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The Tariffs of Tomorrow

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Tomorrow has arrived

- Wi-Fi thermostats are ubiquitous
- Wi-Fi enabled appliances are here
- So are home energy management systems
- It is possible to finally get “prices to device”

Consumers are turning into producers

- Rooftop solar panels are appearing on homes and businesses
- Micro grids are being installed at universities and military bases
- Self-generation at large C&I customers is receiving increasing interest
- Battery storage is within reach

The future awaits

- Self-driving cars are being tested based on “deep learning” and may be safer than driven cars
- Ride sharing has gone global
- Electric cars are making their appearance felt on the road

The organic generation is here

- Consumers are turning “green and organic”
- They want low prices, high reliability and ultimately grid-independence
- They are very diverse in their preferences
- Barring the electrification of the transportation sector, annual sales growth is expected to remain below 1% for the indefinite future

The Grid has to be reinvented

- In her new book, “The Grid,” Dr. Gretchen Bakke, says that the current move toward more sustainable energy solutions will require “a serious reimagination of the grid. The more we invest in ‘green’ energy, the more fragile our grid becomes.”

- Bakke says that “the grid is worn down, it’s patched up, and every hoped-for improvement is expensive and bureaucratically bemired.”

Utilities are trapped in an existential dilemma

- The business model built by Samuel Insull was premised on continuing electrification of the economy
  - There were economies of scale in power plants. Bigger power plants produced electricity at lower costs than smaller plants. Falling costs meant falling prices which meant rising electricity sales and higher earnings for the utilities.
- Now that cycle has run out of steam
  - Smaller decentralized power plants are emerging on residential and commercial rooftops and larger consumers are engaging in co-generation.
- Notes Bakke, “The utilities don’t know how to upgrade existing technology without putting themselves out of business. Nor do they know how to continue with the existing infrastructure without going out of business.”

As uncertainties about sales growth loom large, it is time to move ahead with rate reform

- The bedrock principles of rate design find their best expression in the writings of Professor James Bonbright
- These assert that cost-causation should be the overriding principle in order to promote equity between customers and efficiency in the utilization of scarce capital and fuel resources

Rates should reflect costs

- Bonbright argued that a purely volumetric rate assumes that the total costs of the utility vary directly with the changes in the kWh output of energy.
  - He calls this “a grossly false assumption” and says such a rate “violates the most widely accepted canon of fair pricing, the principle of service at cost.”

- And, while discussing the Hopkinson rate, he said that such a “rate distinguishes between the two most important cost functions of an electric-utility system: between those costs that vary with changes in the system’s output of energy, and those costs that vary with plant capacity and hence with the maximum demands on the system (and subsystems) that the company must be prepared to meet in planning its construction program.”

Bonbright cited the earlier work of the British engineer, D. J. Bolton

- *"More accurate costing has shown that, on the average, only one-quarter of the total costs of electricity supply are represented by coal or items proportional to energy, while three-quarters are represented by fixed costs or items proportional to power, etc. If therefore only one rate is to be levied it would appear more logical to charge for power and neglect the energy."*

Commercial and industrial (C&I) rates conform with Bonbright

These rates are comprised of 3 elements

1. a fixed service charge to cover the costs of billing, metering and customer care;
2. a demand charge to cover the costs of the distribution grid and of transmission and generation capacity costs;
3. and an energy charge to cover fuel costs; this often varies by time-of-day and is sometimes dynamic

Residential tariffs of today = the residential tariffs of yesterday

They consist of a volumetric energy charge and a fixed charge

- Capacity costs are buried in the volumetric charge, using the load factor of the class
- The fixed charge does not fully recover the fixed costs of serving the customer

In 98% of the cases, the energy charge is flat and does not vary with time-of-use or location

The 2-part rate creates subsidies between customers with different load factors; neither does it promote efficient use of energy

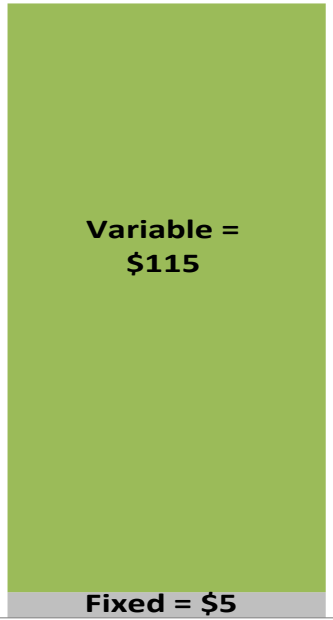
Two-part rates do not reflect any utility's cost structure

Cost categories	Utility's Costs	Customer's Bill

Variable ($/kWh)
- Fuel
- Operations & maintenance

Fixed ($/customer)
- Metering & billing
- Overhead

Size-related (demand) ($/kW)
- Transmission capacity
- Distribution capacity
- Generation capacity



It is time to change residential rates

Back in 1961, Professor Bonbright asked us to guard against the "tyranny of the status quo"

However, 2-part rates remain ubiquitous

They persist for two reasons

- Lack of advanced metering: but now about half the customers have smart meters
- A perception that residential customers are *not* ready for a change: yet they have welcomed change in every other walk of life

Energy costs should be recovered through time-varying rates

Economic efficiency

- The costs of supplying and delivering electricity vary by day, and by hours within a day; they also vary by location
- Unless consumers see this temporal-and-locational variation in prices, excess generation capacity will be built and kept on reserve to meet peak loads during a few hundred hours of the year

Equity

- Under flat energy rates, customers who consume relatively less power during peak periods subsidize those who consume relatively more power during peak periods

Grid capacity costs should be recovered through demand charges

Utilities should begin moving to a three-part rate, i.e., a monthly service charge, a demand charge and a time-varying energy charge

- Time-variation in energy rates does not eliminate the need for demand charges
- Georgia Power has ~2,200 C&I customers on real time pricing but these customers still face a demand charge for their use of the grid https://www.georgiapower.com/docs/rates-schedules/marginally-priced/6.20_RTP-DA.pdf
- Facility-based demand charges co-exist with dynamic pricing rates in California for C&I customers

It is déjà vu all over again

- “It is hoped that at some future date the three-part will be the exclusive rate for residence consumers. Such a rate may some day be demanded by good load-factor consumers.”
  - W. J. Greene, Electrical World, November 7, 1925.

How do we move into the future?

- We have to address the concerns about winners and losers
- We have to listen to customers and speak their language
- But we can’t sit still

Beginning the transition

- Offer 3-part rates as the default option and provide bill protection for the first three to five years
- Make them opt-in for customers with special circumstances
- Or get them to subscribe to a baseline load shape and buy deviations at spot

Presenter Information

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Ahmad Faruqui is an economist whose 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 more than a hundred clients on five 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 the governments of Australia, Egypt, Ireland, Philippines, Thailand and the United Kingdom and given energy seminars on all six continents. His research on the energy behavior of consumers has been cited in Business Week, The Economist, Forbes, National Geographic, The New York Times, the San Francisco Chronicle, the San Jose Mercury News, the 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 four books and more than 150 articles, papers and reports on energy matters. His work has appeared in peer-reviewed journals such as Energy Economics, Energy Journal, Energy Efficiency, and the Journal of Regulatory Economics and trade journals such as The Electricity Journal and the Public Utilities Fortnightly. He holds bachelors and masters degrees from the University of Karachi and a doctorate in economics from The University of California at Davis.