The Fundamentals of the Future International Emissions Trading System

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Problematique

- The European Emissions Trading System (ETS) constitutes the basis for the future international carbon market
- The dynamics of its fundamentals will dictate the future price of carbon, according to three sets of variables:
  - Emissions reduction constraints (cf. reduction objectives of the European Council, March 8-9, 2007)
  - Market configuration (i.e. its geographical extension)
  - New flexibility margins provided by a longer time-period for the adjustment of investments

Introduction

- **Importance**
  - Emissions trading system assures the least cost allocation (in theory)
  - ETS will continue after 2012…
  - ETS integrates the credits from the Kyoto project based-mechanisms: CDM and JI
  - CO_2 price estimation becomes a key risk-management issue for the utility analysts …and the financial analysts
- **Problems**
  - Uncertainty of CO_2 price
  - Lack of sectoral analysis
  - Lack of analysis representing different carbon market configurations
- **Methodology**
  - Emissions quota allocations ← PNAQ, UNFCCC, EIA, POLES
  - MACC ← POLES
  - CO_2 market analysis ← ASPEN
- **Conclusion**
  - The benefits of an extended carbon market gain importance in 2020 and the new flexibility margins provided by a longer time-period for the adjustment of investments compensates for the increasing pressure towards stronger emission reductions

Methodology : sectoral allocations

- Global carbon market : EU25, rest of Annex B countries, non-Annex B countries
- EU25 – 12 sectors; other countries – 4 sectors
- Base year emissions : data from UNFCCC, EIA
- Quotas 2010 : Kyoto objectives
- Quotas 2020 : reduction of 20% of CO_2 emissions (Council proposed 20% reduction of GHG emissions)

Sectoral Distribution

- From 2nd NAPs, national GHG emissions inventories and POLES

Sub-sectoral allocations ← UE25

		Base year	2004	Kyoto	2020	Difference							
						(base year-Kyoto)		(base year-2020)		(2004-Kyoto)		(2004-2020)	
		Mt CO2				*Mt CO2*	*%*	*Mt CO2*	*%*	*Mt CO2*	*%*	*Mt CO2*	*%*
Industry	Chemistry	128	106	86	76	-42	-33	-52	-41	-20	-19%	-30	-28%
	Ferrous metals	222	151	221	196	-1	0	-26	-12	70	46%	45	30%
	Minerals	330	289	281	255	-49	-15	-75	-23	-7	-2%	-34	-12%
	Others	102	103	79	69	-23	-22	-33	-32	-24	-23%	-34	-33%
Total Industry		782	649	668	596	-115	-15	-186	-24	19	3%	-53	-8%
Energy	Electricity	1348	1292	1156	1013	-192	-14	-335	-25	-135	-10%	-279	-22%
	Other transf.	248	217	164	147	-84	-34	-101	-41	-54	-25%	-70	-32%
Total Energy Industries		1595	1509	1320	1160	-276	-17	-435	-27	-189	-13%	-349	-23%
Transport	Road	694	875	832	715	137	20	21	3	-43	-5%	-160	-18%
	Aviation	18	24	19	17	1	8	-1	-5	-4	-18%	-7	-28%
	Others	40	39	40	33	0	0	-7	-17	1	2%	-6	-15%
Total Transport		752	938	891	765	139	18	13	2	-47	-5%	-173	-18%
Others	Residential	527	474	484	418	-42	-8	-109	-21	10	2%	-56	-12%
	Services	200	187	183	158	-17	-9	-42	-21	-4	-2%	-29	-15%
	Others	107	77	87	74	-20	-19	-33	-31	10	13%	-3	-4%
Total Others		834	738	754	650	-79	-10	-184	-22	16	2%	-88	-12%
Total Energy		**3963**	**3833**	**3633**	**3171**	**-331**	**-8**	**-792**	**-20**	**-200**	**-5%**	**-662**	**-17%**

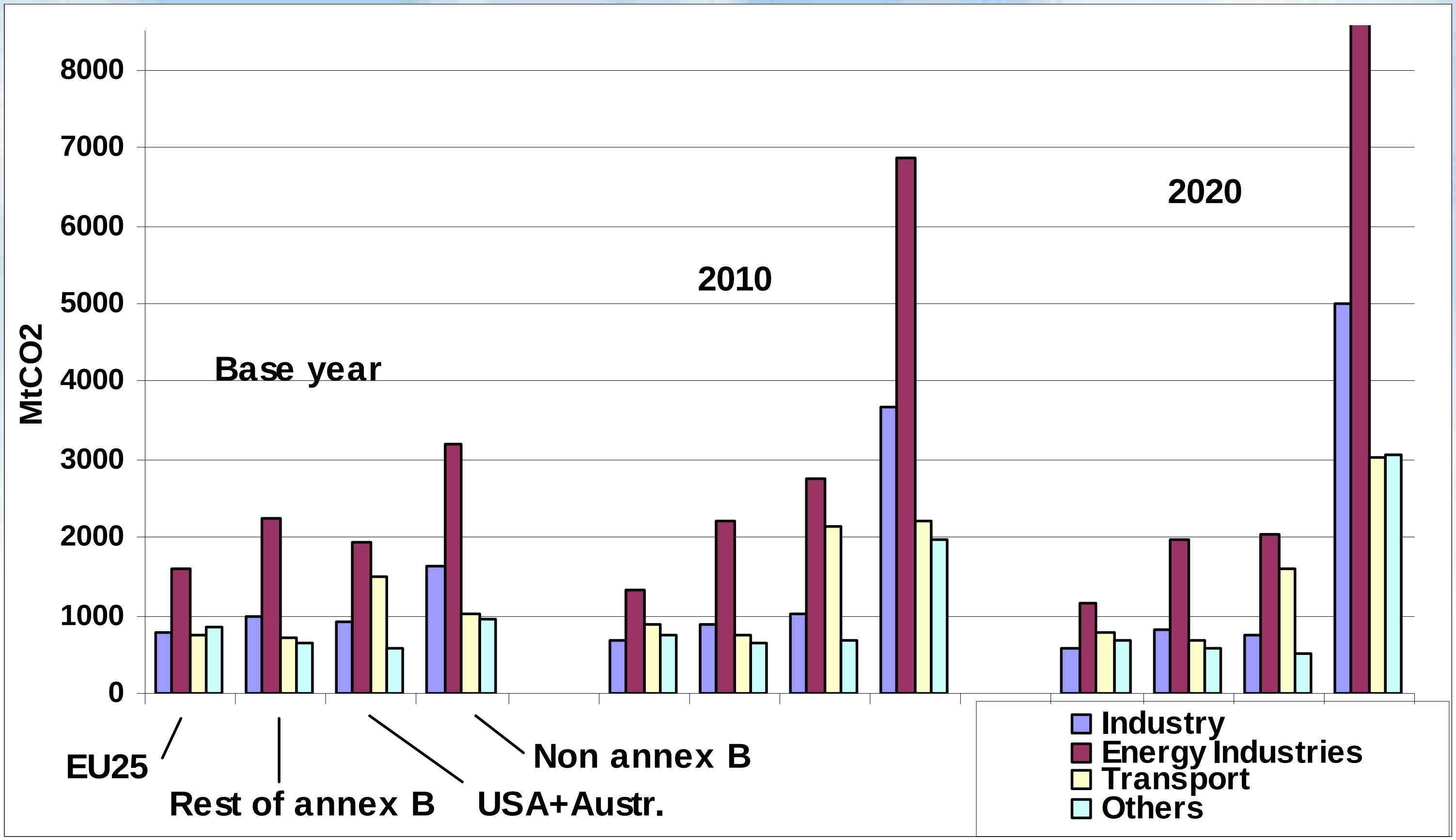
- **According to our CO2 allocation assumptions:**

  - the most important reduction in quantity is achieved electricity sub-sector in 2010 and 2020;

  - the most important increase in quantity is for road transport in 2010 and 2020 relative to 1990 emission levels;

  - the allocation is generous for European Industry of ferrous metals relative to 2004 emissions levels.

Sectoral allocation ← the world



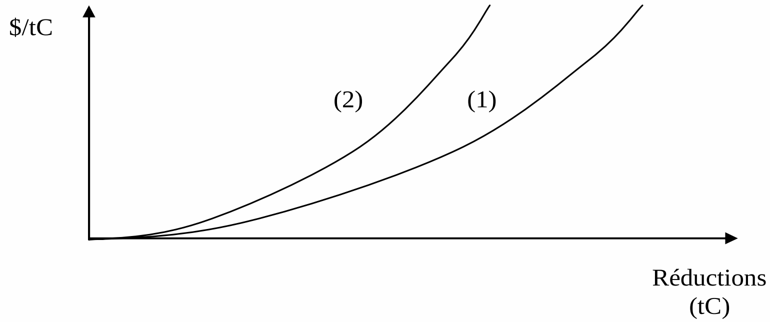
- According to our CO2 allocation assumptions:

  - The global CO2 emissions increase by 45% in 2010 and by 58% in 2020 relative to the base year level 1990;

  - Non-Annex B countries responsible for the increase.

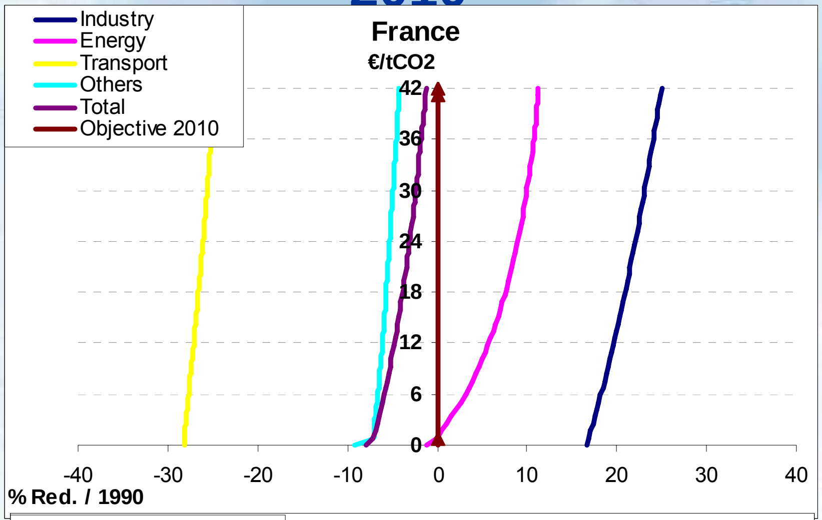
Methodology : MAC curves ← POLES

- Linear carbon tax is introduced in the successive simulations of the Reference scenario (without carbon policies)
- The “final” tax varies from 0 to 125 €/tCO2, by step of 2,5 €/tCO2
- MACCs are produced at sectoral and country/region level:

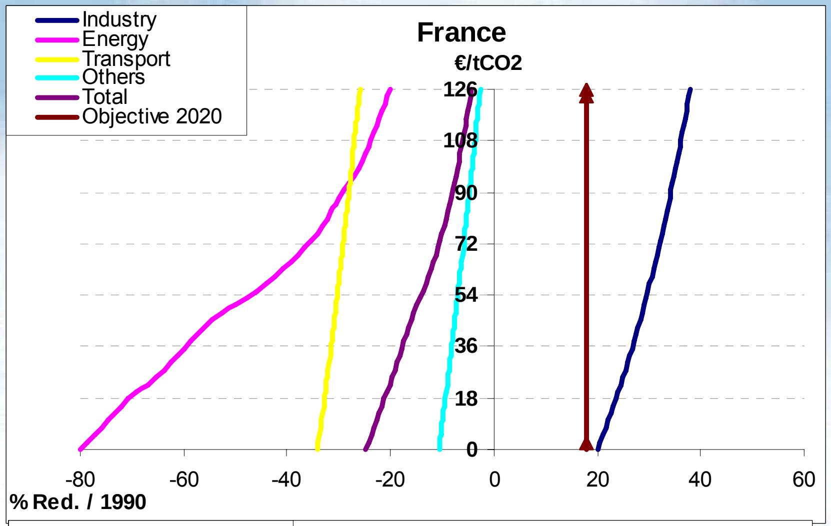


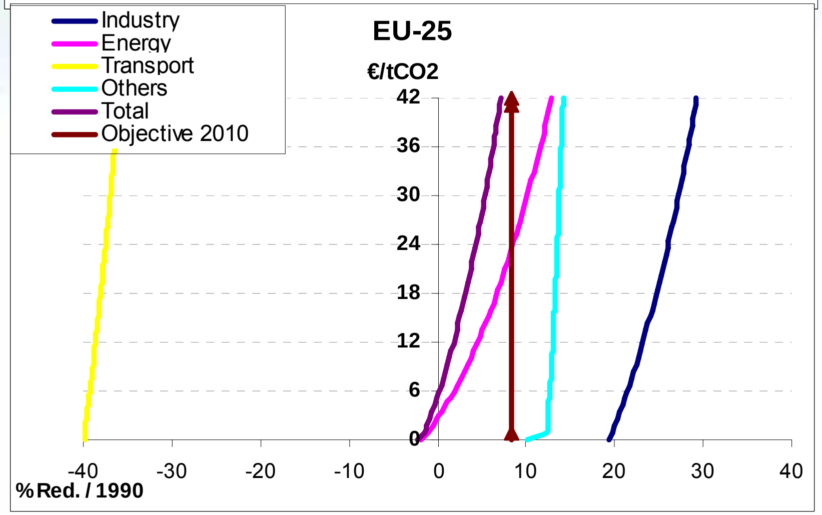
Sectoral MACCs

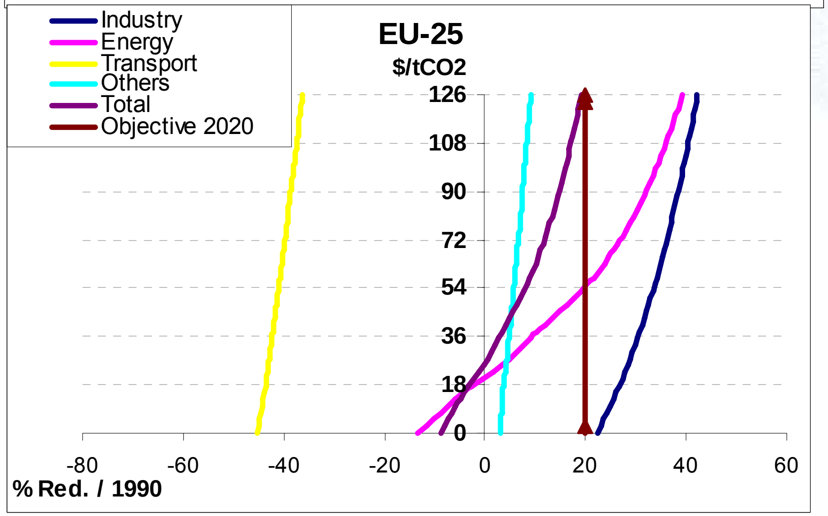
2010



2020

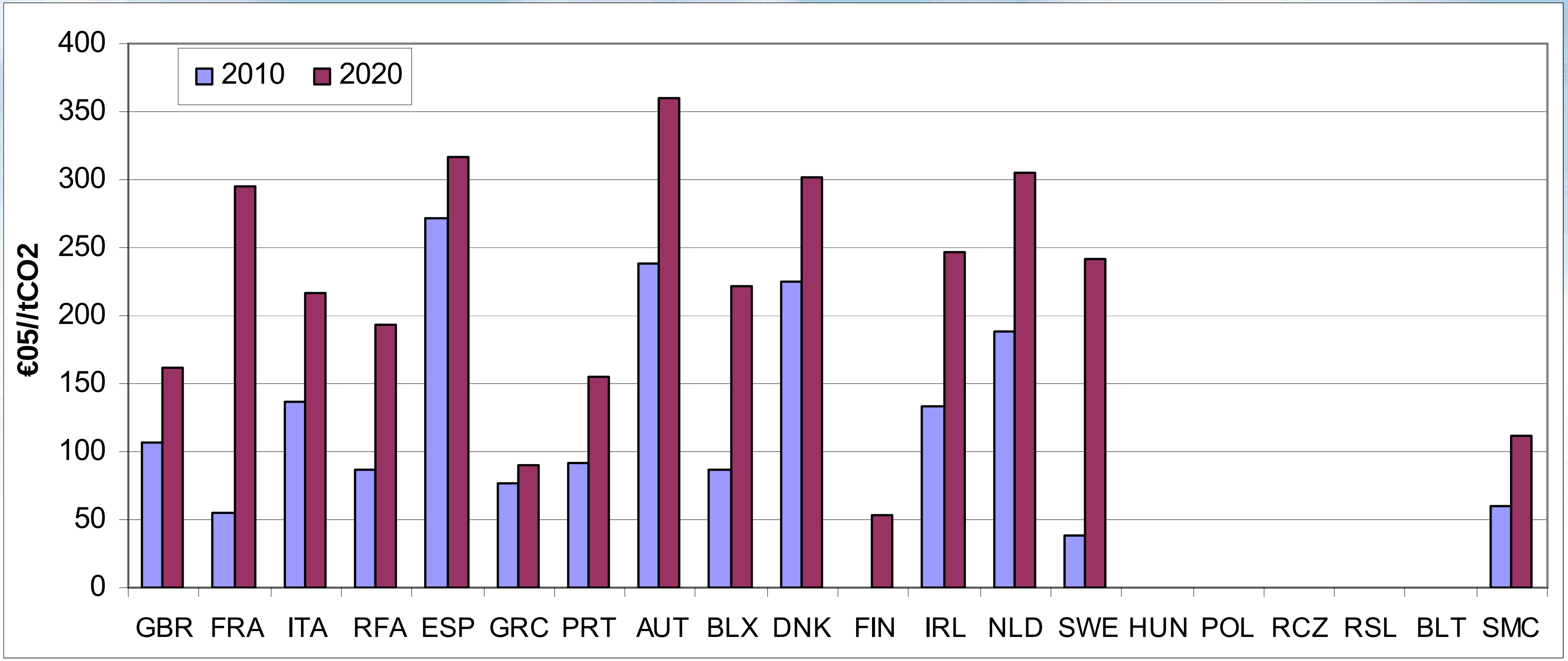






- **Electricity sector presents high elasticity to the carbon price**
- **Zero cost reduction in the Industry sector**

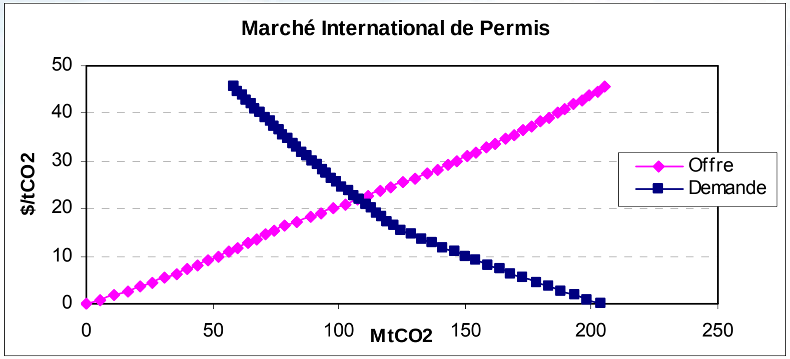
National MAC



- Highest MAC : Spain and Austria
- Allowance trade profit new member countries

Supply and demand on the CO2 market ← ASPEN

- Aggregation of MACCs from POLES for the participating sectors by country
- Definition of supply and demand on the CO2 market in function of the allocations of emissions by country/sectors
- Calculation of the corresponding equilibrium price



- Determination of the purchases / sales by country / sector and of the national reduction costs with and without the exchange

Configuration / size of the CO2 market

- **Different carbon market configurations / scenarios**

Countries / Regions	EU 25	Opening to CDM non-Annex B	Opening to JI Russia, Ukraine, Bulgaria, Romania, RCEU*	Inclusion of Rest Annex B	All countries
Trading Sectors	*industry+electricity*				*all sectors*
Scenarios					
S1	V				
S2	V	V			
S3	V	V	V		
S4	V	V	V	V	
S5	V	V	V	V	V

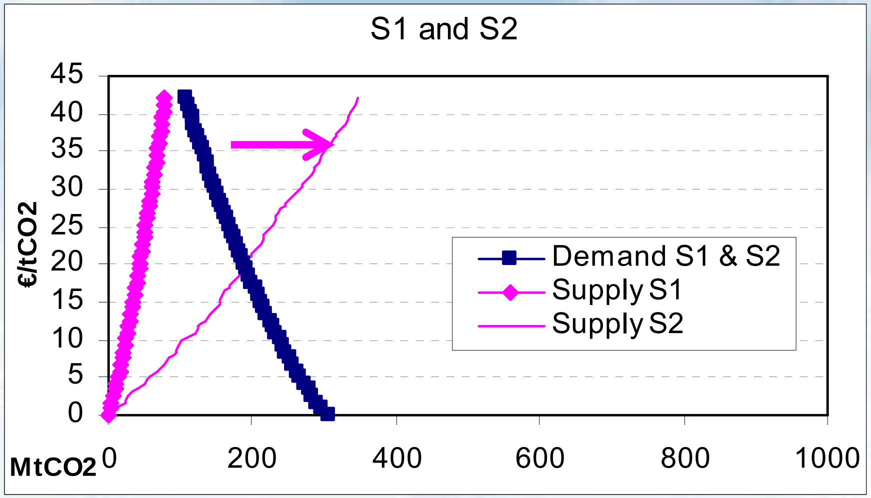
- **Variants for 2 variables:**

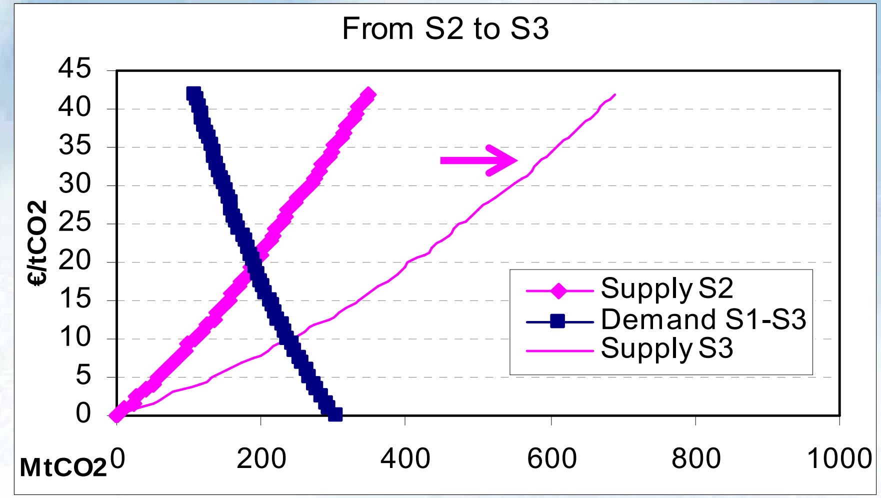
1. CDM potential: 15% in 2010 and 2020

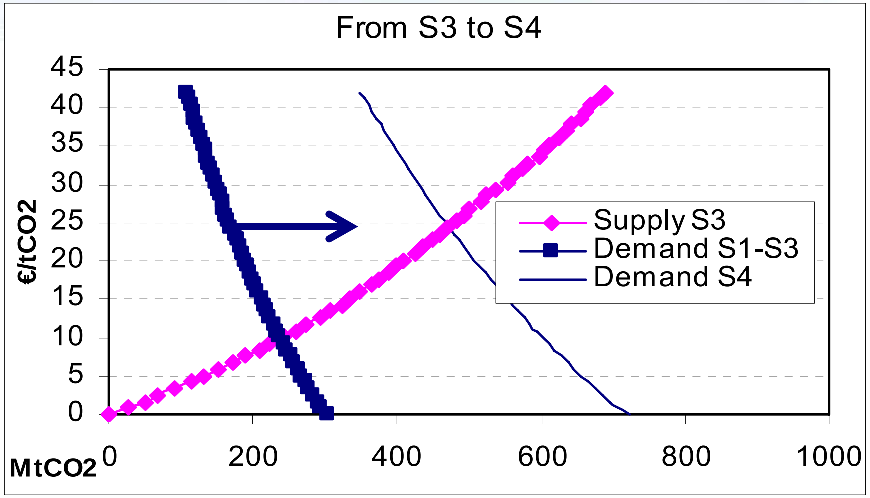
2. "Hot air" presence : either 0 or 50% en 2010

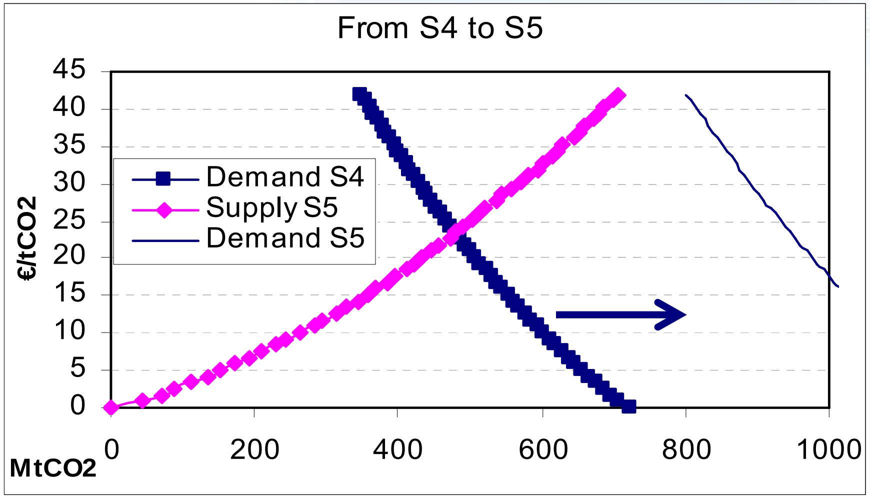
: either 0 or 100% en 2020

Carbon market analysis in 2010

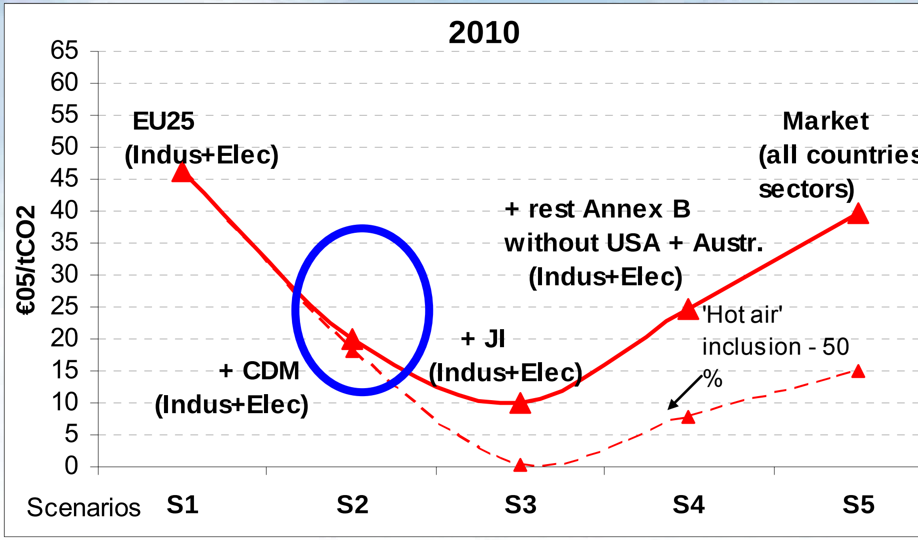


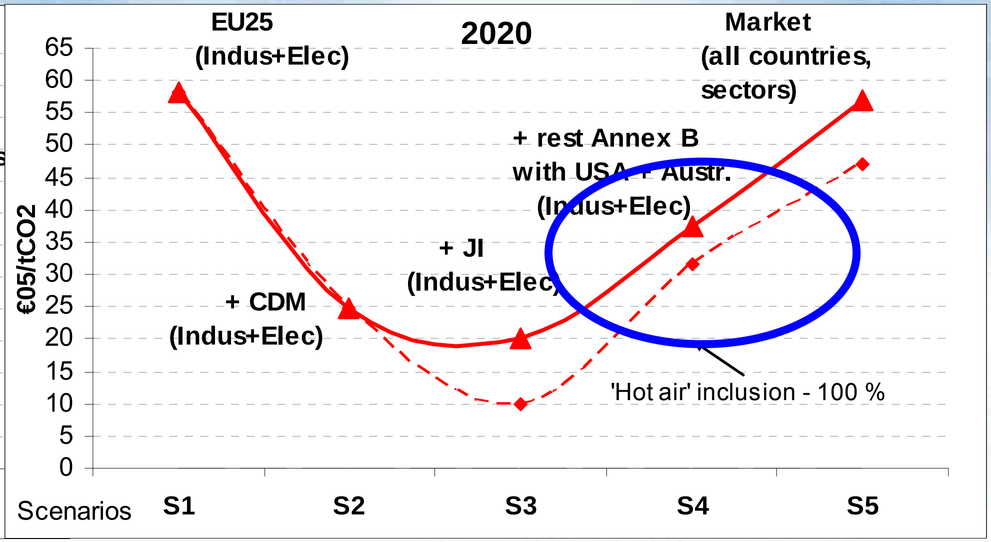






Carbon market analysis and the CO2 price in 2010 and 2020





- In the short term, CO2 price is influenced by “hot air”
- CO2 price in 2020 not extremely high: longer time period provides smoother adjustment in less polluting capital

Results: scenario 2 for 2010

		Reduction objectives, MtCO2		Domestic reduction, MtCO2		Sales / Purchases of CO2 allowances, MtCO2		Domestic costs without trading, M€	Domestic costs with trading, M€
		Electricity	Industry	Electricity	Industry	Electricity	Industry		
EU25	France	10	0	8	0	2	0	113	109
	Germany	69	0	34	4	35	-4	1345	972
	UK	60	9	12	4	47	5	3405	1198
	Italy	6	13	5	3	1	10	471	294
	Rest of Europe	116	16	73	9	43	7	6096	1740
	Total EU 25	261	39	133	21	128	18	11429	4312
CDM	China			49	26	51%	50%		-850
	India			13	5	14%	11%		-200
	Rest Asia			16	7	17%	13%		-238
	Latin America			2	3	2%	6%		-17
	Africa+Middle East			12	9	12%	17%		-231
	Turkey			3	1	3%	3%		-50
	Total CDM			95	51	-95	-51		-1587

- **49% of the European deficit in ETS in 2010 is covered by the CDM credits, 51% by domestic reduction measures**
- **The deficit is modest for Industry sector; the domestic reductions are greater than the credits purchases**
- **The reduction burden belongs to the electricity sector**
- **Asia supplies 81% of the CDM credits**

Results: scenario 4 for 2020

		Reduction objectives, MtCO2		Domestic reduction, MtCO2		Sales / Purchases of CO2 allowances, MtCO2		Domestic costs without trading, M€	Domestic costs with trading, M€
		Electricity	*Industry*	*Electricity*	*Industry*	Electricity	Industry		
EU25	France	85	0	25	6	61	-6	8100	2803
	Germany	210	0	110	8	99	-8	8168	5868
	UK	91	17	51	10	40	7	4415	3195
	Italy	22	4	15	7	7	-3	686	655
	Rest of Europe	171	45	170	37	1	7	6699	3335
	Total EU25	580	66	371	67	208	-1	28068	15856
Rest Annex B	USA+RJAN*	1573	20	1240	108	333	-88	35063	33724
	Canada	165	26	73	8	92	18	13426	5584
	Japan	343	144	153	56	190	88	27430	14449
	Rest of Annex B	11	0	3	0	7	0	941	344
	Total Rest Annex B	2092	190	1469	172	623	17	76860	54101
CDM	China			170	78	46%	53%		-4795
	India			37	18	10%	12%		-1115
	Rest Asia			66	19	18%	13%		-1662
	Latin America			30	9	8%	6%		-688
	Africa+Middle East			64	24	17%	16%		-1619
	Total CDM			367	149	-367	-149		-9879
ex JI	Russia	0	0	232	52	-95%	-56%	0	-5998
	Total ex JI	152	6	396	99	-244	-93	1356	-7159

- **Carbon market reduces reduction costs in all countries; by more than a factor of 2 in France, Canada, close to a factor of 2 in Japan**

Conclusion

- The reduction burden weights heavily on the electricity sector
- At the same time, the electricity sector is the most flexible according to the MACCs analysis
- Weak reduction targets along with low MACs prevail in industry sectors
- The CO2 price in 2010 is very sensitive to “hot air”
- Without the CDM credits, the CO2 price in 2010 would be 46€/tCO2 in
- The benefits of enlarged carbon market increase in 2020 since more than half of the reductions should be achieved in ETS sectors