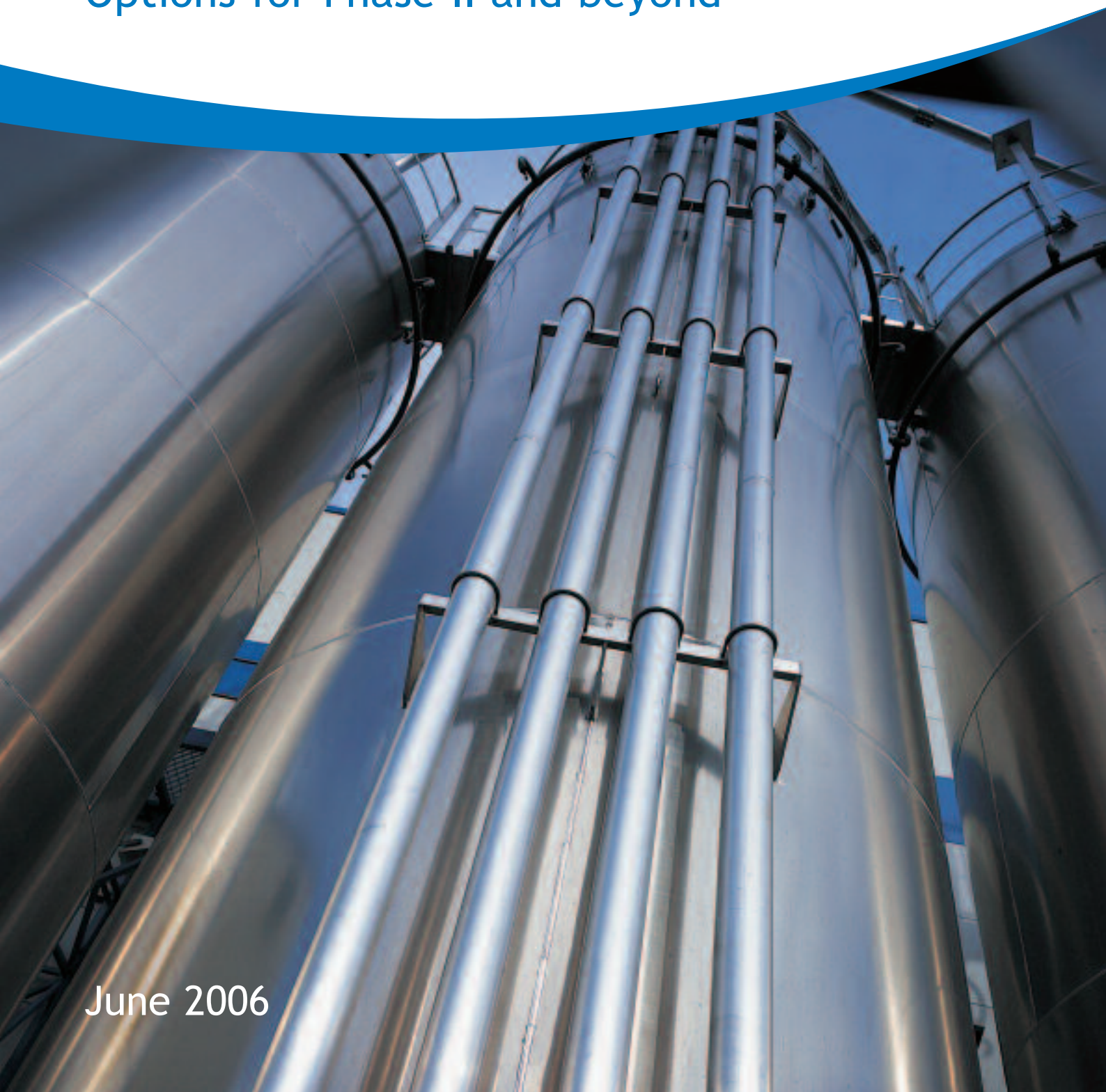
CARBON TRUST

Making business sense of climate change

# Allocation and competitiveness in the EU Emissions Trading Scheme

## Options for Phase II and beyond



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# Preface

The EU Emissions Trading Scheme is a driving force for business interest in reducing $CO_2$ emissions. In capping emissions from power generation and much of heavy industry in Europe, it gives value to their efforts to reduce emissions and has created a market worth tens of billions of Euros annually. Putting a price on carbon has been an achievement of global significance and provides a focal point also for those seeking to invest through Kyoto's international project mechanisms.

Like any market, price is central and the key to prices is the balance between supply and demand. Recent events have underlined the need for robust allocation as the system moves into the Kyoto phase and investors are already starting to look beyond that to the post-2012 period. Yet governments also have a duty not to undermine the competitiveness of their industries and there are fears that the two could conflict.

Building upon our pioneering 2004 study of competitiveness implications, in 2005 the Carbon Trust initiated an international collaborative study with the European research network *Climate Strategies*, led by our Chief Economist, Michael Grubb. We are grateful to the wide group of researchers involved, and also to those that co-sponsored the work, the full results of which are presented in seven papers published in the academic journal *Climate Policy*.

Drawing upon that analysis, this report explains the main findings and sets out the Carbon Trust's own conclusions and recommendations for the future of the EU ETS as an instrument that can both help business deliver emission reductions efficiently and also protect and ultimately enhance its competitiveness in a $CO_2$-constrained world.

**Tom Delay**
**Chief Executive**
The Carbon Trust

# Executive summary

The first phase of the EU Emissions Trading Scheme, 2005-7, has successfully created incentives that give economic value to $CO_2$ emission reductions across Europe for all the participating sectors. It has also established and demonstrated the importance of sound verification systems. These are big achievements that lay the foundations for efficient business responses to the challenge of climate change mitigation. Phase I also confirms that sectors can profit from the EU ETS, but that this is very unequally distributed between sectors. Moreover, present approaches to allocation create volatility in the market and distract industry from the core task of emission reductions, the incentives for which are further undermined by uncertainties around the extension of the scheme post-2012. Learning from Phase I will enable a more robust system for Phase II and beyond.

In 2006, governments will decide on allocations for Phase II (2008-12), and conduct a review of options for continuing the EU ETS post-2012. As a contribution to these processes, the Carbon Trust has supported extensive research, particularly into the allocation and competitiveness aspects of the scheme. That work, published separately as a set of academic papers, forms the evidence base for the Carbon Trust conclusions set out here.

The focus of this report is on the key issues and specific decisions required to ensure that the EU ETS provides an effective, efficient framework that protects the competitiveness of business in the UK and Europe, whilst providing clear and stable incentives to support low carbon investment. Given the reality of the need for climate change mitigation, we consider this balanced approach to be fundamentally in the strategic interests of industry in the UK and Europe. It leads us to three core recommendations for Phase II allocation and to identify three main options for post-2012 design.

## Allocations for 2008-12

*Total free allocations should be substantially below total projected 'business as usual' emissions and should involve some cutback for all sectors.* This is to reduce the volatility arising from cutbacks that are small compared to uncertainties in projections; to hedge against an unavoidable element of inflation in those projections; to reduce potential perverse incentives from current and future expectations about free allocations; and to ensure that management in all sectors has to actively consider mitigation options, rather than focusing purely upon projections and compliance. The degree of cutback should be differentiated according to the cost and international exposure of different sectors; notably bigger cutbacks to power generators could help to address distributional and legal (State aid) concerns.

*Benchmarking allocations, e.g. against the performance of best practice technologies, could offer important advantages* compared to projection-based allocations, but can be complex; diverse approaches between countries in Phase II will give useful experience. Benchmarking allocations to incumbents can be differentiated by fuel/technology type to protect the value of existing assets. However a common standard for new entrant reserves (NERs) should be sought across the EU, based on effective capacity rather than technology or fuel. Differentiating NERs to cover the emissions of new carbon-intensive coal plants would act to subsidise these investments, which would conflict with climate change mitigation objectives, raise power prices in the long term, and would risk them becoming stranded assets as carbon controls tighten. Care needs to be taken to avoid similar possible distortions from technology-specific NERs in other sectors.

*Maximum use of allowed auctioning (10%)* would increase supply of allowances, reduce distributional disparities, and improve the efficiency of the EU ETS. Governments can use auction revenues creatively to address distributional concerns and to support low-carbon technology investment in the EU through revenue recycling. Coordinated minimum price auctions would reduce price volatility, help to stabilise the system and provide a more secure platform for low-carbon investments.

## Profits, costs and competitiveness

The measures set out above will not preclude most participating sectors profiting from the EU ETS during Phase II: though most profits will accrue to power generation (notwithstanding greater allowance cutbacks), the same basic mechanisms apply for others.

In addition to continuing abatement possibilities and any availability of allowances through auctions, EU ETS prices will be constrained by the large volume of external emission credits from international projects already submitted for registration (principally under the Clean Development Mechanism).

At prices likely under these circumstances, cement and steel production are the only participating sectors for which net input cost impacts may exceed 2% of sector value-added; if these sectors maximise profits by passing on opportunity costs, they could lose a few percent of market share to imports over the Phase II period. Alternatively, companies can choose to scale back their potential profit increases to protect market share. The potential for both profiting and loss of market share increase at higher carbon prices.

Downstream sectors outside the EU ETS face slightly higher prices as the costs of carbon become factored into product prices, as detailed in our previous report.

Accelerating investment in energy efficiency and low-carbon energy sources is the surest way to contain the costs of carbon controls over the longer term. Companies can use revenues associated with ETS price impacts to support longer term emission reduction investments, in both energy efficiency and low-carbon supplies; auction revenues could be used to assist other sectors.

However, such investment will only occur at scale if there is a clearer and more credible prospect of returns from low-carbon investment across Europe post 2012. Without this, the operational costs of the EU ETS will not be matched by the benefits that can flow from more efficient investment and innovation. This raises the more serious, strategic, dimension of competitiveness, which concerns the nature and location of all new investments based on expectations for the post-2012 period.

## Post-2012 design

Facilitating low-carbon investment and securing the potential benefits of the EU ETS thus requires a timely, concrete commitment to its continuation beyond 2012. But this must be in a more durable form that addresses concerns about distribution, incentives, and industrial competitiveness.

Declining free allocation combined with greater auctioning offers the simplest solution to distributional and incentive problems.

In the absence of an international agreement that puts in place a global price for carbon, three approaches are available that would enable the EU ETS to protect competitiveness of investments in Europe under higher carbon prices over longer periods:

- International sectoral agreements which ensure that major competing producers of specific internationally traded products embody a similar carbon cost
- Border tax adjustments that reimburse companies for direct carbon costs incurred on exported products, and establish a directly equivalent charge on imports on a non-discriminatory basis
- Output-indexed (intensity) allocation that increases allowances in line with the production of carbon-intensive intermediate goods, and thus takes most of the carbon cost out of product prices.

To secure the value of low-carbon investments, EU governments should commit now to continuing the EU ETS whilst developing all of these options as a potential basis for post-2012 implementation. In addition, carbon-intensive new entrants during Phase II should not be promised free allocations for subsequent periods, as this would exacerbate perverse incentives and could undermine the EU's options for future design.

These three options would require the ETS Directive to be renegotiated in relation to allocation procedures. Such changes are neither feasible nor necessary for Phase II operation. Rather, Phase II should be a period in which greater cutbacks combined with some auctioning create a more stable platform for business engagement and investment, and in which experience is gained with benchmarking and auction design. Meanwhile, the profits potentially accruing to participating sectors can be harnessed to jump-start UK and European investments for a globally carbon-constrained future.

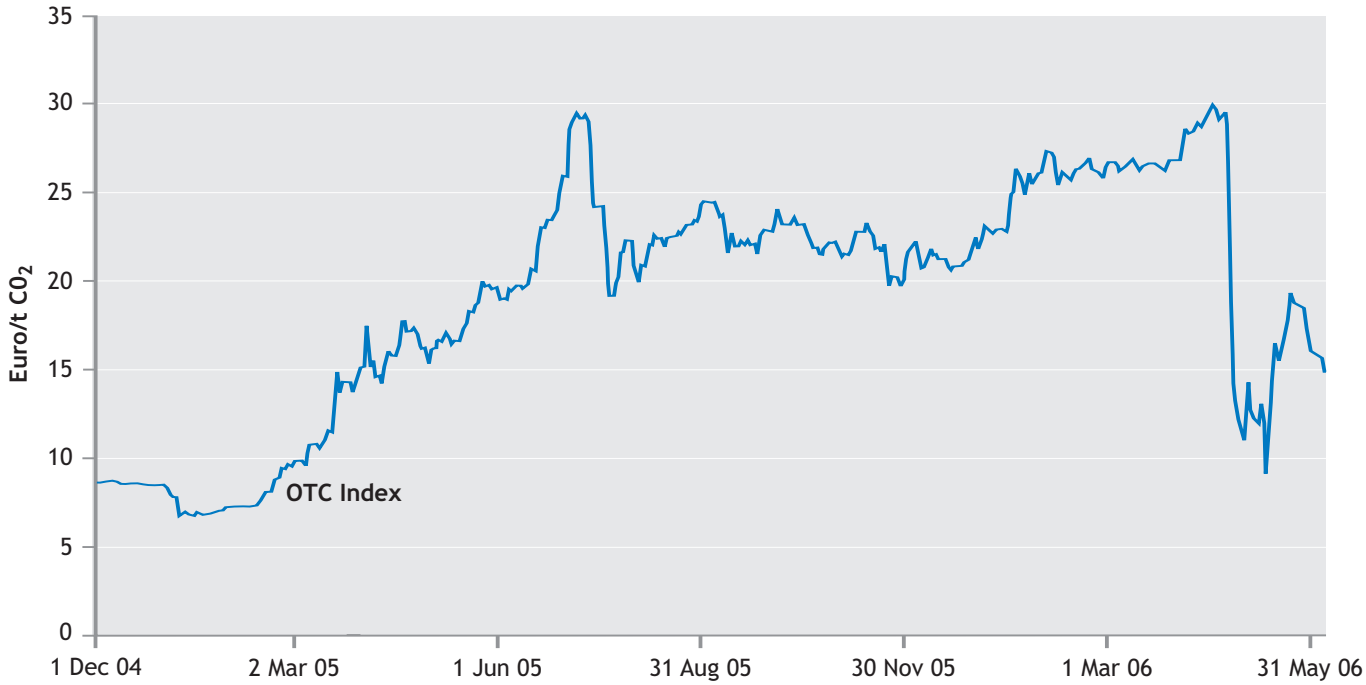
The research underpinning this report was coordinated by the *Climate Strategies* network and appears as a set of seven papers forming a Special Issue of the *Climate Policy* journal, published in June 2006.

# Introduction

The EU Emissions Trading Scheme was launched in January 2005 to cap $CO_2$ emissions from heavy industry. Covering almost half of all EU $CO_2$ emissions, it forms the centrepiece of European policy on climate change. Trade in these emission allowances gives value to reducing $CO_2$ emissions and has formed a market with asset value worth tens of billions of Euros annually. This first phase of the EU ETS runs from 2005-7. Halfway through the first phase offers an opportunity to take stock and to learn from the lessons of the system to date.

In Spring 2006, the first verification data on emissions were released, and prices in the trading market tumbled as it became apparent that emissions in many cases were well below their initial allocation of free emission allowances; much is to be learned both from this, and from the reaction of both the market and governments.

***Chart 1*** *EU ETS trading prices from December 04 to May 06*




Source: European Energy Exchange

[1] *The European Emissions Trading Scheme: Implications for Industrial Competitiveness*, Carbon Trust, 2004, available from www.carbontrust.co.uk

[2] Unless otherwise indicated, all data referred to in this report are drawn from these studies, which are written up as a Special Issue of the research journal *Climate Policy*. This comprises seven individual papers: modelling of combined economic impacts of EU ETS and domestic policies (for the UK); empirical

Moreover, during 2006, the EU Emissions Trading Scheme faces practical decisions in two key areas. The first is the allocation plans for the first Kyoto period of 2008-12. The second is the conclusion of a major review to lay out options for continuing the system post-2012, and to signal how the Directive may evolve in that context.

Core to the EU ETS are issues of allocation and pricing, and the costs, competitiveness concerns and incentives that flow from these. They are also pan-European issues — no one country can adopt an approach to allocation that results in huge disparities compared to its neighbours in the system. Recognising this, and building upon our earlier study on industrial competitiveness, in 2005 the Carbon Trust launched a collaborative study with the European research network Climate Strategies. The work aimed to update and expand our earlier study,[1] and add to this much deeper analysis of the issues surrounding allowance allocation, costs and incentives.[2] This report summarises the key findings from a Carbon Trust perspective.

## Five principles underlying the economic impacts of emissions trading

**The aim of an emissions cap-and-trade scheme is to secure emission reductions at the lowest possible overall cost: trading allows companies to seek emission reductions to meet the aggregate emissions cap wherever and however it is cheapest to do so. Five principles underlie the practical economic impact of an emissions trading system applied to $CO_2$:**

1. $CO_2$ constraints generate economic 'rents': by constraining a previously free activity (emitting $CO_2$), allowances to emit acquire an economic value, with associated price impacts and financial flows. Free allocation of allowances to companies give them *potential* to capture this value and profit, subject to:
   (a) degree of alignment of free allowances with costs (e.g. sectors outside the EU ETS have no allowances and thus have no potential to profit; and sectors cannot get allowances associated with the electricity they consume)
   (b) constraints on ability to pass-through $CO_2$ costs to customers (for example due to imports of like products from outside the EU that do not yet face $CO_2$ costs)

   The Annex to our previous study[1] described more fully the mechanisms by which sectors in the EU ETS can expect to profit from the system, subject to these constraints
2. Profit and market share are not synonymous, and *for internationally traded goods they are frequently in tension:* the more that companies profit by raising prices to reflect the opportunity costs of carbon, the greater the possible erosion of their market share over time
3. The power generation sector can and does pass through the bulk of marginal/opportunity costs to the wholesale power market, as expected in a competitive system, resulting in substantial profits and downstream costs where electricity markets are competitive
4. Other participating sectors also have potential to profit in similar ways, but the net impact is complicated by details of electricity retail market regulation, by international trade, and by downstream company, regional and product differentiation
5. The details of allocation methods matter: new entrant, closure, and incumbent allocation rules all affect the incentives, pricing and efficiency of the scheme.

estimation of price pass-through in the power sector; modelling of incentives in power operation and investment; modelling of trade and incentives in the cement sector; legal issues around free allocation; auction impacts and design options; and a policy overview that includes generalised numerical analysis of competitiveness issues and implications for Phase II and post-2012 options. Individual papers are downloadable from the Carbon Trust website.

# Learning from Phase I

The EU ETS was built on the basic insight that setting emission caps and allowing them to be freely traded enables companies to seek emission reductions wherever and however it is cheapest to do so. Years of practical experience with such schemes, particularly in the US, confirmed their basic feasibility and offered valuable experience in designing the EU ETS. Yet, the EU ETS is by far the most ambitious cap-and-trade scheme in the world. It tackles arguably the most difficult of environmental problems, namely $CO_2$ from fossil fuels and industrial processes. It covers twenty-five countries, each of which has the authority to issue emission allowances. And in terms of sheer scale it is unprecedented; at the peak prices in 2005, the value of allowances issued in 2005 across the EU reached over €60bn. It represents a major incentive to cut back on $CO_2$ emissions.

Putting a price on carbon has, moreover, been an achievement of global significance. The high EU ETS prices in 2005 led to a surge of investment in projects intended to generate emission reduction credits, particularly through emission-reducing investments in developing countries under the Clean Development Mechanism, that generate emission credits that European companies can use to comply under the EU ETS (and that governments can use to comply with their Kyoto targets). The EU ETS carbon price is watched, in Europe and around the world, as perhaps the principal index of how seriously the world is starting to tackle the problem of climate change, and of the potential value of low-carbon investments.

Phase I of the EU ETS already shows that carbon cap-and-trade is feasible, and that the EU ETS has a sound basic market design. Companies traded across Europe, against a transparent market price reflecting perceptions about scarcity and the cost of abatement. The recent events in the market, in which verification proved that emissions in 2005 were below expectations, demonstrated that verification systems are sound and essential — and may demonstrate that companies responded efficiently and cut their emissions more easily than expected. The market responded to the new information.

Yet the achievement has not been without problems. First, the volatility of the carbon price (Chart 1) has been a problem. In the few months after its launch, prices rose from around €10/$tCO_2$, to almost €30/$tCO_2$ — much higher than most had expected. It then oscillated around €20-30/$tCO_2$ before tumbling in Spring 2006.

The first year also confirmed economists' predictions that sectors — especially power generation — would pass through most of the carbon costs in their product prices, and as a result profit from their free allocations. In the year of high prices, power generators in the UK made around €1bn profit from the way that carbon prices fed through to electricity prices — despite being the biggest buyers of allowances in the entire EU system. The combination of this with the carbon costs themselves have prompted fears about the scheme's impact on the competitiveness of major industrial energy consumers.

Like any market, the key to prices is scarcity. The most fundamental difference between emissions trading and any normal market is that the amount available depends directly on government decisions about allocations; and these in turn hinged upon emission projections. The price instability, and recent collapse, is thus partly a story about projections.

The first round of cutbacks in the EU ETS were very small: about 1% of projected 'business-as-usual' needs across Europe, contrasting for example with the US $SO_2$ programme, which involved cutbacks of over 50% against historical emissions, and additional reductions later.

The price crash occurred as data on actual 2005 verified emissions were released, and this displays the extreme sensitivity arising from the small cutbacks of EU ETS allocations. Contrary to many expectations, emissions proved to be lower than initial allocations, despite the high gas prices that had led to increased use of coal in power generation (Chart 2). Even as late as Spring 2006 there were retrospective estimates from a leading provider of market intelligence that turned out to be wrong. The uncertainty in projections upon which allocation plans had originally been based was of course far wider still. This inevitably creates price volatility and risk of price collapse and undermines the credibility of the market. Along with the lack of post-2012 clarity, such volatility greatly weakens the EU ETS in terms of being an effective incentive for low-carbon investment.

Verification data at a national and sectoral level highlight the extent of the surplus, which in aggregate data is partly masked by cutbacks to power generators. Data available for five of the major European economies at time of going to press (UK, Germany, France, Austria and Netherlands) show that across these countries, allocations exceeded emissions in six of the eight sector categories in all countries; there were small deficits in the refineries sector

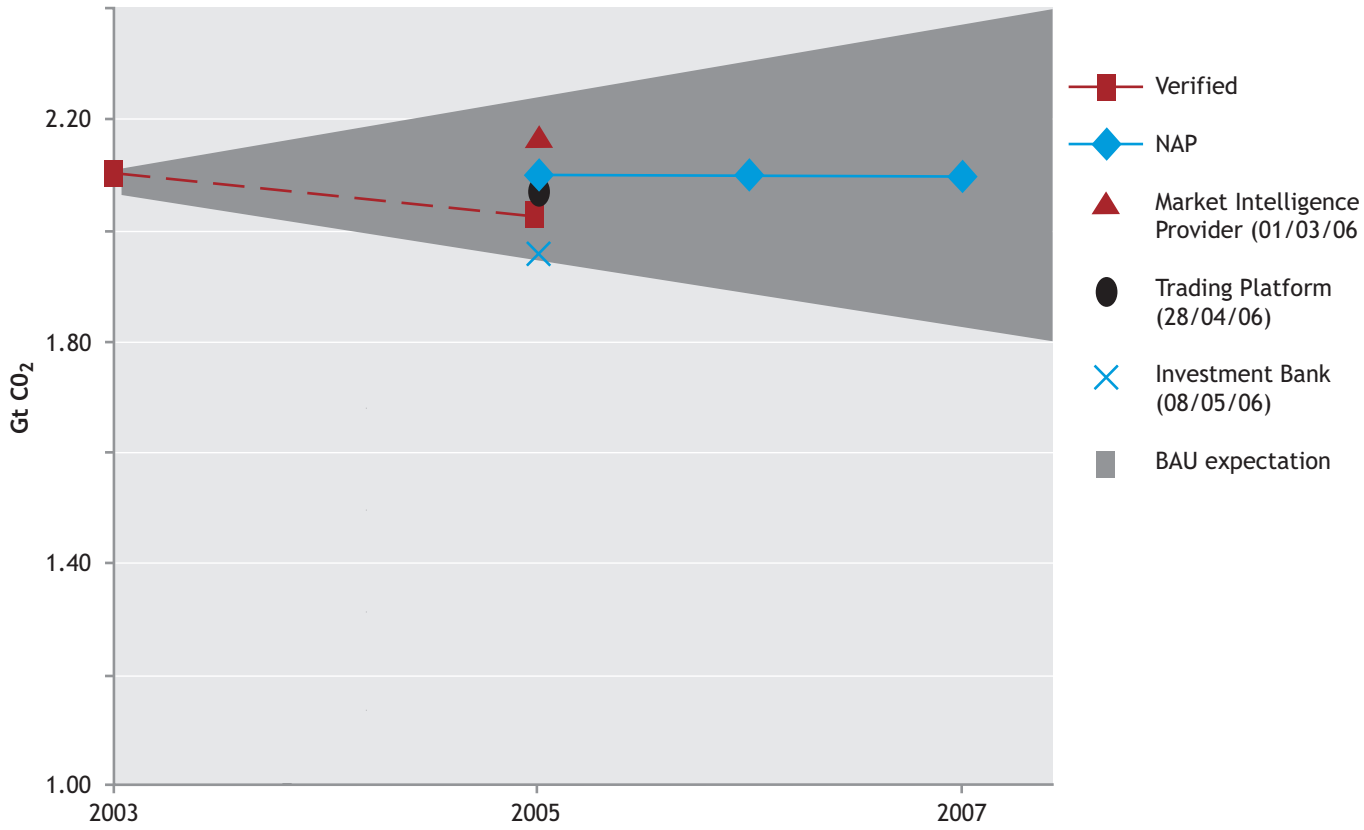
in Germany and Austria. The average (unweighted) degree of surplus exceeded 15% in four of the eight sector categories. In contrast, in all these countries except for France, power sector emissions exceeded initial allocations, though to widely varying degrees. In other sectors, many of the companies with surplus failed to capitalise on this by entering the market, but rather appear to have been satisfied to comply without necessarily considering maximising benefits from abating and selling their surplus allowances.

Moreover, some of the initial responses to the events of Spring 2006 give a foretaste of numerous other possible problems:

- Suggestions to 'bank' surplus allowances forward into Phase II (the Kyoto first period), without understanding and correcting the cause of the initial problem, may simply exacerbate similar problems in the next, crucial Kyoto phase
- Plans to withdraw allowances from the market risks being seen as penalising abatement; indeed such ex-post adjustment risks undermining the basis of a stable market upon which industry feels confident to invest
- Proposals to use 2005 as the base year for Phase II allocation risk a perverse 'updating' incentive, that higher emissions today will be rewarded with bigger allocations in future periods.

The overarching lesson is that the market and verification has worked, but the initial allocation didn't; and that this creates numerous potential risks. Whilst Phase I has successfully introduced the EU and the world to carbon markets, the emerging experience thus points to potential problems and issues that have yet to be solved. We now consider these outstanding challenges more closely.

***Chart 2*** *Emissions, allocations and projection uncertainties for installations covered by the EU ETS: the evidence from 2005*




Source: Climate Strategies studies: Grubb and Neuhoff (Policy Overview)
Notes. The Chart shows best estimates of total $CO_2$ emissions from EU ETS sectors in 2003 and 2005 (connected by dotted line), compared to allocations (flat line 2005-2007), and two estimates of 2005 emissions provided by market analysts in the months leading up to the release of the verified emission data. The shaded area indicates a plausible range of uncertainty in emission projections for the Phase I period at the time of initial allocation decisions.

# Seven challenges for the EU ETS Phase II

Analysis of the Phase I experience and extensive research highlights seven challenges that allocations for the next phase of the EU ETS should address.

**1. Price instability.** Price instability, such as that already observed, carries a high cost. Faced with big uncertainty, companies will tend to delay investment. The risk of low $CO_2$ prices amplifies other obstacles to low-carbon investments. Business needs a stable framework against which to invest and to maximise its competitiveness in a world that will become increasingly carbon-constrained. Yet as indicated, the modest cutbacks contemplated under the EU ETS inherently tend to create instability. Policies which can provide more price stability in the EU ETS would be valuable.

**2. Risk of ex-post government interference.** The idea of the EU ETS is to create a trading market in which the private sector can act and judge the consequences of action according to stable rules for the period defined. All the tools of market analysis are undermined if governments may interfere 'ex-post' — if they change the rules in the light of how things develop. This may introduce all kinds of problems, including undermining the incentive to abate (if the response will be to tighten allocations) and the risk of investors taking legal action if governments try to change the rules. Yet to avoid this, all must be confident that the market will deliver a significant price, sufficient to support real emission reductions.

**3. Closure and new entrant incentives.** The risk of perverse incentives does not begin or end with government interference, however, it can be intrinsic to the process of free allocation. Allowances are valuable assets; behaviour will be influenced by the rules and expectations about getting them. The policy of most governments in Phase I to withdraw allowances from installations when they close created a perverse incentive to keep old and inefficient units operating, at the minimum run conditions required to qualify. Obviously, there may be valid reasons not to want to encourage closures, but keeping polluting plants going may well be at the expense of new, cleaner investment. Giving free allowances to new entrants seems to make sense to try and offset this — but that then protects new carbon-intensive facilities from paying the cost of carbon. If such facilities expect to continue receiving free allocations in the future, simulations in our studies show that the EU ETS can even act to subsidise the construction of new carbon-intensive coal plants that would not have been built without it, because they receive the revenues of higher electricity prices without paying the cost of their carbon.

***Table 1*** *Effect of allocation methods to power sector incumbents*

| | Impacts | More expenditure on extending plant life relative to new build | | Increase plant operation | | Less Energy Efficiency Investments |
|---|---|---|---|---|---|---|
| **Allowance allocation method** | **Distortions** | Discourage plant closure | Distortion biased towards higher emitting plant | Shields output (& consumption) from average carbon cost | Distortion biased towards higher emitting plant | Reduce incentives for energy efficiency investments |
| **Auction** | | | | | | |
| **Benchmarking** | capacity only | X | | | | |
| | capacity by fuel/plant type* | X | X | | | |
| **Updating from previous periods'** | output only | Y | | X | | |
| | output by fuel/plant type* | X | X | X | X | |
| | emissions | X | X | X | X | X |

Source: Climate Strategies study: Neuhoff, K., Keats, K., Sato, M., 2006. Allocation, incentives and distortions: the impacts of EU ETS emissions allowance allocations to the electricity sector. Climate Policy 6(1).
Note. 'X' indicates a direct distortion arising from the allocation rule. 'Y' indicates indirect distortions if allocation is not purely proportional to output/emissions. '*'differentiating by plant type adds additional distortions compared to purely fuel-based distinctions.

Such problems are not confined to power generation. For example, steel blast furnaces are much more carbon-intensive than electric arc furnaces, but the former receive far more allowances: as in power generation, the EU ETS could similarly reward the less efficient technology.

**4. Incumbent distortions.** The 'perverse incentives' arising from free allocations are not confined to rules around closure and new entry. For example, if allocations to incumbents are given out in proportion to recent emissions, companies may be led to believe that higher emissions now will be rewarded by higher allocations in the next phase (the 'updating' or 'early action' problem). Table 1 shows a 'pyramid' of such distortions. The incentive that higher emitters per unit of output may be rewarded by more allocations could potentially be avoided if allocations are 'benchmarked', so that plants get an allocation per unit of capacity, for example, not related to historic emissions; but even with these potential changes some other perverse incentives would still remain[3].

**5. Uneven impacts and 'excessive' profits.** As predicted in our previous study (see Introduction), the power sector has made large profits out of the EU ETS where there are competitive wholesale power markets. This is because competitive markets factor in the 'opportunity costs' of $CO_2$ emissions, raising electricity prices, whilst the companies have had nearly all of their actual emissions covered for free (in economic terms, they receive 'double compensation' for the costs of carbon — paid both by the consumer through prices and the government through free allocation — see Annex to our previous report). The UK power sector made around €1bn profit from the impact of the EU ETS in 2005.

This does not happen everywhere; for example where prices are directly regulated, such cost pass-through is generally disallowed. But this then forces the utilities to cross-subsidise between their generation and sales, undermines market liberalisation and reduces price incentives to reduce emissions.

Nor is this confined to the power sector: most other sectors in the EU ETS can pass some opportunity costs on to their customers (discussed further below for traded goods). Our modelling analysis suggests that all EU ETS sectors should profit from the scheme across the relatively wide range of carbon prices as seen in phase 1 of the scheme. In contrast, sectors outside the EU ETS face the cost of carbon in power prices, with no benefits from free allocations. These distributional impacts inevitably generate tensions. Moreover, the profits arising from free allocations (and certainly surplus allocations) may amount to a form of State aid, creating legal pressures to reduce the scale of allocation and profits.

**6. Lack of cutback incentives in other sectors.** Governments now recognise that power generators tend to do well out of the EU ETS, but are much more cautious in their treatment of other sectors. In Phase I, governments gave other sectors almost everything they projected to be needed, resulting in the large surplus of allocations revealed in the 2005 verification data. The psychology of negotiations that gives a sector everything that it projects that it would emit, without any $CO_2$ constraint, places an unhealthy emphasis on lobbying around emission forecasts, which are inherently uncertain, and amplifies the risks of perverse incentives. Moreover, having secured compliance without taking any action, they have had no need to think about opportunities for abatement, or optimisation in the market — many ended 2005 without even selling the surplus they had. Indeed the approach creates incentives to highlight the difficulties of mitigation rather than to assess objectively the full range of options, in addition to giving most of these sectors profits arising from the combination of pricing effects with the value of free allocations — particularly if these turn out to be surplus to requirements.

**7. Risk of over-supply during Phase II.** The expected balance of supply and demand, and associated uncertainties, should be an important consideration for Phase II NAPs. This must include the potentials for credits generated internationally through the Kyoto Protocol mechanisms. The high EU ETS prices in 2005 led to a surge of investment in projects intended to generate emission reduction credits, particularly through emission-reducing investments in developing countries under the Clean Development Mechanism. As of March 2006, the projects officially registered or submitted for verification or registration would generate some 825 $MtCO_2$ — equivalent up to 2012. In addition, projects in eastern Europe and Russia under Kyoto's Joint Implementation provisions are rapidly accumulating. Estimates of the total supply of credits under the Kyoto system during 2008-12 span the range 1000-3000 $MtCO_2$-equivalent, an average of 200-600 $MtCO_2$ per year. Japan and perhaps Canada will also be competing for these credits, but their demand is extremely unlikely to match this supply (Japanese total demand for international purchase will be in the range 50-200 $MtCO_2$/yr, of which some would be met from non-project Kyoto allowances).

This on its own makes sustained high prices during the Phase II of the EU ETS period implausible, and increases the risk of a price collapse, since many of these projects are now committed and will be seeking buyers for their credits almost irrespective of the price.

Moreover, the high gas prices of recent years are expected to reverse in the next few years as new supply infrastructure is completed and Continental energy markets open up to more competition. This would in itself facilitate greater use of gas power generation instead of coal, making it cheap to reduce $CO_2$ emissions by tens of $MtCO_2$/yr across Europe compared to current 'business-as-usual' forecasts, and also reducing the impact of the EU ETS on power prices. The risk in Phase II is thus unlikely to be high carbon prices, but rather the reverse — the risk of incentives too weak, too mixed and too unstable to support low-carbon investment to any significant degree. Fortunately there are solutions, and we now turn to these.

[3] For example, a weaker version of the problem around closure rules remain. If governments avoid that problem by saying that facilities will get the full set of free allowances for the next period whether they close during it or not, this creates a strong incentive to at least keep facilities going until the next round of allocations are settled, and then decide whether to close a facility and cash in the allowances.

# Recommendations for Phase II allocations

The EU ETS combines 'caps' with 'trading'. Fears that reducing the free allowance allocation would restrain the ability of companies to produce are misplaced. In addition to cutting back on their emissions in response, companies can acquire additional allowances in the market from three different sources:

- Other companies, that manage to keep emissions below their initial allocation
- Governments through auctions, subject to a 10% cap on the amount of allowances that governments can issue through this route during Phase II
- Emission reduction credits generated from international projects through the Kyoto mechanisms.

Cutting back on free allowance allocation thus does not translate into a cutback of feasible emissions or output; it simply helps to establish the price and incentives that companies face to undertake cost-effective emissions abatement. In principle, free allocation is a temporary derogation from bearing the full costs of $CO_2$ emissions.

Recognising this and to address the challenges set out above, we reach the following conclusions about Phase II allocation.

**i) Give all sectors less free allowances than projected 'business-as-usual' needs, but differentiate the cutback according to sector exposure**

Allocations equal to projected 'Business-as-Usual' (B-a-U) emissions lead to an unhealthy focus upon lobbying around projections, rather than a focus on abatement. In a world that has to become increasingly carbon-constrained, this is a waste of company resources and does not assist long-run competitiveness. Moreover, the evidence that it leads to an inflation of emission projections and undermines the market is consistent and readily explicable. In addition, 100% free allocation amplifies all of the potential perverse incentives indicated above that undermine the efficiency of the EU ETS.

Such inefficiencies raise the cost of controlling carbon, which is against business' long term interest. The key to reducing business' long-term exposure to carbon costs is through clear and stable incentives for timely investment in energy efficiency and low-carbon energy options.

Thus all sectors should receive some degree of cutback, even if very modest. We show below that the costs of modest cutbacks in Phase II allocations carry no significant implications for competitiveness. The approach of ensuring some cutbacks across all sectors should be shared across Europe.

Abandoning the idea that companies should get what they project will also facilitate a move towards benchmarking of allocations based upon best practice, which can reduce or avoid many of the potential perverse incentives set out above. Benchmarking is not simple but it holds great promise, and experience with benchmarking would be extremely valuable for the future.

Cutbacks should be differentiated by sector, according to their competitive exposure and ability to pass costs through. The electricity sector is barely exposed to foreign competition and unlike other sectors it does not face electricity price increases in inputs: for this and other reasons its potential profits from the EU ETS are much bigger than in other sectors. In countries with competitive markets, greater cutbacks for power generation have no direct implications for other sectors, since the price is predominantly set by the opportunity cost of carbon, not by the profit/loss balance of power generators.

**The balance of cutbacks, auctioning and abatement: an illustration for Phase II**

EU ETS sectors emit about 2.2 $GtCO_2$/yr, of which the power sector currently accounts for around 60%. To illustrate the potential magnitudes involved, after allowing for forecasting errors:

- A 20% cutback in free allocations to the power sector would generate a 'potential' demand (i.e. relative to 'no control' emissions with no emissions abatement) of about 260 $MtCO_2$/yr
- a 5% cutback to other sectors on the same basis, about another 45 $MtCO_2$/yr
- A maximum 10% of auctioning would make around 210 $MtCO_2$/yr available through auctions, out of a total of 2100 $MtCO_2$ European supply (ie. Almost 1900 $MtCO_2$ given out for free, the remainder through auctioning).

The net cutback across the EU — to be met through emissions abatement (e.g. fuel switching, end-use efficiency, and international purchase of Kyoto credits) — would then still be only around 100 $MtCO_2$/yr. This is close to the total surplus of allowances in 2005, and about half of the lowest estimates of the total supply of Kyoto project credits.

Allowing for some inflation of emission forecasts, this might require allocations below projected emissions by about 25% for power generation and 10% for other sectors respectively.

Thus, free allocations to the power sector should be cut back by more than for others. In practice, countries may find it complex to establish clear criteria to differentiate approaches between the other sectors, so may choose to apply the same rules across the energy consuming sectors. Some illustrative numbers are shown in the box on the previous page.

**(ii) Benchmark allocations where feasible, differentiated by technology type for incumbents but not for new entrants**

Significant cutbacks, particularly for power generators, make it easier to allocate using 'benchmarks', e.g. allocations per unit capacity installed. This avoids some of the perverse incentives associated with allocations based upon emissions, whether recent or projected. For incumbents, benchmarks could be differentiated by plant type, to give more to coal than to gas power generators for example, to avoid large transfers between existing assets.

However, allocations to new facilities from New Entrant Reserves should not be differentiated by plant type. As explained earlier, this would amount to subsidising new carbon-intensive investments. In particular, giving more to coal than gas plants rewards investment in new carbon-intensive coal facilities, that would last decades. This conflicts with all that we know about climate change, would increase the cost of future emission reductions, and as carbon controls tighten would lead to higher electricity prices for everyone.

The damaging effects would be amplified if carbon-intensive new entrants not only receive free allowances for the period 2008-2012 but receive promises for subsequent periods. This could also undermine various options that governments have to implement European and international solutions to address longer-term competitiveness issues and emission spill-overs, as discussed later in this report. The way to reduce the impact of climate change on electricity costs is not to shield new carbon-intensive investments, but to ensure that they face the true cost of the carbon risks they impose, to open electricity systems to lower carbon entrants (for which pass-through $CO_2$ costs will be much lower), and thus to accelerate investments towards low-carbon electricity systems.

**(iii) Use auctions to increase supply, to stabilise prices, and to assist European industry and governments embark on the transition towards a low-carbon economy**

Using auctions will increase the supply of allowances into the market, in regular and predictable ways. This is helpful to market transparency and operation, and compared to the purchase of international emission credits it keeps the money in the European economy. Auctions avoid the problems of perverse incentives associated with free allocation and reduce the disparity of profit levels between electricity and other sectors. In addition to reducing distributional concerns, revenues should be recycled and used to support investment in energy efficiency and low-carbon technologies.

Auctioning is core to the US emissions trading plan of the Regional Greenhouse Gas Initiative, which is due to cover power generation from seven north-east states from 1 Jan 2009. This stipulates that a minimum of 25% of allowances should be auctioned, with revenues dedicated to support 'consumer benefits'. The auction provisions also help to address 'leakage' of emissions to generation in non-participating states. In the EU ETS, the Directive stipulates that a maximum of 10% of allowances in Phase II can be auctioned. This should be sufficient to address the core concerns in Phase II and would generate valuable experience for beyond, but this constraint should be relaxed for subsequent periods.

Auctions should also be used more actively to help stabilise prices, given the experience of Phase I and potential scope of excess supply. The key mechanism would be for governments to release some of their allowances through joint minimum-price auctions. This process would not conflict with the existing terms of the Directive, and there are several familiar, readily-available approaches to conducting such auctions. If the overall cutback is set such that the market requires at least some of these allowances, this ensures that the price will not drop below the agreed minimum bid price. This will greatly boost investor confidence in low-carbon technologies, and also opens up the possibility of being able to signal intentions around longer term carbon prices.

Auction revenues can be recycled in ways that ensure that no ETS sector is worse off as a result of the scheme, to support directly investments by European industry and consumers in energy efficiency and low-carbon R&D and infrastructure, and to assist with Kyoto compliance (e.g. in relation to international investments under the Kyoto international mechanisms). These are entirely feasible objectives that can help to give European industry a competitive edge in a carbon constrained world, and they should be built into auction design.

# Costs and competitiveness

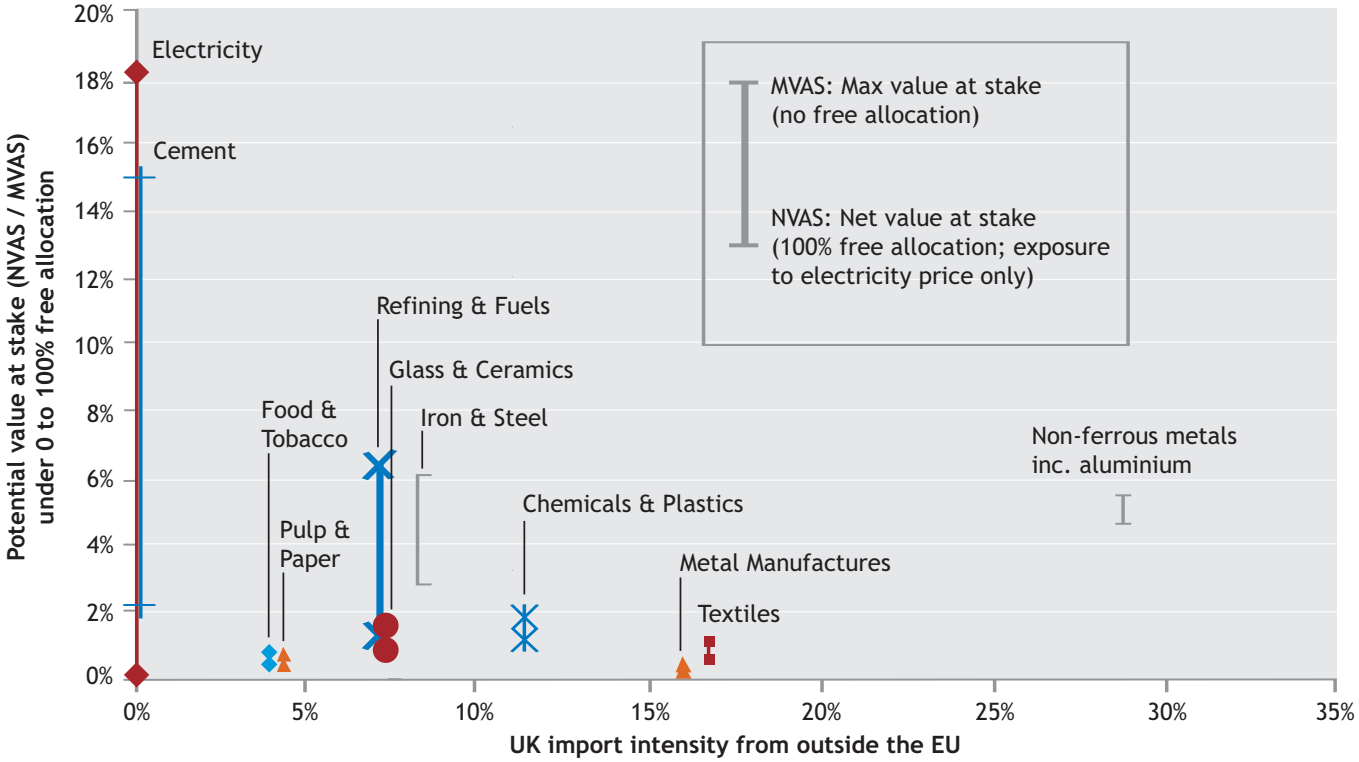
The sheer scale of the EU ETS means that it could affect the costs of key industrial sectors more than any previous environmental policy — perhaps more than all the others put together. It is crucial that the EU ETS does not significantly reduce the competitiveness of industry in the UK and Europe — and that where possible it becomes an instrument to enhance it. This requires a sense of scale relative to other influences, and how this differs by sector and how it relates to allocation.

The 'value-at-stake' relative to sector value-added is illustrated in Chart 3. This chart illustrates the UK situation, which in many respects is one of the most exposed countries in Europe to external trade effects. The lower end of the bars shows impact with 100% free allocation, which still leaves sectors exposed to the electricity price impact. The value-at-stake scales up the bars in proportion to the degree of cutback in their free allocations — the top of the bars corresponds to zero free allocation.

The Chart underlines the unique exposure of aluminium, as explained in our previous studies, if it buys electricity from the grid: its net value-at-stake is more than twice that of any other sector, and so is its trade intensity, so that very small price differences could have a big effect.

Under the assumptions used (see notes to Chart — these represent plausible conditions under Phase II for countries with coal-dominated power systems and no new gas plant construction), and assuming 5% cutback in free allocations, the value-at-stake for cement, and for iron and steel, is 2-3%. For all other sectors the figure is 1.3% or lower. The impacts could be higher than this for a few other individual subsectors — notably within glass and ceramics, and in chemicals, both of which have average NVAS exposure close to 1% of value-added. In all cases, the actual net impact depends on the extent that industries can undertake cost-effective emissions abatement measures or pass on $CO_2$ related costs to product prices.

***Chart 3*** *UK international trade intensity and value-at-stake over range 0-100% free allocation, relative to sector value-added*




Source: Climate Strategies study: Grubb and Neuhoff (Policy Overview)

Notes: The chart shows (vertical axis) potential value at stake, which we define as the potential impact of the EU ETS on input costs relative to sector value-added, before any mitigation or pass-through of costs to product prices; and (horizontal axis) current trade exposure of these sectors. The lower end of the bars shows impact with 100% free allocation; the upper end the theoretical impact of zero free allocation (or equivalent carbon tax). Results are for a carbon price of €15/t$CO_2$ and an electricity cost pass-through resulting in wholesale electricity cost increase of €10/MWh, consistent with a coal-dominated power system (modern natural gas plants would result in about half this rate of electricity price impact for the same carbon price). Scaling the electricity price would move the lower point of the bars in proportion; scaling the carbon price would scale the length of each bar in proportion.

The height of the bars not only shows the sensitivity to allocation, but also the potential for the sector to profit from the difference between the average cost impact after allocation, and the opportunity cost impact: the upper end of the bars gives a rough indication of the potential relative impact on output prices, if firms pass through these opportunity costs. If market prices reflect these, as in competitive electricity markets, the sectors will tend to profit from the difference.

Passing through the opportunity cost impacts of the EU ETS would increase prices relative to imports from regions outside the EU ETS[4]. This forms the main constraint on ability to pass $CO_2$-related costs on to customers. The chart also shows (horizontal-axis) the existing degree of imports from outside the EU.

The cement sector illustrates the extremes. Hardly any cement is currently imported from outside the EU, due principally to transport costs. But its Maximum Value at Stake (MVAS) — and the relative significance associated with opportunity cost pricing — is more than twice that of any other sector. Our studies show that profit-maximising behaviour in the cement industry would lead to significant imports in coastal regions: maximising profits drives up prices enough to overcome the barriers that have traditionally limited imports. The cement industry could choose instead to limit price increases in coastal markets, for example by just enough to recover their average cost increase from the EU ETS, which at €15/$tCO_2$ would mean cement prices increasing by around 2% — insufficient to spark a big rise in imports (see our previous report). In practice, moreover, experience from Phase I has already shown significant capacity to cut back emissions by reducing clinker input (and sometimes importing clinker) and using more non-fossil fuels. Small cutbacks during Phase II should be reasonably accommodated through a mix of these strategies.

Overall, our studies suggest that all sectors in the EU ETS have the potential to profit in aggregate, but for both cement and steel the modelling suggests a small percentage loss of market share. Refining is also potentially equally sensitive to allocation, though much less exposed to electricity price effects.

Of course, differences of allocations between Member States would affect cash flows of their companies (the length of the vertical bars gives an indication of sensitivity to this), most of which have far greater trade within Europe than outside it. In reality these internal EU dimensions have a strong impact on lobbying and allocation decisions, but again this must be kept in perspective. At a carbon price of €15/$tCO_2$, even a 5% differential allocation in the iron and steel, or refining and fuels, sectors would represent a 0.25% change in the sector 'value-added'. Only in cement and electricity could the value of a 5% allocation differential potentially approach 1% of sector value-added. In both these cases, this remains trivial compared to existing price differentials between different parts of Europe, because of transport costs, and tie-line constraints and transmission losses, respectively. Concerns about an uneven playing field in European allocation, whilst very understandable, need to be set in this context.

For these reasons, competitiveness is not a serious concern in terms of the direct impact of Phase II EU ETS costs. Rather, Phase II is likely to be a phase in which most of the participating sectors can accrue profits from the EU ETS, that can be used to assist investment, for example in low-carbon technologies.

Competitiveness, rather, is a strategic issue. Major multinational companies, typical of many of the sectors covered by the EU ETS, evaluate large investment decisions very carefully with respect to the long term prospects in different regions. If they see a credible risk that the EU ETS leads to sustained differentials in carbon prices over future decades that feed through to production costs, then Europe may indeed face a strategic competitiveness problem. The EU ETS needs to continue after 2012, but it must do so in ways that will credibly protect the strategic competitiveness of investments in Europe. We now show how.

[4] Sectors outside of the EU ETS would face the cost impact at the bottom of each bar (electricity price exposure) and an equivalent incentive to change the price of their products; there would be no divergence between average and marginal/opportunity costs, and no resulting scope for profiting from such divergence.

# Continuing the EU ETS post-2012

Clarity about the future would be extremely valuable. Fundamental uncertainties delay investment: reducing it can enable more efficient investment and thus reduce ongoing $CO_2$ emissions and prices. This will not be easy to achieve as the future context for emission reductions is uncertain. International negotiations remain fraught with difficulty. Given the huge divergences in international positions, it may be many years before they conclude — certainly, too late to be of much help in supporting efficient investment now. It remains implausible that the world will jump in one step to an all-encompassing, global agreement including policies that lead to a uniform carbon price across all the EU's competitors, including developing countries.

A credible commitment and structure to support low-carbon investment in Europe is thus needed in advance of any comprehensive global agreement. It needs to be capable of supporting potentially higher carbon prices, over the timescales relevant to new investment — potentially decades. Unlike Phase II, this could for the longer term raise important challenges for international competitiveness in several sectors. For any commitment on post-2012 design to be credible and justifiable, these concerns have to be addressed. So too do the problems around perverse incentives, for example those arising from expectations about getting future free allowances based on most recent emissions.

Allocation will anyway have to move away from projection-based approaches for purely pragmatic reasons. Many countries are currently trying to allocate for Phase II relative to projections of 'what emissions would be during 2008-12 if there were no $CO_2$ policy or problem'. This requires complex speculation to unravel what may have already been influenced by climate concerns, a year of high carbon prices, the impact of $CO_2$ on gas prices and expectations about the future. After five years of operation and investment based on the EU ETS, constructing a 'no carbon policy' projection as a baseline for the post-2012 period would be an impossible exercise. It is a wholly impractical basis for the long term — consistent with the view that Phase II is essentially a transitional period towards a better-grounded and more durable approach.

Against this background we identify three options to sustain the EU ETS as an effective incentive for low-carbon investment post-2012:

- International sectoral agreements, covering all major competitors in a particular sector, to implement policies that reflect $CO_2$ costs in product prices of energy-intensive, internationally mobile goods. Fully global participation may not be required, either of countries or sectors: protecting EU industry under the EU ETS may only require agreement involving the principal competing nations covering the core sectors identified above[5]. Agreement to adopt policies that reflect $CO_2$ costs in electricity generation would also be desirable to ensure more consistent international treatment of downstream impacts on electricity-intensive industries
- Use of border-tax adjustments to compensate industry producing in regions with high $CO_2$ costs for these costs when exporting, with a symmetric tariff being applied to imports. This can be designed to avoid discriminating against industry in either region, and can thus be compatible with the World Trade Organisation. This would probably require the use of auctioning rather than free allocation to allow compensation for actual costs incurred, not opportunity costs.
- A third option would be to make allocations proportional to production levels (output-indexed, or intensity-based allocation), for example per tonne of cement produced. Depending upon the proportion awarded, this would reduce exposure by bringing down the opportunity costs associated with production in line with the average costs after allocation, thus lowering prices and reducing both emissions leakage (due to imports of energy-intensive products) and profiting. This is a form of ex-post adjustment and is currently precluded by the Directive. It is possible but would considerably complicate the system by requiring retrospective adjustments to allocations, and it would shield product prices from the real costs of $CO_2$. Allocations would also have to be in proportion to the carbon-intensive component of production, for example production of clinker in cement, to prevent companies simply getting allowances for cement produced but importing the clinker. Thus it would not support radical innovation that avoided carbon-intensive intermediate processes, or substitution by consumers towards less carbon-intensive products. But it would still reward investment by the sectors to reduce the carbon intensity of their operations.

[5] In theory, agreements with sector organisations themselves could be considered, but the absence of any precedents or institutional authorities for such an agreement would make it problematic. The more serious proposals for sectoral agreements have focused upon governmental commitments, in consultation with their industries.

All these options are complex; each has strengths and weaknesses. But all offer avenues that can be developed, in discussion with the industries concerned, and with other governments. In practice, the EU may not face a straight choice between these three options. Where effective sectoral agreements can be secured, these are probably the first-best choice; but they are unlikely to be easy or quick to negotiate, and may come down to focusing on particular products or subsector markets. Border-tax adjustments, similarly, are unlikely to be 'all or nothing'. They would rather be considered in context of particular industries and products, where a valid case of competitiveness concern was raised, and for which other solutions appeared inappropriate. Output-indexed allocations, similarly, could be considered in some cases, but the wider their adoption, the more deleterious the impact on the economy-wide efficiency of $CO_2$ controls.

Thus, options exist to maintain for the long term the core incentives for low-carbon investment in the EU ETS sectors, without reducing the attraction of Europe as a place to invest in these sectors. Indeed by making it plain that the EU will sustain incentives for low-carbon investments, and knowing that climate change is a problem that the whole world will have to tackle, such approaches have every prospect to enhance the long-run competitiveness of European industry.

EU countries do not have to decide now which of these options to follow, nor how exactly to implement them. Rather, our conclusion is that solutions are available, and that the EU can unambiguously commit to continuing the EU ETS, recognising that three avenues are available to support this decision in the event of failure to secure a truly global agreement. The next few years can then be used to engage industry and other stakeholders in dialogue about which would be the most appropriate avenue to follow, perhaps on a case-by-case basis given the limited number of sectors involved in the EU ETS.

# Annex. The 2005 Verification Data

During Spring 2006, EU Member States collected data on actual verified emissions from installations covered by the EU ETS. As the data were released, this revealed that emissions were substantially lower than many participants had expected, and in most cases lower than initial allocations.

The Carbon Trust commissioned ENTEC Consulting to undertake a detailed analysis of the verification data. Their report, available on the Carbon Trust website, sets out the supply-demand balance across all the Member States for which data were available at time of going to press (all major countries except Poland). This confirms that there was an overall surplus, of more than 60 $MtCO_2$; and that the dominant shortfall was in the UK power sector, which was short by more than 30 $MtCO_2$ of allowances.

The report also provides more detailed analysis of allocations and emissions in five of the major European economies for which comprehensive sectoral data were available at time of going to press (UK, Germany, France, Austria and Netherlands). The analysis separates small combustion installations as a separate category, and also splits glass from ceramics, to give eight sector categories in all. Several corrections were required to classification errors in the source data. These results are set out in Table 2, in terms of the % difference between allocations and verified emissions.

This reveals important insights about the nature of the allocation problem. Across these countries, allocations exceeded emissions in six of the eight sector categories in all countries; there were small deficits in the refineries sector in Germany and Austria; whilst power sector emissions exceeded initial allocations in all these countries except for France, though to widely varying degrees. The average (unweighted) degree of surplus exceeded 15% in four of the eight sector categories.

The degree of shortfall to the UK power sector reflects rejection of the UK's request to increase the allocation it had initially submitted to the EC. The UK power sector deficit thus masks a more general story of surplus that is consistent across other sectors, and all countries. Given that these allocations were agreed barely a year before the system started operating, this is a troubling finding. Some of the surplus may be attributable to actual mitigation activities in 2005, but no-one claims that this could account for such a huge difference in the space of one year. It underlines the extent to which projections were inflated in the context of projection-based allocations, even over this short period.

It is also notable that many of the companies with surplus failed to capitalise on this by entering the market. Rather, having secured allocations sufficient to ensure compliance without any need to mitigate, many appear to have been satisfied with this, and have not sought to maximise benefits by selling their surplus allowances, or by considering the potential benefits that could arise from participating in the market with additional abatement.

***Table 2*** *Surplus of allocation over 2005 verified emissions by sector in five major European economies.*

| Sector | Country | | | | | Unweighted average |
|---|---|---|---|---|---|---|
| | UK | Netherlands | France | Germany | Austria | |
| Glass | 11.4% | 1.1% | 11.3% | 19.0% | 0.1% | 8.6% |
| Paper & Pulp | 34.3% | 10.5% | 45.3% | 37.1% | 5.0% | 26.4% |
| Cement & Lime | 13.5% | n/a | 0.7% | 15.7% | 4.3% | 6.9% |
| Ceramic | 23.5% | n/a | 16.8% | 40.7% | 4.7% | 17.2% |
| Refineries | 7.6% | 12.6% | 12.8% | -0.4% | -3.6% | 5.8% |
| Iron & Steel | 6.1% | 60.3% | 7.5% | 13.8% | 3.7% | 18.3% |
| Small combustion | 10.8% | 17.4% | 29.0% | 11.0% | 15.7% | 16.8% |
| Power stations | -22.5% | -5.3% | 8.7% | -0.3% | -17.7% | -7.4% |
| **TOTAL** | **-13.2%** | **7.6%** | **14.6%** | **4.4%** | **-2.9%** | |

Source: Derived from analysis carried out for the Carbon Trust by Entec, June 2006 (based on disclosure as of 19th May).

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