Emissions Trading

Denny Ellerman
Senior Lecturer
Sloan School of Management, MIT

Engineering, Economics and Regulation
of the Electric Power Sector (ESD 934, 6.974)
May 11, 2009

Outline

- What is Cap-and-Trade?
- Some History and Pictures
- Allocation, Cost, and Electric Power Regulation

Two Types of Emissions Trading

Credit Trading, or Baseline-and-Credit

Credit for over-control of some specified standard usable to excuse under-control elsewhere

Trading in differences from pre-existing standard

Allowance Trading, or Cap-and-Trade

Trading in limited "rights" from the "bottom up"

No prescribed standard for individual sources

Evolution of Emissions Trading

- Credit Trading has evolved out of conventional regulation
  - Pre-existing standard (baseline) already in place
  - High transaction costs have limited use
- Allowance Trading is radically different
  - Decentralized, property rights system
  - Emerged in the U.S. out of political stalemate
  - Far more successful than expected

Market Aspects of Credit and Allowance Trading

Credit Trading ≈ Barter Economy

"Market" is created for each transaction

Rules and terms of trade differ by transaction

Regulator typically approves each trade

Allowance Trading ≈ Market Economy

Market is created up-front by the regulator

Uniform rules and no pre-approval of trades

A Closer Look at the Cap-and-Trade Mechanism

- An absolute limit is decided
- Emitters issued tradable permits = "cap" < previous emissions
- A fundamentally different "command" to the firm
  - Measure and report emissions and
  - Surrender allowances = emissions
  - No prescribed practice, technology, reduction, etc.
- Tradability enables market and single price to coordinate efficient abatement actions (equal marginal cost)

Three Unique Features

- Rights to emit must be created and allocated
  - Generally by free allocation (grandfathering)
  - Unique in being explicit and transparent
- Emissions must be measured and reported
  - Radical innovation in environmental regulation
- Maintenance of Registry or Tracking System
  - Analogous to a check-clearing system

Consequences and Reactions

Efficient, Decentralized Property Rights System,

But "Rights to Pollute"?

Transformed Regulator…Bank-like clerk

But Removes Administrative Discretion

Outline

- What is Cap-and-Trade?
- Some History and Pictures
- Allocation, Cost, and Electric Power Regulation

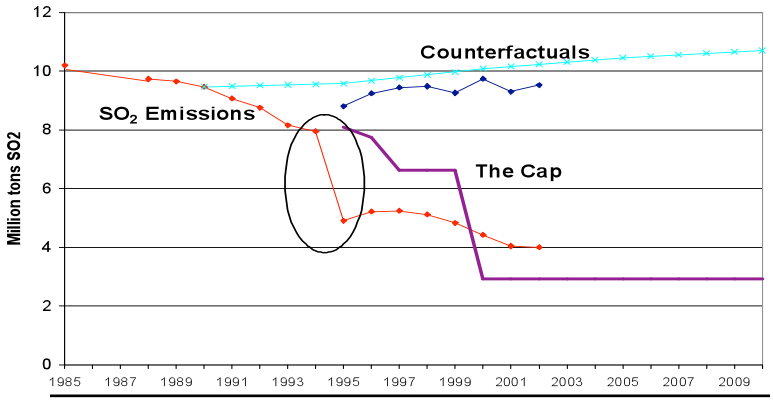
Some History (1)

- Early credit-based trading (U.S., late 1970s-1980s)
  - Some cost savings, but generally disappointing
- Leaded-gasoline phase-down (US: 1985-86)
  - 1st allowance based program; successful
- Los Angeles RECLAIM Program (1994-)
  - SO_2 and NOx; local; multi-sector
- US Acid Rain (SO_2) Program (1995-)
  - Canonical cap-and-trade, very successful
  - National scope, power plants only

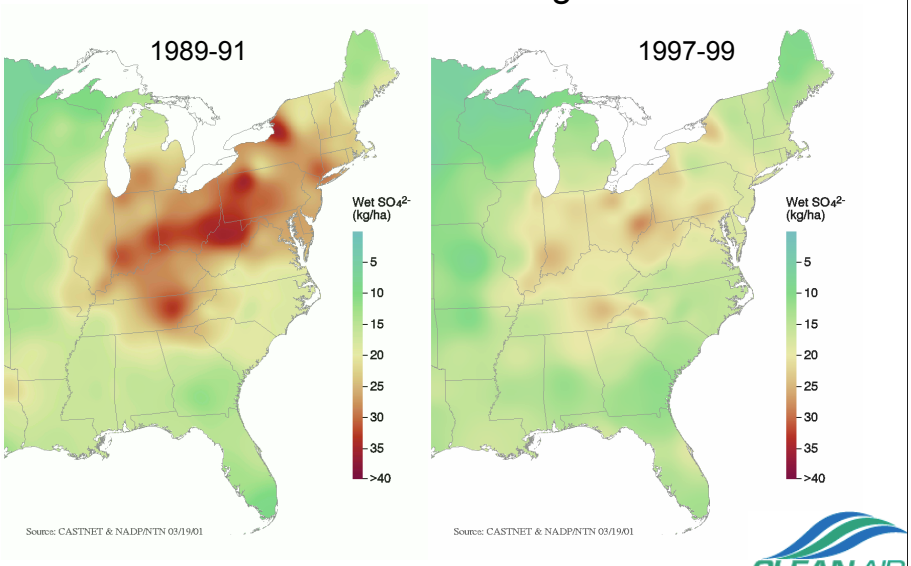
Some History (2)

- OTC/NOx Budget Program (1999-)
  - Regional, mostly power plants
- EU ETS (2005 -)
  - First CO_2 and multi-national system
  - Largest cap-and-trade market and program
- Kyoto Protocol (2008 -)
  - Government trading; essentially voluntary
- Regional Greenhouse Gas Initiative (2009 -)
  - 1st mandatory US program; very low prices

Why the SO_2 Program was Successful

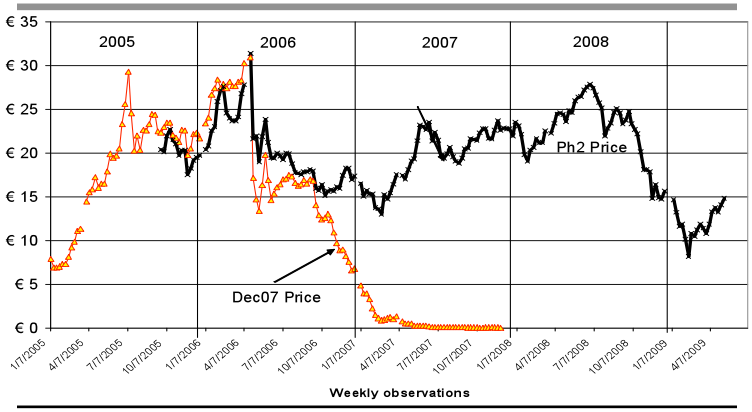


Monitored reduction in wet sulfate deposition due to Acid Rain Program



CLEAN AIR MARKET PROGRAMS

CO_2 Prices in the EU ETS



Massachusetts Institute of Technology

A. Denny Ellerman
Page 14

Lessons from Cap-&-Trade

- Cost savings are substantial (50%) but not extravagant (95%)
- Environmental effectiveness is better than with command & control
- Simplicity, flexibility, and strict accountability are the key to success
  - No more fuzzy compliance
- Markets have emerged almost effortlessly

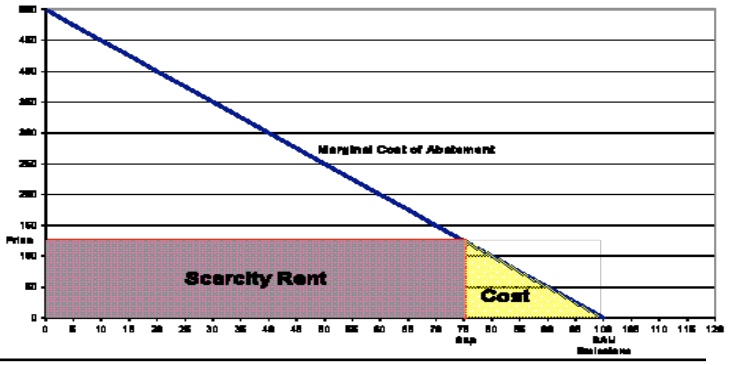
Outline

- What is Cap-and-Trade?
- Some History and Pictures
- Allocation, Cost, and Electric Power Regulation

The Allocation Problem

- Cap creates a scarcity rent embodied in allowances. Who should receive it?
- **Prior Use Claims**—incumbent emitters
  - Also, compensation and political uses
- **Public Use Claims**—the government
  - Double dividends and lump sums
- Always recycled. Issue is how & to whom?

Allowance Value and Abatement Cost



Two Ways to Distribute Allowances

- Auctioning: Most recommended
  - Government sells allowances to emitters
- Free allocation: Most used
  - Emitters receive allowances for free
- General agreement on hybrid approach
  - Some initial free allocation
  - Eventual full auctioning

Cost Implications

- Straight-forward with auctioning
  - Pay as for any other input into production
- Free allocation raises **opportunity cost** issue
  - Typically fixed and historical; independent of current emissions or production
  - Allowance use incurs an opportunity cost
  - Do emitters recognize opportunity cost?

"Windfall Profits" and Electric Power Regulation

- No (private) windfall profits with auctions
  - Added cost recovered like anything else
- Free allocation and liberalized power markets
  - Rate-payers absorb cost; suppliers benefit
- Free allocation and cost-of-service regulation
  - Value of free allocation is not a "cost"
  - Lower electricity rates, but inefficient

Summary

- An efficient, effective, and decentralized way to limit emissions
- Requires market to be "constructed" and emission rights to be distributed
- Allocation of allowance value is contentious
- Interaction with electric power regulation is complicated