

US Regulatory Mechanisms For Promoting Energy Efficiency

Ahmad Faruqui, Ph.D.

**Sydney Australia
December 12, 2011**

The pursuit of energy efficiency has evolved over the past four decades

◆ **First wave—1970s**

- Information and public appeals

◆ **Second wave—1980s**

- Utility-funded rebate programs (no change in rates)

◆ **Third wave—1990s**

- Outsourcing to energy service companies

◆ **Fourth wave—2000s**

- Rewards to shareholders and decoupling

◆ **Fifth wave—2010s**

- Innovative rate design, legislated standards and behavioral economics

Today, energy efficiency is delivered through multiple channels

- ◆ **Information.** Educate consumers to control their energy bills by changing their energy using behavior
- ◆ **Market transformation.** Reach out to appliance manufacturers, dealers and contractors to transform the way in which they develop and install new technologies and to architects and builders to modify construction practices
- ◆ **Codes and standards.** Set minimum levels for appliances and buildings at the federal and state levels and enforce them at the local level
- ◆ **Rate design.** Incentive efficient energy use through inclining block rates
- ◆ **Spending.** Innovative mechanisms to shorten payback periods through rebates and “on bill” financing

Energy efficiency programs are operating on a scale comparable to power plant construction

- ◆ Leading state examples
 - Minnesota has saved over 2,300 MW since 1990
 - The Pacific Northwest has saved over 1,600 MW over a similar timeframe
 - California has saved over 1,500 MW in the last 5 years
- ◆ Ten states have EE programs on a scale large enough to displace power plants (saving an additional 0.4% to 1.0% or more of load each year)
 - California, Connecticut, Iowa, Massachusetts, Minnesota, New York, Oregon, Rhode Island, Vermont and Wisconsin

Source: RAP 2010

The leaders in energy efficiency are mostly located on the two coasts

Top 10 Current Energy Efficiency Savings by State

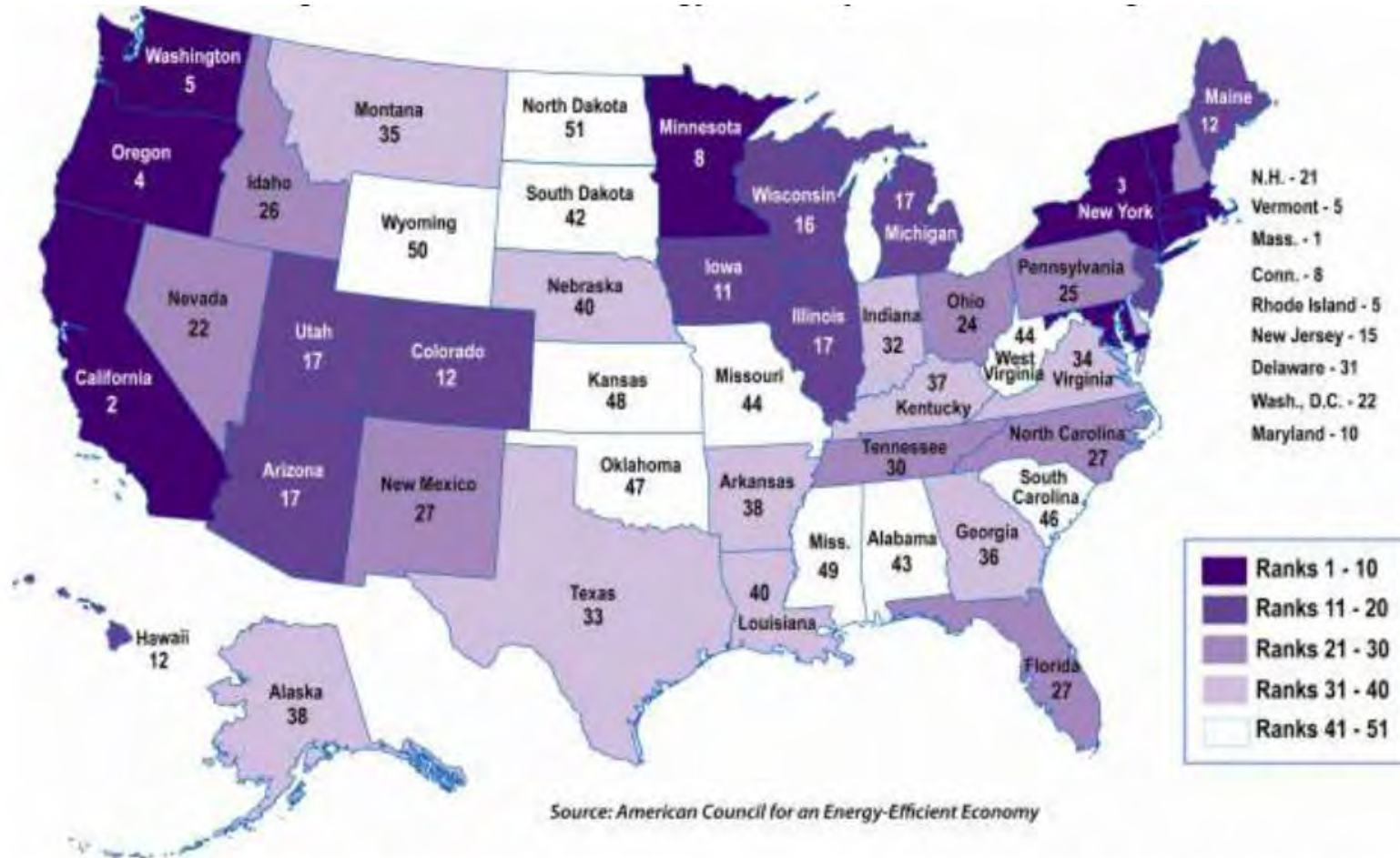
2007 data, ranked by total MWh savings

Rank	State	Total Incremental Electricity Savings (MWh)	Savings as Percent of Electricity Sales
1	CA	3,393,016	1.3%
2	WA	635,062	0.7%
3	NY	540,612	0.4%
4	MA	489,622	0.9%
5	WI	467,725	0.7%
6	MN	463,543	0.7%
7	TX	457,808	0.1%
8	OR	437,494	0.9%
9	CT	371,899	1.1%
10	FL	348,208	0.2%

Source: ACEEE 2009 State Energy Efficiency Scorecard

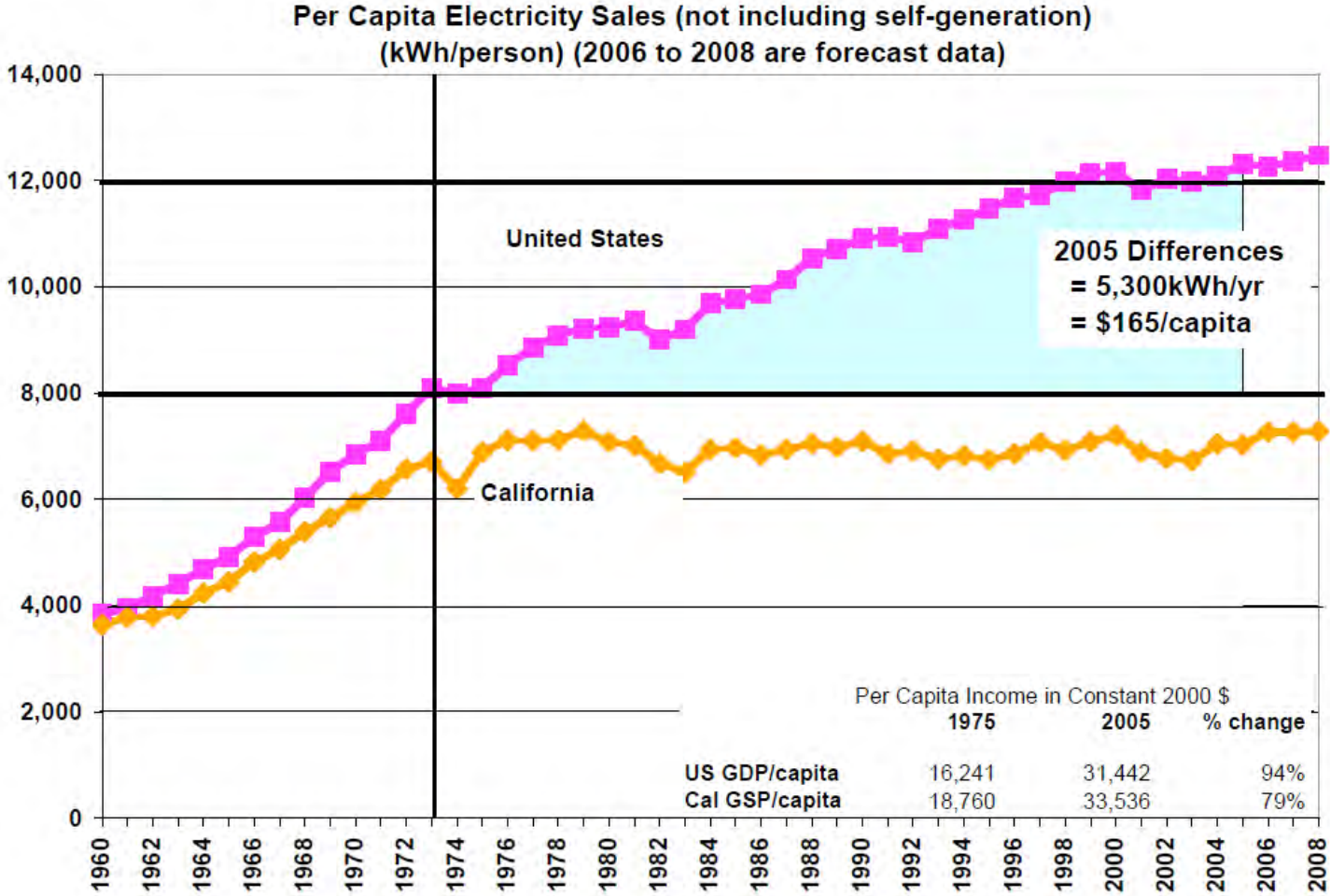
Source: DOE EERE News

Results vary greatly across states because of differences in regulatory mechanisms



Notes: Several states have the same score and tie for the same ranking, including 5, 8, 12, 17, 22, 27, 38, and 44. We do not score the U.S. territories due to lack of data, though hope to include them in future rankings.

California has demonstrated the viability of energy efficiency measures over many decades



Source: Rosenfeld, Arthur. *Energy Efficiency in California*. November 2008.

Alternative regulatory mechanisms

- ◆ Obligation on distribution utility, often accompanied by financial incentives
 - Most states, including California
- ◆ Obligation borne by a state agency
 - E.g., New York, Wisconsin
- ◆ Creation of an “Energy Efficiency Utility”
 - Efficiency Vermont; Oregon Energy Trust; Sustainable Energy Utility (Proposed in some Mid-Atlantic states)
- ◆ Legislation (Energy Efficiency Resource Standards)
- ◆ Performance contracts with 3rd parties
 - Texas
- ◆ Aggregators bidding into regional capacity markets
 - New England ISO and PJM Forward Capacity Markets

State commissions are incentivizing the utilities to engage in energy efficiency

- ◆ Provide rapid energy efficiency *cost recovery*, which can become a major stumbling block
- ◆ *Decouple* sales from revenues, allowing fixed costs to be recovered
- ◆ *Reward shareholders* for engaging in a business that appears to be at counter-purposes with the core business

Shareholder reward mechanisms come in three flavors

- ◆ Utilities get a share of the savings created by the EE programs (California, Colorado, Oklahoma, others)
- ◆ Utilities capitalize their DSM expenditures into the rate base and earn a bonus return-on-equity (Nevada)
- ◆ Utilities get a share of the avoided power plant costs (Duke Energy)

The most popular one is shared savings

- ◆ Net benefits measured by the Total Resource Cost (TRC) test can be measured immediately after a program year is completed and installations are validated
 - Regulators choose a “share” for the utility, which is made contingent on the achievement of energy savings and peak demand reduction goals
 - The incentive can be collected in a succeeding year or spread over a longer collection period to allow for measurement and verification

The California example

- ◆ Utilities get a share of net TRC test savings
 - 9-12% depending on how close they come to meeting EE savings goals over 2006-08
 - If the utilities achieve 100% of the goals, the verified net benefits would be \$2.7 billion
 - Then \$2.4 billion of those net benefits will go to ratepayers and \$323 million to utility shareholders
- ◆ If utility portfolio performance falls below 65% of the savings goals, then financial penalties begin to accrue

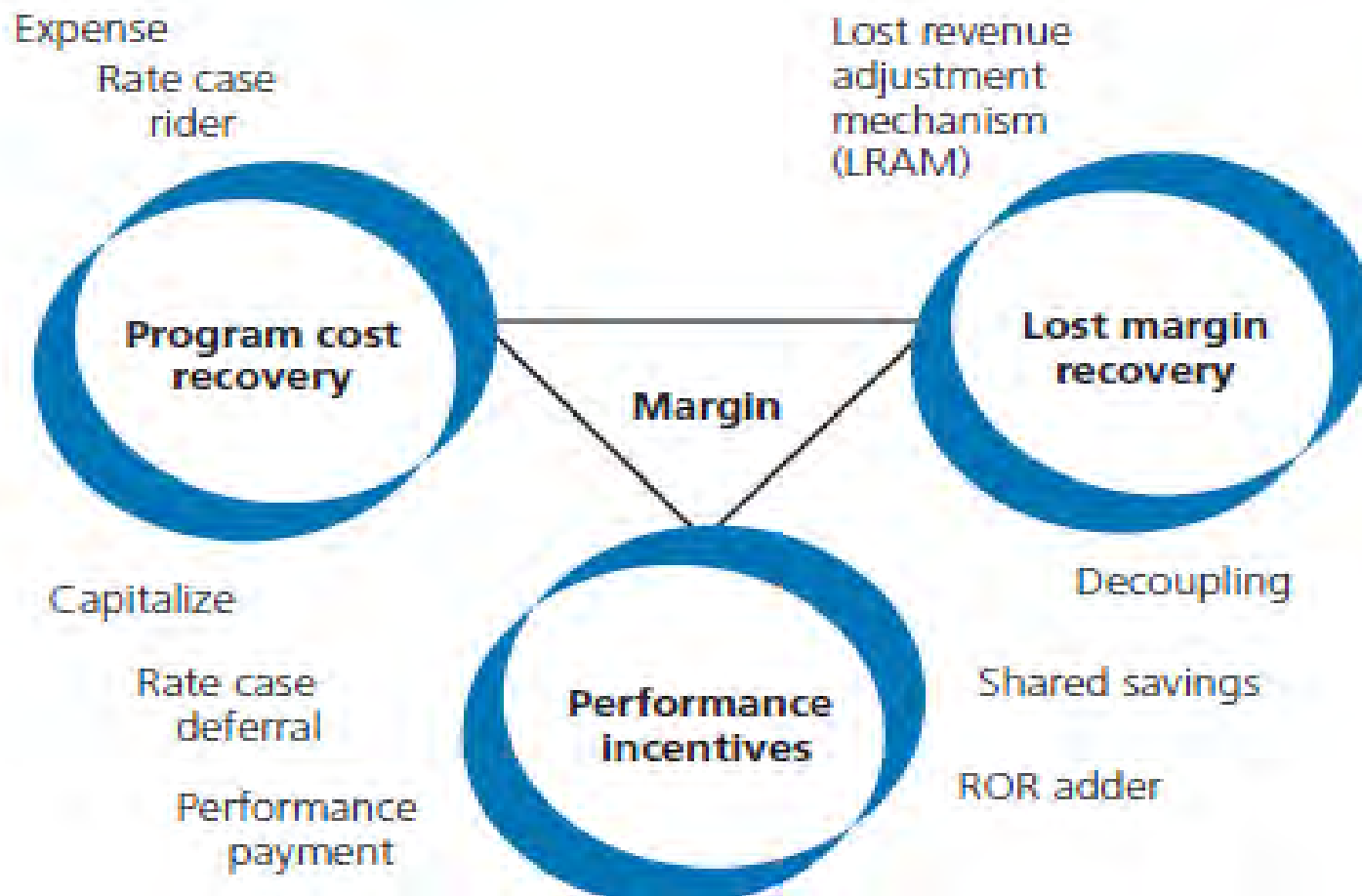
Capitalization is another model

- ◆ EE expenditures are capitalized as a regulatory asset, which earns the allowed return on equity (RoE)
- ◆ The regulatory asset is amortized just like a power plant, but over a shorter period
- ◆ This spreads the recovery of costs over time, but adds carrying costs
- ◆ Up to 2009, the PUC Nevada regularly approved RoE “adders” of 500 basis points on the equity portion
- ◆ However, Nevada has recently changed to expensing costs and allowing lost fixed revenue recovery

Duke's "Save-a-Watt" model has evolved

- ◆ In return for doing a certain amount of EE, the utility "sells Save-a-Watts" at a price below the avoided costs of not building power plants, 50% - 75%
- ◆ No explicit cost recovery
- ◆ The utility proposed full control and risk of the EE programs, but has accepted significant limits to gain approval
- ◆ In exchange, Save-a-Watt now includes lost fixed cost recovery, with a limit of three years for impacts of the EE measures

The regulatory mechanisms interact to enable energy providers to deliver energy efficiency



Source: U.S. EPA 2007

Legislation is being used to push the envelope

Many states are setting targets for energy efficiency

- ◆ Under Maryland's EmPOWER initiative, the state will reduce energy consumption by 15% by 2015
- ◆ Pennsylvania's Act 129 requires a 1% reduction in consumption by 2011, a 3% reduction in consumption by 2012 and a 4.5% reduction in peak demand by 2013
- ◆ The Arizona Corporation Commission requires electric utilities to reduce the amount of power they sell by 22% by 2020
- ◆ New Mexico has a stated goal of a 20% reduction by 2020

Types of Energy Efficiency Resource Standards

◆ Statewide EERS

- Set by legislation
- Managed by regulators
- All utilities to achieve a certain level of savings
- Examples: California, Massachusetts, New York

◆ Tailored utility targets

- Set by regulators; varies by utility
- Examples: Colorado, Vermont, Oregon

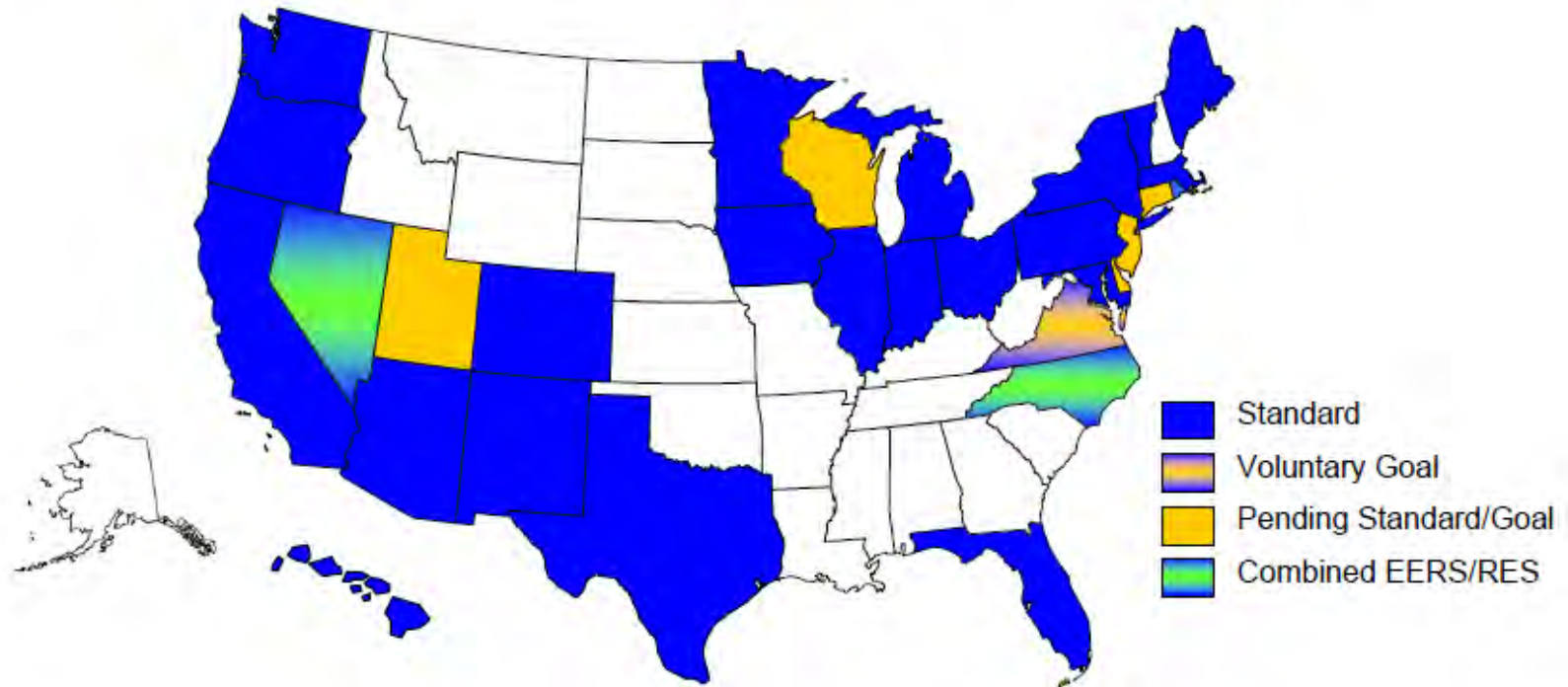
◆ Combined EERS-RPS

- Energy efficiency and renewable energy are considered jointly

U.S. States with EERS

State Energy Efficiency Resource Standard (EERS) Activity

November 2010



Twenty-four states have enacted energy savings goals, or Energy Efficiency Resource Standards (EERS), through legislation and several states have a pending EERS

Source: RAP 2011

Common elements in regulatory mechanisms

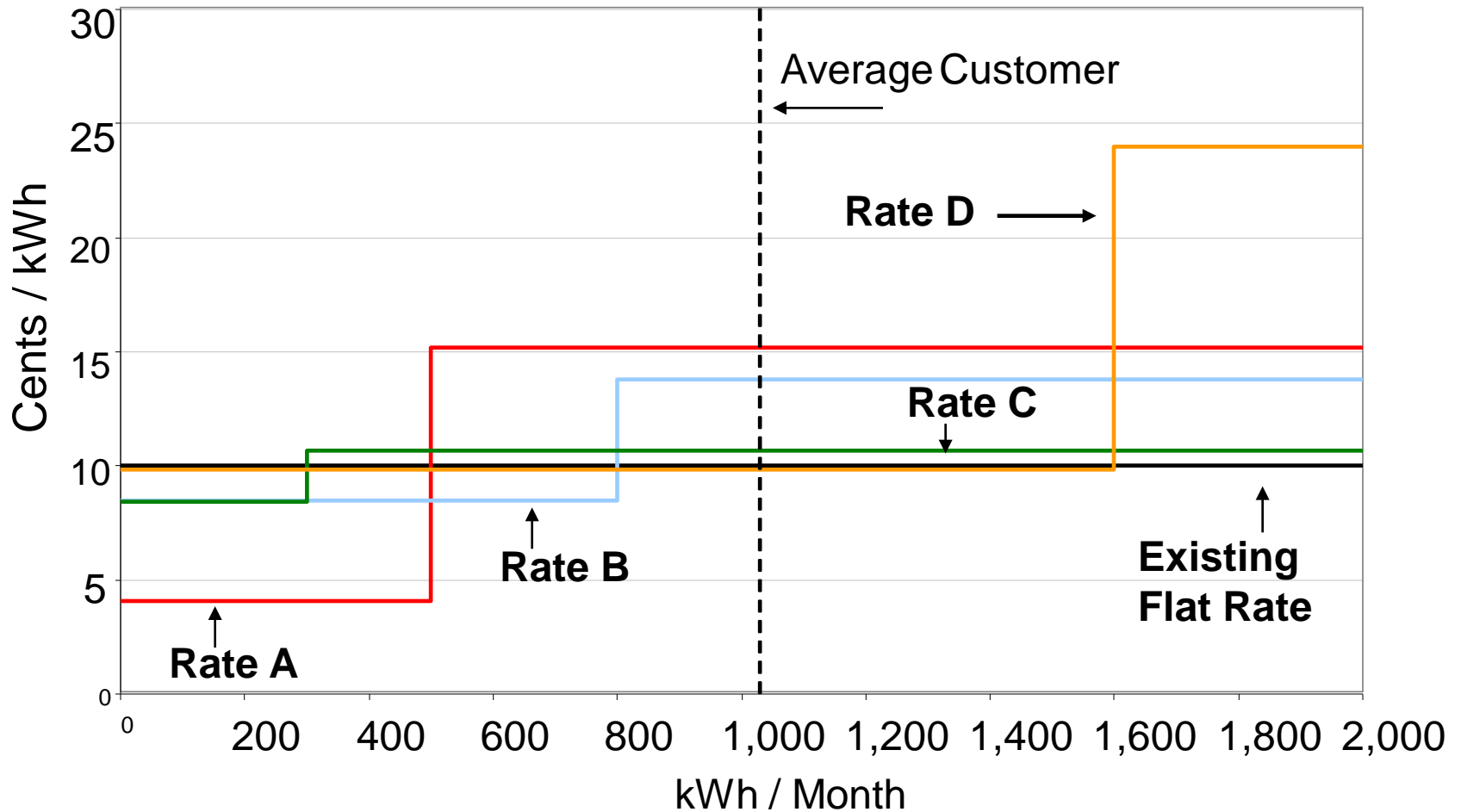
- ◆ Well-defined targets (implementation of all cost-effective energy efficiency as measured with the TRC test)
- ◆ Flexible spending cap to deliver adequate funding
- ◆ Streamlined regulatory approvals
- ◆ Energy provider protection from sales erosion
- ◆ Multi-year programme cycle
- ◆ Consolidated gas and electricity measures
- ◆ Motivation for investor-owned utilities
- ◆ Built-in stakeholder engagement process
- ◆ Standardized approach to measurement and verification
- ◆ Standardized databases on energy efficiency measures

Source: IEA

Program types

- ◆ Inclining block rates
- ◆ Behavioral change programs
- ◆ Financing programs

Four illustrative rate designs



Behavioral programs

Bill comparisons with a group of peers sent through the mail with smiling faces and tips how to move up in the ranking

Web-portals that provide you your load profile and a disaggregation to large end-uses

In-home displays that show how much power you are using when and how much it is costing you

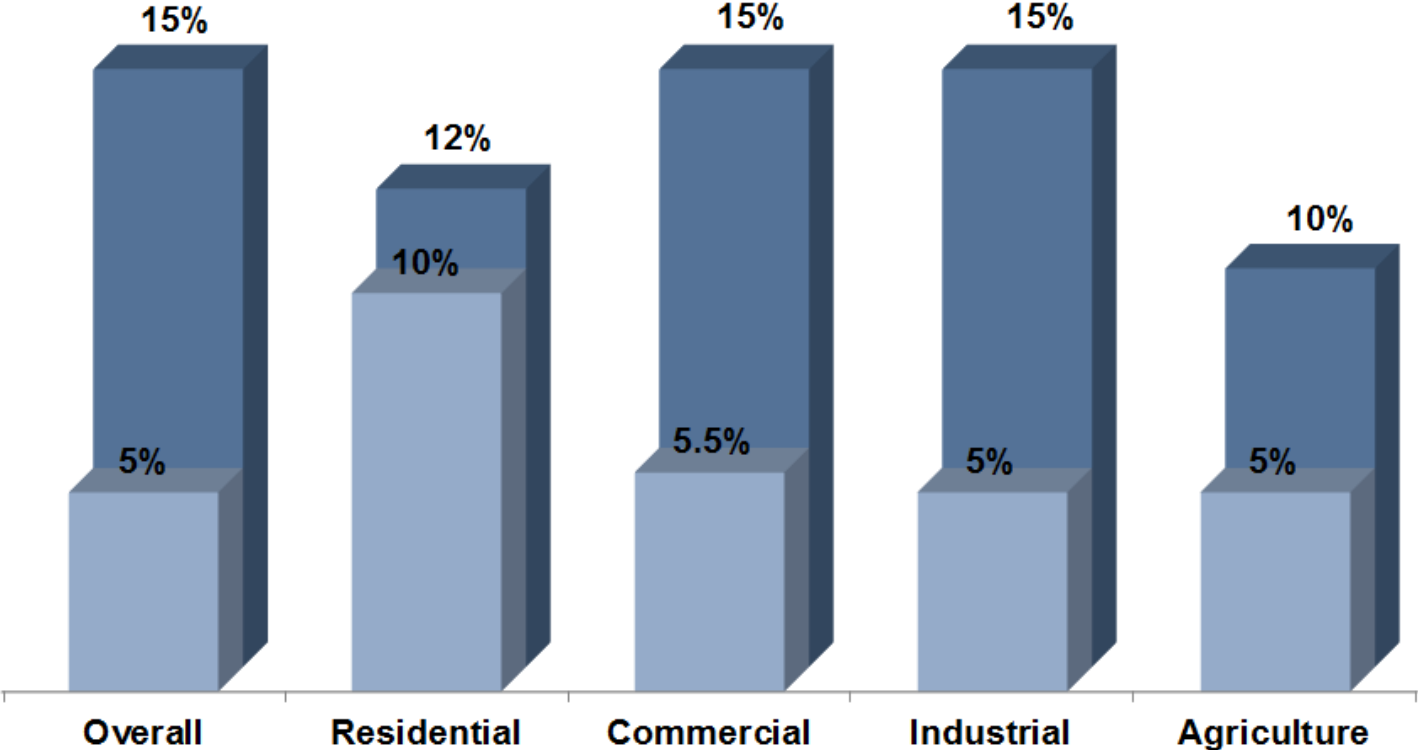
Energy Orbs that signal expensive and inexpensive times to use energy

On-bill finance program designs

- ◆ Two different financing mechanisms
 - on-bill financing through a utility tariff;
 - on-bill financing through loans from the utility company (on-bill loans).
- ◆ Is repayment assigned to the individual or the meter?
- ◆ Tariff-based systems allow for a longer payment period, decreasing monthly paybacks, allowing renters to benefit, and allowing the obligation to not appear as consumer debt
- ◆ Tariff-based systems require regulatory approval (for increasing the rates) while on-bill loans can be taken on by the providers without approval
- ◆ Early programs focused on medium payback equipment and appliances
 - Water heaters, windows, heating & cooling systems
- ◆ Latest developments (NYSERDA) focused on deep retrofits

A survey of 50 experts shows that energy efficiency is going to have a big impact by 2020

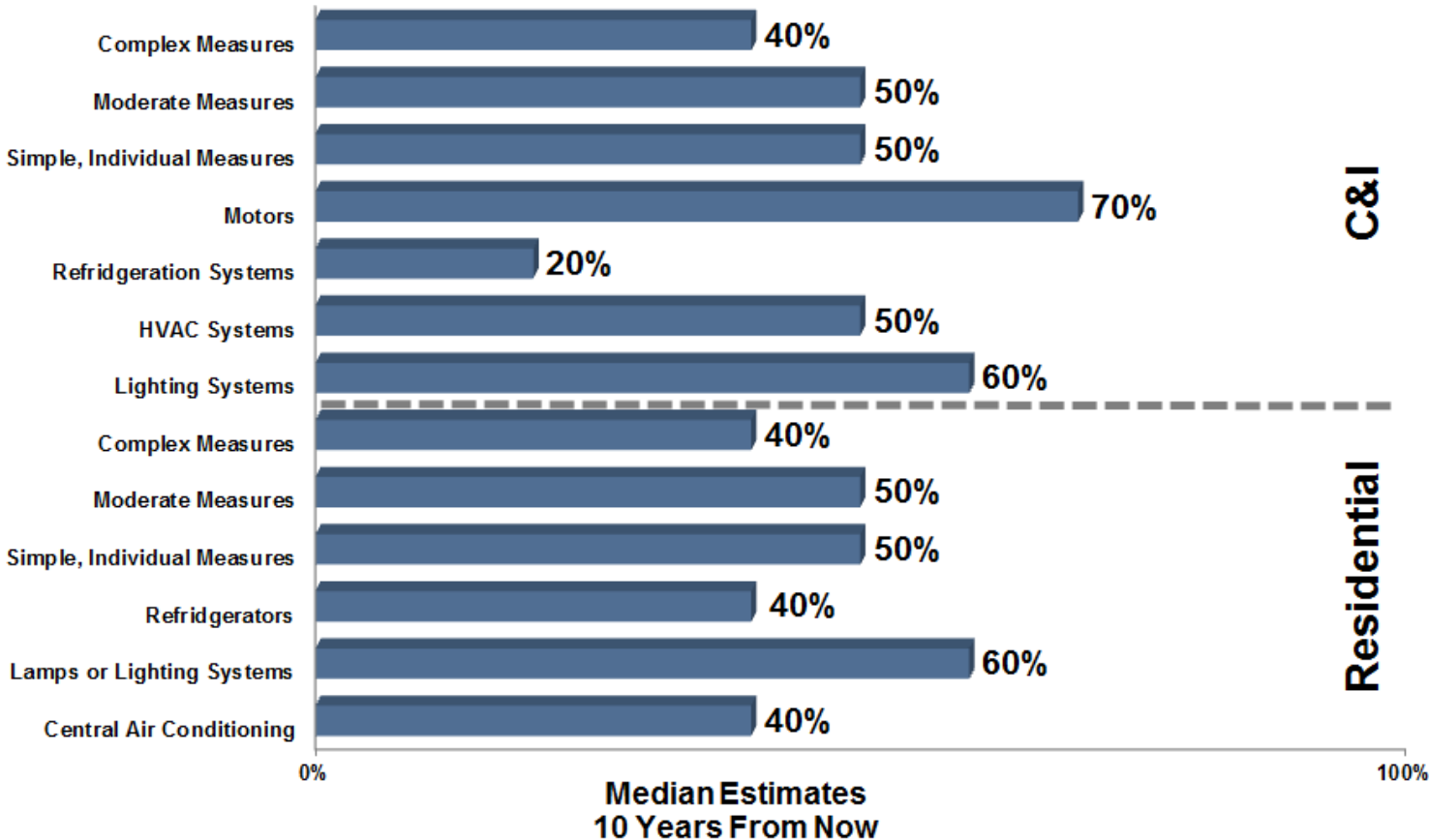
Electric Energy Efficiency Savings Forecast



**Median Low and High Estimates
10 Years From Now**

The highest level of customer engagement is projected in C&I motors and residential lighting

**Electric Energy Efficiency
Percent of Customers Choosing High-Efficiency Options**



Conclusions

The intensity of energy efficiency varies widely across states, with some showing significant gains and others showing only modest improvements

One of the key drivers behind this variation is the intensity of regulatory pressure

Regulatory mechanisms vary across states, depending on the state's history with energy efficiency, the political and cultural make-up of the policy makers, and on the pre-disposition of the state's population toward energy efficiency

References

- Consortium for Energy Efficiency, “State of the Efficiency Program Industry – 2009 Expenditures, Impacts and 2010 Budgets,” December 10, 2010.
- Cowart, Richard, “Efficiency Obligations and EE Resource Standards,” Regulatory Assistance Project, April 12, 2011. PowerPoint presentation.
- Faruqi, Ahmad, “Inclining Toward Efficiency,” *The Public Utilities Fortnightly*, August 2008, http://www.fortnightly.com/display_pdf.cfm?id=/08012008_CommissionWatch.pdf
- Faruqi, Ahmad and Doug Mitarotonda, “Energy Efficiency and Demand Response in 2020: A Survey of Expert Opinion,” *The Brattle Group*, November 2011, http://www.brattle.com/_documents/UploadLibrary/Upload990.pdf
- Faruqi, Ahmad, Sanem Sergici, and Ahmed Sharif, “The Impact of Informational Feedback on Energy Consumption – A survey of the experimental evidence,” *Energy*, Volume 35, Issue 4, Special Demand Response Issue, April 2010, pp. 1598-1608.
- Sciortino, Michael, et. al, “The 2011 State Efficiency Scorecard,” American Council for an Energy-Efficient Economy (ACEEE), report no. E115, October 2011.

Biography

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 demand-side 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.

About *The Brattle Group*

The Brattle Group provides consulting and expert testimony in economics, finance, and regulation to corporations, law firms, and governments around the world.

We combine in-depth industry experience, rigorous analyses, and principled techniques to help clients answer complex economic and financial questions in litigation and regulation, develop strategies for changing markets, and make critical business decisions.

Climate Change Policy and Planning
Cost of Capital
Demand Forecasting and Weather Normalization
Demand Response and Energy Efficiency
Electricity Market Modeling
Energy Asset Valuation
Energy Contract Litigation
Environmental Compliance
Fuel and Power Procurement
Incentive Regulation

Rate Design, Cost Allocation, and Rate Structure
Regulatory Strategy and Litigation Support
Renewables
Resource Planning
Retail Access and Restructuring
Risk Management
Market-Based Rates
Market Design and Competitive Analysis
Mergers and Acquisitions
Transmission

Contact *Ahmad Faruqi* at 925-408-0149, Ahmad.Faruqi@Brattle.com, or at *The Brattle Group*, 201 Mission Street, Suite 2800, San Francisco, CA 94105