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The EU ETS: Taking stock and looking ahead

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1. Introduction

The European Emissions Trading Scheme (EU ETS) is the flagship of EU climate change policy for a number of political, environmental and economic reasons. For the EU, emissions trading is one of the crucial pillars upon which the both the EU's climate change policy and the (yet to emerge) global regime should rest. Environmentally, the ETS is important because it covers almost half of the EU CO_2 emissions and more than a third of total greenhouse gas emissions. Economically, the ETS is important as it is the show case for applying the economic policy instrument emissions trading in practice at large, cross-border scale for CO_2 emissions. It has been argued that the success of the ETS is crucial to convince other parts of the world to adopt similar schemes. Although this might be somewhat exaggerated, it is certainly true that a failure – defined whatsoever – might have negative repercussions on the attractiveness of emissions trading. Almost certainly there will be delays in its application.

Ever since the launch of the ETS there has been a debate on how to improve the ETS taking into account so-called "teething problems" (i.e. issues that emerged during the learning by doing) and the strategic issues to ensure the environmental outcome, improving the economic efficiency (i.e. to reduce costs of reducing emissions) and finally, to be instrumental to foster investment in order to bring the EU onto a low-carbon and eventually, zero-carbon trajectory.

This paper will address the strategic issues. The paper is the Background Paper for a meeting of the European Climate Platform (ECP) on 5 April 2006, which will bring together key representatives of the research community, EU and member state officials and stakeholders to address the principal strategic questions related to the further development of the ETS. Based on this Background Paper we hope to identify possible ways forward dealing with actual and perceived shortcomings of the EU ETS.

The purpose of this Background Paper is to identify the challenges the ETS faces and to either explore options and, if not possible, identify the principle policy questions that emerge from the current state of the ETS. Based on expert contributions and general discussions, the 5 April meeting will attempt to further analyse the principal challenges and put forward a set of recommendations. The principal results of the meeting will from the basis for a revised version of this paper that will be presented as ECP report at the upcoming meetings of the Subsidiary Bodies to the UNFCCC in Bonn in May 2006.

2. Status of the ETS

Even though the ETS will ultimately be judged on the basis of its effectiveness as a tool to reduce GHG emissions, the underlying rationale for choosing emissions trading was based on economic considerations. From the outset, those designing the ETS have attempted to internalise a market externality (i.e. CO_2 emissions) with minimal impact on competitiveness. Under the ETS, the market price of carbon is equal to the lowest marginal abatement cost amongst all controlled sources, thereby ensuring that the environmental objective is achieved at the least cost. The resulting market price was expected to create long-term predictability, which is critical for spurring investment. In addition, the ETS should offer flexibility to management to choose the most cost-effective compliance strategy. And finally, the EU ETS has attempted to add extra flexibility and potentially low-cost abatement options by allowing credits from the Kyoto Protocol's project mechanisms to be used for compliance via the Linking Directive. Although the ETS has been adopted in a very short period of time – reflecting the strong political will in the EU to meet its obligations under the Kyoto Protocol – implementation is far from complete. In many respects, the EU ETS is still a construction site with many critical elements of the infrastructure still under creation. For example, only around two-thirds of the 25 registries are in place, although they might soon be. Moreover, in some member states, the

installation level allocations have not yet been decided, the International Transaction Log will not be functional for some time and only the most hesitant steps are being taken towards implementing the Linking Directive. A lack of infrastructure inhibits trading activity and efficient price-setting.

While this infrastructure is progressively being put into place, the initial phase of the EU ETS has coincided with high energy prices, which in the context of non-functioning energy markets generally has increased costs to enterprises. Beyond that, another important factor for the initial results of the EU ETS has been the increased spread between coal and gas prices, which has pushed up EU allowance prices. In the short term, fuel switching – from coal to gas – is the principle way to reduce CO_2 emissions. However, the coal/gas spread increase has compelled power plants to burn more coal, which in return has made CO_2 prices climb. In addition to shortcomings due to the lack of infrastructure, this has generally meant that it was mainly the power sector, which is short due to allocation and the coal/gas spread that has engaged in the trading market. The industrial sector – generally long – has been less engaged. In addition, most active trading participants come from those member states with tighter allocation, and hence are buyers. On the other hand, market participants from those countries with less tight allocation, potential sellers from mainly but not only the new member states, have not yet engaged in trading as a result of a lack of infrastructure and in some cases, the absence of installation level allocation.

Further uncertainty is added for example by the pending case on the UK claim for an addition 20 $MtCO_2$, the effects of entry in the EU and the ETS of Bulgaria and Romania, the further development of the projects mechanisms, the timing of the International Transaction Log, international developments with effects on oil and gas markets and the relative illiquidity and the perceived high level of market power concentration in the ETS market.

Against this background it is too early to pass (final) judgement on the ETS. Nevertheless, a number of issues have been identified by the literature and that will be discussed in the following sections: allocation including new entrants and closure rules, investment, economic impacts including power prices, sector coverage and the ETS in the global carbon market as strategic long-term questions.

3. Allocation: lessons from phase I

Now that the first round of allocation is almost completed, a number of concerns have been identified. An important concern is that of environmental targets, because most member states have allowed emissions from the covered sectors to rise in the period 2005-07, despite the fact that many must reduce their emissions to achieve their Kyoto Protocol targets. For example several member states have allowed their covered sectors to increase emissions by as much as 10 or 20%, although they are on a trajectory that will them not enable to meet the Kyoto Protocol targets. Other concerns relate to the high degree of decentralisation with a considerable level of member state discretion in the allocation process (i.e. NAP-related issues). This has led to inconsistencies between member states, which could distort competition, diminish the efficiency of the market and ultimately, undermine environmental effectiveness and the trust placed in the system. Some have been addressed by the updated Guidance document, published in late 2005 (European Commission, 2005).

The following broad experiences can be mentioned:

- **Total number of allocation:** Allocation has often been based on projections of future needs and for most Member States (MS) the allocation lies over current emissions. Generally, governments engaged in close dialogue with the industry prior to the allocation, and there were little means for the national governments to hold back to pressures from their own industry. Since the submission of extra allowances did not

have any immediate cost to MS the rules opened up for classic free rider situation. For energy-intensive industries, allocation was a means for compensation of ETS-related costs. The situation is however different for phase II, which coincides with the Kyoto Protocol commitment period. For phase II, many MS will either have to decrease the allocation considerably, reduce emissions in the non-trading sectors or buy shortages through CDM and JI (Zetterberg et al, 2004).

- **Shortages are in the energy sector:** When allocation is reduced in relation to projections or current emissions this is often done in the power or energy sector. In Sweden the allocation to energy installations is 80% of emissions 1998-2001. Similar reductions are done in the UK, Denmark and Austria. The reason for this is that the energy sector is assumed to have the lowest costs for abatement and for MS with liberalised energy markets also has the possibility to pass through the extra costs associated with allowances to the clients. But there are MS that have not followed this. In Finland and Lithuania the energy sector has received more allowances than current emissions (Zetterberg et al, 2004).

- **Considerable interest in benchmarking:** As the first phase allocation plans were developed there was considerable support for using benchmarking, both among governments and industry. The main arguments being that benchmarking rewards CO_2-efficiency, it is seen as a driver towards more CO_2-efficient processes and it is perceived as fair. This support is currently still high in industry. Consequently, governments in different MS, for instance in the Netherlands, Germany, the UK and to some extent Sweden, have invested a lot of effort in investigating alternative allocation methodologies. However, experiences to date have shown that benchmarking is often associated with problems concerning data retrieval and the definition of product groups. (e.g. Radov, Harrison and Klevnas, 2005, Zetterberg and Åhman, 2005).

- **Allocation involves high values.** The value of allocation is important. Compared to fuel costs, the value of allocation lies between 18% and 27% for Denmark, Finland, Germany and the Baltic MS. Compared to fixed costs, the value of allocation lies between 70 % - 105 % for these MS (Åhman & Holmgren, 2006).

- **New entrant rules distort competition.** Each MS have developed rules for allocation to new entrants and these rules vary considerably between MS. A new natural gas CHP plant would in Germany receive allowances corresponding to 130% of its expected emissions. The corresponding figures are 120% for Finland, 90% for Denmark and 60% for Sweden. For a new natural gas combined cycle electricity production unit (no heat) the differences are even larger. In Germany the installation would receive 105% of the required allowances. In Finland 100 %, in Denmark 82 %, and in Sweden 0% (Sweden does no give allowances for non-CHP). Since the differences in allocation are associated with large values, current allocation rules has an impact on investment decisions, and can significantly distort competition if they remain unchanged (Åhman & Holmgren, 2006). Often but not always are these differences result of the Burden-sharing agreement.

- **Closures rules create wrong incentives**. Most MS apply closure rules stating that if an installation is closed or if production is reduced significantly the allocation will be reduced. The rule may seem logic, since the company will not need all allowances. But the problem with this rule is that it reduces considerably the incentives for clean technology that the ETS was intended to create (Åhman et al, 2005). See following section.

3.1 New entrants (i.e. new capacity) allocation

As the 2004 Guidance document states (p. 12), "the treatment of new entrants, i.e. installations starting operation in the course of a trading period, is one of the most important design choices in any emissions trading scheme" (European Commission 2004). The reason is that as part of the allocation process, they may affect firms' compliance strategies. Theory suggests that new installations should be forced to buy allowances. The reason is that the economic *incentives* to develop new and more carbon-efficient technologies are the same regardless of whether a new installation is given allowances for free or not. It is also argued that new installations do not carry the cost of previous investment, which was made when there was no carbon constraint (i.e. sunk costs), although this is only true as long as a new entrant is not an upgrade of an existing installation (for an overview and further details, see Egenhofer and Fujiwara, 2005 and 2006).

The most commonly voiced arguments in favour of free allocation to new entrants run along the following lines:

1. Existing installations are overcompensated through grandfathering, which may justify subsidy of new installations.
2. Existing installations are encouraged to continue operating since allowances are withdrawn if the close. This puts new installations at a disadvantage. Thus the justification for free allowances to new entrants becomes easier under current closure rules than if closures got to keep their allowances.
3. Since firms typically are constrained by capital, and capital markets are not perfect, there could be reason to subsidise capital by allocating free allowances in order to reduce the investment barrier.
4. Perceived fairness; if existing installations get free allowances, why should new installations not also get them, especially as they carry a price risk? If new entrants are not granted allowances on the same basis as existing market participants, price risk, particularly in an illiquid market could be important. This is heightened by the fact that a new entrant entering the market could be looking to buying its allowances from its incumbent competitor.
5. Equitable allocation will help to contribute limiting wholesale power price rises and help to minimise windfall profits to generators.

Hindering new entrants will actually undermine the deployment of new and more efficient technology, a key objective of climate change policy. Within the EU, new entrants have especially argued that market power concentration and partly inefficiently working power markets in many EU member states or regions put new entrants in an additional disadvantage. It would not only keep inefficient plants in operation, but would keep an upward pressure on power prices as it would keep high costs producers (as marginal generator) in the market. An additional complication is that it is very difficult to distinguish between new entrants and capacity expansion. If they are not treated the same way, the result could be gaming (see Ahman & Zetterberg, 2003).

Closely linked to new entrants are rules on closures, i.e. what happens if an installation that has received allowances seizes to operate. On closure, theory suggests that allowances in case of closure should not be removed as this keeps correct incentives to close inefficient installations.. As more efficient new entrants will replace these installations, emissions would go down (see also Åhman et al., 2005). Conversely, withdrawing allocation upon closure equals introducing an inefficient subsidy of continued operation. This puts existing installations at an advantage compared to new entrants. Since the number of allowances that would be lost upon closures are greater for inefficient installations – assuming they have been allocated a greater number of allowances per unit of production than more efficient installations – the effects of this subsidy

on incentives can in fact be significant. Efficiency aside, some argue the opposite point. As allowances are given for free, they constitute a transfer of wealth from governments to firms. With closure, the justification for this transfer disappears.

In practice, only two member states, i.e. the Netherlands and Sweden 'follow' the theory and allow for keeping of allowances in case of closures. As this extends only to the end of the first period, the incentive effect is likely to be small, however. In some cases member states were in favour to keep power plants running for reasons of security of supply. As to new entrants, most member states have created a new entrance reserve to be allocated for free to new entrants. The setting up and management of new entrants' reserves have increased complexity, thereby adding costs and reducing the efficiency. The governments must decide on how to allocate, for example on the basis of expected emissions (since new entrants will have no historic emissions base)or based on benchmarks and projected production. . Member states must also decide what to do if more new entrants appear once the set-aside fund has been used up and conversely, what use will be made of any allowances that are left in the reserve at the end of the period.

Some member states (e.g. Germany, Italy, Austria and Poland) have introduced transfer rules, saying that in case of new investment operators should be allowed to "transfer" allowances to new installation. This has a similar incentive effect as to allow keeping allowances when closing, but increases the complexity of the system. Further, they favour new investments made by incumbent companies over "true" new entrants to the market (see Bode et al, 2005, and Ahman et al, 2005).

The first round of allocation has shown that special provisions for new entrants is a political priority in all member states and is likely to remain so in the second phase. It is therefore realistic to propose that member states continue to allow (but not require) new entrant reserves. However, to avoid competitive distortions between member states,a standardised approach across member states is needed. Further, to obtain a level playing field between incumbents and new entrants the interaction between rules on closures and new entrants should be given more consideration (see Ahman et al., 2005).

3.2 Allocation methodologies: The limits of grandfathering?

Experiences with the first round of allocation in the ETS have shown the limits of using grandfathering as allocation methodology. These limits are shortcomings related to the base year that becomes increasingly remote, complexities for new entrant allocation as well as closure rules, distributional impacts and more generally thereby adding complexity, administrative burdens and transaction costs (e.g. PriceWaterhouseCoopers, 2005). On the other hand it is hard to perceive that EU industry would accept auctioning in the absence of a global climate change regime that imposes comparable carbon constraints to all its competitors. This has heightened interest in benchmarking approaches, another free approach. Preconditions for benchmarking are an agreement on i) the nature of benchmarks (e.g. fuel, technology or product-specific) and ii) which metrics to apply (e.g. installed capacity, projected utilitisation rates, projected output or BAT) and iii) ensuring the availability of data, which would include industry consent. None of this is trivial.

3.2.1 Benchmarks

A benchmark system could be defined as fuel, technology and/or product-specific. The benchmark or performance standard would serve as guide to allocate allowances on some sort of "fair" criteria. As allocation is linked to performance, benchmarking rewards CO_2-efficiency including low carbon investment and early action. Hence, benchmarking is principally meant as a means to address fairness and investment as it rewards performance. However, it does not always fully take into account sunk costs – as for example grandfathering does – that arise due

to investment that has been made prior to the carbon constraint. Once the benchmarks are established, there may be less lobbying during the allocation process although it can be assumed that the lobbying would be even fiercer during the establishment of the benchmarks, as it is not the allocation but the formulation of the benchmark that would decide upon losers and winners. Most importantly using technology- and fuel neutral benchmarks for allocation to both existing and new installations would reduce the perverse incentives introduced by adjustments of allocation to closures and new entrants. Nevertheless, while benchmarking might be appropriate to set efficiency criteria concerning the allocation of emissions rights, the question of fixing the activity level for each installation is an open and difficult one.

There is no inherently stronger incentive effect of benchmarking than it is for grandfathering or auctioning except if governments resort to updating, which the updated Guidance document (European Commission, 2005) has ruled out.

Benchmarking requires to process a lot of data, hence may cause an administrative burden. The Swedish benchmarking experience shows difficulties with data availability and other complication, such as setting boundaries of output or how to measure it. In some sectors such as steel, it appears to be very difficult to set a benchmark for an integrated mill due to the complexity of the production processes but also different legal operators. The alternative, a theoretical benchmark would be more practical but would have the disadvantage not fully reflecting the situation in each individual installation. Although over time, in line with the Sevilla process on BAT, it should be thinkable to move towards benchmarks.

Benchmarks have been used by some member states in their phase I NAPs. Some member states (e.g. Germany, Denmark and Finland) have used benchmarks for allocation to new entrants, and some (e.g. Sweden, Netherlands, Italy) used benchmarks for some installations and /or fixed energy efficiency rates for energy production installations. While such approaches are covered by the Directive, the problem is that the metrics differ between member states. For instance, some member states base allocation on installed capacity and projected utilisation rates, some on projected output and others still on BAT. Hence, a fist step towards progress on benchmarks would be coordination across member states to avoid inconsistencies.

Avoiding fragmentation in the EU internal market would mean using EU-wide benchmarks. There may also be a political problem applying fuel neutral benchmarks. Fuel neutral benchmarks will lead to allocation that is either considerably lower than expected emissions (in the case of coal) or allocation considerably higher than expected emissions (in the case of natural gas). One can argue that this is one of the aspects that benchmarking is meant to achieve. But as fuel neutral benchmarking creates considerable winners and losers, it is likely that there will be increased pressure on governments from the losers. In order to reach acceptance for the NAPs, governments may be hesitant to deviating from status quo, i.e. current emissions. We can also note that in those cases where benchmarks are applied, notably for new entrants, usually fuel specific benchmarks are used, which creates an allocation close to what emission based allocation would have delivered. Fuel-neutral benchmarks may also create security of supply concerns, mainly for those countries depending on high-carbon power generation.

3.2.2 Auctioning

Auctioning is allowed in the EU ETS, to a limited extent. 5% of the total quantity allocated in each country may be auctioned for the first phase of the scheme, and 10% for the second phase. While only Denmark, Hungary, Ireland and Lithuania will use auctioning in NAPs phase I, several member states have indicated to make more extensive use of auctioning in NAP phase II.[1] It is therefore highly likely that allocation methodologies including benchmarking and

[1] The Association of Danish Energy Companies (Dansk Energi) has publicly announced their support for auctioning (Hansen 2005). Auctioning is generally also supported by environmental NGOs.

auctioning will become a central issue of 2006 review. The main issues related to auctioning is likely to be the impact on costs and resulting effects on competitiveness (i.e. profits, market share) for the energy-intensive industries, whose competitors are not subject to a similar carbon constraint, a "secondary allocation" debate on how to recycle revenues as well as open questions on the mechanics of auctioning, notably to avoid that market dominance is enhanced (i.e. "deep pocket" issues).

4. Investment certainty

The effect on investments is one of the most contentious issues in the debate around the design and the future of the EU ETS (see IEA 2003 for an overview). In the long-term, a critical element for meeting the climate change challenge will be investment in new and low-carbon technologies. Such investment can be facilitated by a greater degree of certainty, but certainty is reduced by a number of factors, some of which are beyond the EU's control. Beyond the EU's control, for example, are both the nature of commitments and the structure of a future global agreement, but also some of the impacts of the Linking Directive in the period to 2012.

At the same time, the EU ETS adds to investment uncertainty. Additional uncertainty stems from the short-term allocation periods, possibly perverse effects from new allocation methodologies, notably new entrants and closure rules or the possible depletion of new entrants' reserves. Current allocation periods provide certainty for only three, and then five years – periods that are far shorter than those associated with investment cycles.

Possible options

There have been discussions on how to create greater stability and predictability for the covered sectors of the EU ETS. We attempt to review a number of options including allocation-related solutions (e.g. a 14-year guaranteed allocation based on fuel-specific benchmarks in the German NAP I), the alignment of targets with the investment cycle by using for example long-term efficiency targets as a basis for setting a cap for the manufacturing industry, benchmarks and auctioning, or the so-called 'TenYear Rule'[2], long-term indicative targets or a ceiling on the allowance price.[3]

a) The most obvious option is longer allocation periods to ensure predictability and certainty. A critical precondition for longer allocation periods however is that efficiency indicators at installation level are in line with long-term climate change objectives (e.g. fuel-neutral benchmarks).

b) Closely linked are rules for new entry and closures and a possible re-design to add more certainty. This could already be dealt with in NAPs phase II. Nevertheless, they run up against the fact that the Directive has foreseen multiple short allocation periods, making it difficult to extend certainty beyond these periods.

c) There is strong interest and support among member states to further analyse and develop benchmarks. In order to do so, there is a need to ensure: i) consistency across member states on both the types of benchmarks (e.g. fuel, technology or product-specific), ii) the metrics to apply (e.g. installed capacity, projected utilisation rates, projected output or best available technology and techniques, and iii) data availability. Given the different approaches used by

[2] Under the Ten-Year Rule (see 3.5), a member state will allocate allowances based on the average of, say, three reference years (e.g. 2000-2002) for 10 years. After ten years, the reference years would be updated on a rolling basis, i.e. from 2000-02 to 2001-03, etc. Hence, there is some compensation for sunk costs but not forever. A new entrant would receive allowances from a reserve according to emission rate benchmarks (to be standardised across the EU member states).

[3] For more details see, Egenhofer and Fujiwara (2006), pp. 16-21.

member states, it is unlikely that EU-wide benchmarks will play a major role in NAP phase II, unless some sectors would opt for such an approach.

d) Long-term efficiency targets for the manufacturing industry, for example based on benchmarks, are another potential way to increase long-term certainty for the sector. The principal item is how such a system could be incorporated into the EU ETS, which operates on absolute caps. Setting relative targets would transform the ETS into a baseline and credit scheme, which is not foreseen under the Directive. Hence, this becomes a topic for the 2006 review. However, nothing would stop member states from basing their allocation to the energy-intensive sectors on long-term efficiency targets.

e) Using auctioning in combination with recycling of revenues has also been proposed as a possible way to create investment incentives as it is thought that it would create a more reliable forward curve, and hence clearer price signals. The downside is that auctioning would have a negative impact on costs, thereby affecting the competitiveness (i.e. profits, market share) of energy-intensive industries. In addition, this would open a 'secondary allocation' debate on how to recycle revenues and raise questions on the mechanisms of auctioning.

f) A so-called 'ten-year rule' (Åhman et al, 2005) has been proposed to balance efficiency considerations, including investment, with perceived issues of fairness. This concept attempts to acknowledge the need both to compensate incumbent installations for sunk costs and to not discriminate against new entrants for reasons of fairness. It can be used for both emissions and performance-based allocation. The main criticism has been the risk that insufficient reserves of new entrants would deter new investment.

g) To provide a signal to the power sector, the idea has been proposed to develop long-term indicative targets for the EU as a whole, or, if more appropriate, for the relevant national or regional markets. In order for such an indicative target to serve its purpose, it would require extending them far beyond the short-term allocation periods. This would imply, however, that member states develop energy strategies on how to arrive at the needed reductions. Another issue is the legal nature of such indicative targets. Non-binding targets have very often been of little practical effect, as can be seen from the EU energy efficiency targets in the 1980s, or more recently, from 'soft' targets agreed under the Lisbon agenda. In order to be effective, targets could be attached to a revised EU ETS, in much the same way that indicative targets have been formulated in the Annex of the Renewables Directive. Long-term certainty would be helped by a common EU energy policy.

h) Another proposal has been a ceiling on the allowance price (i.e. price cap) which would provide long-term certainty as the upper limit of the allowance price and hence, the investment incentive is set. This raises however questions both on the environmental effects as reductions would not necessarily be achieved and on the functioning of the allowance market as it could reduce liquidity. Moreover, if the ceiling is too low, the incentive for reductions would be equally low. In fact such a system would become in effect a carbon tax. There is high risk that governments would give in to pressure from industry for a low ceiling. In any case, setting the ceiling is a highly politicised act and this by itself could increase uncertainty again.

5. Economic impacts (including power price increases)

The potential economic impact of the ETS can either stem from the need to cover process emissions – not covered by free allocation – or power price increases. The actual impact on each sector or installation then depends on: i) a sector's ability to pass through costs in different product markets and ii) the structure of national or regional power markets.

Several studies (e.g. IEA, 2005, Demailly and Quirion 2005, Carbon Trust 2004, Quirion, 2003) tend to confirm that EU climate policy could lead to market share losses and, as a result, to carbon leakage, especially if the indirect effects owing to the inclusion of carbon in the power price are realised. Potential losses in market share, however, depend on the extent to which EU producers can pass on the extra cost to consumers and suppliers. A second element is how quickly non-EU producers can increase their production in the short-term. Therefore it is most likely that negative effects on competitiveness do not fully come into play in the immediate short-term. This is even truer as long as investors assume that over a reasonable period other countries will gradually become subject to carbon constraints. The one notable exception to the general finding is aluminium, where studies agree it is directly affected in its net value as a result of the fact that the sector cannot pass on price increases, as product prices are set by international commodity markets. Studies (Carbon Trust, 2004; IEA, 2005) conclude that it is aluminium sector – which is not included in the EU ETS – that very likely will experience the biggest economic impact. According to the aluminium industry, the power price constitutes more than 25% of the total production costs of primary aluminium. As primary aluminium is a globally traded commodity, its price is set by the world market and the European aluminium industry has no opportunity to pass on the increased costs. Preliminary conclusions from a study of McKinsey (forthcoming) indicate that a price of €25/t CO_2 will lead to a 14% cost increase for primary aluminium production. An internal analysis by Hydro (Nord, 2005) shows an even greater increase. The aluminium industry reckons that this would represent an average 10% of the selling price of metal at today's prices (Stevens, 2005).

Under a €10 per tonne of CO_2 scenario by the IEA (2005) study, basic oxygen furnace steel, cement and aluminium would incur high reductions in margins of between 6-8%. At current CO_2 prices, the impact is significantly higher. Contrary to the IEA study, the Carbon Trust (2004) concluded that at a price of €10 per tonne of CO_2, only aluminium would be directly affected in its net value. At a price of €25 per tonne of CO_2, however, Carbon Trust (2004) estimated that aluminium, cement and steel would need to be able to pass on significant price increases in order to maintain their market share. The figures are 31.4% for aluminium, 7.3% for steel and 17.4% for cement. Although there is major controversy on the ability of pass-through of sectors, it is hard to imagine that industries are able to pass-through cost increases in that magnitude.

Neither of the studies has examined the specific effects that occur due to geographical proximity of non-EU competitors for example in the Mediterranean in cement or refining. For some industries the competitive disadvantage is related to the geographical proximity of their competitors' particular installations (e.g. refining or cement production in the Mediterranean countries).

Power prices are influenced by many factors, of which the EU ETS is but one. In general it is difficult to assess the impact of CO_2 allowance prices, as these are determined by a large variety of factors, including fuel prices, available generation capacity, euro/dollar exchange rates, investment costs, power imports, weather conditions, heat demand ('must runs'), the flexibility of gas contracts as well as market expectations and more. Even the extent to which CO_2 prices are passed through to power prices varies by market, load factor and the power market in question (see Sijm et al 2005; Sijm et al 2006).

The objective of the EU ETS was to include the CO_2 price in the marginal costs of power. While the ETS is likely to push up power prices, it may at the same time reduce coal prices. It must also be noted that the EU ETS was launched at a time of very high energy prices, which has influenced power prices. In addition, high gas prices make power plants continue to burn more coal and push up EU allowance prices. This is coupled with the fact that current allocation rules provide for disincentives to close inefficient plants, and allow for potential windfall profits for the power sector, which are possible because of a lack of competition and because of distortions in EU power markets.

Are there options to address competitiveness issues?

Since the start of the ETS, a number of issues potential options to address the issues have been discussed. They are reviewed by Sijm et al (2005) and Harrison and Radov (2005) and tested on their political suitability for example by CEPS (Egenhofer & Fujiwara, 2005 and 2006). There seems no ideal option to address implications.

In the follow, CEPS has identified two different categories of measures: **'alleviation'** and **'compensation'** measures. Alleviation measures aim at changing the incentive structure and the functioning of the allowance market essentially through regulation. Attention is needed to ensure that such measures do not impede efficiency of the EU ETS, power or other markets. Compensation measures try to correct undesirable economic and social outcomes from the trading market. In principle they are executed through recycling of revenues, allocation or subsidies. They raise issues on the organisation of this compensation (i.e. allocation, raising and distribution of funds), notably, how to minimise government intervention. Measures from both categories may have unintended consequences. Some options are discussed in greater detail in the Appendix.

6. Sector coverage

Expanding the coverage of the ETS is a continuing issue for the EU ETS for such extension can be done via unilateral opt-ins and via changes in the Directive (through co-decision). The following sections cover a) unilateral opt-ins and b) expansion to transport. Important work on sector-coverage expansion is currently under way in the framework of the LETS project[4].

6.1 Unilateral opt-ins

The EU ETS explicitly allows for more GHGs to be included in the EU ETS. This will be part of the 2006 Review. At the same time, under Art. 24 of the EU ETS Directive, there is a possibility for member states to unilaterally include additional GHGs, subject to European Commission approval based on both economic and environmental objectives such as potential effects on the internal market, distortions to competition, environmental integrity and reliability of the planned monitoring and reporting system. The rationale for including non-CO_2 GHGs is both environmental and economic (see Box 1). Inclusion of new gases can offer major environmental and economic benefits such as covering more sources or potentially lower compliance costs if marginal costs in the trading sector are higher than in the installations to be opted-in.

Box 1. Efficiency gains of a multi-gas strategy

Including additional gases increases the variety of reduction options, offers additional innovation potentials if innovation lead times are respected and increases liquidity and ultimately the efficiency of the market. Precondition are however effective monitoring and that inclusion achieves real reductions, for example beyond business-as-usual. According to Capros et al. (2000), a '6-gas strategy' approach for the EU ETS could decrease the allowance price by more than a third from the current price level. According to this estimate, the EU ETS allowance price for one tonne of CO_2 equivalent could be reduced from €33/tCO_2 with CO2 only to €20/tCO_2 with six gases only to reach the EU's Kyoto target, i.e. 8% reduction in GHG emissions. Although estimates about efficiency gains remain controversial for example depending on the translation of Global Warming Potentials (GWP) (e.g. Aaheim et al., 2004), there is an acknowledgment that multi-gas trading is generally more efficient, i.e. it reduces compliance costs (e.g. Hyman et al., 2002; Kets, 2002).

[4] LETS website : http://www.environment-agency.gov.uk/business/444217/590750/590838/1294204/1295326/1291719/?version=1&lang=_e

Among the reasons for limiting the ETS to CO_2 emissions only have been the willingness to keep the EU ETS initially as simple as possible but also the belief that the other non-CO_2 gases are difficult to monitor with comparable accuracy. This contrasts with the UK scheme and the initially proposed Norwegian scheme, both of which cover all six GHGs. The internal BP scheme covers CO_2 and methane. France has introduced a N_2O tax, assuming that this gas can be accurately measured.

While the issue of new gases will be dealt with in the 2006 Review, there may be a case for unilateral opt-ins under Art. 24, if there are clear economic and environmental benefits, including notably that monitoring and reporting are ensured. Another precondition is that opt-ins do not disproportionately increase the complexity of the scheme, i.e. that transaction costs outweigh the environmental and economic benefit. This could for example be achieved by the de minimis rule for installations. In order to avoid that different member states apply different de minimis rules, all member states that wish to opt-in should co-ordinate the definition of thresholds. Otherwise, there is a risk of different rules applying across the EU, leading to distortions to competition or gaming. Another area for transaction costs have been the drawing up of monitoring guidelines.

6.2 Transport (in general and aviation)

The attraction of increasing the sources (and gases) under the EU ETS lies in the opportunities to increase the options for emission reductions within the ETS and hereby lower the total costs for reaching climate targets. This is a fundamental argument for using emission trading. The sectors that are outside the EU ETS consists mainly of transportation and housing and to a lesser extent of agriculture, forestry, fisheries, aluminium, chemical industry and lighter manufacturing industries. So what are the implications of including more sectors into the EU trading system from economic and equity point of view?

Some insights can be offered by studying the example of the transport sector. Both the European Commission and the EU council of Ministers have expressed their interests in analysing whether air transport emissions could be included into the EU ETS. The last six months the discussions have focused on design elements of how aviation can be included in the system. These elements include coverage of non-CO2 effects of aviation such as condensation trails, geographical coverage, trading entities, allocation responsibility, allocation methodology and interaction with the Kyoto protocol. These elements have been analysed in detail in CE (2005). CE Delft (NV, 2006) and Sweden's FlexMex2 commission (SOU 2005) have also performed introductory studies on the feasibility of including road transport and shipping into the EU ETS in a longer time perspective.

When discussing options for introducing transportation under a cap and trade programme, the leading issue appears to be if transportation should lie under the same cap as the current trading industries or if transportation should lie under its own dedicated cap. The transportation sector differs from the industrial sector in two important ways: firstly, the sector is expanding at a fast rate and secondly, the willingness to pay for carbon emissions is much larger in the transport sector than in the industrial sectors. These facts have significant implications on the consequences from having one common cap or two separate caps.

As mentioned previously, from a pure economical point of view, putting transportation under the same cap would minimise the society costs for obtaining a given climate target, dynamical effects not considered. Since the transportation sector is so important as an emission source the introduction of this sector in the EU ETS is attractive. But given the growth rate of this sector and the willingness to pay, including transportation under the same cap as the current trading industry we would expect a dramatic increase in the demand for allowances. This would

increase the price of allowances and probably of electricity, and increase the risk for leakage of EU industries to outside the EU.

One alternative solution would be to have two caps; one cap for the current trading industries and one separate cap for transports. By having separate caps we could isolate the sectors from each other and define separate emission targets for each sector. Having separate caps would thus "protect" the current trading industries from prise increases due to increased demand from transportation. The allowance prices would be different in the different caps, which indicates that the costs for emission reductions are different in the different sectors. Total costs for society would be higher compared to implementing a common cap. The distribution of costs on different actors is also very different if we have two separate caps compared to one common cap.

The insights from this example of separate caps can be generalised. With the burden sharing agreement as an overall constraint, setting a cap for the trading sector implicitly sets an emission target or "cap" for the non-trading sectors. Our choice of sector coverage and size of the trading sector cap in relation to the implicit emission target in the non-trading sectors will have direct implications on the society's total costs for reaching the climate target, and also significant implications on how these costs are distributed between sectors. Were we place the divider between the trading sector cap and the non-trading sector emission target will have implications on the total costs for reaching a climate target (economic efficiency) and considerable implications for the distribution of these costs between sectors (equity). This shows how important it is to develop policies that strike an appropriate balance between reductions the trading sector, transportation and other non-trading sectors. Ironically, this issue has received little attention so far.

Some argue that the growth of the transportation sector needs to be limited and that therefore, it's inappropriate to have transportation under the same cap as industry. The advocates of this argument see the sector (growth) target as more important than the climate target. The debate is interesting because it puts a finger on something important that lie at a higher political level than climate policy. When discussing the role of different sectors in reaching climate targets, what is it really that we want to achieve? Is it economic efficiency in reaching climate targets? Or is the target to reach a balance between different sectors that we believe to be optimal for the development of the society. To find solutions that are politically acceptable? If so, it is relevant to ask if climate policy instruments such as ETS the best instrument for this.

7. Global carbon markets: The forward agenda of linking of schemes

Article 24 of the ETS Directive foresees the linking of the ETS with other national or regional emissions trading schemes via an international agreement. This reckons that the development of emission markets could become a possible pillar of the architecture in the post-2012 regime. To date, it is difficult to provide an assessment of the feasibility of such linking as those schemes to which the ETS could be linked to, are in development only with yet uncertain design options.

Against this background, only a few tentative conclusions can be made. Linking of emissions trading schemes even if they inhibit widely divergent designs such as on banking rules, coverage of sectors and gases or opt-ins/opt-outs does not run into fundamental problems, as long as technical fixes are put into place (Blyth and Bosi 2004; Haites and Mullins 2001; Baron and Bygrave 2002; Haites 2003). However, such fixes generally reduce the efficiency through adding transaction costs, market fragmentation or through perverse effects or distortions. Linking of schemes will most likely require considerable adjustments of existing domestic and regional emissions trading schemes beforehand. This is associated with a risk of increasing complexity up to a point, where the economic efficiency of such schemes becomes

questionable. Critical issues for linking are allocation, monitoring, reporting and verification and issues of global governance Egenhofer and Fujiwara 2006).

The *most* critical issue for linking are distributional impacts as different participants would be affected in dissimilar ways. When two programmes are linked, the market price will be higher than the pre-link price in one of the trading schemes and lower than the pre-link price in the other zone, thereby creating winners and losers. Winners will be net sellers in the low price scheme as the price goes up for them and net buyers in the high price scheme as prices go down for them. The reverse is true for net buyers in the low price scheme and net sellers in the high price scheme (Haites 2003; Bode 2003). The same holds true for expansion of the scheme. As a result, even though linking or expansion can yield an economic benefit, certain participants in the trading scheme will be worse off. Thus, extra incentives will be needed for potential losers.

A purely market driven carbon market which allows market participants to search for arbitrage possibilities may therefore be a better option, at least for the short-term.

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Appendix: Options to address power price increases: alleviation and compensation measures

A) Alleviation measures

Alleviation measures aim at changing the incentive structure and the functioning of the allowance market essentially through regulation. Attention is needed to ensure that such measures do not impede efficiency of the EU ETS, power or other markets. The following alleviation measures have been considered:

a) Some have argued that the *auctioning of allowances*, as long as it is combined with revenue recycling, could be a suitable way to address the competitiveness issue. Auctioning ensures that all participants are treated in the same way. In addition, it is preferable from an efficiency point of view and reflects the 'polluter-pays' principle. Finally, it generates revenues to be recycled to address public policy objectives, such as reduction of other taxes, or to address market distortions. The disadvantages on the other hand are well-known: it increases the cost for participating industries and is comparable to a tax and hence enjoys little political acceptability. Recycling of revenues can mitigate these effects, but it is not evident how to do this efficiently. It then becomes a matter of the management of a 'secondary allocation'. Of particular concern are internal market issues and the role of the EU but also the impact on companies' cash flow. Most important, however, is the temporary limitation of auctioning under the current Directive, i.e. 5% and 10% maximum, for the first and second period respectively. While some have argued that the Directive would allow for a higher level of auctioning as long as it is accompanied by full recycling, the issue would almost certainly have to be settled by the European Court of Justice. Furthermore, using 100% auctioning would lead to higher power prices as a result of full-cost pass through. For the medium and longer term, this would lead to a shift to less carbon-intensive fuels, most likely gas. Such a shift to gas could further increase import dependency on mainly Russian gas, potentially increasing risks associated with security of supply. The effects of higher power prices of course could be offset by the revenue recycling, depending on the exact rules for recycling.

b) Limiting the CO_2 allowance price has sometimes been mentioned as a possible measure. This could be done for example by relaxing the overall cap of the covered sector or by encouraging the influx of CDM and JI credits into the EU ETS as a result of the Linking Directive. Relaxing the overall cap implies that emissions reductions will have to be undertaken by other sectors – given the Kyoto Protocol's targets – which is likely to increase overall compliance costs for member states, as low-cost reduction options in the covered sector would be omitted. On the other hand, compensating for the relaxing of the overall cap by member states using the Kyoto Protocol's project mechanisms (i.e. CDM/JI credits) is likely to run against current political, technical and other constraints related to those mechanisms. While the EU can attempt to address them, it will need the cooperation of all international partners in the UNFCCC. Encouraging the influx of CDM/JI credits through the Linking Directive faces the same difficulties. The purchase of AAUs by member states, as an alternative, might be politically difficult unless such AAUs are 'greened' through for example the Green Investment Scheme (GIS), which earmarks revenues from the sale of excess AAUs for projects that reduce greenhouse gas emissions. Ultimately, the use of flexible mechanisms finds its limit in the Kyoto Protocol's and the Linking Directive's supplementary provisions.

c) Another option that has been discussed to limit the CO_2 price is to set a maximum price on an EU allowance, but this is not a viable option for the second period (2008-12) as the current Directive does not allow the setting of a maximum price. Moreover, setting a

maximum price risks missing the environmental objective of the covered sector with the consequence that reductions would have to be achieved by other sectors, which would increase overall compliance costs. Another downside of setting a maximum price is that it would reduce liquidity and therefore may actually undermine trading activity and so could be seen as 'managing a market'.

d) Another possible measure that has been discussed is a system of *allocation* of emissions allowances based on *relative quota or a Performance Standard Rate* (PSR) such as an energy/carbon efficiency benchmark per unit of output. A benchmark could be multiplied by the expected output to determine the allowance *ex-ante* or alternatively, multiplied by the realised output, i.e. with *ex-post* adjustment. The major advantages are that it would virtually avoid windfall profits, reward carbon efficiency and be popular with industry since it is less restrictive of economic growth. There are a number of shortcomings, however: lower economic efficiency, less environmental certainty and higher information and other transaction costs. The principal issue is that a relative quota system does not fit into the present Directive (and the political consensus) and hence could not be implemented before 2012.

e) A *regulatory measure* would be to restrict power price increases – either at the wholesale or retail level – to avoid passing through of opportunity costs. Instead power companies would only be allowed to pass through the real, average costs of CO_2 allowances. While such a mechanism would restrict power price increases beyond average costs and eliminate windfall profits, it would radically alter the incentive structure of the ETS. Such a proposal would counter the ETS' intention to set a price for CO_2 and include this into the marginal cost of production including power. There is no reason to treat carbon separately from other cost factors, especially costs stemming from the abatement of NOx, SO_2 or other pollutants. This raises the fundamental question on how to reconcile such an approach with one of the key objectives of the internal energy market, namely providing undistorted price signals based on full marginal costs, such as fuel, labour and environmental costs including carbon costs. In essence, this would constitute a move back to a regulated market. Furthermore, regulators have limited, if any instruments at hand to regulate whole sale prices. There are a number of implementation issues although Member States could impose some sort of a "voluntary agreement" between energy-intensive industries and power generators (Sijm et al 2005: 92). . As a result, such regulation would create additional inefficiencies in the power market. Intervention in the power market of that kind is likely to distort production, consumption and as a consequence investment decisions. It would almost certainly increase total power demand as the costs of CO_2 would not be internalised, with higher emissions. *De facto*, it would mean that the power sector would be largely 'sheltered' from the carbon constraint. 'Exempting' the power sector despite the Kyoto commitment would mean that costs of emission reductions are pushed to other sectors in the economy, which would be economically detrimental.

B) Compensation measures

Compensation measures attempt to correct undesirable effects of the EU ETS from a societal perspective. When assessing their relative merits, it is important to assess the potential environmental, economic or social effects against the principal objectives of the ETS, i.e. to reduce CO_2 emissions in a cost-effective way. There are a number of *compensation* measures including government support in the form of tax breaks, other reductions of burdens, government subsidies, re-distributed 'windfall taxes', but also more subtle mechanisms that could work through the ETS. They also raise a number of questions, however.

The fundamental assumption upon which compensation or redistribution rests depends on whether energy-intensive companies choose to cross-subsidise their production by the amount

of the compensation they have received – at least in the short-term – or whether they base their investment decisions on opportunity costs, meaning that the revenues are invested where they promise the highest return, i.e. possibly in other regions than the EU. Hence, compensation measures would need to be designed to create incentives for investing in the EU.

Another critical element is where the financial resources for compensation come from and how they are redistributed. If it is the government that compensates, it is likely that revenues will first be collected via a tax on windfall profits, auctioning, or through other measures. Compensation raises many equity issues and internal market issues.

An option that has been discussed intensively (e.g. in various CEPS Task Forces) is indirect allocation of emissions allowances. In such a system of grandfathering, electricity users receive emissions allowances for free while power generators are responsible for surrendering allowances according to their actual emissions. They would buy their allowances from the energy-intensive sector, for which this would constitute compensation. While this would allow for full pass-through of CO_2 costs (the intended objective of the ETS), reduce possible windfall profits and compensate energy-intensive industries, it raises issues of fairness for the non-covered sector and households remain uncompensated. Including them in such a scheme would, however, increase the complexity of the EU ETS significantly. Furthermore, those energy-intensive sectors that in fact are able to pass through the cost increases due to higher power prices would be compensated twice, reaping in fact windfall profits.

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The ECP is a joint initiative of the Climate Policy Research Programme (Clipore) of the Swedish Foundation for Strategic Environmental Research (Mistra) in Stockholm and the Centre for European Policy Studies (CEPS) in Brussels. Established in 2005, the ECP aims to facilitate interaction within the policy research community, mainly but not exclusively in Europe. Its working methods consist of bringing together a select number of policy-makers, negotiators and experts to vigorously debate key topics in the area of international climate change policy and to widely disseminate its conclusions. The ECP actively seeks dialogue with policy-makers and other stakeholders while being dedicated to academic excellence, unqualified independence and policy relevance. The ECP is governed by a steering group, drawn from government and academia. For further information, see: http://www.ceps.be/Article.php?article_id=484 .

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