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AN EVOLVING MODEL FOR JUDICIAL REVIEW OF ENVIRONMENTAL, SAFETY AND HEALTH RULEMAKING: *SMALL REFINERS LEAD PHASE- DOWN TASK FORCE V. EPA*

In one of his first attempts to carry out his campaign promise to create a more efficient government, President Reagan issued Executive Order No. 12,291, *Federal Regulation Requirements*.¹ Among other things, this Order is intended to "reduce the burdens [on industry] of existing and future regulations."² It directs that, in promulgating new regulations, agencies may not undertake action unless the potential benefits to society from the regulation outweigh the potential costs.³ The Executive Order reflects the

1. Exec. Order No. 12,291, 3 C.F.R. 127 (1982), *reprinted in* 5 U.S.C. § 601 (1982).

2. Exec. Order No. 12,291, 3 C.F.R. 127 (1982), *reprinted in* 5 U.S.C. § 601 at 431 (1982).

3. Exec. Order No. 12,291, 3 C.F.R. 128, *reprinted in* 5 U.S.C. § 601 at 431. The Order appears to require a rigorous balancing of costs versus benefits of any proposed regulation. Section 2 of the Order states, in pertinent part:

(b) Regulatory action shall not be undertaken unless the potential benefits to society for the regulation outweigh the potential costs to society;

(c) Regulatory objectives shall be chosen to maximize the new benefits to society;

(d) Among alternative approaches to any given regulatory objective, the alternative involving the least net cost to society shall be chosen; and

(e) Agencies shall set regulatory priorities with the aim of maximizing the aggregate net benefits to society, taking into account the condition of the particular industries affected by regulations, the condition of the national economy, and other regulatory actions contemplated for the future.

Id. The Order explicitly states, however, that its requirements are subject to the provisions of applicable laws. *Id.* See also *infra* note 9 and accompanying text. A great deal of confusion surrounds the use of various terms that describe methods of measuring economic impact. Terms such as "cost-benefit" and "cost-effectiveness" analysis have been interpreted to mean different things. See, e.g., Kasper, *Cost-Benefit Analysis in Environmental Decision-making*, 45 GEO. WASH. L. REV. 1013-15 (1977) (no agreement exists on the meaning of "cost-benefit analysis"; use of the term ranges from intuitive to quantitative comparisons of costs versus benefits).

To avoid confusion, this Note will use the terms "cost-effectiveness" and "cost-benefit" in the following manner: The term "cost-effectiveness analysis" will be used to refer to the economic technique of evaluating the costs and effectiveness of alternative methods of complying with a standard. In an ideal case, the alternative methods would be equally effective. The term "cost-benefit analysis" will be used to refer to the net, quantitative comparison of the costs and benefits of a standard. The term "incremental cost-benefit analysis" will be used to refer to strict economic analysis, or marginal analysis, by which the most economi-

widespread attitude of the late 1970's and early 1980's that too much government interference with business operations,⁴ and inadequately reasoned government regulation,⁵ have caused serious economic harm.⁶

At the time of the 1980 Presidential campaign, Congress also was concerned with the effect of agency regulations on businesses, particularly on small businesses. This led to the enactment of the Regulatory Flexibility Act.⁷ The Act in general requires federal agencies to consider alternative methods of regulating small businesses so that the economic impact on them is lessened whenever possible.⁸ The alternatives considered, how-

cally efficient standard may be determined. Incremental cost-benefit analysis involves estimating the point at which the cost of expanding an activity (the marginal cost) equals the benefits gained from expanding the activity (marginal benefits). See Ruff, *The Economic Common Sense of Pollution*, 19 THE PUBLIC INTEREST 69, 70-71 (1970).

4. Exec. Order No. 12,291, 3 C.F.R. 127 (1982). Section 2(a) of the Order states that administrative decisions shall be based on adequate information concerning the need for government action. See also Douglas, *A Perspective from the Private Sector*, 13 NAT. RESOURCES LAW. 643, 644 (1981) (experience of most businesses is that more government control usually means less efficient business operations).

5. 3 C.F.R. 127 (1982). The Order is intended to ensure "well-reasoned" regulations.

6. See, e.g., Haveman & Christainsen, *Environmental Regulations and Productivity Growth*, 21 NAT. RESOURCES J. 489, 508 (1981). The authors estimate that eight to twelve percent of the slowdown in economic productivity that occurred during the 1970's was attributable to environmental regulations alone; see also Ridker & Watson, *Long-Run Effects of Environmental Regulation*, 21 NAT. RESOURCES J. 565 (1981) (discussing potential future effects of environmental regulations on economic growth).

Public opinion polls also indicate that support for environmental programs that do not consider costs may be weakening. In a poll conducted by the Opinion Research Corporation in 1977, and repeated in 1978 and 1980 by Resources for the Future, supportive responses to a strongly pro-environmental option declined over those three years. Individuals were asked whether the following statement represented their opinion: "Protecting the environment is so important that requirements and standards cannot be too high, and continuing improvements must be made regardless of cost." The percentage of individuals indicating agreement with the statement declined from 55% (a majority) in 1977 to 42% in 1980, a drop of over 10 percentage points in three years. COUNCIL ON ENVIRONMENTAL QUALITY, ELEVENTH ANNUAL REPORT OF THE COUNCIL ON ENVIRONMENTAL QUALITY 406-07 (1980). A sharp decline (58% in 1977 to 27% in 1980) was also seen in the percentage of individuals willing to accept a slower rate of economic growth in order to protect the environment. *Id.* at 409.

The number of individuals who felt that pollution control programs cost "more . . . [than they are] worth," however, also declined—from 19% in 1977 to 13% in 1980. *Id.* at 406-07. Overall, the polls indicated that support for environmental programs in general remained high through 1980. *Id.* at 407.

7. Regulatory Flexibility Act, Pub. L. No. 96-354, 94 Stat. 1165, 5 U.S.C. §§ 601-12 (1982). Section 2 of the Act provides, in part, that "when adopting regulations to protect the health, safety and economic welfare of the Nation, Federal agencies should seek to achieve statutory goals as effectively and efficiently as possible without imposing unnecessary burdens on [small businesses, organizations or governmental jurisdictions]."

8. Section 3(a) of the Regulatory Flexibility Act requires agencies to prepare and make publicly available regulatory flexibility analyses. 5 U.S.C. §§ 603-604 (1982). Section 603

ever, must be consistent with the stated objectives of applicable statutes.⁹

In contrast to the concern for the economic impact of regulations articulated by the Congress, the President, and federal agencies in the early 1980's, the attitude of government institutions in the early 1970's favored protection of the environment and public health almost to the exclusion of economics. Congress enacted a number of comprehensive statutes designed to reduce pollution and protect natural resources and public health including the Clean Air Amendments of 1970,¹⁰ the Federal Water Pollution Control Act of 1972,¹¹ and the Occupational Safety and Health Act of 1970.¹² The Clean Air Amendments and the Federal Water Pollution Control Act were described as "technology forcing" statutes because they required stringent controls on pollution sources to be developed within short periods of time.¹³ Legislative history for all three acts indicates that costs of implementation were viewed as secondary to strict pollution control.¹⁴

requires an initial regulatory flexibility analysis at the time a rulemaking is proposed. This analysis must include, among other things, a description of significant alternatives to the proposed rule that would accomplish the applicable statutory objectives while minimizing economic impact on small entities. Section 604 requires the agency to prepare a final regulatory flexibility analysis at the time a final rule is issued. This analysis must include, among other things, a description of each of the significant alternatives to the rule which was considered, and a statement of the reasons for rejecting any of the considered alternatives.

Section 3(a) of President Reagan's Executive Order No. 12,291 specifically permits agencies to combine implementation of the analysis required by the Executive Order "with any Regulatory Flexibility Analyses performed under 5 U.S.C. 603 and 604." 3 C.F.R. 127 (1982). *See also supra* note 3 and accompanying text.

9. 5 U.S.C. § 606 (1982) (§§ 603 & 604 do not alter in any manner standards otherwise applicable by law to agency action).

10. Clean Air Amendments of 1970, Pub. L. No. 91-604, 84 Stat. 1676, 42 U.S.C. §§ 7401-7706 (1982).

11. Federal Water Pollution Control Act of 1972, Pub. L. No. 92-240, 86 Stat. 47, 33 U.S.C. §§ 1251-1376 (1982).

12. Occupational Safety and Health Act of 1970, Pub. L. No. 91-596, 84 Stat. 1591, 29 U.S.C. §§ 651-678 (1982).

13. *See, e.g.*, Clean Air Amendments of 1970, 42 U.S.C. § 110(a) (1982), requiring industry to meet standards for ten major contaminants within strict national deadlines. Much of the debate surrounding the 1970 amendments focused on whether it was feasible for industry to meet the deadlines imposed. *See, e.g.*, 116 CONG. REC. 32,904-05 (1970) (remarks of Sen. Griffen) (the technology required to satisfy the 1970 Clean Air Amendments is not available, and only a "pious hope" exists that such technology can be developed in time). *See generally* Le Pierre, *Technology-Forcing and Federal Environmental Protection Statutes*, 62 IOWA L. REV. 771 (1977).

14. *See* S. REP. NO. 1196, 91st Cong., 2d Sess. 3 (1970) (under the Clean Air Amendments of 1970, existing sources of pollution should either meet the standard or be closed down, and new sources should be controlled to the maximum extent possible); 116 CONG. REC. 37,631, 37,345 (1970) (Occupational Safety and Health Act would impose substantial costs on employers, but such costs are part of the cost of doing business) (remarks of Sen.

Increased concern for the cost of implementing these statutes has meant that agencies charged with developing safety or environmental standards must now consider the competing interests of economic and environmental well-being.¹⁵ The federal courts have played an important role in interpreting environmental legislation and in balancing the economic interests of industry with protection of public health or natural resources.¹⁶ The

Dominick and Sen. Yarborough, respectively); 117 CONG. REC. 38,810 (1971) (some disruption in economy would result from Federal Water Pollution Control Act of 1972, possibly forcing many marginal plants to close) (remarks of Sen. Bentzen). See also Sagoff, *Economic Theory and Environmental Law*, 79 MICH. L. REV. 1393, 1418 (1981) (environmental legislation of the last twenty years has consistently indicated a preference for national policies that respond to concerns other than economic efficiency); Fisher, *Controlling Government Regulation: Cost-Benefit Analysis Before and After the Cotton Dust Case*, 36 AD. L. REV. 179, 204 n.214 (1984) (Federal Water Pollution Control Act of 1972 established important principle that so long as control technology exists, it should be used regardless of economic considerations such as actual need for control).

By contrast, current efforts to develop acid rain legislation encounter serious obstacles in the form of economic concerns. See *Acid Rain Control (Part 1): Hearings on H.R. 3400 Before the Subcomm. on Health and the Environment of the House Comm. on Energy and Commerce*, 98th Cong., 1st Sess. 1 (1983) (opening statement of Chairman Henry A. Waxman) ("legitimate concerns have been raised about possible adverse employment and utility rate effects . . . [a]nd we will be unable to pass acid rain control legislation so long as it is synonymous with massive job losses and electric rate increases.").

15. Agencies are faced with walking a very narrow line between the competing interests of economic productivity and environmental well-being. A recent decision by the Colorado Industrial Commission indicates that adjudicatory bodies are willing to hold federal agencies liable for workers' environmentally caused injuries, even though the workers' exposures remain within federally established exposure levels. The Colorado Industrial Commission recently determined that a worker's death was the result of cancer caused by exposure to radiation during 15 years' employment at a nuclear weapons plant. The worker had never been exposed to radiation doses higher than the federal government's permissible exposure level. The Commission found, however, based on expert testimony, that the government's standard could result in extensive exposure to some body organs through inhalation or ingestion of radioactive materials. Thus, the Commission held that the Department of Energy was liable for the worker's death, despite the fact that federal guidelines had been observed. Wash. Post, Apr. 25, 1984, at A2, col. 1.

16. See generally Leventhal, *Environmental Decisionmaking and the Role of the Courts*, 122 U. PA. L. REV. 509 (1974). The author describes the role courts should take in reviewing agency decisions and suggests that, while deference is owed to the expertise of the agency, judges should carefully scrutinize the agency's stated rationale for its action, even if that calls for examining complicated scientific information. *Id.* at 511. This level of judicial scrutiny, referred to as the "hard look" doctrine, is intended to provide searching review of agency actions, without substituting judicial judgment for that of the agency. *Id.* at 514. See *National Lime Ass'n v. EPA*, 627 F.2d 416, 451 n.126 (D.C. Cir. 1980) for an outline of the historical development of the "hard look" doctrine.

In the 1977 Clean Air Act Amendments, Congress specifically approved application of "hard look" review to agency actions taken pursuant to the Clean Air Act. See H.R. REP. NO. 564, 95th Cong., 1st Sess. 558 (1977). The House Report noted that courts should continue applying a thorough, comprehensive level of review in implementing the arbitrary and capricious standard for judicial review under the Clean Air Act. *Id.* The report noted fur-

United States Court of Appeals for the District of Columbia Circuit, in reviewing agency regulation under a number of substantive statutes, has suggested a model that accommodates these legitimate but competing interests in judicial review of agency action.¹⁷ Considerations comprising the model include assessments of the amount of risk to health or environment involved; the degree to which an agency standard reduces that risk; the technological feasibility of complying with the standard; and the degree to which the agency must balance the economic impact of the standard against the goals to be achieved by it.

ther that, while there may be little practical difference between the substantial evidence and arbitrary and capricious standards of review established by § 706 of the Administrative Procedure Act, the intent of Congress was to retain the arbitrary and capricious standard for actions taken pursuant to the Clean Air Act. *Id.* See also *infra* notes 35, 96 and accompanying text.

In general, application of the "hard look" doctrine to scientific issues focuses on substantive review of agency decisionmaking as opposed to requiring extraordinary procedural safeguards. Thus, as Judge Leventhal stated in *Essex Chem. Corp. v. Ruckelshaus*, 486 F.2d 427, 434 (D.C. Cir. 1973):

[While the court's role] is not in setting standards for emission control but in determining if the standards as set are the result of reasoned decisionmaking. . . . [e]ven this limited function requires that we foray into the technical world to the extent necessary to ascertain if the Administrator's decision is reasoned. While we must bow to the acknowledged expertise of the administrator in matters technical we should not automatically succumb thereto, overwhelmed as it were by the utter 'scientificity' of the expedition.

In contrast to this view, others, particularly Judge Bazelon, have advocated reliance on agency procedures to ensure adequately reasoned decisions involving technical issues. Judge Bazelon's concurring opinion in *International Harvester Co. v. Ruckelshaus*, 478 F.2d 615, 652 (1973) (Bazelon, J., concurring) espouses this view, explaining:

[I]n cases of great technological complexity, the best way for courts to guard against unreasonable or erroneous administrative decisions is not for the judges themselves to scrutinize the technical merits of each decision. Rather, it is to establish a decisionmaking process that assures a reasoned decision that can be held up to the scrutiny of the scientific community and the public.

The U.S. Supreme Court has restricted, if not eliminated, application of this latter view by its decision in *Vermont Yankee Nuclear Power Corp. v. Natural Resources Defense Council, Inc.*, 435 U.S. 519 (1978) (reviewing courts may not impose procedures on an agency beyond the statutory minima of the Administrative Procedure Act). Thus, the current approach to judicial review of agency science decisions apparently must incorporate strict substantive review of the agency's record and the agency's explanation of its decision as based upon that record.

17. The following cases illustrate various elements of a general model for review of environmental rulemakings: *National Lime Ass'n v. EPA*, 627 F.2d 416 (D.C. Cir. 1980) (agency standard must be technologically achievable by industry as a whole); *Weyerhaeuser v. Costle*, 590 F.2d 1011 (D.C. Cir. 1978) (agency must balance cost of standard against industry as a whole); *Ethyl Corp. v. EPA*, 541 F.2d 1 (D.C. Cir.) (en banc), *cert. denied*, 426 U.S. 941 (1976) (in absence of certainty of harm agency may regulate upon showing of significant risk to human health); *Kennecott Copper Corp. v. EPA*, 462 F.2d 846 (D.C. Cir. 1972) (agency must attempt to quantify level of adverse harm as basis for regulation).

In *Small Refiners Lead Phase-Down Task Force v. EPA*,¹⁸ the United States Court of Appeals for the District of Columbia Circuit addressed the extent to which the Environmental Protection Agency (EPA) must balance economic considerations against the concern for public health in promulgating new standards for lead in gasoline.¹⁹ The court also addressed the extent to which the agency must show a risk to human health before imposing a final regulation. After finding in the EPA's rulemaking record a significant risk to human health,²⁰ the court held that extensive economic analysis was not required in determining the final standard to be implemented; the EPA need balance only the standard's overall cost to the industry as a whole.²¹

In October 1982, the EPA, pursuant to section 211(c)(1)(A) of the Clean Air Act,²² imposed a new refinery standard regulating lead additives in gasoline.²³ The new standard provided uniform treatment to large and small refining companies,²⁴ despite the fact that small refineries previously had been granted special treatment pursuant to section 211(g)(2) of the Clean Air Act.²⁵ Section 211(g)(2) of the Act essentially provided that the smaller the refinery, the greater the amount of lead the refinery could use per gallon of gasoline produced.²⁶ Congress, however, specifically authorized the EPA's Administrator to use discretion in continuing this treatment beyond October 1, 1982.²⁷

The Small Refiners Task Force (SRTF), a coalition of twelve small refiners, challenged the new uniform standard as arbitrary and capricious, alleging that the EPA had not considered adequately other methods of

18. 705 F.2d 506 (D.C. Cir. 1983).

19. *Id.* at 525-26 (stating that review could not be restricted to health considerations alone but must include consideration of the EPA's economic reasoning).

20. *Id.* at 531 ("significant risk" of adverse effects from lead justified the EPA's decision to reduce lead content of gasoline). Lead, at relatively high dosage levels, can cause anemia, fatigue, nerve damage and even death. *Ethyl Corp.*, 541 F.2d at 8. Low blood lead levels are associated with intellectual impairment in children. *Small Refiners*, 705 F.2d at 529.

21. *Id.* at 536-37 (the EPA's balancing of health benefits against cost to the industry as a whole was reasonable).

22. Clean Air Amendments of 1970, 42 U.S.C. § 7545(c)(1)(A) (1982). This statutory provision permits the Administrator of the EPA to regulate the use of additives, including lead additives, in gasoline produced if, in the Administrator's judgment, such content may reasonably be anticipated to endanger the public health or welfare.

23. *See* 47 Fed. Reg. 49,324 (1982).

24. *Id.*

25. Clean Air Act Amendments of 1977, 42 U.S.C. § 7545(g)(2) (1982). *See also infra* note 180.

26. *See infra* note 180.

27. *See infra* note 181.

regulating the industry.²⁸ SRTF maintained that a system of regulation that would continue to provide special treatment for small refiners would not so nearly threaten their financial survival.²⁹ They proposed a dual standard that would permit small refiners to use more lead in the gasoline they produced than large refiners could use.³⁰ SRTF argued that the EPA had not shown the need to set a more stringent standard than the two-tiered system would provide.³¹

The court of appeals held that the record developed during the rulemaking procedure showed atmospheric lead to be a significant risk to human health,³² and that reductions of lead in gasoline resulted in reduced absorption of lead by populations studied.³³ The court was troubled that the EPA had not more fully explained the health basis for choosing its final standard over some other standard.³⁴ The court stated, however, that it found a rational basis for the EPA's choice³⁵ since EPA "had balanced health benefits against cost to the industry as a whole."³⁶

This Note will outline the historical treatment of environmental rulemakings by the United States Court of Appeals for the District of Columbia Circuit. It will trace the development of the standard of review applied in *Small Refiners Lead Phase-Down Task Force v. EPA*, including

28. Brief for Petitioner at 42-43, 48-49, *Small Refiners Lead Phase-Down Task Force v. EPA*, 705 F.2d 506 (D.C. Cir. 1983).

29. Brief for Petitioner at 31, 41-42, *Small Refiners*, 705 F.2d 506 (D.C. Cir. 1983).

30. *Id.* at 45-47. Specifically, SRTF proposed the use of a 2.50 grams per leaded gallon/1.10 grams per leaded gallon (2.50 gplg/1.10 gplg) standard. This would allow small refiners to use 2.50 grams of lead per gallon of leaded gasoline produced while other refiners' lead use was limited to 1.10 grams per leaded gallon produced.

31. *Small Refiners*, 705 F.2d at 527. See also Brief for Petitioner at 43-44, *Small Refiners*. SRTF argued that the dual standard would result in significant reductions of blood lead levels, yet would permit 25 to 30 small refiners, who could not meet the more stringent proposed standard, to continue in business. *Id.* at 31, 43-44. SRTF maintained that the EPA must show that the additional lead reduction resulting from the more stringent standard was necessary for health reasons. *Id.* at 46-47.

32. *Small Refiners*, 705 F.2d at 531.

33. *Id.* at 527-28.

34. *Id.* at 537.

35. *Id.* at 536-37. While the court stated that the final standard imposed was reasonable (hence, met the arbitrary and capricious standard of review imposed by § 307(d) of the Clean Air Act), it further stated that the agency's action was supported by "'substantial' evidence in the record viewed as a whole." *Id.* at 526. There is a continuing trend among courts to merge the standard of review under the "hard look" doctrine of the arbitrary and capricious test with the substantial evidence test. See DeLong, *Informal Rulemaking and the Integration of Law and Policy*, 65 U. VA. L. REV. 257, 284-89 (1979) (substantial evidence test and arbitrary and capricious test have converged as a result of strict review under arbitrary and capricious standard and the difficulty of reviewing policy judgments under substantial evidence standard). See also *supra* note 16; *infra* note 96 and accompanying text.

36. *Small Refiners*, 705 F.2d at 536.

an examination of the impact on the *Small Refiners* decision of United States Supreme Court cases interpreting the Occupational Safety and Health Act of 1970. Finally, the Note will consider the potential effects of the *Small Refiners* approach on future health and environment controversies, suggesting that the D.C. Circuit should encourage the use of cost-benefit analysis in circumstances where the state of knowledge regarding a particular environmental hazard reflects a great deal of scientific certainty, but should apply risk-benefit analysis³⁷ where uncertainty is great.

I. DEFINING THE LIMITS OF AGENCY DISCRETION IN REGULATING TOXIC SUBSTANCES

A. *U.S. Supreme Court Test: The Benzene and Cotton Dust Decisions*

Two recent and well-known cases before the United States Supreme Court, *Industrial Union Department v. American Petroleum Institute*³⁸ (*Benzene*) and *American Textile Manufacturers Institute v. Donovan*³⁹ (*Cotton Dust*) addressed the limits of agency discretion in setting standards for hazardous substances. Both of these decisions addressed the Occupational Safety and Health Administration's (OSHA) interpretation of the Occupational Safety and Health Act of 1970⁴⁰ (OSH Act, or Act). Section 3(8) of the Act requires OSHA to promulgate occupational safety and health standards⁴¹ that are reasonably necessary to regulate toxic materials or harmful physical agents. Standards set by OSHA to regulate these substances are also subject to section 6(b)(5) of the OSH Act which provides that "[t]he Secretary . . . shall set the standard which most adequately assures, to the extent feasible . . . that no employee will suffer material impairment of health or functional capacity"⁴² even if the employee is regularly ex-

37. See *infra* note 124 and accompanying text.

38. 448 U.S. 607 (1980).

39. 452 U.S. 490 (1981).

40. Occupational Safety and Health Act of 1970, Pub. L. No. 91-596, 84 Stat. 1590, 29 U.S.C. §§ 651-678 (1982) [hereinafter cited as OSH Act].

41. Section 3(8) of the OSH Act provides the basic definition of the term "occupational safety and health standard" as "a standard which requires conditions, or the adoption or use of one or more practices, means, methods, operations, or processes, reasonably necessary or appropriate to provide safe or healthful employment and places of employment." 29 U.S.C. § 652(8) (1982). This definition raises two issues: first, the *extent* to which a proposed remedial measure is "reasonably necessary or appropriate" under the Act; and second, the *degree* of safety required to provide "safe or healthful employment or places of employment." For example, "reasonably necessary" could mean economically reasonable; "safe or healthful" could require absolute safety or health.

42. 29 U.S.C. § 655(b)(5) (1982). The full text of § 6(b)(5) of the OSH Act provides:

The Secretary, in promulgating standards dealing with toxic materials or harmful physical agents under this subsection, shall set the standard which most adequately

posed to the hazard in the workplace. In both *Benzene* and *Cotton Dust* the Supreme Court reviewed the agency's interpretation of sections 3(8) and 6(b)(5) of the OSH Act, addressing what findings OSHA must make regarding the health risks and economic impact of a proposed standard before issuing a final regulation.

Benzene addressed OSHA's efforts to regulate the use of benzene in the workplace. Benzene, a demonstrably hazardous compound, is commonly used in the manufacture of such products as motor fuels, solvents, detergents, pesticides and various other organic chemicals.⁴³ Workers employed in gasoline service stations, petroleum refineries, coking operations, chemical processing, and related industries are subject to low-level exposure to benzene as a consequence of their employment.⁴⁴ Benzene's normal route of entry into the body is by inhalation of vapors, with subsequent absorption into the bloodstream.⁴⁵ Acute effects of benzene inhalation, occurring at exposure levels ranging from 250 to 20,000 parts per million (ppm), include dizziness, nausea, and, at the upper exposure level, unconsciousness and death.⁴⁶

In addition to the acute effects of exposure to benzene (which workers in

assures, *to the extent feasible*, on the basis of the best available evidence, that no employee will suffer material impairment of health or functional capacity even if such employee has regular exposure to the hazard dealt with by such standard for the period of his working life. Development of standards under this subsection shall be based upon research, demonstrations, experiments, and other such information as may be appropriate. In addition to the attainment of the highest degree of health and safety protection for the employees, other considerations shall be the latest available scientific data in the field, the feasibility of the standards, and experience gained under this and other health and safety laws.

Id. (emphasis added). While § 3(8) of the OSH Act applies to all occupational health standards, the plain language of § 6(b)(5) indicates that the section applies only to health standards involving toxic materials or harmful physical agents. *Benzene* suggests, however, without deciding, that the second and third sentences of § 6(b)(5) may apply to all types of health and safety standards. 448 U.S. at 612 n.1. As a whole, § 6(b)(5) probably indicates a greater willingness on the part of Congress to tolerate a heavier economic burden on industries where serious threats to human health from toxic materials and harmful physical agents are involved. *See, e.g., Cotton Dust*, 452 U.S. at 512 (by enacting § 6(b)(5), Congress chose to impose separate and additional requirements that override the economic balancing implied by § 3(8), whenever toxic materials/harmful physical agent standards are promulgated).

43. *Benzene*, 448 U.S. at 615.

44. *Id.* at 615-16. Gasoline service station attendants, by far the largest number of workers exposed to benzene, were excluded from protection under OSHA's benzene regulations due to the impracticality of devising protective measures. 43 Fed. Reg. 5919, 5923 (1978). This indicates that technological feasibility was an important limitation considered by OSHA in promulgating standards under § 6(b)(5).

45. 43 Fed. Reg. 5920 (1978).

46. *Id.* at 5921.

most industries would not normally risk other than by accidental spills), evidence has also linked exposure with serious blood disorders, such as leukemia and aplastic anemia,⁴⁷ and to chromosomal abnormalities.⁴⁸ In 1969, on the basis of the evidence connecting benzene exposure to blood disorders, the American National Standards Institute⁴⁹ (ANSI) adopted a national consensus standard of 10 ppm in eight hours with a ceiling concentration level of 25 ppm.⁵⁰ In 1971, the Secretary of the newly created Occupational Safety and Health Administration adopted the ANSI standard as the federal standard pursuant to section 6(a) of the OSH Act.⁵¹

By 1976, several studies had more firmly established the link between benzene and leukemia,⁵² particularly at relatively high levels of exposure (200-500 ppm). On this basis, after an attempt to impose temporary emergency standards,⁵³ OSHA, in 1977, issued a notice of proposed rulemaking

47. *Benzene*, 448 U.S. at 617-18.

48. *Id.* at 632-33; see 43 Fed. Reg. at 5921; Sullivan, *The Benzene Decision: A Contribution to Regulatory Confusion*, 33 AD. L. REV. 351, 352 (1981); Aksoy, Dincol, Erdem & Dincol, *Acute Leukemia Due to Chronic Exposure to Benzene*, 52 AM. J. MED. 160 (1972); Vigliani, *Leukemia Associated with Benzene Exposure*, 271 ANNALS N.Y. ACAD. OF SCI. 143 (1976) for descriptions of acute and chronic effects of benzene at various exposure levels. In the latter study, for example, the author noted that 100% solutions of benzene had been used in the past in several industries and workers had been chronically exposed to 200-500 ppm benzene, with maximum peaks as high as 1500 ppm. *Id.* at 144-45.

49. The American National Standards Institute, a nonprofit organization, set standards for exposure to various workplace hazards. These standards, developed using input from industry and labor union sources, were complied with by industry on a voluntary basis.

50. *Benzene*, 448 U.S. at 617.

51. *Id.* Section 6(a) of the OSH Act, 29 U.S.C. § 655(a) (1982), directs the Secretary to promulgate safety and health standards as soon as possible or within two years from the date of enactment. The Secretary, in this case, chose the ANSI standard to be the federal occupational health standard for benzene. See 43 Fed. Reg. 5919 (1978).

52. The National Institute for Occupational Safety and Health (NIOSH), OSHA's research arm, relied on several studies published in the mid-1970's to support its conclusion. See, e.g., Aksoy, *Types of Leukemia in Chronic Benzene Poisoning*, 55 ACTA HAEMATOLOGICA 65 (1976); see generally Vigliani, *supra* note 48; see also McMichael, Spirtas, Kupper & Gamble, *Solvent Exposure and Leukemia Among Rubber Workers: An Epidemiologic Study*, 17 J. OF OCCUP. MED. 234, 238 (1975) (demonstrating a high incidence of leukemia in workers in the rubber tire industry who had been exposed to benzene over a period of several years).

53. An emergency standard may be issued by OSHA pursuant to § 6(c) of the OSH Act, 42 U.S.C. § 655(c) (1982). This section of the OSH Act provides the Secretary with authority to promulgate standards that are effective immediately if he determines that employees are exposed to grave danger from toxic materials or harmful physical agents, or that the emergency standard is necessary to protect employees from such danger. An emergency standard for benzene was promulgated in 1977, reducing exposure to benzene from 10 ppm to 1 ppm. 42 Fed. Reg. 22,516 (1977). On May 19, 1977, the United States Court of Appeals for the Fifth Circuit issued a temporary restraining order preventing the emergency standard from taking effect. *Id.* at 27,452.

to establish a new permanent standard for benzene.⁵⁴ The proposed standard reduced the permissible exposure level (PEL) to benzene from 10 ppm to 1 ppm.⁵⁵ Significantly, the agency sought comments as to whether the 1 ppm standard was the minimum "feasible" exposure level and whether certain industries should be exempt from the standard.⁵⁶ It did not solicit comments as to whether benzene, at an exposure level lower than 10 ppm, presented a significant health risk.⁵⁷

In determining a final standard, OSHA was also guided by its internal policy regarding carcinogens.⁵⁸ The agency's carcinogen policy essentially required industry advocates to provide proof that a safe level of exposure to a given carcinogenic substance exists.⁵⁹ In the absence of such proof,

54. 42 Fed. Reg. 22,516 (1977).

55. *Id.*

56. *Benzene*, 448 U.S. at 623.

57. *Id.* OSHA, however, did solicit comments as to whether certain industries should be exempt from compliance, whether it was feasible to replace benzene in solvents with other substances, and what the economic and environmental effects of the regulations would be. 42 Fed. Reg. at 27,452.

58. *Benzene*, 448 U.S. at 624 n.19 (quoting hearing testimony of Deputy Director Wrenn).

59. *Id.* OSHA's regulatory policy regarding carcinogens provided that in the absence of a known or demonstrated safe level, or a "no-effect" level, of exposure to a carcinogen, no safe level would be presumed and exposure would be reduced to the greatest extent feasible. *Id.* This policy was similar to the policy underlying the Delaney Amendment to the Federal Food, Drug and Cosmetic Act, which prohibits the use in food or drugs of color or food additives that have been demonstrated to cause cancer. 21 U.S.C. §§ 348(c)(3)(A), 376 (b)(5)(B) (1982).

Support for OSHA's carcinogen policy rested on one of two generic models for cancer initiation. The model on which OSHA relied, sometimes called the "one-hit" or "single-event" theory, holds that cancer can be caused by "the interaction of one molecule of a carcinogen with a critical receptor in one cell." Maugh, *Chemical Carcinogens: How Dangerous Are Low Doses?*, 202 Sci. 37 (1978). This interaction results in a permanent change in the cell's genetic material—a change that may ultimately result in cancer. According to this view, since the change is permanent, it can lead to cancer at any time, and may be caused by exposure to a single carcinogen molecule. Thus, no safe level of exposure exists. *Id.* Some support for the single-event theory is found in the fact that the relationship between the incidence of lung cancer and the number of cigarettes smoked daily follows a linear curve down to fairly low incidence levels. *Id.* at 38. Evidence from radiation-induced cancer also supports this theory; but chemical carcinogens are subject to cellular barriers that do not affect the entrance of radiation energy into cells. See *infra* note 213.

The second major model of cancer initiation holds that there is a threshold, or no-effect level of exposure to a carcinogen. Below this level of exposure, cancer will not develop. Support for this theory includes, among other things, the fact that some metals, such as nickel and chromium, which occur naturally in mammalian enzyme systems, cause cancer at high levels of exposure. Maugh, *supra*, at 39.

The single-event/no-effect controversy is complicated by the fact that, for practical reasons, conclusive experiments to test for the development of cancer at human exposure levels cannot be conducted. For example, ascertaining whether a significant risk of cancer exists at typical human exposure levels would require the use of six million mice for an experiment

OSHA'S carcinogen policy provided that no safe level of exposure would be presumed and exposure to the carcinogen would be limited to the lowest level possible without forcing the industry into bankruptcy.⁶⁰ The final standard for benzene, issued February 10, 1978, limited benzene exposure to 1 ppm over an eight-hour period.⁶¹

The American Petroleum Institute (API), a trade association that represents the petroleum industry, challenged the new standard.⁶² On behalf of its members, API argued that, before reducing the permissible exposure level of benzene below 10 ppm, OSHA must conduct a cost-benefit analysis comparing the benefits gained from reduced exposure with the cost to the industry of complying with the standard.⁶³ API also argued that

conducted over a period of one and one-half to two years. Practically speaking, such an experiment cannot be conducted. Instead, experiments exposing small numbers of animals to extremely high doses of carcinogens are conducted, and the data for the lower human exposure levels are inferred from these experiments. Debate continues in the scientific community as to whether "no-effect" levels of exposure to carcinogens exist. See McGarity, *Substantive and Procedural Discretion in Administrative Resolution of Science Policy Questions: Regulating Carcinogens in EPA and OSHA*, 67 GEO. L.J. 729, 733-36 (1979).

60. *Benzene*, 448 U.S. at 639; see Sullivan, *supra* note 48, at 351-52. Thus, in addition to the technological limiting factor discussed *supra* note 44, standards promulgated under OSHA's carcinogen policy were limited by economic feasibility. *Benzene*, 448 U.S. at 639. OSHA interpreted the economic feasibility limitations to mean that an industry could be forced to bear any costs that would not impair the industry's continued viability. *Id.* According to OSHA's estimates, the cost to industry of imposing the final standard for benzene was \$266 million for capital investments, approximately \$200 million for first-year operating costs, and recurring annual costs of \$34 million. OSHA estimated that 35,000 employees would benefit from the regulation. *Id.* at 628-29. OSHA determined that these costs did not threaten the financial welfare of affected firms or the general economy. *American Petroleum Inst. v. Occupational Safety & Health Admin.*, 581 F.2d 493, 503 (5th Cir. 1978), *aff'd sub nom. Industrial Union Dep't v. American Petroleum Inst.*, 448 U.S. 607 (1980). While OSHA did not quantify the benefits accruing from its standard, the *Benzene* Court interpreted OSHA's economic impact study of the standard to indicate relatively small benefits. *Benzene*, 448 U.S. at 630. OSHA, on the other hand, determined that the benefits of the proposed standard were likely to be appreciable. 43 Fed. Reg. 5941 (1978).

61. The final standard was codified at 29 C.F.R. § 1910.1028 (1979).

62. *American Petroleum Inst. v. Occupational Safety & Health Admin.*, 581 F.2d 493 (5th Cir. 1978), *aff'd sub nom. Industrial Union Dep't v. American Petroleum Inst.*, 448 U.S. 607 (1980).

63. Essentially, cost-benefit analysis is an evaluation of what is spent or sacrificed in relation to what is gained. When benefits exceed costs, the allocation of resources is cost-justified. A different allocation of resources, however, might produce benefits that exceed costs by an even greater amount. The latter choice would make the most sense from a strictly economic point of view. See L. SILK, *ECONOMICS IN PLAIN ENGLISH* 58 (1978); see also *infra* notes 89-93 and accompanying text for a discussion of cost-benefit analysis in the context of OSHA regulations.

Cost-benefit analysis, however, is of limited value where the benefits to be realized include preservation of human health. A strict cost-benefit approach would require imposing dollar values on human life, a prospect that few would suggest. For example, in *Cotton Dust*, the American Textile Manufacturers, Inc. (ATMI), conceded that a rigid cost-benefit calculation

OSHA had not shown benzene imposed a significant risk to human health at exposure levels below 10 ppm. The United States Court of Appeals for the Fifth Circuit upheld the challenge and invalidated the standard on the basis that the 1 ppm limit was not supported by appropriate findings.⁶⁴ Specifically, the court held that OSHA had not shown that leukemia had ever been caused by exposure to less than 10 ppm benzene, and that OSHA had thereby failed to demonstrate that the reduction was necessary.⁶⁵

A five to four plurality of the United States Supreme Court affirmed.⁶⁶ The Court determined that section 3(8) of the OSH Act required OSHA to show that a proposed standard "is reasonably necessary and appropriate to remedy a significant risk of material health impairment."⁶⁷ In the Court's view, on the basis of section 3(8) alone, the agency must make a threshold determination that a significant risk exists. In promulgating the benzene standard, OSHA had not shown that reducing exposure to benzene from 10 ppm to 1 ppm benzene would result in added safety.⁶⁸ The *Benzene* Court concluded that the agency record supporting the 1 ppm standard did not provide substantial evidence that long-term exposure to 10 ppm benzene presents a probability of significant risk of health impairment.⁶⁹ Thus, the Court held that OSHA had failed to make the necessary threshold showing that the new benzene standard would alleviate a significant

that places a dollar value on employee lives is not required. 452 U.S. at 507 n.26. However, ATMI argued that OSHA must make a reasonable estimate, based on factual evidence, of the expected risk-reduction benefits of its standard, and then balance these benefits against cost. ATMI maintained that the agency must find that the reduction in health risk is significant based on consideration of the costs of the standard. *Id.* at 506-07 n.26. Nonetheless, as OSHA's Secretary pointed out, ATMI's characterization of the cost-benefit exercise would involve evaluating all benefits that would accrue, including the intangible ones to human health. To balance these benefits against costs requires quantifying the value of human life. *Id.* See also *infra* note 238. For a full discussion of *Cotton Dust*, see *infra* notes 82-94 and accompanying text.

64. *American Petroleum Inst.*, 581 F.2d at 505.

65. *Id.* at 510.

66. *Benzene*, 448 U.S. 607 (1980). The plurality opinion was written by Justice Stevens and joined by Chief Justice Burger and Justice Stewart. Justices Powell and Rehnquist wrote separate concurring opinions. Justice Marshall wrote the dissent, and was joined by Justices Brennan, White and Blackmun.

67. *Id.* at 639. See *supra* note 41 and accompanying text for a discussion of § 3(8) of the OSH Act. Several courts have relied on the *Benzene* interpretation of the significant risk test. See *ASARCO, Inc. v. OSHA*, 647 F.2d 1 (9th Cir. 1981) (invalidating an arsenic standard); *Pratt & Whitney v. Secretary of Labor*, 647 F.2d 96 (2d Cir. 1981) (applying significant risk of harm test to OSHA's authority to issue citations for violations of safety practices); *Texas Indep. Ginners Ass'n v. Marshall*, 630 F.2d 398 (5th Cir. 1980) (invalidating the cotton dust standard for the cotton ginning industry).

68. *Benzene*, 448 U.S. at 653.

69. *Id.*

risk of harm to the workers in the industry.⁷⁰ In light of its holding, the Court did not reach the issue of whether OSHA was required to use a cost-benefit analysis in promulgating a final benzene standard.⁷¹

Concurring in the decision, Justice Powell maintained that the agency also must demonstrate that the benefits of the standard are reasonably related to the costs of its implementation.⁷² In his view, the provisions of sections 3(8) and 6(b)(5), respectively requiring a health standard to be "reasonably necessary" and "feasible," necessitate that costs of implementing the standard be proportionate to expected health and safety benefits.⁷³ Justice Powell observed that the Act's legislative history represented a legislative compromise between the interest of workers in having a safe, healthful workplace and the industry's need to function without undue interference.⁷⁴ He maintained that OSHA's reading of the Act's "feasibility" requirement under section 6(b)(5) would permit the promulgation of standards without regard to economic effects unless those effects would cause massive dislocation within an industry.⁷⁵ Thus, the agency's interpretation would require industries to provide totally risk-free environments, a result that Congress clearly had not intended.⁷⁶

70. *Id.* at 639, 653, 659. The Court stated that the Secretary failed to meet his threshold responsibility of proving that the standard was necessary to remedy a significant health risk. *Id.* at 639, 653.

71. *Id.* at 640.

72. *Id.* at 667 (Powell, J., concurring).

73. *Id.*

74. *Id.* at 668 n.5. See statement of Senator Williams, OSH Act sponsor, 116 CONG. REC. 37,342 (1970) (OSH Act is "good-faith effort" to balance competing needs of workers and industry).

75. *Benzene*, 448 U.S. at 667-68. "Massive dislocation" within an industry is apparently synonymous with "bankruptcy" of the industry. *Cf.* *Industrial Union Dep't AFL-CIO v. Hodgson*, 499 F.2d 467, 478 (D.C. Cir. 1974) (interpreting OSHA's asbestos standard, the court stated: "Congress does not appear to have intended to protect employees by putting [all of] their employers out of business."). Other descriptions of what would represent an intolerable amount of harm to the industry include costs that would "impair the viability of industries subject to the regulation" and costs that "ruin . . . entire industries." *Benzene*, 448 U.S. at 639, 641 (quoting OSHA's views of intolerable economic harm). The *Industrial Union* court also noted that, to determine feasibility, it might be necessary to consider other adverse economic impacts on an industry, such as the likelihood of creating undue concentration of an industry where only a few leading firms could meet the standard, or the likelihood of damaging the industry's competitive standing in a world market. *Industrial Union*, 467 F.2d at 478.

76. *Benzene*, 448 U.S. at 669. Justice Rehnquist also concurred in the result, but asserted that the language of § 6(b)(5) of the OSH Act was completely precatory, and that the resulting uncertainty of interpretation indicated that the Act impermissibly delegated legislative power to administrative agencies. *Id.* at 675, 686. Writing for the dissent, Justice Marshall contended that the Secretary complied with the plain meaning of § 6(b)(5). *Id.* at 688-89 (Marshall, J., dissenting).

Soon after issuing *Benzene*, in *American Textile Manufacturers Inst. v. Donovan (Cotton Dust)*,⁷⁷ the Court addressed squarely the issue left unresolved by the *Benzene* plurality—whether the OSH Act required cost-benefit analysis as a prerequisite to issuing safety standards. Pursuant to the OSH Act of 1970, OSHA had promulgated new, restrictive standards for the regulation of cotton dust particles in textile industry workplaces in order to reduce the risk of byssinosis, a respiratory disease caused by these particles.⁷⁸ A group of cotton textile manufacturers challenged OSHA's regulations, alleging that the Act required OSHA to conduct a cost-benefit analysis before issuing such regulations.⁷⁹ The United States Court of Appeals for the District of Columbia Circuit upheld the cotton dust standard as promulgated by the agency on the basis that the agency had demonstrated a risk of health impairment from exposure to cotton dust. Moreover, the court held that the agency was required only to relate the costs of the standard to the industry as a whole. The court ruled that Congress had struck the balance between costs and benefits in favor of workers who would be exposed to the hazard.⁸⁰

The Supreme Court granted a writ of certiorari to decide the narrow issue of what relationship between costs and benefits the agency must demonstrate before promulgating a standard.⁸¹ The Supreme Court affirmed the lower court's decision, holding that the Act itself does not require OSHA to perform cost-benefit analysis in promulgating necessary standards for substances that pose significant risks to workers.⁸² The *Cotton Dust* Court suggested that so long as the agency demonstrates that a standard will reduce the risk posed by a toxic substance, it need not attempt to minimize the economic impact of the standard by using cost-ben-

77. 452 U.S. 490 (1981).

78. The term "cotton dust" refers to small cotton particles that enter air streams as particulates when cotton fibers are processed. The cotton dust particles, which may contain a mixture of bacteria, fungi, soil, pesticides and other contaminants, are inhaled and become lodged in lower respiratory passages, causing a range of disabilities collectively known as byssinosis. The most severe form of byssinosis ("brown lung") includes symptoms of breathlessness and tightness of chest. See Sullivan, *The Cotton Dust Decision: The Confusion Continues*, 34 AD. L. REV. 483, 484 (1982); see also *Cotton Dust*, 452 U.S. at 495-97 nn. 6-9 and accompanying text (discussing health effects associated with cotton dust).

79. *American Fed'n of Labor v. Marshall*, 617 F.2d 636 (D.C. Cir. 1979). The industry wanted OSHA to adopt the proposed industry standard of 400 $\mu\text{g}/\text{m}^3$ of respirable dust as the permissible exposure level (PEL) rather than OSHA's proposed PEL standard of 200 $\mu\text{g}/\text{m}^3$. In addition to maintaining that cost-benefit analysis was required, the industry argued that OSHA had failed to consider its proposal. *Id.* at 652, 662.

80. *Id.* at 663-64.

81. *Cotton Dust*, 452 U.S. at 506.

82. *Id.* at 512.

efit balancing.⁸³ Rather, it held that the language of the OSH Act requires the agency to reduce exposure to the substance to the lowest level "feasible."⁸⁴ The test for feasibility is "limited only by the extent to which . . . the reduction is 'capable of being done.'"⁸⁵ The Court interpreted the language of section 6(b)(5) to mean that Congress had already considered the relationship between costs and benefits, and had placed the benefit of worker health above all other considerations except industry's ability to comply with the standard.⁸⁶ It reasoned that a standard promulgated by the agency based upon a balancing of costs and benefits might undercut the requirements of section 6(b)(5) if it were to result in a different balance than that struck by Congress.⁸⁷ Thus, in the Court's view, the "feasibility" analysis mandated by the OSH Act was directed only toward determining whether the standard imposed was technologically and economically achievable, not whether the benefits numerically outweighed the economic costs of the standard.⁸⁸

Although the Court concluded that the OSH Act does not require that the agency conduct a cost-benefit analysis, it suggested in dicta that the feasibility requirement might nonetheless encompass considerations of whether the standard imposed is necessary and appropriate.⁸⁹ This view is based on the language contained in section 3(8) of the OSH Act defining occupational safety and health standards as those "reasonably necessary or appropriate to provide safe or healthful employment and places of employment."⁹⁰ While the *Benzene* Court relied on this statutory provision to support its decision that the agency must make a specific finding of significant health risk before attempting any regulation whatsoever,⁹¹ the *Cotton Dust* Court implied that it could be interpreted to restrict the agency's discretion in implementing standards under the feasibility test.⁹² It is clear

83. *Id.* at 509.

84. *Id.* at 508.

85. *Id.* at 508-09.

86. *Id.* at 509.

87. *Id.*

88. *Id.* at 513-14. The Court stated that Congress did not intend any further balancing by the agency before setting toxic material and harmful physical agent standards than that the standards be economically and technologically achievable.

89. *Id.* at 513-14 n.32. Writing for the Court, Justice Brennan set forth the following illustration: "[I]f the use of one respirator would achieve the same reduction in health risk as the use of five, the use of five respirators was 'technologically and economically feasible,' and OSHA thus insisted on the use of five," then additional restrictions on OSHA's discretion to choose between the one- and five-respirator standards might be required. *Id.*

90. *See supra* note 41 and accompanying text.

91. *See supra* note 67 and accompanying text.

92. *Cotton Dust*, 452 U.S. at 513 n.32.

from *Cotton Dust*, however, that section 3(8) cannot be interpreted to impose upon the agency an overriding requirement of cost-benefit analysis, as this interpretation would eviscerate the requirement in section 6(b)(5) that risks be reduced to the extent feasible.⁹³

Together *Benzene* and *Cotton Dust* developed a two-pronged approach for testing the validity of agency-promulgated health standards under the OSH Act.⁹⁴ First, an agency must show that the new standard will result in the reduction of a significant health risk. Second, an agency must show that the standard set is both technologically and economically achievable by the industry affected. The agency is not required to perform cost-benefit analysis unless specifically mandated to do so by Congress.

Although the Supreme Court opinions addressed only agency regulation under the OSH Act, the United States Court of Appeals for the District of Columbia Circuit, in earlier cases, employed a similar analysis when presented with challenges to agency action taken under other environmental statutes.⁹⁵ In reviewing standards promulgated by the Environmental Protection Agency under the Clean Air Act of 1970 and Federal Water Pollution Control Act of 1972,⁹⁶ the D.C. Circuit has required the agency

93. *Id.* at 513. Justice Brennan recited without deciding, however, ATMI's argument that issuance of a single health standard, without cost-benefit balancing, might result in a serious misallocation of resources available to protect worker health if other hazards exist in the workplace. *Id.* at 509 n.29. He pointed out that the issue of cost-benefit analysis arises more properly when the need exists to choose from among several standards that regulate different varieties of health hazards. *Id.* *Benzene* and *Cotton Dust* each involved a single toxic material or harmful physical agent.

94. See Sullivan, *supra* note 78, at 489. Sullivan points out that, when read in conjunction, the *Benzene* and *Cotton Dust* cases hold that once OSHA has demonstrated to the court's satisfaction that a significant risk exists, then a cost-benefit analysis need not be performed by the agency. He suggests, however, that a cost-benefit analysis might be required to show that a health risk is significant.

95. See, e.g., *supra* note 17 and accompanying text; see generally Hadley & Richman, *The Impact of Benzene and Cotton Dust: Restraints on the Regulation of Toxic Substances*, 34 AD. L. REV. 59 (1982). The authors state that, while *Benzene* and *Cotton Dust* involved statutory construction of the OSH Act, it is useful to read other health, safety or environmental statutes with these two Supreme Court decisions in mind. They maintain, for example, that the "reasonably necessary and appropriate" limitations placed by § 3(8) on the literal language of § 6(b)(5) in *Benzene* were necessary in order to avoid an overbroad delegation of legislative authority to a federal agency by Congress. *Id.* at 70. As with the OSH Act, other health, safety and environmental statutes represent a balance struck by Congress to limit the discretion of federal agencies in promulgating what may be arbitrary measures to curb various harms, while permitting agencies to exercise enough authority to deal with the complex scientific and economic issues they face.

96. Under both § 307(d)(9)(A) of the Clean Air Act, 42 U.S.C. § 7607(d)(9)(A) (1982), and the Federal Water Pollution Control Act, 33 U.S.C. §§ 1251-1375 (1982), the standard for judicial review is the "arbitrary and capricious" test as derived from the Administrative Procedure Act, 5 U.S.C. § 706(2)(A) (1982). The Occupational Safety and Health Act, on

to show that the standards chosen will result in a measurable benefit to the public, and that the affected industry can technologically and economically achieve the standard imposed. The D.C. Circuit has not required extensive economic analysis in setting standards.

*B. United States Court of Appeals for the District of Columbia Circuit:
Factors Considered in Setting Environmental, Safety and Health
Standards*

1. Substantial Risk

In *Kennecott Copper Corp. v. EPA*,⁹⁷ the court addressed the EPA's promulgation of secondary ambient air quality standards under the Clean Air Act.⁹⁸ Secondary air quality standards are those standards designed to protect the public welfare by limiting the deleterious effects of pollution on diverse categories of interests such as property, soil, water, crops, visibility, weather, wildlife and personal comfort and well-being.⁹⁹ In an informal rulemaking completed in 1971, the EPA promulgated a national secondary air quality standard for sulfur oxides pursuant to sections 108 and 109 of the Clean Air Act.¹⁰⁰ The standard limited the annual arithmetic mean amount of sulfur oxides to sixty micrograms per cubic meter of air.¹⁰¹ The

the other hand, authorizes judicial review based on substantial evidence on the record as a whole, as derived from 5 U.S.C. § 706(2)(E) (1982). The substantial evidence test has been considered a stricter standard for review of agency actions by courts. In recent years, however, the distinction has become less clear. Particularly because the so-called "hard-look" doctrine evolved from the "arbitrary and capricious" test, courts have begun to view the two tests as equally rigorous. For example, in *Pacific Legal Found. v. Department of Transp.*, 593 F.2d 1338, 1343 n.35 (D.C. Cir.), *cert. denied*, 444 U.S. 830 (1979), the court stated that "the emerging consensus of the Courts of Appeals [is] that the distinction between the arbitrary and capricious standard and substantial evidence review is largely semantic. . . ." Moreover, a number of cases involving the "arbitrary and capricious" standard have applied the standard of judicial review used in *Greater Boston Television Corp. v. FCC*, 444 F.2d 841, 850 (D.C. Cir. 1970), *cert. denied*, 403 U.S. 923 (1971), a substantial evidence case. *See Ethyl Corp. v. EPA*, 541 F.2d 1, 36 (D.C. Cir.) (en banc), *cert. denied*, 426 U.S. 941 (1976) (collecting cases that have relied on *Greater Boston* in addressing the arbitrary and capricious standard). *See also supra* notes 16, 35.

97. 462 F.2d 846 (D.C. Cir. 1972).

98. Clean Air Amendments of 1970 (current version at 42 U.S.C. § 7409 (1982) [hereinafter cited as Clean Air Act]). Section 108(a)(1) of the Act requires the Secretary to publish a list of air pollutants that, in his judgment, have an adverse effect on public health or welfare, and the presence of which results from numerous mobile and stationary sources. 42 U.S.C. § 7408 (1982). In developing this list, the Secretary, under § 108(b)(1), is to issue to the states and appropriate air pollution control agencies information on air pollution control techniques, including data relating to "technology and cost of emission control." 42 U.S.C. § 7408(b)(1) (1982).

99. 42 U.S.C. §§ 7409, 7602 (1982).

100. 36 Fed. Reg. 1502 (1971).

101. *Kennecott Copper*, 462 F.2d at 847.

agency reached this figure on the basis of conclusions contained in an air quality criteria paper published in 1969 by the United States Department of Health, Education and Welfare (HEW).¹⁰² Section 109 of the Clean Air Amendments of 1970 specifically authorized the EPA to use the HEW's air quality criteria papers in devising ambient air quality standards.¹⁰³

The Kennecott Copper Corporation challenged the final standard, emphasizing that the summarizing paragraph of the air quality criteria document demonstrated damaging effects of sulfur oxides only at concentrations of eighty-five micrograms per cubic meter or greater.¹⁰⁴ The corporation alleged that the agency had therefore failed to justify its selection of the lower standard of sixty micrograms per cubic meter.¹⁰⁵ The EPA argued that the summarizing paragraph of the document was not conclusive and that the body of the document referred to lower figures. Alternatively the agency argued that the sixty-microgram figure was justified on the basis of anticipated future effects and the margin of safety needed to avoid the adverse effects that occur at the eighty-five-microgram level.¹⁰⁶ The court remanded the matter to the EPA for further explanation of why the more stringent sulfur oxide standard was chosen.¹⁰⁷ The circuit court held that the agency had not provided a sufficient indication of the basis for the sixty-microgram figure and that without further explanation the court could not resolve whether the agency's action was an abuse of discretion.¹⁰⁸

Although secondary air quality standards are designed to protect the

102. *Id.* at 848 n.9.

103. Prior to enactment of the Clean Air Amendments of 1970, air quality criteria were promulgated by the Secretary of the United States Department of Health, Education, and Welfare, under the Clean Air Quality Act of 1963, Pub. L. No. 88-206, 77 Stat. 392, 42 U.S.C. §§ 1857-1857g (1963) (amended 1970). The Administrator of the EPA was authorized by § 109(a)(1) of the Clean Air Amendments of 1970 to issue ambient air quality standards based on criteria developed by the Secretary under the prior act. Pub. L. No. 91-604, 84 Stat. 1676, 42 U.S.C. § 7409(a)(1) (1982).

104. *Kennecott Copper*, 462 F.2d at 848.

105. *Id.*

106. *Id.*

107. *Id.* at 850-51.

108. *Id.* at 849. Under § 553 of the Administrative Procedure Act, informal rulemaking, such as that permitted by the Clean Air Act, requires agencies to issue notice of any proposed action, followed by a comment period, and finally by a concise general statement of basis and purpose of the adopted rule. 5 U.S.C. § 553(a) (1982). The court showed some deference to agency rulemaking in the environmental context when it declined to require the EPA to address in detail, in its statement of basis and purpose for the new rule, all comments submitted, stating that "as applied to environmental regulations, produced under the tension of need for reasonable expedition and need for resolution of a host of nagging problems, we are loath to stretch the requirement of a 'general statement' into a mandate for reference to all the specific issues raised in comments." *Kennecott Copper*, 462 F.2d at 850.

general public welfare rather than public health, the *Kennecott Copper* court's holding prefigured the requirement developed in *Benzene* that a showing of specific material risk be made before an agency can regulate hazardous substances. Similar to *Benzene*, *Kennecott Copper* held that the EPA had not supported its rulemaking decision with adequate evidence showing the need for the standard chosen.¹⁰⁹ This decision represented one of the D.C. Circuit's earliest attempts to address the complexities involved in agency regulation of toxic substances. The underlying issue, however, of exactly what threshold showing an agency must make to support the standard it has selected was left unresolved.

Four years later, the D.C. Circuit addressed this issue in *Ethyl Corp. v. EPA*.¹¹⁰ Under section 211(c)(1)(A) of the Clean Air Act, the EPA was granted broad authority to regulate fuel additives in gasoline.¹¹¹ This statutory provision permitted the EPA to control or prohibit the sale or manufacture of any fuel additive whose emission products would "endanger the public health or welfare."¹¹² In 1973, because of the perceived health hazard from automobile lead emissions, the agency exercised its statutory authority, and adopted standards that required reduction in the lead content of gasoline to .5 grams per gallon (gpg) by January 1979.¹¹³

Industry refiners and lead-additive producers challenged the standards, alleging that the EPA had incorrectly interpreted section 211(c)(1)(A) in terms of the threshold determination to be made before imposing new standards.¹¹⁴ Ethyl Corporation argued that the EPA could not promulgate emission limitations based on the mere finding that leaded gasoline presents a significant risk of harm to the health of urban populations; rather, the agency must prove that lead in gasoline had caused actual harm.¹¹⁵ The refiners maintained that the agency was not empowered to

109. *Kennecott Copper*, 462 F.2d at 850. See also Jorling, *The Federal Law of Air Pollution Control*, FED. ENVTL. L. 1063 (1974). The author states that the insufficient evidentiary basis for the EPA's standard in *Kennecott Copper* was due to a general inadequacy of knowledge available at that time concerning air pollution control. He argues that the strength of any regulatory system rests on the accumulated knowledge that can be used to support regulations.

110. 541 F.2d 1 (D.C. Cir.) (en banc), *cert. denied*, 426 U.S. 941 (1976).

111. 42 U.S.C. § 1857(f) (1970) (current version at 42 U.S.C. § 7545 (1982)).

112. 42 U.S.C. § 1857(f) (1970). The language of this section was amended in 1977 to specifically endorse the court's holding in *Ethyl Corp.* The statute now permits the EPA to regulate fuel additives when, in the Administrator's judgment, emissions products of the additive "may be reasonably anticipated to endanger" the public. Section 211(c)(1)(A) of the Clean Air Act, 42 U.S.C. § 7545(c)(1)(A) (1982).

113. 38 Fed. Reg. 33,734. The final regulations were codified at 40 C.F.R. § 80.20 (1975).

114. *Ethyl Corp.*, 541 F.2d at 12.

115. *Id.*

assess risks or make policy judgments regarding use of lead in motor fuels.¹¹⁶ They further urged that the agency could not regulate lead in fuels on the basis of the cumulative impact of lead from all sources, including sources other than mobile emissions, but rather must show specifically that lead in gasoline caused harm.¹¹⁷

The D.C. Circuit upheld the EPA's interpretation of section 211(c)(1)(A) of the Clean Air Act.¹¹⁸ The court held that the agency was empowered by the statute to make policy judgments, particularly since some of the issues involved in promulgating environmental regulations are "on the frontiers of scientific knowledge," and therefore insufficient data was available to make a fully informed factual determination of whether lead in gasoline caused actual harm to human health.¹¹⁹ Although acknowledging that studies in the record presented conflicting views of the impact of lead from mobile sources on human health, the court held that the agency's analysis of the record and assessment of potential risks was within the scope of the Act's directive.¹²⁰ The circuit court also held that, while airborne lead alone might not pose a threat to human health, the EPA could regulate sources of airborne lead, such as gasoline lead emissions, so long as the agency found that they contributed to the risk in such a way as to significantly endanger human health.¹²¹ The court stopped short of requiring a factual showing that lead in gasoline by itself produces an identifiable increment of lead in the human body and that this increment causes a health hazard.¹²²

Thus, the *Ethyl Corp.* court established and defined "significant risk" as the appropriate threshold showing that permits agency action.¹²³ The sig-

116. *Id.*

117. *Id.*

118. *Id.* at 7.

119. *Id.* at 26-27 (quoting *Industrial Union Dep't AFL-CIO v. Hodgson*, 499 F.2d 467, 474 (D.C. Cir. 1974)). *Industrial Union* reviewed OSHA's authority to promulgate occupational health standards for asbestos under §§ 3(8) and 6(b)(5) of the OSH Act.

120. *Ethyl Corp.*, 541 F.2d at 10, 54-55.

121. *Id.* at 29-32.

122. *Id.* The court stated that where evidence is difficult to obtain, uncertain, or conflicting due to limited scientific knowledge, the court would not demand "rigorous step-by-step proof of cause and effect." *Id.* at 28. On the other hand, Judge MacKinnon's dissent in *Ethyl Corp.* predicated the EPA's authority to regulate lead on the ability of EPA to show that lead in gasoline was directly linked to lead in the human body. *Id.* at 95 (MacKinnon, J., dissenting).

123. *Id.* at 13 (a "significant risk" under § 211(c)(1)(A) is one that is likely to endanger health). In defining "significant risk," the court drew heavily from the decision in *Reserve Mining Co. v. EPA*, 514 F.2d 492 (8th Cir. 1975) (en banc). In *Reserve Mining*, the Eighth Circuit addressed the issue of whether the EPA could restrict the Reserve Mining Co.'s discharge of asbestos fibers into Lake Superior. Although asbestos had been shown to cause

nificant risk test, as outlined by *Ethyl Corp.*, rather than requiring a strict cause-and-effect showing of harm, requires an assessment of the risk to human health that might result from exposure to the hazard. By allowing the EPA to assess the risk from lead in gasoline, the *Ethyl Corp.* court essentially based its decision upon a risk-benefit¹²⁴ analysis in which the risk of health impairment from exposure to lead was weighed against the benefits of continued use of lead by the refining industry. The court determined that the risks of health impairment outweighed the benefits of continued unrestricted use, and consequently upheld the EPA's lead phase-

cancer when inhaled, whether it could cause cancer as a result of ingestion was unknown. However, cancer as a result of ingestion was an accepted medical theory. The court addressed the issue of risk and decided that, in this case, the danger was great but unproved. It refused to impose an immediate injunction on the company, but placed it on a compliance schedule requiring it to phase out its discharges. *Reserve Mining*, 514 F.2d at 499-500, 514-20.

124. For a discussion of risk-benefit analysis, see generally Gelpe & Tarlock, *The Uses of Scientific Information in Environmental Decisionmaking*, 48 S. CAL. L. REV. 371 (1974). The authors discuss general situations in which use of risk-benefit analysis is appropriate. Appropriate situations include those situations where information is available but indefinite and those situations in which information is unavailable and unobtainable for either practical or theoretical reasons. *Id.* at 392-95. In balancing the risks imposed by a substance or activity against the costs of forgoing use of the substance or activity, the decisionmaker must consider "both the probability of the occurrence of an adverse impact and the magnitude of the impact." *Id.* at 425 (emphasis added). Thus, a risk with a low probability of occurrence but a potentially catastrophic adverse impact might outweigh the economic advantages of the substance or activity. Judge Leventhal applied this view to the regulation of carcinogens when he stated, in a panel discussion in 1976, "[w]hen the consequences of an action are very great, as in the case of carcinogenic chemicals, a lower probability of catastrophic effects will justify action by a court to protect the public." LEGAL AND SCIENTIFIC UNCERTAINTIES OF WEATHER MODIFICATION 73 (W. Thomas ed. 1977) (panel discussion). See *Reserve Mining Co. v. EPA*, 514 F.2d at 536 (the possibility of cancer resulting from discharge of wastes is sufficient to outweigh continued discharge activity, even though the occurrence of cancer is based on an unproven medical theory); cf. *Carolina Environmental Study Group v. United States*, 510 F.2d 795, 799 (D.C. Cir. 1975) (discussing the probability of a major nuclear disaster, the court stated "the probability of an occurrence may be so low as to render it almost totally unworthy of consideration").

As Gelpe & Tarlock point out in their discussion of the use of maverick scientific expert witnesses, a decisionmaker must be prepared to draw a line between "the valid refusal to consider spurious claims of risk and the invalid refusal to consider real risks that are of low probability or impossible to prove." Gelpe & Tarlock, *supra*, at 426. This distinction is particularly important in considering arguments whether risk-benefit analysis is constitutionally permissible. It is generally considered that due process requires society's right to prohibit an activity (whether individual freedom or discharge of wastes into a lake) be limited to cases where a causal relationship between the alleged harm and the prohibited activity can be demonstrated. In contrast to showing actual harm, risk-benefit analysis involves taking actions where a causal relationship is presumed but not demonstrated. As Gelpe & Tarlock maintain, however, risk assessment is simply an alternative standard for establishing cause that is particularly useful where scientific uncertainty is involved. Gelpe & Tarlock, *supra*, at 375-76, 383.

down standards.¹²⁵

2. "Technological Feasibility"

In *National Lime Association v. EPA*,¹²⁶ the D.C. Circuit had an opportunity to consider the extent to which technological feasibility may limit agency discretion in setting protective standards. In March 1978, pursuant to section 111 of the Clean Air Act,¹²⁷ the EPA promulgated final standards limiting the amount of lime dust in air resulting from the pulverizing of limestone.¹²⁸ Section 111 authorizes the EPA to issue new source performance standards (NSPS) designed to limit air pollutants that may be emitted from newly constructed or modified emissions sources. In setting NSPS, the EPA must determine that they reflect the degree of limitation achievable through application of "the best technological system of continuous emission reduction . . . which has been adequately demonstrated . . ." ¹²⁹ The agency had tested several plants in an effort to determine NSPS based on the best technology available.¹³⁰ The issue before the court was whether the test data underlying the EPA's newly promulgated standard supported adequately the conclusion that the proscribed emission levels were in fact achievable on a repetitive basis.¹³¹

The *National Lime* court held that the EPA had failed to consider adequately whether its test plants were representative of the industry as a whole, particularly in light of the many variations, such as size and age of feedstock, that would be encountered nationwide.¹³² The court established a two-pronged test for determining achievability of a NSPS. First, the agency must identify specific variable conditions that might contribute significantly to the amount of emissions produced.¹³³ Second, the agency must develop methods of testing that, given the range of variables identified, provide some degree of assurance of achievability of the standard for the industry as a whole.¹³⁴ The EPA failed to show that the standard to

125. *Ethyl Corp.*, 541 F.2d at 55.

126. 627 F.2d 416 (D.C. Cir. 1980).

127. During the course of the EPA's rulemaking proceeding in this case, Congress amended § 111 of the Clean Air Act in enacting the Clean Air Act Amendments of 1977, Pub. L. No. 95-95, 91 Stat. 685 (codified as amended at 42 U.S.C. § 7411 (1982)). The *National Lime* court held the EPA subject to the requirements of the amended version of § 111. *National Lime*, 627 F.2d at 429.

128. 43 Fed. Reg. 9452 (1978).

129. 42 U.S.C. § 7411 (1982).

130. *National Lime*, 627 F.2d at 435.

131. *Id.* at 430.

132. *Id.* at 432-33.

133. *Id.* at 433.

134. *Id.*

be imposed was achievable by the industry as a whole.

The D.C. Circuit has also shown that consideration of the issue of technological feasibility may actually be a way of addressing economic feasibility. In *Sierra Club v. Costle*,¹³⁵ for example, the issue of technological feasibility involved economic as well as technological considerations. *Sierra Club* arose when Congress, in 1977, amended section 111(a)(1) of the Clean Air Act to provide special regulatory treatment for electric power plants.¹³⁶ Prior to the amendments, the EPA had promulgated NSPS for coal-fired electric power plants that specified a ceiling for sulfur dioxide emissions.¹³⁷ Operators of coal-fired power plants found they could meet this standard by burning low-sulfur coal,¹³⁸ and thereby could avoid installing new technology that was both costly and required continuous supervision. As amended, section 111 required the EPA to establish NSPS that achieved percentage reductions in emissions lower than the emissions that would have resulted from the use of low-sulfur coal alone.¹³⁹ The

135. 567 F.2d 298 (D.C. Cir. 1981). A number of articles discussing the issues in *Sierra Club* were published during litigation. These articles indicated the growing importance of the issue of energy costs and the impact of the economy on environmental regulation. See *id.* at 313 n.8 for a list of articles. See *infra* note 249 for an estimate of the economic cost of the proposed standards at issue in *Sierra Club*.

136. Clean Air Act Amendments of 1977, Pub. L. No. 95-95, § 109(c)(1)(A), 91 Stat. 685, 699-700 (1977) (codified as amended at 42 U.S.C. § 7411(a)(1)(A) (1982)). Among other things, Congress was concerned that the National Ambient Air Quality Standards System of air pollution regulation would constrain long-term economic growth. For example, the capacity for an area to accept new emissions sources would be limited, or costly retrofitting of already constructed plants would be required, as ambient air quality standards were reached in that area. To ease this burden, Congress amended the Clean Air Act to require new emitting sources to meet NSPS that reflect the best system of technology adequately demonstrated. Thus, the cost of emission control would be faced by utilities at one time, as each new plant was built, and the minimal pollution allowed by the stringent new standards would, in the long term, maximize potential growth. See H.R. REP. NO. 1175, 94th Cong., 2d Sess. 158, 161 (1976), reprinted in THE ENVIRONMENTAL POLICY DIVISION, CONGRESSIONAL RESEARCH SERVICE, THE LIBRARY OF CONGRESS, 95th Cong., 2d Sess. 7 A LEGISLATIVE HISTORY OF THE CLEAN AIR ACT AMENDMENTS OF 1977, at 6706-08 (1977).

137. *Sierra Club*, 657 F.2d at 315. The original standards, promulgated in 1971, limited sulfur dioxide emissions to 1.2 pounds of sulfur dioxide per million British thermal units (1.2 lbs/MBtu). 36 Fed. Reg. 5931 (1971).

138. Low-sulfur coal is primarily available from the western states of Wyoming and Montana, and from West Virginia. See ENERGY INFORMATION ADMINISTRATION, U.S. DEP'T OF ENERGY, PUB. NO. DOE/EIA-0407, IMPACTS OF THE PROPOSED CLEAN AIR ACT AMENDMENTS OF 1982 ON THE COAL AND ELECTRIC UTILITY INDUSTRIES 31 (1983). Coal from the eastern United States, because it is high in sulfur, required pretreatment (washing techniques) or the use of costly flue gas desulfurization equipment by coal-fired power plants, even under the 1971 performance standards. *Id.* at 15.

139. 42 U.S.C. § 7411(a)(1)(A)(ii) (1982). The actual language of § 111 requires reduction below the emission levels that "would have resulted from the use of fuels which are not subject to treatment prior to combustion . . ." *Id.* Congress intended to prevent industry

amendments required these percentage reductions in addition to an emission ceiling. The major technology available as an alternative to burning low-sulfur coal was flue gas desulfurization (FGD), an expensive process that removes sulfur from exhaust emissions by adding alkaline materials to the exhaust stream.¹⁴⁰

The EPA responded to the statutory amendments by issuing revised NSPS in June 1979 that imposed strict pollution controls on coal-fired electric power plants.¹⁴¹ The revised NSPS, however, adopted a sliding-scale approach, requiring removal of seventy to ninety percent sulfur dioxide from plant emissions, depending upon the sulfur content of the coal used.¹⁴² Under this regulatory scheme, power plants could meet the standards either by burning low-sulfur coal while using potentially less costly (dry scrubber) flue gas desulfurization, or by using standard (wet scrubber) flue gas desulfurization alone. Environmental groups challenged the regulation, contending that the required reduction level was impermissible since it did not reduce emissions to the greatest extent feasible.¹⁴³ Specifically, Sierra Club alleged that in requiring the use of the best technological system of reduction available, section 111 of the Act required a uniform national percentage reduction standard,¹⁴⁴ and thus the variable standard was an abuse of the agency's discretion.¹⁴⁵

The D.C. Circuit rejected Sierra Club's argument that use of a variable standard conflicted with the statute. The court looked first to the language of section 111 and held that it contains no express mandate to promulgate a uniform standard.¹⁴⁶ Moreover, the *Sierra Club* court found that the legislative history¹⁴⁷ clearly contemplated the adoption of a regulatory

from by-passing the use of desulfurization technology by using low-sulfur coal. H.R. REP. NO. 564, 95th Cong., 1st Sess. 510 (1977) (performance standards should be upgraded to preclude use of untreated low sulfur coal as a means of compliance).

140. Flue gas desulfurization consists primarily of the injection, into coal-fired power plant exhaust streams, of a liquefied or dry stream of alkaline material, such as lime, to neutralize the sulfur oxides escaping. *Sierra Club*, 657 F.2d at 323-25. The use of dry streams of desulfurizing material is referred to as dry-scrubbing. This technique of desulfurization was new and, in the court's view, was encouraged under § 111(j) of the Clean Air Act. This provision allows a waiver from the application of NSPS for technologies that are unproved but which may ultimately meet the NSPS. *Id.* at 324, 346-47. See also *infra* note 149 and accompanying text.

141. 44 Fed. Reg. 33,580 (1979).

142. *Sierra Club*, 657 F.2d at 316.

143. *Id.* at 316-17.

144. *Id.*

145. *Id.*

146. *Id.* at 318.

147. 123 CONG. REC. 26,846 (1977) (remarks of Sen. Muskie) ("EPA's Administrator is given the flexibility to set a range of pollutant removal based on varying fuel characteristics")

scheme that would permit a range of emission levels to reflect varying fuel characteristics.¹⁴⁸ The court also reasoned that the variable standard encouraged the use of innovative new technology, and that section 111(j)(1)(A) of the Act authorized a variance from meeting the stringent standards of section 111(a)(1) when new technology was to be used and substantial compliance could be demonstrated.¹⁴⁹ Thus, the *Sierra Club* court specifically upheld the use of a dual standard even where a more stringent standard was technologically feasible. In doing so, the D.C. Circuit suggested that dual standards may be used when applicable legislation indicates a willingness to accept a dual standard and economic considerations argue in favor of such a standard.

3. Economic Feasibility

In *Weyerhaeuser Co. v. Costle*,¹⁵⁰ the D.C. Circuit specifically considered the issue of economic feasibility as one factor that must be addressed in determining the validity of final water pollution control standards. The standards at issue in *Weyerhaeuser* were promulgated pursuant to sections 301(b)(1)(A) and 304(b)(1)(B) of the Federal Water Pollution Control Act of 1972 (FWPCA).¹⁵¹ These statutory provisions directed the EPA to develop, by 1977, nationally uniform regulations for various categories of industrial effluent dischargers. Essentially, section 301(b)(1)(A) of the FWPCA required the EPA to develop national standards for discharging industries based on what was called the best practicable control technology currently available (BPCTCA).¹⁵² Section 304(b)(1)(B) described what factors must be considered in determining BPCTCA.¹⁵³ One factor involved a comparison between the cost of application of the technology

if NSPS will not be undermined.). See *Clean Air Act Conference Report: Statement of Intent; Clarification of Select Provisions*, 123 CONG. REC. 27,071 (1977). The conference report clearly indicates that the Administrator may set the reduction required by NSPS under the amendments as a range, but this range is allowed only to reflect varying fuel characteristics.

148. *Sierra Club*, 657 F.2d at 321.

149. *Id.* at 346-47. The standard's 70% reduction option would ensure compliance where dry scrubber technology was employed and would encourage further development of this new, potentially lower-cost technology. *Id.* at 347-51.

150. 590 F.2d 1011 (D.C. Cir. 1978)

151. Federal Water Pollution Control Act of 1972, Pub. L. No. 92-500, 86 Stat. 815, 33 U.S.C. §§ 1311(b)(1)(A), 1314(b) (1982).

152. 33 U.S.C. §§ 1311(b)(1)(A), 1314(b) (1982).

153. Section 304(b)(1)(B) states, in part:

Factors relating to the assessment of best practicable control technology currently available . . . shall include consideration of the total cost of application of technology in relation to the effluent reduction benefits to be achieved from such application, and shall also take into account the age of equipment and facilities involved, the engineering aspects of the application of various types of control techniques,

chosen and the effluent reduction benefits that could be achieved from such application.

The EPA developed national standards for waste discharge by various subcategories of paper manufacturers.¹⁵⁴ In doing so, the EPA considered, among other factors, the cost of compliance with the standard by each subcategory as a whole and the total cost of compliance with the various subcategory standards by the industry as a whole.¹⁵⁵ The agency found that both the industry as a whole and each subcategory could absorb the costs of the standard, and that the costs were reasonably counterbalanced by the effluent reduction benefits.¹⁵⁶ Essentially, the EPA used economic analysis that ensured the achievability of the standard chosen, but did not maximize the benefits achieved per unit of cost.¹⁵⁷ Several paper mill companies challenged the limitations, alleging that the EPA was required to consider the costs and benefits of waste treatment control, not by balancing costs of the standard against the industry, or subcategory, as a whole, but by analyzing whether the benefit gained from each additional level of reduction was worth the cost required to achieve that level of reduction.¹⁵⁸ The companies maintained that in conducting such cost comparison, the EPA could avoid requiring an additional degree of effluent reduction that was wholly out of proportion with the costs of achieving that reduction.¹⁵⁹

process changes, non-water quality environmental impact (including energy requirements), and such other factors as the Administrator deems appropriate
33 U.S.C. § 1314(b) (1982).

The court held that this section should be read to require two separate analyses. The first analysis required by the section is a balancing of the standard's costs to the industry as a whole versus effluent reduction benefits achieved. *Weyerhaeuser*, 590 F.2d at 1045-46. The second analytic requirement applied to the "take into account" language of § 304(b). The court held that this language meant that the agency must consider the factors listed (e.g., nonwater quality environmental impact, energy requirements, etc.) without giving each factor a specific weight. The refinery had argued that the agency must balance, in a cost-benefit manner, such things as non-water quality environmental impact versus the gains to be achieved through use of the new standards. *Id.* at 1046, 1050.

154. *Weyerhaeuser*, 590 F.2d at 1047.

155. *Id.*

156. *Id.* The EPA found that the industry as a whole would readily absorb the estimated \$1.6 billion cost of compliance with the standard. Out of 270 affected mills employing 120,000 people, 8 were expected to close and 1800 people were expected to be laid off. The greatest impact would fall on one subcategory consisting of fewer than 30 mills. Three of these mills were expected to close as a result of the standard, with 550 jobs lost. *Id.*

The overall benefits of the standard were estimated at 5,000 fewer tons of the pollutant category per day. *Id.* The EPA also calculated the cost per pound of pollutant removed for each subcategory of the industry, and found the balance to be favorable. *Id.*

157. *Id.*

158. *Id.*

159. *Id.* The paper companies cited legislative history of the Act stating that the balancing test between the effluent reduction benefits and the total cost of the technology imposed

The *Weyerhaeuser* court upheld the EPA's approach, declining to impose a requirement of incremental cost-benefit analysis. In the court's view, the cost of compliance was not a factor to be given primary importance.¹⁶⁰ It reasoned that a requirement that the EPA perform an elaborate task of incrementally balancing costs versus benefits would bog the agency down in burdensome proceedings on a relatively subsidiary task.¹⁶¹ Thus, the court concluded that, even when a statute specifically requires some consideration of costs versus benefits, the agency fulfills its obligation by performing a fairly simplistic analysis that balances costs to the industry (or subcategory) as a whole versus benefits.¹⁶² The basic goal of this type of analysis is to determine whether the industry, or subcategory, can achieve the standard imposed without experiencing complete financial disaster. This type of cost-benefit balancing, however, unlike incremental cost-benefit analysis, does not maximize the benefits achieved per amount of dollars invested.¹⁶³

was intended to limit the application of technology where the additional degree of protection provided was wholly out of proportion with the costs of achieving that level of protection. *Id.* at 1045 n.52, 1047.

160. *Weyerhaeuser*, 590 F.2d at 1048. The court relied on *American Iron and Steel Inst. v. EPA*, 526 F.2d 1027 (3d Cir. 1975), *aff'd in part & rev'd in part sub nom. DuPont v. Train*, 430 U.S. 112 (1977), to support this interpretation of the Act. *American Iron* discussed Congress' commitment to the goal of controlling water pollution through the Federal Water Pollution Control Act and stated that "the cost of compliance was not a factor to be given primary importance." *Id.* at 1051. Congress realized that achievement of the Act's goals would force industries to develop water control technology not yet in existence, and would probably result in the closing of some of the nation's plants. *Id.* at 1050.

161. *Weyerhaeuser*, 590 F.2d at 1048. The court upheld the EPA's economic analysis of the standard despite the fact that, during the rulemaking comment period, industry commenters had submitted to the agency an incremental breakdown of the costs and benefits of various standards. Thus, contrary to the court's statement about the EPA having to perform an elaborate analysis, the agency could have used the industry's cost-benefit analysis to arrive at a suitable standard. The industry's analysis, however, actually supported the EPA's decision. *Id.* at 1047-48. While the court indicated the possibility of remanding to the EPA if the industry's analysis had disclosed a "hidden imbalance"—a cost not in proportion with the benefit gained from the additional increment of discharge reduction achieved—the court clearly indicated that the EPA was not required to perform incremental cost-benefit balancing on its own initiative. *Id.* at 1048 (quoting *American Iron*, 526 F.2d at 1076 n.19).

162. *Weyerhaeuser*, 590 F.2d at 1048. The court stated specifically that the EPA need not perform more than net cost-benefit balancing to meet its obligations under § 304. *Id.*

163. *Id.* (stating that the costs of a standard need not be calculated with "pinpoint" precision).

II. *SMALL REFINERS LEAD PHASE-DOWN TASK FORCE V. EPA: AN IDEAL CASE FOR APPLICATION OF THE CURRENT MODEL FOR JUDICIAL REVIEW OF ENVIRONMENTAL, SAFETY AND HEALTH RULEMAKINGS*

A. *Elements of the Model*

The Occupational Safety and Health Act of 1970, Clean Air Amendments of 1970 and Federal Water Pollution Control Act of 1972 require the implementing agencies to set standards that protect health or natural resources despite what may be heavy economic burdens on affected industries.¹⁶⁴ Each act is designed to provide the most protection possible, without requiring the agency to evaluate extensively the degree to which health benefits outweigh the economic impacts of the standards chosen.¹⁶⁵ Rather, Congress has already balanced the costs of regulation versus the health or environmental advances to be achieved under each act.¹⁶⁶ The acts represent a public policy that favors protection of human health and the environment over unrestricted economic growth.¹⁶⁷ They do not, however, represent a policy that favors providing absolute safety for human health or the environment at any cost.¹⁶⁸

164. See *supra* note 14 and accompanying text.

165. Courts interpreting these statutes have consistently held that cost-benefit analysis, for example, is not necessary under the provisions of these statutes unless such provisions specifically require cost-benefit analysis. See, e.g., *Cotton Dust*, 452 U.S. at 510-12; *Small Refiners*, 705 F.2d at 526 n.42; *Weyerhaeuser*, 590 F.2d at 1048 (even where cost-benefit balancing is required, minimal net-balancing will fulfill the requirement).

166. See, e.g., 116 CONG. REC. 32,905 (1970) (the costs imposed by the Clean Air Amendments of 1970 represent a policy decision that only Congress has the right to make) (remarks of Sen. Muskie); *Cotton Dust*, 452 U.S. at 509 (Congress itself defined the relationship between costs and benefits); *American Iron & Steel Inst. v. EPA*, 526 F.2d 1027, 1052 (3d. Cir. 1975) (some economic disruption was anticipated by Congress as the price to pay for efforts under the Federal Water Pollution Control Act, and the EPA, therefore, is given wide discretion in implementing standards).

167. This policy was best summarized by Sen. Muskie during floor debates on the Clean Air Amendments of 1970: The "old philosophy, that when you see the smoke rolling out of the tops of the blast furnaces there is prosperity, doesn't go anymore . . . Prosperity doesn't mean anything if they are not going to live to enjoy the prosperity." 116 CONG. REC. 32,901 (1970) (remarks of Sen. Muskie, quoting hearing witness). See also Sagoff, *supra* note 14.

168. 116 CONG. REC. 32,905 (1970) (under the Clean Air Amendments of 1970, certain costs, such as requiring automobile manufacturers to stop producing cars altogether if they cannot meet prospective standards by a certain date, might be too great) (remarks of Sen. Muskie); 116 CONG. REC. 37,614, 37,621-23 (1970) (OSH Act § 6(b)(5) should not be interpreted to require absolute health and safety in all cases) (remarks of Sen. Dominick). The fact that the Federal Water Pollution Control Act, with its stated goal of zero discharge, or absolute protection, allows variances in appropriate cases under § 404 of the Act, indicates that absolute safety is primarily an ideal rather than an assured end point.

In light of the similarities among these legislative directives, the D.C. Circuit has developed a common model for judicial review of agency regulation under these acts. This model addresses the minimum requirements an agency must meet to justify the standards it imposes. While its general elements may be modified to the extent that specific provisions of environmental or health statutes require,¹⁶⁹ these elements include showing that a significant risk of harm exists; that the standard imposed alleviates the risk; that the standard is technologically achievable by the industry; and that the economic impact of the standard on the industry as a whole is acceptable. This model was applied correctly in *Small Refiners Lead Phase-Down Task Force v. EPA*.

B. Application of the Model

In *Small Refiners Lead Phase-Down Task Force v. EPA*,¹⁷⁰ the United States Court of Appeals for the District of Columbia Circuit addressed the limits of the EPA's discretion, pursuant to sections 211(c)(1)(A)¹⁷¹ and 211(g)(2)¹⁷² of the Clean Air Act, to regulate the amount of lead in gasoline produced by small refiners. In examining the agency's final decision, the court considered the four elements of the model that has evolved in the D.C. Circuit for review of environmental actions,¹⁷³ and framed its holding accordingly. It concluded that the EPA had sufficiently justified the standards it imposed on small refiners by showing that lead from gasoline presents a significant risk to human health, especially in young children;¹⁷⁴ that reducing the amount of lead added to gasoline produced by small refiners reduces the threat to human health;¹⁷⁵ that small refiners could achieve the new standard through inter-refinery transactions;¹⁷⁶ and that the economic impact of the standard imposed on the industry as a whole

169. See, e.g., *Sierra Club v. Costle*, 657 F.2d at 347, where the court held that § 111(j)(1)(A) of the Clean Air Act, which encouraged the use of new technology, modified § 111(a)(1), which required the use of the best available technological system of air pollution reduction.

170. 705 F.2d 506 (D.C. Cir. 1983).

171. Section 211(c)(1)(A) of the Clean Air Act states, in pertinent part, that the Administrator of the EPA may control or prohibit any fuel additive if the additive "causes, or contributes, to air pollution which may reasonably be anticipated to endanger the public health or welfare. . . ." 42 U.S.C. § 7545(c)(1)(A) (1982). See *supra* notes 22, 112 and accompanying text.

172. 42 U.S.C. § 7545(g)(2) (1982). See *infra* note 180.

173. See *supra* note 17 and accompanying text.

174. *Small Refiners*, 705 F.2d at 529, 531.

175. *Id.* at 527-28.

176. *Id.* at 536.

was reasonable.¹⁷⁷

The *Small Refiners* court first reviewed the EPA's statutory authority to promulgate the standard in question. It found that section 211(g)(2) of the Act, which had been added as part of the 1977 Clean Air Act Amendments,¹⁷⁸ granted the EPA broad authority to regulate small refiners.¹⁷⁹ The statute provided that until October 1, 1982, small refiners were to be treated on a sliding-scale basis so that the smaller the refinery, the more lead it could use per gallon of gasoline it produced.¹⁸⁰ After that date, the EPA could regulate small refiners in whatever manner the Administrator deemed appropriate, so long as experience gained under the sliding-scale regulations was considered.¹⁸¹ The court held that section 211(g)(2) required only that the EPA consider in good faith its experience with sliding-scale regulation in determining a final standard.¹⁸²

After examining the EPA's statutory authority to promulgate the standard, the court examined the record that the agency relied on to support the specific standard it imposed. Although small refiners are located primarily in rural areas, evidence in the record indicated that some small

177. *Id.*

178. Pub. L. No. 95-95, § 223, 91 Stat. 685, 764 (codified at 42 U.S.C. § 7545(g) (1982)).

179. *Small Refiners*, 705 F.2d at 515.

180. Section 211(g)(2) of the Clean Air Act established that small refiners were to be regulated as follows until October 1, 1982:

If the average gasoline production of the small refinery for the immediately preceding calendar year . . . was (in barrels per day):	The applicable amount [of lead] is (in grams per gallon):
5,000 or under	2.65
5,001 to 10,000	2.15
10,001 to 15,000	1.65
15,001 to 20,000	1.30
20,001 to 25,000	0.80
25,001 or over	As prescribed by the Administrator, but not greater than 0.80

181. *Small Refiners*, 705 F.2d at 515. Section 211(g)(2) states that the "Administrator may promulgate such regulations as he deems appropriate with respect to the reduction of the average lead content of gasoline refined by small refineries on and after October 1, 1982, taking into account the experience under the [sliding-scale]." 42 U.S.C. § 7545(g)(2) (1982).

182. *Small Refiners*, 705 F.2d at 516. The *Small Refiners* interpretation of this section is consistent with *Weyerhaeuser's* treatment of the "take into account" language in § 304(b) of the Federal Water Pollution Control Act. See *supra* note 153 and accompanying text. Thus, the phrase "take into account" seems to require good faith consideration without special weight given to any specific factor, including economic considerations, and without exact balancing among listed factors.

refiners made sales of leaded gasoline to urban centers.¹⁸³ It also indicated that the blood lead levels of children in both rural and urban areas were affected by small refiner lead use,¹⁸⁴ and that these levels were detrimental to health. The *Small Refiners* court specifically noted that studies in the agency's record had shown a significant risk of adverse health effects from blood lead levels as low as 10-15 micrograms per deciliter.¹⁸⁵ The court also noted that an EPA consultant had estimated that the 1.10 gplg/2.50 gplg dual standard proposed by SRTF would produce a mean blood lead level of 7.7 micrograms per deciliter for whites and 10.1 micrograms per deciliter for blacks by 1990.¹⁸⁶ The court held, therefore, that the EPA's record adequately supported the agency's conclusion that small refiners' lead use posed a significant risk to the health of individuals in both urban and rural environments¹⁸⁷ and that reduction of blood lead levels below the level that would be produced by the proposed dual standard was necessary to ensure adequate protection against adverse health effects.¹⁸⁸

The court next examined several studies in the record that showed strong correlation between gasoline lead use and blood lead levels. These studies demonstrated that a positive linear relationship exists between lead levels in gasoline and blood lead levels.¹⁸⁹ They showed that as lead had

183. *Id.* at 532-33.

184. *Id.* at 529, 533.

185. *Id.* at 531. The *Small Refiners* court can be criticized, perhaps, for the active role it played in interpreting the agency's rulemaking record to find a significant health risk at 10 micrograms per deciliter. The EPA never clearly stated that a "significant risk" to health existed from exposures to lead that resulted in blood lead levels as low as 10 micrograms per deciliter. Rather, the EPA stated that the studies of health effects at blood lead levels as low as 10 micrograms per deciliter were "suggestive of a potentially lower maximum safe level of blood lead" than the 30 micrograms per deciliter considered potentially dangerous by the federal Centers for Disease Control and that "reasonable steps to control lead emissions" should be taken. 47 Fed. Reg. 38,077 (1982) (emphasis added). It could be argued that this aspect of the *Small Refiners* decision violated a general principle of administrative law that a "court is not to make its own findings." See Leventhal, *supra* note 16, at 511; cf. Roders, *Judicial Review of Risk Assessments: The Role of Decision Theory in Unscrambling the Benzene Decision*, 11 ENV'T'L L. 301, 302 (1981) (the suspicion arises that the willingness of a court to uphold an agency's decision depends exclusively on whether the judge agrees with the result). On the other hand, participants in the administrative process have recognized that agencies and courts constitute "a partnership in furtherance of the public interest" and that the "court is in a real sense part of the total administrative process, and not a hostile stranger." *Greater Boston Television Corp. v. FCC*, 444 F.2d 841, 851-52 (D.C. Cir. 1970), *cert. denied*, 403 U.S. 923 (1971).

186. *Small Refiners*, 705 F.2d at 531.

187. *Id.* at 529, 531, 533.

188. *Id.* at 531.

189. *Id.* at 527-30. A study by the Centers for Disease Control showed that as gasoline lead use declined between 1976 and 1980, mean blood lead levels declined in virtual lock-step. *Id.* at 527. Thus, a positive correlation existed between lead content in gasoline and

been removed from gasoline over the preceding several years, blood lead levels correspondingly had been reduced.¹⁹⁰ The court found that this portion of the record sufficiently demonstrated that reduced lead use by small refiners would lower blood lead levels and thus reduce health risks.¹⁹¹

The court also examined the EPA's evidence regarding the technological ability of small refiners to meet the standard. The EPA primarily based its feasibility analysis on a model that treated all small refineries as though they were a single small refinery, with characteristics equal to a weighted average of all small refineries.¹⁹² On this basis, the EPA concluded that small refiners, in aggregate, had the capacity to meet the proposed standard without reducing the octane rating of gasoline they produced.¹⁹³ The agency also concluded that, through the use of inter-refinery trading of lead credits, those refiners that needed to exceed the new standard to produce high-octane gasoline could purchase lead "credits" from those refiners that produced high-octane gasoline without using lead.¹⁹⁴ The court held that use of the model, in combination with the inter-refinery trading of lead credits, was a reasonable approach to determining the capability of small refiners to meet the standard.¹⁹⁵

Finally, the court examined the economic impact of the standard. The court noted that section 211(c)(2)(A) of the Clean Air Act, which requires the EPA to consider alternative means of achieving emissions control before regulating lead pursuant to section 211(c)(1)(A) of the Act, does not specifically impose a requirement of cost-benefit analysis. It further stated, however, that review of standards promulgated under section 211(c)(2)(A) need not be restricted to a consideration of health benefits alone.¹⁹⁶ In the court's view, four pieces of evidence compelled examination of economic impact. First, nothing in section 211(c)(2)(A) specifically restricts EPA's consideration of relevant factors, including economic factors.¹⁹⁷ Second, since a related section of the Act specifically requires cost-benefit analysis

blood lead levels. See *infra* note 216 and accompanying text for a discussion of dose-response curves.

190. *Small Refiners*, 705 F.2d at 527.

191. *Id.* at 531, 533.

192. *Id.* at 535.

193. *Id.* at 534-36.

194. *Id.*

195. *Id.* at 536.

196. *Id.* at 526 n.42. The court also stated that since economic considerations formed a major part of the EPA's rulemaking record and analysis, the court was required to review the EPA's economic reasoning to determine if the final standard was reasonable. *Id.* at 526.

197. *Id.* at 526 n.42.

before additives can be regulated to prevent impairment of emission control devices, it is unlikely that Congress would at the same time forbid the EPA from considering economic costs under section 211(c)(2)(A).¹⁹⁸ Third, the legislative history of section 211 indicates that before controlling or prohibiting the use of fuel additives, the EPA is required to consider technical and cost factors.¹⁹⁹ Fourth, Congress took economic feasibility into account when it enacted section 211(g), granting small refiners the special relief of a sliding scale system of regulation.²⁰⁰ Thus, the court held that the EPA properly included consideration of economic impact of the standard in its rulemaking decision.²⁰¹

The only issue remaining was whether the EPA had sufficiently justified, in terms of economic impact, the level of reduction chosen or whether the agency should have considered more carefully the economic advantages of alternative standards.²⁰² In essence, the court was required to decide whether or not incremental cost-benefit analysis, although not mandated specifically by statute, was necessary to support the final standard chosen by the EPA. The court upheld the validity of the final standard chosen indicating that, once EPA had shown reduction of a significant risk to health, the agency need only balance expected health benefits against the cost to the industry as a whole.²⁰³

I. The D.C. Circuit's Treatment of Significant Risk

As compared with the view expressed in *Ethyl Corp., Small Refiners* reflects a more restrictive view of EPA's discretion to implement a toxic substance control standard. This restrictive view, however, is appropriate in light of the facts of *Small Refiners*. In circumstances where factual uncertainty surrounding the health effects of a toxic substance is great, such as in

198. *Id.*

199. *Id.* ..

200. *Id.*

201. *Id.* at 526.

202. *Id.* See also Brief for Petitioner at 46, *Small Refiners*, 705 F.2d 506 (D.C. Cir. 1983). SRTF argued that, under the uniform standard imposed by the EPA, projected annual lead emissions would be reduced 74% during the years 1983 through 1990 as compared to 68% if small refiners were allowed to comply with a separate 2.50 gplg standard. According to SRTF, the EPA had not shown that the added economic burden imposed by the uniform standard was warranted by the lead emission reduction achieved. *Id.* at 46-47.

In promulgating the uniform lead standard, the EPA had complied with the Regulatory Flexibility Act, 5 U.S.C. §§ 603-604 by preparing the required Regulatory Flexibility Analyses. The final Regulatory Flexibility Analysis document described the final standard chosen and four alternatives that were ultimately rejected. *Small Refiners*, 705 F.2d at 537-40. While this was sufficient to meet the requirements of the Regulatory Flexibility Act, it was not a cost-benefit comparison of the possible choices.

203. *Id.* at 536.

Ethyl Corp., a specific showing of actual harm should not be required to justify regulation. Where, on the other hand, adequate scientific evidence is available to assess the harmful impact of a toxic substance, a more definite showing of significant risk should be made.

In *Small Refiners*, for example, studies in the EPA's record demonstrated the effects of lead on human health at various exposure levels.²⁰⁴ Other studies showed the effect that removing lead from gasoline had on blood lead levels and indicated that removal of lead correlated well with reduction of blood lead levels.²⁰⁵ The court indicated that to justify regulation under these circumstances, the EPA must be able to quantify the level of exposure to lead that results in a significant risk to human health.²⁰⁶ Moreover, the agency must show that its proposed regulation will reduce the risk of health impairment.²⁰⁷

In *Ethyl Corp.*, however, the D.C. Circuit upheld the use of a regulatory threshold test that required the EPA to show only a serious threat of harm from leaded gasoline. The agency was required to prove factually neither that lead in gasoline caused disease at a specific level, nor that removal of lead from gasoline would reduce the risk to health.²⁰⁸ To a large extent, this was because a great deal of uncertainty surrounded the state of knowledge at that time regarding the health effects of lead.²⁰⁹ Since the uncertainty of the available evidence was great, the court focused on the risk of harm that continued use of lead could cause.²¹⁰ Because the court was convinced that the potential harm from continued use of leaded gasoline was great, and, in fact, outweighed the benefits of continued unrestricted use of lead, it was willing to uphold the regulations despite the EPA's less than definite showing that the regulation would reduce actual harm.

The method of analysis used in *Ethyl Corp.* is essentially risk-benefit analysis.²¹¹ Under such analysis, the risks of uncertain harm are treated as the cost of continued use of a toxic substance. When these costs are

204. *Id.* at 527-30.

205. *Id.*

206. *Id.* at 525, 531. The court stated that judicial deference to the EPA did not relieve the agency of its duty to explain why its final standard is an appropriate one; and a simple-minded argument that gasoline lead is bad and the EPA's standard reduces lead was not enough to satisfy the agency's duty. *Id.* at 525. While the court did not demand certainty, it expected the agency's choice of numerical standard to be within a zone of reasonableness. *Id.*

207. *Id.* at 527-31 (the EPA's decision to reduce lead was supported by clear evidence that further reduction in lead usage would result in reduced health impairment).

208. *Ethyl Corp.*, 541 F.2d at 24, 28.

209. *Id.*

210. *Id.*

211. *See supra* note 124 and accompanying text.

weighed against the benefits derived from continued use of the substance, a judgment as to whether or not to regulate can be made. If, for example, the risk of harm from continued use of a toxic substance is great and the benefits of continued use are low or moderate, use of the substance should be restricted. If, on the other hand, the risk of harm is moderate or remote, but the benefits of continued use are high, continued use probably should be allowed.²¹² In circumstances where factual uncertainty regarding the health effects of a substance is great, the threshold or significant risk test should be characterized more by risk-benefit analysis than by factual proof of harm.

Another area in which risk-benefit analysis is appropriate is the regulation of carcinogenic substances. Since the actual disease mechanism of cancer is unknown, it is difficult to quantify the level at which exposure to a known cancer-causing substance will result in disease. Some medical evidence suggests that a single exposure to carcinogenic substances may be capable of triggering events that ultimately lead to cancer.²¹³ Any test requiring an empirical threshold showing that a toxic substance poses a significant risk of harm at a given level of exposure may preclude reasonable regulation of carcinogens, since a triggering event caused by a low, and unmeasurable,²¹⁴ level of exposure may ultimately result in cancer. Detectability is further complicated by the fact that a cancer may develop fully only twenty or more years after exposure has occurred.²¹⁵ The model

212. *See Reserve Mining*, 514 F.2d 492 (8th Cir. 1975) (en banc), in which the Eighth Circuit, upon balancing a remote risk of cancer against the benefits of continued mining discharges, imposed a liberal compliance schedule on the discharging source.

213. *See* Maugh, *Chemical Carcinogens: How Dangerous are Low Doses?*, 202 SCI. 37 (1978). The author explains that extensive evidence from radiation-induced cancer shows a linear dose-response curve that decreases, as exposure decreases, almost to zero dose. Extrapolating from this evidence to chemical carcinogens, some medical theorists hypothesize that a single molecule of carcinogen can trigger cancer by interacting with a single cellular receptor. Other scientists, however, argue that the radiation-induced cancer evidence cannot be extended to chemical carcinogens since cellular mechanisms can prevent reaction between the chemical carcinogen (but not radiation) and critical areas of the cell (particularly the DNA-containing nucleus of the cell). These scientists theorize a level of chemical exposure exists below which cancer cannot be caused. *See also* McGarity, *Substantive and Procedural Discretion in Administrative Resolution of Science Policy Questions: Regulating Carcinogens in EPA and OSHA*, 67 GEO. L.J. 729, 734 n.26 (1979); *supra* note 59 and accompanying text (discussing cancer mechanisms).

214. *See supra* note 59 and accompanying text.

215. *See* Note, *Establishing Causation in Chemical Exposure Cases: The Precursor Symptoms Theory*, 35 RUTGERS L. REV. 163, 169 (1982) (30 year latency period for development of health problems from exposure of shipyard workers to asbestos); Selikoff, *Occupational Lung Disease*, in ENVIRONMENTAL FACTORS IN RESPIRATORY DISEASE, ch. 13, at 199, 208 (D. Lee ed. 1972) (lapse of 40 years may occur before appearance of lung cancer caused by occupational exposure); Dubos, *Adaptation to the Environment and Man's Future*, THE CON-

for setting toxic substance standards that requires demonstrating linear dose-response curves,²¹⁶ such as can be demonstrated currently for exposure to lead or cotton dust, is inappropriate when a substance is known to have certain toxic effects, but medical evidence is unavailable to show cause and effect. In such circumstances, only the risk of harm can be shown, and thus regulatory efforts should focus on the risk involved.

2. *Benzene and Significant Risk*

Benzene, for example, involved efforts to regulate a known carcinogenic substance. The *Benzene* Court appeared to advocate risk-benefit analysis in such circumstances, presumably because evidence of health effects was uncertain or unavailable.²¹⁷ The Court stated, for example, that OSHA was not required to support its findings with scientific certainty.²¹⁸ If the probability were one in a thousand that regular inhalation of gasoline vapors containing benzene would be fatal, the risk is significant, and regulations to reduce or eliminate the risk are appropriate.²¹⁹ This effort to assess and balance risk against the benefits of continued use is consistent with *Ethyl Corp.* The actual holding of *Benzene*, however, appeared to require the type of certainty of harm that was available in *Small Refiners*. While *Small Refiners* was an appropriate case to require certainty approaching the level of cause and effect, *Benzene* was not.

The principal holding of *Benzene* required OSHA to make a threshold showing that a significant risk of harm was present *and* that the risk could be eliminated or reduced by a change in practices.²²⁰ If the Court, by this

TROL OF THE ENVIRONMENT, A DISCUSSION AT THE NOBEL CONFERENCE 59, 64 (J. Roslan-sky ed. 1967) (nonlethal radiation levels may cause harm that is not manifested for 20 or more years). See *supra* note 15 for a discussion of government liability for exposing workers to federally permissible radiation levels.

216. See *American Petroleum Inst. v. OSHA*, 581 F.2d at 504 n.24, explaining that a dose-response curve shows the relationship between different exposure levels and the risk of harm associated with those exposure levels. For toxic substances in general, exposure to higher levels of the substance results in greater risk of harm than exposure to lower levels of the substance. See also McGarity, *supra* note 213, at 736-35 n.27.

217. *Benzene*, 448 U.S. at 655. The Court gave an example of risk-benefit analysis when it stated that the risk is not significant if the risk of fatality following exposure to a substance is only one in a billion. The Court implied that such a risk is "plainly acceptable." *Id.* The Court further suggested, in this part of the opinion, that it advocates the use of this type of analysis when an agency faces scientific uncertainty, explaining that the requirement that a significant risk be identified prior to regulation is not intended as a "mathematical strait-jacket." *Id.*

218. *Id.* at 656.

219. *Id.* at 655.

220. *Id.* at 639-40. The Court clearly focused on the proposed standard's ability to reduce risk. For example, the Court stated that the OSH Act requires OSHA to promulgate

statement, was requiring a definite or quantifiable showing that the regulation would reduce or eliminate the risk involved, then it was imposing a test that approximated showing cause and effect.²²¹ While it may be reasonable to require statistical quantification of the risk posed by a toxic substance as a precondition to regulating the substance, it is not necessarily reasonable to require quantification of the probability that the proposed measure will succeed in reducing the harm.²²²

standards that are reasonably necessary and appropriate to "remedy" a significant risk. *Id.* The Court also stated that the OSH Act was intended to require "elimination" of significant risks. *Id.* at 641. A threshold test that includes the requirement to show the likelihood of alleviating harm is similar to the cause-and-effect test advocated in the *Ethyl Corp.* dissenting opinion. The dissent in that case argued that only after the EPA had shown that lead in gasoline caused a significant health hazard could the EPA claim "that controlling or prohibiting lead would reduce significantly such health hazard." *Ethyl Corp.*, 541 F.2d at 95 (MacKinnon, J., dissenting) (emphasis in original). See also Hadley & Richman, *The Impact of Benzene and Cotton Dust: Restraint on the Regulation of Toxic Substances*, 34 AD. L. REV. 59, 64 (1982) (*Benzene* accepted for the proposition that OSHA must make a finding of significant risk and of likelihood of alleviation of risk).

OSHA, in response to the *Benzene* and *Cotton Dust* cases, adopted a four-step process for setting standards. The significant risk test under this process includes the requirement of showing that compliance with the proposed standard will reduce the risk of the hazard. See *OSHA to Use Four-Step in Setting Standards*, CHEMICAL & ENGINEERING NEWS, July 20, 1981, at 7.

221. The *Benzene* Court stated specifically that § 3(8) of the OSH Act requires that the risk from a toxic substance be "quantified sufficiently" before it can be characterized as significant. *Benzene*, 448 U.S. at 655. It is logical to infer that, in the *Benzene* Court's view, an agency also must quantify sufficiently the proposed standard's ability to alleviate the risk of harm. Thus, when it promulgated standards to regulate exposure to cotton dust, OSHA, in reliance on *Benzene*, stated that the prevalence of harm caused by exposure to cotton dust was likely to be reduced by the proposed standards. *Cotton Dust*, 490 U.S. at 506 n.25. OSHA carefully quantified the risk reduction to be obtained from the proposed standard by relying on the strong linear relationship between the incidence of harmful effects and the ambient concentration of respirable cotton dust particles. *Id.* at 503. The *Cotton Dust* decision, by stating that it was "difficult to imagine what else the agency could do to comply with . . . [the] Court's decision in [*Benzene*]," implied that using this type of evidence was the ideal, if not the only, way to meet the *Benzene* threshold test. *Cotton Dust*, 490 U.S. at 503 n.25. By requiring a quantifiable showing that a standard reduces risk, the *Benzene* opinion essentially required the type of linear dose-response correlation available in *Cotton Dust* and *Small Refiners*, but unavailable for any carcinogen given the current state of knowledge.

222. In the case of multiple sources of exposure to a single substance, for example, it may be possible to quantify the level of harm caused by a given level of exposure to the substance, but not be possible to ensure that reducing the exposure attributed to one of many sources will reduce the risk of harm. Thus, in *Ethyl Corp.*, even though the EPA had some evidence that exposure to a certain level of lead would cause harm, the agency could not prove that lead in gasoline, as opposed to ingested lead from lead-based paint, caused harm. *Ethyl Corp.*, 541 U.S. at 29-30.

The *Small Refiners* court appeared to ignore this aspect of the *Benzene* threshold test when it said that the significant health risk from low blood lead levels would "justify EPA in banning lead from gasoline entirely." *Small Refiners*, 705 F.2d at 531. This ignored the fact that, at least until recently, it was thought that other environmental sources of lead could

In *Ethyl Corp.*, for example, one basis for the agency's decision to regulate lead in gasoline was the theory that children in urban areas ingested airborne lead that fell to the ground and mixed with dust.²²³ The D.C. Circuit held that a "supportable and reasonable hypothesis may well form the basis for regulations . . ." ²²⁴ This rule conflicts with what appears to be the requirement in *Benzene* that the agency quantifiably demonstrate that a benefit will occur as a result of the regulation imposed.²²⁵ When the risk of harm is based only upon a medical theory, the agency will encounter serious difficulty in trying to quantify the likelihood of successful reduction of harm. This, in fact, occurred in *Benzene*, as OSHA had based its standard primarily on the medical theory that no safe level of exposure to a carcinogen exists.

Examination of cases involving varying degrees of certainty of the cause and effect of toxic substances indicates that risk-benefit analysis is a more successful test of significant risk in those cases where uncertainty is great. Where the causal relationship between a toxic substance and its associated harm is well understood, however, a stronger factual showing can be required to meet the significant risk test. In these circumstances, where certainty is great, the significant risk test should require a factual showing that the toxic substance causes harm at a specific level of exposure and that reducing exposure below that level will reduce the substance's adverse effects. Even where toxic substances are well understood, however, cause and effect will be difficult to show where multiple sources are involved.

3. Economic Analysis

Small Refiners is consistent with the treatment of economic analysis in *Cotton Dust* and *Weyerhaeuser*. The *Small Refiners* court held that the uniform standard chosen was justified because the EPA had balanced the health benefits against the cost to the industry as a whole. The court, having found that lead from gasoline posed a significant health risk and that reduction below the industry's dual standard was necessary,²²⁶ refused to

result in a low blood lead level background for members of urban populations. To have banned lead in gasoline under such circumstances would not have resulted in reduced blood lead levels unless the other lead sources were controlled. *But see* Mahaffey, *Sources of Lead in the Urban Environment*, 73 AM. J. OF PUB. HEALTH 1357, 1358 (1983) (while the blood lead burden attributed to lead from paint, leaded gasoline, and industrial emissions will vary from location to location, recent studies have shown a general urban pattern of contamination consistent with the use of leaded gasoline).

223. *Ethyl Corp.*, 541 F.2d at 43-46.

224. *Id.* at 44.

225. *See supra* notes 220-21 and accompanying text.

226. *Small Refiners*, 705 F.2d at 533.

impose the requirement that the EPA analyze and compare the effectiveness and costs of other alternatives. Thus, the court implicitly declined to require the agency to consider alternative standards that might be equally effective in reducing risk but less costly for industry. Further, the circuit court refused to analyze whether the agency had chosen the most economically efficient standard that met the significant risk test. These types of economic analyses—cost effectiveness and incremental cost-benefit balancing—were similarly rejected in *Cotton Dust*²²⁷ and *Weyerhaeuser*.²²⁸

The rationale of the Supreme Court's decision in *Cotton Dust* was grounded in the unique provision of the OSH Act requiring OSHA to regulate a toxic substance to the extent "feasible."²²⁹ This provision indicates that Congress was willing to have the agency focus on the benefits to human health rather than on the costs incurred by industry.²³⁰ The Court also examined other statutes and noted that where Congress had intended agencies to perform cost-benefit balancing, it had explicitly included the requirement for such analysis in the statute.²³¹ Since Congress had not expressly included a cost-benefit provision in its statutory directive to OSHA to promulgate health standards, the Court refused to impose one.²³²

In *Weyerhaeuser*, the D.C. Circuit's decision not to require incremental

227. See *supra* notes 82-88 and accompanying text. In *Cotton Dust*, the Court implied that cost-effectiveness analysis might be appropriate in some situations. See *supra* note 89 and accompanying text. OSHA, in fact, presently employs cost-effectiveness analysis in setting health standards under § 6(b)(5) of the OSH Act. See *OSHA to Use Four-Step in Setting Standards*, CHEMICAL & ENGINEERING NEWS, July 20, 1981, at 7. But see Note, *Cost-Benefit Analysis, Cost-Effectiveness Analysis and the Cotton Dust Standard: A Matter of Life and Death*, 35 RUTGERS L. REV. 133, 135 (1982) [hereinafter cited as Note, *The Cotton Dust Standard*], asserting that the logic of feasibility analysis neither requires nor permits cost-effectiveness or cost-benefit analysis.

228. See *supra* note 161 and accompanying text.

229. 29 U.S.C. § 6(b)(5) (1982), *supra* note 42 and accompanying text. Feasibility analysis would seem to preclude simple, or net, cost-benefit balancing as well as incremented cost-benefit balancing in that, under feasibility analysis, it is not necessary for the benefits of a standard to outweigh its costs. It is, however, necessary that the standard be the most protective of feasible alternatives. See, e.g., Note, *The Cotton Dust Standard*, *supra* note 227, at 148 (cost-benefit analysis is incompatible with feasibility analysis). But see *Cotton Dust*, 452 U.S. at 544 (Rehnquist, J., dissenting) (interpreting the majority opinion as permitting, but not requiring, use of cost-benefit analysis under § 6(b)(5)); Hadley & Richman, *The Impact of Benzene and Cotton Dust: Restraints on the Regulation of Toxic Substances*, 34 AD. L. REV. 59, 68 (1982) (stating that it is unlikely that courts will interpret *Cotton Dust* to prohibit use of cost-benefit analysis by OSHA under § 6(b)(5)).

230. *Cotton Dust*, 462 U.S. at 520-21.

231. *Id.* at 510-11.

232. *Id.* at 512. See *supra* note 229 for a discussion of whether *Cotton Dust* prohibits use of cost-benefit analysis.

cost-benefit analysis was based upon a similar rationale. The court stated that the cost of compliance, as determined from congressional intent, was a minor provision.²³³ It reasoned that requiring incremental cost-benefit analysis would unnecessarily bog down the agency on a task that Congress had not deemed important.²³⁴ The *Weyerhaeuser* court's refusal to require incremental cost-benefit analysis was made more striking by the fact that the EPA possessed such an analysis prepared by industry that supported the agency's decisionmaking.²³⁵

The decision in *Small Refiners* to reject cost-benefit analysis was based upon the same considerations as expressed in *Cotton Dust* and *Weyerhaeuser*. Section 211(c)(1)(A) of the Clean Air Act, which authorized the EPA to regulate lead, did not specifically require the use of cost-benefit analysis. The court, therefore, refused to impose a requirement of such analysis on the agency. Rather, it required the agency to show that it had balanced the cost of the standard against the industry as a whole.²³⁶

The treatment of economic considerations in *Small Refiners* further reveals a serious shortcoming of the current model for judicial review of environmental, safety and health rulemakings. While courts have interpreted many environmental statutes as limiting the extent to which agencies may use economic analysis in setting standards, few courts have explicitly clarified the types of analyses or the circumstances under which such analyses may be permitted.²³⁷ In those situations, such as the *Small Refiners* case, where evidence is available for quantifying the costs and benefits of alternative standards, and where statutory directives do not pro-

233. *Weyerhaeuser*, 590 F.2d at 1048.

234. *Id.*

235. *Id.* The *Weyerhaeuser* court indicated, however, that a different result might have been necessary if the industry's incremental cost-benefit analysis had revealed hidden costs at high reduction levels. See *supra* note 161.

236. *Small Refiners*, 705 F.2d at 536.

237. It is unclear from *Small Refiners* the extent to which economic factors should be considered in setting standards pursuant § 211(c)(1)(A) of the Clean Air Act. For example, while the court refused to require incremental cost-benefit balancing, it implied that such analysis might have been appropriate. Specifically, the court stated that it was troubled by the EPA's failure "explicitly to consider the health benefits of alternative standards" but could not say that the EPA's "balancing of costs against benefits was so seriously flawed that the final rule . . . [was] unreasonable." *Small Refiners*, 705 F.2d at 537. The court also stated that deference to agency expertise did not relieve the EPA of its duty to explain why the standard it chose was appropriate, and that the agency had ample data from which to work. *Id.* at 525, 531. Thus, the court was criticizing the EPA for not considering more carefully the advantages and disadvantages of alternative standards that met the significant risk test. The EPA, in fact, had sufficient data to perform incremental cost-benefit balancing, and thereby to choose the most economically efficient standard that sufficiently protected health. Moreover, although the court stated that the EPA had balanced costs against benefits, the agency had never numerically estimated the anticipated costs and benefits of

hibit such analysis, the court should encourage agencies to use systematic economic techniques such as incremental cost-benefit or cost-effectiveness analyses as part of the rulemaking record.²³⁸ While statutes and public policy might not permit ultimate regulatory decisions to be based upon such analyses, they can be used to provide insight into proposed regulations.²³⁹ The quantification required to perform cost-benefit analysis is

the standard imposed. The court was referring, at best, to an intuitive cost-benefit analysis on the part of the EPA.

In contrast to refusing to require cost-benefit balancing, the court permitted the EPA to base its decision, in part, on an inter-refinery lead credit trading system. *Id.* at 534-36. This system allows those refiners who exceed the lead-content standards to purchase lead credits from refiners who use less lead than the standard permits. *Id.*; see *supra* notes 192-95 and accompanying text. By approving use of an inter-refinery lead credit trading system, the court implicitly approved the use of cost-effectiveness analysis since the trading system was one economic alternative that would satisfy the requirements of the new standard. Another alternative would have been to have required all refiners to meet the standard on an individual basis. The latter alternative presumably would have had harsher economic effects but might have been more protective in that less abuse of the lead reduction program would have been possible.

238. The argument against using economic analysis as the sole basis for environmental decisionmaking centers primarily on the capacity, and propriety, of using economic analysis to assess environmental and health harms. Some parameters of environmental decisions, such as the value of a clean river or the beauty of a forest, may be difficult or impossible to quantify. Other parameters, such as the value of human life and freedom from suffering, are both difficult to quantify and raise the moral question whether quantification should be attempted at all. See Note, *The Cotton Dust Standard*, *supra* note 227, at 133. For a thoughtful discussion of the inadequacies of using economic analysis in environmental decisionmaking, see Sagoff, *supra* note 14, at 1410-12. The author explains that economic analyses can measure the intensity with which individuals hold certain beliefs but cannot evaluate the merits of those beliefs. Thus, an economist can measure how much a consumer is willing to pay for a given level of environmental protection, but not how much the same individual, acting as a citizen, values the same program. A consumer may, for example, acting in self-interest, purchase a less expensive, but environmentally more harmful product. The same individual, acting as a citizen, may vote for an economically inefficient environmental program in the belief that the program is of great value to the community as a whole. While economic techniques can measure consumer interests, they cannot adequately measure the more intangible values that at least partially comprise environmental decisions. *Id.* William Ruckelshaus, the current Administrator of the EPA, seemed to embrace this view when he described the EPA's role as a "transcendent" obligation to protect human life and that which sustains human life—the natural environment. Lash, *EPA: What Really Happened*, Wash. Post, July 29, 1984, at 8, col. 2 (Magazine). Environmental decisionmaking primarily involves values that transcend economic choices, and economic choices alone cannot form an adequate basis for such decisions. While economic analyses should not be used as the sole basis for environmental decisions, they are, however, relevant in decisionmaking. Perhaps, therefore, as noted ecologist Eugene P. Odum has suggested, "[s]omehow, ecology and economics must be merged." E. ODUM, *FUNDAMENTALS OF ECOLOGY* 431 (3d ed. 1971).

239. See Kasper, *Cost-Benefit Analysis in Environmental Decisionmaking*, 45 GEO. WASH. L. REV. 1013, 1022 (1977) (maintaining that the difficulties encountered in performing cost-benefit analysis of environmental problems help to focus the decisionmaker on which issues still need to be resolved); see also Fisher, *Controlling Government Regulation: Cost-Benefit*

likely to force the agency to analyze rigorously the issues it faces in its rulemaking, thereby encouraging thoroughly reasoned decisionmaking.

Despite its flaws, *Small Refiners* may represent an extension of an apparent trend within the D.C. Circuit to examine more carefully the economic impact of environmental regulations. In contrast with *Ethyl Corp.*, for example, *Small Refiners* restricted the agency's discretion to implement protective standards by requiring some consideration of the cost of the standard. In *Ethyl Corp.*, the court indicated that the EPA might actually be precluded from considering economic factors in promulgating standards pursuant to section 211(c)(1)(A) of the Clean Air Act.²⁴⁰ *Small Refiners*, on the other hand, clearly held that, in reviewing the EPA's most recent section 211(c)(1)(A) standard, economic factors must be considered because the EPA had considered economic costs as one factor in its rulemaking and nothing in the plain language or legislative history of the statute precluded economic analysis from being considered.²⁴¹ The court's shift in emphasis regarding economic considerations may reflect the influence of three factors: the impact of *Benzene* and *Cotton Dust*, the economic slowdown of the mid-to-late 1970's, particularly with respect to the increasing cost of energy; and the relative success of early environmental regulations.

It is possible that the *Ethyl Corp.* decision would not have been reached, based on the evidence presented, if it had been decided after *Benzene* and *Cotton Dust*. Essentially, both *Benzene* and *Cotton Dust* were responses by the Supreme Court to industry challenges, on economic grounds, of the particular standards promulgated.²⁴² *Benzene* formed an initial method for screening decisions that would impose costs on industry, ensuring that sufficient justification for the proposed standard existed by applying a cause-and-effect significant-risk test.²⁴³ *Cotton Dust*, although it did not impose cost-benefit analysis, contained clear admonitions against a policy

Analysis Before and After the Cotton Dust Case, 36 AD. L. REV. 179, 183 (1984) (cost-benefit analysis enables agency and public to examine project rationale and assumptions); Sagoff, *supra* note 14, at 1400, 1413 (cost-benefit analysis may be a relevant source of supplemental evidence in environmental policymaking, but nonmarket convictions supersede economic techniques).

240. *Ethyl Corp.*, 541 F.2d at 54 n.124.

241. See *supra* notes 196-201 and accompanying text.

242. See *supra* notes 63 and 79 and accompanying text.

243. See *supra* notes 67, 221 and accompanying text. When *Ethyl Corp.* was decided, § 211 of the Clean Air Act required EPA to find, prior to regulating a fuel additive, that the additive would endanger public health. *Small Refiners*, 705 F.2d at 514 n.12. This could easily have been interpreted to require a cause-and-effect showing that lead in gasoline caused actual harm. See, e.g., *Ethyl Corp.*, 541 F.2d at 95 (MacKinnon, J., dissenting). Such a showing could not have been established at that time.

of providing absolute safety for workers at any cost.²⁴⁴ Thus, in cases such as *Ethyl Corp.*, where it cannot be shown with certainty that a toxic substance contributes to health impairment, both the *Benzene* significant risk test and the *Cotton Dust* policy against providing absolute safety irrespective of costs indicate that economic considerations must begin to take precedence over unproved adverse health effects.²⁴⁵

The economic slowdown of the 1970's has also led to greater judicial consideration of economic factors, particularly when the cost of energy is involved. In *Sierra Club*, for example, the D.C. Circuit permitted the EPA to implement standards that were less rigorous than the industry was capable of achieving.²⁴⁶ Specifically, the court permitted the use of a sliding-scale standard by which greater amounts of sulfur oxides could be discharged when high-sulfur coal was burned.²⁴⁷ Although the court held that both the plain meaning and legislative history of the Clean Air Act permitted this regulatory scheme,²⁴⁸ to some extent its decision may have been influenced by the potential impact of sulfur oxide standards on the cost of electricity generated by affected plants.²⁴⁹

Finally, the environmental improvements that have been made to date may have created room to consider economic factors more carefully. The legislative history of the Clean Air Amendments of 1970 indicates, for example, that, at that time, the costs in terms of medical care and agricultural disruption of the deleterious effects of air pollutants possibly outweighed the costs of correction.²⁵⁰ Regulatory programs, such as the EPA's phase-down of lead in gasoline, have eased to some extent the deleterious effects

244. See *supra* note 168 and accompanying text.

245. See, e.g., Langbein, *Water*, in PUBLIC POLICY TOWARD ENVIRONMENT 1973: A REVIEW AND APPRAISAL 42, 48 (N.Y. Academy of Sciences 1973) ("to avoid all perceptible danger as a matter of policy is either costly or likely to lead to [the] worse danger of aseptic inactivity.").

246. *Sierra Club*, 567 F.2d at 321.

247. *Id.* at 316, 410.

248. *Id.* at 321.

249. *Id.* 313. The court stated that the importance of the standard arose not only from the environmental and health interests involved, but also from the impact of the emission controls on the economy. The potential effect on the economy was heightened by the increasing trend among utilities to burn coal, an abundant energy source that could replace scarcer fuels, to produce electricity. *Id.* The cost of the revised NSPS litigated in *Sierra Club* has been estimated as tens of billions of dollars. Ackerman and Hassler, *Beyond the New Deal: Coal and the Clean Air Act*, 89 YALE L. J. 1466 (1980). In addition, recent opinion polls have indicated that the public does not favor protecting the environment if that prevents obtaining an adequate supply of energy. COUNCIL ON ENVIRONMENTAL QUALITY, ELEVENTH ANNUAL REPORT OF THE COUNCIL ON ENVIRONMENTAL QUALITY 410 (1980).

250. 116 CONG. REC. 33,091-92 (1970).

of some toxic substances.²⁵¹ Thus, the cost of further reducing lead in gasoline becomes more important as statutory goals are reached. Toxic substances are, however, a continuing problem and greater understanding of disease mechanisms permits continual refinements in determining what level of exposure constitutes a hazard.²⁵²

Thus the cumulative effect of the *Benzene* and *Cotton Dust* decisions, the decreased economic productivity of the 1970's, and the successful environmental efforts to date may have influenced the *Small Refiners* court to focus more carefully on economic factors when reviewing environmental rulemaking. *Small Refiners*, in turn, suggests a trend in the D.C. Circuit to more carefully review economic costs of environmental, safety and health regulations.

III. CONCLUSION

The United States Court of Appeals for the District of Columbia Circuit in *Small Refiners Lead Phase-Down Task Force v. EPA* applied what is becoming a standard model for review of health, safety and environmental rulemaking. In *Small Refiners*, the court essentially had an ideal factual background for application of the current model in that evidence of a direct causal relationship between the substance regulated and its health effects was available. By examining how the model works under the facts of *Small Refiners*, however, it should be clear that elements of the model are easily misapplied. For example, in applying the significant-risk test to circumstances in which cause and effect are uncertain, courts should consider using risk-benefit analysis rather than requiring an agency to quantify both the risk of the harm and the likelihood of alleviating that harm through the regulation imposed. This would permit agencies to regulate on the basis of accepted but unproven scientific theories, or in cases where multiple

251. See, e.g., *Small Refiners*, 705 F.2d at 527-31.

252. See, e.g., *id.* at 530 (early studies indicating maximum safe level of blood lead at 30 $\mu\text{g}/\text{dl}$ superseded by more recent studies indicating maximum safe level as 10 $\mu\text{g}/\text{dl}$); see also *Texas v. EPA*, 499 F.2d 289, 301 n.16 (5th Cir. 1974) ("Decisions . . . may become [arbitrary] . . . by dint of scientific advancement. By its use of . . . sparse data, the EPA creates a continuing responsibility to develop, review and apply . . . more sophisticated information."); *PCB and Dioxin Cases, Hearing Before the Oversight and Investigations Subcomm. of the House Energy and Commerce Comm.*, 97th Cong., 2d Sess. 138 (1982) (testimony of Dr. Vernon Houk, Centers for Disease Control) ("[H]istorically . . . as we learn more about [hazardous] substances, we generally find they are more toxic than we thought."); *Reasons Underlying the Registration Decisions Concerning DDT, 2,4, 5-T, Aldrin and Dieldrin, Before the Environmental Protection Agency*, 1 ENVTL. L. REP. 30,028, 30,029 (Mar. 18, 1971) (the safety of a product is an evolving concept which is constantly being refined in the light of increasing knowledge).

sources of a toxic substance contribute to harm and it is unclear that regulating only one source will alleviate the harm.

Where, on the other hand, extensive scientific evidence of cause and effect is available, the model should encompass the use of cost-benefit analysis as one part of the rulemaking record. In such cases, careful economic analysis can be used to identify and examine hidden costs of a proposed regulation and the possible advantages of alternatives. Courts applying the current model for review of environmental rulemakings, however, have not required the use of cost-benefit analysis unless it is specifically called for by statute. Thus in *Small Refiners*, even though sufficient data were available for more careful examination of alternatives, the court did not require or encourage use of cost-benefit analysis.

Nonetheless, *Small Refiners* indicates a greater emphasis on economic considerations in setting standards for toxic substances than has been shown by courts in the past. It may represent a trend in the District of Columbia Circuit toward a more restrictive view of agency discretion to implement toxic substance regulations. This more restrictive view, however, should be applied only in those situations where the causes of the harmful effects of a toxic substance or industrial practice can be shown with a high degree of certainty.

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