

Design of a Practical Approach to Greenhouse Gas Emissions Trading Combined with Policies and Measures in the EC



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Executive Summary

This paper supplements the Final Report for the Study Project “Designing Options for Implementing an Emissions Trading Regime for Greenhouse Gases in the EC”. Background information on the Study is contained in the February 2000 Final Report of the Study and the July 1999 Interim Report of the Study.

The Interim Report identified a need for a more detailed analysis of how a downstream approach to emissions trading might work in the EC. The issue of how such a system would fit with existing and planned policies and measures at the national and Community level was also identified as requiring additional analytical work. This paper responds to these needs.

This paper provides a "strawman" proposal, originally intended to generate dialogue with Member States present at the workshop on 8 December 1999. The proposal provides a detailed profile of how a more limited EU-wide emissions trading system covering selected industrial sectors combined with the current system of policies and measures could go into effect in advance of 2008.

The “strawman” proposal presents one way in which an EC emissions trading system may be designed to balance the need to create a new system that fits well with the traditions of environmental regulation within the EC, with the need to take advantage of the new opportunities afforded by the Kyoto Protocol (KP) to pursue cost-effective greenhouse gas regulation. Table ES-1 summarises the strawman proposal.

The development of this design does not constitute endorsement as the preferred option by the Study Team. Rather, this option represents one practical approach that could be useful for launching discussions between the Commission and the Member States on the design of a Community emissions trading scheme.

Table ES-1 Summary of Strawman Proposal for EC Greenhouse Gas Trading System

Design Issues	Strawman Proposal	Options
When does the trading system start?	The trading system can start before the first commitment period under the Kyoto Protocol, preferably by 2002 to allow 5 years experience before the wider international trading programme in 2008-12.	2008
What is the unit of	Allowances ² are defined in tonnes of CO ₂ -	

¹ This paper has been prepared by Tim Hargrave, Ned Helme, Tim Denne of the Center for Clean Air Policy (CCAP), Suzi Kerr, Motu Economic Research and a consultant to the Center, and Jürgen Lefevere, Foundation for International Environmental Law and Development (FIELD). The paper draws on the scoping papers and Interim Report prepared by FIELD and CCAP in the first phase of the Project to design options for implementing an emissions trading scheme for GHGs in the EC. The authors wish to thank Erik Haites, Dick Stewart, Fanny Missfeldt, Onno Kuik, Per Schreiner and Farhana Yamin for comments on earlier drafts.

Design Issues	Strawman Proposal	Options
exchange?	equivalent. Each allowance has a unique number; it provides the holder with a right to emit one tonne of CO ₂ -e in any Member State. In 2008-12 the allowances are assigned amount units (AAUs) as defined under Article 17 of the Protocol. Prior to 2008 the allowances are separate EC commodities.	
Duration of allowances	During the first commitment period under the Kyoto Protocol (2008-2012), allowances can be used to cover emissions in any year of this period. If unused, they can be banked to cover emissions in future commitment periods. Prior to 2008, allowances can be used to cover emissions in any year from the start date to 2007 but cannot be banked for use after 2007.	
Who owns the allowances?	Allowances are owned by the current holders. Holders can be any government, firm or individual regardless of whether they need to surrender allowances. In 2008-12, only when allowances are surrendered by the entity to the government do they become available to the Member State for compliance purposes. Each year, when the allowances have been used for compliance purposes to cover emissions in selected source categories, they are retired and are no longer available for use or trade.	
Role of entities/firms	Each source included in the trading system must surrender annually to the Member State government in which the source is located, allowances equal in number to the tonnes of emissions of CO ₂ -equivalents of emissions in the previous year.	In some Member States, entities that are elsewhere part of the trading system, might be regulated through other policies and measures (PAMs), with the government holding, trading and surrendering allowances equal in number to the emissions from the relevant source categories.
Role of Member States	Member States must distribute allowances to entities, approve trades (there is likely to be blanket approval of all trades), measure emissions from sources included in the trading system and report to the Commission on an annual basis, and impose penalties on entities not surrendering sufficient allowances. Member States must establish a registry to maintain information on emissions and allowance holdings including those held by entities, by the government and those retired.	As for Strawman Proposal but Member States do not distribute allowances to entities but rather retain them under government ownership. Deciding how many allowances are distributed to trading sources.
Role of the Community	Defining number of allowances to be distributed to aggregate of all source categories included in trading system. Defining rates of penalties that apply to Member States Defining minimum entity penalty levels Defining monitoring system	Defining formulae for grandfathering (e.g. maximum number of allowances that can be allocated to specific entities) Only defining the tradable

² We have used the term allowance to describe a unit of exchange that allows the holder to emit one tonne of pollutant. This differentiates it from permits that tend to allow holders to emit a given amount on an annual basis.

Design Issues	Strawman Proposal	Options
		commodity.
Role of the Commission	Maintaining a Community registry. Enforcement of Member State penalties (see below for description).	Organising auction of allowances
How are allowances distributed?	Through free allocation (grandfathering) or auction; the choice is left to Member States.	(1) Compulsory auction by Member States (2) Grandfathering at level agreed by Community (3) Grandfathering plus set-aside for new entrants (4) Community auction
How many allowances are available for trading?	The number of allowances distributed by each Member State is set by the Community taking account of the source categories included, their expected BAU emissions, benchmarks of performance of the same source categories elsewhere and the Burden Sharing Agreement (BSA). The total number of allowances distributed is less than the national assigned amount in the BSA. Prior to 2008, the objectives and intent of the BSA will be considered in setting allowance numbers to be distributed.	Member States are free to choose how many allowances are distributed (auction or grandfather) during the first commitment period (providing it is less than their target under the BSA). Prior to 2008, it is set as for Strawman Proposal.
How are emissions measured?	By calculation using activity or fuel use data and emission factors.	Direct measurement using emission monitors (where possible).
Which source categories are included?	As a starting point, CO ₂ emissions from energy use in power plants >50MW _{th} , refineries, and iron and steel, inorganic chemical, cement and paper pulping plants. But this could readily be extended to include, for example, other energy CO ₂ sources, industrial process emissions of CO ₂ , N ₂ O, SF ₆ , HFCs and PFCs; CH ₄ (including landfills, gas distribution and coal mining).	(1) All energy CO ₂ via energy producers (upstream approach) (2) As for Strawman plus additional categories and sinks (3) Up to Member States to choose
Can other source categories be included?	Yes – allowance allocations are then agreed with the Community	Yes - Member States then choose allowance allocations
Is inclusion in the trading system compulsory for entities in selected source categories in all Member States?	Yes, for the minimum number of source categories agreed by the Community	No, Member States choose which source categories, if any, are included
What are penalties for Member States?	Member States must pay a fee per tonne of CO ₂ equivalent for every tonne of CO ₂ -e emissions from the source categories included in the trading system for which they do not hold and retire allowances. The Community will set the fee rate at a level significantly above the expected market price of allowances. In 2008-12 the fee will apply to every tonne of CO ₂ -e emissions over and above the Member State's assigned amount.	No financial penalties but other sanctions include: (1) subtraction from future commitment periods with interest (2) buyer liability (3) compliance reserves (4) mandatory buying requirement
What are the penalties for entities?	Community will set minimum penalties on emissions sources	No mandatory penalties on entities. States expected to pass penalties on to entities.
Is there buyer or seller liability?	Seller liability – because the Community can define effective financial penalties for non-	

Design Issues	Strawman Proposal	Options
	compliance. Member States are assessed for compliance purposes against their modified assigned amount taking account of any transfers or acquisitions. In the period prior to 2008, in any Member State, the emissions from selected source categories must be equal to or less than the aggregate number of allowances distributed.	

I. Introduction

Before launching into the discussion of the specifics of the proposed system, it is important to note a number of guiding assumptions that shape our analysis:

- Since the EC (a regional economic integration organisation) is authorised under Article 4 of the KP to achieve joint fulfilment of Article 3 emissions limitation and reduction commitments, any trading system established by the EC can be considered to be a domestic policy and measure. Such policies and measures, like those of any other Party, would be subject to review by experts under Article 8. The EC appears to be free to establish an EC-wide trading system prior to agreement by the COP on the rules, procedures and modalities for emissions trading under Article 17 and, if it so desires, prior to commencement of emissions reductions in 2008 pursuant to the KP.
- Supplementary rules pursuant to Article 17 will not apply to emissions trading within the EC as it will be treated as domestic activity.³
- Any EC trading system would be designed to assist in achieving the overall targets established for its Member States under the Burden Sharing Agreement (BSA) reached at the Environmental Council meeting on June 16-17, 1998. However, allocations of emissions allowances or assigned amount units (AAUs) established under the BSA are not assumed to “belong” to the Member States as this would compromise any discussion of the competence of the EC.
- Participation by individual emissions sources in inter-State trading will be mandatory.
- EC competition rules barring non-discrimination between EC nationals, state aid, and favouritism to nationally produced products shall not be abridged by the trading system unless explicitly waived on environmental grounds.
- Community intervention in this policy area shall respect the subsidiarity principle.
- Member States and emissions sources can purchase AAUs, certified emission reductions (CERs), and emission reduction units (ERUs) from outside the EC to meet their commitments.

This paper begins with a discussion of potential effects on EC Trade and Competition Law of allocation and auction rules under the trading system as well as the effects of overly weak or overly stringent policies and measures (PAMs) on competition. In the latter case, we will focus on the potential competitive advantage a country could give to a sector through very lenient regulation in contrast to another country that chooses to apply strict caps under a trading system or more stringent

³ In the event that the Community as a whole does not meet its commitments, each Member State is then responsible for achieving its agreed-upon share of the Community target individually. At that point, trading between Member States of the Community would be governed by the rules of Article 17 and by any supplementary rules adopted by the COP/MOP.

PAMs to the same sector. In Section III we define the tradable unit. Section IV discusses whether to make trading mandatory on an EU-wide basis, whether the Community should define the number of allowances to be distributed to the aggregate of all source categories included in the trading system and to Member States for such categories. Subsequent sections address critical design issues in succession. These issues are defining the sectors to be included in trading; monitoring, reporting and verification; the compliance system; and finally, integration of trading with other PAMs. In each of these areas, we recommend an optimal division of responsibility between the Community and the Member States based on an assessment of how such a division will:

- 1) affect the likelihood of EC and Member State achievement of their commitments under the Kyoto Protocol,
- 2) minimise any adverse effects on fair competition within the Community,
- 3) maximise economic efficiency, and
- 4) conform to the subsidiarity principles of the EC Treaty.

II. Effects on Fair Competition

Two types of cost are important to firms: The first and most important, is the cost of producing extra units, or marginal cost. This determines what a firm can sell more output for without making a loss. It determines a firm's ability to expand into new markets. The second is the average cost, which determines the overall profitability of the firm and the sustainability of its production and sales. In a non-competitive market, a firm with lower average costs is able to subsidise its marginal units in order to capture a greater share of the market. While this is not profitable in the short run it may lead to the collapse of competitors and have longer run advantages. Firms that are more profitable, and that have larger assets or access to capital are more able to oppose and deter such non-competitive practices.

A. Effects of Differences in Stringency of Regulation on Fair Competition

Climate policy will have some competitive effects; in fact it is intended to do so. Policy seeks to lower the greenhouse gas intensity of units of production and reduce production from firms with high greenhouse gas intensity. Greenhouse gas intensive firms will be less able to compete under effective climate policy. It is important, however, that policy not affect fair competition; by this we mean that competition among firms is based on the true economic costs of production and is not distorted by subsidies.

For firms included in a trading system in which there is trading between all Member States (and from 2008, internationally), allowance prices, per tonne of CO₂ equivalent emitted, will be equal and consistent with a least cost approach to achieving emission limitation commitments. If firms in the same sector but in other countries are facing lower marginal cost increases from climate policy, those facing the higher costs can claim unfair competition. Other policies and measures, unless they are harmonised throughout the Community (e.g. harmonised rates of carbon taxes), mean firms face

different marginal costs of control and hence of production from those included in trading. Although this is already an issue under existing PAMs, the design of the trading system can ensure that fair competition concerns are limited.

In 2008-12, the domestic allocation of allowances on an aggregate basis determines the marginal cost of sectors faced by PAMs. It is possible for a country to provide a competitive advantage to an emissions sector covered by policies and measures (PAMs) other than trading by imposing very lenient regulation on the sector. It would then compensate by placing very strict PAMs on other sectors, by allocating few allowances to trading sectors and hence forcing them to buy more internationally or, during the first commitment period, by buying external AAUs out of general revenue. For instance, a country that decided not to control emissions from cement manufacture might provide a cost advantage to its cement manufacturers over those in other countries.

To limit effects on fair competition, the trading system should be designed so that Member States are not able to distribute a small number of allowances to source categories included in the trading system, thus allowing them to impose weak regulation and low marginal costs of control on sectors not in trading. Those in trading will still only face the EC-wide or international allowance price. This suggests rules, which set minimum numbers of allowances that must be distributed to trading sectors. Prior to 2008 when there is no binding target for the country as a whole, the incentive is the opposite – Member States will wish to over-allocate to trading sectors as there is no consequence for the required stringency of PAMs. Here rules will need to be set to prevent over-allocation to trading sectors. These two design elements are best achieved through rules that enable the Community to set the actual number of allowances that will be distributed to source categories included in trading.

B. Effects of Allocation Options on Fair Competition

There are two basic options for distributing allowances: auction in which firms must buy all the allowances they need and grandfathering in which existing firms are given some allowances at no cost. Grandfathering allowances affects average costs but not marginal costs (any emissions have an opportunity cost as the firm cannot sell the allowances) and thus provides no real competitive advantage *vis-à-vis* those who must buy allowances. Grandfathering is a lump-sum payment; it makes the owners of the firm wealthier, but does not directly alter their marginal production costs relative to a firm required to surrender allowances and to buy them all.

The reallocation of wealth across and within industries could affect efficiency if there is imperfect capital mobility. Firms that receive allowances will be wealthier and therefore may have a cheaper more liquid source of finance available than firms that must rely on their usual sources of finance. The firms that receive the resources will not necessarily invest them in the same industry; they will invest them wherever they can get the best return.

The economy of the country as a whole will be disadvantaged if grandfathering is used because of the loss of efficiency gains that could have been achieved through

revenue recycling if the allowances were auctioned. Grandfathering would lower that country's overall productivity and make it harder for their firms to compete. Some firms will be wealthier, but all are likely to face higher production costs because general tax levels (e.g.: on capital and labour) will be higher than they would have been if the auction revenue had been recycled into tax cuts. Even firms that are grandfathered allowances will face higher marginal production costs and hence will find it harder to compete with other countries.

These arguments suggest that Member States should be made aware of the disadvantages to themselves of grandfathering (it is less efficient and will hurt their economy more than others) but grandfathering should not be limited; they should have the freedom to deal with their own political situation in order to create workable regulations. However, this needs to be qualified; grandfathering might be defined as a form of state aid and thus subject to restriction by EC Treaty (see discussion in Section IV). In this case, there may be a requirement for Community harmonisation of approaches to allowance allocation which are unnecessary on fair competition grounds.

C. Should New Entrants be Protected?

Policy makers are frequently concerned about the fate of new entrants into allowance markets. However these concerns are often overstated. Once the allowances are in private hands they can, and often will, be sold on the secondary market. New entrants who do not receive allowances directly should have no difficulty in gaining access to allowances, although they will have to purchase them. They will face the same marginal and average opportunity costs of emitting as existing firms so have no competitive disadvantage. They do not have any stranded assets so do not face costs from regulation if the industry is competitive. They only enter if they expect to make profits and will take the environmental regulation into account as an additional cost. Existing firms and new entrants need to make a normal return on all their capital whether it owns it as assets or has borrowed it. However, where there are significant constraints on access to capital, the need to purchase allowances will provide a barrier to entry not faced by incumbents and Member States may want to set aside allowances for distribution to new entrants. This is not an essential element of the design but also should not be prevented.

The issue of fair competition is addressed in further detail in Appendix A.

III. Defining the Tradable Unit

It is important from an economic efficiency standpoint that all allowances traded in the EC trading system be interchangeable, regardless of their country of origin or who is selling them. Thus the Commission will need to establish a single definition of an allowance.

A. 2008 and Beyond

For 2008 and after, the allowances in circulation in the EC trading system should simply be AAUs created under the Kyoto Protocol. Member States would take the Community-specified portion of their AAUs and allocate them to the trading system. These allowances each would represent one tonne or one thousand tonnes of CO₂-equivalent emissions, whatever is decided under Kyoto. They could be banked for use in future commitment periods, consistent with Article 3.13 of the Protocol. Use of this approach would integrate trading into the broader context of Kyoto commitments.

Another means of reflecting the fact that trading was part of a broader policy context would be to allow trading entities to purchase AAUs and ERUs from Annex B countries outside the EU15 and CERs from developing countries to meet their trading system commitments. This would reduce the overall cost of compliance and would cause no environmental harm. It would mean, though, that the total number of allowances allocated to the trading system would not represent a firm cap on the sources included in the system.

B. Trading Prior to 2008

If the EU trading system starts prior to 2008, then the Community will have to establish the tradable unit itself. We recommend that it follow the Kyoto lead and define units in terms of CO₂-equivalent emissions. Doing so would eliminate the confusion of having one type of unit prior to 2008 and another unit afterward; also, it would accommodate the possibility of including certain sources of methane and other non-CO₂ gases in the EU system, which would be desirable from an economic efficiency standpoint.

The units created prior to 2008 should be denominated as EC PAAs or with some other name that clearly distinguishes them from Kyoto AAUs. These units created strictly for pre-2008 trading would not be bankable for use under the Protocol post-2008, since the Protocol would not recognise them.

In theory Member States (and emissions sources within those States) could purchase CERs through the CDM or ERUs through JI prior to 2008 to meet their EC trading system commitments rather than for Kyoto compliance. This should be allowed, since it causes no environmental problem and in fact would help jump-start the use of the Kyoto mechanisms. Purchase of ERUs for pre-2008 use actually would provide an environmental benefit by effectively tightening the overall cap for the first Kyoto commitment period. This is because the ERUs would represent assigned amount “moved forward” by the selling country, leaving the country with less to use in the first commitment period.⁴

We recommend that the commitment period approach rather than annual compliance is taken if trading starts prior to 2008. The same reason this approach was decided upon under the Kyoto Protocol applies in the EU pre-2008 trading context: Flexibility

⁴ A Member State that used these ERUs to meet its commitments under the pre-2008 EU trading system would not be barred under Kyoto Protocol rules from using them again for compliance in the first Kyoto commitment period. However, the EC could and should move unilaterally to disallow such double use.

over time will reduce compliance costs in the same way that flexibility over space does.

IV. Allocation of Allowances

In developing a design for a downstream EU emissions trading system coupled with PAMs, we have two objectives in mind: to increase the likelihood of EC and Member State achievement of the commitments of the KP at least cost and to minimise the adverse effects on fair competition within the Community of any strategy to meet those commitments. The ensuing discussion will first cover approaches to allocation in the post-2008 trading system operated in conjunction with the Kyoto Protocol and the BSA and then address special issues that might arise in conjunction with a pre-2008 trading program. As noted, this discussion assumes trading by emissions sources is authorised both pre- and post-2008.

As shown in Table ES-1 earlier, we are suggesting a “strawman” proposal on the allocation issue that would divide authority between the Community and the Member States as follows:

The Community would:

- mandate sectors (e.g. electricity, heavy industry) to be included in the trading program,
- establish an aggregate quantity of assigned amount allocated to the trading sectors on an EU-wide basis, and
- determine the number of AAUs distributed to each Member State for the trading sectors in that State, taking into account expected business as usual emissions, possible benchmarks of performance for the source categories, and the overarching level of AAUs assigned to each Member State pursuant to the BSA.

The Member States would:

- auction or distribute free AAUs to emissions sources within the mandated trading sectors.

In the course of the discussion of the pros and cons of the strawman, we will also touch upon two alternative approaches to allocation including:

- 1) Community-wide mandatory trading in selected sectors, with individual Member State control of both allocation in aggregate to those sectors and allocation to emissions sources within those sectors, and
- 2) Individual Member State decision-making on which sectors are involved in trading as well as on all allocations. The Community would retain authority to define the tradable commodity, Member State penalty levels for non-compliance, and monitoring requirements.

Finally, we will examine the implications of allowing a Member State to carry out all international trading, in effect prohibiting legal entities in that State from participating directly in international trading.

We need to answer three sequential questions to define the allocation system design:

- 1) Should emissions trading be mandated on an EU-wide basis for selected economic sectors?
- 2) Should the EU agree on an aggregate CO₂ cap for these sectors and translate this into individual aggregate Member State caps for the same sectors?
- 3) Upon what basis should such aggregate Community and Member State caps be set?

A. A Mandatory Community-wide Trading Scheme for Selected Sectors?

1. Arguments for a Mandatory System

Greater Economic Efficiency and Lower Transaction Costs

Mandating emissions trading for selected sectors of the Community economy will maximise economic efficiency relative to a situation in which Member States choose which sectors and firms may trade. These efficiency gains result from differences in marginal control costs between sources in different Member States. In general, the larger the number of sectors and states participating in the trading system, the greater the gains in efficiency and the greater the savings in control costs. While some efficiency gains could still be achieved in a system allowing Member States to opt-in to the trading system, the gains are considerably greater if the system is comprehensive for all companies in a given sector in the Community.

Transaction costs are also reduced in a centralised system, as the rules are the same for all countries, the commodity is the same, and the processes for reporting and monitoring are the same. As an example, in the US context, transaction costs for the nationally-directed sulphur dioxide program are approximately one percent of each trade while for the nitrogen oxides trading program operating in the 13 eastern seaboard states under varying state rules the costs tend to exceed five percent according to brokers active in both markets (Bartels 1999).

Fewer Adverse Effects on Fair Competition

A second argument for mandating trading in selected sectors in the Community is that it may reduce potential adverse effects on fair competition. For example, anti-competitive effects could result if one Member State elected to exempt a sector from trading and regulated it instead through a less stringent PAM or voluntary agreement. This would effectively subsidise companies in the exempted sector, a result that would not be possible if that sector were required to be included in the trading system. Council-issued guidance on the application of the subsidiarity principle suggests Community intervention is justified when actions by Member States will conflict with the requirements of the EC Treaty. In our example, a mandatory trading system would correct or avoid the potential distortion of competition that would result from one Member State effectively exempting a sector through a weak PAM, while other States imposed emission caps on the same sector.

Level Playing Field for Electricity and Heavy Industry

Third, as the Community debate leading up to agreement on the BSA demonstrated, the electricity and heavy industry sectors are very important politically in the Community. Since adoption of the United Nations Framework Convention on Climate Change in 1992, Member States have faced considerable political resistance to their unilateral efforts to limit greenhouse gas emissions from these sectors. That resistance has focused on the potential adverse impacts on the competitiveness of such sectors within the Community that could result from unilateral action by individual Member States. If the Community is to move to limit emissions from the electricity and heavy industrial sectors, it appears critical from a political feasibility standpoint that it be carried out on a Community level to insure the proverbial level playing field. Moreover, most studies indicate that these sectors offer the most cost effective opportunities for greenhouse gas emission reduction within the Community. Thus, they cannot be ignored or lightly regulated if the Community wishes to meet its Kyoto commitments.

The level playing field/equalisation of conditions for competition argument has been the cornerstone justification for most EC environmental legislation over the past 25 years and is singularly appropriate in the case of greenhouse gases.

Community's Responsibility for Compliance with Kyoto Protocol

Finally, the shared responsibility for compliance by the Community as a regional economic integration organisation under KP Article 4 creates an excellent argument for an expanded Community role in the trading system. The Community can be found in non-compliance with the KP if any Member State fails to meet its BSA ceiling, and there are not enough excess AAUs held by other States to cover its shortfall. This shared responsibility creates a reduced incentive for Member States to comply fully with their individual commitments, if they believe that other Member States will "over-comply" by an amount sufficient to cover their under-compliance. In effect, this creates a potential "tragedy of the commons" problem. The problem is limited somewhat, though, by the fact that if other Member States do not over-comply sufficiently, then the Community as a whole will be in non-compliance. Each Member State then must meet its share of the BSA or face individual non-compliance sanctions. Setting up a mandatory trading system for selected sectors reduces the risk/incentive somewhat for governments to "under-regulate" the sectors included in trading. This is particularly true if the mandatory system is coupled with a Community decision on the amount of allowances to be distributed by Member States either by allocation or auction to companies in the affected sectors.⁵

2. Arguments Against a Mandatory Trading System

Sovereignty and Subsidiarity

The principal arguments against a mandatory Community-wide trading system centre on sovereignty and subsidiarity concerns. It can be argued that states are capable of

⁵ This existing incentive to not comply would be eliminated by creation of a system of Community financial penalties on Member States for non-compliance. Such penalties would be set well above the marginal cost per ton of achieving greenhouse gas emission reductions in the Community creating a much larger disincentive to non-compliance. This is discussed in more detail in Section VII on compliance below.

managing trading on their own. Denmark has already embarked on a trading system for electric utilities, and the United Kingdom is planning to start its own trading system for entities subject to its new domestic climate levy in the next year or so. It can be argued that creating a centralised trading system will interfere with these new initiatives. The response to these arguments is that a Community-wide system can be designed to build on these Member State innovations rather than interfering with them. While it may be necessary to modify some of the trading rules developed in these Member State systems, a Community-wide system is not envisioned to control allocation of assigned amounts to emissions sources. Thus, prior national decisions about allocation of emissions allowances and setting of targets for utilities in Denmark or for companies in the UK would not necessarily be affected by creation of a Community-wide system. Depending on the aggregate level of AAUs set aside by the Community for a given State for its “trading” sectors, Denmark and the UK could elect to maintain or modify their previous allocations to individual companies within those sectors. In addition, if the Community system did not include an industry that a given Member State wished to regulate through a cap and trade policy, that Member State could request that that industry be included in the Community cap and trade system.⁶

The key to preserving an important and appropriate role for Member States within the Community-wide cap and trade system is granting Member States control of the allocation of auction of assigned amounts to private entities. Through distribution of allowances, Member States have an excellent opportunity to deal with inequities to communities, companies and citizens that will result from the higher energy prices and differential economic impacts caused by greenhouse gas regulation. Finally, creation of a larger Community-wide trading market could be advantageous to Member States and companies who have started trading earlier, as those entities could be better positioned to compete effectively in the new market and to shape the design of the community-wide system.

Ineffectiveness in Preserving Fair Competition

Opponents of a mandatory Community-wide trading system argue that this approach will be ineffective in preventing potential fair competition problems resulting from implementation of the Kyoto Protocol. They point out that mandating trading in certain sectors does not eliminate the potential for adverse impacts on competition in sectors not included in the trading program and that the Community has established procedures for limiting state aid and other anti-competitive policies. In their view, these procedures can be utilised on a case by case basis, and are more effective than mandating trading.

In response, it is clear that mandating that certain sectors throughout the Community participate in trading prevents the most serious threat to fair competition in those sectors— a complete exemption of one of those sectors from greenhouse gas regulation by a Member State. Clearly, mandating trading for some sectors does not protect against exemptions and related competition problems in the sectors not included in trading. However, by including in the trading system the sectors most involved in international competition, we have eliminated the largest potential threats to fair

⁶ The Community system could allow for a Member State to request the opportunity to opt-in to the trading system additional sectors of its economy, subject to agreement by the Community regarding how much of the non-trading portion of its BSA it would allocate to those opt-in sectors.

competition that might result from the Kyoto Protocol within the EU. One solution to the remaining potential competition problems is simply to extend the trading system to cover all sectors and all gases through an upstream system as is advocated in the longer study prepared by the authors for the Commission.⁷

Trading is Untested in the EU

A third line of argument against a mandatory trading system centres on the assertion that trading is a largely untested environmental regulatory technique in the European context. As such, how can it be justified as a principal area of Community intervention in environmental policy, when action at the Community level must be justified on the grounds that clear benefits will result and will exceed those possible from Member State implementation? While it is true that trading is a largely untested technique within the Community, it does not follow that therefore it should only be tried at the Member State level first. The economic literature on trading makes the case that the wider the participation and the more comprehensive the coverage, the greater the potential efficiency gains that can result. Hence, a Community-wide system with consistent rules would seem to offer greater benefits to the Community than a Member State-driven system. In addition, it is worth noting that trading was largely untested in the US prior to the passage of the 1990 Clean Air Act Amendments. States and major portions of federal EPA were sceptical and preferred command and control approaches prior to 1990, yet it has succeeded dramatically and has been extended to nitrogen oxide regulation as well as to regulation in other environmental media in the U.S.

In sum, it appears that mandatory inclusion of selected sectors in a Community-wide trading system produces more benefit than disbenefit to the Community and its Member States. The greater economic efficiency of such an approach, coupled with its neutral impact on fair competition appears to outweigh concerns about Member State sovereignty. Member State control of the distribution of allowances to emissions sources insures that equity concerns arising from greenhouse gas regulation are resolved at an appropriate governmental level without major adverse impacts on the efficiency of the trading system. It also appears to offer significant political benefits, as a Community-wide approach to limiting greenhouse gases from selected sectors like electricity and heavy industry seems to have a greater prospect of success than unilateral actions by Member States. A cap and trade system for electricity and heavy industry will create the proverbial “level playing field” for these companies who face significant competition both within the EU and beyond.

B. Aggregate Cap for Trading Sectors?

The second major element of the proposed Community trading system would be a quantitative ceiling defined in carbon dioxide equivalent tons for the sectors to be included in the system. To establish this cap or ceiling, the Community would need to agree on a division of the assigned amount available to the Community under the KP into two parts, a portion for the trading system and the remaining portion for sectors to be governed by individual Member State policies and measures. In a similar

⁷ See “Designing Options for Implementing an Emissions Trading Regime for Greenhouse Gases in the EC”, Scoping Paper #5.

fashion the Community would also agree on division of the aggregate Community ceiling for the trading sectors among the Member States, so that the sum of the Member State trading sector caps equalled the aggregate Community cap agreed to. The assigned amount for each Member State available for its non-trading sectors would thus be equal to its original BSA minus the amount it is allocated for the trading sectors. Member States would retain the right to allocate or auction the assigned amount earmarked for sources included in trading as they see fit.

1. Arguments for An Aggregate Cap

Leaving Cap Setting to States Invites Subsidies

Why not simply allow Member States to divide up their assigned amounts received under the BSA between their trading and non-trading sectors? There are three major arguments for not leaving this decision to individual Member States. First, allocation between trading and non-trading sectors by Member States would create an opportunity to subsidise certain non-trading sectors. For example, if a Member State elects to “under-allocate” the cap for selected industrial sectors, this would free up assigned amount for the non-trading sectors. This additional assigned amount could then be used to exempt one of the non-trading sectors from regulation, thereby subsidising that sector in comparison to its competitors in other Member States.

An example makes this clear. Setting a tighter cap for a given industry included in the trading sectors, steel in country X for example, results in a slight rise in the overall marginal cost of reductions in the sectors governed by trading, because the overall supply of AAUs to the trading sectors has been reduced by country X’s action. However, this effect is spread over all the participants in the trading system in all Member States and not felt solely by the steel industry in country X. In effect, all participants in the trading system face higher costs as a result of country X’s decision to under-allocate, and the steel industry in country X faces the highest costs as it must purchase more assigned amount at higher prices than would otherwise have been the case. Meanwhile, country X can now exempt from GHG regulation a non-trading sector, methane from sheep and cattle for example, as it has excess AAUs from the under-allocation to its steel industry that it can now use to cover the unregulated emissions from livestock operations. The non-existent regulation of sheep and cattle farming constitutes a direct subsidy for that industry in country X. Capping the assigned amount for all trading sectors on a Community and Member State basis clearly prevents cross-subsidies between trading and non-trading sectors. Country X could still exempt the sheep and cattle farming sector from any regulation under PAMs, but it cannot “finance” that subsidy on the backs of other countries’ trading sectors. Instead, it must be paid for in the form of tougher regulation by country X of its other non-trading sectors.

Cap Setting by States Faces Intense Domestic Political Pressures

Second, reaching agreement in the Community on caps for trading sectors is closely akin to agreeing on an overall Community strategy for compliance with the KP. In effect, such an allocation would constitute a Community decision on how much of its greenhouse gas reductions should come from the sectors included in the trading system.⁸ Alternatively, leaving the setting of caps for trading sectors to Member

⁸ Of course, the companies involved in trading retain the right to buy AAUs, CERs, and ERUs from other companies and nations in lieu of making domestic reductions.

States invites intense domestic lobbying campaigns by affected industries to receive less stringent caps and to encourage decision-makers to leave more of the burden to the PAMs sectors. Given the uncertain environmental results of many PAMs (taxes, efficiency standards etc.), it may be difficult for Member States to resist the pressure to place more “confidence” in the effectiveness of PAMs in reducing emissions. The history of US regulation by states in the ozone attainment program of the US Clean Air Act since 1970 provides ample evidence of the difficulties states face when forced to choose which sectors should bear the burden of achieving costly emission reductions. Both in 1977 and in 1990 when the Act was re-authorised, the US Congress was forced to set specific federal requirements for an increasing number of polluting sectors because of the failure of many states to regulate these sources adequately.⁹

The Burden Sharing Agreement Provides a Strong Basis for Setting Caps at the EU Level

The final argument for setting sectoral caps at the Community level rests on the history of the development of the BSA. According to a recent study by the Center for International Climate and Environmental Research in Oslo of that process, the foundation of the BSA was laid by the design by Dutch negotiators of a sectoral allocation scheme known as the Triptique Approach (Ringius 1997). It set separate targets for the electricity generation sector, the light domestic sector, and the energy-intensive, export-oriented sector. While the Triptique targets were modified in the political process that followed, they were premised on the need to avoid disruptive export and trade effects due to climate policy – one of the goals we have set here for designing a successful emissions trading system for the Community. The domestic sector was defined to include households, services, light industry, agriculture and transportation. CO₂ emissions per capita from this sector did not vary significantly across Member States, though the cohesion countries (Spain, Portugal, Greece and Ireland) generally emitted less. Considerable differences exist between states, however, with regard to emissions from the heavy industry and electricity sectors. Thus, the potential for adverse effects on competition exists if Member States are given a totally free hand in determining which sectors will bear the brunt of required emissions reductions. The success of the BSA is a useful precedent for setting further trading and non-trading sectoral caps in the Community. Much of the political “heavy lifting” has already been done, and the BSA should provide a useful starting point.

It should be noted that the BSA is still a political agreement, contained in the Council conclusions. In order for the BSA to become binding it will need to be included in a legal instrument. One way to make this agreement binding is through its inclusion in the Decision on the ratification of the Kyoto Protocol and that Decision could also include agreement on the sectors to be included in the trading system and the allocation of assigned amount to those sectors in aggregate in each Member State.

2. Arguments Against Community Cap Setting

Too Difficult Politically

The principal countervailing argument against Community mandated caps lies in the difficulty of achieving agreement on such caps for electricity and heavy industry.

⁹ See Title I, U.S. Clean Air Act as amended August 1977, Title I, US Clean Air Act Amendments of 1990

While the negotiation on the BSA was ultimately successful, it was nonetheless a difficult and protracted process to decide a “negotiating” position for the Community at Kyoto. To agree on an aggregate cap for specific industries could prove to be more difficult and could open old “wounds” regarding the BSA.

Cap Setting Should Be a Member State Prerogative

This approach also appears to step on Member State prerogatives in politically important sectors to some degree. Concerns are certain to be raised by companies in Denmark and the UK, for example, that they have already been complying with caps agreed to with their host governments, so it is unfair to renegotiate these allocations. As mentioned earlier, our strawman proposal leaves allocation decisions within and between trading sectors to Member States. Thus, for example, Denmark could choose to continue to allocate AAUs to its power generators on the same basis as it is now doing (perhaps tightening them on a pro rata basis since the current caps for 2003 understandably do not require the electricity sector to meet a sectoral equivalent of the national percentage reduction that would be required if the BSA were made binding in 2008). It would need to allocate the remainder of its aggregate cap for trading sectors to the sectors not currently included in the existing trading system. The UK could follow a similar track, although it could be a bit more complex as the soon-to-be-proposed optional cap and trade system for heavy industry covers more sectors than the Danish program does. As we know from the earlier discussion on competition, grandfathering allowances among emissions sources has no effect on the marginal cost of achieving CO₂ reductions. It is simply a wealth transfer to emissions sources, albeit an important political decision, but not one that adversely affects future competition much.

3. Allocation and State Aid for Environmental Protection

The Community rules on state aid require Member States to request an exemption from the Commission for “government financial assistance to specific enterprises or industries that distorts or threatens to distort competition and may effect (sic) trade between Member States”.¹⁰ Although grandfathering of allowances should not, in principle, have a major impact on competition, it could in specific cases be considered a form of state aid under Article 87 of the EC Treaty. The possibility for this to occur increases when Member States are left more freedom to decide on the method and quantity of allocation of emission allowances to specific industries. In the allocation of AAUs, Member States could for instance have a perverse incentive to pursue other policy goals through their allocation decisions, by for instance allocating to less competitive sectors of industry a larger amount of AAUs free of charge than this sector would normally receive based on its past and predicted emissions. Where this issue could be joined even more dramatically would be in a case where one Member State elects to auction AAUs to the steel industry in its country while a neighbouring Member State chooses to grant AAUs gratis to steel companies within its jurisdiction. Clearly, steel companies in the country employing an auction would want to challenge under the state aid rules the free grant of AAUs to their competitors by the government of the neighbouring State.

¹⁰ Article 87(1), (old 92(1)), EC Treaty

The risk inherent in such challenges post-2008 is that trading by affected companies could be halted until the challenges are resolved. The potential for numerous challenges could introduce a high level of uncertainty about trading and thereby reduce reliance on trading as a means to reach compliance. This would mean higher costs for compliance. It would be desirable to resolve questions about whether certain forms of allocation constitute state aid prior to commencement of the first commitment period in 2008. One of the great strengths of the US sulphur dioxide trading system was the certainty of its allocations, which were established in the statute. Legal challenges were still brought on various grounds, but they were easily resolved well before the first deadline for achieving emission reductions. Four options seem viable to resolve the state aid issue:

- 1) The Community prescribes auctioning, run by the Commission or by the Member States as the only method to distribute all allowances to emissions sources in the trading sectors,
- 2) The Community draws up allocation rules to be applied by the Member States in the allocation of AAUs to emissions sources,
- 3) The auction or allocation of AAUs is checked under the current system for controlling state aid prior to 2008. Each Member State would have to notify the Commission of allocation decisions that may be covered by the state aid rules. Allocations that qualify as state aid need to be accorded by the Commission (with the possibility of appeal to the European Court of Justice). To be considered, third party challenges to state allocation decisions would have to be filed prior to 2008 to eliminate the risk of interference with the functioning of the trading system.
- 4) All Member State auction and allocation decisions are exempted from the State Aid rules.

While mandatory auctions offer the most economically efficient approach to the distribution question and promise the greatest economic benefits to the Community as a whole, they will likely face stiff opposition from the regulated community who would prefer to receive AAUs gratis. Developing Community rules for allocation may prove difficult and could be opposed by Member States for sovereignty reasons. Option three leaves some complex decisions to the Commission but has the advantage of resolving the issue prior to or shortly after the commencement of the first commitment period. The fourth option, a blanket exemption, also has the advantage of simplicity, but it will not protect against the small number of potentially egregious grandfathering decisions that could occur in an unfettered system. An alternative, preferred option might be the combination of options two and three. The Commission could draw up guidelines on which types of allocation would be covered by the state aid rules and which allocations could be exempted. Member States would still have to notify the Commission of allocation decisions that could be considered as state aid, but it would reduce the number of decisions the Commission would need to make and would greatly increase the legal certainty and the predictability of the system.

C. How Might Community and Member State Caps Be Set for the Trading Sectors?

As a starting point, the Community could focus on what level of emission reduction it wishes to achieve from the trading sectors, by deciding at what level below the 1990

aggregate Community emission level for these sectors it will set the cap.¹¹ It is likely that this cap will be tighter than the overall 8 percent below 1990 levels required by the KP for the Community, because reductions are likely to be more cost-effective from these sectors than from transport, for example. This choice of cap level likely will be driven by an assessment of relative cost-effectiveness of reductions from various sectors, impacts on international competitiveness for the Community as a whole, equity, and, of course, political viability.

The overall cap could be developed through an iterative bottom-up and top-down assessment process. Member States could begin the process by proposing initial individual aggregate ceilings for their trading sectors, in effect creating a bottom-up aggregate Community ceiling proposal for the trading sectors. Commission competition experts could then review the 15 individual Member State proposed ceilings for a given sector and offer their assessment of the relative effects on competitiveness of the proposed combination of Member State ceilings, and then the Commission could propose an overall ceiling, at a comparable level of stringency, as well as individual member state ceilings, based on agreed analytic factors.

While there are obviously an infinite number of possible factors upon which the Commission could rely, three basic approaches (as well as combinations of these approaches) give a taste for the possibilities:

- 1) Pro rata allocation of the cap to Member States based on their share of the Community's 1990 baseline emissions for the trading sectors,
- 2) Pro rata allocation based on a business as usual (BAU) baseline for 2008 for the trading sectors, or
- 3) Pro rata allocation based on benchmark emission rates for affected sectors.

Appendix B provides a fuller discussion of these options.

Each of these approaches to the allocation formula has pluses and minuses. Some combination of these and other factors will undoubtedly be the basis for the Community's decision on the caps for the trading sectors. It should be noted that the benchmark approach bears particular similarities to that found in the Triptique proposal developed by the Dutch during the negotiations on the BSA. The Triptique attempted to get agreement on energy efficiency improvement targets for heavy industry and also applied a uniform de-carbonisation rate to heavy industry to encourage fuel switching. In the utility sector, it set limits on projected growth in electricity consumption but allowed greater growth rates for the four cohesion countries (Ringius 1997). While the approach was modified in the subsequent Ministerial negotiations, the usefulness of starting from a shared somewhat objective analytic basis was unquestioned.

Relying on the bottom-up and top-down proposals and the assessment of competitive effects, the Member States could negotiate the needed caps. Once agreed, each

¹¹ It should be noted that this cap is not an absolute cap because entities can raise their cap by purchasing AAUs, CERs, or ERUs from other legal entities. It might be more correctly referred to as the quantity of assigned amount to be distributed to emissions sources in these sectors either through gratis allocation or via auction.

Member State would receive an aggregate assigned amount cap for the trading sectors. That aggregate total would be subtracted from the Member State's BSA total to establish what each country would have for a cap on its non-trading sectors. Member States would retain the right to allocate the trading cap or auction it to emissions sources within the affected sectors as they wished.

One danger of this overall negotiation strategy, however, is that some Member States may decide that the BSA needs to be revisited. Remember as noted earlier, the BSA is not currently a binding limit – its ratification is tied to ratification by the Community of the Kyoto Protocol. An in-depth negotiation on Member State caps for the trading sectors will highlight for everyone once again all the warts of the earlier compromise agreement. Nonetheless, the effort is worth the trouble when you take account of the significant cost savings that a solid trading system will offer.

D. Special Case: Allowing a Member State Government to do all Trading with No Legal Entity Participation from that Member State

In the strawman proposal, legal entity trading is permitted in all Member States. What would be the implications for efficiency, competition and compliance of allowing a Member State government to be the sole trading entity in its country? In effect, to bar emissions sources from involvement in trading with other Member States and with emissions sources in those States? Given indications that the Netherlands is currently considering a strategy that would have the government doing all trading, while electricity and industrial sources are governed by a system of energy efficiency covenants and voluntary agreements, this question has real-world consequences.

Government-only trading would have an adverse effect on the efficiency of the trading system. By not allowing emissions sources in the country to sell allowances, it will prevent some cost-effective domestic reduction opportunities from being available on the world market. Virtually every country will have some cost effective emission reduction or sink enhancement opportunities that will be missed, if there is no legal entity trading. It would be possible to identify these and carry them out as Joint Implementation (JI) transactions. However, the higher transaction costs and the reduced incentive for emissions sources to develop these, as compared to comprehensive entity-level trading, would certainly lead to missed opportunities, higher marginal costs of control and some loss of efficiency.

In terms of effects on fair competition, the big question is whether the energy efficiency agreements for what-would-have-been trading sectors constitute much less stringent regulation. If so, such agreements may constitute a subsidy and an adverse impact on fair competition. In fact, over time, it may lead to companies from the same sector that are participating in trading and facing caps in neighbouring countries to press for similar exemptions or less stringent caps. This could erode support for the trading system across the Community. In terms of compliance, we would find similar concerns, though perhaps less serious. If the voluntary agreements governing these sectors in the Member State are weaker than comparable trading caps in the rest of the Community for these sectors, then the likelihood of shortfalls in reductions in the Member State increases. Alternatively, the government of the Member State

could simply purchase more allowances from the market to cover the shortfall. This would eliminate the potential non-compliance, but it would constitute a subsidy provided to the companies regulated by the voluntary agreements.

Where governments also wish to sell allowances on a government-only basis, questions will arise as to the basis for establishing that allowances offered for sale are in fact surplus. Since the underlying sectors are not governed by caps and a domestic trading system, it is difficult to contemplate how the reductions will be demonstrated. Will these be in effect joint implementation efforts tied to particular project-related reductions? Or will they be along the lines of the Swiss model, offered at the end of each year once the government has determined that such allowances have been freed up as a result of reduced emissions relative to BSA levels in the previous year?¹² While this discussion is meant simply to illustrate some of the issues that might arise rather than providing an in-depth analysis, it certainly reflects a serious set of potential difficulties on competitiveness, efficiency, and compliance grounds. It is clearly preferable to bar government-only trading for industrial sectors included in the Community-wide trading system.¹³

E. The Pre – 2008 Trading Alternative – How Might Allocation Be Handled?

The first question for a pre-2008 program is what does the Community wish to accomplish with this program? Two goals come to mind: learning by doing and ramping up toward the Kyoto targets so as to avoid sudden economic dislocations that could result if no actions were taken to reduce emissions prior to 2008. It seems that the arguments laid out above for mandating trading for certain sectors and for setting both overall and Member State caps for the selected sectors are equally compelling for a pre-2008 trading program. The Community will need to decide on the interim target that it would like to achieve during the pre-2008 period. Ideally, the cap might be set to achieve partial progress toward meeting the BSA levels of emissions. Deciding on the overall target and on individual Member State caps for the trading sectors will likely be a contentious process.

One alternative that is not available for the post-2008 program but could be very attractive in the pre-2008 program is that of setting a cap and combining it with a “safety valve” price that emissions sources could pay in lieu of making further reductions. Modelled after the recent proposal by Resources for the Future (RFF 1999) for an early binding domestic CO₂ trading system for the US, this safety valve price of perhaps \$40/tonne carbon¹⁴ would effectively set the upper bound for the cost that any legal entity might face in complying with the pre-2008 program. A legal entity facing a marginal cost greater than \$40/tonne would simply pay the fee per tonne and cease making additional reductions. Such an approach could not be used in the permanent program post-2008 because Member States would not comply with

¹² Swiss Proposal to UNFCCC. UNFCCC/SB/1999/8.

¹³ It is assumed that due to the structure of the Kyoto Protocol, all legal entity international trading will be mirrored by exchanges between parties (governments) of assigned amount. What is discussed in this section is whether government only trades should be permitted in sectors where the EU has established legal entity trading.

¹⁴ The climate levy to be established in the UK for major industrial sectors on April 1, 2001 is set at \$40/ton carbon.

their commitments if the marginal costs of doing so exceeded the safety valve level. In the context of the interim program, it may have particular attractiveness, however. With the existence of the safety valve, Member States and emissions sources would be less wary of agreeing to a particular cap and allocation, because they would have certainty regarding how much compliance could cost on a worst case basis. Since the pre-2008 program does not need to be tied to the BSA targets per se, this approach also provides considerable flexibility for the Community to link this program to the efforts that Member States already have underway on a unilateral basis. Thus, this program can be designed to be compatible with the Danish and British programs in terms of allocation.

F. Conclusions

Much of the argument in this section has centred on seeking to avoid adverse effects on fair competition through implementation of a somewhat centralised trading system for selected industrial sectors. One can argue that claims regarding the magnitude of the potential dangers of Member States using the allocation process either to advantage individual firms within the trading system or to advantage others outside the system through exemptions from climate regulation may be somewhat overblown. After all, any action by a Member State to favour one industry or company must be offset by more stringent regulation of another company or sector. In effect, meeting a State's BSA target is a zero-sum proposition, so subsidising one sector means punishing another and likely leads to a net economic loss for the State in question. While from a substantive standpoint, the zero-sum game argument is quite valid, the fact is that there are a myriad of examples of countries around the world trying to advantage their companies and industries through subsidies, lax regulation, trade barriers and the like. In effect, policymakers in these countries are ignoring the fact that subsidisation of one industry probably hurts the overall economic competitiveness of the nation. The creation of the WTO is clear evidence of the global consensus on this problem.

On one level then for this analysis the question becomes – how important are the Community's fair competition rules in the context of implementation of the Kyoto Protocol? Do the threats to competition justify giving the Community a major role in trading and allocation decisions? The Community has “looked the other way” previously in situations where effects on competition have been pitted against individual Member State policy goals such as the continuing exemption from state aid for German subsidies to its coal industry. These are difficult questions to answer hypothetically, given how little certainty we have about the true costs of compliance with the BSA.

Thus, the issue basically boils down to a critical policy call by the Member States. A strong case has been made for the economic benefits (e.g. efficiency gains, cost savings, incentives for innovation, resource efficiency and enhanced international competitiveness) to the Community and the greater probability of achieving the Community's emission reduction goals that will flow from the creation of a mandatory trading program with specified aggregate limits on the number of allowances available for distribution to emissions sources. It is certainly possible to leave these decisions to Member States without creating a non-functional trading system. It is

even foreseeable that a trading program without any Community involvement could develop, with Member States developing autonomous trading programs, as Denmark and the UK are doing, and linking these together in some useful fashion. Some of the economic benefits certainly will flow from a Member State-driven trading system. The issue is really whether or not Member States recognise the greater opportunities and advantages that would accompany a more centralised system and are willing to put aside some of their prerogatives to enjoy these.

The strawman proposal keeps Member States in charge of distributing allowances to emissions sources within their borders. This gives States the ability to balance equity concerns, to tailor the final design of the trading system in such a way that the impact on vulnerable companies, communities, and individuals can be mitigated at least in part. Of the downstream allocation options considered here, the strawman appears to offer the best balance of efficiency gains and opportunity to deal with equity concerns.¹⁵

Establishment of the EU and Member State aggregate trading caps will require further negotiation, which could be modelled after the successful process that produced the landmark burden sharing agreement. Reliance on a combined bottom-up and top-down assessment process seems most promising. Asking Member States to propose their own caps on trading sectors and then comparing these to a top-down assessment based on benchmarks would establish a quantitative basis from which the negotiations can proceed.

V. Sectors to Include in Trading

A. Overview and Criteria for Evaluation

A key issue in the design of a downstream cap-and-trade system is of course which sectors and sources to include. In making this decision, a number of criteria need to be considered, including:

- *Environmental effectiveness:* It is desirable to include as many sources as possible in the trading system, because cap-and-trade programs impose an absolute emissions limit and therefore offer greater certainty of desired environmental outcome than non-trading policies and measures.
- *Economic efficiency:* In general, capturing more sources and a higher percentage of total emissions in the trading system will reduce the overall cost of CO₂ control. This is especially true when the marginal costs of mitigation differ widely among sources and industries.
- *Effects on competition:* Ideally, the system will be designed so that competing firms and industries face the same marginal cost of carbon control, so that GHG

¹⁵ As we noted at the outset of this paper, the study team believes that an upstream trading system coupled with an allowance auction offers an even greater stream of economic benefits, an increased likelihood of compliance with emission reduction goals, and a superior balance of efficiency and equity. See our final report for details.

controls do not distort competition. This may be achieved by designing the overall GHG control strategy so that firms and industries in competition with one another are either both included in or excluded from trading (if they are excluded, they should be subject to the same non-trading PAMs.)

- *Administrative burden:* The system should be designed so that the cost to government of administering the program is manageable. Government tasks include maintenance of a registry, verification of emissions reports, distribution of allowances, technical assistance and enforcing penalties for non-compliance. While there is no clear threshold number of sources where a program becomes unmanageable, in general the administrative costs to government will be minimised if the number of regulated sources also is minimised. Of course, the monitoring and reporting burden placed on emissions sources also should be manageable.
- *Relationship to PAMs:* One consideration that has both environmental and economic implications is the relationship of the trading system to non-trading PAMs. From a strictly environmental perspective, the trading system need not cover sectors already regulated through strict PAMs. A survey of existing PAMs shows, however, that for the most part heavy industry is not subject to stringent carbon regulation in Europe.

From an economic perspective, the relationship between trading and PAMs is important because PAMs reduce the efficiency of trading by forcing reductions in particular sectors. Note, though, that the overlay of trading on existing PAMs such as efficiency standards could improve the economic efficiency of PAMs by giving regulated sectors an incentive to make reductions beyond those required by the PAMs. Note also that some PAMs will improve the efficiency of the trading system by addressing market failures. The relationship between trading and existing PAMs is discussed further in section VIII.

Obvious tradeoffs exist among the criteria outlined above, in particular between the desire for broad coverage of sources and the desire to minimise administrative costs. Overall, one goal of program design should be to include a relatively small number of economic sectors and emissions sources that contribute significantly to total emissions. While including as many sources as possible is advantageous, to avoid introducing competitive distortions it is desirable to exclude industries that are made up of both small and large facilities unless the small facilities are so small in number that they may easily be included. While broad coverage is desirable, it is important, especially at the beginning of the programme, that the trading system not be vulnerable to charges that it distorts fair competition.

Potential distortions are not of great concern if the non-trading PAMs imposed on small sources are stringent and the small sources have the option either to join the trading system or pay a carbon tax equal to the price of allowances in lieu of complying with the PAMs. This idea is discussed further in section VIII.

B. A Look at the Data

Table 1 provides an overview of 1997 CO₂ emissions in the EU15. The table shows that thermal power stations are the biggest contributor to total EU CO₂ emissions, accounting for nearly 30 percent of EU CO₂ emissions. The power sector is followed by the transport sector (27.5 percent) and the household and other sector (21 percent.) Industrial emissions account for nearly 17 percent of emissions.

In trying to define which sectors and sources should be included in the trading system, we take it as a starting point that it would not be feasible to include the transport sector, households and other small sources in a downstream system. This assumption is consistent with that made in the first phase of work and is one of the reasons that we recommended a comprehensive upstream system in the earlier scoping paper.¹⁶ Here we concentrate our attention on the power sector, and energy other heavy industry.

Table 1: 1997 Total Inland Emissions of energy-related CO₂ in the EU15 (million tonnes)

Sector	1997 MtCO ₂	% of Total
Electricity and Heat Production	913,5	29,9%
• Thermal power stations	896,9	29,3%
• District Heating Plants	16,6	0,5%
Energy branch	146,8 ¹⁷	4,8%
Industry	514,4	16,8%
• Iron and Steel	166,0	5,4%
• Non-ferrous metals	13,2	0,4%
• Chemicals	75,6	2,5%
• Glass, pottery and building materials	81,3	2,7%
• Ore extraction	4,3	0,1%
• Food, drink and tobacco	42,5	1,4%
• Textile, leather and clothing	13,2	0,4%
• Paper and printing	30,8	1,0%
• Engineering and other metals	33,0	1,1%
• Other	48,1	1,6%
Transport	841,5	27,5%
Households, commerce, public authorities, etc.	642,1	21,0%
• Households	443,2	14,5%
• Agriculture	52,6	1,7%
• Other	146,3	4,8%
Total	3058,4	100,0%

Source: Eurostat

Table 1 shows that among heavy industries, the sectors that deserve greatest consideration are iron and steel (5.4 percent of total CO₂ emissions), energy (4.8 percent), glass, pottery and building materials (2.7 percent, probably due mainly to the cement industry), chemicals (2.5 percent), and food, drink and tobacco (1.4 percent.) The paper and printing industry accounts for 1.0 percent of total EU15 CO₂ emissions.¹⁸ Nearly three-fourths of energy branch emissions – and 3.6 percent of

¹⁶ See *Identifying the Proper Incidence of Regulation in a European Union Greenhouse Gas Emissions Allowance Trading System*, July 1999.

¹⁷ Of which 109.0 million tonnes come from refineries (3.6%.)

¹⁸ Unfortunately, more disaggregated data are not available through either the European Environment Agency (CORINAIR) or Eurostat. For instance, it is not possible to distinguish emissions from

total emissions – come from refining. In examining these data, it is important to keep in mind that emissions from electricity consumed by industry is accounted for in the power sector. Likewise, to avoid double-counting, industries other than power would be required to turn in allowances for on-site emissions but not those associated with purchased electricity, as the latter would be accounted for at the power generating station.

Large Combustion Plant Directive

In considering which of these sectors to include in trading, a fundamental question is whether an already-defined population of regulated emitters could be taken as the trading system population. A first place to look in answering this question is the Large Combustion Plant Directive (LCPD) since it has already been used to define a population of emissions sources (European Council 1988).¹⁹ The LCPD requires Member States to “draw up programmes for the progressive reduction of total annual emissions” of sulphur dioxide, nitrogen oxides and dust and lays down “emissions ceilings and corresponding emissions reductions for SO₂ and NO_x.” The LCPD applies to “combustion plants with a rated thermal input equal to or greater than 50 MW.” The Commission has recently put forward a new proposal to amend the Directive; this proposal would update the “emission limit values” applicable to new combustion plants and would broaden the scope of the Directive to include some gas turbines (European Commission 1999a).

Use of the LCPD to define the trading system population would mean that the system would include sources from across a variety of sectors, because the LCPD defines its regulated population primarily according to thermal capacity without regard to industrial sector. The obvious advantage of using this approach for trading is that the system would cover all large emitters regardless of industry. The drawback is that competitive distortions could be introduced in industries composed of both large and small sources. This issue is discussed further below.

Which sectors and sources would be included in trading if the LCPD were used to define the trading system? It is hard to say exactly, because definitive data on which sources are regulated under the LCPD are not available. There are no large point source (LPS) reporting requirements under European law, and only a handful of countries require reporting by large sources.²⁰ A 1996 report by Radunsky and Ritter gives us some sense of which sources might be included, however. This report, which was based on 1990 CORINAIR reporting, discusses 1990 emissions from large point sources (Radunsky and Ritter 1996). Data on large point sources were not collected in systematic fashion for CORINAIR94.²¹

The Radunsky and Ritter report shows that in 1990 in the 29 European countries that reported, large point sources accounted for 1,728 million tonnes of carbon dioxide, or

inorganic chemical production from emissions from organic chemical production, or to separate paper pulping emissions from other paper and printing emissions.

¹⁹ We are not implying here that the establishment of the trading system should be accomplished through an amendment to the LCPD, instead simply that the sources covered under the LCPD may be the appropriate group of sources to include in trading. The issue of establishing the trading system via amendment to existing policies is considered further in section VI below.

²⁰ Personal communication with Andre Jol, European Environment Agency, November 4, 1999.

²¹ Personal communication with Andre Jol, EEA, November 4 1999.

36 percent of total carbon dioxide emissions. The number of large point sources in the EU15 totalled 1,662. A minimum definition of “large point source” was established; it included the following:

- Power plants with a thermal capacity greater than 300 MW;
- All refineries, sulphuric acid production plants and nitric acid production plants;
- Iron and steel plants producing greater than three million tonnes per year;
- Paper pulp production plants producing greater than one million tonnes per year; and
- Other facilities, including certain vehicle painting units, large airports and any other activity creating more than 1,000 tonnes of SO₂, NO_x or NMVOCs or more than three million tonnes of CO₂ per year.

This definition was extended by most Member States to conform with the LCPD (i.e., to include point sources with thermal capacity of greater than 50 MW.)

The report shows that 67 percent of CO₂ emissions from large point sources came from power plants, while industrial combustion plants greater than 300 MW (sectors undefined), refineries and inorganic chemical plants accounted in aggregate for only 14 percent (see Table 2). For the entire 29 country region, there were 478 power plants with capacity of greater than 300 MW thermal, 212 industrial combustion plants greater than 300 MW thermal, 219 refineries and 184 chemical plants. In addition, the report shows that in the 29 reporting countries, there were 104 power plants and 399 industrial combustion plants with thermal capacity between 50 and 300 MW.

Table 2: Large Point Source CO₂ Emissions in Europe in 1990 (29 countries)

<u>Source Sector</u>	1990 CO ₂ (kilotonnes)	% of total LPS
Public Power Plants > 300 MW _{th}	1,160,276	67
Industrial Combustion Plants > 300 MW _{th}	178,877	10
Refineries	58,322	3
Inorganic Chemical Industries	9,726	1
Other	320,862	19
Total Large Point Source Emissions	1,728,063	100

Source: *CORINAIR 1990 Summary Report 3: Large Point Sources.*

C. Analysis of the Data

Clearly, from the standpoint of coverage, which affects both environmental effectiveness and economic efficiency, including in the trading system all sources covered under the LCPD is desirable. The data above suggest that doing so also would be administratively feasible, in that the number of sources is small and estimation of emissions should be straightforward. Defining the system in this way would mean that the system would include all power plants greater than 50 MW thermal, all refineries, all sulphuric acid production plants, all nitric acid production

plants and other industrial combustion plants greater than 50 MW from a variety of industries.

Potential Economic Distortions

As noted, the issue that arises in defining the cap-and-trade system's regulated population in this way is economic distortion. Including only large point sources in trading would mean that small and large sources within a given industry would face different GHG control policies and thus different regulatory costs, introducing the possibility that small sources could gain a competitive advantage over large sources, unless strict PAMs were introduced for the latter. Further, defining the trading system population based on thermal capacity would introduce an incentive for companies to build new plants below the threshold size to avoid inclusion in the cap-and-trade system.

These issues could be significant in some industries but not in others. In the iron and steel, refining, sulphuric acid production, nitric acid production and paper pulping sectors, they are not significant because virtually all plants are large point sources and are expected to be for the foreseeable future.²² Further, the possibility of distortions and perverse incentives is also low for the cement industry because the number of cement plants in Europe is small, meaning that all plants could easily be included in the trading system. Including all of these sectors in trading therefore is desirable.

In the power sector, the issue is more difficult. CORINAIR 1990 figures show that in the sector, nearly all emissions of SO₂ and CO₂ came from power plants of greater than 300 MW_{th}, suggesting that the potential for distortions and perverse incentives is small (Grosslinger, Radunsky, and Ritter 1996). Smaller sources such as gas turbines and distributed generation options are increasingly competitive, however, meaning that the potential for problems could become significant.²³

If small sources are expected to play a significant role in future European electricity markets, then either the LCPD population of regulated sources would have to be amended for the purposes of GHG trading to include combustion plants less than 50 MW and gas turbines, or PAMs that imposed a regulatory burden equivalent to that of

²² Data on CO₂ emissions by industry by plant size were not available for Europe, either for CORINAIR or Eurostat. US data from the Manufacturing Energy Consumption Survey shows, however, that economic sub-sectors containing large establishments (defined as 4-digit SIC codes using greater than 100 TBtu per year and containing less than 650 establishments) accounted for a very high percentage of total emissions in the refining, chemicals, primary metals and paper industries but very low percentages (35 percent or less) in the food and kindred and stone/glass industries. These conclusions are presented in Festa, David, *US Carbon Emissions Trading: Some Options that Include Downstream Sources*, Center for Clean Air Policy, Washington, DC, 1998.

This finding that certain industries were composed almost exclusively of large plants while other industries contained a mix of small and large facilities was corroborated by the expert opinion of Crawford Honeycutt, industrial emissions specialist at the US Department of Energy's Energy Information Administration, November 9 1999. Mr. Honeycutt also stated that there while regional variations exist, there is little difference between industrial structure in the US and that in Europe for the industries in question.

²³ District heating facilities must also be considered in system design because they compete with power generators. Eurostat data show, however, that these facilities account for only 0.5 percent of total European CO₂ emissions (again see Table 1); further, district heating plants are in use in only five EU15 nations (Austria, Denmark, Finland, Germany and Sweden.) Eurostat, *Carbon Dioxide Emissions from Fossil Fuels, 1985 – 1996*.

trading would have to be put in place. If it is thought that the number of small sources could grow to be very large (for example, if auto-production becomes economically feasible at small commercial establishments), then the latter option (strict PAMs) would be preferred. One way to ensure equivalency between trading and PAMs is to impose tough measures on non-traders (e.g., a high carbon tax) and then allow firms to opt out of the measure and into trading. This idea is discussed further in section VIII.

Distortions may also arise in other energy-intensive industries. CORINAIR90 data show that SO₂ and CO₂ emissions from industrial combustion in boilers, gas turbines and stationary engines are quite evenly split between facilities of less than 50 MW thermal capacity and those greater than 50 MW. In particular, the food, drink and tobacco sector includes many small producers. Thus including this sector in trading might be administratively difficult and lead to economic distortions.²⁴

D. Conclusions

Both environmental and economic considerations argue for the inclusion of as many sectors and sources as possible in a downstream trading system. Balanced against these considerations are the desire to avoid introducing economic distortions into the economy and the administrative imperative to limit the trading system to a manageable number of sources. In particular, the distribution of allowances to emissions sources would be made more complicated by the inclusion of many small facilities, especially if allowances were distributed through grandfathering.

The data show that first and foremost, the power sector must be included in the trading system, and that including all plants with thermal capacity of greater than 50 MW is feasible. Not including generators smaller than 50 MW could provide a competitive advantage to small generators, which would be an environmental problem if these were, for example, diesel generators. This problem could be remedied, however, by including small sources in the regulated population (as is now proposed for some gas turbines under the LCPD) or by applying a carbon tax or other non-trading measure.

In addition to the power sector, iron and steel plants, refineries, inorganic chemical (sulphuric acid and nitric acid) plants, cement plants and paper pulping plants should be included in the trading system because they are significant emissions sources but at the same time are large and relatively few in number. Including these sectors is especially important because of the dearth of PAMs covering these sectors. A downstream trading system that included these sectors as well as power generators would cover nearly 45 percent of European CO₂ emissions. From a political standpoint, including these sectors would be seen as fair in that it appears that, with the exception of paper pulping, the sectors account for a significant portion of emissions in nearly all countries.²⁵

²⁴ Again, data on the split between large and small sources for the food, drink and tobacco sector are not available for Europe; however, US data show that in the food and kindred industry sub-sectors made up of large establishments accounted for only 23 percent of total sectoral emissions. Festa, *US Carbon Emissions Trading: Some Options that Include Downstream Sources*.

²⁵ Eurostat, *Carbon Dioxide Emissions from Fossil Fuels, 1985 – 1996*. We have defined a sector to be significant if it accounts for greater than one percent of a country's total CO₂ emissions. The only

Including large plants from sectors other than these (for example, the food industry) would be desirable from an environmental perspective but might result in economic distortions because of the mix of large and small plants in the industry. Whether or not including large plants but not small ones in trading would actually result in distorted competition would depend in part on the PAMs that were used to address emissions from non-trading plants. The optimal solution would be to include large sources in trading and to cover small sources with an equivalent carbon tax; if however, PAMs for small sources are unlikely, then it is probably best to exclude the sectors from trading, because including them would lead to distortions between small and large producers. We note, however, that the LCPD and the more expansive Integrated Pollution Prevention and Control Directive (IPPC, described further in Sections VI and VIII), because they define the regulated population by and large according to thermal capacity, already must cause such distortions. The Community and its States apparently have concluded that the distortions are either insubstantial or politically acceptable. If this is also the case for CO₂ regulation, then it would make sense to use the LCPD to define the trading system population. The list of proposed sectors to include in trading is provided in Table 3.

If policy-makers decide that a more gradual approach than that recommended here is required (i.e., that not all of the sectors listed in Table 3 should be included in the initial trading system), then we recommend that the system start with at least the power sector. Which sectors are included in addition to power should be determined based on the relative contributions of each sector to total emissions, the energy intensity of different industries, because energy-intensive industries will have more to gain from trading, and the strength of any PAMs that are expected to be put in place in each sector.

Table 3: Industry Sectors to Include in a Downstream Trading System

Sector	Percentage of EU15 CO ₂ Emissions ²⁶
Electricity and heat production	29.9%
Iron and Steel	5.4%
Refining	3.6%
Chemicals	2.5%
Glass, pottery and building materials (including cement)	2.7%
Paper and printing (including paper pulping)	1.0%
Total	45.1%

Source: Eurostat.

exceptions are as follows: The chemical industry (organic and inorganic) accounts for less than one percent of total CO₂ emissions in Denmark, Greece, Finland and Sweden; and the steel industry accounts for less than one percent of emissions in Greece.

²⁶ The numbers included in this table represent the contribution to emissions of the broader sectors (thermal power plants, chemicals, glass, pottery and building materials, and paper and printing) that include the sectors of interest. As such they over-state the total contribution of the sources that would actually be included in trading.

VI. Monitoring, Reporting and Verification

Critical to the success of the trading system will be the development of institutions and procedures for the *measurement* (or monitoring) of emissions, *reporting* of emissions and *verification* by regulatory authorities of reported emissions. These components of the trading system were previously discussed in Scoping Paper 8: *Compliance-related Aspects of Greenhouse Gas Emissions Trading in the EU*. A system for trading allowances also will be necessary and is discussed here.

Two types of monitoring, reporting and verification will be necessary: the emissions source level and the Member State level.

A. Monitoring, Reporting and Verification at the Source Level

The monitoring, verification and enforcement of entity trading in principle will be done by the individual Member States, using their existing structures. To avoid cheating and the devaluation of allowances of particular countries (in the event there is buyer liability), minimum standards will be needed regarding the rules and procedures for monitoring, reporting and verification. We believe that this would require a further degree of harmonisation of these issues than is currently the case in European Community environmental law (again see Scoping Paper 8.)

1. Rules on monitoring and measurement

Standardised methods should be developed for the monitoring and measurement of greenhouse gas emissions at the source. In general, monitoring of emissions will mean *calculation* based on fuel use data and emissions factors rather than direct *measurement*, though the latter could be used. It is important that the monitoring system specify one approach or the other, because the two approaches can lead to different numbers, which would provide emissions sources with an opportunity to game the system in search of the best result. We prefer calculation to measurement, because the cost of direct measurement will be prohibitive for smaller sources and because problems currently exist with the quality of direct measurements of CO₂.²⁷ Therefore Community rules for emissions monitoring should elaborate the practices to be used by emissions sources to calculate fuel use as well as the methods to be employed by Member States to develop emissions factors for the different fuel types.

One possible vehicle for developing standardised methods for the monitoring and measurement of greenhouse gas emissions is the IPPC Directive (Council Directive 96/61/EC), which obliges specified industrial activities to obtain permits that include emission limit values (ELVs), or equivalent parameters or technical measures, based on best available technique (BAT), for a variety of different substances. The IPPC is described in greater detail in Section VIII.

This Directive already requires the Member States to include in the permits “suitable release monitoring requirements, specifying measurement methodology and frequency, evaluation procedure and an obligation to supply the competent authority with the data required for checking compliance with the permit” (Article 9(5)). The

²⁷ Per Brian McLean, Acid Rain Division, US Environmental Protection Agency.

national authorities then have to supply data on these requirements to the Commission (Article 15(3)). The same provision also allows the Commission to propose measures to ensure the inter-comparability and complementarity among the data. Although greenhouse gases are not explicitly included in the gases to be monitored under the IPPC Directive, it is worth investigation whether or not the latter could be used as a basis for elaborating basic monitoring and measurement guidelines for the emissions trading regime.

Another alternative would be to elaborate minimum monitoring requirements through the Large Combustion Plant Directive, already described in Section V. As noted, while the population of regulated sources under the LCPD conforms more closely to the proposed contours of the trading system, the LCPD applies to some facilities that are unlikely to be included in trading (e.g., small food processing plants.) Thus use of the LCPD to establish monitoring requirements will mean the imposition of some monitoring requirements that are not strictly necessary for the functioning of the trading system.

If the IPPC and LCPD are found not to be a suitable basis for the establishment of the monitoring regime at entity level, the monitoring guidelines would have to be included in separate legislation. In any case, these policies represent useful precedents for establishing greenhouse gas monitoring requirements.

2. Rules on Reporting

In a downstream system, it is desirable that all covered emissions sources present their calculation of emissions, including fuel combusted as well as emissions factors. The system should allow for sources to depart from pre-determined emissions factors as long as they are able to present relevant supporting documentation. As noted in the earlier scoping paper, monthly reporting may be sensible because it would conform to corporate financial accounting norms; in addition, reporting of this frequency would enable the regulatory agency to more closely follow emissions trends and to improve the accuracy of emissions reports. In the US the Energy Information Administration notes major changes in energy use from one month to the next and then notifies the reporting entity of the discrepancies. If the change is due to a reporting error then it is corrected.

In cases where emissions are measured directly, then emissions data could be regularly transmitted directly to national authorities, making emissions calculations unnecessary. This is the approach used under the US Acid Rain programme, where reporting occurs electronically on an hourly basis.

European Pollutant Emissions Register

One place where trading system reporting requirements might be established is the European Pollutant Emissions Register (EPER), which is being proposed by the Commission pursuant to the IPPC. Its main purposes are to collect comparable emissions data from emissions sources and then disseminate this information to the public. EPER would apply to all facilities covered under the IPPC and would require reporting by facilities for air and water emissions of 50 different pollutants, including all the greenhouse gases covered under the Kyoto Protocol, SO_x, NO_x, other ozone precursors and heavy metals (European Commission 1999b.)

The current Commission proposal sets minimum reporting threshold values so that small sources are not required to report. The currently proposed thresholds are set such that at least 90 percent of total industrial emissions in Europe would be required to report. Under the proposal, facilities would report annually to Member States, which would then report both facility-specific and aggregate data to the Commission. The proposal calls for Member States to establish reporting requirements for all facilities and also states that the Commission will develop a reporting Guidance Document. In addition, facilities would be required to state whether their emissions were measured, calculated based on accepted methodologies and emissions factors, or estimated based on best assumptions or expert opinion (European Commission 1999b.)

A vote on EPER is due in early 2000, and it is expected that reporting will begin in 2003 for 2001 emissions (European Commission 1999b.) Given that the EPER will require reporting from all of the sources that we recommend should be included in the trading system and requires facilities to disclose information on their methodologies, it appears to be a useful vehicle for implementing trading system reporting. This is especially true given that most EC requirements on reporting concern the reporting by Member States to the Commission and normally do not regulate reporting by emission sources to national authorities.²⁸

Although annual facility-level reporting is less than ideal, it also is not a major problem. One modification to the EPER that would be useful would be a requirement that sources included in the trading system have to apply either accepted calculation methodologies. Even better would be to require the use of specific calculation methodologies. Such a requirement should be complemented by an appeal procedure which allows sources to use other methods if they can show that they are more accurate.

3. Rules on verification

Current EC environmental legislation in almost all instances leaves verification to Member State authorities. EC law thus usually does not contain specific requirements on the verification frequency or methods. Article 14 of the IPPC Directive for instance states only that Member States have to take the necessary measures to ensure that “operators of installations afford the representatives of the competent authority all necessary assistance to enable them to carry out any inspections within the installation, to take samples and to gather any information necessary for the performance of their duties.”

This approach has been subject to much criticism. Differences in verification efforts between Member States are increasingly seen as distorting the internal market and reducing the effectiveness of EC environmental legislation. In response to these concerns the Commission adopted on 12 December 1998 the Proposal for a Council Recommendation providing for minimum criteria for environmental inspections in the

²⁸ For instance, Article 14 of the IPPC Directive requires Member States to establish that “the operator regularly informs the competent authority of the results of the monitoring of releases and without delay of any incident or accident significantly affecting the environment”. The IPPC Directive does not contain any requirements on the frequency or scope of the reporting, however.

Member States (COM(98)772). The proposal is still in a very early stage of the decision making procedure, and it is unclear whether it will be adopted and, if so, in what form. The European Parliament has for instance indicated that it would like to see it adopted in the form of a binding Directive rather than a non-binding Recommendation.

The current proposal aims at harmonising the following elements:

- the requirement to elaborate plans for environmental inspections (including the identification of the specific sites or types of installations covered as well as the frequency of visits for different types of sites);
- criteria for site visits (including the right for officials to have access to sites and information and circumstances in which non-routine site visits are to be carried out);
- the requirement to draw up a report after every visit;
- investigations of serious accidents, incidents and occurrences of non-compliance; and
- the provision of general information on a Member State's inspection activities.

It is not clear that this proposal could serve as the basis for a verification regime for the emissions trading system. Regardless of whether it can be or instead separate legislation is needed, we recommend that Member States be required to use appropriate and well-established sampling techniques to select a representative sample of sources covered in the trading system. We also suggest that national authorities be permitted to review the information that underlies the fuel use data and emissions factors reported by emitters. Relevant records would include fuel purchase receipts and records from fuel flow meters. Finally, we recommend that any directive or regulation related to verification under the GHG trading system allow national authorities to employ competent private sector auditors and other third parties in the verification process. Using private auditors would require the Commission to establish verification protocols (or to adapt them from the UNFCCC process), but it also would vastly expand the pool of auditors and allow for much more thorough examination of emissions reports.²⁹

²⁹ The verification techniques described here form part of what is referred to in Article 5 of the Kyoto Protocol as the "national system." Article 5 requires all Annex I Parties to develop "national systems" for the estimation of GHG emissions and removals. Essentially what we are advocating here is that the EC legislation on GHG verification allow for a partial review of Member State compliance with KP Article 5. The link to Article 5 need not be made explicit but it could be. This is true even if the trading system is established prior to 2008, since national systems guidelines should be finalised by COP-6 in 2000 or shortly thereafter.

B. Monitoring, Reporting and Verification at the Member State Level

The main Community instrument for the monitoring of greenhouse gas emissions by the Member States is the Monitoring Mechanism (recently amended by Council Decision of 26 April 1999 amending Decision 93/389/EEC for a monitoring mechanism of Community CO₂ and other greenhouse gas emissions). The Monitoring Mechanism contains a number of elements that may be important for the operation of the emissions trading regime.

- *National programmes:* Member States have to devise, publish and implement national programmes for the limitation or reduction of greenhouse gas emissions. These programmes need to contain estimates of the effects of policies and measures, details on the base year emissions, inventories of anthropogenic emissions and removal by sinks, details of national policies and measures and estimates of the effect of policies and measures.
- *Annual reports:* Member States have to report annually on their emissions of greenhouse gases and removal by sinks, in the case of CO₂ by 31 December for the previous calendar year, and for the other gases for the previous year but one.
- *Annual evaluation of progress:* The Commission is to evaluate annually the progress of Member States.

The reporting under the Monitoring Mechanism is based on the Intergovernmental Panel on Climate Change (IPCC) reporting guidelines. Currently the IPCC is developing GHG emissions inventory *best practices* which cover a wide range of topics related to inventory quality, including the use of proper methodologies, data collection procedures, verification techniques and quality assurance/quality control practices. The IPCC best practices are likely to be adopted at least in part by the Parties to the Kyoto Protocol, pursuant to the “national systems” provisions of KP Article 5 (mentioned above.)

It would make sense that the EU require Member States to adopt and report on these practices under the Monitoring Mechanism. Early adoption by the EU of best practices could strengthen the EU’s performance on climate change and would push the development of the Protocol in the right direction.

VII. Addressing Non-compliance

As with monitoring, reporting and verification, the discussion of how to address non-compliance must be broken into two parts: enforcement by Member States against emissions sources and enforcement by the Community against Member States.

A. Ensuring Compliance by Emissions Sources

1. Measures Taken During the Commitment Period

Tools for addressing non-compliance can be divided into preventive measures that are taken prior to the end of the commitment period to address non-compliance before it has actually occurred and end-of-period sanctions that act as a deterrent to non-compliance and address it once it has occurred.

Regarding the former (preventive measures), we recommend that two tools be used. First, all emissions sources covered in the trading programme should be in compliance with the monitoring and reporting requirements in effect in their respective countries. Sources not meeting these requirements should be barred from selling, which would either eliminate the possibility of their earning profits from selling allowances or increase the cost of compliance by eliminating the option of buying. Alternatively, strict financial penalties could be levied in response to non-compliance with monitoring and reporting requirements. Ideally the sanctions for non-compliance with these requirements would be laid out in a general way in any Directives on monitoring and reporting that are enacted (see again Section VI) as well as specified in Member States' enabling legislation.

Second, we recommend is the annual surrender of allowances to cover the year's emissions. This measure would require each emissions source, at the end of each year, to submit a list of the allowances it had retired to cover its emissions during the year. (Alternatively, it could surrender allowances to the Member State government, which would then retire them.) This measure would ensure that sources were not selling allowances that they had in effect already spent and would provide the market with current information on the availability of specific allowances. It also would lead to early trading and price discovery, because some sources might need to buy at the end of each year rather than waiting until the end of the commitment period.

2. End of Period Sanctions

Member States will need to impose sanctions on regulated facilities that at the end of the commitment period do not surrender allowances to cover all of their emissions. The main purpose of sanctions is not to punish so much as to provide a strong deterrent to non-compliance. A variety of sanctions options exist, including financial penalties, requirements to make up emissions exceedances – perhaps with “interest,” and tighter emissions limits in future commitment periods.

As noted in Scoping Paper 8, we believe that sanctions should include strong, automatic financial penalties that far exceed the price of allowances. Such penalties are fundamental to ensuring that the trading programme is an environmental success. The US sulphur dioxide cap-and-trade programme provides an example of this: In that programme, the penalty for non-compliance now is approximately \$2,500 per ton of exceedance, while the price of allowances in the market is now about \$200. In addition, under the US SO₂ programme facilities in non-compliance are required to purchase allowances to cover their overages. The cost of non-compliance is much greater than the cost of purchasing allowances to come into compliance, which is why thus far there have been no instances of non-compliance.

Another benefit of strong penalties is that it will lead to more robust trading. This occurs for two reasons. First, the threat of strong, credible penalties will mean that the programme is taken more seriously by emissions sources, which then are more inclined to trade because trading is a means of facilitating compliance. Second, the imposition of strong penalties obviates the need for buyer liability. Under buyer liability, buyers of allowances would have to return some or all of the allowances they purchased if the seller or other prior holder of the allowances was out of compliance at the end of the commitment period. While this would provide some environmental benefit in the absence of strong penalties, it also would greatly increase the transaction costs associated with trading and reduce the gains from trading. By providing certainty that environmental goals will be met, strong penalties render buyer liability unnecessary.

In European Community Environmental Law no precedents exist for the harmonisation of penalties for infringement of Community environmental law. Recent Community Directives are restricted to requiring that Member State sanctions for violations of (national legislation implementing) Community legislation need to be “effective, proportionate and dissuasive”. This formulation was first used by the European Court of Justice (see for instance Case 68/88 of 21 September 1989, *Commission v. Greece*) and is now generally used in much recent legislation such as the VOC Directive (Council Directive 1999/13/EC of 11 March 1999 on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain activities and installations.) There is, however, an increasing interest at Community level in the issue of sanctions. For instance, IMPEL (the European Union Network for the Implementation and Enforcement of Environmental Law) is currently studying national sanctions for breaches of Community environmental legislation, with a view to assessing the necessity for Community guidelines on sanctions.

Sanctions are a very sensitive issue. Member States very much feel that the determination and application of sanctions falls within their national sovereignty, and that the subsidiarity principle precludes Community involvement in this. At the same time, companies involved in trading have a great interest in ensuring the credibility of the system and thus may prefer strong penalties. No entity will want to take steps to comply with its commitments if it feels that competing firms will not take similar steps, and as noted above, strict penalties eliminate the need for a complicated buyer liability system.

We recommend a Directive that establishes minimum penalties that States must impose on emissions sources. The minimum penalty level would greatly exceed the expected cost of allowances.

B. Enforcement/Penalties for Member States

1. Measures Taken During the Commitment Period

As in the case of measures taken to prevent non-compliance by emissions sources, we believe that an effective measure for preventing non-compliance by Member States would be the imposition of strict monitoring and reporting requirements. In the context of the Kyoto Protocol, this means that States would have to be in compliance with Article 5, which requires Parties to the Protocol to establish national systems for preparing emissions inventories, and Article 7, which requires Parties to report (among other things) information needed to assess compliance with emissions commitments made under Article 3 of the Protocol. We suggest that the EC use the Monitoring Mechanism to ensure that all States are meeting the requirements of Articles 5 and 7. States that do not meet these requirements should be barred from trading or subject to financial penalties.

Annual surrender of allowances would be an effective measure for encouraging States' compliance as well as that of individual emissions sources. To effect annual surrender States would simply compile a list of all the allowances that had been retired by its sources covered under the trading programme; in addition, in the post-2008 period they also would retire allowances each year for emissions from sources not included in trading. For the latter component, annual surrender would be based on year-end provisional estimates of emissions since final inventories would not be immediately available. Once final inventory figures were available (perhaps in the subsequent year-end report), then the number of allowances surrendered would be adjusted.

2. End of Period Sanctions

Current enforcement of compliance with Community law can be divided into two categories. The first category is that of the enforcement by the Commission while the second track of enforcement of Community law is that by individuals. We focus here on the former.

The Commission has the responsibility for the correct application of community law. The main procedure the Commission uses to check this application is the infringement procedure, laid down in Article 226 of the EC Treaty. If the Commission finds that a Member State violates Community law it may, after an elaborate pre-litigation procedure which allows for a Member State to correct the infringement, bring a Member State before the European Court of Justice (ECJ). If the ECJ finds a violation of Community law it issues a declaratory judgement with which Member States need to comply. If Member States do not comply with this judgement, the Commission may bring the Member States before the Court for a second time, this time on the basis of Article 228. The Maastricht Treaty amended Article 228 in November 1993 to allow for the possibility for the European Commission to request the European Court of justice to impose a lump sum or penalty payment. So far no penalty payment has been imposed upon Member States. Although the Commission is now regularly initiating the procedure for the imposition of fines, the mere threat of being fined has so far in all cases lead to the Member States rectifying the infringement before the actual imposition of the fine.

The procedure under which this fine can be given is, however, not suitable for ensuring compliance with an emissions trading regime. The whole procedure, from the discovery of the violation of Community law to the final imposition of the penalty, may take between four and eight years (The Court takes on average 21 months to decide on the initial infringement procedure and another 21 months for the procedure for the imposition of the penalty, not including the time needed for the pre-litigation).

The infringement procedure (Articles 226-228) does, however, contain a number of elements that could be useful in the design of an emission trading compliance regime:

- “Compliance period”(true-up): if an infringement is discovered, then the Member State is notified. It then has a limited time to restore the infringement.
- The imposition of a penalty if the Member State fails to restore the infringement.

To the extent possible, this procedure should be used as the basis for imposing financial penalties on Member States that have been found at the end of the commitment period to be out of compliance with their commitments under the Burden Sharing Agreement. This enforcement procedure could be linked to the Monitoring Mechanism, which would provide the vehicle for determining non-compliance. As with penalties on emissions sources, it is important that the penalties on Member States be automatic and strict – they should far exceed the potential economic benefits of non-compliance.

Penalties and the Burden Sharing Agreement

Prior to 2008 States would be judged solely in relation to their trading system caps, while in 2008 and beyond they would be judged relative to their Burden Sharing Agreement commitments. Strong penalties are important in both instances but especially important in the latter context and in the context of Article 4 of the Kyoto Protocol, which allows for “joint fulfilment” of Protocol emissions control obligations. By allowing the Member States of the EC to have their compliance assessed jointly, Article 4 implies that a Member State that over-complied would have to give its excess AAUs back to the EC if doing so were necessary for EC compliance. This situation is not mitigated by the BSA, which provides no mechanism for an under-complying Member State to compensate an over-complying State. Thus Article 4 and the BSA together create a perverse incentive for Member States to not comply with their BSA commitments in cases where they think that other States will over-comply.

States will not want to under-comply to such an extent that their under-compliance causes the EC as a whole to miss its commitment because under Article 4 they would then be judged against their individual commitments under the “bubbling” agreement, but they will be tempted to under-comply up to that point. The amount that any one State can under-comply is further limited by the fact that other States will also be tempted to under-comply.³⁰

³⁰ For example, imagine a situation where State A is expected to over-comply by 100 units. In response, State B decides to under-comply by 100 units, knowing that its exceedance will be covered by State A. If State C also under-complies by 100 units, then the EC as a whole will be out of compliance by 100 units and all States will be subject to sanctions. In essence, when trying to game the

This situation becomes even more complicated when we consider the fact that AAUs will be devolved to emissions sources (“legal entities”) through either grandfathering or auctioning. The fact that a Member State that had over-complied might need to return AAUs to the EC at the end of the commitment period suggests that the Member State might in turn have to confiscate AAUs from a legal entity rather than allowing the entity to bank the AAUs for use in a later period.

Strong financial penalties for non-compliance with the BSA will provide a deterrent to deliberate non-compliance by Member States. They would not completely solve the “tragedy of the commons” problem, however, because emissions sources and Member States that might have over-complied will be less likely to do so if they fear that their excess allowances will be confiscated. The gains from trading that would have occurred if no threat of confiscation existed would be lost. This suggests that the imposition of strong penalties should be accompanied by a rule banning confiscation of excess AAUs. Alternatively, the penalties collected from States that are out of compliance could be used to compensate States and companies that have had their excess AAUs confiscated. Ultimately, some mechanism should be added to the BSA to ensure that either 1) allowances will not be confiscated from either States or individual emissions sources or 2) in the event that confiscation is allowed, both individual emissions sources and Member States that over-comply will receive the financial penalties collected from non-compliers as compensation for the excess AAUs that are taken. One sensible approach would be to bar confiscation of AAUs from emissions sources but to allow EC confiscation of a State’s excess AAUs, with the provision that the penalties collected from the under-complying Member State would be paid back to the over-complying State. This would give emissions sources the comfort that AAUs could not be taken from them.

Potential for Double Jeopardy

If the EC as a whole is in compliance with its Kyoto Article 3 commitment but some Member States are out of compliance with their BSA commitments, then those Member States will be subject to EC penalties but not penalties under the Protocol. If, however, the EC is out of compliance under the Protocol, then Member States that have not complied with their BSA targets will be subject to penalties under both EC law and the Protocol. This duplication is unnecessary if penalties are strong under both sets of rules, suggesting that Member States should be given a credit against penalties they owe under EC law for penalties paid under the Protocol. Such a system would be easy to implement if penalties in both cases were financial, but more difficult to implement if penalties under the Protocol were hard to quantify (e.g., loss of the right to trade, trade sanctions.) In this case it might make more sense to waive the EU penalties in lieu of the sanctions under the Protocol.

Buyer Liability under the Kyoto Protocol

One final point should be made about the relationship of the EC trading system to the Protocol. It is possible that a buyer liability regime may exist under Kyoto. This does not, however, suggest that such a regime is needed within the EU. If the EU system included strong financial penalties on both emissions sources and Member States that were in non-compliance as suggested here, then there would be very little risk of non-

system to under-comply but avoid penalties, States will have to consider the actions of all States not just those likely to over-comply. This will limit potential under-compliance.

compliance by either individual sources or States. Buyer liability would be unnecessary and even counter-productive, in that it would reduce the gains from trading.³¹ Buyer liability within the Community might even be barred on the grounds that trading within the EU would be considered a domestic activity under the Kyoto Protocol.

It is possible that Member States (or entities within them) could buy AAUs from a non-EU country that was found at the end of the commitment period to be in non-compliance. In this situation, if a buyer liability regime were implemented internationally, then some portion or all of the AAUs purchased would be invalidated. In practice this would mean that they could not be used for compliance with either Kyoto commitments or for EU trading system purposes. EU Member States therefore would have an incentive to assess the quality of AAUs purchased from outside the EU and would favour EU AAUs (as would everyone else.) Thus buyer liability under the Kyoto Protocol would affect the purchasing choices made by EU15 nations but it in no way means that buyer liability would be necessary within the EU system.

VIII. Integration of a Trading System with Other Policies and Measures

A. Overview

Emissions trading in the EU will need to integrate with a number of other policies and measures which have been developed over time and form the current Community strategy on climate change. The strategy includes Community measures and actions that Member States are taking with the oversight of the Community Monitoring Mechanism. Current measures will tackle:

- energy use via cross-sectoral measures such as the proposal for a Community Directive restructuring the taxation of energy products and Member State carbon and energy taxes;
- emissions from energy transformation via measures to promote energy efficiency, renewables and combined heat and power (CHP);
- energy efficiency in industry, commerce and households;
- transport, landfill and agricultural emissions plus absorption by sinks.

Table 4: Summary of Policies and Measures

	Community Measures	Examples of Member State Measures
Energy use	Proposal for a Council Directive restructuring the Community framework for the taxation of energy products (COM (97)30)	Carbon taxes (Denmark, Finland, Sweden) Energy taxes
Energy Transformation	Goal of 12% contribution of renewables to	Support systems for renewables and

³¹ For a fuller discussion of the costs and benefits of buyer liability, see Hargrave, Tim, Ned Helme, Suzi Kerr and Tim Denne, *Defining Kyoto Protocol Non-Compliance Procedures and Mechanisms*, Center for Clean Air Policy, 1999.

	primary energy supply by 2010. IPPC Directive includes energy efficiency as component of BAT	CHP.
Industrial energy use	IPPC Directive	Energy efficiency information programmes, subsidised audits Energy Efficiency Benchmarking Covenant (Netherlands)
Residential and commercial energy use		Building codes (energy efficiency)
Transport	Negotiated Agreement with ACEA	Planning measures, fuel duty, differentiated vehicle taxes
Landfill emissions	Landfill Directive requires gas collection and recovery or flaring from new landfills.	
Agriculture and forest sinks	CAP reforms Measures being considered in context of Strategy Paper for Reducing Methane Emissions	Planting grants State plantation programmes

Although emissions trading can be introduced for a limited number of sources, through placing a price on emissions, it will have widespread effects in the economy. Existing measures may not be compatible with the introduction of a price instrument. Of particular concern is where trading and PAMs impose a double burden on some sources and a single or no burden on others; this is both inefficient and unfair. However the actual effects will differ depending on whether it imposes additional costs at the margin or on average.

Emissions trading produces least cost emissions reductions by placing the same price on emissions from all sources included. It imposes a cost at the margin as each additional unit of emission requires the surrender of an allowance, and every emission reduction is rewarded through reducing the allowance requirement. Other policies may similarly place a cost on emissions at the margin and this increases the incentive to reduce emissions from that sector, meaning that more is done in one sector and less in another than would occur in the least cost achievement of emission targets.

Many other PAMs do not place a price on emissions at the margin, e.g. measures that encourage or require the introduction of energy efficient or low emission equipment. These may reduce the level of emissions per unit of activity but provide no incentive to reduce activity levels; in fact they may encourage greater levels of activity as the energy costs of use may fall. Although imposing emissions trading on top will impose a second cost burden, it represents an efficiency improvement because it provides incentives for marginal reductions in emissions beyond those achieved by the adoption of the new technology.

In this section firstly we explore the nature of these burdens associated with the other PAMs and practical aspects of compatibility. And secondly we examine ways in which trading might be extended to other sectors through a transition over time from existing PAMs to a trading system.

B. Compatibility of Existing Instruments and Emissions Trading

There are different levels of possible compatibility or incompatibility between existing instruments and trading.

- Instruments will be incompatible where they impose double burdens on emissions from particular sources.
- Instruments might be particularly compatible where there are existing legislative or administrative elements which might be used for emissions trading.

Trading and PAMs might be compatible where PAMs address non-price barriers to emission reduction; in these circumstances trading might be laid on top of a trading system. In addition, measures may be in place to address an activity or source of greenhouse gases but for other objectives; in these circumstances governments may wish to place an allowance requirement on top of the existing regulation. Also individual Member States, or the Community as a whole, may wish to target emission reductions from specific sources rather than to use cost as the sole criterion for selecting the mix of emission reductions.

1. IPPC Directive

As noted in Section VI, under the IPPC Directive particular industrial activities must obtain a permit that includes emission limit values (ELVs), or equivalent parameters or technical measures, based on best available technique (BAT), as a minimum for a variety of substances listed in Annex III of the Directive (see Box 1.) The IPPC Directive does not explicitly cover any of the six GHGs included in the Kyoto Protocol³². The list of substances covered is, however, only 'indicative', requiring the permit to include emission limit values for pollutants 'likely to be emitted from the installation concerned in significant quantities'. Member States may thus include GHG emissions in their implementation of the IPPC Directive, and are even forced to do so if these emissions are 'significant' (although the Directive does not define 'significant').

Box 1: indicative list of substances for which emission limit values need to be included in the IPPC permit

1. Sulphur dioxide and other sulphur compounds
2. Oxides of nitrogen and other nitrogen compounds
3. Carbon monoxide
4. Volatile organic compounds
5. Metals and their compounds

³² While none of the six GHGs in the Kyoto Protocol is explicitly included in the list, methane (CH₄) and nitrous oxide (N₂O) are implicitly included, because the IPPC Annex I list contains organic compounds and oxides of nitrogen, respectively. Nevertheless, when the term "oxides of nitrogen" is used in relation to pollution, it is usually taken to refer to nitric oxide (NO) and nitrogen dioxide (NO₂), but not N₂O as the latter's principal adverse environmental effect is with respect to climate change. Similarly the principal adverse environmental effect of CH₄ is in relation to climate change, so CH₄ would not necessarily be included in a list of "volatile organic compounds" in this context. These permits are analogous to allocations that would be necessary under an ET system, to the extent that confer specified legal obligations on polluters that must be complied with. But unlike an ET system, IPPC permits are not tradable. The possible introduction of tradable obligations under the IPPC raises the issue of whether all obligations would need to be tradable, or just GHG allocations. Carbon dioxide, and the other three gases included in the Kyoto Protocol (HFCs, PFCs and SF₆) are not included, even implicitly, on the list.

6. Dust
7. Asbestos (suspended particulates, fibres)
8. Chlorine and its compounds
9. Fluorine and its compounds
10. Arsenic and its compounds
11. Cyanides
12. Substances and preparations which have been proved to possess carcinogenic or mutagenic properties or properties which may affect reproduction via the air
13. Polychlorinated dibenzodioxins and polychlorinated dibenzofurans

Annex IV of the IPPC Directive requires energy efficiency to be taken into account when determining BAT. This introduces some limited controls on greenhouse gas emissions, viz. those associated with the efficiency of energy conversion. There is some degree of conflict between energy efficiency goals and the reduction of other pollutants that needs to be weighed up in the current assessment of BAT. However, an emissions trading system might take away the need to consider energy efficiency. This possibility is alluded to in the recent UK Fourth Consultation Paper on the IPPC Directive³³.

The IPPC Directive requires the ELVs in existing Community legislation to be taken into account (none exist so far for GHGs). It also allows for the harmonisation of ELVs across Member States for each category of industry and for the gases in Annex III taking account of information provided by Member States and industries, e.g. ELVs might be harmonised to reduce competitiveness effects.

There are two relationships between the IPPC Directive and trading which are of issue. Firstly the possible incompatibilities with the approach used towards permitting and secondly the possibility of using the Directive as the legislative basis for introducing trading.

Inconsistencies between IPPC and Emissions Trading

There are a number of ways in which the Directive adopts a different approach to that of emissions trading and may be incompatible.

- Although not explicitly required to do so, Member States may cover the emission of GHGs in IPPC permits. If they did, ELVs for greenhouse gases would reduce the cost-effectiveness of an emissions trading system through requiring specific levels of reduction at some plants. To ensure trading, this might be explicitly disallowed. Alternatively, ELVs might be considered analogous to an allocation formula (grandfathering) of greenhouse gas emission allowances which would then be tradable. Such permits would need to be singled out from the IPPC Directive, or would need to be given a separate 'tradable' status.
- The precedent of shared competence under the IPPC is significant. Member States are responsible for implementing and ensuring compliance with the regime, but the Community retains the competence to determine minimum limits on the emissions, where the need for Community action arises. In this case, however, the Community role might need to be in determining maximum limits, i.e. to ensure

³³ UK Department of the Environment, Transport and the Regions (1999) Fourth Consultation Paper on the Implementation of the IPPC Directive

that Member States do not set ELVs at the facility level for greenhouse gases included in trading.

- The IPPC Directive requires permits to contain suitable monitoring requirements, specifying measurement methodology and frequency, evaluation procedure and an obligation to supply the competent authority with data required for checking compliance with the permit (Article 9). For greenhouse gases under the trading system, the monitoring, verification and enforcement requirements may need to be 'harmonised' in a similar way to guarantee the compatibility of data and the functioning of the trading system, whether using direct monitoring or emission estimation systems.

Shared Administrative Opportunities

Administratively and procedurally speaking, there is wide scope for relating the operations of the IPPC and ET systems:

- Section V suggests that a subset of activities included in Annex I of the IPPC Directive, could be used as the basis for the trading system. The Directive would provide the means for extension of this initial set of sources over time to include additional industrial, waste management and manufacturing processes.
- National authorities with the resources and skills to administer IPPC permits would be well placed to manage the issuing, monitoring, verification and compliance assessment relating to allowance allocations. The main issue would be how to maintain independence between the allocation and verification functions.

2. Large Combustion Plant Directive

Council Directive 88/609/EEC of 24 November 1988 on the limitation of emissions of certain pollutants into the air from large combustion plants (LCP Directive) introduces bubble limits and ELVs for SO₂, NO_x and particulates for combustion plants greater than 50MW_{th}. In July 1998 the Commission brought out a proposal to amend the LCP Directive. The amendment will strengthen the ELVs and extend the scope of the Directive to cover gas turbines.

The LCPD provides a means for defining which plants are included in the trading system and possibly for the initial allocation of allowances (as ELVs) if this were to be harmonised. However, it does not provide a framework for permitting as does the IPPC Directive.

The setting of ELVs for other pollutants will affect the ability of plants to trade but this is not inappropriate. Trading will need to operate alongside existing measures established to achieve different environmental objectives.

3. Energy and Carbon Taxes

Most Member States have a variety of taxes which apply to energy fuels and which are used to achieve objectives including revenue raising, emission limitations and energy security. At the Community level, the proposal for a Council Directive Restructuring the Community Framework for the Taxation of Energy Products (COM (97) 30 final) would introduce minimum taxation levels for a number of energy products.

The infrastructure for the tax systems might be used as the basis for a trading system, e.g. monitoring and reporting systems might be transferable. However, typically taxes have operated upstream, e.g. at the point of import of the fuel or of extraction. Whereas there are considerable advantages to operating a trading system at this level, the strawman proposal under discussion here would operate downstream, i.e. with final emitters.

To the extent that tax levels have been set in order to provide incentives for greenhouse gas emission reductions, introducing an allowance system in addition to the tax will involve double regulation and increased marginal costs for the sectors covered by both. For example, an electricity generator may be required to purchase allowances to cover emissions from the plant while facing a price for fossil fuels that include a tax representing the eventual CO₂ emissions.

Whereas it is up to individual Member States whether they impose additional costs on specific sectors, introducing an emissions trading system EU-wide may require adjustments to be made to the levels of minimum taxation included in the proposal for a Directive on energy tax restructuring.

Depending on the current price on emissions, introducing emissions trading on top may improve or reduce economic efficiency.

If a carbon tax, for example, is set at 10 Euros per tonne of CO₂ and the market price of emissions allowances is 5 Euros per tonne, then introducing trading on top of the existing tax reduces efficiency - emissions from this sector face a price of 15 Euros per tonne versus the trading price (and thus the price of the next least cost emission reduction) of 5 Euros per tonne. Either leaving the existing measure, and not introducing trading in that sector, or removing it and introducing trading, would be more efficient than , as both would impose a price closer to the trading price.

If choices need to be made about which instrument to choose, permits are preferable on efficiency grounds as they set a price on emissions at the level required to meet the emissions cap, and ensure that the same incentive is introduced for reducing emissions from all sources, even those in other countries. Taxes may be set too high, in which case too much emission reduction occurs in the taxed sector, or too low, in which case too little occurs and more must be undertaken in other sectors, probably at higher cost.

One advantage of taxes from an administrative perspective is that they provide greater certainty regarding revenues raised. Although auctions of allowances can be used to raise revenues, the amounts are uncertain because of uncertainties over allowance price. This is part of the tax-permit trade-off; emissions trading gives greater certainty of outcome but certainty on price, whereas taxes provide certainty on price but uncertainty on outcome.

4. Voluntary and Negotiated Agreements

Under voluntary or negotiated agreements, firms typically agree to meet given levels of efficiency, e.g. the agreement with the European Automobile Manufacturers Association (ACEA) and the Dutch energy efficiency agreements with industry. In some instances Negotiated Agreements set a voluntary target for emission reductions.

They impose no real cost at the margin in that most require improvements in emission intensity of output rather than limiting total emissions. Firms face pressure to reduce their average emissions but not marginal emissions.

Placing emissions trading on top of voluntary agreements thus would improve efficiency through providing incentives for reductions of marginal emissions, e.g. limiting production would be rewarded also. However, Voluntary and Negotiated Agreements typically are developed on the understanding that, if firms or sectors meet the targets agreed, governments will not regulate the signatories. This applies both to the transport agreement with ACEA and the Dutch energy efficiency agreements with industry. Negotiated Agreements thus are unlikely to survive the imposition of a trading system and the extra costs that arise; firms have signed expressly to avoid this kind of direct regulation.

5. Energy Efficiency Standards

Energy efficiency standards require firms and/or products to meet specific levels of energy use. To the extent that they are set in order to limit greenhouse gas emissions, they are incompatible with the objectives of a trading system which seeks least cost reductions rather than particular reductions from specific sources. However, this is complicated by the fact that energy efficiency standards might be targeting:

- a range of objectives including multiple pollutants and energy security;
- non-price barriers to energy efficiency, for example, household product standards might go some way towards tackling landlord-tenant problems.

Where these other objectives dominate, efficiency standards might be used in sectors also covered by trading.

However, even where energy efficiency standards are targeting greenhouse gas emissions, introducing emissions trading on top represents an efficiency improvement. Through placing an additional incentive at the margin firms or households will have additional incentives to reduce emissions where they can do so at lower cost than the price of allowances.

6. Information Programmes

Information programmes can more clearly be seen as compatible with trading; they can assist in the functioning of markets through making a wide range of market actors aware of opportunities for emission reduction options.

7. Renewables Programmes

A number of Member States have introduced measures to encourage renewable energy consistent with the EC's renewables target. In most instances, as for energy efficiency measures, the encouragement of renewables has multiple objectives which, in addition to reduction of greenhouse gases, include reductions in emissions of other pollutants, energy diversity and security. As for energy efficiency standards, to the extent that these other objectives dominate, these measures can simply run in conjunction with greenhouse gas emissions trading.

If subsidies are used to encourage greenhouse gas reductions, introducing emissions trading on top will still represent an efficiency improvement. This holds even if subsidies are establish an equal but opposite incentive, e.g. through subsidising the price of electricity from renewable fuels or ensuring a guaranteed sales price at a level that reflects the value of the greenhouse gas savings. Subsidies provide incentives for a narrow range of emission reduction opportunities. In contrast, introducing emissions trading would provide electricity generators with a much wider set, including switching from coal or oil to gas, and combined heat and power. Although renewables will be double rewarded, the incentives for emission reductions in response to a price on emissions will ensure consideration of the full range of least cost opportunities and these other options are likely to dominate over the switch to renewables at current prices.

D. Opting out of PAMs

Where PAMs exist already, trading might be designed to exclude sectors already covered. However, if a transition to a more comprehensive trading system was wanted, rather than simply removing the existing measure, individual sources might be given the opportunity to opt in to trading.

The US SO₂ trading system was established to address acid rain and covers the largest coal-fired power plants throughout the US. It allows combustion sources³⁴ not required to participate in the Acid Rain Program the opportunity to enter on a voluntary basis, and receive their own acid rain allowances. Sources are allocated allowances to cover their emissions on the basis of historical energy use and allowed emission rates. By reducing emissions below its allowance allocation, an opt-in source will create unused allowances, which it can sell. Outside of the trading system, depending on current local air quality, these plants might be regulated through a number of technology or emission standards.

This opt-in approach might provide a model for a similar approach to trading in the EU.

For governments this might be desirable because, where sources are in the trading system, there is greater certainty of emissions being limited to the capped level. Entities may opt in to trading because, if they do, they are exempt from the requirements of the PAMs, and the allowance price is less costly than the policies and measures that they would otherwise face. Or they may do so because they can make

³⁴ Combustion sources are defined as fossil fuel-fired boilers, turbines or internal combustion engines.

additional low cost emission reductions and earn additional revenues from sales of allowances.

1. Negotiated Agreements

Under negotiated agreements, sectors or plants agree to achieve a level of emissions or fuel use specified in terms of a tonnage cap or as an emissions rate per unit of output. Firms under a voluntary agreement might opt in to a trading system through:

- buying allowances to cover any shortfalls between what was agreed under the voluntary agreement and actual emissions; or
- to turn the voluntary emissions cap into a binding cap with an allocation of allowances.

Buying to Cover Shortfalls

The EU Negotiated Agreement with the European Automobile Manufacturers Association (ACEA) sets a quantified CO₂ emission objective for the average of new passenger cars sold in the European Union. Average emission rates must be limited to 140 g/km to be achieved by 2008³⁵.

As an alternative to the basic agreement, regulations might be introduced whereby vehicle manufacturers could purchase emission allowances to cover any shortfall, although this would require individual manufacturers to take on the target or for ACEA itself to take on the responsibility for purchase. Using information on numbers of vehicles sold and average kilometres travelled, the average fuel economy of the vehicle types included in the agreement can be used to estimate total emission levels for those vehicles in comparison with targeted emissions under the agreement. Any emissions overage would represent the number of allowances required.

Mathematically this is expressed as:

$$\text{Overage} = (\text{VS} \times \text{VK} \times \text{FE} \times \text{C}) - (\text{VS} \times \text{VK} \times 140)$$

Where:

VS = The number of new vehicles sold

VK = The average kilometres travelled per new vehicle (km/vehicle)

FE = The fuel economy (litres/kilometre)

C = The CO₂ emission factor per unit of fuel (g CO₂/litre)

The motivation from the Commission's or Community's perspective in introducing such flexibility might be for two reasons:

- The agreement is regarded as too expensive and some way out might be desirable to limit these costs. However, given the fact that it has been voluntarily entered into by the vehicle manufacturers who will be better informed about likely future

³⁵ The Agreement covers passenger cars of category M1 (as defined in Directive 70/156/EEC), although innovative vehicle concepts and cars using alternative fuels or radically new propulsion systems will equally be counted towards the objective.

costs than will governments, this is unlikely to be sufficient reason.

- There is a risk that vehicle manufacturers will not stick to the agreement if it is relatively expensive but the consequences of failure to meet the agreement are not severe. This is a possibility.

Currently, the consequences of not meeting the agreed average emissions rate is that vehicle manufacturers face other, currently unspecified, regulatory measures. This is coupled with a number of assumptions that are part of ACEA's commitment and which affect its validity, e.g. availability of suitable fuels, no competitive distortions and unhampered diffusion of fuel efficient technologies³⁶.

Although the Commission has stated that it has no reason to believe that the assumptions will not be borne out, there is some risk that the objectives of the agreement will not be met, either because the consequences were not regarded as particularly severe by the vehicle manufacturers or because they felt that the above factors that determined their ability to meet the agreement did not hold.

Under these circumstances the opportunity of an opt-in to trading provides the Commission with greater certainty of an emission outcome. Purchases would need to be from the existing allowance market; this would reduce the number of allowances available to other sources and limits other sources' ability to emit. The allowed emissions for sectors not included in trading would not change and the compliance challenge for these sectors would be the same as if the Agreement's target had been met.

However, this needs to be heavily qualified by the concerns over estimation of emissions. One problem with this approach is that emissions from the vehicles of the manufacturer opting in are not monitorable with the same accuracy that emissions from other sources are; they are based on broad assumptions about kilometres travelled pre vehicle and fuel economy rather than taking account of actual fuel use.

Turning Voluntary Targets into Binding Targets

The voluntary target might be turned into a binding target; the target would be used to set the number of additional allowances that would be distributed in the trading system, probably through grandfathering to the firms currently in the negotiated agreement. The vehicle manufacturers might wish to do so if they believed that the target that they had agreed to in the voluntary agreement was relatively low cost to achieve (i.e. less than the allowance price at the margin). This would enable vehicle manufacturers to make additional reductions below targeted levels and to sell the allowances that were surplus to requirements. The Commission and the Community might wish to do so because it would provide incentives for additional emission reductions beyond that included in the voluntary agreement; it also provides much greater certainty of achievement.

For the ACEA agreement, the rate-based target might be turned into a target on a tonnage basis which could be used as a cap for total emissions from those vehicle

³⁶ An Environmental Agreement with the European Automobile Industry. Communication from the Commission to the Council and the European Parliament

types. However, vehicle manufacturers are not really a suitable place for allowance responsibility to be placed because of the measurement difficulties (Winkelman, Hargrave, and Vanderlan 1999). Vehicle emissions are better included in a trading system through an allowance requirement at the refinery level.

The Netherlands Covenant for Benchmarking Energy Efficiency may provide a clearer model. It requires large Dutch firms to achieve levels of energy efficiency equal to the best of international firms. In return, the government will exempt these firms from national energy taxes, and other energy efficiency or CO₂ limitation requirements. This agreement allows these firms to increase their production so long as their energy intensity is kept low. These firms might be willing to convert this agreement into a responsibility to hold allowances coupled with an allocation of allowances based on some level of agreed future activity rates. However, this is a complicated negotiation and, given the current rights of the entities involved, is likely to require the government to over-allocate allowances to this sector. This will need to be compensated by tighter PAMs elsewhere in the economy or through government purchase of AAUs, ERUs or CERs from other countries.

2. Carbon Taxes

A number of Member States, including Denmark, Finland and Sweden, have carbon taxes. In addition, the Netherlands, has an energy levy and the UK is introducing a climate change levy. Carbon taxes have been established in a similar way to an upstream allowance system, i.e. taxes are levied largely on fossil fuel use. In all countries there are significant exemptions to the tax system for energy intensive industries that are competing internationally.

The relationship between taxes and allowances might be achieved in two ways:

- Firms covered by a tax might elect to purchase allowances rather than pay the tax where it is cheaper to do so (or may be given a tax credit where they have also purchased allowances). This provides no real benefits in environmental or compliance certainty as, where the tax is more expensive than the allowances, it is providing greater incentives for emission reductions. However, this approach does provide a means for ensuring those sectors covered by a tax are not paying too much. Governments miss out on revenue under this scenario. They cannot provide the buyer with the necessary AAUs as, presumably, the government will be holding sufficient AAUs to cover emissions consistent with taxes levied at the higher price. The purchase of allowances from other sectors will mean that emissions elsewhere will be reduced which will free up some government-held AAUs for sale but at a lower price than the tax rate.
- Taxes might be used as a way out of the allowance system, e.g. firms have a choice of paying a tax rather than purchasing an allowance. This effectively sets a price limit on allowances. It has been proposed as a way to introduce a trading system; it limits firm's exposure to high allowance prices but does not ensure achievement of the emissions cap (NZ Ministry for the Environment 1997, Denne 1999, and RFF 1999). It is a consideration if the Community is wishing to introduce an early trading system (pre-2008) as a pathway to a fully functioning system for the first

commitment period but is not an option for a trading system during the commitment period.

3. Energy Efficiency Standards

Energy efficiency standards such as building codes are used in most Member States to limit energy demand. An opt-in to trading might be applied through allowing firms that do not meet the standard to purchase allowances to make-up the difference. For example, builders erecting buildings that do not meet the standard might purchase allowances to cover the expected additional emissions associated with the extra energy use. This would operate in the same way as opting out of Voluntary Agreements. Opting out in a way that allows trading-off energy savings for emission allowances simply on the basis of greenhouse gas consequences of energy use ignores the multiple benefits associated with these energy savings, e.g. reducing fuel poverty, and often standards are introduced to tackle a non-market barrier to energy efficiency, e.g. the landlord-tenant issue. It is unlikely that these offer much scope for transition into trading rather they might be used alongside a trading system and the price effects of trading would reinforce the objectives of the efficiency standard and improve its economic efficiency (as discussed above).

In contrast to these demand-side efficiency measures, those to encourage supply-side efficiencies, i.e. efficiency of conversion, would be more suited for inclusion. In most instances the trading system will already include relevant plants but there will be some smaller plants for which opting in to trading may be possible.

E. Conclusions

Emissions trading can be introduced most easily through building on some existing Community instruments and the institutional arrangements that they establish. Possibilities include the IPPC Directive and the Large Combustion Plant Directive (LCPD). The IPPC Directive may be the clearest vehicle because of the permitting system it introduces and the associated monitoring requirements. However, allowances will need to be defined differently from IPPC permits because greenhouse gas emissions cannot be included in an integrated permit and the permit still be tradable (purchasing plants would need to have the same ratio of greenhouse gas emissions to emissions of other substances) and greenhouse gas requirements will not be defined on the basis of BAT (unless achieving the target can be defined as BAT in aggregate). These differences may be fundamental and require a different instrument but the trading system will require a very similar bureaucracy for monitoring and enforcement.

In terms of coverage (see Section V), over time, the initial number of source categories included in the trading system might be increased. In many instances this can include laying a trading system on top of the existing set of policies and measures and this represents an efficiency improvement where existing measures do not provide incentives at the margin for emission reductions. In other instances PAMs might be removed and sectors added to the trading system along with the distribution of additional allowances. There may be opportunities for source categories currently covered by PAMs, voluntarily to opt in to the trading system, while avoiding their

responsibilities under the existing PAMs. However, these opportunities may be limited because often these instruments will be used to achieve multiple objectives including reductions in emissions or other pollutants. Suitable instruments for establishing such a “cross-walk” include carbon taxes, supply-side efficiency measures and potentially voluntary agreements.

Firms wishing to take the cross-walk into trading would need to apply for exemptions either from national or Community legislation. These possibilities will need to be explicitly included in existing and new regulations.

IX. Conclusions

This paper has presented a strawman proposal for the design of a downstream trading system combined with policies and measures. While the Study Team views another option, the upstream approach, to be the preferred approach to trading on environmental and economic grounds, the strawman presented here is a workable middleground option that balances the need to integrate the trading system into existing policies and measures within the EC, with the need to take advantage of the opportunities for cost-effective greenhouse gas regulation that are created by the Kyoto Protocol, and in particular Article 17 on emissions trading.

The key features of the strawman proposal outlined here include the following:

- Commencement of the programme prior to 2008.
- Trading by emissions sources rather than governments.
- Definition by the Community of the number of allowances to be allocated to the trading system in aggregate and to each Member State.
- Member State control of allowance distribution to emissions sources.
- Member State monitoring and verification of reported emissions, based on Community guidelines, or use of existing Community policies to establish monitoring and verification rules.
- Financial penalties for non-compliance on Member States and minimum Community requirements for Member State penalties on emissions sources.
- Opt-in to the trading system for selected emissions sectors covered by non-trading policies and measures. Sectors would have to be approved by the Community.

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Appendix A. Further Discussion of Effects on Fair Competition

This appendix provides a more detailed discussion than Section II of the paper on the effects on fair competition.

The EC Treaty seeks to eliminate trade barriers between its Member States in order to promote the internal market. Four key areas are targeted by the Treaty:

- 1) Prohibition on discrimination on the basis of nationality;
- 2) Prohibition on the granting of state aid that distorts or threatens to distort competition by favouring certain undertakings or the production of certain goods to the extent that it affects trade between Member States;
- 3) Prohibition on the imposition of internal taxation in a way that products produced in other Member States are directly or indirectly taxed in excess of “similar domestic products;”
- 4) Competition rules on undertakings designed to prevent undue market power

As is discussed in detail in Scoping Papers #1 and #5 of the Study Team’s interim report, these rules face the greatest potential challenge from Member State decisions on allocation of assigned amount both to sectors and entities within the trading system and to those covered by PAMs.³⁷ The discussion here lays out the issues regarding potential impacts on fair competition from greenhouse gas regulation in the Community.

For the EU to maintain fair competition, competition among firms must be based on the true economic costs of production and not be distorted by subsidies. Fair competition also requires that firms have free access to markets, and that governments avoid creating non-tariff barriers. An unfair competition problem arises when regulation raises the costs of production of one firm more than that of another firm in the same industry in another country.

This appendix focuses on two basic sources of changes in ability to compete: differences in stringency of regulation across sectors within countries, and domestic regulation methods that provide lump-sum compensation to sectors.

³⁷ See *EC Trade and Competition Law Issues Raised by the Design of an EC Emissions Trading System and Allocation of Greenhouse Gas Reduction Responsibilities Among and Within the Countries of the European Union*, July 1999.

A. Firms Compete on Marginal Costs

A firm can sell products if its cost is lower than the price it is able to receive in the market. As long as there are no trade barriers the firm that will have the most success selling products will be the firm with the lowest costs. Two different types of cost are relevant. The first and most important, is the cost of producing extra units, or marginal cost. This determines what a firm can sell more output for without making a loss. It determines their ability to expand into new markets. The second is the average cost which determines the overall profitability of the firm and the sustainability of their production and sales. By profitability we mean a return on capital above the normal return or cost of capital.

The asset position of the firm, or their wealth, may affect their profitability indirectly. A firm needs to make a normal return on all its capital whether it owns it as assets or has borrowed it, so having more assets does not necessarily make it more profitable. Marginal and average cost and wealth vary significantly across firms for many reasons. They are primarily determined by factors other than regulation such the skill of their management, the quality and cost of labour, the cost of land, energy and natural resources, access to transportation networks and historical factors that determine the physical and financial capital structure of the firm.

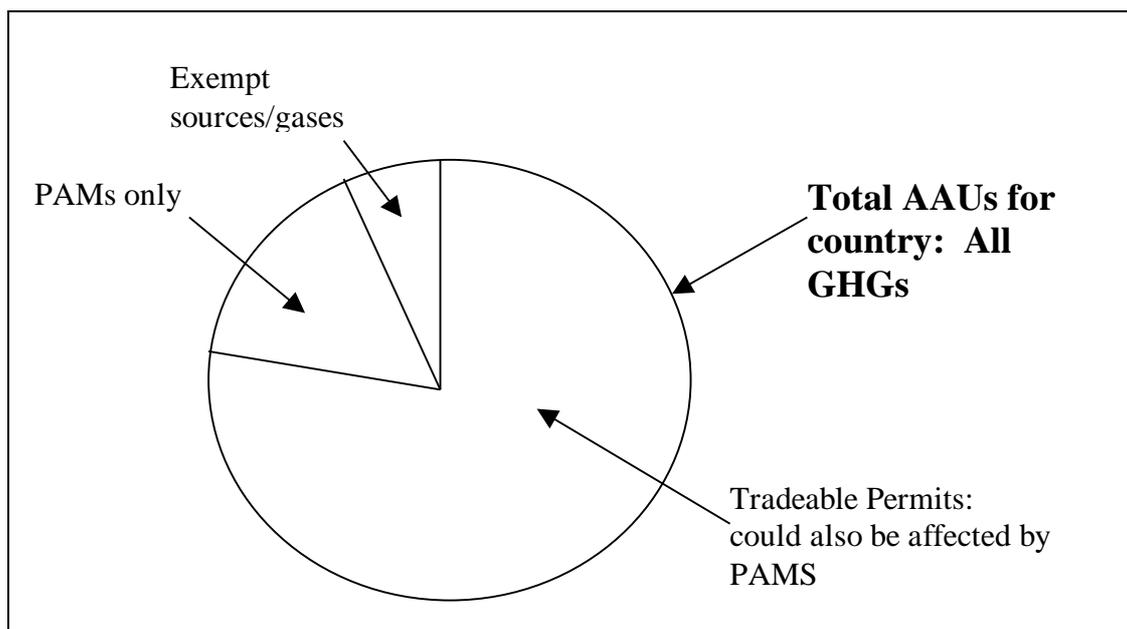
Every country has some comparative advantages – i.e. ability to compete in production of some goods. Government policies that subsidise industries can lower their costs and make them more able to compete. However these subsidies are costly to the rest of the economy so what increases competitiveness in one industry lowers it in others.

B. Effects of Differences in Stringency of Regulation on Fair Competition

Within each country, the total amount of allowances must be allocated across gases and sources – see Figure A1. Because total GHG emissions are capped, the allocation to one gas or set of sources affects those available for others. If some sectors are exempt from regulation or only have policies and measures (PAMs) applying to them, they are not capped; the government, however, still faces an effective cap on emissions from those sectors within its own allowance budget. It could ease this constraint by purchasing AAUs externally. This would change the size of the circle. Trading within the country will affect the relative sizes of the wedges.

Sectors covered by PAMs are allocated allowances in the same way that sectors covered by trading are. The government simply bears the compliance risk that PAMs sectors will emit more than their allocated allowance level.

Figure A1 Initial Allocation of Allowances among sources and gases



A downstream domestic trading system is unlikely to cover all sources and gases, at least initially. This limitation raises the issue of how countries allocate assigned amount between sources covered by the trading system and those covered through PAMs, and among those covered by PAMs, and whether a competitive advantage can be derived through this allocation. A country cannot give a marginal competitive advantage to one of its industries by allocating that industry a disproportionate share of allowances with a trading system, because doing so would not change the industry's marginal costs when allowances are tradable. Marginal cost is always equal to the international allowance price. It is possible, however, that a country could provide a competitive advantage to an emissions sector covered by policies and measures (PAMs) other than trading. The domestic allocation of allowances determines the marginal cost of sectors faced by PAMs.

A plethora of non-economic instruments to encourage emission reductions exist and have been proposed. These include efficiency or technology standards, product standards, labelling requirements, voluntary agreements, infrastructure investments and recycling requirements among others. These approaches implicitly allocate GHG abatement responsibility among sectors and actors. They will lead to a pattern of reductions and cost bearing though these may be hard to predict or even monitor *ex post*. They will lead to marginal costs of abatement that vary within and among sectors and are different from the international allowance price.

Illustration: Steel Industry

Suppose, for simplicity that all firms in the steel industry have the same emissions per unit of output and the same marginal cost of steel production. 1 unit of output produces one ton of CO₂ and costs \$100.

Marginal Cost Differences from PAMs

Suppose that Country A **exempts** their steel industry from CO₂ regulation. The total marginal cost of steel production is \$100.

If country B **requires the use of a technology** that reduces CO₂ emissions by 8% per unit (or 0.08 tons) and costs \$8.00 for each unit produced (\$100 per ton of emissions reduced) the marginal cost of production for their steel firms is \$108.

If country C imposes **very stringent technological controls** or has a **voluntary agreement with the steel industry that limits their total emissions below a cap**, their marginal cost of abatement may be brought up to or even beyond the social cost of emissions. If the marginal cost to the firm of reducing the extra emissions produced through an extra unit of output is equal to \$150, the firm's marginal cost is equal to their normal production cost of \$100 plus the extra abatement cost of \$150. Their total marginal cost will be \$250.

Clearly, country C will have difficulty competing with country A and even country B. Only country C is making its firms bear the full cost of additional emissions. Country A is making no effort; country B is requiring an efficient level of reduction through technology but making no effort to reflect the social cost of emissions in the price of the product and hence lead to efficient use of steel. These differences are a serious problem for fair competition.

Many countries will choose to use non-trading forms of regulation, especially for those gases and sources that are difficult to directly monitor at a sub-state level. For example, countries may choose to regulate small sources of N₂O through equipment standards rather than directly controlling emissions. Similarly governments will probably find it infeasible to monitor agricultural sources of methane from individual farms so may subsidise feed additives or try to directly change farming practices. Some governments will simply prefer direct regulation to allowances for historical or political reasons.

Governments will need to estimate the number of allowances necessary to cover the emissions from these non-allowance activities and either the government or a body that represents the sector will trade on their behalf if the sector falls short or has excess. A country could provide a competitive advantage to an emissions sector covered by PAMs by imposing very lenient regulation on the sector; they would then compensate by placing very strict PAMs on other sectors, by allocating few allowances to trading sectors and hence forcing them to buy more internationally, or by buying external AAUs out of general revenue. For instance, a country that decided not to control methane emissions from livestock might provide a cost advantage to its farms over farms in other countries.

One key situation where many sources may be regulated (or not) outside of the allowance system would be where the allowance system was defined downstream (i.e. at the energy user level not the fossil-fuel producer level). Because of the

administrative complexity of such a system many small sources are likely to be excluded from the system.

Illustration continued: Marginal costs in Steel Industry under economic instruments

If country D imposes a **tax** on CO₂ emissions of \$150 per unit of CO₂, their steel firms will face marginal costs equal to their normal production cost of \$100 plus the extra tax of \$150. They will almost certainly reduce emissions to avoid some of this tax but on the margin the cost of reducing emissions further will be equal to the tax. Their total marginal cost will be \$250.00. They will compete on equal terms with country C but not countries A and B.

They may have an advantage over the firm in country C if they are able to find more efficient ways to reduce emissions than the technology controls. If their government allows them to purchase permits in lieu of paying the tax they may be better off than country C if the international permit price falls below \$150.

Suppose country E imposes a **tradable permit system** on its steel industry and allows companies to purchase permits domestically and internationally. The firm's marginal cost will be \$100 plus the permit price. A firm that holds permits either through grandfathering or previous purchases faces an opportunity cost because they are unable to sell this permit; a firm that does not hold permits must buy an additional permit.

If the permit price is \$100 they will compete on better than equal terms with firms in country C and equal terms with D if D can also trade, but will not be able to compete with firms that are exempt from regulation or who face only technology standards that do not control total emissions but only emissions per unit of output.

Within a domestic trading system, all sources covered will have the same marginal costs of abatement. If allowances can be internationally traded, this marginal cost will be the same across countries for all firms included in trading. The initial allocation of allowances to the sector will have no influence on this marginal cost. The marginal cost is defined by actual emission reductions.

1. Average Costs

The average cost of abatement varies with regulatory stringency. It varies even when economic instruments are used and the marginal cost is equalised. Firms that face less stringent initial targets or that receive some form of output based allocation (possibly based simply on continuing to operate) will have lower average costs.

Trading will reduce average costs for each firm but will not necessarily make them converge. Average costs do not affect competitiveness directly but they do directly affect profitability. In a non-competitive market a firm with lower average costs is able to subsidise its marginal units in order to capture a greater share of the market. While this is not profitable in the short run it may lead to the collapse of competitors and have longer run advantages. Firms that are more profitable, and that have larger assets or access to capital are more able to oppose and deter such non-competitive practices.

2. Grandfathering

The effect of regulation through product prices, wages and returns to capital (e.g.: dividends) changes marginal costs in the same way in an auctioned allowance program as in a grandfathered program. All efficient forms of regulation lead to a series of marginal costs across industries and individuals that are determined by the way the owners of firms are able to pass on costs to other firms, workers and consumers. The changes in the distribution of wealth that result from grandfathering and the use of tax/auction revenue determine how the ultimate distribution of wealth varies among the options.

Some people believe that if firms are grandfathered carbon allowances rather than having to buy them in auctions, they will have a competitive advantage *vis-à-vis* those who must buy allowances or pay carbon taxes. This would imply that firms involved in voluntary agreements would also have a competitive advantage even if they set absolute caps on emissions. This is generally based on a misunderstanding of allowance markets and grandfathering.

Grandfathering gives allowances to firms based on past behaviour, not current or future behaviour. It is a lump-sum payment. If a firm increases its production to export more, and emits more greenhouse gases in doing so, it requires more allowances. If allowances were auctioned, the expanding firm would need to buy more or draw down banked reserves. If allowances were grandfathered, it would need to use up some of the stock it holds and would have fewer to sell or use in the future. In every case, the opportunity cost of increasing output is the production cost plus the cost of the additional allowances necessary. If the firm reduces production, it saves the opportunity cost of the allowance price; it avoids the need to buy allowances, or can sell the allowances it was grandfathered. The grandfathering of allowances makes the owners of the firm wealthier, but does not directly alter their marginal production costs.

Grandfathering will have no direct adverse efficiency effects through marginal costs if it is based on previous, non-manipulable data. If allowances are allocated on the basis of things that cannot be altered they have no effects on the costs of production; they are simply a transfer of wealth. The reallocation of wealth across and within industries could affect efficiency if there is imperfect capital mobility. Firms that receive allowances will be wealthier and therefore may have a cheaper more liquid source of finance available than firms that must rely on their usual sources of finance. Of course, grandfathering will have a major affect on the income of the current shareholders and owners so firms have a strong interest to fight for it.

Whether the wealth transfer is efficiency-improving depends on the value of the capital to the firms that receive it and what would have happened to the resources if they had not been given away in grandfathering (see revenue recycling). Grandfathering could give resources to relatively less efficient firms, or to firms in industries that are declining and do not need new capital. The firms that receive the resources will not necessarily invest them in the same industry; they will invest them wherever they can get the best return.

There is an old joke about a farmer who wins \$1 million in the lottery. When asked what he will do with the money, he says that he will keep farming until it runs out. If firms are run by profit maximisers they will not behave in this way. They certainly would not gain economic advantage by doing so. A coal mine that receives a large allocation of permits through grandfathering will not spend the money the permits represent subsidising the coal price when they can see that their mine will never be profitable. Maybe they will invest it in internet companies.

Grandfathering can occur in a number of ways. The cleanest form is where the existing firms are given allowance rights in perpetuity. This is a simple wealth transfer. However in practise grandfathering is often done on an annual basis where a firm that closes down ceases to receive allowances. This can affect a firm's decision to exit an industry. A firm may have average costs that exceed the price of the product so be making a loss but that loss may be offset by the value of the allowances they receive each year. Thus an inefficient firm may stay in business. If the allowances were grandfathered lump sum, an uneconomic firm would simply sell the future allowances and make their exit decision on the basis of economic profitability.

If the grandfathering is done on the basis of output (output-based allocation) it is more like an output subsidy than grandfathering and has very different effects on costs and wealth. A firm with output based allocation does not face the full opportunity cost of emitting. If they reduce output, they do not have excess allowances to sell. If a large number of firms receive similar output-based allocations (or are exempt), the price of the product will fall to reflect their marginal cost and they will take over the entire market.

Illustration continued: Marginal costs in Steel Industry with output-based allocation

Suppose Country F uses a tradable permit system with **output-based allocation**. Suppose that the firm receives 0.92 permits for each unit of output (an 8% reduction from business as usual). A firm that produces one more unit will need to buy an extra permit for \$100 but they will also receive 0.92 more permits valued at \$92. Thus their marginal cost will only rise by \$8 to \$108. They are in the same situation as country B. The firm has a lower marginal cost of production than those facing a normal tradable permit system, a tax or stringent PAMs.

Output-based allocation is a problem for competition as are many voluntary agreements and any other rate-of-emission-based forms of regulation. Lump-sum grandfathering is not a problem for competition. It makes the owners of companies richer but does not give companies a competitive advantage. In fact, the economy of the country as a whole will be disadvantaged if grandfathering is used because of the loss of efficiency gains that could have been achieved through revenue recycling if the allowances were auctioned (see discussion below). Grandfathering would lower that country's overall productivity and make it harder for their firms to compete. Some firms will be wealthier, but all will face higher production costs because general tax levels (e.g.: on capital and labour) will be higher than they would have been if the auction revenue had been recycled into tax cuts. Even firms that are grandfathered allowances will face higher marginal production costs and hence will find it harder to compete with other countries.

C. Regulation and the Entry and Exit of Firms

1. New Entrants

Policy makers are frequently preoccupied with the fate of new entrants into allowance markets. From an efficiency and equity point of view this concern is misplaced. Once the allowances are in private hands they can, and often will, be sold on the secondary market. New entrants who do not receive allowances directly will have no difficulty purchasing allowances. As long as allowances are allocated by auction or through lump-sum grandfathering, they will face the same marginal and average opportunity costs of emitting as existing firms so have no competitive disadvantage. New firms do not have any stranded assets so do not face costs from regulation if the industry is competitive. They only enter if they expect to make profits and will take the environmental regulation into account as an additional cost. The costs to firms from climate regulation relate to their investments before the regulation was imposed not to their ongoing activities.

If trading were not allowed, output-based allocation would have the advantage that new entrants receive allowances, and emissions can vary with changes in industry structure. Allowances would very roughly be allocated to equalise marginal costs. When trading is allowed output-based allocation is unnecessary and inefficient.

2. Regulation and Exit of firms

If a regulation provides a subsidy to existing firms that they receive on the basis of output or continued existence while new firms do not receive the subsidy, old firms will have a cost advantage over new firms. Output-based allocation rarely has this discrimination but poorly designed grandfathering could. Regulators are often tempted to withdraw the future allowance allocations from firms that go out of business. If these allowances have little value they are unlikely to affect the exit decision of a firm. If however they were very valuable, continuing to receive allowances may become a key reason for the firm to continue. Such a firm could continue to produce even its marginal and average production costs are high because they can subsidise their output. If they cease to produce they cease to receive the allowances.

D. Why would countries subsidise some industries at the cost of others?

Do the advantages to some sectors outweigh the macroeconomic disadvantages from constraints on trading, and subsidies to specific sectors through exemptions or grandfathering? There are two basic schools of thought on this: the strategic trade school (e.g.: Laura Tyson (1992) or Lester Thurow (1992)) and the productivity school (e.g.: Paul Krugman (1996)). This is essentially an argument that has been going since the 1700s (Adam Smith vs. the Mercantilists) so is unlikely to be resolved in this context.

1. Strategic Trade Arguments

If a country can alter its long-term comparative advantage through short-run subsidies to some sectors, the short-run economic costs could be outweighed by long-run economic advantages.

If international trade is seen as a zero sum game where everyone wants to specialise in energy intensive industries and countries have to fight for market share, subsidies will help energy-intensive industries gain market share. But is market share worth it? Are the countries that subsidise their industries and gain market share really winning relative to the countries that lose market share in this industry? Five basic arguments are put forward for subsidising some sectors at the expense of others.

The first argument is the ‘infant industry argument’ whereby it is argued that industries need a certain amount of help to get started possibly because there are initial learning costs or minimum economies of scale, combined with limits on capital availability. Others would argue that some industries have greater potential to generate growth in the economy as a whole through technological or skills leakage and hence should be subsidised. Alternatively it might be argued that some industries are so large that they cannot be allowed to fail because they would have significant macroeconomic effects. Fourth, countries have historically argued that some industries are essential for national security and must be maintained at all cost. Finally, if trade negotiations are seen as a game, countries may believe that they should maintain protection even if it is costly so that they have concessions to offer other protectionist countries in order to get them to lower their trade barriers. This only works if the other barriers are eventually lowered in response.

2. Productivity Arguments

This argument is built on basic neo-classical economics. What matters for competitiveness, i.e. the ability to sell products, is being able to produce high quality products at lower cost than your competitors. Unless there is some sort of market failure, the benefits of subsidies to one sector do not outweigh the increased costs to other sectors from the higher tax burden. While there may be technological spillovers and minimum economies of scale, governments are not good at ‘picking winners’ i.e. emerging sectors, or providing effective support. Empirical evidence suggests that decisions on which industries to support tend to be based on political economy rather than any objective assessment of potential efficiency gains to the economy (Grossman and Helpman 1994). The government is probably better to focus on running an efficient economy across all sectors and treating all equally.

While mainstream economists generally believe the productivity arguments, it is clear that governments are still persuaded to create regulatory and trade policies that protect some sectors. Hence it seems likely that governments will choose to exempt some sectors from regulation and provide more lenient regulation to others. It seems unlikely that this will benefit the country as a whole but it almost certainly benefits the sectors that receive preferential treatment.

How does this affect other countries?

If one country subsidises its exporting sector, the importing countries gain overall through purchasing products that are subsidised by a foreign government. E.g.: if country A subsidises steel production by imposing lenient carbon regulation on their steel sector, country B as a whole benefits from cheaper steel imports. The country B steel industry cannot compete with lower steel prices but resources can be moved from this industry to other more productive areas in the economy.³⁸ Country B and other countries lose to a certain extent because the Country A economy is less efficient and hence they demand fewer imports. Country B could also lose if Country A protection is inconsistent, e.g.: dumping, so that steel prices fall enough to destroy the Country B steel industry but then rise again so that Country B does not reap the benefits of lower steel prices.

The equivalent destructive trade practice in EU trading might be unstable regulation (e.g.: suddenly allowing a very stringently or very leniently regulated major sector to trade or suddenly disallowing it from trading allowances) that destabilises the allowance market and makes it difficult for other countries to make good long-term decisions in energy intensive industries.³⁹

In summary, some sectors will face some comparative disadvantage if another country treats those sectors in a preferential way. It is not clear that this leads to disadvantage in the economy as a whole however; it will benefit the other sectors who receive cheaper imports and whose competitors in the other country are being forced to subsidise their preferred sector. The net effect on importing countries is contentiously argued though the mainstream economic consensus is that the global effect of freer trade is positive for all. In any case, if the importing country retaliates with its own protection it is generally agreed that this will not help the importing country; it will impose punishment on the original protectionists but also hurt domestic importers.

E. Effect of international allowance trade on fair competition

Trading equalises marginal costs thus increasing the fairness of trade on the margin. It does give additional gains to sectors that are treated preferentially, if their governments allow them to sell, but it also provides gains to their competitors who are not preferentially treated.

The freer is allowance trade generally, the less likely it is that any one country's policies will have a large effect on the allowance market. Free trade will tend also to lower allowance prices. The lower the international allowance price is the more pressure there will be on government from non-subsidised sectors to allow them to trade freely and the weaker the arguments for subsidies will be from sectors that could be subsidised. Lower allowance prices will also reduce the impact of any non-

³⁸ This argument has come out clearly in the recent US debate over the demand for protection of the US steel industry against cheap Asian imports. The automobile industry, for one, has argued against steel import restrictions because they gain from the cheaper steel.

³⁹ Because the allowance market deals with homogeneous goods it will tend to be more liquid and competitive than product markets so the ability of individual countries to influence the allowance market itself as a whole will be lessened.

competitive regulatory practices that would affect production on other countries by simply limiting the effect of regulation on production costs.

Exclusions and subsidies to specific sectors should be discouraged in the usual ways including pressure from WTO. However, we should not fall into the trap of requiring comprehensiveness or even harmonisation of regulation as a prerequisite of trading. This would fall into the hands of those who want to undermine trading and the treaty as a whole. This would directly limit trading and would be damaging to all parties.

In conclusion, EU policy should focus on enhancing the comprehensiveness of regulation and on encouraging tradability of allowances. Countries should be made aware of the disadvantages to themselves of grandfathering but it should not be limited. Countries should have the freedom to deal with their own political situation in order to create workable regulations.

Appendix B. Discussion of Alternative Approaches to Allocating Assigned Amount to the Trading Sectors

As noted in Section IV, there are three basic approaches (as well as combinations of these approaches) to dividing among the Member States the Community's aggregate assigned amount to be allocated to trading sectors. These are:

1. Pro rata allocation of the cap to Member States based on their share of the Community's 1990 baseline emissions for the trading sectors,
2. Pro rata allocation based on a business as usual (BAU) baseline for 2008 for the trading sectors, or
3. Pro rata allocation based on benchmark emission rates for affected sectors.

Reliance on 1990 baseline emissions is the simplest approach and will protect those who have made reductions in the past nine years. It will penalise those with the greatest growth in emissions since 1990. In addition, such an approach will penalise those with the cleanest sources of fuel in the base period and reward those with the dirtiest. For example, a country like Germany with its heavy reliance on coal for electricity generation would have a far easier time meeting a target based on an across-the-board percentage reduction below 1990 levels than would a country that relies principally on natural gas, nuclear or renewables.

In contrast, reliance on the BAU baseline will engender battles over what is an appropriate projection for each sector and Member State's emissions level for 2008. It will not recognise reductions undertaken since 1990 and thus will reward those who have made fewer reductions and have shown the most emissions growth.

The benchmark approach would have two basic elements:

- An energy efficiency target for a given sector, and
- a target emission rate, measured in carbon per unit of output (such as per kilowatt-hour) for the same sector

Business as usual growth rates could be set uniformly for the Community and Member States as a starting point for the negotiations. The energy efficiency target, a desired level of efficiency for all plants in the sector, would then be applied to the EU-wide projected output and to each Member State's projected output for the sector. Where existing plants already met the efficiency goal, there would be no reduction in projected output. Then the desired EU aggregate CO₂ emission level for the sector would be divided by the adjusted output projections for the sector to arrive at a target emission rate in carbon per unit of output. Each Member State's allocation for that sector would then be derived by multiplying its adjusted output projection times this new emission rate.

For example, in the utility sector, the energy efficiency improvement would be applied to projected kilowatt-hour levels for 2008 – 12 to establish an adjusted desired load for the period. Then the aggregate tonnage set aside for the electricity sector (say, 15 percent below 1990 levels) would be divided by the new projected level of kilowatt-hours for the 2008-12 period to establish a Community-wide target rate per

kilowatt-hour. This rate would then be applied to the new, energy efficiency corrected kilowatt-hours projection for each Member State in the commitment period to establish its cap. As an additional refinement, this approach could be limited to fossil fueled sources by removing projected kilowatt-hours from zero emitting sources from the divisor. This would avoid allocating assigned amounts to plants with zero emissions such as renewables and nuclear, since these plants will have no liability under the trading system.

This approach would have the advantage of taking into account the fuel mix in the affected sectors of each Member State and not requiring one-size-fits-all percentage reductions as the basis for setting targets. It would, however, face difficulties in establishing carbon per unit of output in industrial sectors as products vary in their energy intensity, particularly in a sector like chemicals.