Energy Policy for the Future

Trends and Overview

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Synapse Energy Economics
Utility Performance Incentive Mechanisms

A Handbook for Regulators

Prepared for the Western Interstate Energy Board
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http://www.synapse-energy.com/project/performance-incentives-utilities
Addressing the Challenges
Challenges in the Electricity Sector

• Environmental goals
• Declining sales = declining revenues
• Ensuring DG customers pay their “fair share”
• Smart Grid Investments

Source: EIA, November 2016 Monthly Energy Review
Electric Utilities and Policy Goals

How do we provide utilities with incentives that align with public policy goals?

**Traditional Goals**
- Reliability
- Safety
- Power plant performance
- Customer service
- Lower costs

**Environmental Goals**
- Renewable energy
- Reduced emissions
- Improved load factor

**Emerging Areas**
- Customer Engagement & Control
- Resiliency
- Flexible Resources
- Customer-targeted services
- Smart grid
- DG
- Reduced losses

**Energy Efficiency**
- Improved load factor
- Reduced emissions

How do we provide utilities with incentives that align with public policy goals?
Traditional Cost of Service Regulation

<table>
<thead>
<tr>
<th>Key Components</th>
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<tbody>
<tr>
<td>• Utility’s costs are reviewed after they are incurred</td>
<td></td>
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<tr>
<td>• The “revenue requirement” is set to allow the utility the opportunity to recover its costs</td>
<td></td>
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<tr>
<td>• Utility Revenues = Sales * Rates</td>
<td></td>
</tr>
<tr>
<td>• Rates are held constant until next rate case</td>
<td></td>
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<tr>
<td>• A rate of return is earned on capital investments</td>
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<table>
<thead>
<tr>
<th>Incentives</th>
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<tbody>
<tr>
<td>• Sell more electricity</td>
<td></td>
</tr>
<tr>
<td>• Invest in more infrastructure</td>
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</tbody>
</table>
Threats to Utility Revenues

Falling costs of solar...

Rising installations

But distributed solar helps meet policy goals
- Customer choice
- Reduced emissions
- Less need to build new infrastructure and large generation

Source: Barbose and Darghouth, LBNL, Tracking the Sun IX, 2016

Potential for Cost Shifting

• Solar can lower overall system costs
• But because sales also declines, rates may increase
• Concerns about impacts on non-solar customers

May lead to higher rates, especially in the near-term.
Options

Rate Design

- Demand Charges
- Time of Use Rates
- Fixed Charges
- Net Metering 2.0

Alternative Regulation

- PBR
- Incentives
- Decoupling
Rate Design
Proposals to increase the fixed charge

• Many utilities proposing steep fixed charge hikes, with an average proposed increase of **96%**
• **44** fixed charge increases in Q3 2016 *(NC Clean Energy)*

TOU Pricing; TOU with CPP

CPP pricing is in effect only for “critical event” days when the system is most stressed.
Penetration of Residential Customers on Time Varying Rates

Source: U.S. Energy Information Administration as of January 2015
Moving Toward Time-Varying Rates?

- California to transition to default TOU rates
- Maryland: default Peak Time Rebates
- Arizona: >50% of customers on a TOU rate
- Discussions ongoing across the country
Trends in Net Metering
Traditional Net Metering

1. Solar Panel Generates 1100 kWh
2. House Uses 1000 kWh Total
   Dominion bills you for 0 kWh and a monthly service charge
3. 100 kWh is delivered to the grid
   (when solar production is greater than the home or business usage)
   100 kWh carryover applied

Image credit: solarideahouse.com
Proposed or Enacted Changes to Net Metering Policies in 2015

Source: NC Clean Energy The 50 States of Solar
Net Metered Capacity as Percent of Net Summer Capacity

Only 5 states exceed 5% net metered solar capacity

Source: US Energy Information Administration as of January 2016
Considerations Before Implementing NEM 2.0

• Is there a demonstrated problem?
  ▪ Utility revenue adequacy?
    • Can be addressed through decoupling
  ▪ Cost-shifting?
    • Has a thorough analysis been conducted?
    • Does the analysis account for the long-term benefits provided by DG?
    • Are there opportunities for low-income solar, community solar, or municipal solar?

• What impact will NEM 2.0 have on DG adoption?
  ▪ Many states implemented NEM to support DG development.
  ▪ Payback periods should be modeled to understand the implications on DG adoption of a NEM 2.0 rate.
Alternative Regulation

• Revenue Decoupling
  ▪ Addresses revenue adequacy concerns
  ▪ Reduces disincentive toward energy efficiency and distributed generation

• Performance-Based Regulation
  ▪ Performance incentives can provide new revenue streams
  ▪ Can help to incentivize innovation and alternative investments
Revenue Decoupling

• Common approach to addressing utility incentive to sell more electricity

• Under discussion in several states, including CO, NV

Source: Lowry et al., Alternative Regulation, 2015.
### Performance-Based Regulation

<table>
<thead>
<tr>
<th><strong>Objective</strong></th>
<th>Provide financial incentive for utility to increase efficiency and reduce utility costs. Reduced costs should ultimately benefit customers.</th>
</tr>
</thead>
</table>
| **Key Components** | Rate case moratorium  
| | Attraction relief mechanism (ARM) provides automatic relief for increasing cost pressures, but is not linked to a utility’s actual costs  
| | Performance incentive mechanisms for reliability, safety, etc. |
| **Optional Components** | Revenue decoupling  
| | Earnings sharing mechanism  
| | Efficiency carryover mechanism  
| | Cost trackers |
# Regulatory Models (simplified comparison)

<table>
<thead>
<tr>
<th>Regulatory Element</th>
<th>Cost of Service Regulation</th>
<th>Performance-Based Regulation (especially Multi-Year Rate Plans)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency of rate cases</td>
<td>As needed</td>
<td>Pre-determined, fixed period (e.g., 5 years)</td>
</tr>
<tr>
<td>Revenue adjustments between rate cases</td>
<td>Generally none</td>
<td>Attrition relief mechanisms</td>
</tr>
</tbody>
</table>
| Performance Incentive Mechanisms          | If implemented at all, generally narrowly focused on safety, reliability, and customer service | • Traditionally focused on areas that may experience service degradation due to cost reductions  
• Increasingly designed to create incentives to achieve a broad set of desired outcomes. |
Recent United States PBR Precedents

Recent Canadian PBR Precedents

# Examples of Possible Performance Metrics

<table>
<thead>
<tr>
<th>Metric</th>
<th>Purpose</th>
<th>Metric Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System load factor</strong></td>
<td>Indication of improvement in system load factor over time</td>
<td>System average load / peak load</td>
</tr>
<tr>
<td><strong>Line losses</strong></td>
<td>Indication of reductions in losses over time</td>
<td>Total electricity losses / MWh generation, excluding station use</td>
</tr>
<tr>
<td><strong>Demand response (DR)</strong></td>
<td>Indication of participation and actual deployment of DR resources</td>
<td>Potential and actual peak demand savings (MW)</td>
</tr>
<tr>
<td><strong>Distributed generation (DG)</strong></td>
<td>Indication of the technologies, capacity, and rate of DG installations, and whether policies are supporting DG growth</td>
<td>Number of customers with DG&lt;br&gt; MW installed by type (PV, CHP, small wind, etc.)</td>
</tr>
<tr>
<td><strong>Non-Wires Alternatives</strong></td>
<td>Avoidance of costly utility infrastructure through energy efficiency, storage, demand response, etc.</td>
<td>Net savings to customers</td>
</tr>
</tbody>
</table>
Reforming the Energy Vision (NY REV)

• Goals:
  • Reduce emissions
  • Innovation and new technologies
  • Empower customers with energy choices
  • Affordability
  • Resiliency

• Actions:
  • Improving DG interconnection
  • Improved management of the distribution system & DERs
  • Optimizing distributed energy resource location
  • “Animating the market” – marketplaces for energy efficiency, solar+storage, etc.
  • Avoiding costly traditional infrastructure investments:
    • Brooklyn Queens Demand Management (BQDM) initiative
BQDM Performance Incentive

Deferral of ~$1 billion in traditional solutions

BQDM Program

- Demand growth in 3 networks in Brooklyn-Queens would have required ~$1 billion in capital upgrades.

- Instead, Con Edison is planning to use a $200 million program to enable deferral of the upgrades.
  - Customer-side (41 MW, $150 million)
  - Utility-side (11 MW, $50 million)

- Utility expenditures treated as 10-year capital assets with regulated return, with performance incentive on ROE.

BQDM Geography

Source: ConEd
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About Synapse Energy Economics

• Synapse Energy Economics is a research and consulting firm specializing in energy, economic, and environmental topics. Since its inception in 1996, Synapse has grown to become a leader in providing rigorous analysis of the electric power sector for public interest and governmental clients.
• Staff of 30+ experts
• Located in Cambridge, Massachusetts
Appendix
Intersection of Historical and Future Costs

Rates Reflect Embedded Costs

Customer Behavior Drives Future Costs

- Need for T&D upgrades
- Need for additional peaking generation
- Environmental impacts

Utility Revenue Recovery

Rate Design impacts Customer Behavior

- Install solar?
- Conserve energy?
- When to use electricity?

www.synapse-energy.com - Melissa Whited
Recent Residential Demand Charge Proposals

• Demand-charge proxies:
  • Rhode Island
  • Massachusetts
  • Colorado

Proposals universally opposed by intervenors

• Oklahoma
  • Proposed a mandatory demand charge
  • Draft settlement would create a demand charge pilot, but not a mandatory rate

• Arizona
  • UNS: Dropped demand charge proposal for non-solar customers
  • APS: June 2016 proposal for time-limited demand charges for most customers
A Better Demand Charge?

• TOU rates would
  • Send a price signal to reduce demand in **all peak hours**
  • Result in Customer B paying a higher bill than Customer A.

![Graph showing peak hours and TOU rates for Customer A and Customer B]
Net Metered Capacity

Source: US Energy Information Administration as of January 2016

www.synapse-energy.com - Melissa Whited
Customer Credits for Monthly Net Excess Generation (NEG) Under Net Metering

www.dsireusa.org / January 2016

- NEG credited at retail rate; credits do not expire
- NEG credited at retail rate at first, then credits expire or are reduced (e.g., to the avoided cost rate at the end of year)
- NEG credited at less than retail rate (e.g., avoided cost rate)
- NEG is not compensated
- No statewide mandatory net metering rules

Notes: The map shows NEG credits under statewide policies for investor-owned utilities (IOUs); other utilities may offer different NEG credit amounts. IOUs in HI, NV, MS, and GA have other policies for compensating self-generators. Some IOUs in TX and ID offer net metering, but there is no statewide policy. IOUs in WI differ in their treatment of NEG.
Performance Incentive Pitfalls to Avoid

Undue rewards or penalties

- Excessive rewards (or penalties) undermine the whole concept of incentive mechanisms.
- **Potential solutions:**
  - Use an incremental approach: start low and monitor over time.
  - Careful PIM design (e.g., shared savings).

Unintended consequences

- An incentive for one performance area may cause the utility to underperform in areas that do not have incentives.
- **Potential solutions:**
  - Focus on performance areas that are isolated from others.
  - Be cautious of implications for other performance areas.
  - Consider implementing a diverse, balanced set of incentives.

Regulatory burden

- PIMs can be too costly, time-consuming, or too much of a distraction.
- Can be a problem for utilities, regulators, and stakeholders.
- **Potential solutions:**
  - Streamline using existing data, protocols, and simple designs.
  - Reduce the amount of money at stake.
Pitfalls to Avoid (Cont)

Uncertainty

- Metrics, targets, and financial consequences that are not clearly defined reduce certainty, introduce contention, and are less likely to achieve policy goals.

- **Potential solutions:**
  - Carefully specify metric and target definitions, soliciting utility and stakeholder input where possible.
  - Adjust targets and financial consequences only cautiously and gradually so as to reduce uncertainty and encourage utilities to make investments with long-term benefits.

Gaming and Manipulation

- Utilities may have an incentive to manipulate results.

- **Potential solutions:**
  - Identify verification measures.
  - Consider using independent third parties (that are not selected or paid by the utility) to collect or verify data.
  - Avoid complex data analysis techniques that are difficult to audit and reduce transparency.