Front Doors, Back Doors, and Trapdoors to Acid Rain Control*

INTRODUCTION

Despite numerous attempts during the past several years, Congress has repeatedly failed to enact control legislation[1] to address the scientific, political, and socioeconomic issues of acid rain.[2] Negotiations between the United States and Canada in 1985 resulted in a finding that acid rain was a serious environmental and diplomatic problem which could best be addressed by additional scientific research, control technology development, and more cooperative activities between the two nations.[3] Legislative efforts to mitigate the alleged environmental effects of acid deposition[4] have largely focused on controlling sources of precursor emissions of sulfur dioxide.[5]

Barring further legislative initiatives, substantial authority exists within the current statutory framework to effect these emission reductions or to mitigate the alleged effects of acid rain.[6] This note identifies provisions within existing United States statutes which might be employed to reduce acid deposition,[7] particularly that

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1. *See Stafford Offers Acid Rain Legislation; Says Industry Has Stalled Control Efforts*, [Current Development] 17 Env't Rep. (BNA) 1564 (1987).

2. *See generally* U.S. CONGRESS OFFICE OF TECHNOLOGY ASSESSMENT, ACID RAIN AND TRANSPORTED AIR POLLUTANTS: IMPLICATIONS FOR PUBLIC POLICY (1984) [hereinafter OTA REPORT] (discussing the risks of damage, the risk of additional pollutant control, and the regional allocation of these risks).

3. D. LEWIS & W. DAVIS, JOINT REPORT OF THE SPECIAL ENVOYS ON ACID RAIN 7 *passim* (Jan. 1986).

4. Potential adverse environmental impacts include: acidification of lakes and streams and the subsequent loss of fish populations, agricultural crop damage, decline in forest productivity, materials damage, and human health concerns. OTA REPORT, *supra* note 2, at 41-48.

5. CONGRESSIONAL BUDGET OFFICE, CURBING ACID RAIN: COST, BUDGET, AND COAL-MARKET EFFECTS 1 (1986) [hereinafter CBO REPORT].

6. *Contra* Reed, *Reforming Environmental Law*, 15 Envtl. L. Rep. (Envtl. L. Inst.) 10062, 10063 (Mar. 1985) (stating: "Other apparent problems, like acid rain, have no response on the books.").

7. Acid deposition or, as it is more commonly known, "acid rain" is a type of air pollution in which acidic compounds in the atmosphere (primarily sulfates and nitrates which result from atmospheric chemical transformations of precursor emissions of sulfur oxides and nitrogen oxides respectively) are deposited in wet and dry form on the

component of it associated with sulfur-based emissions. Principally, this note examines the potential for additional sulfur dioxide emission reductions using the current Clean Air Act[8] and assumes the desirability of such reductions can be established by the scientific evidence. Additionally, several novel approaches to acid rain mitigation under other environmental pollution control and natural resources statutes are suggested as alternatives.

CLEAN AIR ACT

The statute most directly applicable to the acid rain phenomenon is the Clean Air Act [hereinafter, "the Act" or "the CAA"],[9] which is designed to protect human health and the environment from air pollution. The CAA is appropriate to consider because it has a proven track record and has been refined through numerous court battles during its relatively brief history.

Sulfates and nitrates, the principal acidic components of acid rain,[10] are not directly regulated by the CAA; however, precursors of these substances, namely sulfur dioxide (SO_2) and nitrogen oxides (NO_x), respectively, are specifically controlled by the Act. The anthropogenic component[11] of these atmospheric pollutants results largely from fossil fuel combustion in the electric utility and transportation sectors.[12] Because acid deposition is comprised largely of sulfur-based compounds,[13] which affect ecosystems more than nitrogen compounds,[14] proposed measures like the CAA have focused

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earth's surface. CBO REPORT, *supra* note 5, at xv, 1. The terms "acid rain" and "acid deposition" are used interchangeably in this note.

8. Clean Air Act, 42 U.S.C. §§ 7401-7642 (1982 & Supp. 1985) (Pub. L. No. 95-95, 91 Stat. 685, *amended by* Pub. L. No. 95-190, 91 Stat. 1401 (1977)).

9. *Id.*

10. CBO REPORT, *supra* note 5, at xv.

11. In eastern North America, 90 to 95 percent of the acidity in precipitation may be the result of human activities. NATIONAL RESEARCH COUNCIL, ACID DEPOSITION: ATMOSPHERIC PROCESSES IN EASTERN NORTH AMERICA 13 (1983) [hereinafter NRC REPORT].

12. Percent of 1980 national emissions by source category:

Sulfur dioxide: electric utilities—64%; industrial combustion/processes—25%; other—11%

Nitrogen oxides: transportation—38%; electric utilities—34%; industrial combustion/processes—23%; other—5%.

Interagency Task Force on Acid Precipitation, ANNUAL REPORT 1984 TO THE PRESIDENT AND CONGRESS 34 (1984).

13. In the East, sulfur compounds currently contribute about twice as much acidity to precipitation as nitrogen compounds. OTA REPORT, *supra* note 2, at 16.

14. U.S. GOV'T ACCOUNTING OFFICE, AN ANALYSIS OF ISSUES CONCERNING "ACID RAIN" iv, 32 (1984).

primarily on SO_2 emission reductions.[15] Although the CAA has caused a substantial reduction in SO_2 emissions, it still allows considerable amounts of these emissions in the United States.[16] These emissions when expressed as acid rain are allegedly responsible for certain adverse effects in various aquatic and terrestrial ecosystems and may contribute to the deterioration of certain man-made materials.[17] Current provisions of the CAA offer several possible avenues for further reductions of SO_2 emissions.

Before discussing the substantive provisions of the CAA, one point is in order. Many of the potential emission reductions under the CAA depend upon the promulgation of regulations by the Environmental Protection Agency (EPA). When these rules are legally challenged, the courts consequently assume an important role in determining the ultimate effectiveness of particular provisions of the CAA. Hence, their standard of review of agency action is crucial. Generally, the courts will uphold an agency's action unless it is "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law."[18] This standard of review will apply to most EPA decisions under the CAA. On questions of statutory construction the courts will show "great deference to the interpretation given the statute by the officers or agency charged with its administration."[19] As the Supreme Court noted, "[T]he ultimate standard of review is a narrow one. The court is not empowered to substitute its judgment for that of the agency."[20] Therefore, an overriding principle bearing upon each potential agency decision discussed hereafter is the broad discretionary authority bestowed upon agencies.

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15. *See supra* note 5 and accompanying text.

16. Between 1970 and 1983, sulfur dioxide emissions nationwide declined 26%. U.S. EPA, NATIONAL AIR POLLUTANT EMISSION ESTIMATES, 1940-1983 42 (1984). 1984 SO_2 emissions from all sources are estimated at 23.6 million tons. U.S. EPA, Response by Lee M. Thomas, Administrator, U.S. EPA to Honorable John D. Dingell, Chairman of House Committee on Energy and Commerce, requesting answers to questions on H.R. 4567, the "Acid Deposition Control Act of 1986" (May 1986) (question 1 response, table entitled "SO_2 Emission Estimates by Source Sector, 1970 to 1984" by E.H. Pechan & Associates).

17. *See supra* note 4.

18. Administrative Procedure Act, 5 U.S.C. § 706(2)(A) (1982).

19. EPA v. Nat'l Crushed Stone Ass'n, 449 U.S. 64, 83 (1980) (quoting Udall v. Tallman, 380 U.S. 1, 16 (1965)).

20. Citizens to Preserve Overton Park, Inc. v. Volpe, 401 U.S. 402, 416 (1971).

National Ambient Air Quality Standards

An obvious starting point is section 109 of the CAA[21] which, *inter alia*, requires the EPA to establish National Ambient Air Quality Standards (NAAQS) to protect public health (primary standards) and public welfare, i.e., environmental and economic interests (secondary standards).[22] Relevant to the acid rain issue, standards currently exist for sulfur oxides, (measured as sulfur dioxide), nitrogen dioxide, and particulate matter. Annual and twenty-four hour primary standards and a 3-hour secondary standard prescribe limits on the concentration of sulfur oxides in ambient air.[23] Annual and twenty-four hour primary and secondary standards exist for particulate matter.[24] National primary and secondary standards have also been specified for nitrogen dioxide.[25] Within the present statutory authority of section 109, several options for achieving additional sulfur dioxide emission reductions are possible.

Based upon the requisite criteria documents which are subject to revisions at five-year intervals,[26] revised sulfur oxides standards might be based upon the health and welfare effects of these pollutants or their derivatives. Such revisions might include: a more stringent permissible concentration within the present averaging time periods and standards for additional averaging periods, e.g., a short-term (one- or three-hour) primary standard or a long-term (annual) secondary standard. A revised primary standard, in comparison to a secondary standard, would have a more immediate impact on emission reductions because of the more stringent timetable for implementation.[27]

In March 1984, the EPA issued a revised air quality criteria document for particulate matter and sulfur oxides.[28] This document, which is currently undergoing EPA review,[29] includes recent

21. 42 U.S.C. § 7409 (1982).
22. *Id.* § 7409(b).
23. 40 C.F.R. §§ 50.4-.5 (1986).
24. *Id.* §§ 50.6-.7.
25. *Id.* § 50.11.
26. 42 U.S.C. §§ 7408(a), 7409(d)(2)(B) (1982). Criteria documents present the latest scientific knowledge on air pollutants and their effects, and they serve as the technical basis for the establishment of air quality standards.
27. Primary standards must be attained no later than three years from the date of approval of a state plan implementing the standard; secondary standards, on the other hand, must be attained within a "reasonable time." 42 U.S.C. § 7410(a)(2)(A) (1982).
28. *See* 49 Fed. Reg. 10,408 (1984).
29. The Clean Air Scientific Advisory Committee (CASAC) has completed its review of the 1982 Air Quality Criteria for Particulate Matter and Sulfur Oxides and the 1986 Second Addendum to Air Quality Criteria for Particulate Matter and Sulfur Ox-

clinical studies on the effects of SO_2 on exercising asthmatic and other sensitive individuals. Based upon the outcome of this review, the EPA may propose a new one-hour primary standard within the 0.25 to 0.50 ppm range for ambient SO_2 levels.[30] This standard could have a significant effect on SO_2 emissions. For example, strict enforcement of the current SO_2 standards is expected to result in a 2.3 million ton reduction in electric utility SO_2 emissions by 1995.[31] A 0.50 ppm standard would yield a 4.4 million ton reduction, and a more stringent 0.25 ppm standard would produce a 9.0 million ton reduction in electric utility SO_2 emissions over the same time period.[32] If the health studies can substantiate the need for more restrictions on ambient SO_2 levels, this revised primary standard would provide a significant and direct approach to acid rain control.

Revising the secondary sulfur oxides standard on the basis of acid deposition impacts to the environment requires a better understanding of the cause-and-effect relationship than is currently available. Tracing the pathway of SO_2 emissions through chemical transformations, transport, and deposition to adverse environmental effects is a difficult technical task. As an example of the complexity of the problem, the Clean Air Scientific Advisory Committee notes that "SO_2 is only one of the precursor pollutants that leads to the formation of acid deposition."[33] In late 1984, the EPA issued its findings on the possible adverse welfare effects of acid deposition in a report entitled, *The Acidic Deposition Phenomenon and Its Effects: Critical Assessment Review Papers* (CARP).[34] Despite numerous reported impacts of acid deposition, the EPA maintains that to date the available scientific evidence is not adequate for standard-setting.[35]

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ides. Letter from Morton Lippman, Chairman, CASAC, to Lewis M. Thomas, Adm'r, U.S. EPA (Feb. 19, 1987).

30. Based upon an expected recommendation by CASAC that the standard be established at the low end of the range of concern, the EPA is likely to make a decision on a one-hour NAAQS for SO_2 in May 1987. *Id.*

31. B.H. Braine, ICF Incorporated, Current Efforts to Reduce Sulfur Dioxide Emissions 7 (June 18, 1986) (presentation to Utility Air Regulatory Group).

32. *Id.*

33. Letter from Bernard D. Goldstein, Chairman of CASAC, to William D. Ruckelshaus, Administrator, EPA (August 26, 1983) (with attached report "CASAC Recommendations").

34. OFFICE OF RESEARCH AND DEVELOPMENT, EPA, THE ACIDIC DEPOSITION PHENOMENON AND ITS EFFECTS: CRITICAL ASSESSMENT REVIEW PAPERS VOL. I (1984) [hereinafter CARP].

35. "It is premature and unwise to prescribe emission controls based on our current scientific understanding of the problem." *Review of the Federal Government's Research Program on the Causes and Effects of Acid Rain*, 99th Cong., 1st Sess. 2 (1985 and photo reprint n.d.) (statement of Lee M. Thomas, Administrator, U.S. EPA).

However, this situation could change in light of pending litigation.

Similar to a citizen suit filed nine years earlier by the Sierra Club,[36] the Environmental Defense Fund (EDF) filed suit in December 1985 alleging that the EPA had failed to complete a mandatory review and revision of the ambient standards for sulfur oxides.[37] EDF maintains that the criteria document and the CARP contain findings that the deposition of sulfur compounds causes adverse health and welfare effects sufficient to require a revision of the NAAQS. The outcome of this action will largely depend upon the court's jurisdiction to hear the case and an examination of proper agency discretion in not revising the standards. As a result of the considerable deference shown to agencies, the EPA is likely to prevail.

As part of the revision of criteria and standards under section 109, the EPA might establish, in addition to those already promulgated for sulfur oxides, a specific standard for sulfates, which is a major acidic component of eastern precipitation, or a more general standard for acid aerosols.[38] Little scientific evidence exists to support a primary sulfate standard;[39] however, a secondary standard could be better substantiated.[40] Compliance with these new ambient air quality standards could readily be determined by current monitoring techniques.[41]

Enforcement is the problem. Compared to SO_2 emissions, annual emissions of primary sulfate are insignificant.[42] Therefore, source-specific emission limitations would have a minimal effect on ambient concentrations of sulfate. Secondary sulfates, those which result

36. *See* Sierra Club v. Train, No. 76-656 (D.D.C. order filed Jan. 19, 1978), *cited in* Environmental Defense Fund v. Costle, 448 F. Supp. 89, 93 (D.D.C. 1978), *aff'd sub nom.* Citizens to Save Spencer County v. EPA, 600 F.2d 844 (D.C. Cir. 1979).

37. *See* Environmental Defense Fund v. Thomas, No. 85-9507, [Pending Litigation] 16 Envtl. L. Rep. (Envtl. L. Inst.) 65,889 (S.D.N.Y. filed Dec. 5, 1985).

38. *See* Sierra Club v. Train, No. 76-6656 (D.C. Cir. filed Apr. 20, 1976, *dismissed with prejudice* Jan. 19, 1978) (action to force promulgation of sulfate standard).

39. *See, e.g.,* OFFICE OF SCIENCE AND TECHNOLOGY POLICY, REPORT OF THE ACID RAIN PEER REVIEW PANEL V-10 (1984) ("acidic deposition does not directly affect human health. Even indirect effects . . . appear to have no immediate health effect. . . ."). *Contra* OTA Report, *supra* note 2, at 13 (finding disagreement in the scientific community: opinion ranges from minimal to significant effects of sulfates on human health).

40. *See, e.g.,* Press Release from the Ad Hoc Committee on Acid Rain: Science and Policy (Oct. 18, 1985) ("[S]ubstantial consensus exists on sources of acid deposition, on certain types of damage caused by deposition and on likely effects of reducing the emissions responsible for the acidity. Adequate scientific information exists to select emission-reduction strategies to reduce acid deposition efficiently.").

41. *See, e.g.,* CARP, *supra* note 34, at 5-13 to 5-24.

42. *Id.* at 2-63, -67.

from the chemical conversion of SO_2 to sulfate in the atmosphere, are more important to ambient sulfate levels.[43] Attempting to maintain ambient sulfate concentrations through SO_2 emission limitations strikes at the very heart of one of the key uncertainties in the acid rain scientific debate—the relationship of ambient sulfate levels to SO_2 emissions.[44] Establishing the link between source emissions at one location and corresponding sulfate concentrations at receptor sites elsewhere remains an unresolved problem.

Because of scientific uncertainty, therefore, states would have difficulty specifying appropriate SO_2 emission limitations for sources within their borders. Because the relationship between SO_2 emissions and ambient sulfate levels is strongly influenced by factors such as the concentration of other pollutants, spatial and temporal distributions of pollutants, and meteorology, it would be necessary to reduce emissions in disproportionately greater amounts in order to achieve a desired reduction in sulfate deposition.[45] This overcontrol approach is also necessary in order to produce a specified sulfate reduction at a particular location—areas of peak atmospheric sulfate concentrations do not necessarily coincide with areas of maximum SO_2 emissions density.[46] Even for local sulfate level concerns, it would be difficult to predict the appropriate SO_2 emission reductions, since the rate of conversion, transport, and deposition of SO_2 is so variable.[47] Recent research, which purportedly better defines the relationship between emissions and deposition, may alleviate these problems somewhat.[48] If follow-up studies bear out these claims, the resulting information should prove extremely valuable to determinations under other sections of the CAA.

A revision of the NAAQS for particulate matter could also affect SO_2 emissions. A new secondary ambient air quality standard for

43. *Id.* at 5-23, -24.

44. *See, e.g.*, NRC REPORT, *supra* note 11, at 139 (finding that the variability in ambient concentrations of sulfate does not correlate with the variability in SO_2 emissions; rather, sulfate concentrations are predominantly controlled by meteorology).

45. *See id.* at 10-11. *See also* Streets, Lesht, Shannon & Veselka, *Climatological Variability*, 19 ENVTL. SCI. TECH. 887, 891-93 (1985) (discussing factors affecting targeted control strategies). *Cf.* CARP, *supra* note 34, at 5-14 (discussing the variable response of sulfate levels to SO_2 emission changes).

46. Katzenstein, *Acid Rain—A Further Look at the Evidence*, 93 POWER ENG'G 32, 33-34 (1986).

47. Ferguson & Machta, *Work Group 2 (Atmospheric Sciences and Analysis), United States—Canada Memorandum of Intent on Transboundary Air Pollution* 10-2 to 10-3 (Final Report Nov. 1982).

48. *See* Oppenheimer, Epstein & Yuhnke, *Acid Deposition, Smelter Emissions, and the Linearity Issue in the Western United States*, 229 SCI. 859 (1985).

fine particulate matter (<2.5 micrometers in diameter) to address the regional haze problem, which is reportedly caused in part by anthropogenic sulfate particles,[49] is one option. Because of the interrelated aspects of sulfur/nitrogen oxides emissions, acid deposition, climatological effects, and visibility, the use of this common standard linked to fine particles may be a more appropriate approach than a separate set of controls for each pollutant.[50] A second option is a revised primary standard based upon recent scientific evidence which more precisely characterizes the health impacts from fine particulate matter.[51] Major emission reductions could result from a fine particulate standard.[52] However, one EPA official notes that the implementation of such a standard could take as long as seventeen years,[53] presumably because it would take that long to establish emission limitations within state plans, to upgrade existing control equipment on sources, and to develop and implement monitoring techniques.

Revised particulate matter standards were proposed in March 1984.[54] In lieu of a fine particulate matter approach, the EPA chose a third option, a PM-10 standard. The proposed primary standard would replace total suspended particulates (TSP) as an indicator for particulate matter with a new indicator that includes only particles with a diameter less than or equal to ten micrometers, hence the term, PM-10. The EPA expects this standard will cause the imposition of control measures in a significant number of areas.[55] Although not a fine particulate standard, this proposal ultimately could lead to SO_2 emission reductions if agencies were to consider controls for sulfates when conventional controls on primary PM-10 emissions do not result in compliance with the standard.

Another issue related to ambient standards is the averaging

49. CARP, *supra* note 34, at 5-78.

50. CASAC Conclusions and Recommendations on Major Scientific Issues and Studies Associated with the Development of Revised NAAQS for Particulates, *reprinted in* 49 Fed. Reg. 10,429 (1984).

51. *See* OFFICE OF ENVIRONMENTAL CRITERIA AND ASSESSMENT, U.S. EPA, AIR QUALITY CRITERIA FOR PARTICULATE MATTER AND SULFUR OXIDES (1982).

52. Congressional Research Service, Mitigating Acid Rain: Options for Control CRS-11 (Feb. 1986) [hereinafter CRS Paper].

53. *Study Finds EPA Could Reduce SO_2 Emissions By 12-Million Tons Yearly*, 8 Inside EPA 13 (Feb. 6, 1987) [hereinafter Inside EPA].

54. *See* Revised Particulate Matter Standards, 49 Fed. Reg. 10,408 (1984) (to be codified at 40 C.F.R. pt. 50) (proposed Mar. 20, 1984).

55. Regulations for Implementing Revised Particulate Matter Standards, 50 Fed. Reg. 13,130, 13,138 (1985) (to be codified at 40 C.F.R. pts. 51, 52, 81) (proposed Apr. 2, 1985).

method for determining compliance with the NAAQS. The use of running (rolling) averages, as compared to block (calendar day) averages could result in SO_2 emission reductions of one to three million tons. Implementation of such a system, however, would be "difficult, time-consuming, and expensive."[56] A challenge to the EPA's decision to use block averaging for determining compliance with the SO_2 NAAQS was recently denied.[57]

To summarize this section: substantial SO_2 emissions are possible through a variety of revisions to the SO_2 and particulate matter NAAQS; and, a more stringent primary SO_2 standard would have the most significant and direct impact on SO_2 emissions. The remaining question is whether existing scientific evidence can support a primary standard. Revised standards for fine particulate matter, if they can be scientifically substantiated, and changes in compliance determination methods could also provide SO_2 emission reductions. Although current scientific results are mixed, these regulatory changes by the EPA would likely be upheld as rational decisions if challenged in the courts. Both a NAAQS for sulfate and a secondary standard for SO_2 are less scientifically defensible.

State Implementation Plans

Section 110 of the CAA[58] describes the primary mechanism for implementation of the NAAQS: the State Implementation Plans (SIP's). Because of the importance of this section to the general implementation of the Act, many of its substantive provisions are addressed elsewhere in this note. Discussed below are some additional points which could affect SO_2 emissions.

Section 110(e)[59] allows an extension of the deadline for compliance with the primary NAAQS. When states fail to meet the compliance deadline or fail to comply with other applicable requirements, the EPA has several enforcement options, including the imposition of construction sanctions, the issuance of administra-

56. Inside EPA, *supra* note 53, at 13. Compliance with a 24-hour standard under the running average method notes the number of exceedances of the emission limitation in any twenty-four hour period within the year; under the block averaging method, compliance is measured on a midnight-to-midnight basis, and thus two violations of the emission limitation are allowed in a twenty-four period so long as they don't occur within the midnight-to-midnight time frame. *EPA Moves to SO_2 Block Averaging, But Continues To Eye One-Hour Standard*, 7 Inside EPA 9 (April 11, 1986).

57. Natural Resources Defense Council v. Thomas, No. 86-1305 (D.C. Cir. 1986).

58. 42 U.S.C. § 7410 (1982).

59. *Id.* § 7410(e).

tive compliance orders, and the initiation of civil actions.[60] Similarly, the EPA can take action against sources in violation of a SIP or of the Act's other requirements.[61] As a consequence, there is better compliance and potentially lower emissions. Along these same lines, more stringent enforcement of SIP compliance through citizens' suits[62] could result in reduced emissions.

A more rigid system of enforcing the emission limitations within the SIP, perhaps by tightened methods of establishing compliance, could reduce SO_2 emissions up to three million tons annually.[63] Minor changes in such compliance methods can substantially affect emissions. For example, when "a fixed, never-to-be-exceeded emission limitation is applied to a variable source [of emissions], the source is effectively required to pollute well below the fixed limit most of the year in order to insure compliance on its few days of high emissions."[64] In general, a fuller utilization of the inspection, continuous emission monitoring, and other source surveillance provisions of 40 C.F.R. § 51.124[65] could better ensure that sources are in compliance with applicable requirements and thereby indirectly achieve a reduction in emissions without implementing additional controls. Limited resources for enforcement impede these efforts however. Although federal programs for air quality protection are relatively well-funded, state and local agencies often have insufficient funds and personnel to enforce properly the various requirements of the SIP.[66]

Finally, states have the authority to establish emission limitations which would result in air quality better than that required by national standards.[67] Correspondingly, existing authority under present state statutory schemes could provide additional means for states to achieve emission reductions. While such an approach may aid in the abatement of acid rain caused by local, in-state sources, it provides little relief for the long-range transport component of acid

60. *Id.* §§ 7413(a)(2), (a)(5).

61. *Id.* §§ 7413(a)-(d).

62. *Id.* § 7604.

63. CRS Paper, *supra* note 52, at CRS-11. The EPA estimates that a "small amount" of reduction would result. Inside EPA, *supra* note 51, at 13.

64. 40 C.F.R. § 51.124 (1987).

65. Kamp v. Hernandez, 752 F.2d 1444 (9th Cir. 1985). Despite this fact, the court permitted a change from a single-point rollback system to a multi-point technique with the Arizona SIP, even though a 26% chance of violation of the SO_2 NAAQS existed under the new technique. *Id.* at 1447, 1450.

66. THE NATIONAL COMMISSION ON AIR QUALITY, TO BREATHE CLEAN AIR 87-93 (1981) [hereinafter NCAQ].

67. 42 U.S.C. § 7416 (1982).

rain, unless states agree to implement such controls on a regional basis.

Standards of Performance for New Stationary Sources

Section 111 of the CAA[68] establishes nationally uniform standards for both new and modified stationary sources in order to increase the likelihood that emissions resulting from industrial growth in this country will not cause violations of the ambient air standards. At the same time, such standards aim to ensure that "air quality requirements will not affect the location of facilities."[69] The New Source Performance Standards (NSPS) require that certain categories of sources control emissions to a level achievable by applying the best system of continuous emission reduction, considering cost.[70] For electric utility steam generating units—the major source of SO_2 emissions—constructed after September 18, 1978, NSPS require not only a specified emission limitation, but also include a percentage reduction requirement.[71] Units constructed prior to this date, but after August 17, 1971, are subject only to the emission limitation.[72] Because of these requirements, and the fact that NSPS for all categories of sources are generally more stringent than the emission limitations for existing sources, emissions of SO_2 could decline in the future as new, cleaner sources replace older, existing facilities.[73]

The increasing trend of electric utilities to extend the life of boilers could affect this potential decrease in future emissions resulting from the NSPS requirements.[74] In order to avoid the high cost associated with construction of new power plants, electric utility com-

68. *Id.* § 7411.

69. H.R. REP. No. 1146, 91st Cong., 2d Sess. 9-11 (1970); S. REP. No. 1196, 91st Cong., 2d Sess. 15-19 (1970).

70. 42 U.S.C. § 7411(a)(1) (1982).

71. Standards of Performance for Fossil-Fuel-Fired Steam Generators, 40 C.F.R. § 60.43a (1987) (construction commenced after Sept. 18, 1978).

72. Standards of Performance for Fossil-Fuel-Fired Steam Generators, 40 C.F.R. § 60.43 (1987) (construction commenced after Aug. 17, 1971).

73. The National Coal Association predicts a 3.54% decrease annually in utility SO_2 emissions from 1985 to 1990, due in part to the retirement of older sources and their replacement by sources subject to NSPS. NATIONAL COAL ASSOCIATION, THE DOWNWARD TREND IN SULFUR DIOXIDE EMISSIONS AT COAL-FIRED ELECTRIC UTILITIES; 1985 UPDATE 10 (1986). *Contra* ICF INC., COMPARISON OF ELECTRIC UTILITY COAL-FIRED SULFUR DIOXIDE EMISSION FORECASTS BY EPA AND NCA 5, 10 (Mar. 12, 1986) (analyzing the assumptions of two emissions forecasts, noting that EPA predicts a 2.2 million ton increase between 1984 and 1990 and a 4 million ton increase between 1990 and 2010).

74. *See* J.L. McCormick, Environmental Policy Institute, Environmental Implica-

panies are renovating existing boilers to extend their operating life. As a result, these units will continue to emit at the typically higher, non-NSPS levels longer into the future than Congress expected when it enacted the NSPS provisions. Consequently, SO_2 emissions could increase in the future.[75] Whether or not a renovation to extend operating life subjects a source to NSPS depends upon the project's characterization as a "modification"[76] or a "reconstruction."[77]

A "modified" source may be exempt from NSPS if it meets one of the several exceptions specified in the NSPS regulations.[78] For example, "routine" maintenance, repair, and replacement would not subject either modified or reconstructed sources to NSPS.[79] Also exempted is the use of an alternative fuel or raw material if the existing facility was originally "designed to accommodate that alternative use."[80] Neither the term "routine" nor the phrase "designed to accommodate" have been expressly defined by the EPA. Strict construction of definitions for these ambiguous terms could minimize the number of existing units that would be exempt from NSPS and thereby better assure decreases in future SO_2 emissions. Within the reconstruction regulations, refinements of terms such as "replacement of components," "depreciable components," and "comparable entirely new facility" could also minimize life extensions, as would fixing a lower threshold level of capital expenditure to trigger NSPS requirements.[81] Similar definitional issues affect the applicability of prevention of significant deterioration, nonattainment, and stack height requirements on life-extended facilities.[82]

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tions of Boiler Life Extension (May 23, 1986) (presentation to Edison Electric Institute Energy and Environment Comm.).

75. DeMocker, Greenwald, & Schwengals, *Extended Lifetime for Coal-Fired Power Plants: Effect Upon Air Quality*, PUB. UTIL. FORT. 30, 35 (Mar. 1986). *But see* McGowin, Leadenham, Parkes, Miller, & Fan, *Sensitivity Analysis of Electric Utility SO_2 Emissions in the U.S.* 1 (Mar. 1986) (EPRI paper for Clean Air Act Issue Group which concludes that 76% of the pre-NSPS coal-fired capacity in the U.S. could remain in service beyond their normal 40-year life without causing an increase in SO_2 emissions).

76. A "modification" is a physical change in, or a change in the operation of, an existing facility that results in an increase in emissions or emissions rate for regulated pollutants. 40 C.F.R. §§ 60.2, 60.14 (1987).

77. A "reconstruction" is a replacement of components of an existing facility in which the fixed capital cost of the new components exceeds 50 percent of the cost of a comparable new facility. *Id.* § 60.15(b).

78. *Id.* § 60.14(e).

79. *Id.* § 60.14(e)(1).

80. *Id.* § 60.14(e)(4).

81. *Id.* § 60.15(b)(1), (c).

82. *See* 40 C.F.R. §§ 51.165-.166 (1987); 40 C.F.R. §§ 81.300-.356 (1987); 50 Fed. Reg. 27,892, 27,907 (1985).

Section 111(b)(1),[83] the cornerstone of NSPS, authorizes the EPA to designate categories of sources and to promulgate NSPS for them. The promulgation of NSPS for source categories not currently subject to these restrictions could contribute to declines in future SO_2 emissions.[84] For example, the proposed NSPS for industrial-commercial-institutional steam generating units are expected to reduce SO_2 emissions for a typical unit by 510 to 2,670 tons per year, resulting in a 320,000 ton per year reduction in nationwide emissions in the fifth year of compliance.[85] Minor changes within these rules, such as the inclusion or exclusion of emissions during start-up, shutdown, or system malfunction could also affect future emissions.

The development and subsequent required application of new "best technological system[s] of continuous emission reduction" would also promote reductions in future SO_2 emissions. New technologies currently under development for electric utility applications, such as coal gasification, would permit 95 percent or better SO_2 removal efficiencies.[86] The key questions are when these technologies will be commercially available, and when the EPA will revise the NSPS to require their application.[87] In addition to more stringent standards, stricter compliance with the statutory deadlines for promulgation and revision of NSPS[88] would increase the effectiveness of these provisions.[89] Delays in the implementation of these regulations permit new sources to commence operations with less stringent emission limitations and do not allow the more immediate realization of benefits from improvements in control technology.

The methods for determining compliance with NSPS also affect future emissions for new sources.[90] Fuel analysis, a common

83. 42 U.S.C. § 7411(b)(1) (1982).

84. *See also* 40 C.F.R. § 60.16 (1987) (establishing a priority list of major source categories for future NSPS regulation).

85. Standards of Performance for New Stationary Sources, 40 C.F.R. §§ 406-496 (1987).

86. *See generally* ELECTRIC POWER RESEARCH INSTITUTE, COOL WATER COAL GASIFICATION PROGRAM: FOURTH ANNUAL PROGRESS REPORT (Oct. 1986) (discussing *inter alia*, the results of environmental monitoring for this integrated-gasification combined cycle (IGCC) system).

87. Congressional Research Service, The Clean Air Act and Proposed Acid Rain Legislation: Can We Get There from Here CRS-8.

88. *See* 42 U.S.C. § 7411(b)(1), (f)(1) (1982).

89. *See* NCAQ, *supra* note 66.

90. *See* Donner Hanna Coke Corp. v. Costle, 464 F. Supp. 1295, 1304 (W.D.N.Y. 1979) ("It is undisputed that the method of determining compliance with an emission

method of compliance determination, is complicated by the fact that chemical characteristics of fuels, such as coal, are quite variable, even for coal supplied by the same mine.[91] Because of this variability, the averaging time for determining compliance with an SO_2 emission limitation is critical.[92] Shortening the averaging period requires a corresponding lowering of the sulfur content in the fuel in order to ensure compliance. Longer averaging periods tend to reduce the number of violations of emission limitations by counterbalancing emission "peaks" with more emission "valleys." Hence, a short-term three-hour standard, as opposed to a longer-term thirty-day standard, would result in fewer SO_2 emissions as sources use lower sulfur coal to ensure compliance.[93] Likewise, running (rolling) averages in lieu of block averages[94] effectively impose lower sulfur restrictions as sources take additional precautions in order to avoid excess emissions. Similar principles hold true for other compliance determination methods such as continuous emission monitoring systems.

The EPA has adopted a thirty-day rolling average compliance method for Subpart D sources.[95] Revisions to the Subpart D rules, which would change the method of determining compliance from a periodic performance test to a continuous monitoring method, have been repeatedly delayed since their proposal in October 1983.[96] These changes could reduce SO_2 emissions by 200,000 tons annually.[97] Appropriate averaging time is the primary concern at issue.[98] Other issues causing delay include: "the exclusion of emissions data during start-up, shutdown, or system malfunction

standard can affect the level of performance required by the standard, even though the standard itself has not changed.").

91. Standards of Performance for New Stationary Sources, 48 Fed. Reg. 48,960, 48,961 (1983) (to be codified at 40 C.F.R. pt. 60, subpt. D) (proposed Oct. 21, 1983).

92. *Id.*

93. Interpretation of Table 1, *id.*.

94. *See supra* note 54.

95. 40 C.F.R. § 60.43a(g) (1987).

96. *See* Standards of Performance for New Stationary Sources, 48 Fed. Reg. 48,960 (1983) (to be codified at 40 C.F.R. pt. 60, subpt. D) (proposed Oct. 21, 1983). The deadline for public comment was subsequently extended. *See* 49 Fed. Reg. 1,997 (1984); *Id.* at 10,950; *Id.* at 13,059; *Id.* at 22,335.

97. CRS Paper, *supra* note 52, at CRS-11. *Cf.* Memorandum from Burton, System Applications, Inc. to Steigerwald, U.S. EPA, "Power Plant Operating Practice Regarding Sulfur Dioxide Emission Limit Averaging Times," 2, 6 (July 23, 1981) (attachment to Docket No. IV-C-001) (noting that decreases in emissions will likely offset the small potential for emission increases).

98. Letter comments of David G. Hawkins, Natural Resources Defense Council, to Docket IV-D-151A at 20-23 (July 31, 1984).

from the calculation of average emissions"; enforcement problems; minimum data capture rates; the quarterly reporting system; coal sampling analysis procedures; and sulfur retention credits—all of which could ultimately affect future emissions from these Subpart D sources.[99] A legal question also exists as to the validity of these standards if the revision in the monitoring techniques would impose lower sulfur-in-fuel levels.[100]

Improvements in monitoring techniques and more stringent quality assurance/quality control procedures for the required monitoring would better ensure that sources are in compliance with the restrictive NSPS requirements.[101] Such changes, however, should consider the concern that the added cost of compliance be commensurate to the environmental benefit.[102]

Lastly, section 111(d) of the NSPS provisions provides regulatory authority over existing sources that emit pollutants not sufficiently widespread for NAAQS consideration and not sufficiently hazardous to be listed under section 112, if these existing sources would be subject to NSPS were they new sources.[103] Arguably, sulfates satisfy these requirements and pose such danger to public health and welfare that a state might consider a standard of performance for certain existing sources. By construing section 111(d) as allowing the designation of a pollutant which is caused, but not emitted, by a source category, a state could set a standard of performance for existing electric power plants analogous to that for new plants.[104] The major problem with this approach is that section 111(d) is designed to deal with local pollution problems, and sulfates would likely be viewed as an ubiquitous problem.[105] Furthermore, it could be ar-

99. *Id.* at 27-29.

100. *See* Amoco Oil Inc. v. EPA, 501 F.2d 722, 742 (D.C. Cir. 1974); Portland Cement Ass'n v. Ruckelshaus, 486 F.2d 375, 376 (D.C. Cir.), *cert. denied*, 417 U.S. 921 (1974) ("[A] significant difference between techniques used by the agency in arriving at standards, and requirements presently prescribed for determining compliance with standards, raises serious questions about the validity of the standard."). *See also supra* note 87 (making a similar point).

101. *See generally* NCAQ, *supra* note 66, at 2.2-20, 4.1-1 to -45 (discussing the economic costs and benefits of air pollution control and recommending that cost-effectiveness of controls be considered).

102. Standards of Performance for New Sources, 49 Fed. Reg. 9,676 (proposed Mar. 14, 1984) (addition of Appendix F).

103. 42 U.S.C. § 7411(d) (1982).

104. Edwards, *Through the Crevices: Acid Rain and The Clean Air Act*, 11 OHIO N.U.L. REV. 671, 710-11 (1984).

105. Smith, *Playing the Acid Rain Game: A State's Remedies*, 16 ENVTL. L. 255, 295 (1986) (citing Lee, *Interstate Sulfate Pollution: Proposed Amendments to the Clean Air Act*, 5 HARV. ENVTL. L. REV. 71, 82 (1981)).

gued that most sulfates are not emitted and therefore are not subject to this provision.

The bottom line is that the NSPS provisions are presently of limited utility in bringing about sizeable reductions of SO_2 emissions in the near term. First, the major SO_2 sources in the U.S. are already subject to NSPS. Additionally, in order to list additional "categories of stationary sources," the EPA must demonstrate that the source category "contributes significantly to air pollution . . .";[106] a stringent standard, especially when one considers the actual quantity of SO_2 emissions from the remaining non-NSPS source categories. Secondly, because construction of new, major-emitting sources is declining or at least being deferred, lower emissions will be phased in over an extended period of time and thus provide little immediate relief. To the extent that life extension projects successfully avoid NSPS requirements, emission reductions will be further delayed. Nonetheless, some reduction will occur, and additional reductions are possible through certain regulatory actions by the EPA. Many would agree that any decrease in emissions is better than none at all, and thus even small reductions of emissions through the NSPS provisions should be pursued.

International Air Pollution

Section 115 of the CAA authorizes the EPA to require states to revise their SIP when the Administrator of the EPA, "upon receipt of reports, surveys, or studies from any duly constituted international agency has reason to believe that any pollutant or pollutants emitted in the United States cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare in a foreign country. . . ."[107] For this provision to be applicable, the Administrator must also find that the foreign country offers the United States reciprocal protection.[108] Upon satisfying these requisite conditions, the EPA under section 115 could require SIP revisions in those states shown to be contributing to air pollution in a foreign nation, such as Canada, and thereby effect a reduction in emissions.

In 1984, under the "citizen suit" provision of the CAA,[109] several eastern states, national environmental groups, and American citizens who own property in Canada sued the EPA in an attempt to

106. 42 U.S.C. § 7411(b)(1)(A) (1982).
107. *Id.* § 7415(a).
108. *Id.* § 7415(c).
109. *Id.* § 7604(a)(2).

compel the Administrator to take action under section 115.[110] The D.C. District Court held that two letters written in January 1981 by outgoing EPA Administrator Costle contained findings satisfying the section 115 requirements, and, therefore, ordered the EPA to require revisions to appropriate states' SIPs, if the Agency determined that the reciprocity finding remained "viable."[111] On appeal, the court held that the letters did not impose a mandatory duty upon the current Administrator to issue SIP revision notices to culpable states, because the "endangerment" and "reciprocity" findings in the letter were issued without notice and comment.[112] The requisite international reports are available; the matter now lies within the hands of the current EPA administration which heretofore has declined to proceed.

Despite this recent failure to initiate action under section 115, this international air pollution provision appears to provide a viable means of addressing acid rain because its language "establishes a very liberal basis for triggering abatement action."[113] For example, the Administrator need only have a "reason to believe" that U.S. emissions "contribute" to foreign pollution that "may reasonably be anticipated to endanger" health or welfare.[114] None of these terms impose a difficult standard upon the Administrator from a legal standpoint. However, this relatively low legal threshold test to trigger abatement action is complicated by the more serious problem of the implementation of a remedy by the U.S. EPA. Predictions of particular impacts from specific U.S. sources are difficult to ascertain using current scientific methods.[115] Thus, identifying the appropriate U.S. sources for emission reductions would be an arduous task. A "shotgun approach"—uniform reductions for multiple sources—may minimize the environmental impacts but prove costly and inequitable to U.S. sources. At a minimum, targeting appropri-

110. *See* New York v. Thomas, 613 F. Supp. 1472 (D.D.C. 1985), *rev'd*, 802 F.2d 1443 (D.C. Cir. 1986), *cert. denied*, 107 S. Ct. 3196 (1987).

111. *Id.* at 1481-86.

112. *See* Thomas v. State of New York, 802 F.2d 1443 (D.C. Cir. 1986), *rev'g*, 613 F. Supp. 1472 (D.D.C. 1985), *cert. denied*, 107 S. Ct. 3196 (1987).

113. Wooley, *Acid Rain: Canadian Litigation Options in U.S. Court and Agency Proceedings*, 17 U. TOL. L. REV. 139, 142 (1985). *Contra* Teague, Under the Clean Air Act, EPA Cannot Allocate Emission Reductions in Light of the Uncertainties Associated with Source-Receptor Relationships 14 (finding that "section 115 . . . imposes upon EPA a substantial evidentiary burden," because the pollution sources must be identified before an endangered finding can give rise to EPA action) (transcript of speech at the Third Annual Conference of the Acid Rain Information Clearinghouse, Dec. 3, 1986).

114. Wooley, *supra* note 113, at 142.

115. *See* 49 Fed. Reg. 48,152, 48,153 (1984); 49 Fed. Reg. 34,851, 34,863-65 (1984).

ate U.S. sources would require a substantial investment of time and resources for additional research.[116]

The reciprocity requirement is more a political concern than a legal issue. An amendment to the Canadian Clean Air Act in 1980 authorizing controls on Canadian sources to prevent transboundary pollution appears to have "given the United States essentially the same rights" as section 115 of the U.S. CAA provides to Canada.[117] The actual determination of this fact by the EPA Administrator raises sensitive diplomatic questions as well as domestic political concerns. Making a determination that would impose costly controls on U.S. sources in order to protect foreign resources puts the Administrator in an awkward predicament. Factors likely to influence this decision are the relative effectiveness of current air quality programs and the prospect of future emission reductions within the two countries.

In Canada, binding air quality standards are set at the provincial level in conformity with national ambient air quality objectives.[118] Since 1980, all regions of Canada are in attainment for the annual ambient SO_2 requirements—which are more stringent than United States ambient air standards—and significant (27%) SO_2 emissions reductions were achieved between 1970 and 1980.[119] Recent agreements by the Canadian Federal and Provincial Environment Ministers provide for a 50% reduction in SO_2 emissions in eastern Canada by 1994.[120] However, unlike the U.S. CAA, the Canadian Act has neither statutory deadlines for compliance nor penalties for noncompliance.[121] Also, no stack height provisions exist.[122]

On its face it appears that the Canadian government has been equally or more diligent than the U.S. in addressing SO_2 emissions and acid rain concerns. Closer inspection, however, raises serious questions about the comparability of the Canadian air program and the probable success of future emission reduction plans in that country. The lack of sufficient enforcement mechanisms is one con-

116. Affidavit of C.L. Elkins, Acting Adm'r, Office of Air & Radiation, U.S. EPA, at para. 8, New York v. Thomas No. 84-0853; renumbered No. 85-5970 (D.C. Cir. Sept. 18, 1986).

117. *See* Clean Air Act § 21.1, Act of Dec. 17, 1980, ch. 45, 1980-81, 82-83 Can. Stat. 1160.

118. EMBASSY OF CANADA, WASHINGTON, D.C., ACID RAIN CONTROL IN CANADA 5 (1984).

119. *Id.* at 2, 32. For a discussion of U.S. performance, see *supra* note 16.

120. *Id.* at 21. For a discussion of U.S. projections, see *supra* note 73.

121. *Id.* at 31.

122. *Id.* at 34.

cern. Also the promise of future reductions is inconsistent with the actual performance record of major Canadian SO_2 emitters. For example, prior commitments by Ontario Hydro to install emission controls have subsequently been cancelled.[123] The Canadian government itself has expressed uncertainties about the provisions' efforts:

> [T]here is the suspicion that the Federal Government is not really effecting a . . . reduction in acid rain-causing emissions, but is manipulating statistics to give the appearance of action.
>
> . . . .
>
> For those Canadians . . . who . . . argue for more stringent controls on American polluters, Canadian government inaction and/or obstinacy with respect to domestic controls have been, quite frankly, an embarrassment.[124]

Such considerations not only will influence the EPA's determinations about international pollution, but also will affect the course of future negotiations with Canada and possibly Congressional voting on future international environmental matters. For example, Congress may be reluctant to provide budgetary support for bilateral research efforts or to fund demonstration projects such as those endorsed by the U.S.-Canadian special envoys on acid rain.[125]

It is difficult to estimate the reduction that might be achieved under the section 115 provisions, but it is likely to be substantial. However, until the link between Canadian impacts and U.S. sources can be better defined, section 115 will probably remain a closed door. The political and diplomatic implications of this provision create additional impediments to its application to the acid rain issue. Nevertheless, a determined EPA Administrator intent on acid rain mitigation could overcome these barriers and open this potentially large front door to acid rain controls.

Stack Heights

Section 123 of the CAA[126] limits the degree to which emission

123. *See* W.H. Megonnell, Edison Electric Institute, Canada and Sulfur Dioxide Emissions Control: Long on Promises—Short on Performance (Mar. 18, 1986) (an expansion of views presented to the Coal Club at the Rayburn House Office Building, Feb. 12, 1986). *See also* letter from Michael S. McMahon of Benesch, Friedlander, Coplan, & Aronoff to J. Walter Giles, Deputy Minister, Ministry of the Environment, Canada (Oct. 4, 1984) (questioning the promises of Ontario Hydro to reduce emissions).

124. W.H. Megonnell, *supra* note 123, at 7, quoting from HOUSE OF COMMONS SUBCOMM. ON ACID RAID, TIME LOST: A DEMAND FOR ACTION (1984).

125. *See supra* note 3 and accompanying text.

126. 42 U.S.C. § 7423 (1982).

limitations can be affected by stack heights in excess of good engineering practice (GEP)[127] or other dispersion techniques. Although important to the maintenance of ambient air quality levels in the vicinity of a source, the use of tall stacks and other dispersion techniques in lieu of continuous emission controls can result in greater atmospheric loadings of air pollutants.[128] These techniques facilitate the long-range transport of air pollutants—a primary acid rain concern.[129]

By regulating the portion of the stack height or other dispersion technique that can be used in setting emission limitations, the EPA can limit the atmospheric loading of emissions of acidic air pollutants and their precursors without actually regulating the physical height of the stack or directly setting emission limitations. Lowering the effective stack height makes the local NAAQS more relevant. Emissions, which actually escape local NAAQS scrutiny because they are emitted through tall stacks, are artificially brought into the nearby region by modeling based upon GEP stack height. The result is lower emissions.

Revisions to the stack height regulations and subtle changes in its definitions can have substantial impact on allowable emissions. The EPA has wide discretion in defining key terms such as "nearby terrain," "excessive concentrations," and "other dispersion techniques," and in establishing a formula for determining stack height credits.[130] More stringent constructions of these terms could result in SO_2 emission reductions as high as 7.6 million tons per year.[131]

After a lengthy, litigious history and considerable administrative delay,[132] the EPA issued revised final rules on stack heights in July 1985.[133] These revisions have subsequently been challenged.[134]

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127. *Id.* § 7423(c).

128. Stack Height Regulation, 50 Fed. Reg. 27,892, 27,893 (1985) (codified at 40 C.F.R. § 51.118 (1987)).

129. *Id.*

130. *See also* Vestigo, *Acid Rain and Tall Stacks Regulation Under the Clean Air Act*, 15 ENVTL. L. 711, 741-42 (1985) (suggesting methods for tightening the restrictions imposed by stack height regulations).

131. [Current Developments] 15 Env't Rep. (BNA) 2021 (Mar. 22, 1985) (National Clean Air Coalition's estimates). *See also* Inside EPA, *supra* note 51, at 12 (noting a strict policy on stack height regulations could easily cause 1.5 million ton annual SO_2 emissions reductions, and 3-4 million tons are possible if more stringently constructed).

132. *See* Sierra Club v. EPA, 719 F.2d 436 (D.C. Cir. 1983), *cert. denied*, 468 U.S. 1204 (1984).

133. Regulations to implement section 123 were originally promulgated in February 1982. *See* 47 Fed. Reg. 5,864 (1982). These regulations were subsequently challenged, and in October 1983 the D.C. Circuit Court remanded portions for reconsideration, and approved and reversed other portions. *See* Sierra Club v. EPA, 719 F.2d 436 (D.C. Cir.

The implication of these regulations for acid rain is evident. The EPA expects that the 1985 final rules will result in a 1.7 million ton annual reduction in SO_2 emissions.[135] However, the legal challenges could substantially prolong the implementation of these rules and consequently delay the realization of emission reductions.

Interstate Pollution Abatement

Section 126 in conjunction with section 110(a)(2)(E) of the CAA provides a legal mechanism for states to protect their air quality from sources in other states.[136] Stationary sources in one state are prohibited from emitting any air pollutant which will (1) prevent attainment or maintenance of any NAAQS; (2) interfere with prevention of significant deterioration (PSD) provisions; or (3) interfere with visibility protection in another state.[137] Section 126 provides a procedural mechanism for enforcing the substantive provisions of section 110(a)(2)(E) in that a downwind state concerned about acid deposition within its borders can petition the EPA to find that an out-of-state source is interfering with its air quality goals related to visibility, SO_2 attainment, or PSD.[138]

In 1980 and 1981, the States of Pennsylvania, New York, and Maine filed section 126 petitions requesting the EPA to take action against seven midwestern states who were allegedly in violation of the prohibitions against interstate pollution.[139] After a substantial delay by the EPA and a subsequent court order,[140] the EPA denied these petitions on December 4, 1984, finding that "the petitioning States' demonstration did not adequately support their claims of in-

1983), *cert. denied*, 468 U.S. 1204 (1984). After several extensions of the promulgation deadline in order to provide additional time for comments, final rules were published. 50 Fed. Reg. 27,892 (1985).

134. *See Utilities Seek Appeals Court Review of EPA's New Stack Regulations*, [Current Developments] 16 Env't Rep. (BNA) 867 (1985); 51 Fed. Reg. 15,885 (1986) (notice of denial of petition to reconsider).

135. 50 Fed. Reg. 27,892, 27,906 (1985). *But see* Inside EPA, *supra* note 53, at 13 (certain EPA officials estimate that "less than a half a million" tons of reduction will result from "the policy that is shaping up." The Congressional Research Service predicts with "some uncertainty" that 600,000 to 2 million tons will result).

136. *See* 42 U.S.C. §§ 7410(a)(2)(E), 7426 (1982). *See also* New York v. EPA, 716 F.2d 440 (7th Cir. 1983) (construing section 110(a)(2) of the CAA).

137. 42 U.S.C. § 7410(a)(2)(E) (1982).

138. This right to petition was clarified in Alabama Power Co. v. Costle, 636 F.2d 323, 398 n.27 (D.C. Cir. 1979).

139. Interstate Pollution Abatement, 49 Fed. Reg. 48,152 (1984) (final determination).

140. *See* New York v. Ruckleshaus, 21 Env't Rep. Cas. (BNA) 1721 (D.D.C. 1984 mem. opinion).

jury." The petitioners failed to demonstrate that out-of-state sources were: (1) preventing attainment or maintenance of the NAAQS for SO_2 or particulate matter, or (2) interfering with PSD or visibility measures.[141]

Important to the acid rain issue was the EPA's determination that the scope of section 126 does not extend to acid deposition, sulfates *per se*, or to regional haze visibility impairment.[142] The EPA further determined that an out-of-state source must make a "significant contribution"[143] to the levels of pollution causing a NAAQS or PSD increment violation within a petitioning state before section 126 relief is available.[144] Lastly, in interpreting the "prevent attainment or maintenance" and "interfere" language of section 110(a)(2)(E), the EPA determined that its intervention was inappropriate absent a violation of a NAAQS or a PSD increment.[145] The denial of this petition has subsequently been challenged in the courts.[146]

Despite its apparent potential to provide relief from the acid rain problem, the interstate pollution provision has largely been ineffective to date because of the significant legal and technical hurdles to its implementation.[147] The "prevent attainment or maintenance" language of section 110(a)(2)(E) imposes a high burden of proof on petitioning states. The court in *State of Connecticut v. EPA (Connecticut Fund I)*[148] rejected a "substantial impact" test and affirmed the EPA's interpretation that "prevent maintenance" means a violation of a NAAQS, not merely a significant impact on air quality in the affected state.[149] Also, "minimal impacts" from out-of-state sources on the air quality of a state in nonattainment for a NAAQS will be tolerated.[150] Rejecting this minimal impact test, the Sixth

141. 49 Fed. Reg. 48,152, 48,157 (1984).

142. *Id.* at 48,154.

143. In the Proposed Determination under section 126 of the Clean Air Act, the EPA enumerated a list of factors to be considered in determining that a contribution is "significant." Interstate Pollution Abatement, Proposed Determination, 49 Fed. Reg. 34,851, 34,859 (proposed Sept. 4, 1984).

144. 49 Fed. Reg. 48,152, 48,155-56 (1984).

145. *Id.* at 48,155.

146. *See* New York v. EPA, No. 85-1082, [Pending Litigation] 15 Envtl. L. Rep. (Envtl. L. Inst.) 65,856 (D.C. Cir. brief filed Mar. 19, 1985).

147. *See generally* Smith, *supra* note 105, at 269-93 (discussing recent court decisions relating to interstate pollution).

148. State of Connecticut v. EPA, 696 F.2d 147 (2d Cir. 1982) [hereinafter Connecticut Fund I].

149. *Id.* at 156.

150. *Id.* at 165. "[N]othing in the legislative history indicates that § 7410(a)(2)(E)(i)(1) was intended to prevent even minimal impacts upon another state's pollution

Circuit imposes the more stringent "substantial contribution" test for similar situations, but, consistent with *Connecticut Fund I*, does not apply it in attainment areas.[151] Although the reference to "*any* such . . . ambient air standard" [emphasis added] in section 7410(a)(2)(E)(i)(1) suggests that interstate effects on all NAAQS pollutants must be considered, it is within the EPA's discretion not to consider the interstate impact of one pollutant on all others. For example, the impact of SO_2 emissions in one state on the TSP levels in another state need not be considered.[152] These interpretations minimize the chances of a successful section 126 petition.

The seemingly more lenient "interfere" language of section 110(a)(2)(E) has been an equally troublesome barrier in practice. Until a PSD increment is actually violated by a significant contribution from an out-of-state source, the EPA will not intercede under section 126.[153] Again, this interpretation imposes a rigorous standard upon petitioning states.

The language of section 126(b)[154] implies that petitioning states must identify the particular source responsible for section 110(a)(2)(E)(i) violations[155]—a substantial burden in light of current scientific techniques. The technical difficulty of demonstrating through computer modeling that SO_2 emissions in one state affect the SO_2 or TSP NAAQS or the PSD increments in another state reduces the effectiveness of section 126.[156]

Lastly, a state has no obligation to "respect its neighbor's air quality standards (or design its SIP to avoid interference therewith) if those standards are more stringent than the requirements of federal law"[157]—another drawback for petitioning states.

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concentrations simply because that state has not attained the national standards." *Id.* at 164.

151. Air Pollution Control Dist. of Jefferson County, Kentucky v. EPA, 739 F.2d 1071, 1092-94 (6th Cir. 1984).

152. Connecticut Fund for the Environment, Inc. v. EPA, 696 F.2d 169, 177 (2d Cir. 1982) [hereinafter Connecticut Fund II]; *see also* Connecticut Fund for the Environment, Inc. v. EPA, 696 F.2d 179, 183-84 (2d Cir. 1982) [hereinafter Connecticut Fund III]. *But see* Connecticut Fund I, *supra* note 144, at 162-63 (expressing reservations about this holding).

153. 49 Fed. Reg. 48.152, 48,155 (1984).

154. "Any State or political subdivision may petition the Administrator for a finding that *any major source* emits . . . ." 42 U.S.C. § 7426(b) (1982) [emphasis added].

155. Archer, *Controlling Acid Rain: The Clean Air Act and Federal Common Law Nuisance*, 84 W. VA. L. REV. 1135, 1154 n.76 (1982).

156. *See* Connecticut Fund I, *supra* note 148, at 165; Connecticut Fund II, *supra* note 152, at 174, 177.

157. Connecticut v. EPA, 656 F.2d 902, 909 (2d Cir. 1981). The Second Circuit reaffirmed this holding in Connecticut Fund I, *supra* note 148, at 157 n.22, and the

Given the EPA's broad discretion in making administrative decisions and the recent pattern of its construction of sections 126 and 110(a)(2)(E), the interstate pollution provisions appear for now to offer little opportunity for parties seeking relief from acid rain. Moreover, the precedents that have developed under this section will make future petitions even more difficult. Improvements in source-receptor relationship modeling could ameliorate this dilemma to some extent, but securing additional SO_2 reductions will remain difficult.

Prevention of Significant Deterioration of Air Quality

Sections 160-169 of the CAA[158] and the associated regulations found in the SIP requirements of 40 C.F.R. §§ 51.166, 52.24 function to protect air quality in clean air regions of the country; that is, areas where ambient air quality is better than that specified by the NAAQS. Increases of certain pollutants, namely SO_2 and particulate matter, over baseline concentrations are limited to fixed increments,[159] depending upon the area's classification.[160] Several potential means for effecting SO_2 emission reductions exist within these provisions.

Major emitting facilities, which can include "major modifications" to existing sources as well as new sources, may not be constructed in PSD areas unless best available control technology (BACT) is applied.[161] The definition of BACT allows a case-by-case determination of this term.[162] A more stringent application of the BACT requirement could result in fewer SO_2 emissions. In fact, the ability to set BACT more stringently than NSPS is a characteristic of the PSD program which can result in significant emission reductions for new sources.[163] Certain constructions of other terms, such as "potential to emit," and "source capable of accommodating"—both of which relate to major modification—could have similar effects.[164] For example, if a broad interpretation of the term

Sixth Circuit held similarly in Air Pollution Control Dist. of Jefferson County, Kentucky v. EPA, 739 F.2d 1071, 1088 (6th Cir. 1984).

158. 42 U.S.C. §§ 7470-7479 (1982).

159. *Id.* § 7473(b).

160. International parks, national wilderness areas and memorial parks in excess of 5,000 acres, and national parks in excess of 6,000 acres are designated Class I. Other areas are Class II unless redesignated. *Id.* § 7472.

161. *Id.* § 7475(a)(4).

162. *Id.* § 7479(3).

163. Edwards, *supra* note 104, at 713.

164. *See* 40 C.F.R. § 51.166(b)(2)(iii)(e)(1), (b)(4) (1987). *See also, supra* notes 76-84 and accompanying text.

"source" is applied, then the entire facility, not only the facility's boiler, must be "accommodated" to use alternative fuels for that source to be exempt from PSD review.[165] Another exemption from the "major modification" definition is provided for the use of municipal solid waste as an alternative fuel.[166] This exclusion is well-founded in light of the increasing problem of waste disposal in communities and the fact that municipal solid waste contains fewer sulfur compounds than coal. With such an exemption, coal-fired power plants are more apt to consider conversion to this alternative fuel and thereby reduce their SO_2 emissions.

Section 164(a) permits states to redesignate areas as Class I.[167] Because increments within Class I areas are more stringent, a redesignation of certain state lands to this more protected status could result in lower future emissions of SO_2. Although this provision allows for states to protect ecologically sensitive areas within their boundaries, actual redesignations may be difficult to achieve for political and economic reasons.[168] A state might be reluctant to impose more stringent permitting requirements than neighboring states if economic development would be impaired.

Whereas most responsibility under the CAA has been delegated to the EPA, section 165(d)[169] provides the Federal Land Manager (FLM) with substantial authority ("an affirmative responsibility") regarding PSD permits.[170] One important provision authorizes the denial of a PSD permit if the FLM demonstrates that the emissions from the proposed facility would "have an adverse impact on the air quality-related values" of the Class I areas.[171] This denial is allowed even when the applicable PSD increments are not exceeded. This broad "adverse impact" standard which considers impairment to the area's national significance, the quality of a visitor's experience, and the structure and functioning of the ecosystem[172] provides substantial discretionary authority to the FLM. More concerted application of this power could provide some relief from future SO_2 emissions.

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165. 40 C.F.R. § 51.166(b)(2)(iii)(e)(1) (1987).

166. *Id.* § 51.166(b)(2), (b)(2)(iii)(d).

167. 42 U.S.C. § 7474(a) (1982).

168. *Cf.* 40 C.F.R. § 51.166(g)(2) (providing for the review of redesignation plans by "elected leadership" and others).

169. 42 U.S.C. § 7475(d).

170. *Id.* § 7602(i).

171. *Id.* § 7475(d)(2)(c).

172. *See, e.g.*, NATIONAL PARK SERVICE, PERMIT APPLICATION GUIDANCE FOR NEW AIR POLLUTION SOURCES (1985); 47 Fed. Reg. 30,222, 30,223 (1982); 47 Fed. Reg. 41,480 (1982).

The PSD program in practice, like the NSPS provisions, offers no significant SO_2 emission reductions, unless the agencies employ these provisions to their fullest.

Modeling

Section 165 of the CAA requires the EPA to specify air quality models to be used in PSD proceedings.[173] Air quality models are also employed in a number of other air quality-related determinations within state implementations plans: the classification of regions for SIP development and evaluation; the setting of emission limitations associated with GEP stack height; the determination of the adequacy of control strategies; and the determination of emission offsets.[174] Modeling is also relevant to the long-range transport and transformation processes associated with acid rain which are discussed elsewhere in this note.[175]

Despite considerable advances in the science of computer modeling, the EPA has been slow to revise its guidelines for air quality models.[176] Because model predictions are closely tied to regulatory decisions affecting emissions levels, revisions to these guidelines could indirectly have major impacts on SO_2 emissions. Depending upon one's point of view, these impacts may be positive or negative. For example, new recommended models, if approved by the EPA, have the potential to prompt changes in emission limitations for certain sources.[177] These limitations, which were determined with cruder models than those currently available, may need to be adjusted upward or downward depending upon the outcome of the more refined modeling techniques. The Rough Terrain Diffusion Model (RTDM), currently under consideration by the EPA, purportedly provides better evaluations of air quality impacts on ele-

173. 42 U.S.C. § 7475(e)(3)(D).

174. 40 C.F.R. §§ 51.118, .119, .150 app. S.

175. *See supra* notes 31, 41-46 and accompanying text.

176. In December 1977, the EPA held its first modeling conference and subsequently published its "Guideline on Air Quality Models" (EPA-450/2-78-027, U.S. EPA Office of Air Quality Planning and Standards Research, April 1978). *See* 43 Fed. Reg. 48,018 (1978). The Guideline was incorporated by reference in the PSD regulations at 40 C.F.R. §§ 51.166, 52.21 (1987). In March 1980, EPA solicited submissions of private models for potential inclusion in planned revisions. *See* 45 Fed. Reg. 20,157 (1980). After public meetings in October 1980, a second conference, and a series of internal EPA workshops, the EPA proposed to adopt a revised guideline. *See* 49 Fed. Reg. 48,018 (1984). Following public hearing and a third conference, the EPA adopted by final rule the "Guideline on Air Quality Models (Revised)" (EPA 450/2-78-027R). Requirements for Preparation, Adoption, and Submittal of Implementation Plans, 51 Fed. Reg. 32,176 (1986) (to be codified at 40 C.F.R. pts. 51, 52).

177. 51 Fed. Reg. 32,176, 32,177 (1986).

vated terrain receptors,[178] which could allow for more precise, and perhaps more stringent, control of emission sources in certain areas. However, a concern exists that this model underpredicts ambient air quality impacts[179] which could lead to the specification of higher emission limitations for certain sources.

Other modeling guideline parameters such as the specified individual model algorithm,[180] the use of National Weather Service or on-site meteorological data, and model performance evaluation techniques could influence modeling results.[181] Also, the new rules allow substitutions or modifications in situations where the specified model in the guidelines is inappropriate. This discretion to use non-approved models encourages horsetrading by sources wishing to relax their emission limitations. As one writer puts it, ". . . a polluter simply can attempt to circumvent section 123 [stack height provisions] by developing a scientific model that employs favorable factors."[182] Sources with emission limits based upon non-approved models now emit about 4.5 million tons of SO_2 per year.[183] Requiring the use of EPA-approved models might diminish these emissions.

Notably absent from the EPA's revised guidelines' list of "preferred" models for regulatory purposes is a regional sulfate model, although the EPA was aware of at least one model designed to predict sulfate concentrations.[184] This decision confirms the uncertainty regarding source-receptor relationship modeling and suggests that further development of these models is necessary.

In general, improvements in models would allow more accurate predictions of air quality impacts and thus, when applied within the various provisions of the CAA, could result in emission reductions within certain states. In addition, the modeling of direct, inter-regional impacts of individual sources could result in an indirect tightening of emission limitations and simultaneously ameliorate

178. *See id.* at 32,180; Utility Air Regulatory Group Comments on EPA's Proposal to Revise its Modeling Guideline, Docket A-80-46, at 3, 6-8 (Dec. 9, 1986).

179. D.G. Hawkins, NRDC letter to Docket A-80-46, Item V-D-22 at 2 (Dec. 9, 1986).

180. *See, e.g.*, 51 Fed. Reg. 32,176, 32,177 (1986) (deciding to use the Bjorkland & Bowers Stack-Tip Downwash Algorithm in lieu of the Briggs Algorithm).

181. *See* Requirements for Preparation, Adoption, and Submittal of Implementation Plans, 49 Fed. Reg. 48,018, 48,019 (1984) (to be codified at 40 C.F.R. pts. 51, 52) (notice of proposed rulemaking Dec. 7, 1984).

182. Vestigo, *supra* note 130, at 733.

183. Hawkins, *supra* note 179, at 5.

184. Teague, *supra* note 113, at 9.

many of the current interstate pollution conflicts.[185]

Accelerated model research and development is warranted. Until improvements occur, many regulatory decisions pertaining to the acid rain issue will need to wait. For example, the designation of precise emission reductions at a specific source that will yield predetermined, desirable reductions of acid deposition at affected receptor sites is not possible with currently available air quality models. Also, improved economic models could provide better information on electricity rate, employment, and industrial growth impacts from proposed acid rain control legislation. In the interim, limiting modeling to approved, perhaps overly-conservative, versions would provide the greatest protection to ambient air quality levels and simultaneously bring some relief to the acid rain problem. The EPA should strive to revise modeling guidelines as quickly as possible in order to take advantage of the most recent developments in computer technology.

Visibility Protection

Related to the fine particulate secondary standard for the prevention of regional haze,[186] section 169A of the Clean Air Act provides special protection against visibility impairment in certain Federal lands such as national parks and wilderness areas by establishing "as a national goal, the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory [C]lass I Federal areas which impairment results from manmade air pollution."[187] Regulatory response to the visibility provisions has been slow in the making.

In November 1979, the EPA promulgated regulations designating areas in which visibility is to be protected.[188] Over a year later Phase I regulations, which principally apply to the effects of single source (plume blight) on visibility in Class I areas, were promulgated.[189] In December 1982, the EPA's failure to respond to states' inaction in implementing these regulations resulted in a lawsuit by the Environmental Defense Fund.[190] In the resulting settlement agreement, the EPA agreed to a two-stage implementation schedule

185. Edwards, *supra* note 104, at 704.

186. *See supra* notes 47-48 and accompanying text.

187. 42 U.S.C. § 7491(a)(1) (1982).

188. *Compare* 40 C.F.R. § 51.300(b) (1987) (listing states subject to the visibility provisions) *with* 40 C.F.R. §§ 81.401-.437 (1987) (listing states with mandatory Class I areas).

189. *See* 45 Fed. Reg. 80,084 (1980) (codified at 40 C.F.R. § 51.300-.307).

190. Environmental Defense Fund v. Gorsuch, No. C82-6850 RPA (N.D. Cal. filed

which will not be fully completed until some time in 1987.[191]

In its 1980 rulemaking, the EPA deferred the Phase II regulations for regional haze until better scientific evidence becomes available.[192] An interagency task force on regional haze[193] investigated further research needs and identified several possible corrective strategies, including fine particulate and sulfate NAAQS, revised NSPS, and reductions in SO_2 emissions from eastern sources.[194] To date no Phase II regulations have been proposed.

Despite the acknowledged connection between sulfur-related emissions and visibility impairment caused by regional haze,[195] the major obstacle to regulatory action is the limited scientific basis for determining responsible sources.[196] Since the beginning of the implementation of the visibility rules, the EPA has found the modeling of regional scale transport of pollutants inadequate for regulatory decisions.[197] Until the validity of model predictions can be better substantiated, the reduction of SO_2 emissions through the visibility provisions is unlikely. Uniform emission reductions throughout a large region could provide some relief to visibility impairment, but

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1982), *sub nom.* Environmental Defense Fund v. Thomas, No. C82-6850 RPA (settled 1984, settlement amended 1986).

191. Approval and Promulgation of State Implementation Plans, 49 Fed. Reg. 20,647 (1984) (settlement of litigation). The EPA agreed to a two-stage promulgation of SIP revisions for those state plans found to be deficient in 1) visibility monitoring and new source review requirements and 2) assessments of best available retrofit technology (BART), visibility impairment, long-term strategies, and integral vista requirements. *See id.* After providing an opportunity for states to revise their SIPs for Phase I deficiencies, the EPA disapproved the deficient SIPs and promulgated revised plans for these states, thus completing the first stage of implementation. 50 Fed. Reg. 28,544 (1985); for proposed regulations, *see* 49 Fed. Reg. 42,670 (proposed Oct. 23, 1984). In accordance with the second stage in the agreement, the EPA issued in January 1986 a notice of deficiency in the SIPs of thirty-two states. 51 Fed. Reg. 3,046 (1986). The deadline for federal remedies of these deficiencies extends as late as August 1987 for some plans. 49 Fed. Reg. 20,647, 20,648 (1984).

192. 45 Fed. Reg. 80,084, 80,086 (1980).

193. *See* 49 Fed. Reg. 44,770, 44,771 (1984).

194. U.S. EPA, DEVELOPING LONG-TERM STRATEGIES FOR REGIONAL HAZE: FINDINGS AND RECOMMENDATIONS OF THE VISIBILITY TASK FORCE 18-20, apps. D, E (1985) [hereinafter TASK FORCE].

195. "The benefits of improved visibility estimated for SO_2 rollbacks are uncertain, but might be substantial." *Id.* at 17, app. D-34. "Vermont has demonstrated that visibility impairment . . . is caused by regional haze . . . predominantly [from] . . . sulfur emissions." 51 Fed. Reg. 43,389, 43,393 (proposed Dec. 2, 1986). *See also, supra* note 47 and accompanying text.

196. *See* 49 Fed. Reg. 34,851, 34,863-64 (1984).

197. 44 Fed. Reg. 69,116, 69,118 (1979). *See also*, 45 Fed. Reg. 34,762, 34,764 (1980); 51 Fed. Reg. 43,393 (1986) (finding further model evaluation work is needed). *Cf.* TASK FORCE, *supra* note 194, at app. E-18 (finding that no comprehensive assessment of regional haze in the East has been conducted).

such a strategy would not be as environmentally beneficial or cost effective as targeted emission reductions. Pinpointing appropriate sources for emission reductions in order to maximize the alleviation of regional haze problems in specific areas must await further refinements in modeling and other scientific techniques.

In an attempt to remedy through the visibility protection program what could not be achieved by acid rain control legislation, the State of Vermont recently revised its SIP to address both the Phase I and Phase II visibility requirements.[198] In a rather novel approach to the regional haze problem in its Class I area, Vermont proposed a national emission reduction plan to rollback SO_2 emissions in the forty-eight contiguous states and asked the EPA to disapprove the SIPs of eight states whose emissions allegedly interfere with Vermont's plan to control regional haze.[199] The EPA's decision to take no action on these proposals associated with regional haze will likely be challenged by Vermont in the courts.[200] This challenge will probably fail because, as the EPA has correctly concluded, under section 110, regional haze provisions are not required to be included within SIPs.[201] The present visibility regulations are limited to plume blight and do not include regional haze.[202] Although section 110 speaks in terms of the agency's approval/disapproval of SIP submissions and revisions[203] and does not expressly provide for "no action," the court likely will find that the EPA has not abused its discretion in making its "no action" decision on the regional haze portions of the Vermont SIP and thus will close the door on this clever approach to the acid rain problem.

A last point within the visibility provisions is the concept of integral vistas.[204] To preserve the view from within Class I areas, the Federal Land Manager may designate integral vistas.[205] The im-

198. 51 Fed. Reg. 43,389 (proposed Dec. 2, 1986).

199. *Id.* at 43,391, 43,393.

200. *EPA Punts Sulfate Control to Protect Visibility in Vermont SIP; State to Sue*, 7 Inside EPA 18 (Nov. 28, 1986).

201. 51 Fed. Reg. at 43,393.

202. *Id.* at 43,389-94. *Accord* 49 Fed. Reg. 48,152, 48,154 (1984) (denying Maine's § 126 petition because regional haze is not a "measure required to be included in an applicable implementation plan").

203. "The Administrator shall . . . approve or disapprove such plan or any portion thereof." 42 U.S.C. § 7410(a)(2) (1982). "The Administrator shall approve any revision . . . ." *Id.* § 7410(a)(3)(A).

204. " 'Integral vista' means a view perceived from within the mandatory Class I Federal area of a specific landmark or panorama located outside the boundary of the mandatory Class I Federal area." 40 C.F.R. § 51.301(n) (1987).

205. *Id.* § 51.304.

portance of this regulation is that it extends the authority of the visibility rules beyond the Class I property boundaries. In response to this discretionary duty, Secretary of the Interior Hodel has decided not to issue final regulations identifying integral vistas associated with mandatory Class I areas.[206] Similarly, the Department of Agriculture has stated its intention not to propose integral vistas.[207] Only one integral vista has been identified in the United States—Roosevelt-Campobello International Park.[208] Revision of the rules to extend the deadlines for the identification of integral vistas,[209] and a subsequent identification by the FLM, could impose emission restrictions within certain limited areas, if it can be shown that a source is causing impairment of the view from that Class I area. Widespread emission reductions, however, are very unlikely. Until the EPA addresses the regional haze problem, the implementation of the visibility provisions will have little effect on SO_2 emissions. Despite the limitations in our understanding of the source-receptor relationship, the EPA could promulgate reasonable regulations based upon the substantial body of scientific evidence that does exist. The current EPA administration does not agree. As a result of the continuing delays within this program, this backdoor to acid rain control is narrow, if not closed, for now.

Nonattainment and Emissions Trading

Part D of the CAA[210] provides the basic program for nonattainment areas of the country and for the preconstruction review and permitting of new sources in these areas.[211]

New sources must adopt a "lowest achievable emission rate" (LAER), and must also obtain offsetting emission reductions from nearby sources currently in operation.[212] Also, states, through their SIP, must provide for "reasonable further progress" towards attainment of the NAAQS in these areas by the adoption of "reasonably available control technology" (RACT) for existing sources.[213] The nonattainment provisions, as well as other requirements of the

206. News release, Department of Interior (Oct. 25, 1985 & photo. reprint n.d.).
207. Letter from Ass't Secretary, Natural Resources & Environment, USDA to C.L. Elkins, U.S. EPA (Oct. 28, 1985).
208. *See* 46 Fed. Reg. 22,707 (1981).
209. The deadline for designation of integral vistas by the FLM was Dec. 31, 1985. 40 C.F.R. § 51.304(a) (1987).
210. 42 U.S.C. §§ 7501-7508 (1982).
211. *Id.*
212. *Id.* §§ 7503(1)(A), (2).
213. *Id.* § 7502(b)(3).

CAA, have given rise to the concept of emission trading in an attempt "to reduce control costs, encourage faster compliance, and free scarce capital for industrial revitalization."[214]

Emissions trading consists of bubbles, netting, offsets, and banking (storage) of emission reduction credits (ERC).[215] The bubble concept treats an entire plant with multiple stacks or a group of nearby plants as a single source, as though an imaginary bubble with a single opening at the top covered all the emission sources. Thus, emissions at one or more existing sources can increase in exchange for a compensating extra decrease at other emission sources.[216] Netting may exempt "modifications"[217] of existing sources in PSD and nonattainment areas from new source review and associated requirements as long as no net emission increase results.[218] By "netting out," the modification is not considered "major" and therefore is not subject to preconstruction permit requirements.

Offsets also may be used by new sources wishing to locate in attainment areas where their emissions would otherwise impair NAAQS, PSD increments, or visibility requirements. In some instances, reductions of emissions by a facility may produce unused ERC that may be "banked" for future use in bubble, offset, or netting transactions by that facility or that may be sold as an external offset to other facilities wishing to locate in that area.[219]

The latest EPA Emissions Trading Policy [hereinafter "Policy"] statement,[220] which replaces the original bubble policy[221] and makes final revisions to the Interim Emissions Trading Policy,[222] sets forth more stringent trading policies in order to ensure adequate environmental protection from such transactions.[223] Further rulemaking will implement this policy guidance. A number of changes have been suggested to improve the emissions trading pol-

214. Emissions Trading Policy, 47 Fed. Reg. 15,076, 15,076 (1982) (interim statement).

215. *Id.*

216. Emissions Trading Policy, 51 Fed. Reg. 43,814, 43,830 (1986) (final policy statement).

217. *See* 40 C.F.R. § 51.166(b)(2)(i) (1987).

218. *See* Chevron U.S.A. Inc. v. Natural Resources Defense Council, 467 U.S. 837 (1984), *overruling* Natural Resources Defense Council v. Gorsuch, 685 F.2d 718 (D.C. Cir. 1982).

219. Edwards, *supra* note 104, at 719.

220. 51 Fed. Reg. 43,814, 43,831-32 (1986).

221. *See* 44 Fed. Reg. 71,779 (1979).

222. *See* 47 Fed. Reg. 15,076 (1982).

223. 51 Fed. Reg. 43,814 (1986).

icy. The latest EPA Policy addresses many of these suggestions through which additional reductions of SO_2 emissions might be achieved. Further refinements to the policy might provide additional opportunity for reductions.

One commentator has noted that "marketing of emission reductions dilutes legal emission reduction requirements by crediting voluntary reductions which would have occurred anyway."[224] It does, however, encourage facilities to seek cost-effective reductions for marketing reasons which they might not have pursued otherwise. By distinguishing between voluntary reductions and those arising from a legal requirement, and allowing emission reduction credits only for the former, a larger reduction in overall emissions could result. The new Policy addresses this concern by requiring the ERC be based upon "surplus" reductions, those not required by current regulatory or SIP requirements.[225] For the purpose of determining a "surplus" in attainment areas, the Policy generally requires the application of the lower of actual or allowable values for the three factors used in calculating baseline emissions: emission rate, capacity utilization, and hours of operation.[226] If PSD has been triggered, then "only reductions below a source's actual emissions can be considered surplus."[227] These restrictions and similar ones for nonattainment areas also attempt to address the concern for eliminating "paper credits," which represent the difference between actual emissions and allowable emissions.[228] Also to prevent double-counting, credits resulting from shutdown will be allowed only if the SIP has not previously counted these reductions in its attainment strategy.[229]

Discounting trades, i.e., allowing less reduction credit than actually achieved, and establishing a *de minimis* level below which credits could not be obtained, would also provide greater emission reductions.[230] The EPA has applied this concept in its Stack Height Emissions Balancing Policy Proposal by proposing to require between 20% and 100% additional emission reductions from sources "providing" reductions to sources affected by the new stack

224. Edwards, *supra* note 104, at 721-22.

225. 51 Fed. Reg. 43,814, 43,831-32 (1986).

226. *Id.* at 43,832.

227. *Id.* at 43,838.

228. Levin, *The Clean Air Act Needs Sensible Emissions Trading*, 4 ENVTL. F. 29, 32 (1986).

229. 51 Fed. Reg. 43,814, 43,841 (1986).

230. Edwards, *supra* note 104, at 721-22.

height limitations.[231] The Policy addresses this issue through the concept of "ambient equivalence," which ensures that an ERC at one location actually balances an emission increase at another location.[232] These measures guarantee that no net emission increases occur, and in fact they could produce extra emission reductions.

Allowing post-application crediting of reductions would encourage sources to overshoot deliberately in their efforts to achieve reductions.[233] Within the Policy, post-application crediting is permitted in nonattainment areas which require, but lack, approved demonstrations of attainment. This measure provides an incentive for extra emission reductions. On the other hand, pre-application crediting of reductions will be denied, thus preventing sources from obtaining credits before they are actually ascertained and realized. Consequently, emissions in the region are lower.

Allowing NSPS bubbles for two or more new facilities in which the combined total emissions are less than the amount of emissions that would have otherwise resulted is another means of increasing emission reductions. A recent application of this technique will result in a reduction of an extra 3,100 tons of SO_2 emissions per year.[234] Although these "compliance bubbles" produce a net emission reduction benefit, it is unclear whether they are consistent with a literal reading of the NSPS provisions. Assuming these bubbles are valid, expanding this concept to bubbles between new and existing sources could achieve further reductions.

The eliminations of ERC altogether, especially in areas not expected to meet attainment deadlines, would clearly maximize emission reductions in those nonattainment areas.[235] The problem with this approach is that industrial growth would be precluded in these areas.

More stringent enforcement of the nonattainment requirements—for example, rigid application of LAER and better assurance that other sources owned by a new source seeking to locate in the area are in compliance with environmental requirements—

231. Stack Height Emissions Balancing Policy, 50 Fed. Reg. 52,418 (1985) (to be codified at 40 C.F.R. pt. 51) (proposed Dec. 23, 1985).

232. 51 Fed. Reg. 43,814, 43,844 (1986) (one hundred pounds of ERC created at one source may offset the ambient impact of a 100-pound increase at a nearby source but only an 80-pound increase elsewhere).

233. Levin, *supra* note 228, at 33.

234. *See* 50 Fed. Reg. 3,688 (1985) (to be codified at 40 C.F.R. pt. 60) (proposed Jan. 25, 1985).

235. Doniger, *The Bubble on the Cusp*, 4 ENVTL. F. 29, 34 (1986).

would also promote emission reductions.[236]

Directly applicable to the regional problem of acid rain is the expansion of the bubble policy to a multi-state, regional level in order to achieve a set reduction for an entire region.[237] Major emission reductions could be achieved while still providing a flexible, cost-effective, and equitable mechanism for emission reductions by sources within the region. The administrative burden of enforcing interstate agreement will be a major hurdle in implementation.[238] Nevertheless, in its proposed Stack Height Emissions Balancing Policy, the EPA is considering an interstate trading approach within the same air quality control region.[239]

The amount of total emission reductions available from a well-planned trading policy is difficult to predict, but lower overall emissions are possible with a carefully crafted policy. The extent of these reductions is entirely within the EPA's discretion.

Clean Air Act Summary

Comprehensive implementation of the current Clean Air Act provisions could result in total SO_2 emissions reductions equal to the eight to twelve million tons expected from proposed acid rain control amendments. In fact, a stringent application of certain measures, such as a revised primary SO_2 NAAQS, could alone produce substantial emission reductions. Other provisions applied in a concerted effort could yield several million tons of further reductions.

The authority to reduce SO_2 emissions exists within the current Clean Air Act; the barriers to realizing these reductions lie elsewhere. First and most important, better scientific evidence is needed to support action under several of the provisions. For example, more certain proof of adverse impacts on human health and the environment would facilitate revision of the NAAQS; better resolution of the source-receptor relationship would expedite action under the interstate and international pollution provisions; and advances in computer modeling and technological controls would aid activities under the NSPS, stack height, and visibility provisions. Second, the EPA's discretion in such matters has impeded progress under

236. NATIONAL CLEAN AIR COALITION, CLEAN AIR BRIEFING BOOK FOR MEMBERS OF CONGRESS 34 (April, 1985).

237. Hartman, *Alternatives for Regulatory Control of Acid Rain in the Northeastern United States*, 11 FORDHAM URB. L.J. 455, 479-80 (1983).

238. *Id.* at 480-81.

239. *See* 50 Fed. Reg. 52,418, 52,419 (1985).

the CAA. To date, the EPA has not vigorously pursued additional SO_2 emission reductions. Delays in implementing regulations, lenient construction of Agency authority and of key statutory terms, and a laissez-faire attitude have characterized the EPA's performance under the statute. The great deference afforded administrative agencies has served to minimize SO_2 emission reductions. Rather than condoning aggressive emission control decisions, courts have instead sanctioned Agency inaction and delay. Were the EPA to initiate emission reduction actions under appropriate CAA provisions, the courts would likely defer to the Agency's decisions on these matters. Although the scientific findings are incomplete, the existing information constitutes a substantial body of evidence which could support regulatory decisions.

Perhaps the EPA's reluctance to proceed under the CAA can be justified on the basis of scientific uncertainty, cost-benefit considerations, or public policy grounds. It is true that the CAA is better suited for addressing localized, ambient air quality impacts than the long-range transport and atmospheric loadings associated with acid rain. But if SO_2 emission reductions are deemed the appropriate course of action, the legal mechanism for seeking these reductions is available. The EPA merely needs to initiate the actions. Although the passage may be difficult, the CAA opens the door.

OTHER STATUTORY AUTHORITY RELATED TO ACID RAIN

Clearly, the CAA provides the most direct statutory means for dealing with the acid rain phenomenon. Nevertheless, other statutory authority might, under novel interpretations, address acid rain concerns. This section of the note identifies and briefly discusses this potential authority. It is presumed that open-minded agencies and courts and creative "lawyering" would be necessary in order to overcome the obvious argument that the legislative history of these statutes does not support their application to acid rain. Further legal challenges include broadening the statutory terms and provisions to encompass acid rain and SO_2 emissions.

Trapdoors, which typically approach rooms from a different plane, might aptly describe these approaches which are suggested as alternatives to the more direct methods under the CAA.

The broad objective of the Federal Water Pollution Prevention and Control Act [hereinafter "The Clean Water Act" or "CWA"],[240] is "to restore and maintain the chemical, physical, and

240. Water Pollution Control Act, 33 U.S.C. §§ 1251-1376 (1982 & Supp. III 1985).

biological integrity of the Nation's waters" by eliminating the "discharge of pollutants into the navigable waters . . ." and by establishing "an interim goal of water quality which provides for . . . recreation in and on the water. . . ."[241] Under section 502, the term "discharge of pollutant" means "any addition of any pollutant to navigable waters from any point source."[242] The term "pollutant" includes, *inter alia*, "chemical wastes . . . and industrial . . . waste discharged into water,"[243] and the term "point source" means "any discernible, confined and discrete conveyance . . . from which pollutants are or may be discharged."[244]

Given these broad definitions, one might argue that acid rain falls within several provisions of the CWA. Under a broad interpretation of this statute, the SO_2 emissions (discharge of a pollutant) from a stack (point source) could be subject to the requirements of the CWA because they impair the "chemical, physical, and biological integrity of the Nation's waters."[245] More specifically, either conventional pollutants, which already include pH—a measure of acidity—or non-conventional, non-toxic pollutants could be redefined by the EPA to include acidic precursors.[246] Thus, air pollutants which are indirectly discharged into water could become regulated as water pollutants. Non-point sources, such as the atmosphere with its inputs of acidic materials, are addressed in section 304(f) and within the broad planning authority in Subchapter II of the CWA.[247] For example, storm water runoff, which includes acidic components from the atmosphere, falls within the latter authority.[248] Facilities contributing to these non-point sources could be held indirectly responsible for this pollution.

Also, states might require air emission limitations on acidic precursors from a source in order to ensure compliance with a water quality standard such as acidity.[249] Furthermore, states are granted broad authority to control pollution—defined as "man-made or man-induced alteration of the chemical, physical, biological . . . in-

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(*See* Water Quality Act of 1987, 33 U.S.C. § 1251-1376 (Supp. 1987) for recent changes in the Water Pollution Control Act).

241. *Id.* § 1251.
242. *Id.* § 1362(12).
243. *Id.* § 1362(6).
244. *Id.* § 1362(14).
245. *Id.* § 1251(a).
246. *See id.* § 1314(a)(4).
247. *See id.* §§ 1281, 1284, 1285(j), 1288, 1342(b)(2)(B).
248. *Id.* § 1292(2)(B).
249. *See id.* § 1313.

tegrity of water"[250] under section 510 of the CWA.[251] Since effluent limitations have not been promulgated for sulfates, states have considerable discretion in considering such limitations under section 510.

Similar to the CAA, authority under sections 306[252] and 310,[253] respectively, to regulate new sources and to abate international pollution might be employed to address the acid rain issue. However, many of the same problems that encumber that use of these provisions within the CAA would also apply here. Lastly, two provisions address the restoration of publicly-owned fresh water lakes;[254] activities under these sections might include mitigative measures, such as liming, to restore acidified lakes.

The major problems with construing the CWA to address acid rain through the control of air pollutant emissions are the congressional intent behind the CWA and the existence of the CAA. It would be difficult to demonstrate that Congress intended the CWA to address water quality impacts from acid rain, and such an interpretation by regulatory bodies would likely be considered arbitrary, capricious, or an abuse of discretion.

Also, the CAA, which directly applies to SO_2 and other acidic precursors, impliedly preempts the regulation of stationary source air pollutants through other statutes and thus places air pollutants outside the EPA's scope of authority under the CWA. Inspection of the CWA's language supports this conclusion. For instance, the provisions of the CWA generally are limited to more traditional definitions of water quality. An example is "point source" which is defined in terms of "pipe, ditch, channel, tunnel, conduit, well," etc.[255] Forcing smoke stacks within this definition would be difficult because the path from smokestack emissions to identifiable levels of pollution in bodies of water is very tenuous and tracing it presently is beyond the technical capability of computer models.

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)[256] was designed to address past releases of hazardous waste. The Superfund Amendments and

250. *Id.* § 1362(19).
251. *See id.* § 1370.
252. *See id.* § 1316.
253. *See id.* § 1320.
254. *See id.* §§ 1314(j), 1324.
255. *Id.* § 1362(14).
256. 42 U.S.C. § 9601-9657 (1982 & Supp. III 1985), *amended by* Superfund Amendments and Reauthorization Act of 1986, Pub. L. No. 99-499, 100 Stat. 1613 (to be codified at 42 U.S.C. §§ 9601-9657).

Reauthorization Act of 1986[257] provided additional resources to the EPA, instituted new procedures, and added more detail to cleanup standards, settlement procedures, and judicial review.[258] Application of this "cleanup" statute to the acid rain problem could pose a difficult legal challenge in light of the statute's purpose of mitigating hazardous waste problems. Under an extremely broad interpretation of the statute's purpose and its language, an argument for acid rain action might be possible.

Section 104 authorizes the President of the United States to provide for remedial action in the event of a release of a hazardous substance or any pollutant or contaminant "which may present an imminent and substantial danger to the public health or welfare."[259] The recent amendments reinforced this substantial endangerment authority by putting within the President's discretion the ability to take action when "no other person with the authority and capability to respond will do so in a timely manner."[260] Many observers would say that the EPA has repeatedly failed to respond to acid rain which is presenting an "imminent and substantial danger" to the public welfare. Additional authority exists under the National Contingency Plan and abatement action provisions of Sections 105 and 106.[261] For example, in determining priorities among releases throughout the country, the following facts should be considered: "the potential for destruction of sensitive ecosystems"[262] and the "potential contamination of the ambient air. . . ."[263] Both concerns are directly applicable to the acid rain questions based upon the purported impacts of SO_2 and sulfates to the environment.

The key terms within CERCLA for acid rain purposes are "release," "hazardous substance," and "pollutant or contaminant." Although the scope of the term with regard to certain regulations has not been fully defined by the EPA,[264] "release" is broadly defined in the statute to include any "emitting . . . into the environ-

257. Pub. L. No. 99-499, 100 Stat. 1613 (to be codified at 42 U.S.C. §§ 9601-9657).

258. Garrett, *The Superfund Amendments of 1986*, 12 CHEMICAL WASTE LITIG. REP. 940, 940 (1986).

259. 42 U.S.C. § 9604(a)(1).

260. Pub. L. No. 99-499, § 104(c), 100 Stat. 1618 (1986) (to be codified at 42 U.S.C. § 9604(a)(4)).

261. 42 U.S.C. §§ 9605-9606.

262. *Id.* § 9605(8)(A).

263. Pub. L. No. 99-499, § 105(a), 100 Stat. 1625 (1986) (to be codified at 42 U.S.C. § 9605(8)(A)).

264. *See* Notification Requirements, 50 Fed. Reg. 13,456, 13,458 (1985) (to be codified at 40 C.F.R. pts. 117, 302) (deferring decisions on exemptions for "continuous releases" and "federally permitted releases").

ment."[265] Continuous releases and federally permitted releases,[266] such as SO_2 emissions, are exempt from the notification and associated penalty provisions of CERCLA,[267] but such emission releases are arguably subject to certain other requirements of the statute. The definition of the term "pollutant or contaminant" is similarly broad and includes "any element, substance, compound, or mixture . . . which either directly or indirectly may have adverse effects on any organism."[268] Again, SO_2 could arguably fall within this definition. Lastly, in addition to the broad scope of the definition of "hazardous substances,"[269] the EPA may designate as hazardous substances such "substances which, when released into the environment may present substantial danger to the public health or welfare or the environment."[270] Hence, a designation of acid rain or any of its associated precursors as "hazardous" by the EPA or a similar finding by the President under the "pollutant or contaminant" definition, could bring acid rain within the purview of CERCLA. Unless certain hurdles, as discussed below, can be overcome, such events are unlikely to happen.

First, and most important, CERCLA was not intended to deal with impacts from emitted substances which are directly regulated under other statutes; in other words, SO_2 emissions are more appropriately controlled under the Clean Air Act. Also, sulfates, which are primarily formed as secondary pollutants in the atmosphere, are not emitted and thus are not within the CERCLA definition of "release." However a broad interpretation of the term "emitting" could encompass the transformation process from SO_2 to sulfate. Second, acid rain and its precursors do not exhibit characteristics typically considered "hazardous" within environmental statutes.[271] Third, establishing that acid rain or its precursors present a substantial danger to health or the environment, raises the same cause-

265. 42 U.S.C. § 9601(22) (1982). *See also* 50 Fed. Reg. at 13,462 (excluding only air that is not completely enclosed in a building or structure from the definition of "environment" provided in 40 C.F.R. § 302.3 for purposes of the term "release into the environment").

266. *See* 42 U.S.C. § 9601(10).

267. *See id.* § 9603(b), (f)(2).

268. Pub. L. No. 99-499, § 101(f), 100 Stat. 1616 (1986) (to be codified at 42 U.S.C. § 9601(33)).

269. *See* 42 U.S.C. § 9601(14).

270. *Id.* § 9602(a).

271. *See, e.g.*, Resource Conservation and Recovery Act, 42 U.S.C. § 6921(a) (1982) (listing toxicity, persistence, potential for accumulation in tissue, and flammability as factors to consider in identifying hazardous characteristics).

and-effect questions that hamper action under the Clean Air Act.[272] Establishing the magnitude and extent of acid rain is equally complex. In sum, it appears a remote possibility that CERCLA could lead to controls of SO_2 emissions.

One other provision of CERCLA might be applicable to acid rain, not from an emission control point of view but rather from a mitigation of damages perspective. Section 107 imposes liability on facility owners and operators—a facility includes any "structure,"[273] e.g., a stack—for removal, remedial, and other necessary response costs and for "damages for injury to, destruction of, or loss of natural resources, including the reasonable costs of assessing such injury, destruction, or loss resulting from such a release."[274] Under this provision, emission sources might be required: to remedy acid rain effects through local mitigative measures such as the liming of acidified bodies of water, or to bear the cost for research to identify the level of effects. Such actions, however, again raise the cause-and-effect question previously discussed, but do offer a reasonable alternative.

Under a broad interpretation, other statutory authority appears to offer some very narrow doors to acid rain mitigation.[275] Actual relief under these statutes designed to protect the nation's natural resources would be challenging because of the legal cause-and-effect obstacles discussed above.[276] The major hurdle, similar to the one blocking relief under the CAA, is the present inability to establish the link between a responsible pollutant source and a particular affected ecosystem. Despite their limitations, these statutes could provide enterprising parties with a reasonable means of addressing a

272. *See supra* text accompanying notes 31-33.

273. 42 U.S.C. § 9601(9).

274. 42 U.S.C. § 9607(a).

275. *See, e.g.*, The Endangered Species Act, 16 U.S.C. §§ 1531-1543 (1982, Supp. III 1985 & Supp. IV 1986). The Act ensures that actions by federal agencies do not threaten the continued existence of endangered or threatened species and do not adversely affect their habitats. *Id.* § 1536(a)(2). Assuming that the EPA's approval of a SIP authorizing emissions that contribute to acid deposition is a federal "agency action," the EPA might be required to demand a SIP revision to eliminate those emissions which are jeopardizing the existence of an endangered or threatened species or its habitat. *See* Wetstone, *Air Pollution Control Laws in North America and the Problem of Acid Rain and Snow*, 10 ENVT'L. L. REP. (ENVTL. L. INST.) 50,001, 50,011 (1980).

See also the Organic Act of the National Park Service, 16 U.S.C. §§ 1-18f (1982, Supp. III 1985 & Supp. IV 1986). The Act mandates that Federal areas such as national parks, monuments, and reservations shall be regulated "by such means as will leave them unimpaired for future generations." *Id.* § 1.

276. *See, e.g.*, Camfield v. United States, 167 U.S. 518 (1897); United States v. Alford, 274 U.S. 264 (1927); Kleppe v. New Mexico, 426 U.S. 529 (1976).

particular problem in certain circumstances where more direct methods under the Clean Air Act are not readily available. Therefore, they should not be ignored when considering the various legal solutions to the acid rain problem.

CONCLUSION

Assuming the wisdom of SO_2 emissions reductions, substantial authority exists within present United States' statutes to address the acid rain phenomenon. The Clean Air Act, which already has resulted in considerable reductions in these emissions, provides ample opportunity for further reductions. Compared to other statutory authority, the Clean Air Act provides the most direct means, with fewer legal hurdles. Certain provisions of the Act could produce substantial emissions reductions, while several other sections could yield additional minimal reductions.

The lack of conclusive scientific evidence and adequate technical methodologies presents the most substantive barrier to addressing the problem. Although many scientific questions still need to be resolved, the implementation of control initiatives by the EPA would possibly be viewed as rational agency decisions in light of the currently available scientific evidence, and thus they could withstand any subsequent legal challenges. To date, however, the EPA has made little progress in effecting additional SO_2 emission reductions under the Clean Air Act. Litigation, inconclusive scientific evidence, and internal Agency policy have contributed to this administrative delay.

Addressing the acid rain phenomenon through other statutes would be problematic, but creative applications of these statutes might provide some relief. The Clean Air Act, on the other hand, in its present form offers a number of viable alternatives to the solution of the problem.

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