

# The EU Emissions Trading Scheme – present lessons, future evolution

Presentation to Annual Forum on Energy & Sustainability  
Madrid, 15 Nov 2006

Professor Michael Grubb  
Chief Economist, the Carbon Trust

*Senior Research Associate, Faculty of Economics, Cambridge University*  
*Visiting Professor, Imperial College*



# Outline

- Introduction and early lessons
- Electricity sector insights
- Energy intensive consuming industries
- Uncertainty, instability and the role of auctioning
- Beyond 2012
- Core Conclusions
- *Not: additional sectors ...*

Phase I, intended as the initial, trial phase, proves success in market design and verification, reveals important lessons on profits and allocation

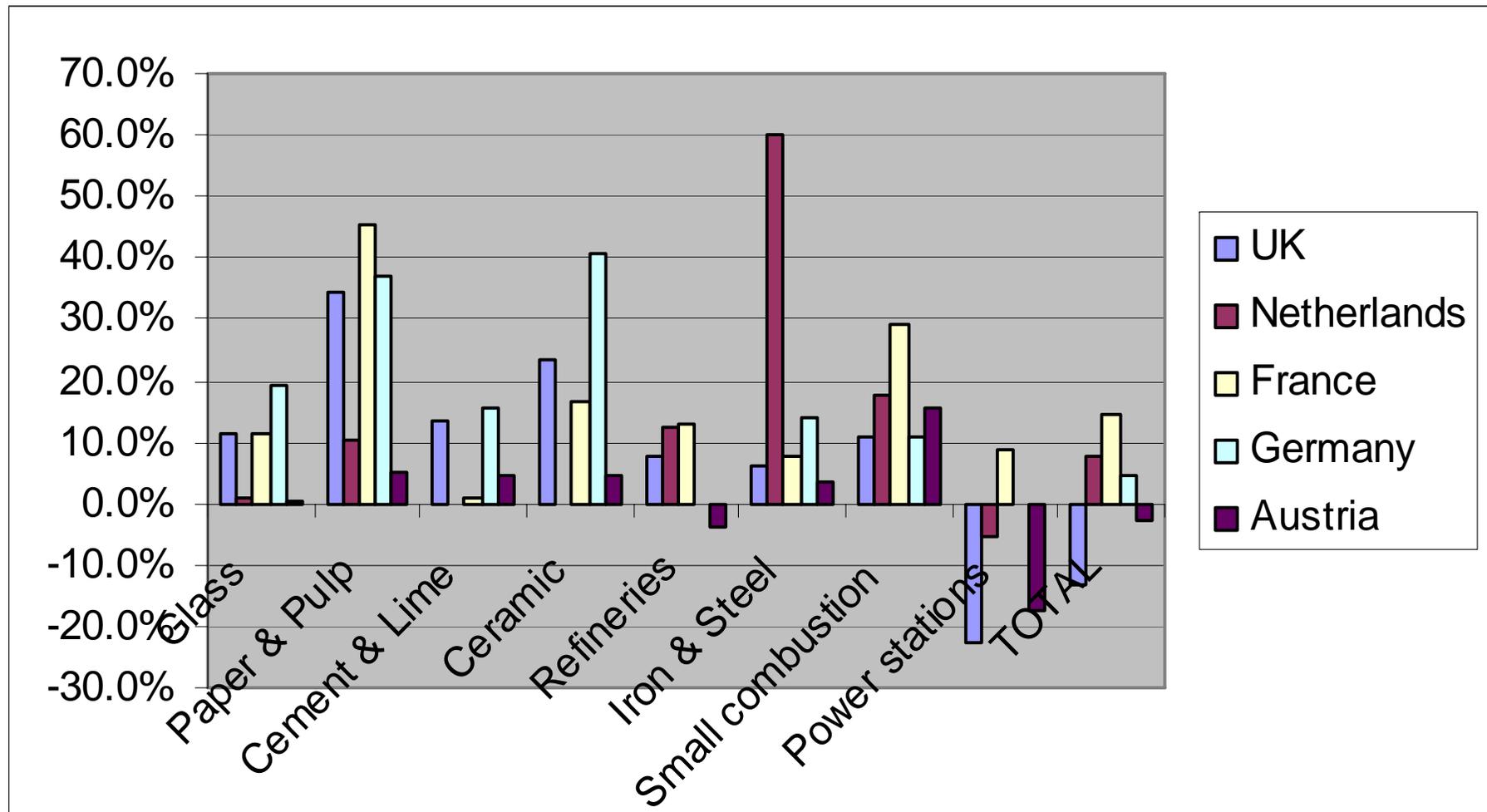
- An EU-wide market that gives value to company efforts to reduce CO2 emissions, and incentivises them to seek out the least-cost means of doing so
- The market mechanics have worked well – extensive trading through various mechanisms
- The stringent verification requirements have proved effective and valuable
- .. But raise questions about whether the threshold of 20MW thermal is too low, increasing transaction costs for small environmental gain
- Phase I confirms the predictions that some sectors (notably electricity) profit from the combination of free allowances and passing through the opportunity costs

# The recent market 'crash' – and reactions - point to the core issues

- “Allocation, allocation, and allocation ....”
  - The danger of small cutbacks combined with projection uncertainties
  - Gaming of the system given asymmetric information
  - lack of harmonisation makes it a problem of EU coordination
- .. And the response:
- Retrospective political interference undermining market confidence (German proposal)
  - Perverse updating incentives (2005 baseline)
  - Risks of carrying forward into Phase II (banking)
- These and lack of post 2012 certainly are looming concerns

# 2005 verification data by sector underline the ubiquity of the overallocation problem

Excess of >10% common in many sectors across leading EU economies – even greater in many others (esp Accession 10)

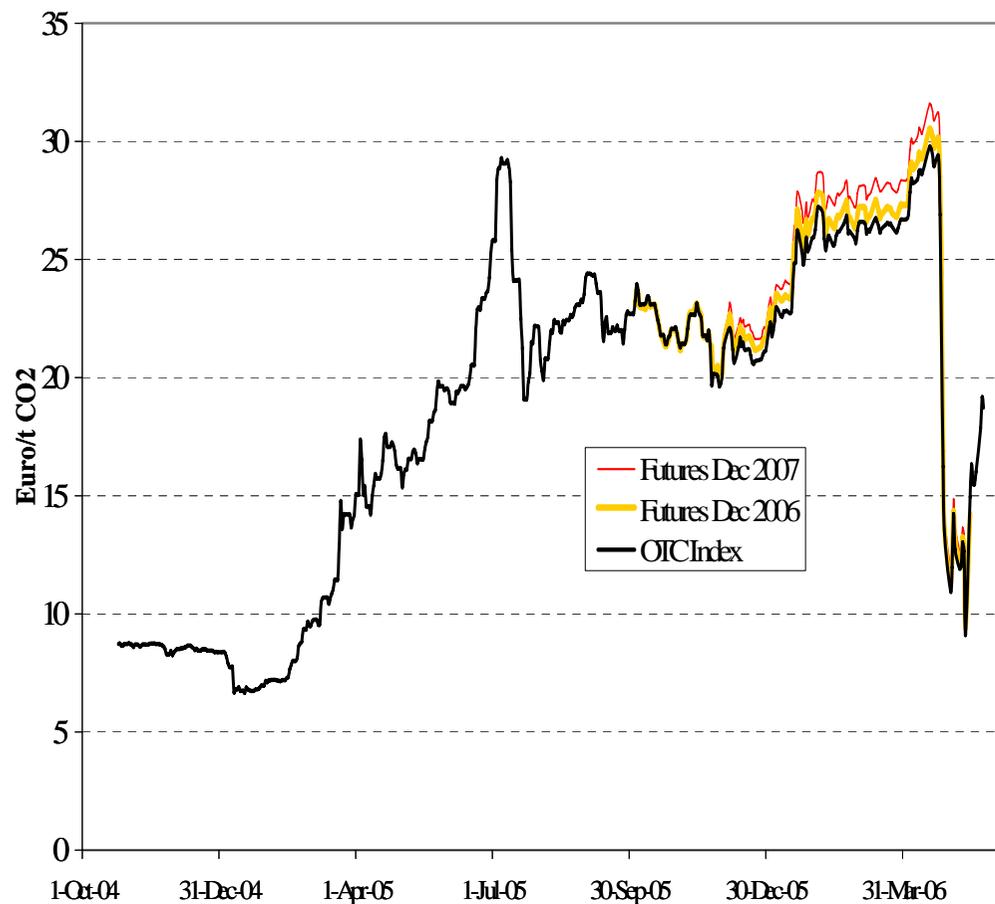


# BIG Money – though not quite in the way that some expected

- Disputes continue over the reasons for the surplus in 2005 - but it is some combination of overallocation and greater than predicted abatement (eg. in cement sector) (see recent paper by Ellerman and Buchner)
- At €20/tCO<sub>2</sub>, the asset value of 2.2bnCO<sub>2</sub> allowance is around €40bn/yr ... €100ms have been won or lost in trades against erroneous price expectations
- Where competitive electricity markets, pricing effects as expected lead to profits – totalling **several €bn** across the EU, swamping the modest net purchases in the sector
- In principle, similar mechanism could generate profits for some others (eg. inland cement), subject to external constraints ..

# A carbon cap generates economic rents

- which can lead in interesting directions and is an area inadequately considered by research to date ....



- Power sector profits from EU ETS c. €5bn? during 2005
- E.On announce €100m R&D Centre
- UK Environmental Transformation Fund announced 'co-incident' with Auctioning decision
- UK £1bn National Institute for Energy Technologies (NIET) announced to be 50:50 co-funded with private sector, initial sponsors E.On, EdF, Shell, BP.
- International and sectoral investment linkages emerging through the CDM

# Electricity sector insights

Making business sense of climate change



# Impact of CO2 allowance prices on electricity prices

- **In countries with liberalised markets and competition:**
  - Empirical evidence confirms that generators add opportunity costs
  - CO2 price of 20Euro/tCO2 increases electricity price by 10-16 Euro/MWh
- This is neither an aberration nor unfair - it is a natural consequence of efficient pricing in a competitive market
- **In countries *without* competitive retail prices:**
  - Regulation or threat of regulation can prevent pass through of opportunity costs to domestic consumers
  - If governments intervene to prevent pass through to industrial contracts, then transparency/liberalisation further reduced
  - Likely to undermine incentive structure of ETS towards efficient investment and operation as CO2 prices are not internalised
- And with competitive markets, price pass-through *is* affected both by electricity market structure and CO2 allocation methods

# Repeated allocations to power sector incumbents can lead to significant distortions, - degree and nature depends on allocation method

		Auction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Benchmarking	{	Capacity only	X			
		Capacity by fuel/plant type	X	X		
Updating from Previous periods	{	Output only	X		X	
		Output by fuel/plant type	X	X	X	X
		Emissions	X	X	X	X

## Impacts

- Increased expenditure on extending plant-life
- Inefficient fuel choice
- Less efficiency improvements

Discourage plant closure  
 Distortion biased towards coal  
 Shields output from average carbon cost  
 Distortion biased towards coal  
 Reduce incentives for  
 Efficiency-improving investment

## Closure and new entrant allocation rules can induce additional investment-related distortions

- Withdrawing allocations upon power station closure (“contingent” allocation”) leads to unwarranted life-time extensions (relative to new build), increasing system costs and allowance prices
- Allocation plans grant free allowances to new entrants partly to compensate for distortions created by closure conditions
- If new entrant allocation is fuel or technology-specific
  - The more CO<sub>2</sub>-intensive technology is shielded from CO<sub>2</sub> costs but benefits disproportionately from price uplift
  - Leads to inefficient *additional* investment in carbon-intensive plants, extra costs, and higher long term electricity prices
- If new entrant allocation is based on uniform benchmark (tCO<sub>2</sub>/kWe)
  - Acts as a capacity payment supporting all new investment
  - Can reduce electricity prices as it reduces scarcity premium and lowers marginal carbon intensity over time

# How much do these theoretical distortions matter?

- If power sector expects gas prices at levels up to c.2003, or expects free allocations to decline substantially across all technologies, perverse incentives may be short-run but not long-run / investment problem
- But many companies really “believe” the most recent evidence – and under current gas prices and allocations, if projected forward, allowance updating results in construction of new coal fired power stations
- *... even if these coal plants are subsequently rarely used, the value of allowance sales (opportunity cost) makes investment profitable and inflates future electricity prices*

*An inherent logic must minimise special closure rules and drive new entrant allocation rules towards capacity-based benchmark across EU*

# Energy intensive consuming industries

Making business sense of climate change



Focusing only on **volume** of allocation is shortsighted and misses issues more important to long-run incentives and competitiveness, ie. influence on prices

	Approx <b>UK</b> domestic output, 2001	Relative impact on value- added of 10% allocation change	Relative impact on value- added of 30% elec pass- through change
Pulp, paper etc	£8bn	0.12%	0.59%
Glass & Ceramics	£4bn	0.07%	0.27%
Cement & construct	£6bn	0.38%	0.46%
Iron & Steel	£8bn	0.73%	0.80%
Electricity	£30bn	1-2%	5%

**Total value of these commodity sales in EU over 2008-12 > €2000bn**

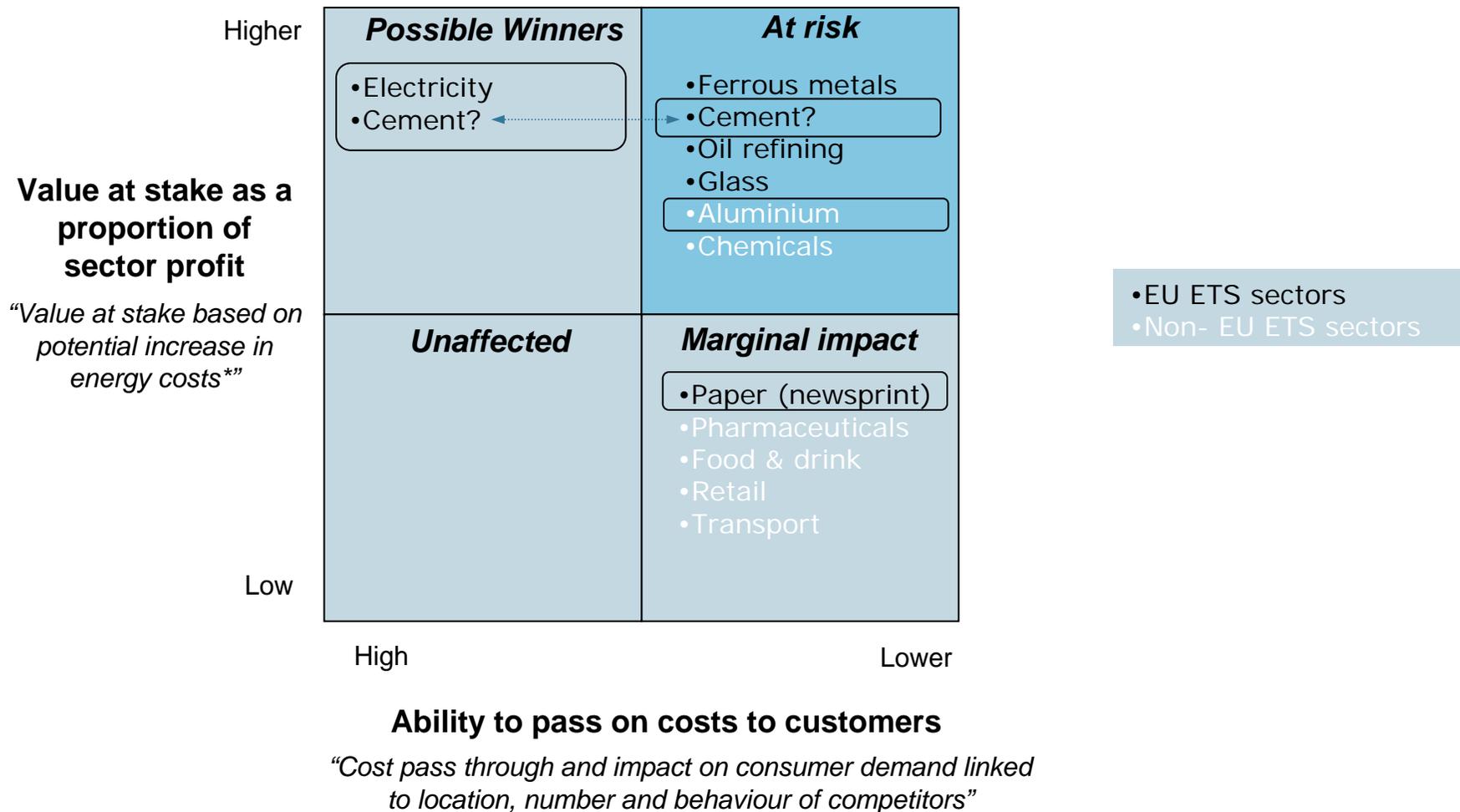
**A 1 or 2% change in product prices generally matters more than the current struggles over allocation and pass-through**

Key is to understand the difference between

⇒ *marginal incentives* – which affect prices and long-run competitiveness

⇒ and *allocation transfers* – which determine short run cash flows

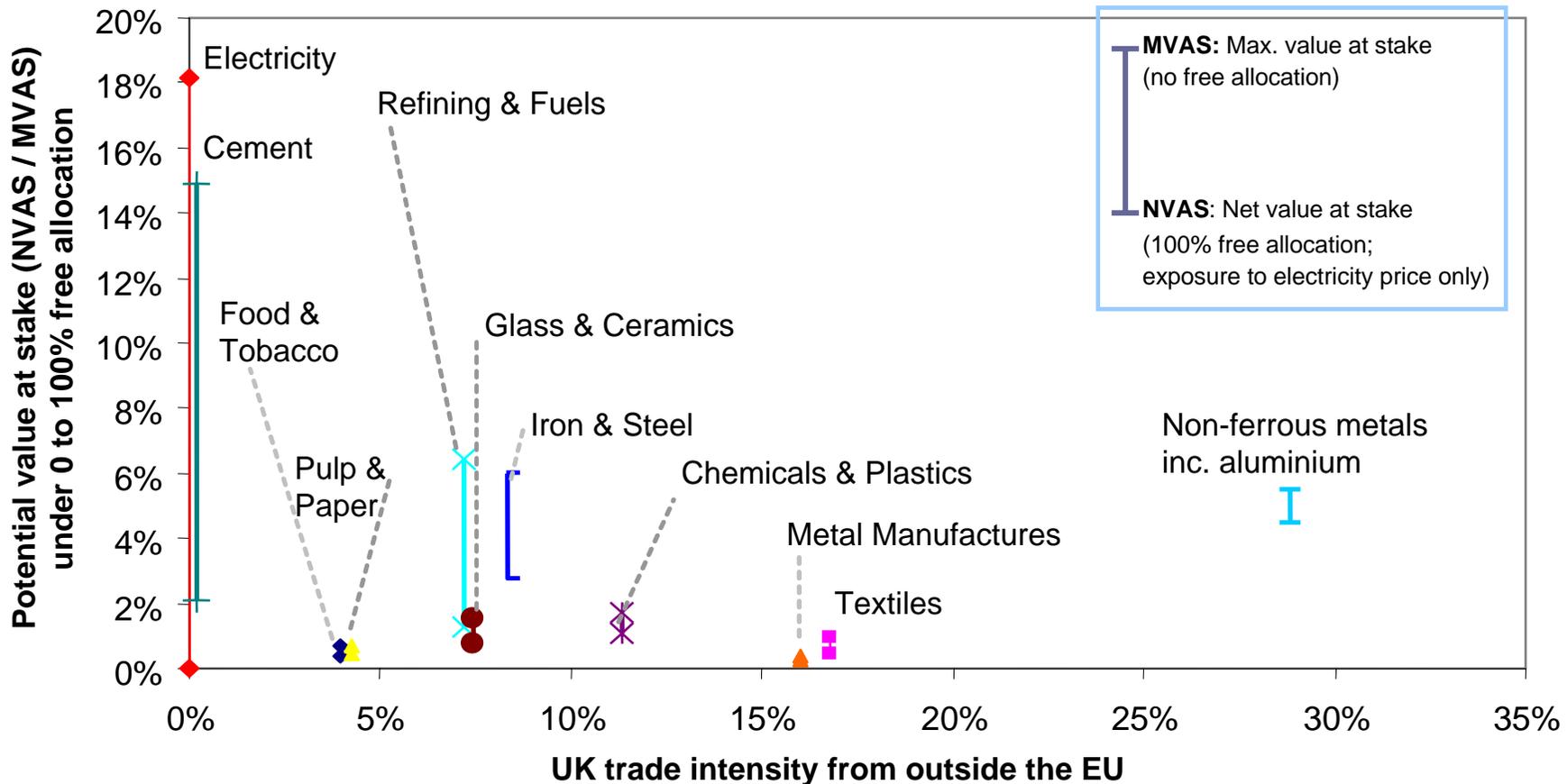
# Relative exposure of sectors will depend on value at stake and price pass through



Note: \*e.g. cost increase if 40% uplift in electricity price and allowances need to be purchased for ~10% of emissions – indicative value at stake in phase 2 of ETS scheme

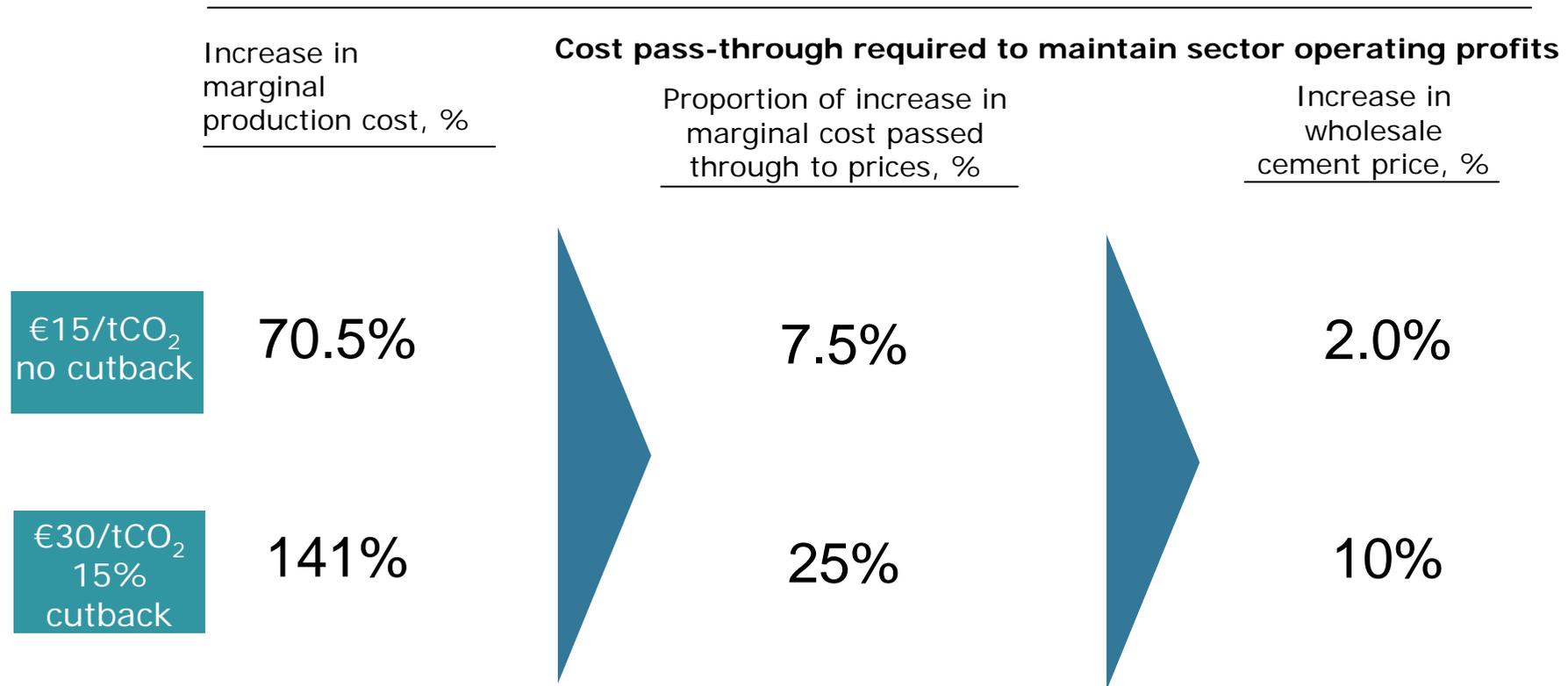
# Costs & competitiveness: profit/loss depends upon pricing policies and incentives, allocation, and trade situation

*net value-at-stake insufficient for major Phase II problems*



- **Upper end of range:** zero free allocation
- **Lower end of range:** 100% free allowances (effect of €10/MWh electricity price increase to sectors)
- Assumes allowance price of €15/tCO<sub>2</sub> and no CO<sub>2</sub> price pass through in sector

Even Cement has potential to profit from the EU ETS with modest price rises – but at cost of market share  
*e.g.* modest pass through needed to maintain profits but marginal cost change makes imports competitive near coastal ports



Scenarios 1 & 2, 100% direct allocation assumed helps offsets electricity price rise (c.90% cost pass-through in electricity)

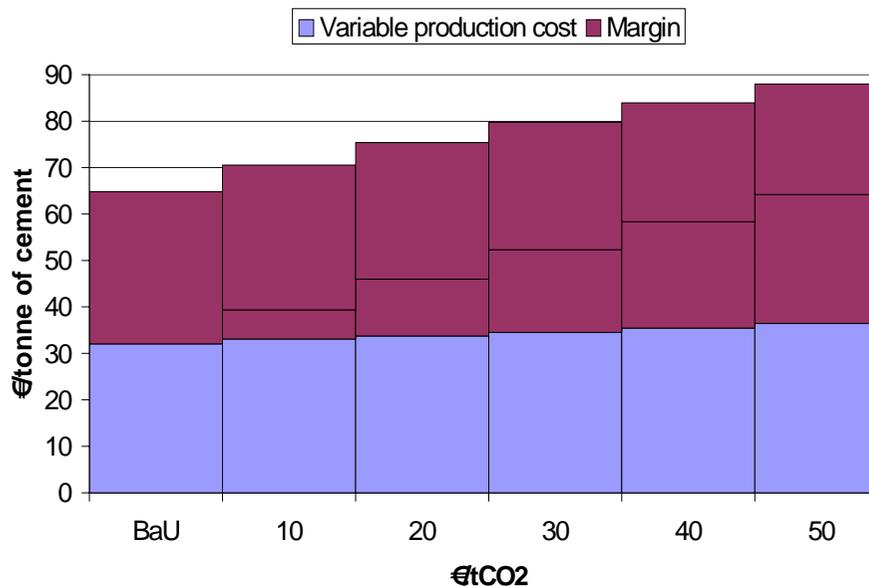
Long term scenario, required cement cost pass through increases as its direct allocation is cut back 30%

**Profit-maximising pass through predicted by Cournot modeling: >50%**

With fixed allocation, domestic cement costs rise and profit-maximisation leads to big profits with erosion of market share

## COSTS

Variable production cost increases;  
 → CO<sub>2</sub> opportunity cost increases but less than proportionally.

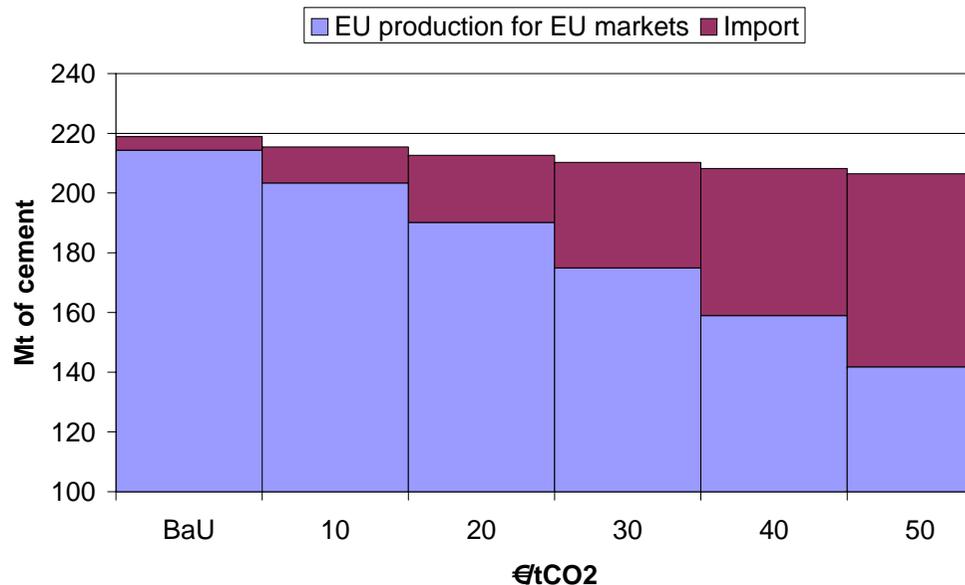


Margin over variable production cost increases, large aggregate sector profit

For 20€/tCO<sub>2</sub>, extended cost: +14€/t cement (~200km by road) domestic price: +15%

## VOLUMES

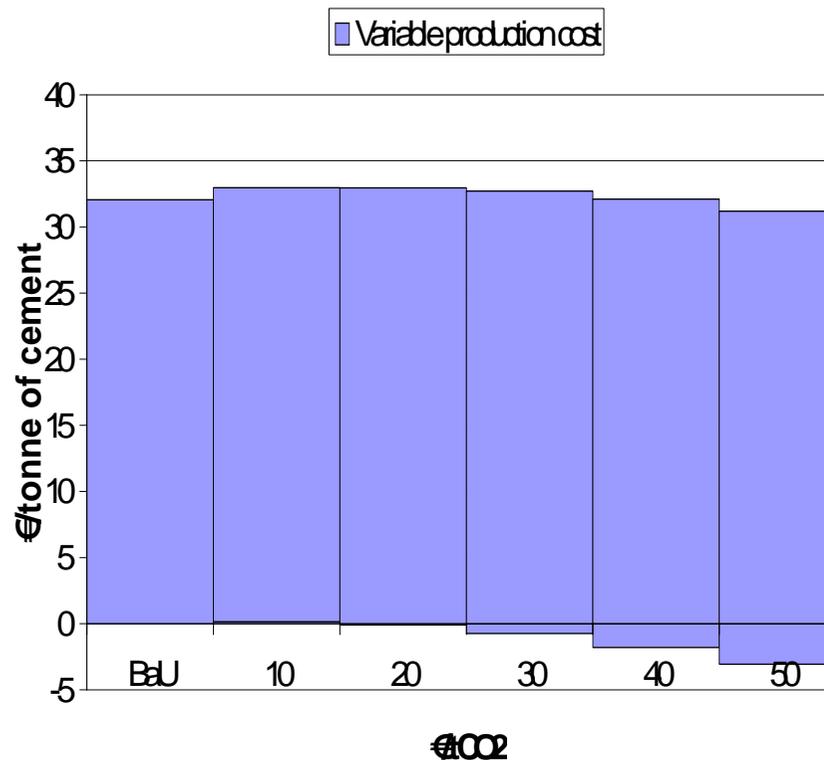
consumption not highly hit (-3% for 20€/tCO<sub>2</sub>) but big rise of imports  
 → Exports collapse.



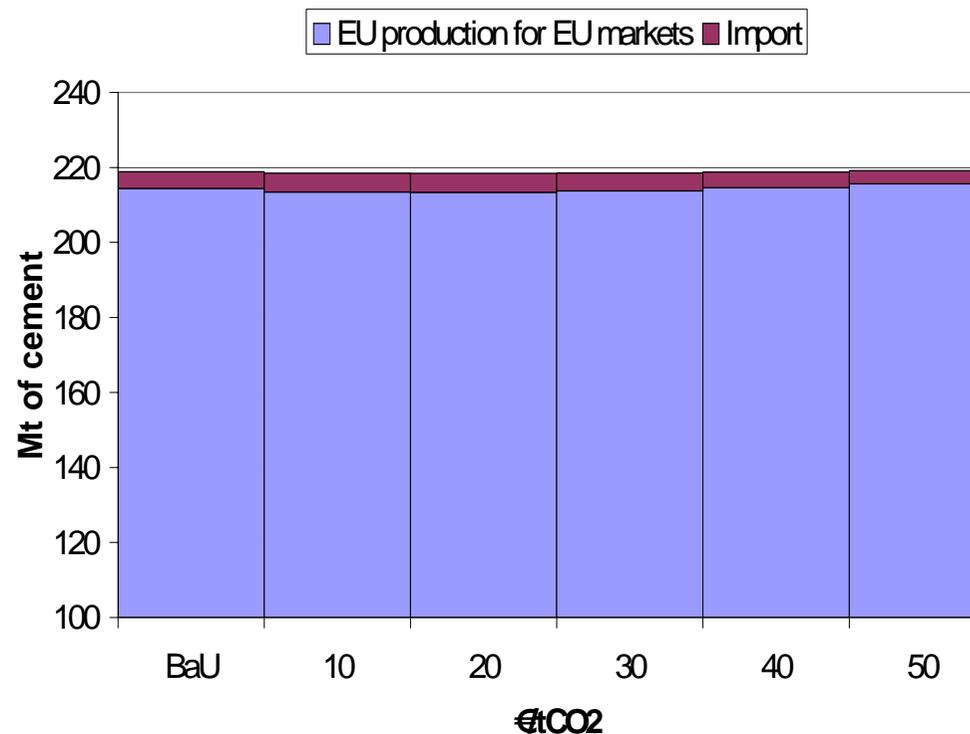
EU aggregate imports rise from 2% in BaU to 10% of consumption for 20€/tCO<sub>2</sub>

Output-based (intensity) allocation, per tonne of cement produced, changes picture dramatically by aligning marginal (opportunity) costs to average costs

## COSTS

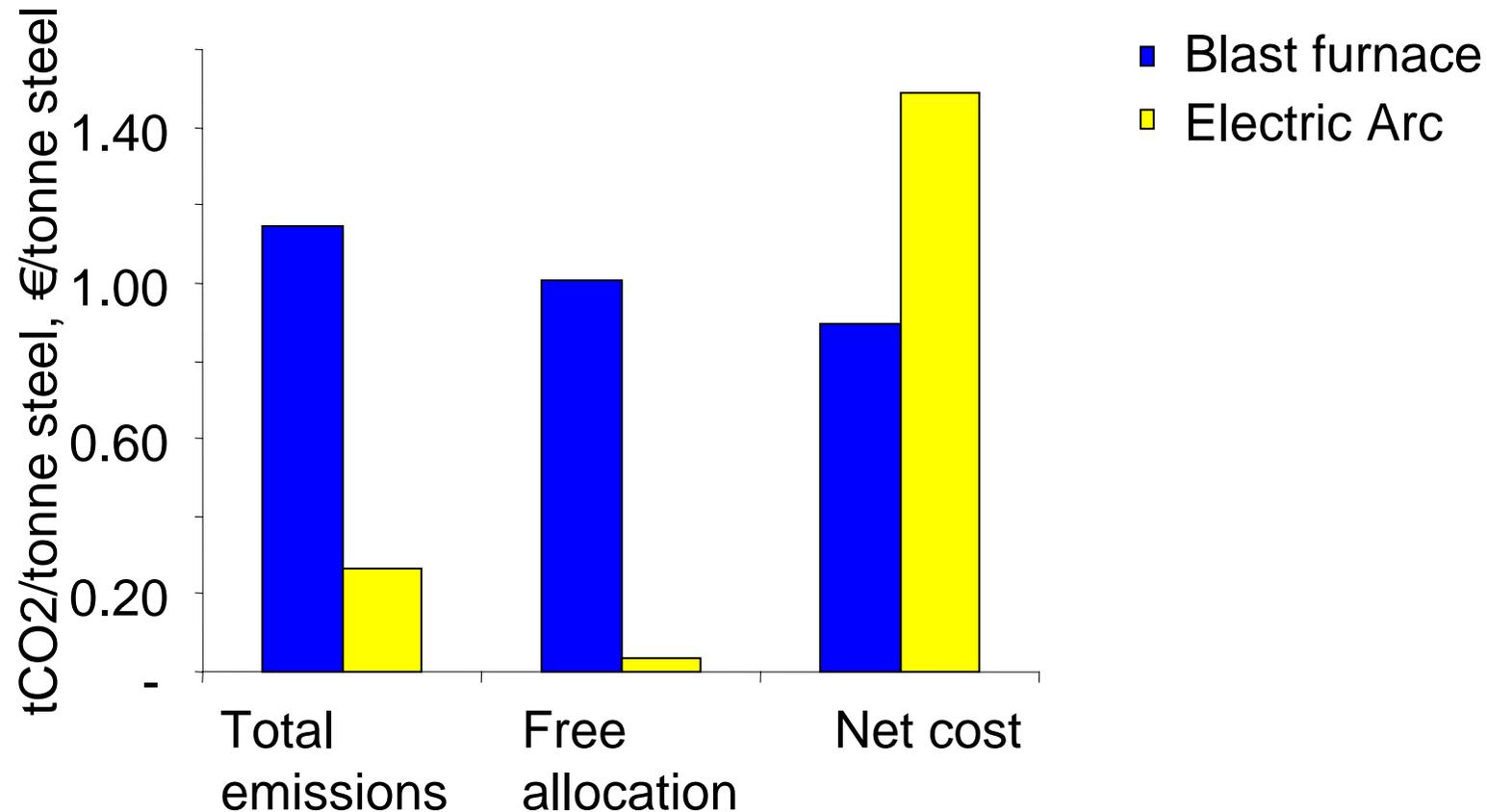


## VOLUMES



.... But shields the economy from the true cost of carbon and incentives for radical process innovation that avoid carbon-intensive intermediates ...

## Potential for distortions also in other sectors: Blast furnace vs. electric arc steel production



Integrated blast furnace the most carbon intensive.

But electric arc faces bigger cost deficit under grandfathered allocation.

However, important caveats due to limited substitutability of inputs & products

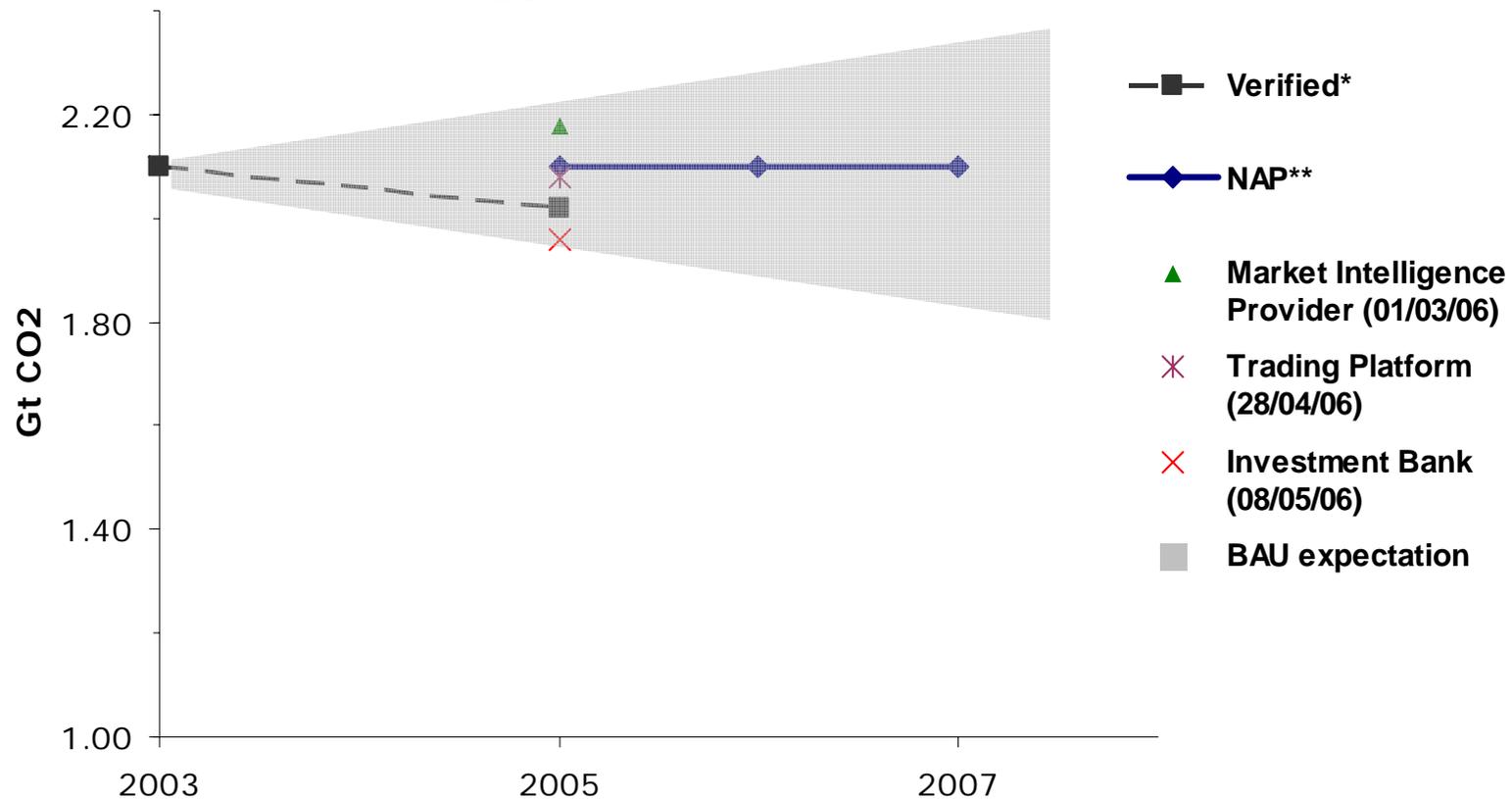
# Allocation, profit and competitiveness: understanding the Five Principles

- *In general*, the economic rents associated with CO2 constraints mean that free allocation gives *potential* to profit, subject to:
  - (a) degree of alignment of allowances with costs (eg. Not sectors outside EU ETS or affected primarily by electricity pass-through costs)
  - (b) constraints on cost pass-through due to imports and other factors
- Profit and market share are not synonymous, and *in short term they are usually in opposition*
- Accumulated evidence confirms that where there are competitive power markets, power sector is passing through bulk of opportunity costs, resulting in substantial profits and downstream costs
- Most other sectors within EU ETS can be expected to profit but to much less degree, with some loss of market share over time, details complicated by details of market regulation, by international trade, and by downstream company, regional and product differentiation
- New entrant, closure, and incumbent allocation rules all affect the incentives, pricing and efficiency of the scheme

# Uncertainty and the role of auctioning

# The price crash of Spring 2006 shows how small cutbacks with projection uncertainties carries potential for price volatility

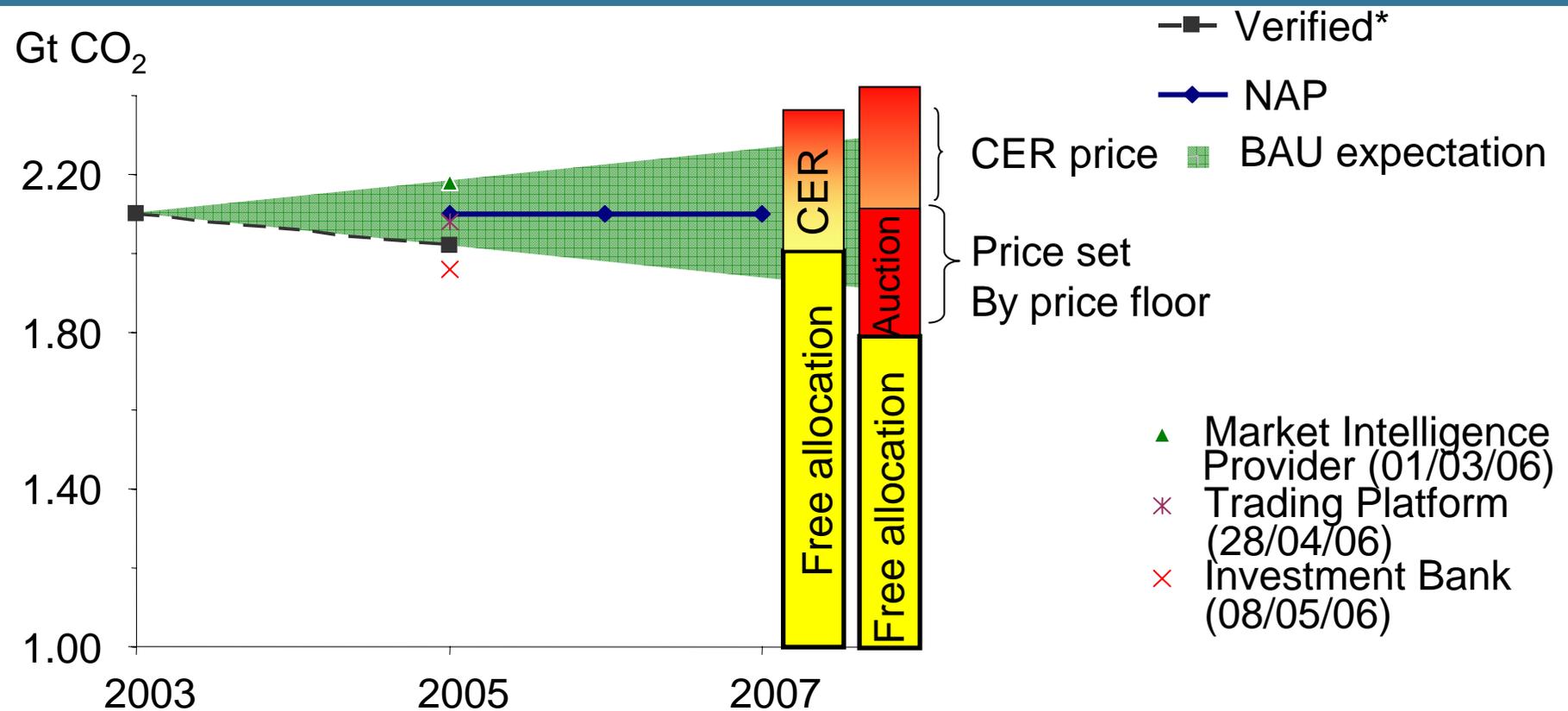
- *Cutbacks were only about 1% below projected 'BaU'*
- *As late as March 06, major provider got "retrospective estimate" completely wrong*
- *Power sector emissions were focus of all cutbacks and shortages (tbc) – surplus in other sectors must be much bigger*



# Systematic upward bias in emission projections is to be expected and the empirical evidence is now overwhelming

- At least three factors explain upward bias in emission projections
  - Inherent optimism of macroeconomic and sector growth assumptions: no-one plans for or promotes the possibility of underperformance or failure
  - The 'gaming' incentives combined with asymmetric information between government and industry
  - 'You don't know what you don't know' in emission abatement possibilities: repeated evidence of 'awareness' effects in mitigation delivery
- The empirical evidence in is consistent and overwhelming
  - UK ETS
  - Climate Change Agreements
  - .. And now European-wide overallocation for 2005
- Coordinated minimum-price auctions could increase market stability and investor confidence (ref: talk by Karsten Neuhoff)

# Volatility unavoidable unless minimum-price auctions used to give scope to adjust



Coordinated auction with price floor can set floor to allowance price

- Facilitates low carbon investment
- Reduces emissions and thus allowance price

\* Still incomplete data as of 5 June 2006

# Phase II allocation

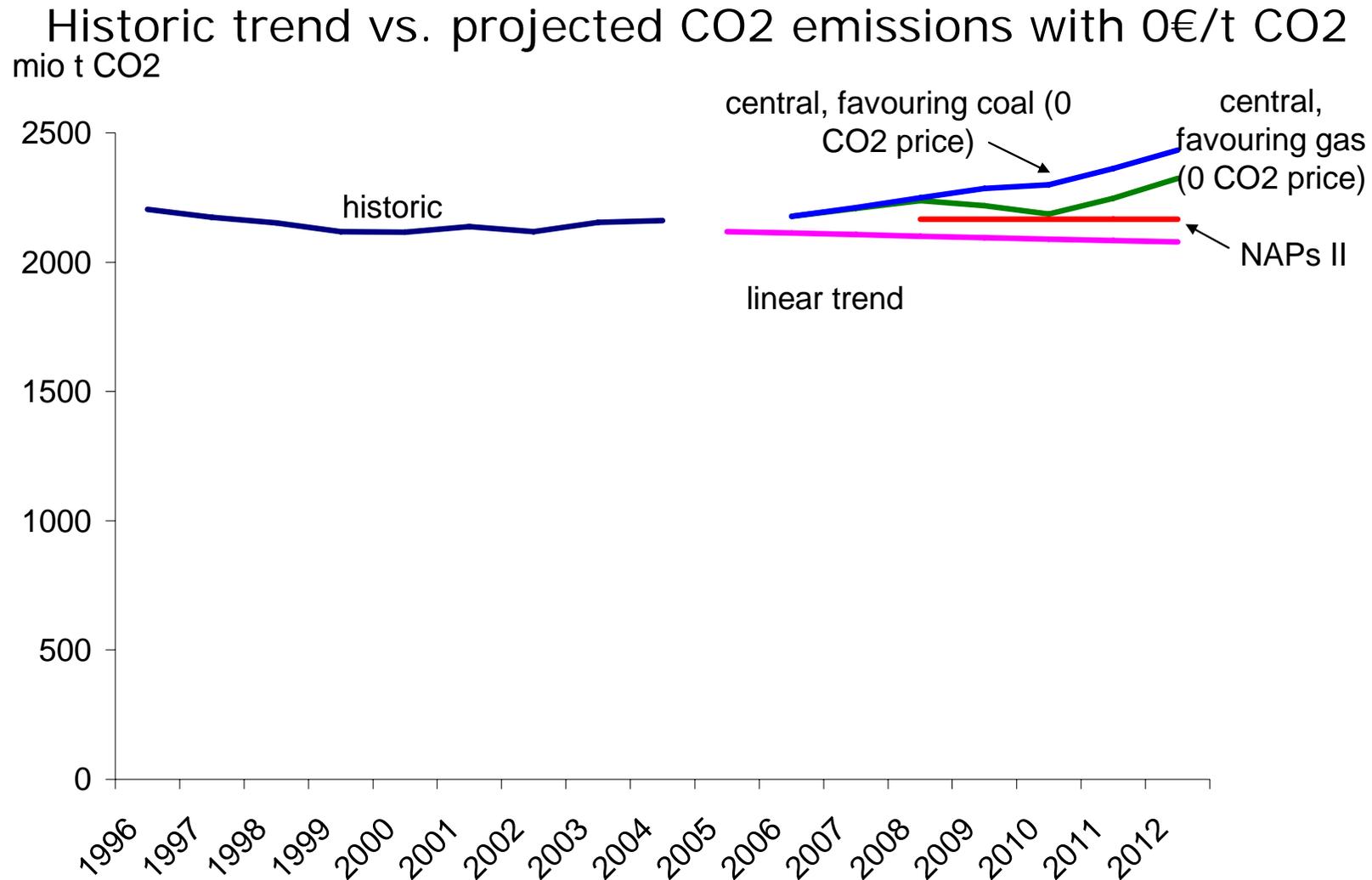
Making business sense of climate change



# Context for Phase II allocations (Kyoto first period, 2008-12)

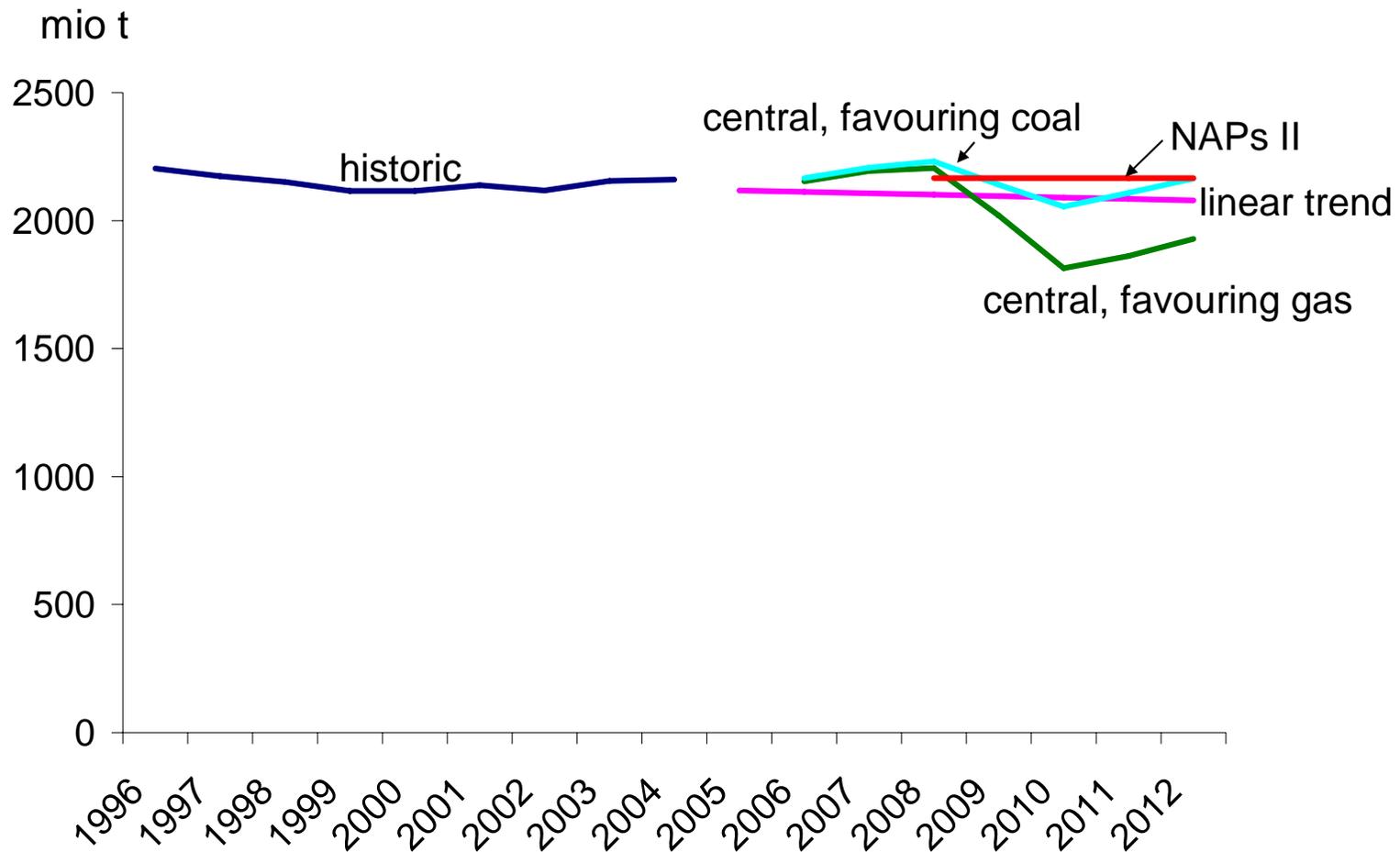
- Deadline for Phase II NAPs to be submitted was just a few weeks after the release of the Phase I verification data
- Continued diverse perspectives on prospects with big downside potential on prices
  - Large volume of CDM / JI credits (100-200 MtCO<sub>2</sub>/yr through period from CDM alone)
  - Additional potential governmental supply associated with Kyoto surplus in eastern Europe and other Transition Economies
  - Baselines have been universally readjusted to world of high gas prices: fall in gas prices could remove 10s MtCO<sub>2</sub> from market
- Auctioning restricted to 10% of total allocations; a continuing hot topic of debate
- Competitiveness unlikely to be problem in course of Phase II but is a *strategic* issue about expected future revenue streams from investment in different regions

EU25 total allocation is close to actual 2005 emissions, and above 10-yr trend extrapolation, but slightly below projected emissions due to power sector expansion



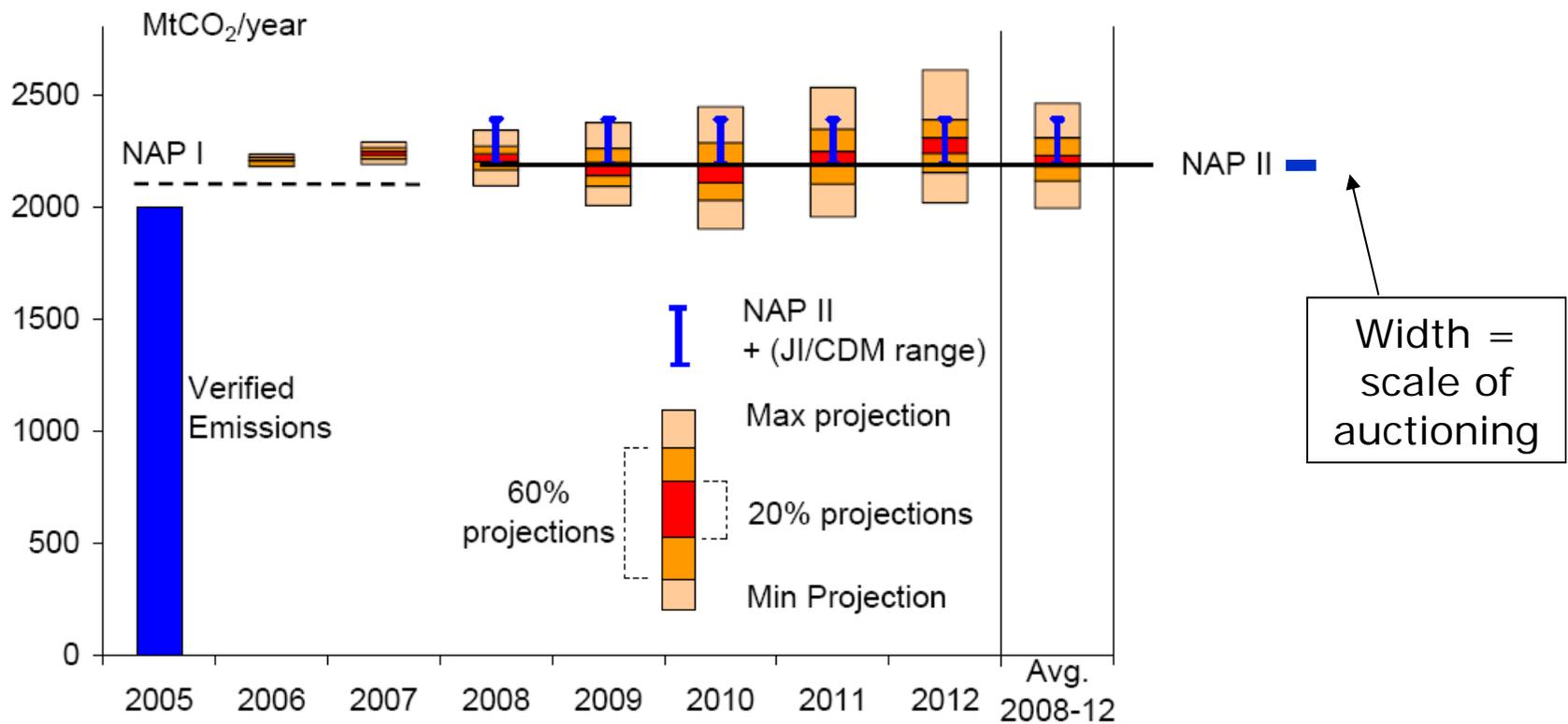
... but NAPs II cannot support €20/tCO<sub>2</sub> even under 'favouring coal' assumptions, and big surplus under 'favouring gas': even without *JI/CDM* or other sector response

Historic trend vs. projected CO<sub>2</sub> emissions with 20€/t CO<sub>2</sub>



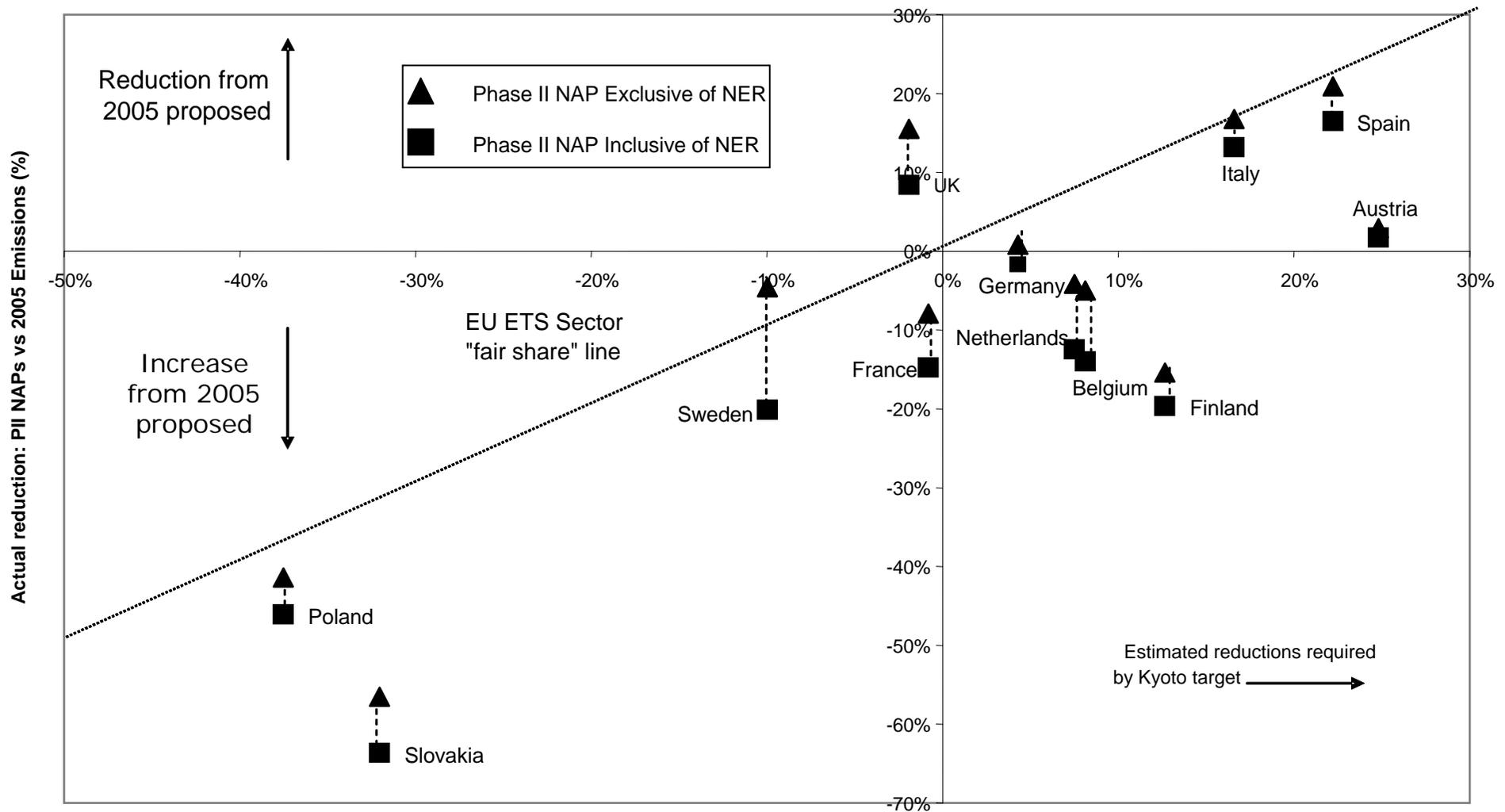
Chance of NAPs supporting carbon price of €20/tCO<sub>2</sub>,  
 is less than 1 in 3 (& negligible if JI/CDM committed)  
 - *auctioning volumes too trivial to stabilise the market*

Projected emissions vs. Cap, when the power  
 sector is exposed to 20€/t CO<sub>2</sub> price



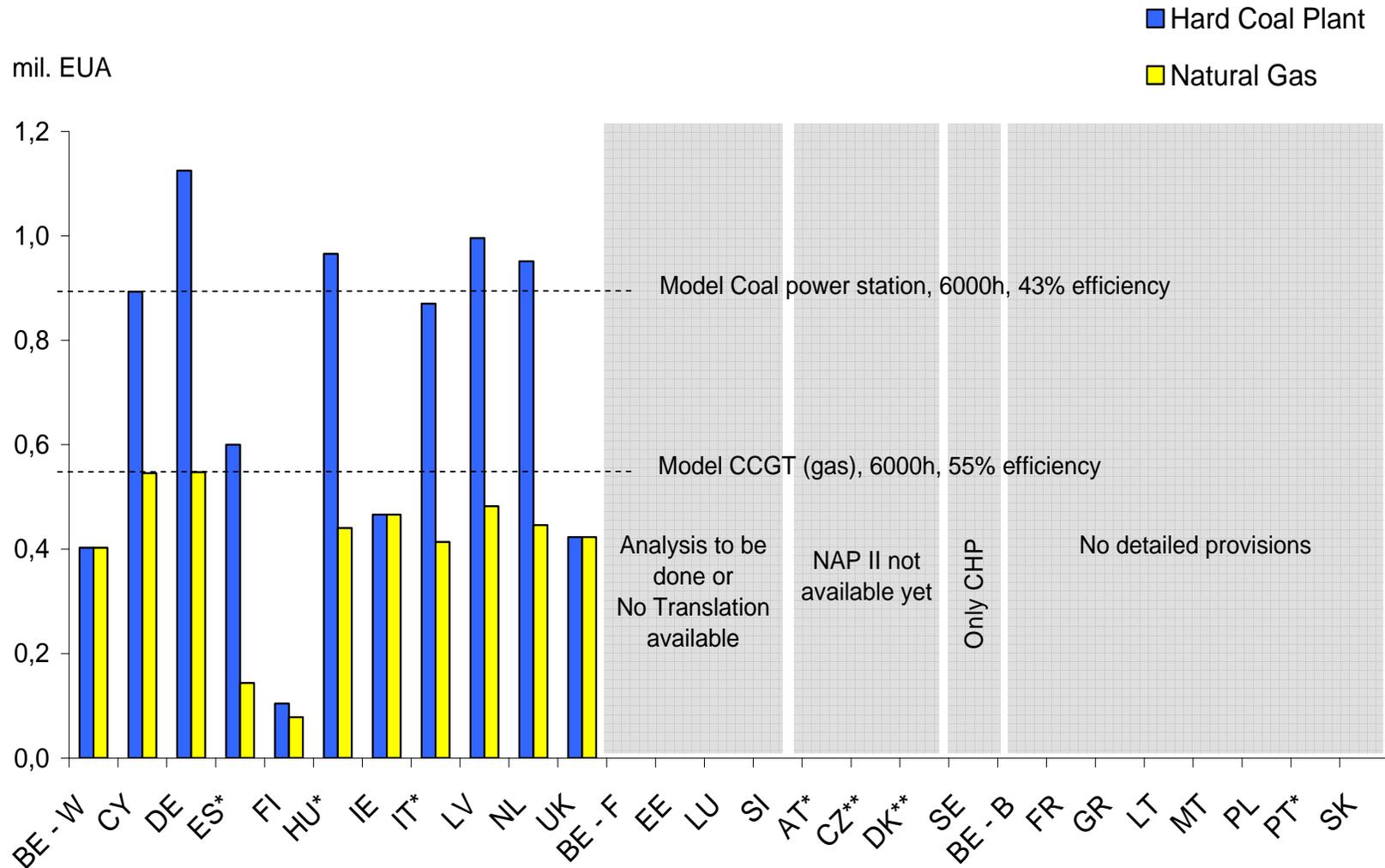
Source: Neuhoff, Ferrario, Grubb, Gabel, Keats (Sept 2006)

# Proposed phase II EU ETS NAPs: cutbacks from verified 2005 levels and estimated cutbacks required for Kyoto compliance\*



\* Many EU ETS phase II plans are draft and proposed cutbacks may change. This chart compares EU ETS emissions data compared to 2005 EU ETS emissions data. Note that changes in coverage of NAPs between phase I and phase II affect some countries (UK, France, Sweden) and phase II data has been adjusted to enable a like for like comparison (e.g. excluding UK phase I opt outs from consideration in phase II). Polish data estimated as Phase I 2005 data incomplete.

# The new entrant details matter: the German NAP provides the biggest subsidies for new coal plant (the more it emits, the bigger the subsidy)



## A weak EU ETS may have perverse impacts on JI/CDM, and put Kyoto under strain

- To comply with Kyoto, governments need to 'fill the gap' between total domestic emissions and Kyoto target through purchase of Kyoto credits
- Weaker allocations to EU ETS sectors increase cost to public sector in three ways:
  - Substitution - more allowances in EU ETS mean governments have to make up the difference
  - Weak EU ETS price reduces abatement, increasing the overall volume of external credits required for European compliance
  - The bigger demand for Kyoto credits may drive up JI/CDM price
- Without auction revenues to fund such purchase, this may place considerable strain on Treasury / public willingness to 'foot the bill' (especially whilst voters also pay power bills that enable some companies to make big profits)

# The present state of play for Phase II - procedural

- Almost all Member States have announced Phase II NAPs, most submitted to the European Commission, which formally has 3 months to accept / reject
- European Commission decision covering many NAPs simultaneously now expected end November
- Formal criteria for decision:
  - Avoidance of subsidy / State Aid compatibility
  - Kyoto consistency
    - Requires a projection of *total national* emissions, and evidence of Treasury commitment to fund purchase of sufficient international Kyoto credits to ensure compliance
- Informal criteria ....
  - Countries that have proposed strongest NAPs (eg. Spain, Italy, UK) lobby for stronger allocations in others
  - Not uncommon for other government bureaucracies to be quietly encouraging rejection after losing battle with industry lobbying
- Even if the 'big cut' works, expect many months of ongoing negotiation on some details, and other plans, before the final Phase II picture emerges
- Outstanding questions:
  - Will the Commission challenge any details as opposed to volumes?
  - How will the Commission treat the big surplus in most of the New MS?
  - Can the Commission – or MS – revisit auctioning for Phase II?

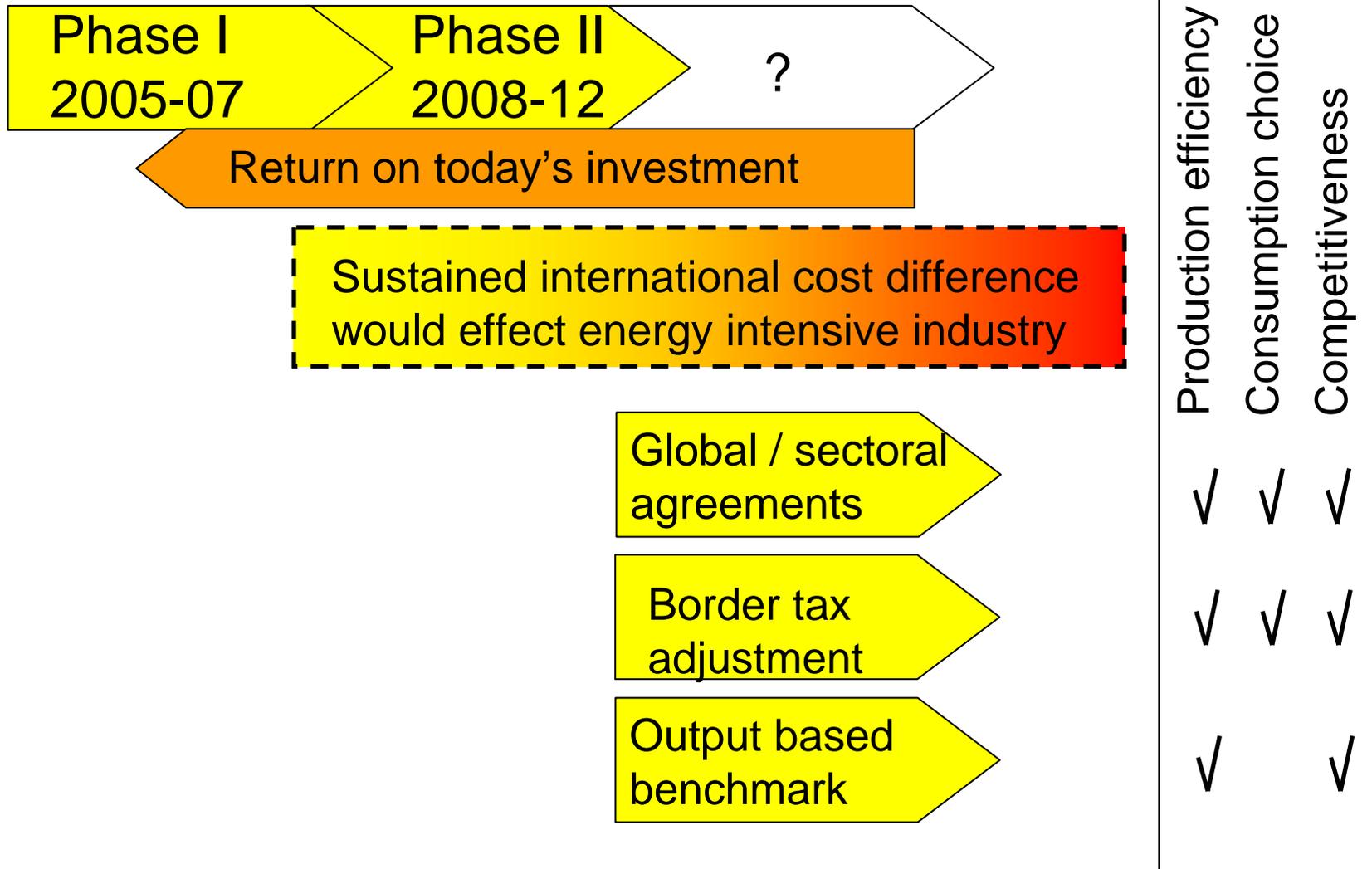
# Beyond 2012

# Looking beyond Phase II

- Without a clear sense of Phase III, the EU ETS becomes a short term incentive / cost for operational adjustment but not an investment driver
- Much of the attention on Phase III has surrounded 'additional sectors and gases'. Whilst important for the sectors concerned, this is a sideshow to the big picture. The EU ETS is designed for large energy-intensive facilities and is likely to remain so
- Active auctioning provides opportunity to seek the right balance between quantity- and price- signals, and open prospect for post-2012 price signalling
- But tackling climate change seriously will require higher carbon prices for some decades – making competitiveness a more genuine source of concern

# Efficient response to the ETS requires clarity post-2012

Expectation drives investment, detailed options determine competitiveness



# The EU ETS faces five broad structural scenarios/options for post-2012

<b>Option for post-2012</b>	<b>Comments</b>
(1) Embed "as is" in a comprehensive global agreement	The "first-best" – almost certainly unobtainable
(2) Embed "as is" in global sectoral agreements covering core exposed sectors	More credible in terms of "high politics" but institutionally wholly unprecedented – how to reach binding deal with global sectors? <i>Hybrid</i> with (1) could be explored
(3) Move to output-based and/or downstream allocations for core competitively exposed sectors	Removes core incentives related to product pricing & substitution and complicates system
(4) Sectoral protection through Border Tax Adjustment	Maintains core incentives but complicates trade and carries attendant risks of trade disputes
(5) Abandon the EU ETS	Disaster for EU credibility and for global efforts to tackle the problem

With any free allocations, the pursuit of long-term objectives using instruments that have to adapt to shorter term cycles requires institutional independence

- Current allocation processes mix security of supply, secure industry support, and compensation for forgone profits
  - Political process with multiple objective creates complex NAPs
  - NAPs create perverse economic incentives
  - Investment delayed/distorted because future NAPs unpredictable
- Historically monetary policy had multiple objectives
  - Governments could not credibly commit to low inflation target as market knew employment and GDP growth are important
  - Therefore, they had to compromise more on GDP growth and employment to convince market of low inflation objective
  - Central banks now have one objective: control inflation
- **Use the next few years to establish institutional mechanisms analogous to national and European Central Banks, charged with prime goal of designing allocation to deliver emission goals with minimal distortion whilst compensating existing installations for distributional impacts**

# Questions explicitly placed 'on the table' by the EU ETS Review Report , 13 Nov 2006 (ToR for Working Group study to report by 30 June 2007)

- Scope of Directive
  - Combustion installations definition
  - Small installation threshold
  - Other sectors and gases inc unilateral inclusions
  - Inclusion of carbon capture and storage
  - Internal project-based crediting
- Further harmonisation and increased predictability
  - Setting the cap
    - Single EU-wide cap vs separate cap determination
    - "taking into account" 2 deg.C and reduction pathways of 15-30% by 2020
    - Periodicity and guidelines
  - Allocation methodologies by sector – extent of harmonisation, and '.. Eg. whether to abolish allocations based on projections and ... historic base period or rather / also on efficiency parameters'
  - Auctioning, coordination / EU-wide, schedules, design etc., and benchmarking.
  - Predictability structures
  - New entrant, "harmonised approaches with a view to further strengthening incentives for investment into low emitting technologies and to ensure closely comparable conditions across the EU ...
  - Harmonisation of closure rules
- Robust compliance and enforcement
- Linking with emissions trading schemes in third countries
  - Should existing provisions extend to countries "which have yet to ratify the Kyoto Protocol'
  - CDM and JI ... consider Community-level arrangements for authorisation of projects

# Lessons and Conclusions

# Where are we now?

- In the middle of one of the biggest man-made rent grabs in modern history, as 25 governments and their industries struggle over allocations for 2008-12
- In a situation of high stakes and volatility, as the European Commission tries to exercise its role as 'policeman of the governments'
- At a defining moment in European energy policy, as we struggle with the relationship between the Nation and the EU, and between further Liberalisation or Retreat to cope with the profit-making properties of EU ETS

## Some initial high-level conclusions from EU experience with economic instruments

- No practical economic instrument is 'pure': because it aims to change relative prices in ways that favour lower carbon technologies over high carbon incumbents, fierce struggles are inevitable
- It has proved *possible* to implement a harmonised market in emissions cap-and-trade for industrial emissions across 25 diverse countries
- Industry attitudes change once the instrument is adopted: lobbying then focuses upon 'getting the best', and 'the best' has been large aggregate profits for some sectors,

# Some specific conclusions around the EU ETS

- The major problems are not with market design, but with the allocation process
  - Allocation and efficiency *do* interact particularly with repeated-rounds
  - The logical solution to most problems with the EU ETS is to work towards greater auctioning over time
  - Free allocation can only work if there is a central authority empowered to accept or reject allocation plans according to agreed criteria
- For the longer term, continuing free allocation will require greater institutional independence of allocation authorities, tasked with neutralising P&L impacts rather than a host of other pressures
- The EU ETS will continue post 2012 irrespective of progress elsewhere

## If Phase I was a trial, Phase II is a transitional period ...

- ... allows most participating sectors to profit and build up reserves to help fund low carbon adjustment
- Directive will need renegotiation for Phase III
- Renegotiation neither necessary nor possible for Phase II
- ... a period of intense analysis, development and negotiation with *[almost]* all long-term options “on the table”
  - As now elaborated in the EU ETS Review

# Headline conclusions for post-2012: Three options and their implications

- Competitiveness is a *strategic* issue about investment location: investment security and efficient operation require EU governments to commit unambiguously to continuation of the EU ETS, but in ways that do not drive investment abroad
- To be credible, design and allocation should be based upon joint exploration with other Kyoto Parties of three contingent options:
  1. Sectoral agreements covering all significant trade partners
  2. Sector- and carbon-specific border tax adjustments
  3. Output-based (intensity) allocation and downstream allocation
- These will require revisions to Directive for post 2012, but not before
- Continued free allocation will also require new institutional foundations analogous to the creation of Central Banks

# EU ETS allocation and competitiveness: Collaboration between researchers in UK, Netherlands, Germany and France

Allocation and competitiveness in the EU Emissions Trading System: <b>policy overview</b>	Grubb, Neuhoff  
Emissions, firm profits, and market prices: the consequences from emissions trading	Smale, Hartley, Hepburn, Ward, Grubb
CO2 cost pass through and windfall profits in the power sector	Sijm, Neuhoff, Chen
Allocation, incentives and distortions: the impact of EU ETS emissions allowance allocations to the electricity sector	Neuhoff, Keats, Sato
CO2 abatement, competitiveness and leakage in the European cement industry under the EU ETS	Demailly, Quirion
Free Allocation of allowances under the EU Emissions Trading System – legal issues	Johnston
Auctioning of EU ETS Phase II allocations: how and why?	Hepburn, Grubb, Neuhoff, Matthes, Tse