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Evolving Frameworks for Regulation, Revenue and Rate Design

Kentucky Solar Advocacy Network

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Three intertwined trends

- Higher penetrations of variable renewable energy, energy storage, new kinds of distributed resources, and flexible demand
- New regulatory models and innovation in incentives
- New rate designs and compensation mechanisms for demand-side resources
1 Changing Needs and Resource Options
Variable renewable generation is growing quickly

“Net Load” presents new shape
Variable renewables can be complementary

![Illustrative Texas wind and solar resource compared with load shape](chart)

Storage options

• Different technologies allow for different uses
  • Pumped hydro
  • Lithium ion
  • Molten salt
  • “Aqueous air”
  • Green hydrogen or green methane

• Different locations allow for different benefits
  • At generator
  • On T&D system
  • Customer sites
Load-side resources can “shift” demand
Limited curtailment can “shed” during critical hours

Responsive load can “shimmy” to meet short-term grid needs

Source: PJM
2 Regulation, Revenue and Incentives
All regulation is incentive regulation

- Understand what the incentives are and how they affect behavior
- Traditional cost-of-service regulation often considered the baseline
- Range of alternatives and additions around for decades; new options being explored around U.S.
Issues with “traditional” regulation

• Throughput incentive
  • Traditional regulation sets *prices*, not *revenues*
  • More kilowatt-hours sold = more $ utility makes

• Capital investment bias
  • Utility profits based on capital investments in rate base
  • Asymmetric information makes regulatory scrutiny difficult

• Fuel adjustment clauses
  • Allow utilities to quickly pass through increases in fuel and purchased power costs
  • Fair if this is the biggest change in costs, but if other costs are going down that should be reflected
Established solutions

• Restructuring and competition move away from traditional cost of service model

• Decoupling and “revenue regulation” can break link between sales and profits

• Multi-year rate plans and integrated planning can mitigate bias toward capital projects

• Financial incentives for service quality and energy efficiency programs exist in many places
Restructuring and competition

- Restructuring isn’t deregulation. It’s a different kind of regulation.
- Different states had different approaches to divestment of resources, recovery of stranded costs and prevention of conflicts of interest.
- Costs and benefits are disputed and depends on how well restructured markets operate.
  - PJM, NYISO, and ISONE: capacity markets
  - TX: Energy market and operating reserve demand curve
- Retail competition has had successes and failures too.
Different incentives before and after restructuring

Incentives changed from revenue based on investment levels to revenue based on energy production
Procurement strategies for regulated utilities

- PURPA rules vary state by state
- “All-source” generation solicitations should include renewables, storage and demand-side resources
  - Purchased power agreements from third-parties can be cheaper
- Non-wires alternative solicitations can avoid T&D investments and upgrades
Revenue-sales decoupling

- Breaks mathematical link between sales volumes and revenues
  - Lowers utility financial downside from EE and DG
- Can shift management focus to customer service
- Reduces risks to utility and customers
- May lower incentives to respond to outages
New frontiers

- Performance-based regulation
- New types of performance incentives
- New types of revenues for utility

*These three frontiers are overlapping and interdependent!*
What is performance-based regulation?

- Financial incentives and metrics linked to outcomes
- Multi-year determination/formula for allowed revenue
- Decoupling
- Earnings sharing mechanisms

*Not all of these will be present in every PBR established*
PBR initiatives around the U.S.

Source: Advanced Energy Economy
Multi-year rate plans can:

- Reduce capital bias with long-term revenue guarantees
- Reduce frequency of rate cases, freeing up commission and utility staff for other needs
- Improve culture of utility management
- Improve utility performance and lower utility costs
Productivity growth of CMP versus other U.S. utilities, 1992-2014

Carte blanche for cost cutting
Pacific Northwest Bell

- Customer service cut
- Charged for customer service phone access
- Incentive to keep customers on hold
Innovative incentives in RI

System efficiency incentive:

Performance incentive is 45% of net benefits (remainder to ratepayers) from annual capacity market savings as a result of:

- Incremental BTM PV beyond forecasts,
- DR not eligible for other incentives,
- Incremental storage,
- Additional peak reductions from non-wire alternatives
- Partnerships with third parties
Reforming the Energy Vision in NY

- Modest reforms to date
  - Multi-year rate plans and decoupling
  - Requirements for non-wires alternative solicitations
  - Earnings adjustment mechanisms
  - Platform service revenues
- Earlier orders included longer term vision for broader reform, including Distribution System Platform Provider
3 Rate Design
General goals of rate design

- Efficient forward-looking price signals
- Recovery of revenue requirement
- Equitable intra-class cost allocation
- Customer understanding and acceptance
- Achievement of public policy goals

Within overarching frame of imposing pricing discipline – Equivalent to competitive markets
Smart Rate Design

For a Smart Future

Authors
Jim Lazar and Wilson Gonzalez

July 2015
Principles of smart rate design

1. Customers should be able to connect to grid for no more than the cost of connecting to grid

2. Customers should pay for grid services and power supply in proportion to how much they use these services and how much power they consume

3. Customers who supply power to grid should be fairly compensated for full value of power they supply
Rate design influences investments and behavior

- Whole house rate design influences a wide range of levers
  - Investments in appliances, distributed generation, storage, and energy management
  - Behavioral patterns

- Other programs, like targeted demand response and direct load control, typically are not as broad
## Examples of smart rate design

<table>
<thead>
<tr>
<th></th>
<th>Residential</th>
<th>Medium C&amp;I</th>
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</thead>
<tbody>
<tr>
<td>Customer Charge ($/mo.)</td>
<td>$4</td>
<td>$25</td>
</tr>
<tr>
<td>Site Infrastructure ($/kW)</td>
<td>$1</td>
<td>$2</td>
</tr>
<tr>
<td>Off-peak (cents per kWh)</td>
<td>7 cents</td>
<td>5 cents</td>
</tr>
<tr>
<td>Mid-peak (cents/kWh)</td>
<td>9 cents</td>
<td>8 cents</td>
</tr>
<tr>
<td>On-peak (cents/kWh)</td>
<td>14 cents</td>
<td>13 cents</td>
</tr>
<tr>
<td>Critical peak (cents/kWh)</td>
<td>75 cents</td>
<td>75 cents</td>
</tr>
</tbody>
</table>
Customer charges and demand charges

- Customer charges: flat monthly charge
  - Limit to marginal cost of connection and billing
  - Risks customers disconnecting from grid
  - Inefficient from broader competition perspective
- Demand charges: 15- or 30-minute customer peak
  - Generally inefficient for shared system costs
We pay for other “grids” in volumetric prices
Understandability and transitions

- Customers must be able to understand their rates and manage their bills
  - Data provision and online tools can help
- Gradual transitions can diffuse knowledge and help acceptance
  - Start with opt-in and move to opt-out or mandatory
  - Shadow billing and hold harmless protection
- Companion programs are important
  - Cost-effective energy management technology programs
  - Special low-income programs
Fort Collins: Smart residential rate

<table>
<thead>
<tr>
<th></th>
<th>Summer</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Charge</td>
<td>$ 6.78</td>
<td></td>
</tr>
<tr>
<td>Off-Peak</td>
<td>$ 0.069</td>
<td>$ 0.067</td>
</tr>
<tr>
<td>On-Peak</td>
<td>$ 0.241</td>
<td>$ 0.216</td>
</tr>
<tr>
<td>Tier Charge (Over 700 kWh)</td>
<td>+ $.0194 / kWh</td>
<td></td>
</tr>
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</table>
## Oklahoma Gas & Electric: SmartHours variable peak pricing

<table>
<thead>
<tr>
<th></th>
<th>Summer Variable Peak: 2 pm to 7 pm weekdays</th>
<th>Summer Off-peak: All other hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Charge ($/mo.)</td>
<td>$13</td>
<td></td>
</tr>
<tr>
<td>Low (cents per kWh)</td>
<td>5 cents</td>
<td>N/A</td>
</tr>
<tr>
<td>Standard (cents per kWh)</td>
<td>10 cents</td>
<td></td>
</tr>
<tr>
<td>High (cents/kWh)</td>
<td>22 cents</td>
<td></td>
</tr>
<tr>
<td>Critical peak (cents/kWh)</td>
<td>41 cents</td>
<td></td>
</tr>
<tr>
<td>All other hours</td>
<td>N/A</td>
<td>5 cents</td>
</tr>
</tbody>
</table>
Equity and customer class definitions

• Establishing separate rate classes for low-income, low-usage, or multifamily buildings can help
  • Low-income discounts can be done with or without a separate low-income customer class
  • Can have simpler rate designs

• Separate electric heating customer class can solve multiple issues simultaneously
  • If utility is summer peaking, lower winter kWh rates are justified
  • Low income customers with inefficient electric heating are tracked separately
Net metering puzzle

• Many jurisdictions adopted net metering in 2000s
  • Monthly netting and retail rate credit rollover
• Issues
  • Potential for revenue shifting increases with DG adoption
    • Different perspectives on value (or avoided costs) of clean DG
  • Costs of integrating high levels of variable DG
  • Inefficiencies in baseline rate design
Net metering solutions

- Netting period changes can be linked to time-varying rates
  - Under monthly netting, customer with zero kWh net consumption only pays customer charge
  - Moving to TOU period netting can be significant
- Delink export credit value from import rates
  - Top down in California
  - Bottom up (VDER) in New York
- Bi-directional distribution rate
  - Charge A&G costs to both imports and exports
Hawaiian Electric TOU rate

Interim Time-of-Use Rates*
(For illustrative purposes only)

*Illustration reflects September 2019 electric rates with applicable surcharges.
# Illustrative impact of TOU rate design and netting

<table>
<thead>
<tr>
<th>Rate Element</th>
<th>Rate</th>
<th>Unit</th>
<th>Time Period</th>
<th>Load</th>
<th>Generation</th>
<th>Net</th>
<th>Billed Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Charge</td>
<td>11.50</td>
<td>$/Month</td>
<td></td>
<td></td>
<td></td>
<td>11.50</td>
<td></td>
</tr>
<tr>
<td>Off-Peak</td>
<td>0.136</td>
<td>$/KWh</td>
<td>9 AM to 5 PM</td>
<td>195.3</td>
<td>477</td>
<td>-281.7</td>
<td>(38.31)</td>
</tr>
<tr>
<td>Mid-Peak</td>
<td>0.329</td>
<td>$/KWh</td>
<td>Other Times</td>
<td>198.6</td>
<td>42</td>
<td>156.6</td>
<td>51.52</td>
</tr>
<tr>
<td>On-Peak</td>
<td>0.419</td>
<td>$/KWh</td>
<td>5 to 10 PM</td>
<td>140.1</td>
<td>15</td>
<td>125.1</td>
<td>52.42</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td>534</td>
<td>534</td>
<td>0</td>
<td>77.13</td>
</tr>
</tbody>
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4 Final Thoughts and Resources
Tying it all together

- The modern electric system is changing rapidly, and policy reforms are needed to keep up
- There are many ways to reform the traditional cost-of-service model to improve consumer and societal outcomes
- Current rate designs are simple but fail on several key metrics, particularly the need for demand flexibility
Resources

- Smart Rate Design for a Smart Future
- Next-Generation Performance-Based Regulation: Volume 1 (Introduction—Global Lessons for Success)
- Next-Generation Performance-Based Regulation: Volume 2 (Primer—Essential Elements of Design and Implementation)
- Next-Generation Performance-Based Regulation: Volume 3 (Innovative Examples from Around the World)

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About RAP

The Regulatory Assistance Project (RAP)® is an independent, non-partisan, non-governmental organization dedicated to accelerating the transition to a clean, reliable, and efficient energy future.

Learn more about our work at raponline.org