Utility-Sector Energy Efficiency: Current Status, Key Challenges, and Potential Role in a Carbon Constrained World

Presentation to the 36th Annual PURC Conference

Gainesville, Florida, February 5, 2009

by

Martin Kushler, Ph.D.

Director, Utilities Program

American Council for an Energy-Efficient Economy

TOPICS

- Definitions
- Overview and current status of utility-sector energy efficiency policy (and results)
- Key regulatory issues and challenges
- A provocative glimpse of the future

RATIONALE FOR ENERGY EFFICIENCY AS A UTILITY SYSTEM RESOURCE

SIMPLY STATED:

- Utility systems need to have adequate supply resources to meet customer demand
- To keep the system in balance, you can add supply resources, reduce customer demand, or a combination of the two
- In virtually all cases today, it is cheaper to reduce customer demand than to acquire new supply resources

  [True for electricity and natural gas]

❖ [Plus EE can also provide large greenhouse gas reductions]

KEY REQUIREMENT:

- There needs to be a practical and acceptable mechanism for utilities to acquire energy efficiency resources

DEFINITIONS

ENERGY CONSERVATION

Saving energy by *doing with less or doing without* (e.g., setting thermostats lower in winter and higher in summer; turning off lights; taking shorter showers; turning off air conditioners; etc.)

ENERGY EFFICIENCY

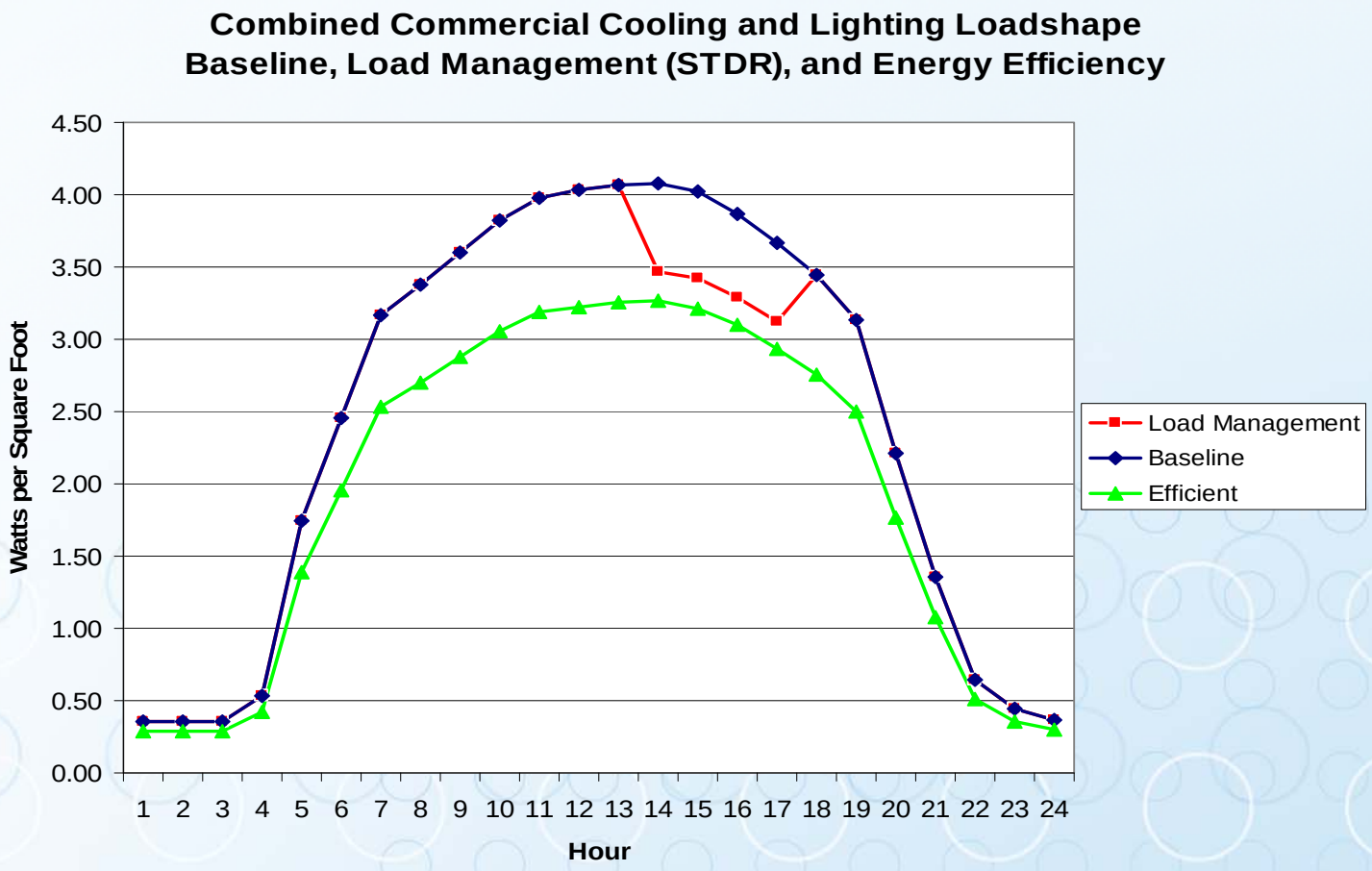
Measures which result in producing the *same or better levels of amenities* (e.g., light, space conditioning, motor drive power, etc.) *using less energy*. Measures are generally *long-lasting* and save energy *across all time periods* for which the end-use equipment is in operation.

DEFINITIONS (continued)

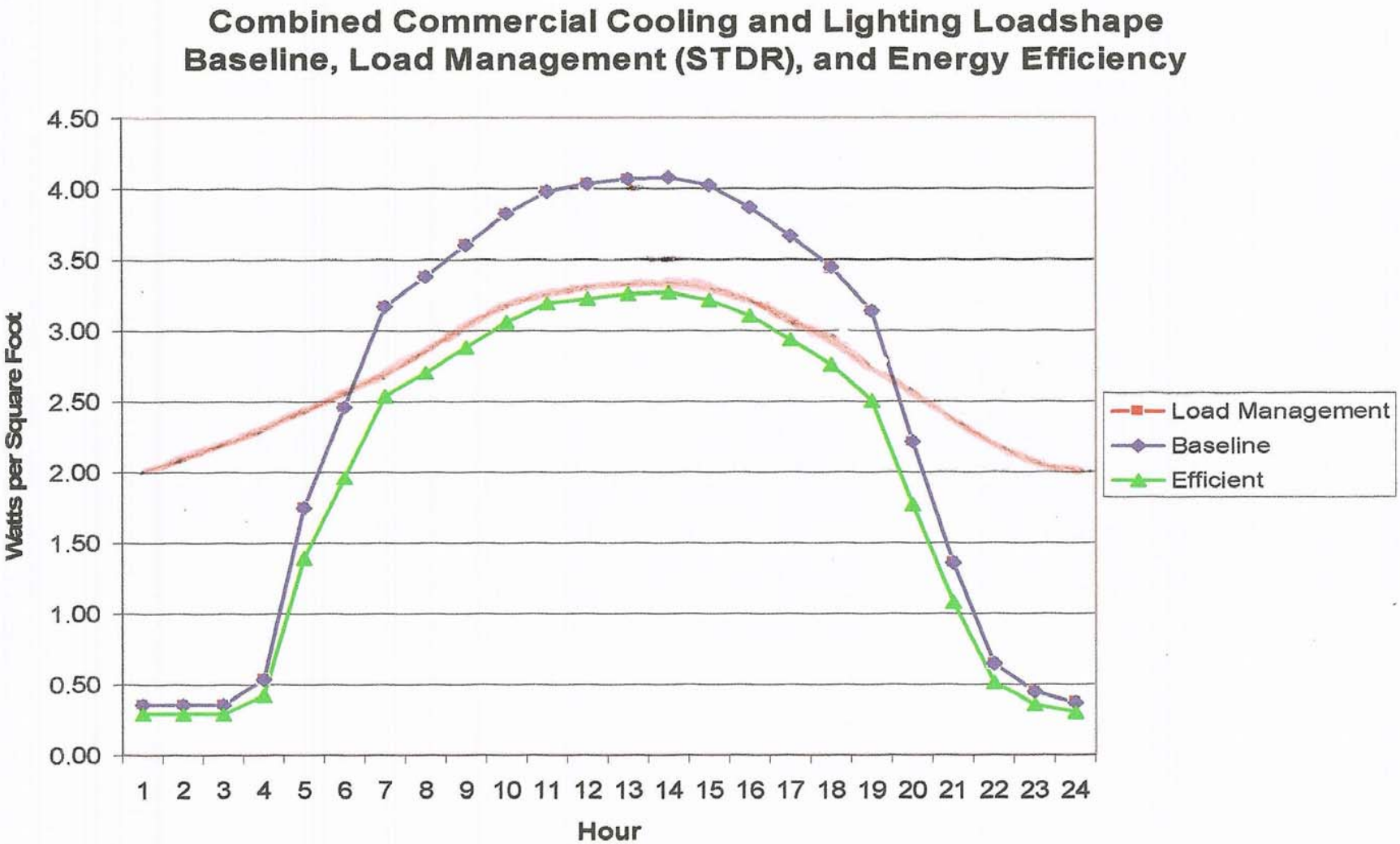
LOAD MANAGEMENT (Including Demand Response)

Load management programs seek to *lower peak demand* during specific, *limited time periods*, by temporarily *curtailing* electricity usage or *shifting* usage to other time periods.

Energy Efficiency Compared to Load Management (4 hr curtailment)



Electric System Efficiency vs. Energy Efficiency



COMPARISON OF BENEFITS

ENERGY EFFICIENCY

- can reduce system peak demand
- reduces total energy consumption
  - reduces consumption of natural resources
  - reduces air emissions
  - can reduce energy imports
- effects are long-lasting

LOAD MANAGEMENT (& DEMAND RESPONSE)

- reduces system peak demand very well
- little or no effect on total energy use
  (or possibly even increases usage)
- little or no effect (or possibly negative) on:
  use of resources; air emissions; energy imports
  - effects are temporary and short duration

One Key Challenge

The electric industry prefers load management/DR and is mildly to openly averse to energy efficiency.

(See: ***Regulating Electric Distribution Utilities as if Energy Efficiency Mattered*** ACEEE, 1999, U993 http://www.aceee.org/store/proddetail.cfm?CFID=527376&CFTOKEN=86519831&ItemID=201&CategoryID=7)

<u>Primary reason:</u>

Utilities tend to prefer Load Management/DR because it lowers peak demand during the highest cost time periods without really reducing their total sales or throughput of electricity.

Energy Efficiency may reduce peak demand, but it also reduces overall sales (thus adversely affecting short term profits).

WHAT IS AN "ENERGY EFFICIENCY PROGRAM" ?

An organized effort to try to encourage and facilitate customer implementation of energy efficiency improvements (residential and business)

Key elements

- Public information, education and persuasion
- Information, training, and incentives to "trade allies" (retailers, contractors, etc.)
- Economic incentives for customers (e.g., rebates)
- Quality control, monitoring, and evaluation

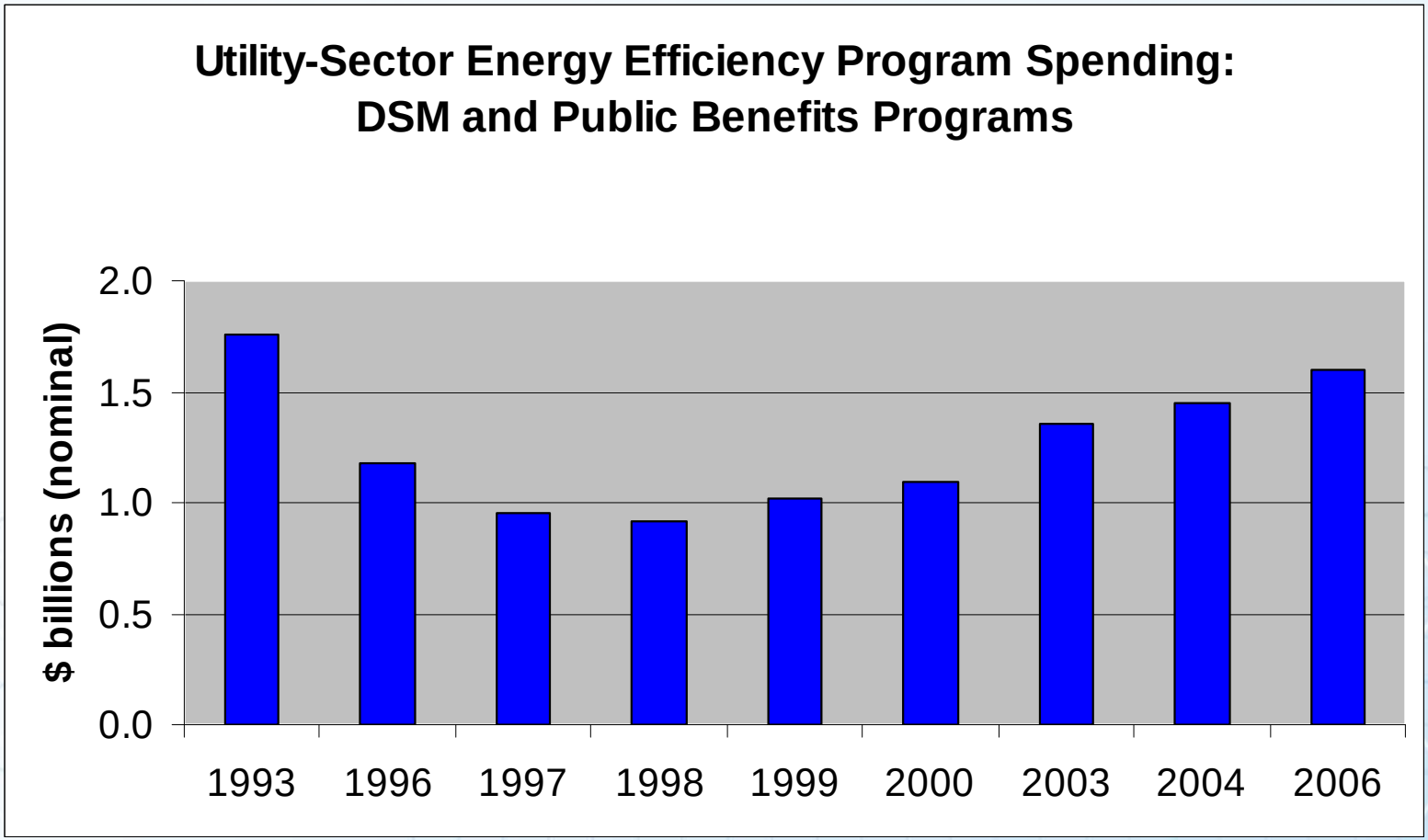
  [Note: providing brochures and web sites with "conservation tips" does NOT count!]

➢ Excellent examples: ACEEE report: *Compendium of Champions….* http://www.aceee.org/pubs/u081.htm

ACEEE American Council for an Energy-Efficient Economy

Annual Spending on Utility Sector Energy Efficiency Programs 1993-2006

[nominal dollars]



ACEEE American Council for an Energy-Efficient Economy

ENERGY EFFICIENCY IS A WELL-PROVEN RESOURCE

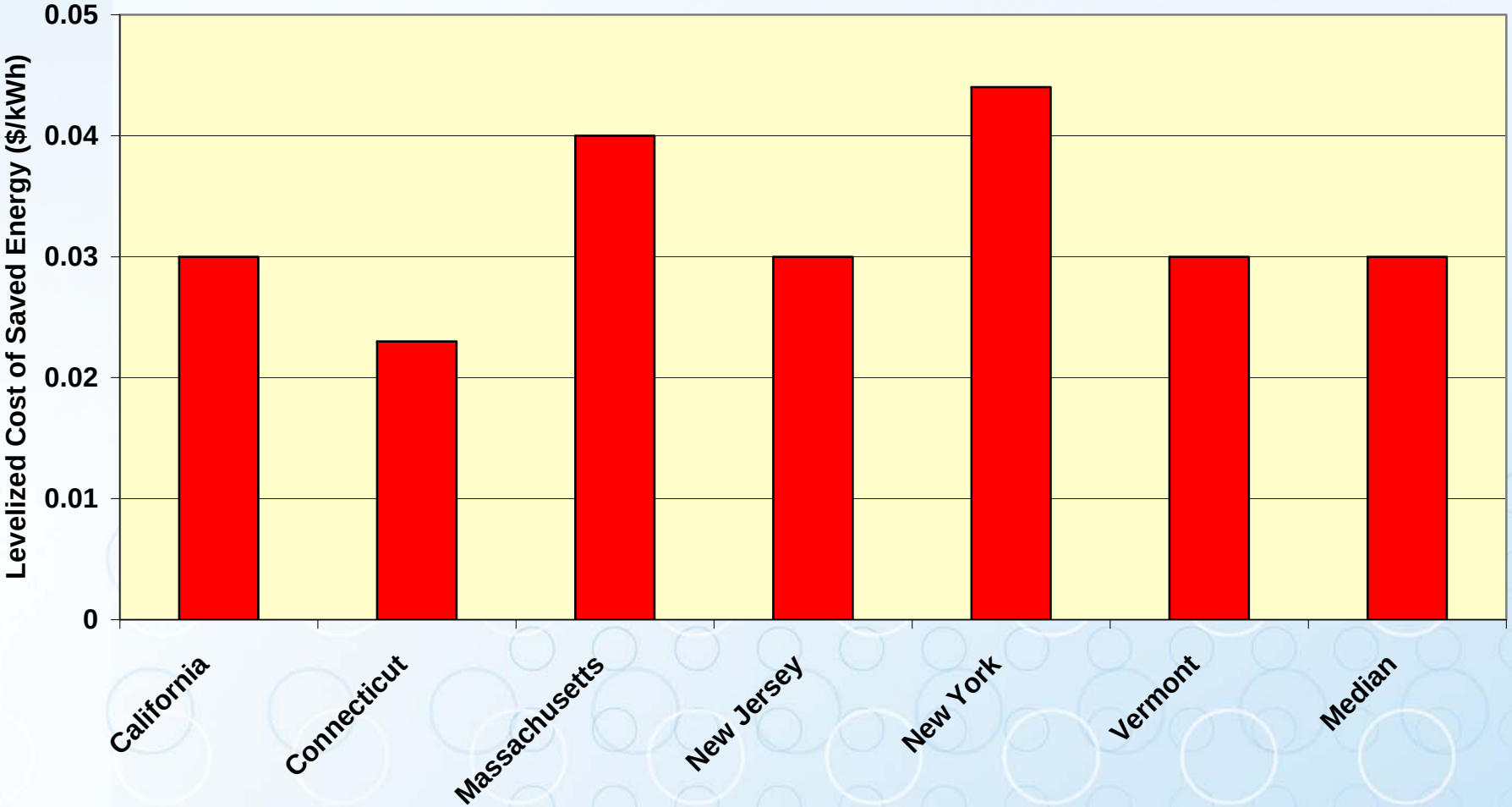
- DSM from 1985-1994: 29,000 MW @ $.03/kWh
  [see RAP report: *Efficient Reliability*… Cowart, 2001]
- Two different national studies by ACEEE found a median cost of 3cents/kWh
- A number of states have reported avoiding multiple power plants over time with energy efficiency

<u>Energy Efficiency produces a variety of additional benefits</u>

- Transmission and distribution level savings
- Reduced environmental emissions
- Local economic benefits
- Helps hold down the market cost of energy

Cost of saved energy through program energy efficiency improvements

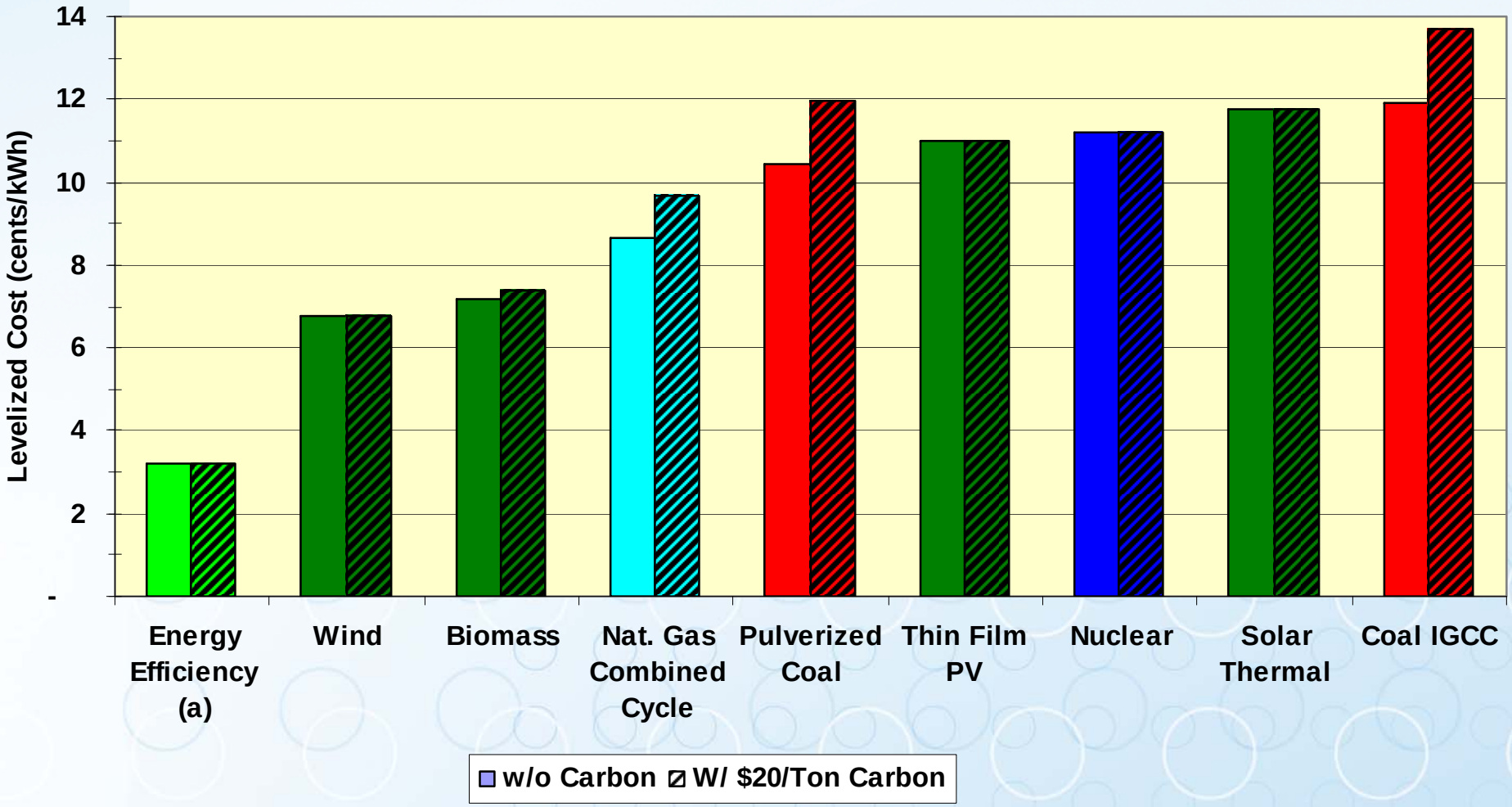
Evaluated results of All-Sector State-Level Energy Efficiency Programs



Source: ACEEE, "Five Years In," 2005

ACEEE American Council for an Energy-Efficient Economy

Cost of New Electricity Resources



Source: Lazard 2008 for NARUC (midpoint of range)

ACEEE American Council for an Energy-Efficient Economy

ENERGY EFFICIENCY ON A "POWER PLANT" SCALE

- Some 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
- At least ten states have EE programs on a scale large enough to displace power plants (i.e., save 0.4% to over 1.0% of load each year)
  - CA, CT, IA, MA, MN, NY, OR, RI, VT, WI

SOME GOOD REFERENCES ON UTILITY-SECTOR ENERGY EFFICIENCY

Efficient Reliability: The Critical Role of Demand-Side Resources in Power Systems and Markets

by Richard Cowart, Regulatory Assistance Project, Vermont, June 2001

http://www.raponline.org/Pubs/General/EffReli.pdf

Five Years In: An Examination of the First Half-Decade of Public Benefits Energy Efficiency Policies

Kushler, York & Witte, ACEEE, April 2004

http://www.aceee.org/pubs/u041.pdf

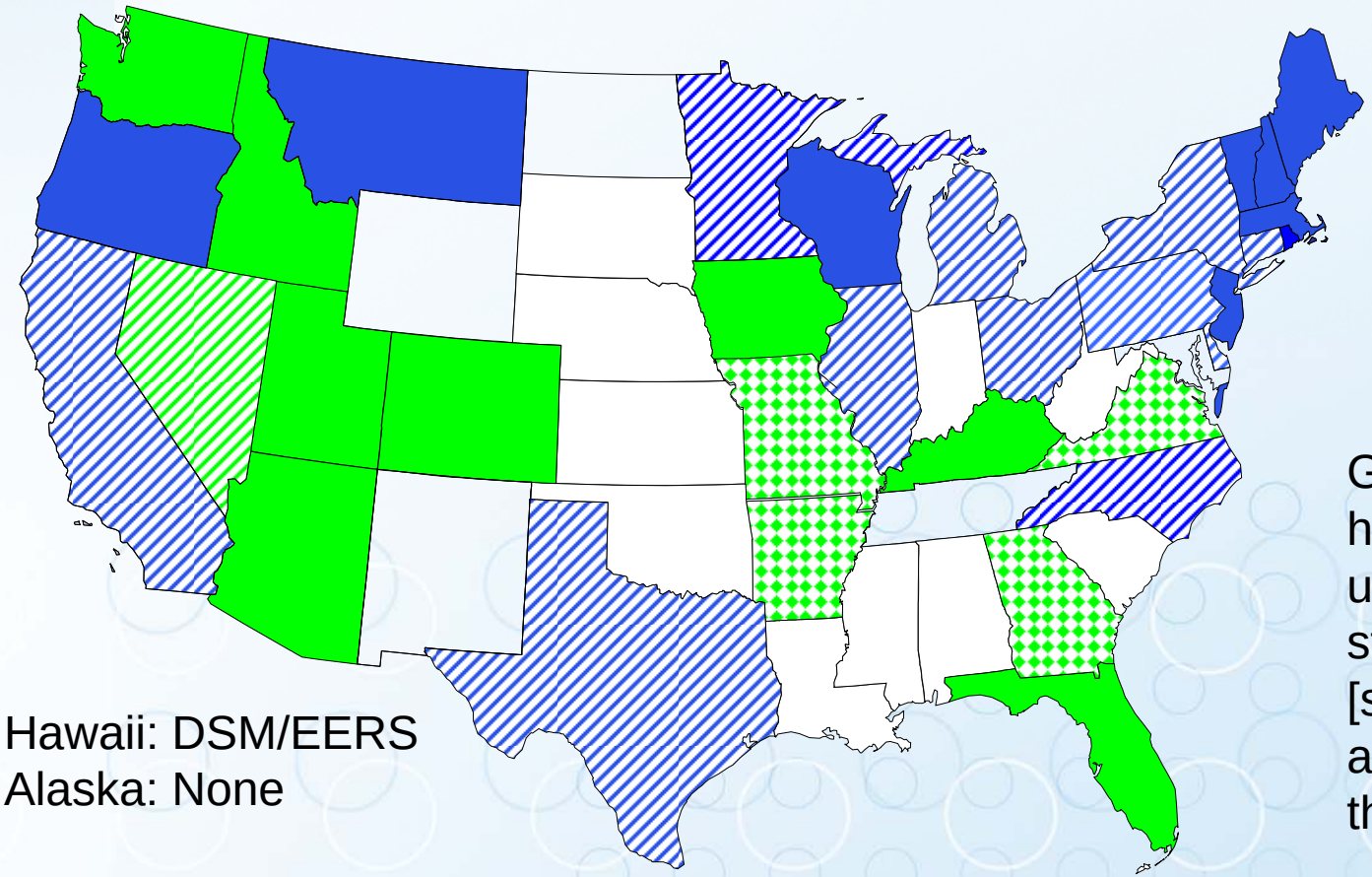
3 BASIC POLICY APPROACHES FOR UTILITY SECTOR ENERGY EFFICIENCY PROGRAMS

1. Require funding for energy efficiency through *utility rate cases* (traditional approach)
2. Provide funding for energy efficiency through *statewide system benefit funds* (most common recent approach)
3. Establish *binding savings targets* for utilities [e.g., an "energy efficiency resource standard"]

   (newest trend in the industry)

Funding approaches and programs can be tailored to meet the unique needs of each state

The Landscape of Utility Sector Energy Efficiency Programs in the US



Blue states have statewide public benefit approach that supports EE

Green states have utility DSM under regulated structure [spotted states are developing their approach]

Hawaii: DSM/EERS
Alaska: None

Striped states have Energy Efficiency Resource Standard (EERS)

ACEEE American Council for an Energy-Efficient Economy

ENERGY EFFICIENCY ADMINISTRATIVE APPROACHES
(for utility-sector energy efficiency)

21 states: Utility Administration

6 states: State Agency Administration

3 states: "Third Party" Administration
(thus far, non-profit organizations)

ENERGY EFFICIENCY SPENDING & SAVINGS LEVELS

- Nationally: roughly $2.0 billion in utility sector EE spending

<u>Top 20 States:</u>

- Spending Range: $8.0 million to $600 million
  - 0.6% to 4.0% of gross revenues
  - Mean: 1.3% of gross revenues
  - Median: 1.2% of gross revenues
- EE annual savings as a percent of annual sales:
  - range: 0.2% to 1.7% annual savings
  - mean: 0.7%
  - median: 0.65%

[Many states setting goals to ramp up to 1.5% to 2.0%/yr.]

EE COST-EFFECTIVENESS TESTS

6 states: no B/C test applied

19 states: yes, required

5 states: yes, but not required

[Side note:

- only 2 of 23 states with renewable energy programs apply a B/C test
- Only 15 of 45 states with load management/demand response programs apply a B/C test]

OF THE 24 STATES THAT USE B/C TESTS FOR EE

Most of the states use more than one test:

15 states use: Total Resource Cost (TRC) test

11 states use: Utility Cost (UC) test

8 states use: Ratepayer Impact (RIM) test

7 states use: Societal Cost test

Of states that identified a primary test:

3 specify societal

3 specify TRC

2 specify UC

1 specifies TRC and UC

1 specifies RIM

COST-EFFECTIVENESS RESULTS

From a previous ACEEE study (*Five Years In…)*

Overall median B/C results reported

- C&I programs: 2.5-2.6 to 1
- Residential programs: 1.6-1.7 to 1
- Across all programs: 2.1-2.5 to 1

[should be even higher now, given much higher supply costs]

Median reported cost of conserved energy: 3.0 cents/kWh

From a second recent study

Rough estimate of overall cost of conserved energy:

~ 3.0 cents/kWh (from reported spending and savings across 19 states)

Natural Gas Program Spending, Savings and Cost-Effectiveness

	Min	Max	Mean	Median	Total
Annual program spending: all programs* (n = 32) ($ million)	$.079	$36	$3.7	$0.954	$131
Annualized 1st year savings: all programs* (million therms)	0.025	10	1.3	0.568	44.8
•Savings: residential programs (n = 20)	0.025	7.0	0.824	0.267	16.5
•Savings: C/I programs (n = 10)	0.025	10	2.4	1.3	23.9
Cost-effectiveness					
•Cost of conserved energy: 1st year $/therm (n = 8)	1.53	6.70	3.63	2.59	
•Cost of conserved energy: lifetime $/therm (n = 7)	0.07	0.80	0.38	0.28	
•Benefit/cost ratio (n = 9)	1.08	5.05	1.98	1.42	

OK, so I agree that energy efficiency can be a very cost-effective resource….

Why do regulators need to take action?

CRUCIAL POINT: Energy efficiency requires policy and regulatory action……Why?

1) Market failures at the consumer level

   (i.e., lack of information, lack of availability, up-front cost barrier, split incentives, prices don't reflect full social cost of energy, etc.)

2) Institutional barriers

   (i.e., energy suppliers profit from higher sales, benefits of energy efficiency are fragmented, EE long-term benefits don't fit well in energy market mechanisms)

See ACEEE report: *Can We Just "Rely on the Market" to Provide Energy Efficiency?* http://www.aceee.org/pubs/u011.htm

WHY REGULATORS???
THE MOST IMPORTANT POLICY PRIORITY: UTILITY SECTOR ENERGY EFFICIENCY PROGRAMS

- Substantial **utility-funded** energy efficiency resource programs are the cornerstone of the policy efforts of every leading state on energy efficiency
  - States don't spend tax dollars on this…they are all broke
  - Utilities spend $billions on the utility system every year (e.g., $10 billion in Michigan)…
  - ➢ Just direct 1% or 2% to energy efficiency

KEY CHALLENGE

Utilities do not voluntarily engage in "serious" customer energy efficiency programs

["Conservation tips" don't count as "serious" energy efficiency]

THE FUNDAMENTAL PROBLEM

- Under traditional regulatory approaches, utilities have strong economic incentives to seek greater energy sales and avoid declines in sales
- This is true for both vertically integrated utilities and "distribution only" utilities in restructured states

  [some have referred to this as "throughput addiction"]

See ACEEE report: *Regulating Electric Distribution Utilities as if Energy Efficiency Mattered* http://www.aceee.org/pubs/u993.htm

UTILITIES HAVE 3 KEY ECONOMIC CONCERNS REGARDING ENERGY EFFICIENCY PROGRAMS

[In order of importance]

- **Cost recovery** for the direct costs of a program
- **Addressing the disincentives** of "lost revenues" resulting from energy efficiency improvements that reduce customer energy use
- **Providing an opportunity for earnings** from energy efficiency program activity (to reflect the fact that they can generate earnings from supply-side investment)

COST RECOVERY: A KEY THRESHOLD REQUIREMENT

- This is essential in order to expect utilities to proceed with energy efficiency programs

  (and frankly, is essential no matter who administers the energy efficiency programs)

- Many mechanisms to accomplish this
  - Costs embedded in rates
  - Special tariff riders
  - Deferred accounts
  - "Public Benefits" type surcharges

ECONOMIC INCENTIVES: HIGHLY DESIRABLE

- This type of approach is increasingly common, although not yet universal
- While not essential to achieve programs, it is probably essential to achieve sincere effort to maximize program effectiveness (assuming utilities are involved in program administration/delivery)
- Many mechanisms available to accomplish this
  - Cash award for meeting goals
  - Earn a rate of return on EE expenditures (tied to performance)
  - Earn a share of "net benefits" from the programs
  - Bonus rate of return for the company (tied to performance)

DECOUPLING/LOST REVENUE SOLUTIONS: IMPORTANT FOR REACHING BROADER EE GOALS

- Less commonly used, but “decoupling” is growing
- Not essential to achieving programs
- Not sufficient by itself to assure programs
- However, some means of addressing utility disincentive from lost sales is essential to achieving true utility cooperation in broader energy efficiency objectives

[Utilities can be motivated to some extent through direct performance incentives, but the effect only applies to targeted programs….not to broader objectives for customer energy efficiency.]

TWO BASIC MECHANISMS FOR ADDRESSING LOST REVENUES

- **Decoupling** – Essentially, "truing up" for actual sales above or below forecast

  NOTE: INCREASING THE FIXED CHARGE COMPONENT OF THE BILL IS **NOT** "DECOUPLING" !!!

- **Direct lost revenue compensation**

  DIRECT LOST REVENUE RECOVERY HAS SEVERAL DISADVANTAGES, AND HAS FALLEN OUT OF FAVOR

  - Vulnerable to 'gaming'
  - Leads to very contentious reconciliation hearings
  - Doesn't do anything to address the utility disincentive regarding broader energy efficiency policies (e.g., codes and standards),
  - Nor does it diminish the general utility interest in pursuing load-building

WHAT ARE STATES DOING?

In late 2006, ACEEE conducted a national review of state policies and approaches regarding utility shareholder incentives and disincentives.

Aligning Utility Interests with Energy Efficiency Objectives:

A Review of Recent Efforts at Decoupling and Performance Initiatives

http://www.aceee.org/pubs/u061.htm

KEY FINDINGS

- **Cost Recovery** – At least 25 states have operating utility sector energy efficiency programs. All of those states have some type of approved cost-recovery mechanism
- **Shareholder Incentives –** At least 7 states have incentive mechanisms in place, at least 3 more are developing them

  [Note: 9 of the 25 states did not have utilities administer the EE programs, so such incentives weren't appropriate.]
- **Decoupling/lost revenues –** At least 5 states have decoupling mechanisms approved, and at least another 5 states are actively considering it. [We did not find any states that still provided direct lost revenue recovery]

EXCELLENT NEW STUDY BEING CONDUCTED

Lawrence Berkeley National Lab (Chuck Goldman, et. al.) is heading up an excellent study:

Impact of Energy Efficiency Incentives for a Prototypical Southwest Utility

Analyzing the impacts of various incentives and ratemaking mechanisms, on shareholders and ratepayers, using detailed financial models of a prototypical electric utility.

- Several different types of "shareholder incentive mechanisms"
- Decoupling
- Different levels of EE investment

Keep an eye out for this one!

CONCLUDING OBSERVATION: MOMENTUM TOWARD EE IS BUILDING RAPIDLY

Many factors are converging to make energy efficiency the top priority electric system resource

- High and volatile fuel prices
- Customer/political dissatisfaction with high costs
- 'NIMBY' issues re: power plants and transmission lines
- Rising power plant construction costs
- Power plant cost recovery risks
- Environmental policy objectives (esp. global warming)
- Environmental cost risks

A number of states are actively examining strategies to expand their utility-sector energy efficiency efforts.

EPILOGUE:
A GLIMPSE AT A BRAVE NEW ["CARBON CONSTRAINED"] WORLD

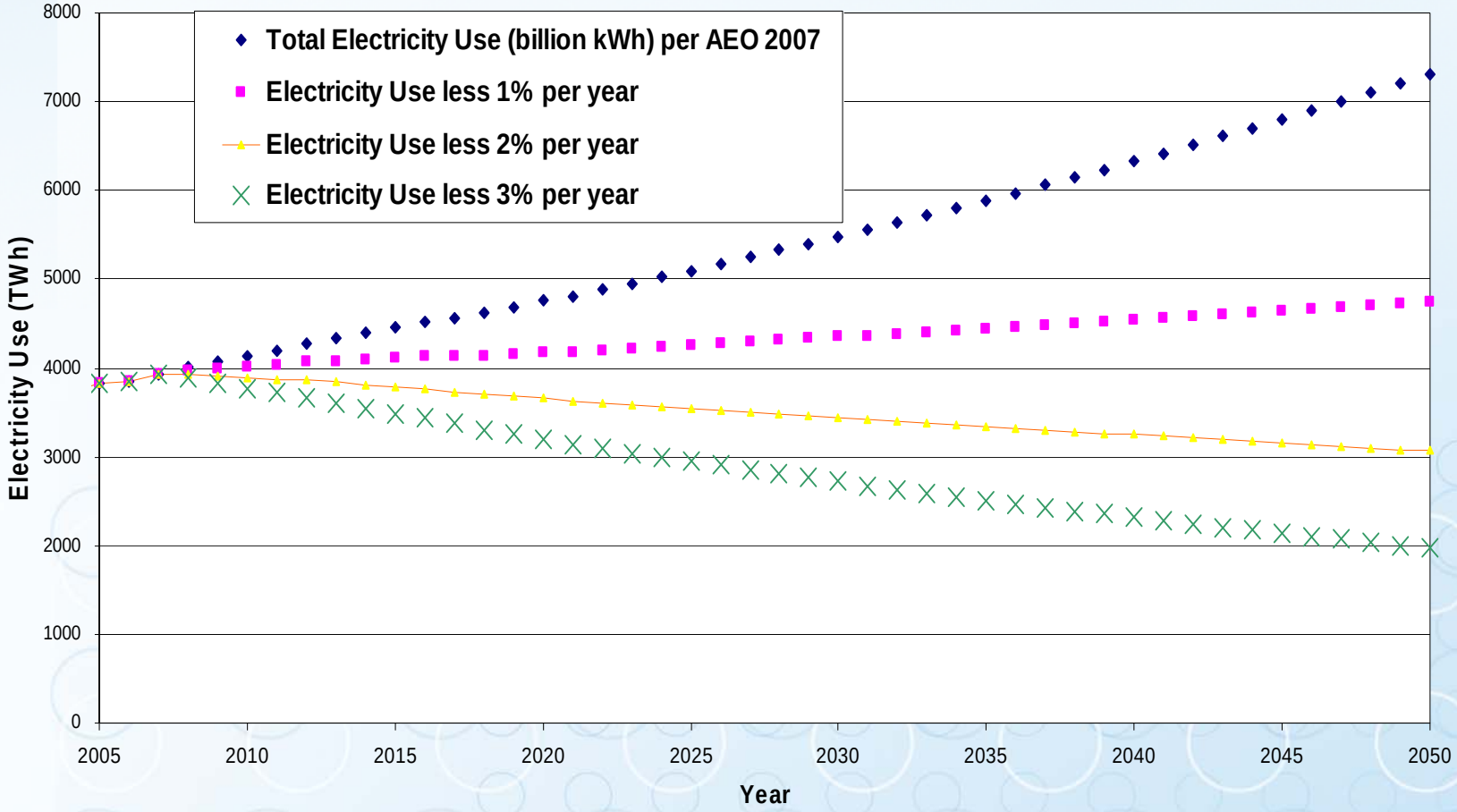
As the objectives for energy efficiency programs have evolved from:

1. 'Token customer service'; to
2. 'Significant utility system resource'; to
3. 'The most important "wedge" in achieving large-scale reductions in carbon emissions'…..

The need to address "the economics" of energy efficiency for utilities has moved from "important" to "***essential***"

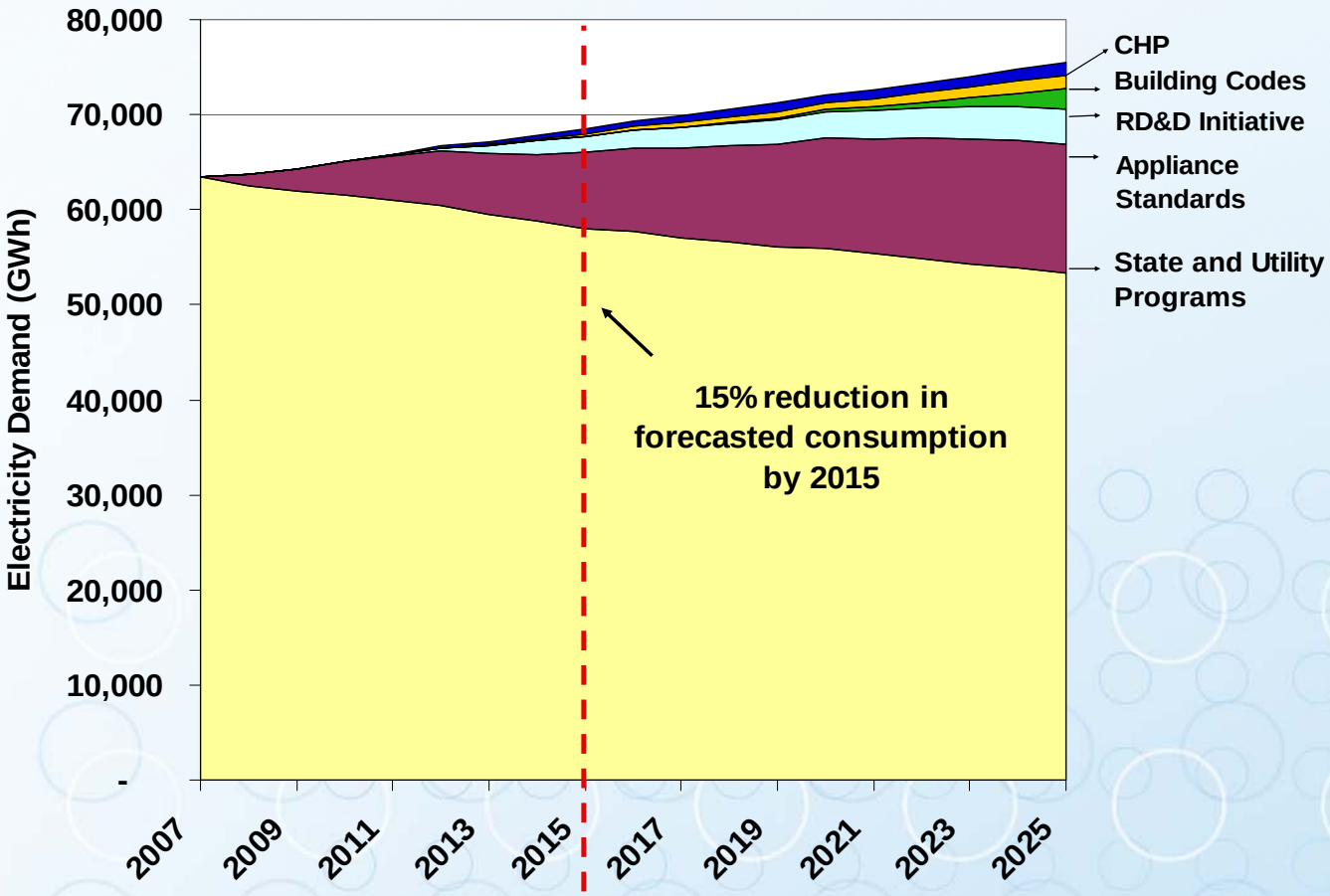
FOR A UTILITY CEO, THE FUTURE AIN'T WHAT IT USED TO BE

Electricity Use as a Function of Annual Savings Rate



ACEEE American Council for an Energy-Efficient Economy

Share of Maryland Electricity Sales That Can Be Met by Efficiency Policies



ACEEE American Council for an Energy-Efficient Economy

CONCLUSION:
WE MAY BE ON THE BRINK OF A REGULATORY REVOLUTION

- For 80 years our electric (and natural gas) utility system has been premised upon…and designed to achieve.... continual growth in energy sales
  - Cost recovery
  - Rate design
  - Cost allocation for system expansions
  - Utility earnings
- Given the realities we face in the 21st Century, it is imperative that we develop a new "business model" for utilities
- A utility must be economically viable under conditions where their gross throughput of energy is declining
- **Moreover….they must become willing partners in *facilitating* that decline!!!**

MORAL OF THE STORY

Utility regulators will need to be heavily involved if the potential of energy efficiency is to be fully realized.

Commission Staff

Saving the planet!