Utility-Scale Energy Efficiency: Options and Prospects

Bucharest Forum

European Commission

Directorate-General for Energy and Transport

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The Regulatory Assistance Project

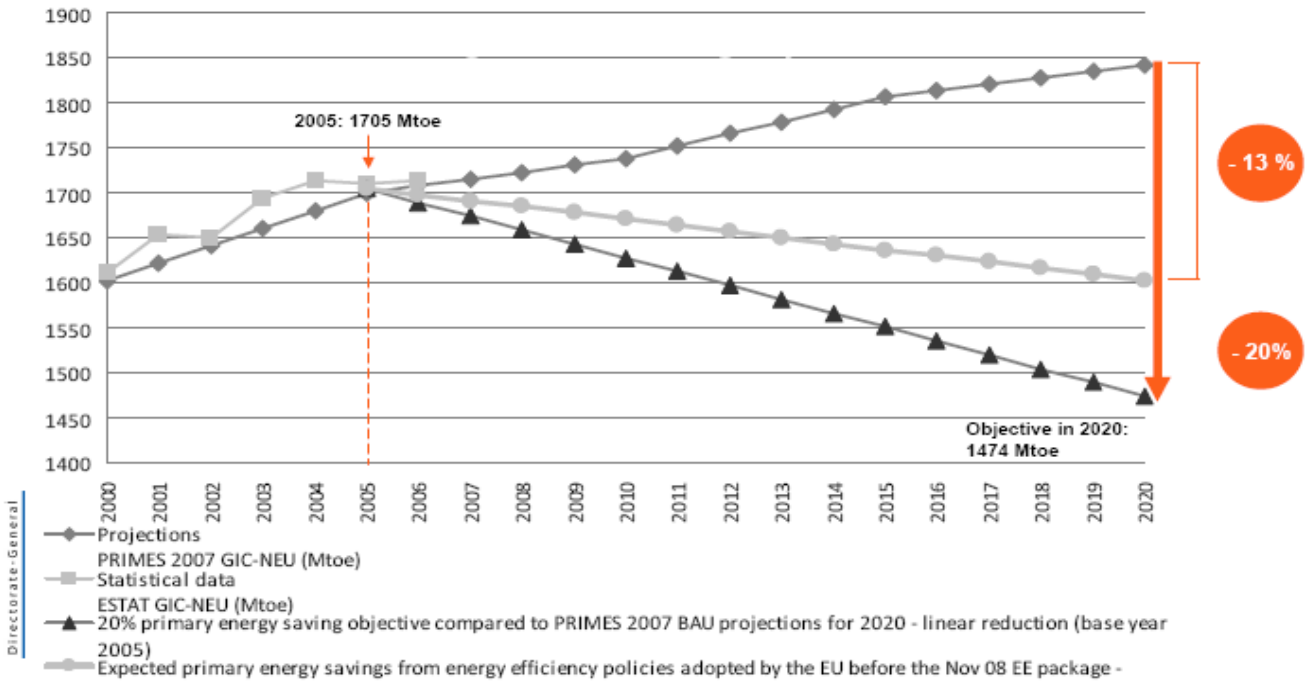
RAP is a non-profit organization providing technical and educational assistance to government officials on energy and environmental issues. RAP is funded by several foundations, US DOE & EPA and international agencies. We have worked in over 16 nations and 40 US states, and now work closely with the European Climate Foundation.

Richard Cowart is the Director of European Programs for RAP.

He was Chair of the Vermont PSB, Chair of NARUC's Energy & Environment Committee, and of the US National Council on Competition and the Electric Industry. Recent assignments include technical assistance to the US Congress, the Regional Greenhouse Gas Initiative (RGGI), the New York ISO, the California PUC, the National Association of Clean Air Agencies, and China's national energy and environmental agencies.

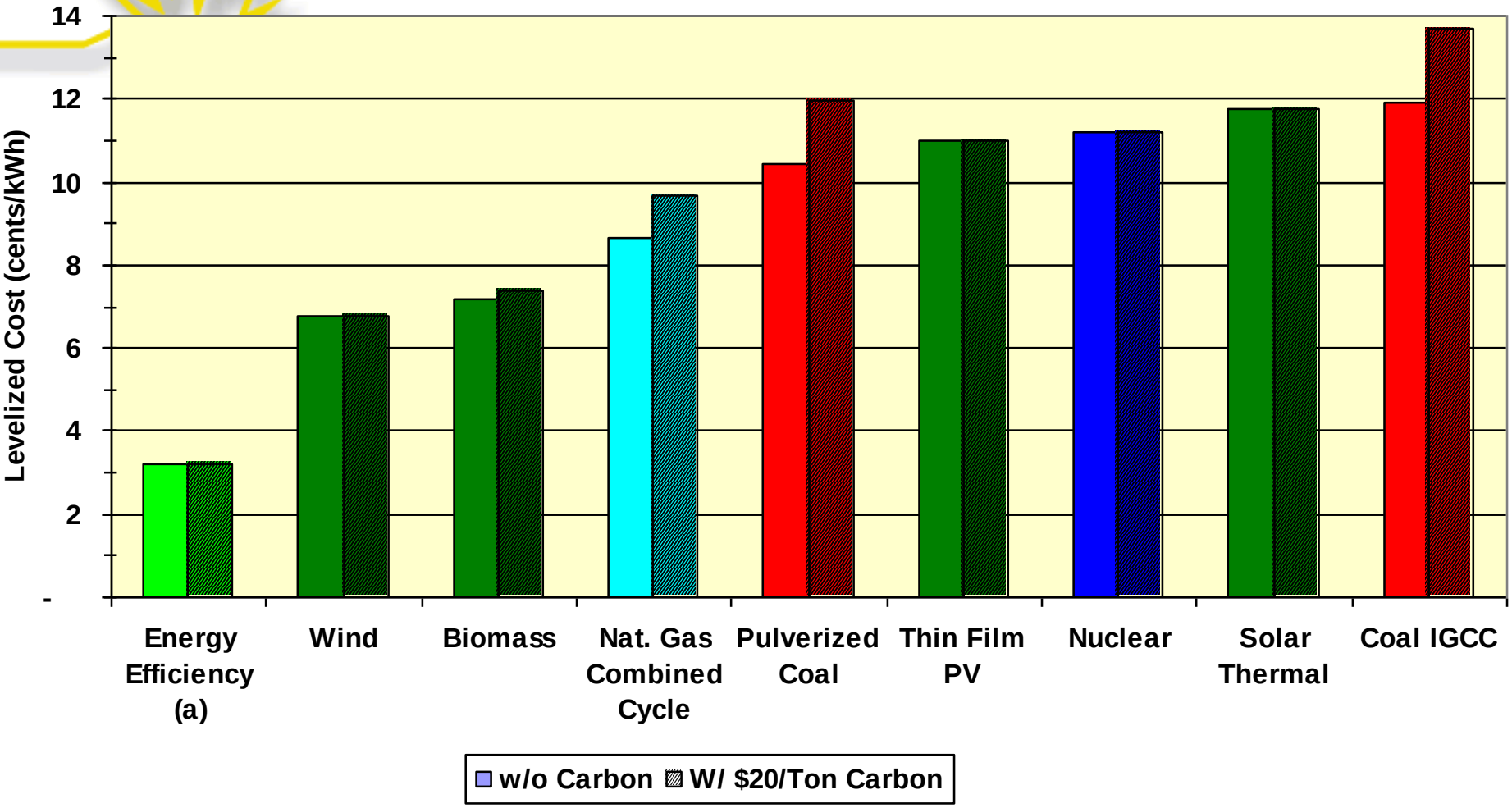
EU not on target to meet current EE goals

20% EU primary energy savings in 2020



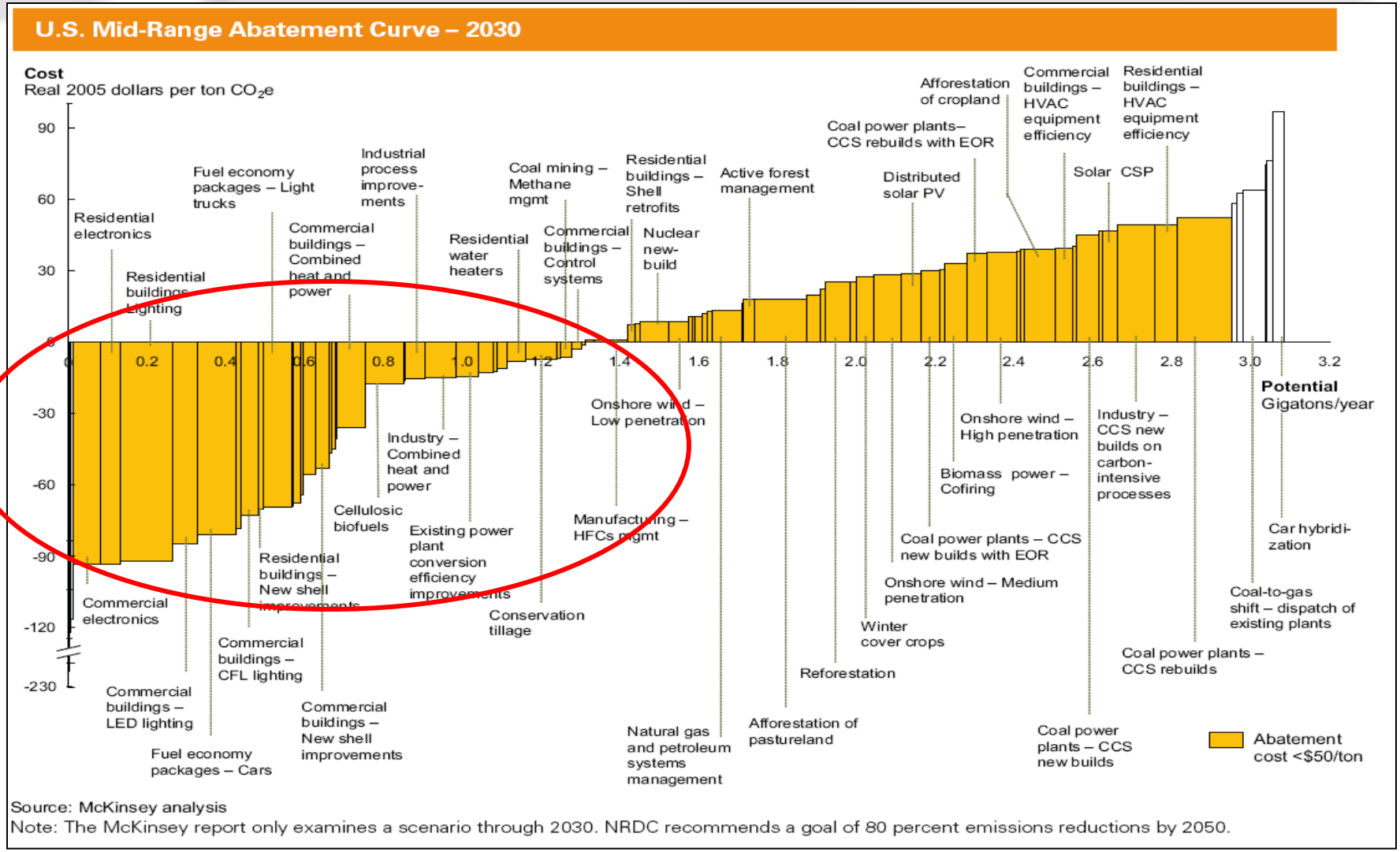
Directorate-General

Cost of New Electricity Resources



Source: Lazard 2008 for NARUC (midpoint of range)

Efficiency is the low-cost "carbon scrubber"



Source: McKinsey analysis

Note: The McKinsey report only examines a scenario through 2030. NRDC recommends a goal of 80 percent emissions reductions by 2050.

An "Efficiency First" Power Policy

- **Utility-scale energy efficiency delivers:**
  - Cost savings & productivity gains
  - Energy security and reliability
  - Essential solution for environmental & climate goals
- **Elements of a Utility-Scale Efficiency Strategy**
  1. **Obligations** -- Workable and enforceable Efficiency Obligations
  2. **Financing** – "Efficiency First" investments using carbon revenues, structural funds, economic stimulus funds, etc.
  3. **Markets** – Open markets to efficiency services
  4. **Profitability** – Make efficiency profitable for power entities
  5. (And more – Codes and standards, smart grids with smart rate design, etc, etc)

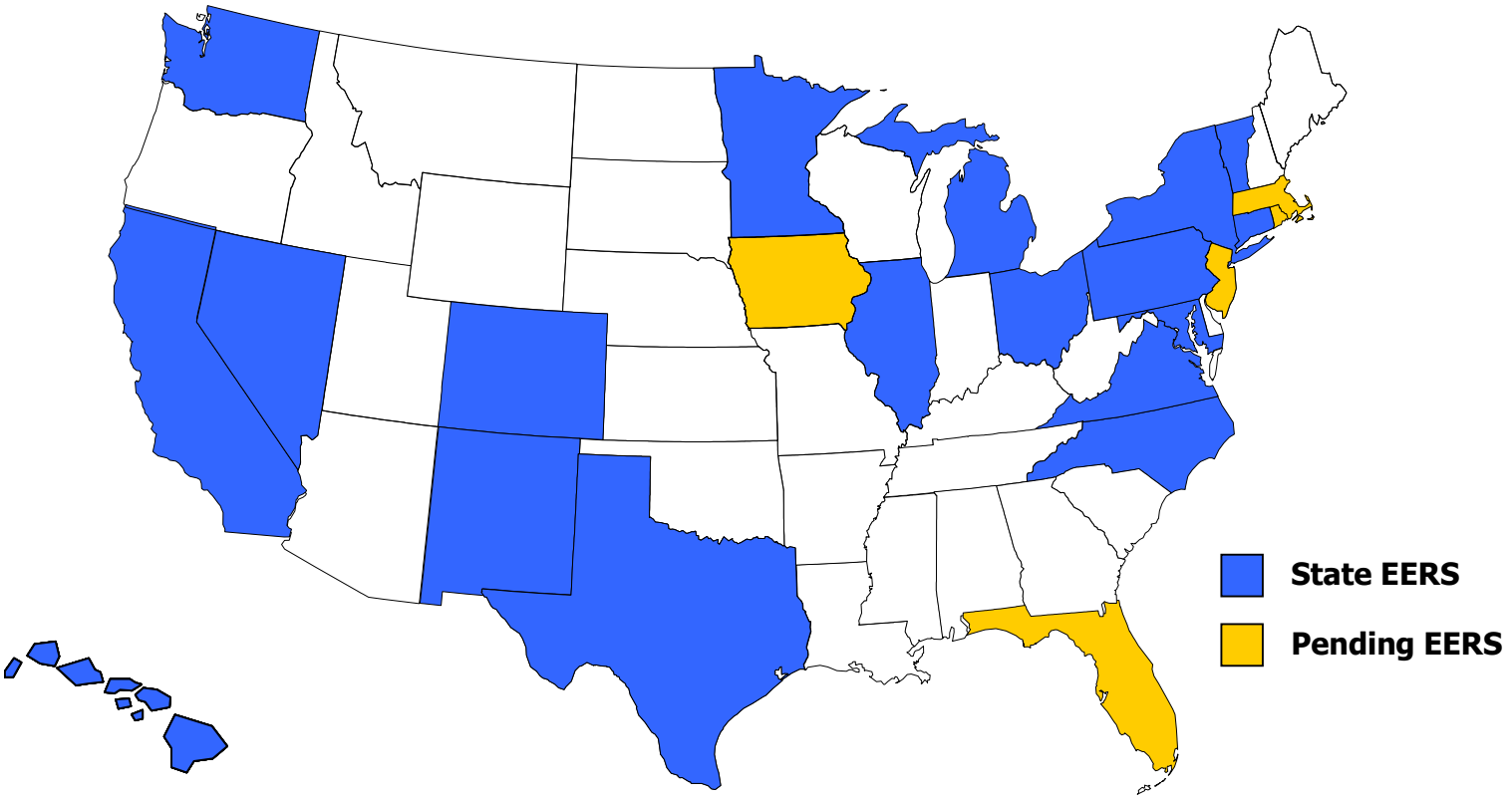
Element 1: Efficiency Obligations

- **20/20/20 – Can the EU and/or MS make the EE obligation mandatory? If so, who is responsible?**
- Indications from the US:
- **US states** are increasingly turning to EE as a resource, 19 states now have mandatory EE targets;
- **Great variety in administration** – Distribution utilities, State agencies, “efficiency utility” option.
- **US Congress considering national EERS**
  - Either stand-alone or as an essential complement to cap-and-trade for carbon

Why EE Obligations?

- Achieve substantial energy and emissions savings
- Performance based – emphasizes savings, not spending
- Can be easier to legislate savings targets than spending amounts
- Can start programs quickly, without years of least-cost analysis (but targets should be based on cost-effective opportunities)
- States can choose implementation path

US: 19 States with Energy Efficiency Resource Standards (EERS)

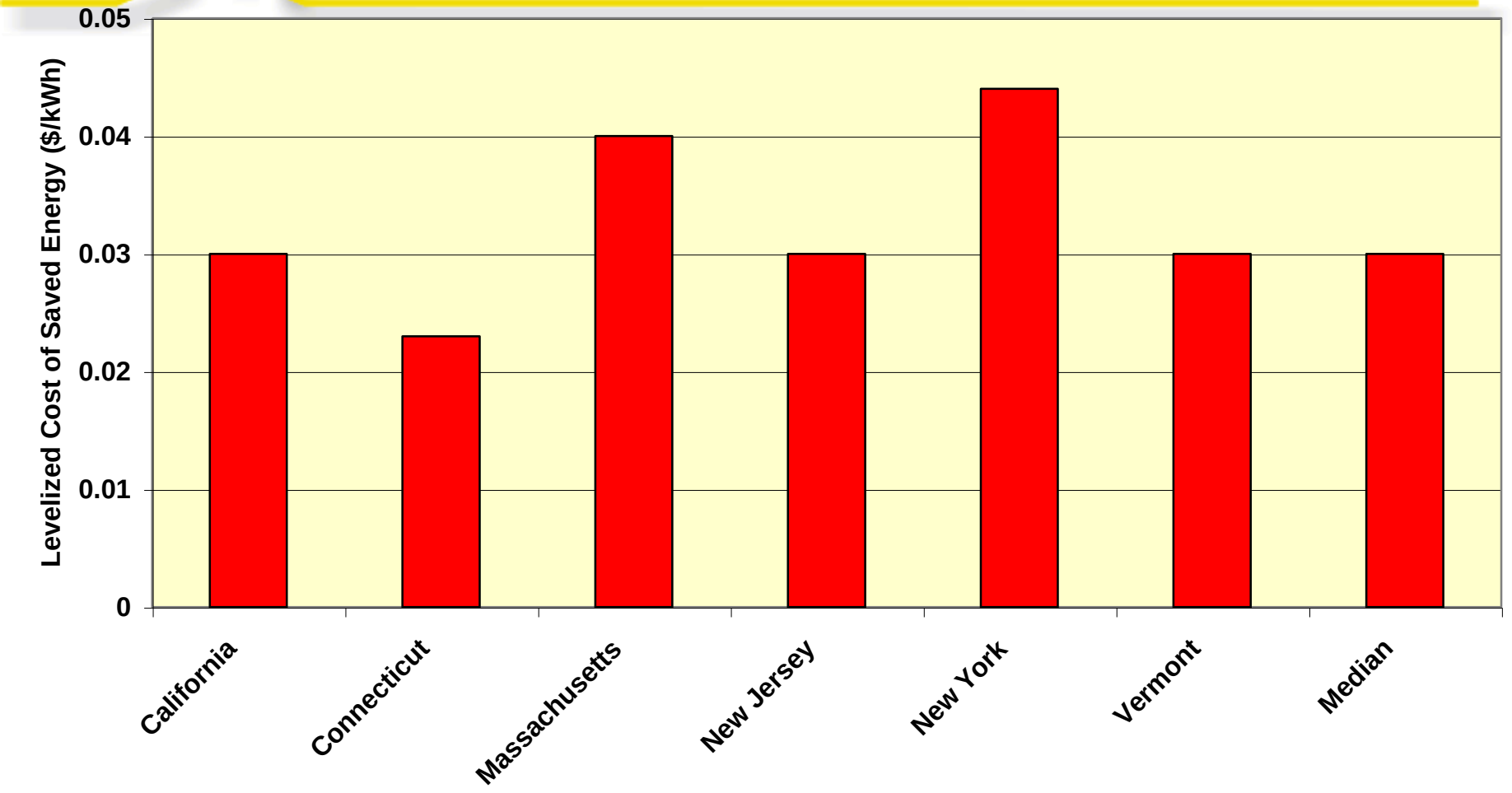


These plus BAU EE will save ~6% of total US power by 2020

ENERGY EFFICIENCY ON A "POWER PLANT" SCALE

- 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 (i.e., save an additional 0.4% to 1.0% or more of load each year)
  - CA, CT, IA, MA, MN, NY, OR, RI, VT, WI

Efficiency resources are cost effective across many states: 3 cents/kwh



Source: ACEEE, "Five Years In," 2005

Delivery Mechanisms for EE

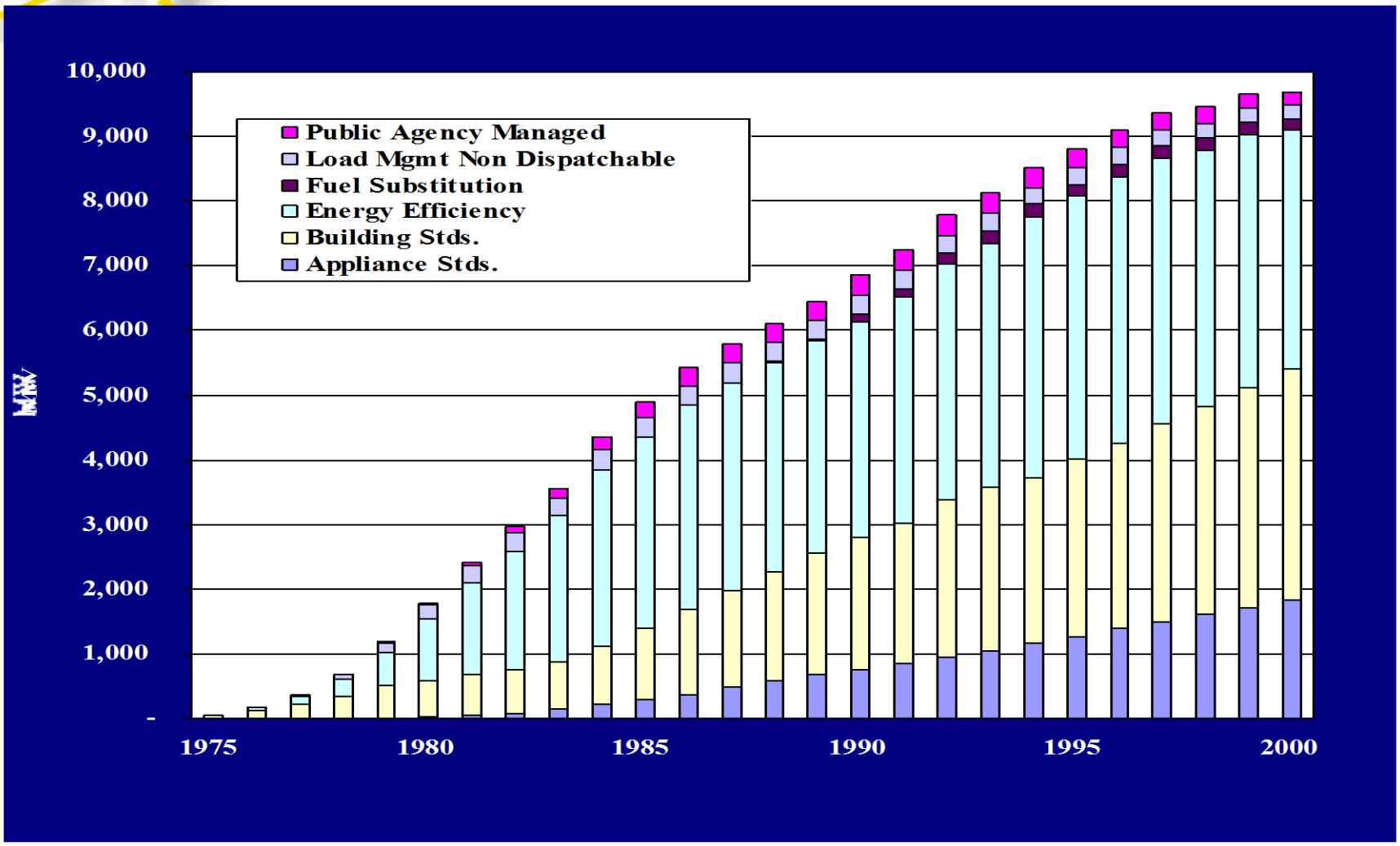
at least 4 options now used in the US

1. **Obligation on distribution utility**
   - Most states, including CA
2. **Obligation borne by a state agency**
   - E.g., New York, Oregon
3. **Energy Efficiency Utility**
   - *Efficiency Vermont* is the leading case
4. **Performance contracts with 3rd parties**
   - Texas

Savings Obligation on Distribution Utilities -- California example

- Policy driven by the CA "loading order": in all utility policy choices, EE comes first, then renewables, before fossil
- Major investor-owned utilities must develop EE plans with targets, subject to regulatory review
- So Cal Edison spending >$400 million/year
- Cumulative savings: 22% to 25% of load
- **NOTE**: Regulators also adopted "decoupling" and performance incentives for EE success

California: a portfolio of efficiency measures pays off over time



California efficiency investments lower demand by 25% over 25

The **Efficiency Utility** – "Efficiency Vermont"

- A unique franchise – comprehensive **EE services only** -- awarded through a public tender and competitive bidding
- Funded by a **uniform "wires charge"** on electricity sales
- Supervised by the **energy regulator**
- Based on a **performance contract**
- **Single brand** builds awareness, trust
- Efficiency Vermont is now meeting 7% of Vermont's energy requirements and is on path to meet well over 12% by 2012
- "Low-hanging fruit" is reappearing – costs per MWH actually declining & now meeting **>100% of load growth**

Cost and savings performance – ambitious programs can cost less per MWh saved

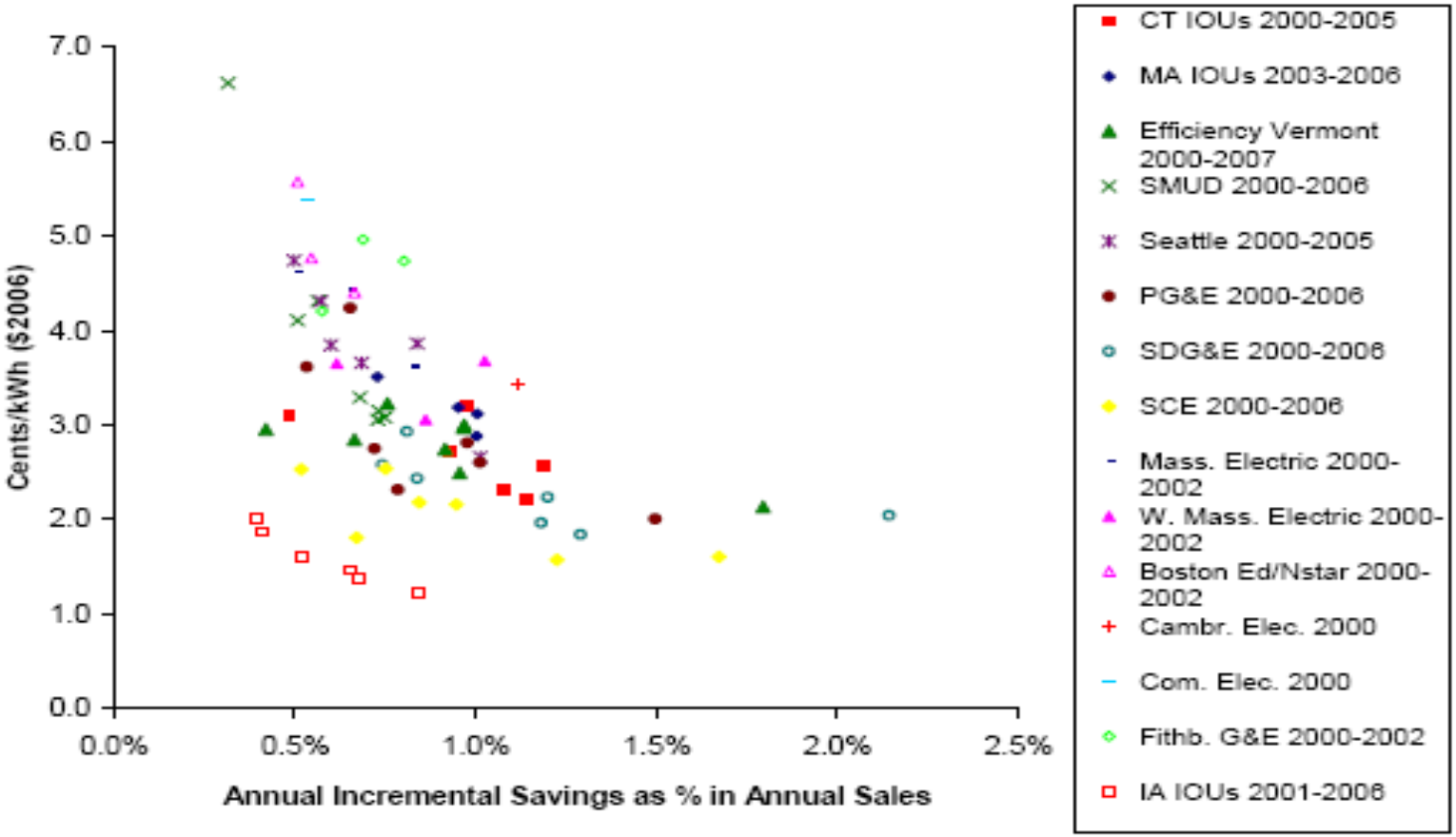
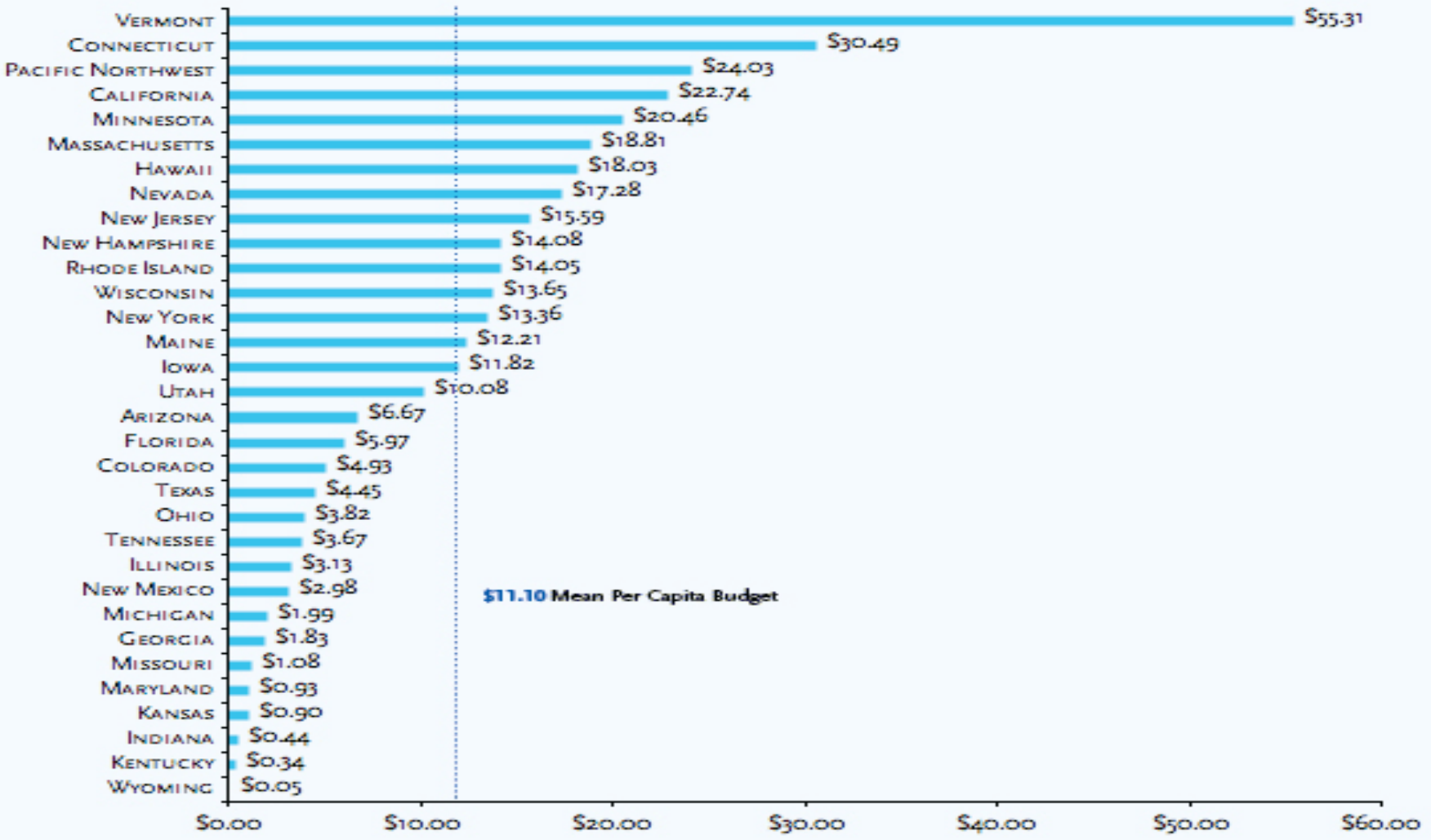


Figure A.4. Utility CSE vs. Annual Savings as a Percent of Annual Sales

UNITED STATES

2008 Per Capita Budgets, Electric Programs

Excluding Load Management



Nevius M, Krouk J, Griffith S, Lasky C, "Reaching Higher: Annual Industry Report 2008," Consortium for Energy Efficiency, 2008.

A National Clean Energy Standard proposed in US Congress (pending 2009)

- Part of the leading climate legislation
- Obligation on Local Distribution Companies
- Mandatory 20% from **EE and RE combined** by 2020
- A minimum of 12% must be renewables
  - Major compromise for states claiming low renewables potential
- Includes renewables, CHP, recycled energy, end-use efficiency
- States can set higher targets if they want

Efficiency Obligations Some issues in the EU

- **Can the EU make the 20% Efficiency target mandatory?**
- **Where should Member States place the obligation? Retailer? Disco? Government? – Other?**
- **Would it be better to create new efficiency agents?**

  -- Efficiency Utility or Energy Savings Trust?

More on details:

- Should EE trade against RE in a combined low-carbon standard?
- Should reductions from codes, education, market transformation, etc. count as qualified savings?
- What is the best balance of deemed savings and detailed M & V?
- Should “prospecting” by ESCOs be rewarded through a feed-in tariff, standard contract offer, or tradable white tags?

Element 2. Energy Efficiency is the Cornerstone for Successful GHG Cap-and-Trade

- **Key points:**
  - **Carbon price alone will not deliver what we need**
  - **Consumer/industry cost can be too high in power markets**
  - **Auction revenues create a huge new funding opportunity for EE**
- Evolution from “ancillary policy” to “complementary policy” to “cornerstone” role.
- California GHG Plan: 80% of reductions come from policies, only 20% from cap-and-trade based carbon price.

Conclusion:

Create Efficiency Obligation to reduce emissions and Design cap-and-trade to finance efficiency

Where will power sector reductions come from?

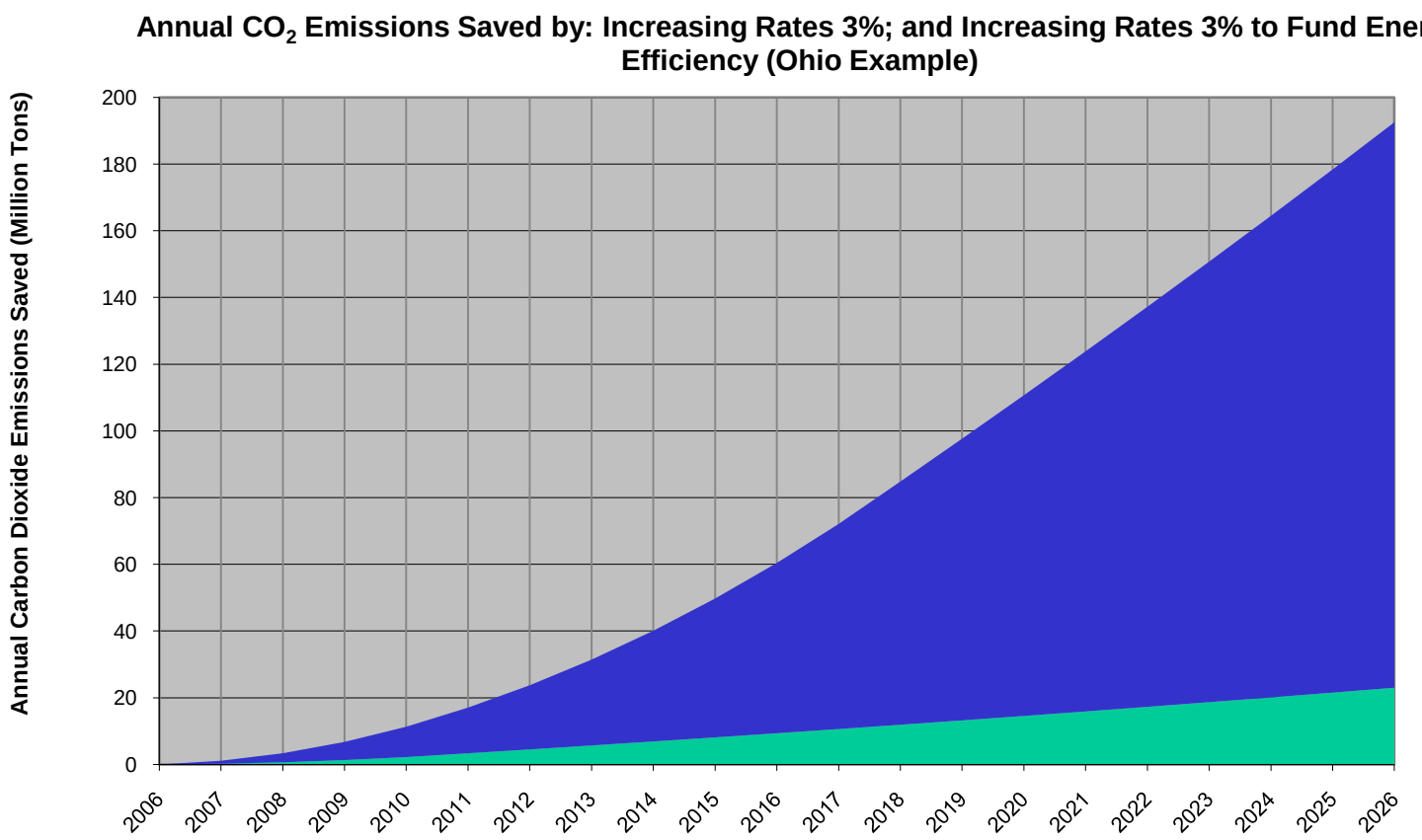
3 main possibilities:

- Reduce consumption
- Re-dispatch the existing fleet
- Lower the emission profile of new generation (including repowering)

For each opportunity, ask:

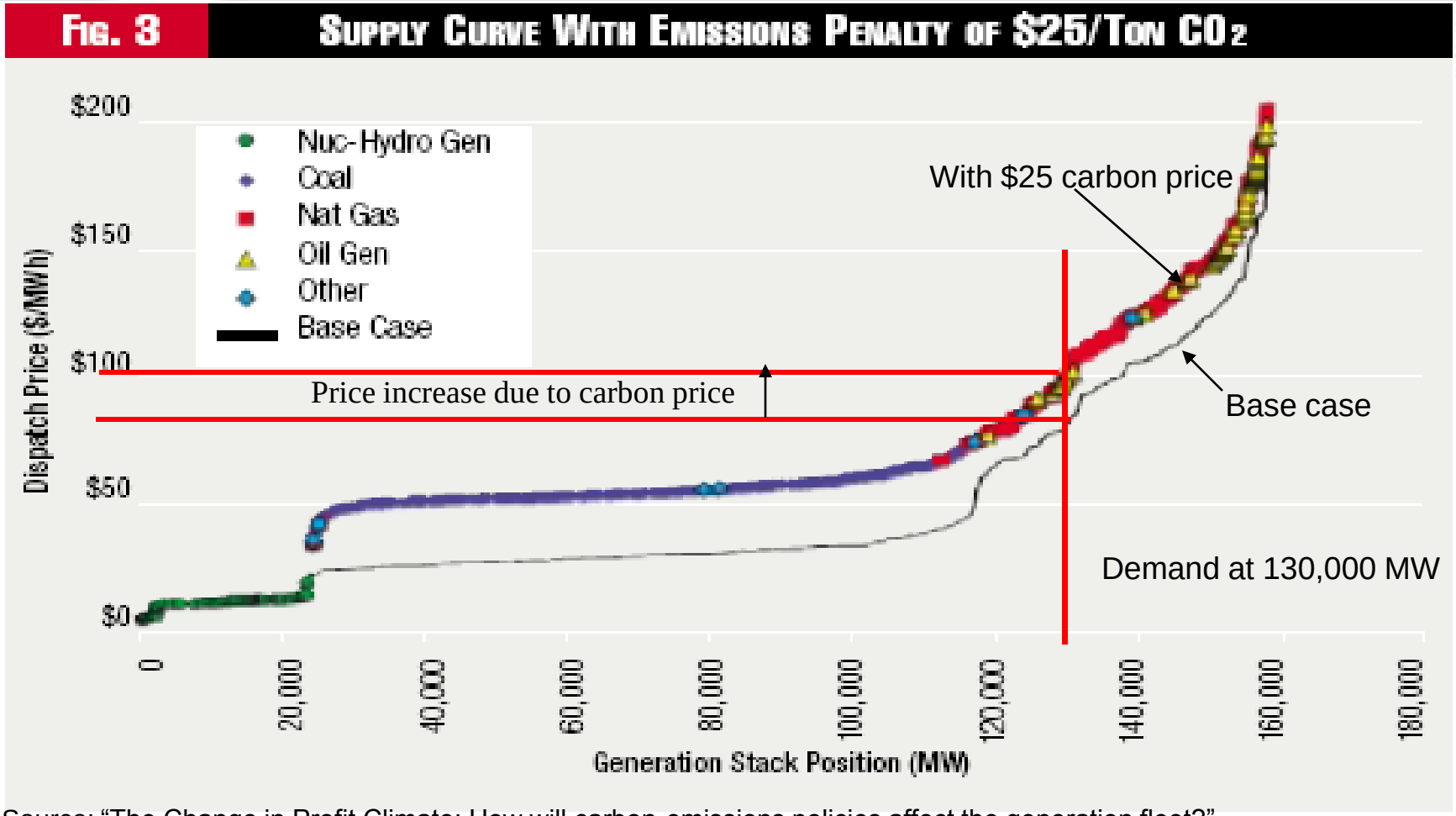
1. **How many tons will it avoid?**
2. **How much will it cost consumers per ton ?**
3. **What tools – including what kind of carbon caps -- get the best results on #1 & #2 ?**

Efficiency programs can save 7x more carbon per consumer $ than carbon taxes or prices



Assumptions: Electricity use increases by 1.7% per year; Retail electric sales increase by 3%; Price elasticity is -0.25 (-0.75 for a 3% increase), distributed over 5 years; Carbon dioxide emissions are 0.915 tons per MWh in Ohio; Cost of EE is 3 cents per kWh; Average EE measure life is 12 years

Power Markets Problem: **Carbon taxes and auctions** to sources can increase wholesale power prices with small effect on dispatch or emissions



Source: "The Change in Profit Climate: How will carbon-emissions policies affect the generation fleet?" Victor Niemeyer, (EPRI) -- Public Utilities Fortnightly May 2007 <some captions, demand and price lines added>

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Why carbon taxes and auctions create “high cost tons”

- Carbon price must be very high to save many tons (for gas to displace coal, etc.)
- Fossil units almost always set the clearing price
- Short-term clearing price provides the benchmark for longer-term and bilateral contracts
- SO: Carbon penalty on sellers raises prices generally
- Inframarginal rent a/k/a “windfall gains” to generators paid for by consumers

Main solution: Design GHG cap-and-trade for efficiency: The "Cap and Invest" strategy

- Allocate up to100% of initial credits to consumer trustees (eg, distribution utilities, Weatherization and other EE programs) Generators need to purchase allowances, recycling much windfall revenue BACK to consumers
- Energy regulators/gov't supervise use of the money to benefit consumers
- **Best result: focus these $ on investments that lower carbon (EE, RE, and CCS)**
  - RGGI MOU - state minimum commitment is 25%
  - RGGI states: Auction ~90%; EE allocation ~80%
- Results: lower cost per ton avoided, lighter macro-economic impact >> quicker progress in reducing GHG emissions

Can We Create a Carbon Allocation for Efficiency in Europe ?

- **Goal:** Allocate a sizable pool of carbon allowances to utilities, LDCs, or efficiency agencies to promote end-use efficiency
- **US national proposal (in Waxman-Markey, now pending)**
  - 10% of allowances to US states for public-run EE programs
  - 35% of allowances to LDCs for various purposes (EE permitted, not mandated)
  - ~10% of allowances to gas LDCs/ 1/3 must be spent on EE
- **HOW CAN THIS BE DONE IN THE EU?**
  - Include this idea in the Action Plan for Efficiency?
  - Begin with leading Member States?
  - What steps are needed now? Reports? Models? Etc?

Element 3: Markets – Open Power Markets to Efficiency

- Liberalized markets tend to underinvest in EE as a long-term system resource
- One answer is to require all-source bidding (and equality of treatment) for supply and demand-side/distributed resources
- An “Efficient Reliability Rule” should apply to market interventions that support reliability

Example 1: EE credits in New England ISO's Forward Capacity Market

- Needed: reliable capacity on a forwards basis (to avoid future capacity crisis)
- Generator proposal: Pay for Generation capacity in advance, for 10-year forward period
- Better solution: Let supply and demand-reduction bid to meet growth needs
- First auction 2007: demand resources including EE won 2/3rds of the bids for new capacity & lowered the clearing price
- NOTES: this could be a source of funding for programmatic efficiency; ESCOs can be paid too.

Example 2: "Standard Performance Contracting" for EE (Texas)

- **Legislature sets the goal (X% of load growth)**
- **Regulator sets the level of incentive payments** to "project sponsors" for installing eligible energy efficiency measures in residences, businesses or industrial facilities.
- Incentives based on engineering estimates of the savings (deemed savings approach) for many measures.

- **Utility has no role in delivery** – simply pays for the resource delivered – **akin to a feed-in tariff for EE**
- At first very modest goal (10% of load growth) now 20% of load growth, Legislature is considering raising again to 30%-50%

- In 2007, $72.6 million was spent on EE through this program
- Investments in 2007 = 122 MW saving & 371 GWh annually

Element 4. Making Efficiency Profitable

- Three questions:
  - **Who should deliver** energy efficiency?
  - Can we make it **profitable to those agents to deliver "deep efficiency" services?**
  - Can we lessen disincentives to traditional industry participants?
- Market structure matters – this is much harder in restructured, liberalized markets.

Indications from the US experience

- In the move to restructuring and competitive markets (1994+) efficiency spending by utilities was cut 50%.
- US generation/sales are now about 50% competitive, 50% vertical integration – need different tools.
- Distribution wires companies (LDCs) own meters and bill customers – thus a possible route to deliver EE.
- US states now use: wires charges for EE cost recovery, “decoupling” for lost revenues, and incentives for superior performance.
- Congress may require states to address the throughput = profits problem.

Making efficiency profitable: EU Options

- **"Decoupling" profits from sales** is essential for LDCs and integrated utilities.
  - (But not helpful to generators in wholesale markets)
- **White certificates and EE feed-in tariffs** can reward ESCOs and retailers and encourage deeper savings beyond mandates.
  - (But also encourage cream-skimming)
- **Performance contracts with franchised EE delivery agents**, supported by wires charges and carbon revenues.
  - (But requires government supervision)
- **NOTE: "Smart meters"** by themselves don't deliver efficiency or solve these problems

For more information…

- *"Carbon Caps and Efficiency Resources: How Climate Legislation Can Mobilize Efficiency and Lower the Cost of Greenhouse Gas Emission Reduction" (Vermont Law Review 2008)*
- *"Energy Efficiency Policy Toolkit" (C Harrington et al, RAP August 2006)*
- *"Efficient Reliability: the Critical Role of Demand-Side Resources in Power Systems and Markets" (R Cowart, for the National Association of Regulatory Utility Commissioners, June2001)*
- *"Why Carbon Allocation Matters – Issues for Energy Regulators" (RGGI memo March 2005)*

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