UNC SCHOOL OF LAW

NORTH CAROLINA LAW REVIEW

Volume 69 | Number 6 Article 3

9-1-1991

North Carolina Air Toxics Regulations

Deanna Schmitt

NOTES

North Carolina Air Toxics Regulations

The State of North Carolina recently adopted regulations for the control of toxic air pollutants (TAPs) within its borders.[1] The regulations are the latest step in an air toxics program the State began developing in 1985 in response to reports of increasing in-state emissions of toxic pollutants.[2] Although the federal government purported to control air toxics through section 112 of the Clean Air Act (CAA),[3] federal regulation had proven to be virtually unworkable. Not only did the federal statutory scheme place unrealistic deadlines upon the Environmental Protection Agency (EPA),[4] but it also required the Agency to regulate hazardous pollutants with an "ample margin of safety,"[5] a particularly arduous task considering no conclusive scientific data exists for determining "safe" exposure levels for many pollutants.[6] As a practical matter, individual states had to regulate air toxics on their own.[7]

In February 1990, the North Carolina Environmental Management Commission (EMC) adopted a program regulating 105 toxic air pollutants.[8] Because the air toxic guidelines went into effect as of May 1990,[9] there has been little opportunity to assess the effectiveness of the North Carolina measures or their impact on industry. Meanwhile, in November 1990, the federal government revitalized its regulatory scheme to address more effectively the hazardous air pollution problem.[10] Title III of the 1990 CAA lists 189 TAPs that the EPA must regulate by source categories over the next ten years.[11] The Act delegates

---

1. NORTH CAROLINA ENVIRONMENTAL DEFENSE FUND, TOXIC AIR EMISSIONS IN NORTH CAROLINA: AN UPDATE FOR 1989 2 (2d ed. Oct. 1990) [hereinafter NCEDF]. The North Carolina Environmental Defense Fund analyzes air toxic emissions in North Carolina and prepares yearly data reports. *Id.* at 1.

2. *Id.* at 6. In 1988, North Carolina ranked twelfth nationally in total air toxics emissions by weight and exceeded the emissions of California and New Jersey. *Id.* at 22.

3. 42 U.S.C. § 7412 (1988), *amended by* Clean Air Act of 1990, Pub. L. No. 101-549, § 301, 104 Stat. 2399, 2531 (1990) (codified at 42 U.S.C.A. § 7412 (West Supp. 1991)).

4. *See infra* text accompanying notes 21-22.

5. 42 U.S.C. § 7412(b)(1)(B) (1988).

6. *See infra* text accompanying notes 25-26.

7. *See* 1 DIVISION OF ENVIRONMENTAL MANAGEMENT, DEPARTMENT OF ENVIRONMENT, HEALTH, AND NATURAL RESOURCES, REPORT OF PROCEEDINGS OF PUBLIC HEARINGS ON PROPOSED AMENDMENTS TO REGULATIONS 15A NORTH CAROLINA ADMINISTRATIVE CODE 2D.0535 AND .0902 AND 2H.0602, at I-1 (Aug. 1989) [hereinafter HEARINGS]. As of 1986 approximately 38 states had regulated or were in the process of regulating toxic air pollutants. 4 *id.* app. B at VI-60 (survey of state air toxics programs).

8. N.C. ADMIN. CODE tit. 15A, r. 2D.1104 (Aug. 1990). The air toxics regulations controlled emissions for 84 of the toxic substances as of May 1, 1990, and emissions for the remaining 21 beginning May 1, 1991. *Id.* Vigorous opposition by various industries as well as the requirement of a lengthy economic impact assessment delayed the promulgation for several years. NCEDF, *supra* note 1, at 2; *see* 1 HEARINGS, *supra* note 7, at I-2.

9. N.C. ADMIN. CODE tit. 15A, r. 2D.1104 (Aug. 1990).

10. *See* Clean Air Act of 1990, Pub. L. No. 101-549, § 301, 104 Stat. 2399, 2531-74 (1990) (codified at 42 U.S.C.A. § 7412 (West Supp. 1991)).

11. 42 U.S.C.A. § 7412(b)(1) (West Supp. 1991).

the task of developing standards of "maximum achievable control technology" (MACT) for various source categories to the EPA, with such standards to be developed on an industry-wide basis.[12] In light of the federal government's new air toxics regulations, the question arises whether the EMC will administer the North Carolina regulations in their present form or as a supplement to the federal standards, or whether the Commission will have to revise or abandon the North Carolina regulations to meet the new federal requirements.

This Note begins by surveying the development of the North Carolina air toxics regulations and summarizing the substantive provisions of both Title III of the 1990 CAA amendments and the North Carolina regulations, distinguishing the regulatory approaches of each.[13] The Note then suggests that North Carolina retain its present regulations to remedy the existing problem of toxic air pollution, demonstrating that these regulations can coexist with the new federal system of air toxics regulations. The Note further contends that North Carolina should not rely on its regulatory scheme as merely a protective measure in the event of the EPA's default or failure of the federal air toxics program, but should begin immediate and complete implementation of its own toxic air regulations to ensure that its goals for cleaner air are attained. Unlike the federal regulations, North Carolina's air toxics guidelines may be better suited to address specific problem areas by regulating on a facility-by-facility basis and providing for additional attention where multiple sources are located. The Note concludes that, although the uniform regulatory approach used by the CAA may provide the best "fit" for a national solution to the air toxics problem, the federal program may overlook localized problem areas. North Carolina must retain its more flexible regulations, implementing them in conjunction with the CAA to ensure more comprehensive control of toxic air pollution.

I. EVOLUTION OF THE NORTH CAROLINA AIR TOXICS REGULATIONS

Congress designed former section 112 of the federal CAA to eliminate the TAP problem; unfortunately, the statute fell far short of this goal.[14] Section 112 required that the EPA "list" certain toxic substances for which it intended to promulgate standards.[15] Although there were dozens of potential candidates for regulation, the EPA listed only eight pollutants in the twenty years after section 112 was enacted.[16]

---

12. *Id.* § 7412(d),(e); *see* J. QUARLES & W. LEWIS, THE NEW CLEAN AIR ACT: A GUIDE TO THE CLEAN AIR PROGRAM AS AMENDED IN 1990, at 31 (1990).

13. The North Carolina regulations follow a predominately health-based approach, while the federal regulations, in contrast, follow a technology-based approach. For an explanation of each regulatory method, see *infra* text accompanying notes 103-09.

14. *See* 1 HEARINGS, *supra* note 7, at I-1 (noting the "relatively limited ability" of § 112 of the old CAA to control toxic air pollutants).

15. 42 U.S.C. § 7412(b) (1988), *amended by* Clean Air Act of 1990, Pub. L. No. 101-549, § 301, 104 Stat. 2399, 2531 (1990) (codified at 42 U.S.C.A. § 7412 (West Supp. 1991)); *see* Note, *Toward Sensible Regulation of Hazardous Air Pollutants Under Section 112 of the Clean Air Act*, 63 N.Y.U. L. REV. 612, 617 (1988).

16. Marchant & Danzeisen, *"Acceptable" Risk for Hazardous Air Pollutants*, 13 HARV. ENVTL. L. REV. 535, 536 (1989). The eight pollutants currently listed are asbestos, benzene, beryllium, coke

There are several reasons why the EPA has allowed many potentially hazardous pollutants to go unregulated. Part of the problem stems from the statute itself: the statute's time constraints made expansive listing impracticable. Section 112 required the EPA to list substances that the EPA Administrator decided "may reasonably be anticipated to result in an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness."[17] Within 180 days after listing a pollutant, the Administrator had to publish proposed regulations and give notice of public hearings for comment to be held within thirty days.[18] Within 180 days of the proposal publication, the EPA had to promulgate final emission standards[19] setting "the level which in [the Administrator's] judgment provide[d] an ample margin of safety to protect the public health from such hazardous air pollutants."[20] These time constraints forced the EPA to conduct the extensive research necessary to determine appropriate emissions standards for a pollutant without time for a thorough assessment.[21] Moreover, after each listing the EPA had to identify all emission sources, investigate various kinds of control strategies, and obtain information on compliance costs before it could publish final emissions standards. Such preparation for final emission standards usually takes a minimum of two years.[22] The EPA, knowing it could not present final emissions standards for numerous TAPs within six months, began slowing the process by listing only one pollutant at a time.[23]

Although unrealistic time constraints may have delayed the listing process somewhat, a more serious problem stemmed from the "ample margin of safety"[24] concept. Most toxic substances regulated under section 112 are carcinogens that have no known "threshold" below which adverse human health effects do not occur.[25] This means that no level of exposure has been identified as inherently "safe." If no safe exposure level exists, then section 112 literally required complete and immediate prohibition of all emissions of a pollutant once the EPA listed it.[26] Such an all-or-nothing approach caused the EPA to choose "nothing" more often than not. Complete elimination of many pollutants may be technologically impossible. Moreover, outright bans could induce the shutdown of major industries, resulting in massive social dislocation.[27] To avoid such dire consequences and in response to pressure from industry, the EPA in-

---

oven emissions, inorganic arsenic, mercury, radionuclides, and vinyl chloride. National Emission Standards for Hazardous Air Pollutants, 40 C.F.R. § 61.01 (1990).

17. 42 U.S.C. § 7412(a)(1).

18. *Id.* § 7412(b)(1)(B).

19. *Id.*

20. *Id.*

21. Graham, *The Failure of Agency-Forcing: The Regulation of Airborne Carcinogens Under Section 112 of the Clean Air Act*, 1985 DUKE L.J. 100, 123-24.

22. *Id.* at 124.

23. *Id.* at 124-25. Failure to list a pollutant within a reasonable time is legally defensible because § 112 places no time limit on the listing of a pollutant. *Id.* at 125.

24. 42 U.S.C. § 7412(b)(1)(B).

25. Marchant & Danzeisen, *supra* note 16, at 536-37; *see* Industrial Union Dept., AFL-CIO v. American Petroleum Inst., 448 U.S. 607, 613, 638 n.43 (1980) (recognizing that no "safe exposure level" exists for certain pollutants).

26. *See* Marchant & Danzeisen, *supra* note 16, at 537.

27. *Id.*

stead chose to regulate only a few pollutants.[28] To avert widespread industry shutdown, the EPA based the few standards it set on "best available" control technology.[29] In short, the EPA's steadfast refusal to entertain major industry closings as a solution to the TAP problem rendered Congress's strict health-based approach to toxic emissions limitations a dead-end path to progressive pollution control.

Once the federal system proved inadequate, states began filling in the gaps with their own air toxics legislation. By 1987, several states, including California and New Jersey, already had remedial legislation in place.[30] North Carolina, however, had not reacted yet to the growing toxic air emissions problem. In 1985, North Carolina decided to take action for several reasons. First, heightened public concern about toxic chemicals in the atmosphere necessitated action.[31] Second, the State was aware that the EPA had failed to regulate these pollutants effectively under section 112.[32] Third, scientific reports indicated an increase in the release of numerous TAPs—including carcinogens, mutagens, and teratogens—into North Carolina skies.[33]

With funding from the EPA, the North Carolina Division of Environmental Management (DEM) began a survey of sources of North Carolina toxic air pollutants.[34] After compiling a list of pollutants, DEM initially sought to emulate other state programs by proposing a "strict factored approach" to obtain ambient air levels.[35] This approach uses the threshold limit value (TLV)[36] of a pollutant multiplied by a particular safety factor.[37] Industry strongly objected to this approach, arguing that the DEM applied the TLVs out of context and that a constant safety factor was inappropriate under the circumstances.[38]

---

28. *Id.*

29. Note, *supra* note 15, at 615. Best available technology (BAT) standards consider both technological feasibility and economic cost of implementation. *Id.* The statutory language of § 112, however, precludes tradeoffs between health factors and nonhealth feasibility factors. *See* 42 U.S.C. 7412(b)(1)(B); Note, *supra* note 15, at 613. In fact, Congress envisioned the possible shutdown of industries in the absence of control technology available to assure zero emissions. *See* 116 CONG. REC. 42,385 (1970). At least one court has upheld the EPA's decision to incorporate feasibility factors in setting emissions standards. *See* Natural Resources Defense Council v. EPA, 824 F.2d 1146, 1157 (D.C. Cir. 1987).

30. NORTH CAROLINA ENVIRONMENTAL DEFENSE FUND, TOXIC AIR EMISSIONS IN NORTH CAROLINA: AN UPDATE FOR 1988, at 21 (1989).

31. *See* 1 HEARINGS, *supra* note 7, at I-3 (listing reasons for instituting a North Carolina air toxics program).

32. *Id.*

33. *Id.* A mutagen is a substance that tends to increase the frequency of alterations in genetic or hereditary material. 2 WEBSTER'S THIRD NEW INTERNATIONAL DICTIONARY 1492 (1976). A teratogen is a substance that causes developmental malformations in fetuses. *Id.* at 2358.

34. 1 HEARINGS, *supra* note 7, at I-3.

35. *Id.* at I-2. For an explanation of a modified (as opposed to a strict) factored threshold limit value approach, see *infra* note 54.

36. A threshold limit value (TLV) is the "time-weighted average concentration, for a normal 8-hour workday and 40-hour workweek, to which nearly all workers may be repeatedly exposed . . . without adverse effect." AMERICAN CONFERENCE OF GOVERNMENT AND INDUSTRIAL HYGIENISTS, THRESHOLD LIMIT VALUES AND BIOLOGICAL EXPOSURE INDICES FOR 1988-1989, at 4 (1988) [hereinafter ACGIH]; NCEDF, *supra* note 1, app. C.

37. The strict factored approach applies only one safety factor (1/200) to the threshold limit value of a pollutant to obtain acceptable ambient levels (AALs).

38. 1 HEARINGS, *supra* note 7, at I-2.

Therefore, industry suggested that North Carolina establish an independent scientific panel to develop acceptable ambient levels (AAL) for the pollutants.[39] The North Carolina Academy of Sciences established the Air Toxics Panel, charging it with reviewing the list of proposed toxic air pollutants recommending a suitable approach for determining AALs.[40]

In reviewing the list of pollutants the Panel limited its choices to chemicals that the American Conference of Government and Industrial Hygienists already had assigned a TLV, that the EPA had listed as carcinogens in the category of Group A (human carcinogens) or Group B (probable human carcinogens),[41] or that North Carolina Division of Health Services considered to be of public health concern. The Panel further limited its work to chemicals for which there was potential exposure in North Carolina.[42] Additionally, the scientific panel proposed a "modified factored approach"[43] in determining the AALs.

After these initial studies, the EMC entered into a contract with Radian Corporation to do an economic impact study of the proposed regulations.[44] At public hearings on the proposed regulations, various industrial representatives argued that the economic impact statement was incomplete and that it underestimated the regulations' impact by "ignoring the loss of competitiveness and the resulting loss of profitability that would accompany a slight increase in prices for

39. *Id.*

40. *Id.*

41. Group A human carcinogens are those chemicals for which there is sufficient evidence from epidemiological studies to support a causal association between exposure to the agent and cancer. Group B probable human carcinogens are chemicals for which there is sufficient evidence of carcinogenicity from animal studies and limited or inadequate evidence from epidemiological studies. EPA Guidelines for Carcinogen Risk Assessment, 51 Fed. Reg. 33,992, 34,000 (1986). North Carolina's AALs for carcinogens are based on unit risk factors developed by the EPA's Carcinogen Assessment Group (CAG). Unit risk factor is an estimate of the incremental lifetime cancer risk over the background occurring in a population in which all individuals are exposed continuously to a concentration of 1 ug/m^3 of the agent in the air that they breathe. EPA Proposed Guidelines for Carcinogen Risk Assessment, 49 Fed. Reg. 46,294, 46,299 (1984); 2 HEARINGS, *supra* note 7, at V-650.

42. NORTH CAROLINA ACADEMY OF SCIENCES, REPORT AND RECOMMENDATIONS OF THE AIR TOXICS PANEL OF THE NORTH CAROLINA ACADEMY OF SCIENCES 6 (Sept. 1986), *reprinted in* 4 HEARINGS, *supra* note 7, at VI-7 [hereinafter AIR TOXICS PANEL]. Limiting the lists of air toxics to those that pose an actual threat to human health in North Carolina saves both time and money. The EMC's resources should be allocated properly to control only those pollutants that North Carolina's industries actually emit.

43. 1 HEARINGS, *supra* note 7, at I-2; *see infra* note 54.

44. 1 HEARINGS, *supra* note 7, at I-2; *see* RADIAN CORPORATION, ASSESSMENT OF THE ECONOMIC IMPACTS OF NORTH CAROLINA'S PROPOSED AIR TOXICS REGULATION (Apr. 1988) [hereinafter RADIAN]. Section 143-215.107(f) of the North Carolina General Statutes provides that in the event the federal government has not adopted regulations on a matter, the EMC may not adopt regulations until it considers "an assessment of the economic impact of the proposed standards." N.C. GEN. STAT. § 143-215.107(f) (1990).

The North Carolina legislature adopted this section—called the Hardison Amendment after Senator Harold Hardison—in 1975. The statute constrains the EMC's development of air quality standards in two ways. First, the EMC may not adopt standards more stringent than those promulgated by the federal government. Second, where the federal government has not regulated, the EMC must conduct an economic impact assessment before the standards are adopted. *Id.* The economic impact study must be part of the rule-making record and include an "estimate of the economic and social costs to commerce and industry, units of local government, and agriculture necessary to comply with the proposed standards and an examination of the economic and social benefits of such compliance." *Id.*

products produced by North Carolina industries."[45] Further, they argued that the assessment failed to evaluate certain social impacts of the regulations, including job losses and jobs that would not be created.[46] Environmentalists, in contrast, asserted that the statute requires only an "estimate" of regulatory costs, and does not specify with any detail what the assessment should contain, how extensive it needs to be, or what type of comparisons need to be made.[47] Moreover, environmentalists argued that the DEM compiled a legitimate report, and that the study could be reasonably relied upon given the limited resources available.[48] Following the public hearings, the EMC approved the economic impact statement[49] and the new guidelines for TAPs became effective as of May 1, 1990.[50]

The North Carolina regulations contain a list of TAPs that the Air Toxics Panel divided into noncarcinogens (acute irritants, acute toxicants, and chronic toxicants) and carcinogens.[51] The Panel chose acceptable ambient levels for both types of pollutants. For noncarcinogens, the Panel applied various safety factors to TLVs to obtain a concentration that protects the human population exposed outside of the abutting property line of any emissions source.[52] These safety factors consider variability in human susceptibility, continuous exposure over a 168-hour week as compared to a 40-hour week, uncertainties inherent in studies of chronic effects, and the severity of effects.[53] The Panel then applied these factors to the TLVs to determine the concentrations acceptable as ambient air levels.[54]

---

45. 2 HEARINGS, *supra* note 7, at V-461 (comments by Charles Case on behalf of the Chemical Industry Council of North Carolina). Radian Corporation's impact study reported that under worst case conditions less than three percent of 325 North Carolina facilities surveyed would experience significant economic hardship, and 19% would be able to comply with minimal added controls or by raising stack height. *See* RADIAN, *supra* note 44, at xiii.

46. 2 HEARINGS, *supra* note 7, at V-461 (comments by Charles Case on behalf of Chemical Industry Council of North Carolina).

47. *See* N.C. GEN. STAT. § 143-215.107(f) (1990).

48. 2 HEARINGS, *supra* note 7, at V-550 (comments at public hearing by Steven Levitas on behalf of the North Carolina Environmental Defense Fund). Environmentalists assert that limited resources hamper North Carolina's ability to devote the time and energy necessary to achieve a dynamic air toxics program. NCEDF, *supra* note 1, at 23.

49. The North Carolina Attorney General has ruled that the EMC has the ultimate responsibility and authority to determine whether an economic impact assessment is sufficiently complete. HEARINGS, *supra* note 7, at I-88.

50. N.C. ADMIN. CODE tit. 15A, r. 2D.1104 (Aug. 1990).

51. *Id.* Acute irritants are chemicals that cause irritation at the site of contact immediately following exposure of eight hours or less. Acute toxicants are chemicals that cause adverse effects at sites distant from the point of exposure within eight hours. Chronic toxicants are chemicals that cause adverse effects after multiple or prolonged exposures. 4 HEARINGS, *supra* note 7, at VI-32 to VI-33.

52. 1 HEARINGS, *supra* note 7, at I-2.

53. AIR TOXICS PANEL, *supra* note 42, at 11-16.

54. 1 HEARINGS, *supra* note 7, at I-2. The application of various safety factors to TLV values is called a "modified factored approach." The use of several factors is designed to account for the multiple differences between community and occupational exposures. For example, the Air Toxics Panel decided on a factor of 10 to account for the variability in human susceptibility. AIR TOXICS PANEL, *supra* note 42, at 12. The TLV does not always reflect this variation because workers are usually healthy adults. In contrast, the population at large includes children, elderly persons, and other sensitive subgroups. *Id.* The Panel also adjusted for continuous community exposure by adopting a factor of four to account for the difference between a 40-hour workweek and a 168-hour

The Air Toxics Panel determined the AALs for known carcinogens and probable carcinogens in a different manner. Carcinogens, as opposed to noncarcinogens, are nonthreshold agents.[55] Because no data confirm a safe level of exposure for these chemicals, the Panel had to decide on an "acceptable" level of risk.[56] The Panel first categorized each agent as either a known human carcinogen (Group A) or probable human carcinogen (Group B), based on studies by the Carcinogen Assessment Group of the EPA.[57] For known carcinogens, the Panel determined AALs based on a lifetime risk of one incidence of cancer in one million exposed persons.[58] For probable human carcinogens, the Panel determined a less stringent AAL based on a lifetime risk of one incidence of cancer in 100,000 exposed persons.[59] These "acceptable" risk factors are based on current federal and state practice and are not considered extreme.[60] For known human carcinogens, the Panel used quantitative risk assessment[61] techniques, based on available human data, to determine the incremental air concentration (concentration attributable to an emission source) associated with an additional lifetime cancer risk of one in a million persons exposed.[62] For probable human carcinogens, the Panel determined AALs similarly, except it used extrapolations from animal studies to determine the incremental air concentration associated

---

week. *Id.* at 12-13. The Panel used a factor of two to adjust for the uncertainty inherent in studies of chronic effects. *Id.* at 14. It also decided to apply a safety factor of two to those agents eliciting irreversible or life-threatening effects at concentrations that might be reasonably expected to occur in the ambient air. *Id.* at 14-15.

55. "Nonthreshold" means that there is no "safe" level of exposure. Industrial Union Dept., AFL-CIO v. American Petroleum Inst., 448 U.S. 607, 638 n.43 (1980); *see* Comment, *The Clean Air Act: Economic and Technological Feasibility in Setting Standards Under Section 112*, 20 LAND & WATER L. REV. 397, 403 n.73 (1987). A minority of scientists believe that carcinogens do have a threshold. Doniger, *Federal Regulation of Vinyl Chloride: A Short Course in the Law and Policy of Toxic Substances Control*, 7 ECOLOGY L.Q. 500, 511 n.42 (1978).

56. The "acceptable" level of risk is not the product of any actual data, but is primarily a policy decision. AIR TOXICS PANEL, *supra* note 42, at 26.

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

58. AIR TOXICS PANEL, *supra* note 42, at 16.

59. *Id.* Industry officials critical of the AALs established by the Air Toxics Panel noted that lifetime risk estimates assume that the average life span is 70 years and that exposure to a particular cancer-causing agent is continuous during life. 2 HEARINGS, *supra* note 7, at V-522 (comments Richard V. Hargitt on behalf of E.I. Du Pont de Nemours).

60. EPA, the Occupational Safety and Health Administration, and the Food and Drug Administration use the same criteria for control of carcinogenic chemicals. 2 HEARINGS, *supra* note 7, at V-472 (comments at public hearing by Dr. Carl M. Shy, M.D., Chairman, Air Toxics Panel, North Carolina Academy of Sciences).

61. Quantitative risk assessment, as defined by the National Academy of Sciences, is the calculation of the probability of potentially adverse health effects from human exposure to environmental hazards. ENVIROLOGIC DATA, REVIEW OF THE NORTH CAROLINA PROPOSED AIR TOXICS PROGRAM § 1.3 (Jan. 1989), *reprinted in* 2 HEARINGS, *supra* note 7, at V-579. The risk assessment process usually involves four steps: hazard identification, dose-response assessment, exposure assessment, and risk characterization. EPA Proposed Guidelines for Carcinogen Risk Assessment, 49 Fed. Reg. 46,294, 46,295 (1984). Hazard identification is a qualitative assessment that looks at the weight of the evidence to determine whether a chemical poses a hazard to human health. *Id.* Dose-response assessment characterizes the relationship between the dose of a chemical and the incidence of an adverse health effect in humans. This process usually involves extrapolations made from high to low doses and from animal to human exposures. *Id.* Exposure assessment estimates the intensity, frequency, and duration of human exposures to a chemical in the environment. *Id.* Risk characterization is the final step of combining exposure and dose-response assessments to reach a quantitative estimate of the risk. *Id.*

62. AIR TOXICS PANEL, *supra* note 42, at 16.

with an additional lifetime cancer risk of one in 100,000 persons exposed.[63]

The AALs are not strict regulations but merely guidelines that aid the EMC in deciding whether human health is adequately protected.[64] The regulations provide that a facility may not emit any of the toxic air pollutants listed "in such quantities that may cause or contribute beyond the premises . . . to any *significant* ambient air concentration that may adversely affect human health."[65] The EMC is to rely on the AAL guidelines in determining what concentrations are "significant."[66]

To date, North Carolina has established AAL guidelines for 105 TAPs—eighty-four AALs effective May 1, 1990, and twenty-one AALs effective May 1, 1991.[67] With few exceptions, all sources of air toxics must have a permit to emit any of these air toxics.[68] The regulations require existing sources to apply for a permit or permit modification 180 days after they receive notice from the DEM requesting that they apply for a permit to emit TAPs.[69] The DEM makes such notification or "permit calls" on the basis of Standard Industrial Classification (SIC) codes, which group industries of similar type.[70] This grouping benefits both the DEM and industries. It helps reduce the workload of the permitting staff by calling only a manageable number of industries at one time. Phasing in the program also spreads out the demand for air pollution control equipment, making it easier and cheaper for companies to obtain and install required technology.[71]

To acquire a permit, a new source must demonstrate through modeling[72] that the AALs or guidelines will not be exceeded because of the facility's emissions.[73] Alternatively, a new source may avoid compliance with AALs by proving that a greater concentration than that set forth would not adversely affect human health.[74] Although this poses a difficult burden, a new source may support a request for a higher concentration in one of two ways. First, the new source may establish that the areas where the ambient concentrations are expected to exceed the AALs "are not inhabitable or occupied for the duration of the averaging time of the pollutant of concern."[75] For instance, a new source

63. *Id.* By definition, probable human carcinogens have no conclusive data based on human epidemiological studies, but the carcinogenicity may be based on "sufficient" animal studies. *See* EPA Guidelines for Carcinogen Risk Assessment, 51 Fed. Reg. 33,992, 34,000 (1986) (EPA's definition of Group B probable human carcinogens).

64. *See* 1 HEARINGS, *supra* note 7, at I-12 (agency response to comments).

65. N.C. ADMIN. CODE tit. 15A, r. 2D.1104 (Aug. 1990) (emphasis added).

66. *Id.*

67. NCEDF, *supra* note 1, at 22; *see* N.C. ADMIN. CODE tit. 15A, r. 2D.1104.

68. 1 HEARINGS, *supra* note 7, at I-3; *see* N.C. ADMIN. CODE tit. 15A, r. 2H.0610 (Aug. 1990). With the exception of new sources combusting only unadulterated fossil fuels or wood, all new sources of air toxics must have a permit. *Id.*

69. N.C. ADMIN. CODE tit. 15A, r. 2H.0610(a)(3).

70. *Id.* r. 2H.0610(a)(4).

71. 1 HEARINGS, *supra* note 7, at I-46.

72. For a discussion of modeling, see *infra* text accompanying notes 86-98.

73. N.C. ADMIN. CODE tit. 15A, r. 2H.0610(b)(1).

74. *Id.* r. 2H.0610(b)(2).

75. *Id.* r. 2H.0610(b)(2)(A).

may assert that the area in question is over a body of water and cannot be inhabited. Of course, for pollutants with a short averaging time,[76] an owner may still have difficulty showing that persons will not occupy the area during that time. For example, even if the area in question is an uninhabited body of water, fishing or other recreational activities may bring people into the area for short periods of time. Second, a new source may produce new toxicological data showing that the AAL for the pollutant in question is too low and the facility's ambient impact is below the level indicated by the new data.[77] Such data, however, is not easy to come by and may prove quite costly to obtain.[78] Furthermore, because of the uncertainties inherently involved in air toxics research, it is doubtful that a source will be able to prove with any degree of accuracy that a higher concentration will not adversely affect human health in any way.

Likewise, existing sources may obtain a permit by demonstrating either that they will comply with the guidelines, that noncompliance would not adversely affect human health, or that they qualify for one of three exceptions.[79] An existing source may receive a permit, even if it is not in compliance, if it submits a schedule satisfying the agency that it will comply with the air toxics guidelines within three years after receiving a permit call.[80] An existing source also may exceed the guidelines for a pollutant if the source can demonstrate that compliance is technologically infeasible[81] or would result in significant economic hardship.[82] These exceptions are premised on the belief that it is easier to adapt new sources to technological innovations in pollution control than to retrofit existing sources for the same pollution control. Generally, standards are more lax for existing sources than for new sources. Existing sources falling into a technological or economic infeasibility exception have three years after receiving written

76. Each category of toxic pollutants has a different averaging time. For carcinogens, facilities must average data over a period of a year. *See id.* r. 2D.1104(a). For chronic toxicants, acute systemic toxicants, and acute irritants, facilities must average data for 24 hours, one hour, and 15 minutes respectively. *Id.* To show that no adverse affects on human health will result from emissions exceeding the AALs, a source must demonstrate that the area in question is uninhabited and that most persons probably will not occupy the area for the duration of the averaging time. *Id.* r. 2H.0610(b)(2).

77. *Id.* r. 2H.0610(b)(2)(B).

78. The Air Toxics Panel collected the best scientific data and used state-of-the-art techniques for determining AALs. *See* 1 HEARINGS, *supra* note 7, at I-14, 19. Further, for carcinogens, the Panel relied on judgments of the EPA's Carcinogen Assessment Group because it felt that "these risk assessments, which are made at a national level and are subject to extensive peer review, provide the State with the best current scientific judgment about carcinogenic risks." 2 *id.* at V-472 (comments at public hearing by Dr. Carl M. Shy, M.D., Chairman, Air Toxics Panel, North Carolina Academy of Sciences). To obtain new toxicological data that would meet a facility's burden of proof, the owner would have to hire a team of experts, which would prove quite costly and offer no guarantee of success.

79. N.C. ADMIN. CODE tit. 15A, r. 2H.0610(c).

80. *Id.* r. 2H.0610(c)(1).

81. *Id.* r. 2H.0610(c)(2). "Technologically infeasible" means that the technology necessary to reduce emissions to a level that does not exceed the AALs does not exist. 1 HEARINGS, *supra* note 7, at I-51 to I-52 (agency response to comments).

82. N.C. ADMIN. CODE tit. 15A, r. 2H.0160(c)(3). " 'Significant economic hardship' means the cost of installing the technology necessary to prevent the acceptable ambient levels from being exceeded would result in a negative net profit when the installation of the technology is amortized over five years." 1 HEARINGS, *supra* note 7, at I-52 (agency response to comments).

notification from the DEM to achieve maximum feasible control[83]—not necessarily AAL compliance. It may be quite some time, however, before the DEM decides to notify certain industries.[84]

How do owners or operators determine the ambient concentrations around their facility? Owners are likely to use what is known as dispersion modeling.[85] Dispersion modeling estimates the concentration of a pollutant using mathematical simulations based on information about atmospheric and stack emission conditions.[86] The purpose of the models is to " 'predict pollutant concentrations at any point in the neighborhood of the source.' "[87] These models operate under the assumption that a pollutant disperses vertically out of the smokestack and then "disperses laterally as predicted by the laws of fluid dynamics."[88] Dispersion modeling analysis typically consists of two stages: the screening stage and the refining stage.[89] The screening stage employs relatively simple techniques to estimate a maximum pollutant concentration by using an array of "worst case" meteorological data. Using "worst case" meteorology accounts for all possible atmospheric conditions. This screening model is intentionally designed to overpredict concentration levels.[90]

If the screening model exhibits concentrations in excess of any applicable state or federal standard for any pollutant, the owner performs refined dispersion modeling. The refined modeling is more exacting, time consuming, and expensive and involves using actual meteorological data. The results of the refined modeling are more precise and invariably predict lower concentrations than the screening model.[91]

The modeling process incorporates various facility-specific and meteorological conditions by plugging these factors into a mathematical equation as variables or input. Some of these variables include wind speed, wind direction, atmospheric stability, temperature, mixing height, emission rate, stack gas temperature, stack gas exit velocity, stack diameter, stack height, and terrain features.[92] The EPA explains how a slight variation in a few of these parameters can make a significant difference in ambient concentrations of a pollutant:

"[A] gaseous pollutant emitted over a grassy field will disperse much

83. N.C. ADMIN. CODE tit. 15A, r. 2H.0610(d). "Maximum feasible control" means "the maximum degree of reduction for each pollutant . . . using the best technology that is available taking into account, on a case-by-case basis, energy, environmental, and economic impacts and other costs." *Id.* r. 2H.0602(6).

84. *Cf.* 1 HEARINGS, *supra* note 7, at I-45 to I-46 (facilities will receive permit calls only as quickly and to the extent that the permitting staff can manage the workload).

85. *See id.* at I-35 (agency response to comments).

86. Case, *Problems in Judicial Review Arising from the Use of Computer Models and Other Quantitative Methodologies in Environmental Decisionmaking*, 10 B.C. ENVTL. AFF. L. REV. 251, 324 n.362 (1982).

87. *Id.* at 317 n.327 (quoting Alabama Power Co. v. Costle, 636 F.2d 323, 348 (D.C. Cir. 1980)).

88. *Id.* at 324 n.362.

89. 1 HEARINGS, *supra* note 7, at I-35 (agency response to comments).

90. *Id.* at I-35 to I-36.

91. *Id.* at I-36.

92. *Id.* at I-37.

> differently than if the pollutant is emitted over a large urban area. There the dispersion will be affected not only by the local weather conditions but also by the greater turbulence caused by the different types of surface areas and heat sources throughout a city."[93]

The problem with using so many highly sensitive variables is that modeling is arguably an inaccurate method of determining ambient concentrations. Some critics, for example, consider modeling "a very poor approximation of reality."[94] On the other hand, one must keep in mind that facility owners use modeling for permit purposes only; modeling determines only operational processes, air pollution control equipment parameters, and emissions rates to be included in the permit.[95] Once a permit is issued, its conditions are enforced through monitoring, not modeling.

The EMC chose modeling for this limited purpose because of its concern with cost-effective methods to achieve its clean air goals. The permit program itself can prove quite costly to industry, but the use of modeling to determine ambient concentrations of a pollutant is much cheaper than establishing, maintaining, and operating an adequate ambient monitoring network.[96] Although modeling is a plus for larger industries, which would be faced with installing extensive monitoring equipment and hiring qualified personnel to staff their many monitoring stations, smaller industries may find dispersion modeling to be the more cumbersome choice.[97] Dispersion modeling is highly technical and requires computer time and expertise that may not be readily available in smaller industries. The advantage of modeling, however, is that it allows all calculations to occur on the premises in front of a computer, and industries are more likely to get results quickly, even if it means sacrificing some accuracy.[98] Facilities need permits before operating, and the convenience of modeling ensures fast and efficient permit issuance.

Once permits are in place, facilities must use monitoring and reporting devices to determine compliance with the AALs.[99] The regulations require facilities with air quality permits to report emissions of listed TAPs.[100] Methods of quantifying emissions include stack testing, mass balance calculations, and emissions factors.[101] The owner or operator of the facility is responsible for both the determination of emission rates and the accuracy of the data.[102]

---

93. Cleveland Elec. Illuminating Co. v. EPA, 572 F.2d 1150, 1161 (6th Cir. 1978) (quoting EPA brief).

94. 3 HEARINGS, *supra* note 7, at V-2486 (comment at public hearings by William M. Deal, Vice President of Manufacturing, Bernhardt Furniture Co.).

95. 1 *id.* at I-36 (agency response to comments).

96. *Id.* at I-35.

97. 2 *id.* at V-716 (comments by Larry Runyan on behalf of the American Furniture Manufacturers Association) (refined modeling requires "additional time and expertise which most industries will not have available in-house").

98. *Id.* at I-36 to I-37.

99. N.C. ADMIN. CODE tit. 15A, r. 2D.1105.

100. *Id.* r. 2D.1105(c)(1).

101. 1 HEARINGS, *supra* note 7, at I-40.

102. *See* N.C. ADMIN. CODE tit 15A, r. 2D.1105; 1 HEARINGS, *supra* note 7, at I-40.

II. NORTH CAROLINA'S HEALTH-BASED APPROACH TO AIR TOXICS CONTROL

North Carolina adopted acceptable ambient levels for each toxic air pollutant without considering technological or economic infeasibility factors in its assessment. This health-based approach[103] presupposes that there is a certain level of pollution to which the public may be exposed without sacrificing public health and safety. This approach then establishes an acceptable or ideal limit on the level of pollutants in the ambient air. The ambient air level is derived by assessing various health-related factors and deciding on a level of risk that is acceptable for the maintenance of public health and welfare.[104] Subsequently, control measures are developed to achieve this ambient level. The health-based approach in its purest form disregards technological or economic feasibility factors in its analysis.[105] North Carolina, however, makes exception for existing sources when compliance with AAL guidelines would constitute economic hardship or when compliance is technologically infeasible.[106] North Carolina, by providing this exception, combines its health-based approach with another approach to pollution control, the technology-based approach.

The technology-based approach focuses on technology or pollution control measures that are available and feasible in light of the type of industry involved and often includes an inquiry into whether the industry is an existing or new source.[107] Then, the best available technology (BAT)[108] or a similar standard is applied regardless of whether any ambient goals are reached.[109] Title III of the 1990 CAA amendments exemplifies the technology-based approach to pollution control.

III. TITLE III OF THE 1990 CLEAN AIR ACT AMENDMENTS

In response to the failure of the health-based approach to air toxics regulation in section 112,[110] Congress enacted new legislation designed to remedy some of the problems plaguing the previous CAA amendments.[111] First, Con-

103. For a discussion of a technology-based approach to regulation, see *infra* notes 107-09 and accompanying text.

104. The goal in setting ambient standards is to ensure that the air we breathe is sufficiently safe. *See* 42 U.S.C. § 7409 (1988).

105. The health-based approach provides no room for consideration of technological and economic feasibility. It often imposes standards that force industry to develop the control technologies needed to protect public health fully. *Cf.* Note, *supra* note 15, at 619 (provisions of CAA § 112 are technology-forcing); Marchant & Danzeisen, *supra* note 16, at 539 (same).

106. N.C. ADMIN. CODE tit. 15A, r. 2H.0610(c) (Aug. 1990); *see supra* notes 81-82 and accompanying text.

107. *Cf.* Ackerman & Stewart, *Reforming Environmental Law*, 37 STAN. L. REV. 1333, 1334-37 (1985) (criticizing the best available technology approach for distinguishing between existing and new sources).

108. The BAT approach contemplates applying the best control technology currently available to all similar types of industries uniformly. *Id.* at 1334-37. For the purposes of this Note, the BAT approach shall be used when referring to a technology-based approach.

109. Graham, *supra* note 21, at 133.

110. *See supra* notes 3-6 and accompanying text.

111. *See* Clean Air Act of 1990, Pub. L. No. 101-549, § 301, 104 Stat. 2399, 2531-74 (1990) (codified at 42 U.S.C.A § 7412 (West Supp. 1991)).

gress took the initiative and established its own list of hazardous air pollutants instead of delegating "listing" decisions to the EPA.[112] In the past, the Agency refused to identify substances producing adverse health effects because it knew that after listing a pollutant it would not be able to write standards to regulate it.[113]

Instead of creating control standards for individual pollutants, the Administrator now establishes categories of industrial sources that emit substantial amounts of each TAP.[114] The EPA must publish the list of categories by November 15, 1991, and thereafter must provide an opportunity for public comment on the list.[115] Once the EPA publishes the final list, the Act requires regulation of all major sources in each category.[116] This source-by-source approach (as opposed to a pollutant-by-pollutant approach), combined with the mandatory list of pollutants, should speed the regulation process and help prevent foot-dragging by the EPA.

The Administrator must promulgate regulations establishing emission standards for all categories of major sources and area sources of TAPs.[117] The emission standards

> shall require the maximum degree of reduction in emissions of the hazardous air pollutants . . . that the Administrator, taking into consideration the cost of achieving such emission reduction, and any non-air quality health and environmental impacts and energy requirements, determines is achievable for new or existing sources in the category or subcategory to which such emission standard applies.[118]

Industries may implement this so-called maximum achievable control technology (MACT) using a wide variety of control measures including installation of control mechanisms, substitution of materials, change in work-practice methodology, and increased operational standards.[119] The MACT control standard represents a marked departure from the strict risk-based or health-based approach of the old air toxic regulations[120] and allows the EPA to consider economic as well as other non-health-based criteria in determining MACT.

---

112. 42 U.S.C.A. § 7412(b)(1) (West Supp. 1991). Under the 1990 CAA amendments, the EPA Administrator has discretion to add to the list any pollutants that pose adverse health effects, but the Administrator may delete pollutants from the list only upon a showing that the substance "may not reasonably be anticipated to cause any adverse effects to the human health or adverse environmental effects." *Id.* § 7412(b)(3)(B). Although it may be in the best interest of some industries to try to petition for a change, scientific uncertainty will likely obviate any chance of success.

113. *See supra* text accompanying notes 24-29.

114. J. QUARLES & W. LEWIS, *supra* note 12, at 34.

115. 42 U.S.C.A. § 7412(c)(1).

116. *Id.* § 7412(d)(1). Further, the EPA must assure that "90 per cent of the area source emissions of the 30 hazardous air pollutants that present the greatest threat to public health in the largest number of urban areas" achieve compliance within ten years. *Id.* § 7412(c)(3).

117. *Id.* § 7412(d)(1).

118. *Id.* § 7412(d)(2).

119. *Id.* § 7412(d)(2)(A)-(E). This provision offers greater flexibility in control measures than was permitted under § 112 of the 1977 amendments. *See* 42 U.S.C. § 7412(d) (1988), *amended by* 42 U.S.C.A. § 7412(d) (West Supp. 1991).

120. *See* J. QUARLES & W. LEWIS, *supra* note 12, at 33; *supra* notes 24-29 and accompanying text. In the past, the EPA sought to graft such considerations onto the old regulations despite the fact that the literal language of § 112 did not allow inclusion of technological or economic feasibility

As is common to technology-based statutes,[121] the 1990 amendments impose more stringent standards on new sources than on existing sources. For new sources, the MACT may be no less stringent than the emission control currently achieved in practice by what the Administrator determines is the best controlled similar source.[122] Existing sources may have less stringent standards than new sources in the same category; the standard, however, may not be less stringent than the average emission limitation achieved by the best performing twelve percent of existing sources in the category of thirty or more sources, or the average emission limitation achieved by the best performing five sources in the category with fewer than thirty sources.[123] Although new source standards are tougher than those for existing sources, technological and economic feasibility continue to be appropriate factors to consider in determining new source MACT.[124]

The new amendments also provide a schedule for the promulgation of MACT standards. By November 15, 1992, EPA must establish priorities for its list of source categories by considering the adverse effects of TAPs on the public health and the environment, the quantity and location of TAP emissions that each category will emit, and the efficiency of grouping categories according to the pollutants emitted.[125] Once the EPA sets priorities, it must promulgate MACT standards for the first forty categories no later than two years after enactment of the 1990 CAA.[126] Within four years, the EPA must establish standards for twenty-five percent of all of the listed categories. Within seven years standards must be promulgated for an additional twenty-five percent of the source categories, and at the end of ten years, all listed categories must have standards in place.[127]

All sources must comply with MACT standards within three years after promulgation.[128] Congress, however, has built in an incentive for sources to reduce emissions on their own. The amendments provide that an existing source may obtain a six-year extension for compliance if it achieves a ninety percent reduction in emissions prior to the proposal of an applicable MACT standard.[129] Existing sources may want to analyze technological mechanisms, economic factors, and regulatory schemes to decide whether they can make a few minor changes now in order to qualify for the six-year extension later.[130] Because these decisions must be made before MACT standards are issued, however, industry must predict now whether achieving an immediate ninety-percent reduction will result in a savings over the cost of future compliance. Most likely,

---

factors in the equation. *See supra* note 29. Now Congress has chosen to incorporate those factors in the 1990 amendments. *See* 42 U.S.C.A. § 7412(d)(2) (West Supp. 1991).

121. Ackerman & Stewart, *supra* note 107, at 1335-36.

122. 42 U.S.C.A. § 7412(d)(3).

123. *Id.*

124. *Id.* § 7412(d)(2), (3); *see* J. QUARLES & W. LEWIS, *supra* note 12, at 34.

125. 42 U.S.C.A. § 7412(e).

126. *Id.*

127. *Id.*

128. *Id.* § 7412(i)(3)(A).

129. *Id.* § 7412(i)(5).

130. J. QUARLES & W. LEWIS, *supra* note 12, at 35.

industries will have to conduct a cost-benefit analysis individually to decide whether the cost of voluntary reductions now is less than any benefits associated with a six-year delay of the MACT standards.

Because of the EPA's prior record of laxity in promulgating air toxics control regulations,[131] Congress was not content to leave the implementation of MACT standards to the Agency completely, so it designed the so-called "MACT hammer."[132] If the EPA fails to promulgate MACT standards as required, sources will become subject to case-by-case MACT standards after states have their permit programs approved.[133] Permits will contain emission limitations for TAPs subject to regulation so that there will be equivalent standards under this alternative regulatory method.

Once the EPA establishes MACT standards, it must decide whether more stringent standards are required after application of MACT controls to protect the public health with an "ample margin of safety . . . [and] taking into consideration costs, energy, safety, and other relevant factors, [to prevent] an adverse environmental effect."[134] This plan, designed to address the problem of residual risks, is one health-based aspect that Congress has not abandoned. The EPA must promulgate residual risk standards with an ample margin of safety nine years after establishing MACT standards in the case of the first source categories regulated and eight years for all other categories.[135] Legislation mandates that the EPA establish residual risk standards for carcinogens that present a cancer risk greater than one in one million after MACT controls have been installed.[136] Because of the uncertainty of risk assessment, the 1990 amendments call for the National Academy of Sciences to review the EPA's risk assessment methodology for determining carcinogenic risk associated with air toxics exposure and to recommend improvements in methodology.[137]

The above regulations primarily deal with normal, everyday releases from facilities. In addition, the new amendments propose methods of preventing and responding to accidental releases of toxic substances.[138] Here, the amendments require a completely new regulatory program. The EPA must publish, not later than November 15, 1992, an "initial list of 100 substances which, in the case of

131. *See supra* 26-29 and accompanying text.

132. J. QUARLES & W. LEWIS, *supra* note 12, at 34.

133. *Id.*; *see* 42 U.S.C.A. § 7412(j). The state-issued permits "shall contain emission limitations for the hazardous air pollutants . . . emitted by the source that the Administrator (or the State) determines, on a case-by-case basis, to be equivalent to the limitation that would apply to such source if an emission standard had been promulgated in a timely manner." *Id.* § 7412(j)(5). This provision adds a layer of protection in case the EPA fails to promulgate an emissions standard. It also requires the states to apply the MACT standards required under federal law.

134. 42 U.S.C.A § 7412(f)(2). The EPA must promulgate these more rigorous standards in the event Congress fails to act on its risk assessment report. *Id.* § 7412(f)(1)-(2).

135. *Id.* § 7412(f)(2)(C).

136. *Id.* The federal act requires that categories of sources emitting a pollutant classified as a known, probable, or possible human carcinogen reduce emissions to a level associated with a lifetime cancer risk of less than one in one million. The North Carolina regulations, however, distinguish between known and probable carcinogens by allowing an acceptable risk of one in 100,000 for probable human carcinogens. *See supra* note 59 and accompanying text.

137. 42 U.S.C.A. § 7412(f)(2)(A).

138. J. QUARLES & W. LEWIS, *supra* note 12, at 36; *see* 42 U.S.C.A. § 7412(r).

accidental release, are known to cause or may reasonably be anticipated to cause death, injury, or serious adverse effects to human health or the environment."[139] The amendments identify sixteen pollutants that must be included.[140] By 1993 the EPA must promulgate regulations for the prevention and detection of accidental releases and measures for emergency response, including the preparation of risk management plans.[141] Owners or operators of a facility subject to accidental-release regulations subsequently will be required to develop risk management plans that comply with the EPA regulations and include a hazard assessment, a prevention program, and a response plan.[142]

In sum, the new federal regulation of air toxics has shifted from a health- or risk-based approach to primarily a technology-based approach, applying MACT standards to similarly situated sources and allowing for more flexible methods of control technology.

IV. RETENTION OF NORTH CAROLINA'S AIR TOXICS REGULATIONS

The North Carolina and federal regulations take two different approaches to the problem of cleaning the ambient air. North Carolina relied on a predominantly health-based approach in formulating AALs,[143] whereas the 1990 CAA amendments use a technology-based approach in prescribing emissions standards.[144] Although both the North Carolina and the federal programs combine elements of each approach, both are essentially predicated on one theory or the other. Neither approach to environmental regulation has obtained overwhelming support.[145] Environmentalists advocate preservation of public health and a clean environment at any cost and therefore favor a strict health-based approach. Industrialists, in contrast, view cost minimization as a primary goal and favor a technology-based approach. As a result, two opposing groups actively dispute the value of these two methods of regulation.[146] The choices are not as clear cut as they may seem, however, for each method contains inherent weaknesses.

Neither the health-based nor the technology-based approach can be effective on its own because each addresses different issues. The technology-based approach responds to immediate problems of scarcity and technological infeasibility but fails to project a long-term plan for pollution reduction.[147] The health-based approach, in contrast, takes an idealistic approach to long-term

139. 42 U.S.C.A. § 7412(r)(3).

140. *Id.*

141. *Id.* § 7412(r)(7)(B).

142. *Id.*; *see* J. QUARLES & W. LEWIS, *supra* note 12, at 36.

143. *See* 1 HEARINGS, *supra* note 7, at I-11 (agency response to comments).

144. *See* J. QUARLES & W. LEWIS, *supra* note 12, at 33.

145. *See* 1 HEARINGS, *supra* note 7, at I-66 to I-69 (agency summary of testimony in favor of technology-based regulatory scheme); *cf.* Doniger, *supra* note 55, at 555-56 (comparing health-based and technology-based statutes regulating toxics at state and federal levels).

146. *See* 1 HEARINGS, *supra* note 7, at I-4 to I-11 (agency summary of the competing arguments of industry and environmentalists); Latin, *Ideal Versus Real Regulatory Efficiency: Implementation of Uniform Standards and "Fine-Tuning" Regulatory Reforms*, 37 STAN. L. REV. 1267, 1293 (1985).

147. Ackerman & Stewart, *supra* note 107, at 1335-37.

goals, but ignores the short-term problem of limited technical innovation and resources.[148] In addition to these theoretical difficulties, practical problems plague both approaches. The efficacy of the health-based approach is limited by scientific uncertainties associated with risk assessment,[149] while the technology-based approach avoids the risk assessment difficulties, but faces problems of substantial cost and limited flexibility needed to address the idiosyncracies of individual facilities.[150]

Despite the substantial difficulties encountered in each regulatory approach, North Carolina should retain its health-based regulations in conjunction with the federal scheme for several reasons. First, although risk assessment techniques are fraught with uncertainties, the Air Toxics Panel used the best possible research techniques and based its assumptions on the most current data available.[151] The major problem facing the Panel and agencies applying the health-based approach to TAP regulation is the treatment of carcinogens and the corresponding risks. Risk assessment, the most common technique used in epidemiological studies, requires scientific determinations under conditions of substantial uncertainty concerning the risks involved, limited availability of scientific data, and economic barriers to conducting adequate research.[152]

Ultimately, the health-based or risk-based approach is subject to the confines of present scientific knowledge. Many statutes using the health-based approach result in two-part risk assessment analysis. The first part involves a political decision as to what level of cancer risk is acceptable. The second part is a scientific determination of the level of exposure to a pollutant which causes that particular risk.[153] Unfortunately, the causal relationship between a pollutant and cancer is often difficult to assess.[154] Part of the problem is that cancer is a latent disease that fails to manifest itself until fifteen to forty years after exposure begins.[155] Also, the operation of chemical carcinogens and their effect on human metabolic processes confound scientists.[156] There is substantial disagreement in the scientific community as to how much exposure to a potential carcinogen actually begins cell mutation. Scientists question whether one brief exposure is enough or whether several extended exposures within a short period

148. 1 HEARINGS, *supra* note 7, at I-68 to I-69 (agency summary of comments).

149. *See* Doniger, *supra* note 55, at 508-14.

150. 1 HEARINGS, *supra* note 7, at I-68 (agency response to comments); Ackerman & Stewart, *supra* note 107, at 1335-36.

151. *See supra* note 78.

152. Doniger, *supra* note 55, at 508-14. These factors prevent agencies from making precise and informed decisions about risks at varying degrees of pollutant exposure. The limitations of science and the controversial nature of risk management techniques result in substantial litigation challenging these acceptable risk levels as unfounded and capricious, leaving the agencies constantly fighting for ground. *See, e.g.*, Industrial Union Dept., AFL-CIO v. American Petroleum Inst., 448 U.S. 607, 630-38 (1980).

153. *See* Latin, *Good Science, Bad Regulation, and Toxic Risk Assessment*, 5 YALE J. ON REG. 89, 89 (1988).

154. Doniger, *supra* note 55, at 510. To account for gaps in scientific knowledge, regulators incorporate conservative estimates into risk assessment models. *See* Latin, *supra* note 153, at 94 (noting the inconsistent treatment of uncertainty in risk assessment).

155. Doniger, *supra* note 55, at 511-12.

156. *Id.* at 510.

of time will cause cancer to appear.[157] The most perplexing yet important question is what risks can be expected from a varying range of doses.[158] If this correlation was known, risk levels for carcinogens probably could withstand judicial scrutiny. Because of the lack of human studies, scientists have had to resort to animal studies to predict human exposure risks.[159] Two problems arise when using animal studies. First, there is uncertainty in extrapolating dose-response levels across species lines.[160] Second, because scientists must use relatively small test groups,[161] chemicals must be administered at high dosages to establish a strong correlation between the dose and an adverse effect.[162] Therefore, scientists must extrapolate to low doses to mimic the actual exposure level in the environment.[163]

In short, agencies cannot predict how a difference in risk correlates to small changes in dose strength. The North Carolina Air Toxics Panel had to recommend guidelines with these scientific uncertainties in mind. Thus, the Panel combined policy decisions with scientific determinations to propose air toxics regulations. The Panel emphasized that, given scientific uncertainties, its approach "should not be considered a precise method distinguishing safe from unsafe levels of contaminants, but rather a means to establish flexible guidelines which can be used to raise flags of concern and set priorities for action."[164] AALs may be riddled with educated guesses that tend to err on the side of conservatism in order to protect the public health. Nonetheless, the Panel based the AALs on value judgments reflecting the best available scientific information at the time[165] and cannot be accused of being arbitrary or capricious.

The second reason North Carolina should apply its regulations in addition to those established under federal law is that the State has refined its regulatory system by dividing the hazardous air pollutants into noncarcinogens and carcinogens and using assessment methods that cater to known properties of each.[166] This category-specific approach affords the greatest degree of protection because guidelines may be more or less stringent based on varying degrees of toxicity. For the categories of noncarcinogens, the Air Toxics Panel used TLVs for chem-

157. *Id.* at 510-11. Scientists also differ over whether the human body has defense mechanisms against a single exposure and the possible effects of combined carcinogenic substances. *Id.*

158. *Id.* at 511.

159. *Id.* at 512.

160. *Id.* at 513.

161. In order to conduct an animal study with a 95% accuracy rate, the test must involve at least six million animals. These experiments are not practical because of tremendous expense and vulnerability to statistical errors. *Id.*

162. *Id.* at 512-13. Scientists cannot trace sufficiently low doses of chemicals in small test groups. Thus, to induce cancer at detectable rates, scientists must administer chemicals to test animals at much higher doses than humans normally would experience. *Id.* at 512.

163. *Id.* at 513.

164. AIR TOXICS PANEL, *supra* note 42, at 5.

165. 1 HEARINGS, *supra* note 7, at I-14 (agency response to comments questioning the scientific data used to determine AALs).

166. *See supra* notes 51-63. Varying treatment for carcinogens and noncarcinogens not only adds an element of flexibility to North Carolina's approach, but also adds credibility to health-based standards.

icals and multiplied them by various safety factors to come up with AALs.[167] The TLVs are limits assigned to industrial chemicals—chemicals found in the work place by agencies such as the American Conference of Government and Industrial Hygienists (ACGIH) and the Occupational Safety and Health Administration (OSHA).[168] The ACGIH has assessed threshold levels of chemicals in the work place for over forty years, and these threshold limits for noncarcinogenic pollutants are fairly well established.[169] The ACGIH conducted extensive research on limited groups of workers exposed to a limited number of pollutants at specific times and for an exact duration. The TLV determinations represent the best judgment of safe occupational levels given the present state of knowledge.[170] The Air Toxics Panel took these values and compensated for the differing environment, exposure times, and varying susceptibilities to reflect outdoor conditions.[171] These adjustment factors, however, are not well established and involve discretionary judgments in converting TLVs to legitimate AALs. Industry argued that this modified TLV factored approach was not appropriate for outdoor exposure, and the addition of strict numerical factors could not simulate the variance between the work place and continuous outdoor exposure.[172] Although this may be true, the final ambient levels were a product of established scientific data and the best educated assumptions based on this reliable data. Furthermore, if clean air goals are to be attained, regulators must bite the bullet and undauntedly push for health-based regulatory schemes in the face of scientific uncertainty.

This same argument applies to the regulation of carcinogens, which inherently involves more uncertainty, requiring even more guesswork. Applying the most advanced scientific methods, the Air Toxics Panel accepted the risk of one cancer per million persons exposed, and it performed quantitative risk analysis to determine the incremental concentration of a pollutant associated with that risk.[173] Because it is not feasible to conduct experiments on animals or make human observations to define this low risk level, the Panel had to choose a statistical model to estimate the dose associated with this acceptable low risk. The modeling process is scientific in that it incorporates principles of extrapolation and estimation. There is no proof that one particular model is clearly right or valid, however, and these models usually lead to widely divergent results. The Panel decided to use the fairly conservative linearized multistage model to extrapolate from high dose animal studies.[174] The Panel chose this method because it

167. *See supra* note 54.

168. *See* 1 HEARINGS, *supra* note 7, at I-14 (agency response to comments).

169. *Id.*

170. *See* 4 HEARINGS, *supra* note 7, at VI-35; ACGIH, *supra* note 36, at 3.

171. *See* 1 HEARINGS, *supra* note 7, at I-15; AIR TOXICS PANEL, *supra* note 42, at 9-16.

172. 1 HEARINGS, *supra* note 7, at I-13 to I-14 (agency summary of comments by industry representatives).

173. In comments responding to a proposal by the EPA for regulation of benzene in 1988, the National Resources Defense Council accepted this same risk. The Council relied on various sources that cite a risk of one in one million as the upper bound for de minimis risk. Marchant & Danzeisen, *supra* note 16, at 543-44.

174. Letter from Dr. Carl M. Shy, M.D., Chairman, Air Toxics Panel, North Carolina Academy of Sciences to Gladys Van Pelt, Ph.D, Chair, Air Quality Committee, Environmental Management

incorporated an adequate set of conservative assumptions regarding human cancer risks at low doses.[175] To ensure that the most accurate, up-to-date scientific information will be used for future regulation, the North Carolina Department of Environment, Health and Natural Resources is establishing a Secretary's Scientific Advisory Board to advise the EMC and DEM on current developments in toxicology and health risks of air toxics.[176] This step adds a layer of protection so that guesswork in establishing acceptable ambient levels is kept to a minimum.

North Carolina should retain the air toxics regulations because of the flexibility written into its provisions. While maintaining its health-based goals, the state program makes allowances to exceed AALs and in limited circumstances permits variances for existing sources. A variance may be granted if a facility demonstrates that compliance is impracticable due to technological infeasibility.[177] This provision allowing for variances recognizes the difficulty in retrofitting old sources with control devices. If an existing source is successful in demonstrating that meeting the ambient standards is technologically infeasible, then it need only install "maximum feasible control technology."[178] Allowing for variances represents a melding of the technology-based and health-based approaches and is one of the most apparent concessions North Carolina made to industry.

The state regulations also offer flexibility by regulating on a facility-by-facility basis rather than in the uniform manner applied under the 1990 CAA amendments. This distinction can be illustrated by comparing aspects of the North Carolina air toxics program with parallel provisions of the federal scheme.

First, the North Carolina regulations mandate that each owner or operator of a facility apply for a permit in order to emit a toxic pollutant.[179] The North Carolina regulations also require each owner to conduct computer dispersion

---

Commission (July 29, 1988) (discussing Air Toxic Panel's recommendations), *reprinted in* 4 HEARINGS, *supra* note 7, at VI-175.

175. *Id.* This model assumes that risk is linearly proportional to concentration.

176. 1 HEARINGS, *supra* note 7, at I-91; *see* Division of Environmental Management, Department of Environment, Health, and Natural Resources, Draft: Secretary's Advisory Board on Toxic Air Pollutants (undated) (describing Advisory Board's composition and function), *reprinted in* 4 HEARINGS, *supra* note 7, at VI-193.

177. A variance gives a facility an opportunity to avoid the stringent standards and possibly opt for lesser standards by meeting certain conditions. North Carolina allows variances for existing sources if they can demonstrate technological infeasibility, *see supra* note 81, or economic hardship, *see supra* note 82, in complying with the ambient guidelines. N.C. ADMIN. CODE tit. 15A, r. 2D.0610(c)(2)-(3) (Aug. 1990). An existing source may delay compliance by submitting an acceptable schedule that provides for compliance within three years. *Id.* r. 2D.0610(c)(1). The Code does not specify how quickly reductions must proceed during the three-year interval nor whether reductions must be constant and gradual. In any case, a facility may be able to emit pollutants that exceed ambient levels for a period of three years if the DEM accepts its schedule. *Id.* The variance for a new source is much more difficult to obtain because it requires that the source prove either that its emissions do not exceed acceptable ambient levels beyond its property boundary, or that such emissions will not adversely affect human health. *Id.*

178. *See supra* note 83.

179. N.C. ADMIN. CODE tit. 15A, r. 2H.0610(a).

modeling to determine its ambient contribution for a pollutant.[180] Based on these models, the State will implement control technology on an individualized basis to assure that the facility will not contribute significant amounts of a pollutant into the ambient air.

In contrast, the 1990 CAA amendments require that once the EPA lists a category of sources, all sources within the category must achieve emission reductions by applying the MACT standard.[181] This approach is a highly centralized, industry-uniform system often used to implement BAT: the standards apply to all industries of similar types regardless of their geographic location, climate, or population size of those affected. Uniform standards neglect certain areas and allow for creation of high concentrations of pollutants in small areas, or so-called "hot spots."[182]

State systems like North Carolina's can alleviate particularly problematic areas by requiring each source to have a pollution reduction permit and demanding that each facility reduce its own emissions so that collective emissions do not exceed AALs. Whereas uniform controls may prove dysfunctional by regulating some areas more or less than necessary, highly decentralized controls can be tailored to redress specific pollution problems. For example, each of several sources located in close proximity may comply with uniform federal standards on an individual basis, yet the combination of their emissions may cause a significant ambient concentration within the vicinity. A decentralized system like North Carolina's specifically addresses each facility's emissions based on ambient concentrations in the neighboring area and thereby can assure that the ambient concentration in a particular industrial area is not exceeded. Furthermore, North Carolina's regulations require facilities to apply additional control technology if emissions of two or more sources located in a small area exceed AALs.[183]

A highly centralized, uniform approach does have some advantages over a more individualized approach. They include:

> decreased information collection and evaluation costs, greater consistency and predictability of results, greater accessibility of decisions to public scrutiny and participation, increased likelihood that regulations will withstand judicial review, reduced opportunities for manipulative behavior by agencies in response to political or bureaucratic pressures, reduced opportunities for obstructive behavior by regulated parties, and decreased likelihood of social dislocation and "forum shopping" resulting from competitive disadvantages between geographical regions

180. *Id.* r. 2H.0610(b)(1).

181. *See* 42 U.S.C.A. § 7412(c) (West Supp. 1991); J. QUARLES & W. LEWIS, *supra* note 12, at 34.

182. Ackerman & Stewart, *supra* note 107, at 1350.

183. N.C. ADMIN. CODE tit. 15A, r. 2D.1107(a) (Aug. 1990). "The owner of a facility shall not be required to conduct [a] multi-facility ambient impact analysis . . . . This type of analysis shall be done by the Division of Environmental Management." *Id.* r. 2D.1107(c). The Division may require a facility to install additional control technology if ambient impact analysis reveals that it is necessary to protect the public from the combined effect of multifacility pollutants. *Id.* r. 2D.1107(a).

or between firms in regulated industries.[184]

At the federal level, this uniform approach has fostered significant improvements in environmental quality with a cost to society that has not proved excessive.[185] Nevertheless, opponents still argue that uniform standards are not cost-effective.[186] Uniform requirements may waste billions of dollars annually by ignoring variations among plants and industries in the cost of reducing pollution and by ignoring geographic variations in pollution effects.[187] Some argue that North Carolina's health-based approach allows for the most cost-effective methods by regulating facility by facility.[188] Only facilities that need emissions reduction will put on control technology, and sources that need emissions reductions will use only those methods that assure that ambient guidelines will not be exceeded.

This argument also supports North Carolina's use of a health-based regulatory system rather than a technology-based system, such as BAT. The technology-based approach used by the federal government would prove much more costly for North Carolina than implementing a health-based approach, because under the control technology approach, every industry emitting toxic air pollutants would have to install the best control equipment whether or not such controls were necessary to meet the AALs.[189] Because the implicit goal of BAT is the air quality level attainable if every facility installed BAT,[190] the technology-based approach does not assure or even attempt to assure that public health is protected from any adverse health effects.[191] What happens if the best available technology is in place and an unacceptable risk to human health is still present? Additional controls are not technologically or economically feasible in the BAT scenario.[192] The health-based approach allows for many options to achieve ambient goals, including reduced emissions or substitution of materials, because it is not constrained by best available technology.

Furthermore, BAT approaches, although assuring that sources install established control technologies, do not provide a strong incentive for the development of new technology.[193] Once BAT is in place, industry has complied with the standard and no more need be done. Such an approach may even discourage the development of new technology, and the long-term effect may be devastating. Similarly, others contend that the "BAT strategy is inconsistent with intelligent priority setting."[194] Merely applying maximum pollution controls to the pollutant that makes the regulatory agenda may prevent an agency from ad-

184. Latin, *supra* note 146, at 1271.

185. *Id.* at 1273. This is not to say that even excessive costs could not be absorbed by society if necessary.

186. *Id.* at 1273 n.25.

187. *See* Ackerman & Stewart, *supra* note 107, at 1335.

188. *See* 1 HEARINGS, *supra* note 7, at I-68 (agency response to comments).

189. *Id.* at I-68 to I-69.

190. Ackerman & Stewart, *supra* note 107, at 1341.

191. *See* 1 HEARINGS, *supra* note 7, at I-68 (agency response to comments).

192. *Id.*

193. Ackerman & Stewart, *supra* note 107, at 1336.

194. *Id.* at 1337.

dressing the most serious pollutants first. Once a new pollutant is identified, BAT requires costly inquiries into the state of control technology in the industries emitting such pollutants. Then BAT requires implementation of control to the full extent of available technology for each particular pollutant.[195] Not only is this an inefficient method of prioritizing, it is inefficient in terms of cost.

North Carolina should retain the regulations not only because they better meet North Carolina's needs, but also because they may meet its needs sooner. The 1990 CAA amendments contain a complex regulatory timetable. The amendments do not require facilities to put on control technology until after the EPA establishes categories of sources and decides how to rank the categories.[196] The EPA then must promulgate emissions standards for each source category. The schedule requires the EPA to decide on emissions standards for only forty source categories by November 1992.[197] Once the EPA establishes emissions standards, new CAA provisions require facilities to apply MACT within three years.[198] This means that it may be November 1995 before the first industries (listed in the forty source categories) will have to comply with the federal regulations, and it will be November 2000 before fifty percent of the source categories will be regulated.[199]

The North Carolina scheme has the potential to ensure regulation sooner than Title III. Regulations for eighty-four pollutants became effective in May 1990.[200] Already, new sources must apply for permits before beginning construction so that AALs will not be exceeded.[201] Existing sources must apply for permits within 180 days after receiving a permit call.[202] Once an existing source applies for a permit, it must apply MACT no later than three years after receiving notification. Ideally, if the DEM calls existing sources now, they must comply with the air toxics guidelines by May 1993 because, unlike the federal statutory provisions, the DEM need only call a facility's SIC, and compliance must follow within three years.[203] The DEM need not decide on source categories and emissions limitations before requiring any control technology.

North Carolina should not only retain its regulations but should strive for implementation as soon as possible. Accordingly, the DEM should commence permit calling as soon as feasible. The CAA should not provide an excuse to hold back implementation of the state regulations and wait for the EPA to set national emissions standards. Because North Carolina's regulations place no

195. *Id.* at 1359.

196. *See* 42 U.S.C.A. § 7412(e) (West Supp. 1991); J. QUARLES & W. LEWIS, *supra* note 12, at 37-38.

197. 42 U.S.C.A. § 7412(e). These first categories may or may not include pollutants that are prevalent in North Carolina.

198. *Id.* § 7412(i).

199. *Id.* § 7412(e) (standards for half of the categories must be promulgated by November 1997); *id.* § 7412(i) (industries have three years from promulgation to comply). This timetable assumes no bureaucratic delay or foot dragging by the EPA and that the EPA has sufficient resources to accomplish the CAA regulatory program.

200. N.C. ADMIN. CODE tit. 15A, r. 2D.1104 (Aug. 1990).

201. *Id.* r. 2H.0610(a)(1).

202. *Id.* r. 2H.0610(a)(3).

203. The DEM, however, may call a SIC code at any time. *See supra* note 84.

time constraints on the DEM regarding permit calls, the DEM may wait an indefinite period of time before notifying existing sources. Although such delay may be permitted by the Code, the DEM would sacrifice public health by its inaction. North Carolina toxic air pollutants continue to be a major problem that the federal program may not address for five years. Furthermore, even when the CAA requires compliance with the first standards within five years after enactment of the statute, the government-regulated pollutants may not pose a threat to North Carolina. In other words, state facilities may emit certain pollutants that the EPA decides warrant a lower priority. In that case, facilities need not apply control technology until 1997 or later. Finally, the 1990 CAA amendments do not address North Carolina's "hot spots" sufficiently, whereas the state regulations contemplate multiple-facility emissions.

V. CONCLUSION

North Carolina has abandoned the industry-uniform, technology-based approach in favor of a more flexible health-based approach, even though this approach had proved unworkable at the federal level. The state has not fully implemented the plan yet and will not know its efficacy for some time. The North Carolina regulations emphasize goals slightly different from those of the CAA. First, risk management and public safety are of the utmost importance in the state system and, as such, the regulators are willing to face the uncertainties of risk assessment and opt for intelligent guesses based on the best scientific information available, rather than sacrificing air quality and suppressing uncertainties in a BAT system. The second state goal is improving long-term air quality by encouraging scientific innovation and variation in control technology at the industry level. In implementing an individualized facility-by-facility approach, only those facilities in need of controls install them; this method of regulation is not only cost-effective but also resource-conscious. Finally, the state program advocates the use of a scientific panel to review listed TAPs and research possible air toxics in trying to assure that the EMC will revise present standards upon receipt of new scientific data and that facilities will install new control technology as needed.

North Carolina should retain its regulations in conjunction with the federal statutes because the state regulations offer a bold, individualized approach to health-based environmental regulation with a view to cost-effectiveness and opportunity for limited variances for economic or technological infeasibility. North Carolina's decentralized regulations can address specific problem areas that the federal system of uniform standards may overlook. While the North Carolina regulations set ambient air concentration guidelines, the CAA amendments require emission reduction based on MACT standards. Theoretically, neither regulatory system excludes the other and industries can comply with both.[204] Keeping the state's health-based interests in mind, the DEM should

204. 1 HEARINGS, *supra* note 7, at I-73 to I-74 (agency response to comments). Furthermore, the state probably will adopt the EPA's standards. There should be no conflict in having two sets of standards or regulations—one for emission rates and one for ambient concentrations. *See id.*

implement the state guidelines for all sources as quickly as possible. The option to delay permit calls and subsequent regulatory control may seem attractive to the DEM now;[205] a "wait-to-see" attitude, however, subverts the original intent behind these health-based regulations. The EMC considered the possibility of concurrent federal regulations and decided that "[t]o wait for Congress to act would produce needless and unnecessary delay."[206] If the state sits on its hands and fails to implement its own program, it gives facility owners a license to pollute. Where North Carolina has the opportunity and the mechanism to control its own environmental destiny it should do so, and not rely on a federal program that contains no assurance of success.

DEANNA SCHMITT

205. Although industry predicts the permitting process will produce a bottleneck because of limited resources of the permitting staff, the EMC remains convinced that the permit calling process will spread the workload sufficiently to allow for adequate review of permits. *Id.* at I-45 to I-46.

206. *Id.* at I-73.