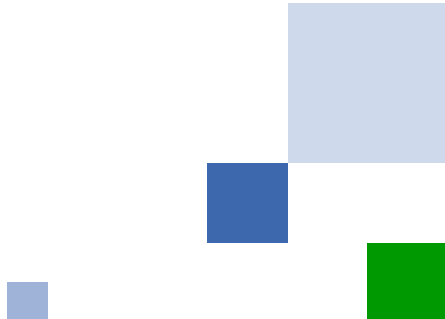


How do we cover the shortfall?

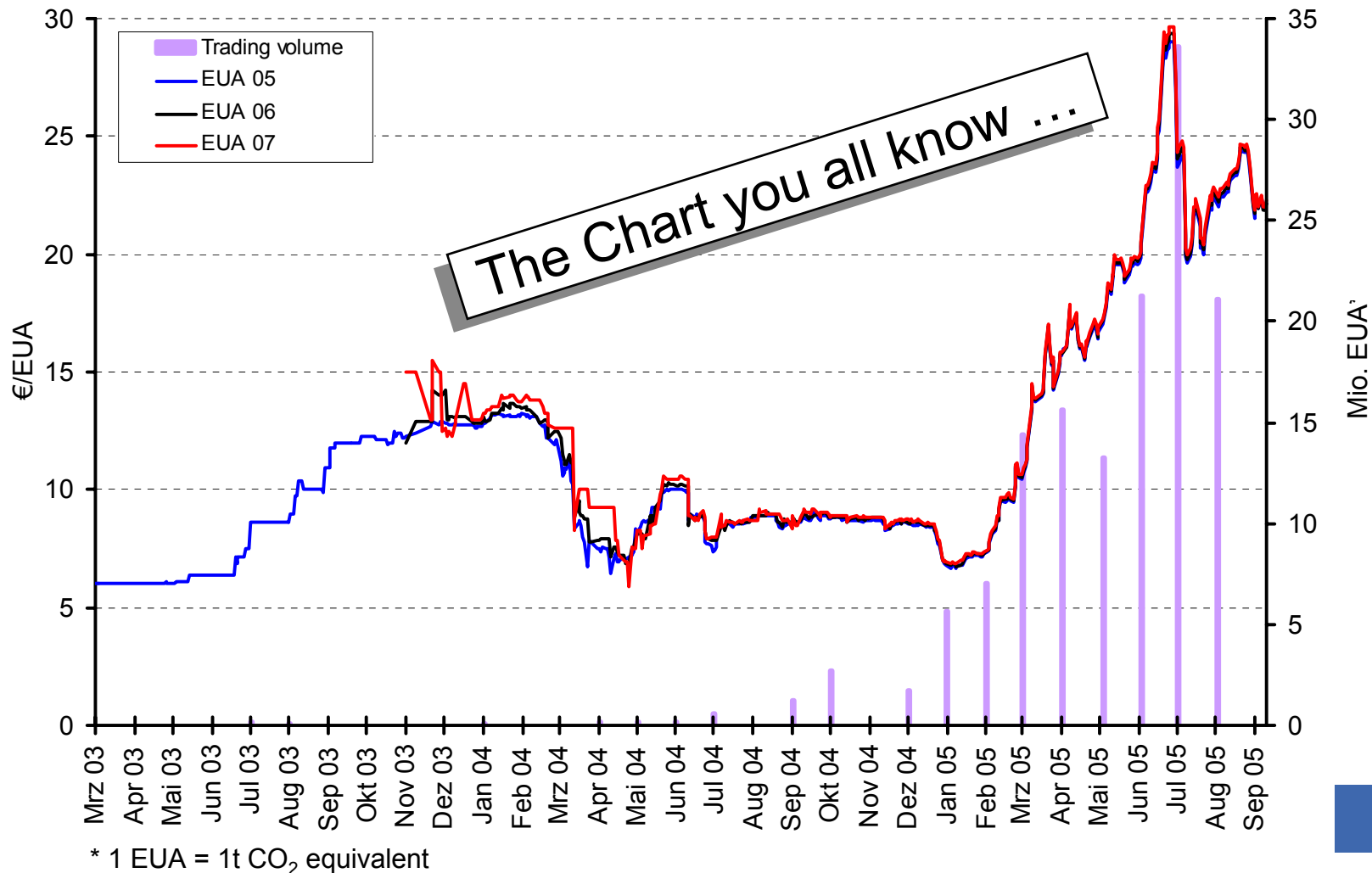
Carbon Market update: IETA Conference Paris, September 27th 2005

Stefan Judisch
Managing Director
RWE Trading GmbH



The result to “market news” ...

Due to the recent media coverage and the vivid (political) discussions, almost everybody is aware of the recent events on the carbon markets. Trading volumes have gone up ... so have prices!



What the experts said ...

“Europe’s new CO₂ constraint is becoming clearer to quantify. We believe it will result in CO₂ allowances trading at € 15 per tonne.”

DrKW Research, October 2003; (re-validated in April 2004)

“The EU Commission indicates carbon prices at the level of € 15 per tonne, which is considerably higher than the most likely price forecasted by Point Carbon”

Point Carbon, “Carbon Market Europe”, June 2003

“ We expect the price of carbon credits to be low in the first 2005 – 2007 period at below € 5 per tonne. The impact on the electricity sector should therefore be muted.”

Deutsche Bank AG, Global Equity Research – “Industry Focus”, March 2004

“I think it's not unlikely that € 10 will be a feasible level for the first trading period of 2005 to 2008, and I believe € 20 would be the upper limit.”

Armin Sandhoevel, head of Dresdner Bank's corporate sustainability section, May 2003



Theoretical Market reactions to CO₂ – Penalisation

Current price of CO₂ emissions in the power market and the EU ETS not consistent

		Power Prices CO ₂ Emission Premium ¹				Traded ^b (EUR / MWh)	Pre ETS price comparison basis 2004 (EUR / MWh)	Max. implied CO ₂ Prices Delta to Baseload 2004 (EUR / MWh)
		Zero Opportunity Cost ³	Theoretical ² Generation Mix ⁴	Marginal Plant ⁵				
		(EUR / MWh)	(EUR / MWh)	(EUR / MWh)	(EUR / MWh)			
Germany Baseload	2005	28.89 0.22	33.69 5.02	36.17 7.50	31.20	28.67	2.53	
	2006	28.89 0.22	33.69 5.02	36.17 7.50	32.45	28.67	3.78	
	2007	28.89 0.22	33.69 5.02	36.17 7.50	33.75	28.67	5.08	

¹ Traded CO₂ prices as of 31/03/2004 (8.60 EUR/mt) multiplied by applicable conversion factor

² German base load 2004 = 28.67 EUR/MWh plus CO₂ premium

³ 95% of allowances allocated for free, cost for remaining 5% represent total carbon costs; leading to conversion factor of 0.025 mt CO₂/MWh

⁴ Generation mix used for conversion (Germany = 0.584 mt CO₂/MWh)

⁵ Carbon intensity of marginal plant determines CO₂ emission price (D = hard coal, 38.5% efficiency, 0.871 mt CO₂/MWh)

⁶ Prices as of 31/03/2004

... and why our assumptions were correct

The average settlement (spot) price on the German electricity market in 2004 was € 28.52 per MWh. Only shortly after the emissions penalization was introduced, prices have gone up. The transition from EUA certificate prices to power price movements can be derived from an analysis of 3 possible scenarios:

zero opportunity cost:

1

95% of allowances allocated for free; cost for remaining 5% represent total carbon cost
 → conversion factor of 0.025 t CO₂/MWh

theoretical generation mix:

2

the theoretical generation mix for the German power production is factored in*
 → conversion factor of 0.584 t CO₂/MWh

marginal plant:

3

Carbon intensity of marginal plant determines the CO₂ emission price. (Coal** in Germany)
 → conversion factor of 0.9 t CO₂/MWh

* Generation mix for Germany in accordance to UCTE data

** Average plant efficiency of 36% considered

The “theoretical generation mix” is the link between EUA and electricity markets

The market currently values a theoretical generation mix scenario for Germany when it comes to CO₂ penalization of electricity prices (all values in €/MWh):

Product	Electricity price (31.Aug 05)	max. implied CO ₂ price (Δ to 2004)	①	②	③
			Zero opportunity cost	theroetical generation mix	Marginal plant
2004	28.52	0	0	0	0
implied 2005	42.88	14.36	0.61	14.34	22.10
2006	44.30	15.78	0.62	14.40	22.19
2007	43.10	14.58	0.62	14.54	22.41

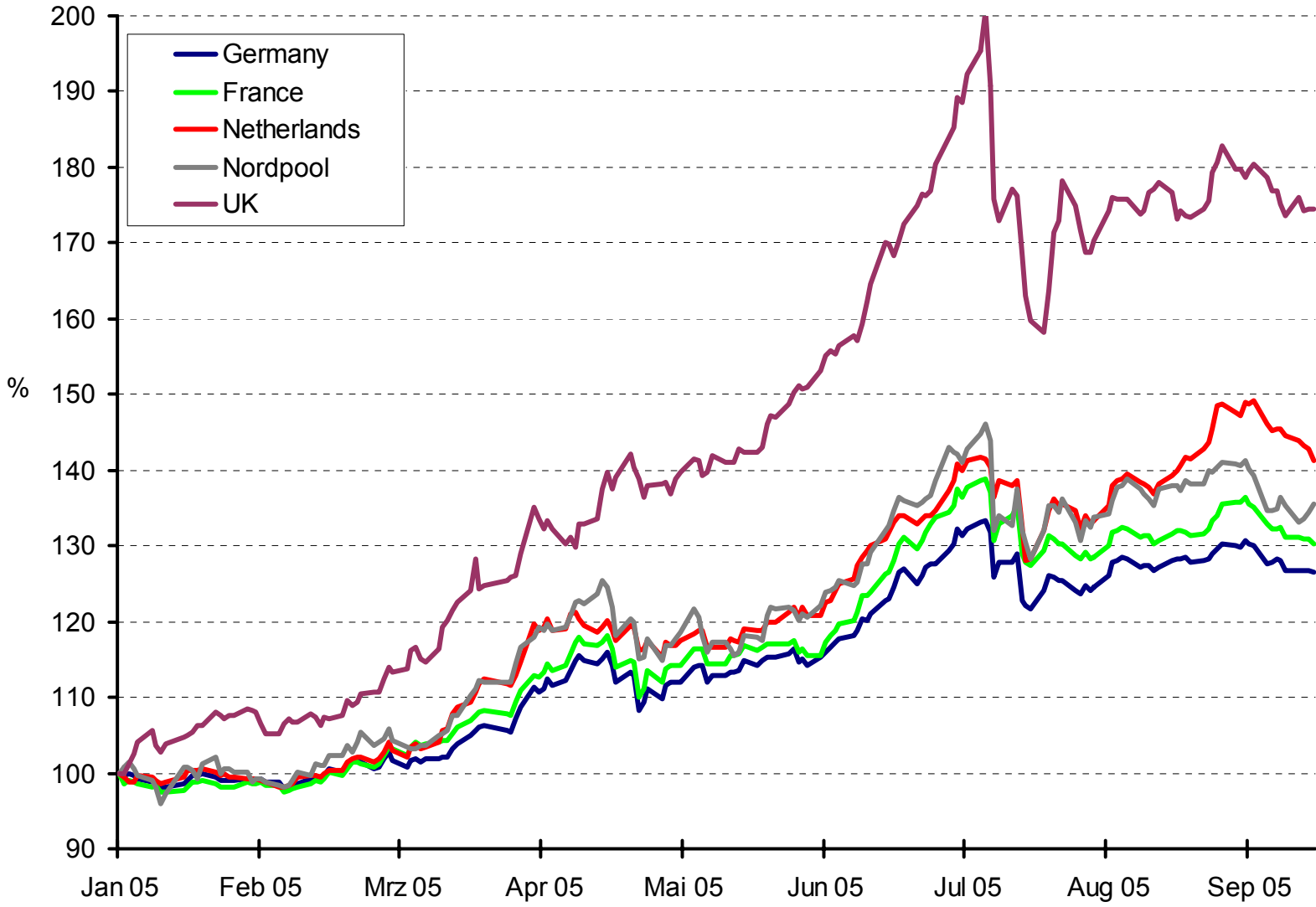


* Electricity prices for Aug 31st 2005 are OTC market prices (mid) for baseload products in relevant calendar year. 2004 price is average final settlement price (spot) for 2004.

** Underlying EUA certificate prices for scenario calculation are € 24.55 per EUA (2005), € 24.65 per EUA (2006) and € 24.90 per EUA (2007). Prices are also OTC market prices (mid) as per 31.08.2005



Development of the Cal 06 forward prices for baseload electricity in relative terms (03 Jan 2005 = 100%)



High correlation on European power markets is a result to the emissions trading scheme

- High correlations* of the European power markets are a result of the pan-European emissions trading scheme as well as the unidirectional development of the coal and gas prices

	2005	2004
– D / F:	98.67 %	97.93 %
– D / NL:	99.06 %	26.19 %
– D / Nordpool:	98.79 %	-68.71 %
– D / UK:	97.55 %	28.75 %

- This Europe-wide market reaction reveals the strong interdependencies between the carbon and the power wholesale markets
- If one wants to understand the market movements on the CO₂ market, one has to closely observe the power sector

* Correlations for market moves of the “Front Year Base” - product from Jan 1st until April in 2004 and 2005

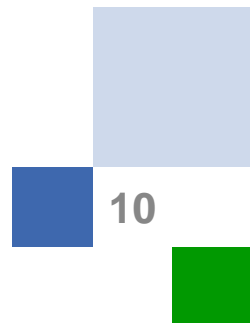
The main issue: How do we cover the shortfall?

- The estimated, European wide short position across sectors remains stable around -200 million tons
- The estimated European-wide short position for the electricity sector also remains stable at around -350 million tons

We currently do not see how this short position can be filled:

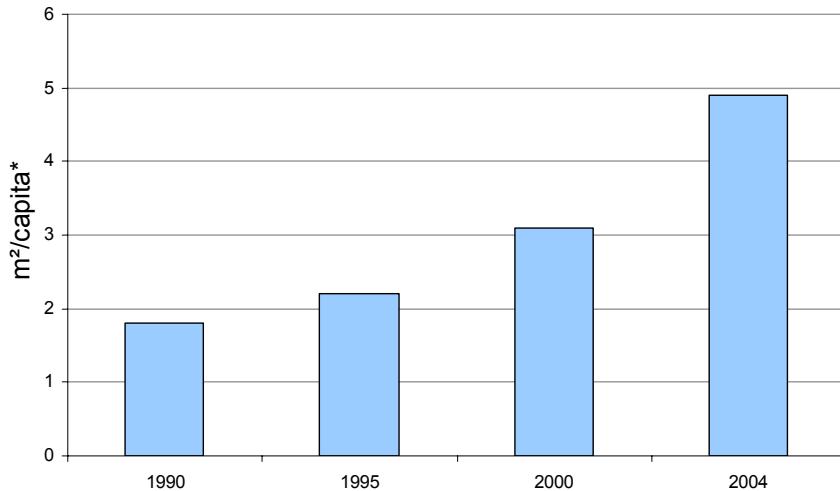
- Demand for electricity from thermal power plants is on the rise above expectations (especially in south-western Europe)
- High gas prices in the UK have not allowed for fuel switching to occur. Significant fuel switching activity will not take place before the EUA certificate price will go above € 70 per EUA certificate
- Market participants with “long” positions – e.g. in the metal or raw material industry – are hesitant to sell their positions in the market. → Currently the most active market participants are the “natural shorts”

Examples supporting our view



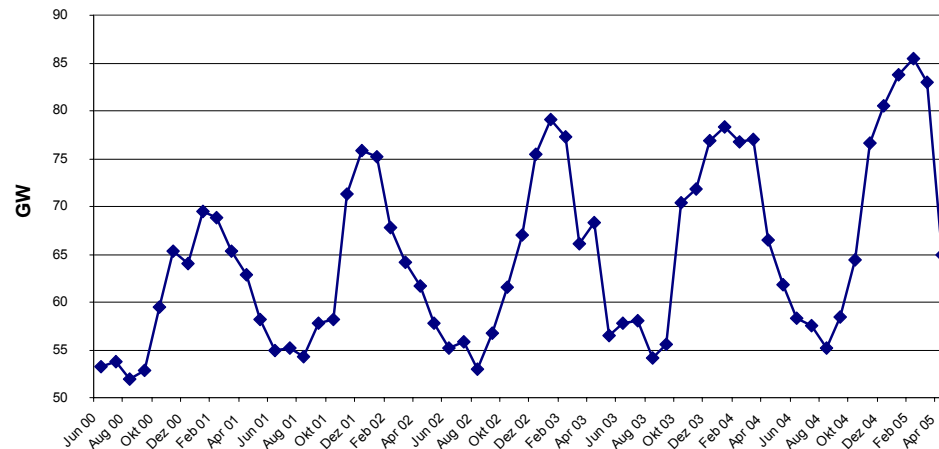
Demand for electricity is on the rise beyond expectations

One example: French consumption



The ratio of air conditioned square meters per inhabitant of France has more than doubled* since 1990. Furthermore, 38%* of the installed air conditioning devices may also be used for heating purposes. Summer and Winter load is therefore affected by this trend.

The French peak load reacts accordingly**:

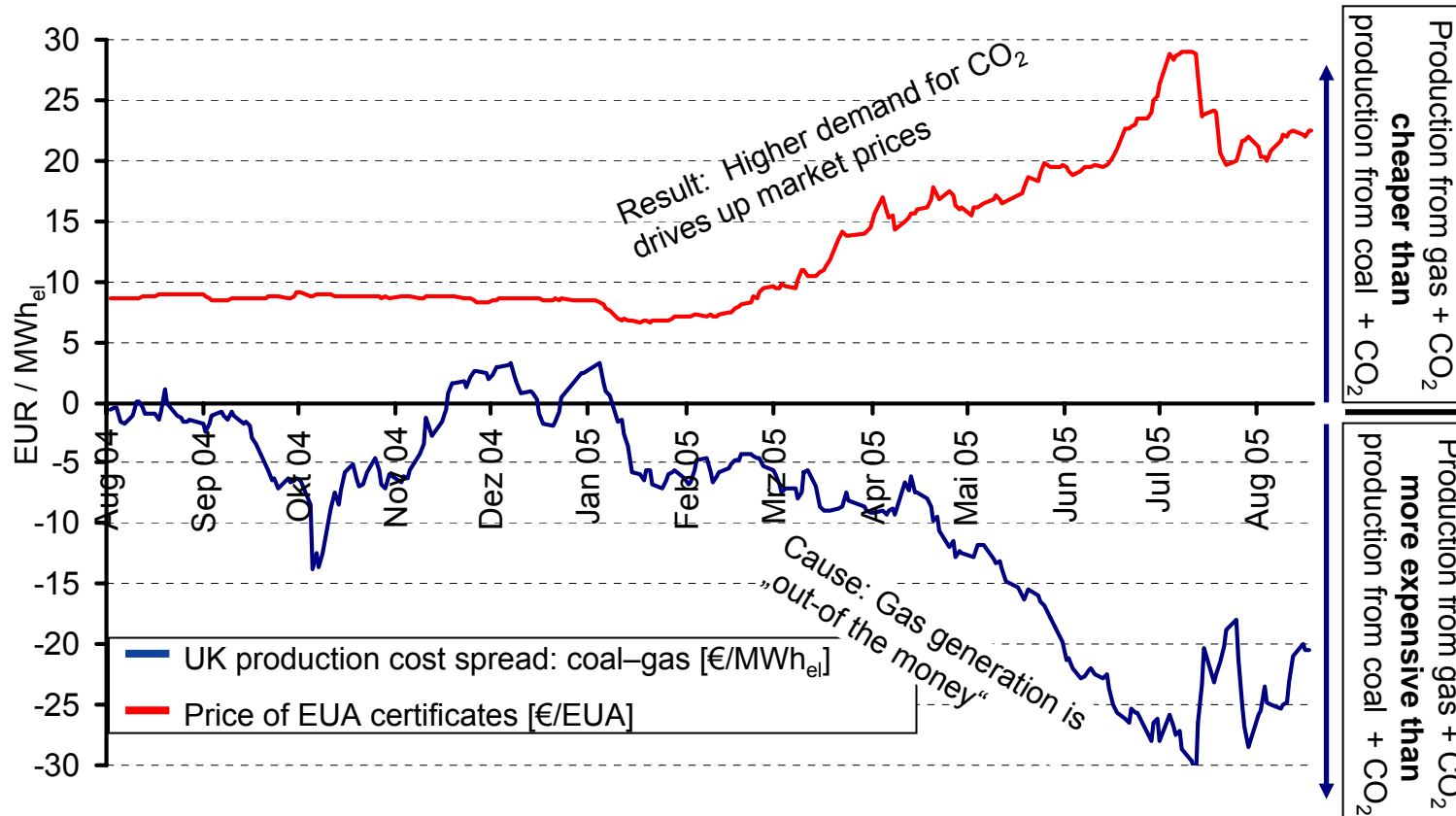


* Source: PIRA Energy

** Source: RTE

Large scale fuel switching activity is very improbable at currently observed market prices

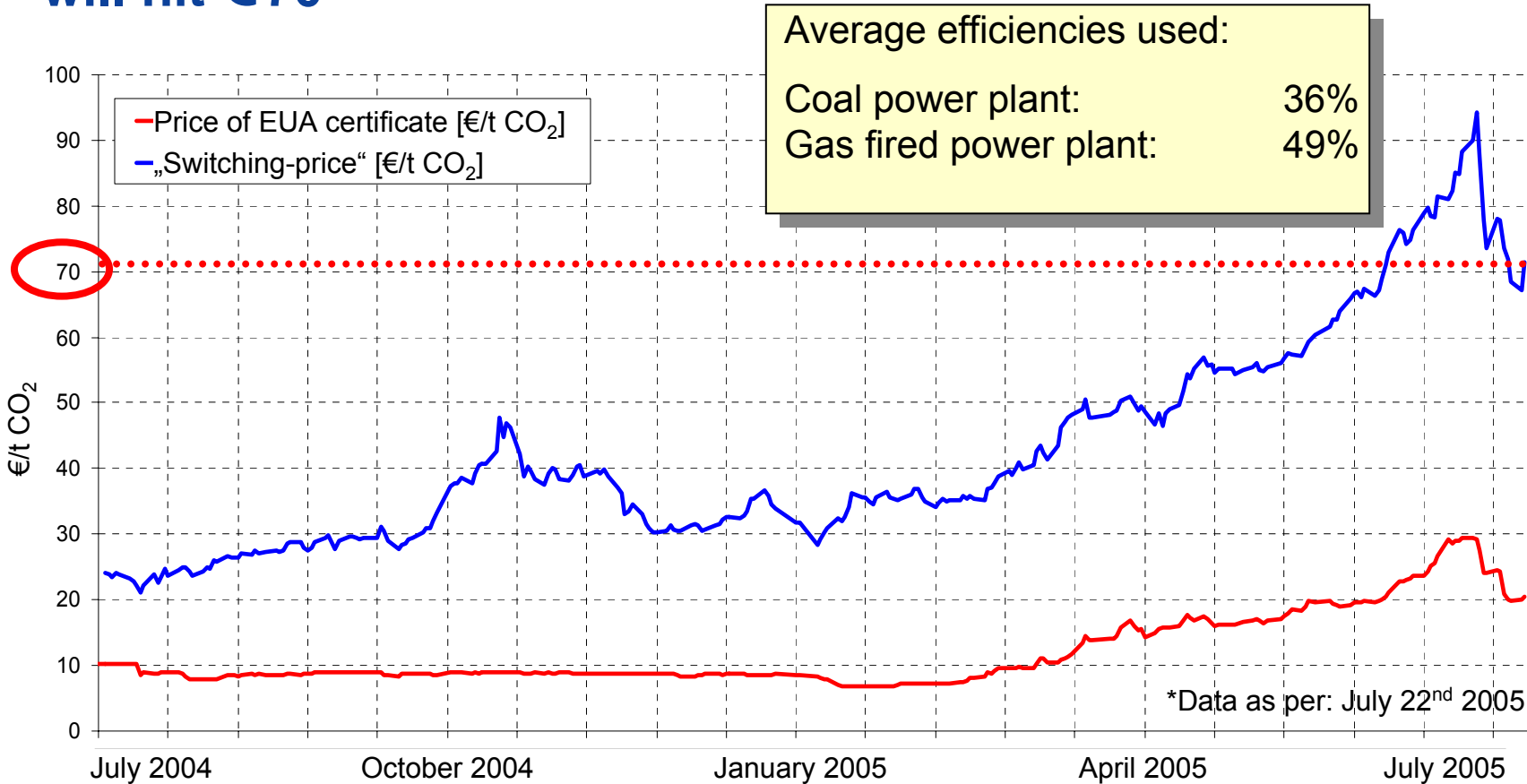
Due to high Gas prices in the UK market, generators are not encouraged to switch their production to CO₂ efficient gas plants. They rather run coal plants with a higher CO₂ intensity and buy the necessary certificates under the European Allowance Scheme – thus driving up prices for the certificates.



- 1) CO₂ price is for EUA 2005 (mid forward price)
- 2) Coal and gas: winter 2005 API #2 (coal) and NBP (gas) mid forward prices
- 3) CO₂ intensities: gas: 0,4 tCO₂ / MWh_{el}; coal: 0,9t CO₂ / MWh_{el}
- 4) Power plant efficiencies: gas: 49%; coal: 36%



No major fuel switch will happen in the UK (at current market levels) unless the price for EUA certificates will hit €70



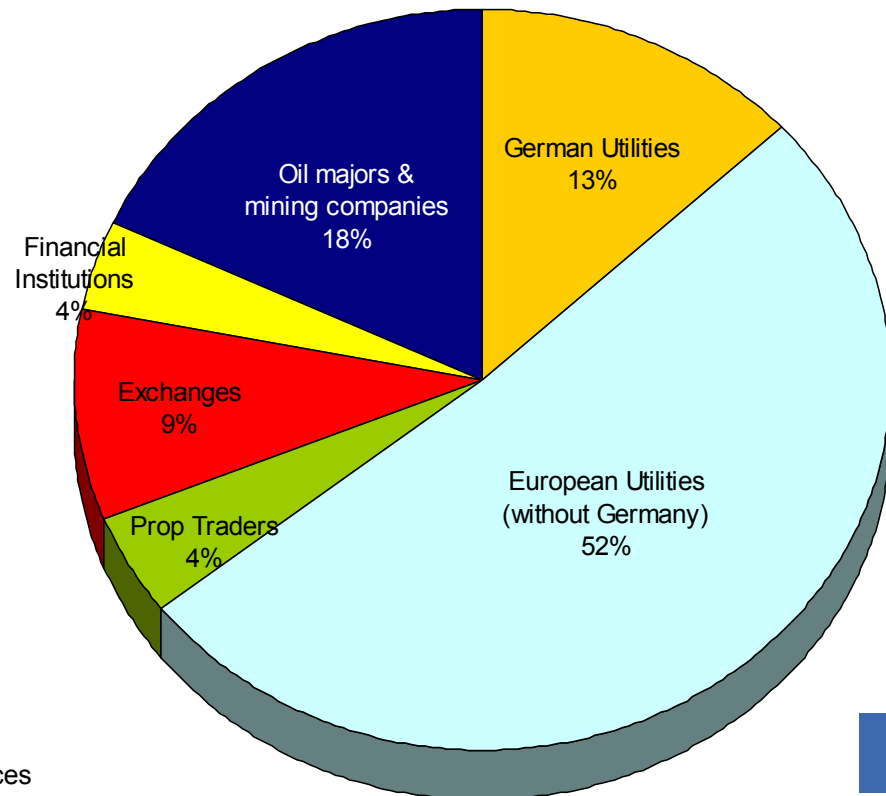
Calculation basis:

- 1) CO₂ price is for EUA 2005 (mid forward price)
- 2) coal and gas: winter 2005 API #2 (coal) and NBP (gas) mid forward prices
- 3) CO₂ intensities: gas: 0,4 tCO₂ / MWh_{el}; coal: 0,9t CO₂ / MWh_{el}
- 4) Power plant efficiencies: gas: 49%; coal: 36%

The “natural shorts” are the most active players on the market – no interest from industrial customers

Right from the start of the first compliance period, CO₂ trading was a pan-European business with participants from all major European countries. It is only lately we see increased interest from financial institutions and oil majors entering the market. We expect further increasing volumes and further increase in diversification of trading strategies. A shift from OTC trades to exchange based transactions can also be observed.

RWE Trading currently observes the following market structure in its transactions*. We have not seen interest in any trades from the metal- or the raw material industry.



*as per August 2005, across all EUA products and marketplaces

Supply response

If the EU allows additional import of emission certificates out of JI/CDM schemes beyond the 6% hurdle, prices for CO₂ would converge globally.

Problem: not enough JI/CDM certificates available (for first compliance period)

Demand response

The energy intensive industry is suffering.

Germany alone could face a demand loss of up to 40 TWh p.a. (\approx 23.4 million t of CO₂ considering the average generation mix)

Price response

Insufficient supply and demand/price elasticity drive CO₂ and power prices up. Carbon intensive power plants lose the fuel cost competitiveness but must still generate at lower utilisation.*

Long term: High power prices and free certificates for new entrants attract new power plant investment

* i.e. “lignite-to-coal“ and “coal-to-gas“ switch

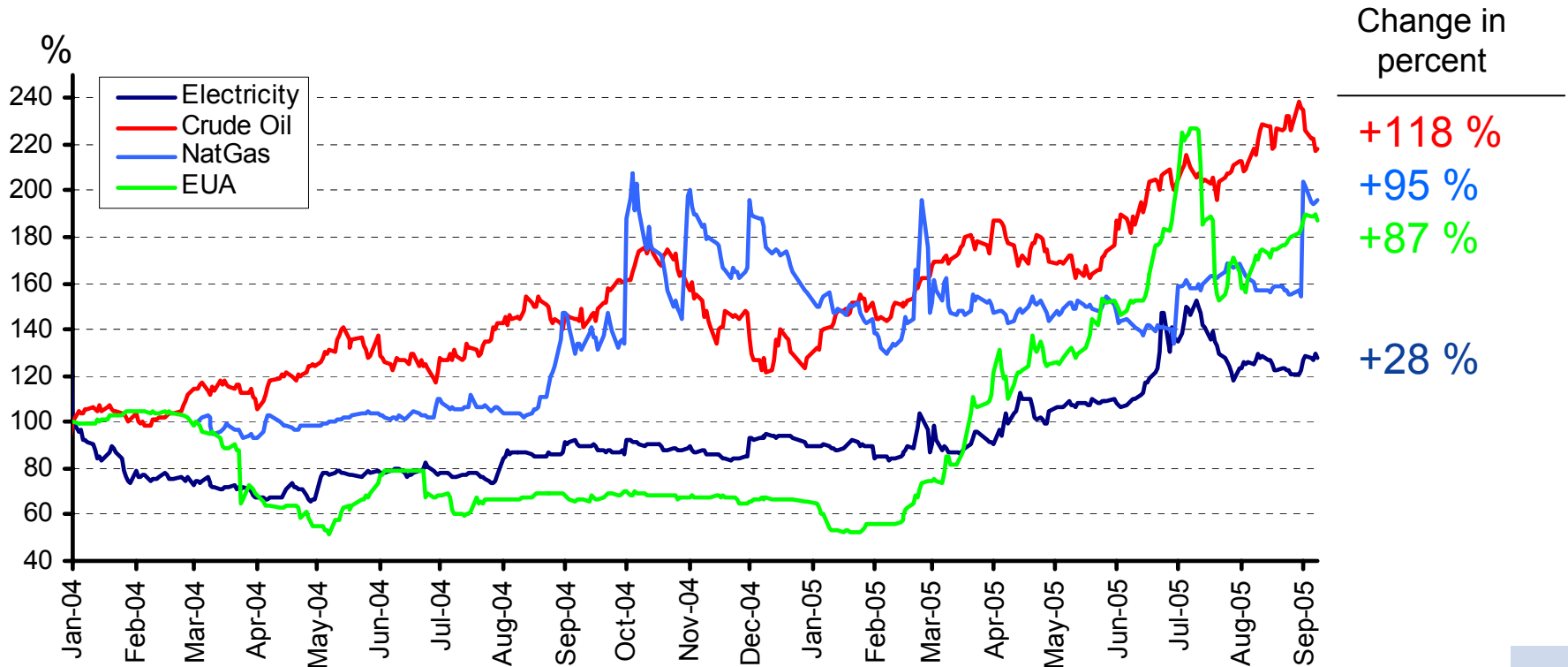
The politically induced, market based penalization system can only work in a liquid trading environment

- Additional trading volume and risk capital across sectors must be attracted to the CO₂ market in order to mobilise market forces
- Trust into the carbon trading markets must increase further
- Cost of carbon must be fully priced in for emissions reduction to occur economically and ecologically most efficient
- Investments in new, more carbon efficient technologies must be made if reduction targets shall be reached
- It is up to politicians to take the uncertainty premium out of the market and therefore induce investment into more carbon efficient technology
- We traders have done our job so far, now it is time for the politicians to do theirs

Backup Slides

Electricity shows a rather moderate price increase compared to the price moves of the primary fuels (and emission certificate prices)

Indexed to 1st January 2004 and 01st March 2004 for Natural Gas



Electricity: German baseload, OTC traded front month product

Crude Oil: Brent Crude oil front month, traded at the International Petroleum Exchange, adjusted for FX rate

Natural Gas: British natural gas front month, traded at NBP hub, adjusted for FX rate

EUA: European Emission Allowances, OTC traded average of 2005-2008 products (first allowance period)

All prices are "mid-prices"

One must fully factor in the cost of CO₂ for each make-or-buy decision in order for the politically induced emission reduction to work



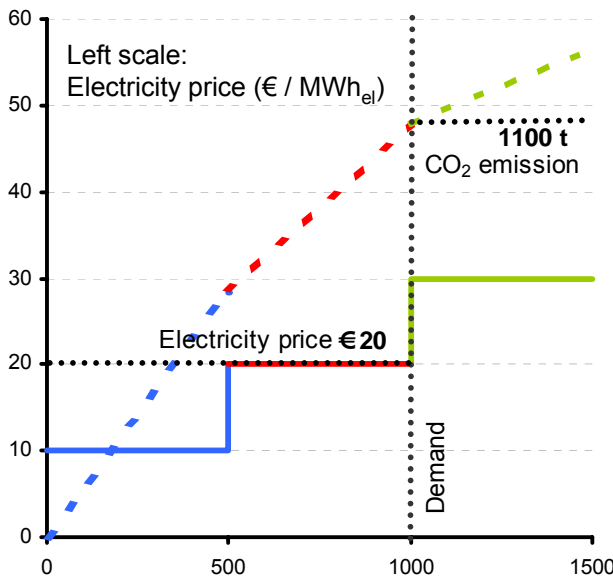
It is economically and ecologically wrong not to fully price in cost for CO₂

Scenario 1: CO₂ not priced in

Producer		A	B	C
Production cost (pre CO ₂)	[€/ MWh _{el}]	10	20	30
max. capacity of producer	[MW]	500	500	500
CO ₂ price	[€/ t]	0	0	0
CO ₂ effectiveness	[t/ MWh _{el}]	1.3	0.9	0.4
CO ₂ cost	[€/ t]	0	0	0
total production cost	[€/ MWh _{el}]	10	20	30

Effect :

Low electricity price: € 20 per MWh
High CO₂ emissions: 1100 t

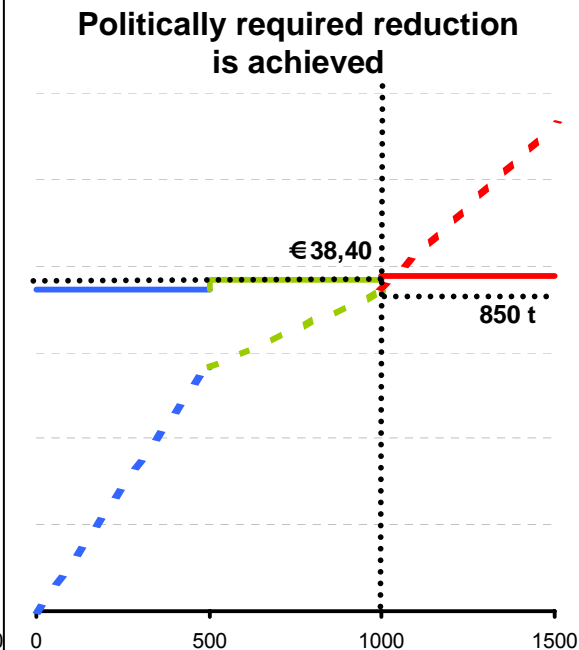


Scenario 2: CO₂ fully priced in

Producer		A	B	C
Production cost (pre CO ₂)	[€/ MWh _{el}]	10	20	30
max. capacity of producer	[MW]	500	500	500
CO ₂ price	[€/ t]	21	21	21
CO ₂ effectiveness	[t/ MWh _{el}]	1.3	0.9	0.4
CO ₂ cost	[€/ t]	27.3	18.9	8.4
total production cost	[€/ MWh _{el}]	37.3	38.9	38.4

Effect:

High electricity price: € 38,40 per MWh
Low CO₂ emissions: 850 t

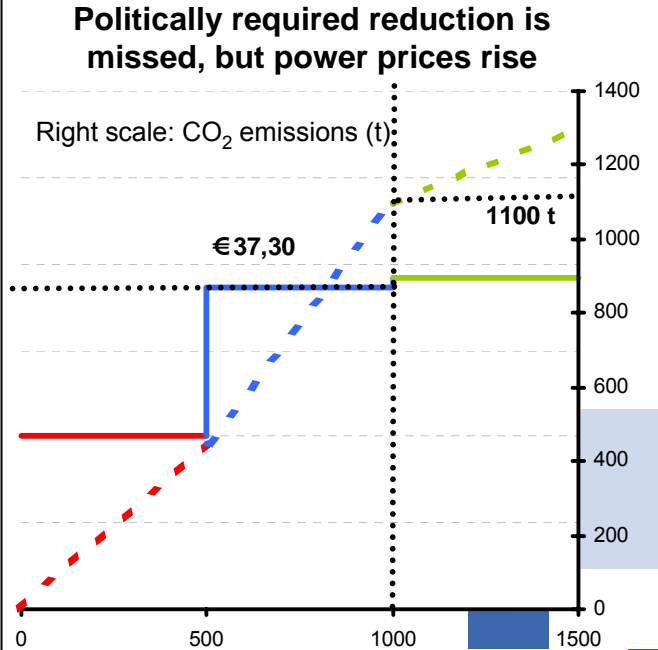


Scenario 3: CO₂ only partly priced in

Producer		A	B	C
Production cost (pre CO ₂)	[€/ MWh _{el}]	10	20	30
max. capacity of producer	[MW]	500	500	500
CO ₂ price	[€/ t]	21	0	21
CO ₂ effectiveness	[t/ MWh _{el}]	1.3	0.9	0.4
CO ₂ cost	[€/ t]	27.3	0	8.4
total production cost	[€/ MWh _{el}]	37.3	20	38.4

Effect:

High electricity price: € 37,30 per MWh
High CO₂ emissions: 1100 t



Identical demand in all scenarios: 1000 MW