

AOSS 480 Winter 2008



Mandatory and Voluntary Carbon Markets in 2008

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Today's Agenda

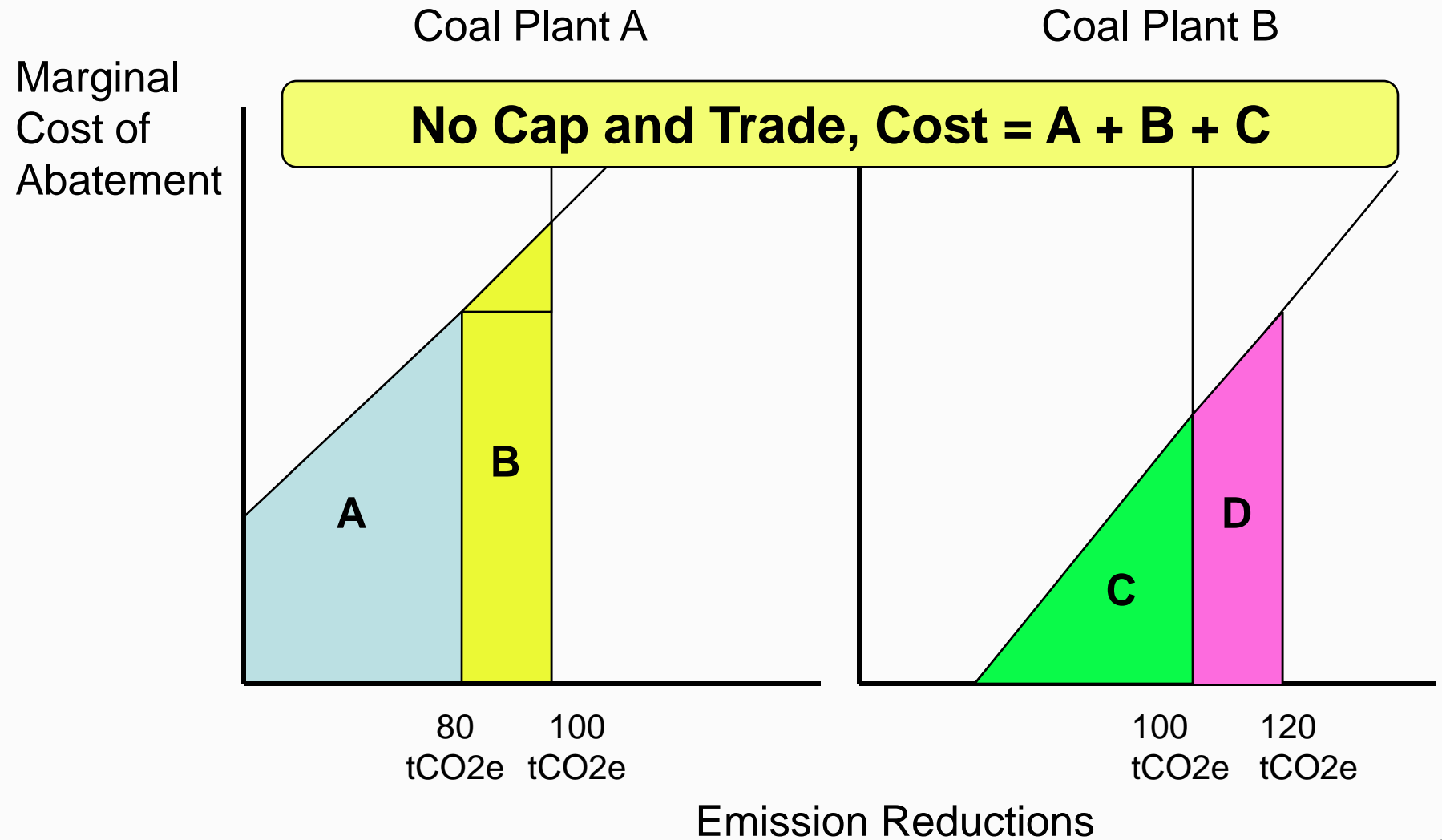
Agenda

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

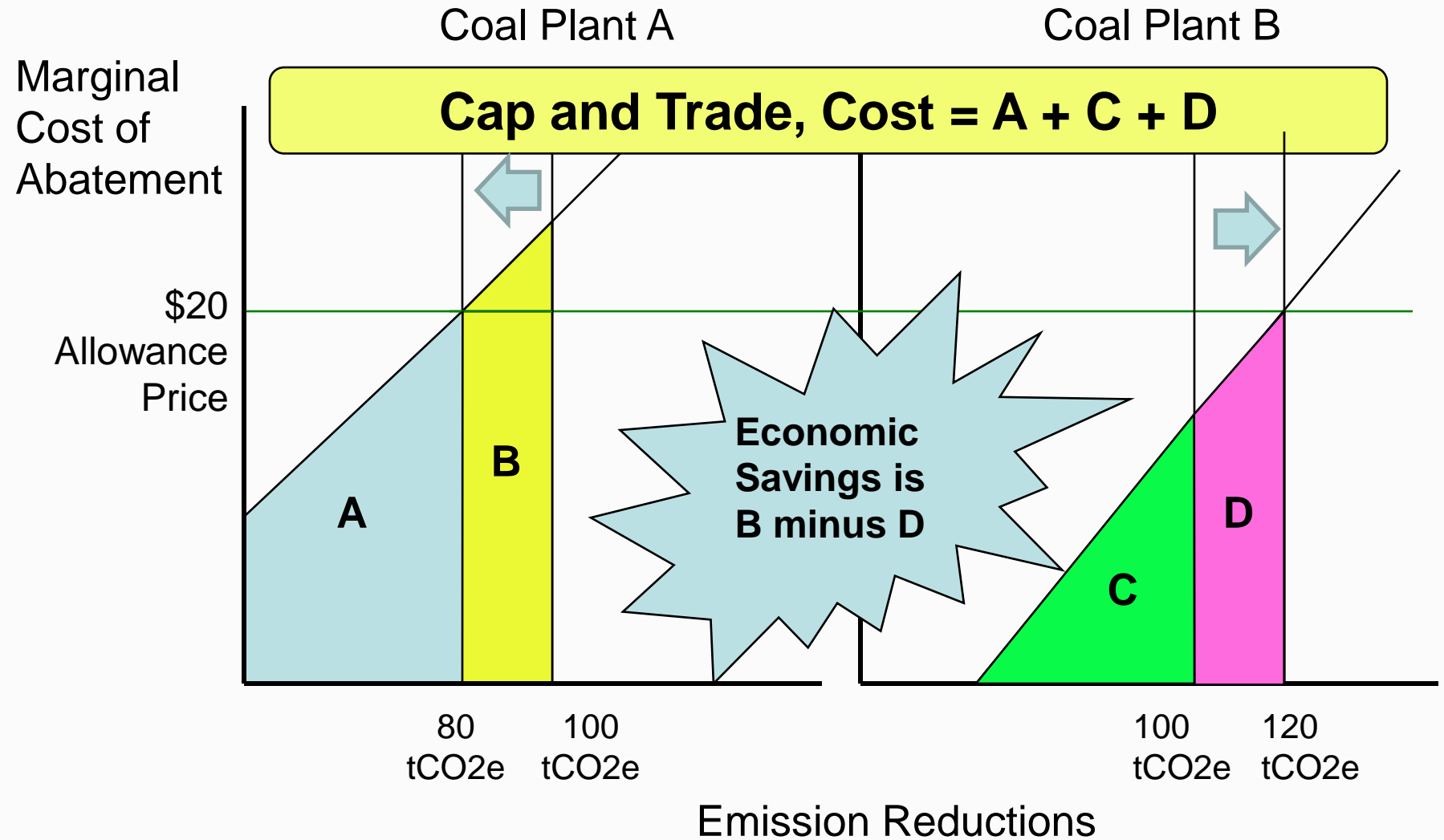
Cap and Trade Mechanism

- Set a “cap” on GHG emissions
- Allocate or auction emissions permits to emitters
- Allow actors to trade permits
- Reduces overall costs

Cap and Trade Mechanism

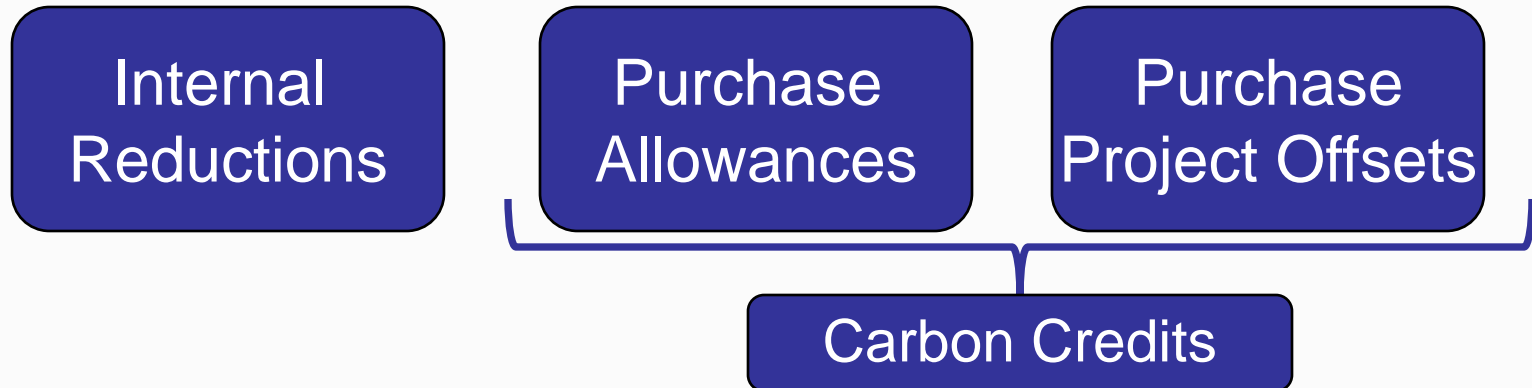


Cap and Trade Mechanism



Meeting Obligations under Cap-and-trade

3 different ways to meet GHG Emissions Obligation



The difference between carbon allowances and offsets:

Allowances:

Allow the holder the
Right to emit 1 tonne
CO2 equivalent

Offsets:

Effectively reduce
Emissions by 1 tonne
CO2 equivalent

Kyoto Protocol

- Negotiated in 1998 and came into force in 2005
- Ratified by all developed countries excepting US
- Annex I (developed) countries commit to reduce GHG emissions by 5% from 1990 baseline by 2012
- No GHG emissions limit for Non-Annex I (developing) countries
- EU Emissions Trading Scheme (ETS) instituted
 - EU agrees to reduce an average of 8% vs 1990
 - Phase I (2005 - end of 2007 with 2% reduction)
 - Phase II (2008 – end of 2012 with 6% reduction)

Kyoto Has Two Types of Offsets

- Kyoto terms them “Flexible Mechanisms”
- Clean Development Mechanism (CDM)
 - GHG reductions projects in non-Annex I countries
 - 940 Projects Registered with UN process
 - 1,160 MM Metric tons of CO₂ equivalents in pipeline
- Joint Implementation (JI)
 - GHG reduction projects in Annex I countries (typically countries in transition)
 - Relatively thin trading
 - 16 MM Metric tons of CO₂ equivalents traded in 2006, more than 50% increase from 2005

Source: UNFCCC, 2008

Source: World Bank, 2007

Economic Rationale for Flexible Mechanisms

Global Warming Potential

**1 Metric Ton of CO₂e
emitted in Indonesia**

=

**1 Metric Ton of CO₂e
emitted in Japan**

Cost to reduce GHG emissions

**1 Metric Ton of CO₂e
emitted in Indonesia**

<

**1 Metric Ton of
CO₂e emitted in
Japan**

Other 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

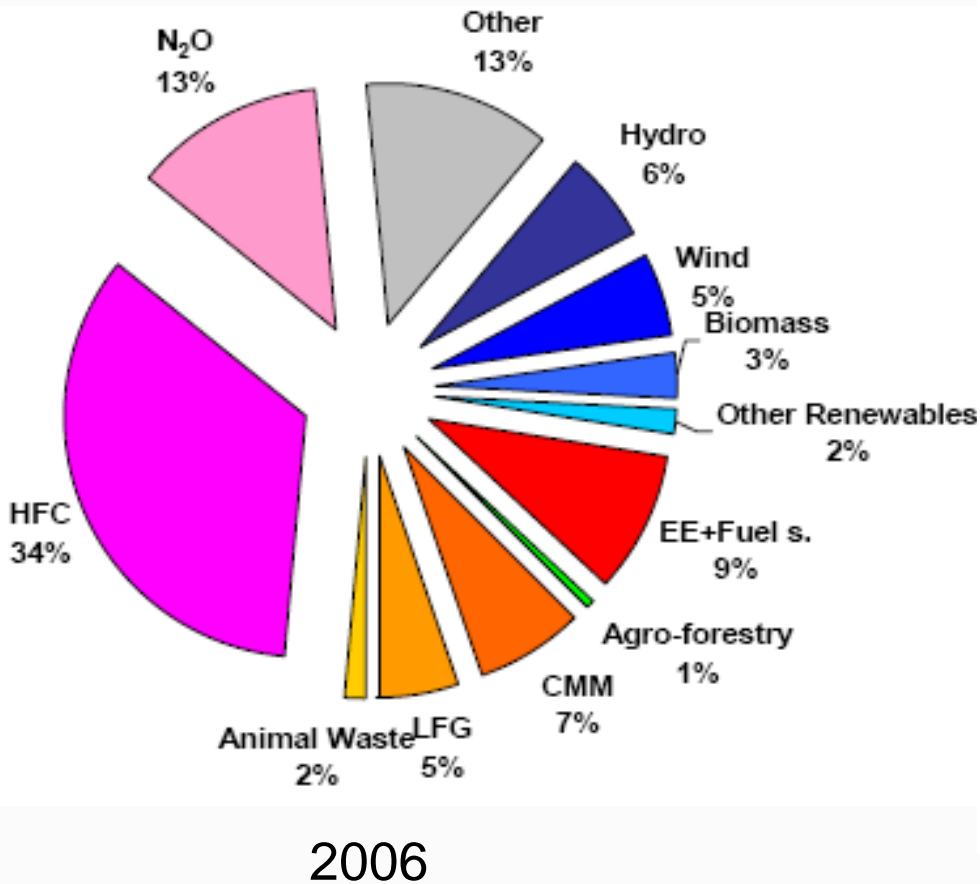
(\$MM)	2007	2008	2009	2010	2011	2012
Capital Investment	5.10	0.2	0.2	0.2	0.2	0.2
Operating Costs	0	1	1	1	1	1
Energy Sales	0	2.5	2.5	2.5	2.5	2.5
Cash Flows	(5.10)	1.30	1.30	1.30	1.30	1.30
NPV (r = 10%)	(0.17)					
IRR	9%					
CER Revenues	0	0.2	0.2	0.2	0.2	0.2
New Cash Flows	(5.10)	1.50	1.50	1.50	1.50	1.50
NPV (r = 10%)	0.76					
IRR	14%					

Acronyms of the Trade

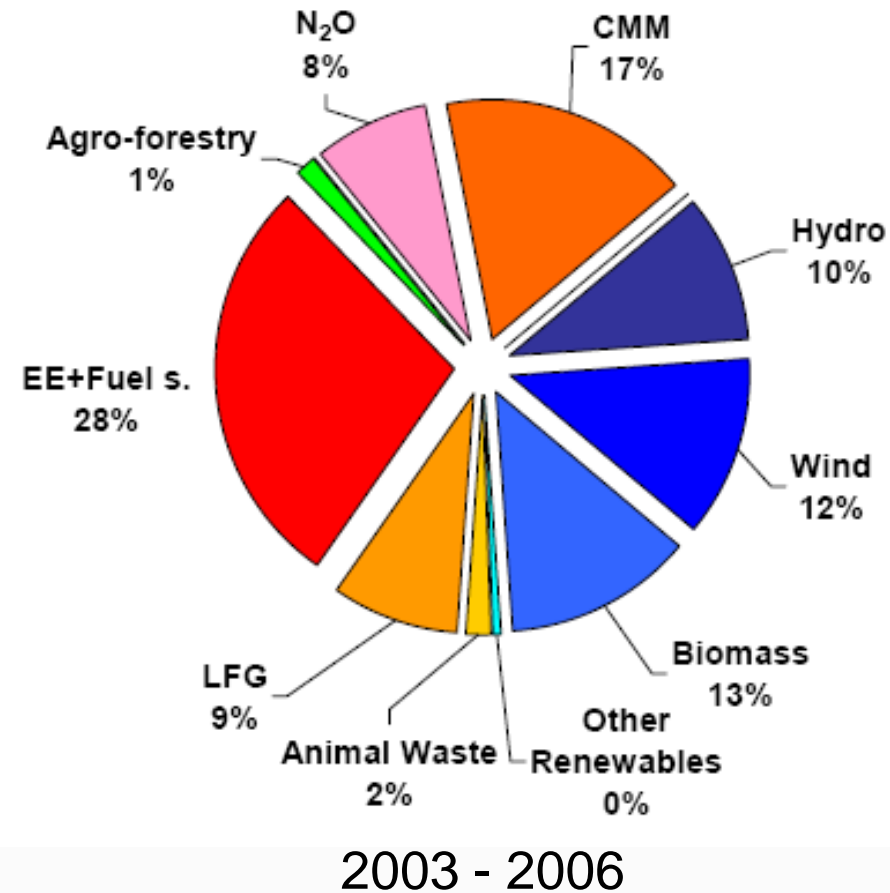
CDM	Clean Development Mechanism
CER	Certified Emissions Reduction (the carbon credit created through CDM)
JI	Joint Implementation
ERU	Emissions Reduction Unit (the carbon credit created through JI)
ETS	Emissions Trading Scheme
EUA	EU Allowance
VER	Verified Emissions Reduction (voluntary carbon credit)

CDM Projects by Activity

Clean Development Mechanism

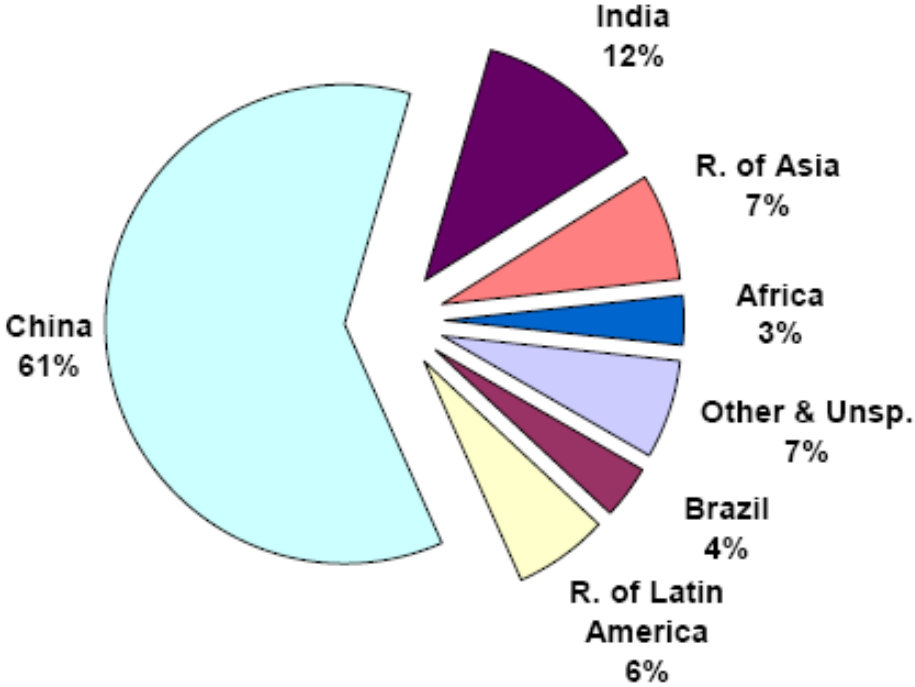


Joint Implementation



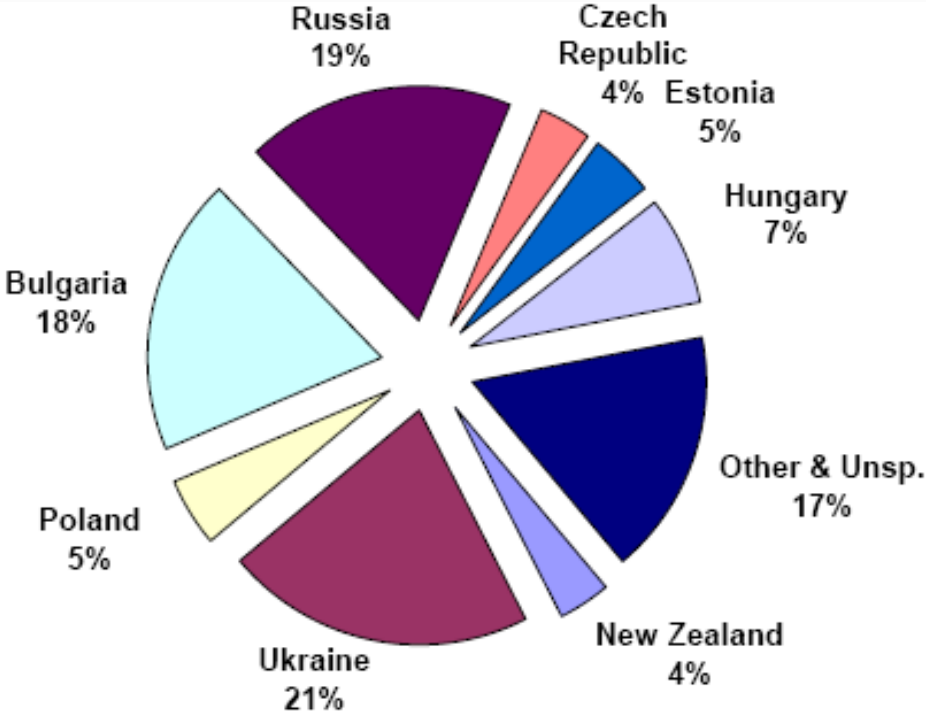
Location of flexible mechanisms

Clean Development Mechanism



2006

Joint Implementation



2003 - 2006

Source: World Bank, 2007

2005 – 2006 Carbon Market

	2005		2006				2007			
	Volume (B tonnes)	Value (B US\$)	Volume (B tonnes)	YTY	Value (B US\$)	YTY	Volume (B tonnes)	YTY	Value (B US\$)	YTY
EU ETS	0.3	\$7.9	1.1	267%	\$24.4	209%	1.6	45%	\$41.0	68%
CDM	0.4	\$2.6	0.5	34%	\$5.3	102%	0.9	91%	\$17.5	233%
Other	0.1	\$0.4	0.1	17%	\$0.5	25%	0.2	186%	\$1.5	233%
Total	0.7	\$10.9	1.6	131%	\$30.1	177%	2.7	65%	\$60.0	99%

- 100% increase in carbon market size from 2006 to 2007

2005 – 2006 Carbon Market

	2005		2006	
	Volume (MtCO ₂ e)	Value (MUS\$)	Volume (MtCO ₂ e)	Value (MUS\$)
Allowances				
EU ETS	321	7,908	1,101	24,357
New South Wales	6	59	20	225
Chicago Climate Exchange	1	3	10	38
UK-ETS	0	1	na	na
Sub total	328	7,971	1,131	24,620
Project-based transactions				
Primary CDM	341	2,417	450	4,813
Secondary CDM	10	221	25	444
Jl	11	68	16	141
Other compliance	20	187	17	79
Sub total	382	2,894	508	5,477
TOTAL	710	10,864	1,639	30,098

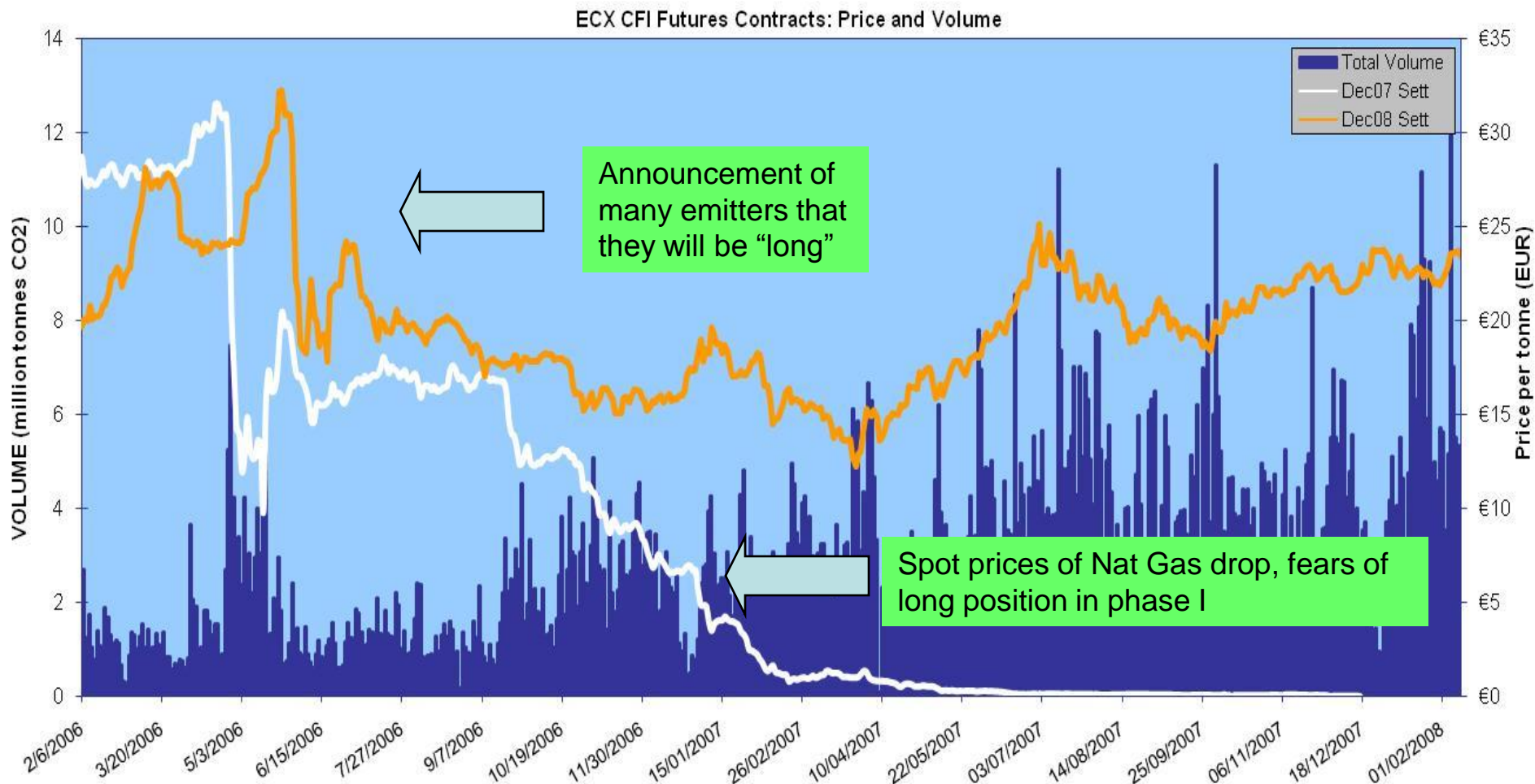
Source: World Bank, 2007

2004 – 2005 Carbon Market

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

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

Price History for EU Allowances



- Current 2008 on Mar 12 vintage futures are priced at €21.90/tonne of CO₂ (~\$34 per tonne)

Long Term Price Determinants?

- 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

Short Term Price Determinants?

■ 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

Price Determinants for Project Mechanisms

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

- Reason 1: Project-level risk

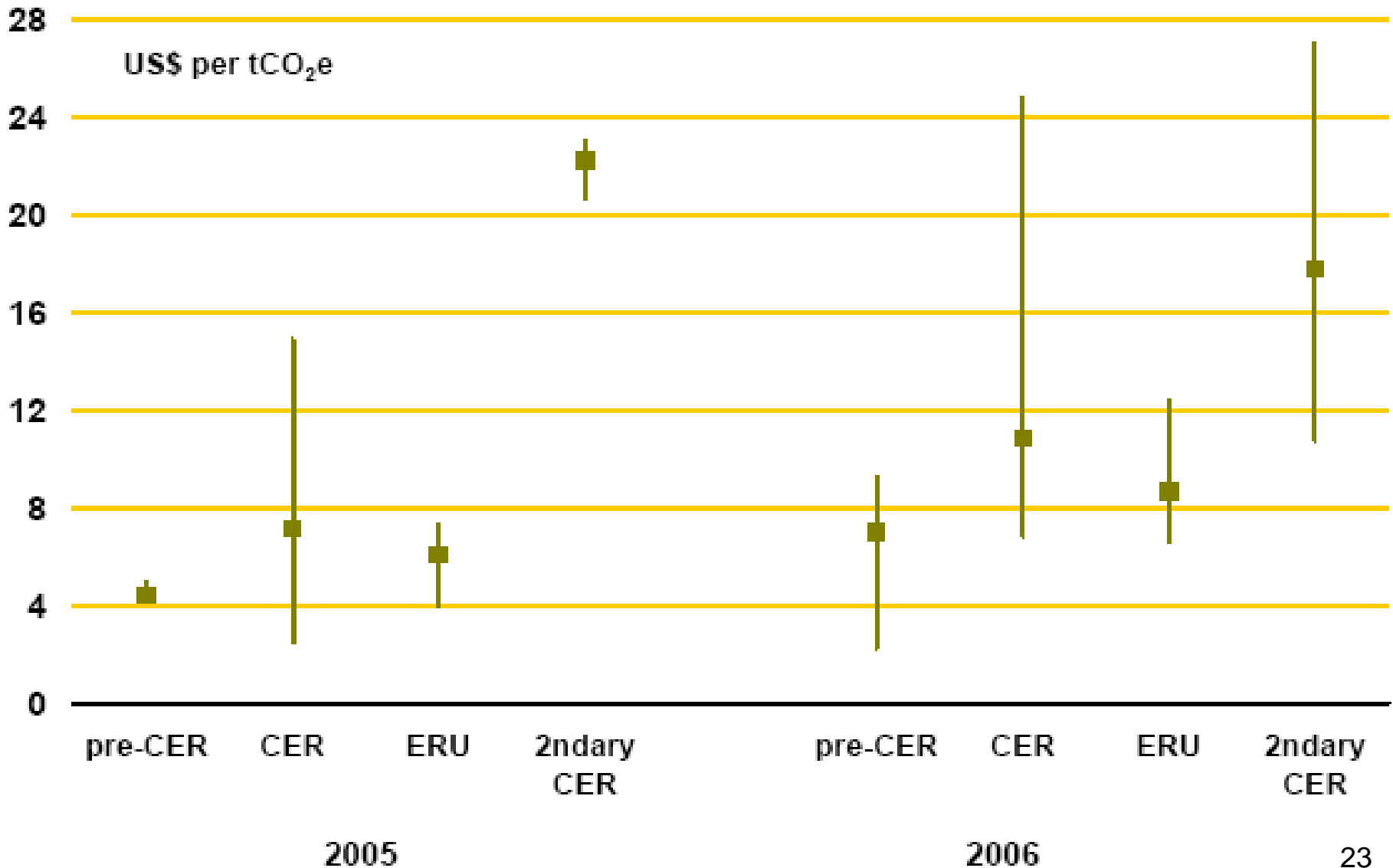
- Methodology Risk
- Registration Risk
- Country Approval Risk
- Certification Risk
- Project Risk
- Country Risk

Generally project owner
takes on this risk

Risks after Certification

- Certified CERs still trade at about 20% discount. Why?
- Reason 2: Eligibility risks and illiquidity
 - Risk that EU countries will reach phase II flexible mechanism limits
 - ETS Approval Risk
 - High transaction costs
 - Lack of pricing information
 - Heterogenous market (sizes and types of projects)

Prices for project-based mechanisms

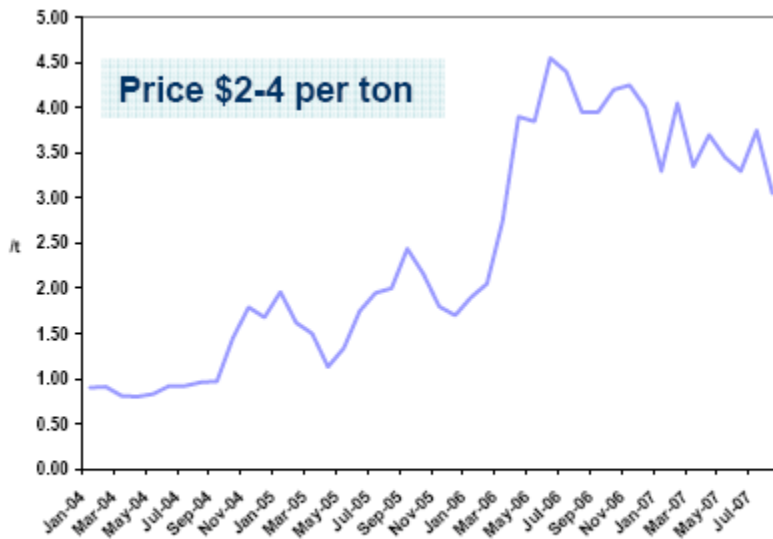


North American Carbon Markets

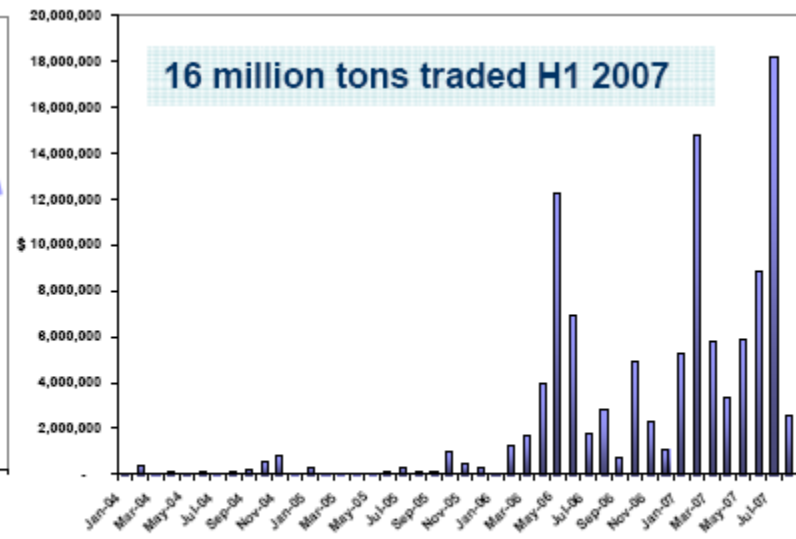
- Chicago Climate Exchange
- Other Voluntary Credit Providers
- Regional Greenhouse Gas Initiative (RGGI)
- Western Climate Initiative
- Potential Federal Legislation

Chicago Climate Exchange (CCX)

- Participants commit to reduce GHG emissions 4% by 2006 (and 6% by 2010) using baseline average emissions of 1998-2001;
- Grew from 127 to 237 members in 2006
- Participants include IBM, American Electric Power (AEP), Dow Corning, BP, Cinergy (Duke Energy), DuPont and Ford
- Price currently \$5.50 per metric ton of CO₂



Prices Jan. 2004 – Sept. 2007



Dollar Value Jan. 2004 – Sept. 2007

Other Voluntary Carbon Markets

- Carbon Brokers: Natsource, Evolution Markets, EcoSecurities, Econergy (primarily sell compliance offsets)
- Retail Providers: Native Energy, Terrapass, Carbonfund.org, Carbon Neutral Company
- Utilize various standards (VCS, ISO 14064, WRI GHG protocol, Green-e, etc)
- Price varies from \$2 to \$12 depending on provider and quality of project

Regional Greenhouse Gas Initiative

Regional Greenhouse Gas Initiative

- MoU signed by 10 states ME, NH, VT, CT, NJ, NY, DE, RI, MA, MD
- 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 depending on price per ton (>\$10 offsets can make up 10% of shortfall)

Western Climate Initiative

- Based loosely on California's AB32
- Other participants: AZ, NM, OR, UT, WA as well as BC, MB
- States commit to reach 15% below 1995 emission levels by 2020
- CA will begin implementation in 2012
- Could potentially include CDM/JI offsets
- Partnership with EU ETS? RGGI?
- Partnership with Midwestern Greenhouse Gas Reduction Accord? (MN, WI, IL, IN, IA, MI, KS, OH, SD)

Legislation at the Federal Level

America's Climate Security Act

Bill	Warner / Lieberman (ACSA)
Sectoral Coverage	Economy Wide (75%)
Cap Type	Mandatory
Cap Levels	2012: 2005 levels 1.8% annual decrease 2050: 70% reduction
Allocation	2012: 18% auction After 2036: 73% auction
Offsets / International Credits?	Up to 15% each
International Participation	After 8 years, assess carbon content on imports

- Passed Environmental and Public Works Committee, and will be introduced into the Senate in the Spring
- House version is being written in the House Energy and Commerce Committee by Rep. Dingell (D-MI)
- 10 other bills have been introduced on Capital Hill

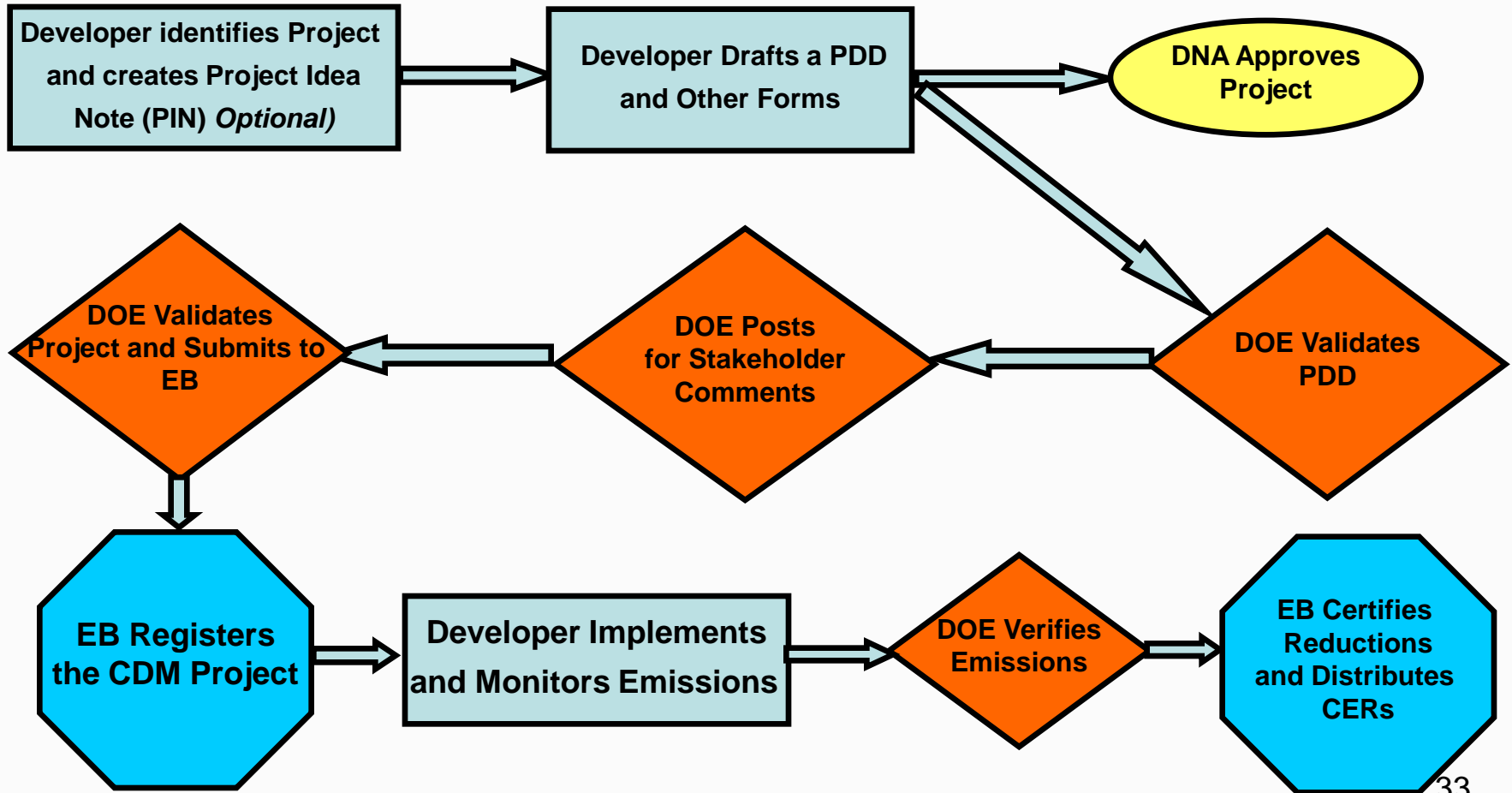
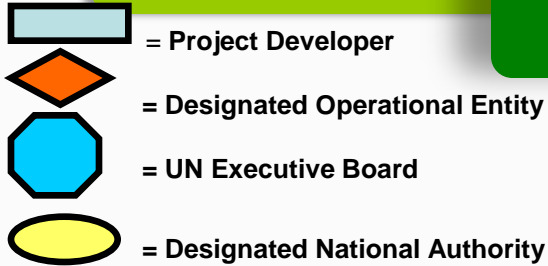
Problems with carbon market?

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

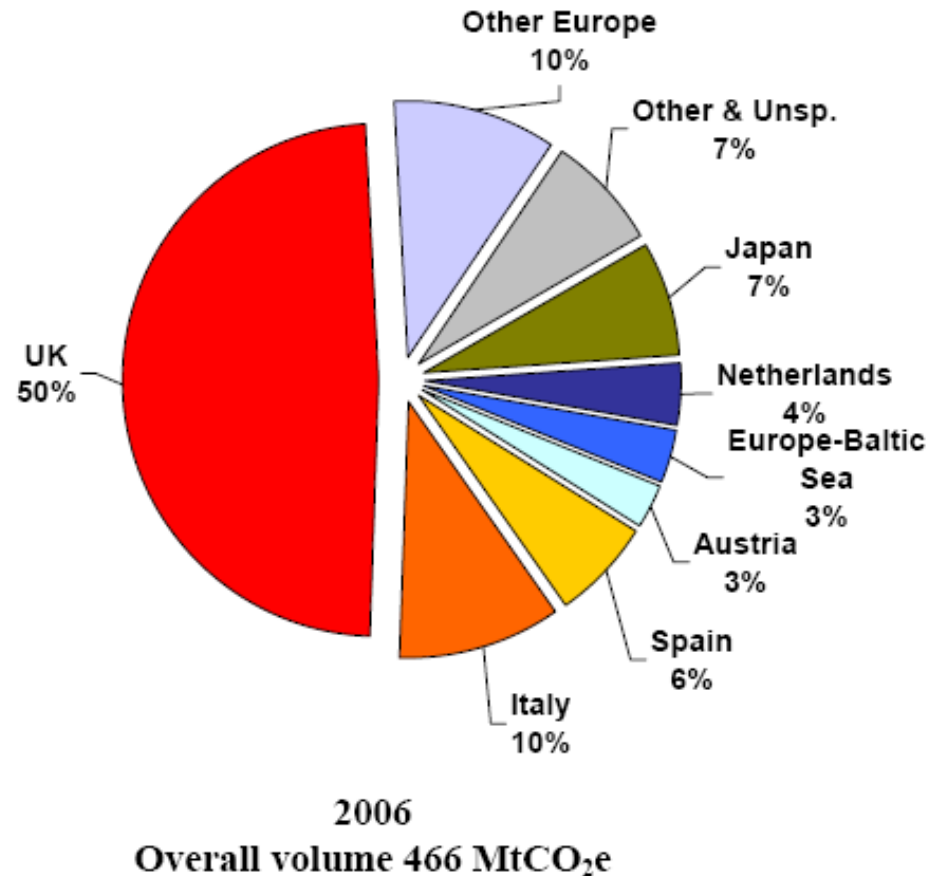
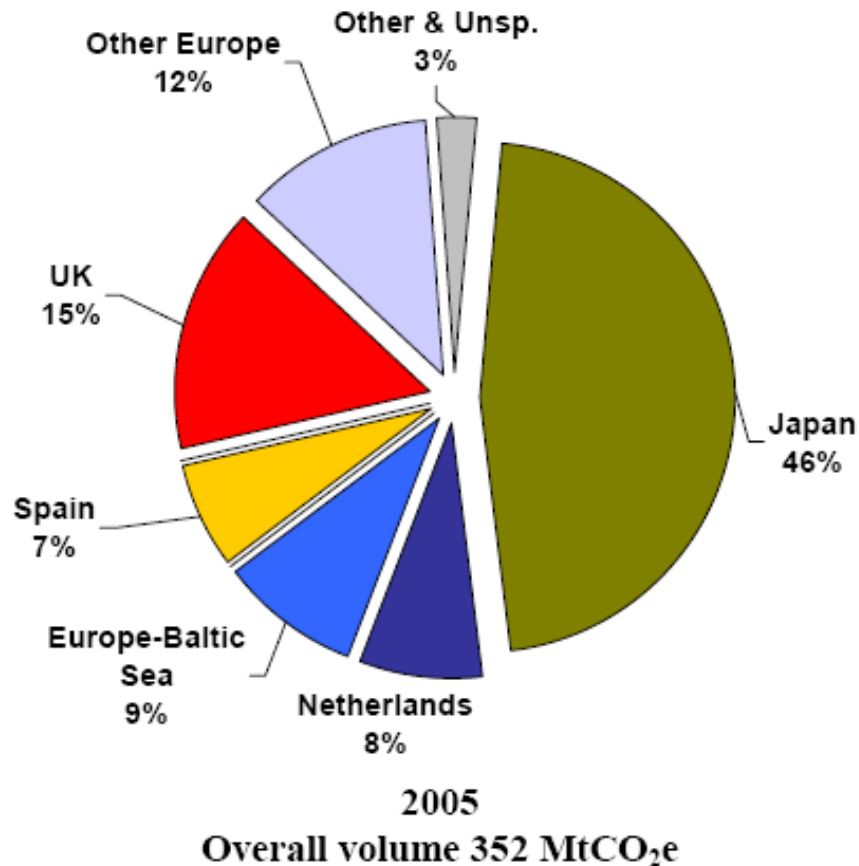
Finally done....

Questions ???

Appendix A: CDM Approval Process



Appendix B: Who's Buying CDM credits?



Source: World Bank, 2007

Largest Players in CDM Markets

OFFSET DEVELOPERS	REUTERS EST. PIPELINE (mT)	COMPANY ESTIMATE PIPELINE (mT)	PROJECTS	DATE
ENEL <ENEL.MI>	112	N/A	N/A	N/A
EcoSecurities <ECO.L>	104	130	402	Nov 07
Orbeo/Rhodia <RHA.PA>	94	110	>2	Mar 08
Climate Change Capital	79	>65	N/A	Aug 07
Natsource	78	N/A	N/A	N/A
EDF <EDF.PA>	74	N/A	N/A	N/A
World Bank	57	177	N/A	Aug 06
Trading Emissions <TREM.L>	51	53	>100	Jan 08
Tricorona <TRIC.ST>	47	68	165	Dec 07
Noble Carbon Credits	47	N/A	N/A	N/A
Camco <CAMIN.L>	45	150 (40 Camco)	>95	Feb 08
RWE <RWE.G.DE>	42	48	N/A	Jul 07
Endesa <ELE.MC>	33	N/A	N/A	N/A
Icecap Limited	28	N/A	N/A	N/A
Agrinergy	22	N/A	N/A	N/A
MGM International	15	60	N/A	Jan 07
Carbon Resource Management	15	N/A	N/A	N/A
Deutsche Bank <DBKGn.DE>	13	N/A	N/A	N/A
European Carbon Fund	10	55	>20	Feb 08
Agcert <AGC.L>	10	16	695	Jun 07
Cargill [CARG.UL]	5	N/A	N/A	N/A
Econergy <ECG.L>	0.7	2	11	Jun 07
TOTAL	982			

Source: Reuters

http://www.reutersinteractive.com/Carbon/91859?utm_source=20080310&utm_medium=email

Appendix C: RGGI Legislative Update

State	Cap (mt)	Status of RGGI Implementation
Connecticut	9.7	CT Legislature passed Public Act 07-242.
Delaware	6.8	Rulemaking not started.
Maine	5.3	Law passed in July 2007. Specific rulemaking will begin Dec 2008
Maryland	37.5	Process pending. Governor requires legislative approval
Massachusetts	26.6	Draft rule released by MA DEP. Regulations drafted by January 2008.
New Hampshire	8.6	Bill proposed in Jan '08 most likely approval in June '08.
New Jersey	20.7	Governor still needs legislative support.
New York	58.3	Implementation rules released
Rhode Island	2.6	Passed legislation in June 2007 to begin rulemaking
Vermont	1.2	Passed legislation in April 2007. Vetoed by Governor, legislature drafting new rules