Order Code RL30285

Global Climate Change: Lowering Cost Estimates through Emissions Trading — Some Dynamics and Pitfalls

August 20, 1999

(name redacted)
Specialist in Energy and Environmental Policy
Resources, Science, and Industry

ABSTRACT

With the negotiation of the Kyoto Protocol, international emissions trading has become the centerpiece of efforts to minimize costs of reducing greenhouse gas emissions. A review of existing cost analyses of U.S. compliance with the Kyoto Protocol indicates consensus that the potential for international emission trading to reduce compliance cost is substantial and indisputable. However, this report also indicates that potential for turning that potential into fact is problematic and that other alternatives may deserve a hearing. Further information on global climate change is available from the CRS Electronic Briefing Book at http://www.congress.gov/brbk/html/ebgcc1.html. This report will be updated as circumstances warrant.

Global Climate Change: Lowering Cost Estimates through Emissions Trading — Some Dynamics and Pitfalls

Summary

A major element in the debate about global climate change has been how to minimize costs by selecting the most economically efficient strategies to reduce greenhouse gases. With the negotiation of the Kyoto Protocol, international emissions trading has become a focal point of attention. Indeed, the Administration believes that the goals of the Kyoto Protocol can not be achieved without effective emissions trading. International emissions trading is one of four "flexibility mechanisms" contained in the Kyoto Protocol (article 17).

A review of existing cost analyses of U.S. compliance with the Kyoto Protocol indicates consensus that the potential for international emission trading to reduce U.S. compliance cost under the Kyoto Protocol is substantial and indisputable. However, whether the potential for international emissions trading can be turned into fact is more problematic. This analysis suggests that implementing international emissions trading under Kyoto would represent uncharted territory for U.S. environmental policy.

First, an international emissions trading scheme has to function very efficiently to achieve the savings projected by analyses. For example, the Administration's analysis relies on an unprecedented amount of international trading to achieve the substantial cost reduction it projects. Under its most aggressive scenario, 82%-88% of the U.S. reduction requirement would be bought from foreign sources. The magnitude of transactions not only raises questions of its feasibility, but also may conflict with the intent of the Kyoto Protocol, which states that international emissions trading is to be "supplemental" to domestic actions.

Second, besides the amount of trading estimated, the sources of these reductions raise additional questions. For example, according to an analysis by Charles River Associates, half the estimated savings from international emissions trading would come either from so-called "hot air" credits that countries of the former Soviet Union have available because of their economic difficulties, or from transactions with Third World countries that are not required to participate in the program.

Third, while the U.S. acid rain emissions trading program is cited as a model for international carbon trading, in fact, unlike an international carbon trading program, the acid rain program does not have to operate particularly efficiently to achieve substantial cost savings. The simplest trades — those between a company's own plants — achieve the greatest cost savings under the acid rain program. Thus, the U.S. acid rain emissions trading program provides little guidance to any future international carbon trading program.

The complexity presented by international emissions trading suggests that alternatives may deserve a hearing.

Contents

List of Tables

Global Climate Change: Lowering Cost Estimates through Emissions Trading — Some Dynamics and Pitfalls

Overview: Importance of Emission Trading to Kyoto Compliance

United States concerns about implementing the Kyoto Protocol focus on three interlinked issues: (1) the considerable uncertainty and risk of substantial cost from carbon dioxide (CO_2) abatement; (2) the competitive impacts of compliance, both domestically and internationally; and (3) the comprehensiveness of the Protocol's scope, in particular, the exclusion of third world countries from any CO_2 reduction program.[1] These implementation concerns, along with perceived scientific uncertainty, have prevented any serious effort by the Administration to seek Senate ratification of the Kyoto Protocol.

Removal of any one of the three interlinked issues might significantly improve the prospects for approval of the Kyoto Protocol, or some other regime to control greenhouse gas emissions. For example, if the cost of Kyoto compliance could be shown to be not as burdensome as some have suggested, the competitive impact would be weakened and the concern about comprehensiveness would lessen. Such concerns, along with scientific doubt, would not be eliminated; however, they would be attenuated.

Such a task would not be easy. Estimates of costs to reduce CO_2 emissions vary greatly, and focus attention on an estimator's basic view about the problem and the future, rather than on simple, technical differences, in economic assumptions.[2] Some of these "lenses" through which people view the problem and their effects on cost analysis are summarized in Table 1. Based on these perspectives, the cost of complying with Kyoto can appear to range from "none" (or indeed, a positive benefit") to an estimate so high as to potentially bankrupt the economy. For example, the American Petroleum Institute, in summarizing the results of several studies concludes that Kyoto compliance would require "heavy taxes or high carbon permit prices" to be achieved, resulting in "sharp declines in domestic demand", "encourage

---

[1]For a analysis of U.S. policy, see Larry B. Parker and John E. Blodgett, *Global Climate Change Policy: From "No Regrets" to S. Res. 98*, CRS Report RL30024, January 12, 1999. For a summary of the Kyoto Protocol, see (name redacted), *Global Climate Change Treaty: The Kyoto Protocol*, CRS Report 98-2 ENR, updated June 23, 1999.

[2]For a further discussion, see: (name redacted) and (name redacted), *Global Climate Change: Three Policy Perspectives*, CRS Report 98-738, August 31, 1998. It identifies three "lenses" through which people can view the global climate change issue, and their influence on cost analysis.

imports and reduce exports," and a "significant loss of jobs" in energy related industries.[3] In contrast, a study by a coalition of public interest groups concludes that new energy policies can "cut energy costs, increase employment, and protect the environment." Such a path is seen as reducing energy costs by $530 a household while exceeding the reduction requirements of Kyoto.[4] None of the perspectives on which these analysis are based is inherently more "right" or "correct" than another; rather, they overlap and to varying degrees complement and conflict with each other. People hold to each of the lenses to some degree. The uncertainties about the risk of global climate change and the critical impacts of differing assumptions about the nature of the problem effectively preclude predictions of the ultimate costs of reducing greenhouse gases.

As a result, attention has focused on how to minimize costs by selecting the most economically efficient strategies to reduce CO_2 emissions. With the negotiation of the Kyoto Protocol, the mechanism that has become the centerpiece of this attention is emissions trading. Indeed, Janet Yellen, Chair of the President Council of Economic Advisors has stated that the "promise of Kyoto can not be achieved without effective emissions trading."[5]

Emissions trading is one of four "flexibility mechanisms contained in the Kyoto Protocol (article 17).[6] Under the Kyoto Protocol, developed countries are given greenhouse gas emissions "budgets" for the compliance period 2008-2012 based on a percentage of their 1990 or 1995 emissions levels (depending on the particular greenhouse gas). If a country determined that it would exceed its emissions limit during the compliance period, emissions trading would permit it to purchase emissions reductions (i.e., "credits"[7]) from another country that determined it would have achieved more emissions reductions than necessary to comply. With emissions trading, countries that can make relatively inexpensive emissions reductions have an incentive to reduce emissions below the level required by the Kyoto Protocol, and sell the extra credits to other countries whose emissions control costs are more

---

[3]Rayola Dougher, *The Impact of the Kyoto Protocol on Allied Industry Output, Employment, and Trade*, American Petroleum Institute, 1999. For a rebuttal of the type of studies on which the API conclusions are based, see Howard Geller, "On Impacts of the Kyoto Protocol on U.S. Energy Markets and Economic Activity." Testimony before the House Science Committee, October 9, 1998.

[4]Alliance to Save Energy, American Council for an Energy-Efficient Economy, Natural Resources Defense Council, Tellus Institute, and Union of Concerned Scientists, *Energy Innovations: A Prosperous Path to a Clean Environment*, Tellus Institute, June 1997. For a rebuttal of the type of studies on which these conclusions are based, see Ronald J. Sutherland, *The Feasibility of "No Cost" Efforts to Reduce Carbon Emissions in the U.S.*, American Petroleum Institute, Issue Analysis #106, May 1999.

[5]Statement of Janet Yellen, Chair, President's Council of Economic Advisers, House Committee on Commerce, Subcommittee on Energy and Power, March 4, 1998.

[6] The other mechanisms are Bubbles (Article 4), Joint Implementation (Article 6), and the Clean Development Mechanism (Article 12).

[7]A credit would generally represent the reduction of one metric ton of carbon equivalent emissions.

Table 1: Climate Change Perspectives and Policy Parameters

Approach	Seriousness of Problem	Risk in developing mitigation program	Costs
Technology	Is agnostic on the merits of the problem. The focus is on developing new technology that can be justified from multiple criteria, including economic, environmental and social perspectives.	Believes any reduction program should be designed to maximize opportunities for new technology. Risk lies in not developing technology by the appropriate time. Focus on research, development, and demonstration; and on removing barriers to commercialization of new technology.	Viewed from the bottom-up. Tends to see significant energy inefficiencies in the current economic system that currently (or projected) available technologies can eliminate at little or no overall cost to the economy.
Economic	Understands issue in terms of quantifiable cost-benefit analysis. Generally assumes the status quo is the baseline from which costs and benefits are measured. Unquantifiable uncertainty tends to be ignored.	Believes that economic costs should be examined against economic benefits in determining any specific reduction program. Risk lies in imposing costs in excess of benefits. Any chosen reduction goal should be implemented through economic measures such as tradeable permits or emission taxes.	Viewed from the top-down. Tends to see a gradual improvement in energy efficiency in the economy, but significant costs (quantified in terms of GDP loss) resulting from global climate change control programs. Typical loss estimates range from 1-2% of GDP.
Ecological	Issue understood in terms of potential threat to basic values, including ecological viability and the well-being of future generations. Values reflect ecological and ethical considerations; attempts to convert them into commodities to be bought and sold seen as trivializing the issue.	Rather than economic costs and benefits or technological opportunity, effective protection of the planet's ecosystems should be the primary criteria in determining the specifics of any reduction program. Focus of program should be on altering values and broadening consumer choices.	Views costs from an ethical perspective in terms of the ecological values that climate change threatens. Values such as intergenerational equity should not be considered commodities to be bought and sold. Costs include aesthetic and environmental values that economics cannot readily quantify and monetize.

expensive. Thus, both the seller and the buyer would have lower costs by virtue of the seller's profit and the buyer's savings.

This mechanism, however, comes with significant restrictions under the Kyoto Protocol. First, emissions trading is restricted to countries that have legally binding greenhouse gas emission limitations. Commonly called Annex 1 parties, only developed, industrialized countries are included.[8] This restriction also applies to two of the other three mechanisms — bubbles and joint implementation projects. Only the Clean Development Mechanism (CDM) can be employed for transactions between Annex 1 countries and countries without legally binding requirements — i.e., developing countries. The specifics of this mechanism are yet to be defined.

A second restriction to trading is the requirement that it "be supplemental to domestic actions for the purpose of meeting quantified emission limitations and reduction commitments..."[9] However, the Protocol is vague as to what "supplemental" means, and the term is subject to continuing negotiation.

Some parties have suggested a third restriction on trading with respect to how reductions are accomplished. Specifically, some have argued that trading be restricted to transactions where the traded carbon credits are the result of explicit controls that reduce greenhouse gases, and not because of economic downturns or other events separate from the Protocol. This issue arises as several countries of the former Soviet Union are projected to have sizeable amounts of credits available for sale because of current economic difficulties. Proponents of trading restrictions argue that such "hot air" reductions would have occurred anyway and would weaken the Protocol's targets. These concerns are heightened by the failure of Russia and seven other members of the former Soviet Union countries to comply with the Montreal Protocol[10] because of "economic difficulties" — the same difficulties that would create the hot air credits. However, the Kyoto Protocol places no restriction on the means countries may use to comply with reduction requirements; thus, this position may be difficult to sustain in negotiation.

Because trading is a central feature of costs analyses of the Kyoto Protocol, this paper analyzes some of the dynamics and pitfalls of carbon trading, based on various analyses done on U.S. compliance with the Kyoto Protocol. As the analysis conducted by the Administration has become the focus of much of the cost debate, it receives special emphasis here.

---

[8]Although called "Annex 1" countries in reference to Annex 1 of the Framework Convention on Climate Change (FCCC), the correct reference is to Annex B of the Kyoto Protocol. The lists of countries in Annex 1 and Annex B are very similar, but not identical. CRS uses the common usage term, Annex 1, in this report.

[9]Article 17, Kyoto Protocol.

[10]The Montreal Protocol is an international environmental treaty designed to protect the stratospheric ozone layer by phasing out the global production of ozone-depleting chemicals, such as chlorofluorocarbons.

Review of Analyses: the Dynamics of Trading

Several attempts have been made to estimate the cost of U.S. compliance with the terms of the Kyoto Protocol. Seventeen estimates by eight different organizations are shown in Figure 1.[11] In terms of the discussion in table 1, these estimates are the result of "top-down" analyses, although some have more aggressive assumptions about market penetration rates for new, more energy efficient technologies than others. Several "bottom-up", technology-oriented analyses of potential carbon reductions under various scenarios have been conducted. However, these analyses rely on assumed availability and penetration of various energy-efficient and low carbon technologies, not international emissions trading, to achieve their cost savings, and so are not reviewed here.[12] Indeed, a recently released "bottom-up" analysis conducted by the Tellus Institute expresses concern that the flexibility mechanisms contained in the Kyoto Protocol could threaten environmental integrity and result in misguided policies that could actually increase costs in the long term.[13]

Most analyses of the Kyoto Protocol either exclude emissions trading or limit trading to the developed countries covered by the Protocol (Annex 1 countries). The latter assumption is consistent with the intent and language of the Protocol — developing countries' participation in emission trading is restricted to a "Clean Development Mechanism," the parameters of which are yet to be sorted out.[14] Only three estimates incorporated a global trading scenario. Despite the wide range of estimates plotted in Figure 1 for each trading scenario, the differences between the three trading scenarios strongly suggest that emission trading would significantly

---

[11]The organizations are the Energy Information Administration (EIA), WEFA, Inc., Charles River Associates (CRA), Pacific Northwest National Laboratory (PNNL), Massachusetts Institute of Technology (MIT), Electric Power Research Institute (EPRI), Data Resources Institute (DRI), and the Clinton Administration. A summary of the first seven analyses can be found in Energy Information Administration, *Impacts of the Kyoto Protocol on U.S. Energy Markets and Economic Activity*, prepared for the U.S. House, Committee on Science, U.S. Govt. Print. Office, SR/OIAF/98-03, October 1998, pp. 137-151. Additional scenarios from the CRA analysis are available in Paul M, Bernstein and W. David Montgomery, *How Much Could Kyoto Really Cost? A Reconstruction and Reconciliation of Administration Estimates*, prepared for the American Petroleum Institute, 1998. The Administration's analysis is contained in *The Kyoto Protocol and the President's Policies to Address Climate Change: Administration Economic Analysis*, July 1998.

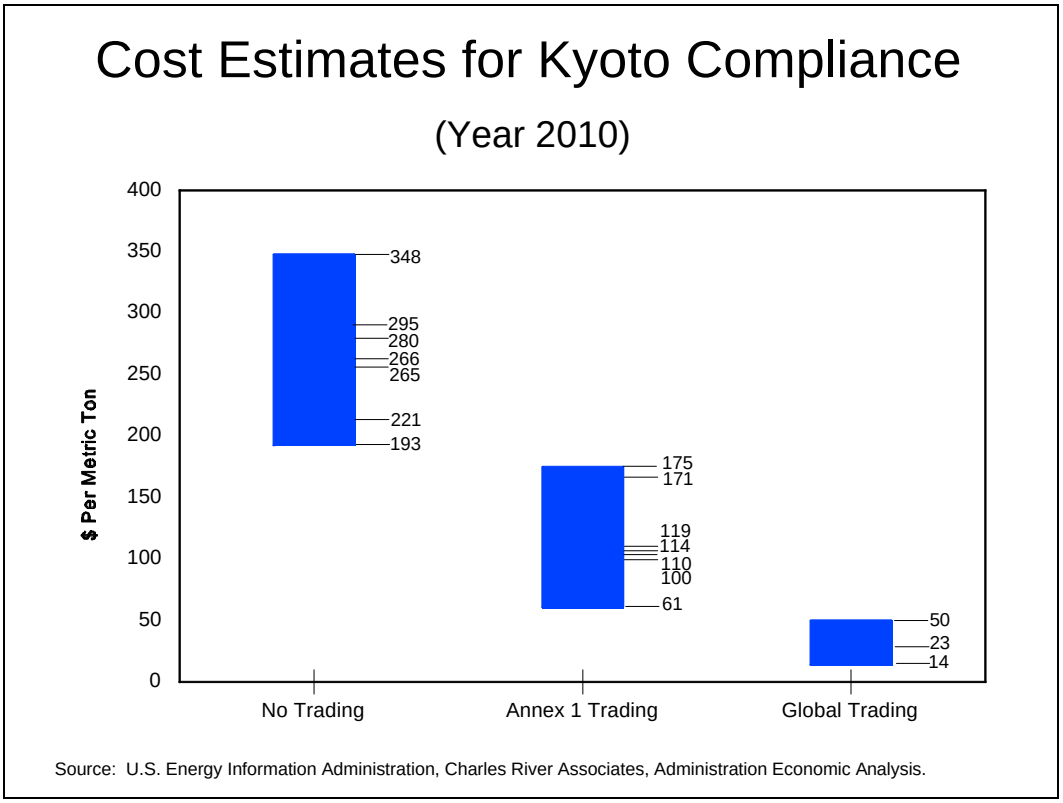
[12]Indeed, the best known of these studies, the "Five-Lab Study," used carbon taxes of $25 and $50 a ton in developing its scenarios. It should also be noted that the "Five-Lab Study examined technology-oriented strategies to achieve stabilization of U.S. carbon emissions at 1990 levels — not the 7% below 1990 levels required under Kyoto. See: Interlaboratory Working Group on Energy-Efficient and Low-Carbon Technologies, *Scenarios of U.S. Carbon Reductions: Potential Impacts of Energy-Efficient and Low Carbon Technologies by 2010 and Beyond*, September 1997. For a critique of the analysis, see: Energy Information Administration, *Impacts of Kyoto Protocol on U.S. Energy Markets and Economic Activity*, prepared for the House Committee on Science, October 1998, pp. 146-151.

[13]Tellus Institute, *America's Global Warming Solution*, a study prepared for the World Wildlife Fund and Energy Foundation, August 1999, pp. 18-20.

[14]The EPRI analysis included above includes some participation in the CDM.

reduce the projected costs of U.S. compliance with the Kyoto Protocol. The "promise" of international emissions trading appears to be indisputable, based on existing analyses.

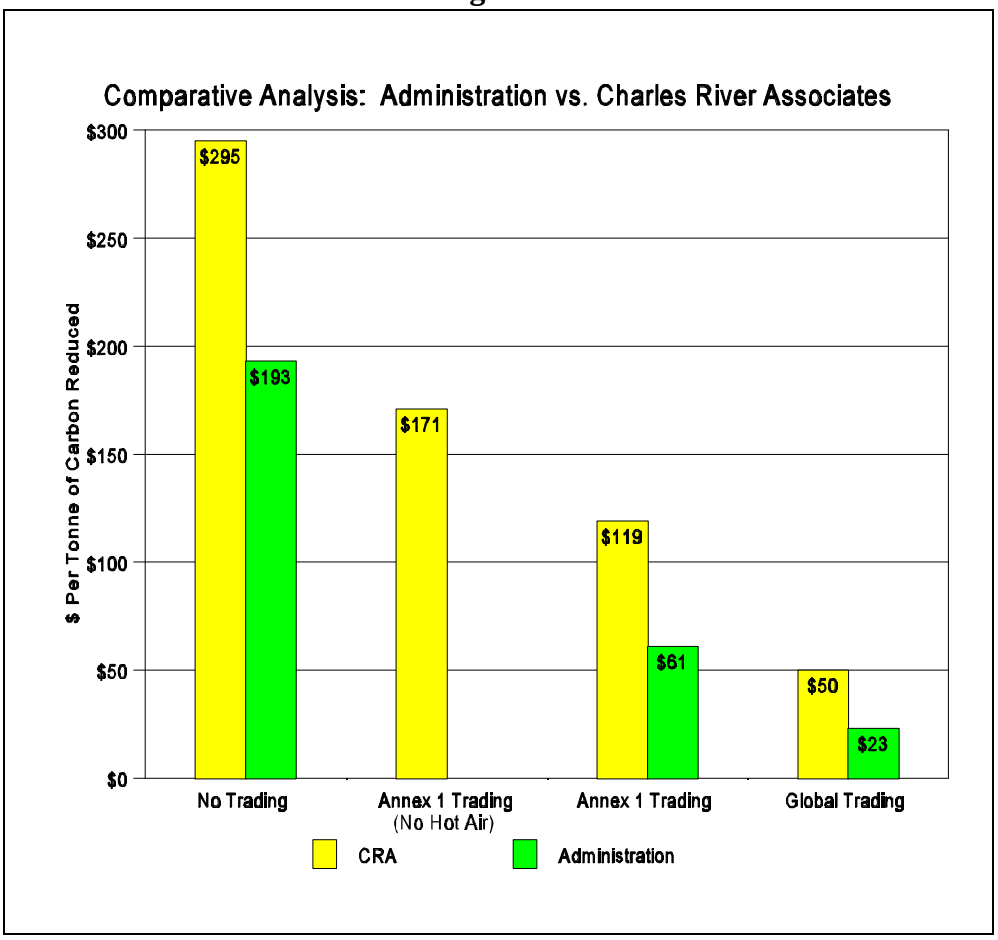
Figure 1



To examine this a little further, two organizations conducted cost analyses for three different trading scenarios. Those estimates, calculated by the Administration and by Charles River Associates (CRA) are provided in Figure 2. As indicated, moving from a no trading posture to an Annex 1 trading posture lowered the cost estimates by 60% (CRA) to 68% (Administration). According to these analyses, if the Kyoto Protocol permitted full global trading, the costs would be lowered by 83% (CRA) to 88% (Administration). These analyses agree on the potential cost reductions presented by emissions trading; a potential that increases as the pool of potential participants increase. This agreement on trading's effect on costs is evident despite the significant disagreement on what the actual compliance costs under the Kyoto Protocol might be.[15]

[15]The difference in costs between the Administration's and CRA's analyses is primarily the result of two factors. First, the Administration assumes a higher energy efficiency improvement rate than CRA. Second, the Administration assumes a higher elasticity of substitution between coal and natural gas. These more aggressive assumptions by the Administration are consistent with its "technological view" of Kyoto implementation. For more on that view, see Table 1.

Figure 2



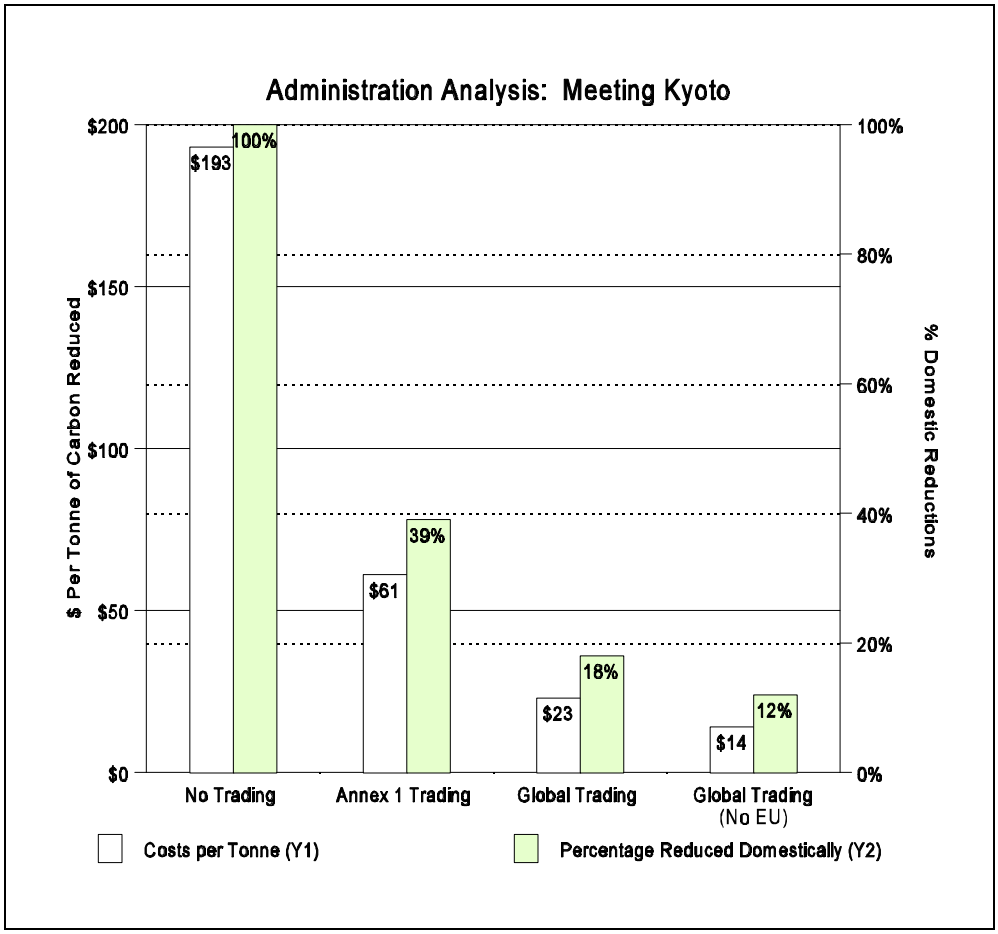
Another important dynamic with respect to trading illustrated in figure 2 is the importance of "hot air" credits to reducing costs. As noted earlier, "hot air" credits is a rather pejorative term used to describe a potentially large pool of CO_2 credits available from the former Soviet Union. This pool of perhaps 200 million metric tons of carbon, according to DOE estimates, results from the substantial reduction in economic activity in the former Soviet Union since 1990 (the baseyear for the Kyoto Protocol). If these credits are dumped on the market during the five-year compliance period (2008-2012), credit prices would be depressed, reducing compliance costs as indicated in the CRA analysis. Likewise, without the availability of these credits, the cost of U.S. compliance under Kyoto could be substantially higher.

This substantial cost savings projected under the CRA analysis illustrates why the Administration opposes any restriction on hot air credits. An increase in the available pool of credit for sale would tend to reduce the price of credits in the trading market. For a country like the United States, which is projected to be very active in the trading market, lower credit prices would translate into lower compliance costs, all else being equal.

Indeed, the lower cost estimates of the Administration's analysis is partially the result of a trading system that is assumed to be very free and unconstrained. In

essence, the Administration assumes the trading system will work very well indeed. Just how well is indicated by Figure 3. In order to gain the 68% cost reduction from emission trading between Annex 1 countries discussed above, 61% of the necessary carbon credits must be bought from other Annex 1 countries. In order to gain the 88% reductions in costs from global trading, 82% of the necessary carbon credits must be bought from other countries. In a maximum trading scenario developed by the Administration, up to 88% of carbon credits would be purchased from other countries.

Figure 3



This scale of potential trading may put any resulting U.S. implementation strategy in conflict with restrictions contained in the Kyoto Protocol, and with the negotiating position of other parties to the Protocol. As noted earlier, according to the Protocol, international emissions trading is to be a "supplemental" implementation tool to domestic efforts. According to the latest European Union position, supplemental means no more than 50%. If the European standard was adopted in negotiation, the estimated savings from trading would be substantially reduced.

Two conclusions emerge from this review. First, there is little debate among the analyses that emission trading could reduce U.S. compliance cost under Kyoto. Indeed, the percentage reductions resulting from increased trading do not differ

greatly. Rather, the dispute is over how well such a program would work. Second, it is the assumption of the Administration's analysis that trading will work extremely well, resulting in substantially lower costs for the United States. This possibility may be difficult to achieve given restrictions contained within the Kyoto Protocol, the negotiating position of some of the other parties, and the sources from which many of the credits are projected to come. Moreover, current efforts to devise a workable trading system suggest that it will be a difficult and lengthy process, at best.

Implementation Pitfalls: Comparison with Acid Rain

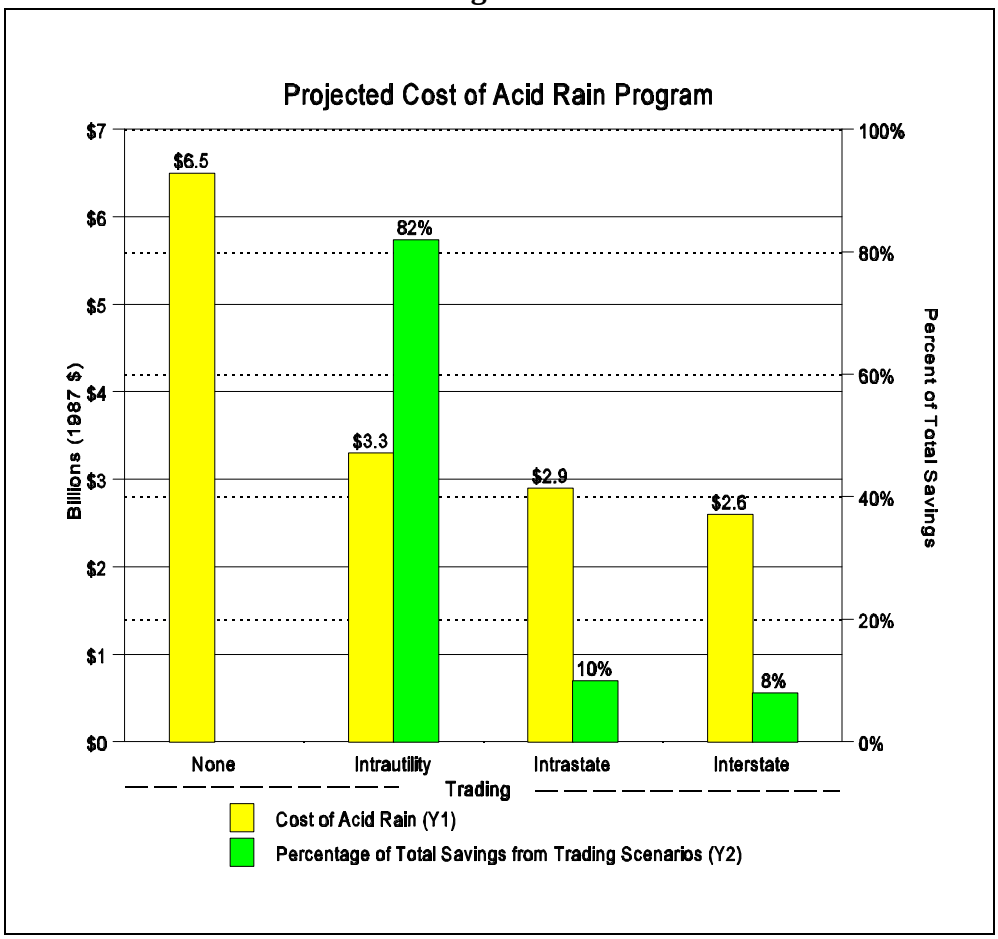
The importance of trading to cost estimates, and the scope to which it is employed by the Administration in its analysis has no direct parallel in any existing environmental program. The closest example of such a trading program is the acid rain program under title IV of the 1990 Clean Air Act Amendments. However, significant differences between acid rain and possible global warming limit the usefulness of title IV as an analogy for an international carbon trading system. For example, the acid rain program involves up to 3,000 new and existing electric generating facilities that contribute two-thirds of the country's sulfur dioxide (SO_2) and one-third of its nitrogen oxide (NOx) emissions (the two primary precursors of acid rain). This concentration of sources makes the logistics of emissions trading manageable and enforceable. However, CO_2 emissions are not so concentrated. Although over 95% of the CO_2 generated comes from fossil fuel combustion, only about 33% comes from electricity generation. Transportation accounts for about 33%, direct residential and commercial use about 12%, and direct industrial use about 20%. Thus, small dispersed sources in these other areas are far more important in controlling CO_2 emissions than they are in controlling SO_2 emissions. This creates significant administrative and enforcement problems for an international emissions trading program if it attempts to be comprehensive. These concerns multiply as the global nature of the program is considered, along with the number of greenhouse gases that would be included in it.

In addition to the substantive differences in the problems, the trading dynamics of national SO_2 trading and international CO_2 trading are different. As indicated by Figure 4, the largest projected saving from emission trading under the SO_2 program is from permitting relatively simple and uncomplicated trading between a utility's own facilities. An additional ten percent can be gained by permitting intrastate trading. However, expanding the boundaries of the trading to interstate trading does not result in as dramatic cost reductions as for intra-company trading. For implementation policy, this is very significant, as it suggests that the SO_2 trading program does not have to work very efficiently to achieve a large proportion of the economic benefits that have been estimated. Given the increasing regulatory and administrative complexity of expanding the scope of trading to regional levels, the trading dynamics suggest that such complexity can be avoided at little loss of economic efficiency.[16]

---

[16]For a further discussion, see: Larry B. Parker, Robert D. Poling, and John L Moore, "Clean Air Act Allowance Trading," 21 *Environmental Law*, 4, 1991, pp. 2023-2068,

Figure 4

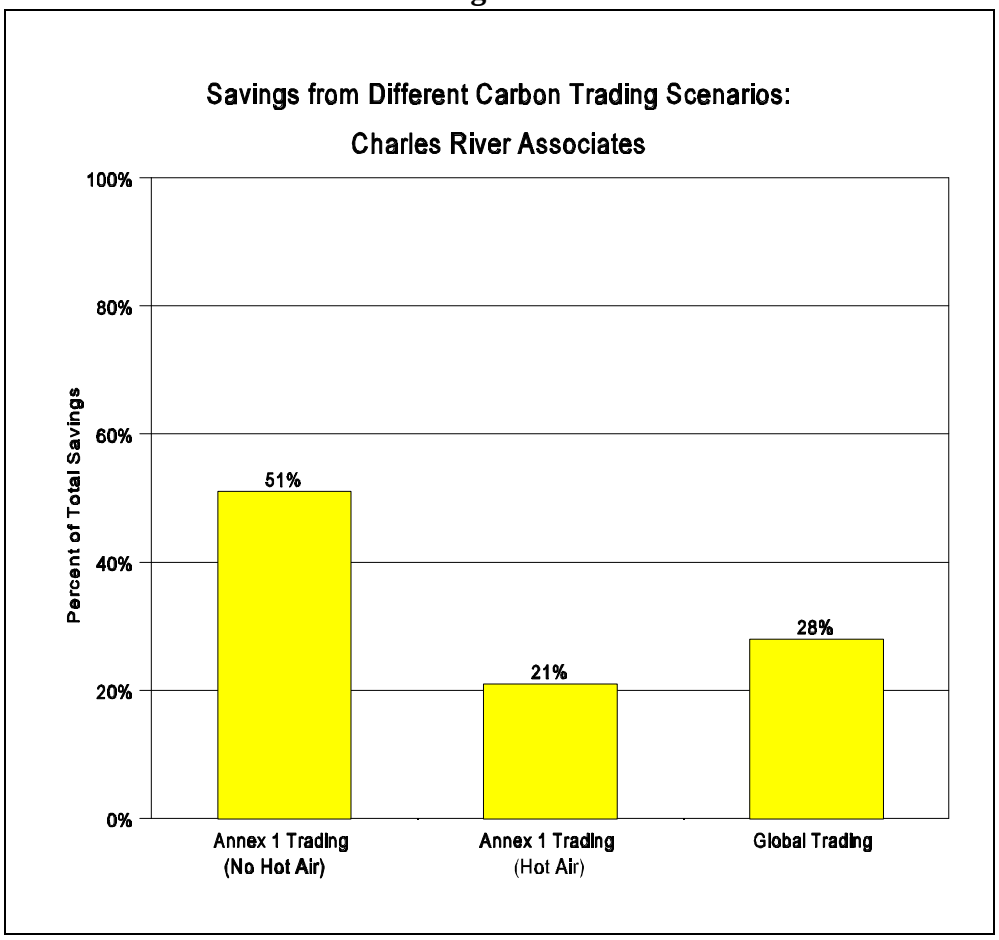


However, although the positive effects of trading have been borne out in the first few years of the SO_2 program, it is not necessarily a harbinger of the potential cost savings from an international carbon trading program. First, the baselines for measuring cost savings are different. For the acid rain program, a unit-by-unit allocation of reduction with absolutely no trading is the baseline from which cost savings from trading are measured. For a carbon trading program, the baseline is an interstate (or intra-country) trading scenario from which cost savings from international trading is measured. Thus, the maximum trading scenario estimated under the acid rain program (interstate trading) is the baseline scenario for measuring the effect of inter-country trading under carbon trading. In essence, the "no trading" scenario of the carbon trading program is the "interstate trading" scenario of the acid rain program. Thus, the scope of international carbon trading is well beyond that of the title IV program.

Second, the trading dynamic under the SO_2 program discussed above contrasts strongly with that projected under an international carbon trading program. As indicated in Figure 5, under an international carbon trading program, only half the anticipated savings from trading occur in transactions between developed Annex 1 countries. About a fifth of the savings projected by Charles River Associates is the result of "hot air" credits. Finally, about a quarter to a third of the anticipated savings

results from transactions with countries not currently covered by the Protocol. Thus about half the total savings from trading would come from sources whose credits are either contested in some quarters, or from countries who are not required to participate in the reduction program at all.[17]

Figure 5



Conclusion

The potential for international emission trading to reduce U.S. compliance cost under the Kyoto Protocol is substantial and indisputable. Whether that potential can be turned into fact is more problematic. The analysis presented here suggests that implementing international emissions trading under Kyoto would represent uncharted territory for U.S. environmental policy.

---

[17]Indeed, it is not clear that developing countries can participate in the CDM unless they assume reduction obligations. For more on the CDM, see United Nations Development Programme, *Issues & Options: The Clean Development Mechanism*, United Nations Publications, 1998.

First, an international emissions trading scheme has to function very efficiently to achieve the savings projected by analyses. For example, the Administration's analysis relies on an unprecedented amount of international trading to achieve the substantial cost reduction its projects. Under its most aggressive trading scenario, 82%-88% of the U.S. reduction requirement would be bought from foreign sources, resulting in domestic CO_2 reductions of only 66 to 99 million metric tons, compared with an estimated 550 million metric tons if all reduction were achieved domestically.[18] Even restricting trading to Annex 1 countries results in 61% of the country's reduction requirement coming from foreign sources. The magnitude of transactions not only raises questions of its feasibility, but may also conflict with the intent of the Kyoto Protocol — and with the positions of some other countries — which states that international emissions trading is to be "supplemental" to domestic actions.

Second, besides the amount of trading estimated, the sources of these reductions raise additional questions. For example, according to analysis by Charles River Associates, half the estimated savings from international emissions trading would come from either "hot air" credits from the former Soviet Union, or from transactions with Third World countries that are not required to participate in the program. Trading with these sources does not have the certainty that trading with most Annex 1 countries would have in terms of monitoring, enforcement, and integrity of transactions. With respect to the former Soviet Union, current problems with achieving compliance with the Montreal Protocol, a far simpler international treaty, does not bode well for the Kyoto Protocol. That "economic difficulties" are proffered by these countries as grounds for non-compliance and non-enforcement of the Montreal Protocol is particularly disturbing, as those same difficulties are the source of the "hot air" credits.

The situation may be more uncertain with Third World transactions as developing countries generally have neither the incentive of a binding obligation under the Protocol, nor the infrastructure to monitor, enforce, and protect the integrity of transactions. In addition, there may be complications resulting from the Kyoto Protocol itself. As currently written, transactions with Third World countries are to be funneled through a "Clean Development Mechanism," an institution whose role and parameters have yet to be worked out. How much this "middle man" mechanism would affect trades is unclear.

Third, the situation with international carbon trading is not analogous to the acid rain program, often cited as a model.[19] The acid rain program involves domestic trading in one pollutant from about 3,000 relatively large stationary sources. As such, it has been administratively manageable, enforceable, and successful. The Kyoto Protocol involves 6 pollutants, millions of small, medium, and large sources, and

---

[18]For further information on the projected U.S. reduction requirement under the Kyoto Protocol, see: (name redacted) and (name redacted), *Global Climate Change: Reducing Greenhouse Gases — How Much from What Baseline?* CRS Report 98-235 ENR, March 11, 1998

[19]For example, see: Council of Economic Advisors, *Economic Report of the President*, U.S. Govt. Print. Off., February 1997, pp. 208-213.

international trading. The maximum trading scenario under the acid rain program — interstate trading — is the baseline for international trading under the Kyoto Protocol. While electric generating facilities — the focus of the acid rain trading program — account for two-thirds of U.S. sulfur dioxide emission, they account for only 29% of the six greenhouse gases emitted in the U.S. (mostly carbon dioxide). Other more dispersed energy uses, such as transportation, make up most of the rest. Add the international scope of carbon trading to this mix, and it is clear that implementation challenges would be on a different level than that encountered with the acid rain program, a level to which the implementation of the acid rain program provides little guidance.

Besides questions raised by the scale of carbon trading, the trading dynamics of carbon trading differ from those of the acid rain program. Unlike an international carbon trading program that must operate very efficiently to achieve much of its cost savings, the acid rain program does not have to do so. The simplest trades — those between a company's own plants — achieve the greatest cost savings under the acid rain program, not interstate trades between unassociated parties. That there have been relatively few interstates trades so far under the acid rain program means once again that the program provides little guidance to any future international carbon trading program.

In short, to expect trading to reduce costs by the 80%-90% suggested by some analyses seems at the current time to be unrealistic. Indeed, the complexity presented by international emissions trading suggest that alternatives may deserve a hearing.