

The Brattle Group

California's Search for a Better Rate Design

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CFEE Rate Design Workshop
St. Helena, California

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The Iron Law of rate design

“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 that there should be a “close season” for tariff discussions.

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, Electrical Engineering Economics, London, 1938

Rate design in California is at a cross-roads

The problem

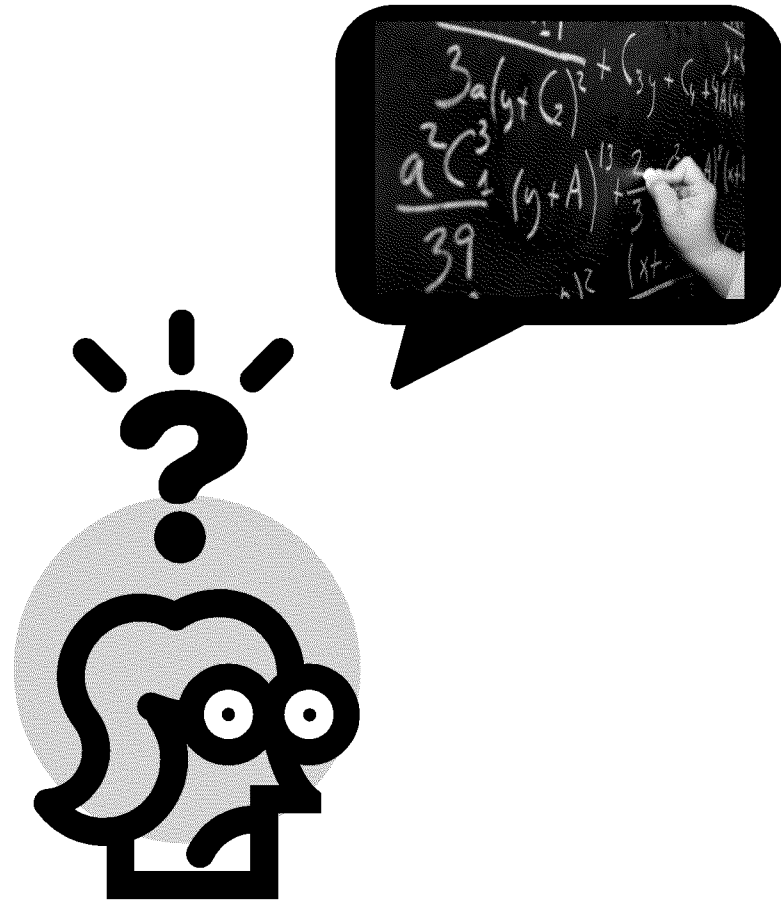
- ◆ Customers find it impossible to comprehend rates which represent a quilt-work of competing goals
- ◆ There is no link between customer actions and bill changes

The cause

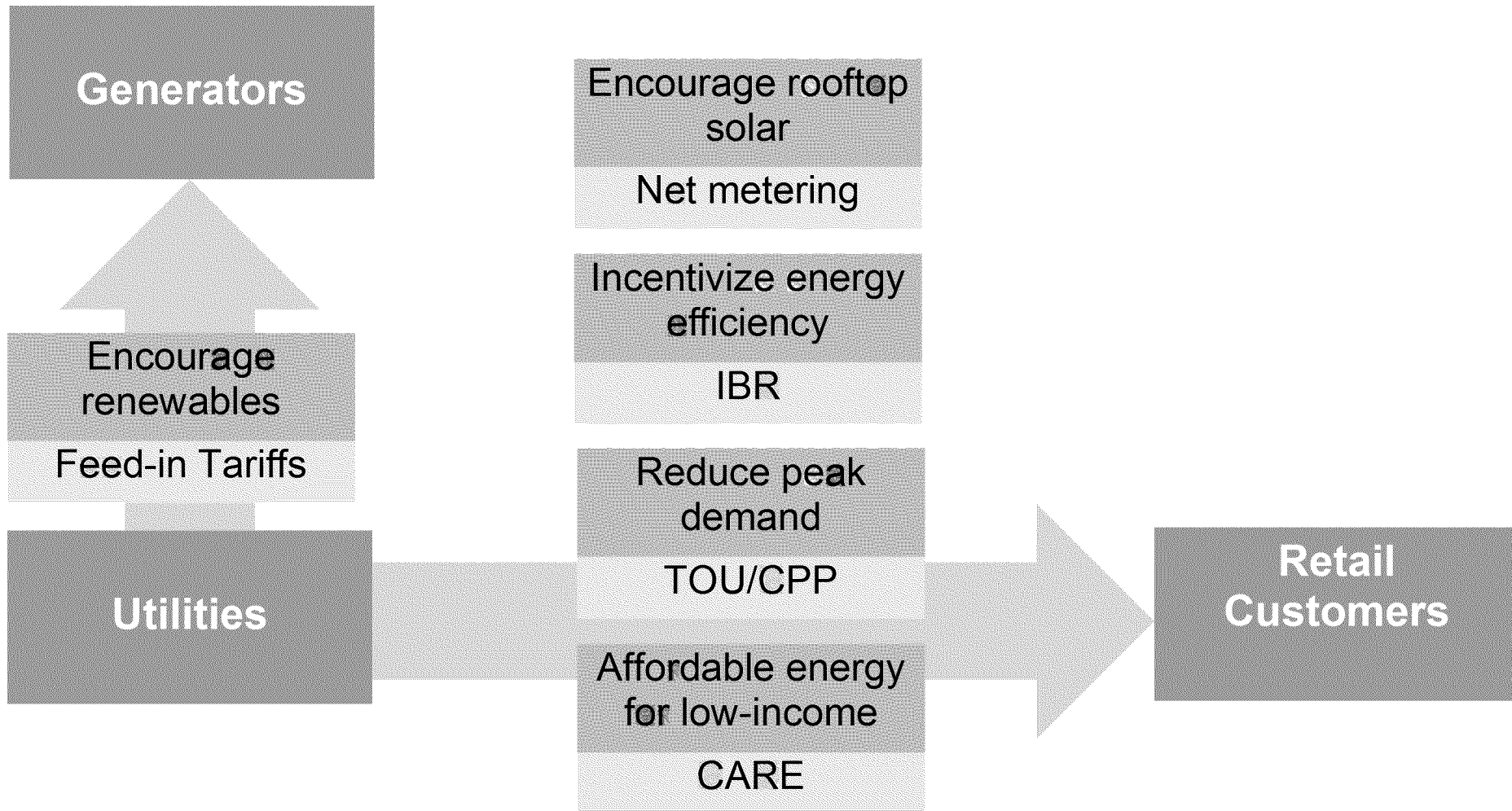
- ◆ Competing legislative & regulatory drivers

Searching for a solution

- ◆ Learn from experience elsewhere
- ◆ Move toward “law of one price” for buying or selling power



What lurks underneath the customer's bill?

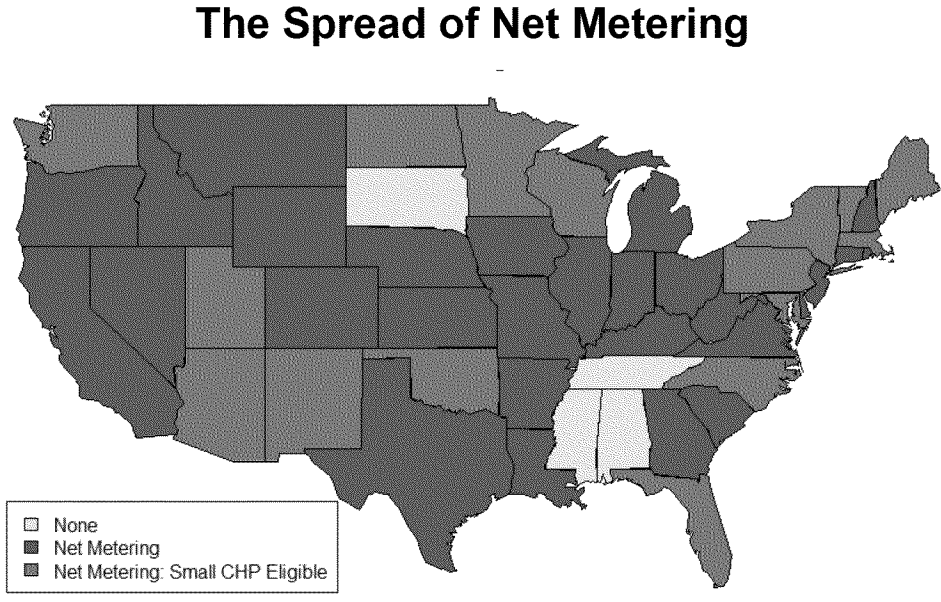
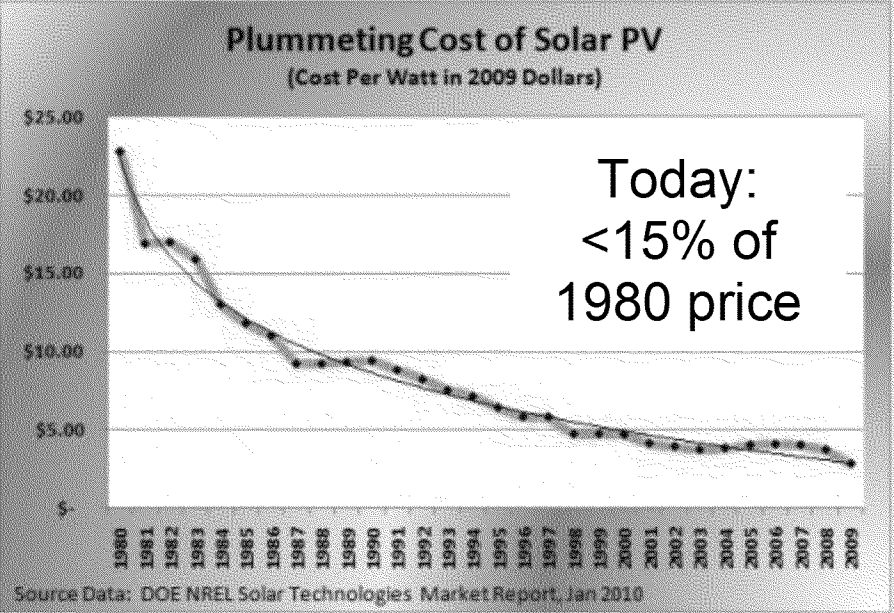


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Every year, the rates embody more than a billion dollars of cross-subsidies

- ◆ **AB 1X subsidy** = \$500 million per year paid from high-use customers to low-use customers
- ◆ **Lack of TOU** = \$400 million per year paid from “flat” customers to “peaky” customers
- ◆ **Low income subsidy** = \$300 million per year paid from non-CARE customers to CARE customers

Net metering policies and falling solar PV costs are encouraging rooftop solar installations...



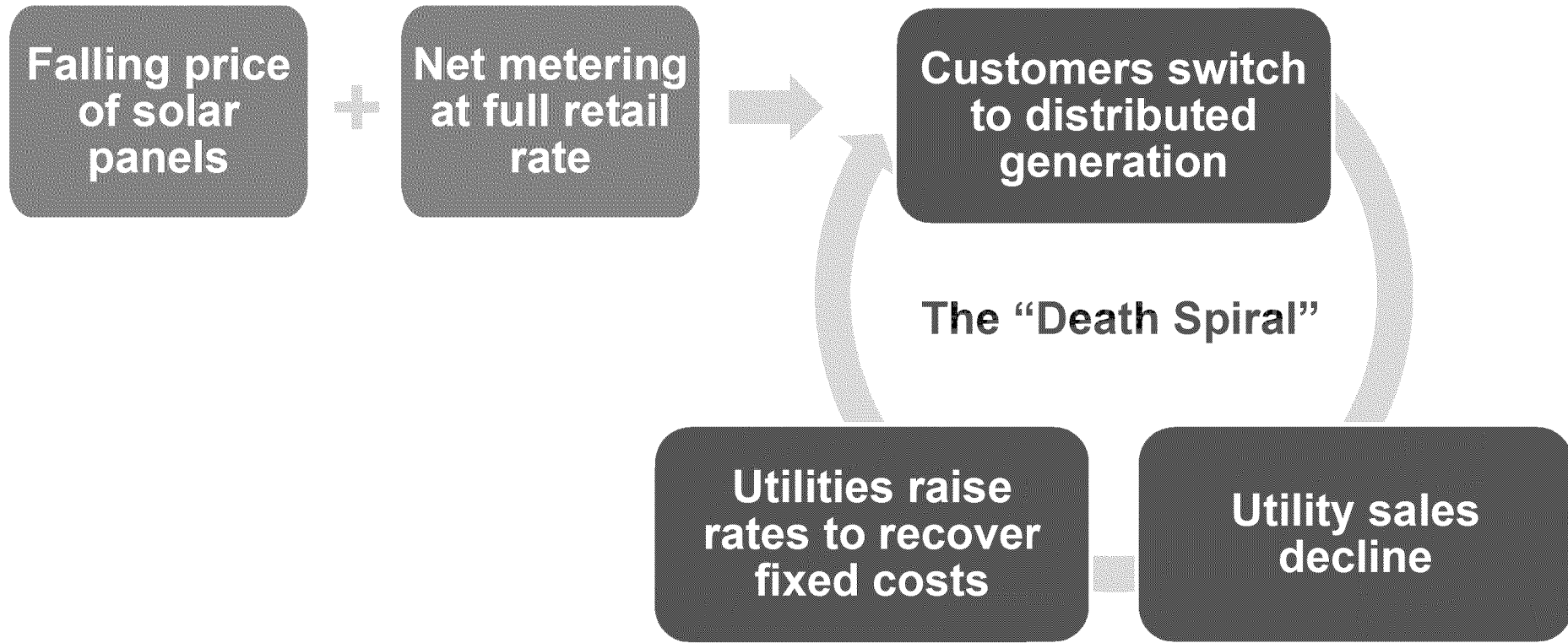
Sources: Interstate Renewable Energy Council, ACEEE

Solar PV prices have fallen 50% in the past two years

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... but this could have unintended consequences



Are network user charges a possible solution?

Feed-in tariffs (FITs) place additional burdens on consumers

Ontario, Canada

- ◆ Payments range up to 80 cents/kWh for rooftop solar (10x market price)
- ◆ Could increase customer bills by \$845 million

Australia

- ◆ FITs have been found to act as a regressive tax
- ◆ Low-income households are “taxed” at a rate 3x that of wealthy households
- ◆ Resulting \$4.7 billion subsidy to solar PV has spurred national debate

Spain

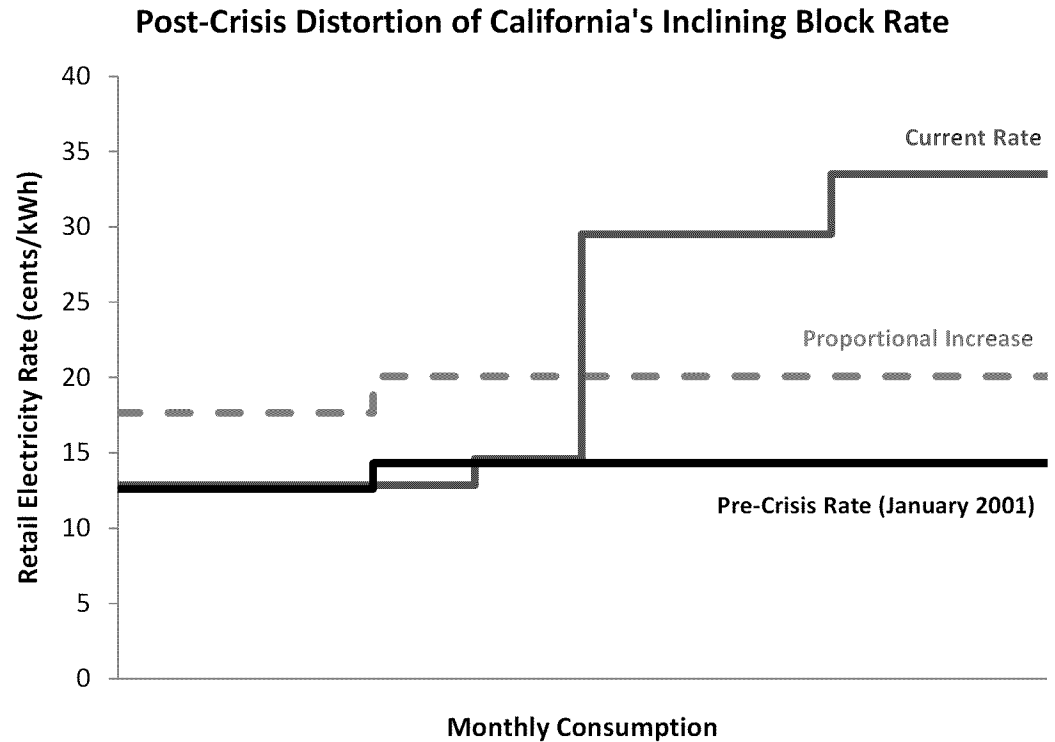
- ◆ Solar FITs were established as long-term contracts that did not account for potential future reductions in wholesale energy prices
- ◆ PVs were being paid 450 Euro cents/kWh while wholesale price was 50 Euro cents/kWh

Brings to mind the PURPA machines of 1978

The default inclining block rate (IBR) is a consequence of state legislation

The Problem

- ◆ Not cost-based
- ◆ Far too many tiers (British Columbia and Colorado just have two)
- ◆ Discourages otherwise beneficial night-time load (e.g., PEVs)



Why not reduce the number of tiers and decrease the price differential?

Default time-of-use (TOU) pricing may be a better alternative

There has been a resurgence of interest in TOU pricing

- ◆ The Ontario Energy Board has rolled out TOU pricing as the default tariff for all 4 million residential customers, replacing a two-tier inclining block rate
- ◆ Three pilots in California and Michigan have successfully tested a similar transition
- ◆ Utilities in Arizona have achieved 40% opt-in adoption rates from TOU rates

Cost-based TOU pricing could promote a number of California's energy objectives

- ◆ Promote adoption of rooftop solar & distributed energy storage
- ◆ Encourage off-peak charging of PEVs
- ◆ Incentivize purchase of more efficient air conditioners and windows and installation of insulation

Consider a “gedanken” experiment where the IBR is replaced with TOU

Based on simulations with actual data from one utility, we found that this

- ◆ Would reduce residential peak demand by 5% to 10%
- ◆ Would not result in an increase in electricity consumption
- ◆ So the goal of energy efficiency would not be sacrificed on the alter of demand response while renewables and PEV’s would be incentivized

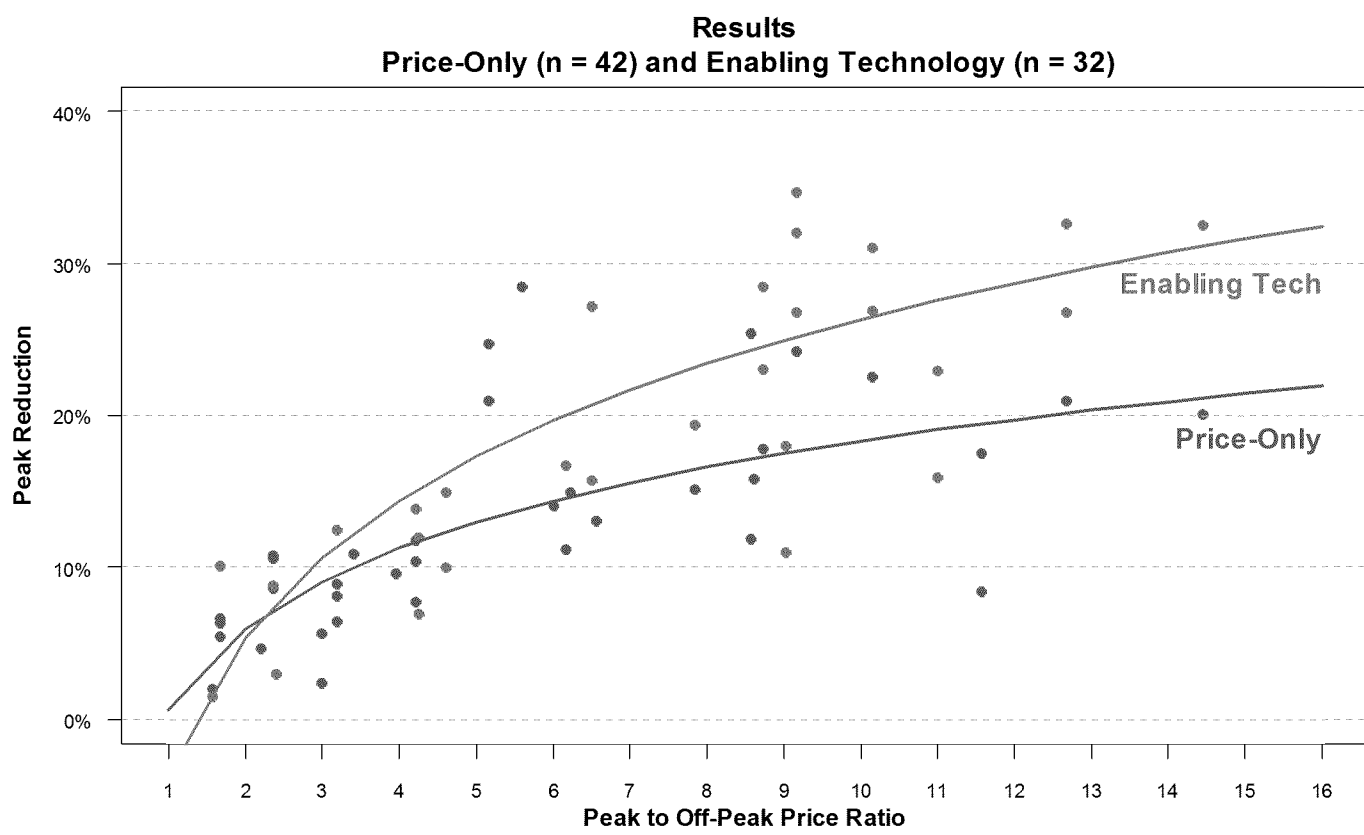
Combing a CPP rate with the TOU rate would further enhance the reduction in peak demand and improve wind integration

Further research on this transition needs to be conducted

- ◆ Distribution of rate impacts across customers
- ◆ Impact on rooftop solar adoption and smart PEV charging behavior

When presented with simple rates, we have ample evidence that customers do respond to price signals

The Arc of Price Response



This is based on 74 pricing tests across three continents during the past decade

What does this all suggest?

California should strive to observe the LAW OF ONE PRICE:

- ✓ Set rates based on marginal costs, adjusted to account for environmental externalities
- ✓ If subsidies are socially necessary, fund them through “energy stamps” that are funded through general revenues

It is possible to change default rates without unleashing a backlash

Option 1: Establish two-part rates

- ◆ Customers specify how much electricity they will “buy forward” at a known flat rate (which includes a “hedging premium”)
- ◆ All remaining usage is priced at marginal (time varying) costs

Option 2: Establish individual customer baselines

- ◆ Each customer is billed on their historical “baseline” profile at current rates
- ◆ Deviations from this profile are charged/credited at time-varying prices

Option 3: Provide 3-5 years of bill protection

- ◆ Customers are moved on to dynamic TOU rates
- ◆ Customers receive total bill protection in year 1 and this is gradually phased out over a three to five year period

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Dr. Ahmad Faruqui is a principal with *The Brattle Group* whose practice is focused on helping clients in the electricity industry encourage the smarter use of energy.

He has helped design, monitor and evaluate demand-side investments for more than three dozen utilities. He has testified before a dozen state and provincial commissions and legislative bodies and serves on the US Department of Energy's technical advisory group on smart grid pilots that involve customer behavior.

He has also worked for the Alberta Utilities Commission, the California Energy Commission, 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 *Business Week*, *The Economist*, *Forbes*, *National Geographic*, *The New York Times*, the *Wall Street Journal* and *USA Today* and he has appeared on *Fox Business 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 from The University of Karachi.

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Market-Based Rates

Market Design and Competitive Analysis