Power Sector Carbon Reduction: Architecture and Policy of Cap and Trade

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Markets and Regulation

- Right: Trust markets
- Left: Regulate markets
- Middle: Use markets as regulatory tools
- Pragmatist: All of the above – it depends on the situation
- GHG reduction can use them all: markets, regulation, regulated markets, and market-based regulation

Coal's Resurgence in Electric Power Generation

Proposed New Plants

Equivalent Power
for
62 Million Homes

94 Plants
62 GW
$ 72 Billion

2.5 GW
$2.5 B
1

0.5 GW
$0.5 B
1

2.3 GW
$2.8 B
6

0.5 GW
$0.8 B
1

1.4 GW
$1.6 B
3

0.5 GW
$0.6 B
1

0.2 GW
$0.2 B
1

1.8 GW
$2.1 B
3

2.4 GW
$2.5 B
3

3.0 GW
$4.0 B
5

0.4 GW
$0.4 B
1

0.7 GW
$0.9 B
3

0.8 GW
$1.2 B
2

0.8 GW
$1.2 B
2

1.4 GW
$2.1 B
4

0.5 GW
$0.5 B
1

2.7 GW
$3.5 B
3

1.4 GW
$1.9 B
4

8.0 GW
$9.2 B
10

1.6 GW
$1.6 B
1

2.5 GW
$2.5 B
1

0.7 GW
$0.7 B
1

1.0 GW
$1.0 B
2

5.0 GW
$6.0 B
8

Undecided
6.0 GW
$7.4 B
8

1.6 GW
$2.1 B
2

1.8 GW
$1.8 B
2

1.6 GW
$1.6 B
2

1.4 GW
$1.0 B
1

1.0 GW
$1.0 B
1

1.4 GW
$1.4 B
1

1.4 GW
$1.6 B
2

0.8 GW
$0.9 B
1

0.2 GW
$0.4 B
1

1.3 GW
$1.3 B
3

0.6 GW
$0.6 B
1

0.4 GW
$0.5 B
1

LEGEND

Capacity (GW)
Investment (B - Billion $)
Proposed Plants

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Power sector carbon management- 5 basic options

- Carbon tax
  - Politically unlikely
- Emissions performance standard (EPS)
  - Focus on intensity
  - With growth, emissions can keep growing
- Cap and trade – all credits auctioned
  - "Carbon tax in disguise?"
  - Authority and funds capture problems
- Cap and trade – generator-based
- Cap and trade – load-based

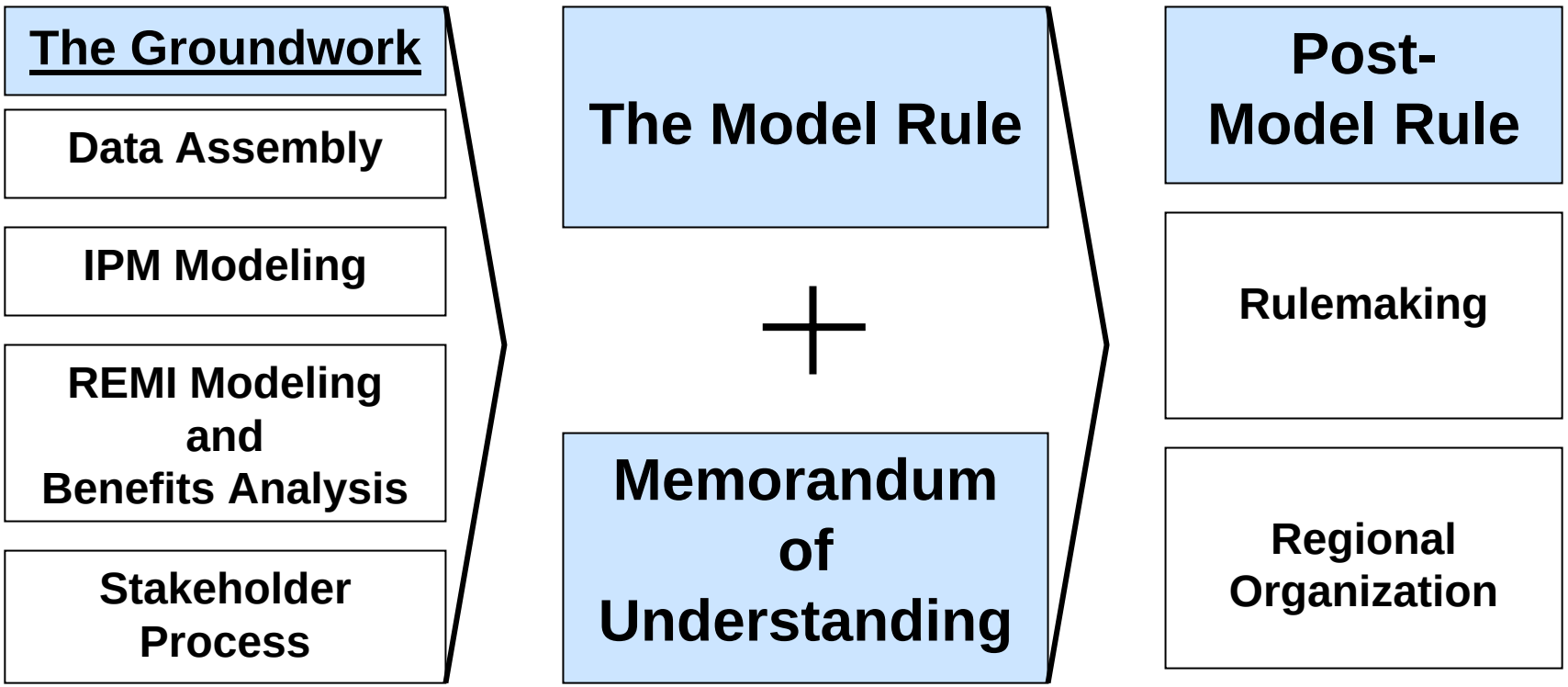
What is cap-and-trade?

- Set a fixed limit on OVERALL emissions, not each single source, declining over time.
- Create a new kind of currency (tradable allowances) for quantities of emissions.
  - "Carbon credits are just another form of money"
- Require emitters (or consumers) to retire allowances to match "their" emissions in each time period.
- Sell or give out allowances
- Permit trades in an allowance market
- Examples: US acid rain and NOx programs

The Northeast Regional Greenhouse Gas Initiative (RGGI)

- 9 states actively engaged
- 2 states (PA, MD) are observing
- Begun 2003, Model Rule expected 2005
- State-by-state adoption 2005-2006
- Launch 2008?

Key Program Components



The Model Rule "Bricks"

The Model Rule
(w/Technical Support Document)

Applicability: 25 MW+

Regional Emissions Cap

State Allowance Budgets

New Source Allowance "Pool"

Opt-In Provision

Compliance Period

Banking

Early Action Credits

Offset Provisions

Penalties & Enforcement

Monitoring & Reporting

Cap and Trade Architecture

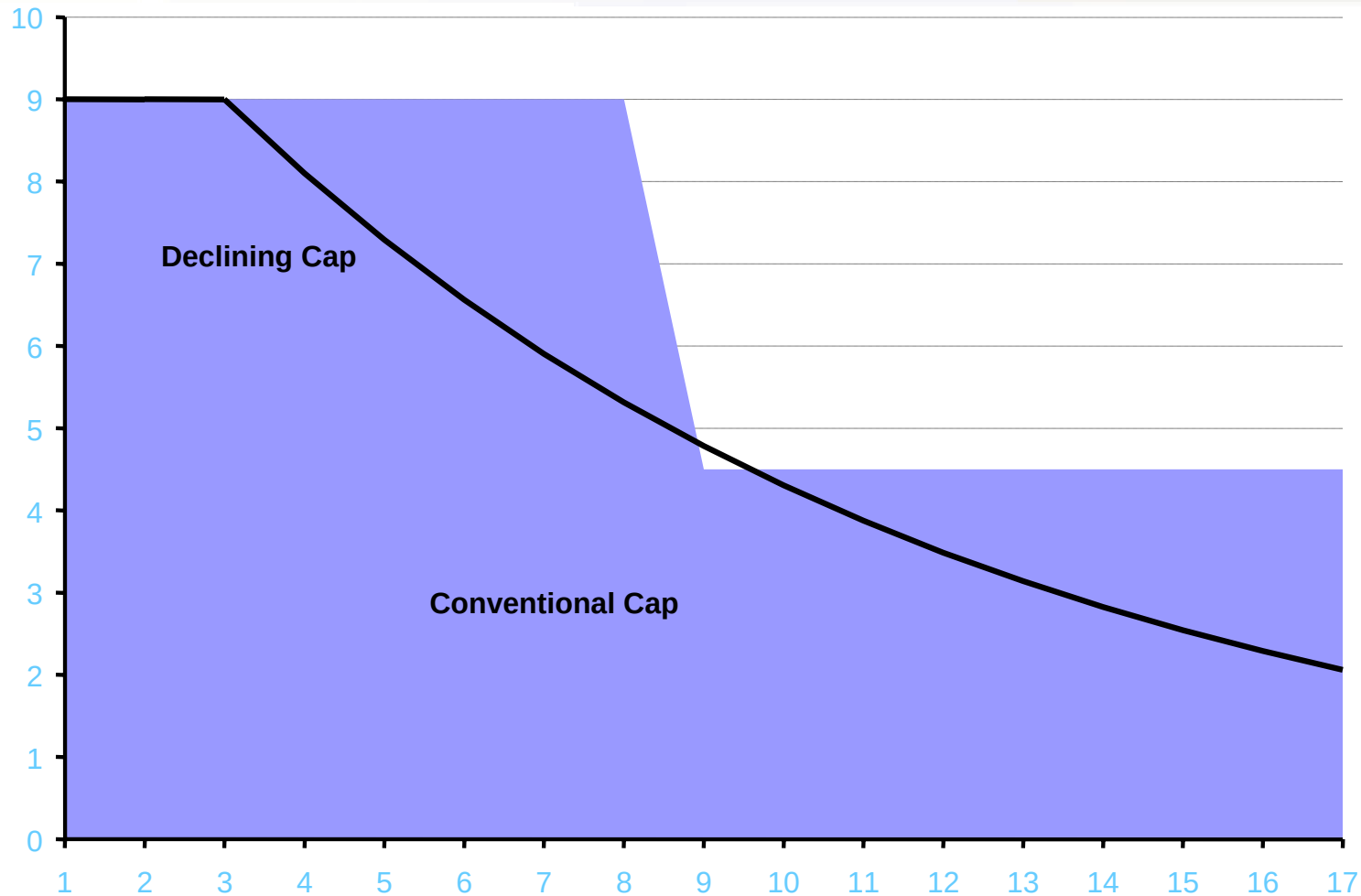
- (1) Cap coverage - what's included?
  - Generator-based or Load-side?
- (2) Cap basics: base year, level & rate of decline
- (3) Circuit breakers and accelerators
- (4) Auction or allocation?
- (5) Allocation choices: generators, consumers, set-asides, etc.
- (6) Leakage control
- (7) Flexibility mechanisms: Offsets, Banking and Borrowing

1. Cap Structure

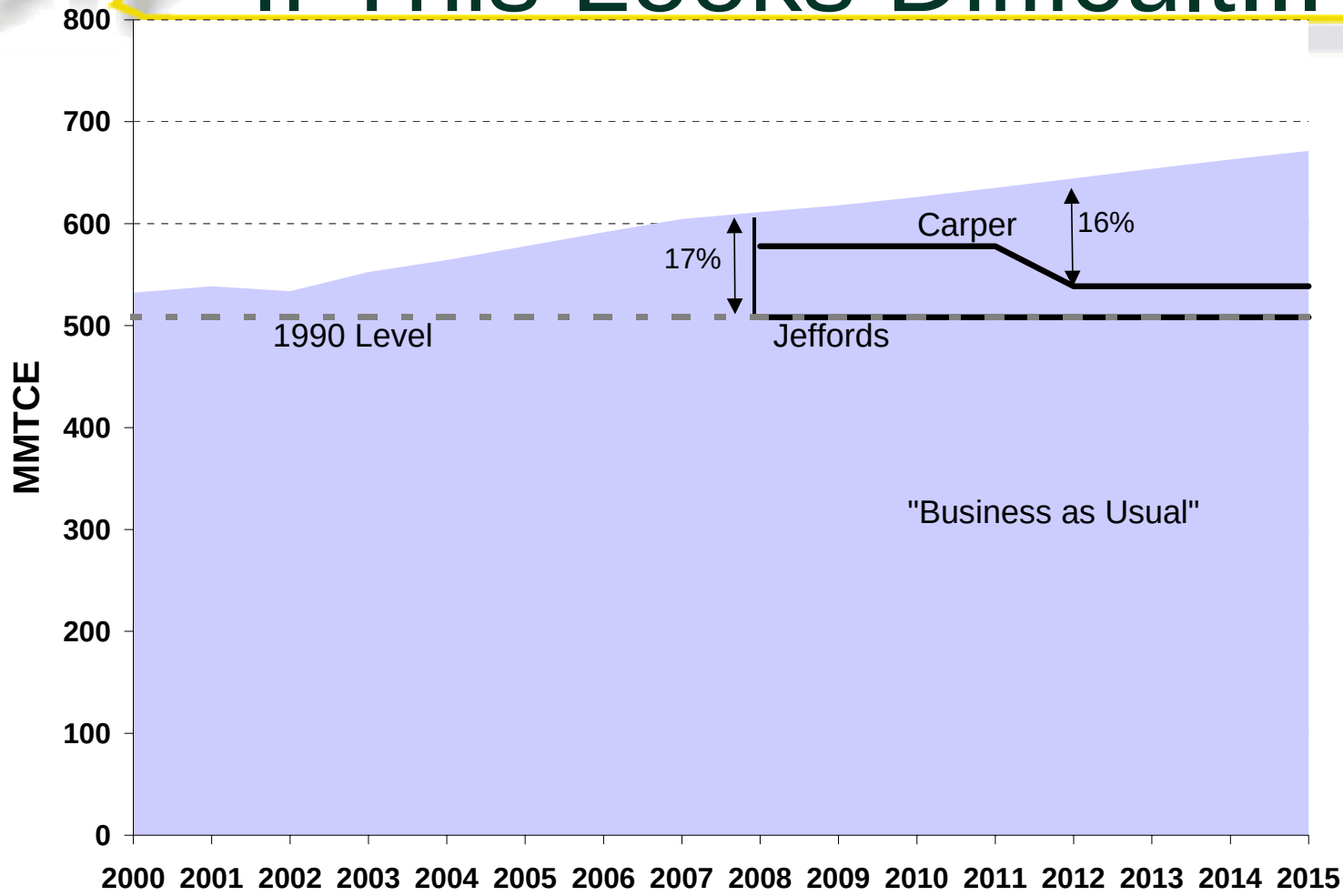
A ramp is better than a cliff, esp for carbon

- The cap decreases by a fixed percent each year. Glide slope defined in advance.
- Test the markets and technologies gradually, with low risk.
- Provide immediate price discovery and monetization.
- Provide a clear driver for new technology and long-term results.

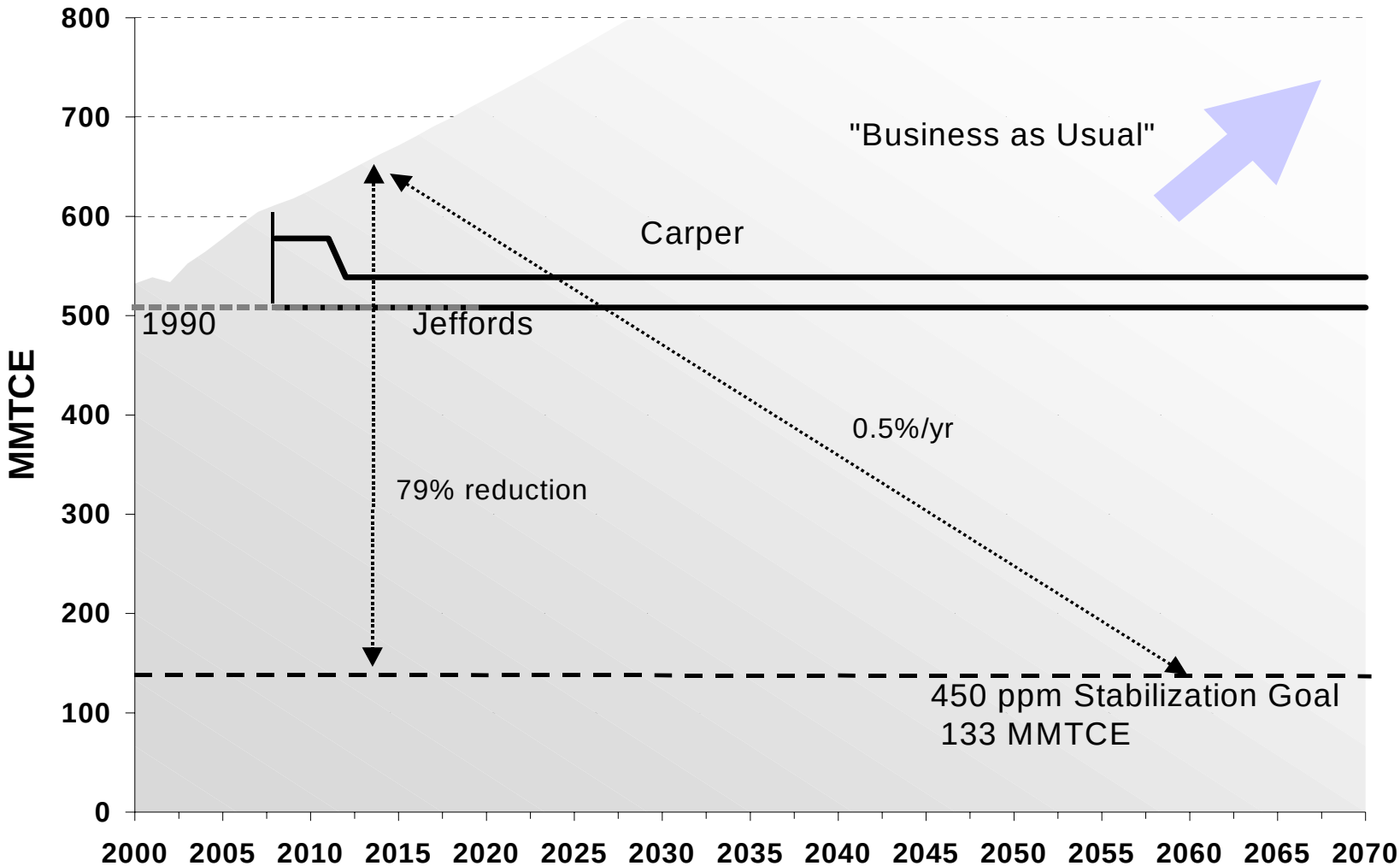
Should the drop be gradual or step-wise?



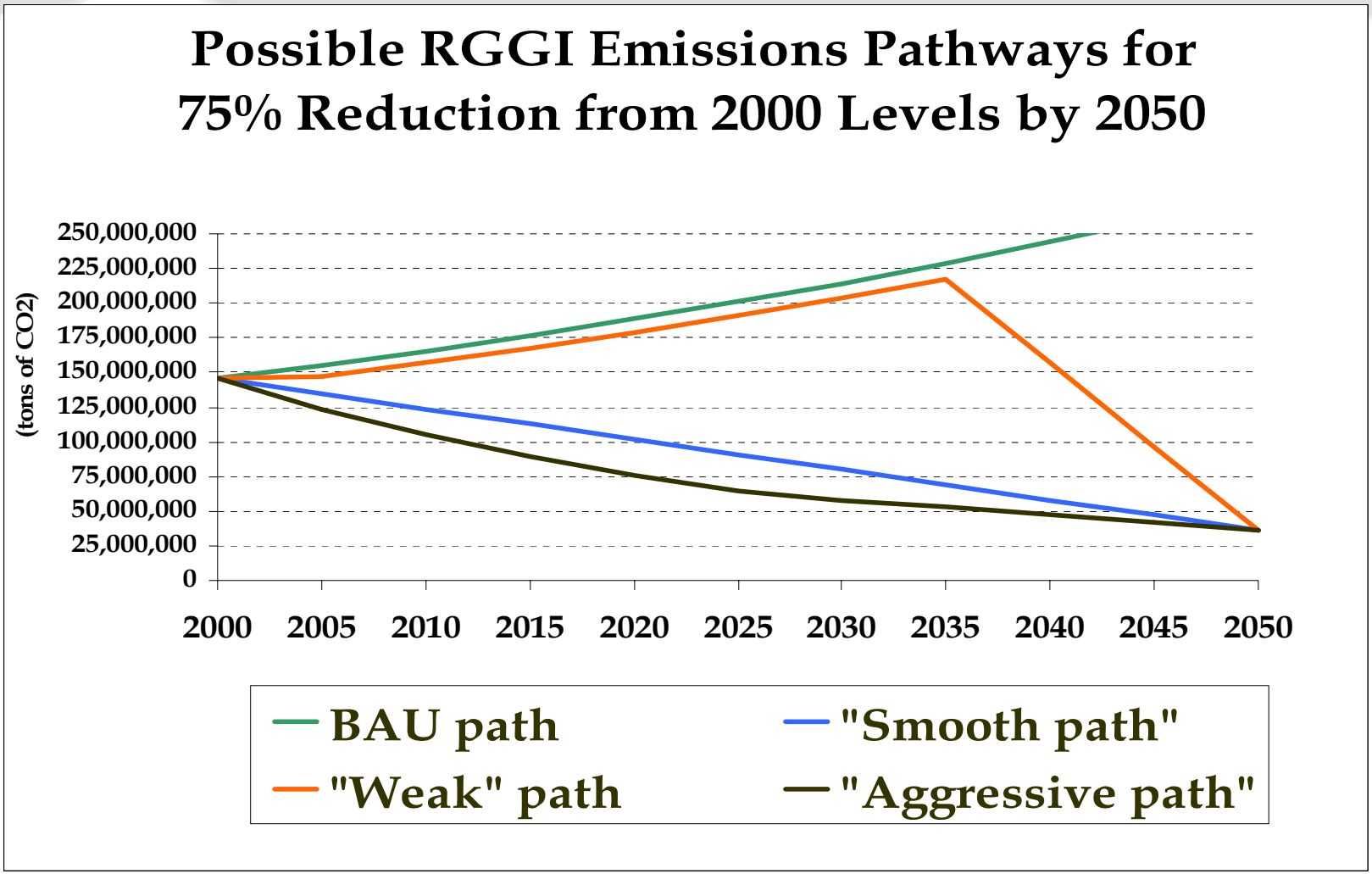
If This Looks Difficult...



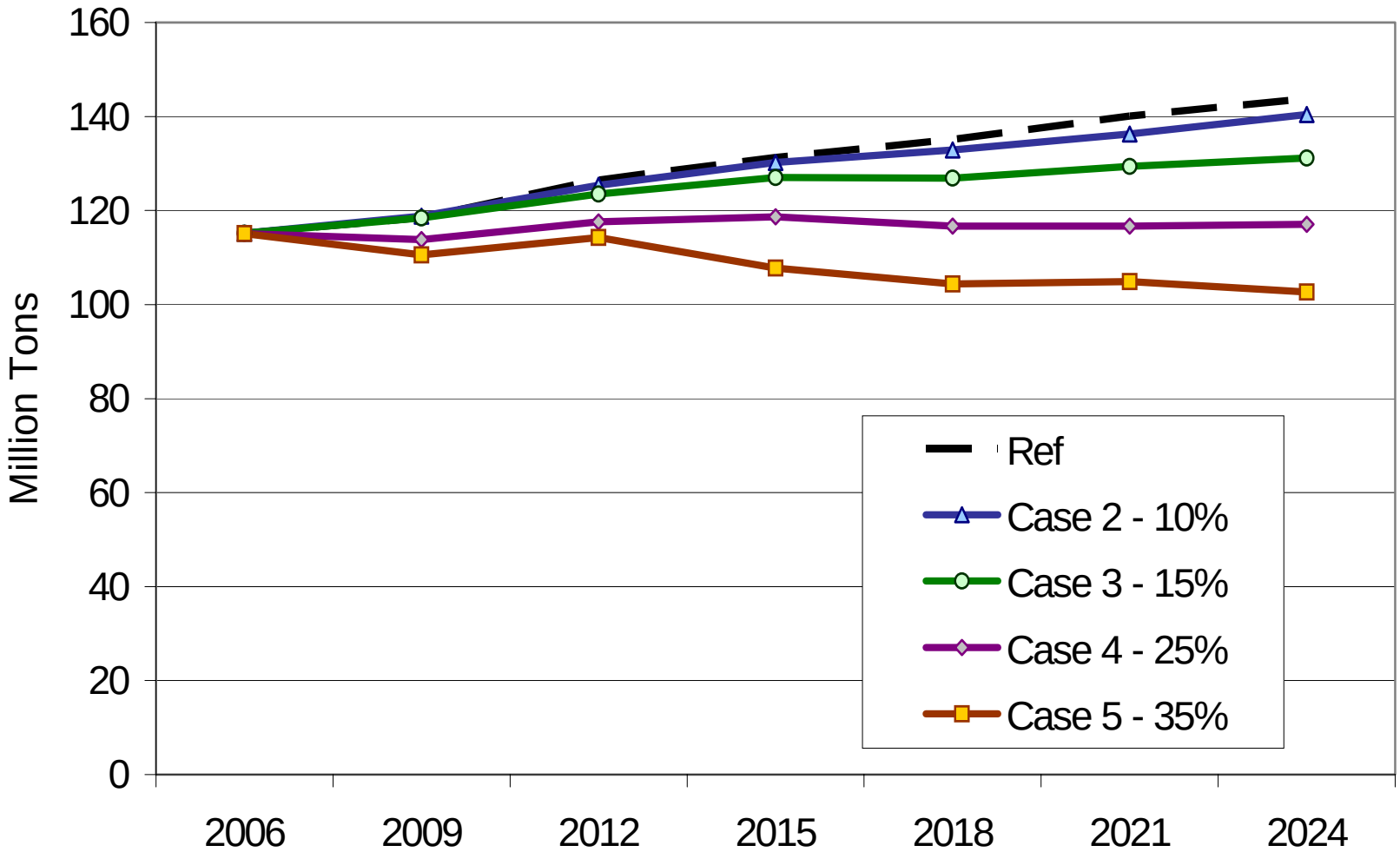
The Ultimate Goal is Even More Challenging!



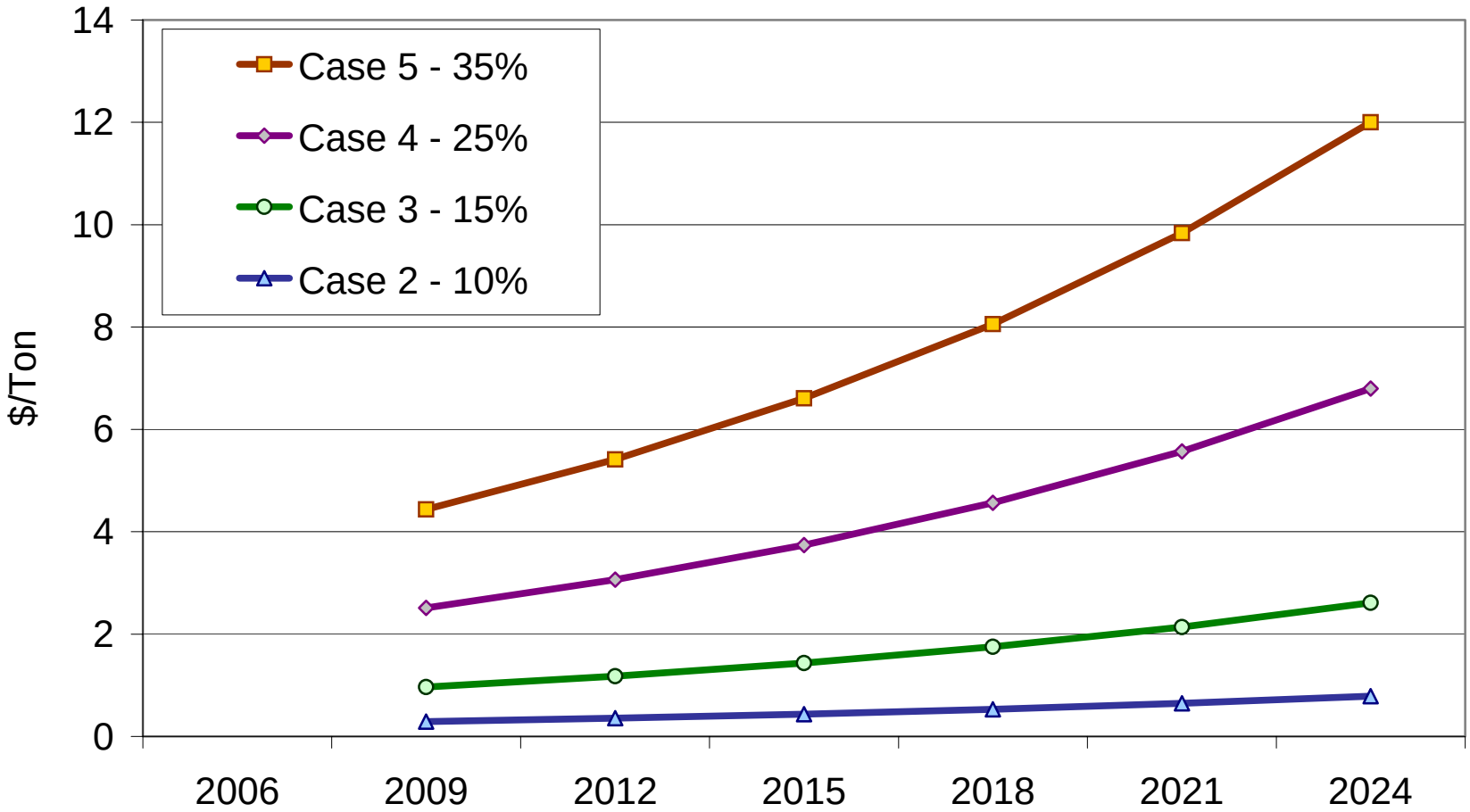
What advocates want



Scenarios RGGI is modeling



CO_2 Allowance Prices across Policy Scenarios

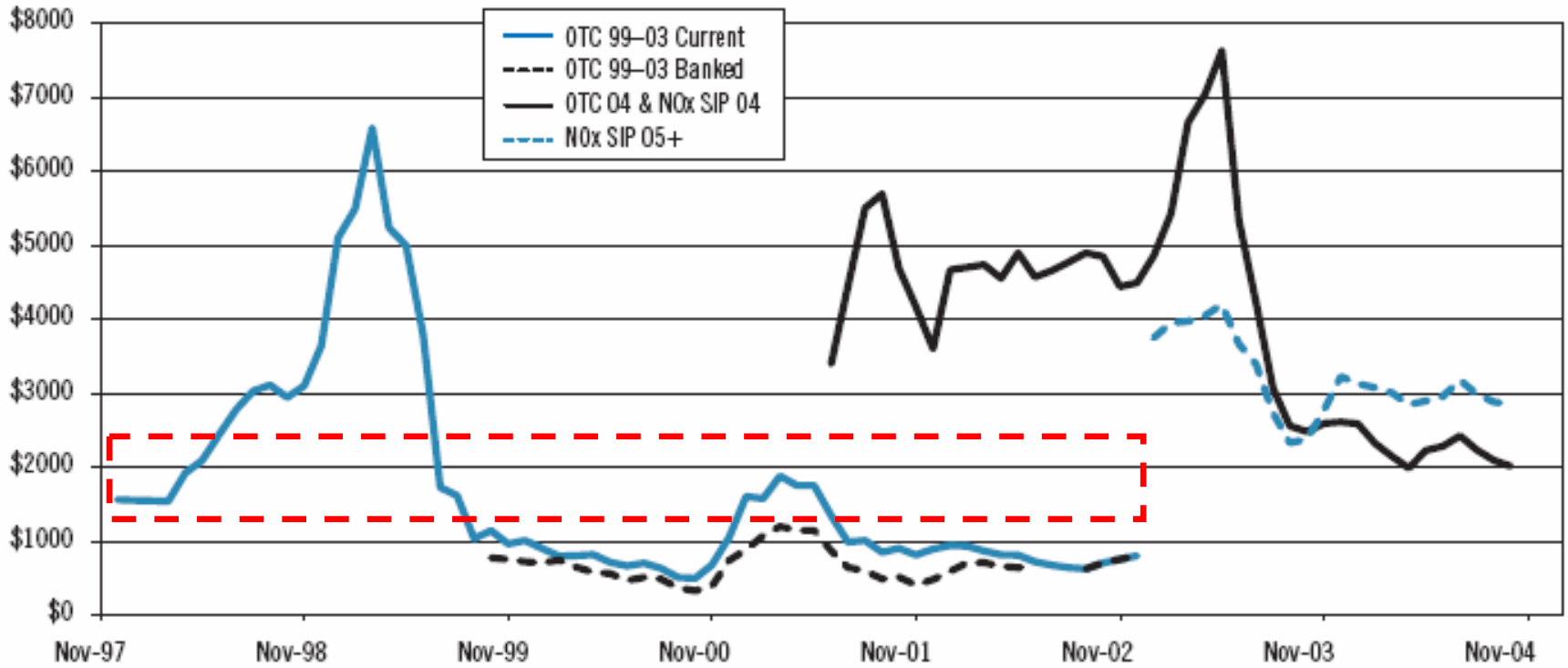


3. Circuit Breaker

- BUT – worries about possible high prices >> create a circuit breaker
- The planned decline in the cap stops if annual average allowance cost exceeds a predetermined cost threshold ($/ton).
- Decline starts again when the annual average cost is below threshold.
- Cap is never exceeded.
- Cost can exceed circuit breaker price.

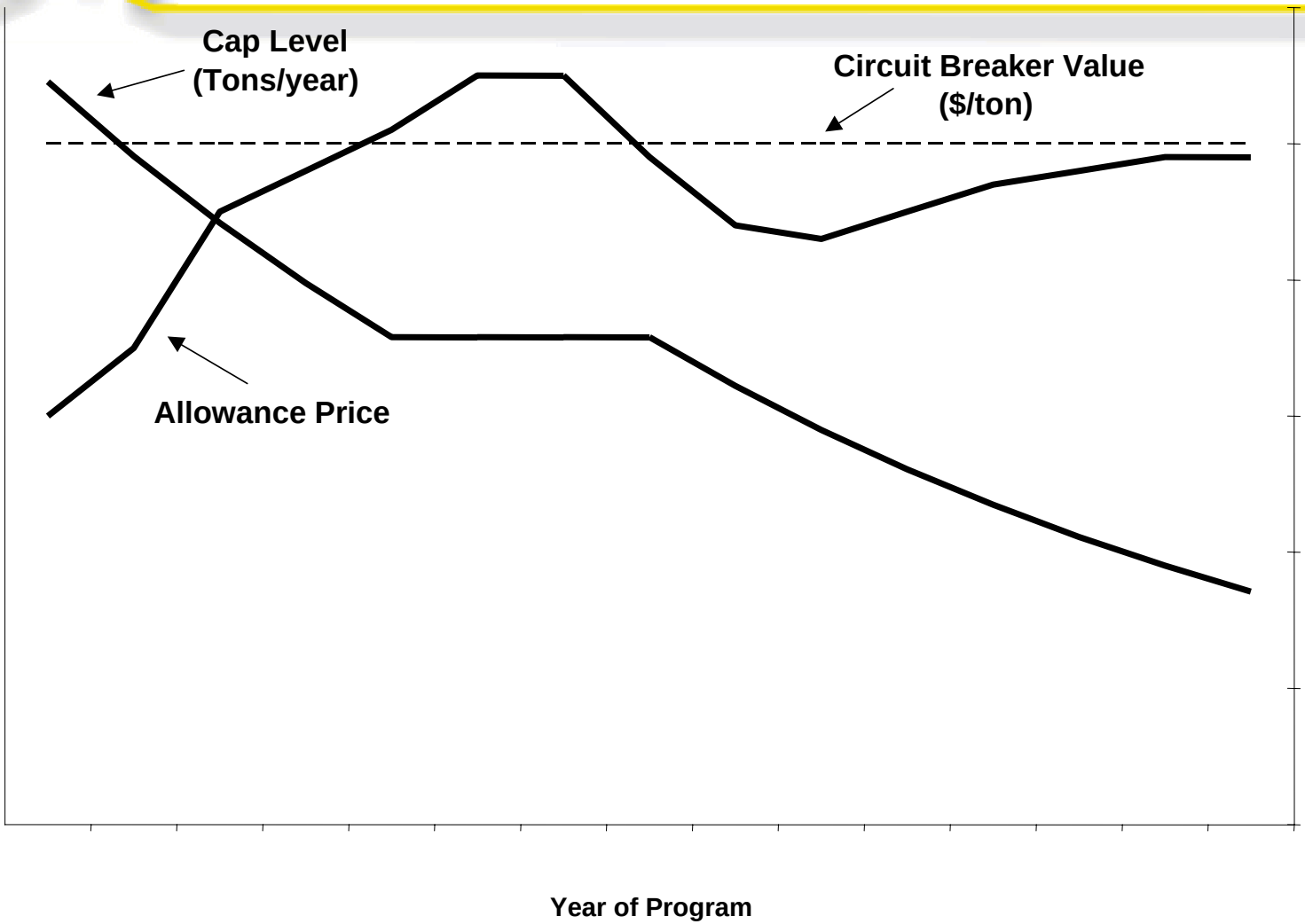
Letting the market work: NOx allowance price history

Figure 6. Market Prices, OTC NO_x Budget Program (nominal dollars)

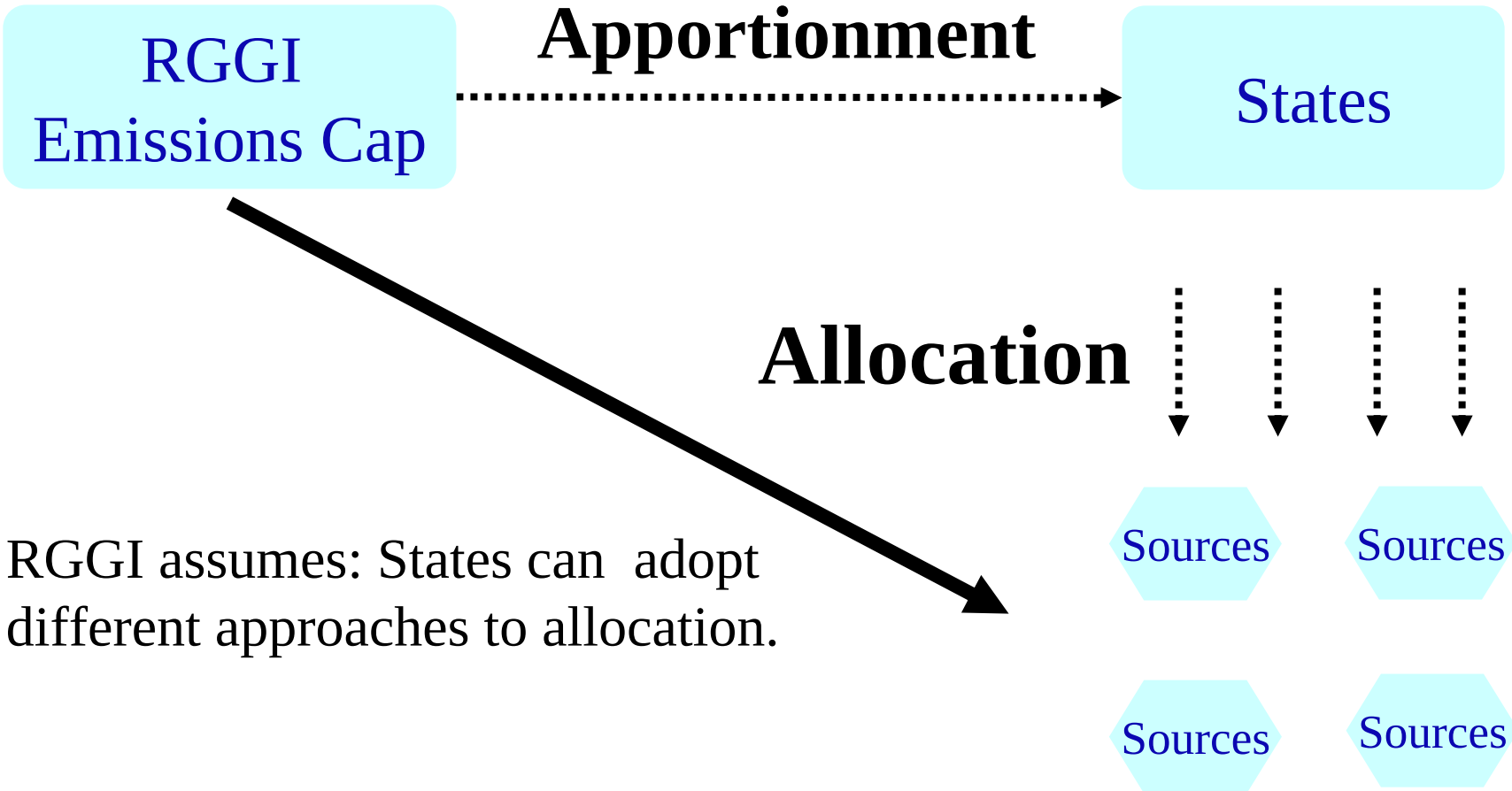


Source: Argus Air Daily. For more information contact: airdaily@argusmediagroup.com. Further use of this data is prohibited without prior written consent.

Circuit Breaker can suspend pace of cap declines



4. Initial Distribution of Allowances



RGGI assumes: States can adopt different approaches to allocation.

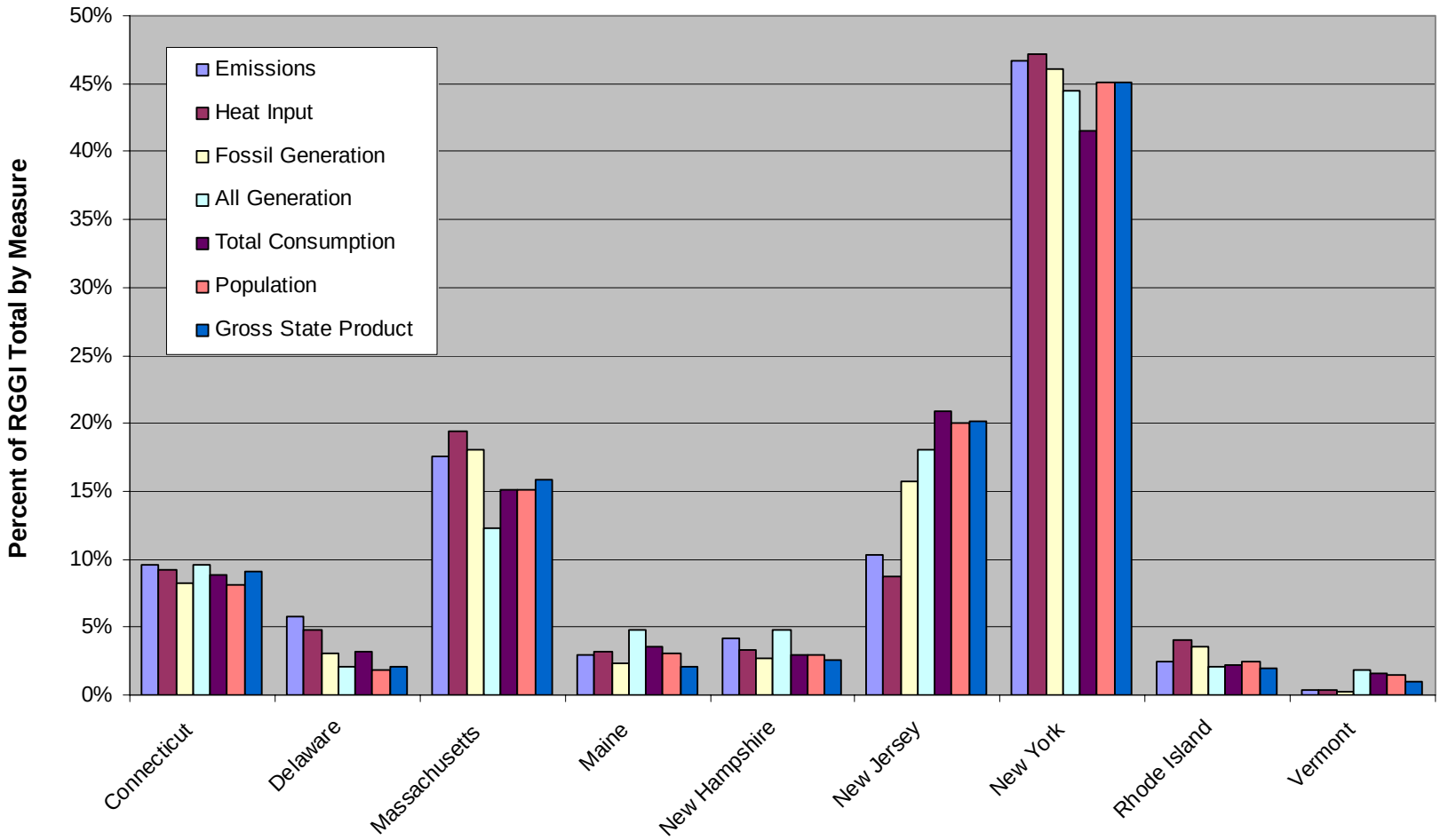
On what basis should allowances be apportioned?

(by states, percent of total RGGI cap)

State	Emissions RGGI Units 2000	Heat Input RGGI Units 2000	Fossil Generation RGGI Units 2000	All Generation 1999-2001 Avg.	Total Consumption 1999-2001 Avg.	Population 2000	Gross State Product 1999-2001 Avg.
Connecticut	9.6%	9.2%	8.3%	9.6%	8.9%	8.1%	9.1%
Delaware	5.8%	4.8%	3.1%	2.0%	3.2%	1.9%	2.1%
Massachusetts	17.6%	19.4%	18.1%	12.2%	15.1%	15.1%	15.8%
Maine	3.0%	3.2%	2.3%	4.8%	3.5%	3.0%	2.1%
New Hampshire	4.2%	3.3%	2.7%	4.8%	3.0%	2.9%	2.6%
New Jersey	10.3%	8.7%	15.7%	18.1%	20.9%	20.0%	20.1%
New York	46.7%	47.2%	46.1%	44.5%	41.5%	45.1%	45.1%
Rhode Island	2.4%	4.0%	3.6%	2.1%	2.2%	2.5%	2.0%
Vermont	0.4%	0.3%	0.2%	1.8%	1.6%	1.4%	1.0%

Source: Derek Murrow, Environment Northeast, “Apportioning the Regional Cap Among States: Allocation Options and Equitable Solutions” RGGI Allocation Workshop, Boston, October, 14, 2004

Potential Measures – Percent of Total RGGI Cap



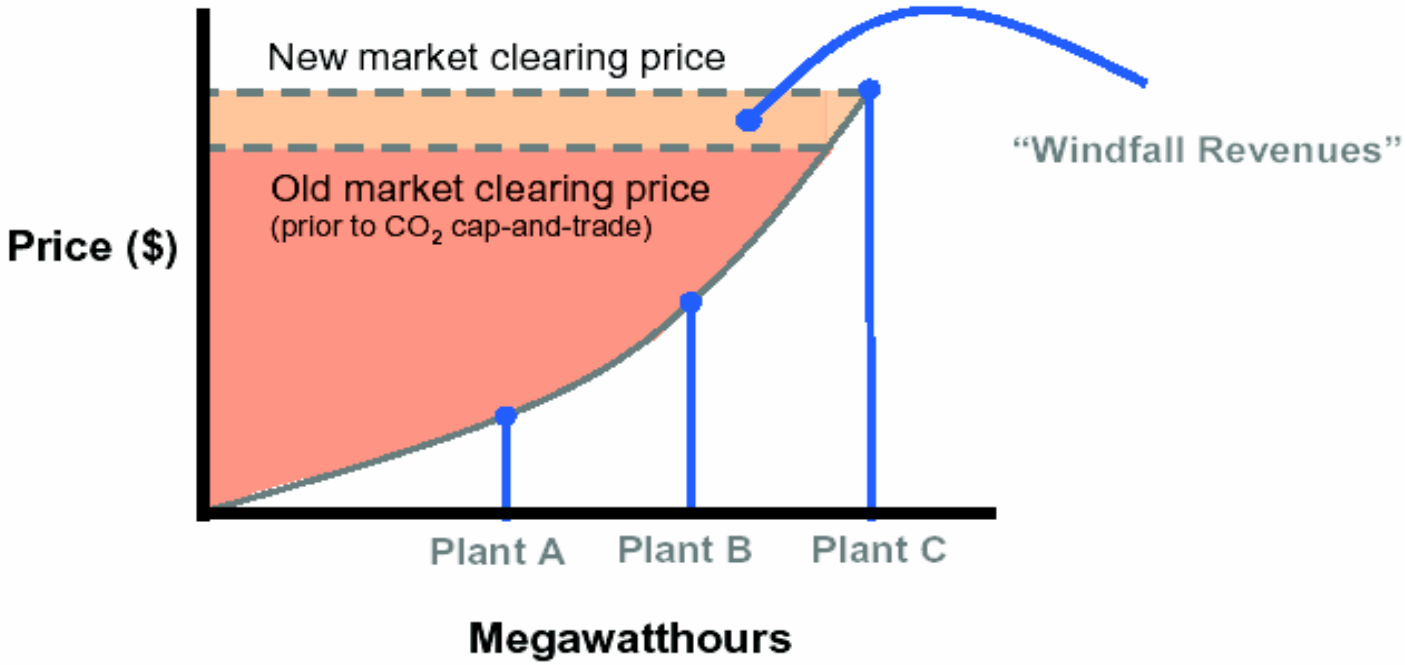
Allocation Choices: RGGI example

State	Emissions	Generation MWH	Consumption
NJ	10%	18%	21%
MA	18%	12%	15%
VT	.4%	1.8%	1.6%
CT	10%	10%	9%

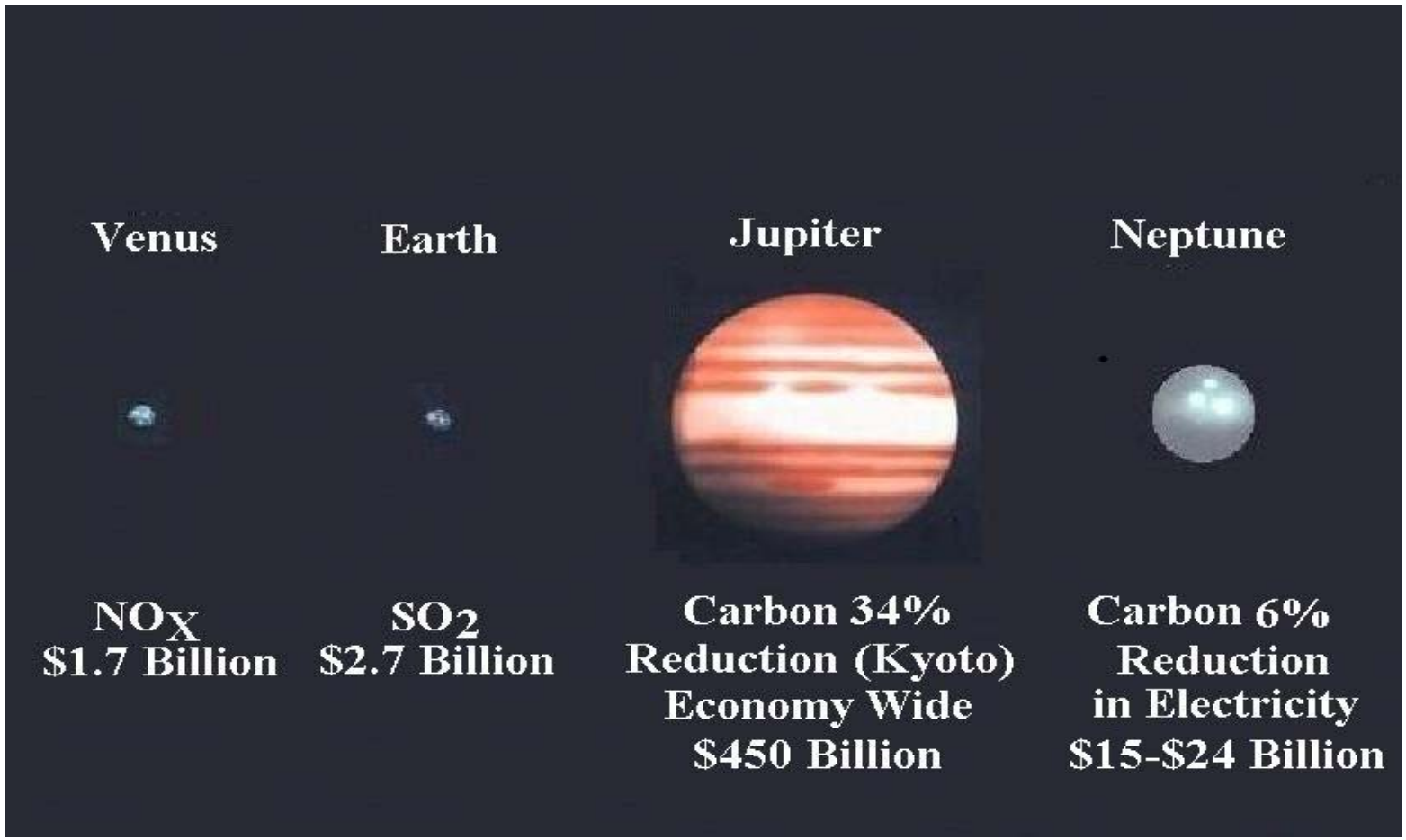
4-5. Generator allocation and the generator windfall problem

Theoretical representation of "windfall revenues"

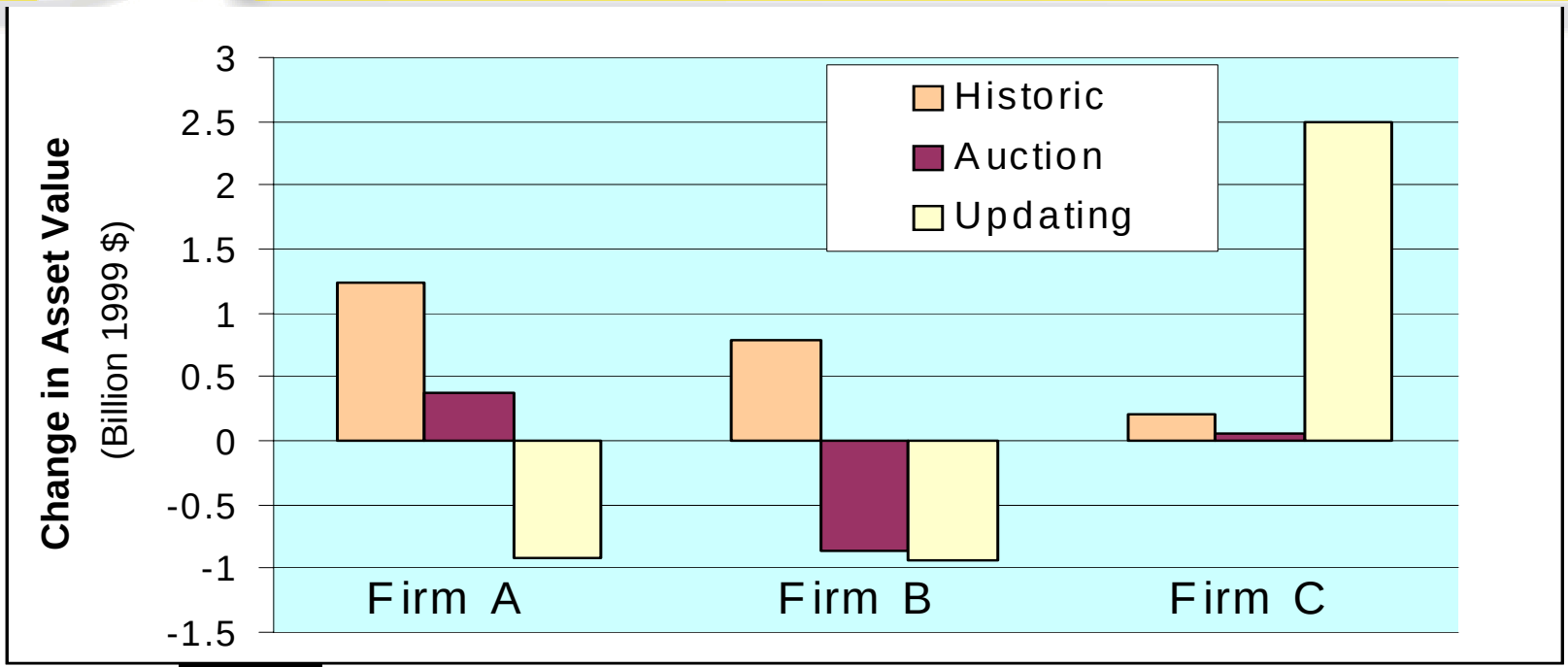
A fossil unit on the margin increases the market clearing price (i.e., the price paid to all generating units dispatched) to reflect the cost of CO_2 compliance

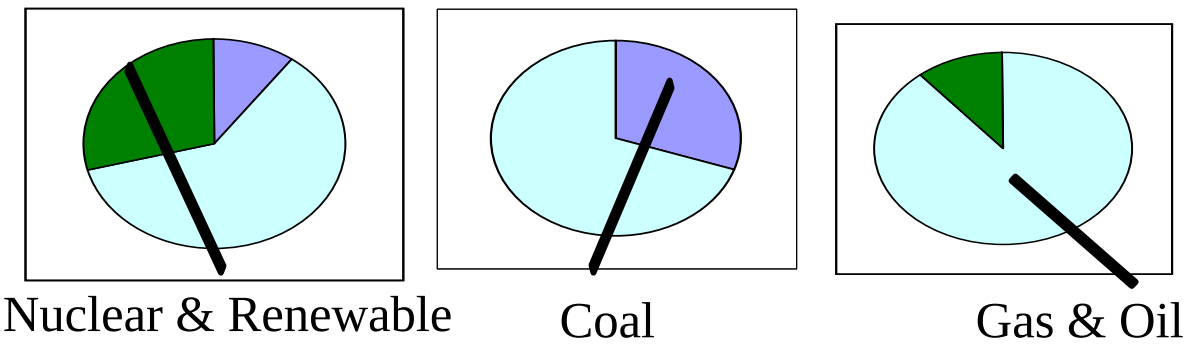


Carbon reduction is big business

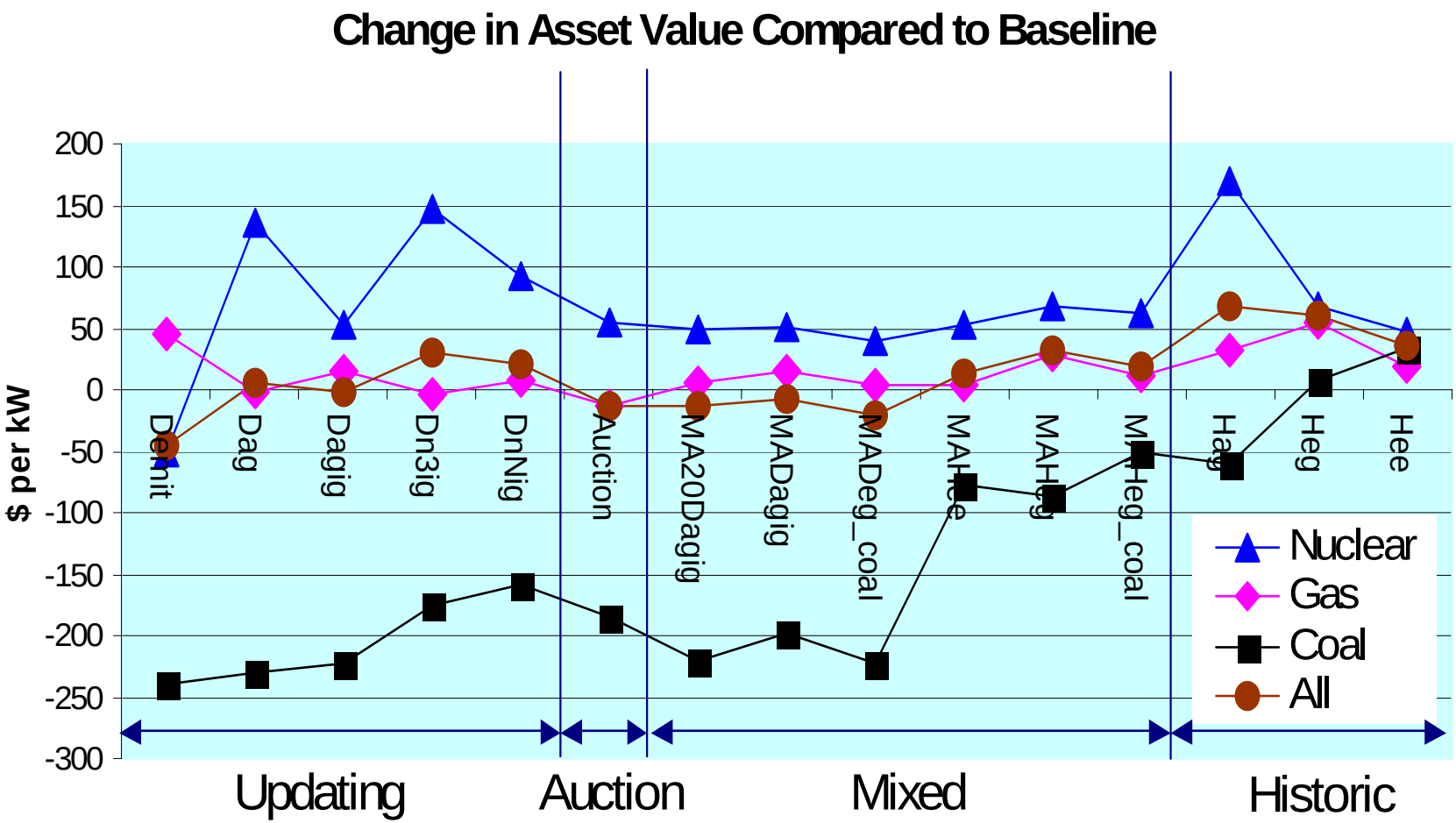


Shareholder Value for Three Firms: Effects of RGGI Allocation Choices

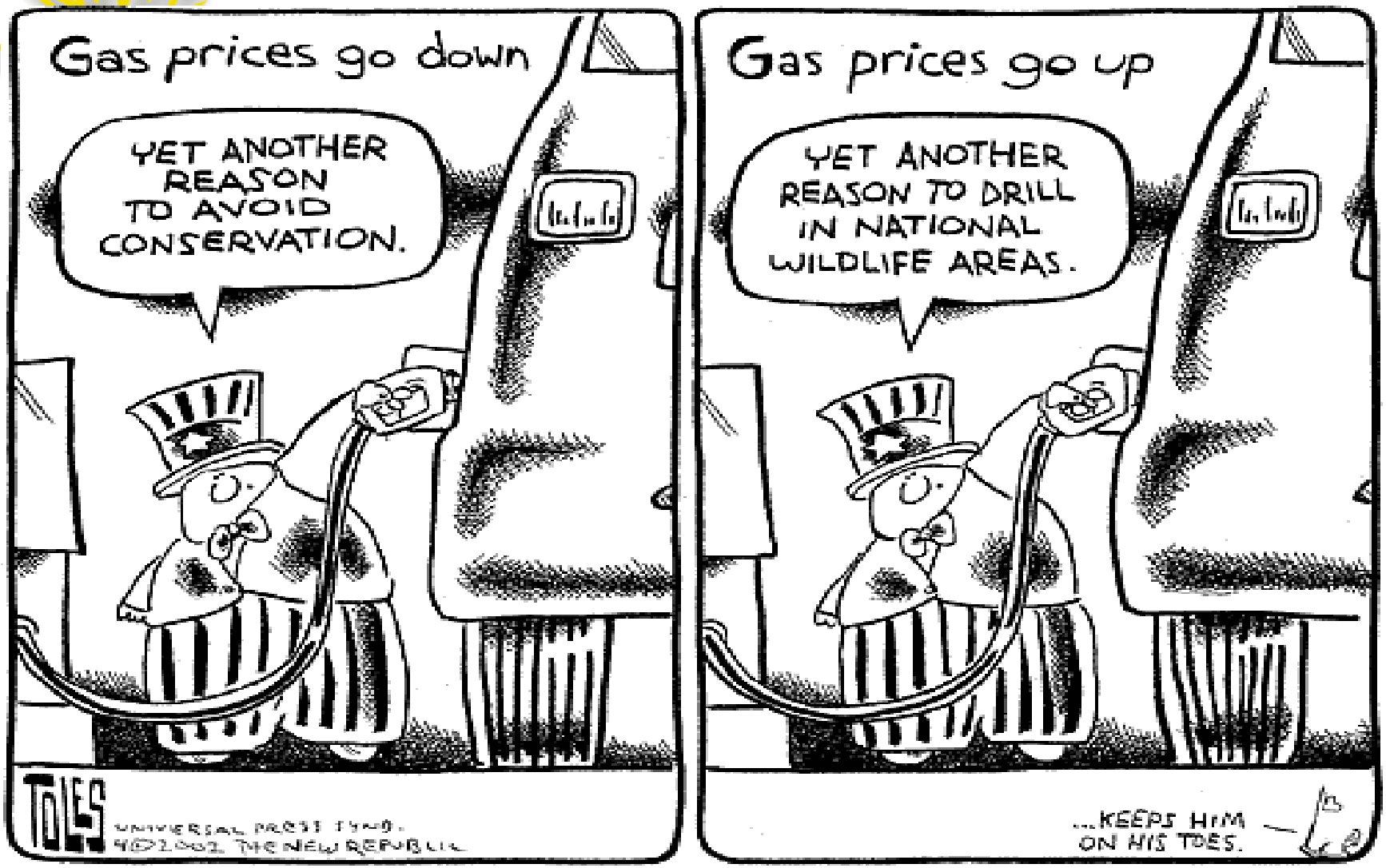




Change in Asset Value across several RGGI scenarios



The political reality of efficiency…



TNR 4-08

Windfall solution: a large consumer allocation

- Allocate 50% or more of initial credits to consumer representatives (eg, distribution utilities)
- Generators need to purchase allowances, recycling the windfall revenue BACK to consumers
- PUCs supervise use of the $$, focus on investments that lower carbon (EE &RE)
- Result: lower program cost, greater efficiency

Role of End-Use Efficiency

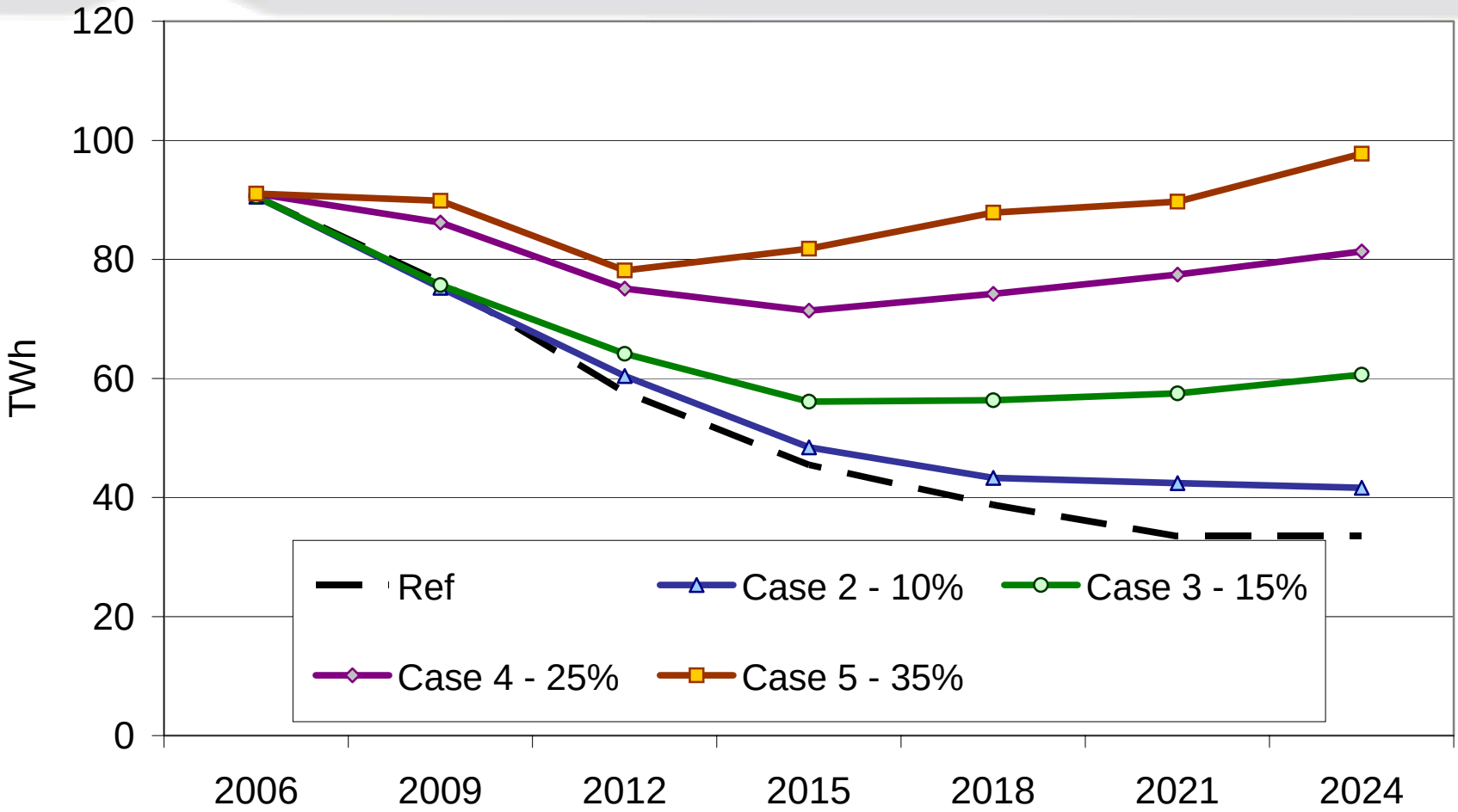
- Reprise: Generators don't do efficiency; LSEs have relationships with customers
- Economic theory: just raise the price of power
- DSM reality: ***Programs*** are needed to surmount market barriers to efficiency
- RGGI reality: Efficiency is the cheapest way to lower carbon emissions, lower power costs
- $ spent through programs will deliver 5x the efficiency savings of $ spent in higher prices
- Key point: Build efficiency support into program architecture.

6. Dealing with leakage

- Leakage: additional emissions outside the capped system (therefore not counted)
- Effects:
  - Erosion of program goal
  - Competitive advantage to “foreign” sources
  - Unofficial safety valve on price impacts
- How much leakage? 10%, 37%, or 70%?
  - RGGI is in a quandary

How much leakage?

RGGI Imports across Policy Scenarios



Controlling leakage

- One proposal: tag and track imports as sources
  - Treat importing utilities as “virtual smokestacks”
- How to ***count*** imports? Choices:

  (1) Assign plant-specific emissions to each purchase

  (2) To avoid “greenwashing” -- assign the average system emissions rate of the exporting system
- Can we track and tag imports? Yes
  - National experience with RPS and disclosure rules
  - Follow the money – if generators can get paid for running, then their emissions can be tagged and tracked.

7. Flexibility mechanisms

- Banking – saving allowances you don't need now, for future use
- Borrowing – emitting too much now, promising to pay back later
- Offsets – causing reductions outside the capped system
  - E.g.,Controlling landfill methane
  - Trees in China?
  - Problem: "anyway tons" and "hot air" reductions

Back to Basics: Load-Side Cap & Trade System

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

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
5. Gains: (a) no leakage problem (b) no generator windfall (c) EE and RE earn carbon value automatically

For more information…

"Another Option for Power Sector Carbon Cap and Trade Systems – Allocating to Load"

Richard Cowart, Regulatory Assistance Project
May 2004 -- Concept Memo, Regional Greenhouse Gas Initiative (RGGI) --Posted at www.raponline.org

Credits: Graphs on generator benefits are borrowed from "Initial Allocation of CO2 Allowances in the Regional Greenhouse Gas Initiative: Preliminary Observations" by Dallas Burtraw and Karen Palmer, Resources for the Future (RGGI Stakeholder Group Meeting New York City June 24, 2004)

Email questions to *RAPCowart@aol.com*