Trends in Wholesale and Retail Rate Design

Marty Blake
The Prime Group, LLC

Key Questions in Developing Rates

- How much revenue should the coop be allowed to collect?
  - Revenue requirements calculation
- How much of the total should be collected from each customer?
  - Rate design
  - Many different ways to collect revenue requirement
  - To accurately compare rate designs, they should all collect the same revenue requirement

Rate Design Principles

- Rates should reflect the cost of serving customers when the rates will be in effect, i.e. the future
  - Based on historical costs during a 12 month test year
  - Pro forma adjustments to reflect known and measurable changes

Rate Design Principles

- If a customer causes a cost to be incurred by the utility, the customer should pay that cost
- Customers should pay their “fair” share of the utility’s margins
- Send a price signal that is consistent with the cooperative’s strategic direction
  - What is the cooperative trying to achieve?

Rate Design Principles

- Recover fixed costs through fixed charges
  - If fixed costs are "variablized", there is a risk of not recovering fixed costs if kWh usage is reduced
- Recover variable costs through variable charges
  - If variable costs are "fixed", customers will not benefit from their efforts to reduce energy usage
- Starting point is the cost of service study

So What's Fixed and What's Variable?

- About 65% to 75% of a distribution cooperative's costs are purchased power (generation and transmission) with the remainder being distribution costs
- Almost all distribution costs are fixed costs (fixed with a capital "F")
- Depending on G&T rate design, purchased power can be viewed as a variable cost to the distribution cooperative that can be reduced by moving customer usage to time periods that are less costly to serve

So What's Fixed and What's Variable?

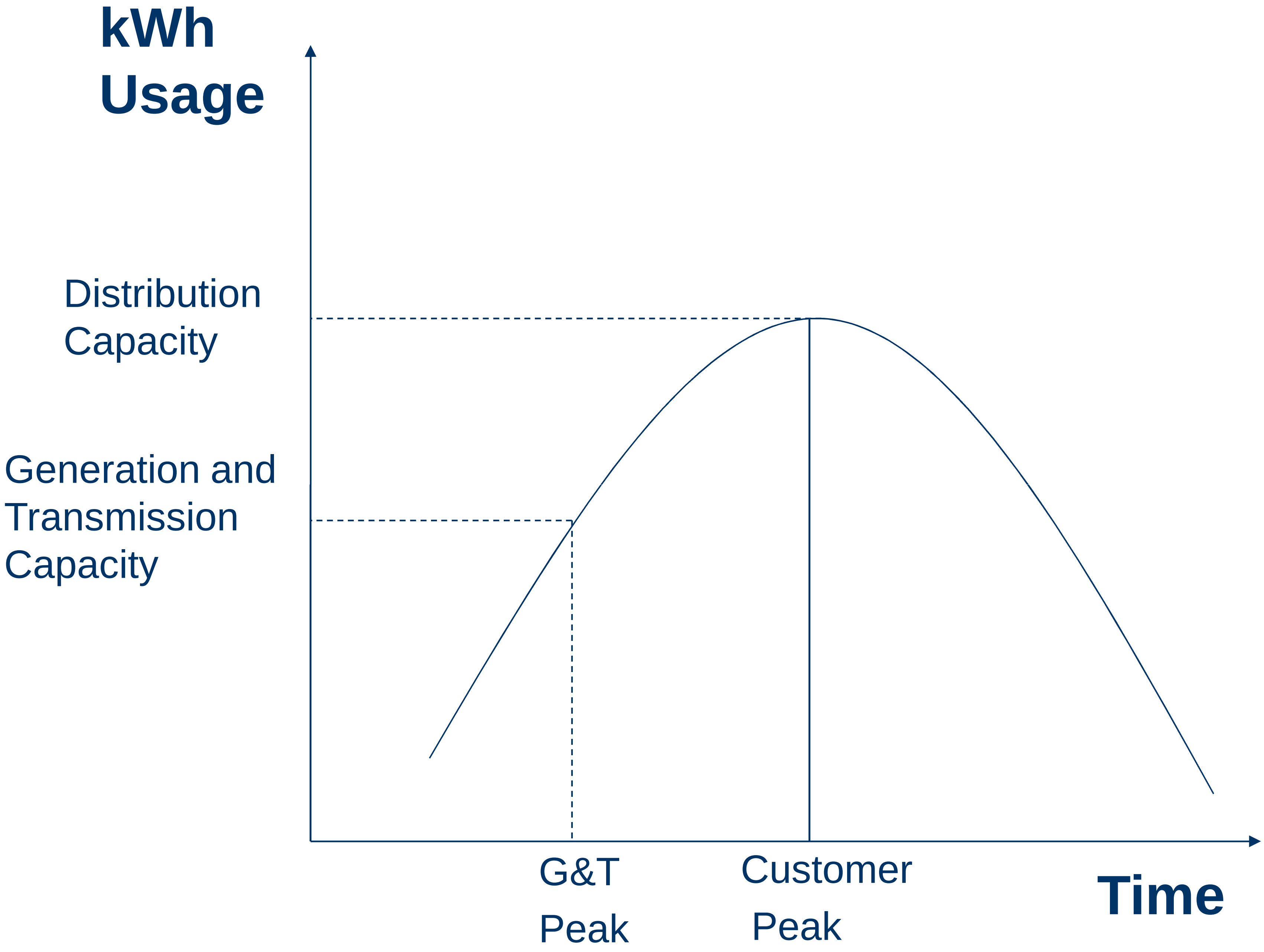
- G&Ts must cover all of their costs, both fixed and variable
- With opportunities to sell excess energy and ability to sell excess generating capacity, what might be regarded as fixed costs may really be somewhat variable
- Fixed with a small "f"

Trends in Wholesale Rate Design

- Provide rates that better reflect the cost differences of providing power at different points in time
  - CP demand rates
  - Time differentiated demand rates
  - Time differentiated energy rates
- Surety of cost recovery
- Peace in the family
- Load Building

Two Types of Demand Costs

- Coincident peak demand
  - Customer’s use of capacity that is coincident with G&T’s peak demand
- Non-coincident peak demand
  - Capacity needed to meet the customer’s maximum use regardless of when it occurs


kWh
Usage
Distribution
Capacity
Generation and
Transmission
Capacity
G&T
Peak
Customer
Peak
Time

Time Differentiated Wholesale Rates

- Demand Charges
  - $9.85 per kW of summer CP demand
  - $6.80 per kW of winter CP demand
- Transmission demand - $3.58 per CP kW
- Substation and radial line - $1.80 per NCP kW
- Energy charges
  - $0.065 per kWh on-peak
  - $0.034 per kWh off-peak

Time Differentiated Wholesale Rates

- Summer (June, July, August) CP demand - clock hour demand that is coincident with system peak demand between 7 AM and 11 PM
- September through November demand is the average of June, July and August CP demands
- Has impact of weighting summer demand charge by 2 with no demand in Fall

Time Differentiated Wholesale Rates

- Winter (December, January, February) CP demand - clock hour demand that is coincident with system peak demand between 7 AM and 11 PM
- March through May demand is the average of December, January and February CP demands
- Has impact of weighting winter demand charge by 2 with no demand in Spring

Time Differentiated Wholesale Rates

- Energy
  - Summer on-peak period - 11 AM to 9 PM, Monday through Friday during June, July and August
  - Winter on-peak period - 7 AM to 10 AM and 6 PM to 9 PM, Monday through Friday during December, January and February
  - Off-peak – all hours other than on-peak

Focus on Cost Recovery

- Rate designs that make it difficult for costs to be avoided or shifted to other members
  - Non-coincident peak demand charges
  - Demand ratchets – billing demand based on highest kW usage during a defined prior period
- Also make it difficult to provide customers with opportunities to reduce their energy bills

Other Objectives for Wholesale Rates

- Focus on keeping the peace among members
  - “Tilted” demand charges (fixed costs shifted to energy charge for recovery)
- Focus on Load Building
  - Energy-only rates
  - Average demand which is essentially an energy-only rate

Load Factor

- Load factor (LF) is the ratio of the average load that occurs over a period of time to the maximum load that occurs during that same time

$$LF = [kWh \div hrs] \div kW_{max}$$

Energy Bill Impacts

Demand Charge per kW		$20.00		
Energy Charge per kWh		$0.030		
	Customer A	Customer B	Customer C	
kW	100	100	100	
kWh	730	36,500	73,000	
Demand Cost	$2,000.00	$2,000.00	$2,000.00	
Energy Cost	$21.90	$1,095.00	$2,190.00	Bill Sum
Total Bill	$2,021.90	$3,095.00	$4,190.00	$9,306.90
Load factor	1%	50%	100%	
Cost per kWh	$2.770	$0.085	$0.057	

Energy Bill Impacts

Demand Charge per kW		$10.00		
Energy Charge per kWh		$0.058		
	Customer A	Customer B	Customer C	
kW	100	100	100	
kWh	730	36,500	73,000	
Demand Cost	$1,000.00	$1,000.00	$1,000.00	
Energy Cost	$42.34	$2,117.00	$4,234.00	Bill Sum
Total Bill	$1,042.34	$3,117.00	$5,234.00	$9,393.34
Load factor	1%	50%	100%	
Cost per kWh	$1.428	$0.085	$0.072	

Energy Bill Impacts

Demand Charge per kW		$0.00		
Energy Charge per kWh		$0.085		
	Customer A	Customer B	Customer C	
kW	100	100	100	
kWh	730	36,500	73,000	
Demand Cost	$0.00	$0.00	$0.00	
Energy Cost	$62.05	$3,102.50	$6,205.00	Bill Sum
Total Bill	$62.05	$3,102.50	$6,205.00	$9,369.55
Load factor	1%	50%	100%	
Cost per kWh	$0.085	$0.085	$0.085	

Missing Opportunities

- Focus on cost shifting and reducing the differences in delivered cost among member systems may result in missing opportunities to drive costs out of the business such as:
  - Direct benefit in avoiding new construction and power purchases
  - Indirect benefit by selling power that is freed up on-peak in energy markets

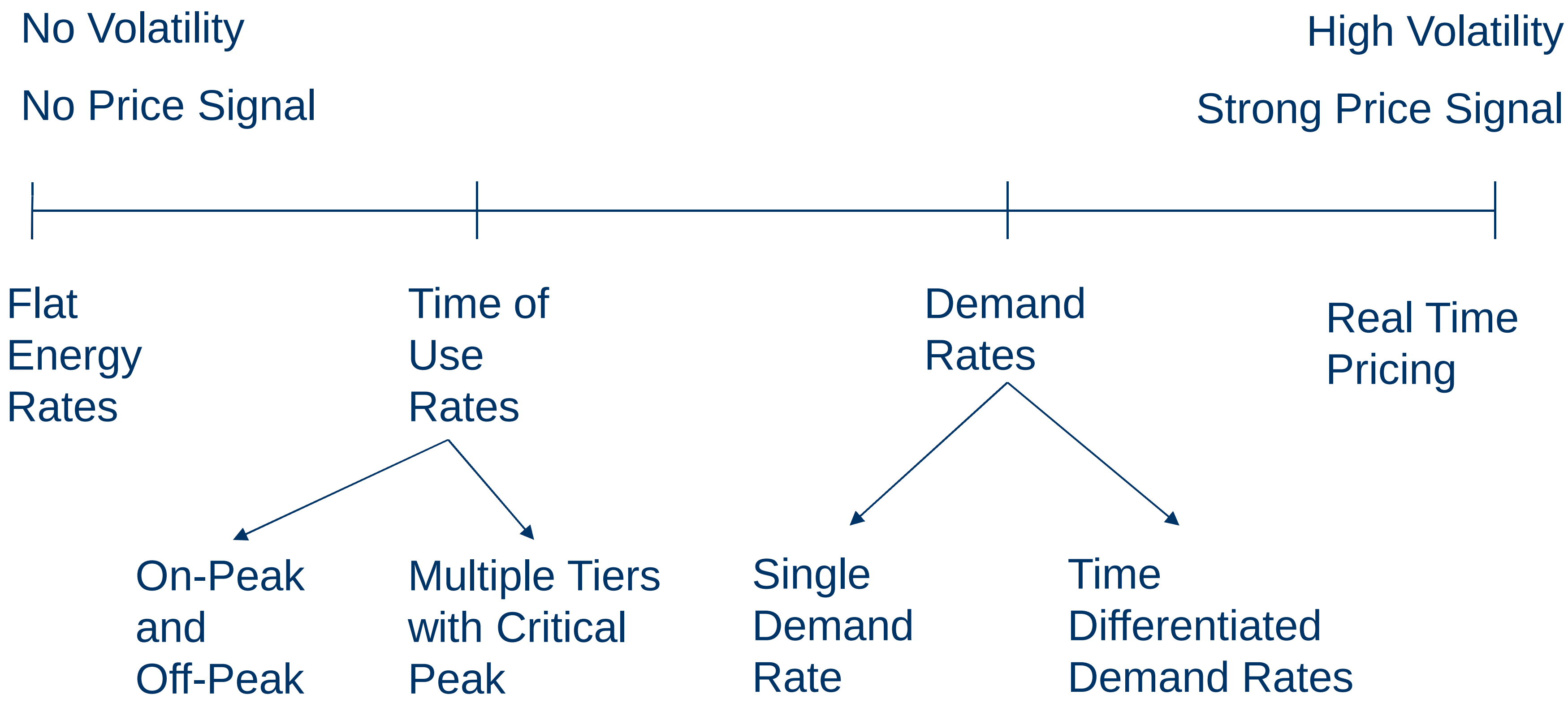
Trends in Retail Rate Design

- Move in the direction of cost-based rates
- Provide incentives for customers to move usage to time periods that are less costly to serve
  - Optional time of use rates
  - Optional demand rates
- Renewable rates
- Inclining block rates

Trends in Retail Rate Design

- Purchased power adjustment mechanisms
- Power factor adjustments
- Prepaid metering
- Line extension policies
- Net metering

The Rate Continuum



Cost Based Rates

- Accurately reflect the unit costs from the cost of service study
- Recover fixed costs through fixed charges
  - Increase customer charges and demand charges
- Recover variable costs through variable charges
  - Reduce energy charge to eliminate fixed costs that were formerly recovered there

Benefits of Cost Based Rates

- Reduces coop revenue and margin variability
- Reduces customer energy bill volatility
- Removes within-class subsidies
- Makes coop more competitive at the margin
- Creates the right environment for energy efficiency and conservation
- Mitigates revenue erosion from net metering
- No significant impact on most low income or fixed income customers

Cost of Service Results

Customer related costs are $20.84/cust/mo.

Margins on customer related <u>$4.83/cust/mo</u>.

$25.67/cust/mo.

Distribution demand costs are $0.012/kWh

Margins on dist demand are <u>$0.008/kWh</u>

$0.02/kWh

Purchased power demand is $0.027/kWh

Purchased power energy is <u>$0.024/kWh</u>

$0.051/kWh

Flat Energy Rate Example

- Customer charge = $25.67/customer/mo.
- Energy charge = 7.1¢/kWh
  - Distribution demand charge = 2¢/kWh
  - Purchased power demand = 2.7¢/kWh
  - Purchased power energy = 2.4¢/kWh
- With flat rates, the only way to reduce energy bill is to cut kWh consumption

Time of Use Rates

- Time of Use (TOU) rate structures are used to recognize differences in costs relative to the time of the day
- Either demand or energy costs can be time differentiated

Reasons for Offering Time Differentiated Rates

- Provides cooperatives with an opportunity to reduce costs by shifting customer usage to time periods that are less costly to serve
- Provides customers with opportunity to manage their energy bill in a time of rising prices
- Provides customers with choice

Time of Use Rate Example

Purchased power demand/peak period kWh =

$772,791 / 5,770,947 hrs. = $0.134

On-peak rate = 2.4¢ + 13.4¢ + 2¢ = 17.8¢ / kWh

Off-peak rate = 2.4 ¢ + 0 + 2¢ = 4.4¢ / kWh

Customer charge = $25.67

Time of Use Rates

- Choosing the on-peak period as narrowly as possible is the key
- Broad peak period (e.g. 7 AM to 11 PM)
  - Not very useful to customers
  - Results is small differential between on-peak and off-peak because the denominator in the calculation of the on-peak adder is large
- Flat rate results if everything is on-peak

Single Demand Rate Example

Customer charge = $25.67

Energy charge = $0.024/kWh

Distribution Demand charge =
$347,267 / 68,227 KW-mos. = $5.09/ NCP KW

Purchased power demand charge =
$772,791 / 59,527 KW-mos. = $12.98/ CP KW

Renewable Energy Rates

- Usually a rate rider that charges a differential between the cost of renewable energy and cooperative's standard generation portfolio
  - Purchased renewable power
  - Cooperative-owned renewable generation
  - Renewable energy certificates (RECs) for 1 MWh of renewable energy
- Usually offered in blocks (e.g. 100 kWh blocks)
- Example, 1¢/kWh premium

Renewable Economics

REC Price	$10.00	
Cost per kWh	$ 0.010000	
Cost per kW of Wind Generation		$ 2,500.00
Carrying Charge		15.00%
Annual Revenue Requirement		$ 375.00
Hours of Annual Production		2,891
Cost Per kWh		$ 0.1297
Cost per Mwh		$ 129.72

Inclining Block Rates

- Price per kWh increases as kWh increases
  - 7¢/kWh for the first 250 kWh
  - 9¢/kWh for 251 to 750 kWh
  - 11¢/kWh over 750 kWh
- May be difficult to cost justify
- Based on policy of encouraging energy efficiency and conservation

Purchased Power Adjustment (PPA)

- Charge or credit per kWh for the difference between the actual cost of power during the month and the power costs included in base rates
  - For example, a charge or credit per kWh equal to the amount by which the coop's actual power costs exceed 4.5¢/kWh

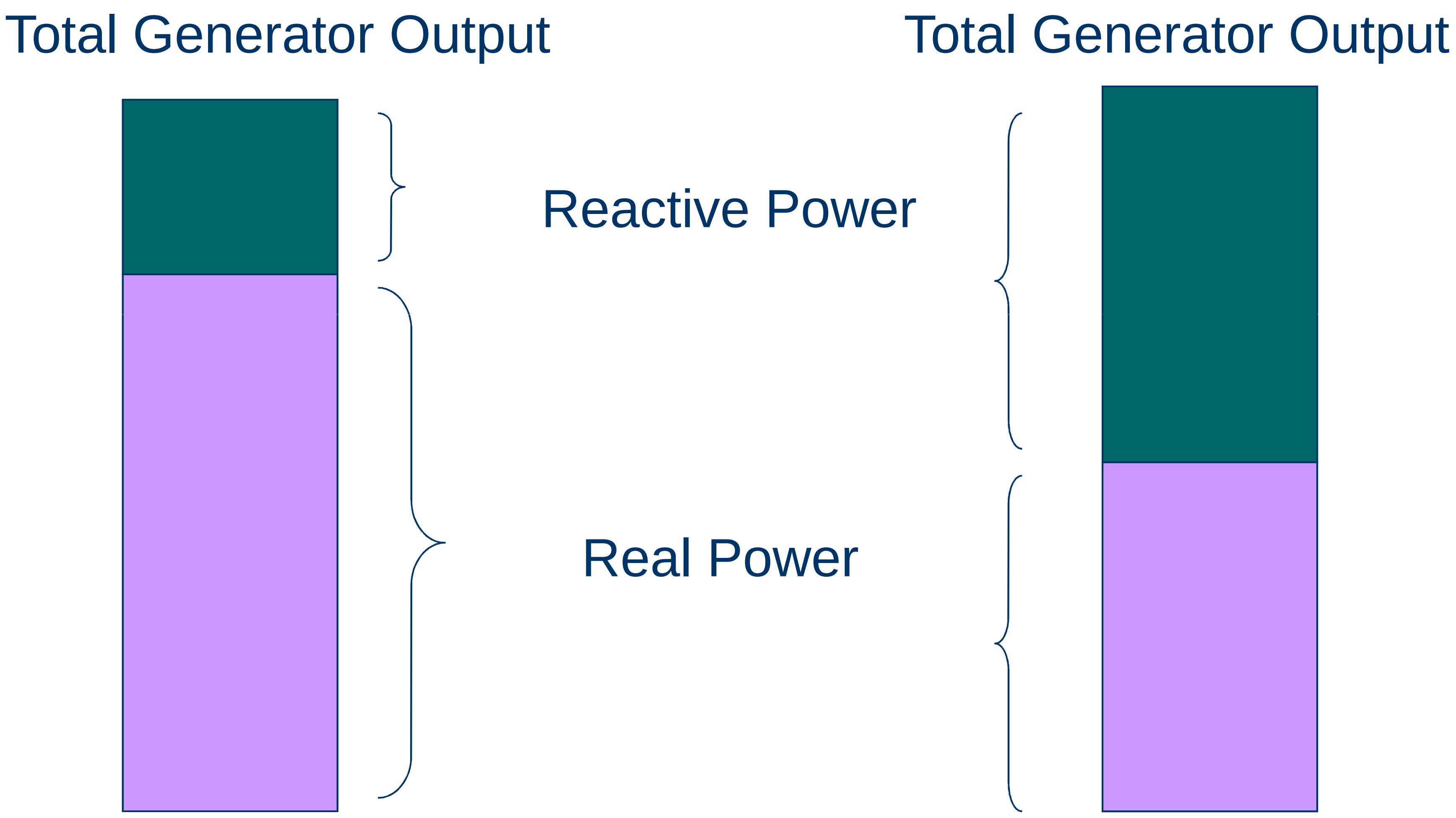
Need For a PPA

- Fuel cost variability
  - Natural gas
  - Coal
- Purchased power cost variability
  - Purchases that are indexed to market
  - Coop Load Factors
  - Purchases to cover forced outages
  - Prices in organized energy markets (LMP)

Power Factor Adjustment

- A charge for differences between a customer's monthly power factor and a specified power factor
  - For example, a charge of 1.5% of the demand charge for each percentage point that a customer's power factor is below 90%
  - Power factor is calculated by dividing kW usage by kVa usage during the month and is usually expressed as a percentage

Apparent Power



Real Power

- The energy or work producing part of apparent power
- Measured in kW
- The product of real power and length of time is energy which is measured by watt-hour meters and expressed in kWh
- Ex. 5 kW x 10 hours = 50 kWh

Reactive Power

- The portion of apparent power that does no work
- Measured in kilovars (kVar)
- Reactive power must be supplied to most types of magnetic equipment, such as motors
- Supplied by generators or electrostatic equipment, such as capacitors

Prepaid Metering

- Reduce collection expense
- Lower bad debt
- Help customers to avoid charges
  - Late payment charges
  - Disconnect charges
  - Reconnect charges
- Eliminate need for customer deposit

Line Extension Policy

- Rates are averages and they recover the average plant investment that applies to a particular customer class
- The purpose of a line extension policy is to make new customers look “average” for rate purposes
- Line extension policies that do not achieve this goal will result in a Coop’s financial position degrading as new customers are added to the system

Net Metering

- Net metering allows customers to use their own generation to offset their consumption over a billing period by allowing their electric meters to turn backwards when they generate electricity in excess of their demand
- Customers receive some compensation for the excess electricity they generate

Questions?

- Marty Blake
  - The Prime Group, LLC
  - P.O. Box 837
  - Crestwood KY 40241
  - 502-425-7882
  - martyblake@insightbb.com