Electric Rates: Development and Challenges

Beartooth Electric Cooperative, January 2019

Burton Benkwith
Regional Vice President, Member Services, CFC
Properly Designed Rates....

- Are more important today than at any time in the history of electric cooperatives!
Section 1 describes the process for developing the revenue requirement including the selection of the Test Year and the development of the appropriate expense adjustments.

Section 2 describes the development of the margin component of the revenue requirement. This section is particularly important because it provides recommendations of how to define the margin component of the revenue requirement based on the Board's financial objectives.

Section 3 describes the steps involved in the development of the cost of service study.

Section 4 describes how the results of the cost of service are used to make decisions related to rate class revenue requirements and provide input data for rate design.

*Other rate specific publications are also available*
New Retail Rate Guide

1.0 THE DIRECTOR’S ROADMAP TO THE RATE ANALYSIS PROCESS

1.1 What policies should the Board have in place?

1.1.1 What are the cooperative’s Financial Strategy or Equity Management Plan objectives?

1.1.2 What is the cooperative’s Rate Design Policy?

1.1.3 What is the cooperative’s Distribution Operating Policy?

1.2 What steps should the Board expect in the development of a Rate Analysis?

1.2.1 Step 1: What should the Board monitor?

1.2.2 Step 2: What is the reason for the rate analysis at this time?

1.2.3 Step 3: What is the total revenue requirement and how was it developed?

1.2.4 Step 4: Why is a cost of service study necessary and what information does it provide?

1.2.5 Step 5: What should the Board consider when a rate change or new rate is proposed?

1.3 Role of the Regulator

1.4 Risk Considerations

1.5 Block Diagram of Process

- Much is expected from next generation director
"Ratemaking is a cornerstone of electric cooperatives' financial strength. It is also one of the most crucial forms of communication between electric cooperatives and their members."

Forward by Sheldon C. Petersen (CFC) & Jim Matheson (NRECA)
In a Perfect World

- Tomorrows single residential rate would:
  - Generate required margin for the class regardless of how many kWh’s are sold
  - Align with power supplier rates
  - Properly charge and reward distributed generation
  - Minimize subsidies within the class
  - Encourage energy efficiency
  - Explainable and supportable
  - Be “competitive”
Why Now?.....What Is Different?

- New Technology
  - AMI
  - Distributed Generation
  - Smart Controls

- Next Generation Member
  - New Services
  - Flexibility/Options
  - More Control
Our Changing World

Technology

- Power Supply Resources
- System Operations
- Member Involvement

Portfolio model → Micro Grid → Participation
Our Changing World

Technology allows the member to become an active agent in our operations and erodes:

1. Homogeneity within a customer class
2. Fixed load profile based on the rate classification
RECAP
Fundamentals of Cost of Service
What Members Need To Pay For

Some costs are fixed. Some are variable*.

*Variable cost are only incurred when a kWh is produced.
The Big Lie

• How We Incur Costs......
  – Membership is cheap
  – Undervalued the wire to the house
  – Energy is the most important thing

• So......Be Patient
Three Step Process to Rate Making

- Revenue requirements *(how much?)*
- Cost of service *(from whom?)*
- Rate design *(how?)*

- The first two are straightforward exercises
- The last step requires consideration of “non-economic” factors
From Numbers to Rates....

Revenue Requirement

Customer Driven Costs

- Costs you incur whether you sell a single kWh or electricity or not
  - Meter reading
  - Billing
  - Admin & general salaries
  - Annual meeting expense
  - Financial audit
  - Debt service

*These costs should generally be recovered through a fixed monthly customer charge*
Demand Driven Costs

- Costs driven by contribution to peak
  - Substation expense
  - Overhead line maintenance
  - Transformer maintenance
  - Engineering fees
  - Work-plan items

*These costs should generally be recovered through a monthly demand charge*
Energy Driven Costs

- Cost that are driven by energy usage
  - Wholesale energy
  - Wholesale transmission

*These cost should generally be recovered through a monthly energy charge*
# Allocation Factor Examples

<table>
<thead>
<tr>
<th>Class</th>
<th>Consumers</th>
<th>Annual Demand</th>
<th>Peak Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>77%</td>
<td>66%</td>
<td>92%</td>
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<tr>
<td>Small Comm</td>
<td>19%</td>
<td>12%</td>
<td>7%</td>
</tr>
<tr>
<td>Large Comm</td>
<td>4%</td>
<td>15%</td>
<td>1%</td>
</tr>
<tr>
<td>Industrial</td>
<td>0%</td>
<td>7%</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100%</td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
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</table>
## Traditional Approach to Rate Design

<table>
<thead>
<tr>
<th>Three part cost</th>
<th>Cost of Service</th>
<th>Common Rate</th>
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<tbody>
<tr>
<td>• Consumer</td>
<td>• Cost of Service</td>
<td>• Common Rate</td>
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<tr>
<td>• Demand</td>
<td>• $36.00</td>
<td>• $22.00</td>
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<tr>
<td>• Energy</td>
<td>• $10.00</td>
<td>• $0.1256</td>
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<tr>
<td></td>
<td>• $0.0420</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Two part rate</th>
<th>Retail Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Consumer charge</td>
<td></td>
</tr>
<tr>
<td>• Energy cost</td>
<td></td>
</tr>
</tbody>
</table>
Common Vocabulary Terms

- Energy vs. Demand
- Non-Coincident Peak (NCP) vs. Coincident Peak (CP)
- On Peak vs Off Peak
- Minimum System
Energy vs Demand

• "Energy" represents the electricity consumed during a billing period, measured in kilo-watt hours (kWh). Directly tied to the fuel used at the generator.....
  – "How Much"

• "Demand" is the rate at which you consume electricity – or the amount needed to power your home at a given point in time, measured in kilo-watts (kW). Directly tied to overall capacity of the generation fleet.
  – "When"

*Historically over-emphasized energy over demand
On Peak vs Off Peak - Winter
On Peak vs Off Peak - Summer
Minimum System

Actual size of system

Size of system to deliver 1-kilo-watt hour

If this circle is 25% the size of the actual system, than 25% of everything we do is customer driven (fixed)
What are today’s rate challenges?
Let's take a look at a few major challenges

1. Slowing growth rates - at coop level and the individual residential level
2. Distributed generation – pressure to properly recover costs
3. Rising wholesale power costs – promotes reduction
4. Emerging technology - leading to options and member control
5. Changing demographic - wants options and flexibility
National Trends

Net Total Migration

-50,000
-25,000
+25,000
+50,000

Seattle
San Francisco
Los Angeles
Chicago
Atlanta
Miami
New York
Boston
Washington
Dallas
Houston
National Trends – Energy Efficiency

Average Household Refrigerator Energy Use, Volume, and Price Over Time

- Red line: Energy Consumption (kWh/yr)
- Blue line: Volume (cubic feet)

Key Points:
- 1972 CA Standard: $1,566
- 1980 CA Standard
- 1990 U.S. Standard
- 2001 U.S. Standard: $550
- 2014 Estimated Energy Use with New Standard

X-axis: Year (1972-2016)
Y-axis: Energy Consumption (kWh/year), Price (2010$), Volume (cubic feet)
Average Residential Usage

7.7% decline since 2007
Impact of Slow Growth

Revenue Growth vs Expense Growth

- Revenue (0.5%)
- Expenses (3.0%)
Cost Based Customer Charges Will......

- Assure fixed costs are recovered each month
- Take weather out of the equation
- Reduce inter-class subsidization
- Reduce volatility in members bill
- Recovery necessary margin
- REDUCE RELIANCE ON SALES

But.......  

- Can you politically get the customer charge where it needs to be?
## Misconception with Higher Customer Charges

<table>
<thead>
<tr>
<th></th>
<th>Rate A</th>
<th>Rate B</th>
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<tbody>
<tr>
<td>Consumers</td>
<td>18,000</td>
<td>18,000</td>
</tr>
<tr>
<td>Annual Usage</td>
<td>302,400,000</td>
<td>302,400,000</td>
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<tr>
<td>Customer Charge</td>
<td>$35.00</td>
<td>$8.00</td>
</tr>
<tr>
<td>Energy Charge</td>
<td>$0.0800</td>
<td>$0.0993</td>
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<tr>
<td>Annual Revenue</td>
<td>$31,752,000</td>
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</table>
# Misconception with Higher Customer Charges

<table>
<thead>
<tr>
<th>Month</th>
<th>kWh</th>
<th>Rate A</th>
<th>Rate B</th>
<th>Diff</th>
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<tr>
<td>Jan</td>
<td>2,000</td>
<td>$195.00</td>
<td>$206.57</td>
<td>$(11.57)</td>
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<tr>
<td>Feb</td>
<td>2,200</td>
<td>$211.00</td>
<td>$226.43</td>
<td>$(15.43)</td>
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<tr>
<td>Mar</td>
<td>1,900</td>
<td>$187.00</td>
<td>$196.64</td>
<td>$(9.64)</td>
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<tr>
<td>Apr</td>
<td>800</td>
<td>$99.00</td>
<td>$87.43</td>
<td>$11.57</td>
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<tr>
<td>May</td>
<td>1,000</td>
<td>$115.00</td>
<td>$107.29</td>
<td>$7.71</td>
</tr>
<tr>
<td>Jun</td>
<td>1,200</td>
<td>$131.00</td>
<td>$127.14</td>
<td>$3.86</td>
</tr>
<tr>
<td>Jul</td>
<td>1,400</td>
<td>$147.00</td>
<td>$147.00</td>
<td>$0</td>
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<tr>
<td>Aug</td>
<td>1,700</td>
<td>$171.00</td>
<td>$176.79</td>
<td>$(5.79)</td>
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<tr>
<td>Sep</td>
<td>1,400</td>
<td>$147.00</td>
<td>$147.00</td>
<td>$0</td>
</tr>
<tr>
<td>Oct</td>
<td>800</td>
<td>$99.00</td>
<td>$87.43</td>
<td>$11.57</td>
</tr>
<tr>
<td>Nov</td>
<td>1,500</td>
<td>$155.00</td>
<td>$156.93</td>
<td>$(1.93)</td>
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<tr>
<td>Dec</td>
<td>1,800</td>
<td>$179.00</td>
<td>$186.71</td>
<td>$(7.71)</td>
</tr>
</tbody>
</table>

Total:

- Rate A: $1,836.00
- Rate B: $1,853.36
- Diff: $(17.36)
Ways to increase customer charges gradually...

<table>
<thead>
<tr>
<th></th>
<th>Current Year</th>
<th>CY+1</th>
<th>CY+2</th>
<th>CY+3</th>
<th>CY+4</th>
<th>CY+5</th>
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<td>Customers</td>
<td>12,000</td>
<td>12,060</td>
<td>12,120</td>
<td>12,180</td>
<td>12,240</td>
<td>12,301</td>
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<td>Energy Sales</td>
<td>288,000,000</td>
<td>290,880,000</td>
<td>293,788,800</td>
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<td>Customer Charge</td>
<td>$8.00</td>
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<td>$20.00</td>
<td>$25.00</td>
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<td>Annual Revenue</td>
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<td>$29,750,400</td>
<td>$29,750,400</td>
<td>$29,750,400</td>
<td>$29,750,400</td>
<td>$29,750,400</td>
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</tbody>
</table>
## Impact to Member

<table>
<thead>
<tr>
<th>Usage</th>
<th>CY</th>
<th>CY+5</th>
<th>Diff</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>$ 8.00</td>
<td>$ 30.00</td>
<td>$ 14.18</td>
</tr>
<tr>
<td></td>
<td>$ 0.0993</td>
<td>$ 0.0837</td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>$ 57.65</td>
<td>$ 71.83</td>
<td>$ 14.18</td>
</tr>
<tr>
<td>800</td>
<td>$ 87.44</td>
<td>$ 96.93</td>
<td>$ 9.49</td>
</tr>
<tr>
<td>1,100</td>
<td>$117.23</td>
<td>$122.02</td>
<td>$ 4.79</td>
</tr>
<tr>
<td>1,400</td>
<td>$147.02</td>
<td>$147.12</td>
<td>$ 0.10</td>
</tr>
<tr>
<td>1,700</td>
<td>$176.81</td>
<td>$172.22</td>
<td>$(4.59)</td>
</tr>
<tr>
<td>2,000</td>
<td>$206.60</td>
<td>$197.31</td>
<td>$(9.29)</td>
</tr>
<tr>
<td>2,300</td>
<td>$236.39</td>
<td>$222.41</td>
<td>$(13.98)</td>
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<tr>
<td>2,600</td>
<td>$266.18</td>
<td>$247.51</td>
<td>$(18.67)</td>
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<tr>
<td>2,900</td>
<td>$295.97</td>
<td>$272.60</td>
<td>$(23.37)</td>
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</tbody>
</table>
Emerging Technology

Challenges to the way we have been doing
The “Internet of Things”

- Technology is advancing so that now a member can control almost everything from their phone
  - Thermostat – “The Nest”, GPS Enabled
  - Lights – “The Flux”
  - Converting to LED (75 kWh/year * 6,000 meters = 450,000 kWh/year lost)
  - Electronic Door Locks
  - Bluetooth Enabled Appliances
Distributed Generation

- Solar
  - Cost continue to drop
  - Efficiency increasing
  - Distribution networks
  - Traditional delivery increases
  - Government incentives
What types of rate challenges does DG present?
DG Rate Issues?

- Perception
- Limitations of traditional rate design
  - Proper cost recovery
  - Subsidies
DG Perception

- Most coops recognize the need to recover fixed costs on a DG consumer.
- Charging a different rate can create distrust with your member

<table>
<thead>
<tr>
<th>Standard Rate</th>
<th>Net Meter Rate</th>
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<tbody>
<tr>
<td>Customer Charge</td>
<td>Customer Charge $35.00</td>
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<tr>
<td>Energy Charge</td>
<td>Energy Charge $0.0900</td>
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<tr>
<td>$0.0900</td>
<td>Buy Back Rate $(0.0320)</td>
</tr>
</tbody>
</table>
DG - All About the “WHEN” not the “HOW MUCH”

kWH Usage-Traditional vs Solar

- Member A
- Solar Member
It's About the "WHEN" not the "HOW MUCH"

Demand-Traditional vs Solar

Varies by member

Jan  Feb  Mar  Apr  May  Jun  Jul  Aug  Sep  Oct  Nov  Dec

Member A  Solar Member
### Traditional Rate

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Charge</td>
<td>$34.83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Charge</td>
<td>$0.1053</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Energy</th>
<th>Demand</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer A</td>
<td>1,400</td>
<td>4.8</td>
<td>$182.25</td>
</tr>
<tr>
<td>Customer B</td>
<td>1,400</td>
<td>3.5</td>
<td>$182.25</td>
</tr>
</tbody>
</table>

### Demand Rate

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Charge</td>
<td>$34.83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demand Charge</td>
<td>$19.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Charge</td>
<td>$0.0400</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Energy</th>
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</thead>
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<tr>
<td>Customer A</td>
<td>1,400</td>
<td>4.8</td>
<td>$182.25</td>
</tr>
<tr>
<td>Customer B</td>
<td>1,400</td>
<td>3.5</td>
<td>$157.49</td>
</tr>
</tbody>
</table>

Demand rates can be designed to be the same.
DG Usage – Winter Day

The DG and non-DG consumer will likely set a peak at the same time

DG consumer will likely purchase less kWh at some point in the day
## Solar Usage – Winter Day

<table>
<thead>
<tr>
<th>Traditional Rate</th>
<th>Cust</th>
<th>Energy</th>
<th>Demand</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Charge</td>
<td>A</td>
<td>1,400</td>
<td>4.8</td>
<td>$182.25</td>
</tr>
<tr>
<td>Energy Charge</td>
<td>B</td>
<td>1,200</td>
<td>4.8</td>
<td>$161.19</td>
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</table>

<table>
<thead>
<tr>
<th>Demand Rate</th>
<th>Cust</th>
<th>Energy</th>
<th>Demand</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Charge</td>
<td>A</td>
<td>1,400</td>
<td>4.8</td>
<td>$182.25</td>
</tr>
<tr>
<td>Demand Charge</td>
<td>B</td>
<td>1,200</td>
<td>4.8</td>
<td>$174.25</td>
</tr>
<tr>
<td>Energy Charge</td>
<td></td>
<td></td>
<td></td>
<td>$0.0400</td>
</tr>
</tbody>
</table>

$21.06 difference includes all demand related costs being avoided by consumer

$8.00 difference includes only energy related costs being avoided by consumer
## Solar Usage – Summer Day

<table>
<thead>
<tr>
<th>Traditional Rate</th>
<th>Cust</th>
<th>Energy</th>
<th>Demand</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Charge</td>
<td>$ 34.83</td>
<td>A</td>
<td>1,400</td>
<td>4.8</td>
</tr>
<tr>
<td>Energy Charge</td>
<td>$ 0.1053</td>
<td>B</td>
<td>1,200</td>
<td>3.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Demand Rate</th>
<th>Cust</th>
<th>Energy</th>
<th>Demand</th>
<th>Cost</th>
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<tbody>
<tr>
<td>Customer Charge</td>
<td>$ 34.83</td>
<td>A</td>
<td>1,400</td>
<td>4.8</td>
</tr>
<tr>
<td>Demand Charge</td>
<td>$ 19.05</td>
<td>B</td>
<td>1,200</td>
<td>3.5</td>
</tr>
<tr>
<td>Energy Charge</td>
<td>$ 0.0400</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$21.06 difference does not properly capture reduction in demand

$32.76 difference captures reduction in both demand and energy
## Properly Designed Rates

<table>
<thead>
<tr>
<th>Service Type</th>
<th>Total Cost of Service</th>
<th>Residential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Related</td>
<td>$18,270,870</td>
<td>$15,029,308</td>
</tr>
<tr>
<td>Demand Related</td>
<td>$44,157,235</td>
<td>$33,519,160</td>
</tr>
<tr>
<td>Energy Related</td>
<td>$27,171,550</td>
<td>$23,014,303</td>
</tr>
<tr>
<td><strong>Total Revenue Requirement</strong></td>
<td><strong>$89,599,654</strong></td>
<td><strong>$71,562,770</strong></td>
</tr>
</tbody>
</table>

- **Customer Billings**: 490,320
- **Demand Billings**: 1,011,908
- **Energy Billings**: 598,110,262

- **Customer Charge**: $30.65
- **Demand Charge**: $33.12
- **Energy Charge**: $0.0385
## Target Specific Costs to Capture

<table>
<thead>
<tr>
<th></th>
<th>Residential</th>
<th>$/kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution Demand</td>
<td>$13,704,830</td>
<td>$13.54</td>
</tr>
<tr>
<td>Purch Power Demand</td>
<td>$19,814,330</td>
<td>$19.58</td>
</tr>
<tr>
<td><strong>Total Demand</strong></td>
<td><strong>$33,519,160</strong></td>
<td><strong>33.12</strong></td>
</tr>
</tbody>
</table>

Energy Charge: $0.0385

In a perfect world, this represents the variable component of your wholesale power cost, the Coop becomes indifferent as to whether or not members are generating electricity on their own.
Hurdles

- Member acceptance – start communicating
- Metering – CP vs NCP
- Pre-pay Metering programs
- Others?
Demand Charge

- True cost-based rate
- Rewards and penalizes the “right people”
- Helps eliminate subsidy within the class
- Can be designed where total cost is same
- Can help obtain a true “net meter” energy rate (avoided costs)

- Difficult to explain
- May not be well accepted
- Investments needed (meters – member support tools)
Rising Wholesale Power Cost

- Increasing wholesale power cost will also put pressure on distribution rates

- Highlights the importance of properly capturing fixed and variable costs
  - The more fixed costs get pushed into energy the higher your energy rate must be....Creating more volitaility

- Might consider rate designs that "unbundle" wholesale costs from distribution costs

- Need to pass along pricing signal from generator to end user
Other Trends

- Minimum Bill – many coops across the country have utilized the “minimum bill” concept to address low/seasonal usage accounts
## Unbundling Costs/Rates

### Traditional Residential Rate
- Customer Charge: $34.83
- Energy Charge: $0.1053

### Unbundled Residential Rate
- Distribution Customer Charge: $34.83
- Distribution Energy Charge: $0.021
- Wholesale Power Cost: $0.0847

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*Could go a step further and breakout wholesale between energy and demand*
DAILY RATE

Daily Access Charge (no kWh included)  .99¢/day

Plus:
Distribution Charge/kWh of:  1.611¢/kWh
Wholesale Power Cost of:  8.865¢/kWh

MINIMUM CHARGE The minimum daily charge shall be .99¢ for single-phase service.

POWER COST ADJUSTMENT The Energy Charge contained in this rate may be increased or decreased by an increase or decrease in wholesale power cost, operational costs or sales volume experienced by the cooperative during term of agreement. The Board of Trustees may increase or decrease the monthly adjustment as it deems necessary to maintain the financial stability and integrity of the Cooperative.
Next Generation Member

- Today's member wants flexibility, simplicity, options
- Embrace alternative energy sources
- Cost conscious
- Information
Now Add All This Together!

- In reality all these forces are happening at the same time.
- New member wants solar and the ability to utilize technology to alter usage patterns in return for a lower bill
- Coops need to have clear positions on their role in this changing landscape
- The best time to change rates is when?
  - You don’t have to!
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