

# Resolving the Crisis in Rate Design

*“The vast literature on electricity tariffs shows so many different views that it would be difficult to be original in proposing tariff changes.”*

*-Hendrik Houthakker, 1951*

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# Rate design has always been an unfailing source of argument

*“There has never been any lack of interest in the subject of electricity tariffs. Like all charges upon the consumer, they are an unfailing source of annoyance to those who pay, and of argument in those who levy them. In fact, so great is the heat aroused whenever they are discussed at institutions or in the technical press, that it has been suggested there should be a “close season” for tariff discussions. Nor does this interest exaggerate their importance. **There is general agreement that appropriate tariffs are essential to any rapid development of electricity supply, and there is complete disagreement as to what constitutes an appropriate tariff.**”*

*-D.J. Bolton, Costs and Tariffs in Electricity Supply, 1938*

# Sales growth has fallen by half and become a serious financial threat to utilities

## When it's a problem...

- ◆ If fixed costs are recovered through volumetric rates, ability to make new investments and fully recover costs is compromised
- ◆ If a slow down in sales growth is coupled with higher costs, earnings are threatened
- ◆ Even with decoupling, sales reductions lead to upward pressure on rates

## It might be less of a problem...

- ◆ If there are timely and frequent rate cases
- ◆ If there is an accompanying improvement in operational efficiency
- ◆ If a larger share of costs are recovered through fixed charges

# The state of play

- ◆ To protect low income and small usage customers and to accommodate environmental groups, fixed costs have been recovered traditionally through variable charges in many states
- ◆ A national survey indicated an average value of \$8 per month for fixed charges but cost-of-service studies suggest that they should lie in the \$30 to \$60 per month range
- ◆ The result is an under-recovery of fixed costs when sales are lower than expected, which leads to earnings erosion
- ◆ The problem is exacerbated by the growing market penetration of distributed generation (DG) and rooftop solar, which is often promoted through net metering
- ◆ DG owners essentially use the utility's grid like a battery without paying for their fair share of the infrastructure

# Estimated intra-class subsidies for a utility in California

**Caveat: The analysis was performed a few years ago and probably understates today's magnitudes**

- ◆ **Overly inclining block rates** = \$500 million per year paid from high-use customers to low-use customers
- ◆ **Lack of time-of-use rates** = \$400 million per year paid from “flat” load profile customers to “peaky” load profile customers
- ◆ **Low income subsidy** = \$300 million per year paid to low-income customers by all other customers

# Net energy metering is yet another inter-customer subsidy, as seen in this example

Components of Electricity Retail Price (¢ / kWh)		
<b>Generation</b>	Fuel	3¢
	Capital	2¢
<b>Transmission</b>	Capital	3¢
<b>Distribution</b>	Capital	2¢
<b>Retail Price = 10¢ / kWh</b>		

## ◆ Typical customer usage and bill

- 1,000 kWh @ 10¢ / kWh = \$100

## ◆ Solar customer producing 600 kWh with net energy metering (NEM)

- Net usage = 1,000 kWh – 600 kWh = 400 kWh
- 400 kWh @ 10¢ / kWh = \$40

## ◆ However, the solar customer should actually pay \$82

- $(1,000 \text{ kWh} @ 10¢ / \text{kWh}) - (600 \text{ kWh} @ 3¢ / \text{kWh}) = \$100 - \$18 = \$82$

## ◆ The non-solar customers are paying the difference of \$42

# California's PUC has initiated a rate design reform proceeding

- ◆ A total of 18 proposals have been received and are under review
- ◆ Key topics in the debate include:
  - Tiered rates vs. Time-of-Use (TOU) rates vs. Flat rates, for the default rate
    - Dynamic pricing, such as PTR and CPP, as opt-in alternatives
  - Introduction of fixed charges
  - Introduction of demand charges
  - Resetting of low-income subsidies
  - Rethinking net energy metering tariffs
  - Developing transition strategies
  - Complementary programs that provide technology, consumer education or points-rewards systems to promote energy efficiency

# The ECON 101 view of how rates should be designed

- ◆ Some stakeholders argue that electricity rates should be based on marginal social cost (MSC)
- ◆ On top of MSC pricing, these parties argue that a fixed charge should be implemented to collect the difference between MSC-revenue and the revenue requirement
- ◆ This rate design oversimplifies the realities of modern electricity generation, transmission and distribution



# Back to the future of rate design

Year	Author	Contribution
1882	Thomas Edison	<ul style="list-style-type: none"><li>Electric light was priced to match the competitive price from gas light and not based on the cost of generating electricity</li></ul>
1892	John Hopkinson	<ul style="list-style-type: none"><li>Suggested a two-part tariff with the first part based on usage and the second part based on connected demand</li></ul>
1894	Arthur Wright	<ul style="list-style-type: none"><li>Modified Hopkinson's proposal so that the second part would be based on actual maximum demand</li></ul>
1897	Williams S. Barstow	<ul style="list-style-type: none"><li>Proposed time-of-day pricing at the 1898 meeting of the AEIC, where his ideas were rejected in favor of the Wright system</li></ul>
1946	Ronald Coase	<ul style="list-style-type: none"><li>Proposed a two-part tariff, where the first part was designed to recover fixed costs and the second part was designed to recover fuel and other costs that vary with the amount of kWh sold</li></ul>
1951	Hendrik S. Houthakker	<ul style="list-style-type: none"><li>Argued that implementing a two-period TOU rate is better than a maximum demand tariff because the latter ignores the demand that is coincident with system peak</li></ul>
1961	James C. Bonbright	<ul style="list-style-type: none"><li>Laid out his famous Ten Principles of Public Utility Rates</li></ul>

# Back to the future (concluded)

Year	Author	Contribution
1971	William Vickrey	<ul style="list-style-type: none"><li>Fathered the concept of real-time-pricing (RTP) in <i>Responsive Pricing of Public Utility Services</i></li></ul>
1976	California Legislature	<ul style="list-style-type: none"><li>Added a baseline law to the Public Utilities Code in the <i>Warren-Miller Energy Lifeline Act</i></li></ul>
1978	U.S. Congress	<ul style="list-style-type: none"><li>Passed the <i>Public Utility Regulatory Act (PURPA)</i>, which called on all states to assess the cost-effectiveness of TOU rates</li></ul>
1981	Fred Schweppe	<ul style="list-style-type: none"><li>Described a technology-enabled RTP future in <i>Homeostatic Control</i></li></ul>
2001	California Legislature	<ul style="list-style-type: none"><li>Introduced <i>AB 1X</i>, which created the five-tier inclining block rate where the heights of the tiers bore no relationship to costs. By freezing the first two tiers, it ensured that the upper tiers would spiral out of control</li></ul>
2001	California PUC	<ul style="list-style-type: none"><li>Began rapid deployment of California Alternative Rates for Energy (CARE) to assist low-income customers during the energy crisis</li></ul>
2005	U.S. Congress	<ul style="list-style-type: none"><li>Passed the <i>Energy Policy Act of 2005</i>, which requires all electric utilities to offer net metering upon request</li></ul>

# James Bonbright's *Ten Commandments*

1. Effectiveness in yielding total revenue requirements under the fair-return standard
2. Revenue stability and predictability
3. Stability and predictability of the rates themselves
4. Static efficiency, *i.e.*, discouraging wasteful use of electricity in the aggregate as well as by time of use
5. Reflect all present and future private and social costs in the provision of electricity (*i.e.*, the internalization of all externalities)
6. Fairness in the allocation of costs among customers so that equals are treated equally
7. Avoidance of undue discrimination in rate relationships so as to be, if possible, compensatory (free of subsidies)
8. Dynamic efficiency in promoting innovation and responding to changing demand-supply patterns
9. Simplicity, certainty, convenience of payment, economy in collection, understandability, public acceptability, and feasibility of application
10. Freedom from controversies as to proper interpretation

# Bonbright Reloaded for the 21<sup>st</sup> century in which utilities face competition

- ◆ *The ideal rate design should promote economic efficiency, preserve inter-customer equity, promote the financial health of the utility, promote transparency to customers and enable customer choice*

# Toward the rate design of the future

- ◆ The rate design would be a two-part tariff, consistent with past writings on the subject, comprising a monthly fixed charge and a volumetric energy charge
- ◆ The fixed charge may be expressed as a single number that applies to all customers but it would be better expressed as a demand charge
- ◆ The volumetric charge would reflect the time-of-day and seasonal variation in the marginal cost of electricity but it would be better expressed as a real-time price, facilitating the grid-integration of renewables if home automation comes to pass
- ◆ With the advent of advanced metering infrastructure (AMI), which now reaches one-quarter of US households and continues to grow, the future seems to be within our grasp and home automation may not be too far behind

# AMI takes the guesswork out of isolating peak demand

*“I remember discussing peak load and asking what caused it. I said, “Surely it is the electric cooker in the morning?” I was told that it was not the electric cooker. Then I said, “It must be the immersion heater.” But I was told it was not. We went through the whole range of electrical appliances, and I was told that none of them caused the peak load. What is worse, if one listens too long, those people will prove it. I warn the Minister not to listen too long to them...”*

*-The Right Hon. A. Robens, P.C., M.P.:  
The House of Commons, 28 Oct. 1952,  
(Cited in I.M.D. Little, The Price of Fuel, 953)*

# Other features of the rate design of the future

- ◆ **The rate design would not be encumbered with any subsidies to address social issues**
  - Not only does that conflict with the equity principle, it often has unintended consequences as seen in California
  - Social issues are best addressed through the tax code
- ◆ **To promote customer choice, the ideal rate design would be put forward as the default rate and be accompanied with one or two options**
  - For example, if customers do not wish to face a time-varying rate, they should be offered a flat rate that reflects the full cost of hedging them from price volatility

# Beginning the transition to the future

- ◆ There are going to be winners and losers in any transition
- ◆ For the end-state to be reached, a way has to be found to cushion the impact on the losers or the train will never leave the station
- ◆ A two-track approach is advisable
  - Manage expectations by making a strong case to the public as to why rates are being changed; this will involve a mass media and outreach campaign, not just an application to the PUC
  - Provide bill protection to the losers so they are held harmless in the first year and gradually exposed to the new rates over a three to five year transition period



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# Biography



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Ahmad Faruqui is a principal with *The Brattle Group* who specializes in analyses and strategy relating to the customer. He has helped design, monitor and evaluate energy efficiency investments for a wide range of electric and gas utilities and testified before a dozen state and provincial commissions and legislative bodies. He has also worked for the Alberta Utilities Commission, Edison Foundation, the Edison Electric Institute, the Electric Power Research Institute, the Federal Energy Regulatory Commission, the Ontario Energy Board and the World Bank. His work has been cited in publications such as *The Economist*, *The New York Times*, and *USA Today*, and he has appeared on Fox News and National Public Radio. The author, co-author or editor of four books and more than 150 articles, papers and reports, he holds a Ph.D. in economics from The University of California at Davis and B.A. and M.A. degrees in economics from The University of Karachi.

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