Lessons from existing environmental markets for the design of climate policy

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Resources for the Future

Carbon Market Design: Issue and Opportunities
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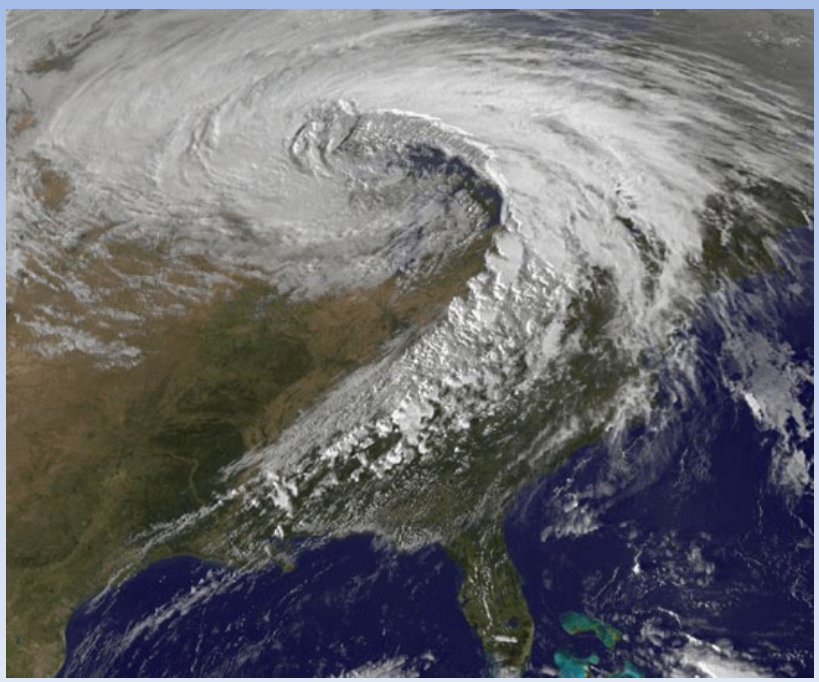
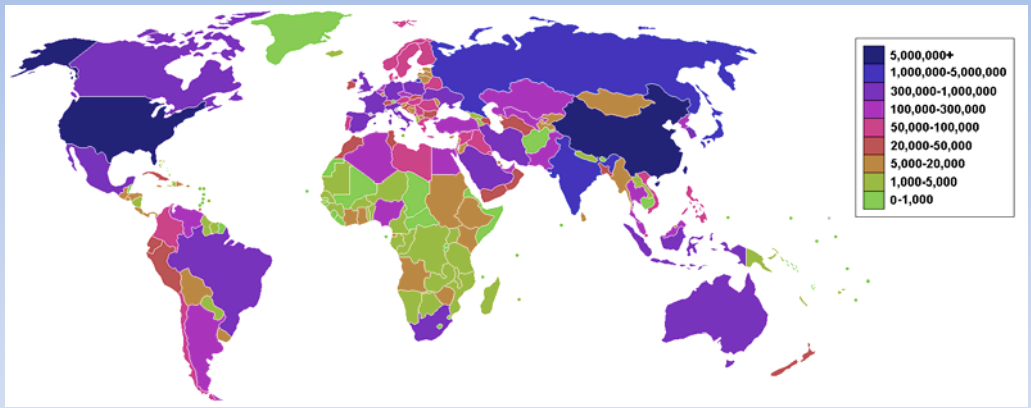
Roadmap

- Previous emissions trading markets in US
- Crucial design issues
  - Allocation
  - Offsets
- Status of CO_2 trading policies

The “Chiclone” – *26 October, 2010 Superstorm*

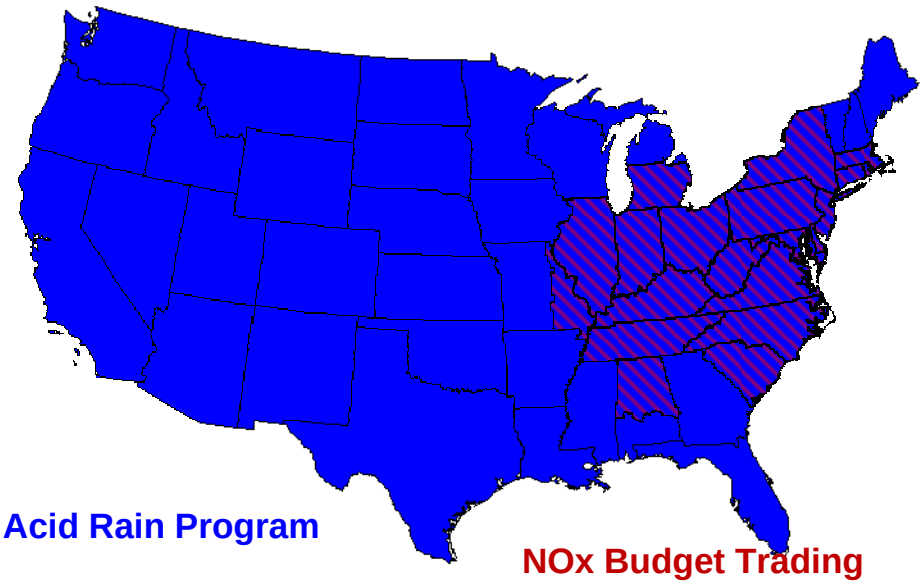


Sources of Global CO_2 Emissions in 2005



U.S. share: 21%

Successful Trading Programs Emerged in the 1990s



Acid Rain Program

NOx Budget Trading Program

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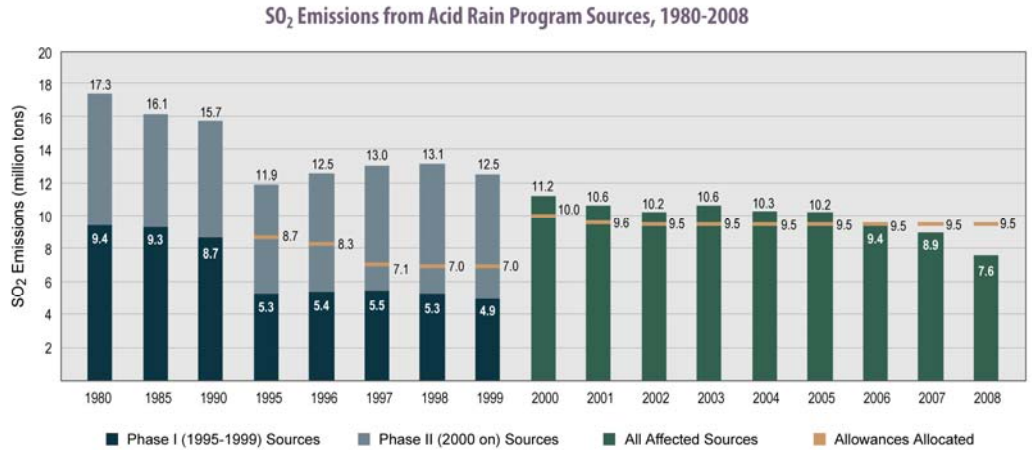
Public Perception of Trading

- Media reactions to first SO_2 allowance trades in 1992
  - "What's next, the L.A. Police Department trying to buy civil rights credits in Wisconsin?" (quote from A.P. wire story)
  - "Why applaud a deal that lets companies buy pollution rights? *People will die."* (op. ed. in USA Today)

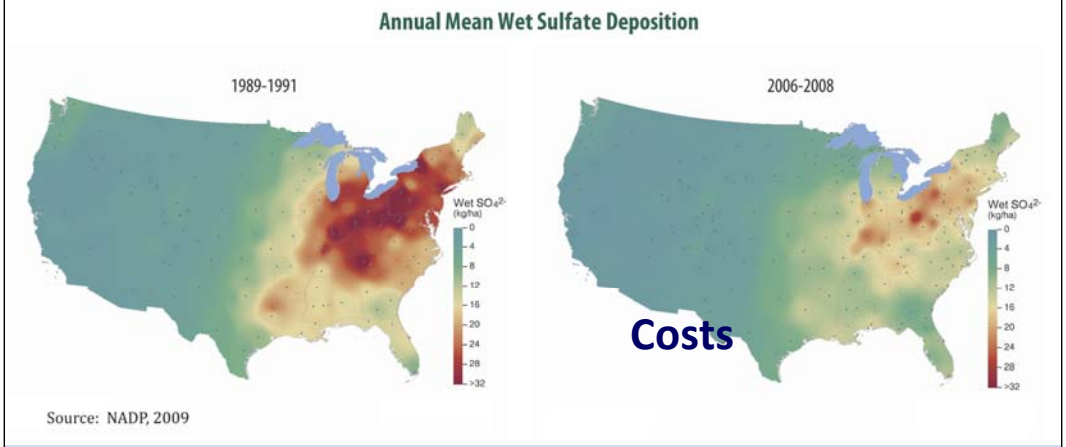
Reactions to Early Trades

SO_2 Cap – Emissions Reductions



Source: EPA, 2009

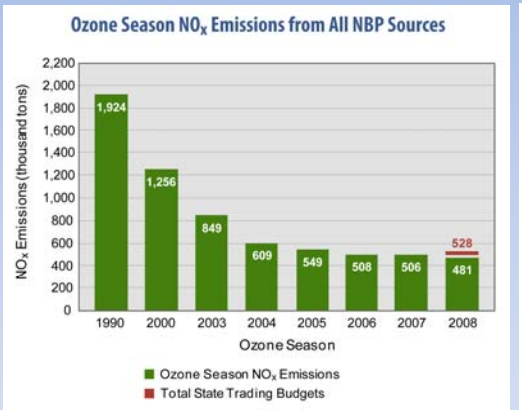
SO_2 Cap – Environmental Results

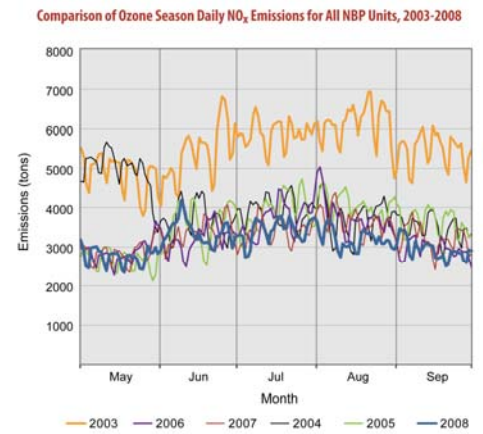


Costs

RFF

NO_x Cap – Results





Note: The relatively high May 2004 daily emissions represent the delayed May 31st compliance date that year for non-OTC states.

Source: EPA, 2009

Critique of Previous Trading Programs

Advances

- Environmental benefits with certainty
- Information systems provided transparency
- Cost savings have been substantial
- Innovation including nonpatentable discoveries

Critique of Previous Trading Programs

Criticisms

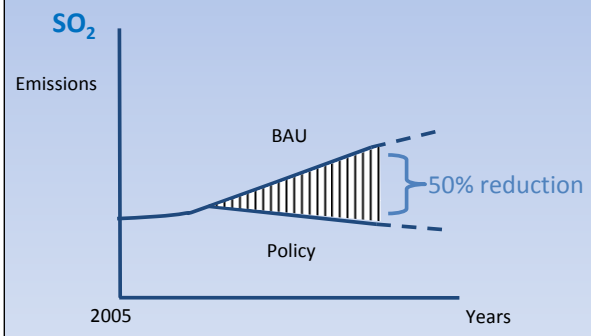
- No adjustments to the cap
- Allocation

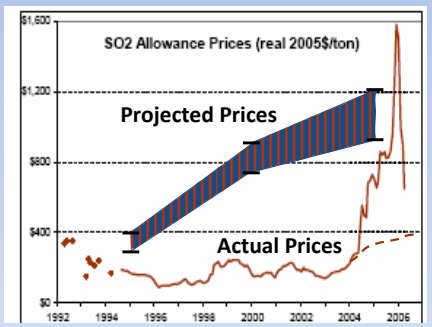
Adjustments to the cap. The fixed cap is unresponsive to new information. Within five years we knew benefits were an order of magnitude greater than costs due to new information about benefits, and substantial cost savings. But it has taken two decades to achieve a change in the level of the cap. One could expect it to take time for scientific information about benefits to work its way through the policy process. But a key revolutionary aspect of trading is that it provides instantaneous information in a summary statistic about the marginal costs of emissions reductions. The fixed cap is unable to take advantage of this information. While a tax approach would do so, the cap with trading has an apparent political advantage. A symmetric safety valve would have yielded substantially greater benefits by taking advantage of the fortuitous decline in compliance costs. In the end, the cost savings from trading are swamped by the foregone benefits (based on damage assessment) that might have been realized if the level of the cap had been able to adjust.

Allocation. The program was devised in a period of regulation in the electricity industry that insured that companies did not charge customers for something (allowances) that they had received for free through grandfathering. This is an inappropriate model for a competitive market. Moreover, in regulated markets it requires complementary policies promoting end use efficiency since product prices will not reflect social costs. Finally, grandfathering raises inconvenient legal issues in the context of border adjustments that might be necessary for climate policies.

No Adjustments to the Cap!

How to manage unexpected changes in costs?





- Note the most important experience we have……produced an unexpected price fall for SO_2

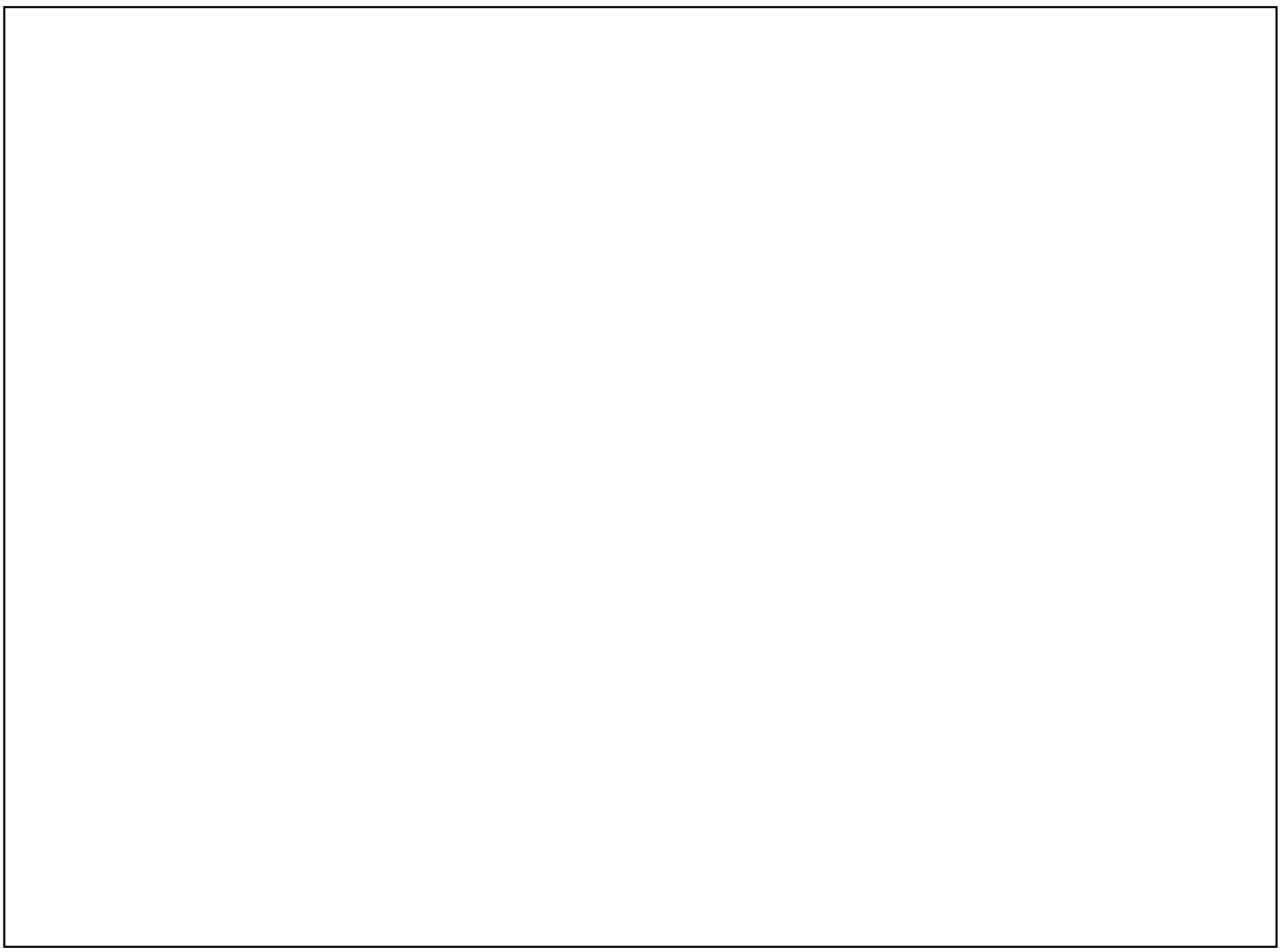
Economic Impact

- Unexpected SO_2 price fall has been most important economically
  - EPA (1990) estimate for Phase II: $742-$974/ton (2005$).
  - Imagine safety valve 33% below mean, at $575/ton.
  - ⇨ Absent CAIR, emission reductions over 2 million tons/yr. (Banzhaf et al.)
- Economic benefits of price floor
  - $16 billion/year (using EPA estimates).
  - $8.5 billion/year (using Banzhaf et al.)
  - Even using information available to congress in 1990, benefits are $1.6-$2.0 billion/year !

➢ These benefits were lost for over two decades until CAIR/Transport Rule took effect in 2010.

Design Elements for Emissions Trading

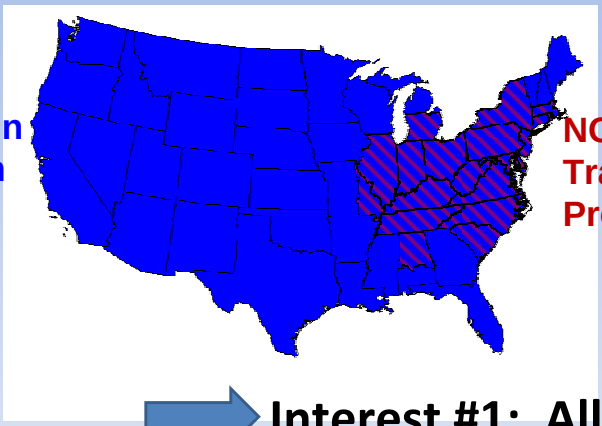
- Point of Compliance
- **Allocation**
- Monitoring & Enforcement
- Cost Management:
  - Banking, Borrowing, (Symmetric) Safety Valve
  - **Offsets**
- Competitiveness
- Federalism



What happened to cap and trade policy in the US?

Why is CO_2 Different?

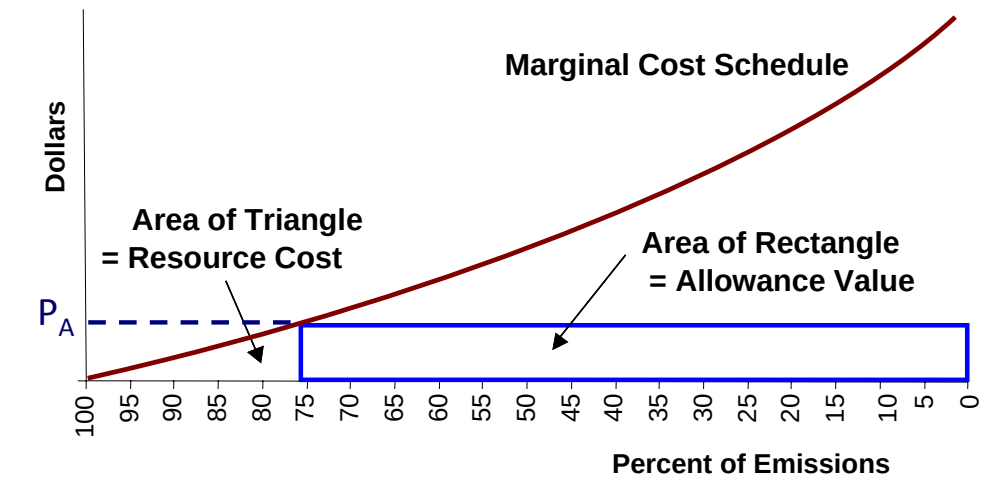
Acid Rain Program



NOx Budget Trading Program

Interest #1: Allocation

Why CO_2 is Different.



Interest #1: Allocation

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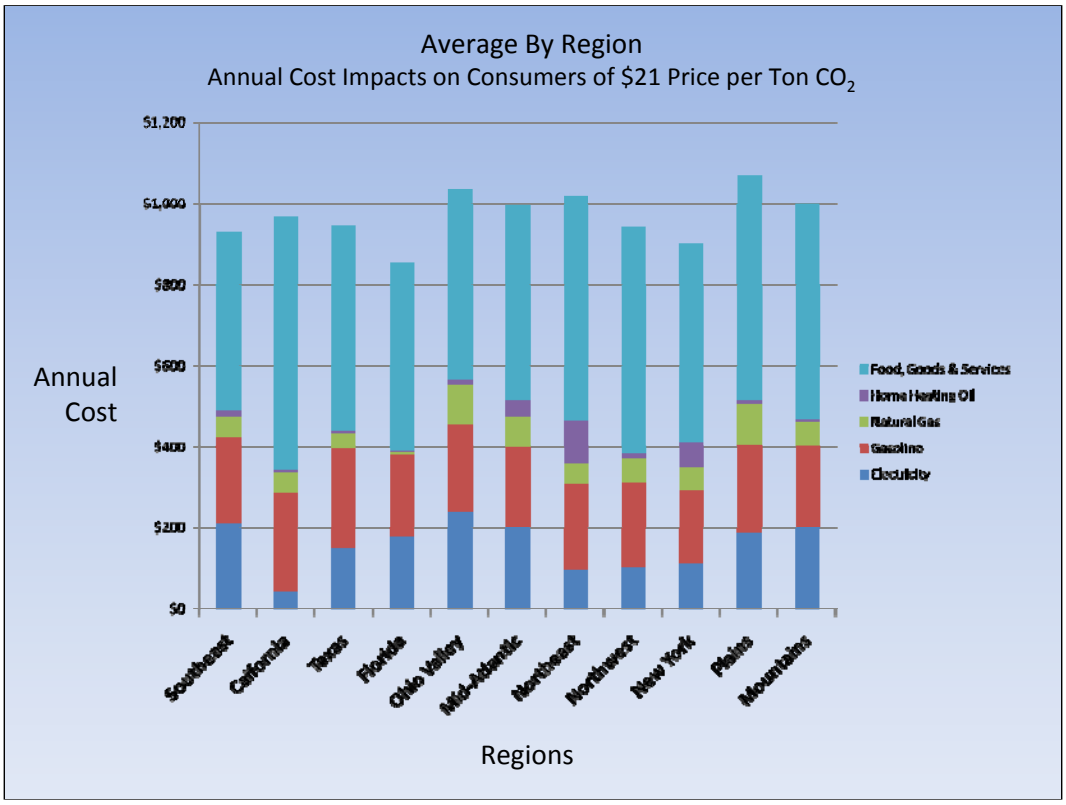
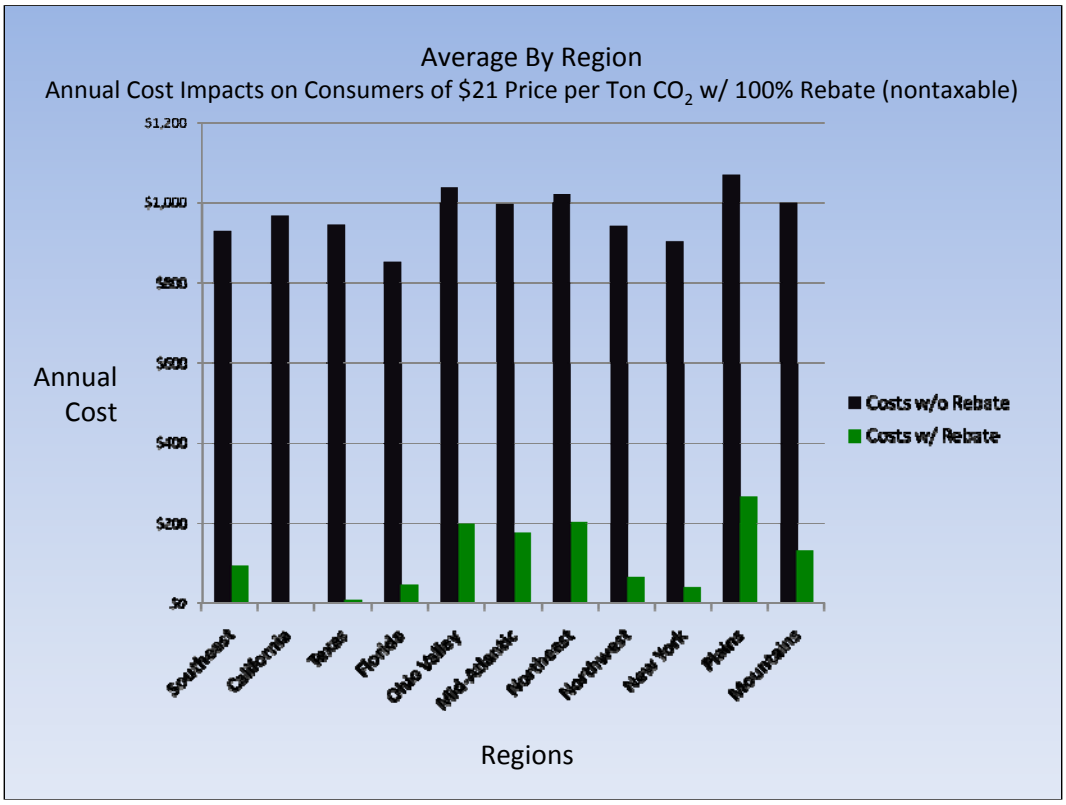
Design Element #1: Allocation

1. Interest group politics
2. Surgical allocation to address leakage
3. Invest
4. Return to consumers
   a. dividends
   b. tax reform

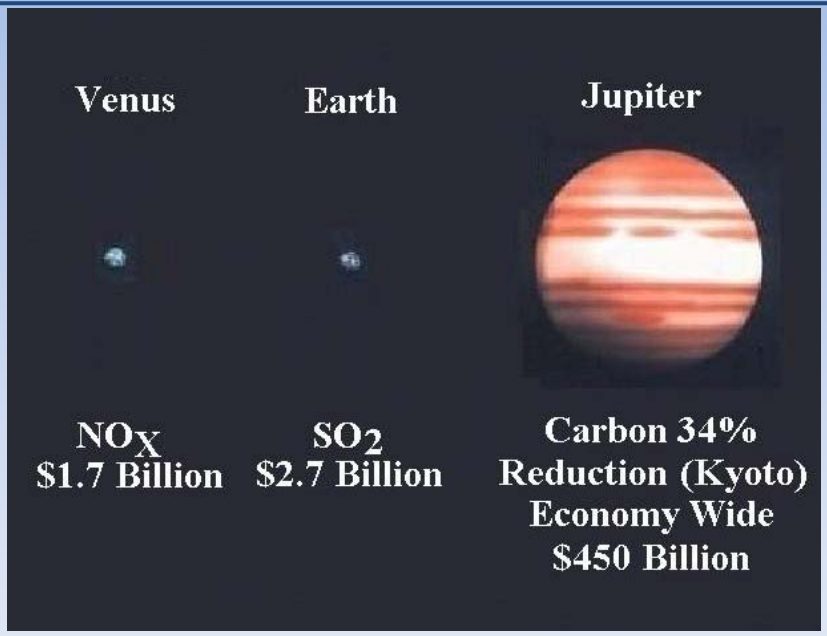
But Public Antagonism in 2009…

1. Wall Street shouldn't get it
2. Government shouldn't get it
3. Whose money is it anyway?
4. Uncertainty about costs,… and fairness

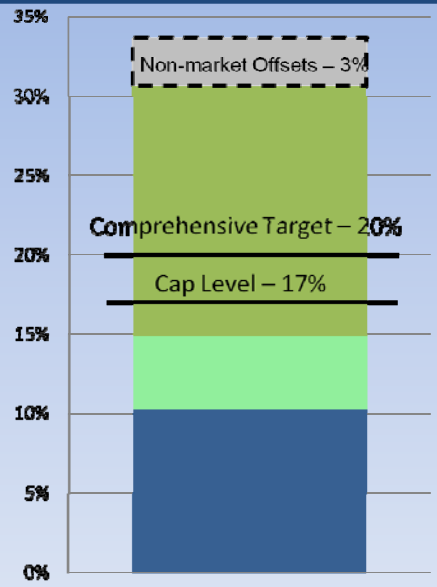

Average By Region
Annual Cost Impacts on Consumers of $21 Price per Ton CO_2
Annual Cost
$1,200
$1,000
$800
$600
$400
$200
$0
Southeast
California
Texas
Florida
Ohio Valley
Mid-Atlantic
Northeast
Northwest
New York
Plains
Mountains
Regions
Food, Goods & Services
Home Heating Oil
Natural Gas
Gasoline
Electricity


Average By Region
Annual Cost Impacts on Consumers of $21 Price per Ton CO_2 w/ 100% Rebate (nontaxable)
Annual Cost
$1,200
$1,000
$800
$600
$400
$200
$0
Costs w/o Rebate
Costs w/ Rebate
Southeast
California
Texas
Florida
Ohio Valley
Mid-Atlantic
Northeast
Northwest
New York
Plains
Mountains
Regions

CO_2 is the largest distribution of a federally-enforced property rights since the 19th century American West.



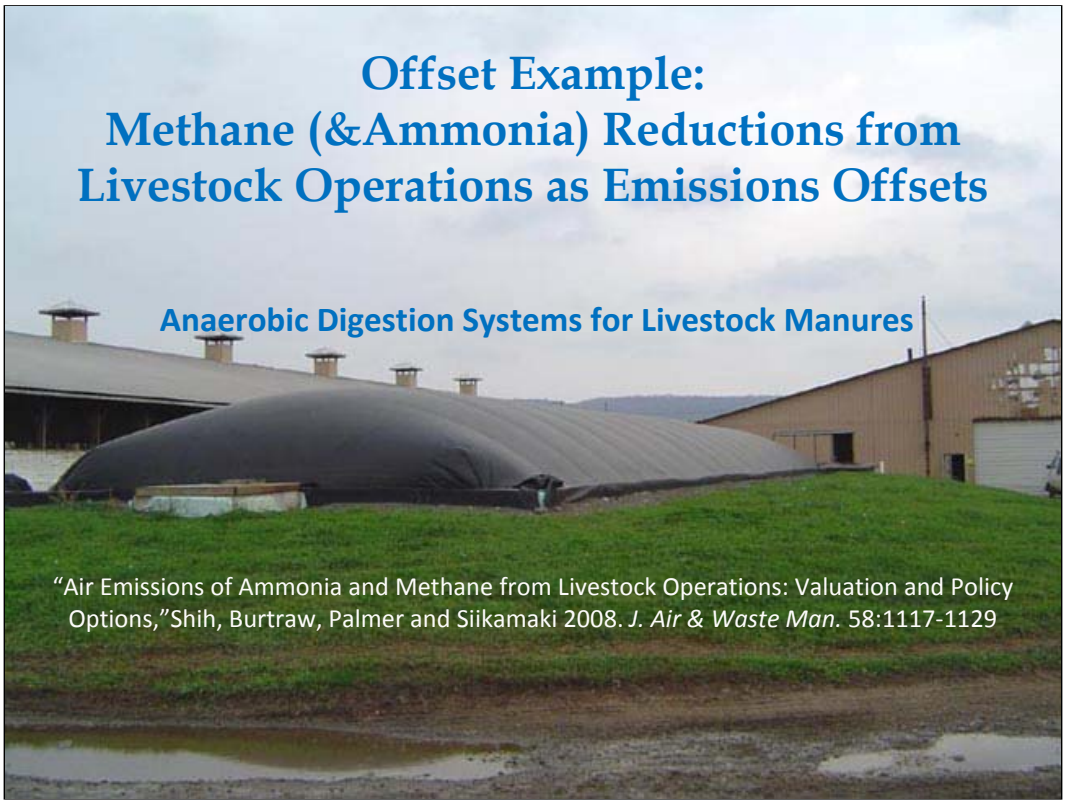
Design Element #2: Offsets



Emission Reductions in 2020 from 2005 Levels Under Waxman-Markey

- Non-Market Offsets
- International Offsets
- Domestic Offsets
- Domestic Reductions

Note: Waxman-Markey EIA modeling results include banking.
EIA 2009. Energy Market and Economic Impacts of H.R. 2454 - Basic Case. <http://www.eia.doe.gov/oiaf/servicerpt/hr2454/excel/hr2454cap.xls>


Offset Example:
Methane (&Ammonia) Reductions from Livestock Operations as Emissions Offsets
Anaerobic Digestion Systems for Livestock Manures
"Air Emissions of Ammonia and Methane from Livestock Operations: Valuation and Policy Options,"Shih, Burtraw, Palmer and Siikamaki 2008. J. Air & Waste Man. 58:1117-1129

Motivation

- Ammonia contributes to formation of secondary articulates
- Methane is a potent greenhouse gas
- Agriculture is major source
- Demands for environmental improvement will put increasing pressure on agriculture

Agriculture will either be "at the table" or "on the table"

- Will future policy involve regulatory constraints or flexible incentives???
  - Particulate matter offset credits for *ammonia* control
  - Greenhouse gas offset credits for *methane* control
  - Net metering policy for the *sale of electricity* generated from methane gas

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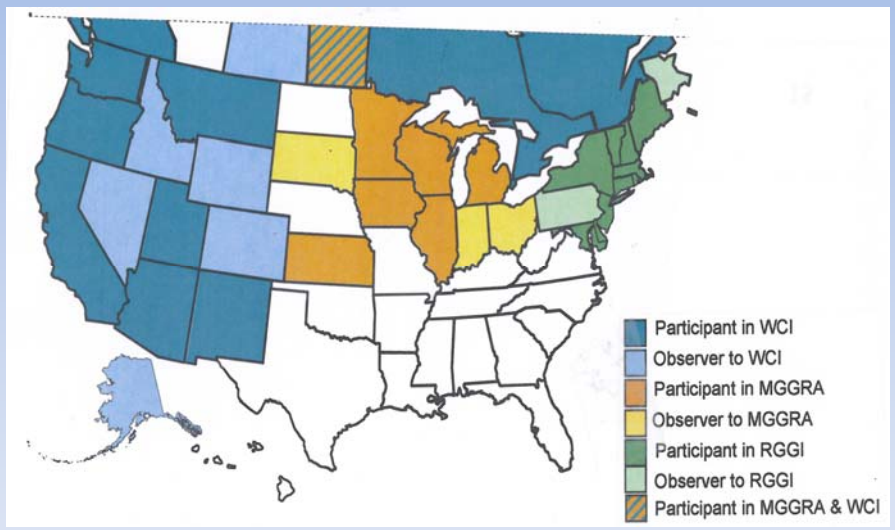
Summary ($/year)

	Dairy size (cows)		
	400	500	1,000
Ammonia control			
Health benefits (PM)	12,030	15,040	30,070
Biofilter cost	120	150	300
Net benefits	*11,910*	*14,890*	*29,770*
Methane control			
Electricity savings	21,910	27,380	54,770
Electricity sales	9,860	12,330	24,640
GHG credit revenues	4,811	6,014	12,030
Health benefits (ozone)	-263	-328	-656
Digester cost	29,680	31,350	37,160
Net benefits	*6,638*	*14,046*	*53,624*
Potential total net benefits from emission controls	**18,548**	**28,936**	**83,394**

*Ammonia control benefit could be over estimated due to air quality model limitations and when the regional PM concentration is not ammonia limited

Map of State Activities



Source: FERC, **http://www.ferc.gov/market-oversight/mkt-electric/overview/elec-ovr-ghg.pdf**

A total of twenty---three U.S. states have participated actively in the design and/or implementation of three regional cap---and---trade programs to reduce greenhouse gas emissions. The first of the three programs, the Northeastern and Mid---Atlantic Regional Greenhouse Gas Initiative (RGGI), which covers CO2 emissions from large power plants, was launched in January 2009. RGGI was followed by the Western Climate Initiative (WCI) and the Midwestern Accord, both of which are economy---wide programs designed for implementation in the 2012 timeframe.

At present, all 10 of the RGGI states are implementing the RGGI program. Both the Midwestern Accord and Western Climate Initiative jurisdictions have completed regional designs. Of the states engaged in these two initiatives, only New Mexico and California have taken steps to promulgate regulations to implement the cap---and---trade program. Many of the states engaged in these programs are currently undergoing a change in gubernatorial administrations (including New Mexico), making the likelihood of implementation uncertain at the present time.

California Emissions Trading Program Overview

Scope

- Starting in 2012: electricity, including imports, and large industrial facilities
- Starting in 2015: distributors of transportation fuels, natural gas and other fuels
- Program covers 360 businesses, representing 600 facilities

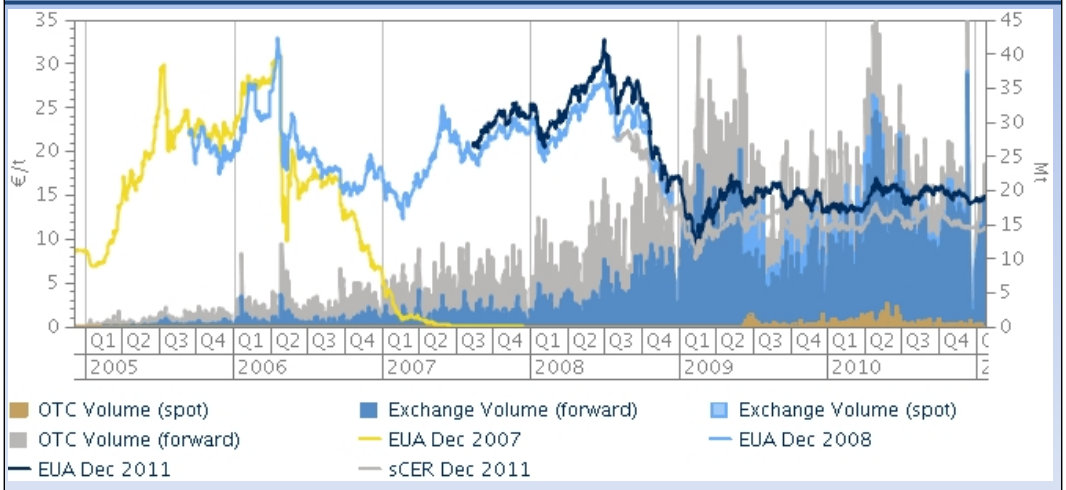
Allowance Distribution

- Industrial sources will start with free allocation at about 90 percent, based on an efficiency benchmark for each industry, updated annually based on product output
- Electricity sector to start with set share in 2012 close about 90 percent free distribution to utilities, with value to benefit ratepayers

Offsets

- Considering four initial offset protocols: forestry; urban forestry; livestock (manure/methane) management;ozone-depleting substances
- Validity of offsets supported by independent verification
- Will have framework for future inclusion of international offset programs from an entire sector within a region
- The 'sectoral' approach could be used in the future to help preserve international forests

EU Emissions Trading System activity is robust; price has stabilized



Source: Point Carbon

Conclusion

Under a well designed incentive-based program agriculture should benefit from climate policy.

The opportunity to shape the program is near term. Climate policy (especially under the Clean Air Act) is like a freight train – it is slow but will be hard to stop.