

Policies for Energy Provider-Delivered Energy Efficiency in North America

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THE **Brattle** GROUP

The Five Waves of Energy Efficiency

- **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, legislation and behavioral economics

Energy Efficiency Requires Multiple Delivery 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.** Shorten payback periods by funding and financing of energy efficiency measures

US Energy Efficiency Programs Are Now Operating on a Scale Comparable to Power Plant Construction

- Leading state examples
 - New England estimated savings of 514MW and 3,502GWh between 2008 and 2011
 - MA utilities saved about 100MW in 2012
 - ISO NE cleared 1,500 MW of EE in 2012 auction (for 2015/16), equal to 4.5% of total capacity requirement
 - PJM cleared over 800 MW of EE in latest forward capacity auction
 - Several states have annual savings goals of 2% or more (Maryland, Arizona, Vermont, NY, RI, Hawaii)
 - The Pacific Northwest saved 254 MW in a single year (2010)
 - California has saved over 2,350 MW in 2009 and 2010 alone

Source: ISO NE, ACEEE, RAP, CEC

The Leaders in Energy Efficiency Are Mostly Located on the Two Coasts

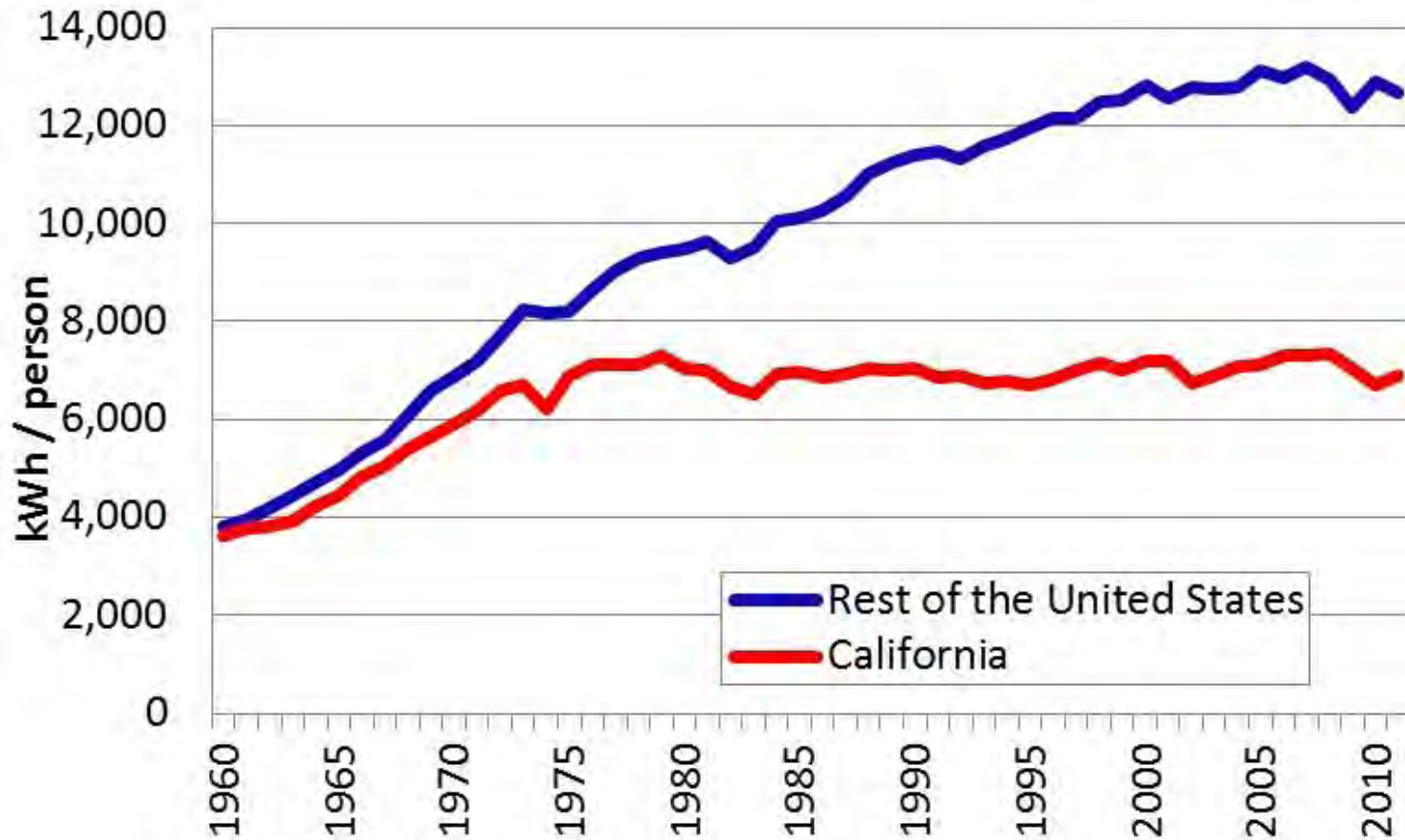
Top 10 Current Energy Efficiency Savings by State

2010 data, ranked by total MWh savings

Rank	State	2010 Net Incremental Savings (GWh)	% of Retail Sales
1	California	4,617,000	1.79%
2	New York	1,215,844	0.84%
3	Minnesota	809,598	1.19%
4	Washington	763,099	0.84%
5	Ohio	722,929	0.47%
6	Arizona	710,564	0.98%
7	Texas	688,103	0.19%
8	Illinois	659,532	0.46%
9	Massachusetts	628,709	1.10%
10	Wisconsin	527,404	0.77%

Source: ACEEE 2012 State Energy Efficiency Scorecard

California Has Demonstrated the Viability of Energy Efficiency Measures Over Many Decades



Source: EIA, NRDC

Governmental Policies to Promote Energy Efficiency

- Obligation on distribution utility, often accompanied by financial incentives
 - Most states, including California
- Obligation borne by a state agency
 - E.g., New York, Oregon, Vermont, 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 Several 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 had it, but has changed, Massachusetts has it now)
- Utilities get a share of the avoided power plant costs (Duke, accepted constraints to gain approval)

The Most Popular One is Shared Savings

- Net benefits (measured by the 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

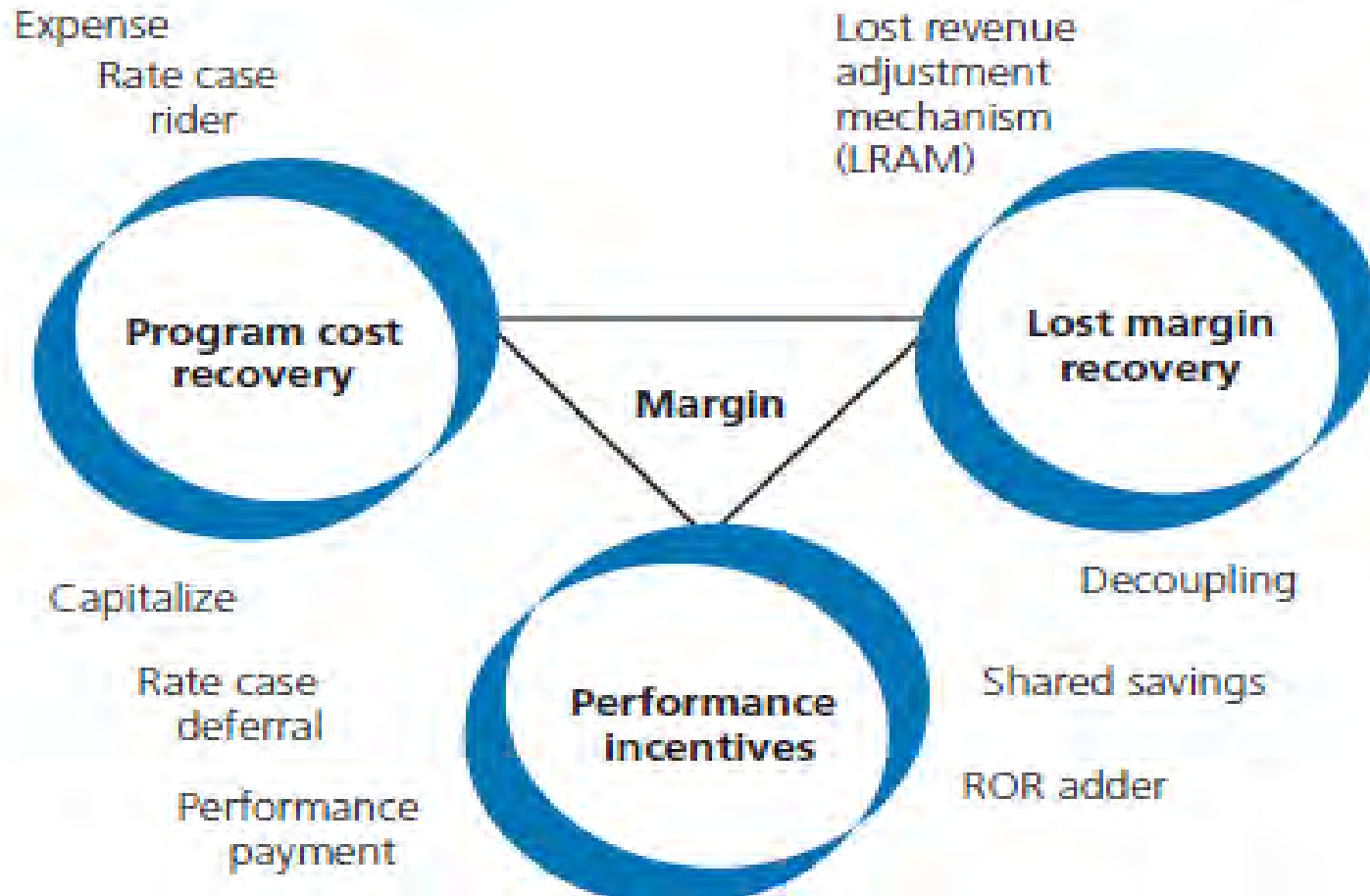
The California Example

- Until 2009, utilities got 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
- 2010-12: Management Fee plus bonus tied to ex-ante review of savings (no ex-post measure; see more below)
- 2013-14: under review

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

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
- Massachusetts Green Communities Act requires utilities to buy ALL cost effective energy efficiency prior to any supply side measures (implemented through 3-year plans by the utilities approved by the PUC)

Program Types

- Incentive programs
- Replacement programs
- Financing programs

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

Examples

Midwest Energy, Inc. – How\$mart

- The How\$mart program, run by Midwest Energy, finances residential and commercial energy efficiency improvements through a revolving fund. The revolving fund is reimbursed through a tariff (surcharge) applied to the customer's monthly utility bill. This program is unique because the surcharge is tied to the property and not the borrower. So the property owner or tenant is only responsible for the surcharge payment while they own or occupy the property.
- Responsibility: Property – tariff (surcharge) is tied to the property's energy meter, so responsibility lies with party responsible for the utility bill (property owner, tenant, or homeowner)
- Level of funding: Full – as long as surcharge is less than 90% of projected energy cost savings.
- Timing of funding: Upfront – Program pays contractor upon completion of work. Program will be reimbursed by customer via surcharge to customer's utility bill.
- Type of funding: Revolving
- Repayment mechanism: On-bill tariff (surcharge).

New York on Bill Recovery Financing

- Tariffed obligation – charge stays with the meter
- On-bill recovery charge treated like utility charges – consumer safeguards for deferred payment arrangements, notices for termination of service; termination of service; late payment charges
- Mortgage recorded for repayment obligation
- Statewide program with 3rd party funding – not utility funded or utility obligation
- Funding provided to address utility billing system modifications
- Expected to be financed through capital markets

NY Program Enabled by Legislation

- Establishes an on-bill recovery charge for repayment of loans for energy efficiency improvements through GJGNY program
- Residential, Small Business/NFP, Multifamily
- Residential program requires comprehensive Home Performance with ENERGY STAR audit and contractor
- Loan limit - \$25,000 residential; \$50,000 small business/NFP, \$500,000 multifamily
- Utility customers of: Central Hudson, Con Edison, NYSEG, National Grid, Orange & Rockland, Rochester Gas & Electric, and Long Island Power Authority
- Covers electric, gas, and heating fuel measures – charge placed on electric bill, unless the majority of savings result

Loan Transferability

- Each loan secured by mortgage upon real property
- Subordinate to any current or future mortgage on property
- May not be used to force payment or foreclose
- Prior to sale of property, seller must provide written notice to purchaser – mortgage will appear on title search
- Unless satisfied prior to sale, on-bill recovery charge survives changes in ownership – arrears at time of transfer are responsibility of incurring customer, unless expressly assumed by purchaser

Some doubts are (re-)emerging about EE investments

- Recent (re-)emergence of rebound issue
 - More energy efficiency reduces the cost of consuming energy and increases disposable income, which in turns could lead to losing some (or potentially all) of the savings
 - Fierce discussion in the academic realm
 - Some European countries have begun to look at rebound explicitly (UK)
- In the US (outside of California) and in many other countries, it turns out that there is very little ACTUAL measurement of ex-ante/ex-post energy consumption after energy efficiency measures are implemented
 - Savings typically = measures installed * engineering estimate of kWh savings
- Rebound effects are likely not trivial, but also not entirely wiping out EE gains (range of estimates is large, but 10-25% possible)
 - Some recent estimates in Mexico for air conditioning rebates >100%
 - Highly dependent on measure, cultural setting, program design

Without measurement, several issues arise

No systematic ex-ante/ex-post energy consumption comparisons lead to

- Uncertain estimates of actual and future energy savings
- Uncertain estimates of current and future GHG emissions reductions (which are often the reason for EE programs)
- Lack of learning about effectiveness of program design features
 - Often, the same EE dollars are spent for very different programs
 - May result in the same engineering estimates of savings
 - But may result in very different actual savings
 - Example: Efficient appliance rebates with or without destroying the old appliance.

Focus on Dollars spent and deemed savings rather than on actual savings creates risks of underperformance (and lower level of GHG reductions than hoped for from EE)

The TRC test may lead to poor investments

The majority of utility EE programs use the total resource cost (TRC) test to determine ex-ante cost-effectiveness of EE measures

- Compares the expected costs and benefits for utilities and ratepayers (potentially including externalities)
- Better than utility-only or customer-only focused tests

When technology improves quickly, this can lead to poor investments

- Typical TRC test compares installing an EE measure today to not installing it today, on an NPV basis.
- With long-lived investments, omits the value of waiting for costs to come down or efficiency to increase
 - Classic current case: TRC test may suggest deploying LED lighting is cost effective, but need 8-10 years to be true. With costs of LEDs declining rapidly, could get more bang for the buck by waiting a few years.

TRC measures are often applied at aggregated level

- Portfolio of programs must pass TRC test
- Means some measures would not pass
 - Could be reasonable (low income, market transformation, spill-over effects)
 - Could help get “easy” savings from not cost-effective measures

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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 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.

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Jürgen Weiss is a principal with the Brattle Group and heads the firm's climate change practice. He specializes in issues broadly motivated by climate change concerns and works in North America, Europe, and the Middle East. His consulting and expert testimony experience have included analyzing the impact of changing regulatory and incentive frameworks for low-carbon technologies, on the economics of both renewable generation sources and existing generation assets, and on the design of efficient incentive mechanisms for renewable energy, energy efficiency, energy storage, and climate change measures.

Jürgen has testified in U.S. state and federal courts, as well as in state regulatory proceedings on related issues, most recently on several long-term contracts for renewable power projects. He has served on advisory councils as diverse as one for California's Low Carbon Fuel Standard and the King Abdullah City of Atomic and Renewable Energy in Saudi Arabia. He holds an MBA from Columbia University and a PhD. In Business Economics from Harvard University.

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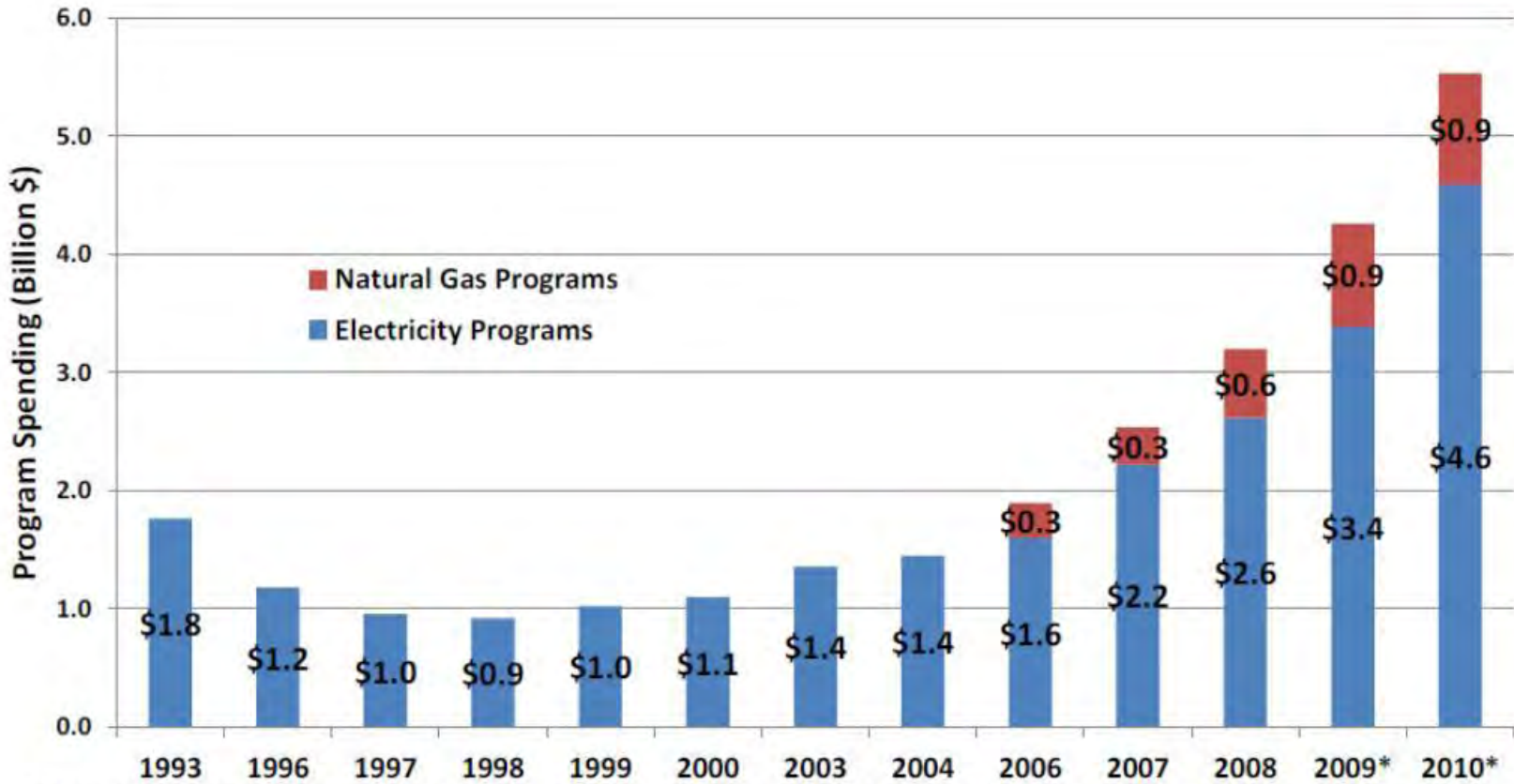
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APPENDIX

U.S. Energy Efficiency Spending is on the Rise



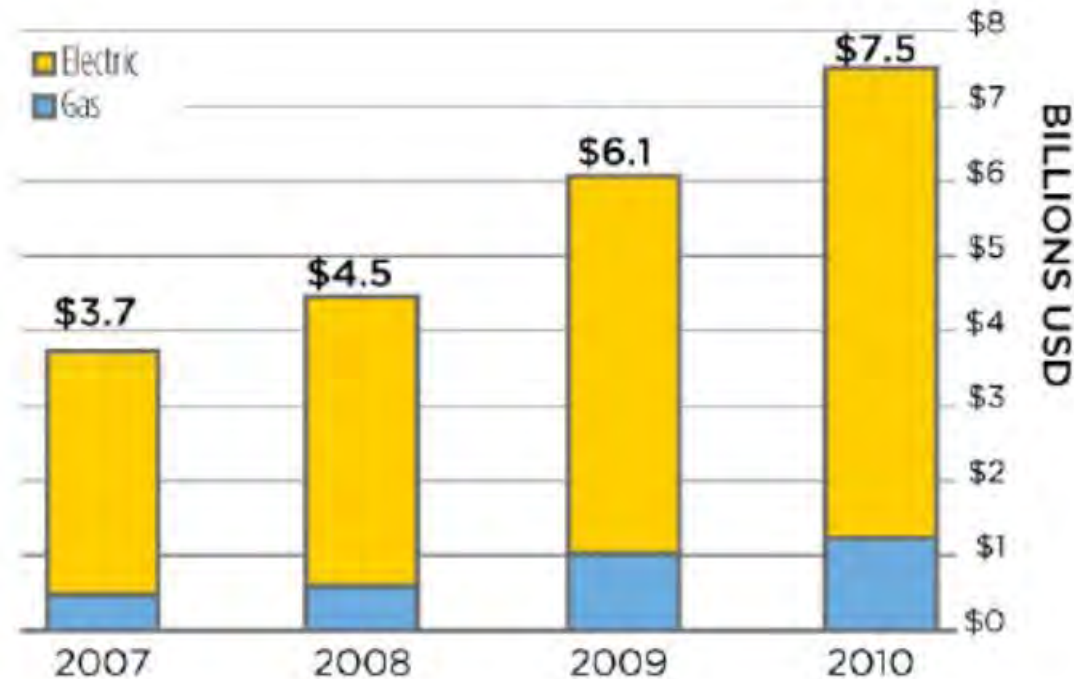
*All values actual program spending (EIA Form 861) except for 2009 and 2010, which are budgets (CEE Annual Industry Reports).

Notes: Includes ratepayer-funded programs. Natural gas efficiency program spending is not available for 1993–2004.

Sources: Nadel et al. (2000); York and Kushler (2002), (2005); Eldridge et al. (2008 and 2009)

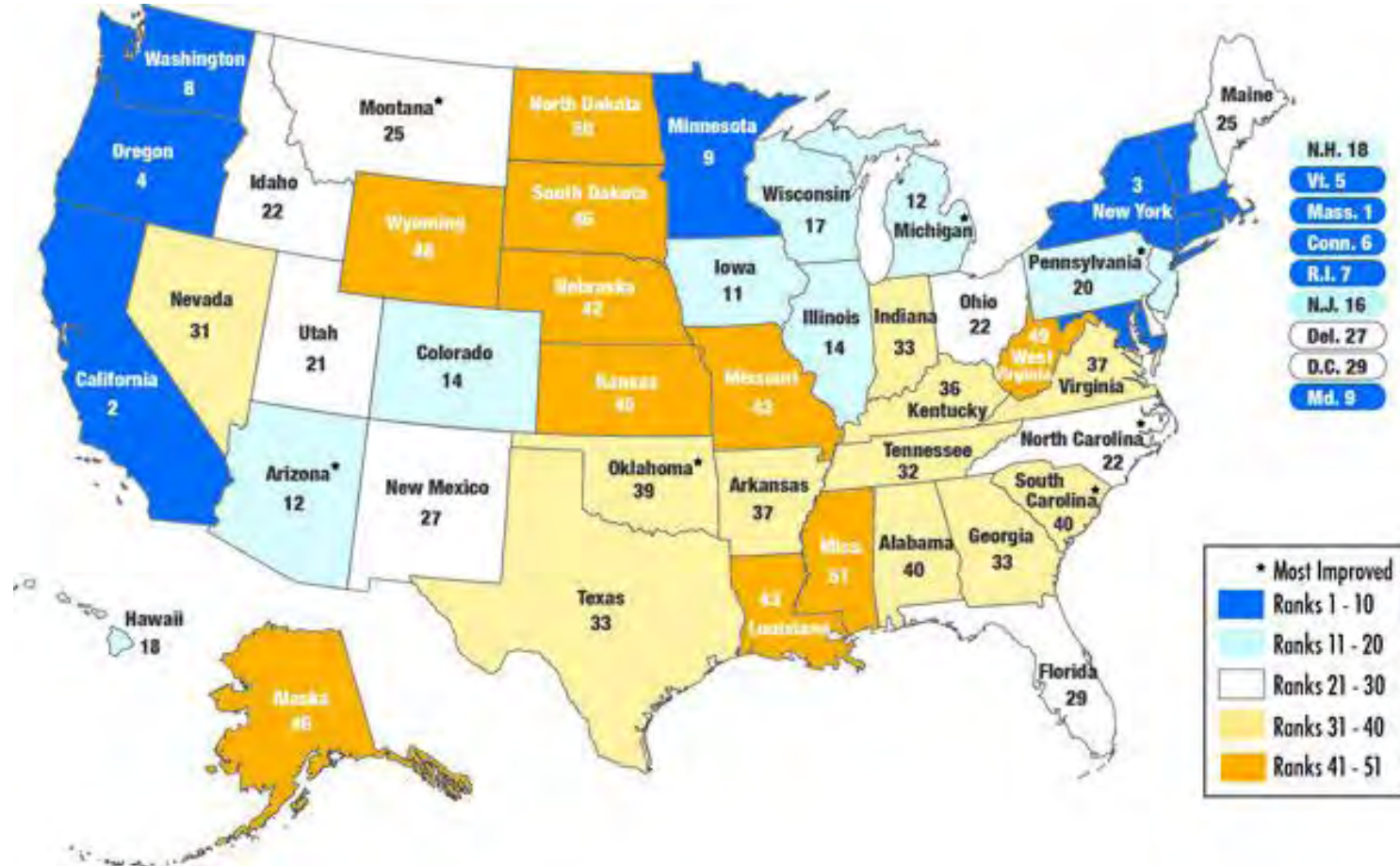
Source: ACEEE 2011

North Americans Are Now Spending \$7.5 Billion on Energy Efficiency



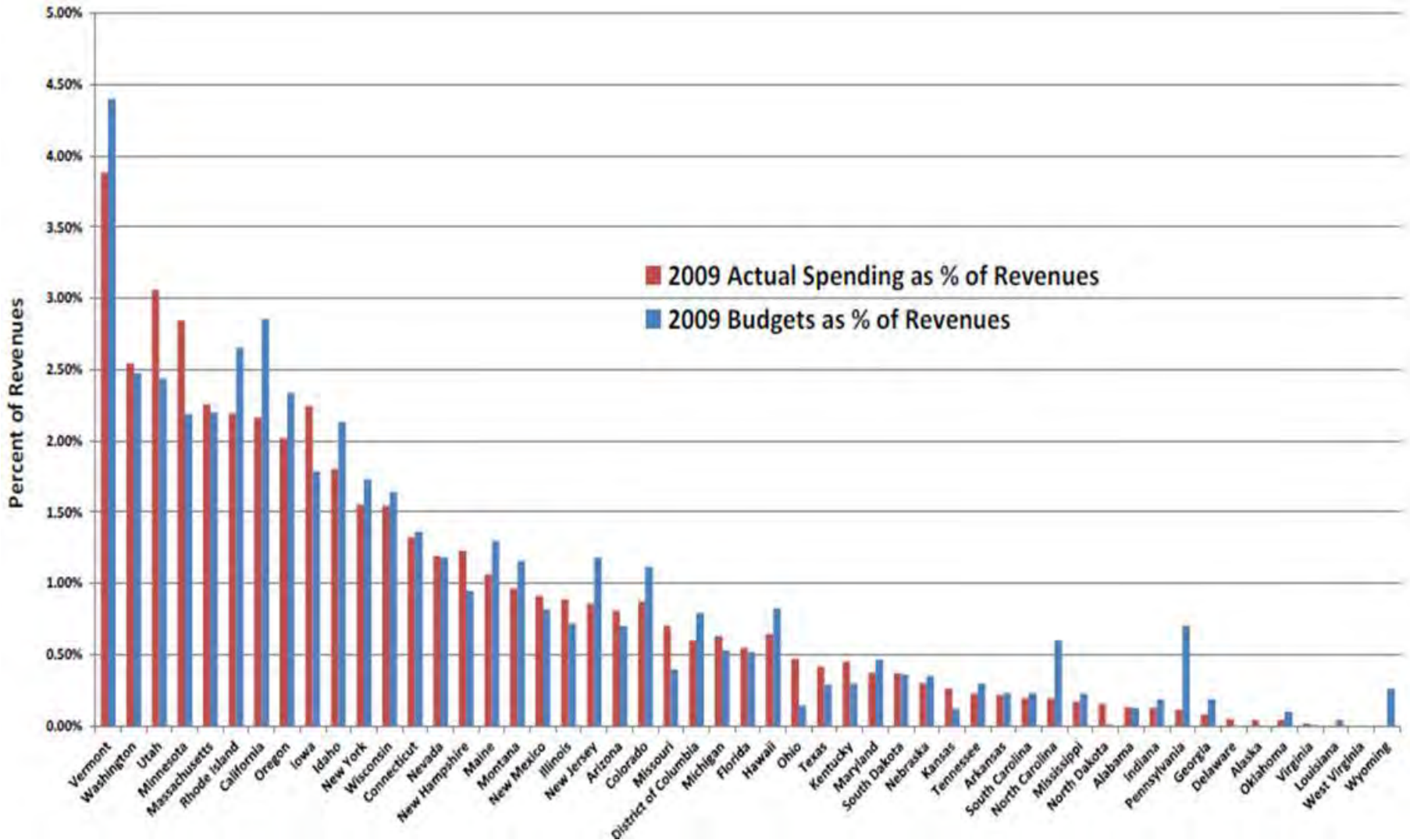
Source: Consortium on Energy Efficiency, 2010

Results Vary Greatly Across States

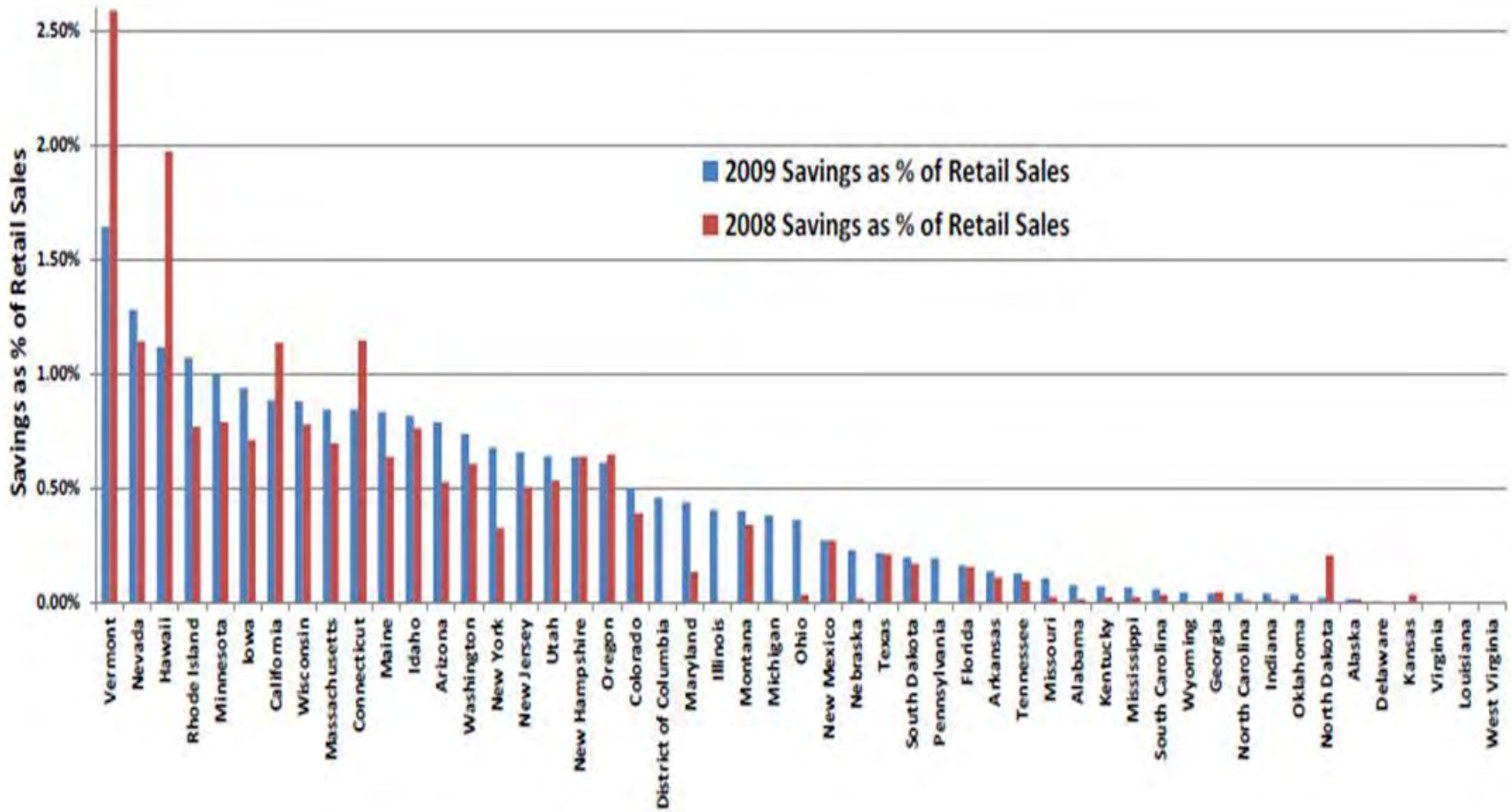


Source: ACEEE 2012 State Energy Efficiency Scorecard

Spending Varies by State



And So Do the Impacts

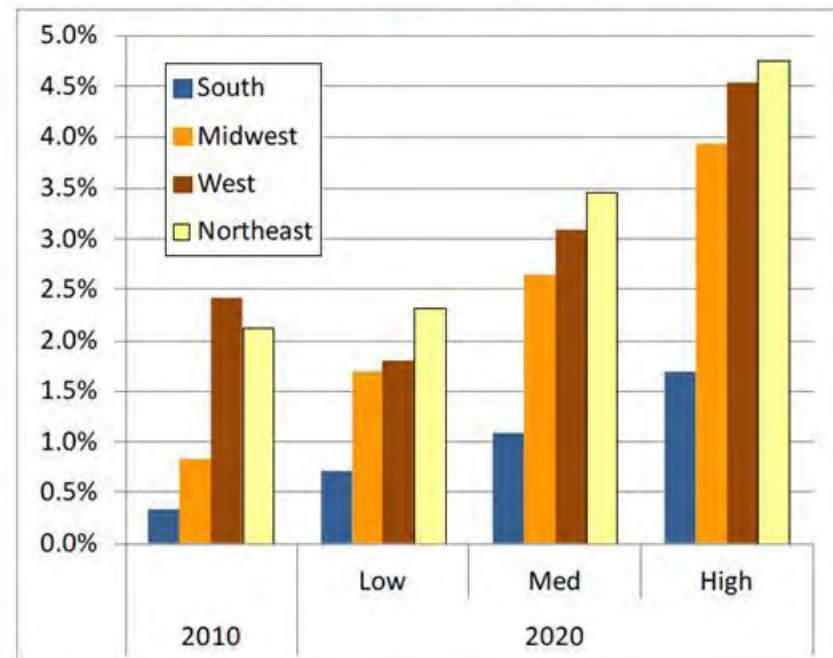


Forecasted Spending Levels

Funding Levels Are Projected to Rise in All Regions under Most Scenarios

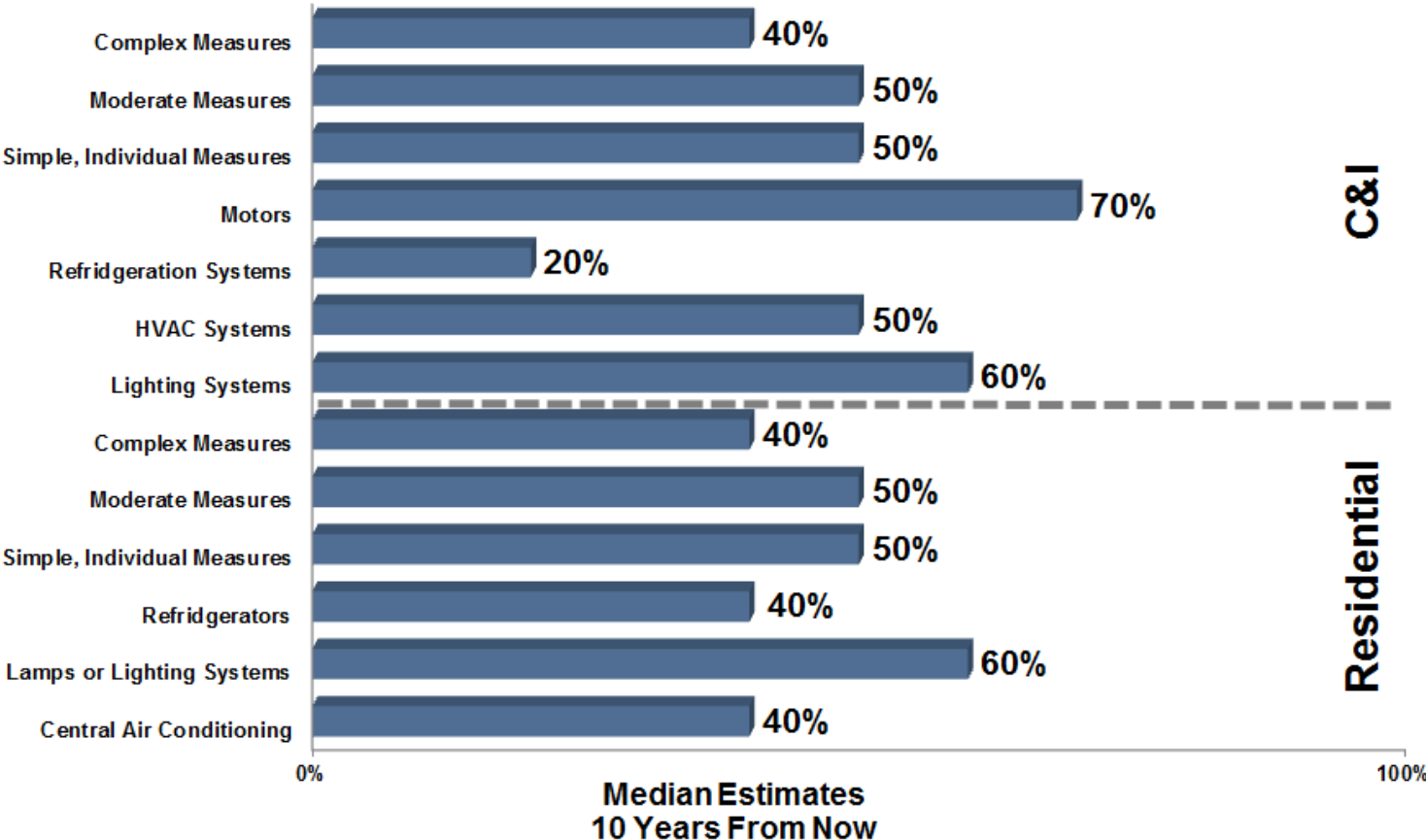
- EE spending as percent of revenues remains highest in Northeast and West (3.5% and 3.1% in 2020 Medium Case)
- EE funding in the South and Midwest is expected to triple by 2020 under the Medium Case
- Funding trajectory in West is highly uncertain; depends on role of ratepayer EE in CA
- Also uncertainty in the Northeast (a little bump or a big one?); longevity and success of “all cost-effective EE” depends on continued political support

Ratepayer-funded Electric EE Programs
(Projected Spending as Percent of Revenues)



The Highest Level of Customer Engagements is Projected in C&I Motors and Residential Lighting

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



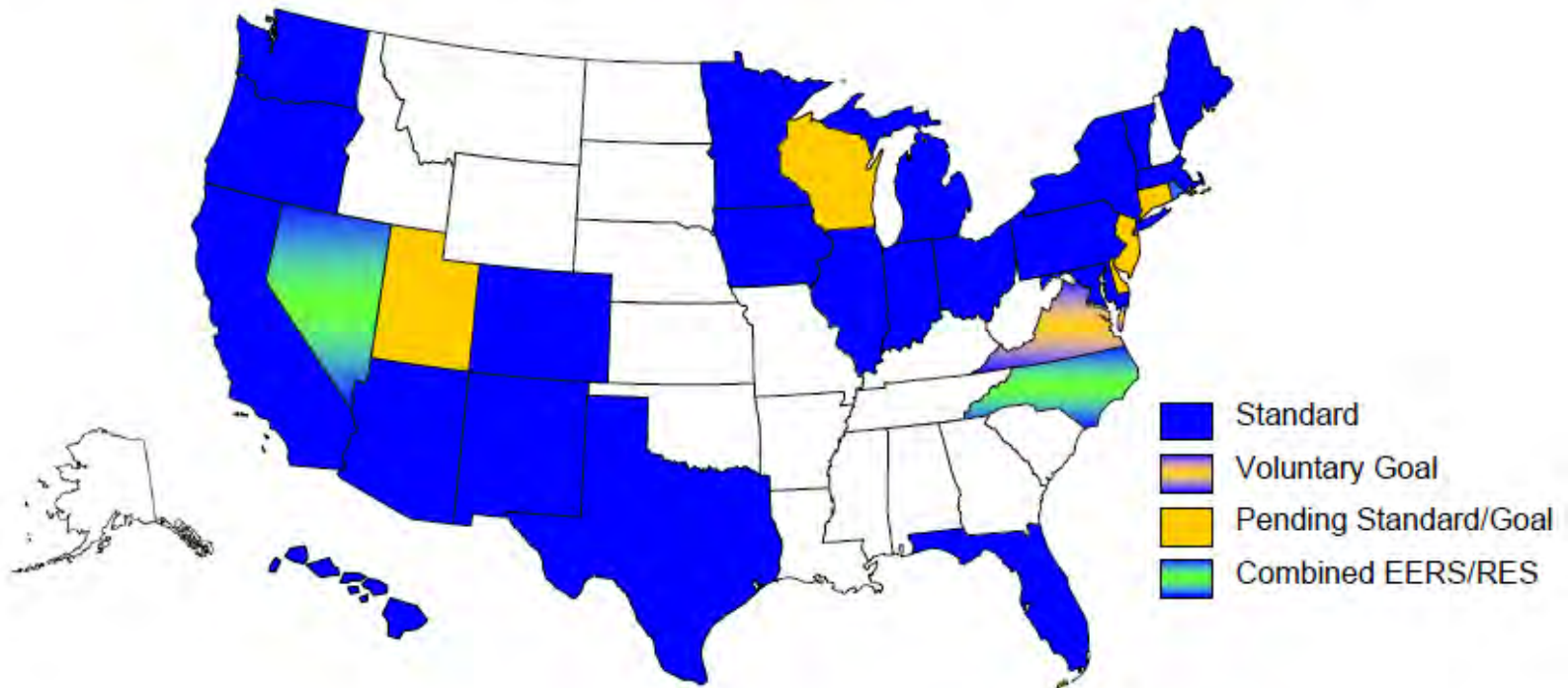
Types of Energy Efficiency Resource Standards (EERS)

- Statewide EERS
 - Set by legislation
 - Managed by regulators
 - All utilities to achieve a certain level – qualitative or quantitative 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 competes with renewable energy

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 Energy Provider-Delivered Energy Efficiency Policies

- 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