Understanding Residential Demand Charges

National Energy and Utility Affordability Coalition

PRESENTED BY

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Why the interest in residential rate redesign?

Existing tariffs do not reflect the underlying cost structure

- This has always mattered, but the costs to provide proper price signals seemed always to exceed the benefits

Current rates are typically two-part designs,

- The first part is a fixed service charge ($/month)
- The second part is a non-time varying energy charge (cents/kWh)
- Even rate blocks have largely disappeared

Costs that vary with system peak-coincident demand, a customer's maximum demand, or with time or location, are often not accurately reflected in existing rates

- Location-specific rates have largely been proscribed.

This is leading to fairness/equity problems that are likely to become more pronounced in the future

An illustrative example of the misalignment between rates and costs for an integrated utility

Cost categories	Utility's Costs	Customer's Bill
Variable ($/kWh) - Fuel - Operations & maintenance	Variable = $60	Variable = $115
Fixed ($/customer) - Metering & billing - Overhead	Fixed = $10	Fixed = $5
Size-related (demand) ($/kW) - Transmission capacity - Distribution capacity - Generation capacity	Demand = $50	

Significantly more skewed for distribution utilities whose costs are nearly entirely fixed.

This is not just a financial problem for the utility

The oversized volumetric rate can be avoided through investment in high-efficiency appliances and distributed generation

If the utility doesn't have an energy revenue adjustment mechanism (ERAM), this creates a revenue shortfall between rate cases. And for all utilities, customers who don't (or can't) make these investments, particularly low income customers, subsidize those who do

Therefore, the cross-subsidy has significant implications with regard to **equity** and **fairness** – two important ratemaking criteria

The current rate design leads to economically inefficient decisions

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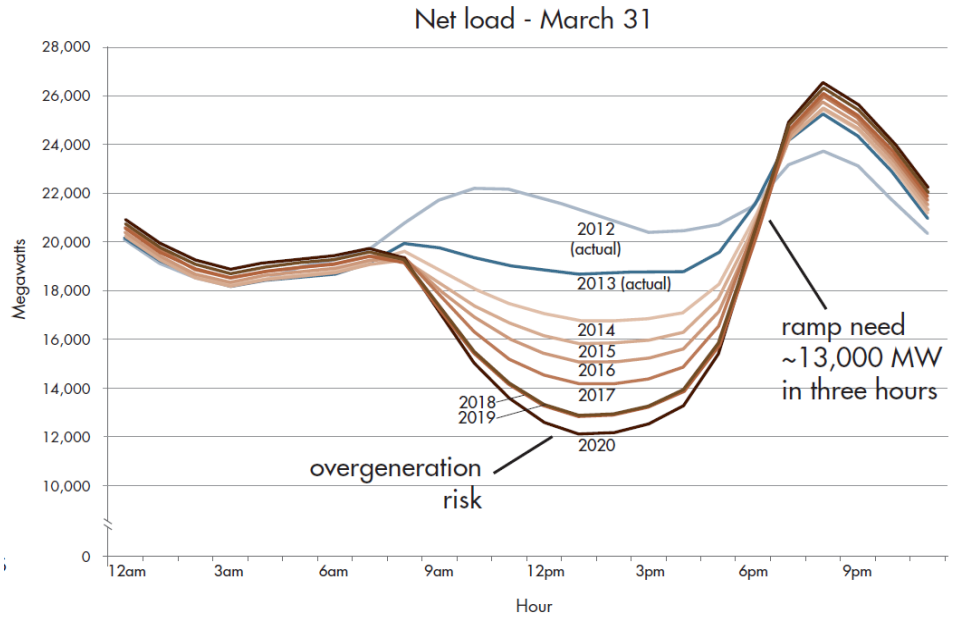
DER adoption also has significant implications on the cost side of the equation

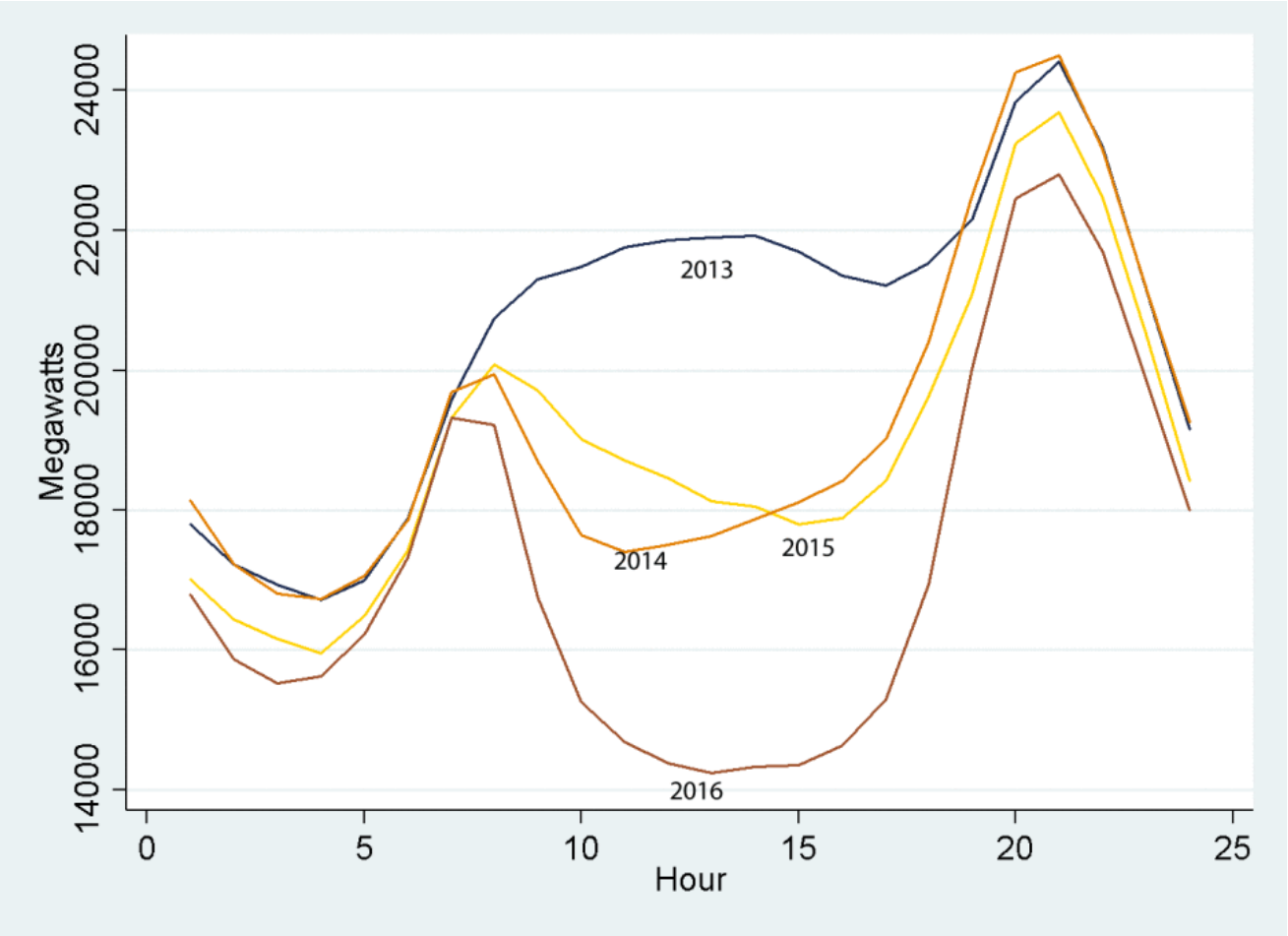
Increases in customer generation may have two effects:

- Reduce capacity costs
  - Depends on the degree generation is coincident with system peak
  - Depends on the degree of customer generation reliability
- Increase other costs
  - Intermittency may result in
    - Increases generation ramping requirements (the duck!)
    - Increased level of operating reserves (idling generation)
    - Reduce efficiency of unit commitment
  - There may also be additional costs associated with maintaining power quality
  - And distribution-level capacity upgrades may be needed

The "Duck Curve"



The Duck Has Landed

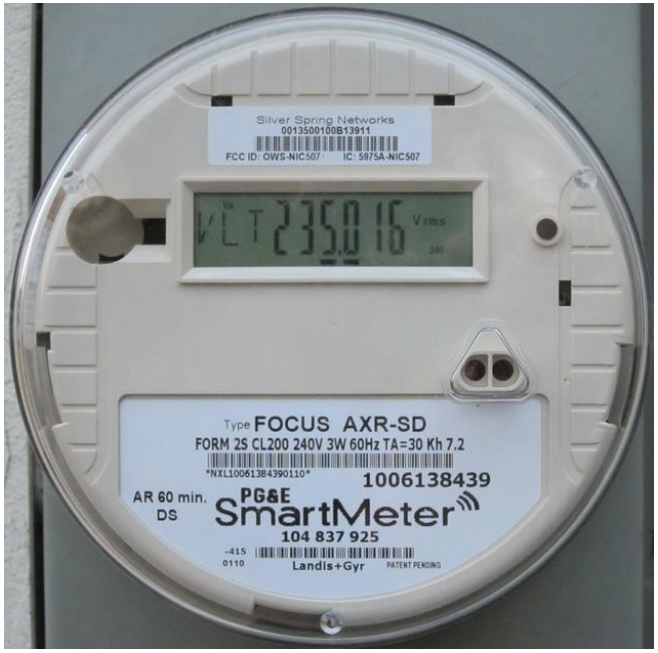


All data taken from CAISO
website. Graph summarizes hourly data, March28-April 3, 2013-2016.

New metering technology improves usage measurement

Traditional meter

Smart meter



Nearly one in every two households now has a smart meter

A demand charge would create a "three part rate"

	Old Two-Part Rate
Fixed charge	$10/month
Volumetric charge	10 cents/kWh
Demand charge	$0

Option A
$10/month
6 cents/kWh
$10/kW-month

(Rates shown are purely illustrative)

or…

Option B
$15/month
6 cents/kWh
$9/kW-month

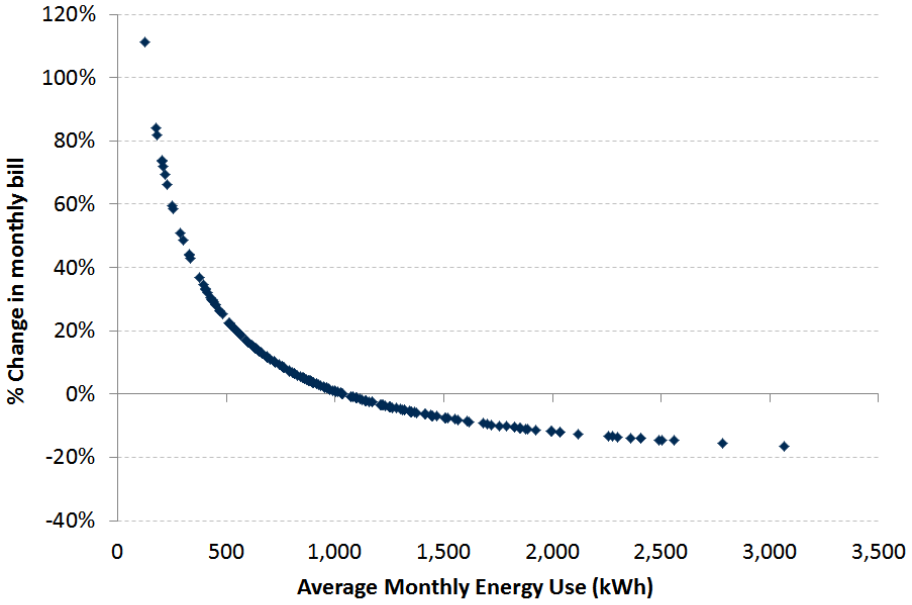
…etc.

A demand charge is not a fixed service charge

- A customer does have control
  - A demand charge can be avoided through managing how much energy a customer uses and when
- It does not automatically increase bills for small customers
  - Small customers are just as smart about their energy usage as large ones

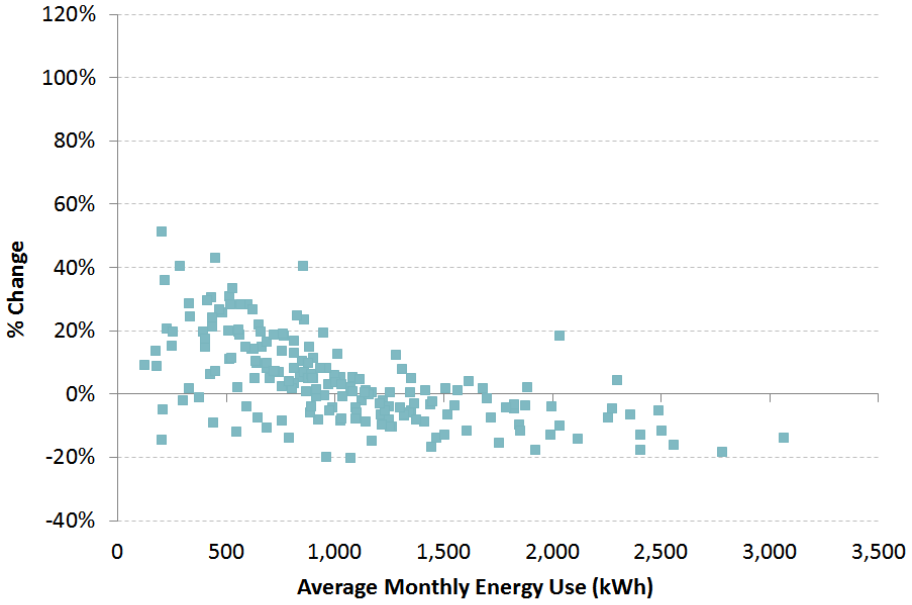
Demand charges do not automatically increase bills for small customers

With Increased Fixed Charge



Note: The three-part rate includes a monthly fixed charge of $10, an energy charge of $0.077/kWh, and a demand charge of $6/kW. The revenue-neutral two-part rate includes a monthly fixed charge of $40 and an energy charge of $0.083/kWh.

With New Demand Charge – No Change in Energy Usage



Note: The three-part rate includes a monthly fixed charge of $10, an energy charge of $0.060/kWh, and a demand charge of $9/kW. The revenue-neutral two-part rate includes a monthly fixed charge of $40 and an energy charge of $0.083/kWh.

- Correlation between bill impact and customer size is stronger with increased fixed charge
- Whether small customers are low income customers is another question entirely…

Customers don't need to be electricity experts to understand a demand charge

Responding to a demand charge does not require that the customers know exactly when their maximum demand will occur

If customers know to avoid the simultaneous use of electricity-intensive appliances, they could easily reduce their maximum demand without ever knowing when it occurs

This simple message should be stressed in customer marketing and outreach initiatives associated with the demand rate

Examples from utility websites

- APS: "Limit the number of appliances you use at once during on-peak hours"
- Georgia Power: "Avoid simultaneous use of major appliances. If you can avoid running appliances at the same time, then your peak demand will be lower. This translates to less demand on Georgia Power Company, and savings for you!"

Staggering the use of a few key appliances could lead to significant demand reductions

Avg. Demand Over 15 min

Appliance	Avg. Demand (kW)	
Dryer	4.0	Flexible Load (7.5 kW)
Oven	2.0	
Stove	1.0	
Hand iron	0.5	
Misc. plug loads	0.2	Inflexible Load (1 kW)
Lighting	0.3	
Refrigerator	0.5	
Total	**8.5**	

Comments

- Use of some of the appliances is inflexible (1 kW)
- Use of other appliances could be easily staggered to reduce demand
- Simply delaying use of the dryer until after the oven, stove, and hand iron had been turned off would reduce the customer's maximum demand by 3.5 kW
- This would bring the customer's maximum demand down to 5 kW, **a roughly 40% reduction in demand**

Several tools are available to facilitate the rate transition

- Gradually escalating the demand charge over time
- Temporary bill protection
- Tiered demand charges or ceiling on applicable demand
- Shadow bills
- Enhanced customer outreach and education
- Rebates for enabling technologies
- Exemption for vulnerable / low income customers

There are good reasons to introduce a well-designed demand charge

- ✓ Better align prices and costs
- ✓ Reduce inter and intra-class cross-subsidies
- ✓ Regulatory precedent (i.e., commercial & industrial experience)
- ✓ Incentivize smarter load management
- ✓ Bills do not necessarily increase for small customers
- ✓ Potential bill savings for low income customers

The devil is in the details

It matters if the utility is integrated (GT&D) vs. merely passing market costs through (D only)

The demand charge will also depend on whether DER customers have been separated into another rate class

There are also many ways to design a demand charge

- Customer's maximum demand during month
- Max demand during peak hours of day (e.g. 2 pm to 6 pm)
- Demand during actual hour(s) of system peak
- Average of customer's highest X demand hours of month
- Average over interval of 15, 30, 60, even 120 minutes
- Etc.

Many important questions must be answered when redesigning residential rates

- How should the new multi-part rate be designed?
- What is the cost basis for the rate?
- What is the cost justification?
- How does the new rate design compare to that of other utilities?
- How will customer bills be impacted?
- Who will be the “winners” and “losers”?
- Can “vulnerable” customers be protected?
- How will owners of distributed generation be impacted?
- Should the rate be opt-in, opt-out, or mandatory?
- Should the rate be offered to all residential customers, or a subset?
- Should customers be offered a menu of rate options?
- If there is rate choice, how will utility revenue be impacted?
- Should the rate be piloted before full-scale deployment?
- How should the pilot be designed?
- Will the new rate change consumption patterns?
- What are the financial implications of these rate changes?
- How should the consumption changes be measured?
- How should the rate be marketed to customers?
- How should the transition to the new rate be made?
- What tools can be offered to customers to facilitate the transition?
- What is the best way to present all of this to regulators?
- And the list goes on…

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New initiatives can address stakeholder concerns

Quantify bill impacts, particularly for low- and moderate-income customers

Assess customer understanding of demand charges through market research and identify the best way to communicate the concept

Assess customer response to demand charges through empirical analysis, pilots, and/or a test-and-learn approach

Establish a national conversation on residential demand charges

Initiatives to address stakeholder concerns (cont'd)

Consider innovative variations on conventional demand charge designs

Develop a customer education plan

Phase in the rate gradually

Develop protections for vulnerable customers

The transition will have to be tailored to the unique circumstances of each regulatory jurisdiction