Synapse
Energy Economics, Inc.

Cap and Trade CO_2 Regulation: Efficient Mitigation or a Give-away?

ELCON Spring Workshop – Nashville, TN

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Cap and Trade: Design Is Important

The Plan…

- Chris:
  - Cap and Trade design considerations
  - Auction vs. allocation
  - Industrial user role
- Ezra:
  - Cap and Trade carbon regulation in *REGULATED* and *DEREGULATED* electricity markets
  - Example: Hypothetical Cap & Trade program impacts in PJM
  - Take-home messages
- Questions & Discussion

Design Elements

- What is the baseline and how is it set?
- Apportionment: how are emissions calculated?
- Allowances: Who gets them and how are they allocated?
- Auctions: What are they? Why do they matter?
- How do these elements relate to the industrial sector

Cap and Trade Fundamentals

- History: 1991 amendments to the Clean Air Act: acid rain
- 1998: Ozone Transport Region (NE and mid-Atlantic States: Nox budget program
- 2005 European Union: CO_2 emissions trading system
- 2009: US NE states: Regional Greenhouse Gas Initiative (RGGI)

Differences Between Regulating Emissions of Acid Rain and Greenhouse Gases

Acid Rain:

- Regulated utility environment
- Direct controls, applied upstream
- Measure reductions at stack with CEM
- Co-benefits: “what’s a co-benefit?”

Greenhouse Gases:

- Patchwork: regulated and restructured
- Regs applied upstream, “controls”?
- CEM measure CO_2, but no control devices
- Co-benefits: matter, as do unintended consequences

Regulated v. Patchwork

- Regulated utilities recover costs through their PSC
- Restructured utilities include costs in hourly electricity bids
- Consumers pay in both cases

Direct v. Indirect Controls

- Acid rain: install scrubbers and SCR, measure reductions = simple
- GHG: limited direct options: fuel switching, nuclear, but both are expensive, have financial risks and take years to construct
- Indirect: energy efficiency, distributed generations (CHP).

Baseline

- What year? Current, highest three, average of last three years
- Applicability: size threshold and basis. Count behind the meter generation?

Apportionment

- What basis?
- Heat input: pounds CO_2 per MMBTu?
- Generation output: pounds CO_2 per MWh
- Population
- Consumption
- Hybrid of the above?
- How matters, and states may make the ultimate decision

Allocation

- Who receives allowances?
- Generators?
- Load serving entities?
- First seller?
- Are allowances provided administratively (free), auctioned, or a mix?

Industrial Sector Role in GHG

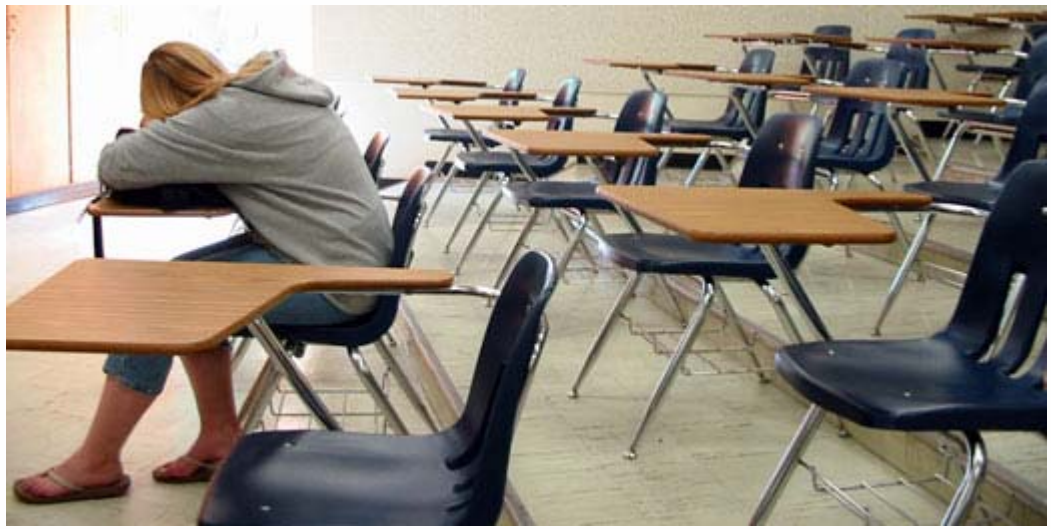
- Energy efficiency investments cost-effective (EE potential studies:1-2 c/kWh in many states)
- States also have climate plans, where EE is one of chief means to achieve reductions
- Co-benefits: new ozone standard out; ISO-NE and PJM capacity markets, generate credits for energy efficiency performance standards

Auctions

- Why?
- Acid rain: generators sold allowances and invested $ in controls.
- GHG: generators sell allowances and ???
- Auction: capture portion of this revenue and direct it to programs that reduce GHG and provide ratepayer benefits

Cap & Trade Regulation

…Cap and Trade allocates scarce resource (emission rights) to most efficient application…blah, blah, blah…



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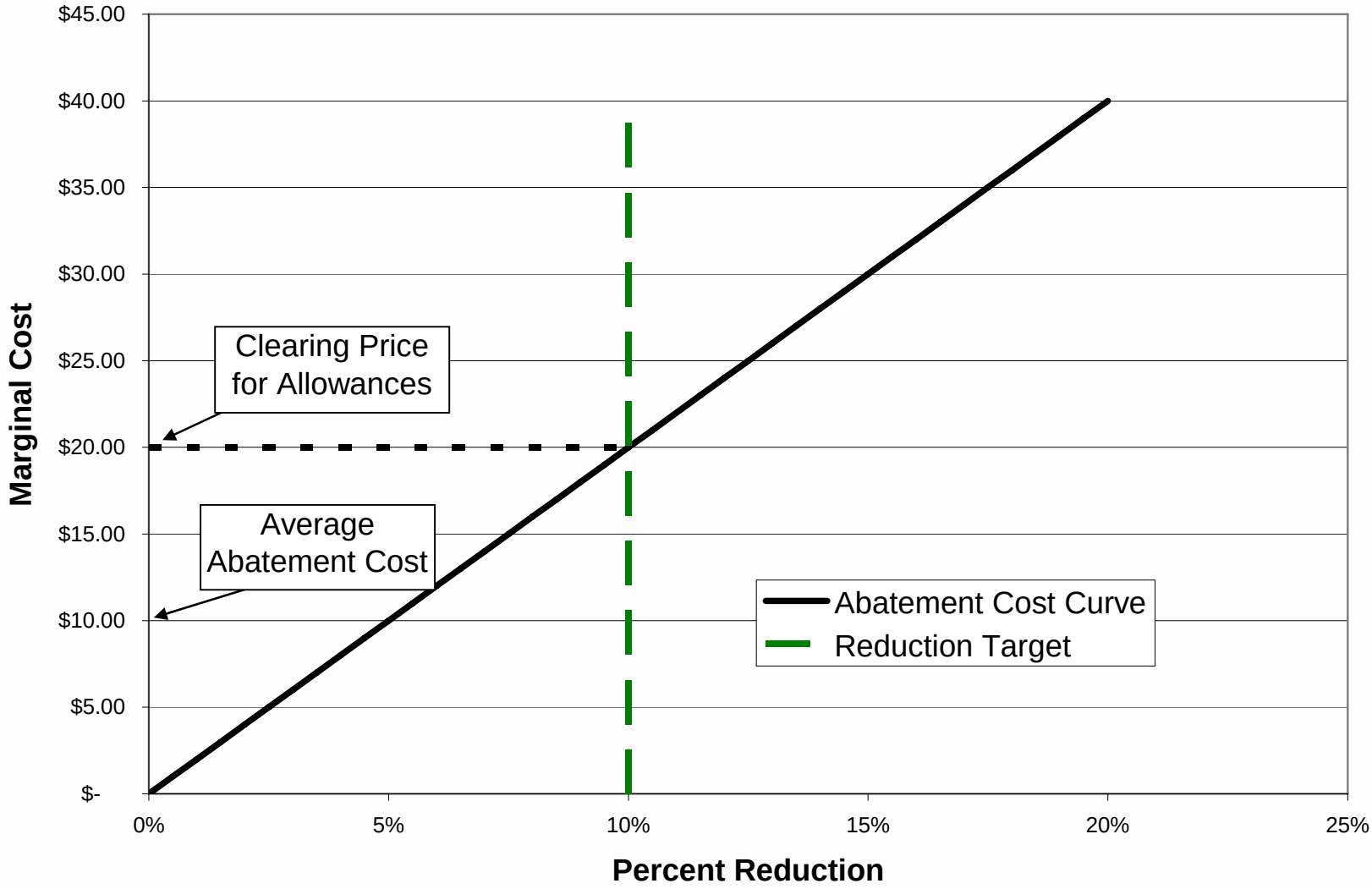
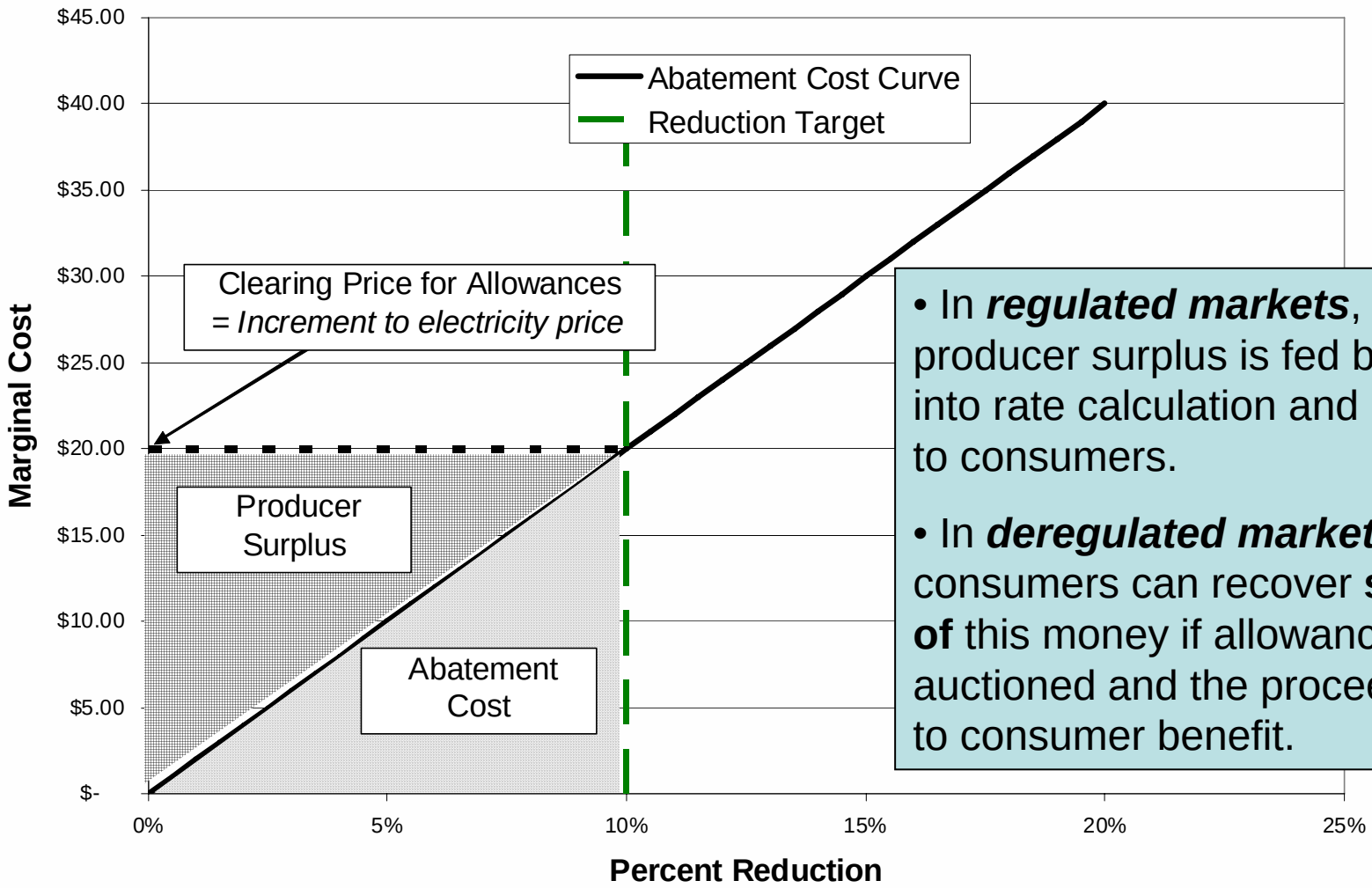
What they show you…



What they may neglect to mention…

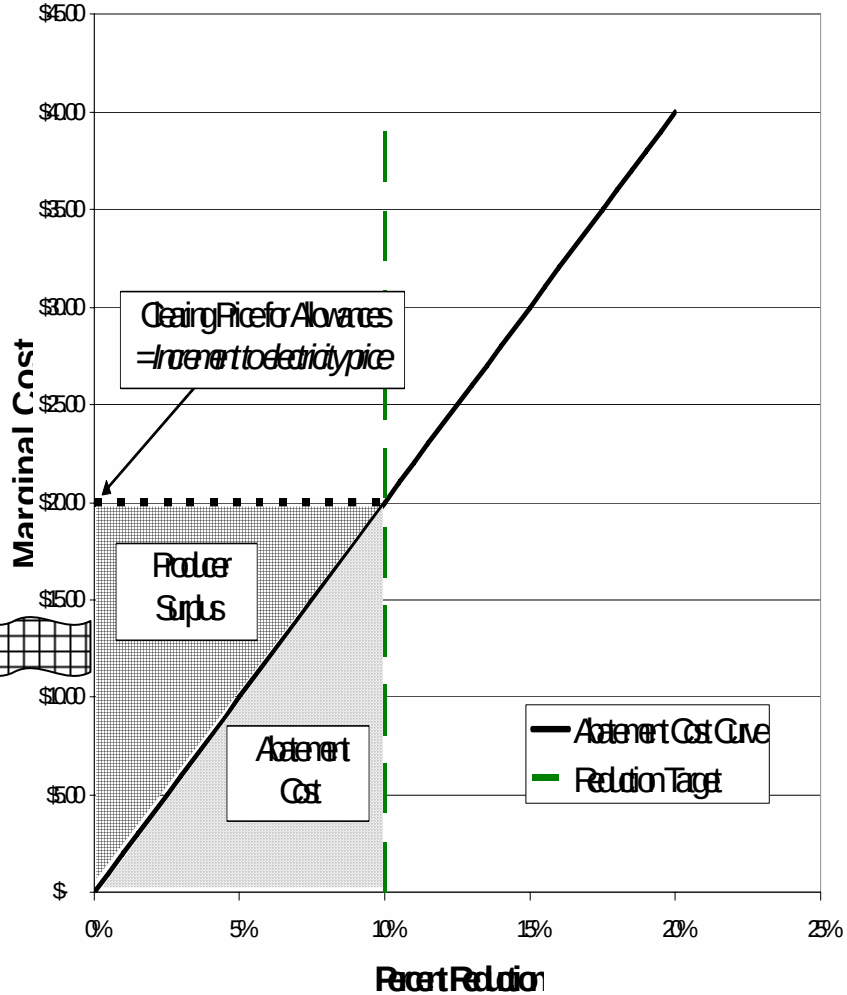


- In ***regulated markets***, producer surplus is fed back into rate calculation and returns to consumers.
- In ***deregulated markets***, consumers can recover **some of** this money if allowances are auctioned and the proceeds go to consumer benefit.

Oh, and this…

Payoff for existing low-carbon resources (primarily nuclear) in **deregulated** electricity markets:

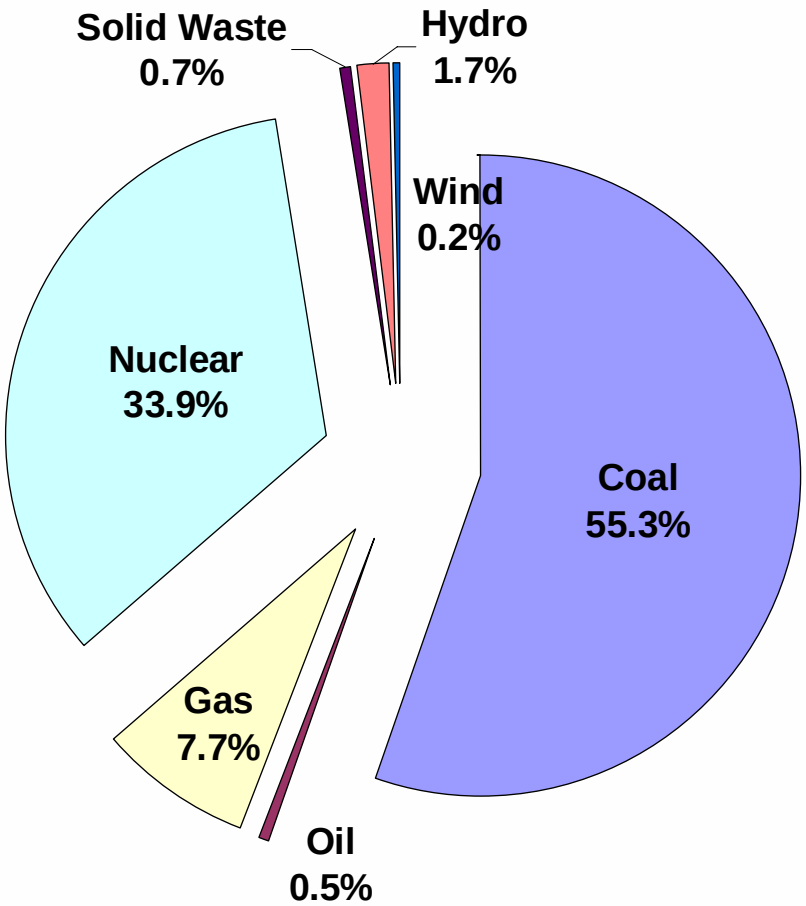
- *Additional revenue: $Billions*
- *Additional cost: $0*



Some definitions…

- ***Regulated*** implies responsible, hands-on utility regulators who carefully balance rates with cost-based revenue requirements
- ***Allowance Allocation*** means 100% of emissions allowances are given to emitters, free of charge, in some proportion to their historic carbon emissions
- ***Allowance Auction*** means 100% of emission allowances are auctioned off, with the proceeds used for the benefit of consumers in some wise and reasonable way.

PJM GWh Production in 2007

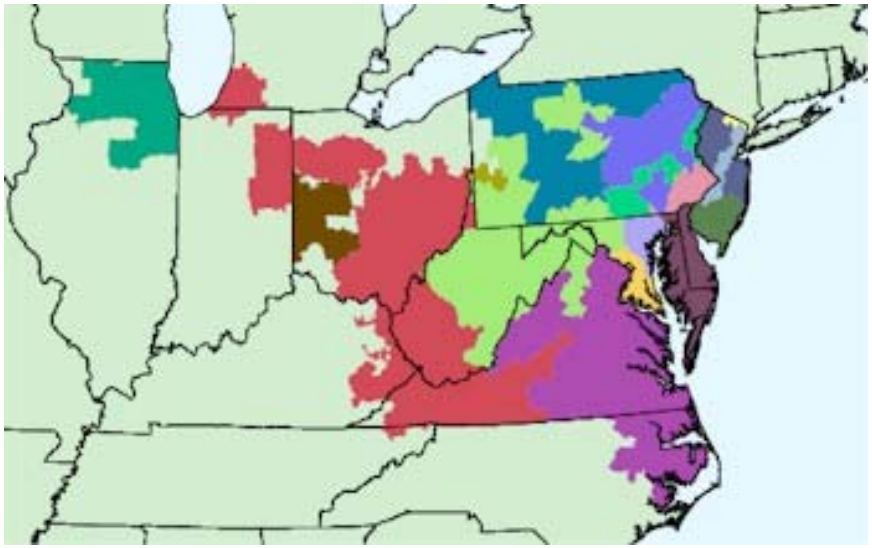


Source: PJM 2007 State of the Market Report

Two Questions:

1. *Who gets the benefit of higher electricity prices?*
2. *Who pays the price?*

Example 1: PJM under Federal Cap & Trade



- *Reduction target:* to 90% of BAU
- *Allowance trading price:* $20
- *Average cost of abatement:* $10

Four scenarios:

- *Regulated with allocation*
- *Regulated with auction*
- *Deregulated with allocation*
- *Deregulated with auction*

Calculating the price impact

Under LMP, only the marginal unit(s) affect the price; thus the price impact of CO_2 allowance costs will be based on the marginal emission rate for each hour and region.

Technology	2007 Time on Margin	CO2 Emission Rate (tons/MWh)
Coal	70%	1.05
Misc	2%	
Natural Gas	24%	0.66
Nuclear	0%	
Petroleum	5%	0.98

Sources:
PJM 2007 State of the Market report (marginal units)
http://www.eia.doe.gov/cneaf/electricity/page/co2_report/co2emiss.pdf

Calculating the price impact

- *Weighted average emission rate in PJM:*

  0.95 tons CO_2 per MWh produced

- *Average price impact of a $20 allowance:*

  0.95 x $20 = ***$19/MWh***

Balance Sheet #1: Cap-and-trade in a regulated market with free allocation of allowances

	Coal	Oil	Gas	Nuclear	Solid Waste	Hydro	Wind	Consumers
Million Ton Allowances Allocated	375	3	31	0	0	0	0	
Value of allowances @$20/ton	$ -	$ -	$ -	$ -	$ -	$ -	$ -	***$ 8,169***
Cost of 10% abatement @ $10/ton average cost	$ (416)	$ (3)	$ (35)	$ -	$ -	$ -	$ -	
Cost of allowances for remaining 90%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	***$ (8,169)***
Sum of allowance and abatement costs	*$ (416)*	*$ (3)*	*$ (35)*	*$ -*	*$ -*	*$ -*	*$ -*	
Price impact	*$ 416*	*$ 3*	*$ 35*	*$ -*	*$ -*	*$ -*	*$ -*	***$ (454)***
Net Gain (Loss)	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ (454)**

All dollar values are in US $Million

Balance Sheet #2: Cap-and-trade in a regulated market with auction of allowances to benefit consumers

	Coal	Oil	Gas	Nuclear	Solid Waste	Hydro	Wind	Consumers
Million Ton Allowances Allocated	0	0	0	0	0	0	0	***408***
Value of allowances @$20/ton	$ -	$ -	$ -	$ -	$ -	$ -	$ -	***$ 8,169***
Cost of 10% abatement @ $10/ton average cost	$ (416)	$ (3)	$ (35)	$ -	$ -	$ -	$ -	
Cost of allowances for remaining 90%	$ (7,491)	$ (54)	$ (625)	$ -	$ -	$ -	$ -	
Sum of allowance and abatement costs	*$ (7,907)*	*$ (57)*	*$ (659)*	*$ -*	*$ -*	*$ -*	*$ -*	***$ 8,169***
Price impact	*$ 7,907*	*$ 57*	*$ 659*	*$ -*	*$ -*	*$ -*	*$ -*	***$ (8,623)***
Net Gain (Loss)	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ (454)**

All dollar values are in US $Million

Balance Sheet #3: Cap-and-trade in a deregulated market with free allocation of allowances

	Coal	Oil	Gas	Nuclear	Solid Waste	Hydro	Wind	Consumers
Million Ton Allowances Allocated	375	3	31	0	0	0	0	***0***
Value of allowances @$20/ton	$ 7,491	$ 54	$ 625	$ -	$ -	$ -	$ -	***$ -***
Cost of 10% abatement @ $10/ton average cost	$ (416)	$ (3)	$ (35)	$ -	$ -	$ -	$ -	
Cost of allowances for remaining 90%	$ (7,491)	$ (54)	$ (625)	$ -	$ -	$ -	$ -	
Sum of allowance and abatement costs	*$ (416)*	*$ (3)*	*$ (35)*	*$ -*	*$ -*	*$ -*	*$ -*	***$ -***
Price impact	*$ 7,422*	*$ 66*	*$ 1,031*	*$ 4,549*	*$ 87*	*$ 233*	*$ 24*	***$ (13,413)***
Net Gain (Loss)	**$ 7,006**	**$ 64**	**$ 997**	**$ 4,549**	**$ 87**	**$ 233**	**$ 24**	**$ (13,413)**

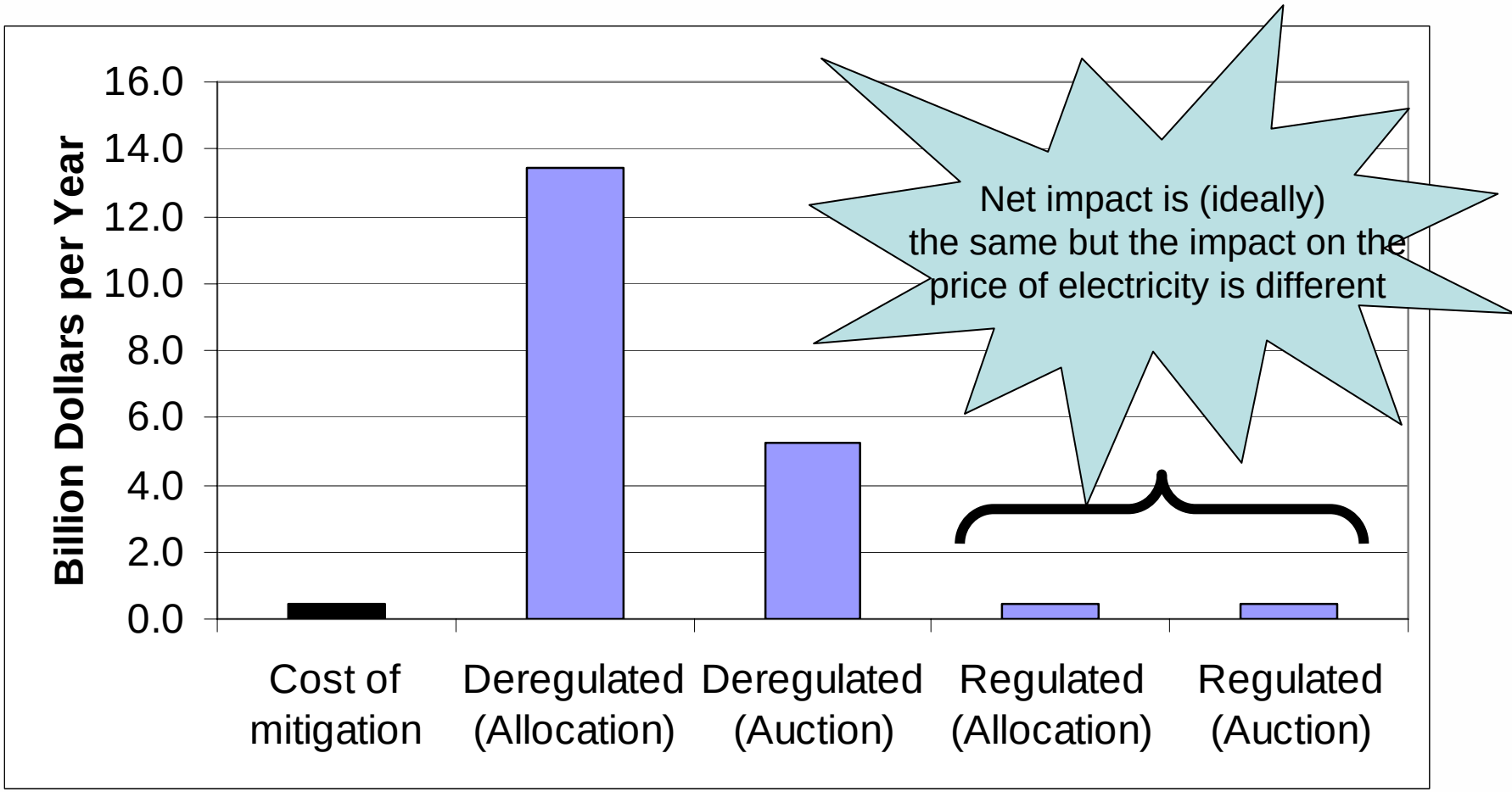
All dollar values are in US $Million

Balance Sheet #4: Cap-and-trade in a deregulated market with auction of allowances to benefit consumers

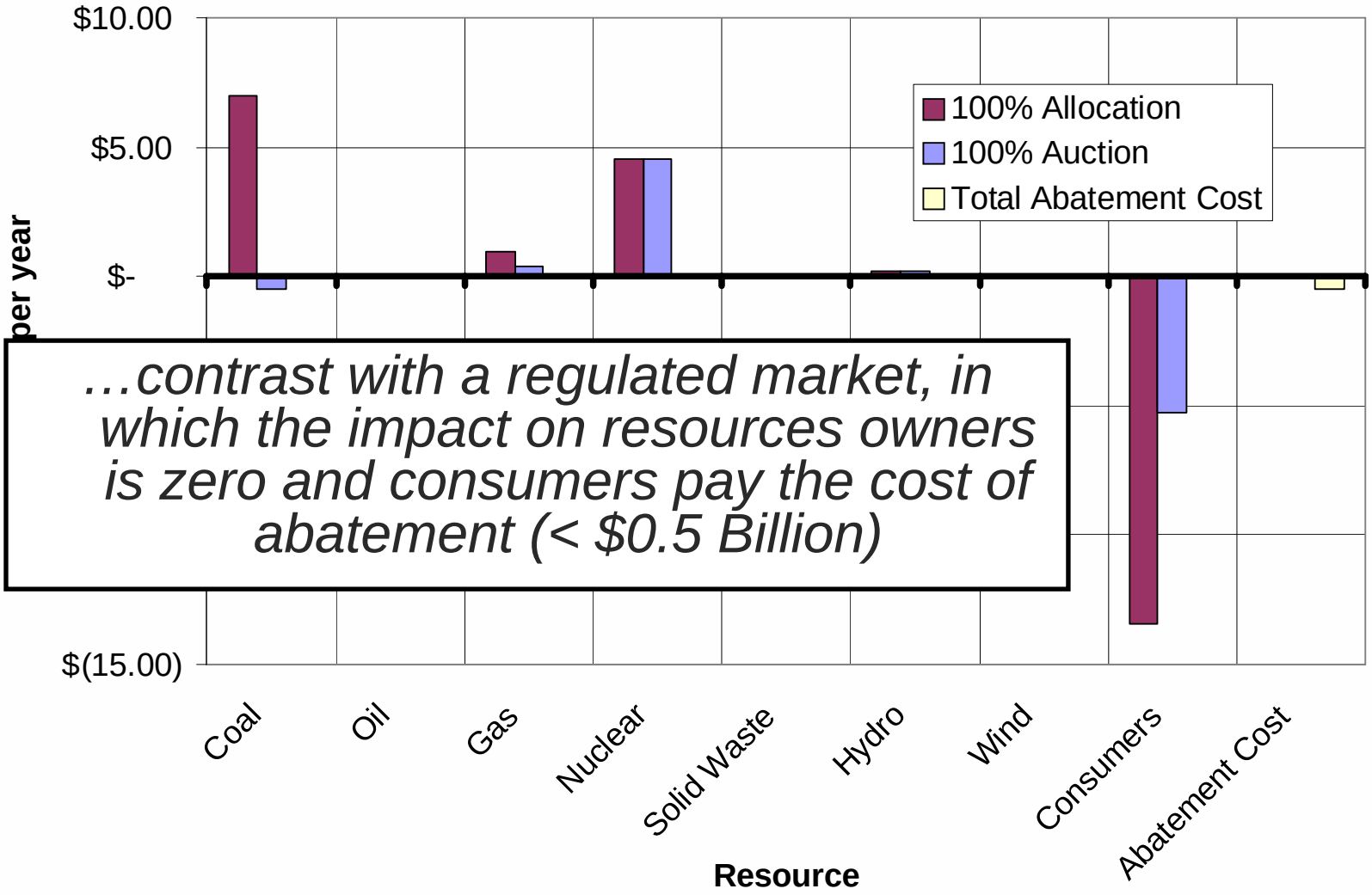
	Coal	Oil	Gas	Nuclear	Solid Waste	Hydro	Wind	Consumers
Million Ton Allowances Allocated	0	0	0	0	0	0	0	***408***
Value of allowances @$20/ton	$ -	$ -	$ -	$ -	$ -	$ -	$ -	***$ 8,169***
Cost of 10% abatement @ $10/ton average cost	$ (416)	$ (3)	$ (35)	$ -	$ -	$ -	$ -	
Cost of allowances for remaining 90%	$ (7,491)	$ (54)	$ (625)	$ -	$ -	$ -	$ -	
Sum of allowance and abatement costs	*$ (7,907)*	*$ (57)*	*$ (659)*	*$ -*	*$ -*	*$ -*	*$ -*	***$ 8,169***
Price impact	*$ 7,422*	*$ 66*	*$ 1,031*	*$ 4,549*	*$ 87*	*$ 233*	*$ 24*	***$ (13,413)***
Net Gain (Loss)	**$ (882)**	**$ 6**	**$ 317**	**$ 4,305**	**$ 83**	**$ 221**	**$ 23**	**$ (5,244)**

All dollar values are in US $Million

Cost to consumers depends on market structure and allocation scheme



Winners and Losers in deregulated market



…contrast with a regulated market, in which the impact on resources owners is zero and consumers pay the cost of abatement (< $0.5 Billion)

Take-home messages for DEREGULATED markets

- Cap and Trade + deregulated electricity markets =
  - HIGH COST
  - MINIMAL BENEFITS
  - WINDFALL PROFITS FOR EXISTING RESOURCES
- Worse with allowance allocation, ***but still pretty bad with auction***
- Existing, amortized nuclear resources make out best, multiplying consumer cost without producing any benefits

Take-home messages for REGULATED markets

- Net cost impact of cap & trade equals mitigation cost, ASSUMING:
  - …if allowances are ***allocated***, prudent, cost-based regulation so that the value of allowances is counted towards the utilities' revenue
  - …if allowances are ***auctioned***, proceeds are used wisely for consumer benefit and are not raided for other purposes
- *AUCTIONING of allowances raises the price per kW-hour, which increases the incentive for energy efficiency*

Winning strategies…

- *Energy efficiency*

- Re-regulate electricity markets before implementing cap & trade
- Windfall profits tax on existing resources (esp. nuclear)

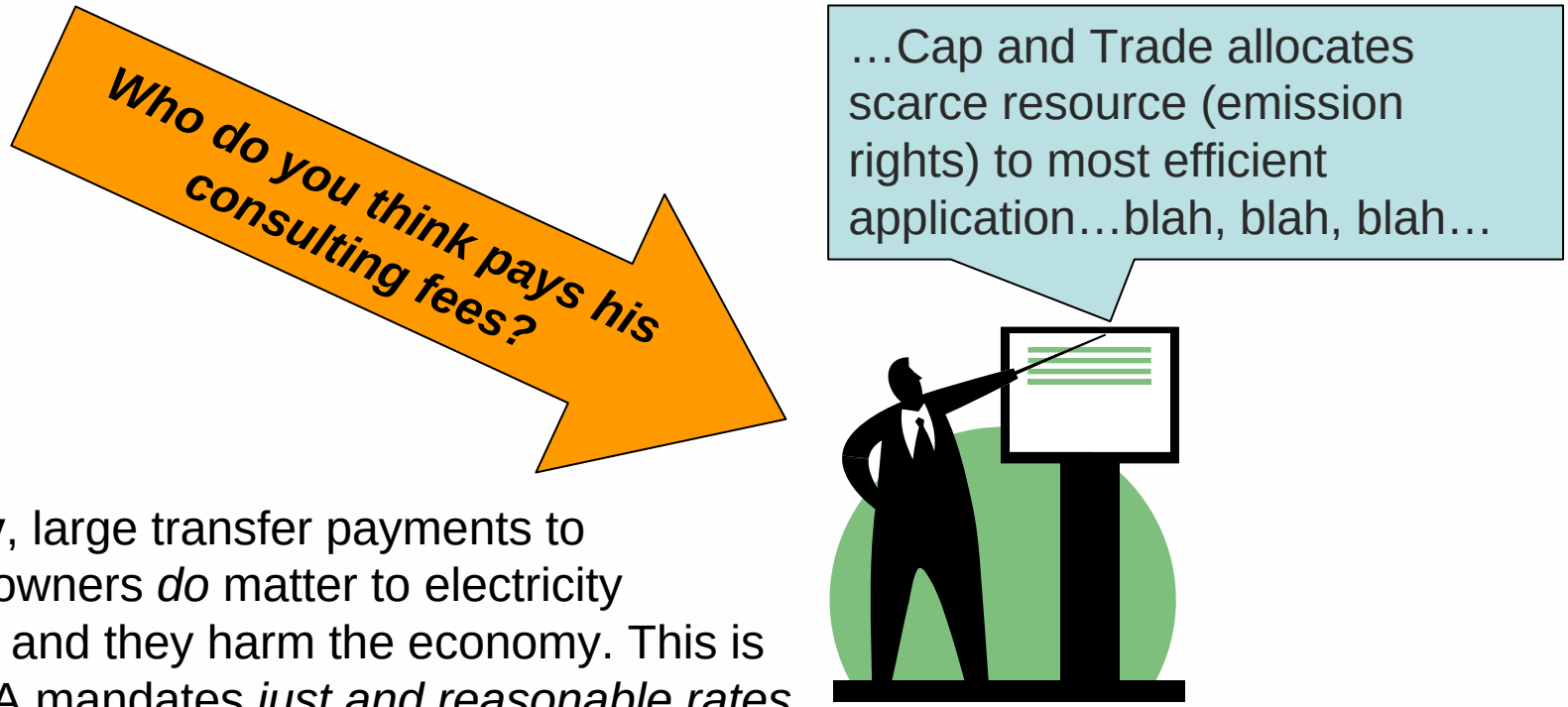
- *Energy efficiency*

- Spend a large chunk of allowance auction proceeds on energy efficiency
- **Large users:** reduce demand or build your own zero-carbon resources, whichever is cheaper

- *Energy efficiency*

Winning strategies

- Direct development of renewable energy and DSM is a MUCH MORE EFFICIENT approach to reducing carbon emissions



Shockingly, large transfer payments to generation owners *do* matter to electricity consumers, and they harm the economy. This is why the FPA mandates *just and reasonable rates.*

Conclusions

- Cap and trade *in deregulated markets* can raise the price of electricity, with an economic impact that is orders of magnitude larger than the actual cost of mitigation
- Big transfer payments to existing, amortized resources who will benefit from higher prices but see no cost impact
- If allowances are allocated in deregulated markets, even coal (most GHG-intensive fuel) makes a windfall
- In regulated markets, consumers pay only the cost of mitigation whether allowances are allocated or auctioned—ASSUMING wise and prudent cost-based regulation
- Program design MUST allow for compliance through efficiency and renewables, and states MUST seize these opportunities!

Discussion Questions

- What are you doing to prepare for GHG regulations? How are you analyzing economics? What assumptions are you using?
- Do you participate in PSC filings? How? How about legislation/ rulemaking?

