices increase with usage/decrease with usage

Inclining Block Rate Example

- Customer charge = $5
- First 100 kWh = $0.04
- Next 300 kWh = $0.06
- Remaining kWh=$0.10
- First 2 kW = $14.50 per kW
- Next 5 kW = $18.00 per kW
- Remaining kW = $20 per kW

Advantages & Disadvantages of Inclining Block Rates

Advantages

- Promote conservation
- Price signal that energy is becoming more expensive
- LRMC may be higher
- Discourages wasteful use

Disadvantages

- Revenue stability problems
  - Weather sensitive
  - Fuel switching
    - PG&E Ag pumping example

California Example

- Inclining block
  - In response to energy crisis
  - Initial response
  - Dissipated over time

Declining Block Rate Example

- Customer charge = $5
- First 100 kWh = $0.14
- Next 300 kWh = $0.06
- Remaining kWh=$0.05
- First 2 kW = $14.50 per kW
- Next 5 kW = $8.00 per kW
- Remaining kW = $5 per kW

Advantages & Disadvantages of Declining Block Rates

Advantages

- Recovers fixed costs in early blocks
- Tracks costs
- Greater revenue stability

Disadvantages

- Marginal cost may be increasing – i.e., fuel
  - Cleco example

Experiences in Other States

- Louisiana - Cleco
  - Inclining in summer
  - Declining in winter
  - Peak switched from summer to winter

Risk to Shareholders

- More risk with inclining block – detriment to revenue stability
  - More sensitive to weather
- Declining block may track costs closer- improves revenue stability

DEMAND SIDE MANAGEMENT

Missouri SB376

- Missouri Efficiency Investment Act
- Utilities want:
  - Incentives
  - Lost revenue recovery
  - Cost recovery

Kansas 441/442

- Legislation – voluntary DSM
- Kansas DSM Orders
- Utilities want:
  - Incentives
  - Lost revenue recovery
  - Cost recovery
- Utilities did not get what they wanted
  - Withdrew DSM programs

Demand-Side Challenges

- DSM reduction results could lead to stranded plant.
- DSM reduction results could raise havoc with earnings.
- Significant problem if all of the DSM expenditures cannot be recovered
- The lost sales/revenue issue
- “Low hanging fruit” already harvested
- Measuring the results
- Excess Capacity

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Demand-Side Activities Tie Up Resources

- Cash flow challenges
- Manpower challenges
- Ties up management time
- Liability issues
- Is demand-side the utility's core competency?

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The Potential for Demand-Side Investments

- Little or none (especially for gas)
- Demand-side programs require a lot of cash, labor, and outsourcing that show up on the income statement as expenses.
- Efficiency Programs are risky.
  - If savings goals are not met, the regulator may imposes a penalty - negatively impacting earnings
  - Most of the readily available energy efficiency programs have been accomplished
- Other methods more effective – building codes, appliance standards, 3rd party administration

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Solution

- Allow the energy utilities to benefit from earnings rewards for demand-side reduction. That is from an earnings perspective, place demand-side alternatives on par with supply-side projects.
- This solution was recently recommended by the U.S. Department of Energy in its report filed in March of 2007 titled: *State and Regional Policies that Promote Energy Efficiency Programs Carried Out By Electric And Gas Utilities A Report To The United States Congress.*
- DOE did NOT say how to calculate a supply-side earnings equivalent for a demand-side energy efficiency program

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The need for earnings equivalency

- Provide utilities with a financial stake in SAVING energy.
- The customers enjoy the majority of the net benefits associated with the energy efficiency programs.
- The shareholders earn cash rewards for holding management accountable for developing and implementing cost-effective energy efficiency programs.

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Objective

- Total <u>net benefits</u> to energy consumers (the price of the energy times the quantity of energy saved, less the cost of the energy efficiency program) should be shared with utility common shareholders at the same level the shareholder would get by supplying the benefit through a supply-side ratebased asset.

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But Note

- The objective is net benefits
- The greater the net benefits – the greater the reward to:
  - Customers
  - Shareholders

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Incentives Tied to Benefits

- Encourage maximum benefits at minimum cost
- Share the value of the benefits not a share of the expenditures on the program
- Tie the reward to the utility to the net benefits NOT the amount of money spent on the DSM program – this is key

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Example

- Benefits
  - –Savings per kWh or savings per therm
  - –I.e., save the consumer $5.
- Costs
  - –Cost of the DSM program
  - –I.e., cost to achieve the savings to the consumer $3

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Example (Continued)

- Net benefits
  - Benefits less costs
  - Costs are passed on to the consumer
  - \$5-\$3 = \$2
- Share the \$2 net savings between customers and shareholders
  - I.e., \$1.80 to the consumer (consumer sees a \$1.80 decrease to their bill)
  - And \$0.20 to the utility (below the line)

Demand Side Management Programs – a Second Solution

- Target to specific customers
- Does not require “subsidies” from other customers

For Example – Efficiency Kansas

- A loan to insulate the house – increase charges to pay for the loan – but the energy savings will off-set the loan payment
- Separate Charge on the bill
- The loan stays with the meter
- Applies to rentals as well
- Easy to measure results for calculation of lost revenue
  - Example – Westar Energy
  - Can adjust lost revenue for new load

For Example - California

- California – recover the cost of the efficiency program in property taxes
- Energy savings off-sets the increase in property taxes
- Separate charges for all customers to pay for energy efficiency or other public purposes ~ 3%

CUSTOMER SPECIFIC RATE STRUCTURES

Customer Class Specific Rate Structures

- Pros of customer class specific rate structures
  - Customer may not operate unless rate is tailored to their need resulting in loss of load and associated fixed costs spread to other customers
  - Could (often does) affect jobs and economic development
  - Example wood products plant in Pineville, Louisiana
    - Discount to try and save the plant
    - Not enough

Customer Class Specific Rate Structures

- Cons of customer class specific rate structures
  - Ties a kwh or molecule of gas to a specific purpose – should make no difference what the energy is used for
  - Undo price discrimination?

Customer Class Specific Rate Structures

- Experiences in other states
  - Example – special rate for large wood products companies in Louisiana
    - Rate tied to operation of certain machines
    - Pros and Cons
  - Example – special rate for aluminum producers in Washington state
    - Rate tied to the price of aluminum
    - Pros and Cons

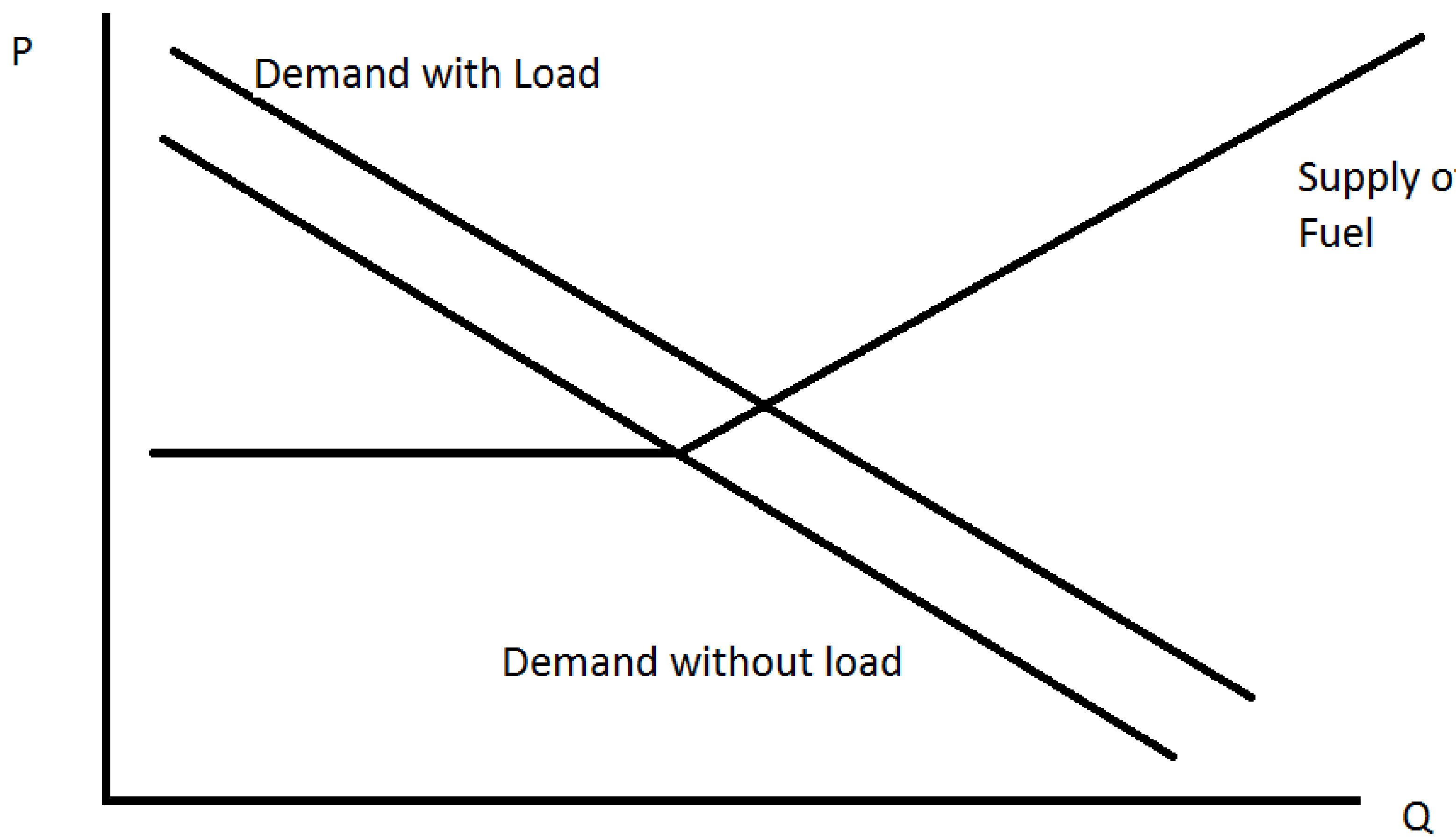
Promotional Rates

- Example – KCP&L (Kansas)
  - Reduced rate for electric heat
  - Pros
  - Cons

Customer Class Specific Rate Structures

– How do customer class specific rate structures change the risk incurred by shareholders and ratepayers?
  - Depends on amount of excess capacity(if any) – capacity shortage could actually increase costs/risk
  - Example – wood products plant in Derider, Louisiana

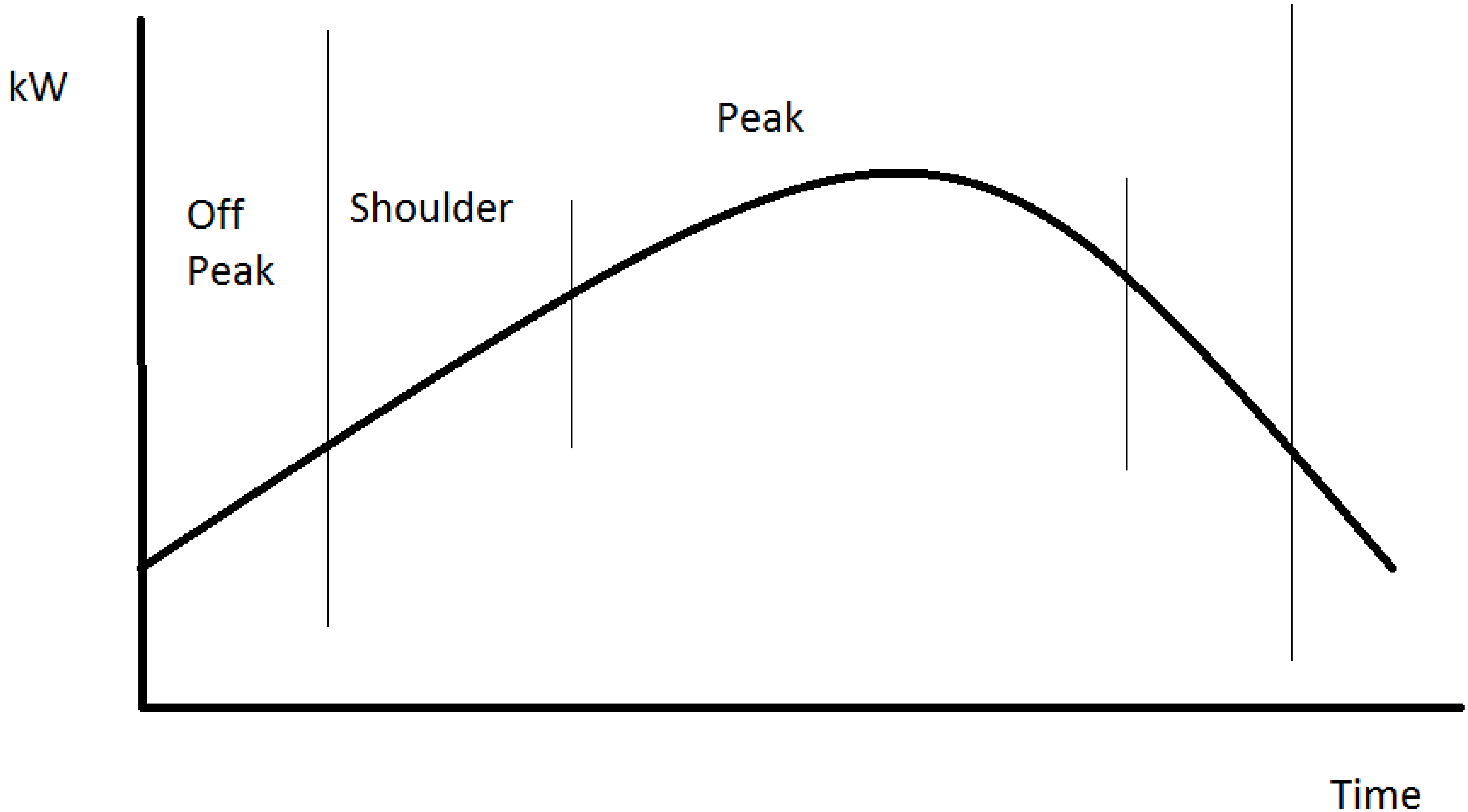
The Deridder Plant



Time of Use

- Time of Use Rates
  - Overview of time of use rates.
  - Pros of time of use rates
    - Track costs
    - Energy efficiency
  - Cons of time of use rates
    - Do customers pay attention?
    - Some customers can’t shift usage – i.e., office building, casino
- Cost of metering/back office

Time of use Rates



Time of Use

- Experiences in other states
    - California
- Are “time of use rates” a rate design modification associated with demand-side cost recovery?
- How does “time of use rates” change the risk incurred by shareholders and ratepayers?

Time of Use

Advantages

- Tracks costs
- Reduced risk/cost of capital

Disadvantages

- Peak rates may not be necessary all the time
- Cost of metering
- Back Office Costs

Seasonal Rates

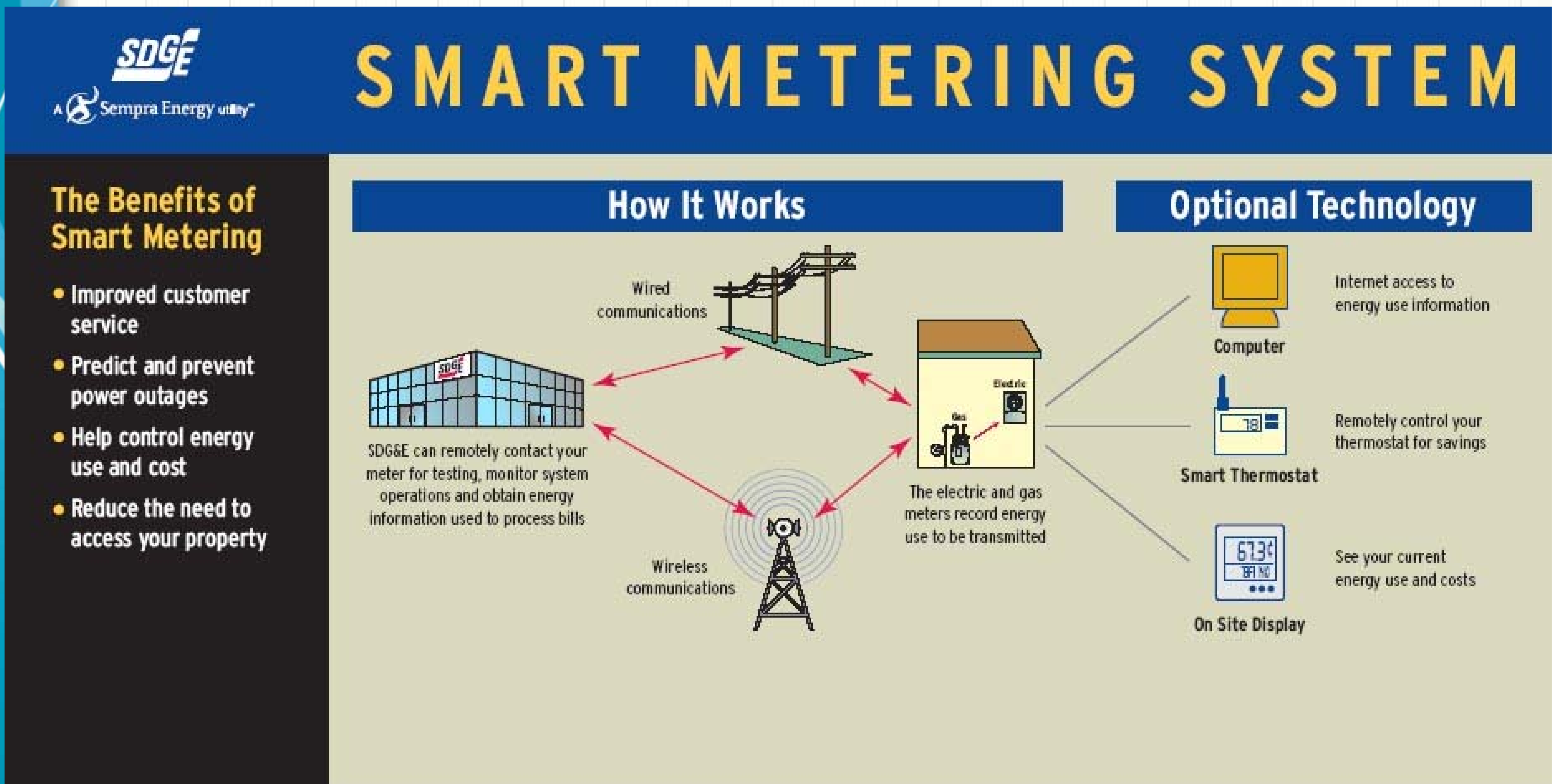
- Overview of seasonally adjusted rates.
- Pros and cons of seasonally adjusted rates.
- Experiences in other states
  - Quite common
  - Unanticipated shift in peak from winter to summer/summer to winter
- Are "seasonally adjusted rates" a rate design modification associated with demand-side cost recovery?
- How do "seasonally adjusted rates" change the risk incurred by shareholders and ratepayers? When considering "seasonally adjusted rates" as rate design modifications, should the Commission consider a reduction in authorized return on equity? What is the experience of other states regarding reduction in authorized return on equity associated with "seasonally adjusted rates"?
  - Tie to DCF model

THE FUTURE: REAL TIME PRICING

Smart Metering/Smart Grid

- AMI
  - Replaces older electric dial meters with digital smart meters
  - 2-way communications between customer and utility
  - Remote electric reads: Hourly for residential, every 15 mins. for business
  - Could tie in other utility services – gas, water
  - Note technology is in flux

A Smart Meter


SDGE
A Sempra Energy utility
SMART METERING SYSTEM
The Benefits of Smart Metering
• Improved customer service
• Predict and prevent power outages
• Help control energy use and cost
• Reduce the need to access your property
How It Works
Wired communications
SDG&E can remotely contact your meter for testing, monitor system operations and obtain energy information used to process bills
Wireless communications
Electric
Gas
The electric and gas meters record energy use to be transmitted
Optional Technology
Computer
Internet access to energy use information
Smart Thermostat
Remotely control your thermostat for savings
On Site Display
See your current energy use and costs

Attributes

- Consumption information available via Web presentment and phone
- Programmable communicating thermostats (PCTs)
- Remote connect/disconnect
- Home area network (HAN)
- Enabling technology and programs
  - Rates
  - Personal Energy Management
- Customers choose how they want to participate
- Shows customers their energy consumption information at the time of use –like filling your car with gas at the pump
- In-home display devices

Customer Benefits

1. Enhances reliability and outage detection, and speeds restoration
2. Gives customers more control over their everyday energy usage, opportunity for lower bills:
   - Better energy usage information
   - New incentive programs/allows for various rates
   - Lowers operating costs
3. Improves customer service
   - Meter reads on demand
   - More flexible and customized services
4. Reduced need to access property
5. Can identify abnormal energy usage
6. Set maximum and minimum electric demand alerts

Utility Benefits

- Meter Reading
- Finance & Accounting
- Energy Procurement
- Customer Billing
- Customer Call Centers
- Outage Management
- Transmission & Distribution
- Load Research
- Meter Operations
- Information Technology
- Credit & Collections
- Demand Response

Developing an AMI Program

- Target AMI Benefits
  - Operational
  - Customer Service
  - Asset Mgmt
  - Energy Efficiency
- Develop "To-Be", AMI enabled, business processes
  - Identify the gap between "To-Be" versus "As-Is" business processes
  - Identify what has to change
- Identify functional & information requirements of "To-Be" business processes
  - Quantify the costs/benefits of changes
- Identify future IT/System requirements & gap versus current IT infrastructure
- Develop customer segmentation strategy
  - Explore viable cost/benefit implementation scenarios
- Quantified benefits & industry metrics

Develop Vendor Solicitations

- Define business & functional requirements
  - Prioritize and categorize identified requirements
  - Translate requirements to vendor solicitations
- Define technical & integration requirements
  - Performance, accuracy, reliability, & integration specification of AMI systems per defined segmentations
  - System integration matrix & requirements
- Define project implementation & deployment requirements
  - Deployment requirements/services
  - Configuration/customization/integration requirements/services
  - Testing & training requirements/services
  - Operations, maintenance & support requirements/services
  - Documentation requirements/services

Evaluate Candidate AMI Systems

- Develop response evaluation criteria
  - Technical, implementation, deployment, cost/benefit
  - Experience, effectiveness, responsiveness, stability
- Evaluate candidate systems
  - Score vendors against requirements
  - Evaluate segmentation scenarios, assess alternatives
  - Assess risk factors
- Finalize customer segmentation
  - Based on vendor technical & cost responses

Cost

- Conventional meter ~ $28
- AMI meter ~ $75 for standard single phase meter

AMI and Rate Design

- Real time pricing
  - Track costs
  - Reduce risk
  - Promote energy efficiency

Pilot Program

- Westar
  - Lawrence, Kansas

DECOUPLING

Decoupling

- There is growing interest in revenue decoupling, especially for gas distributors
- This presentation will explore the motivation behind revenue decoupling proposals
  - The basics of decoupling
  - Some recent decoupling precedents
- Revenue independent from the usual suspects (weather, conservation, etc.)

The Issue

- Calls for revenue decoupling for utilities are driven by a number of industry trends
  - Declining usage per customer
  - Better building materials
  - More energy efficient appliances
  - Costs that are driven mostly by number of *customers not consumption*
  - Rate designs that collect most revenues through *volumetric* charges
  - Energy efficiency policy objectives

Implications

- Cost of serving new customers increasing more rapidly than new customer revenues
- Cost pressures especially great in territories where customers increasing most rapidly
- Increasing need for rate relief

Revenue Decoupling

- Revenue per customer
  - Controlled with a balancing account
  - Increases revenue with customer growth
- Could be indexed
- Neutralizes poor rate design - volumetric based rates, lack of fixed (i.e., customer) charge rate recovery, low energy usage

Revenue Decoupling

- Total revenue
  - Adjust RR each year
- Example
  - FERC transmission rates

Precedents

- Baltimore Gas and Electric – “Rider 8”
  - Approved 1998
  - Applied to residential and general service customers
- Mechanics of Rate Adjustment:
  - Takes place each month, with separate calculations for Residential and General Service Customers
    - 1. Determine change in number of customers = Current Month Number of Customers – Test year Number of Customers
    - 2. Determine change in allowed revenues (called the “Customer Growth Adjustment”), which is equal to the sum of the two components below:

      A. The *Customer Charge Impact* = Change in number of customers [from step 1] * Current customer charge

      B. The *Volumetric Charge Impact* = (Change in number of customers [from step 1] * (Test Year Average Use per Customer)* System charge (per therm)

Precedents (Cont.)

- BG&E (Cont.)
  - Add the allowed change in revenue computed in Step 2 above to test year base revenue
  - Subtract the sum computed in step 3 from actual base rate revenue; the difference is the required revenue adjustment, which is added to the cumulative balance in the balancing account
  - The required revenue adjustment is recovered through volumetric charges

Precedents (con't)

- Southwest Gas - California
  - Approved 2004
  - Applied to residential and master-metered customers
- Mechanics of Rate Adjustment:
  - Monthly baseline volumes were determined for a test year ending June 1, 2002; each month for residential and master-metered customers, multiply these baseline volumes by authorized volumetric charges
  - Subtract the product determine in step 1 above from actual revenues for each covered rate schedule
  - Divide the difference computed in step 2 above by actual volumes delivered under the covered rate schedules

INCENTIVE RATEMAKING

The Need for Incentives

- Cutting costs may jeopardize service quality and reliability
- Limiting investment may jeopardize service quality in the future
- Reduced customer service may jeopardize the customer experience
- Cutting costs may jeopardize employee safety
- Cutting costs may jeopardize customer safety
- Cutting costs may jeopardize recruitment and employee retention

Service Quality Incentives

- The e-economy is highly dependent on reliable power supplies and power quality
- Can substitute for extensive regulatory oversight
- Create the right signals of investment and resource allocation

Three Basic Elements of a Service Quality Incentive

- Quality indicators: aspects of quality that are monitored and measured
- Quality benchmarks: what measure quality is compared to
- Award mechanism: translates a given quality result into a rate change – Links service quality and financial performance

Selecting Quality Indicators

- Select aspects of quality that customers value
- Choose indicators that are under company control (Cost drivers)
- Choose indicators that are readily measurable
- Focus on quality "outputs" that are delivered to customers

Quality Indicators

- Reliability
  - Frequency of outages – SAIFI
  - Duration of outages – SAIDI or CAIDI
  - MAIFI could also be used
  - Examples
- Customer Safety
  - 95% of gas odor related calls responded to in l hour or less
  - 95% of live downed power line responded to in 1 hour or less
- Employee Safety
  - 10 lost time accidents or less per 100,000 hours worked
  - OSHA lost time accident report

Quality Indicators

- Telephone performance
  - 74% of calls answered within 30 seconds
  - Less than 2% dropped calls
- Field service performance
  - 95% of appointments kept within 4 hour window
  - $50 payment for appointments missed or more than 4 hours late. Check sent to customer or handed to customer for late appointment
- Meter Reading
  - No more than 10% estimated bills
  - No more than 3% adjusted bills

Quality Indicators

- Customer Satisfaction
  - 95% “very satisfied” on customer surveys
  - Less than 100 customer complaints to commission per year
- Benchmarks
  - Company history
  - Peer performance of similar utilities
  - US Energy Information Administration (EIA) ranking – state average price
  - Edison Electric Institute (EEI) average price ranking
  - FERC Form 1 system average cost ranking

Example

- Westar Energy tree trimming program

Performance Rewards/Penalties

- Symmetric – both rewards and penalties
  - Creates incentives to improve quality
  - Quality improvements most necessary where quality is substandard
  - Customers may be willing to pay for higher quality
  - Balances chances of penalties due to random influences with rewards due to random factors

Performance rewards/penalties

- Asymmetric – penalties only
  - Incentives designed to counter act cost-cutting incentives so that quality is maintained
  - Since utilities benefit from cost-cutting, rewards for quality improvement are unnecessary
  - Not all customers are willing to pay for improved quality
- Assign dollar values to the performance rewards/penalties and include the rewarded amount in the next year's adjusted revenues

Commodity generation incentives (electric)

- ConEd – New York
  - One basis point for every 100 MW hedged through bilateral contracts
  - One basis point for every 50 MW of added, non-Con Edison, in-City electric generation requiring significant interconnection work
  - One basis point for each additional 20 MW reduction in in-City purchases that is required as a result of supply-side initiatives by Con Edison, including in-City generation additions as well as operational improvements and transmission system enhancements that increase import capabilities

Commodity generation incentives (electric)

- ConEd – New York
  - One basis point for every 10 MW of potential load reduction
  - One basis point for every 100 interval meters installed
  - One basis point for every 20 customers that participate in Con Edison Real-Time Pricing and/or Steam Air Conditioning Programs.

Commodity generation incentives (electric)

- ConEd – New York (Continued)
  - Up to two basis points for substantial progress in achieving price and price volatility mitigation
  - Up to three basis points for substantial good faith efforts to mitigate prices and price volatility such as circuit breakers, price caps, NYC mitigation, corrections of market flaws, software and systems to improve efficiency.

QUESTIONS AND DISCUSSION

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