Carbon Finance

Risks & Opportunities

January 31st 2006

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CO2 Levels are increasing

- CO2 level was 280 ppm in pre-industrial age.
- CO2 level has been rising for last 150 years at an increasing rate. Now over 360 ppm
- With business as usual, will be nearly 1,000 ppm by end of this century and will continue rising
- The elevated level of CO2 in the atmosphere is unprecedented
- According to the evidence from the ice core, over the last 450,000 years the CO2 concentration has never been as high as it is now.
- We are already experiencing some of the consequences

Source: Goldman School of Public Policy, University of Berkeley, California.

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The Climate is Warming

- Globally temperatures have increased 1 degree F over the last century
- In the last few decades the rate of increase has quintupled to the rate of 5 degrees F per century
- Global annual temperatures for 14 of the last 15 years have been above average
- Using records going back to the 1850's the 10 warmest years on record all occurred since 1990
- Evidence from the ice core suggests these are the 10 warmest years in the last 1,000 years

Source: Goldman School of Public Policy, University of Berkeley, California.

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We are already seeing the effects

- Snowpack is melting 1 to 3 weeks earlier in the US.
- Migrating birds are arriving several weeks earlier than on record.
- Flowers are blooming sooner.
- Off San Diego and San Francisco, mean sea level is 8 degrees F higher today than 100 years ago.
- Extreme drought in Amazon rainforest 2005.
- The ice caps are melting: since 1870 sea levels rose by an average of 1.44 mm, since 1950 this figure increased to 1.75 millimetres a year.

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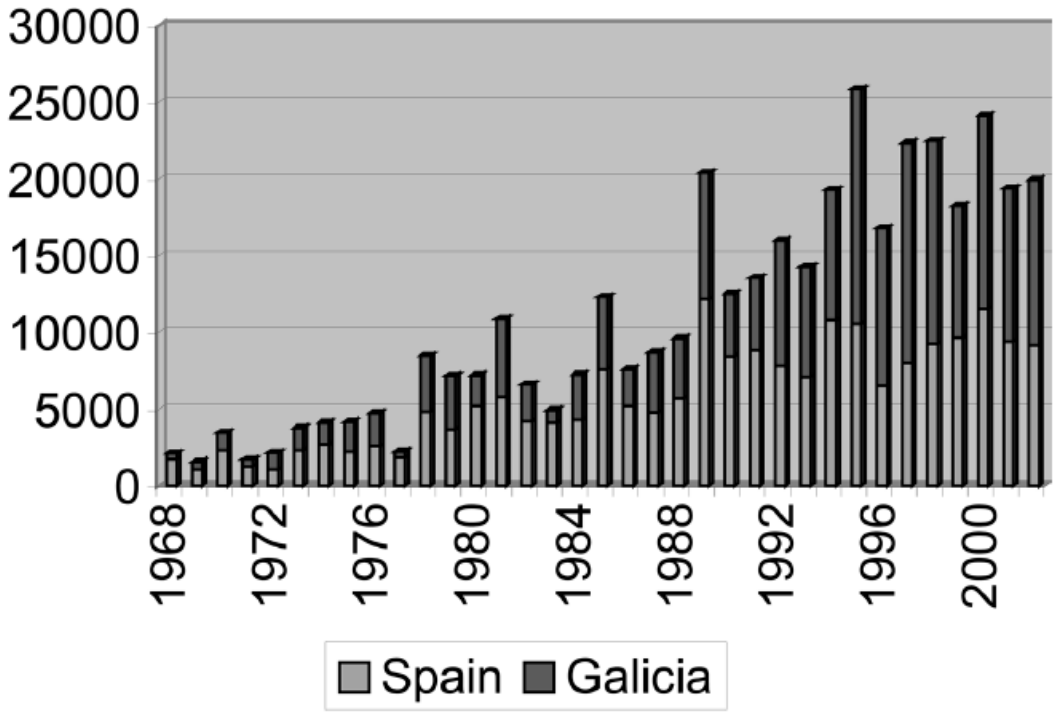
General Climate Reference Data

- Spain's worst drought on record in 2004-05
- Ever increasing incidence of forest fires in Iberia
- 2005 Worst hurricane season ever, AGAIN, in the US
- "So many hurricanes they ran out of names" in 05
- Strongest EVER recorded hurricane (Wilma)
- Extreme drought in Amazon rainforest 2005
- "Unexpectedly bad" floods in France, UK, Germany, Mexico, Guatemala and Austria in 2000-05

Number of Incidents of Forest Fires 1968-02



Source : Francisco Seijo Study Oct 2005

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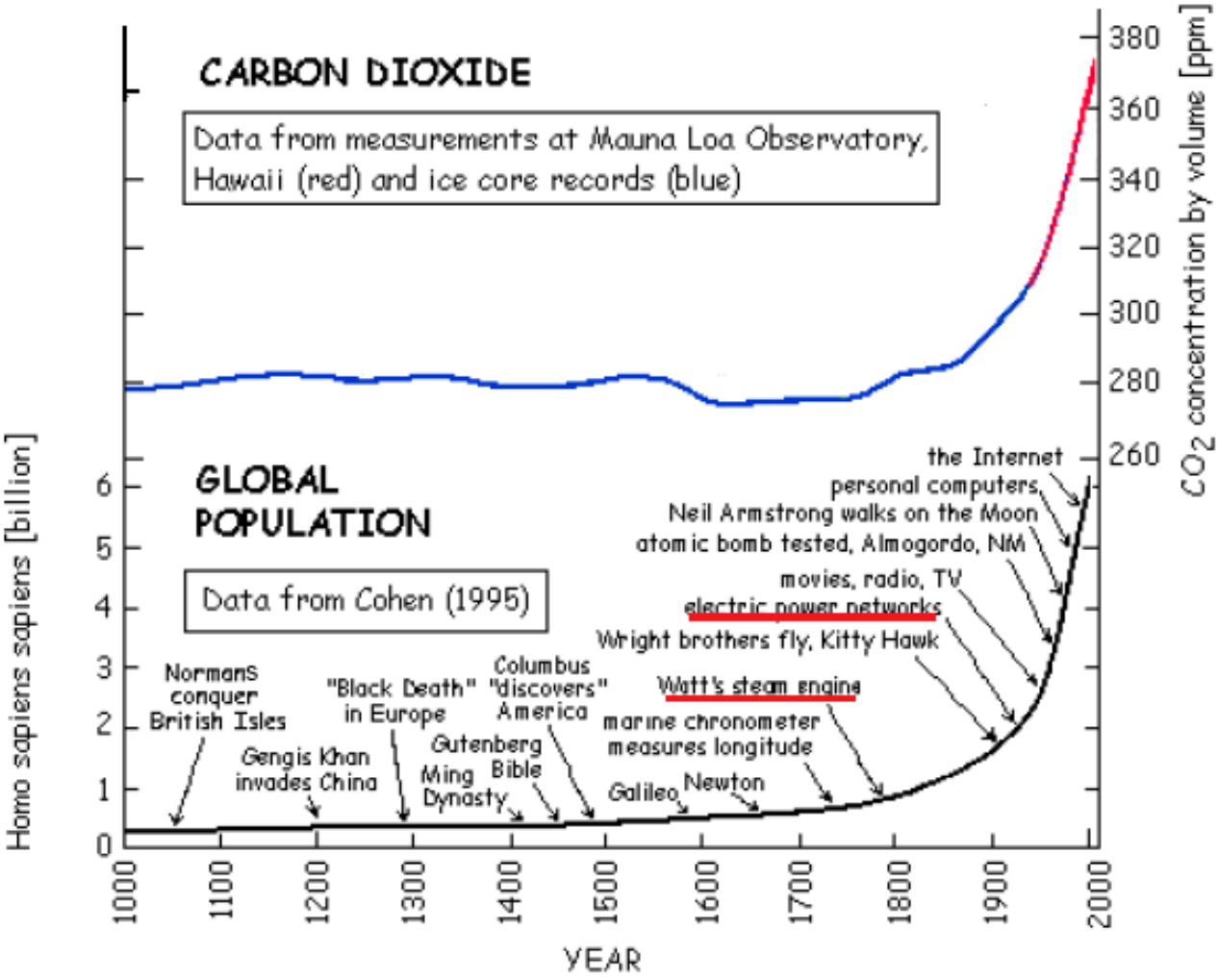
CO2 Concentration Info



UN Framework on Climate Change Quote:

"The principal reason for the mounting thermometer is a century and a half of industrialization: the burning of ever-greater quantities of oil, gasoline, and coal, the cutting of forests, and the practice of certain farming methods."

Source : Brookhaven National Laboratory, US Dept of Energy

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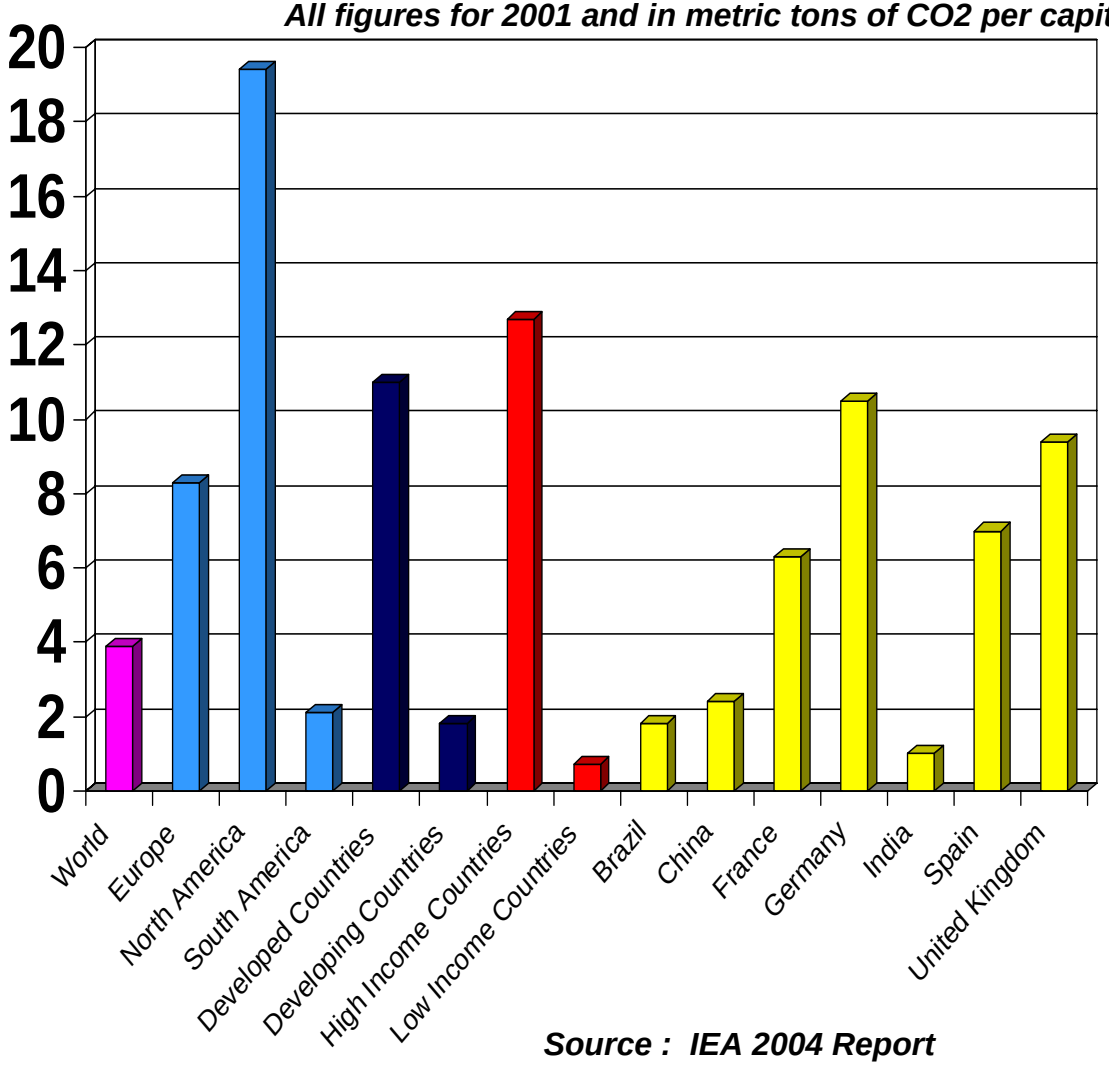
CO2 per Capita Figures

- The “Developed” or “Industrialized” Nations are responsible for 78.8% of the historic green house gas emissions from 1900-1999 *(source WRI)*

All figures for 2001 and in metric tons of CO2 per capita



Source : IEA 2004 Report

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The Carbon Markets

Evolving and Overlapping Markets

***EU ETS**: Benchmark; commoditized, exchange traded; two distinct phases:*

Phase 1 (2005-7): €5-30

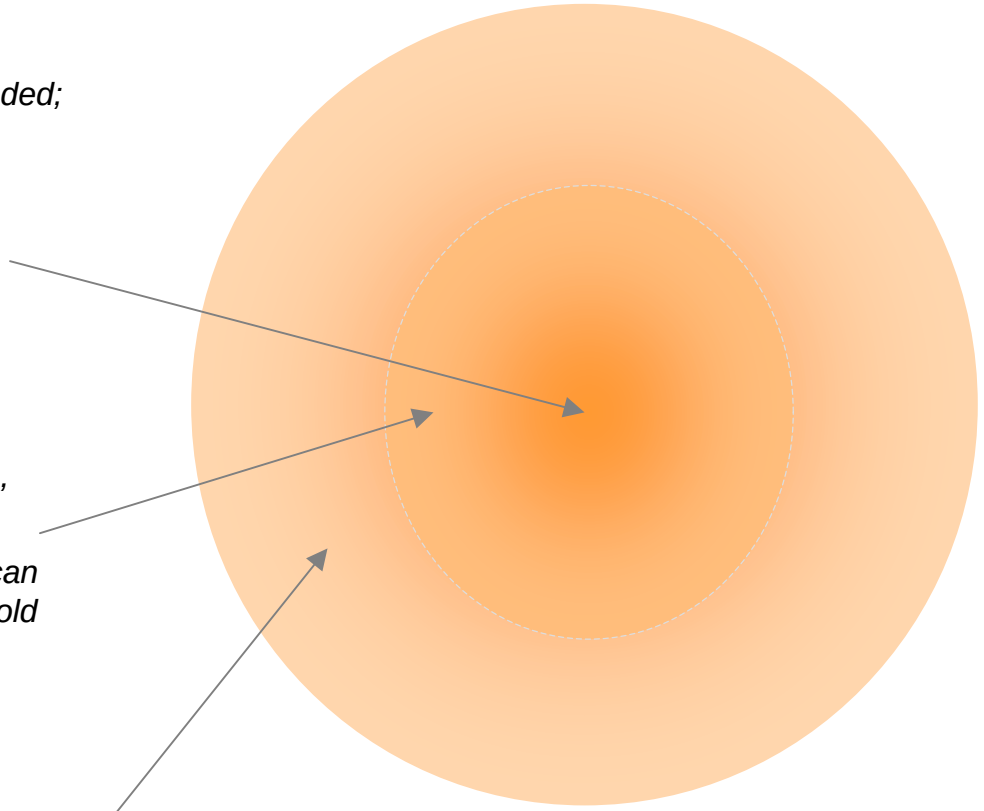
Phase 2 (2008-12): €5-30

Phase 3 (2012-?

***Kyoto Flexible Mechanisms**: much larger volume, projects in emerging markets and EITs*

currently €4-12; some can be used now; all can be banked into 2008-2012, and beyond; or sold outside EU

***Offsets**: variable quality, demand driven by compliance outside Kyoto or by consumer demand (wholesale and retail); potentially the largest market of all*



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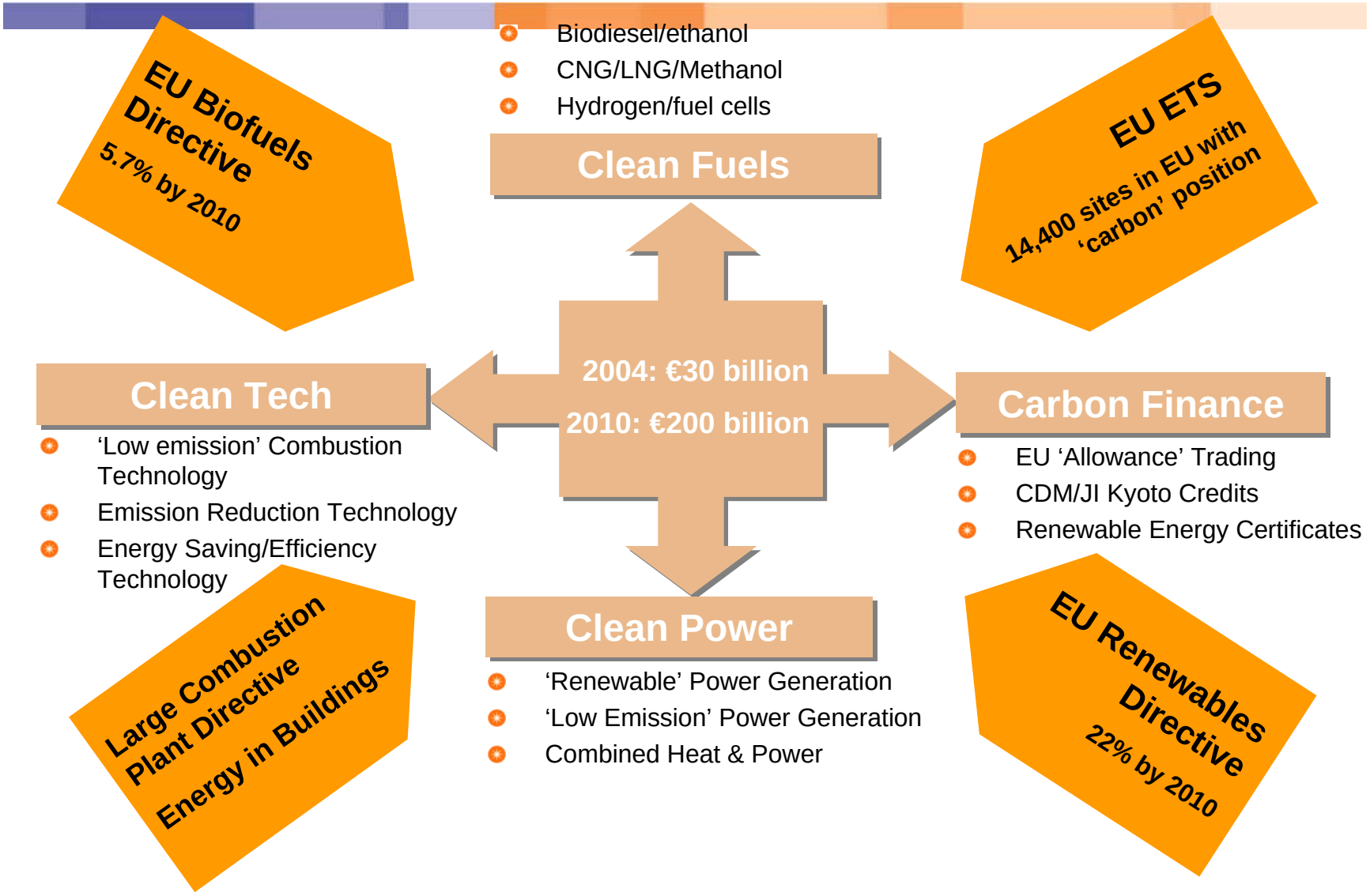
Related & Growing Markets with Major Policy Influencers



Opportunities in Carbon Finance

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The Investment Case

- The carbon market, though embryonic, is growing very rapidly.
- Policy created the market and policy will shape it
- Policy will not make a U-turn
- Demand will be sustained:
  - EU Target of 60% – 75% cuts in 1990 Emissions by 2050 will drive long-term demand i.e. no short-term fix
  - No magic technology bullets
- Increased Supply will be met by a tightening of the policy screw
- It's a global market – influenced by 1st and 3rd world policies, global and local issues, information asymmetry, project risks, weather and economic growth trends

Drivers to growth of carbon market and carbon value are complex and in aggregate are uncorrelated to equity market performance

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Market Size

- According to the US Council on Foreign Policy, the eventual size of the CO_2 trading market is $2.5 trillion to $3 trillion.
- 265million tonnes traded in first year of EU ETS
- 2 billion tonnes of CERs forecast pre 2012 (Point Carbon)
- Chinese economy, world's most dynamic, with most ambitious target for renewables, building UK power sector each year, aggressively targeting CDM for inward investment…(known at World Bank as 'China Development Mechanism')
- ERUs and AAUs: >1 billion tonnes
- Voluntary Market: currently lagging compliance market but potential to offset process and product emissions of transport, energy and other industries
- Voluntary to become mandatory?: Korean companies already procuring VERs in anticipation
- Dec 2005 UNFCCC Meeting of Parties promises geographical and sectoral growth of carbon finance (eg transport systems)
- US: North-eastern states, California and cities developing trading schemes and targets

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Investing Successfully in the Carbon Markets

- **Success requires specialist knowledge that is difficult to replicate:**
  - Policy & research dynamics
  - Energy market dynamics
  - Legal/technical/financial risks
  - The ability to source carbon
  - The ability to manage and distribute carbon

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Macro and micro risks

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Macro versus Micro Risks:

- **Macro risks include systematic issues such as**
  - the price of EU allowances,
  - restrictions on the import of CERs and ERUs into the EU ETS,
  - the impact of large-scale government-to-government AAU transactions on prices in the CDM market,
  - the projected coal-gas spread

- **Micro risks include the deal-specific risks which may lead to counterparty default or under-delivery of emission reductions**
  - Technological risks
  - Policy risks
  - Project finance risks
  - Legal/contractual risks

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Macro risks: The International Legal Architecture

- **"Developed World"**
  - Set a target GHG emissions for 2008-2012
  - Cap of -5.2% of 1990 emissions
  - Assigned Amount Units (AAUs) given to each country
- **Countries could "trade" AAUs**
  - Countries with surplus could sell to those with shortfall
- **Flexibility Mechanisms**
  - Clean Development – investments in developing world
  - Joint Implementation – investments in "capped" countries
- **UNFCCC infrastructure**
  - Oversees registries/inventories and certification
- **Penalties**
  - Excess emissions reduce post 2012 cap with 30% uplift
- **No caps for Developed world**
  - China & India etc. are signatories but emissions are not "capped"
  - Belief that Industrialised world needs to be penalised for past behaviour
- **Limited use of "Flexibility" mechanisms?**
  - Intended as a means of encouraging investment and technology transfer from developed to developing world
  - Constraints introduced by the definition of:
    - "Additionality"
    - Supplementarity
  - CDM Executive poorly supported
  - Decisions have been reversed
- **Little visibility post 2012**
  - G8 summit was inconclusive

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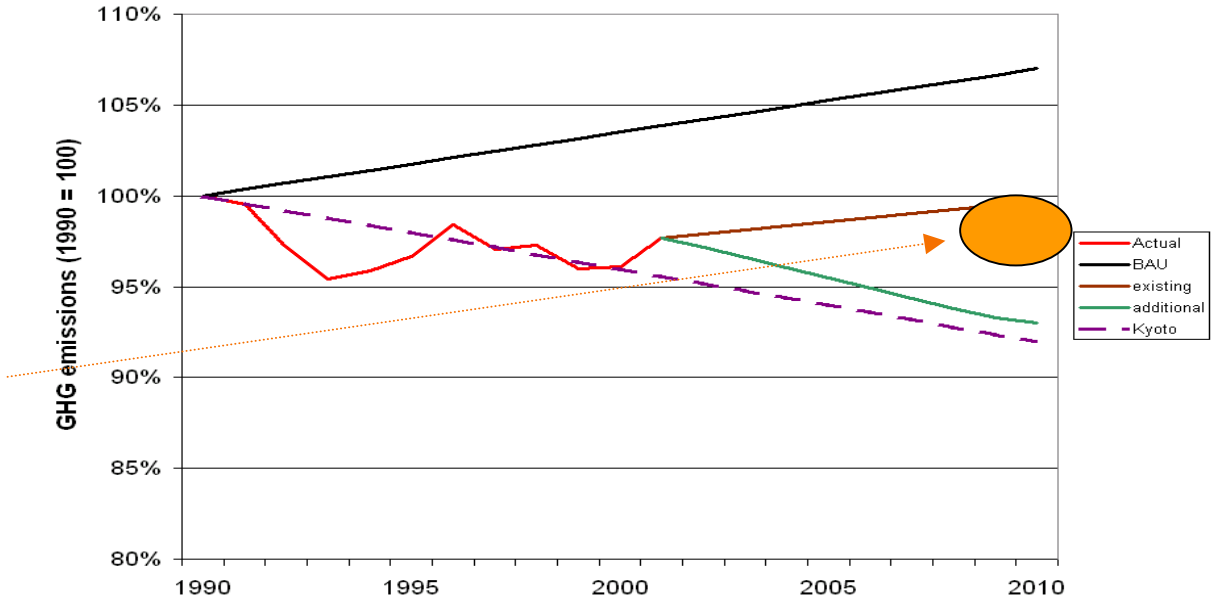
Macro risks: Initiatives and Trends

- Europe has many Directives that reduce GHG emissions
  - Renewables
  - CHP
  - Burden Sharing Agreement
- Europe on track to overshoot objective by 7%
- Additional measures are forecast to reduce overshoot to 1%
  - Labelling
  - Energy Efficiency of Building
  - Biofuels
- Trading should close the gap
- CERs and ERUs can be used via the Linking Directive

European Greenhouse Gas Emissions



Source: European Environment Agency, November, 2003

So Flexible Mechanism both used by governments to help set NAPs
and by EU ETS operators within the EU ETS

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Macro risks: Drivers of EU ETS prices

- Abatement targets set by policy
- New entrants reserve
- Fuel prices
- Weather
- Economic growth
- Technology

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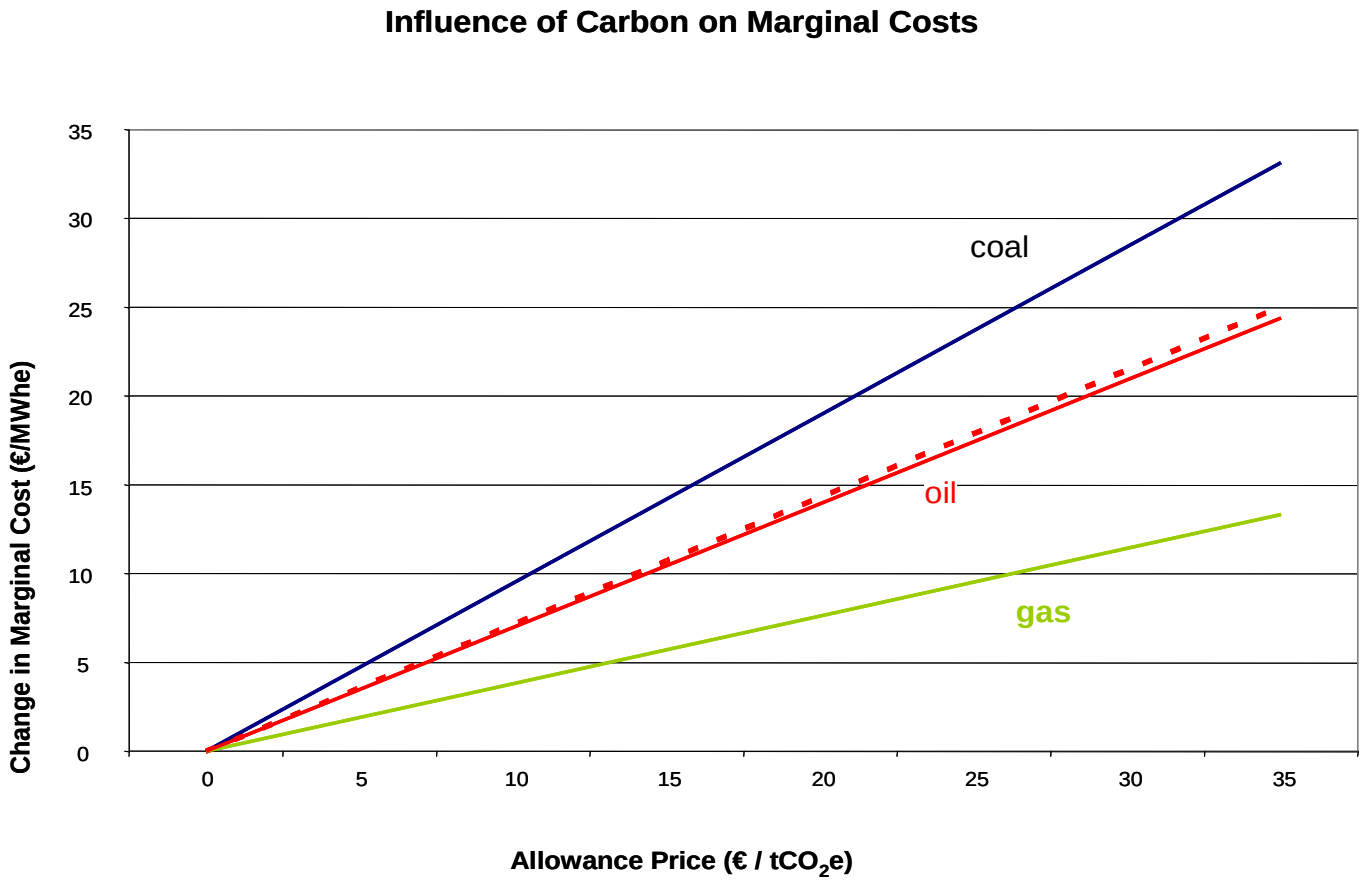
Macro risks: Carbon price formation

Different technologies and fuels have different carbon intensities



With the NAPS set, fuel prices, NER and Flexible Mechanisms drive price.

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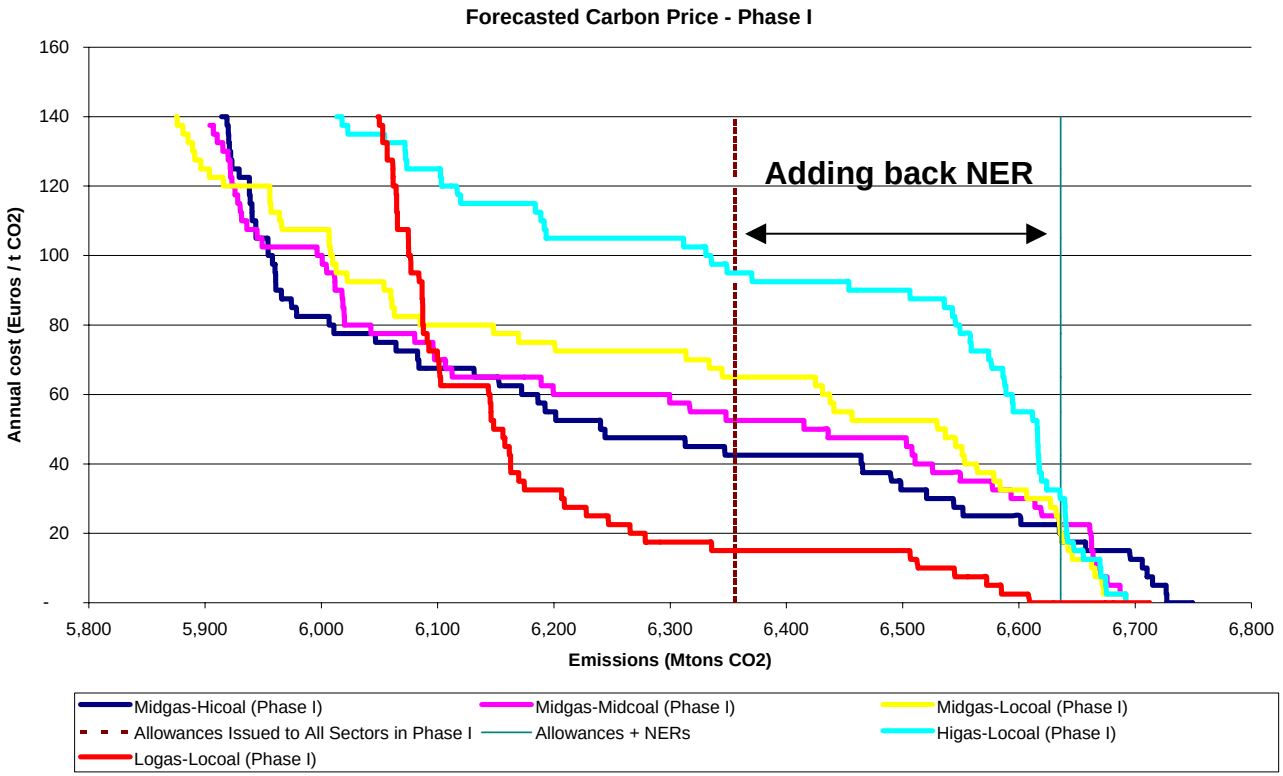
Macro Risks: Price Behaviour Analysis

The "imputed price" is considerably higher than the traded price. Thus traders appear to be hedging marginal movements in fuel and carbon prices. The absolute level may reflect the fact that any shortfalls may be rolled over until March 2008, by when fuel prices, especially gas, may differ. Indeed, the utilities, the major players in these markets, have no immediate need to take any action, seeing that they can pass on costs. At the very least, it is likely that they would apply a 3-year discount to the price they may have to pay in 2008. Alternatively, the market may be more sophisticated. The forecast provided in the chart indicates that the shortfall in Phase I is likely to be lower than the 200 mtCO_2 suggested by the NAPs, when the NER is added back. Thus the allowance price is likely to become particularly sensitive to volume changes, particularly at the end of 2007.



The price of EUAs is more sensitive to gas –coal spread than market short.
BUT NOT AT THE EXTREMES!

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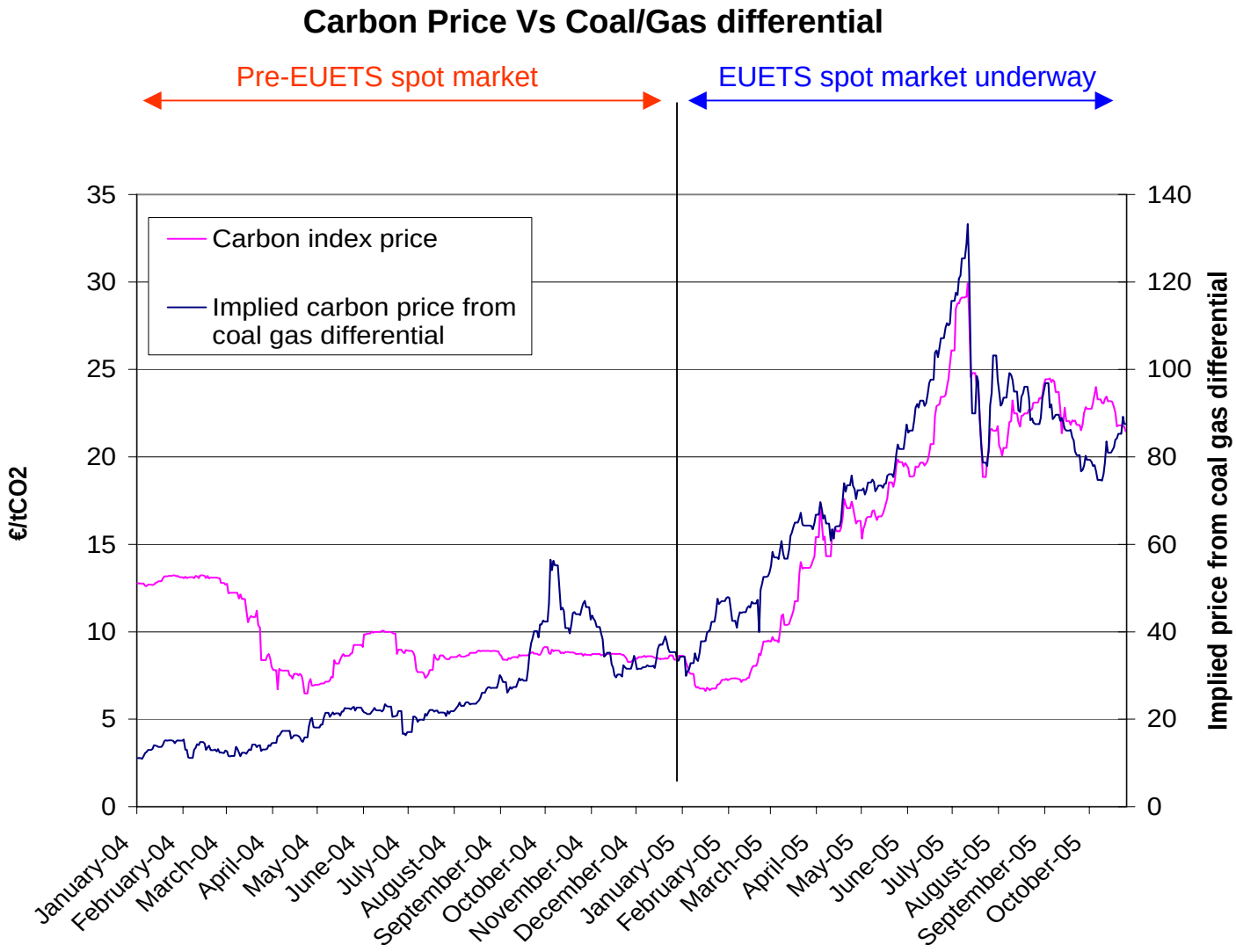
What are EUA Prices?

In 2004, prices were driven by perceptions of demand.

Once allowances were issued, a sensible relationship emerged.

We expect this relationship to continue after 2007

But what will the NAPs be for 2008-2012?



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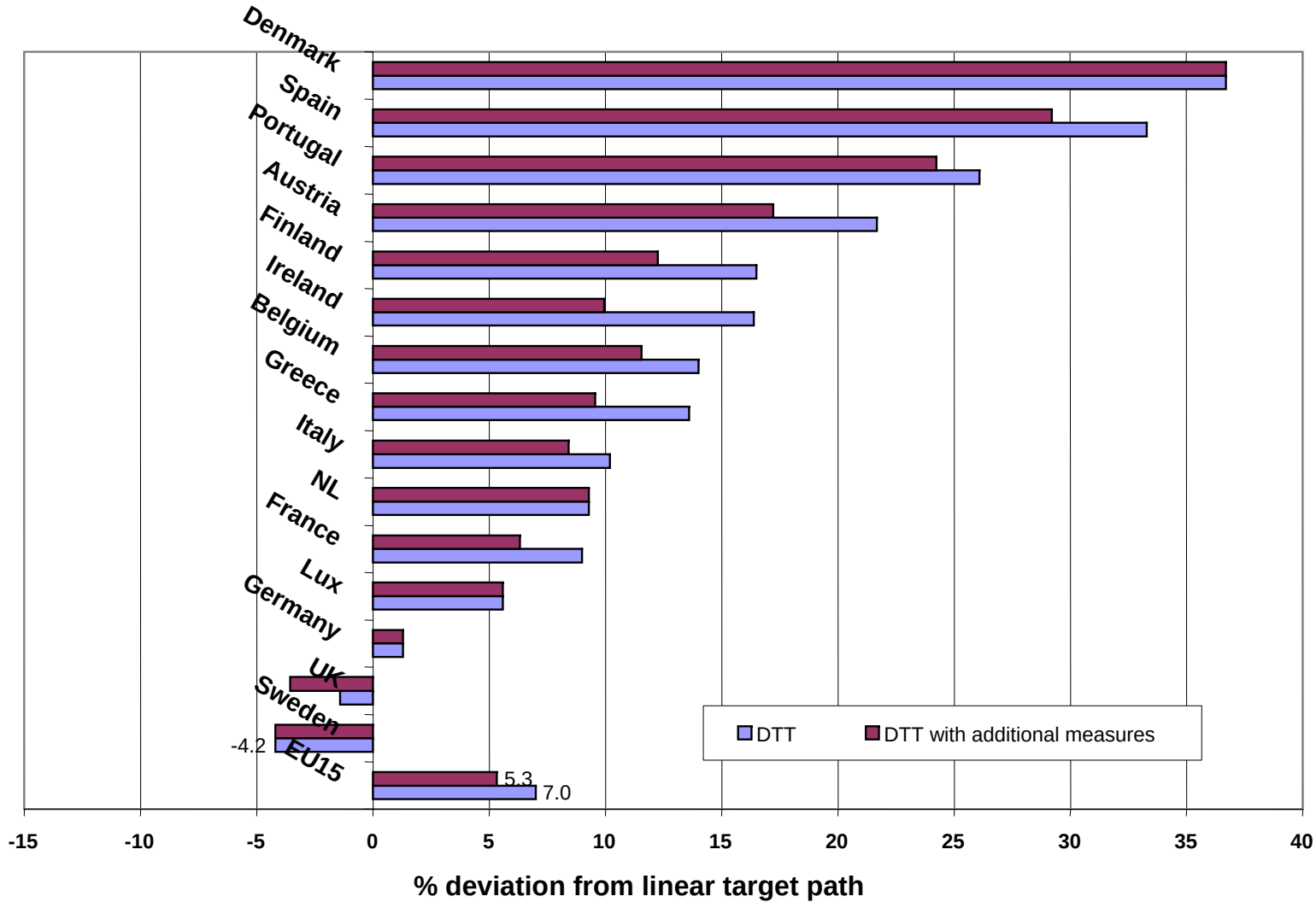
Macro Risks: EU15 performance at 2003

Most Member States are far from compliance.

This should mean tighter NAPs in phase 2.



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Macro Risks: Price Drivers for Phase II, 2008-2012

- But EU member states have other options…
- Use of AAUs:
  - The equilibrium price for AAUs is zero. Russia and Ukraine have, in theory, a big surplus.
  - But greening and ‘supplementarity’ will mean AAUs are used as a safety valve. (‘Supplementarity’ requires domestic action to be at least as effective in meeting targets as use of the ‘flexible mechanisms’).
- Availability of CERs/ERUs through Linking Directive
- Need to set NAPs by June 2006

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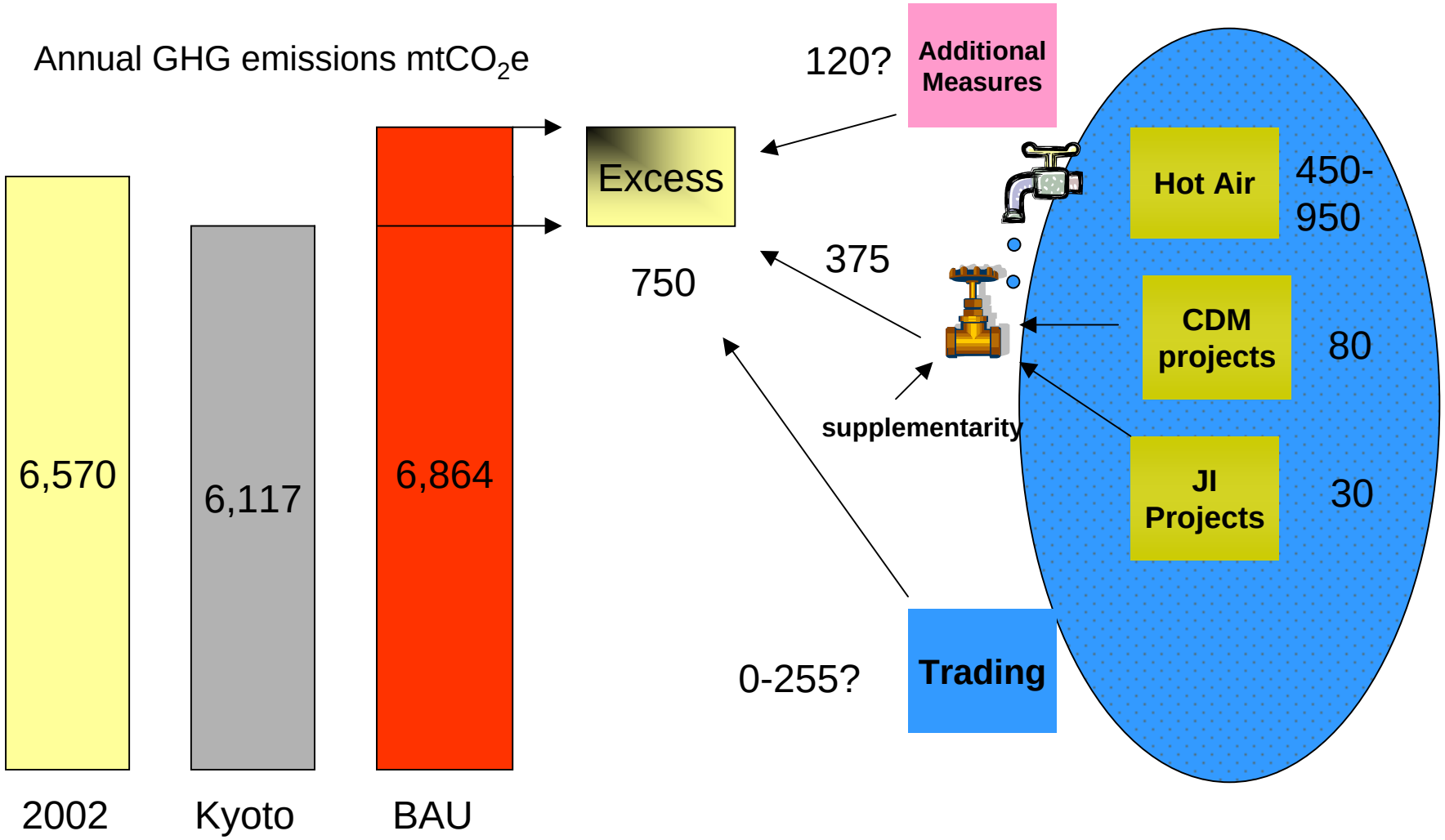
Macro Risks: Kyoto GHG Balance in 2010?



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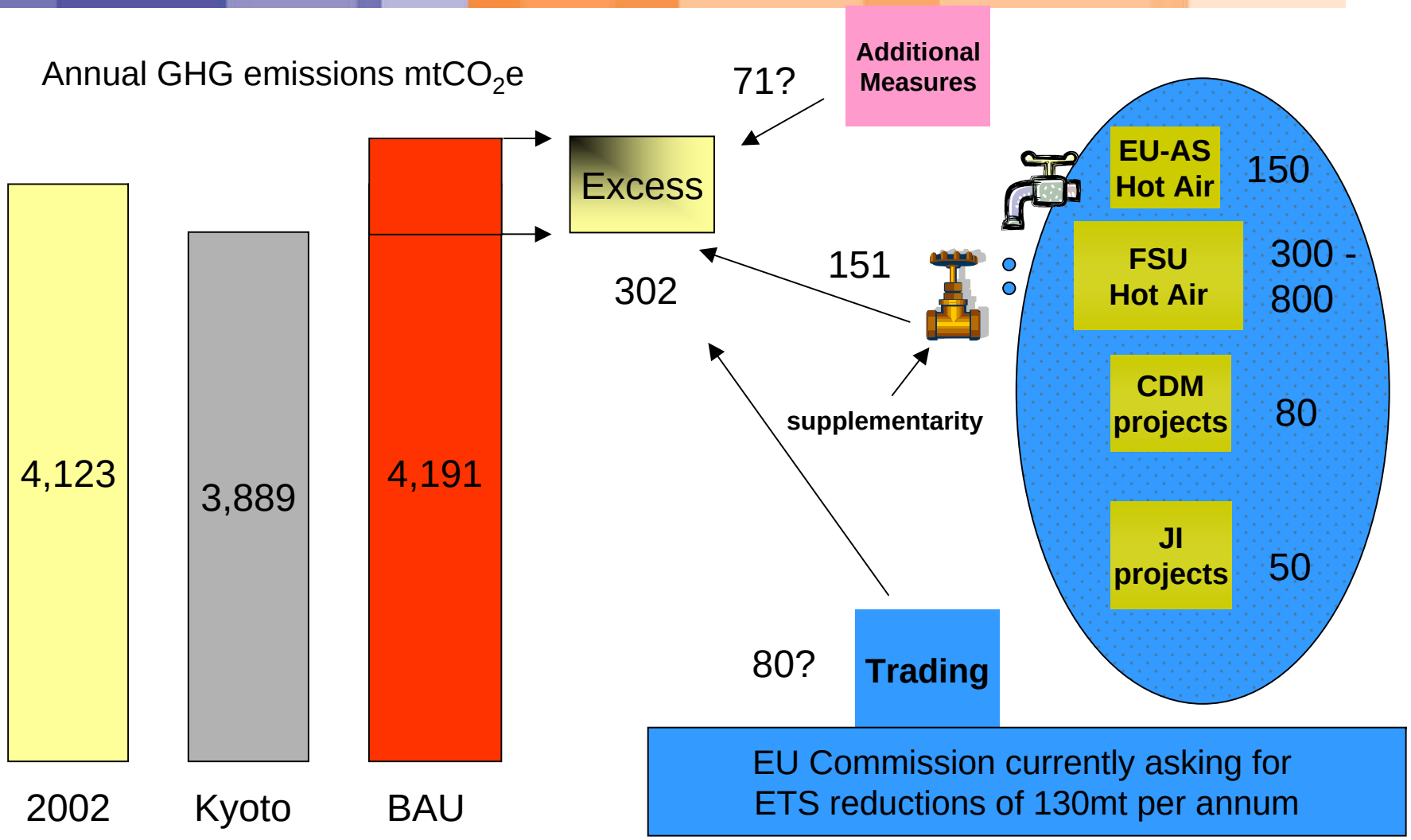
Macro Risks: EU-15 GHG Balance in 2010?



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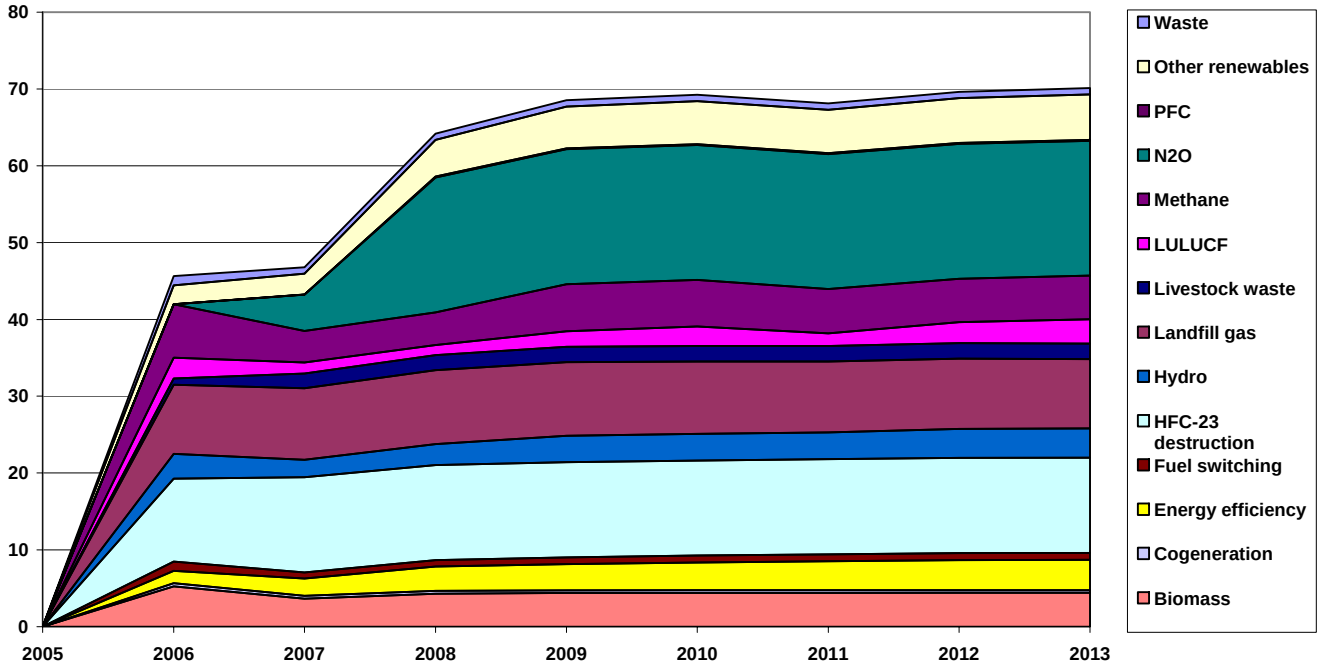
Macro risks: Flexible Supply of Allowances

Forecasting supply of CERs is fraught with uncertainties.

CCC forecasts for CDM and JI now nearer 2 billion tonnes pre 2012

Montreal MOP in November 2005 leaves regulatory uncertainty post 2012, but political momentum.

Publicly known projects could yield 500 million by 2012 - but actual supply nearer 1000-1500 million?



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Conclusions on Macro Risks

- Flexible Mechanisms will have a limited effect in phase 1 as supply of CERs will be restricted by CDM Executive Board process, and may be banked.
- But for phase 2, assumptions about use by governments of AAUs from EU-10 and Russia, Ukraine, Bulgaria and Rumania will be a key determinant of NAP.
- As will assumptions of use by governments of CERs and ERUs.
- Then once the NAPS have been set, supply of CERs and ERUs to ETS operators will be critical.
- So Phase 2 NAP may be tighter but not that much tighter for fear of hurting industry with very high prices. This will limit the effectiveness of EU ETS in investment decisions unless there is clarity about post 2012.
- Fuel prices likely to remain critical with high gas prices leading to >€20 EUA prices perhaps up to €50.
- But supply of CERs and ERUs from China and elsewhere could be huge and might be bought by ETS operators as well as governments leading to <€20 EUA prices even if gas prices stay high.
- Volatility will remain very high as there is considerable uncertainty about all of these dynamics. It is prudent to manage risk dynamically.

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Micro risks: Technology and Project

- CDM and JI are designed to support projects which are not truly commercially viable (otherwise they would not need carbon finance and hence would be categorized as a "business as usual" outcome)
- Hence most CDM and JI projects involve the installation of technologies which are relatively new and unproven
- Examples: catalysts for the decomposition of nitrous oxide in fertilizer plants; equipment for the generation of power and heat from coal mine methane
- Since carbon funds making downpayments on ERPAs are essentially taking project finance type risks, it is essential that they understand the technical risks inherent in these project types
- Carbon funds which sign ERPAs with project developers are taking project finance type risks, especially where there is an element of advance payment
- Executing proper financial due requires a project finance orientation, skills, and experience

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Micro Risks: Policy / Regulatory

- The carbon market is driven by policy objectives and its rules are formulated at the international and national levels by negotiations within the UN framework
- The rules governing the calculation of emission reductions are complex and apply differently to each project type and indeed to each project.
- The quantity and value of an emission reduction asset depends on the quality of the preparation of the documents submitted for approval to the CDM Executive Board
- In this and other areas, a profound understanding of the policy/regulatory issues that govern emissions trading is essential to making sound investment decisions and portfolio management

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Micro Risks: Legal/Contractual

- Emission reduction purchase agreements (ERPAs) are specialized contracts which allocate rights over an asset which exists more in theory than in reality

- The ERPA is therefore the only hard evidence of ownership and an understanding of how risks can be mitigated through ERPA provisions is essential

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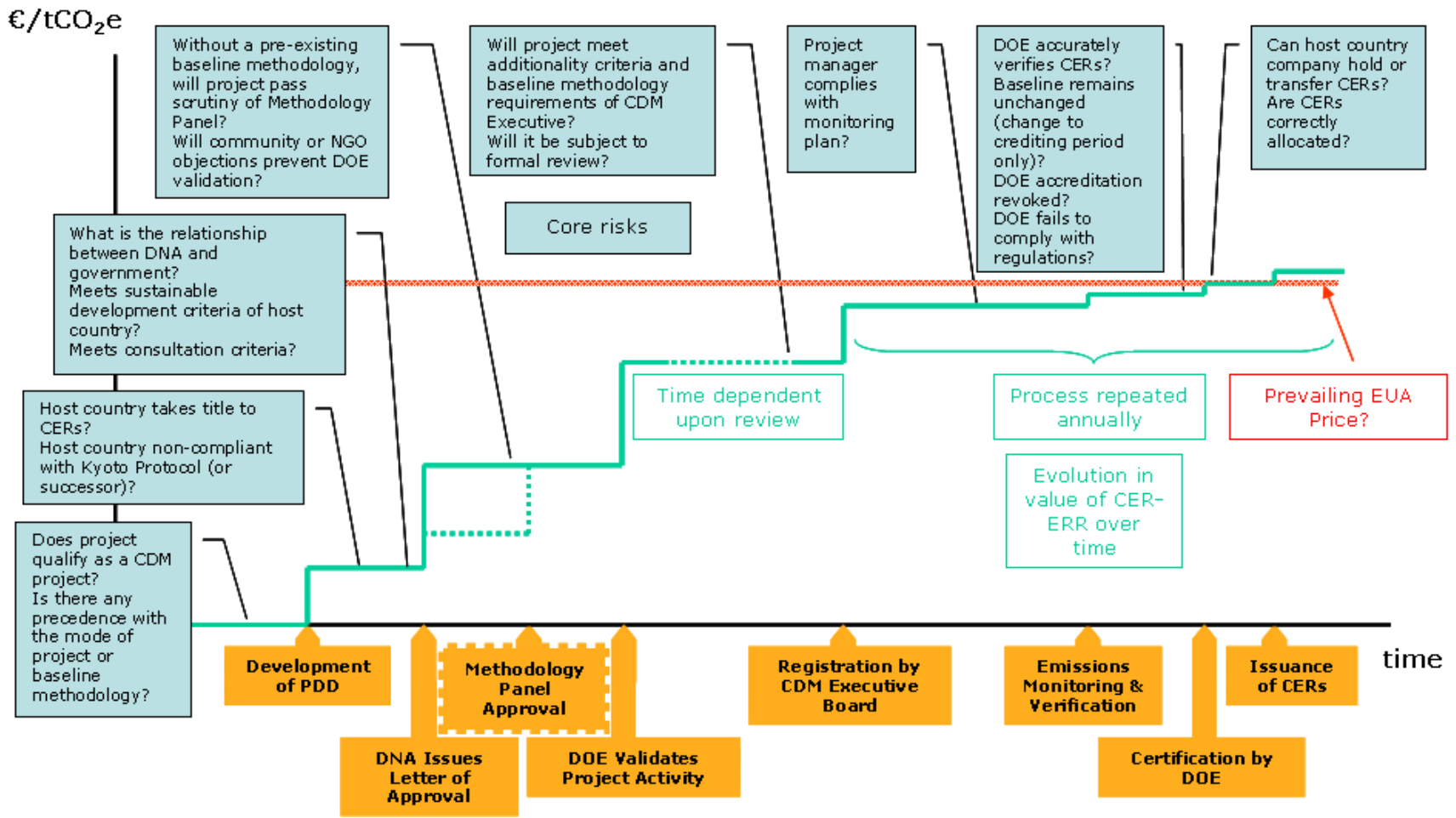
CDM – Value/Risk Timeline



But investing in CDM and JI is not easy!

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