

# The Future of Tariff Reform: A Global Survey

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# A variety of “disruptive technologies” have begun to appear in customers’ premises



# Industry guru, Leonard Hyman, has summed up the industry's conundrum

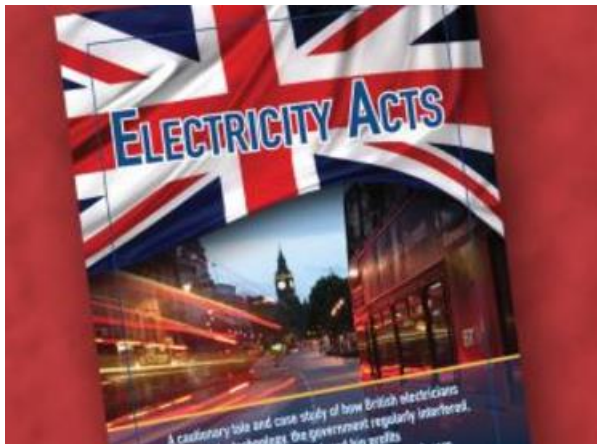
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**“Technology will change the business, but we don’t know for sure how”**

**“And if decentralization and self-generation become the norm, it will become exceedingly difficult to force consumers to pay for the stranded assets at the utility”**

**“Nobody could make former trolley car passengers pay for a service they did not use anymore, either”**



Source: “Electricity Acts: A Cautionary Tale and Case Study,”  
Public Utilities Reports, Inc. 2017.  
<https://www.fortnightly.com/fortnightly/2017/08-0/conversation-len-hyman>

# The industry needs to become customer-centric with the rise of the empowered consumer

## CUSTOMER CENTRICITY - THE BEST BET FOR SUSTAINABLE COMPETITIVE ADVANTAGE

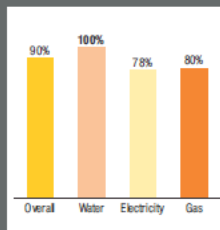


**90%**

OF UTILITY CXOs BELIEVE THAT THE FOCUS ON THE CUSTOMER HAS INCREASED COMPARED TO 2012

CUSTOMER CENTRICITY IS CLEARLY FRONT OF MIND IN THE UTILITY INDUSTRY

How much has the importance of customer centrality to your company changed over the past five years?



## CREATING A NEXT-GEN CUSTOMER EXPERIENCE



CURRENT CUSTOMER CENTRICITY INDEX FOR COMPANIES: 3.8 OUT OF 5

**3.8 ► 4.6**

THE CUSTOMER CENTRICITY INDEX OF UTILITY COMPANIES IS SLATED TO INCREASE BY 0.8 POINTS

## KEEPING CUSTOMERS AT THE CENTRE THROUGH:



- CUSTOMER-CENTRED INTERACTIONS TAILORED FOR EACH CUSTOMER
- INCREASED FOCUS ON MEASUREMENT OF CUSTOMER SATISFACTION

## CUSTOMER CENTRICITY INDEX IS HIGHER IN:



**4.1/5** | CALL CENTER MANAGEMENT

**3.9/5** | FIELD SERVICES

BELIEF THAT THE LEVELS OF CENTRICITY TEND TO BE HIGHER IN THE 'FRONT-LINE' SERVICES

Confidentially, on a scale of 1 to 5, please score your company's level of customer centrality in each of the following areas.



Average Score: 1 – Very Poor 3.5 – Excellent

## HOW DO UTILITY COMPANIES ACHIEVE THIS INCREASED FOCUS ON THE CUSTOMER?

### TECHNOLOGY: KEY FOCUS AREA TO DRIVE CUSTOMER CENTRICITY



BUSINESS PROCESS IMPROVEMENT: 69%



IMPROVEMENT IN TECHNOLOGY AREAS: 53%

Which of the following areas within your company are most in need of attention to improve customer centrality?



### THE TOP RANKING MARKET OPPORTUNITIES ARE ALSO LARGELY TECHNOLOGY BASED



PERVASIVE MOBILE TECHNOLOGY

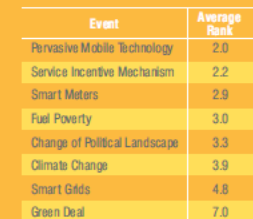


SERVICE INCENTIVE MECHANISM



SMART METERS

What upcoming or on-going regulatory/market events will provide you with the biggest opportunities to bring change to customer centrality?



### AND THE TOP 3 APPLICATIONS THAT NEED TO IMPROVE ARE:



CUSTOMER RELATIONSHIP MANAGEMENT



CUSTOMER SELF-SERVICE PORTALS



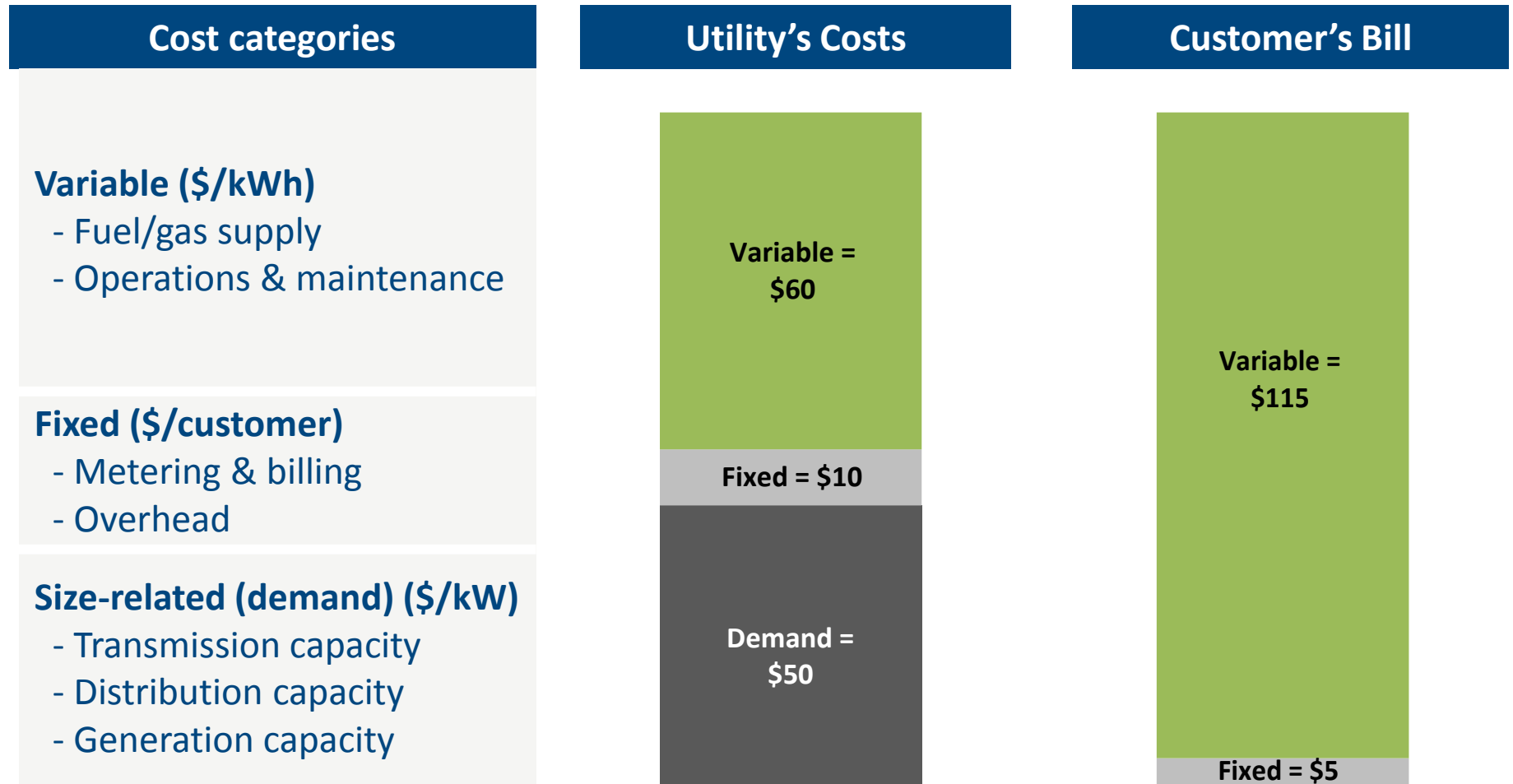
CALL CENTER TECHNOLOGY

Which of the following IT applications need to improve if your company is to become more customer centric?



Source: Centre Forward: Utilities' Progress on Customer Centrality in Utilities – A Wipro and Utility Week Report [READ MORE](#)

# Current rates are stuck in the past



The comparison is significantly more skewed for distribution utilities whose costs are nearly entirely fixed or demand-related.

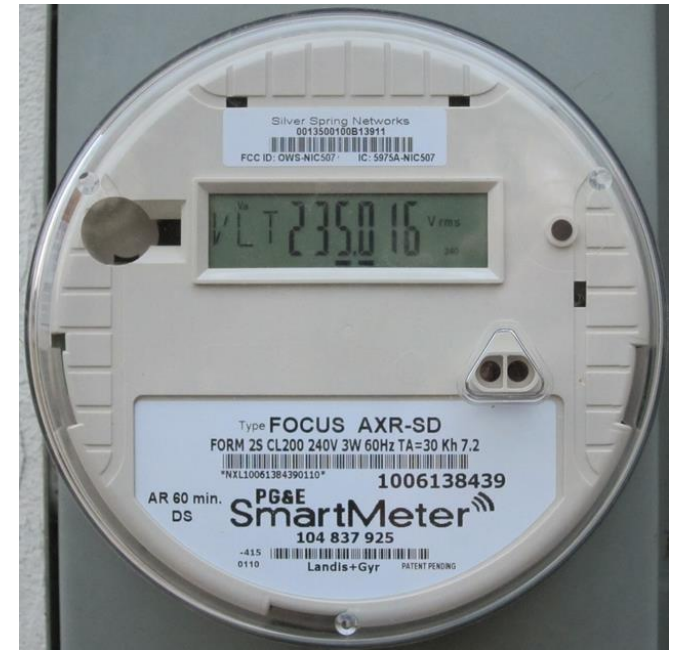


# The transition to smart meters can help introduce smart rates to customers

Traditional meter



Smart meter



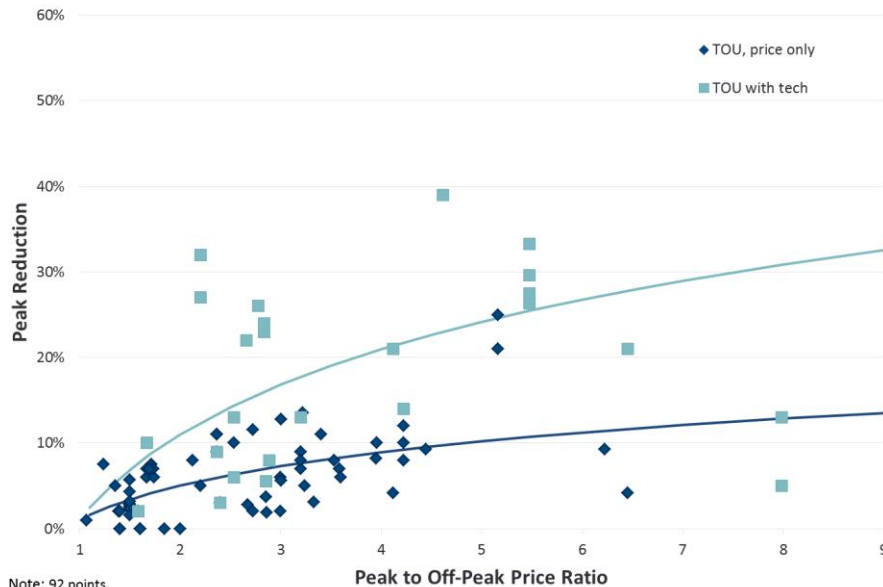
# ...but there is also a need to consider how customers interact with the grid



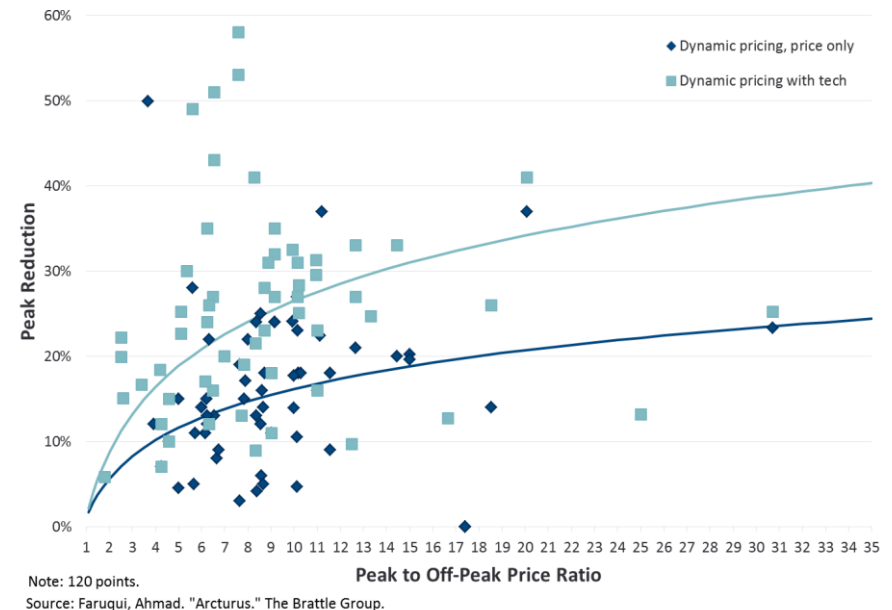
# ...and how customers respond to rates

Customers respond by lowering peak demand as the ratio of peak to off-peak prices goes up and as enabling technologies are provided

## TOU Impacts



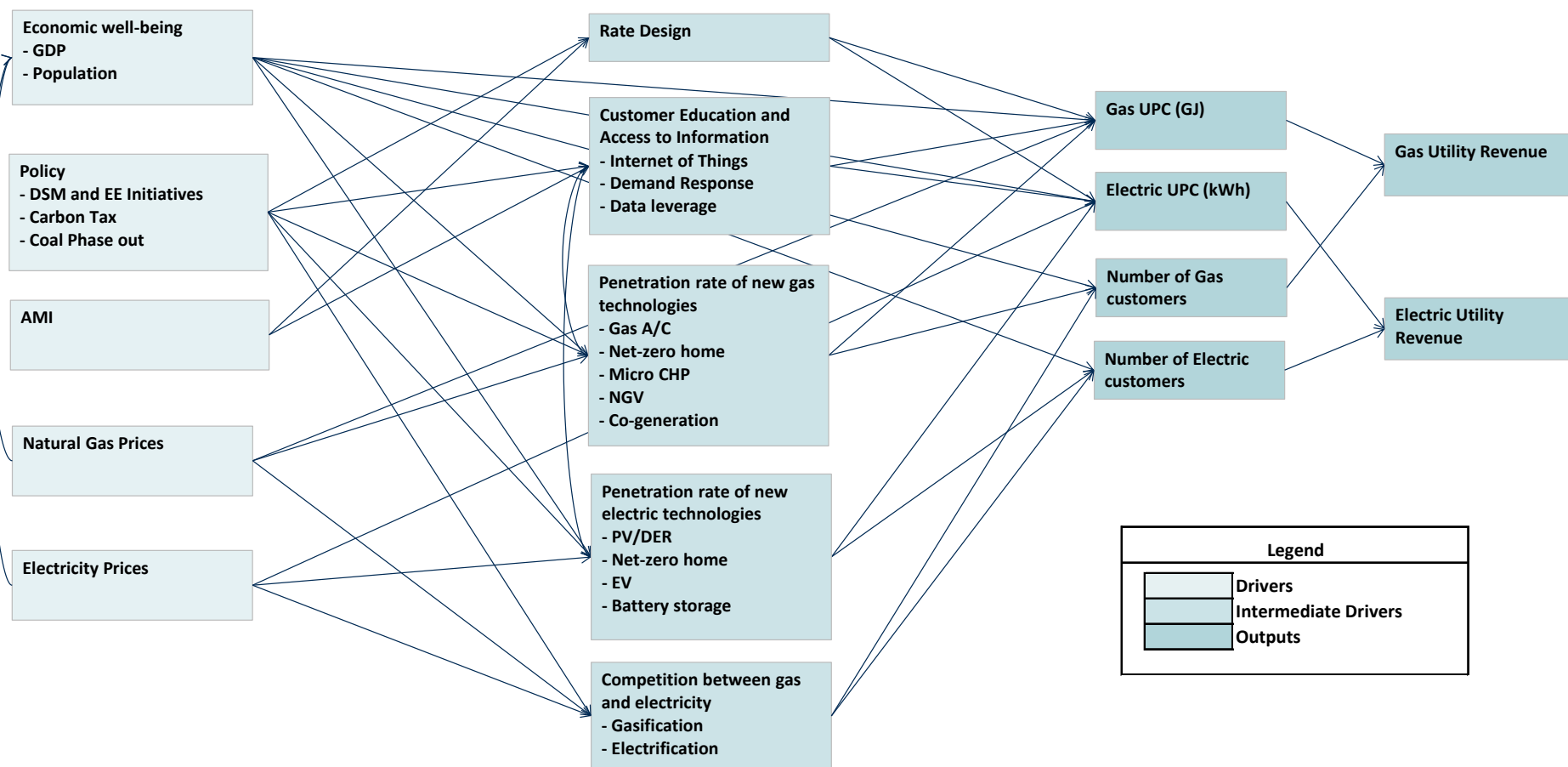
## Dynamic Pricing Impacts





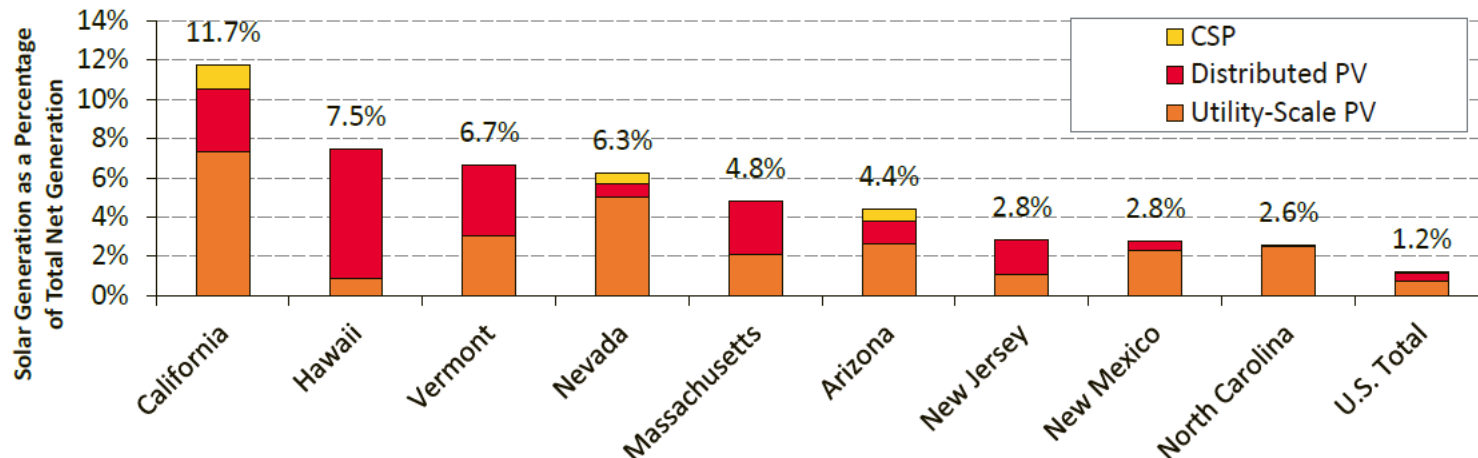
# There is a lot that we don't know about the future of the energy industry

## Map of Drivers and Output Relationships



# Example: Imagine a future where solar penetration continues to increase

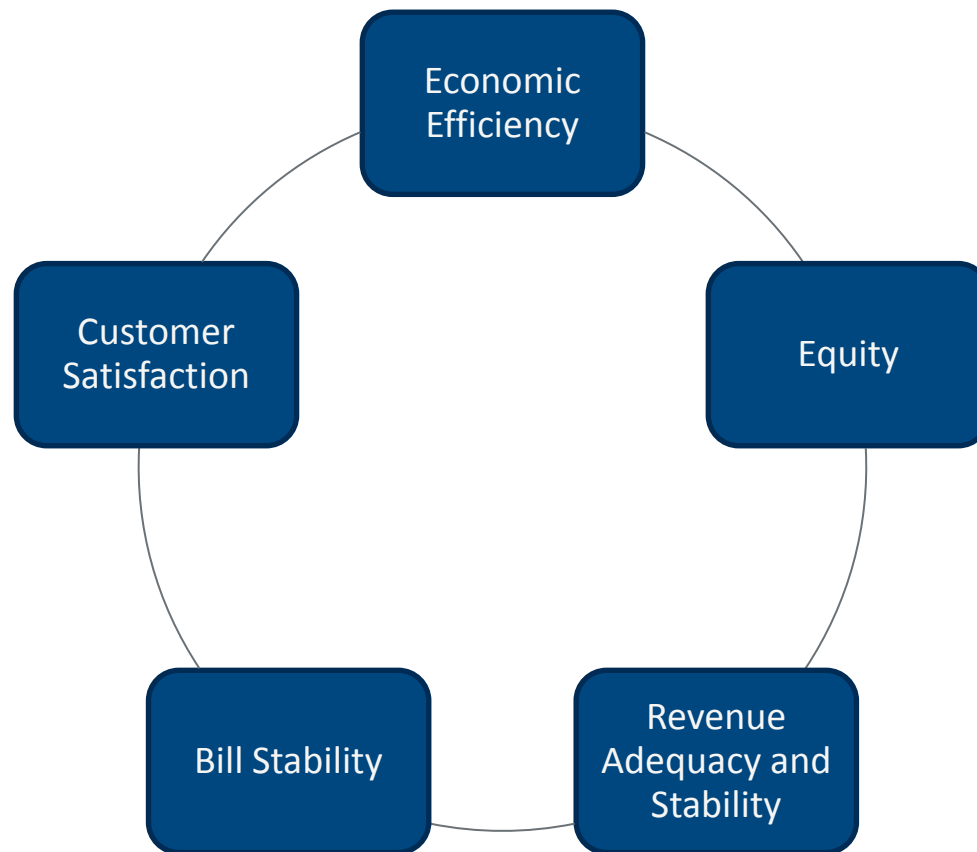
- ❖ What effect will this have on the bills of those customers who do not have deploy solar?
- ❖ How will this affect utility revenues?
- ❖ How would utilities have to change rates to address corresponding problems?



Source: David Feldman, Daniel Boff, Robert Margolis. 2016. *Q3/Q4 2016 Solar Industry Update. Sunshot*, U.S. Department of Energy (DOE). NREL/PR-6A20-67639. <http://www.nrel.gov/docs/fy17osti/67639.pdf>.

# The core principles of rate design will continue to govern future prices

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# **Across the globe, electric utilities are experimenting with multiple pricing options**

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**Guaranteed bill (regardless of usage and load shape)**

**Simple energy-only (volumetric) tariffs with a modest customer charge**

**Time-of-use energy-only tariffs**

**Demand charges**

**Capacity charges**

**Peak time rebates**

**Critical peak pricing**

**Variable peak pricing**

**Real-time pricing**

**Transactive energy**

# Beyond default TOU – Ontario, Canada

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- ❖ For the past five years, some 90% of Ontario's 4 million residential customers have been buying their energy through a regulated supply option which features a three-period TOU rate
  - ❖ They have reduced their peak demand by ~3% , based on a three-year analysis that we carried out for the IESO
- ❖ Knowing the limitations of TOU rates in the evolving energy market, the Ontario Energy Board (OEB) has authorized a series of dynamic pricing pilots that would allow those rates to be offered as supplements to the TOU rates
- ❖ The OEB has ruled that distribution charges will be collected through a fixed charge
  - ❖ The Texas PUC is watching the developments with interest



# Beyond TOU – Dynamic pricing in Oklahoma

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- ❖ **OGE rolled out a dynamic pricing rate coupled with a smart thermostat to its residential customers a few years ago**
  - ❖ “Smart Hours” features variable peak pricing, or five levels of peak pricing depending on what day type it happens to be
- ❖ **Some 130,000 customers are on that rate today; they control their thermostat setting, not OGE**
  - ❖ Average peak load has dropped by ~40%
  - ❖ Average bill savings amount to ~20% of the customer’s bill

# Beyond TOU – Peak time rebates in Maryland

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- ❖ Both BGE and PHI offer dynamic pricing rebates of \$1.25/kWh to their customers in Maryland (~ 2 million households), and bid the load reductions into the PJM market
- ❖ At BGE, about 80% of its customers have taken advantage of the rebates and saved \$40 million in utility bills since the program began in 2013
- ❖ In 2015, BGE's PTR customers showed an average demand reduction of 16.2%, up from 14.5% in 2014 and 13.7% in 2013
- ❖ In the same year, PHI's companies reported savings of 12.3% (Delmarva) and 16.5% (Maryland)

# Beyond TOU – The case of Australia

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- ❖ **Customers already pay fixed charges for distribution that are a larger part of the total bill than in the US**
- ❖ **The distribution utilities are seeking to move their customers to fixed charges and demand charges to recover grid costs**
  - ❖ However the smart meter network is not yet in place
  - ❖ Retail providers may not pass on cost reflective prices
- ❖ **One distribution network is offering significant rebates for dynamic demand curtailment during peak times (~ \$5/kWh curtailed)**
  - ❖ Avoiding costly upgrade on low load factor feeder
  - ❖ Electricity rules say networks must consult alternative resources before building

# Beyond TOU – United Kingdom

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- ❖ **UK Power Networks (London) is piloting a peak time rebate targeted specifically at low income customers**
- ❖ **A couple of pilots have tested time-varying rates**
  - ❖ One rate featured a “wind twinning” tariff which was intended to encourage consumption increases/decreases at times of unexpectedly high/low output from wind generation
  - ❖ Some of the rates tested were dynamic in nature
- ❖ **Ofgem, the regulator, is looking at new ways to increase the role of price responsive demand, including the possible introduction of firms like Amazon and Google into the marketplace**

# Gas pricing innovations are still quite modest in comparison to electric pricing

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## ❖ Metering infrastructure for the gas and electric grid looks very different

- ❖ Almost half of all US households already have advanced electric meters
- ❖ Efforts to deploy gas AMI are still limited – most efforts are in conjunction with electric AMI

## ❖ Gas has storage capability

- ❖ Value of flexibility is lower than for electricity

## ❖ Electric consumer uses are much more diversified

- ❖ Gas is primarily used for space and water heating and cooking
- ❖ There is less leeway to “shift” consumption or adjust demand by turning off selected appliances



# **Nonetheless, some change is occurring in gas pricing**

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**Redefining customer classes**

**Increasing fixed charges**

**Introducing the notion of demand subscription**

**Introducing capacity charges**

**Introducing seasonal rates**

**Exploring rates for emerging technologies**

# Philadelphia Gas Works – Introducing rates for emerging uses and increased fixed charges

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- ❖ PGW made the strategic decision to support the development of specific natural gas uses, including:
  - ❖ NGV refueling
  - ❖ Gas Air Conditioning
  - ❖ Cogeneration (C&I)
- ❖ Separate rates with financial incentives – on the basis that marginal cost is lower than average costs – could impact the adoption of emerging gas uses
  - ❖ Diversifying NG uses can help sustain system utilization
- ❖ PGW also filed a request with the PA PUC in February 2017 to increase fixed charges for its standard Residential, Commercial, and Industrial rates for the first time in eight years

# TOU pricing may induce peak-shaving behavior even among gas consumers

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- ❖ A study has been published that simulates the potential of gas TOU pricing for residential customers in Zhengzhou, China on peak-shaving
  - ❖ Agent-based simulation was used to study the impact of TOU pricing with three time periods: peak, off-peak, and valley
  - ❖ Key assumptions were made about the short-term price elasticity of gas demand
- ❖ **Main findings:**
  - ❖ Peak shaving efficiency increases as the proportion of consumption during peak hours increases
  - ❖ The impact on low-income customers and high-income customers bills would be larger than for middle class customers
  - ❖ Highlights the potential for significant gas operator benefits in a context of increasing demand

# SoCalGas – Residential demand response program with smart thermostats

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- ❖ **“Advisory Thermostat Program” was offered by SoCalGas in Winter 2017 on an opt-in basis**
  - ❖ Offers participants up to \$50 in rebates in exchange for allowing SoCalGas to make minor adjustments on their thermostat settings on specific event days
  - ❖ SoCalGas manages the smart thermostats remotely
  - ❖ Customers must own the specific smart thermostat required for the program
- ❖ **Similar to electric utilities offering demand response programs for air conditioning use in the summer**
- ❖ **Program launched in the context of Aliso Canyon storage not being operational after the major leak**

# Moving ahead with tariff reform (I)

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- ❖ **Understand how customer bills will change if the new rates are implemented immediately**
  - ❖ Identify how much bills will rise for small users
  - ❖ Find ways to mitigate these bill impacts
  
- ❖ **Simulate the impact of the rates to study the likely customer response**
  - ❖ Models, such as PRISM, are available for carrying out such simulations
  
- ❖ **Engage in a customer outreach program to explain why tariffs are being changed**
  - ❖ Make sure the new rates use clear and understandable language
  - ❖ Enlist neutral parties to endorse the change
  - ❖ Use social media to spread the word



## Moving ahead with tariff reform (II)

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- ❖ **Change the rates gradually over a three-to-five year period or provide bill protection that is gradually phased out**
- ❖ **For the first few years, make the rates optional for low income, small users and disabled customers**
  - ❖ Or provide financial assistance for a limited period of time
- ❖ **Consider a subscription concept in which customers “buy” their historical usage and the historical price and buy or sell deviations from that usage at the new tariffs (transactive energy)**
- ❖ **Conduct pilots to test customer acceptance and load response to the new rates**

# Conclusions

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- ❖ **On the electric side, smart meters deployment is widespread, which sets the grounds for an increased use of time-varying pricing and demand charges**
  - ❖ Accurately and clearly communicate price signals to customers
  - ❖ Pricing pilots are showing conclusive results
  - ❖ Leverage IT technology and data analytics for system management
  
- ❖ **On the gas side, utilities must adapt to changing consumption patterns and competition with electrification**
  - ❖ Make rates more in line with cost structure
  - ❖ Re-design customer class definitions to correspond to updated consumption patterns
  - ❖ Introduce rates for new gas uses and off-peak seasonal rates
  
- ❖ **In both industries, utility strategy should be focused on the *relationship* with the customer**
  - ❖ Rates should be tested through pilots and adjusted on the basis of pilot results
  - ❖ Tariff reform should be implemented gradually
  - ❖ Educating and informing customers is key to addressing current issues

# Presenter Information

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Ahmad Faruqui's consulting practice is focused on the efficient use of energy. His areas of expertise include rate design, demand response, energy efficiency, distributed energy resources, advanced metering infrastructure, plug-in electric vehicles, energy storage, inter-fuel substitution, combined heat and power, microgrids, and demand forecasting. He has worked for nearly 150 clients on 5 continents. These include electric and gas utilities, state and federal commissions, independent system operators, government agencies, trade associations, research institutes, and manufacturing companies. Ahmad has testified or appeared before commissions in Alberta (Canada), Arizona, Arkansas, California, Colorado, Connecticut, Delaware, the District of Columbia, FERC, Illinois, Indiana, Kansas, Maryland, Minnesota, Nevada, Ohio, Oklahoma, Ontario (Canada), Pennsylvania, ECRA (Saudi Arabia), and Texas. He has presented to governments in Australia, Egypt, Ireland, the Philippines, Thailand and the United Kingdom and given seminars on all 6 continents. His research has been cited in Business Week, The Economist, Forbes, National Geographic, The New York Times, San Francisco Chronicle, San Jose Mercury News, Wall Street Journal and USA Today. He has appeared on Fox Business News, National Public Radio and Voice of America. He is the author, co-author or editor of 4 books and more than 150 articles, papers and reports on energy matters. He has published in peer-reviewed journals such as Energy Economics, Energy Journal, Energy Efficiency, Energy Policy, Journal of Regulatory Economics and Utilities Policy and trade journals such as The Electricity Journal and the Public Utilities Fortnightly. He holds BA and MA degrees from the University of Karachi, an MA in agricultural economics and Ph. D. in economics from The University of California at Davis.

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Léa Grausz is an Associate at The Brattle Group's San Francisco office. Ms. Grausz has experience in dispute resolution and regulatory proceedings in energy markets, including: electricity and natural gas rate design; incentive-based ratemaking; oil and gas transmission pipeline ratemaking; Liquefied Natural Gas (LNG); upstream natural gas long-term contracting and pricing; French, Belgian and Italian gas market regulation and ratemaking; and liquidity assessment in global oil and gas markets.

Prior to joining The Brattle Group, Ms. Grausz worked for four years for Engie in Paris, France where she led the economic analysis for price negotiations and contract arbitrations in long-term gas supply contracts.

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Hallie Cramer is a Research Analyst at The Brattle Group's San Francisco office. She holds a BS in Economics from Duke University. Her experience at The Brattle Group includes work in utility regulatory rate cases, electricity and natural gas rate design, and economic input-output models.



# Selected Papers

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1. "Moving Forward with Electric Tariff Reform," with Mariko Geronimo, *Regulation*, Fall 2017.
2. "The Impact of Time-of-Use Rates in Ontario," with Neil Lessem, Sanem Sergici, and Dean Mountain, *Public Utilities Fortnightly*, February 2017.  
<https://www.fortnightly.com/fortnightly/2017/02/impact-time-use-rates-ontario>
3. "Dynamic pricing works in a hot, humid climate: evidence from Florida," with Neil Lessem and Sanem Sergici, *Public Utilities Fortnightly*, May 2017  
<https://www.fortnightly.com/fortnightly/2017/05/dynamic-pricing-works-hot-humid-climate>
4. "Curating the Future of Rate Design for Residential Customers." With Wade Davis, Josephine Duh, and Cody Warner. *Electricity Daily*, 2016.
5. "Efficient Tariff Structures for Distribution Network Services," With Toby Brown and Lea Grausz, *Economic Analysis and Policy*, 2015.

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6. “Smart By Default,” with Ryan Hledik and Neil Lessem, *Public Utilities Fortnightly*, August 2014.

<http://www.fortnightly.com/fortnightly/2014/08/smart-default?page=0%2C0&authkey=e5b59c3e26805e2c6b9e469cb9c1855a9b0f18c67bbe7d8d4ca08a8abd39c54d>

7. “Dynamic Pricing in a Moderate Climate: The Evidence from Connecticut,” with Sanem Sergici and Lamine Akaba, *Energy Journal*, 35:1, pp. 137-160, January 2014.

8. “Arcturus: International Evidence on Dynamic Pricing,” with Sanem Sergici, *The Electricity Journal*, 26:7, August/September 2013, pp. 55-65.

<http://www.sciencedirect.com/science/article/pii/S1040619013001656>

9. “Dynamic Pricing of Electricity for Residential Customers: The Evidence from Michigan,” with Sanem Sergici and Lamine Akaba, *Energy Efficiency*, 6:3, August 2013, pp. 571–584.

10. *Time-Varying and Dynamic Rate Design*. With Ryan Hledik, and Jennifer Palmer. Global Power Best Practice Series, The Regulatory Assistance Project (RAP), 2012.

# Selected Papers III

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11. “Dynamic Pricing of Electricity and its Discontents” with Jennifer Palmer, *Regulation*, Volume 34, Number 3, Fall 2011, pp. 16-22.

<http://www.cato.org/pubs/regulation/regv34n3/regv34n3-5.pdf>

12. “Dynamic pricing of electricity in the mid-Atlantic region: econometric results from the Baltimore gas and electric company experiment,” with Sanem Sergici, *Journal of Regulatory Economics*, 40:1, August 2011, pp. 82-109.

13. “California: Mandating Demand Response,” with Jackalyne Pfannenstiel, *Public Utilities Fortnightly*, January 2008, pp. 48-53.

[http://www.fortnightly.com/display\\_pdf.cfm?id=01012008\\_MandatingDemandResponse.pdf](http://www.fortnightly.com/display_pdf.cfm?id=01012008_MandatingDemandResponse.pdf)

14. “Quantifying Customer Response to Dynamic Pricing,” with Stephen S. George, *Electricity Journal*, May 2005.

## Selected Papers IV

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15. "2003 Manifesto on the California Electricity Crisis," with William D. Bandt, Tom Campbell, Carl Danner, Harold Demsetz, Paul R. Kleindorfer, Robert Z. Lawrence, David Levine, Phil McLeod, Robert Michaels, Shmuel S. Oren, Jim Ratliff, John G. Riley, Richard Rumelt, Vernon L. Smith, Pablo Spiller, James Sweeney, David Teece, Philip Verleger, Mitch Wilk, and Oliver Williamson. May 2003.

<http://www.aei-brookings.org/publications/abstract.php?pid=341>

16. "Analyzing California's Power Crisis." With Hung-po Chao, Vic Niemeyer, Jeremy Platt, and Karl Stahlkopf. *The Energy Journal* 22, no. 4 (2001): 29–52

17. "Residential Demand for Electricity by Time-of-Use: A Survey of Twelve Experiments with Peak Load Pricing." With J. Robert Malko, *Energy* 8, no. 10 (1983): 781–795.