Energy Technologies Area Lawrence Berkeley National Laboratory

Rate Design: Trends and Perspectives

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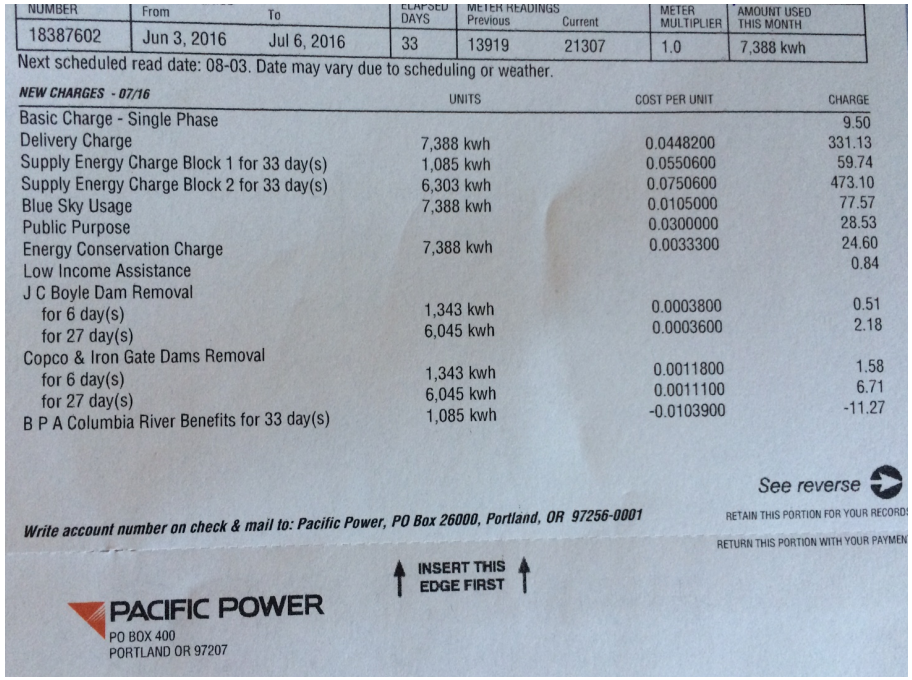
National Conference of State Legislatures
Energy Supply Task Force Meeting
Aug. 7, 2016

Outline

- The electricity bill on one foot
- Recent actions and trends in the U.S.
- Current topic of interest: *Rate design changes to recover fixed utility costs*
  - Options and perspectives
- Q&A

The Electricity Bill on One Foot

- **Fixed customer charge**
  - Set $ amount each billing period that does not vary with energy usage; also called customer charge or basic charge
- **Energy and delivery charges** for each unit consumed
  - Flat across all hours,
  - Vary by usage level (e.g., higher rates at higher levels/blocks), or
  - Vary based on time of consumption
- **Demand charge**
  - Typical for *large* customers (but *not* residential), based on highest electricity demand during a specified time interval
- **Other charges**
  - Such as taxes, franchise fees, and charges for public purposes such as energy efficiency (EE), low-income assistance



NUMBER	From	To	ELAPSED DAYS	METER READINGS Previous	Current	METER MULTIPLIER	AMOUNT USED THIS MONTH
18387602	Jun 3, 2016	Jul 6, 2016	33	13919	21307	1.0	7,388 kwh

Next scheduled read date: 08-03. Date may vary due to scheduling or weather.

NEW CHARGES - 07/16	UNITS	COST PER UNIT	CHARGE
Basic Charge - Single Phase			9.50
Delivery Charge	7,388 kwh	0.0448200	331.13
Supply Energy Charge Block 1 for 33 day(s)	1,085 kwh	0.0550600	59.74
Supply Energy Charge Block 2 for 33 day(s)	6,303 kwh	0.0750600	473.10
Blue Sky Usage	7,388 kwh	0.0105000	77.57
Public Purpose		0.0300000	28.53
Energy Conservation Charge	7,388 kwh	0.0033300	24.60
Low Income Assistance			0.84
J C Boyle Dam Removal			
for 6 day(s)	1,343 kwh	0.0003800	0.51
for 27 day(s)	6,045 kwh	0.0003600	2.18
Copco & Iron Gate Dams Removal			
for 6 day(s)	1,343 kwh	0.0011800	1.58
for 27 day(s)	6,045 kwh	0.0011100	6.71
B P A Columbia River Benefits for 33 day(s)	1,085 kwh	-0.0103900	-11.27

See reverse

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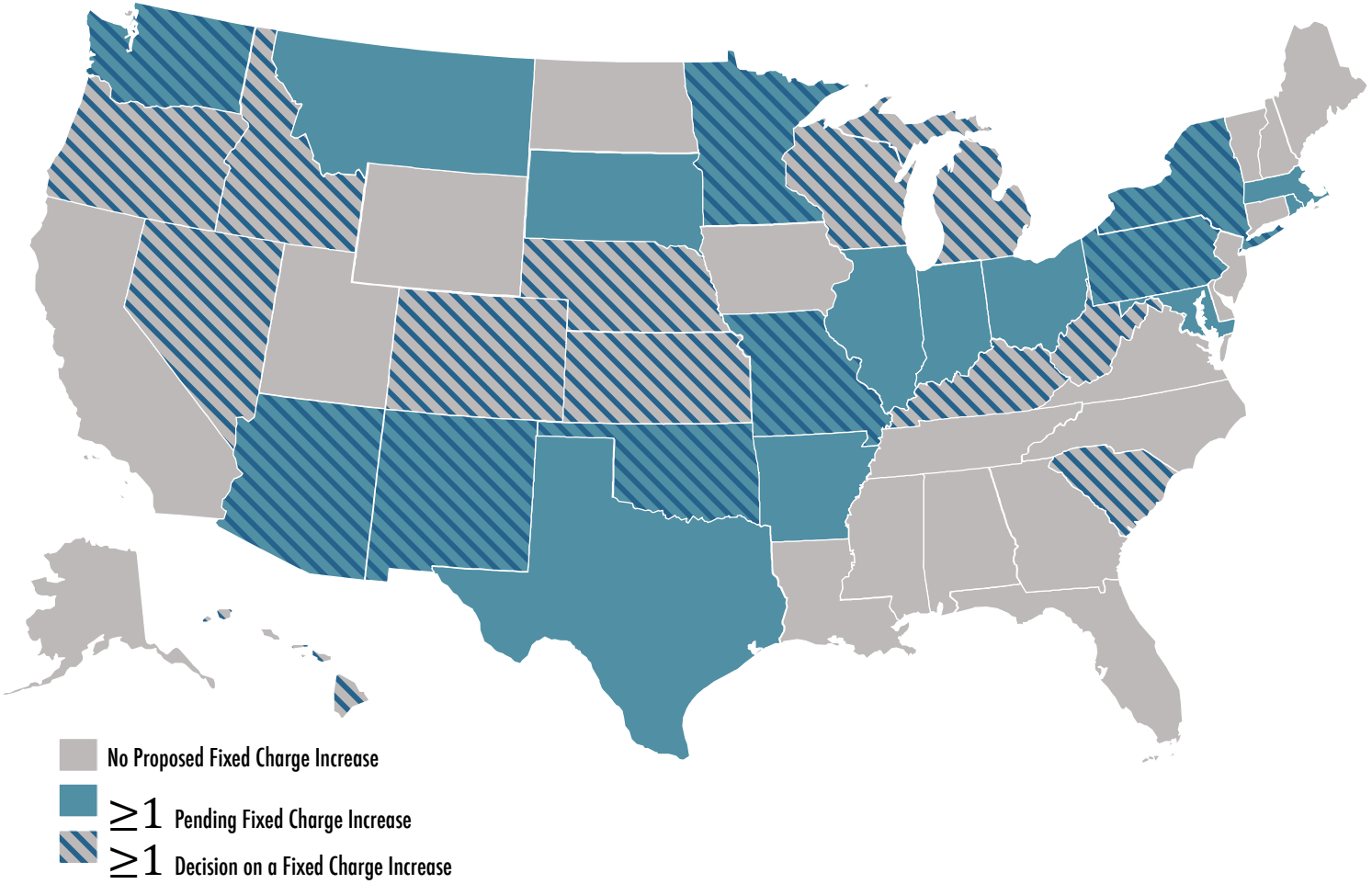
Utility Industry Trends Driving Rate Change Proposals

(1) Aging utility infrastructure in need of replacement
(2) Grid modernization
(3) Environmental regulations
(4) Flat or declining loads and load factors, resulting from greater energy efficiency and slow growing economy
(5) Declining costs and rapidly growing markets for distributed energy resources, particularly solar PV and battery storage
(6) Net metering programs nearing or exceeding existing caps, triggering reviews
(7) Strong interest by growing numbers of large corporate and institutional buyers and municipalities to get more of their electricity from renewable or other low emissions resources

Adapted from Tom Stanton, National Regulatory Research Institute,
Distributed Energy Resources: Status Report on Evaluating Proposals and Practices for Electric Utility Rate Design, October 2015

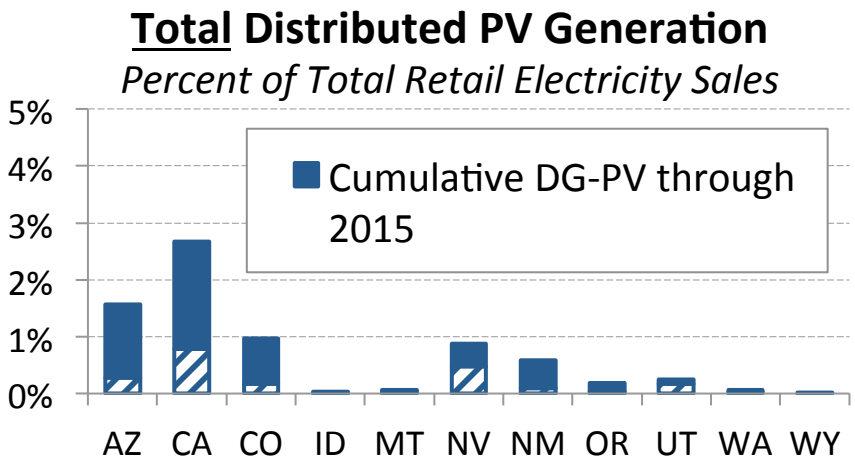
Rate Reform Example: Higher Fixed Charges

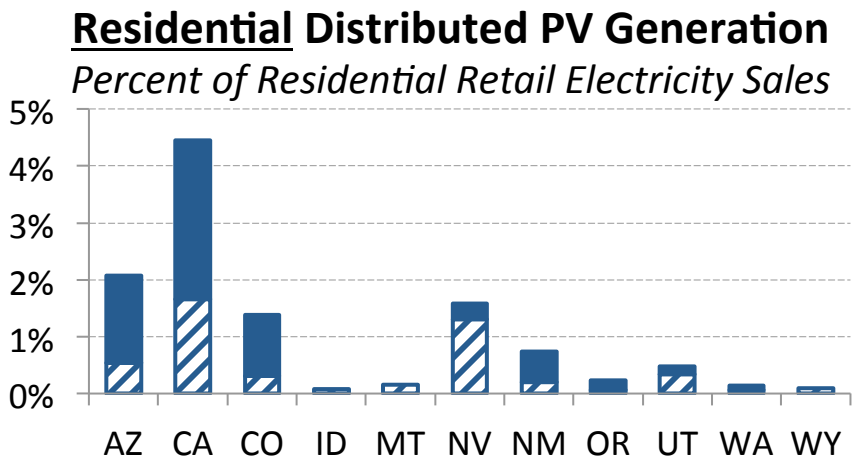
Pending and Decided Utility Residential Fixed Charge Increases in 2015



Source: NC Clean Energy Technology Center and Meister Consultants, 2016.
"The 50 States of Solar: 2015 Policy Review and Q4 Quarterly Report"

Distributed solar is growing fast, but in most states still accounts for ≤1% of retail sales





Calculated from PV installed capacity data from GTM Research and EIA

- With distributed solar's growth, corresponding concerns about:
  - Fixed cost recovery: cost-shifting, erosion of utility shareholder profits, or both
  - Reduced utility earnings opportunities from deferred utility capital investments
- Similar concerns with energy efficiency

New Report: *Recovery of Utility Fixed Costs*

- 5th report in Berkeley Lab's Future Electric Utility Regulation series (see "Additional Slides")
  - Primary funder of series: USDOE Office of Electricity Delivery and Energy Reliability - Transmission Planning and Technical Assistance Division
  - This report also funded by DOE Office of Energy Policy and Systems Analysis
- Four perspectives
  - **Utility** - Lisa Wood, Institute for Electric Innovation and The Edison Foundation, and Ross Hemphill, RCHemphill Solutions (former ComEd VP)
  - **Consumer** - John Howat, National Consumer Law Center
  - **Environmental** - Ralph Cavanagh, Natural Resources Defense Council
  - **Economist** - Severin Borenstein, University of California, Berkeley
- Literature review by Jeff Deason and Lisa Schwartz, Berkeley Lab
- Report, slides and webinar recording: feur.lbl.gov

What Are Fixed Utility Costs?

- Some utility costs vary based on electricity usage, such as natural gas fuel for power plants.
- Other costs are "fixed" over the short run (e.g., a year).
- Typically, fixed charges only cover direct customer service costs: metering, meter reading and billing.
  - Also may cover customer call center and a portion of distribution costs
- Different points of view on what costs are "fixed"
  - Utilities see investments in generation, transmission and distribution infrastructure as fixed, because they are not sensitive to how much energy each customer consumes. (Most of these costs today are covered by variable energy charges.)
  - Others view only direct customer service costs as fixed.
  - Economists remind us that all costs are variable in the long run.
- Why the focus now on recovery of fixed costs?
  - Revenue loss with flat or declining loads in some regions
  - Rise in rooftop solar, and concern about paying fair share of costs
  - Regardless, utilities *always* are interested in more stable revenues.

Options for Recovery of Fixed Costs

1. Raise fixed charges

- Utilities in more than half of U.S. states have recently proposed increasing fixed charges.*
  - For all customers, only for customers with onsite distributed generation, or only for net metering customers
  - Many of the proposed increases have been significant — more than doubling previous fixed charges.
  - Utility regulators have allowed some of these proposed increases, often modified downward, but have disallowed more proposals than they have allowed.
- *Pros* - Stabilize utility revenues and customer bills, reduce need for frequent rate cases
- *Cons* – Resulting lower energy charges reduce customer incentives for energy efficiency and onsite generation and increase demand for electricity; may disproportionately burden low-income households, which tend to use less energy

**Sources: Stanton (2015); NC Clean Energy Technology Center and Meister Consultants (2016)*

Options for Recovery of Fixed Costs (cont.)

2. Establish minimum bills

- Set a lower limit that a customer will pay the utility each billing period, even if the customer's energy usage is zero
- Fixed charge + energy charges will exceed the minimum bill level for majority of customers under typical proposals, so minimum bills have no impact on most customers
  - Customers most likely to trigger minimum have strongly seasonal electricity usage or have onsite generation.
- Not widespread; a few CA utilities have implemented minimum bills
- *Pros* – Do not discourage energy efficiency or increase electricity consumption as much as equal-sized fixed charges
- *Cons* - Result in much less utility revenue compared to higher fixed charges

Options for Recovery of Fixed Costs (cont.)

3. Apply demand charges more widely

- Today, only required for large commercial and industrial customers
  - ≥9 utilities offer *optional* residential tariffs with demand charges
- Based on customer's highest energy usage in a specified time interval (e.g., 15 min. or an hour) over billing period, typically a month
- Usually applied to individual peak demand of customer, regardless of whether demand is coincident with (at the same time as) peak demand of utility system
  - But only highly local components (e.g., service drop, line transformer) are sized to individual customer load, so demand-related costs are primarily associated with peak demand of utility system, not individual customers.
- "Ratchet" – Highest demand in billing period charged for a full year
- *Pros* – If based on time of system peak, provides incentive to reduce system costs; utility can avoid potential cost recovery shortfall when energy use is down, so long as peak demand holds
- *Cons* – Need meters that can measure demand; hard for residential customers to understand, monitor and shift demand; outdated given time-varying rates

Options for Recovery of Fixed Costs (cont.)

4. Offer time-varying rates

- Flat electric rates are not aligned with the dramatic differences in the actual cost of producing and delivering electricity at various times.
  - Under flat rates, customers who use more electricity when it is most expensive for the utility to acquire are subsidized by customers who use more off-peak, inexpensive electricity
- *Pros* – Encourage customers to minimize electricity use during high cost periods, helping reduce utility system costs over time.
- *Cons* – Need meters that can measure consumption by time of use, low-income households and others may have limited ability to shift load, some rate designs make customer bills less stable and shift price risk from the utility to consumers

Options for Recovery of Fixed Costs (cont.)

5. Decouple utility revenues from energy sales

- Decoupling adjusts prices (up or down) to ensure utility recovers its allowed revenue to recover fixed costs, as determined by the state regulator, regardless of the utility's actual energy sales
- ~1/3 of U.S. states have decoupled one or more of the electric utilities they regulate
- *Pros* – Predictable customer bills, fewer rate cases, utility management focuses on cost control to make profit, reduces utility's disincentives for EE related to reduced sales
- *Cons* – Shifts some risks from utility to customers (e.g., weather, economy), utilities may still have incentive to increase sales

6. Adopt a lost revenue adjustment mechanism (LRAM)

- Adjusts prices specifically to address revenue loss from EE and other distributed energy resources
- *Pros* - Improves utility revenue stability; protects against under-recovery of costs, reduces utility disincentives for EE
- *Cons* – Depends heavily on estimated EE impacts and controversial assumptions, reduces utility incentives for cost control

Options for Recovery of Fixed Costs (cont.)

7. File frequent rate cases

- *Pros* – Opportunity to review all utility's costs and rate reasonableness
- *Cons* - Generally seen as incomplete and costly solution; if there is only a small change in underlying costs but a large change in retail sales, a general rate case may not be an appropriately targeted tool

8. Adopt a formula rate plan (e.g., IL, MS, AL)

- Allows a utility to reset rates on an annual basis to recover its cost of service without *a rate case* when its earnings fall above or below a predefined earnings "deadband"
- Often implemented where frequent rate cases would otherwise be likely, due to costs growing more rapidly than delivery volumes
- Often used in tandem with decoupling and performance incentives
- *Pros* – Lowers regulatory costs, reduces operating risk, less likely for utility to under- or over-earn
- *Cons* – May reduce incentive for utility to operate efficiently (design dependent), rate of return on equity may not be refreshed frequently enough, review provisions for filings may be inadequate

Four Perspectives on Fixed Cost Recovery

	Wood/Hemphill (utility)	Howat (consumer)	Cavanagh (environmental)	Borenstein (economist)
Higher fixed charges	◓	○	○	◒[1]
Minimum bills	○	●	●	○
Demand charges	◓	○	◓[2]	○
Time-varying rates	○	●	●	●[3]
Tiered rates	○	●	●	○
Revenue decoupling	○	●[4]	●[5]	○
Frequent rate cases	◓[6]	◒	○	○
Formula rate plans	●	◓[7]	◓	○
Lost revenue adjustment mechanisms	○	○	○	○

○ Poor ◒ Better ◓ Good ● Preferred

[1] First set volumetric price to reflect actual social marginal costs, including costs of externalities whether or not the utility has to pay those costs.
[2] Linked to periods of coincident peak and subject to negotiated resolution of important technical issues.
[3] Reflecting full social marginal cost, with the remaining revenue requirement balanced between higher volumetric rates and higher fixed charges.
[4] Assuming a number of safeguards are implemented (see report).
[5] Necessary but not sufficient.
[6] In combination with a formula rate plan and only for setting revenue requirement; rate design issues to be addressed less frequently (e.g., every three years).
[7] Implementation of formula rates should not deny utility customers and other stakeholders the ability to periodically review and litigate a utility's cost structure.

EMP

Four Perspectives on Fixed Cost Recovery*

	Utility	Consumer Advocate
Favored approaches and why	• **Formula ratemaking** – streamlined, enables investments in critical infrastructure • **Higher fixed charges** – cost-based, provides transparency in pricing grid services • **Demand charges** – cost-based, may incent more EE and DR	• **Time-varying rates** – Properly designed and optional, some customers can reduce bills • **Decoupling** – With consumer protections, enables EE • **Formula rate plans** – With performance standards and consumer protections • **Minimum bills** – But in most cases won't effectively address fixed cost recovery shortfall
Least favored approaches and why **See footnotes on prior slide & report at feur.lbl.gov*	• **Decoupling and LRAM** – Work well for EE, but too much cost-shifting with high levels of distributed solar • **Minimum bills** – Level of minimum bill unlikely to recover full cost of grid services	• **Higher fixed charges** – Shifts costs from high- to low-volume customers (low-income & elder), reduces EE incentives & control over bills • **Demand charges** – Consumers lack ability to respond • **LRAM** – Incentive for utility to overstate savings and weaken EE program effectiveness

	Environmentalist	Economist
Favored approaches and why	• **Minimum bills** – Ensure that all customers make a reasonable contribution to maintaining critical infrastructure • **Time-varying rates** – Economically efficient, support EE & distributed resources • **Decoupling** – Necessary but not sufficient to recover fixed costs & enable EE • **Formula rate plans** – Facilitates recovery of escalating multi-year costs of grid upgrades, use with decoupling • **Demand charges** – Works with EE & solar, link to system-wide peak	• **Time-varying rates** – Should reflect full social marginal cost (SMC), with remaining revenue from higher volumetric rates and higher fixed charges • **Higher fixed charges** – Use with time-varying rates (see above). Concerns remain re: large vs. small users and low-income households. "Claim that 'Fixed costs should be recovered with fixed charges' has no basis in economics."
Least favored approaches and why	• **Higher fixed charges** – Reduce customers' incentive for EE and distributed resources • **LRAM** – Creates incentive for utility to promote EE programs with little savings, incentive to increase energy sales remains	• **Minimum bills** – "identical to fixed charge plus free electricity," not cost-based • **Demand charges** – inefficient, more volatile than dynamic pricing, not cost-based • **Others** – Don't fix problem

Questions for Audience

- Has your legislature taken up any utility rate design discussions? What was the issue? And what was the result?
- Which issues should state legislatures decide, and which issues should be left to the authority of the public utility commission (for regulated utilities) and to city councils and boards (for municipal utilities and rural electric coops)?

For More Information

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Additional Slides

Future Electric Utility Regulation Series

- A new series of reports from Lawrence Berkeley National Laboratory taps leading thinkers to grapple with complex regulatory issues for electricity
- Unique point-counterpoint approach highlights different views on the future of electric utility regulation and business models and achieving a reliable, affordable and flexible power system
- Primary funder: DOE Office of Electricity Delivery and Energy Reliability, Transmission Planning and Technical Assistance Division
- Reports published or underway:
  1. *Distributed Energy Resources (DERs), Industry Structure and Regulatory Responses*
  2. *Distribution Systems in a High DER Future: Planning, Market Design, Operation and Oversight*
  3. *Performance-Based Regulation in a High DER Future*
  4. *Distribution System Pricing With DERs*
  5. *Recovery of Utility Fixed Costs: Utility, Consumer, Environmental and Economist Perspectives*
  6. *The Future of Electricity Resource Planning*
- Additional reports forthcoming: **feur.lbl.gov**
- Expert advisory group (see next slide)

FUTURE ELECTRIC
Utility Regulation

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