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Hoong N. Young

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An Analysis of a Global CO₂ Emissions Trading Program

Cover Page Footnote

The author wishes to thank Professor Wendy Wagner for her guidance on this paper, Julia Kuo for her assistance in editing, and his family for all the support they have given.

AN ANALYSIS OF A GLOBAL CO₂ EMISSIONS TRADING PROGRAM

HOONG N. YOUNG*

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I. INTRODUCTION

With the recent conclusion of the global warming conference in Kyoto, Japan, the greenhouse effect and its impact on global warming has again emerged as a major issue.¹ The resulting treaty, the Kyoto Protocol, hails as a historic first step in the battle against global warming.² The Kyoto Protocol commits the European Union to reducing its greenhouse gas emissions below 1990 levels by 8%, the United States by 7%, and Japan by 6%.³ As part of the plan which President Clinton said "plays to our strengths" of innovation, creativity, and entrepreneurship, emissions trading will have a role in reducing greenhouse gases.⁴

This comment analyzes two of the emissions trading programs that are currently used in the United States and the lessons we can learn from them for implementing a global carbon dioxide (CO₂)

* J.D./MBA, Case Western Reserve University, School of Law and Weatherhead School of Management (1999). The author wishes to thank Professor Wendy Wagner for her guidance on this paper, Julia Kuo for her assistance in editing, and his family for all the support they have given.

1. Diplomats from 160 nations negotiated for 10 days in Kyoto, Japan. See A. Adam Glenn, *A Deal Is Struck in Kyoto* (Dec. 11, 1997) <<http://www.archive.abcnews.com/sections/world/goretalk1208/index.html>>.

2. See *id.*

3. See *id.*

4. See Clinton Takes Middle Road on Global Warming, STAR TRIB. (Minneapolis), Oct. 23, 1997, at A1.

emissions trading program. Part II details the effect of increased levels of greenhouse gas emissions on the greenhouse effect, leading to warnings of global warming. Part III compares and contrasts the three approaches currently used to reduce pollution emissions—traditional command and control, emission taxes, and emissions trading. Part IV describes two major existing emissions trading programs in the United States: the Sulfur Dioxide (SO₂) Program and RECLAIM. Part V critiques the strengths and weaknesses of these two programs. This comment also highlights some of the problems a global CO₂ emissions trading program will face and suggests some possible solutions to these problems.

II. GREENHOUSE EFFECT AND GLOBAL WARMING

Much talk now focuses on the "greenhouse effect" and its impact on the world's climate. Put simply, the atmospheric greenhouse works by allowing shortwave radiation from the sun to enter the earth's atmosphere, thereby warming the earth's land and water surfaces.⁵ As the earth releases some of this heat in longwave radiation, the energy is blocked from escaping the earth's atmosphere by greenhouse gases.⁶ This greenhouse effect has kept the earth considerably warmer than otherwise possible. The increase in the amount of carbon dioxide, one of the primary gases causing the greenhouse effect, has sparked both alarm and debate.

Burning fossil fuels like coal and oil is the main cause for the increase in CO₂ levels.⁷ In 1996, the United States accounted for approximately 23% of the world's total of six billion tons.⁸ Europe accounted for 14% while China accounted for about 12% of global carbon emissions.⁹ Though currently at about half of the United States' current emissions, China is projected to surpass the United States within twenty years.¹⁰

Since the 1970's, scientists have been warning the world about the possibility of a rise in average global temperature due to the

5. See Richard L. Lawson, *Global Warming Treaty May Freeze U.S. Growth*, COAL AGE, July 1997, available in LEXIS, Nexis Library, News Group File.

6. See *Global Warming 'Real'; But Clinton Says New Taxes to Fight It Won't Pass Muster*, THE CHATTANOOGA TIMES, Oct. 7, 1997, § National, at A8.

7. See *id.*

8. See *id.*

9. See *id.* The Kyoto Protocol does not affect developing countries, like China, so their emissions are not restricted. See Glenn, *supra* note 1. "All the initiatives are aimed only at developed countries even though greenhouse gas emissions are growing at much faster rates in many of the developing countries." See Lawson, *supra* note 5.

10. See *Global Warming 'Real'; But Clinton Says New Taxes to Fight It Won't Pass Muster*, *supra* note 6, at A8.

increased greenhouse gases concentration in the atmosphere.¹¹ Scientists now believe the concentration of CO₂ in the atmosphere has increased 30% since the start of the Industrial Revolution, from 280 to 360 parts per million.¹² If left unchecked, scientists expect CO₂ concentrations to increase to 550 parts per million by the middle of the next century.¹³ In 1995, a United Nations-sponsored panel of 2000 scientists found a "discernible human influence" on the global climate and declared that the doubling of greenhouse gases could warm the average global temperature "by 2 to 6 degrees Fahrenheit over the next 100 years."¹⁴ The panel believes the average sea level will rise between six and thirty-seven inches by the year 2100 due to the melting of polar ice caps.¹⁵

Critics of global warming argue that predictions are made based on crude computer simulations.¹⁶ However, evidence exists of the current impact from global warming. A study from the World Wide Fund for Nature pointed out that 1997 was predicted to be the second hottest year in history.¹⁷ The study also predicted that the world is experiencing its biggest thaw since the ice age, and that since 1850 Europe's glaciers have lost about half of their volume.¹⁸ Though the debate on global warming continues, President Clinton joins many world leaders in expressing the need to reduce CO₂ emissions.¹⁹

In 1992, the United States joined the Framework Convention on Climate Change (FCCC) at an international "Earth Summit" in Rio de Janeiro.²⁰ The FCCC is an international agreement that calls for substantial reductions in the release of man-made greenhouse gases.²¹ The initial goal of the FCCC was to reduce greenhouse gas emissions by developed countries to 1990 levels by the year 2000.²² Unfortunately, that standard was not legally binding upon the

11. See Lawson, *supra* note 5.

12. See *Global Warming 'Real'; But Clinton Says New Taxes to Fight It Won't Pass Muster*, *supra* note 6, at A8.

13. See *id.*

14. *Id.*

15. See *id.*

16. See *id.*

17. *Id.* "1995 was the hottest year." NSW: WWF Report Reveals the Dangers of Global Warming, AAP NEWSFEED, Sept. 29, 1997, § Nationwide General News, at Australian General News.

18. See *id.*

19. See *Clinton Takes Middle Road on Global Warming*, *supra* note 4, at A1.

20. See Lawson, *supra* note 5.

21. The FCCC was signed by 166 countries and ratified by 93. U.S. Program Awards Grants to Developing Nations, Global Warming Network Online Today, Jan. 4, 1996, available in LEXIS, Newsletter Library.

22. See Lawson, *supra* note 5.

signatories.²³ In 1996, the United States shifted positions at an international conference in Geneva.²⁴ Undersecretary of State Timothy Wirth announced that voluntary compliance with the goals of the FCCC was a failure and that legally binding emission standards should be created.²⁵ Subsequent international meetings were held in Geneva and in Bonn during February, 1997.²⁶ These meetings led to negotiations on a binding agreement that was finalized in December, 1997, in Japan.²⁷

In addition to the gas emissions reductions to which the United States, Japan, and the European Union have committed, twenty-one other industrialized countries must meet similar reductions under the Kyoto Protocol between 2008 and 2012.²⁸ All are committed to further reductions in the future.²⁹ The inclusion of an emissions trading program was a major victory for the United States.³⁰ Though details have yet to be worked out, the trading program would allow a country that cannot meet its emissions target to purchase quotas from a country that has reduced emissions below its target.³¹

III. TRADITIONAL COMMAND AND CONTROL, EMISSION TAXES, & EMISSIONS TRADING

The Kyoto Protocol introduces a fairly new approach for reducing CO₂ emissions. Traditionally, the United States has applied a "command and control" method to deal with pollution.³² For example, with air pollution, the Clean Air Act (CAA)³³ authorizes the Environmental Protection Agency (EPA) to set national ambient air quality standards (NAAQS).³⁴ The EPA and states then establish a source specific technology-based emissions limit to assist individual polluters in meeting the NAAQS.³⁵ Many economists and scholars

23. See *id.*

24. See *id.*

25. See *id.*

26. See *id.*

27. See *id.*

28. See Glenn, *supra* note 1.

29. See *id.*

30. See *id.*

31. See *id.*

32. See U.S. GAO, *Air Pollution: Allowance Trading Offers an Opportunity to Reduce Emissions at Less Cost*, GAO/RECD-95-30 (Dec. 1994) at 15 [hereinafter GAO Report].

33. Air Pollution Control Act, ch. 159, 69 Stat. 322 (1955) (codified as amended at 42 U.S.C. §§ 7401-7671q (1997)).

34. See *id.* § 7409.

35. See *id.* §§ 7411(a)(1), 7475(a)(4), 7502(c), 7503(a) (1997); Michael C. Naughton, *Establishing Interstate Markets for Emissions Trading of Ozone Precursors: The Case of the Northeast Ozone Transport Commission and the Northeast States for Coordinating Air Use Management Emissions Trading Proposals*, 3 N.Y.U. ENVTL. L.J. 195, 200 (1994).

argue that the command and control method unnecessarily increases cleanup costs.³⁶ For example, the 1977 Amendments to the CAA³⁷ required all utilities to install expensive scrubbers to remove sulfur dioxide (SO₂) from emissions even though many utilities could have reduced SO₂ emissions by switching to low sulfur coal.³⁸ Many also believe that command and control discourages innovative pollution control technology.³⁹ Since the EPA sets cleanup goals based on currently available technology, little incentive exists for firms to spend money on research and development of new pollution control methods.⁴⁰

An alternative to the command and control system is taxing producers for each unit of pollution they emit.⁴¹ The tax would force producers to take into account the cost of pollution. Without the tax and without command and control, the emitted pollution and its effects on the environment are only externalities that are not included when producers analyze costs.⁴² In theory, the efficient firm would try to reduce pollution until the incremental cost of reducing pollution equals the incremental benefits of further pollution reduction.⁴³ This would result in a socially optimal level of pollution at the lowest cost.⁴⁴ However, there are extreme difficulties with implementing an emissions tax. It is often difficult to assess the social costs of pollution.⁴⁵ Many costs are measured in terms of aesthetic damage or damage to a person's health.⁴⁶ In many cases, it is not possible to foresee all the damages polluting can cause. Even if costs could be estimated, regulators would have to constantly update the taxes to include changes in economic activity, inflation, or other changes in the level or impact of that particular source's pollution.⁴⁷ Finally, it will be politically difficult to implement a tax-based pollution control since the tax would mean higher costs to producers which would probably be passed on to the consumers.⁴⁸

36. See GAO Report, *supra* note 32, at 15.

37. Clean Air Act Amendments of 1977, Pub. L. 95-95, 91 Stat. 712 (codified at 42 U.S.C. §§ 7401-7671q (1997)).

38. Douglas R. Bohi & Dallas Burtraw, *SO₂ Allowance Trading: How Do Expectations and Experience Measure Up?*, ELEC. J., Aug. 1997.

39. See GAO Report, *supra* note 32, at 15.

40. See Naughton, *supra* note 35, at 201.

41. See *id.*

42. See *id.*

43. See *id.*

44. See *id.*

45. See *id.*

46. See *id.*

47. See *id.* at 202.

48. See *id.*

A transferable pollution permitting system, or emissions trading system, is an alternative to the emissions tax.⁴⁹ Under an emission trading system, regulators establish the allowable pollution level for a given area and grant permits to existing producers so that emissions do not exceed prescribed pollution levels.⁵⁰ Each producer is allocated permits based on the "producer's past pollution levels or through a competitive bidding auction."⁵¹ Firms that reduce their pollution emissions below their allocated level can sell their surplus permits to other firms or individuals.⁵² Firms that cannot reduce their pollution emissions to meet their allocated level can purchase more permits.⁵³ Under this system, firms can choose the most cost-effective way to stay within their allocated emissions level.⁵⁴ The ability to profit from the selling of emission credits encourages firms to develop innovative pollution control devices.⁵⁵

The emissions trading system has several advantages over the emissions tax system. First, an emissions trading system fits well with current regulatory schemes such as the CAA, which establishes allowable pollution levels.⁵⁶ Regulators set allowable pollution levels while the market decides the price of the tradable permits.⁵⁷ Under the emissions tax system, regulators must somehow calculate the price of the emissions tax and make the tax high enough so that the desired level of pollution reduction can be achieved.⁵⁸ Second, under the emissions trading system, regulators will not have to worry about adjusting prices for inflation or changes in economic activity because the market would make these adjustments automatically.⁵⁹ Third, while both programs would reduce emissions, a tax imposes additional financial burdens on industry.⁶⁰ Not only would firms have to pay for the cost of reducing emissions, firms would also have to pay for the tax liability of remaining emissions.⁶¹

49. *See id.*

50. *See id.*

51. *Id.*

52. *See id.*

53. *See id.*

54. *See id.*

55. *See id.*

56. *See id.*

57. *See id.* at 203.

58. *See* Gary E. Marchant, *Freezing Carbon Dioxide Emissions: An Offset Policy for Slowing Global Warming*, 22 ENVTL. L. J. 623, 632 (1992).

59. *See* Naughton, *supra* note 35, at 203.

60. *See* Marchant, *supra* note 58, at 633.

61. *See id.*

Proponents for emissions trading markets have determined four requirements for a successful program.⁶² First, there must be enough participants in the market; both to sell and to buy emissions credits.⁶³ Without enough participants, price information would be difficult to establish and prices for credit might not accurately reflect actual supply and demand.⁶⁴ Second, transaction costs must be kept low.⁶⁵ Otherwise, buyers and sellers will be discouraged from trading in a market that could have been beneficial to both. Robert Hahn and Gordon Hester identified high transaction costs as the single most important obstacle to the success of pollution markets.⁶⁶ Third, in order for a market-based program to work, there must be effective enforcement.⁶⁷ Both monitoring and sanctions are needed for effective enforcement to exist. Without effective enforcement, the market will become distorted and inefficient.⁶⁸ Finally, the regulatory system must engender confidence in market participants of its stability.⁶⁹ In a market system, there will be tension between the participants' need for stability and the regulators' need to change the rules as new information becomes available.⁷⁰ Though this problem exists for most markets, it is particularly important in the area of pollution control because the commodity, pollution credits, only retain their value if the government maintains the market.⁷¹

IV. EXISTING U.S. EMISSIONS TRADING PROGRAMS

In recent decades, the United States has gained valuable experience from implemented emissions trading programs. Two programs, the SO₂ program and the RECLAIM program, can provide insights to the types of problems that a global CO₂ emissions trading program would face.

62. See Matthew Polesetsky, *Will a Market in Air Pollution Clean the Nations Dirtiest Air? A Study of the South Coast Air Quality Management District's Regional Clean Air Incentives Market*, 22 *ECOLOGY L. Q.* 359, 372 (1995).

63. See *id.*

64. See *id.*

65. See *id.*

66. See *id.* at 372-73.

67. See *id.* at 372.

68. See *id.* at 373.

69. See *id.* at 372.

70. See *id.* at 374.

71. See *id.* at 373-74.

A. SO₂ Trading Program

The SO₂ emissions allowance trading program was enacted through Title IV of the 1990 Clean Air Act Amendments (CAAA),⁷² ushering in the largest-ever nationwide emissions trading program.⁷³ Title IV of the CAAA was passed to combat the problem of acid rain.⁷⁴ Title IV was "designed to achieve a 10 million-ton annual reduction in SO₂ emissions from 1980 levels by the year 2010...Of this reduction, 8.5 million tons is to come from electric utilities, the nation's major source of SO₂ emissions."⁷⁵ Sulfur dioxide emissions reduction will consist of two phases.⁷⁶ Phase I requires 110 of the nation's largest electric utility plants to reduce their emissions by 3.5 million tons a year, beginning January 1, 1995.⁷⁷ Phase II requires almost all utilities to reduce annual emissions by another five million tons beginning January 1, 2000.⁷⁸

Utilities were given freedom in deciding how to meet the required emission reductions. Each utility in the program was assigned an emissions allowance based largely on its emissions between the years of 1985-1987, plus bonus allowances available under a variety of special provisions.⁷⁹ Each allowance gives the right to emit one ton of SO₂.⁸⁰ At the end of each year, each utility must prove to the EPA that it holds at least as many allowances for SO₂ emissions as it emitted that year as measured by devices at the end of stacks called continuous emission monitors (CEM).⁸¹ The EPA grants each utility thirty days to obtain the allowances necessary to cover its actual emissions during the previous year.⁸² If a utility emits more than its specified emissions allowance, the utility will be fined \$2,000 for each ton that exceeds its limit and the utility will be required to offset the excess amount the following year.⁸³

In order to meet these allowance limits, the utility could switch to low sulfur coal, install new scrubbers, or shut down some plants.⁸⁴

72. Clean Air Act Amendments of 1990, Pub. L. No. 101-549, 104 Stat. 2399 (codified at 42 U.S.C. §§ 7401 - 7671q (1997)).

73. See Brian Doherty, *Selling Air Pollution*, REASON, vol. 28, no.1, at 32 (1996).

74. See GAO Report, *supra* note 32, at 2.

75. *Id.*

76. See *id.*

77. See *id.*

78. See *id.*

79. See Doherty, *supra* note 73, at 34.

80. See *id.*

81. See *id.*

82. See *id.*

83. See *id.*

84. See GAO Report, *supra* note 32, at 2.

The utilities also had the option of trading emission allowances.⁸⁵ Utilities that did not emit as much SO₂ as their allowance limits were given emission credits.⁸⁶ These credits could then be banked for future use by these utilities or they could be sold for profit.⁸⁷ For those utilities that could not meet their emissions allowances, they had the option of purchasing emission credits.⁸⁸ Credits could be purchased at the annual EPA auction or they could be purchased through private transactions.⁸⁹

The EPA has effectively monitored the utilities with the CEM equipment by requiring utilities to report on their emissions regularly.⁹⁰ The EPA also has an automated allowance tracking system (ATS) that monitors all deductions of allowances, as well as the issuance, transfer, and tracking of allowances.⁹¹ The ATS allows the EPA to ensure that actual emissions do not exceed available allowances.⁹²

B. RECLAIM Program

As the only area in the United States classified as "severe non-attainment," the South Coast Air Quality Management District (SCAQMD) in the Los Angeles basin introduced the Regional Clean Air Incentives Market (RECLAIM) in 1994.⁹³ RECLAIM is a regional market designed to improve air quality through the reduction of two pollutants, nitrogen oxides (NO_x) and SO₂.⁹⁴ The RECLAIM Program would include stationary facilities emitting four or more tons of NO_x or SO₂ per year.⁹⁵ This meant 390 facilities, representing approximately 65% of the permitted stationary NO_x emissions in the Los Angeles basin were included,⁹⁶ and forty-one facilities, representing 85% of total emissions from permitted stationary SO₂ sources.⁹⁷ Facilities could voluntarily join the program even if they

85. *See id.*

86. *See id.*

87. *See Doherty, supra note 73, at 35.*

88. *See id.*

89. *See id.*

90. *See GAO Report, supra note 32, at 2.*

91. *See id.*

92. *See id.*

93. *See Scott Lee Johnson, Economic Assessment of the Regional Clean Air Incentives Market: A New Emissions Trading Program for Los Angeles, 72 LAND ECON. 277, 278-79 (1996).*

94. *See Thomas H. Klier et al., What can the Midwest Learn from California About Emissions Trading?, CHI. FED. LETTER (Fed. Reserve Bank of Chi., Chicago, Ill.), Aug. 1997, at 1.* The program seeks to reduce the emissions of sulfur oxides (SO_x); however, under the RECLAIM Program rules, the term SO₂ refers to sulfur dioxide. *See Johnson, supra note 93, at 277 n.1.*

95. *See Klier et al., supra note 94, at 1.*

96. *See id.*

97. *See id.*

did not meet the emission standards, however, a facility could not leave RECLAIM after it joined.⁹⁸ Sources not participating in RECLAIM are still subject to existing command and control regulations.⁹⁹ Like the national SO₂ emissions trading program, participants of RECLAIM were each assigned a specific emissions allowance.¹⁰⁰ Each facility was given an allocation of credits to cover all emission sources, such as furnaces and boilers.¹⁰¹

The "cap and trade" market is also incorporated into RECLAIM.¹⁰² It sets an area-wide total emissions cap that declines over time.¹⁰³ Each facility's emissions allowance is also reduced according to a schedule until the year 2003.¹⁰⁴ SCAQMD hopes RECLAIM will reduce total NO_x emissions from the 390 participating facilities by 75% of the starting emission levels.¹⁰⁵ Facilities registered in the RECLAIM program must reconcile their pollution accounts once a year.¹⁰⁶ If a facility pollutes more than its allocated limit, it must purchase pollution credits at one of the Pacific Exchange's emissions credit auctions.¹⁰⁷ If a facility reduces emissions below what it was allocated, it may sell its excess credits.¹⁰⁸

The monitoring, reporting, and record keeping (MRR) for RECLAIM is quite complex. Sulfur dioxide emitters fall into two categories: major sources and process units.¹⁰⁹ Major sources must install CEM systems to monitor emissions, and they must install a device that reports total daily mass emissions electronically, via modem, to the District.¹¹⁰ Process units must elect to measure either their fuel usage or their operating time and production/processing/feed rate.¹¹¹ Process units must also use an emission factor to determine mass emissions.¹¹² Both major sources and process units must report emissions to the District on a quarterly basis.¹¹³

98. *See id.*

99. *See Polesetsky, supra* note 62, at 372.

100. *See Klier et al., supra* note 94, at 1.

101. *See id.*

102. *See id.*

103. *See id.*

104. *See id.*

105. *See id.*

106. *See Phyllis Orrick, The Sky's the Limit: How Buying and Selling Pollutants Could Help Clean Up the Bay Area's Air*, S.F. WKLY, Sept. 3, 1997, § News.

107. *See id.*

108. *See id.*

109. *See Polesetsky, supra* note 62, at 402.

110. *See id.*

111. *See id.* at 403.

112. *See id.*

113. *See id.*

The MRR requirements are even more complex for NO_x emitters. These emitters are classified either as major sources, large sources, or process units.¹¹⁴ "Major sources face the most stringent requirements, while process units face the least."¹¹⁵ The requirements for major sources of NO_x are similar to those for major sources of SO₂.¹¹⁶ Facilities that are considered large sources can choose to comply with MRR requirements for major sources or the more relaxed requirements for large sources.¹¹⁷ Large sources are required to "operate a totalizing fuel meter and any other device that the Executive Officer considers necessary for measuring fuel usage."¹¹⁸ A large source must also calculate mass emissions using either an emissions factor or an equipment-specific emission rate or concentration limit.¹¹⁹ In addition, a large source must report mass emissions to the District on a monthly basis.¹²⁰ Process units can comply with MRR requirements by complying with major source or large source regulations, or process units can choose to comply with less restrictive requirements specifically for process units.¹²¹ Under the less restrictive requirements, process units must install totalizing fuel meters and/or timers, or any other devices that the Executive Officer specifies as being functionally equivalent.¹²² Like all the other NO_x sources, process units must report mass emissions to the District on a quarterly basis.¹²³

V. ANALYSIS OF EXISTING PROGRAMS

The United States' two major existing emissions trading programs should be examined to determine their strengths and weaknesses. The strengths of the SO₂ and RECLAIM programs can assist in constructing an efficient CO₂ emissions trading program. Additionally, weaknesses in the SO₂ and RECLAIM programs can pinpoint potential problem areas in a similar type emissions program.

114. *See id.*

115. *Id.* at 403-04.

116. *See id.* at 404.

117. *See id.*

118. *Id.*

119. *See id.*

120. *See id.*

121. *See id.*

122. *See id.* at 404-05.

123. *See id.* at 403-05.

A. SO₂ Program

Since the first phase of the program began in January 1995, there have been some pleasant surprises. To begin with, significant emission reductions have been met early on in the program.¹²⁴ After January 1995, utilities have been aggressively reducing emissions and taking advantage of the opportunity to bank the allowances earned.¹²⁵ The volume of banked allowances in 1995 and 1996, and the projected amounts through 2000, is much larger than predicted.¹²⁶ Many utilities are banking these credits for use during Phase II of the program.¹²⁷ This has resulted in a win-win situation for both the environment and the industry.¹²⁸ The environment is benefiting from the earlier reduction in SO₂ emissions because it can now start to recover from the effects of lower SO₂ emissions and improve public health earlier than would otherwise be possible.¹²⁹ The utility industry will benefit from banking allowances because the overall cost of compliance with the more stringent Phase II requirements will be lowered.¹³⁰ The lowering of overall costs will help facilitate a smoother transition to Phase II standards.¹³¹

Allowance prices have also been much lower than originally predicted.¹³² While the CAAA were being debated in Congress in 1990, experts predicted the cost of each allowance could be as high as \$1,500, with a common guess of \$750.¹³³ Since trading began, the price has fallen from \$250-\$300 in 1992, \$110-\$140 in 1995, to \$70 in 1996. However, the price rebounded to around \$100 in 1997.¹³⁴

Not all would consider the fact that prices have been lower than expected as proof of the market system working efficiently. Critics are blaming the set-up of the EPA auction for the low prices.¹³⁵ Currently, every buyer pays what he bids, but the seller with the lowest asking price gets the highest bid.¹³⁶ This mismatch occurs because the "lower asking prices increase the probability that a seller trades with high-bidding buyers."¹³⁷ Because more than one seller

124. See Bohi & Burtraw, *supra* note 38.

125. *See id.*

126. *See id.*

127. *See id.*

128. *See id.*

129. *See id.*

130. *See id.*

131. *See id.*

132. *See id.*

133. *See id.*

134. *See id.*

135. See Doherty, *supra* note 73, at 35-36.

136. *See id.* at 36.

137. *Id.* (internal quotes omitted).

exists in the market, sellers have under-stated the value of their allowances to start the bidding.¹³⁸

Another surprise is that the marginal cost of emissions reductions has been dramatically less than projected.¹³⁹ Experts had predicted the cost of compliance using traditional methods at \$1,500 per ton.¹⁴⁰ They had expected marginal costs to be close to \$525 per ton under the market system.¹⁴¹ So far, recent studies suggest marginal costs to be less than \$350 per ton.¹⁴² However, the \$350 per ton cost of compliance is still more than three times higher than what allowances are currently selling for (\$100 in 1997).¹⁴³ This is probably due to a number of factors. One major factor is that, as mentioned previously, utilities are banking a larger amount of emission allowances than expected.¹⁴⁴ The probability that meeting the stringent Phase II standards will be more costly may account for this. The Phase I bank of allowances will delay the full effect of the 8.95 million-ton-cap on SO₂ until 2010.¹⁴⁵ This "delay until 2010 for the most expensive compliance options means that allowance prices today, measured at a discount rate of 8%, should have a value of about one-third that of the cost of these compliance options."¹⁴⁶ In fact, the current market price of allowances (\$100) is about one third of the econometric estimates of long-run marginal cost (\$350).¹⁴⁷

The program's administrative costs have also been low compared to traditional pollution controls. The approximate cost of the program on a yearly basis was \$12 million.¹⁴⁸ This would come out to be about \$1.50 per ton of pollution reduced.¹⁴⁹ For the first five years, the government spent only \$60 million to set up the SO₂ trading program though the estimated cost of the program had been up to \$3.5 billion.¹⁵⁰

138. "This curious system was written into the act by Congress, emulating the structure of Treasury auctions. But unlike the Treasury bills market, the emissions market has more than one seller, which leaves room for unnaturally low sale prices." *Id.*, at 36-37.

139. See Bohi & Burtraw, *supra* note 38.

140. *See id.*

141. *See id.*

142. *See id.*

143. *See id.*

144. *See id.*

145. *See id.*

146. *Id.* White suggests using an 8% discount rate. *See id.* at n.10 (citing KEITH D. WHITE, ET AL., *The Emission Allowance Market and Electric Utility SO₂ Compliance in a Competitive and Uncertain Future*, EPRI TR-105490s (Sept. 1995) (prepared for the Electric Power Research Institute); RESEARCH DATA INTERNATIONAL, INC., PHASE I 1995 DATABOOK, (1995)).

147. *See id.*

148. See Joseph Kruger & Melanie Dean, *Looking Back on SO₂ Trading: What's Good for the Environment Is Good for the Market*, FORTNIGHTLY, Aug. 1997, § Features, at 30.

149. *See id.*

150. *See id.*

Despite all the benefits of the SO₂ trading program since it went into effect, there have been some problems. First, there has been a lower than expected volume of inter-utility trading and trading between economically distinct entities. According to the EPA's Allowance Tracking System (ATS), from 1994 to the end of the first quarter in 1997, more than 38 million private allowances were transferred in 2,400 transactions.¹⁵¹ The majority of these transactions were intra-firm or reallocations.¹⁵² Together, they represented 50% of all transfers and 75% of all allowances transferred.¹⁵³ Trading between economically distinct entities amounted to 8.9 million allowances in more than 1,100 trades.¹⁵⁴ Utilities acquired approximately 3.5 million of these allowances.¹⁵⁵

Several explanations have been given as to why the utilities have not done much trading. One reason is that state commissions run most electric companies and regulate what the companies can do.¹⁵⁶ For example, the state commissions regulate "acceptable rates of return, recoverable costs, the distribution of financial risks and returns between ratepayers and shareholders."¹⁵⁷ Some state commissions have required the utilities to pass on the savings they make on trades to their customers, taking away the incentive to trade in order to make a profit.¹⁵⁸ Many state commissions have not issued any rules on the regulatory treatment of allowance transactions.¹⁵⁹ Because the utility industry is risk-averse by nature, most utilities have not been willing to trade until their state commissions enact new regulations.¹⁶⁰ Finally, in order to protect local, high-sulfur coal production, some state commissions have insisted that their utilities meet the CAAA emissions standards by installing scrubbers.¹⁶¹

Another problem the SO₂ trading program has run into is though total national emissions have been lowered, regional or local emissions might not have improved. New York State, for example, is unhappy that utilities in New York can profit from selling emission allowances to Midwestern states whose extra emissions might rain

151. *See id.*

152. *See id.*

153. *See id.*

154. *See id.*

155. *See id.*

156. *See* GAO Report, *supra* note 32, at 45.

157. *Id.*

158. *See id.* at 46.

159. *See id.* at 45.

160. *See id.* at 45-46.

161. *See id.* at 57.

back down on the Adirondacks.¹⁶² Critics are also unhappy with the fact that a utility can pollute as much as it can purchase in emission credits.¹⁶³ They argue that, from the limited data available, often it is economically efficient to dump pollutants on economically disadvantaged people.¹⁶⁴

However, defenders of the SO₂ emissions trading program would argue that "under Title IV, sources also must comply with source-specific emission reductions set by states to ensure attainment of ambient standards."¹⁶⁵ Therefore, some of the local concerns can be addressed on the state level by having the state set more stringent emissions standards, thereby lowering pollution levels. Even if the problem cannot be alleviated on the state level, proponents of trading programs will point out that in time, even hot spots will eventually be cleaned.¹⁶⁶ As time progresses, the cost of emissions credits will rise as cheaper pollution control methods become available.¹⁶⁷ This will cause even utilities located in "hot spots" to reduce emissions.¹⁶⁸

One final issue challenging the success of the SO₂ program is the lack of property rights associated with the tradable allowances. In order to leave room for further regulations and to protect the EPA from future Fifth Amendment "takings" claims, "the CAA explicitly states that allowances are not real property rights."¹⁶⁹ Without the security of knowing that what they own has property rights, a trader in the SO₂ market lacks the rights that most traders on regular markets have.¹⁷⁰

B. RECLAIM Program

Several points about RECLAIM distinguish it from the SO₂ trading program.¹⁷¹ First, instead of setting up a single market,

162. "The Adirondack Council, an Albany-based environmental group, and the Natural Resources Defense Council are suing the EPA to set standards dictating how much SO₂ can fall on specific regions, not just a cap for the whole nation." Doherty, *supra* note 73, at 35.

163. *See id.*

164. *See id.*

165. Kruger & Dean, *supra* note 148.

166. *See* John J. Fialka, *Selling Pollution as a Commodity*, SACRAMENTO BEE, Oct. 12, 1997, § Forum, at F01.

167. *See id.*

168. Prices for emissions credits will increase with time as the cap on SO₂ emissions decreases. Eventually, utilities will find it cheaper to install new technology, such as Scrubbers, to meet their emissions limits than for them to purchase emissions credits. *See id.*

169. Doherty, *supra* note 73, at 36.

170. *See id.*

171. Initially, RECLAIM forced all participants to sell their emissions credits. However, a SCAQMD rule change now allows companies to hang "on to these credits as insurance to protect against being short when SCAQMD 'trues up' emission levels at the end of the cycle." Ace

RECLAIM set up two distinct zones, a western and eastern trading zone, within the RECLAIM region for trading.¹⁷² This was done because the predominating winds blew the pollution from west to east.¹⁷³ Facilities in the western zone can only purchase credits in the western zone, whereas facilities in the eastern zone can purchase credits from either, or both, trading zones.¹⁷⁴

Second, RECLAIM allows any person to generate trading credits by scrapping old, high-polluting vehicles.¹⁷⁵ Only passenger cars made in 1981 or earlier that are operable and registered in the Basin can qualify.¹⁷⁶ A limit of 30,000 vehicles can be scrapped each year to create trading credits.¹⁷⁷ The inclusion of mobile source credits in the stationary scheme of RECLAIM is quite innovative.¹⁷⁸

Finally, on April 11, 1997, SCAQMD approved Rule 2506.¹⁷⁹ This rule allows equipment and products, known as area sources which include producers of NO_x and SO₂, but do not require a SCAQMD permit, to be eligible for RECLAIM credits as these sources are replaced by cleaner burning equipment.¹⁸⁰ Utilities participating in RECLAIM are excited about this addition to RECLAIM because of the increased economic benefits companies can enjoy when they convert equipment, such as boilers, internal combustion engines, and water heaters, to more energy-efficient models.¹⁸¹

Early studies indicate that the trading program is off to a good, but slow start. Market participation was only 50% in 1995.¹⁸² This figure appears low considering that emissions credits cannot be banked.¹⁸³ However, the high annual baseline set early on in the program probably explains the market participation rate. Regulators wanted to make sure that the annual emissions limits reflected average production levels for each facility and were not being distorted by special conditions, such as a lower production level brought about by a recession.¹⁸⁴ In the end, SCAQMD allowed each

'Reclaim' Auction Indicates Rising Prices, More Interest in SO₂ Credits, UTIL. ENV'T REP., Mar. 1, 1996, § Emissions Trading, at 8.

172. See Polesetsky, *supra* note 62, at 392.

173. See *id.*

174. See *id.*

175. See *id.* at 397.

176. See *id.*

177. See *id.*

178. See *id.*

179. See SCAQMD Expands 'RECLAIM' to Include Emission Credits for Small Equipment, UTIL. ENV'T REP., Apr. 25, 1997, § Emissions Trading, at 9.

180. See *id.*

181. See *id.*

182. See Klier et al., *supra* note 94, at 2.

183. See *id.*

184. See *id.* at 1.

firm to choose their baseline level based on actual emissions for one year between 1989-1992.¹⁸⁵ As a result, the total allocation for 1993 was higher than actual emissions.¹⁸⁶ There is evidence that the surplus allowances built into the annual targets during the early years are disappearing. In the first quarter of 1997, the dollar value of emissions trading exceeded the "annual amounts for the first three years of the RECLAIM program."¹⁸⁷

The structure of RECLAIM's open market trading has created a buyer-beware market.¹⁸⁸ Unlike the SO₂ program where facilities start with allowances that can be used as currency, any facility wanting to sell credits needs to assert to the EPA that it has already reduced its emissions and earned credits.¹⁸⁹ The EPA will then acknowledge the credits, but it will not verify them.¹⁹⁰ The buyer is responsible for verifying that the purchased credits are good.¹⁹¹

VI. GLOBAL CO₂ EMISSIONS TRADING PROGRAM

Experience with the SO₂ emissions program and the RECLAIM program can be useful in developing a global CO₂ emissions trading program. Past results from both programs indicate that a CO₂ trading program on a global scale is possible. However, it is important that the world community learn from the problems of the past programs.

A global CO₂ emissions trading program would allocate allowable CO₂ emissions level for each country. Countries that curb emissions below their allowance would be able to sell their credits. Countries that cannot or will not meet their allowance would have to buy credits. One major obstacle facing a global program is that sources of CO₂ are more varied than the sources of SO₂.¹⁹² In RECLAIM, the restricted geographic size of the program kept the participants within a workable range.¹⁹³ In the SO₂ program, the main culprits were the utility plants who attributed 70% of SO₂ emissions.¹⁹⁴ In the United States alone, utilities account for only

185. *See id.*

186. *See id.*

187. *Prepared Testimony of Peter F. Guerrero*, FED. NEWS SERVICE, July 9, 1997, available in LEXIS, News Library, Fednew File.

188. *See Doherty, supra* note 73, at 37.

189. *See id.*

190. *See id.*

191. *See id.*

192. *See GAO Report, supra* note 32, at 65.

193. *See Doherty, supra* note 73, at 33. The RECLAIM program covers emissions in Los Angeles, Orange, and San Bernardino counties in Southern California. *Id.*

194. *See GAO Report, supra* note 32, at 66.

36% of CO₂ emissions.¹⁹⁵ Mobile sources, such as automobiles, trucks, and airplanes, account for approximately 32% of CO₂ emissions in the United States.¹⁹⁶

A suggestion for dealing with emissions from mobile sources would be to regulate the carbon content of fuels.¹⁹⁷ Refineries that produce fuel would be given allowances according to the desired reduction in CO₂ levels.¹⁹⁸ The market would determine the price of these allowances; consumers (users of mobile sources) would then pay for the increase cost.¹⁹⁹ However, opponents of this plan fear that targeting only producers would create a market that is too small.²⁰⁰ Also, they fear that distributing all the CO₂ rights to this relatively small group would create a windfall for these firms as the value of these rights increase with time.²⁰¹ "An EPA consultant estimated that the CFC permit allocation system would produce \$1.8 to \$7.2 billion in windfall profits for producers."²⁰² Though the profits would be spread over a much larger number of firms, a fossil fuel offset program would also result in windfall profits for the producers.²⁰³

An alternative suggestion for dealing with emissions from mobile sources would be to hold manufacturers of mobile sources (automobile, truck, and airplane manufacturers) responsible for the CO₂ producing potential their products emit.²⁰⁴ Because CO₂ emissions can be calculated with relative ease from fossil fuel consumption and emission factors, it would be feasible to require manufacturers to calculate the CO₂ producing potential of their products.²⁰⁵ If a manufacturer's annual CO₂ producing potential is higher than its allowance, the manufacturer would need to purchase additional emissions credits.²⁰⁶

In anticipation of a global program, Costa Rica is preparing to issue tradable credits to people who invest in a program that protects portions of Costa Rica's rain forest that would otherwise be logged.²⁰⁷ However, extending the program to include such

195. *See id.*

196. *See id.*

197. *See id.*

198. *See id.*

199. *See id.*

200. *See Marchant, supra* note 58, at 653.

201. *See id.*

202. *See id.* at 653 n.103.

203. *See id.*

204. *See id.* at 655.

205. *See id.*

206. *See id.*

207. *See Fialka, supra* note 166.

activities is probably reaching too far. Though biodiversity is important, too many kinds of land use, such as forest clearing for agriculture or urban and industrial projects, can lead to increased levels of CO₂.²⁰⁸ "Data on releases of CO₂ by forest degradation through logging, shifting cultivation, erosion, lowering of groundwater tables, and desertification are of poor quality or unavailable."²⁰⁹ Also, it would be nearly impossible to develop an accurate system to monitor, for example, whether a particular forest area is really being protected from logging.²¹⁰ For this reason, some have suggested the inclusion of these sources would be unworkable in a global program.²¹¹

Another area of concern with the Kyoto Protocol is the fact that, like the SO₂ program, there will be at least two phases in the global program. Currently, the Kyoto Protocol requires compliance by the developed countries.²¹² Developing countries like China and Mexico are against an emissions limit because they fear it would impede their economic growth.²¹³ Therefore, the plan proposes a program for developing countries to be drafted at a later time.²¹⁴ This two-phase program could lead to some of the same problems as the SO₂ program. In the SO₂ program, the two-phase approach led to the situation where many potential sellers of allowances had to achieve emissions reductions before potential buyers of any allowances needed them.²¹⁵ This has led to lower trading levels than expected. With the global program, it is uncertain what the results of excluding developing countries from the market will be. In order to stimulate an active market, the program must set the targeted reduction levels low enough so that the participating countries will be forced to consider trading as an option for controlling their emissions. A predetermined time schedule for all regulated sources is also likely to stimulate more trading than the SO₂ program.²¹⁶

Monitoring emissions by participants will be another challenge to the program. The United States is currently in a better position to

208. See GAO Report, *supra* note 32, at 66.

209. *Id.*

210. See Fialka, *supra* note 166.

211. See GAO Report, *supra* note 32, at 66.

212. See Glenn, *supra* note 1.

213. See William Drozdiak, *U.S. Allies Criticize Anti-Warming Plan; Clinton Proposals Decried as 'Insufficient'*, WASH. POST, Oct. 24, 1997, § A, at A29.

214. See Glenn, *supra* note 1.

215. Phase I only covered the most polluting plants—which should have the lowest pollution reduction costs and are the most likely sellers. See Doherty, *supra* note 73, at 37. Higher-cost reducers do not have to concern themselves with the program until Phase II which begins in the year 2000. See *id.* This has led to a separation of likely sellers and buyers. See *id.*

216. See GAO Report, *supra* note 32, at 64.

deal with the task of monitoring CO₂ emissions.²¹⁷ The CEM, already installed in most utility plants to monitor SO₂ emissions, can be used to measure CO₂ emissions as well.²¹⁸ In fact, the EPA has already been receiving information about CO₂ emissions from most sources of emissions covered under Title IV.²¹⁹ The Director of EPA's Acid Rain Division also believes that "this technology can apply to other large combustion sources."²²⁰

For many countries, however, effective monitoring would be a major problem. Most countries do not have a system of CEM established.²²¹ The need for monitoring will require countries to spend money setting up a system to monitor emissions.²²² However, the problem with monitoring will exist whether the world adopts a command and control program or an emissions trading program to reduce CO₂. Both programs will require the monitoring of emissions. Therefore, the argument against an emissions program based on monitoring costs is not very sound because monitoring costs cannot be avoided. In addition, an argument can be made that a CO₂ emission trading program will encourage participants to monitor each other to ensure fairness.

As previously mentioned, it is fairly easy to calculate CO₂ emissions based on fossil fuel consumption and emission factors.²²³ Therefore, it would not be necessary to force all participating countries to install CEM. Instead, a self-reporting program could be set up based on experience from the lead-trading program.²²⁴ In the lead-trading program, "the total amount of lead put in gasoline by a particular refiner could be easily determined by the amount of lead additives the refiner purchased."²²⁵ Refiners were required to calculate the amount of lead they used and to keep track of all trades.²²⁶ The EPA required refiners to submit quarterly reports detailing the amount of lead rights used or traded.²²⁷ Verification of each refiner's reports is available by examining sales reports of lead manufacturers.²²⁸ Therefore, utilities and other major sources of CO₂ can be

217. *See id.* at 66.

218. *See id.* at 62.

219. *See id.*

220. *Id.*

221. *See id.* at 67.

222. *See id.*

223. *See supra* note 205 and accompanying text.

224. *See* Marchant, *supra* note 58, at 647-48.

225. *Id.* at 648.

226. *See id.*

227. *See id.*

228. *See id.*

required to submit reports. These reports could be verified by the sales reports of producers of fossil fuels.²²⁹

World leaders also need to decide whether or not to allow the banking of credits. Allowing firms to receive credits for emission rights not used in a particular year would result in increased emission in future years. Also, the banking of credits could result in less trading in the market as firms hold on to their credits for future use. On the other hand, by not allowing the banking of credits, a firm that did not use all of its emissions allowance, whether by actual emissions or trading, would lose those particular excess allowances. The environment would benefit from these allowances never being emitted.

However, the advantages of allowing credits outweigh the disadvantages. First, even though future emissions will be higher if banking is allowed, total global emissions will still be reduced because the forgone emissions were included in the global quota in the first place. Second, allowing the banking of credits could help firms lower overall costs of reducing pollution. As the total emissions allowance gets more stringent with time, firms will benefit from the cost savings of having extra emissions credits to use in the future. Finally, there were higher than expected reductions in the SO₂ emissions early in the program because firms were allowed to bank their credits.²³⁰ If the same occurs in the CO₂ program, the early reductions in CO₂ emissions would also be a win-win situation for everyone.

In RECLAIM, two trading zones were set up because of the movement of the pollution by atmospheric winds.²³¹ In the SO₂ program, states like New York are challenging the open trading policy because it continues to allow Midwestern states to pollute and cause the fall of acid rain on New York.²³² These localized problems will be less of an issue with the CO₂ program. Unlike the other two pollutants which caused problems on regional basis, CO₂ poses a global threat.²³³ Carbon dioxide's climate-warming effects are independent of where it is emitted.²³⁴ Allowing some countries to continue their rate of emissions by purchasing credits will not lead to problems for their neighboring countries. As long as global emissions are reduced, the effects of global warming will eventually be

229. *See id.* at 648-49.

230. *See Bohi & Burtraw, supra* note 38.

231. *See Polesetsky, supra* note 62, at 392.

232. *See Doherty, supra* note 73, at 35.

233. *See GAO Report, supra* note 32, at 66.

234. *See id.* at 67.

lessened. This fact should facilitate trading because it enhances the worth of emissions credits.²³⁵

The setting of the baseline and the emissions cap have always been highly debated issues in developing an emission trading program. In the SO₂ program, utilities pushed hard for the earliest baselines they could while environmentalists fought hard for later baselines.²³⁶ In the end, levels from the year of 1980 were chosen as the baseline.²³⁷ In RECLAIM, a similar debate occurred in setting baselines. In the end, SCAQMD decided to allow each firm to choose their baseline level based on actual emissions for one year between 1989-1992.²³⁸ Participants could choose from a range of 4 years because SCAQMD recognized that many industries were suffering from the effects of a recession and thus were producing at a lower level.²³⁹ Unlike the SO₂ program, where Congress chose to set the goal of reducing SO₂ emissions by 10 million tons from 1980 levels without much debate,²⁴⁰ RECLAIM's goal was based more on environmental concerns. What SCAQMD hopes is to have the air quality in its region meet the EPA's national ambient air quality standards.²⁴¹

During the negotiations at the Kyoto Conference, the United States pushed for a reduction in global CO₂ emissions to 1990 levels by the years 2008-2012.²⁴² The European Union, backed by many Third World countries, pushed for a 15% reduction from 1990 levels by the year 2010, while Japan had hoped for a 5% reduction from 1990 levels by the year 2012.²⁴³ In the end, a compromise position was agreed upon by the world leaders.²⁴⁴ Unfortunately, the emissions reduction targets set by the Kyoto Protocol appear to have followed the path of the SO₂ Program—that is, they seem to have been decided based on compromises between nations rather than being environmentally based.

235. See *id.*

236. See Doherty, *supra* note 73, at 34.

237. See *id.*

238. See Klier et al., *supra* note 94, at 1.

239. See *id.*

240. See Lisa Heinzerling, *Selling Pollution, Forcing Democracy*, 14 STAN. ENVTL. L. J. 300, 324 (1995).

241. Telephone Interview with Brian L. Yeh, Air Quality Analysis & Compliance Supervisor, South Coast Air Quality Management District Stationary Source Compliance (Jan. 12, 1998).

242. See Drozdak, *supra* note 213 at A29.

243. See Glenn, *supra* note 1.

244. See *id.*

VII. CONCLUSION

The time has come for the world to address the possible global warming effects greenhouse gases are having on this planet. With experiences from the SO₂ emissions trading program, RECLAIM, and four other trading programs, the United States should lead the world in developing a global CO₂ emissions trading program. By utilizing the strengths and learning from the weaknesses of past emissions trading programs, a CO₂ emissions trading program on a global scale is possible.

