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## The European Emissions Trading Scheme: An Overview of Operations and Lessons

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## THE EUROPEAN EMISSIONS TRADING SCHEME: AN OVERVIEW OF OPERATION AND LESSONS

MICHAEL GRUBB\*

After a decade of struggle during the 1990s, during which the European Union sought to introduce a carbon tax as a principal means of tackling climate change, a sudden change of approach produced a radical breakthrough in attempts to introduce a carbon price in Europe. Considerations of subsidiarity, legal and institutional structures, and the inherent political difficulties of the large-scale revenue transfers embodied in a carbon tax combined to make emissions trading – long proposed by the US Clinton Administration – more practical. After the EU's turnabout on this issue, it took just three years – fast by the standards of European legislative development – to move from concept to a completed EU Directive on Emissions Trading. This article looks at its key features, experience to date, lessons and prospects.

### The EU ETS: key features

The EU emissions trading scheme, which began operating in 2005, caps CO<sub>2</sub> emissions from heavy industry – power generation and half a dozen mandatory energy-intensive sectors, plus all combustion plants above a certain size threshold (20MW). Covering almost half of all EU CO<sub>2</sub> emissions, it forms the centrepiece of European policy on climate change. Trading the allowances to emit CO<sub>2</sub> gives value to reducing emissions and has formed a market with an asset value worth tens of billions of euros annually.

Although unprecedented in its scale and scope, the main pillars of the EU ETS were built on many years of economic research into theories of emissions trading, combined with practical experience of schemes principally for various other pollutants in the US.

The basic idea is straightforward. Based on Coasian theory, defining rights to emit and permitting trade in these allowances enables participants to look for the cheapest way of delivering the aggregate environmental goal. A market emerges and price of emission allowances defines the lowest-cost way of meeting the constraint set. The external impact is internalised, with maximum efficiency. Moreover, allocating free emission allowances enables governments to overcome the problem that had bedevilled carbon tax proposals for a decade, by separating the *efficiency* property of a market-based instrument, from the *revenue transfers* involved in taxation. Free allocation, in other words, offers from a standpoint of political economy a neat, intrinsic way of buying off political opposition to an efficient market solution.

It is such a simple idea it is a wonder it took so long to gain credibility – and in the eyes of some critics, so quick to lose it. Like many simple ideas, its practical implementation posed many challenges. The Directive was carefully designed to be an evolutionary process, in at least three phases:

- A first phase from 2005–07, with various opt-out provisions
- A second phase, with tougher non-compliance provisions, running from 2008–12 to coincide with EU governmental targets under the first commitment period of the Kyoto Protocol
- Subsequent phases to be developed in the light of experience with the first two.

This article appears at the cusp of transition from the first, trial phase, to the “real thing” in terms of its operation at full strength under the umbrella of Kyoto commitments – and shortly before the release of the first salvo on its longer term future, in the form of a European Commission proposal for post 2012 design. It is thus an excellent moment to take stock.



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### Lessons from phase I

Phase I began operation on schedule and the mechanics of market services soon appeared, with information services, brokers, monitoring and verification agencies emerging in abundance. With many millions of euros at stake, CO<sub>2</sub> finally reached the boardroom of companies across Europe.

The main market focus of course was on the price. In the early months, carbon prices rose steadily, tracking the rising gas price that determined the cost of switching away from coal in power sector generation. As gas prices continued to soar, the CO<sub>2</sub> price broke free from this marker and oscillated in the range EUR 20–25/tCO<sub>2</sub> for much of the year (Figure 1).

From several perspectives, 2006 was the defining year for the EU ETS. It started with prices for phase I (2005–07) emission allowances reaching levels higher than anyone predicted, peaking at EUR 30/tCO<sub>2</sub>, whilst governments confidently issued draft National Allocation Plans (NAPs) for how they intended to allocate allowances for phase II, the Kyoto period of 2008–12. The year ended with phase I prices sinking close to zero, and several countries threatening to take legal action to overturn the European Commission's rejection of almost all the submitted NAPs as inadequate. It was certainly a year of vast learning – as befits the middle of the first, learning, period of a major new system.

The key to prices of course is scarcity, and the biggest difference between the EU ETS and other markets is that government decisions create the scarcity. Concerns from some analysts about overall shortage

in phase I proved groundless, when in May 2006 the release of data on verified emissions for 2005 showed a substantial surplus. The price halved overnight, and as the situation clarified over subsequent months, it sank further. The final tally showed that emissions in 2005 were about 100 Mt (5 percent) below the allocated amount, and shortly after the New Year phase I allowances became essentially worthless. Data for 2006 show that emissions increased fractionally, but not nearly enough to mop up the excess supply of allowances.

Debate continues about the reasons for the surplus. The suggestion that some companies might actually have cut back their emissions in the face of a stringent carbon price was for a while drowned in the noise of condemnation about overallocation, but the most detailed studies (e.g., Ellerman and Buchner 2006) suggest that actual abatement was an important component – potentially accounting for the majority of the surplus.

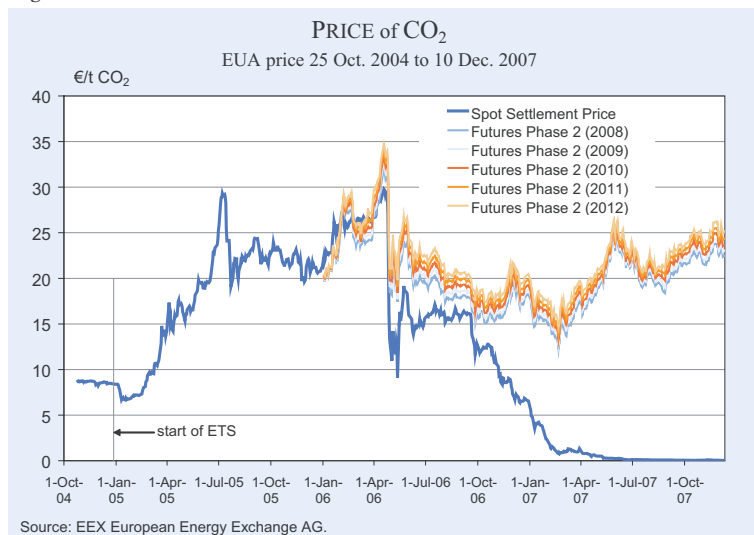
After their initial anguish, the brokers stopped worrying, as forward trade in phase II allowances became an equally active market, and all eyes turned to the struggle over phase II allocations.

### Phase II allocation

It was against this roller-coaster backdrop that countries sought to develop their National Allocation Plans (NAPs) for phase II, the Kyoto period of 2008–12. There was a great deal at stake. Phase I had already shown the huge potential financial value of emission allowances – at EUR 20/tCO<sub>2</sub>, governments were allocating assets worth probably more than EUR 200 billion in total. Not surprisingly, they were subject to huge lobbying pressures. Yet the EU ETS in phase II was central to meeting Kyoto Protocol targets.

Under the terms of the EU ETS Directive, the European Commission is empowered to reject NAPs if they do not meet certain criteria laid out in the directive, relating to the avoidance of surplus allocations and consistency with Kyoto targets. However, the data on verified 2005

Figure 1



emissions were published only six weeks before the official deadline for submitting proposed phase II NAPs to the European Commission – clearly insufficient for governments to consider wholesale revisions.

Most of the NAPs initially proposed for phase II offered modest cutbacks relative to projections of sharply rising emissions – and, in aggregate, would have resulted in an increase of around 5 percent relative to the verified levels of 2005, after correcting for differences in coverage. This was not only inconsistent with Kyoto targets; it would also have left a precariously thin margin below “business-as-usual” emission projections. Depending upon assumed relative energy prices (gas vs. coal, as illustrated) and the inflow of emission credits from abroad, the EU ETS could have been rendered almost impotent for the whole of phase II, requiring hardly any real abatement.

Faced with this risk, on 29 November 2006 the Commission announced a momentous decision. In evaluating the first 11 NAPs (10, after the French government withdrew its plan a few days before), it rejected all but the UK’s as inadequate.

In fact the Commission went further than this. It clarified its interpretation of the directive in terms of specific total allocations that would be deemed acceptable, linking allowed allocations to two main factors. The first was a requirement that allocations be consistent with Kyoto targets, after taking account of other aspects of member state implementation plans including provisions for purchase of international Kyoto credits. The second was an explicit numerical formula that total allocations could not exceed 2005 levels multiplied by projected economic growth, corrected for trends in energy intensity (energy per unit of economic output). Moreover, the economic growth projections and energy intensity corrections were taken from international (EU) sources, not those that member states themselves presented.

Under the terms of the directive, member states had three months to appeal against the Commission decisions. By announcing decisions on such a big group of countries simultaneously, the Commission raised the stakes enormously. Any country that challenged its ruling – as the German economics minister initially threatened to do – would be disputing the underlying interpretation of the directive, which had been applied consistently across all countries,

and would thereby open the floodgates for all to appeal. This would have locked up the EU ETS in legal disputes from which it would probably never have recovered – certainly not in time to be of much use to investors wanting to know the rules for phase II. Faced with rising public debate in the year of its EU and G8 presidencies, Germany backed down and others did so too.

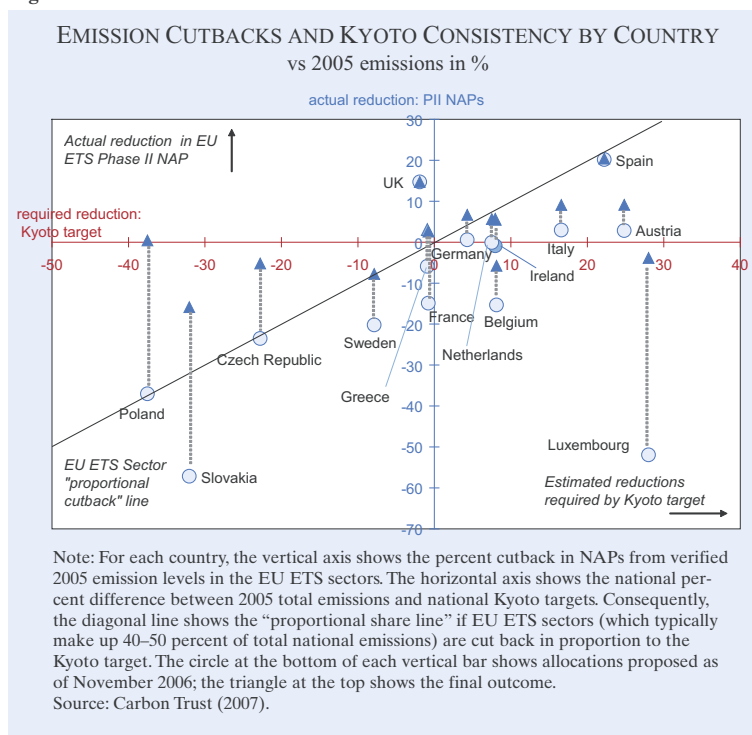
In aggregate, the Commission’s decisions cut total allocations in Europe by 10 percent as compared to the initial submitted and draft plans – turning a proposed aggregate *increase* of 5 percent from 2005 levels into confirmed allocations 5 percent *below* 2005 levels. The final allocations total almost exactly ten billion tonnes of CO<sub>2</sub> over the period – two billion tonnes annually. CO<sub>2</sub> emissions associated with European industry are firmly capped, for the first time, anywhere, since concerns about climate change first emerged on the international political stage some two decades earlier.

### Distribution and Kyoto compliance

Another major impact of the European Commission decisions was to greatly reduce disparities between the different NAPs and to bring them much closer to consistency with national Kyoto targets. Figure 2 shows for each country the percent cutback relative to 2005 levels (vertical axis), against the percent cutback in national emissions required for a country to meet its Kyoto target domestically (horizontal axis). The diagonal line indicates the “proportional share line”, i.e., emission reductions for ETS sectors that would be proportional to the national total cutback implied by Kyoto targets. It also compares the final outcome (triangle) with the original national proposal (circle).

Figure 2 reflects two main themes in the battle over phase II allocation plans in Europe. The first concerned allocation in the EU-15 countries, principally western and southern European countries that are mostly falling short of a path towards their Kyoto targets. The UK, the biggest exception to this pattern, had submitted a relatively ambitious allocation plan and the draft Spanish plan proposed even bigger cutbacks. The German government led the charge against the Commission’s tightening of the screws, but as it backed away from its threat to take legal action, the other EU-15 countries did so too. The net effect of the Commission winning its political struggle – apart from saving the EU ETS as a

Figure 2



**A pause for reflection: what makes the EU ETS different?**

As the dust settles on phase II allocations and attention turns to the phase beyond, this is an opportune time to reflect what makes carbon and the EU ETS so different from trading schemes that have gone before and the policy implications of this.

One factor is the sheer scale. The EU ETS is the biggest such scheme in the world by an order of magnitude. At allowances prices in the range of EUR 10–30/t CO<sub>2</sub>, the value of allowances issued every year is EUR 20–60 billion, compared with the US’s East Coast NO<sub>x</sub> trading programmes (EUR 1.1 billion) or SO<sub>2</sub> trading schemes (EUR 2.8–8.7 billion).<sup>1</sup>

credible market – was to align most of the other EU-15 countries closer to the “proportional share” cutback, many with a significant cutback relative to 2005; those that fell short had to demonstrate stronger offsetting action, in other sectors or through international purchases.

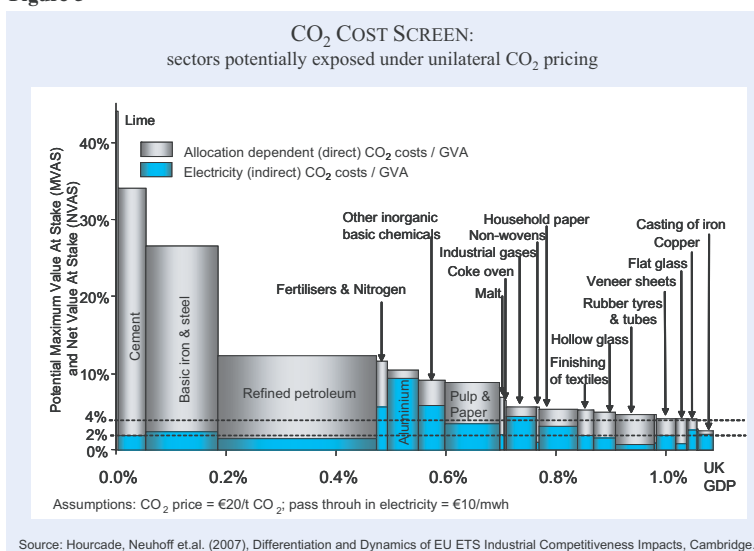
The effort to strengthen NAPs faced a different issue in the new member states of eastern Europe. These were all (except Slovenia) easily on track to comply with their Kyoto obligations, thanks to the decline in emissions far below 1990 levels in the aftermath of economic transition. Here the other element of the Commission’s formula – the cap relative to verified 2005 emissions adjusted for economic growth and energy intensity changes – came to the fore. In some cases (e.g. see Poland, Slovakia and the Czech Republic), this imposed dramatic cutbacks on their plans. To some degree, this turned out to be a struggle over the meaning of accession to the EU itself. The Commission insisted that all EU members had to abide by common rules and expectations, including the provisions to stop surplus allocations forming an implicit subsidy. The majority of the new member states continue with legal challenges – but this has not stopped phase II from proceeding and most challenges are likely to peter out, perhaps with minor adjustments. The result all round is to set national aggregate allocations on a more “level playing field” across Europe than in phase I.

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. Yet part of the problem in the debate over the EU ETS is the tendency to make sweeping generalisations, not least about costs and competitiveness impacts. Figure 3 provides some context, by plotting the potential cost impacts of a EUR 20/tCO<sub>2</sub> price on the most carbon-intensive manufacturing activities, against the value-added of these activities, using the UK example. Cement and steel stand out; for no other significant activity do such carbon costs amount to much more than 10 percent of value-added *even if they had to pay in full*. Free allocation does much to protect cement, steel and a number of other sectors. Out of 159 activities in this study, only 20 – amounting to about 1 percent of value-added in the UK economy – face a full carbon cost impact exceeding 4 percent of their value-added.

This does not make the costs minor, but in terms of potential trade impacts with other regions of the world, it does set them in the context of other international differentials of raw materials, labour costs, interest rate impacts and exchange rate variations, for example.

<sup>1</sup> CO<sub>2</sub> – 2.2 billion tonnes annual emissions in phase I at EUR 10–30/tCO<sub>2</sub>; SO<sub>2</sub> 10 Mt at USD 270–850/t, NO<sub>x</sub> East Coast market, 640,000t at USD 2000/t.

Figure 3



Aside from the scale, many other features stand out, each of which differentiates the EU ETS from a “pure” market and raises important policy issues.

### Small cutbacks and price instabilities

The economic scale, combined with the relative difficulty of reducing CO<sub>2</sub> emissions compared to many other pollutants, underlies the relatively small cutbacks observed. This is problematic particularly since both evidence and theory suggest that projection-based targets and allocations tend to be biased upwards.<sup>2</sup> Small cutbacks in the context of intrinsic uncertainty inevitably create price volatility, which carries a cost. Difficulties in predicting future allowance prices delay investment decisions. By waiting, a company can gain more knowledge about future CO<sub>2</sub> prices, and risk aversion may further reduce the inclination to invest, reflecting classic results of real options theory (e.g., Baldursson and von der Fehr 2004). Given relatively modest cutbacks in the face of large uncertainties, policies which can provide a greater degree of price stability in the EU ETS would be valuable.<sup>3</sup>

<sup>2</sup> This is for three reasons. First, business, like the rest of humanity, tends towards optimism – no business sets out its store based upon pessimism, contraction, or projected failure; it is the aggregate market that suggests the above interpretation to some participants. Second, linking allocations to projected needs creates a huge incentive for businesses to inflate forecasts. Third, assumptions that cutting emissions would take time and capital underestimate the scope for some basic housekeeping measures: companies “don’t know what they don’t know” about mitigation possibilities until they find out. For evidence on emission forecast uncertainties and inflation, see Grubb and Ferrario (2006).

During the battles over allocation for phase II, many governments moved to increase the level of auctioning of allowances, with many now set to issue 5–10 percent of allowances through auctions during phase II. This offers a ready means to improve price stability and investor confidence, if governments set a reserve price. This would then act as a price floor (to the extent that the market needed access to the auction). To avoid competition between member states, they would have to agree the minimum price and basic auction rules. This would not conflict with the existing terms of the directive, remains an option available throughout phase II, and there are several familiar, readily available approaches to conducting such auctions (Hepburn et al. 2006).

The opposite concern is that prices might rise to levels deemed to pose an unacceptable risk to European industry (e.g., Bouttes, Leban and Trochet 2006). Assessment of the phase II supply-demand balance, and of the economics of competitiveness over the five-year period, suggests this is unlikely. It is, however, true that a planned response to any such eventuality would be better than a panic-based reaction such as occurred in the California NO<sub>x</sub> trading system, and a price cap or “safety valve” could allay such concerns. One option, should prices rise to levels of serious political concern, would be to relax current constraints on imports of emission credits from developing countries and perhaps expand the scope of emission credits that could qualify for compliance purposes.

### Over-compensation and windfall profits

A related feature is the tendency towards “overcompensation”. CO<sub>2</sub> costs raise production costs and the

<sup>3</sup> Obviously industry is exposed to volatile prices for many other input factors, but if all producers use similar technologies, then they can pass on changes in input prices to product prices. In contrast, if two competing technologies, e.g., with different levels of energy efficiency, can be used to manufacture the same product, then cost differences that only affect one technology are more difficult to pass to the product price. Risk-averse investors then prefer the solution with lower capital costs – which is usually not the energy-efficient approach. Reducing uncertainty about post-2012 can thus accelerate investment in low-carbon technologies, reducing emissions and CO<sub>2</sub> allowance prices.

normal response is to raise product prices to compensate. Economically, free allocation amounts to an alternative way of compensating companies. If companies in competitive markets maximise profits by setting prices relative to marginal cost of production, these marginal costs now include opportunity costs of CO<sub>2</sub> allowances – in which case there is potential “double compensation”, leading to wind-fall profits.

This has been most evident for the power sector (e.g., Sijm, Neuhoff and Chen 2006). In countries with liberalised power markets, generators have passed through most of the opportunity costs, as expected, with aggregate profits totalling billions of euros. There are notable exceptions, where the retail price levels are set by government contracts or regulation.<sup>4</sup> However, whilst consumers may welcome such protection from the real costs of CO<sub>2</sub>, all these approaches create distortions that can undermine the incentives for CO<sub>2</sub> reductions.

In other sectors, price responses may be constrained by competition from outside Europe. This is not an “all or nothing” constraint: if firms maximise profits, they will still generally pass through much of the opportunity cost, making profits at the risk of some loss of market share (Smale et al. 2006). Granting free allocations is thus highly imperfect as a protection against foreign competition: companies still face the full costs in their marginal production decisions. In most products, the price rise required to recoup the net exposure alone is trivial (Carbon Trust 2004; Sato et al. 2006); the marginal cost incentive is to go beyond this, and end up both making profits from the system and losing some market share.

The more robust justification for free allocation is that it compensates existing assets for the impact of environmental regulation that was not foreseen at the time of construction. This interpretation would create clear criteria for the amount and basis for allocation and indicate that free allocation is part of a transitional process towards a strategic objective of fully internalising CO<sub>2</sub> costs.

### Operational distortions

Free allocation can distort incentives. If installations cease to receive free allowances when they close, this creates a perverse incentive to keep inefficient facil-

ities operational. The repeated negotiations of allocations for subsequent periods create additional challenges. Even beyond 2012, the need for flexibility to adapt to learning in both climate change science and mitigation may make it difficult to commit credibly to much longer allocation periods. The complications of international negotiations put further constraints on such commitments.

Many countries have allocated allowances in relation to historic CO<sub>2</sub> emissions. If companies expect a continuation of this approach, this undermines the incentive for companies to reduce emissions, since higher emissions in one period would be rewarded by greater allocations in the next. This is the “updating” or “early action” problem (Neuhoff, Keats and Sato 2006). In fact there is a “hierarchy” of potential distortions arising from repeated allocations. All distortions can be reduced if governments credibly commit to reducing in subsequent rounds the free allowance allocation related to historic data or existence of installation.

Note that these incentives apply to methodologies at *facility level*. Where countries separate aggregate emission allocations from the way they are distributed between facilities, the incentive effects need to be distinguished.

### Investment distortions

Most governments set aside free “new entrant reserves”, which economically amount to an investment subsidy. If the volume were unlimited, such subsidies might reduce the product price – which may be part of the aim, but is not actually achieved.<sup>5</sup>

Governments use NERs to help support new construction, but giving free allowances in proportion to the carbon intensity of new plants can bias the incentive towards more carbon-intensive investments (Neuhoff et al. 2006). When projected forwards, such distortions are amplified by the multi-period nature of the EU ETS.

<sup>4</sup> In these countries, domestic bills are not affected despite an increase in wholesale price levels, and the vertically integrated companies cross-subsidise their retail costs with the profits from the free allocation. In other countries, dominant power generators might anticipate government intervention and thus refrain from passing on CO<sub>2</sub> opportunity costs to wholesale price levels.

<sup>5</sup> The amounts available in most allocation plans are limited, and the response of new construction too slow. Moreover once operational, carbon-intensive new entrants face the same incentive as incumbents to factor-in opportunity costs of production.

Unlike existing facilities, where one aim of differentiated free allocation is to avoid stranded assets and reduce major revenue transfers between companies, there is no serious rationale for differentiating new entrant reserves. The ideal would be to abolish them altogether, so that zero carbon investments received the full value of their contribution towards decarbonisation. Politically the desire to attract new investment is, however, a strong driver, not only between EU and other regions, but between EU countries. Benchmarking new entrant reserves on the basis of capacity avoids the worst of distortions, but even this can be difficult unless all do the same. It is one of the clearest areas in which potential difficulties in allocation are exacerbated by the lack of harmonisation – if a sector in one country can plausibly argue that the methodology adopted in another is more favourable. We now consider this final characteristic of the EU ETS.

### Devolution of allocation responsibilities

The final way in which the EU ETS differs from many other trading systems is in the devolution of allocation responsibilities, in this case to its 27 member states (now 30, including the EEA countries). This was an essential part of the deal that enabled the adoption of the directive: Member states would never have ceded to the European Commission the power to distribute valuable assets to their industries. Nor is the EU ETS unique in devolving powers of allocation: it is typical in a number of US systems. Moreover, there are different degrees of harmonisation, applicable to different aspects of the EU ETS, and the Commission can and does seek to increase the degree of harmonisation through guidance notes (del Rio Gonzales 2006).

Nevertheless, the devolution of allocation responsibilities does cause significant problems. The most notable area is with respect to new-entrant rules, where free allocation offers a *de facto* subsidy to new investments, raising the prospect of a “race to the bottom” as member states compete to attract investment. In practice, competition on broader aspects of the allocation method to incumbents is also problematic. Politics is largely comparative, and claims by one company or sector that it is being treated more severely than its neighbour can create powerful pressures to weaken allocations. Greater harmonisation over time, particularly for new-entrant rules and in the most heavily traded sectors, is likely.

### Prospects for the future

Considering post-2012 design may appear to be premature, but is likely to be just as important as getting phase II right, given the timescales of new investments and the importance of expectations. Following a review in the latter half of 2007, early in 2008 the European Commission will publish proposals for the design of phase III. It will be the opening salvo in what is bound to be a major battle over the relationship between environment and industry in Europe, and between the member states and the EU’s institutions.

The world will be watching. Negotiations on post-2012 quantified commitments in the framework of the Kyoto Protocol were launched by the Montreal Meeting of Parties in December 2005, but rapid progress is not expected, not least because of continued non-participation by the Bush Administration. Given the complexity of the issues, combined with the international political situation, a global agreement on post-2012 quantified reduction targets is unlikely before 2010. This is too late to be of much use in assisting efficient investment under the EU ETS: a credible EU commitment and structure to support EU low-carbon investment needs to be established well before then.

Credibility on post-2012 targets requires clarity and commitment to a design that *effective, efficient*, and both *economically* and *politically* sustainable. This appears achievable, but not easy. Future design needs to avoid the perverse economic incentives that can result from repeated free allowance allocations, and concerns around competitiveness and leakage must be addressed to allow the EU ETS to maintain higher prices over longer periods.

Economic analysis underlines that competitiveness is primarily a *strategic* issue, not an *immediate* one. Most participating sectors can expect to profit from the EU ETS: but those for which this involves significant price rises on internationally traded products may start to see erosion of exports, and/or import penetration into domestic markets if product price impacts are high enough and sustained (Demailly and Quirion 2006; Smale et al. 2006; Houcarde, Neuhoff et al. 2007). Similarly, decisions on the location of major investments by multinational companies will be based on strategic evaluation of the costs and benefits of locating in different regions over periods of decades (Houcarde, Neuhoff et al. 2007).



Indeed, phase II could be considered as a transitional period in which the profits accruing to several sectors as a result of free allocations could be used to build up investment in low-carbon technologies and associated expertise, enhancing their position for a carbon-constrained world.

The drive to reduce windfall profits, to reduce some of the perverse incentives around grandfathered allocations and strengthen the incentives for low carbon investment all point towards much greater use of auctioning in phase III. Particularly if this is combined with mechanisms for stabilising the price, the EU ETS will start to acquire more tax-like properties over time, moving in an evolutionary way towards what has always proved politically impossible in one step.

### Conclusions

After five decades of struggle over European energy and environmental affairs, establishing a binding emissions cap with a free CO<sub>2</sub> trading market across the EU is no small achievement. It has secured unprecedented management attention devoted to cutting CO<sub>2</sub> emissions and led to a surge of emission reduction efforts both within Europe and in developing countries through its link with Kyoto's Clean Development Mechanism. 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 traumatic events of 2006 demonstrated that verification systems are sound and essential; that companies cut their emissions perhaps more easily than expected; and that the market could respond promptly to new information. The big lesson was on the need for better information and tougher allocation.

A second lesson is the need for an independent authority (for the EU ETS, the Commission) that can act as a "policeman" to ensure that allocations accord with agreed criteria. Indeed the events of

2006 lead much further than this. The Commission's political victory in the allocation struggle, introducing a formulaic approach to establishing acceptable volumes, represents a huge de facto step towards harmonising the allocation process in Europe, at least at the level of aggregate caps. The member states have only themselves to blame for this: left to their own devices they proved collectively unable to offer allocations that would have delivered a meaningful carbon market, leaving no choice other than to centralise the cap-setting process.

However the Commission would have been powerless without the broad criteria agreed in the directive, the basis upon which it made its interpretive decisions. In particular, the Kyoto targets were the essential legal tool that was wielded to ensure meaningful cutbacks. Not only was the Kyoto Protocol's existence essential impetus to creating the EU ETS, but its specific targets proved to be the decisive tool in the battle to establish meaningful, if still modest, allocation cutbacks for European industry.

Phase II thus has already benefited from the biggest lessons in phase I, but it will reveal many more issues that have yet to be tackled. Whilst a credible carbon price will change decisions so as to reduce operational emissions, for example in the dispatch of power stations, the striking limitation of the EU ETS as currently implemented is the weakness of its long-run incentives for lower carbon investments. The New Entrant Reserves intrinsically weaken this by subsidising carbon intensive investments, and the lack of post-2012 clarity further impedes those seeking finance for large, risky investments in low carbon solutions. These are some of the underlying issues that will have to be tackled forcefully for phase III.

Finally, managing the future allocation and international trade of increasingly valuable emission allowances will require stronger institutional foundations. Allocations designed to compensate sectors for average costs need far more sophisticated approaches than yet considered, which might have to be differentiated much more according to specific sectoral characteristics. Long-term credibility is crucial, yet greater sectoral differentiation of approaches could make it even harder to resist pressures to tweak allocations for short-term political convenience. Pressures to harmonise allocation methods across Europe will be challenged by both domestic circumstances, and the desire to expand internationally. Faced with these conflicting pressures, govern-

ments may need to learn from monetary policy, in which the need for credible commitments to tackle inflation led to the establishment of independent central banks with clear mandates, and ultimately the creation of the European Central Bank. Establishing a long-term, clear and credible foundation for managing the EU ETS and its diverse international linkages could require thinking of a similar order.

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