LE DÉFI EUROPÉEN

ISSUES IN THE IMPLEMENTATION OF GREENHOUSE GAS EMISSIONS TRADING IN EUROPE

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Ironically, emissions trading proposals to implement the Kyoto Protocol are being proposed in Europe, not among the nations usually associated with such measures. This article identifies and discusses very briefly the main issues that will have to be considered in adopting a national system of CO_2 emissions trading. These issues are: allocation of permits and monitoring, penalties and liability for non-compliance, comprehensiveness of the emissions cap, integration with renewable energy certificates, integration of sinks and other gases with carbon trading, and cost caps and escape valves. Assuming the current proposals are adopted, Europe bids fair to become the test-bed in which the rules of an eventual international system will be developed in a process not unlike that characterizing the development of the European Union. The European challenge is then both inward, to Europe, to go beyond proposals and to resolve the issues identified here, and outward, to other nations, to take similar steps in matching deed with advocacy.

I. — INTRODUCTION

Fate has imparted a subtle irony to the post-Kyoto scene. Europe, widely perceived to be opposed to the flexibility associated with emissions trading, is in fact proceeding to establish emissions trading systems to implement, at least partially, the limits negotiated in the Kyoto Protocol. Meanwhile, the nations of the Umbrella Group, all staunch advocates of emissions trading as an integral part of the Kyoto Protocol, have yet (with the exception of Norway) to advance comparable proposals. Proposals are not action, of course; but, if one believes that eventually greenhouse gases (GHGs) will be limited on a global scale through emissions trading, Europe could provide the all-important experience that will define the future global system.

This paper identifies and discusses briefly the principal issues that arise in the adoption of domestic emissions trading schemes, with due note of how these issues are treated in the several European proposals to establish emissions trading schemes. Such proposals are being considered in the United Kingdom, Norway, Denmark, France, Sweden, and Germany; and the

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European Commission's *Green Paper on greenhouse gas emissions trading within the European Union* envisions emissions trading on a European scale (2). Notwithstanding the ambition of the EC *Green Paper*, the point of view adopted here is resolutely national because credible national systems constitute the foundation upon which any larger emissions trading system will be built, whether on a European or global scale.

II. — ALLOCATING PERMITS AND MONITORING OF EMISSIONS

Any allowance-based emissions trading system (3) presumes an allocation of permits and some method of measuring emissions to determine compliance. At the international level, the Kyoto Protocol accomplished an initial allocation of permits for the years 2008-12 to all but a few Annex I signatories of the Framework Convention on Climate Change. If emissions trading is to occur below the state level, then « assigned annual amounts », AAUs, will have to be « downloaded » to corporations and other legal entities and some method for measuring emissions and tracking allowance transfers will need to be devised at the national level.

Allocation of permits to firms is one of the more difficult issues to be dealt with in implementing a cap-and-trade system (Ellerman, 1998). Essentially, the decision concerns the assignment of the newly limited use of the atmospheric sink and the associated scarcity rent. The two basic alternatives are either to auction the permits or to « grandfather » them, that is, to grant them without payment to existing emitters based on some principle, usually historical use. The former is often advocated in conjunction with recycling the revenue to achieve some form of « double dividend ». This argument was critical for the narrow majority of the Norwegian Quota Commission recommending that permits be auctioned. Nevertheless, grandfathering is the more common alternative, despite the heated rhetoric about « rights to pollute » (4). The reason is the practical necessity of gaining the consent of existing emitters to the restrictions being proposed. Moreover, when the alternative is some regulatory standard, such as a technology mandate or emission rate standard, emitters are endowed with the same rights, also without charge. The only difference is that the right is embedded less transparently in the standard instead of so explicitly in the allowance. Allocating these rights, whether by allowance or regulatory standard, is preeminently a political decision invoking fundamental issues of equity concerning who has the right to the use of the newly limited resource.

Monitoring is a less contentious issue, but it presents its own difficulties, mainly concerning whether monitoring would occur « upstream » or « downstream ». Most trading proposals anticipate that monitoring would occur downstream at the source of emissions, either by measuring stack exhaust, as in the U.S. SO_2 system (5) or by measuring the carbon content of the fuel used at the emitting source, as envisaged in several of the European proposals. Downstream monitoring works for large industrial facilities, but it would be prohibitively expensive, at least with current technology, for vehicles and homes, which typically constitute at least half of CO_2 emissions. This circumstance leads to proposals for upstream monitoring of carbon content at refineries, natural gas transport hubs, and points of sale for carbon-based fuels (Environmental Law Institute, 1997).

The decision on the point of monitoring is sometimes further complicated by two mistaken beliefs. The first is that permits would be allocated to the entities owning the facilities where monitoring is performed. Such was done in the U.S. SO_2 emissions trading program, but there is no necessary requirement to do so. For instance, proposals to auction permits clearly do not contemplate doing so. The second mistaken belief is that if permits were allocated to an upstream point of monitoring, no incentive to reduce emissions would exist at the point of emissions. Again, as would be the case with auctioning, the cost of the permit, however obtained (including grandfathered permits, which have an opportunity cost), would be passed on to consumers, in the same manner as the cost for any other essential input into the production process.

III. — PENALTIES AND LIABILITY FOR NON-COMPLIANCE

A tradable permit system with a « hard » cap requires that the penalty for not surrendering a permit be relatively high and that the imposition of the penalty be credible and

(2) These proposals are presented in the following documents listed as references to this paper: Denmark (1999), European Commission (2000), MIES-Industry Working Group (2000), Norway (2000), Sweden (2000), U.K. Emissions Trading Group (2000). Hassellknippe and Hoibye (2000) also provide an overview of European emissions trading proposals.

(3) A distinction must be made between allowance-based emissions trading (also called « cap and trade ») and credit-based emissions trading. Allowances are tradable permits to emit and compliance in such a system consists of surrendering an allowance for every ton of emissions. Credits are tradable permits created by and used for deviations from a specified emissions standard. Compliance in such a system consists primarily of meeting the standard but also of having enough credits to cover any exceedence of the standard. As noted in Tietenberg et al. (1999), allowance-based trading has been more successful than credit-based trading.

(4) For example, « Cela revient à parler d'achats de droits à polluer, c'est cela la réalité cynique et brutale ». Mme. Voynet, French Minister of the Environment, Le Monde, *January 21, 2000.*

(5) Occasional reference will be made here, as it is elsewhere, to the U.S. SO_2 emissions trading program, which provides a propitious (and only) large-scale example of how tradable permits can be used to limit emissions. For a complete discussion see Ellerman et al., 2000.

non-discretionary. Since affected parties will choose to pay a penalty when the marginal cost of abatement is still higher, low penalties characterize systems with « soft » caps. Usually, penalties in hard cap systems are several times the expected market price (6). For instance, in the U.S. SO_2 allowance trading system, the penalty was set at $2000 per ton in 1995 and escalated with inflation thereafter, well above even the highest estimates at that time of what the marginal cost of meeting the cap would be and many multiples of observed prices, which have ranged from $70 to $210 per short ton. With the exception of the Danish and French systems, all the European systems proposed anticipate high penalties and « hard » caps.

The credibility of the penalty is relatively easy to achieve for sovereign nations implementing a domestic tradable permit system; however, an analogous penalty is hard to imagine on the international level. This circumstance creates another problem, usually described as « over-selling », which will have to be addressed by any domestic GHG trading scheme that anticipates trading with other countries or integration into a prospective global system.

Over-selling is the sale of more permits than a party has excess to its own need to cover emissions in the relevant compliance period. To cite a commonly used example, suppose Russia had been given 1000 permits and that as a result of either honest miscalculation or roguish behavior, it has sold permits so that at the end of the period it has only 600 permits to cover 700 tons of emissions. The over-all compliance problem is obvious, but the more practical problem is whether the 400 permits purchased in good faith by various buyers and being submitted for compliance are valid, and if not, which permits are not valid. Where sanctioning by a sovereign authority is possible, « seller liability » is the commercial norm. If such were the case, Russia would be fined for being short 100 permits, have its quota for the next period reduced by like amount, and the 400 permits held by buyers would be deemed valid. In the absence of credible international sanctioning, « buyer liability » is proposed. A buyer liability rule might hold that one-quarter of each Russian permit sold to and used by others for compliance would be deemed invalid so that the buyers of those permits would be subject to penalty in such amount. Such liability imposes consequences that would lead buyers to discount permits of questionable validity in the same manner that lenders discount the debt of poor credit risks.

Although seller liability can be presumed to apply for any domestic system with a hard cap, the liability problem cannot be avoided if the domestic system is to be integrated with international trading. If Volvo submits a Russian permit (or a German one for that matter), and it is determined that the issuing country is out of compliance with the Kyoto Protocol, is Volvo also out of compliance in the Swedish system, and if so, by how much? Resolution of the issues of buyer or seller liability at the international level will simplify the problem for individual countries, but not remove it altogether since the individual country will still have to decide whether to accept the international rule and how it would be applied in the domestic system (7).

IV.— COMPREHENSIVENESS OF THE EMISSIONS CAP

With the notable exception of Norway, the proposed European tradable permit systems are not comprehensive in the sense of covering all of the country's carbon or GHG emissions. For most of them, emissions trading is only one of several policies and measures undertaken to achieve climate policy goals, usually the one to be applied to large industrial sources. In principle, several instruments can achieve the target as surely, and perhaps as cheaply, as a single instrument, but distinct problems are created by the choice of partial caps when the Kyoto cap is comprehensive (Hahn and Stavins, 1999).

The most obvious one is assuring that the joint effect of the several instruments is adequate to achieve the Kyoto limit. A partial cap may impose an appropriate share of the national burden on the sectors to which it applies, but there is little reason to believe that the other instruments, whether taxes or regulatory standards, will be chosen to meet the target exactly. Almost surely, they will prove to be either too little or too much, and lead to non-compliance or to unnecessary cost. The former case invokes the liability issue just discussed. If Norwegian entities acquire UK AAUs through the UK Emissions Trading Scheme, would they be valid if the UK's measures in non-capped sectors were to prove inadequate and even though the traded permit represents a reduction of emissions in the capped sector? Governments employing sectoral caps could avoid invalidation of their exported permits by entering the domestic or international permit market to compensate for any deficit due to the inadequacy of the instruments used in the non-capped sectors, but such action assumes governments have the financial means and the will to do so.

The use of multiple instruments also poses a problem of equity that is similar to that incurred in allocating permits. Capped and uncapped sectors will each carry some share of the burden, and determining what is

(6) Typically, any entity in non-compliance will also be required to have a like number of permits taken away from a succeeding allocation to ensure environmental integrity.

(7) Nordhaus et al. (2000) provide an evaluation of the current options under consideration at the international level.

equitable is no less political than the allocation of allowances within the capped sector. The difference lies in the ability of participants facing relatively high marginal costs of abatement to reduce costs. A permit market allows high cost firms to mitigate the costs they would bear with the same permit allocation and no ability to trade. Firms in the uncapped, non-trading sectors will also face differing marginal costs, and the relatively high cost firms will be without means to mitigate these costs other than by some exception to the standard.

This ability to equalize marginal cost is one of the principal reasons that partial cap-and-trade systems are proposed in Europe for large, energy-intensive industries that trade goods within Europe. Even a uniform regulatory standard will create differing marginal costs with consequent advantage and disadvantage in subsequent trade depending on the incidence of abatement costs. Allocating allowances also creates inequities, which will likely invoke questions of state aid, but at least the subsequent exchange of allowances equalizes marginal costs of abatement and limits the difference in treatment among firms to the effects of the lump-sum transfer implicit in the allowance allocation.

A closely related problem is the arbitrage between sectors created by the inefficiency arising from the use of instruments with differing marginal effect. A less stringent tax or regulation in the uncapped sectors may induce domestic leakage from the capped to the uncapped sector, which would make compliance that much more difficult. However, if the cap were to impose lower marginal costs than the other instruments, leakage would flow the other way, raising permit prices but also making compliance more likely. In either case, the arbitrage brings marginal costs closer together.

Finally, when trade in permits occurs, interacting instruments create another form of arbitrage that often raises objection. The common example is a capped sector that also pays an energy or carbon tax. For any given cap and level of activity, the domestic permit clearing price will be lower if the capped sector is taxed than if it is not. With such a tax and international permit trade, the country will either export more permits or import fewer with consequent effects on the international price of permits. By taxing the capped domestic sector, the government makes it cheaper for other nations to meet their obligations.

V.— INTEGRATION OF EMISSIONS TRADING WITH RENEWABLE ENERGY CERTIFICATES

A similar interaction occurs when GHG emissions trading co-exists with renewable energy certificate (REC) trading. In an REC trading system, owners of qualifying renewable energy generating units receive certificates that are required of all electricity distributors in some fixed percentage of electricity sales. Distributors of electricity purchase electricity and renewable energy certificates in separate markets, and generators of electricity from renewable sources are remunerated by the sale of electricity and of certificates into these two markets. A REC trading system is similar to emissions trading in that it creates a market for the renewable attribute of generation that is separate from the cost of electricity, in the same manner as allowance-based emissions trading creates a market for abatement that is separate from the market for the good being produced.

When a carbon permit market and a REC market co-exist, the interaction of the two may pose a problem. A positive price for carbon will support some amount of renewable energy generation, but usually not as much as the ten to twenty percent share typically proposed for REC systems. When the REC requirement is greater than the amount of renewable energy that would be provided with the carbon cap alone, the price of permits in the carbon market will be lower than it would be with the REC requirement, and less carbon abatement will occur in other parts of the capped sector. Some observers may object to this interaction, but the objection is properly aimed at the quantitative target for carbon emissions, which logically implies less emission reduction in one place when there is more reduction in another place, even if there is no emissions trading. When trading exists for both requirements, the separate markets ensure that the two presumably independent objectives are met at least cost, and the interaction means that the price in each market is conditioned on the other.

The problem arises from the frequent justification for renewable energy generation: that it is carbon-free. If renewable energy is advocated only for its carbon-free attribute, implementation of a comprehensive, tight carbon cap removes the need for a separate renewable mandate. Nevertheless, when a renewable mandate is already in place, owners of renewable energy assets, vendors of the same, and advocates of small scale, distributed generation systems are unlikely to accept a reduction in renewable energy generation, and they can be expected to argue for some supplementary renewable requirement, such as a REC system, that would sustain the existing level of renewable generation and perhaps increase it. And, they are likely to argue that the compensating reduction in carbon abatement elsewhere ought not to be allowed. Opening the domestic carbon market to international trade will have similar effects to what occurs when permits and taxes coexist. The lower domestic carbon price resulting from a more binding REC requirement will lead either to more export or less import of carbon permits with consequent reduction in the international carbon price and abatement effort elsewhere.

VI. — INTEGRATION OF SINKS AND OTHER GASES INTO A CARBON TRADING SYSTEM

The Kyoto Protocol embraces possibilities other than CO_2 abatement for influencing the radiative forcing that causes climate change. The inclusion of non-CO_2 GHGs and carbon sinks among abatement options promises significant economic advantages (Reilly et *al.*, 1999), but serious questions can be raised concerning the practicality of doing so, at least in the First Commitment Period. The most serious questions concern data. Knowledge of the stocks and flows of these other gases and of sinks, and the ability to measure and monitor them, is much less than for carbon dioxide. These problems lead naturally to emissions trading proposals, such as those from the EU, UK, Sweden, and France, which start with CO_2 and then expand to include the other gases and sinks as appropriate measuring and monitoring procedures are developed.

The expectation that these problems will be solved is understandable since some agreement on procedures is implicit in the presumption that compliance with the Kyoto Protocol will be determined based on all the listed GHGs and at least some carbon sinks. Unfortunately, progress in addressing these issues is likely to be slow and controversial, in part because the combination of overly ambitious targets and data imprecision invite creative accounting. Although sinks have received the most attention, problems of measurement and monitoring are not limited to them. Credible monitoring the abatement of methane emissions from ruminant flatulence (through changes in diet) or from rice paddy cultivation (from changed agricultural practices) offer similar challenges and potential for creative accounting.

Whatever the degree of international agreement on these procedures, individual nations undertaking serious efforts to limit GHG emissions will still have to grapple with these problems. International agreement would greatly simplify the task, but agreement may not be reached or it may not be acceptable to the country. More generally, nations establishing an emissions trading system that is to be integrated with a global permit market will always have to consider whether to recognize permits from other countries that, in the absence of international agreement or in defiance thereof, adopt liberal definitions that create what may be seen as a new form of « hot air ».

VII. — COST CAPS AND ESCAPE VALVES

An occasional feature of the emissions trading systems being proposed in Europe is a relatively low penalty for exceeding the cap, at least when compared to most estimates of the likely cost of meeting the Kyoto targets. The Danish electric utility CO_2 trading program provides a good example and the reasoning behind it. The Danish penalty, 40 DKK/ton CO_2 ((US$ 22/ton C) is low compared not only to estimates of the marginal cost of meeting the Kyoto targets for Denmark, but also to penalties proposed elsewhere in Europe. The reason for the low penalty is that Denmark's most carbon intensive activity, coal-fired generation of electricity, is also its most variable because of the tight integration of the Nordic electricity grid and the high variability of the hydroelectric generation upon which Norway and Sweden are both heavily dependent. Since annual variations in rainfall could create very high prices in dry years, the Danish penalty effectively truncates the high price variation by providing an escape valve that caps the price at 40 DKK per ton of CO_2, albeit at the potential expense of the quantity target in those years. More generally, the argument is made that a hard emission cap would limit economic growth or otherwise impose unacceptable costs and that an escape value would reduce these effects. A proposal along these lines has been advanced for the U.S. by Resources for the Future, a think tank in Washington DC (see Kopp et *al.*, (1997) and Pizer (1998)).

Countries adopting escape valve features will find that international trading will become problematic. So long as the global market-clearing price is lower than the capped price, there is no problem. Permits will be imported until the domestic and world prices are equal, and the price cap will not be invoked. However, if the international market-clearing price is higher than the capped price, the situation is very different. Foreign buyers would buy permits and the price cap would be invoked to the benefit of the Treasury of the country maintaining the low penalty. As noted by Pizer (1999), this instrument will necessitate either harmonized penalties across countries or some restriction on permit trades with low penalty countries. In the European context, penalties for non-compliance will be properly one of the main issues for harmonization (8).

An emissions trading system with an escape valve can be seen as a carbon tax system with tradable, grandfathered exemptions. The exempted emissions are grandfathered to existing facilities as surely as they are in an allowance-based system and trading simply reallocates these exemptions. The escape valve price is effectively the penalty for exceeding the allocation of grandfathered permits. Equally, any penalty in a tradable permits system can be seen as an escape valve price. If the penalty is high relative to the expected market-clearing price, escape is not attractive

(8) See Viguier (2000) for a discussion of harmonization that draws a helpful analogy with trade in other goods and services.

and the cap is hard. When the penalty is low, escape is attractive and the cap is soft unless other sanctions are invoked.

VIII. — CONCLUDING COMMENT

In the preceding discussion of issues to be dealt with in establishing a domestic emissions trading system, one note recurs: Opening the domestic permit market to international trade complicates matters. Yet, hermetically sealed trading systems seem especially unlikely among the nations of the European Community. The European proposals and the EC *Green Paper* command attention not because of their contribution to near-term emissions reduction, which is likely to be small, but because of their potential for elaborating the rules for GHG emissions trading among larger sets of sovereign nations. For if GHG emission restriction becomes a shared international goal, emissions trading will play a dominant role, and the rules developed in Europe will establish a precedent that will be hard for others to ignore.

It would be nice if an international system of emissions trading could emerge as a result of an over-arching international agreement to which all nations subscribe. But such systems are rarely, if ever, created by universal accord; rather they evolve and grow in response to moral example and practical incentive. Emissions trading has the great advantage of coupling these two forces. The moral example lies in accepting a limit on GHG emissions and the practical incentive comes from the difference in marginal costs of abatement among nations, whether all countries adopt caps of similar stringency or not. The imposition of the cap creates domestic value and a concomitant demand for emission reduction that, in the case of GHGs, can be satisfied as well abroad as at home. The potential for reciprocal benefit leads naturally to international trade, as it does with other goods and services. Other measures to achieve the same limit on emissions, such as taxes or conventional regulatory measures, provide the same moral example, but no inducement for others to follow.

The closest analogy to the evolution of a global emissions trading system is found in Europe. What was initially a limited agreement concerning iron and steel became a Common Market of six, and is now a Community of fifteen that will surely grow. Here, the moral vision of a Europe delivered from internecine strife was always coupled with the practical benefits of larger markets and greater scale. In all such systems, whether some yet-to-be-defined European entity or an even less defined global system of allocating and trading GHG emission rights, a single or small number of countries take the lead and they evolve a set of rules and procedures through negotiation, example, and shared vision. As further illustrated by the European Currency Unit, not all parties must be aboard initially. Over time, followers join in response to self-interest, persuasion, or late-developing commitment. The European challenge is then both inward to the nations of Europe, to go beyond proposals and to provide the example and rules that will define the eventual international system and outward to other nations, to join in the common endeavor by matching deed with word ■

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