Ratemaking for the Future:
Trends and Considerations

MGA Utility Business Model of the Future Meeting

St. Paul

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Synapse Energy Economics

Background

- Synapse Energy Economics is a research and consulting firm specializing in energy, economic, and environmental topics.

- Rate design and incentive regulation consulting for public interest clients (consumer advocates, environmental groups, and public utility commissions).

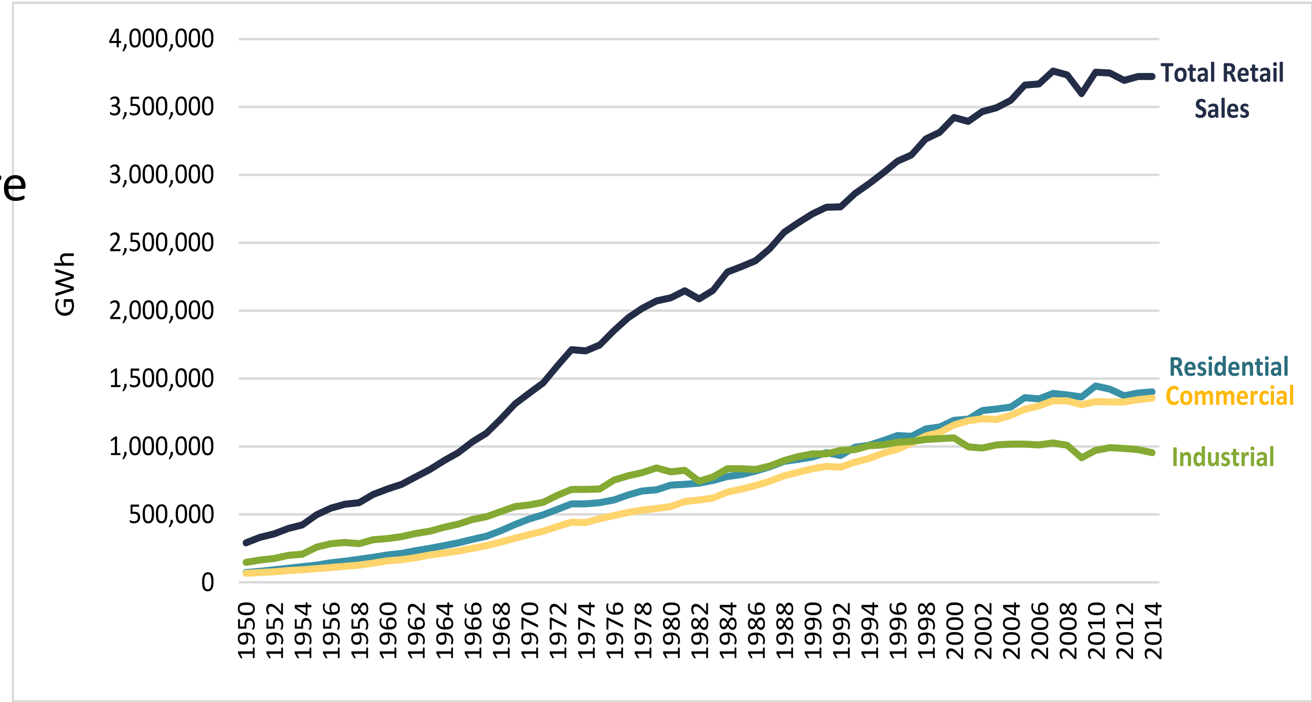
- **Recent Work:**
  - ***Caught in a Fix: The Problem with Fixed Charges for Electricity***. Prepared for Consumers Union. 2016.
  - ***Utility Performance Incentive Mechanisms (PIMs): A Handbook for Regulators.*** Prepared for the Western Interstate Energy Board. 2015.
  - **Demand charges & fixed charges in rate cases:** Massachusetts, Colorado, Missouri, Nevada, Utah, Maine
  - **Other rate design work:** New York REV docket, Hawaii net metering, California TOU rates
  - **Decoupling dockets:** Maine, Hawaii, Nevada, Colorado
  - **Grid Mod dockets:** Massachusetts, New Hampshire, Rhode Island

Addressing the Challenges

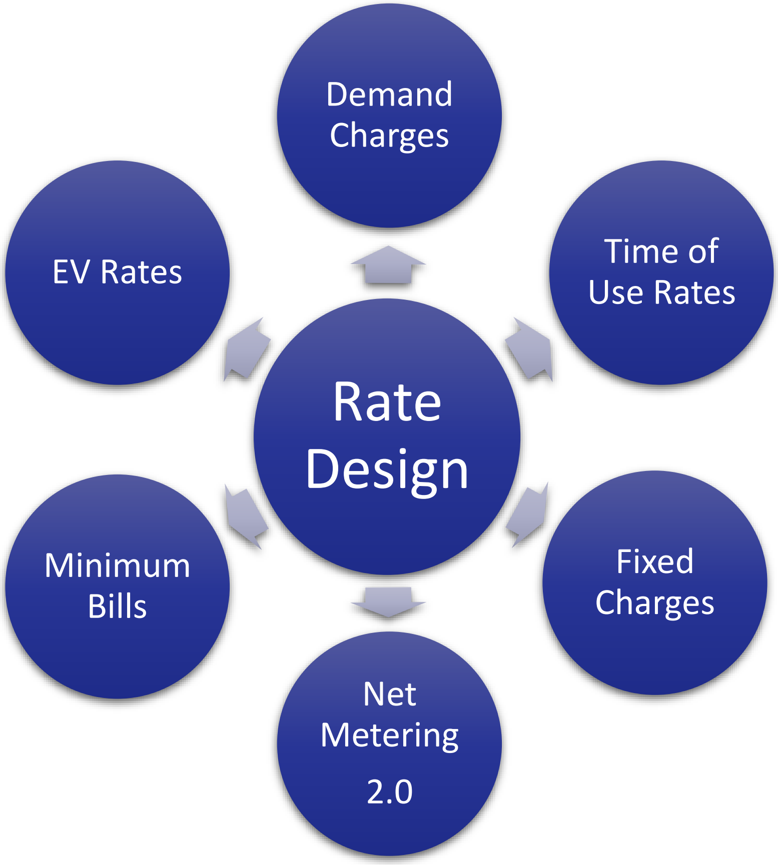
Challenges

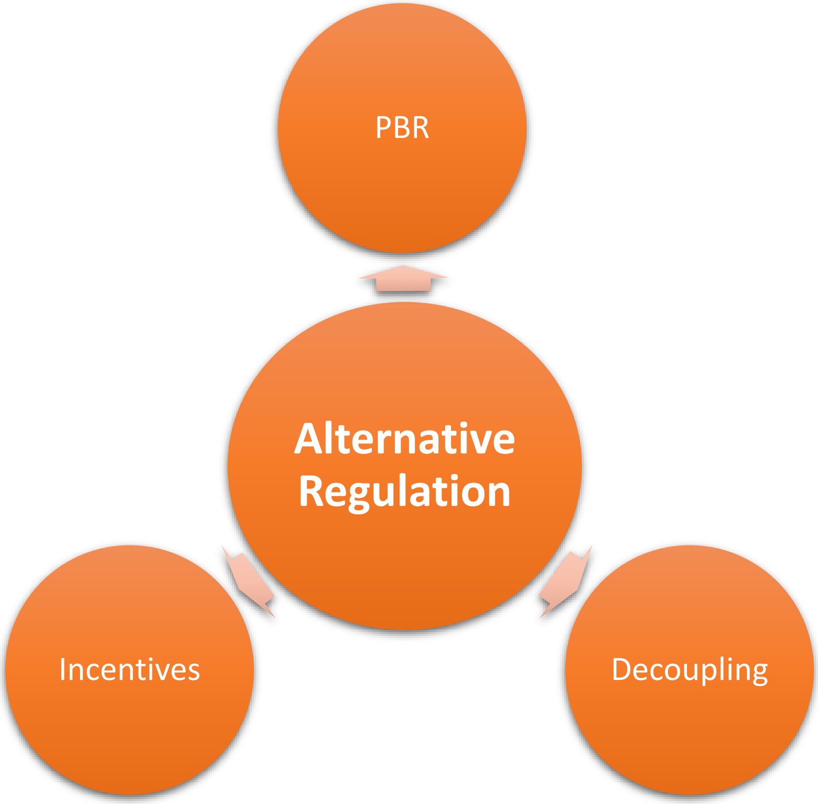
- Environmental goals
- Integration of distributed generation
- Ensuring DG customers pay their “fair share”
- Integration of EVs
- Declining sales
- Aging infrastructure

Image: Glennia, Flickr



Options


Demand Charges
EV Rates
Time of Use Rates
Rate Design
Minimum Bills
Fixed Charges
Net Metering 2.0


PBR
Alternative Regulation
Incentives
Decoupling

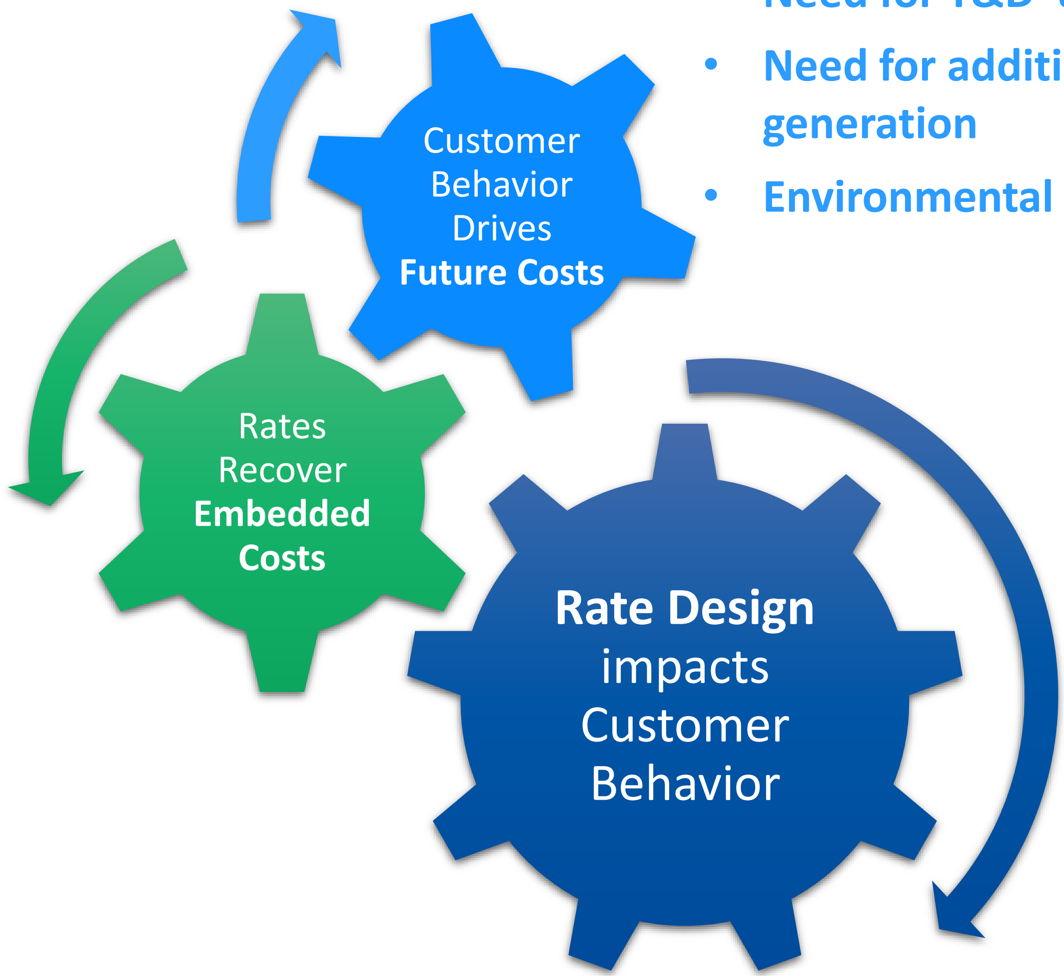
Rate Design

Principles of Rate Design

Revenue Adequacy & Stability	Opportunity to recover allowed revenues; stability in revenues from year to year.
Efficient Price Signals	Send appropriate price signals to ensure efficient resource usage
Fairness	Rates should apportion costs fairly; avoidance of undue discrimination
Stability of Rates	Changes should be gradual
Practical Considerations	Simplicity, understandability, acceptability

These must be balanced, as they may be in tension.

Intersection of Historical and Future Costs



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

Utility Revenue Recovery

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

Biggest Concerns

Consumer Advocates	Environmental Advocates	Utilities

• Fairness
  • DG customers should pay their fare share
• Customer control
	• Efficient price signals
	  • Encourage efficient consumption patterns
	  • Encourage clean energy
		• Revenue adequacy
		• Business model implications

Rate Elements

Residential & small commercial

Rate Component	Cost drivers
Fixed customer charge $/Customer Month	Recovers customer-related costs (costs of meters, service drops, meter reading, and billing and collecting)
Energy charge $/kWh	Energy-related costs (costs that vary with energy usage)
Demand charge $/kW	Demand-related costs (associated with customer's maximum demands on system)

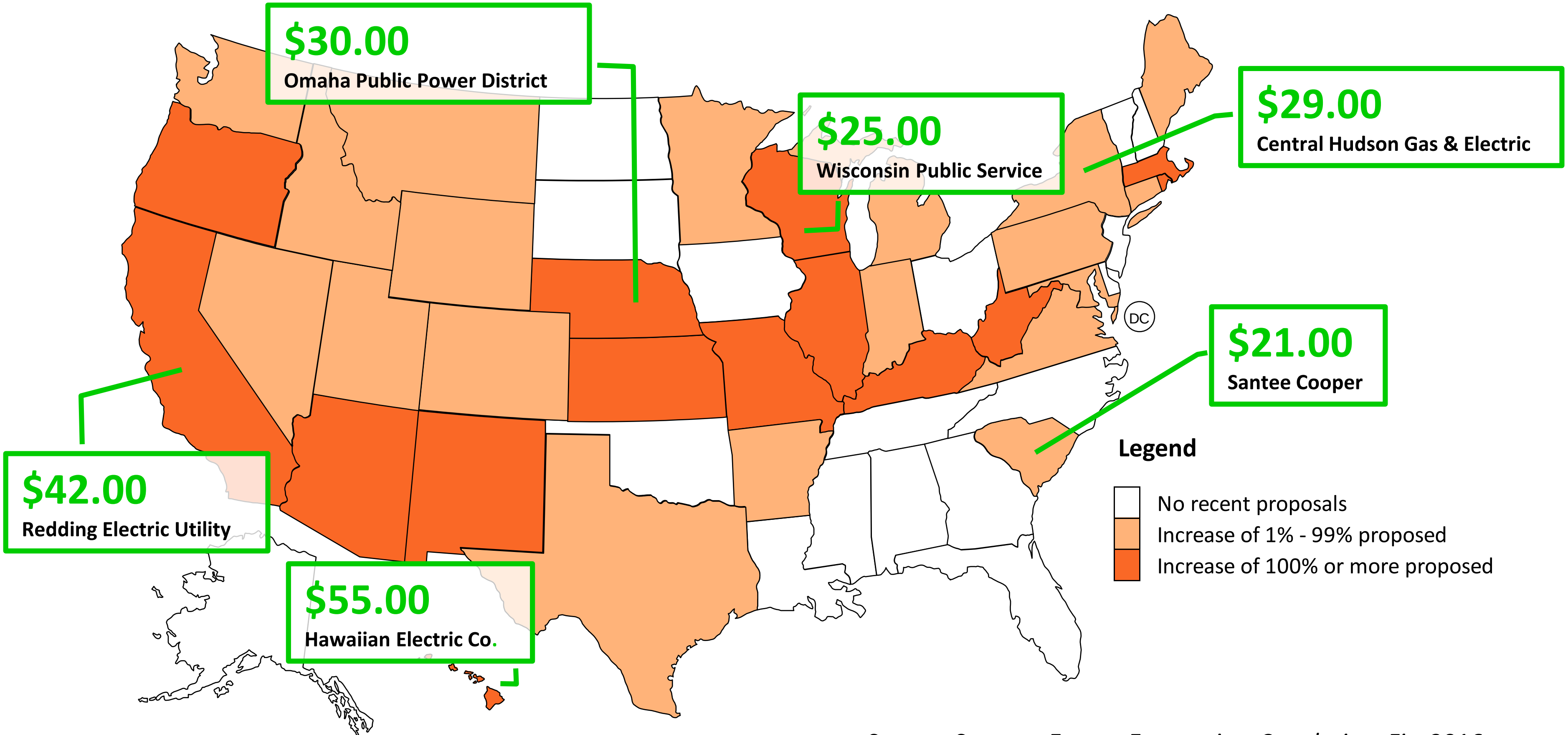
Trends in Fixed Charges

Increase Fixed Charges

Benefits	Drawbacks
Simple.	Reduces customer control over bills.
Reduces utility's revenue recovery risks.	Penalizes low-usage and low-income users.
Ensures a certain amount of revenue recovery from each customer, including DG customers.	Does not send accurate price signals about time or location of use.
	Reduces variable rate, thereby reducing incentives for DG and energy efficiency.

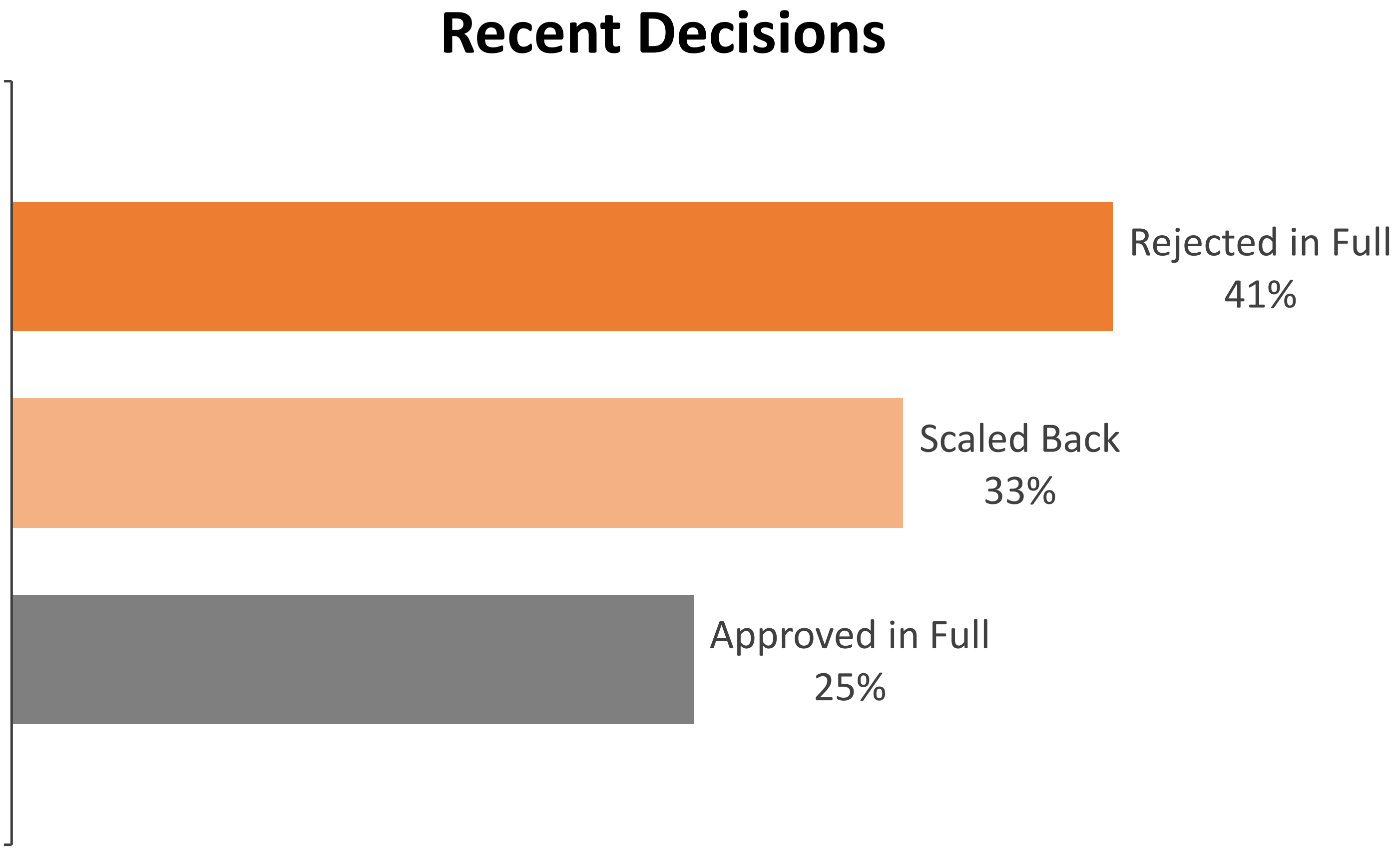
Proposals to increase the fixed charge

- Many utilities proposing steep fixed charge hikes, with an average proposed increase of **96%**
- **75** recent fixed charges identified in Synapse's report



Source: Synapse Energy Economics, *Caught in a Fix*, 2016

Fixed Charges Falling out of Favor



Trends in Minimum Bills

Option 2: Minimum bills

- Does **not** reduce volumetric (energy) charge, but increases bills for NEM customers who offset most or all of their consumption from the grid.

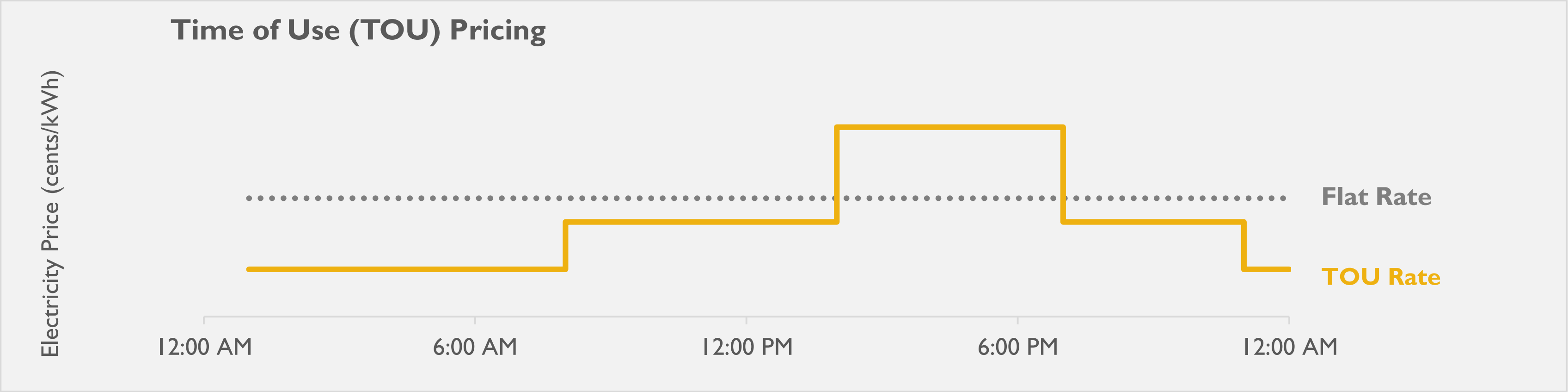
Benefits	Drawbacks
Improves revenue recovery.	Unless minimum bill is large, may not have much impact on utility revenue stability.
Ensures that all customers pay for a minimum amount of system costs.	Low-usage customers (often low-income) may see their bills increase
Better price signals than a high fixed charge.	Doesn't provide more accurate price signals about timing or location of consumption (or production) of energy.

Minimum Bills in Practice

- Fairly common, but not a long-term solution.
- Hawaii:
  - Minimum Bill is $17.00
  - Still needed to change net metering to cope with cost shifting and integration challenges

Trends in Time-Varying Rates

TOU Pricing; TOU with CPP

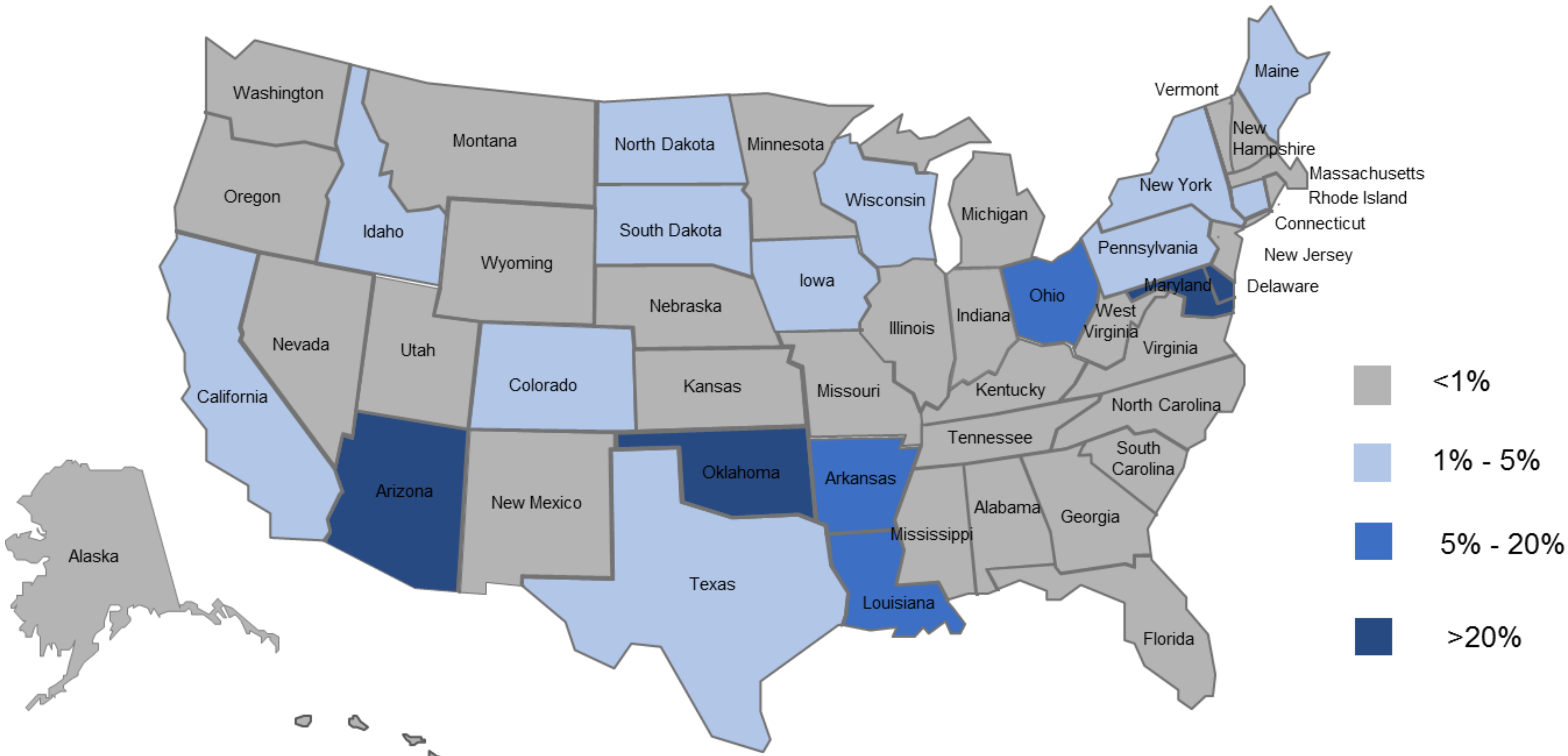


CPP pricing is in effect only for “critical event” days when the system is most stressed.

Time-of-use rates

Benefits	Drawbacks
More accurately reflects the use of system: Compensates PV more for generation during peak hours and less during off-peak hours. Encourages all customers to shift load to off-peak periods.	Must be implemented with significant customer education and customer protection measures for vulnerable groups.
Reasonably simple.	May be difficult and contentious to determine timing of peak periods and price differentials
Preserves price signals to encourage efficiency and DG; preserves customer control	

Penetration of Residential Customers on Time Varying Rates

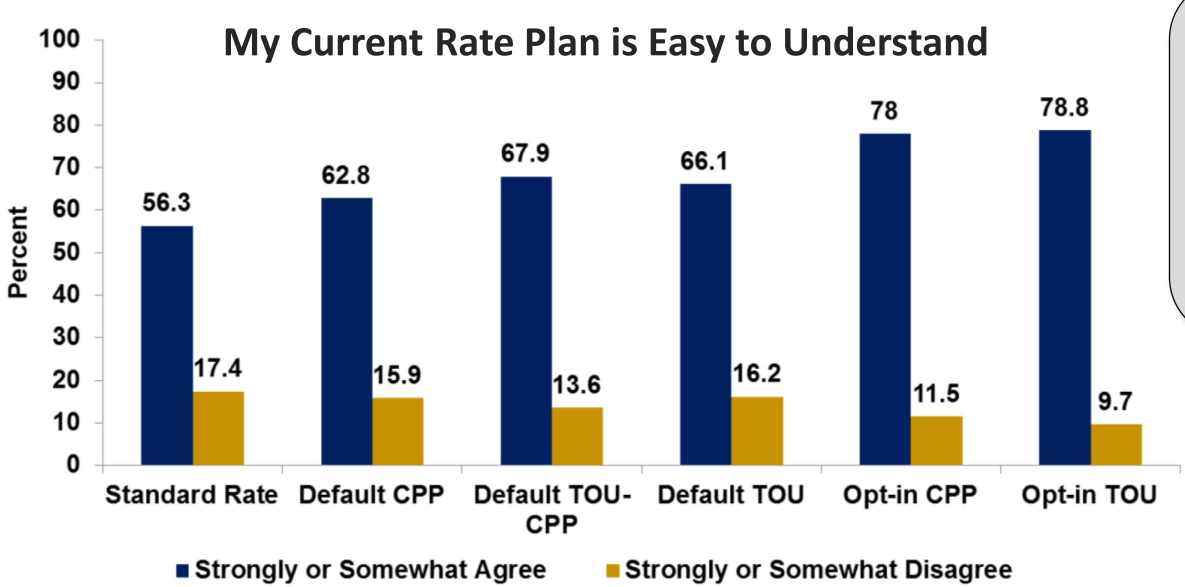


Source: U.S. Energy Information Administration as of January 2015

Moving Toward Time-Varying Rates?

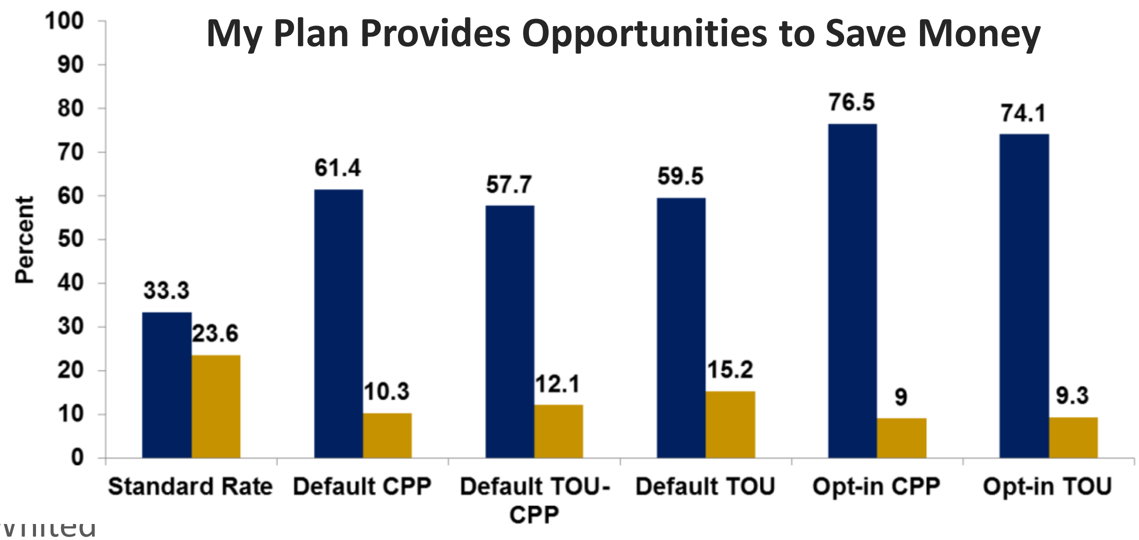
- California to transition to default TOU rates
- Maryland: default Peak Time Rebates
- Arizona: >50% of customers on a TOU rate
- Discussions ongoing across the country:
    - New York
    - Minnesota
    - DC

Understanding and Acceptance of TOU



SMUD Pricing Pilot:

- High customer satisfaction with TOU
- Only 4% drop-out rate



Trends in Demand Charges

Demand charges

- Imposes a monthly charge based on customer's maximum demand (possibly limited to peak hours).
- Energy charge is reduced commensurately.
- May increase or decrease bills for NEM customers.

Benefits	**Drawbacks**
May more accurately reflects costs imposed on system by customer relative to a flat rate.	Does not recognize the temporal aspect of costs and benefits related to energy consumption or production.
Improves utility revenue recovery.	Demand charges based on non-coincident peak are not cost-based for residential customers.
	Complex and difficult for residential customers to respond to.
	May effectively act as a fixed charge, reducing incentives for DG and energy efficiency.

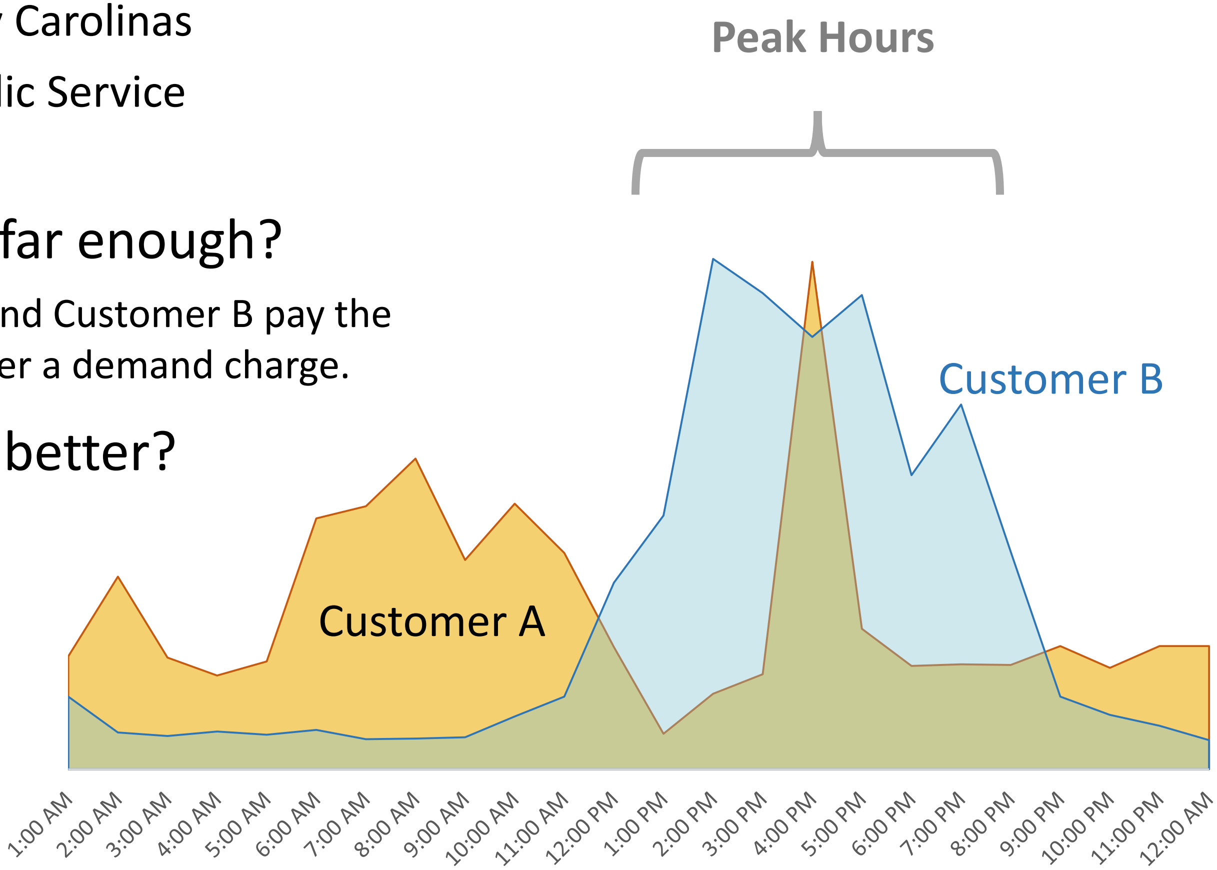
Demand Charges: Nice in Theory?

- 2/3 of utilities with residential demand charges base the charge on a customer's non-coincident peak demand.[1]
  - Data for a MA utility show that 60% of individuals' maximum monthly demands fell outside of the system peak periods.
- Demand charges concentrate the price signal on one hour, not all peak hours. TOU rates provide a better signal.

[1] Rocky Mountain Institute (2016) A Review of Alternative Rate Designs

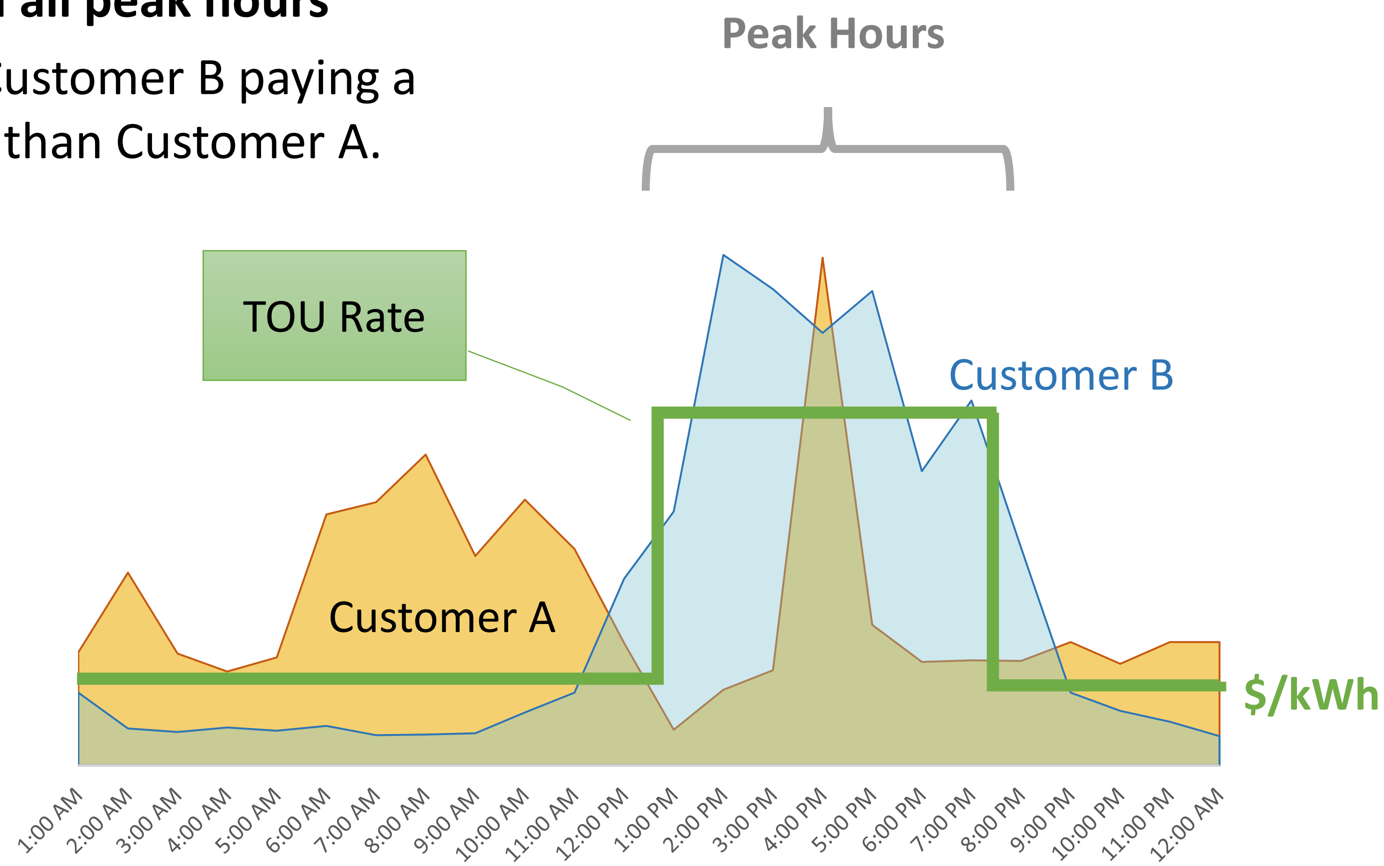
A Better Demand Charge?

- Some utilities have residential demand charges that only apply during peak hours, including:
  - Duke Energy Carolinas
  - Arizona Public Service
- Does this go far enough?
  - Customer A and Customer B pay the same bill under a demand charge.
- Could we do better?



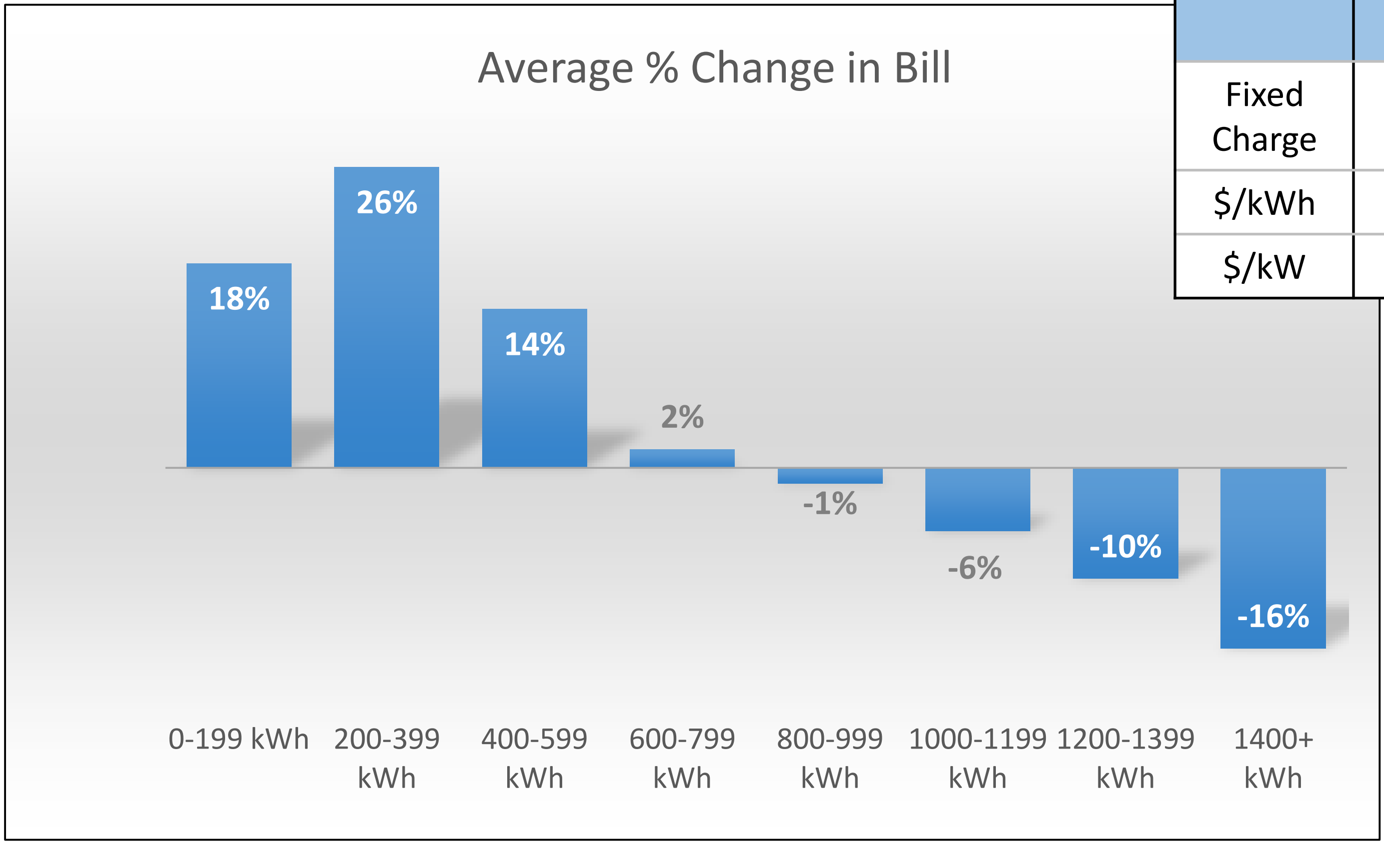
A Better Demand Charge?

- **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.



Impacts on Low Use Customers

- Simulated impact of introducing a demand charge (assuming no change in usage patterns)

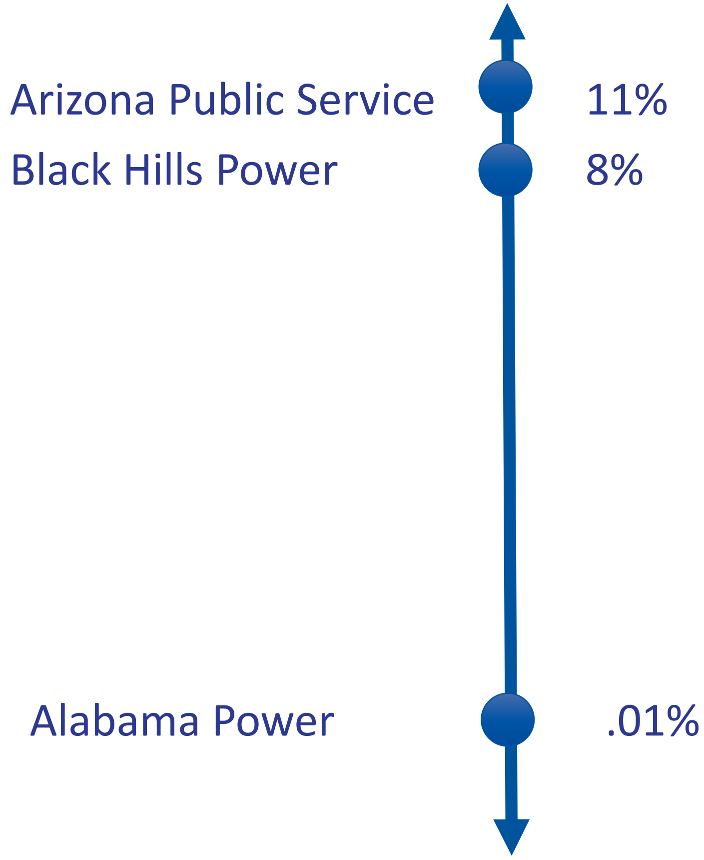


	Flat Rate	Demand Rate
Fixed Charge	$10.00	$10.00
$/kWh	$0.12	$0.06
$/kW	---	$9

Calculated from load data load data for National Grid, Massachusetts.

Demand Charges in Practice

- Only 25 utilities currently offer demand charges.
- For most of those utilities, enrollment is quite low (<1%).
- Where offered, energy-only time-of-use rates are generally preferred to demand rates.
- Demand charges may appeal to a small subset of customers (e.g., large residential customers with ability to control key end-uses).



Recent Residential Demand Charge Proposals

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

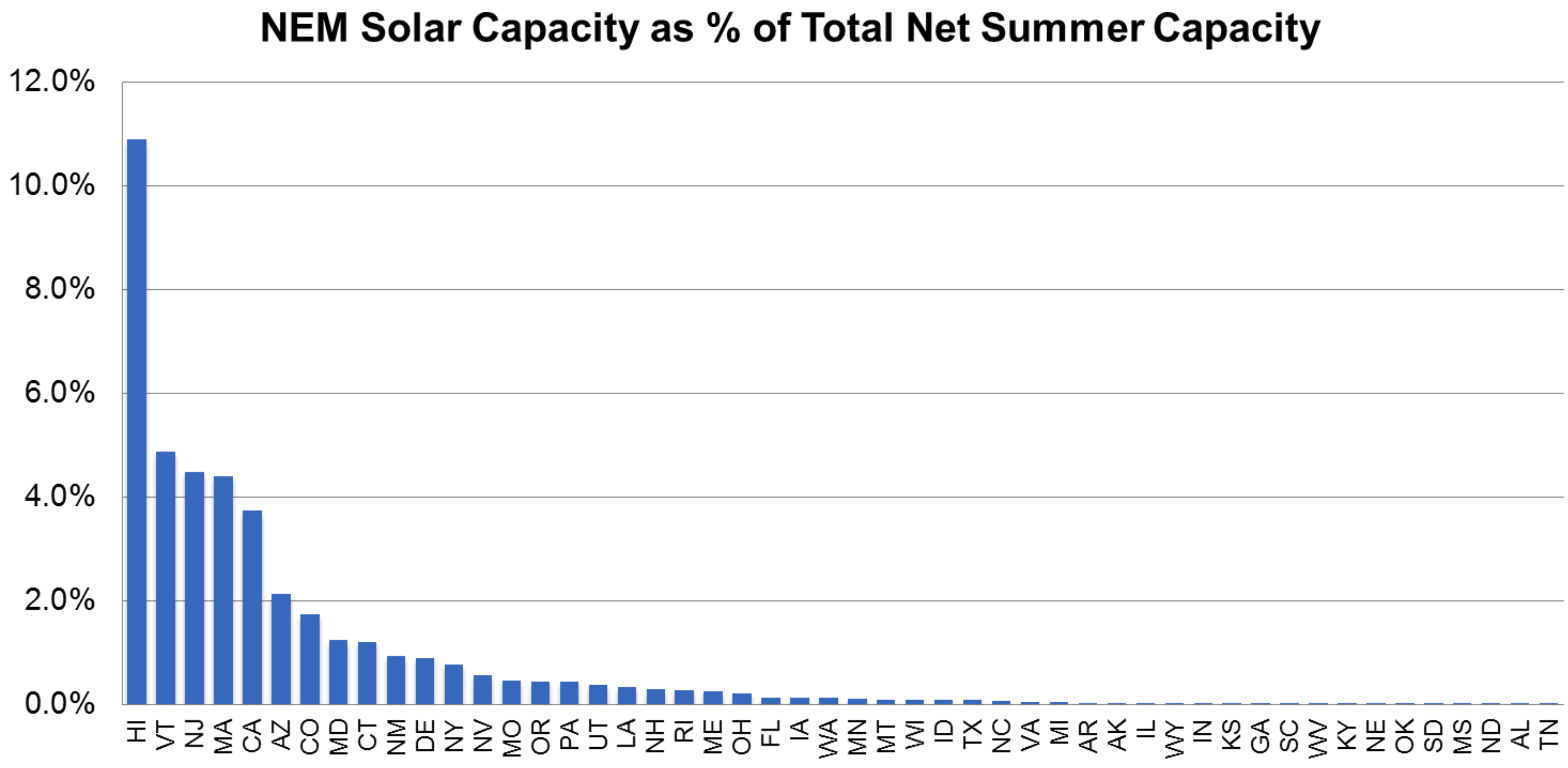
  Proposals universally opposed by intervenors

- **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

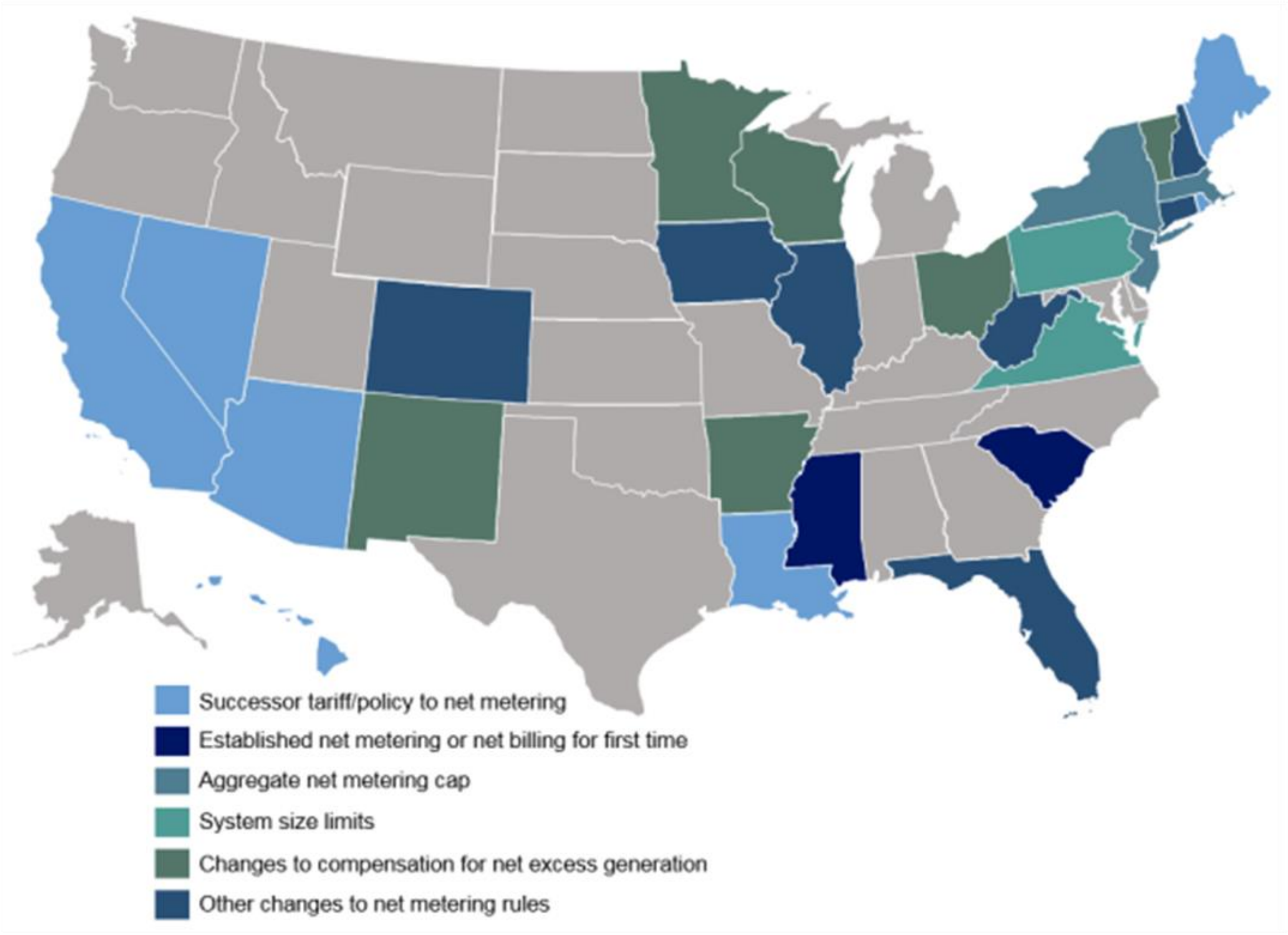
Trends in Net Metering

Net Metered Capacity



Source: US Energy Information Administration as of January 2015

Proposed or Enacted Changes to Net Metering Policies in 2015



Source: NC Clean Energy The 50 States of Solar

Net Metering Modifications and Payback Periods

Initial, draft results:

State	Policy	Payback (Years) Before Policy	Payback (Years) After Policy
AZ	Mandatory demand charges	14	26
HI	Reduced payment for excess generation & higher fixed charge	6	7
MA	Increased fixed charge	4.5	4.7
NV	Increased fixed charge & reduced payment for excess	11	21

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.

Trends in Electric Vehicle Pricing

EV Context

- EV market growing throughout US
  - AEO 2015 projects PEV stock increasing by factor of 5 from 2015 to 2030
- EVs have potential to reduce emissions cost-effectively

But…

- EV benefits depend on when they charge, what powers them
  - Powering with coal increases GHGs and local pollutants
  - Powering on-peak could result in significant capacity, distribution, and generation costs relative to powering off-peak

EV Rates

Many utilities around the country offer residential EV TOU rates

- California
  - SDG&E
  - PG&E
  - SCE
  - SMUD
- New York
  - Con Edison
- Nevada
  - NV Energy
- Michigan
  - Detroit Edison
  - Consumers
  - I&M
- Arizona
  - Arizona Public Service
- Alaska
  - Alaska Electric Light & Power
- Georgia
  - Georgia Power Company
- Hawaii
  - HECO
- Indiana
  - Indianapolis Power & Light
- Kentucky
  - KU Energy
  - LG&E
- Virginia
  - Dominion Virginia Power

It works!
Most charging occurs during off-peak hours.

Demand Charges & EVs

- Workplace Charging During Daytime

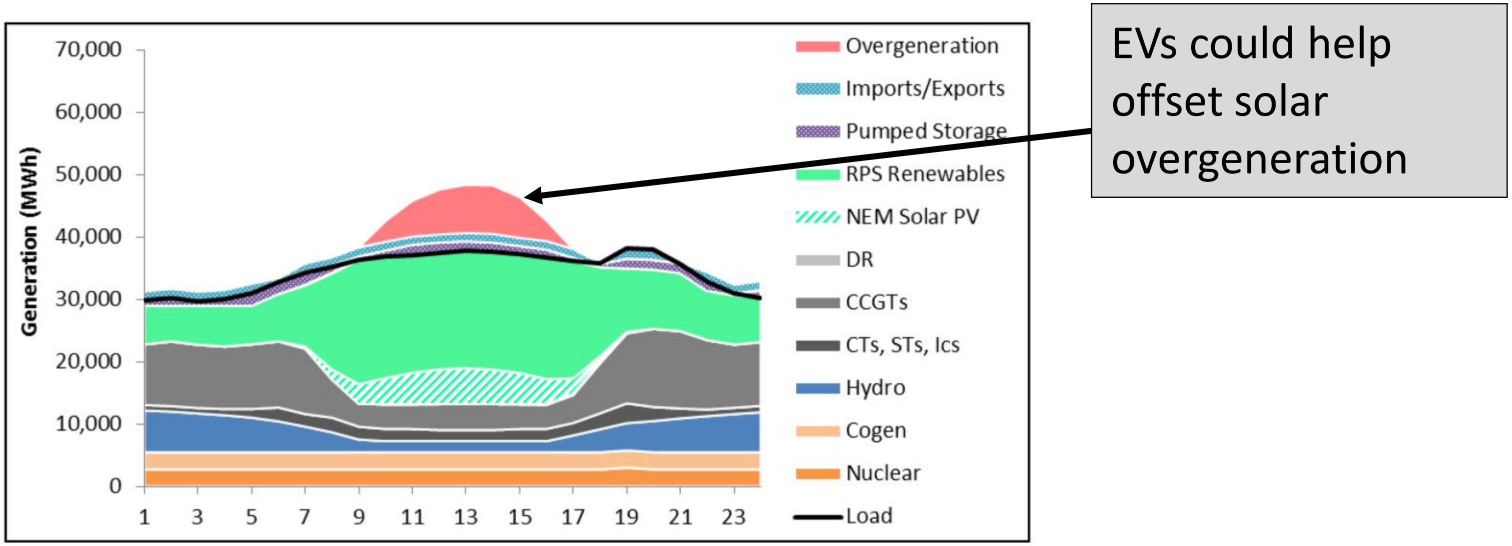


Figure 5. Example of an analysis of the impact of high VG on net load shape and resulting overgeneration

Source: E3 2014

- But most C&I customers have a demand charge
  - = Strong disincentive to charge multiple vehicles

EV Rate Innovation

- SCE offers C&I EV TOU rates, which enable workplaces to avoid crippling demand charges
- SDG&E testing hourly location-specific rates
- V2G (Vehicle to Grid Integration)
  - **BMW** aggregates EVs to provide grid services in Bay area
  - **eMotorWerks** absorbs excess energy on grid and provides dispatchable demand response. Savings shared with EV owners.

Regulatory Responses

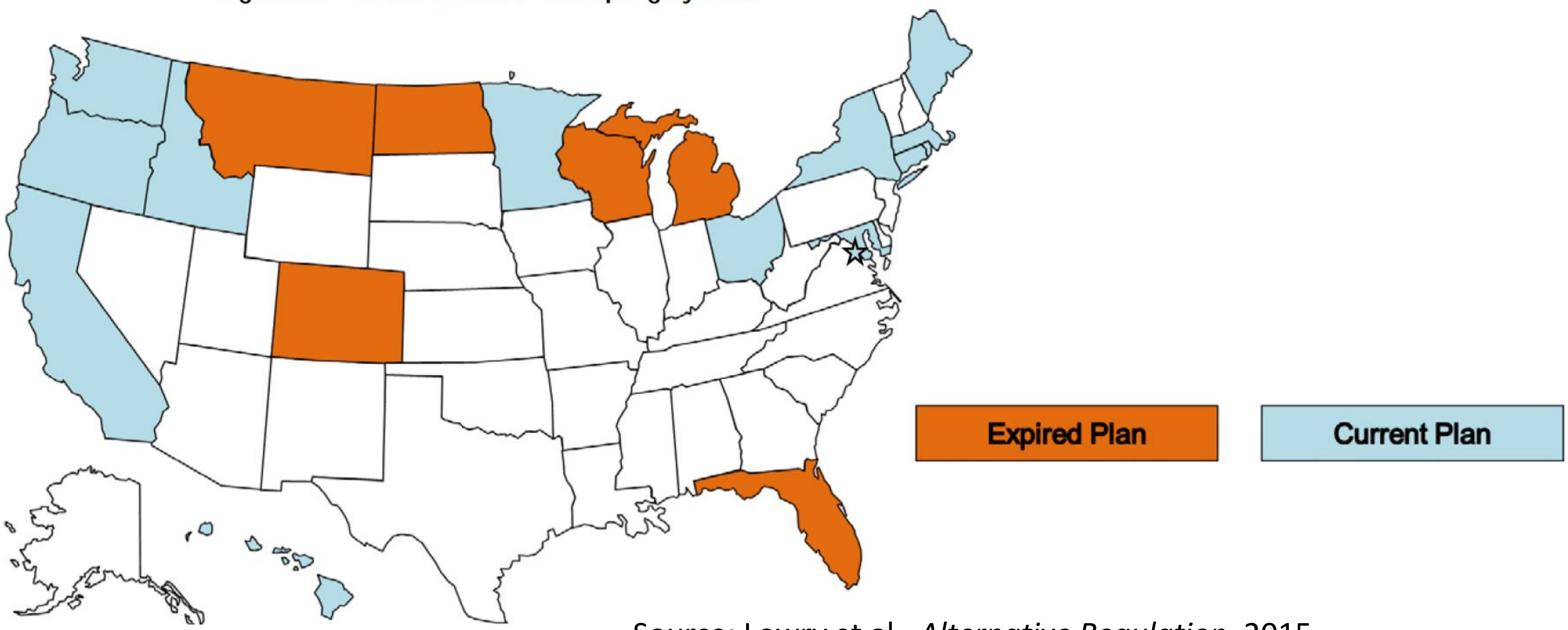
Alternative Regulation

- Revenue Decoupling
  - Addresses revenue adequacy concerns
- Performance-Based Regulation
  - Performance incentives can provide new revenue streams
  - RIIO Totex Approach
    - Utilities earn a return on a portion of total expenses, regardless of whether they are capital or O&M expenses
    - Reduces incentive to invest in capital

Revenue Decoupling

- Common approach to addressing utility incentive to sell more electricity
- Under discussion in several states, including MO, CO, NV

Figure 5a: Electric Revenue Decoupling by State



Source: Lowry et al., *Alternative Regulation*, 2015.

Performance Incentive Mechanisms

PIMs can be implemented incrementally, allowing for flexibility

Performance Incentive Mechanisms

Performance Metrics

1. Identify dimensions of utility performance to track
2. Develop metrics for tracking and reporting performance
3. Set a performance target
4. Add a financial reward or penalty

Whited, et al. (2015) *Utility Performance Incentive Mechanisms (PIMs): A Handbook for Regulators.* Available at *www.synapse-energy.com*

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 under-perform 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

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.

Whited, et al. (2015) *Utility Performance Incentive Mechanisms (PIMs): A Handbook for Regulators.*

Contact

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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