

*AOSS Winter 2007*



# The International Carbon Market

**by Justin Felt**

[feltju@umich.edu](mailto:feltju@umich.edu)

# *Today's Agenda*

## **Agenda**

- Introduction
- Cap and Trade Explanation
- Kyoto Protocol
- Flexible Mechanisms
- Trading Volumes and Prices
- North American Carbon Market
- Criticisms

## *Cap and Trade Mechanism*

- **Set a “cap” on GHG emissions**
- **Allocate or auction emissions permits to emitters**
- **Allow actors to trade permits**
- **Reduces overall costs**
  - Emitters with higher costs of abatement purchase allowances in lieu of full reductions
  - Emitters with lower costs of abatement sell reduce more than required and sell allowances

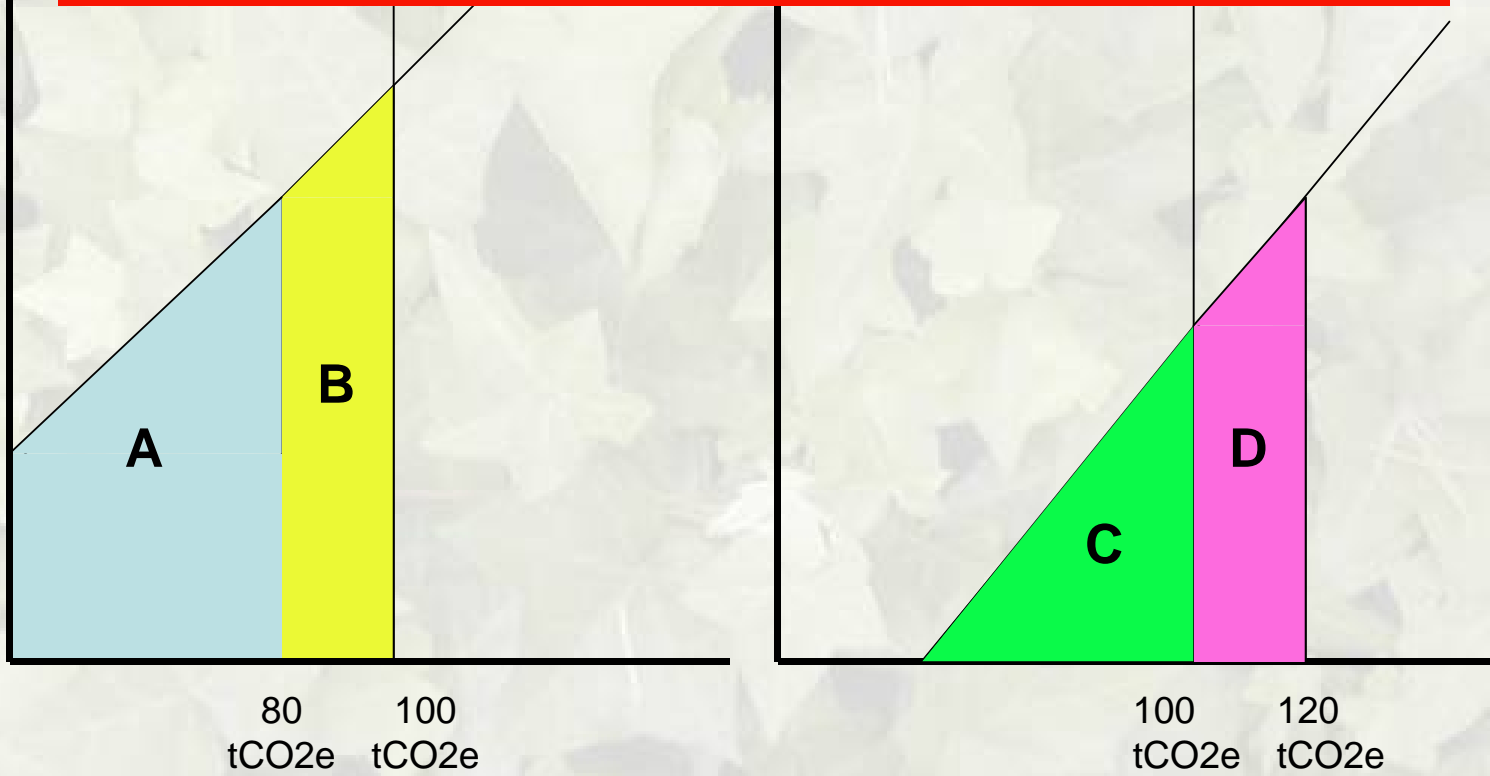
# Cap and Trade Mechanism

Coal Plant A

Coal Plant B

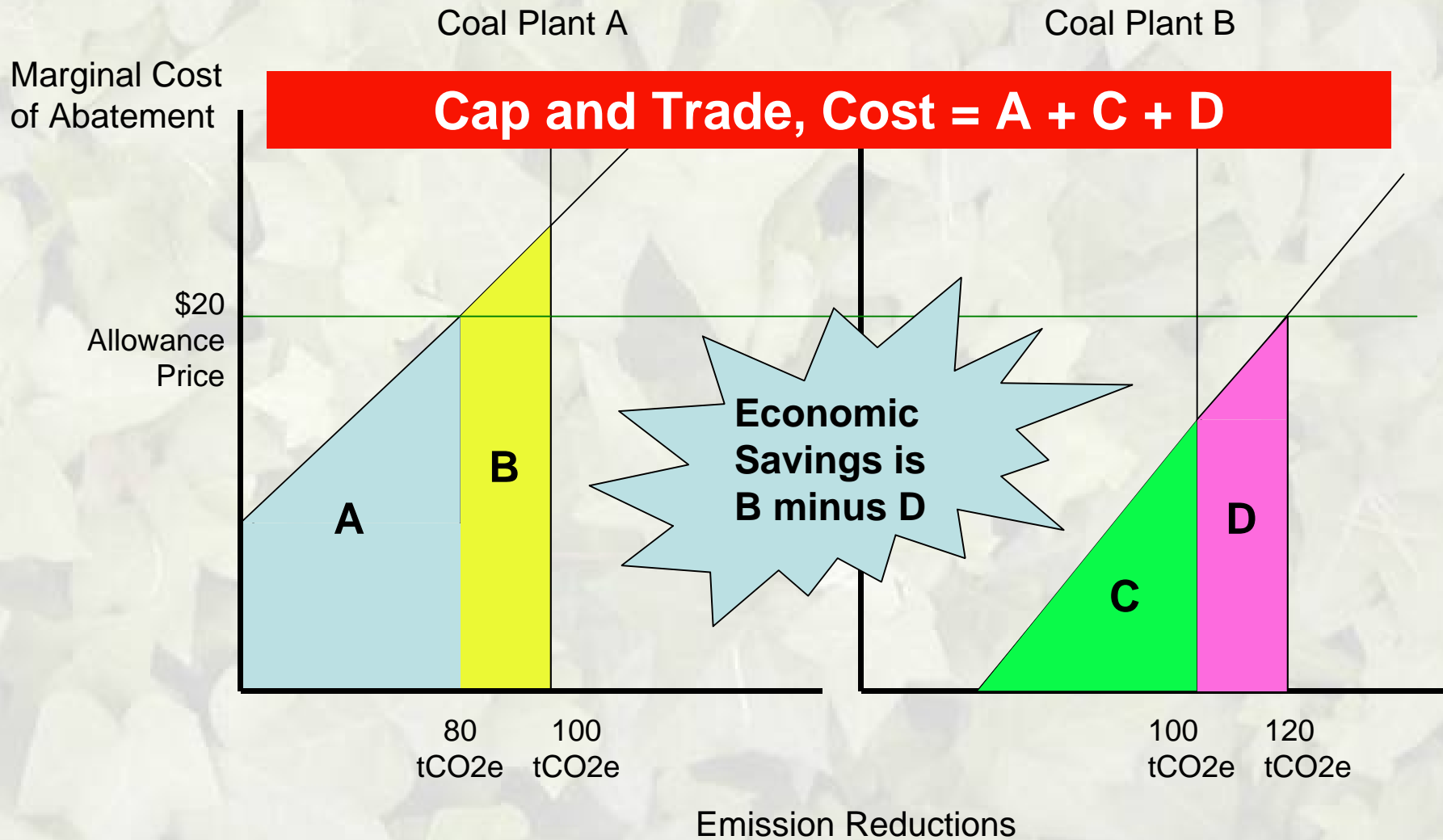
Marginal Cost  
of Abatement

**No Cap and Trade, Cost = A + B + C**



Emission Reductions

# Cap and Trade Mechanism



## *Kyoto Protocol*

- **Negotiated in 1998 with Rio Accords and came into force in 2005**
- **Ratified by all developed countries excepting US and Australia**
- **Annex I (developed) countries commit to reduce GHG emissions by 5% from 1990 baseline**
- **Non-Annex I (developing) countries are not held to any GHG emissions limit**
- **EU Emissions Trading Scheme (ETS) instituted**
  - EU agrees to reduce an average of 8% vs 1990
  - EU countries split into two phases: phase I (2005 - end of 2007 with 2% reduction) and phase II (2008 – end of 2012 with 6% reduction)

## *Kyoto Protocol*

**There are three fundamentally different ways to meet the GHG emissions obligation as an emitter**

- a.) Internal reductions
- b.) Purchase Allowances
- c.) Purchase Project-based credits (called flexible Mechanisms)

**What is the fundamental difference between carbon allowances and offsets?**

- Allowances allow the holder the right to emit one metric ton of CO<sub>2</sub> equivalents
- Carbon offsets effectively reduce emissions by one metric ton of CO<sub>2</sub> equivalents

# *Flexible Mechanisms*

## Two types of Flexible Mechanisms

### ▪ **Clean Development Mechanism (CDM)**

- Represents GHG reductions projects in non-Annex I countries
- 506 Projects Registered with UN through lengthy process
- 740 MM Metric tons of CO<sub>2</sub> equivalents in pipeline

### ▪ **Joint Implementation (JI)**

- Represents GHG reductions in projects in Annex I countries (typically countries in transition)
- Trading is still thin, and many countries have not set up infrastructure
- Only \$101 MM traded in 2005

## *Flexible Mechanisms*

### Economic Rationale for flexible Mechanisms

Global Warming Potential

1 Metric Ton of CO<sub>2</sub>e  
emitted in Indonesia

=

1 Metric Ton of CO<sub>2</sub>e  
emitted in Japan

Cost to reduce GHG emissions

1 Metric Ton of CO<sub>2</sub>e  
emitted in Indonesia

<

1 Metric Ton of CO<sub>2</sub>e  
emitted in Japan

## *Reasons for flexible mechanisms*

- **Lower the cost of emission reductions**
- **Liquidity to the market**
- **Facilitates transfer of clean technology to developing countries**
- **Incorporate developing countries into the Kyoto framework**

## Additionality

- **The project is above and beyond “business as usual”**
  - In other words, it reduces GHG emissions versus the most economical option
  - Need to prove that without sales of carbon offsets, the GHG reduction would not occur

(\$MM)	2007	2008	2009	2010	2011	2012
Capital Investment	5.1	0.2	0.2	0.2	0.2	0.2
Operating Costs	0.0	1.0	1.0	1.0	1.0	1.0
Energy Sales	0.0	2.5	2.5	2.5	2.5	2.5
<b>Cash Flows</b>	<b>(5.1)</b>	<b>1.3</b>	<b>1.3</b>	<b>1.3</b>	<b>1.3</b>	<b>1.3</b>
NPV (r = 10%)	(0.2)					
IRR	9%					
CER Revenues	0.0	0.2	0.2	0.2	0.2	0.2
<b>New Cash Flows</b>	<b>(5.1)</b>	<b>1.5</b>	<b>1.5</b>	<b>1.5</b>	<b>1.5</b>	<b>1.5</b>
NPV (r = 10%)	0.8					
IRR	14%					

## CDM Projects by Activity

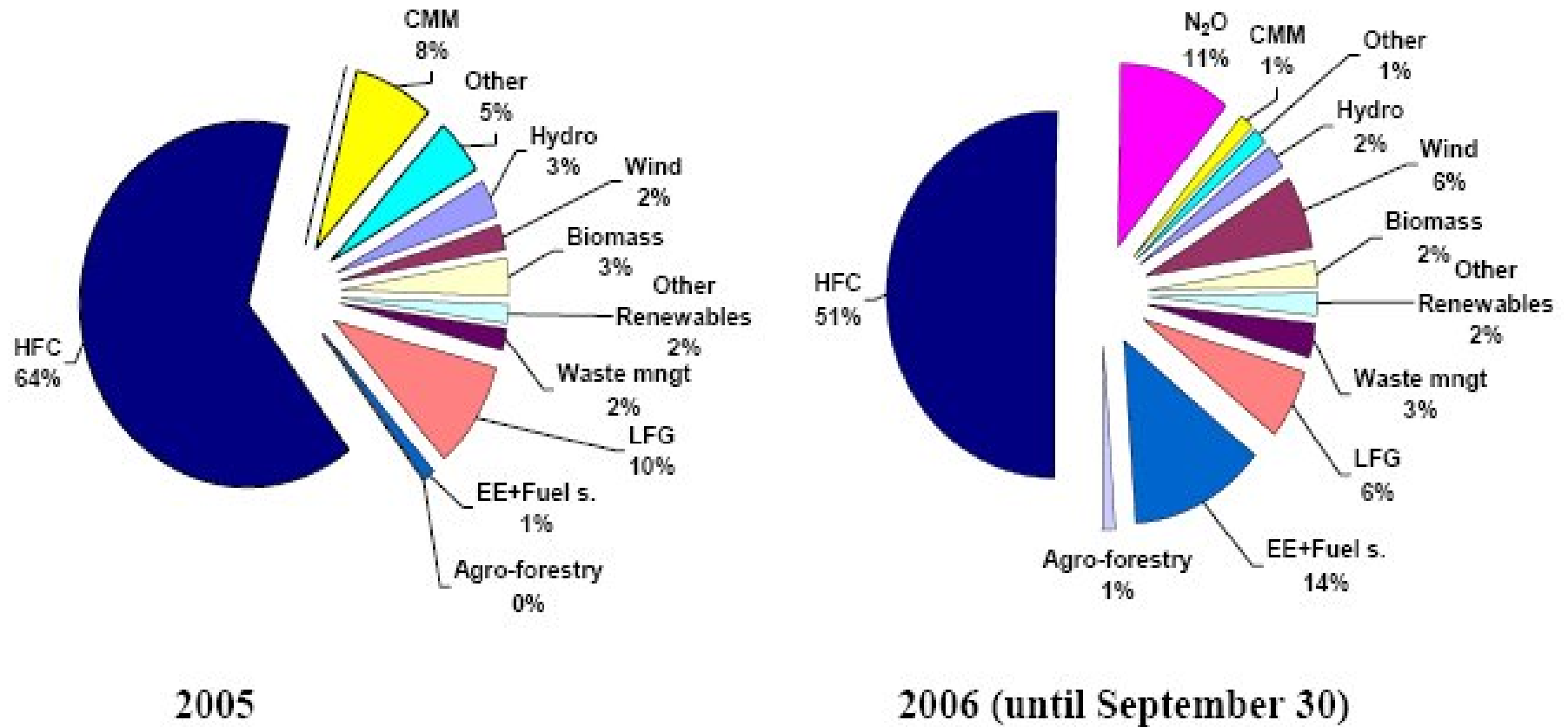
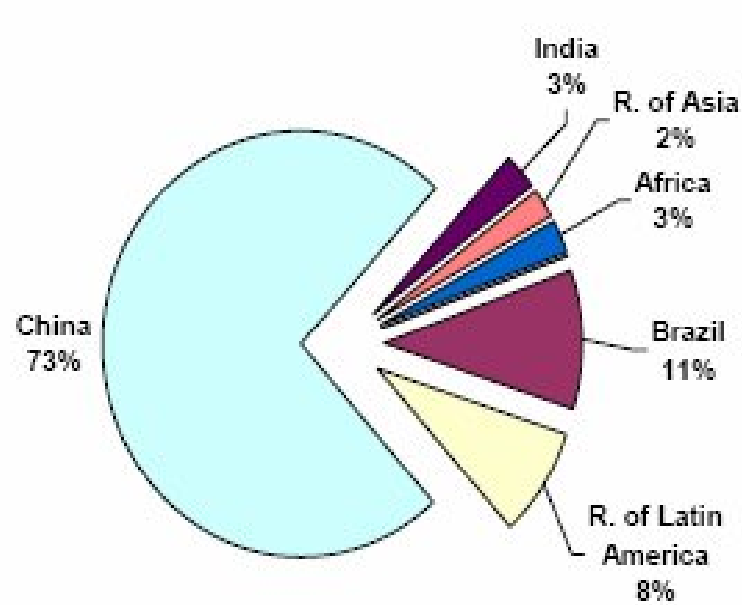
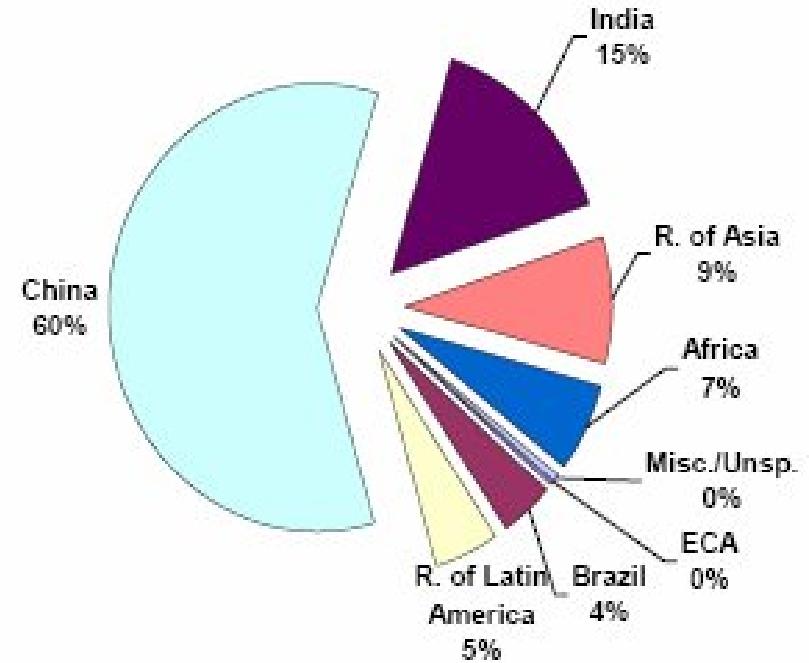


Figure 6: Technology Share of CDM Projects (as a share of volume contracted).

## Who's selling CDM Credits?



2005



2006 (until September 30)

## 2005 – 2006 Carbon Market

	2005		Q1-3 '06	
	Volume (MtCO <sub>2</sub> )	Value (MUS\$)	Volume (MtCO <sub>2</sub> )	Value (MUS\$)
<b>Allowances</b>				
EU ETS	324.31	8,204.48	763.90	18,839.79
NSW	6.11	59.13	16.19	184.07
CCX	1.45	2.83	8.25	27.15
UK-ETS	0.30	1.31	2.26	9.27
<b>Sub total</b>	<b>332.17</b>	<b>8,267.75</b>	<b>788.34</b>	<b>19,051.00</b>
<b>Project-based transactions</b>				
CDM	359.08	2,651.44	214.26	2,260.96
JI	20.85	100.89	11.86	93.88
Other compliance	4.51	36.72	7.92	60.02
<b>Sub total</b>	<b>384.44</b>	<b>2,789.05</b>	<b>234.05</b>	<b>2,414.87</b>
<b>TOTAL</b>	<b>716.61</b>	<b>11,056.79</b>	<b>1,022.39</b>	<b>21,465.87</b>

**Table 1: Carbon Market at a Glance, Volumes and Values for 2005 and 2006 (until September 30).**

Source: World Bank

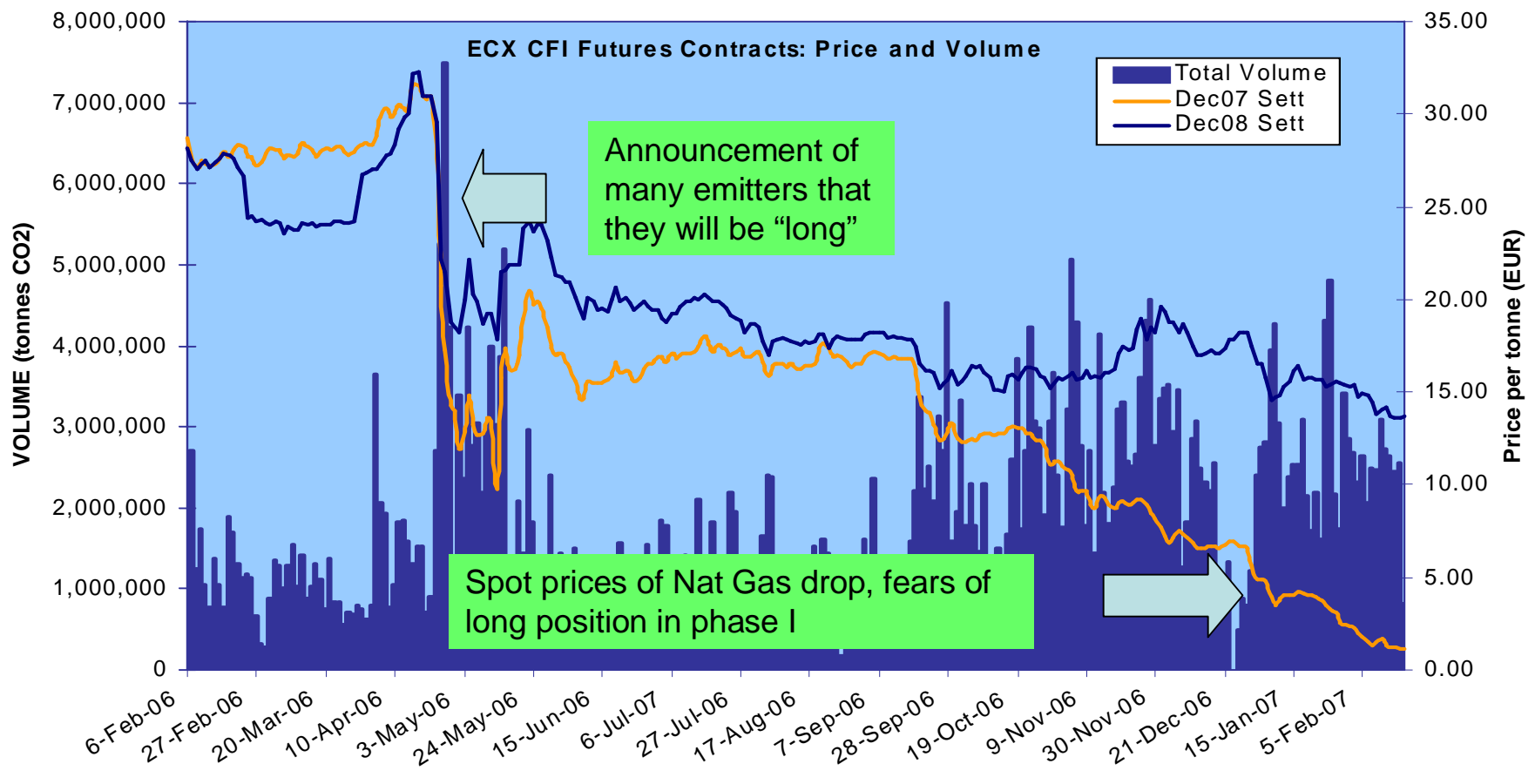
## 2004 – 2005 Carbon Market

	2004	2005		1 <sup>st</sup> Q06	
	Volume (MtCO <sub>2</sub> )	Volume (MtCO <sub>2</sub> )	Value (MUS\$)	Volume (MtCO <sub>2</sub> )	Value (MUS\$)
<b>EU ETS<sup>17</sup></b>	8.49	322.01	8,220.16	202.51	6,552.24
<b>NSW</b>	5.02	6.11	57.16	5.51	86.55
<b>CCX</b>	2.24	1.45	2.83	1.25	2.71
<b>UK ETS</b>	0.53	0.30	1.31	na	Na
<b>TOTAL</b>	<b>16.28</b>	<b>329.87</b>	<b>8,281.46</b>	<b>209.26</b>	<b>6,641.50</b>

**Table 2: Volumes transacted and corresponding values on the main carbon allowance markets.**

Source: World Bank

# Price History for EU Allowances



- Future prices after 2008 are still selling close to €13

## *Price Determinants for Allowances*

### **Long Term**

- **Political and regulatory environment**
  - National Allocation Plans, confidence, bureaucracy, post 2012
- **Ability of emitters to reduce and meet targets**
- **Global economy**
  - GDP increase → more energy use → higher EUA demand
- **Willingness to sell allowances**
  - Russia, E. Europe continue to bank allowances
  - Utilities unwilling to sell
- **CDM/JI sale volumes since it is a substitute for allowances**

# *Price Determinants for Allowances*

## **Short Term**

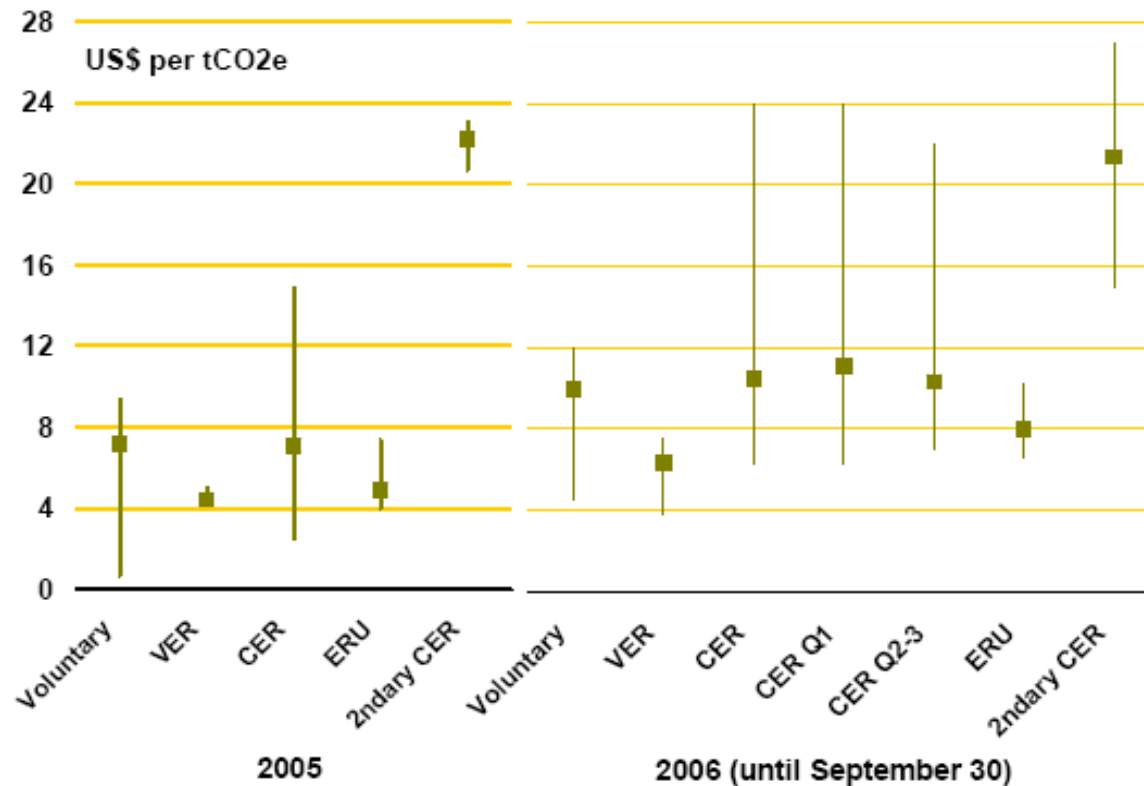
### ▪ **Fuel Prices**

- Price differential between Coal and Natural Gas
- Gap widens → More coal used → More emissions → More demand for EUAs

### ▪ **Weather**

- Extreme heat or cold → More EUA demand
- Less wind, Sun, and Rain → Less renewable resources → More Fossil fuel use → More EUA demand

## Prices for project-based mechanisms



**EUA** = EU Allowance

**CER** = Certified Emission Reduction; produced by CDM projects

**ERU** = Emission Reduction Unit; created from JI projects

**VER** = Verified Emission Reduction; not eligible for Kyoto and it is for used primarily for voluntary GHG reductions

## Price Determinants for Project Mechanisms

- CERs/ERUs are generally priced below EUAs. Why?

### ■ Project level risks

Risk	Description	Examples
Methodology Risk	Risk that CDM methodology for the project is not approved by the Executive Board	Projects such as land use/land use change/forestry (LULUCF), carbon capture and storage (CCS), or biofeedstocks where no methodology exists
Registration Risk	Risk that Project's Project Design Document will not be registered by the Executive Board	Project which fails to show additionality such as energy efficiency projects
Country Approval Risk	Risk that the Designated National Authority of the Host Gov't will not approve the project	Host country does not believe the Project Design Document is completed accurately or that the agreed sales price is fair
Certification Risk	Risk that even though registered the emission Reductions will not be certified	The emission reductions are not monitored sufficiently, or the reductions are not material
Project Risk	Risk that the project itself is not implemented sufficiently or on time	Construction delays, bureaucratic red tape, fuel or raw material shortages, worker strikes, weather or mishaps, etc
Country Risk	Risk that the instability or lack of infrastructure will hinder the projects ability to operate and reduce GHGs	A civil war, change of government, nationalization of the project/company

## **Fully registered and certified CERs still trade at 20% discount--why?**

- **Phase II of ETS, many EU countries will be instituting limits on the percentage of project-based mechanisms**
  - the UK, Germany, Sweden, Portugal and Greece have declared 8%, 12%, 20%, 10%, and 9% limits respectively
- **Uncertainty that the ERs will be approved by the ETS**
- **High transaction costs**
- **Lack of pricing information**
- **Heterogenous market**
  - Varying sizes and types of projects

# North American Carbon Market

## Voluntary Markets

### ▪ **Chicago Climate Exchange**

- \$27 MM of value traded in first three quarters of 2006
- Participants commit to reduce GHG emissions 4% by 2006, using the average emissions 1998-2001
- By 2010, reductions are 6% below baseline
- Participants include IBM, American Electric Power (AEP), Dow Corning, BP, Cinergy (Duke Energy), DuPont and Ford
- Price per Metric ton of CO<sub>2</sub>e is \$3.75 currently
- Meant above all for experiential learning

### ▪ **Other Voluntary Providers**

- The CarbonNeutral Company, Terrapass, DriveNeutral, Native Energy

# North American Carbon Market

## Future Regional Mandatory Markets

### ▪ **Regional Greenhouse Gas Initiative**

- MoU signed by 9 states ME, NH, VT, CT, NJ, NY, DE, RI, MA
- Beginning in 2009, signatories commit to stabilize emission levels at the average 2002-2004 levels by 2015
- Afterwards, there would be a 10% reduction by 2020
- Offsets are allowed to partially offset, even allowing CDM/JI credits

### ▪ **California's "The Global Warming Solutions Act"**

- The state commits to reach 1990 emission levels by 2020
- Directs Air Resources Board to create framework
- Still open-ended
- Could potentially also include CDM/JI credits as well as US internal
- Partnership with EU ETS? RGGI?

### ▪ **Governors of Washington State, NJ, and Illinois set CO2 reduction targets which mirror California**

# North American Carbon Market

## Climate change legislation in the US Congress

Title and sponsors	Reduction target and timeframe	Important attributes
Climate Stewardship and Innovation Act Senators Lieberman (I-CT) and McCain (R-AZ)	Bring emissions to 2004 levels by 2012, to 1990 levels by 2020, to 22% below 1990 levels by 2030, and to 60% below 1990 levels by 2050.	Caps electric power, industrial, commercial, and transport sectors; includes provision for clean development mechanism through which US companies gain credits for emission reductions they sponsor in developing countries.
Global Warming Pollution Reduction Act Senators Sanders (I-VT) and Leahy (D-VT)	Stabilise global greenhouse gas concentrations below 450 parts per million: US reductions to 1990 levels by 2020 and 80% below that by 2050.	Besides economy-wide caps, bill provides for national renewable energy quotas and energy efficiency goals with credits trading programmes.
Electric Utility Cap-and-Trade Act Senators Carper (D-DE) and Feinstein (D-CA)	Caps current emissions through 2011, then at 2001 levels by 2012, thereafter cap lowers further 1% each year through 2020, subject to EPA review.	Electric generation sector only; specifies auctioning of credits, use of offsets; establishes independent scientific panel to make recommendations to the EPA every four years on the reduction rate required.
Climate Stewardship Act House Reps. Olver (D-MA) and Gilchrest (R-MD)	Bring emissions to 2004 levels by 2012, to 1990 levels by 2020, to 22% below 1990 levels by 2030, and to 60% below 1990 levels by 2050.	Same as Lieberman and McCain's, except offset credits may account for only 15% of emissions reductions, and "early action" credits limited to 20% of cap.
Global Warming Reduction Act Senators Kerry (D-MA) and Snowe (R-ME)	Reduce emissions to 60 per cent below 1990 levels by 2050, though at increasing annual reductions starting at 1.5% a year for the first ten years.	Besides economy-wide caps, bill includes nationwide renewable fuels standard, and national renewable energy quota of 20% by 2020.

## *Problems with Kyoto Cap and Trade*

- Allocating permits leads to utilities profiting from sales while passing on costs to consumers
- National Allocation Plans for ETS Phase II are lagging
  - only three countries met the June 30<sup>th</sup> deadline
  - Spain, Portugal, Denmark, Austria, Italy, and Ireland are on pace to miss their target 33.3%, 25.1%, 25.2%, 21.7%, 20.4% and 20.4% respectively with current domestic policies
- Canada is wavering on its Kyoto Commitment
- Market signals are not well coordinated

## *Problems with carbon market?*

- Allocations (mentioned previously)
- Leakage
  - GHG emissions merely move from location within regulated markets to outside of market
- Excludes transportation sector
- Additionality (for project-based offsets)
- Price volatility of carbon credits makes it difficult for corporations to plan effectively

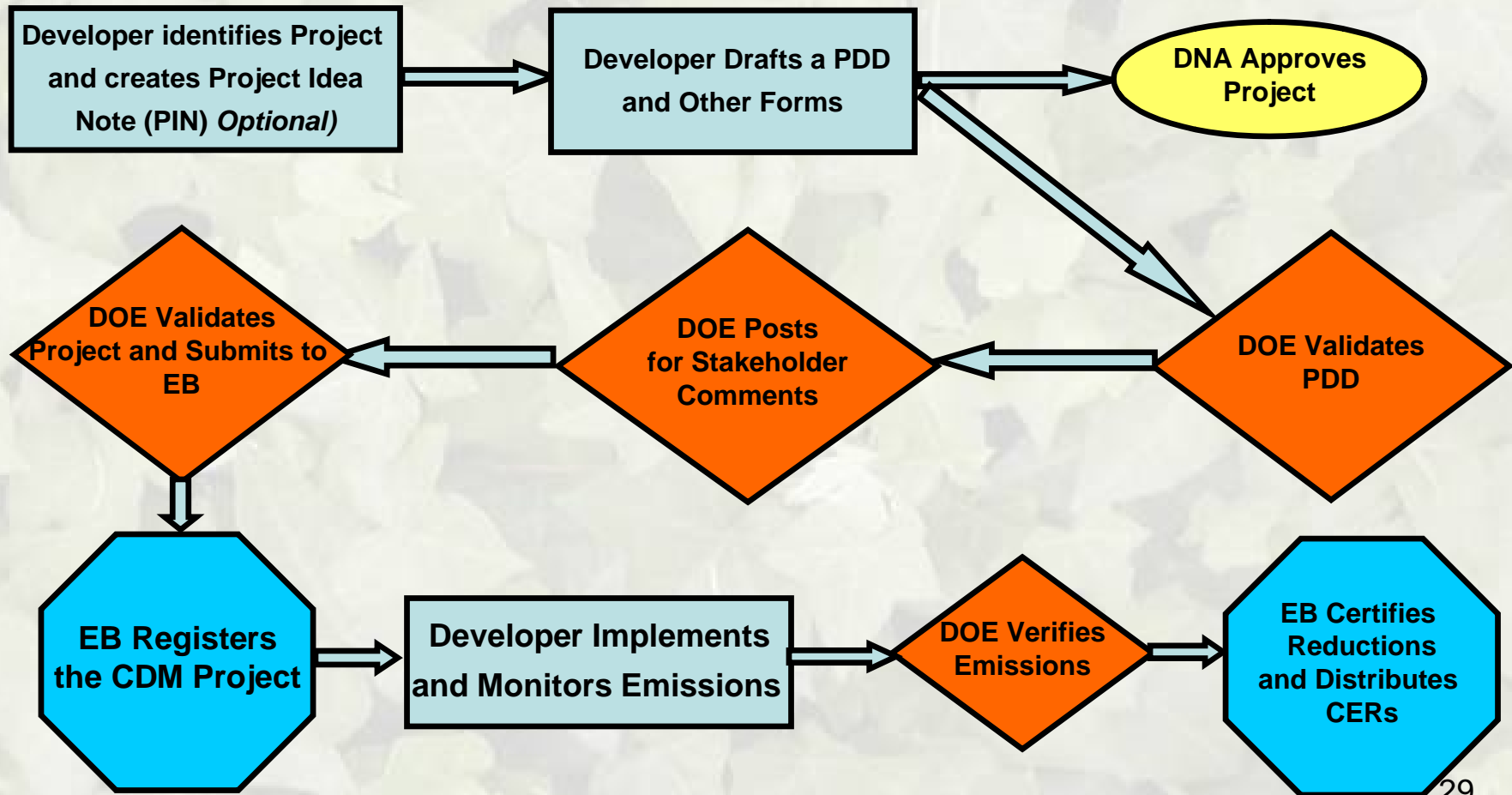
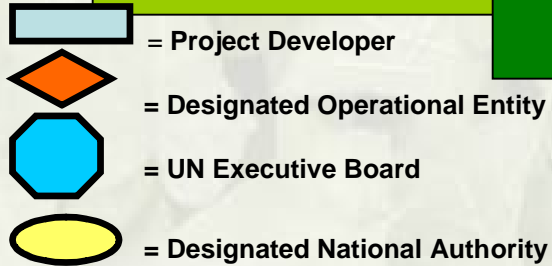
## *Future of International Carbon Market*

- Separate US Federal policy?
- New International framework
  - How to include Emerging Markets?
  - Absolute versus intensity targets?
  - Sectoral versus Geographic caps?
  - Which baseline?
  - Project-based credits?
- A lot of it depends on the United States

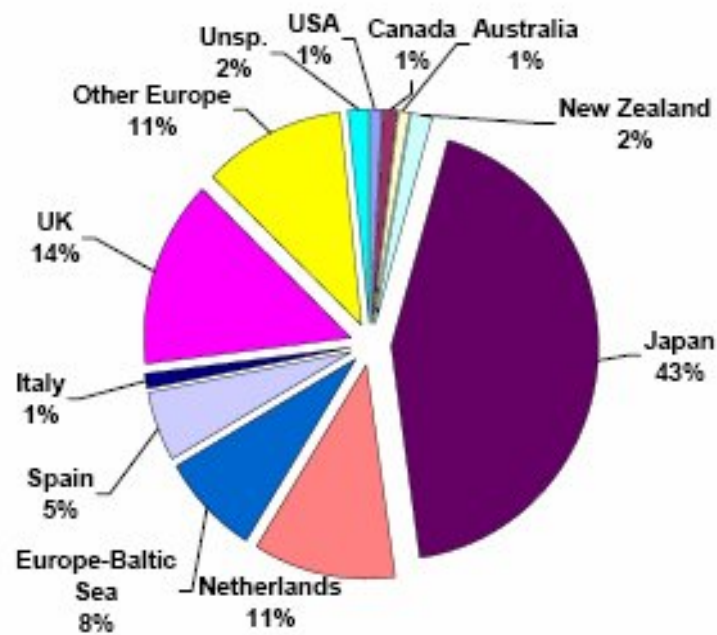
*Finally done....*

Questions ???

# Appendix A: CDM Approval Process

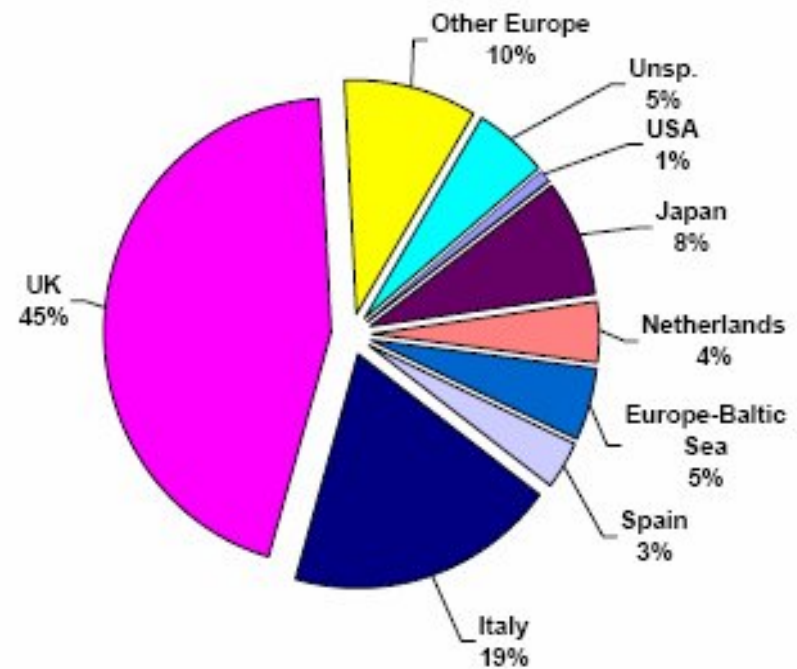


# Who's Buying CDM credits?



2005

Overall volume: 384.4 million tCO<sub>2</sub>e



2006 (until September 30)

Overall volume: 234.1 million tCO<sub>2</sub>e

Figure 3: Primary Market Buyers (as shares of volumes purchased, vintages to 2012)<sup>6</sup>