Energy Efficiency and Climate Change

Why cap and trade design choices really matter

ACEEE
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Starting point: What does it cost to avoid a ton of electric CO_2 ?*

Resource option	CO_2 intensity (tons/MWh)	Cost per MWh	Cost per ton avoided
Coal	.92/MWh	$40	NA
Gas	.45/MWh	$55+	$30+
New Nuclear	big debate	$70+ to ??	$30 to +??
Wind	low	$75	$38
PV	low	$180+	$152+
Efficiency	low	$30	**(-$11)**

**Generation cost data (except nuclear) from EPRI ("Generation Technologies in a Carbon-constrained World," 2005, assuming gas at $6MMbtu); EE data from Efficiency Vermont. For the point made here the precise numbers are not critical.*

Theme: Design Cap &Trade for Efficiency

Goal: Design a GHG Cap and Trade program that inherently promotes ***end-use*** efficiency

Why?

- The whole point of cap-and-trade is to lower the cost of attainment
- End-use efficiency is the lowest-cost way to reduce power sector GHGs
- Lower costs will permit deeper cuts

Today's main points: Four lessons for cap-and-trade architects

- 1.The Acid Rain program design – smokestack-based, free allocations based on historic emissions – is not the best design for a carbon cap/trade system for the power sector.
- 2. **Energy efficiency** is not a "collateral energy policy," it is **the key to success** of power-sector carbon programs.
- 3. Cap-and-trade CAN be designed to promote and pay for much more efficiency.
- 4. RGGI and CA are creating powerful options to improve cap-and trade architecture; federal efforts should build on this experience.

Acid Rain cap-and-trade– What's different now?

- US Acid Rain program – universally recognized success. NOx and CAIR build on this model.
- GHG situation is different:
  - The best low cost solutions are not at the smokestack
  - Nor in the fuel supply -- we don't have low-carbon coal
  - Power markets, utility structures have changed
- Ask: what did the Acid Rain program do for energy efficiency?
- **Message for EE providers, consumer advocates, PUCs & air agencies– don't cede the cap & trade design space to conventional generation**

State and regional power sector carbon caps

California & Oregon

RGGI - now 10 states

Western Climate Initiative – 6 states & 2 provinces

Together, their carbon profiles exceed most nations.

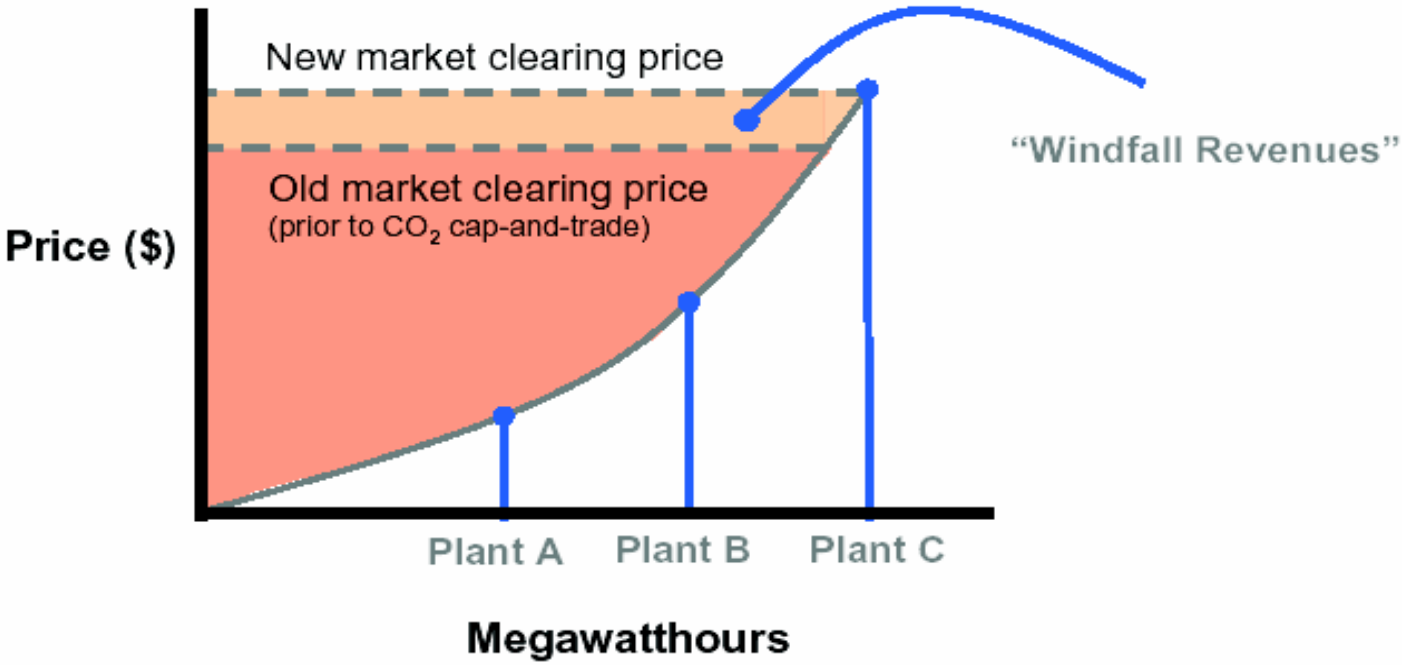
Architectural mistakes: Four wrong assumptions

- 1. Generators lose money under carbon cap and trade, so designers must give them allowances for free
- 2. Carbon taxes or auctions will clean up the mix at acceptable cost to power consumers
- 3. Just manage pollution, price increases and demand elasticity will deliver needed efficiency
- 4. “Allocation is just distributional” -- Initial allocation won’t affect program cost to consumers

Reality #1 Most generators make money with free historic allocation

Theoretical representation of "windfall revenues"

A fossil unit on the margin increases the market clearing price (i.e., the price paid to all generating units dispatched) to reflect the cost of CO_2 compliance



Citigroup Analysis of the Impact of the EU Carbon Market on European Utilities (up to 2007)

citigroup

Utilities 12

So Winners and Losers?

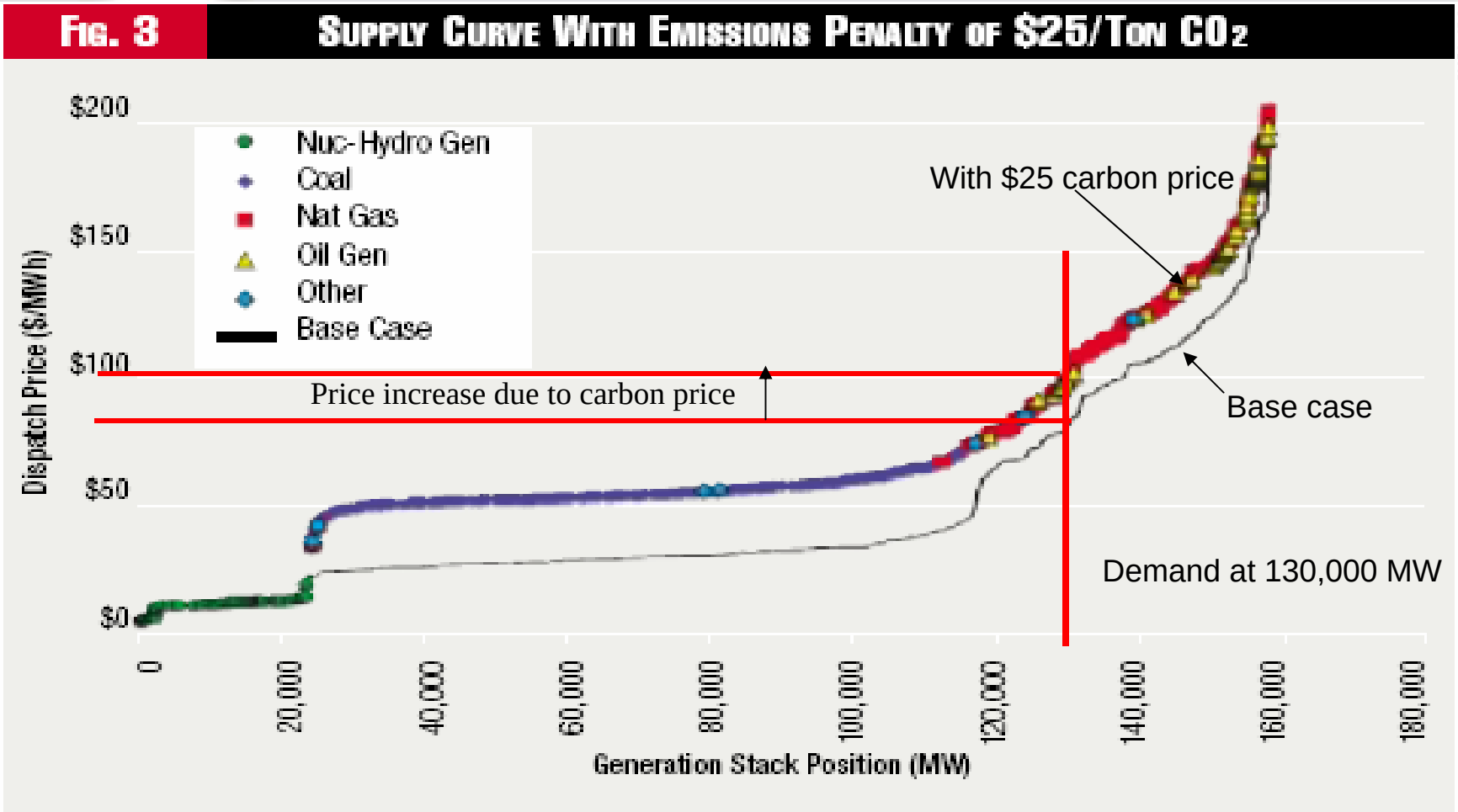
- All generation based utilities – winners
- Coal and nuclear generators – biggest winners
- Hedge funds and energy traders – even bigger winners
- Losers??….herm……Consumers!

avg energy hedge fund fees
2006 bonus { $1.5 Avg, 3.0 Avg, 5.0 Avg

across Europe approx £1 Bn flows from consumers → elec utils → hedge funds, et al

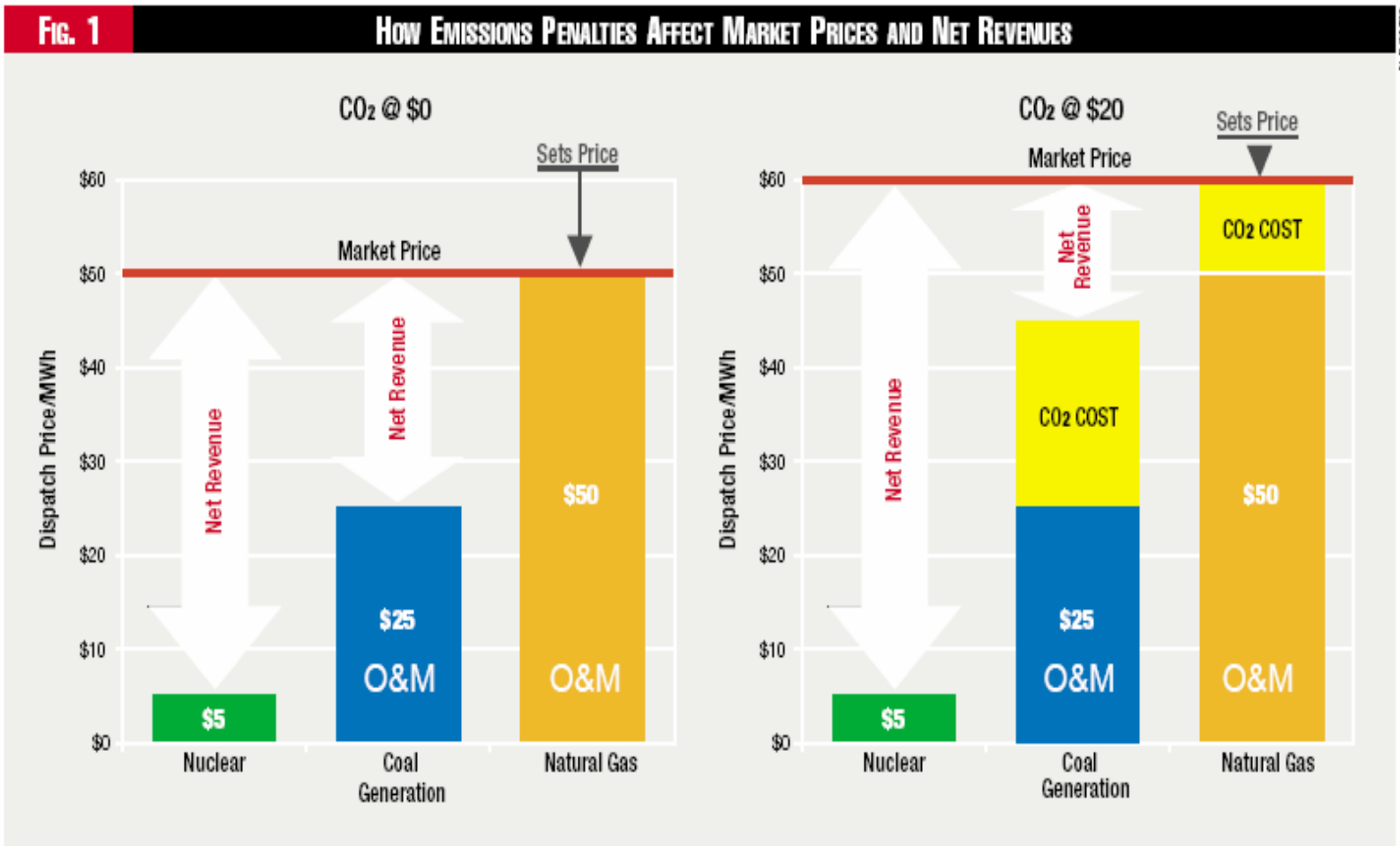
Citigroup Global Markets

Reality #2: 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>

How Emission Charges Can Raise Prices Without Changing Dispatch or Emissions



Source: "The Change in Profit Climate" -- Public Utilities Fortnightly May 2007 --Victor Niemeyer, EPRI

Reality #3: EE *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 5x to 10x 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?

Reality #4: 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.
- Two new techniques can tap the carbon value of efficiency and renewables:
  - **Consumer allocation (RGGI region)**
  - **Load-side cap and trade (California and Oregon)**

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 now much higher – Vermont law is 100%; NY & MA draft rules now at 100%; CT, NJ, MD follow
- Generators need to purchase allowances, recycling some of 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 – Vermont goes first

*"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)

What happens if we double efficiency spending in RGGI?

Extensive modeling* for RGGI found:

- Carbon credit prices drop 25%
- Need for new fossil capacity drops 33%
- Customer bills drop 5% to 12%
- And – even greater EE investments (quite attainable) would yield greater savings

**IPM model runs by ICF Consulting using EE portfolios developed by ACEEE*

CA & OR approach: Load-Side Cap & Trade

Basic rule: LSEs must have credits to cover the emissions associated with their sales to retail customers.

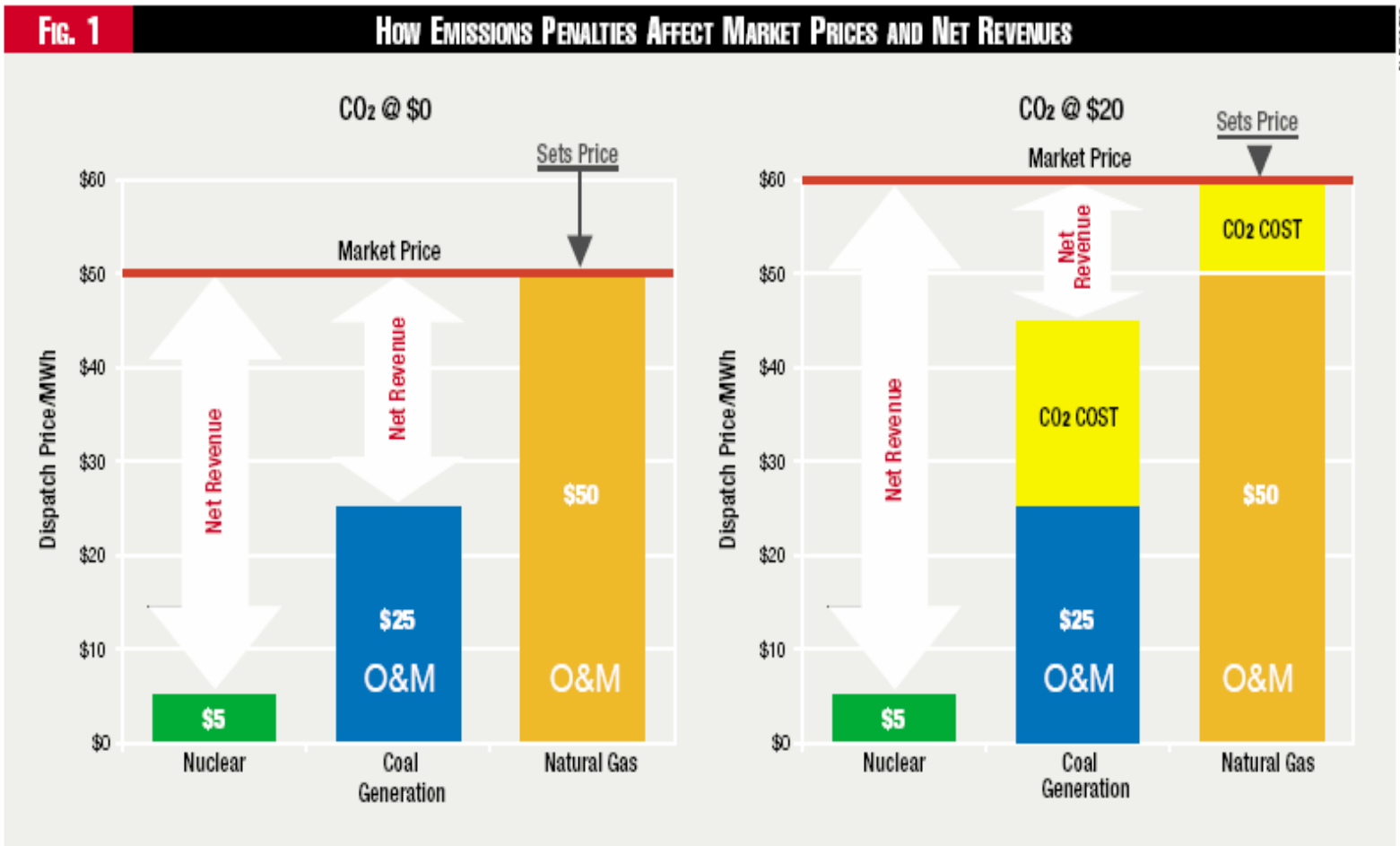
>> A **"carbon budget"** for the utility portfolio manager.

1. Measure historic emissions associated with electricity *serving the state* (or region) –
   - ❖ All sources, wherever located -- both in-state and imports
2. Set "hard" emissions caps to lower impact in stages
3. Distribute allowances ("carbon credits") to LSEs
4. LSEs spend credits as needed to match their portfolio of sources
   - ➢ **can sell excess credits from RE & EE choices**

Benefits of Load-Side Caps a/k/a Utility Carbon Budgets

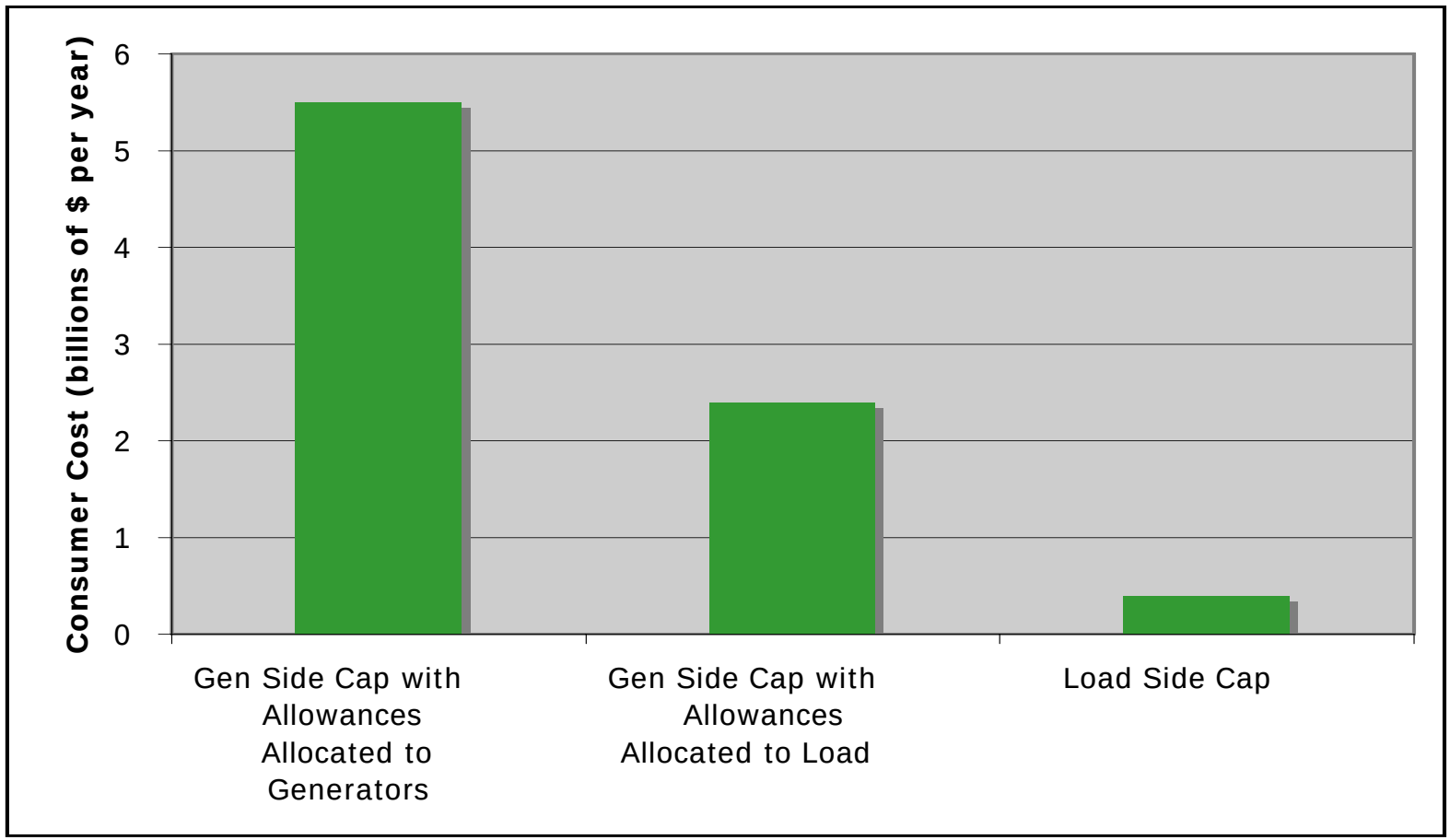
1. Covers all power, including imports (like RPS)
   - 56% of CA's electric carbon is from other states
2. Power markets: lower cost to consumers
3. Minimizes generator windfall – ratepayers pay for a cleaner portfolio but not more than that
   - Means >> **lower cost per ton avoided**
4. **Promotes EE by those in position to deliver it – distribution utilities and other LSEs**
   - **Avoided MWH saves allowances, $$ to LSEs**
   - **Lowers costs to consumers even more**
5. Builds on portfolio management role of LSEs

Reprise: How Emission Charges Can Raise Prices Without Changing Dispatch or Emissions



Source: "The Change in Profit Climate" -- Public Utilities Fortnightly May 2007 --Victor Niemeyer, EPRI

Load-side cap could save CA ratepayers $2 billion to $5 billion annually



Source: Bruce Biewald, Synapse Energy Economics, "Exploration of Costs for Load Side and Supply Side Carbon Caps for California" (at CPUC/CEC August 21, 2007)

Conclusions

- **Efficiency is the key to low-cost power sector carbon reduction**
- **Consumer allocation avoids some generator windfall and provides a revenue source for efficiency**
- **Load-side cap costs less and reveals carbon value of EE to LSEs who can deliver it**
- **Congress will be acting too – will national legislation support efficiency?**

For more information…

- *"Another Option for Power Sector Carbon Cap and Trade Systems – Allocating to Load" (May 2004)*
- *"Why Carbon Allocation Matters – Issues for Energy Regulators" (March 2005)*
- *"Addressing Leakage in a Cap-and-Trade System: Treating Imports as Sources" (November 2006)*
- *"Why A Load-Based Cap?" (March 2007, with Julie Fitch)*
- *"Load-Side Caps for Power Systems: Environmental and Economic Goals" (August 2007)*

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