Powering the 21st Century – Lowering Risks and Costs in a Carbon-Constrained World

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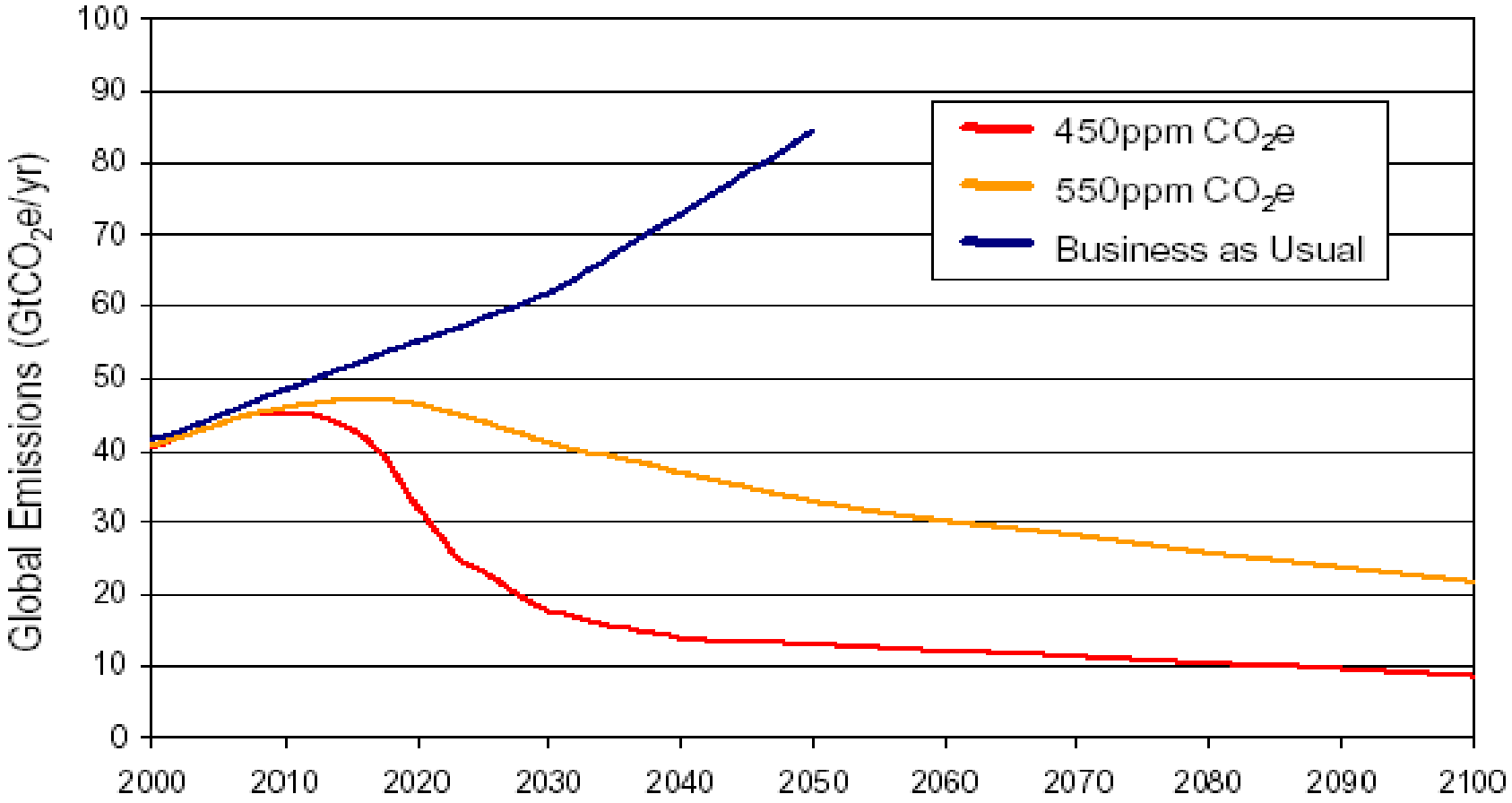
2 billion villagers want a better life

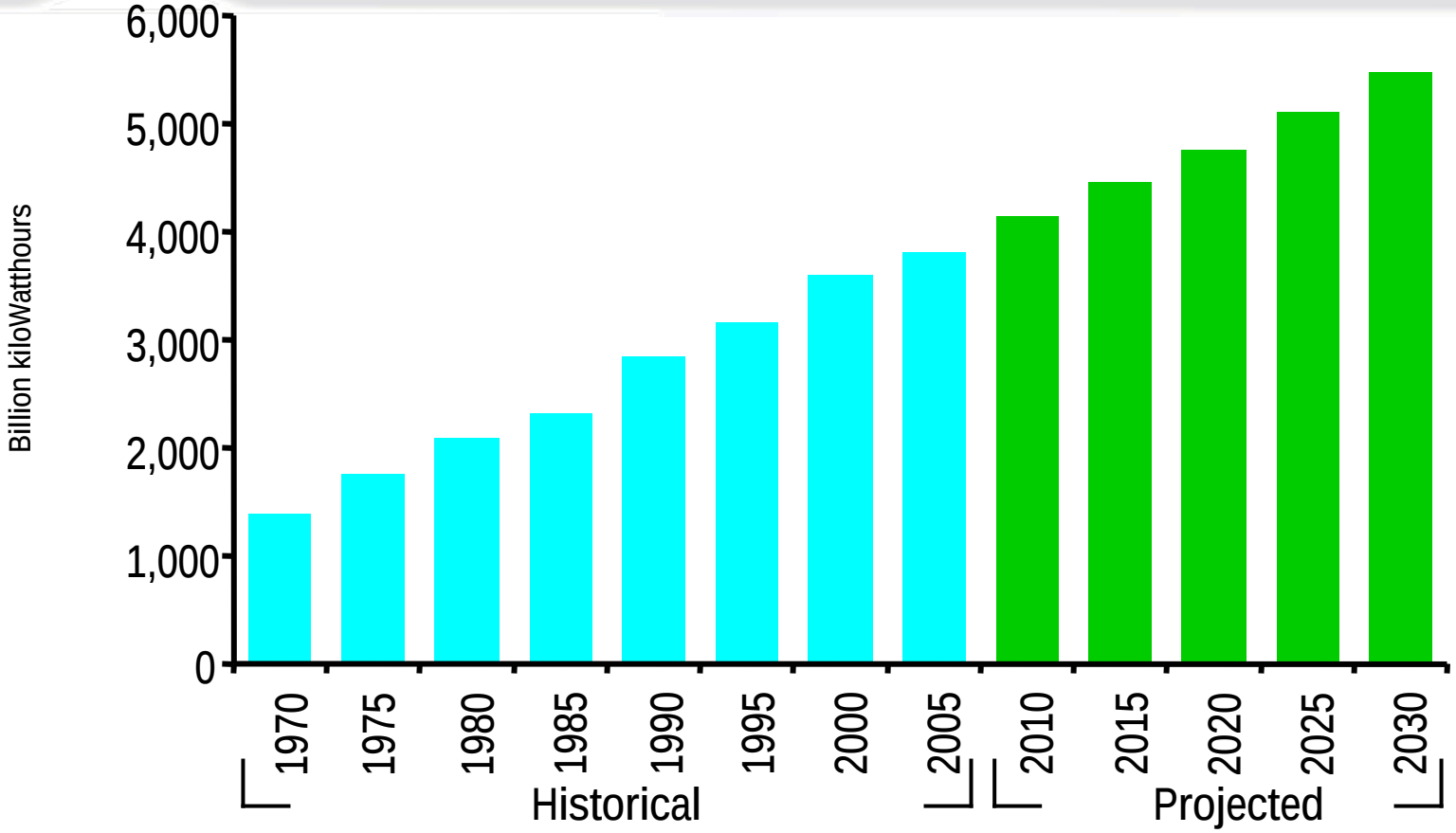
Emission paths to stabilization



Source: Stern Review (UK) October 2006

Demand for Electricity Is Increasing

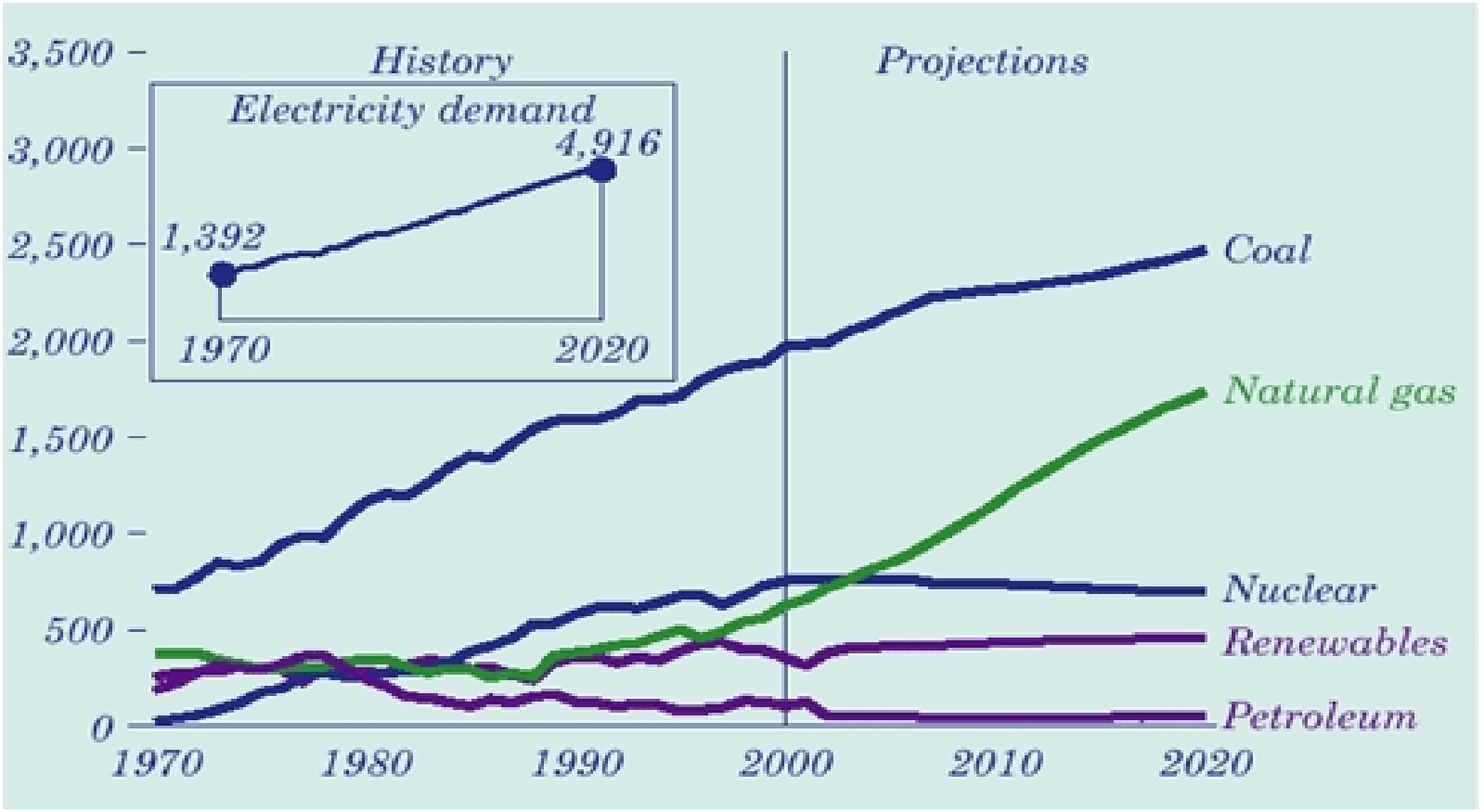
EIA projects U.S. energy demand will grow 40% by 2030



Sources: U.S. Department of Energy, Energy Information Administration, *Annual Energy Review 2005* and *Annual Energy Outlook 2007 Early Release*

New gas does not displace old coal: Both are rising

Figure 4. Electricity generation by fuel, 1970-2020 (billion kilowatthours)



Coal revival has slowed, but is still a big concern

Current Coal-Fired Capacity Additions

Table 1

	General Status	Number of Plants	Capacity (MW)
Progressing Projects	*Under Construction*	24	12,506
	Near Construction	8	4,565
	Permitted	13	6,169
	SUB TOTAL	45	23,240
Uncertain Potential and Timing	*Announced (early stages of development*	76	48,440
	TOTAL	**121**	**71,680**

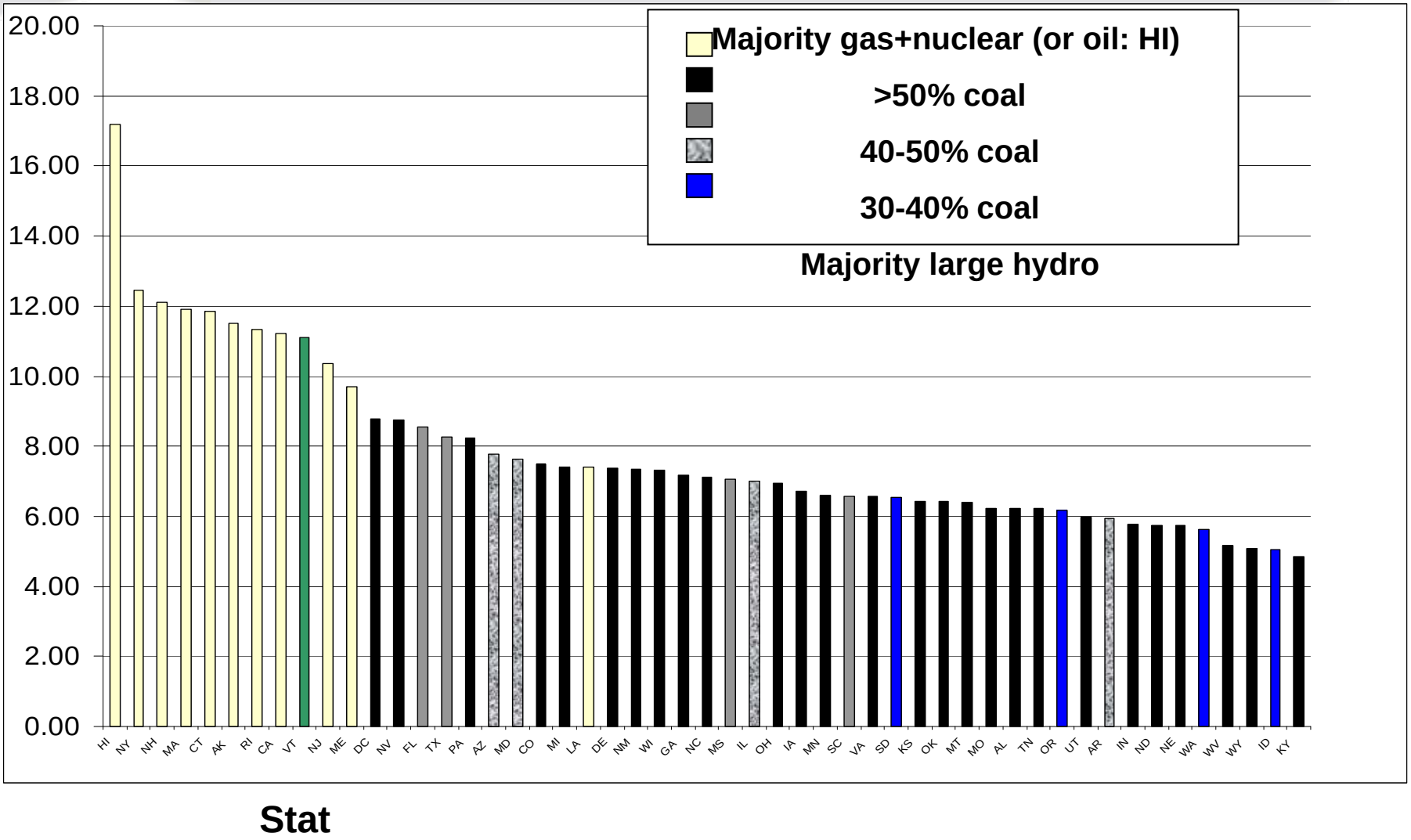
Over 23GW new coal being added now.

71GW total possible

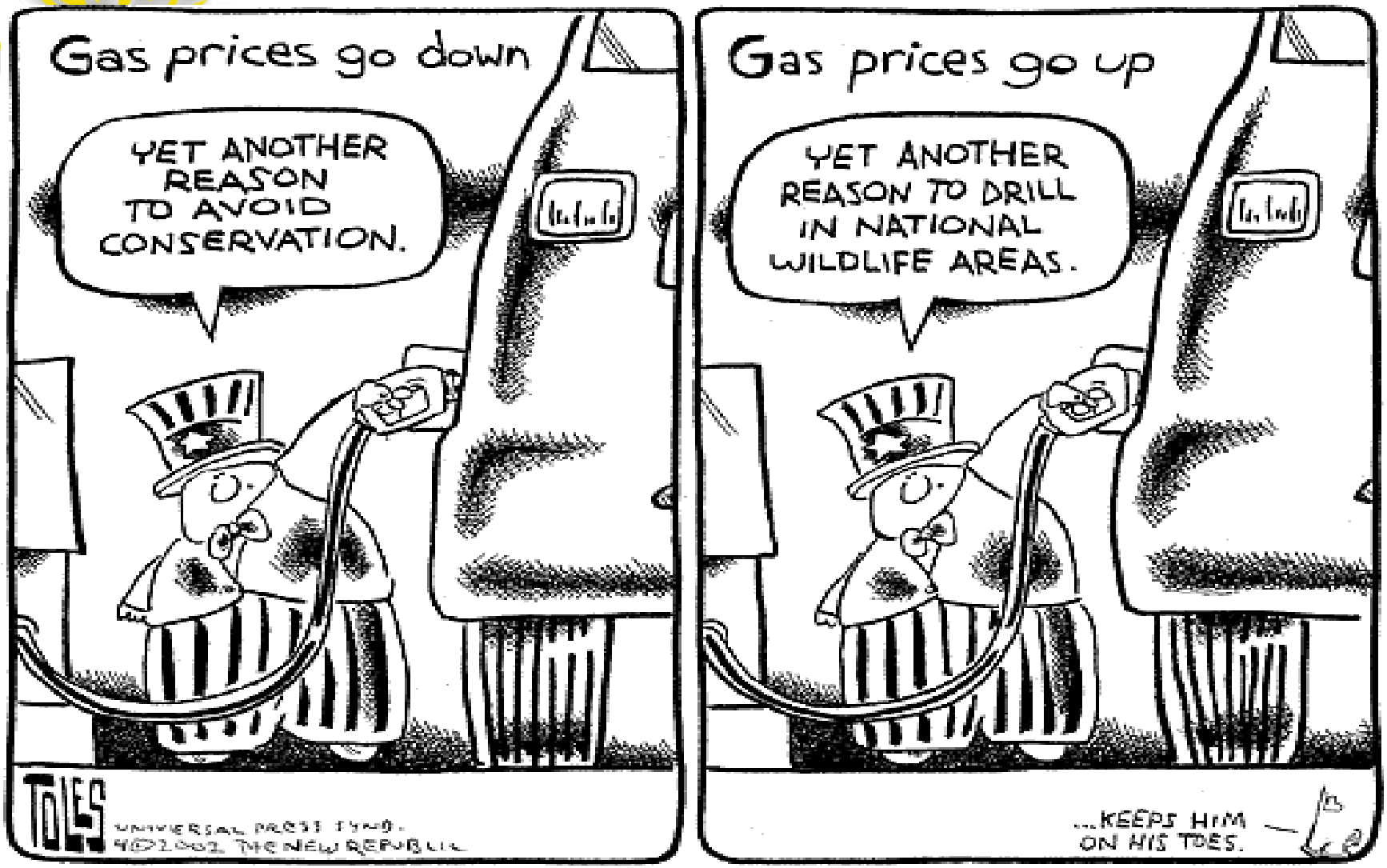
Status Listing	*Description*
Under Construction	Project is under construction
Near Construction	Project has been approved; majority or all permits are obtained. Sponsor is contracting vendors and Engineering, Procurement and Construction (EPC) contractors. Site preparation has begun.
Permitted	In the permitting phase. Two or more permits approved or fuel or power contracts have been negotiated.
Announced	Early stages of development to filing for permits. May include a feasibility study.

Source: Global Energy Decisions – Velocity Suite

High emissions vs. High costs: Is there another choice?



Americans need help when it comes to energy efficiency



TNR 4-6-8

Where will power sector reductions come from?

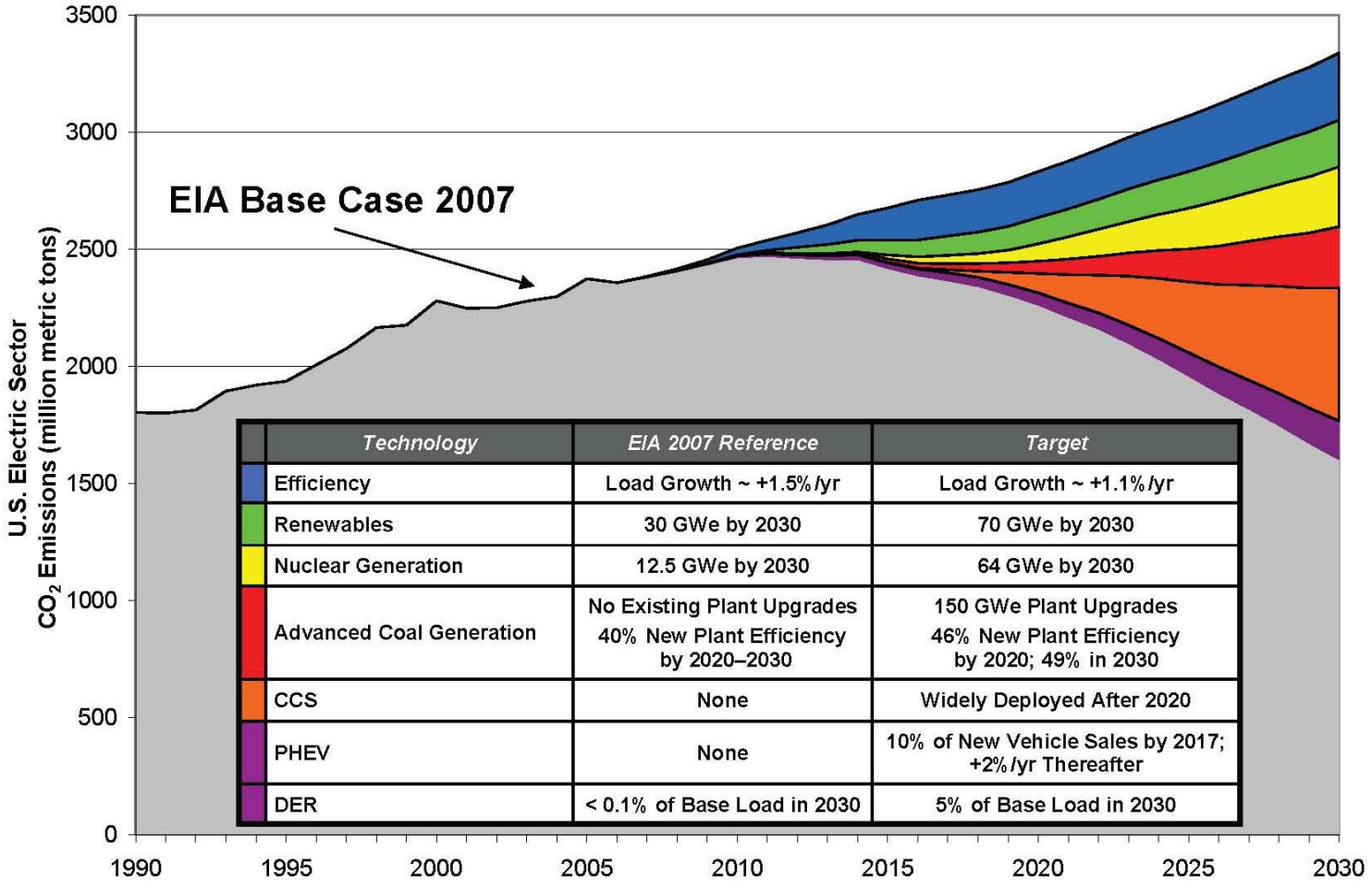
3 main possibilities:

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

For each opportunity, ask:

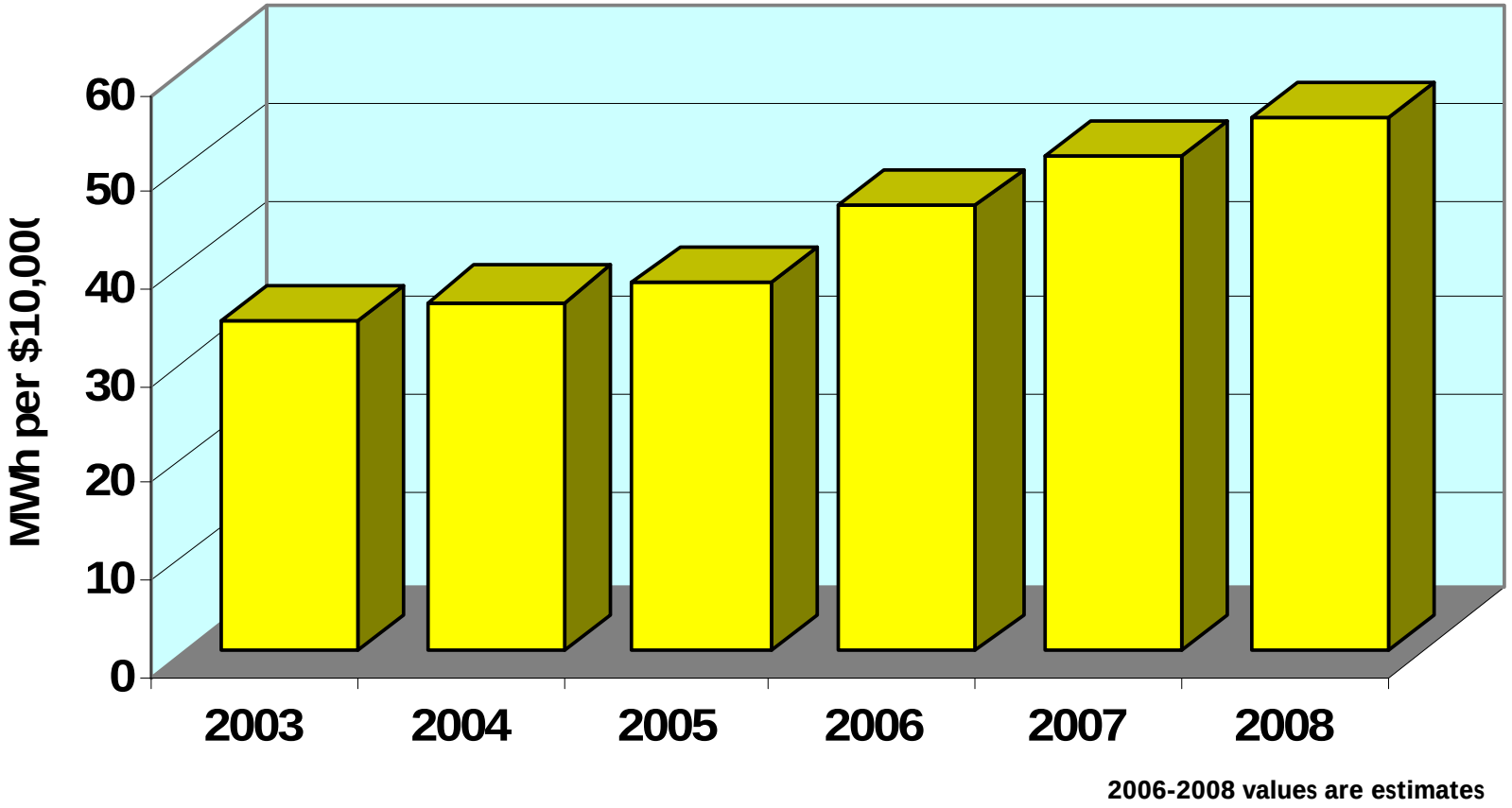
1. **How many tons will it avoid?**
2. **How much will it cost consumers per ton ?**
3. **What tools – including what kind of carbon caps -- get the best results on #1 & #2 ?**

Multiple Solutions Needed – Where should we start?

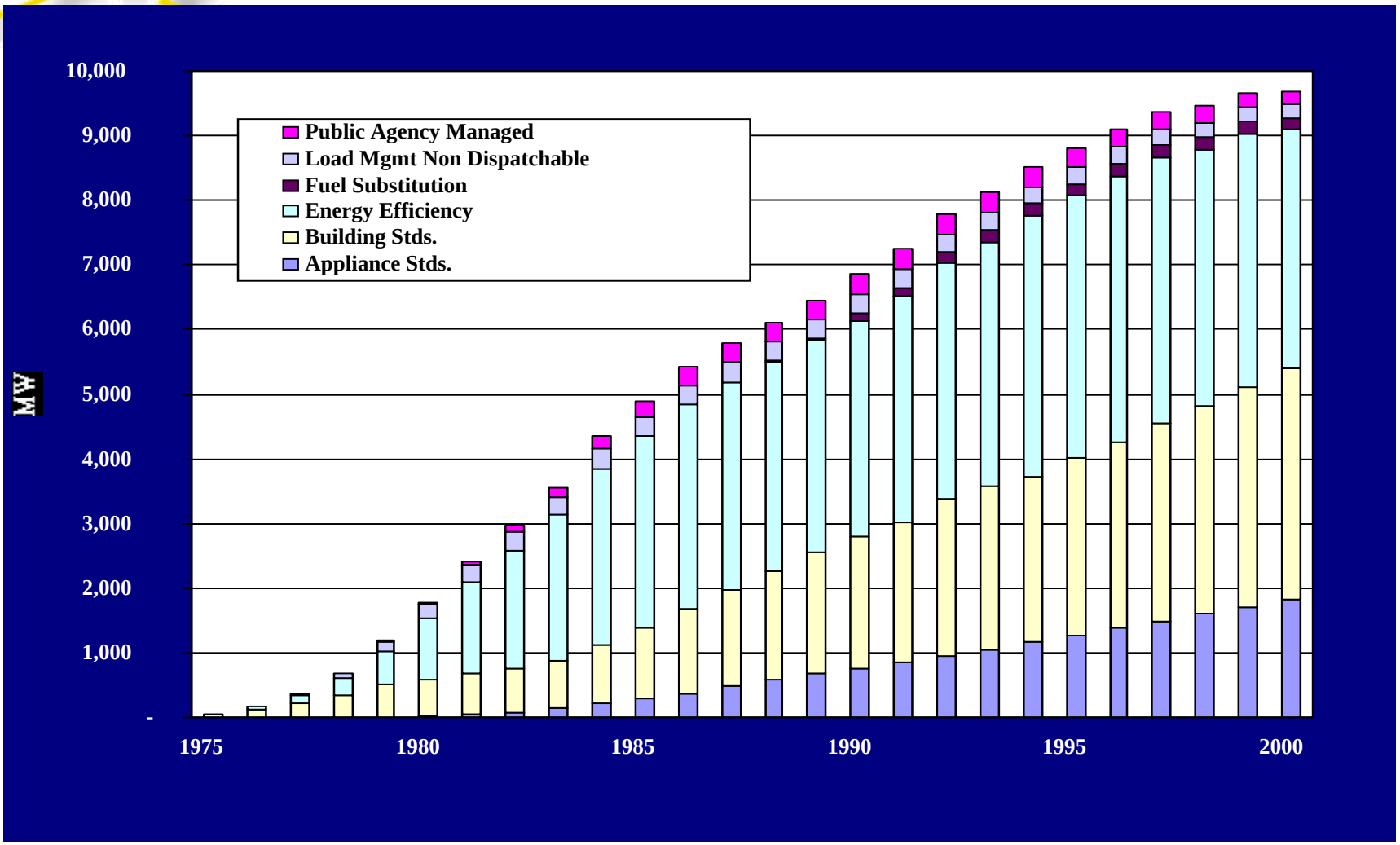


Technology	EIA 2007 Reference	Target
Efficiency	Load Growth ~ +1.5%/yr	Load Growth ~ +1.1%/yr
Renewables	30 GWe by 2030	70 GWe by 2030
Nuclear Generation	12.5 GWe by 2030	64 GWe by 2030
Advanced Coal Generation	No Existing Plant Upgrades 40% New Plant Efficiency by 2020–2030	150 GWe Plant Upgrades 46% New Plant Efficiency by 2020; 49% in 2030
CCS	None	Widely Deployed After 2020
PHEV	None	10% of New Vehicle Sales by 2017; +2%/yr Thereafter
DER	< 0.1% of Base Load in 2030	5% of Base Load in 2030

Efficiency Vermont Savings Yield Rates (MWh per $10,000 invested)

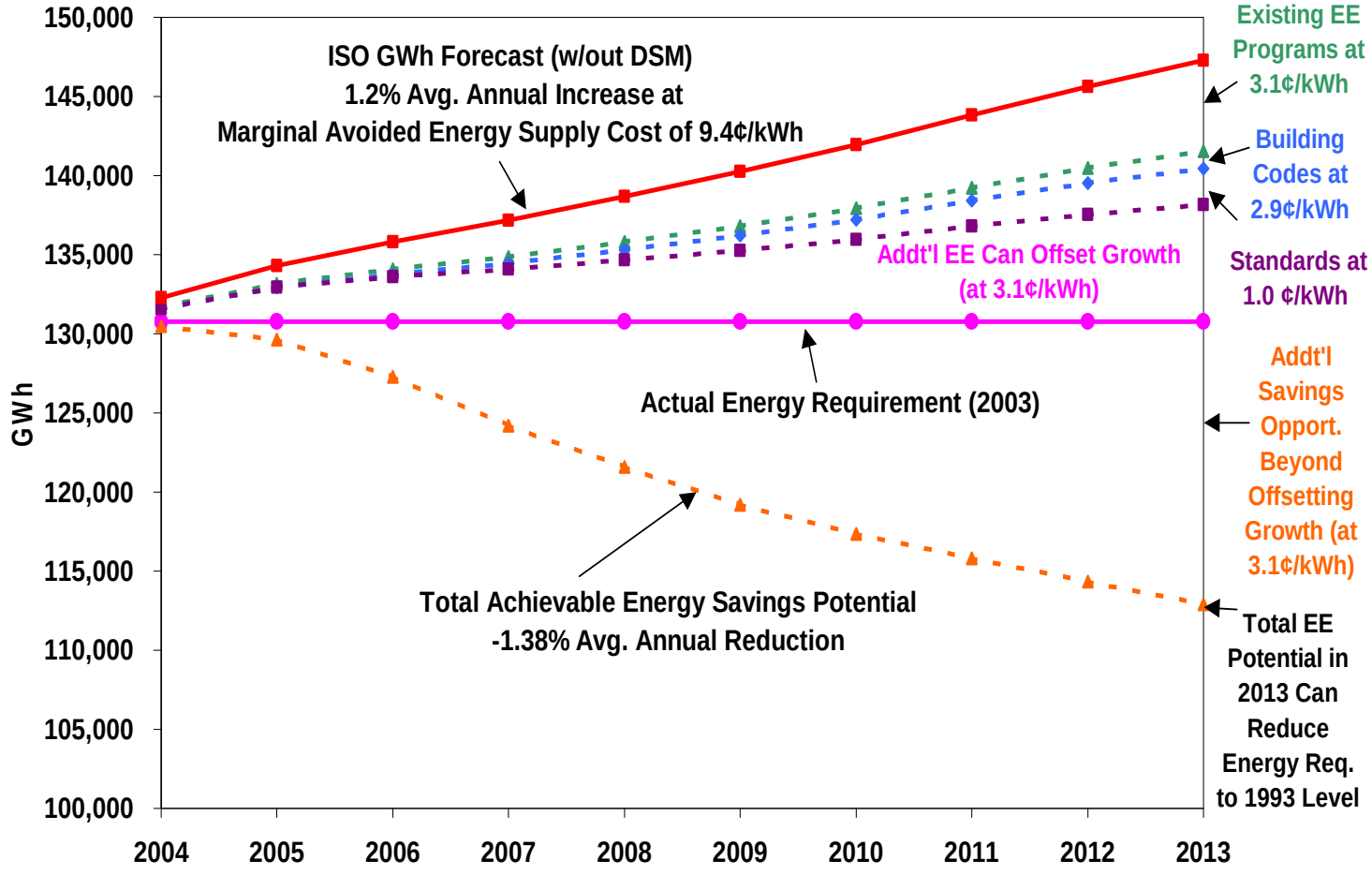


California: a portfolio of efficiency measures pays off over time



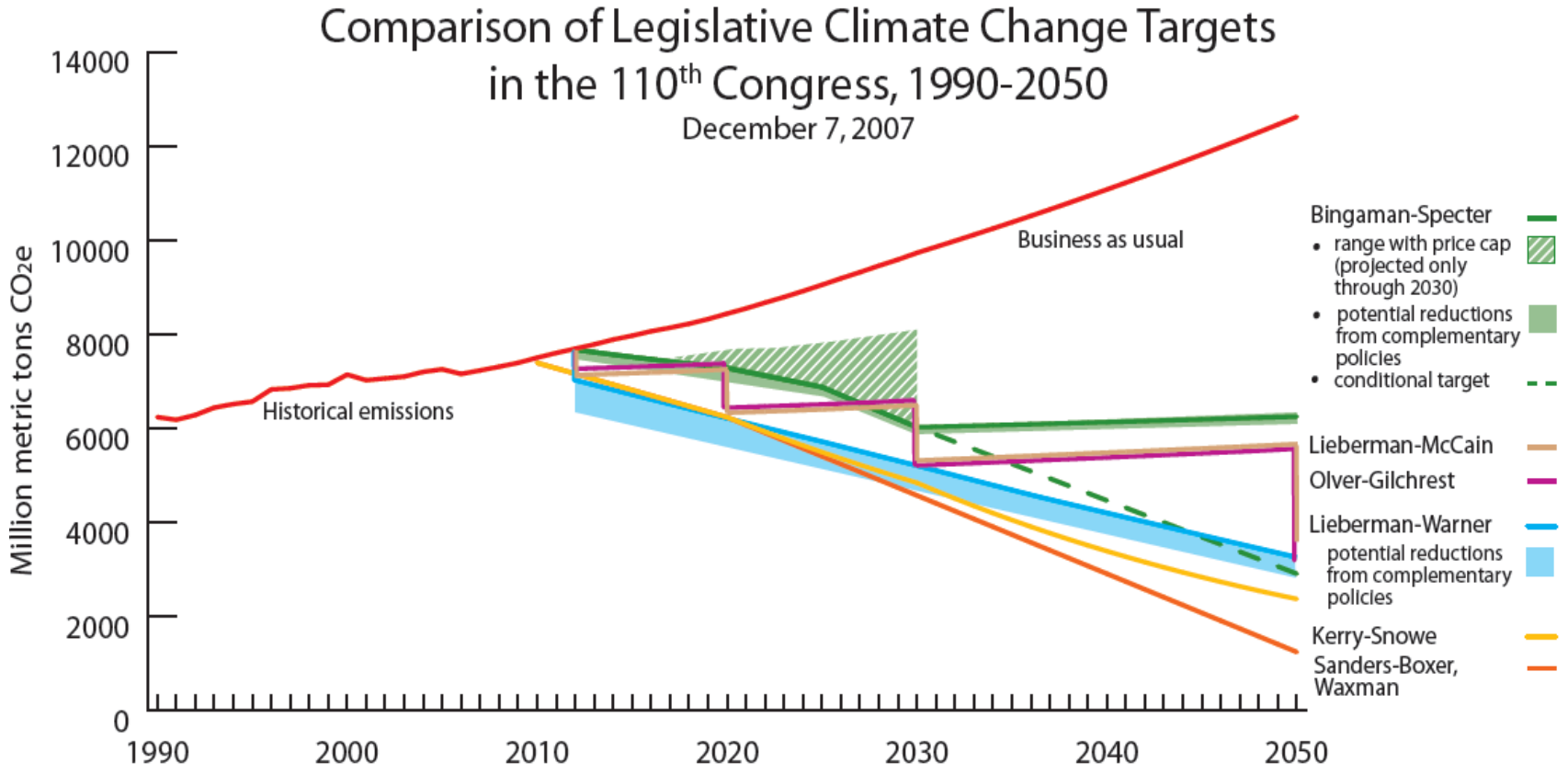
California efficiency investments lower demand by 25% over 25 years

Efficiency in New England can reverse demand growth



Source: NEEP, 2004

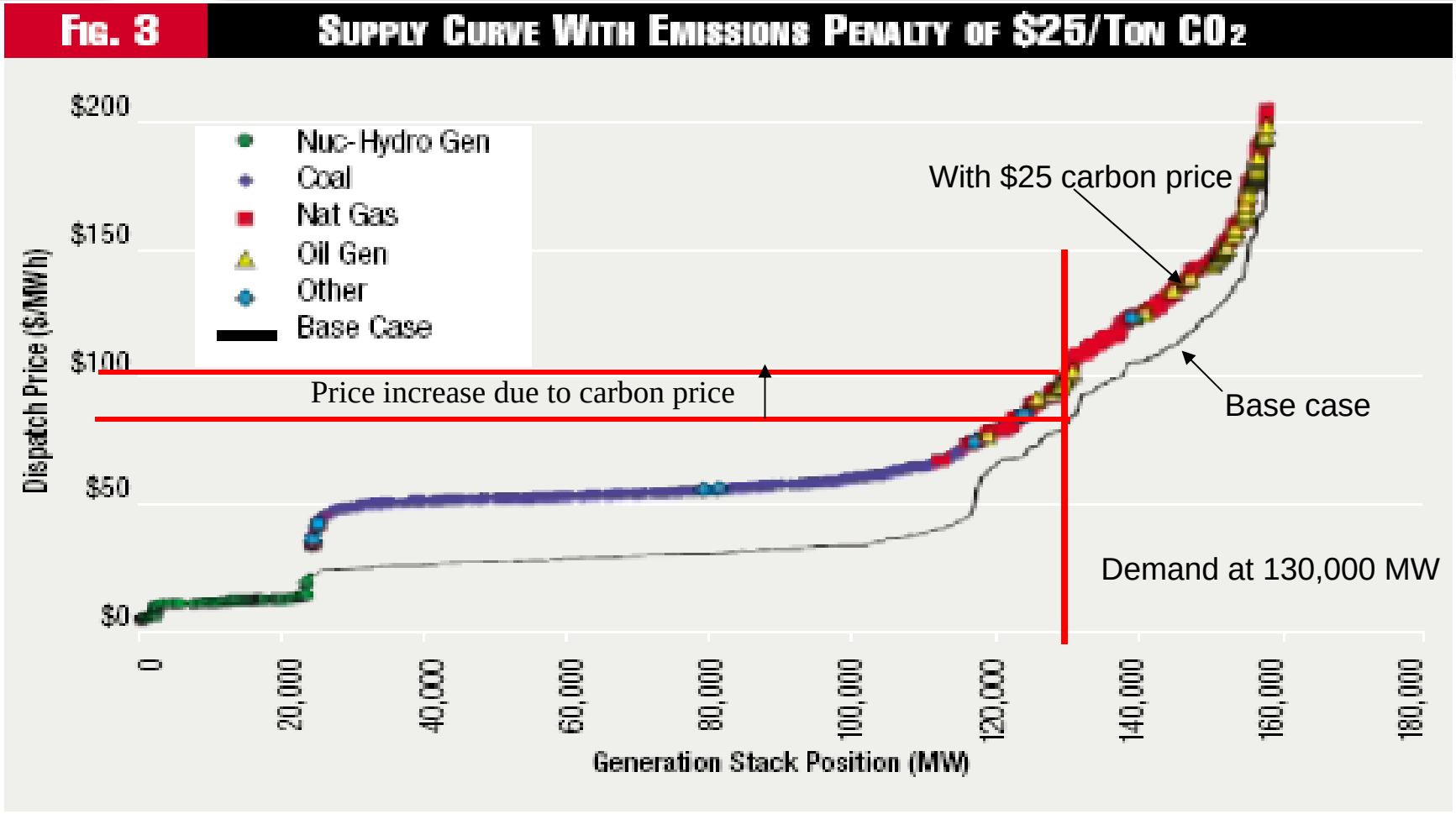
Cap and trade – Design matters!



WORLD RESOURCES INSTITUTE

For a full discussion of underlying methodology, assumptions and references, please see http://www.wri.org/usclimatetargets. WRI does not endorse any of these bills. This analysis is intended to fairly and accurately compare explicit carbon caps in Congressional climate proposals and uses underlying data that may differ from other analyses. Data post-2030 may be derived from extrapolation of EIA projections.

Problem #1: Carbon taxes and auctions to sources can increase wholesale power prices with little effect on dispatch or emissions



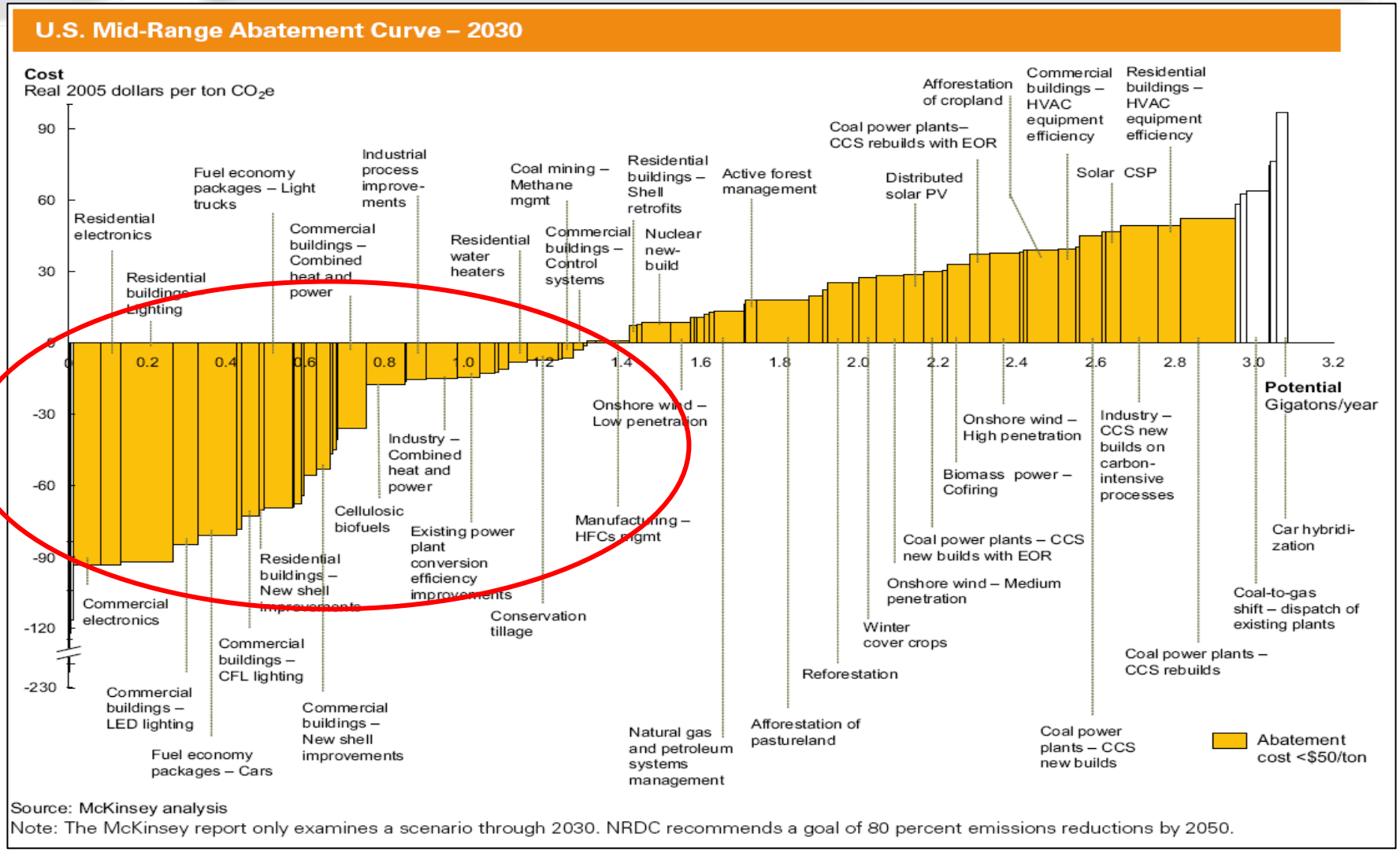
Source: "The Change in Profit Climate: How will carbon-emissions policies affect the generation fleet?"
Victor Niemeyer, (EPRI) -- Public Utilities Fortnightly May 2007 <some captions, demand and price lines added>

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

Problem #2: Also hard to affect ***demand*** with carbon taxes

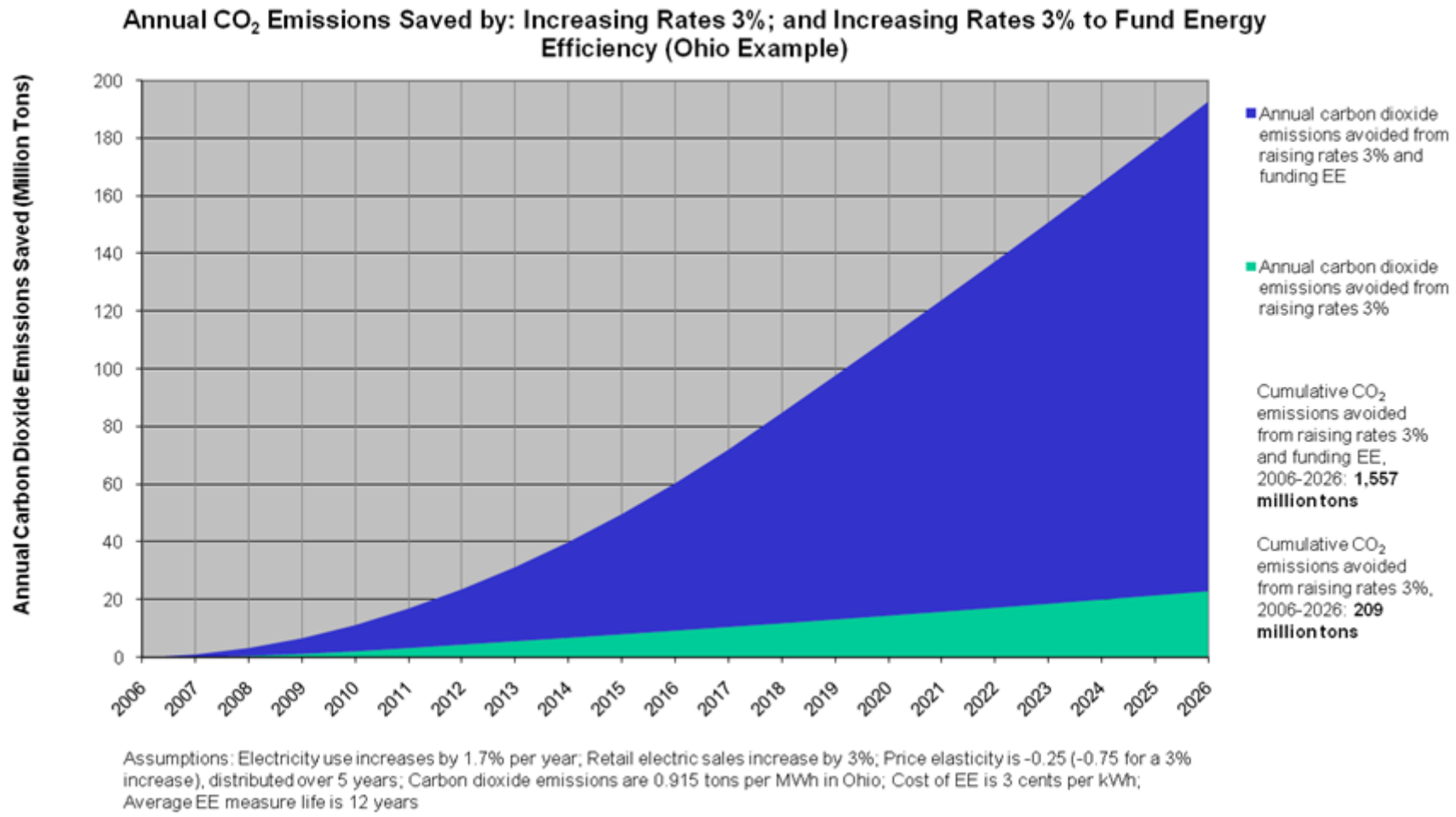
Response #1: Efficiency is the low-cost "carbon scrubber"



Source: McKinsey analysis

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

Efficiency programs can save 7 times more carbon per consumer $ than carbon taxes



RGGI answer: The Consumer Allocation

- Allocate up to100% of initial credits to consumer representatives (eg, distribution utilities, Efficiency Utility)
  - RGGI MOU - state minimum commitment is 25%
  - Most states will be higher – Vermont law is 100%; NY & MA draft rules now at 100%; CT, NJ may follow
- Generators need to purchase allowances, recycling the windfall revenue BACK to consumers
- PUCs supervise use of the $$ for benefit of consumers
- **Best result: focus these $ on investments that lower carbon (EE &RE)**
- Results: lower cost per ton avoided, lighter macro-economic impact >> quicker progress in reducing GHG emissions

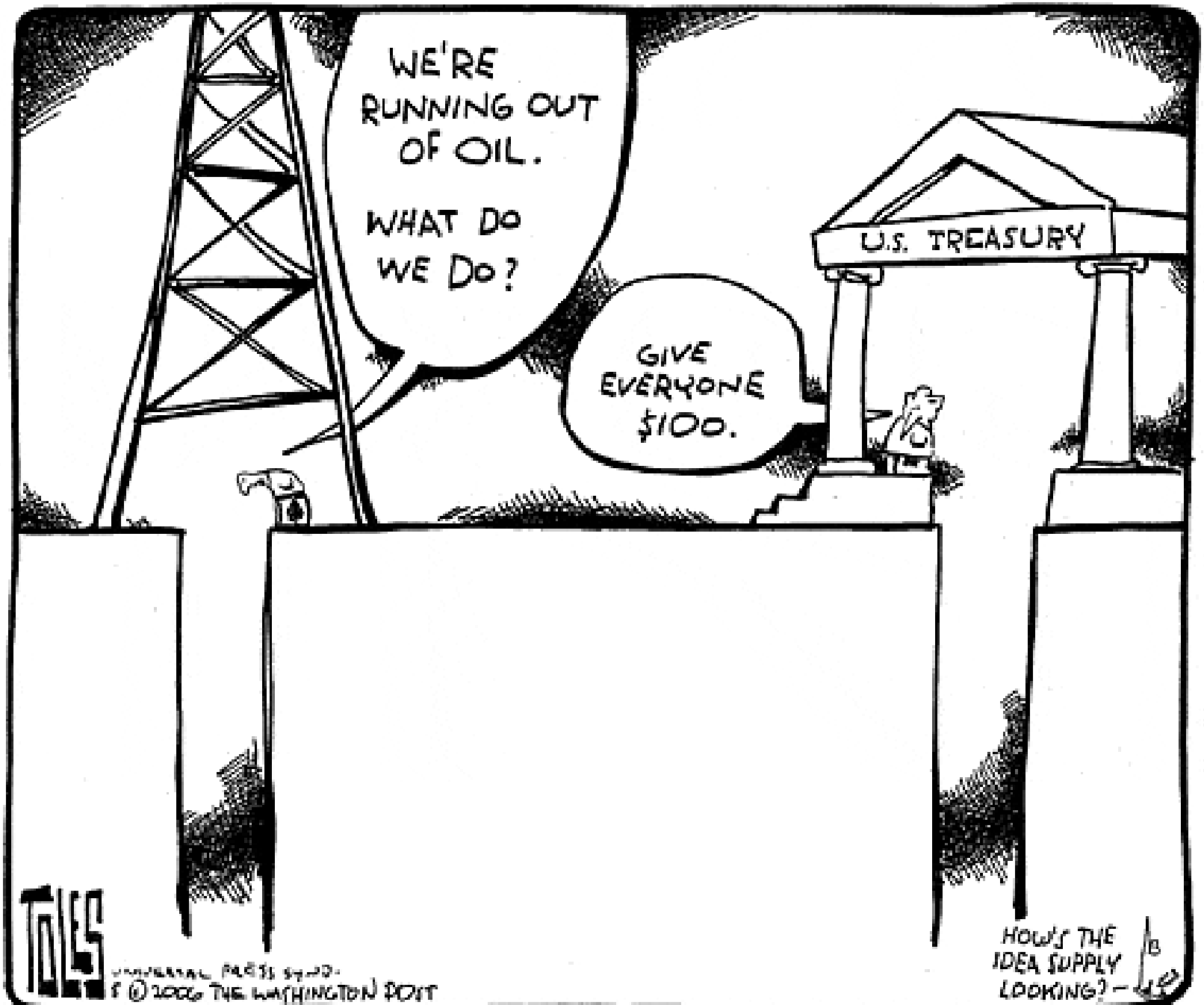
Consumer allocation for efficiency– Vermont leads the way

*"In order to provide the **maximum long-term benefit** to Vermont electric consumers, particularly benefits that will result from **accelerated and sustained investments in energy efficiency** and other low-cost, low-carbon [resources],*

*the public service board …shall allocate **100 percent** of [Vermont's] tradable power sector carbon credits **and the proceeds from the sale of those credits***

*through **allocation to one or more trustees** acting on behalf of consumers"*

--H.860 (enacted 2006)


WE'RE RUNNING OUT OF OIL.
WHAT DO WE DO?
GIVE EVERYONE $100.
U.S. TREASURY
TOLES
HOW'S THE IDEA SUPPLY LOOKING?

Response #3: Regulatory policies to accelerate low-carbon generation

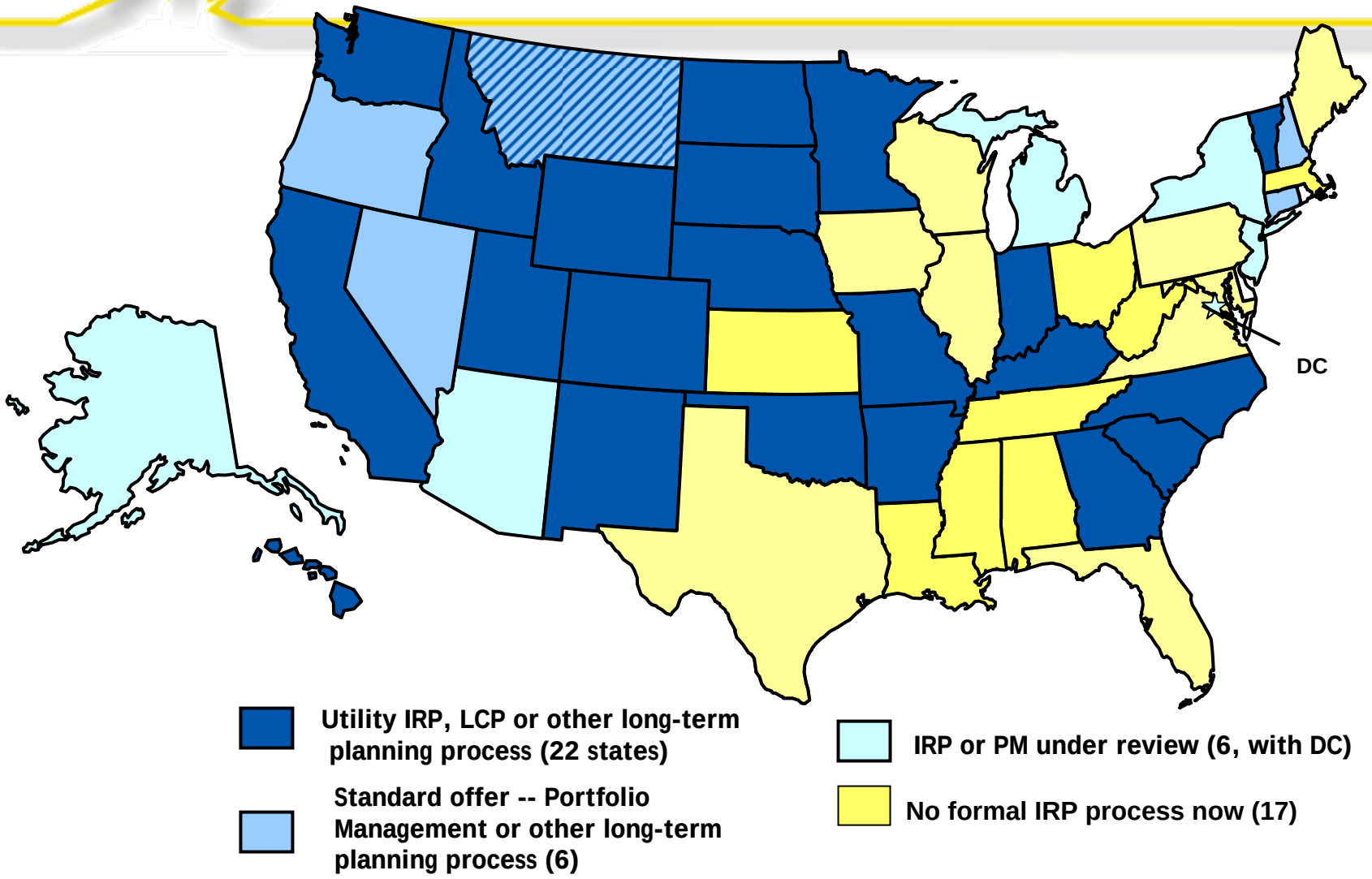
Direct regulatory tools are also needed

- Renewable Portfolio Standards
- Contracting rules & Emission Performance Standards
- Interconnection rules, net metering for DG
- Siting and cost recovery policies to develop and deploy essential new low-carbon generation (esp. carbon capture and sequestration)

Many possibilities lie within the portfolio management functions of electric service providers – and scope of utility regulation.

Response #2:
Add GHG criteria to utility resource planning

At least 28 states have IRP or PM processes in place, with 6 more now under review



Response #3: Avoid "reforms" that make things worse

- **A "moral hazard"** arises when a decision-maker is insulated from the consequences of his choice because someone else will bear the risk and pay the resulting costs.
  - E.g.,recent debate whether to risk creating a moral hazard through government bail out of high-risk mortgage lenders

- Utility regulation offers many arcane methods to hide or shift risks:

- **E.g.,Fuel Adjustment Clause:** "The Commission shall permit an electric public utility to charge an increment or decrement as a rider to its rates for changes in the cost of fuel and fuel related costs <including>
  - The cost of fuel burned…
  - The cost of emission allowances as used, **including allowances for …carbon equivalent greenhouse gas emissions**…"

    --Proposed legislation, from Committee Substitute, S3 (North Carolina) June 2007 (emphasis added)

Don’t preempt state efforts to lead

Utility risk-shifting strategies for high-carbon resources

- Many strategies in play today:
  - Free allocation of carbon credits on an historic basis
  - Regulatory pre-approval
  - “Rolling prudence” filings and reviews for high-carbon resources
  - Automatic recovery of environmental compliance costs
  - Automatic recovery of carbon credit costs
- Ratepayers should bear these risks only when part of a package after all lower-cost solutions have been exhausted.

Political solutions can be a problem– corn-based ethanol example

(a simple comparison*)

- Change 1 lightbulb to CFL:
  - 100 watts to 23 watts x 10,000 hours
  - Saves 770 kwh x 1.8 pounds CO_2/kwh = ~1400 pounds CO_2 <when displacing coal>
  - SAVES the economy $30+ in power costs
- OR Make 700 gallons of corn-based ethanol:
  - 700 gallons x 2 pounds CO_2 saved per gallon = ~1400 pounds CO_2 < when displacing gasoline>
  - COSTS taxpayers $420 (700 gal x .60/gal tax benefits)
- Total utility EE spending nationwide is about $1.6 Billion
- Government support for ethanol is $5.1 – $6.8 Billion

**R Cowart comparison, based on EPA fuel & carbon data; IISD, "Biofuels –at What Cost?" (2006), standard CFL savings data,, and federal + state tax benefits for ethanol. Corrections invited.*

So what does this mean for federal legislation?

1. To moderate generator windfalls and lower the cost-per-ton-avoided: **auction allowances** or allocate them to **distribution utilities** (i.e., to power buyers, not sellers)
2. Dedicate auction revenues to investments in **end-use efficiency**.
3. Focus on **"portfolio-up" policies** (e.g.,RPS & EPS) not "price-down" policies for power sector GHG reduction.
4. **Allocate allowances to states** on a performance basis to support these policies.

Getting Beyond the Auction v. Allocation Debate: A National Efficiency Allocation*

- Proposal: Allocate a pool of carbon allowances to states or LSEs to promote end-use efficiency
- **Allocation should be performance-based:**
  - Reward actual EE success, not expenditures or particular policy approaches
- **How to measure EE success?**
  - Key feature: % improvement compared to a baseline
  - Each state (or LSE) has its *own baseline*
  - *Indiana compared to Indiana, not Indiana compared to California*
  - *Sets up a "virtuous circle" of competition among entities – those who improve faster earn a bigger fraction of the pool.*

As proposed by R Cowart (RAP) and S Nadel (ACEEE) March 2008 – comments and improvements are welcome

Finally: How difficult is it to change the way we live and invest?

- **Challenge: Carbon policies need to create big changes over 50 + years**
- Question: How long did the following changes take?**
  - Build municipal water and sewer systems in every major city
  - Build huge sprawling suburbs
  - Electrify 90% of the USA
  - Place refrigerators, telephones, radios, TVs, computers, microwaves in most homes
  - Build the Interstate Highway system
  - Greatly reduce conventional air and water pollution

  ***For answers: Ask your grandparents*

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 US DOE & EPA, several foundations, and international agencies. We have worked in 40+ states and 16 nations.

Richard Cowart was Chair of the Vermont PSB, Chair of NARUC's Energy & Environment Committee, and of the National Council on Electricity Policy. Recent assignments include technical assistance to RGGI, the New York ISO, the California PUC, the Oregon Carbon Allocation Task Force, and to China's national energy and environmental agencies.

For more information…

- ***Carbon Caps and Energy Efficiency: The Marriage of Need and Potential*** ***(Energy Efficiency Finance Forum April 2007)***

- ***"Power System Carbon Caps: Portfolio-based Carbon Management"*** ***(NREL Carbon Analysis Forum November 2007)***

- ***"Why Carbon Allocation Matters – Issues for Energy Regulators"*** ***(RGGI Policy Memo March 2005)***

- ***"Another Option for Power Sector Carbon Cap and Trade Systems – Allocating to Load"*** ***(RGGI Discussion Memo May 2004)***

- ***"Load-Side Caps for Power Systems: Environmental and Economic Goals"*** ***(California PUC August 2007)***

Richard Cowart, Regulatory Assistance Project

Posted at www.raponline.org

Email questions to *RAPCowart@aol.com*

Conclusions

1. Carbon responsibility, and carbon risk, are real, substantial, and growing
2. **Risk-shifting** is not a substitute for **risk reduction**
3. **Energy efficiency** is the “first fuel” and the first plank in the bridge through this decade
4. Dust off **Least-cost Planning** and **Portfolio Management** practices
5. Regulators should implement **utility-based policies** for clean generation resources
6. **Congress should help states** deliver low-carbon resources through portfolio-based policies.

Problem #3: Climate risk – who bears what risk?

- "Under a cap-and-trade program, the value of allowances issued to the power sector for its emissions of CO2 will be enormous…At $25 Mt (~the EU price) the value of allowances to be allocated to the US power industry would be some $59 billion annually….the equivalent of 83% of the net income of all publicly-traded US electric utilities in 2006.**

- "The impact of CO2 emission limits on the earnings of US utilities will depend on how CO2 emission allowances are allocated by the government."**
  - **With free allocation, "unregulated generators' earnings surge"**
  - **With auction, generators recover costs in the market, and**
  - **In either case, ratepayers pay for increased power costs****
    - **Rates rise 23% to 43% at coal-heavy utilities like MDU, AEP, Ameren**
    - **Rates rise 15% to 29% at mixed-gen Southeast utilities like Duke, Entergy**

- **Conclusion: Regulators have to manage carbon risk on behalf of ratepayers!**

***Source: Bernstein Research, "US Utilities: The Implications of Carbon Dioxide Regulation" (October 2007)*

Response #2: Manage carbon from the portfolio UP, not just the smokestack DOWN

Realistic power solutions require **"what utility regulators do"** not just **"what environmental regulators do"—**

1. Energy efficiency is the essential "bridge fuel"
2. Rediscover, update IRP and Portfolio Management for LSEs
3. New capacity: Accelerate the transition with explicit policies for low-carbon resources (e.g., RPS, all-resource FCM)
4. Promote a new business model for load-serving utilities. (Decoupling, PBR, owned DG, etc.)

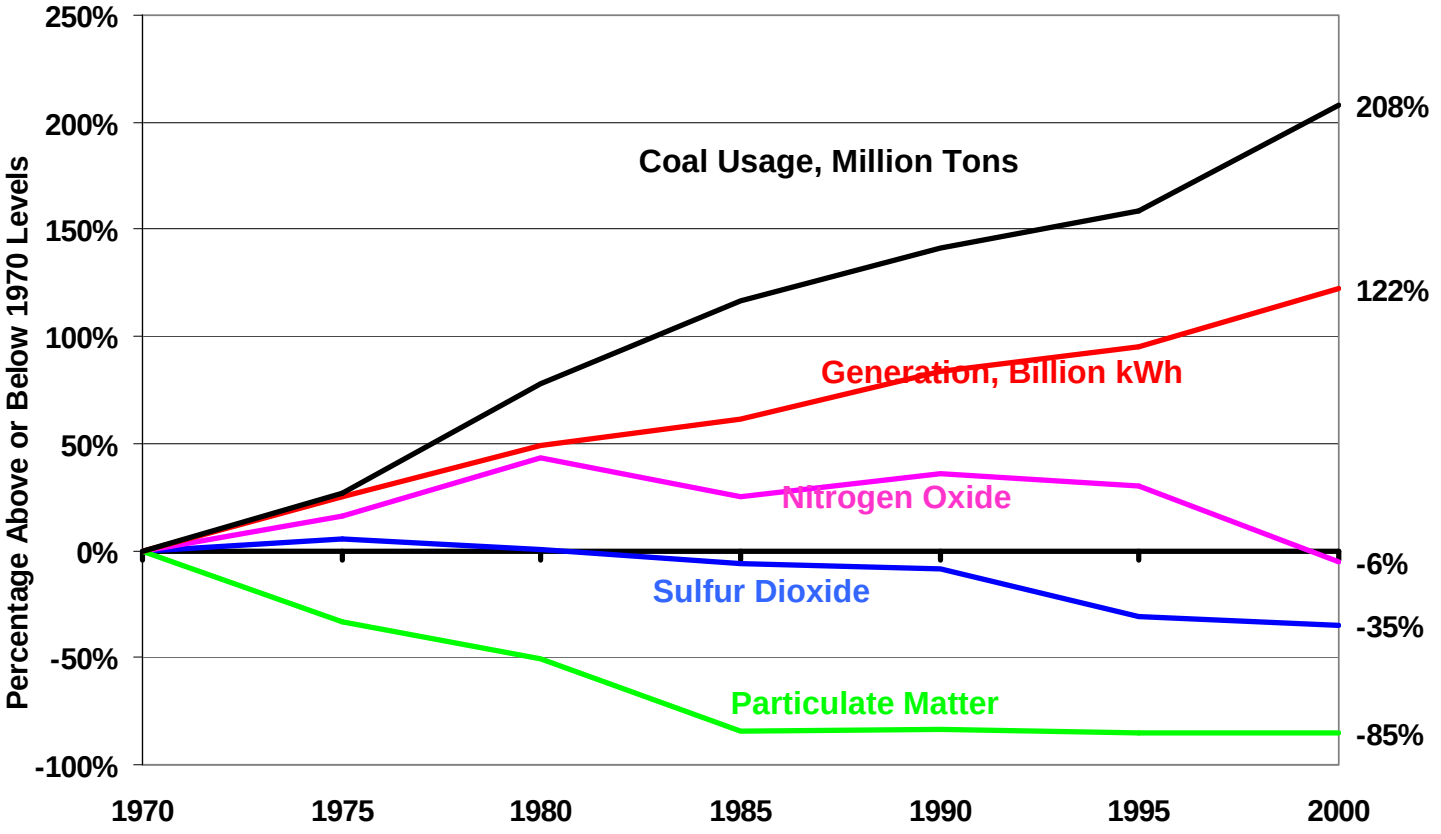
Reality: It's not just distributional -- Carbon credit allocation can mobilize efficiency

- Key point: A carbon program that directly mobilizes end use efficiency **will cost less and achieve more** than one that focuses only on smokestacks.
  - Lower cost attainment – that's the whole point of cap and trade in the first place
- Cap/trade techniques can tap the carbon value of efficiency:
  - **Consumer allocation (RGGI region)**
  - **Load-side caps – carbon budgets for utility companies, akin to Renewable Portfolio Standards**

Is allocation just “distributional”? DC version: allocation for 60 votes

Some emissions from coal generation decreased by 1/3 while coal use tripled

-- *but which line is carbon?*



Source: U.S. EPA and Energy Information Administration.

Thinking about carbon risks

1. **Traditional power supply risks**: rising fuel prices, construction costs, physical performance, etc.
2. **Direct carbon risk**: how much will ***carbon*** cost?
3. **Secondary impacts** of carbon regulation: e.g.,
   - ❖ Natural gas price pressures
   - ❖ Wholesale power cost increases
4. **Carbon policy risks**:
   - ❖ Some cap designs reduce carbon more cheaply than others
   - ❖ Watch out: Carbon markets may be big, but power markets are huge

Introduction

"We've been asking the question: 'Given this price forecast, what should we invest in?' The real question is, 'Given that we *don't know* what prices are, what should we invest in?'"

--Lee Raymond, CEO Exxon-Mobil *(WSJ 4-8-05)*

Efficiency *programs* are more powerful than rate increases

- Economic theory: just raise the price of power
- DSM reality: ***Programs*** are needed to surmount market barriers to efficiency
- **Utility DSM experience: $ spent through smart programs will deliver 7x to 13x the efficiency savings of $ charged in higher prices**
- Key conclusion: Build efficiency support into program architecture.
- BUT: Generators don't deliver efficiency
- Hmmm…who has relationships with customers? How to pay for them?

Topic 3: efficiency as part of cap and trade

- Efficiency is the low-cost carbon scrubber
- Efficiency is the essential “bridge fuel” to advanced technology supply
- Cap-and-trade alone will deliver “high cost reductions” not cheaper efficiency
- Efficiency *programs* funded by carbon revenues will deliver more, cost less.

Juicy details for lawyers: Risk-shifting is NOT risk reduction

- **A "moral hazard"** arises when a decision-maker is insulated from the consequences of his choice because someone else will bear the risk and pay the resulting costs.
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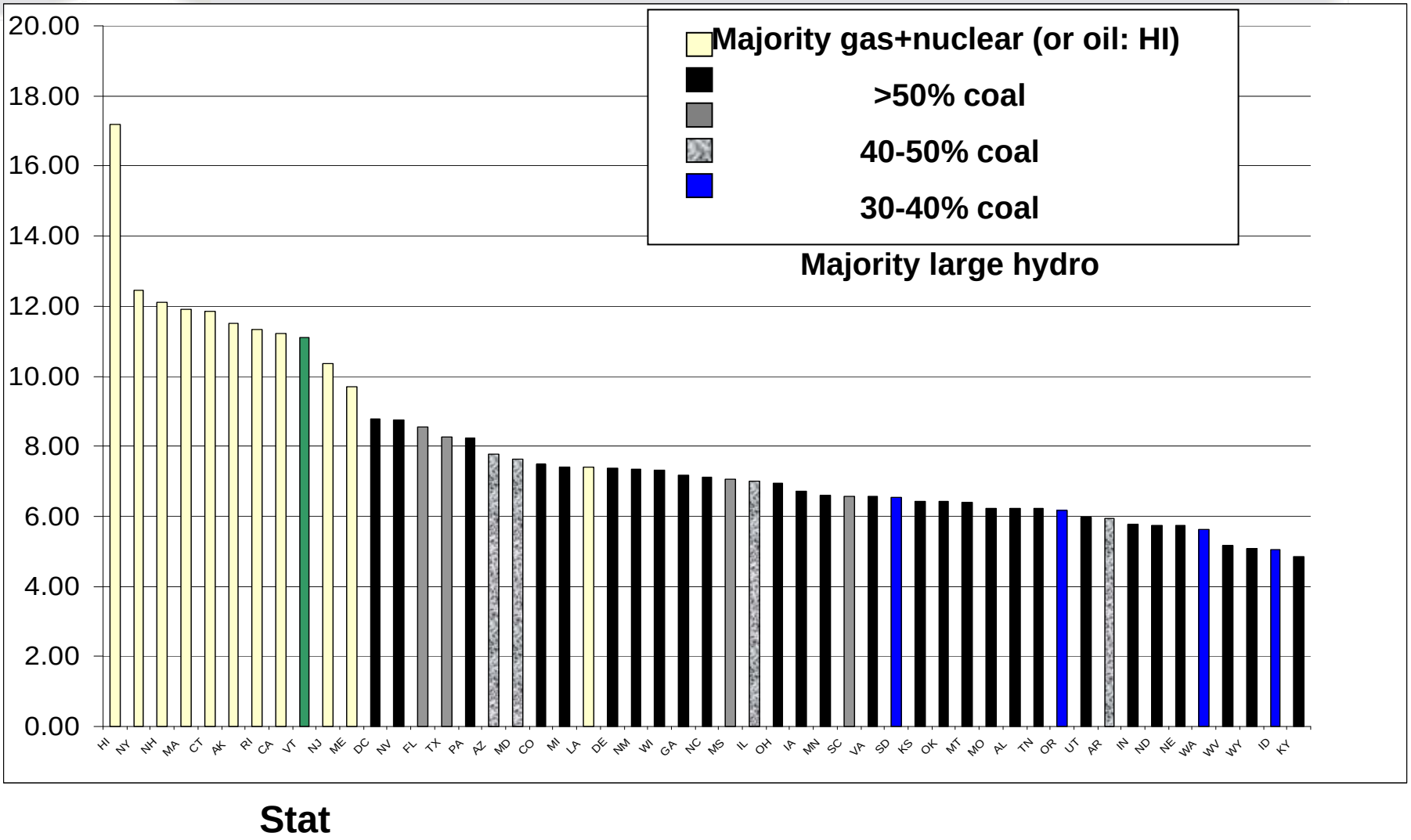


TAB
caglecartoons.com
JUST WHY IS GAS SO EXPENSIVE?
SUPPLY
DEMAND

State Actions Shape National Policy

More like "pioneers" than "laboratories"; where real policy get hammered out:

State Action	When	*Corresponding Federal Action*	When
State Acid Rain Laws	1985	*Federal Acid Rain Program*	*1990*
State Air Toxics Laws	1987	*Federal Air Toxics Program*	*1990*
State NOx Trading (OTC)	1995	*Federal NOx SIP Call*	*2004*
State Mercury Laws	1998-2002	*Federal CAMR Rule*	*2005*
State RPS Laws	1997-2007	*Federal RPS Law*	*Introduced*
State "4-P" Laws for Power Plants	1997-2002	*Federal "4-P" Law*	*Introduced*
Statewide GHG Reduction Laws	2003-2006	*Federal GHG Law (McCain-Lieberman, Carper)*	*Introduced*
State GHG Reductions from Vehicles	2002	*Federal Vehicle GHG Standards*	*?*