Energy Efficiency & Conservation

Impact on Electric Rates

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Outline

- History
- Today
- Conservation vs. Efficiency
- Incremental vs. Average Cost
- Retail Rates
  - Rate Design Criteria
  - Components of Expense
- Examples
  - Load Management
  - Net Metering / Distributed Generation

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“Everything Old is New Again”

- Natural gas and oil prices unstable and rising
- Generating capacity becoming constrained
- New base-load generating resources planned during period of uncertainty
- Environmental issues are a “hot button”
- Regulators & legislators looking to reduce consumption of fossil fuels
- Sound familiar?

History – Prior to 70s

- "Use more, it gets cheaper"
  - Growth in sales stable and predictable
  - Generation resources planned well into the future
  - Capital costs high compared to variable costs
  - Marketing Rates
- Public power utilities encouraged usage
  - Lower average cost per kWh / declining cost industry
  - Wholesale & retail rates reflected cost structure
  - Customers encouraged to increase load factor
    - Reduce peak demand
    - Increase energy usage with same demand
- Era's definition of *economic efficiency : maximize the use of base-load generation assets*

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History – 70s to 80s

- "Owning is expensive; using is cheap"
- Oil embargoes triggered…
  - Dramatic oil & gas prices increases
  - Concerns about availability of oil and natural gas
  - Laws mandating "conservation" and "efficiency" for national security
  - Laws prohibiting natural gas as boiler fuel for new generation.
  - Coal & nuclear primary means of lessening dependence on foreign oil
- New generation was built in THIS regulatory environment but sized on EARLIER load growth assumptions

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History – 70s to 80s continued

- New generation - high capital cost
  - Coal & nuclear higher capital cost
  - High inflation and interest rates
- Consumers encouraged to use less energy
  - State and federal conservation programs
  - Tax credits
  - Utility advertising and PSAs / patriotic to conserve
- Result: new generation sized for projected growth that did not materialize
  - Extremely expensive excess capacity
  - The < the plant operated, the > the average $/kWh
  - The > the plant operated, the < the average $/kWh.

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History – 70s to 80s continued

- Wholesale and retail rates reflected cost structure
  - Often fixed or partially fixed billing units
  - Billing above predetermined level charged lower "incremental" rate
  - All growth is good - each additional kWh is cheaper than average cost and so lowers the average cost
- Era's definition of *economic efficiency: maximize use of **excess** base load generation*

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History – 70s to 80s continued

- Retail rates designed to encourage improvements in end-use energy efficiency
- Customer, power supplier & distribution utility could all win
- Customer encouraged to replace old low efficiency gas with new high efficiency electric…
  - Customer < total energy billing
  - Distribution utility < average wholesale $/kWh
  - Distribution utility > sales
- Many distribution utilities adopted rebate & loan programs, home energy audits and high efficiency appliance sales

History – 70s to 80s continued

- What happened over time?
  - Economy rebounded
  - Electric sales increased as prices stabilized
  - Excess capacity began to disappear
  - Natural gas-fired generation gained favor
    - Legislation repealed prohibitions on new gas-fired generation.
    - New, lower cost gas-fired generation / peakers
- How did this affect the industry?
  - Generation more fully utilized, reducing average $
  - Lower relative electric rates
- This was our world…
- Many electric rates today reflect costs & conditions when the rates were designed, not today

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Efficiency and Conservation

- For this discussion…
  - **Efficiency**: process of maximizing power production to provide the lowest cost of service
  - **Conservation**: process of lowering energy consumption.
  - Efficiency does not necessarily involve conservation, nor does conservation necessarily involve efficiency
  - Utilities have often in the past worked to move regulatory policy from conservation to efficiency

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Today

- “Don’t make us build a power plant”
- New generation capacity required
  - Natural gas generation less attractive as base load
    - Little or no excess capacity / reserve margins
    - Higher prices for natural gas & concerns of long-term viability
  - Political / economic considerations
  - Environmental considerations
    - Federal Energy Policy
    - Emission legislation: pollutants and greenhouse gases
    - Already driving up the cost of coal plants
    - Environmental Motto: “Use less electricity”
- Era’s understanding of *economic efficiency: manage load to defer or eliminate need for future generation capacity*

Incremental vs. Average Cost

- **Average Costs:** The revenue requirement of a utility divided by the utility's sales. Average cost typically includes the costs of existing power plants, transmission, and distribution lines, and other facilities used by a utility to serve its customers. It also includes operations and maintenance, tax, and fuel expenses.
- **Incremental Costs:** The additional cost incurred by producing or purchasing the next available unit of electric energy above the current base cost.

Incremental vs. Average Cost (continued)

- The electric industry once again finds itself in an environment where *incremental costs* are significantly higher than existing *average costs*
- *New load costs more to serve than existing load*
- Gone are the days when discounted or marketing rates offered to compete for new load, or retain existing load, will always produce lower average cost and incremental margins to benefit everyone
- This is a **BIG** change to the industry and will require utilities to rethink wholesale and retail rates

Rate Design

- The cost of generation is the primary determinant of wholesale rates
- The structure of wholesale rates should be the primary determinant in retail rates (even if we think the wholesale rate structure is wrong)
- If a power supplier enters tomorrow's environment with yesterday's or even today's wholesale rates, a mismatch exists, resulting in incorrect pricing signals that can significantly impact end-use consumption

Retail Rates

Rate evaluation criteria

- Fair / non-discriminatory
- Customer impact
- Competitive
- Proper pricing signal
- Understandable
- Encourage proper usage

Proper Pricing Signal

- ALL rates provide a pricing signal – tells customers how behavior can change costs
- Over time, many customers will change behavior for significant savings – others will NOT
- Avoid pricing signals that allow customers to lower costs at the expense of the utility - the more rates reflect cost of service, particularly wholesale rates, the more the utility's pricing signal will lower customer's cost without lowering margins
- Proper pricing of risk
- Retail rates (avoided cost, LM, etc.) must reflect wholesale rate structures

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Example
Should we promote Security Lighting?

…If the Wholesale Rate is:	
	High demand charge with 100% ratchet established in summer months only
	High demand charge with no ratchet based on each month's peak
	No demand charge – wholesale billing by energy only

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Example (continued)
The pricing signal for Security Lighting?

Wholesale Rate	
	High demand charge with 100% ratchet established in summer months only (Security Lighting is excellent load to promote)
	High demand charge with no ratchet based on each month's peak (Excellent load in summer, poor load in winter)
	No demand charge – wholesale billing by energy only (Lighting is no better than any other load)

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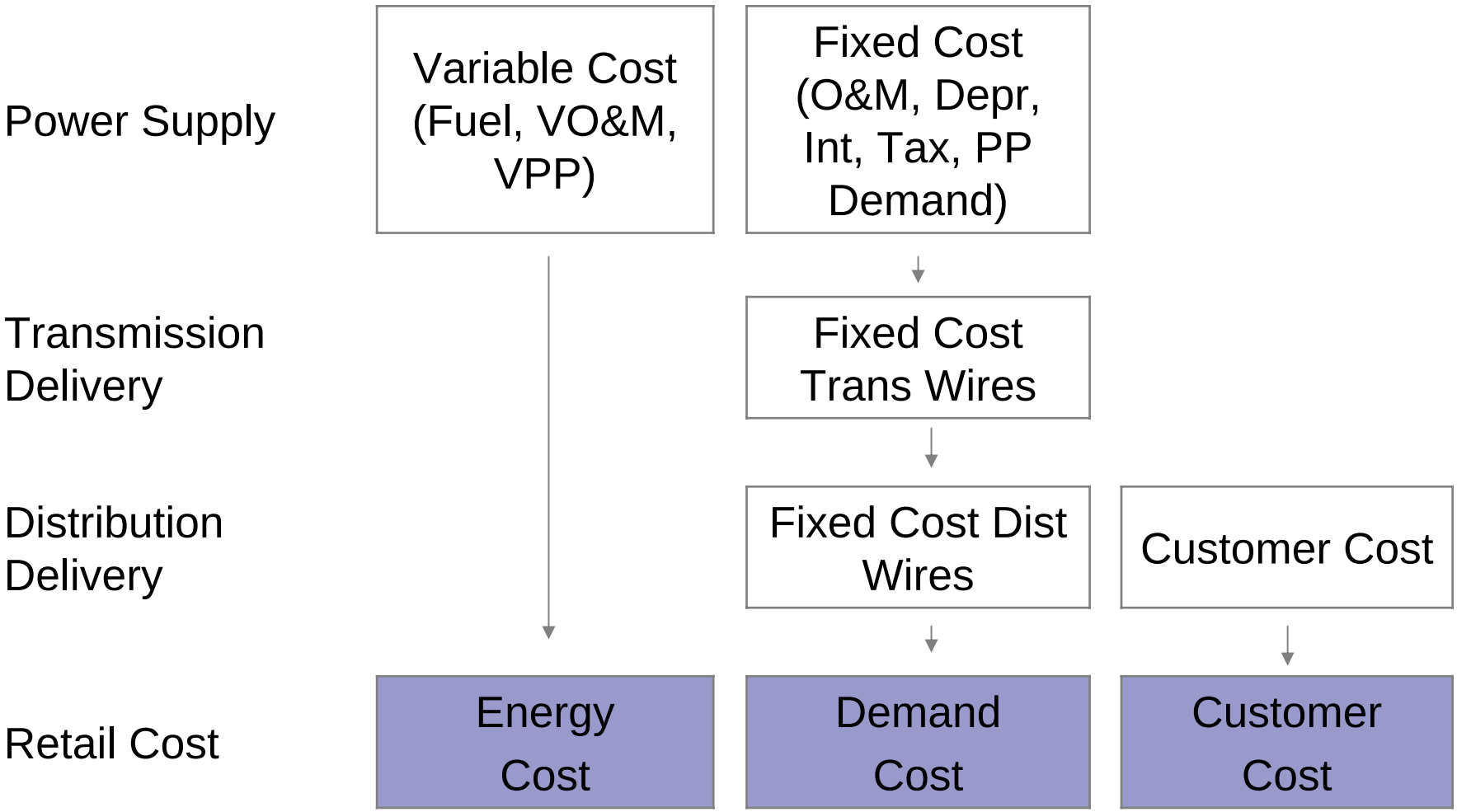
Rate Design separates or *unbundles* Investments and expenses

- Power Supply Component
  - Demand (Capacity and Delivery)
  - Energy (Adjusted for losses)
- Distribution Wires Component
  - Demand Related Component
  - Customer Related Component

Existing Rates

- Many Existing rates are not designed based on cost of service
- As a result, applying load management, conservation and/or DG rates can have unexpected, or even counter-productive results
- The era of marketing rates/programs may be ending
- Retail rates must be based on wholesale pricing signals – **even if those signals are wrong in our opinion**

Classification of Cost



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Recovery of Cost

Total Cost @ Retail Level	Energy Cost	Demand Cost	Customer Cost
Power Supply Rate	Plus: Fixed Cost Allocated to Energy	Less: Fixed Cost Allocated to Energy	
Transmission Delivery	+/- Reallocation PS Trans Cost	+/- Reallocation PS Trans Cost	
Distribution Delivery	+/- Reallocation Dist Fixed and Cust Cost	+/- Reallocation Dist Fixed Cost	Less: Reallocation Dist Cust Cost
Retail Cost	Energy Rate	Demand Rate	Customer Rate

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Why is this important?

- Customers respond to our RATES, not to how our costs are incurred
- ALL rates give pricing signals – correct or not
- Subsidies in our rate designs may give incentives not supported by cost
- Distribution utilities typically desire to encourage customers to modify behavior in such a way as to lower cost as revenue is lowered

Example: Load Management

- Everyone can win
- Customer
  - Control load & reduce peak
  - Lower power cost
- Distribution utility - lower power cost for customer without lowering distribution margins (passing through savings in wholesale power cost)
- Power supplier - assuming load control rate is properly designed and implemented, lower need for additional peak capacity

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Load Management continued

- Load management can reduce peak demand and need for capacity.
- Incentives/rates/penalties
  - Power supplier direct or indirect load control
  - Standard wholesale rates that give load control pricing signals.
  - Retail utility direct or indirect load control
- Special rates
  - Retail load control
  - Distributed generation
  - Interruptible rates
  - Time-of-use rates
  - Cost-plus rates

Load Management continued

- Some existing LM programs evolved into strictly marketing rates
- Examples:
  - Curtailable rates never curtailed
  - HVAC / water heat control later disconnected by customers
  - Voluntary “Scout’s honor” LM
- Still an important role for load management but…
- Utilities should re-examine all existing rate designs, special programs, rebates and incentives to ensure that they achieve today’s objectives

Power Cost Adjustment

Basic Concept

- Some level of power cost is included or “embedded” in base rate designs
- Changes the power cost are recovered through an adjustment factor charged on energy sales

- Remove any customers with load management or other credits from the power supplier – or add credits back into the calculation – or design base rates to reflect this situation - otherwise the utility may be passing any savings through twice - to individual customers AND to all customers (can be corrected in rate design)

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Example: DG / Net Metering

- If power produced is more than on-site requirements in a billing period:
  - The DG customer is compensated by the meter running in reverse
  - Typically, the customer pays the monthly charge and/or minimum bill plus any monthly metering charge, and excess energy is provided at no charge to the utility
  - Some utilities pay avoided cost for excess generation
- If power produced is less than on-site requirements in a billing period:
  - The utility bills the member for energy supplied according to the applicable retail rate schedule

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The Problem With Net Metering

The problem – a sample customer:				
	Single Phase (Residential) Rate			
	Customer Charge		$15.00/month	
	Energy Charge		$0.100/kWh	
		Purchased Power Demand		$0.044/kWh
		Energy/Fuel		$0.024/kWh
		Distribution wires		$0.032/kWh
		Total Energy Charges		$0.100/kWh

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The Problem With Net Metering (continued)

The problem – a sample customer:				
Assume 1,000 kWh generated per month by DG				
	1,000 kWh X $0.100/kWh		$100/month	Customer's Savings
	Unrecovered Costs			
		Distribution Costs	$32/month	Lost to Dist Utility
		Pur Pwr Demand	$44/month	Lost to Dist Utility
		Total Subsidy	$76/month	Lost to Dist Utility
Customer's Annual Savings				$1,200/year
Dist Utility's Reduced Power Cost				-$288/year
Dist Utility's Lost Margins				$912/year

The un-recovered costs (subsidy) is paid by other residential customers or by all other customers

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Avoided Cost

- Actual costs not incurred as a result of DG
- Non-firm avoided cost is primarily fuel.
  - Fuel cost varies at different times of year and day
  - Different power suppliers have dramatically different avoided cost
  - Power suppliers may have a variety of fuel components – complicating determination of avoided cost
- Firm avoided cost MAY include demand components
- Avoided cost may include ancillary service costs/benefits
- May be power supplier or distribution utility AC

Cost of Service – Components of Expense

Residential Rate - No Demand Meter		
Rate	Unbundled COS	Existing Actual
Customer Charge	$27.31/month	$10.00/month
Distribution wires	$0.014/kWh	$0.031/kWh
Pur Pwr Demand	$0.037/kWh	$0.037/kWh
Pur Pwr Energy/Fuel	$0.045/kWh	$0.045/kWh
Total Energy	$0.096kWh	$0.113kWh
Avg 1,000 kWh/month	$123/month	$123/month

If we had this rate design…. Would we care as much about DG?

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Cost of Service – Components of Expense

Residential Billing - No Demand Meter *Assume 500 kWh per month DG output removed*		
Rate	Unbundled COS	Existing Actual
Customer Charge	$27.31	$10.00
Distribution wires	$7.00	$15.50
Pur Pwr Demand	$18.50	$18.50
Pur Pwr Energy/Fuel	$22.50	$22.50
Total Bill	$75.31	$66.50
Cost Reduction to Cust	$48.00	$56.50
Cost Reduction to Utility	$22.50	$22.50
Subsidy	$25.50	$34.00

Cost of Service – Components of Expense

Residential Rate – Demand Meter		
Rate	Unbundled COS	Existing Actual
Customer Charge	$27.31/month	$10.00/month
Distribution Wires	$5.09/NCP kW	$0.031/kWh
Pur Pwr Demand	$13.45/CP kW	$0.037/kWh
Pur Pwr Energy/Fuel	$0.045/kWh	$0.045/kWh
Total Energy	$0.045/kWh	$0.113kWh
Avg 1,000 kWh/month Avg kW 2.75/month	$123/month	$123/month

If we had this rate design…. Would we care at all about DG? Would we need special LM rates?

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Cost of Service – Components of Expense

Residential Billing – Demand Meter *Assume 500 kWh per month DG output removed*			
	Rate	Unbundled COS	Existing Actual
	Customer Charge	$27.31	$10.00
	Distribution wires	$14.00	$15.50
	Pur Pwr Demand	$36.99	$18.50
	Pur Pwr Energy/Fuel	$22.50	$22.50
	Total Billing	$100.80	$66.50
	Cost Reduction to Cust	$22.50	$56.50
	Cost Reduction to Utility	$22.50	$22.50
	Subsidy	$0.00	$34.00

Conclusion

- Since retail rates are a means of passing pricing signals to customers, all industry changes ultimately affect retail rates.
- Many utilities “steer the ship” by sending pricing signals to modify customer behavior.
- Today, the industry is seeing a shift in the relationship between incremental costs and embedded or average costs.
- At the same time, the debate over the environmental impact of energy use has resulted in renewed interest in efficiency and/or conservation.

These two fundamental shifts will affect every aspect of wholesale and retail rate design