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*420 THE NATIONAL AMBIENT AIR QUALITY STANDARDS FOR OZONE

For the past 45 years, the EPA has set uniform national ambient air quality standards for common pollutants pursuant to the mandate of the Clean Air Act. The pollutant that has been the most difficult to control is ozone. Much of the nation's population lives in areas that fail to meet the health-based standards for this pollutant. Ozone nonattainment areas include most of California and the Northeast corridor from Northern Virginia to New York, as well as many of the largest metropolitan areas throughout the nation. Over the years, updated ozone standards have become increasingly stringent, which is resulting in a backlash over the cost of compliance. The compliance requirements are particularly challenging for rural areas in the West, where imported pollution and less than ideal meteorological conditions make compliance difficult and costly. Costs have not been used when determining air quality standards, but this may not be the best policy decision. The EPA is ratcheting down the ozone standards and this will add many new nonattainment areas with new responsibilities for controlling air emissions. This can be expected to lead to more confrontation between the regulated states and the EPA.

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*422 I. National Ambient Air Quality Standards

The Clean Air Act (CAA) of 1967 required the Department of Health, Education, and Welfare (HEW) to issue air quality criteria that reflected the latest scientific knowledge of the public health and welfare effects of any pollutant listed because it reasonably was expected to endanger public health or welfare.[1] Simultaneously, an information document on air pollution

control techniques was to be released. Each state was then to develop numerical ambient air quality standards for each of its Air Quality Control Regions (AQCRs).[2] There was no expectation of national uniformity. For example, states could set stringent standards to favor public health protection or less rigorous standards to protect existing pollution sources or to attract new sources.

In the 1970 CAA Amendments,[3] the requirements for criteria and control technique documents were continued in CAA § 108,[4] but the Administrator of the Environmental Protection Agency (EPA) was now required to issue ambient air quality standards that would be uniformly applicable nationwide.[5] This resulted in the promulgation of National Ambient Air Quality Standards (NAAQS) for substances known as criteria pollutants.[6] Criteria pollutants are those that in the judgment of the EPA's Administrator would reasonably be anticipated to endanger public health or welfare.[7] The NAAQS are atmospheric air quality goals to be met through state implementation plans (SIPs) that will require the emission reductions needed to achieve the standards.

The EPA designated six criteria of air pollutants based on its authority under the 1970 Amendments to the CAA: particulates, sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), photochemical oxidants, and hydrocarbons.[8] There still are six criteria pollutants, but photochemical oxidants are now regulated as ozone ***423** (O_3),[9] lead was added in 1978, and hydrocarbons were delisted in 1983.[10] Hydrocarbons were delisted because the EPA believed that hydrocarbons have no direct adverse health effect at levels found in the ambient air.[11] However, reactive hydrocarbons, known as volatile organic compounds (VOCs), play a significant role in the creation of photochemical oxidants, and for that reason they are regulated.[12] Both reactive and non-reactive hydrocarbons contribute to the greenhouse effect and may be regulated to deal with climate change. Many hydrocarbons are also hazardous air pollutants that are regulated under CAA § 112.[13] The CAA's list of hazardous air pollutants includes benzene and many other hydrocarbons.[14] Regardless of the legal basis for controlling hydrocarbon emissions, the result is the reduction in emissions that lead to ozone formation.

The Administrator is to promulgate "primary" and "secondary" NAAQS for criteria pollutants.[15] A primary standard is one "the attainment and maintenance of which in the judgment of the Administrator, based on such criteria and allowing an adequate margin of safety, are requisite to protect the public health."[16] This includes the need to ensure the safety of "sensitive" populations including asthmatics, children and the elderly.[17] The U.S. Court of Appeals for the D.C. Circuit held that this language requires consideration of the uncertainties associated with inconclusive scientific and technical information and is intended to provide a reasonable degree of protection against hazards not yet identified.[18] Primary standards must significantly reduce adverse health effects but are not required to lower the risk to zero or limit concentrations to background levels.[19]

A secondary standard must "specify a level of air quality the attainment and maintenance of which, in the judgment of the Administrator, based on such criteria, ***424** is requisite to protect the public welfare from any known or anticipated adverse effects associated with the presence of [the] pollutant in the ambient air."[20] Effects on welfare is defined to include effects on soils, water, crops, vegetation, man-made materials, animals, wildlife, weather, visibility, and climate.[21] However, secondary standards to protect welfare have not been important because the regulations establishing national air quality standards use the same numerical values for both primary and secondary standards, except for SO_2, which has the only secondary standard that may affect the regulated community.[22] The SO_2 primary standard has an annual and a one-day standard, but the secondary standard adds a very short term 300 $\mu g/m^3$ standard not to be exceeded more than once a year during a three-hour period.[23]

Most primary standards were to be met by May 31, 1975, while secondary standards were to be achieved within a reasonable time.[24] The 1970 CAA made no provision for dealing with failures to meet the NAAQS, but in 1977 extensive amendments to the CAA created a comprehensive nonattainment program to deal with areas that failed to meet a NAAQS.[25] Under the program, the EPA divided the nation into air quality control regions in coordination with the states, and areas of the state are designated as either (1) "attainment," if the atmospheric concentration is below the NAAQS, (2) "nonattainment," if the concentration is above the NAAQS, or (3) "unclassifiable," if information is lacking.[26] The EPA treats unclassifiable areas as if they are in attainment.[27] Because many AQCRs did not meet the NAAQS, the 1977 CAA Amendments in § 172(a) extended the time to comply with the primary standards until December 31, 1982; but gives the Administrator the discretion to extend the compliance date to December 31, 1987 for nonattainment areas without available and feasible pollution control measures.[28] The 1990 CAA Amendments extended the time for compliance, with the most contaminated ozone nonattainment areas having until November 15, 2010 to meet the standard.[29]

Under CAA § 171(2), a nonattainment area means, for any air pollutant, an area designated nonattainment under CAA §

107(d).[30] The Act defines nonattainment ***425** as "any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for the pollutant."[31] Attainment areas may be redesignated as nonattainment or vice versa.[32] Nonattainment areas that are redesignated as attainment must develop a maintenance plan to ensure the area remains in compliance with the NAAQS and have the plan approved by the EPA.[33]

Each NAAQS has four components. The "indicator" defines the parameter of the substance the EPA will measure. Particulate matter (PM), for example, uses particle size to define the subject of the NAAQS. The "level" specifies the acceptable concentration in the air. The "averaging time" specifies the time span for which the pollution concentration in the air will be averaged. Annual or daily levels are commonly used. The "form" of the NAAQS describes how compliance with the level over the averaging time will be determined. It is common to specify the level will not be exceeded more than a specified number of times over a year or more. For example the $PM_{2.5}$ short-term NAAQS cannot exceed the three year average of the 98^{th} percentile of daily concentrations at each monitoring site.[34] For ozone, the EPA uses the annual fourth-highest ozone concentration of the most recent three-year average of quality-assured certified air quality data.[35] This data must be collected in compliance with the EPA's regulations that include post-collection auditing and verification requirements.[36] Because the EPA requires certification by May 1 of the year following the calendar year for which data was collected, it takes nearly four years to obtain sufficient data to designate an area as nonattainment.[37]

After a NAAQS is issued or modified, the states have a year to make recommendations to the EPA concerning areas that do not meet a NAAQS and suggest appropriate geographic boundaries and classifications.[38] If a monitor shows a violation, the presumption is that the entire Core Based Statistical Area (CBSA) or the Combined Statistical Area (formed by two or more adjacent CBSAs) are nonattainment.[39] However, the CAA requires the inclusion of areas that contribute to ***426** the air quality in a nearby nonattainment area.[40] This requires a case-by-case analysis of each nonattainment area to determine the appropriate geographical boundaries. The EPA on December 4, 2008, issued a memorandum providing guidance concerning designating areas for the purpose of implementing the 2008 ozone NAAQS that listed nine factors to be the basis for evaluation.[41] Subsequently the EPA compressed the factors into a five-factor test that evaluates 1) air quality monitoring data; 2) emissions data, population, population density and growth, traffic and commuting patterns; 3) meteorology; 4) geography/topography; and 5) jurisdictional boundaries.[42] The EPA is given considerable freedom concerning how to weigh these factors, and the courts give substantial deference to its decision.[43]

After a state submits its recommended area classifications to the EPA, the Agency must approve the submissions or modify them after giving a state at least 120 days to show why its proposal is inappropriate. However, the EPA has the final authority to classify areas[44] and it must designate nonattainment areas within two years.[45] Ozone nonattainment areas are designated as marginal, moderate, serious, severe, or extreme depending on the severity of the nonattainment.[46] The EPA issued its list of areas designated as nonattainment for the 2008 ozone NAAQS on May 21, 2012.[47] It identified forty-eight nonattainment areas in twenty-six states, the District of Columbia and Indian country that included 192 counties and part of an additional 36 counties.[48] Numerous petitions were filed challenging the nonattainment designations, but they were denied by the EPA, and its denial was subsequently upheld by the D.C. Circuit.[49]

The states have three years after the date of the EPA's final designation of a nonattainment area to develop a state implementation plan (SIP) specifying how emissions will be reduced in order to meet the NAAQS are met for each criteria pollutant.[50] Emission sources in nonattainment areas are then required to reduce emissions in order to comply with the SIP requirements within five years from the ***427** date that the area was designated, except that the Administrator can extend the compliance date.[51] The requirements for nonattainment areas were made more stringent in the 1990 CAA Amendments with specific requirements for the various criteria pollutants including extensive requirements for ozone nonattainment areas.[52]

Over the years the NAAQS have become more stringent, which has resulted in emission limits for regulated sources being adjusted in order to reach and maintain the NAAQS for each criteria pollutant. If a state fails to create an infrastructure SIP revision or the EPA disapproves the revision, the Agency has two years to issue a federal implementation plan (FIP).[53] Moreover, a state that fails to achieve attainment can be subject to sanctions including the loss of highway transportation funds and restrictions on emissions from new or modified sources.[54] CAA § 116 allows a state to impose more stringent control or abatement requirements than the federal requirements.[55]

II. Ozone

The ozone (O_3) NAAQS, which is the focus of this Article, uses ozone as an indicator of photochemical activity. Photochemical air pollution is a complex mix of many chemicals produced from atmospheric chemical reactions between NO_x, VOCs, and their reaction products. Light energy from sunlight frees an oxygen atom from NO_x that combines with oxygen in the air to form ozone, which is necessary for these reactions to occur. Ozone and free oxygen (O) further react with VOCs to produce many reaction products. As temperatures increase photochemical air pollution concentrations increase, while increases in wind speed and inversion height has the opposite effect.[56]

To prevent photochemical reactions, the CAA regulates emissions of NO_x and VOC emissions. The EPA defines VOCs to mean any compound of carbon that participates in atmospheric photochemical reactions excluding carbon monoxide, ***428** carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate.[57] The EPA also excludes chemicals it determined have negligible photochemical reactivity. This list of excluded organic compounds includes methane, ethane, methylene chloride (dichloromethane), methyl chloroform, sixteen different types of fluorocarbons, and certain types of sulfur containing perfluorocarbons.[58]

Ozone exposure results in acute effects that include lung function impairment, inflammation of the deep lung, respiratory symptoms, and limitations on the ability to perform exercise. Chronic effects may result from long-term exposure to doses below those associated with acute effects.[59] Children are more vulnerable to the adverse effects of ozone exposure because they breathe more air for their size than the average adult, and because their lungs and immune systems are still developing.

The EPA discusses the adverse impacts of ozone pollution on human health in its 2008 ozone regulation.[60] It discusses the epidemiologic studies published since its 1997 ozone NAAQS review, which continued to report associations with respiratory hospital admissions and emergency department visits, as well as additional health endpoints, including the effects of acute (short-term and prolonged) and chronic exposures to ozone on lung function decrements and enhanced respiratory symptoms in asthmatic individuals, school absences, and premature mortality. The EPA also emphasized that controlled human exposure studies of prolonged ozone exposures at levels below 80 parts per billion (ppb) (the 1997 standard) show respiratory effects, changes in lung defenses, and increased airway responsiveness; animal toxicology studies also provide information about mechanisms of action.[61] Subsequently, information became available that shows ozone pollution to be more harmful than was previously acknowledged, which is summarized in the preamble to the proposed ozone rule promulgated December 17, 2014.[62]

The 2014 review emphasizes a large number of new epidemiologic studies dealing with the effects associated with both short and long-term exposures, including new epidemiologic studies about risk factors. These studies observed adverse effects in healthy adults at 72 ppb, with lung function decrements combined with respiratory ***429** symptoms, and lung function decrements and pulmonary inflammation at 60 ppb. Epidemiologic studies show associations between short-term ozone exposures and respiratory hospital admissions and respiratory emergency department visits as well as positive associations between short-term ozone exposure and total (nonaccidental) mortality.[63] Other epidemiologic studies provide expanded evidence of a range of respiratory health effects associated with long-term or repeated ozone concentrations, including both new-onset asthma in children and increased respiratory symptom effects in individuals with asthma.[64]

The formation of secondary oxidation products in the respiratory tract involves reactions with components of the extracellular lining fluid (ELF). The secondary oxidation products transmit signals to the epithelium, pain receptive nerve fibers, and, if present, immune cells involved in allergic responses. The secondary oxidation products initiate responses of the respiratory system leading to "lung function decrements, airway obstruction, and extrapulmonary effects such as slow resting heart rate; initiation of inflammation; alteration of barrier epithelial function; sensitization of bronchial smooth muscle; modification of lung host defenses; and airways remodeling."[65] In 2006, the EPA concluded there was consistent evidence of a causal relationship between short-term ozone exposure and respiratory effects. Short-term increases in ambient ozone concentration was consistently associated with decreases in lung function in populations with increased outdoor exposures, especially healthy children as well as those with asthma.[66] Subsequent studies support and expand upon the strong body of evidence that indicate a causal relationship between short-term ozone exposures and respiratory health effects.[67]

A large number of controlled human exposure studies reported ozone-induced lung function decrements in healthy young adults engaged in intermittent, moderate exertion following 6.6 hours of exposure to ozone concentrations at or above 80 ppb. "The most important of these recent studies reported a statistically significant increase in airway inflammation in healthy adults at moderate exertion following exposures to 60 ppb O3, the lowest concentration that has been evaluated for inflammation."[68] Scientific studies concerning the effect of ozone on the cardiovascular system indicates that short-term

exposure can lead to autonomic nervous system alterations (in heart ***430** rate and/or heart rate variability).[69] Animal toxicological studies demonstrate ozone-induced cardiovascular effects and support the strong body of epidemiologic evidence indicating ozone-induced cardiovascular mortality.[70] New studies reported consistent positive associations between short-term ozone exposure and nonaccidental mortality, with mortality increasing during the warm season.[71]

Children are considered to be at greater risk from ozone exposure because their respiratory systems undergo lung growth until about eighteen to twenty years of age and are therefore thought to be intrinsically more at risk for ozone-induced damage.[72] "One study indicated that within high O3 communities, asthma risk was 3.3 times greater for children who played three or more outdoor sports as compared with children who played no sports."[73]

Crops exposed to ozone have reduced yields of one to twenty percent. Major crops that are sensitive to ozone are corn, cotton, peanuts, soybeans, and wheat. Ozone pollution also adversely impacts trees; it is the primary cause of the decline of the eastern white pine in the eastern United States and the ponderosa and Jeffrey pines in southern California. Significant adverse effects become noticeable in exposed plants at ozone levels of 0.05 parts per million (ppm) to 0.08 ppm.[74]

The bottom line concerning the health effects studies is that the level at which harm is detected continues to move lower, and it becomes more difficult to conclude there is a threshold below which harm does not occur. Moreover, developments in the field of genetics point to genetic predisposition to harm for some individuals, which makes the basis for using thresholds suspect.[75]

III. Ozone NAAQS

In 1971, the adverse impacts of atmospheric ozone levels led the EPA to establish primary and secondary NAAQS at a level of 0.08 ppm, one-hour average, total photochemical oxidants, not to be exceeded more than one hour per year.[76] ***431** Amendments in 1977 to the CAA require the Administrator "not later than December 31, 1980, and at five-year intervals thereafter, to complete a thorough review of the criteria published under § 108 and the national ambient air quality standards ... and shall make such revisions in such criteria and standards and promulgate such new standards as may be appropriate ..."[77] This section imposed a mandatory duty on the EPA to review standards, but does not require the agency to revise the standards.[78] Rulemaking procedures apply if the EPA acts to revise a standard.[79] The CAA also requires that a scientific review committee be appointed to review criteria and standards and recommend appropriate revisions to the Administrator.[80] This committee, the Clean Air Scientific Advisory Committee (CASAC), is a standing committee of the EPA's Science Advisory Board.

The EPA rarely complies with the five-year review requirement. It takes the Agency up to twenty-five years to complete a NAAQS review.[81] Ten or more years elapsed between twelve of the last sixteen reviews. Fifteen of the reviews were completed under a deadline compelled by a consent decree or a court order based on a citizen suit.[82] Ozone NAAQS reviews, discussed below, were completed in 1979, 1997, 2008 and October 1, 2015.

On April 15, 1977, the EPA announced its first periodic review of the NAAQS for photochemical oxidants.[83] On February 8, 1979, the EPA announced revisions to the primary and secondary standards from 0.08 to a more relaxed 0.12 ppm (235 $\mu g/m^3$) one-hour ozone standard.[84] The EPA also made the primary and secondary standards identical, changed the chemical designation of the standards from photochemical oxidants to ozone (O_3), and revised the definition of the point at which the standard is attained to "when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is equal to or less than one ...."[85] The number of days with maximum hourly concentrations above the standard ***432** is determined for each year and then is averaged over the preceding three years. Thus, a violation occurs on the fourth day the NAAQS is exceeded over a three-year period.[86] This less stringent ozone standard was upheld in *American Petroleum Institute v. Costle*.[87] The court held that attainability and technological feasibility are not relevant considerations in the promulgation of the NAAQS, and the EPA does not need to tailor the NAAQS to fit each region or locale.[88]

In 1983, the EPA initiated another review of the ozone NAAQS.[89] Under the CAA, the EPA had until December 31, 1990, to make another decision to revise the NAAQS or retain the existing standard. After the EPA failed to act it was sued on October 22, 1991, by the American Lung Association, five Northeastern states, and two environmental groups. In *American Lung Ass'n v. EPA*, the EPA was placed under a consent order to publish a final decision by March 1, 1993.[90] The EPA was under pressure to promulgate a more stringent ozone standard because studies from the EPA's Clinical Research Laboratory

showed adverse health effects at exposure levels below the ozone standard of 0.12 parts per million. However, President George H.W. Bush's Office of Management & Budget (OMB) pressured the EPA to reaffirm the existing ozone standard because of the high costs associated with meeting a more stringent standard. The EPA proposed to keep the existing ozone standard while continuing its scientific evaluation.[91] On March 9, 1993, the EPA announced it did not plan to finalize its review of the NAAQS for ozone before 1997, and it would retain the existing primary and secondary standards.[92] By that time the Agency was engaged in its third review of the ozone NAAQS.[93] On February 3, 1994, the EPA announced its plan to review the ozone standard and published a schedule for the review process that projected a promulgation of a new standard in mid-1997, if appropriate.[94]

***433** On November 20, 1996, the EPA announced its proposed decision to revise the ozone and particulate matter NAAQS.[95] On July 18, 1997, the EPA promulgated its final rule to revise the NAAQS for ozone.[96] The EPA replaced the one-hour primary standard for ozone with an eight-hour standard of 0.08 ppm based on the three-year average of the annual fourth-highest daily maximum eight-hour average ozone concentrations measured at each monitor within an area. A new secondary standard was provided that was identical to the primary standard. Because the ozone measurement is rounded to three decimal places, the ozone standard effectively was 0.084. In this decision, the EPA stated that a more stringent standard of 0.07 ppm would be close to background concentrations that infrequently occur in some areas due to nonanthropogenic sources of ozone precursors.[97] The 1997 ozone NAAQS was revoked on February 13, 2015 by a new rule that includes anti-backsliding requirements for areas that remain nonattainment for the 0.08 ppm standard, which is discussed below.[98]

While the 1997 ozone rule has been revoked, the *American Trucking Ass'n v. EPA,* case concerning the rule remains an important precedent.[99] On May 14, 1999, a panel of the U.S. Court of Appeals for the District of Columbia Circuit decided the consolidated case--*American Trucking Association v. EPA*.[100] The case was divided into four parts with subparts to deal with a variety of CAA issues. In Part I, Judges Williams and Ginsburg held that the PM and ozone NAAQS were promulgated as an unconstitutional delegation of legislative power. Judge Tatel dissented. This was the most controversial aspect of this case and caused the case to receive a great deal of attention. It is the only part of the decision that was not unanimous.

The court held that the EPA's construction of CAA §§ 108 and 109 was so loose that it rendered the EPA's interpretation an unconstitutional delegation of legislative power. The court was concerned that the Agency had articulated no "intelligible principle" to explain the weight to be given to the factors used in determining the degree of public health concern associated with different levels of ***434** ozone and PM, nor is a principle apparent from the statute. The specific problem of concern to the court was that for non-threshold pollutants, such as PM and ozone, the EPA can set a standard using any value above zero. A non-threshold pollutant is one for which no concentration above zero exists that does not have associated health risks. The EPA, said the court, lacks "any determinate criterion for drawing lines. It has failed to state intelligibly how much is too much."[101] The court did not express concern regarding the criteria used by the EPA--the severity of effect, the certainty of the effect, and the size of the population affected. The court's concern was the lack of constraint on the EPA's power "to pick any point between zero and a hair below the concentration yielding London's Killer Fog."[102]

While the court held that the statute and the EPA's interpretation involved an unconstitutional delegation, the court only remanded the issue to give the Agency "an opportunity to exact a determinate standard on its own."[103] The court opined that if the agency develops a binding standard, it is less likely to exercise delegated authority arbitrarily, and a standard enhances meaningful judicial review.[104] Thus, the court decided the EPA's regulation could be salvaged if the Agency adopted "intelligible principles."[105] In doing this, the EPA is barred by CAA § 109(b)(1) from considering any factor other than "health effects relating to pollutants in the air."[106] "EPA should be capable of developing the rough equivalent of a generic unit of harm that takes into account population affected, severity and probability. Possible building blocks ... might be found in the approach Oregon used in devising its health plan for the poor."[107]

The dissent by Judge Tatel emphasizes the half-century of nondelegation jurisprudence since *A.L.A. Schecter Poultry Corp. v. U.S.*[108] He cited numerous cases that have sustained equally broad delegations to other agencies. Moreover, the CAA must set NAAQS at levels "requisite" to protect public health with "an adequate margin of safety."[109] The EPA identified significant health effects using the guidelines published by the American Thoracic Society and set the NAAQS within ranges recommended by the Clean Air Scientific Advisory Committee (CASAC) created pursuant to CAA § 109(d)(2). Thus, the Agency did not act arbitrarily and Congress has articulated ***435** intelligible principles as is required by the U.S. Constitution.[110]

Parts II through IV of the opinion were decided unanimously. Part II upheld the EPA's refusal to consider costs. The court also upheld the EPA's position that it did not have to comply with NEPA's requirements when setting NAAQS. In Part III the court held that the EPA was precluded from enforcing its revised primary ozone NAAQS except in accordance with the ozone nonattainment provisions found in CAA Subchapter one, Part D, Subpart 2. Thus, although the EPA may promulgate a revised ozone NAAQS and designate an area nonattainment pursuant to CAA § 107(d)(1)-(2), it cannot require areas to comply with the 0.12 ppm ozone NAAQS more quickly than provided in the 1990 CAA Amendments in Part D, Subpart 2. The EPA also cannot require compliance with a more stringent ozone NAAQS than provided in Subpart 2. Thus, CAA § 181 provides the attainment dates for all areas designated pursuant to CAA § 107(d)(1). CAA § 181(a)(1) refers only to primary standards. Therefore, the EPA cannot require compliance with a secondary standard prior to an area's attainment of the 0.12 ppm standard. After an area meets the primary standard, however, the EPA can require compliance with a revised secondary ozone NAAQS "as expeditiously as practicable."[111] Another issue addressed in Part III involved the meaning of § 108(a)(2)'s reference to "all identifiable effects."[112] The court interpreted this provision to require the EPA to consider a pollutant's positive effects as well as its negative effects.[113] The EPA must assess a pollutant's net adverse effect.

Part IV of the opinion dealt with PM. The case involved both fine particulates (those with diameters of less than 2.5 micrometers) and coarse particulates (those with diameters between 2.5 and 10 micrometers). The court upheld the EPA's right to regulate coarse particles, but the court denied the EPA's right to use PM_{10} as the coarse particle indicator because the amount of pollution allowed will depend arbitrarily on the amount of $PM_{2.5}$ in the air.[114] If a separate $PM_{2.5}$ standard is to be used, then larger pollutants, if they are to be regulated, must be based on a $PM_{2.5\text{-}10}$ measurement to avoid double regulation of the $PM_{2.5}$ component.[115]

In summary, the D.C. Circuit did not declare any law unconstitutional. It merely remanded a rule to the Agency to articulate a test for determining the standard for non-threshold pollutants. The majority and the dissent provide guidance on how ***436** this should be accomplished, but the EPA could come up with the same numbers for the ozone standard if it develops an appropriate methodology. Thus, Part I of the decision was similar to many cases that have been remanded based on an arbitrary and capricious standard. Part II of the decision was a win for the EPA. The Agency's restrictive interpretation of when NEPA, the UMRA, and the RFA apply to the EPA's rulemaking was upheld. Part III of the decision could significantly limit the creation of a new ozone NAAQS. If sources are not required to meet more stringent ozone NAAQS by CAA § 181, the EPA's right to promulgate a more stringent NAAQS loses some of its value.

On May 22, 2000, the U.S. Supreme Court granted the Government's petition to review the remand of the ozone and particulate standards at issue in the *American Trucking* case. On May 30, 2000, the U.S. Supreme Court granted an industry petition for review of *American Trucking* to include the issue of whether costs should be considered by the EPA when setting health standards under the CAA. This allowed the U.S. Supreme Court to review *Lead Industries Ass'n v. EPA,*[116] which held that the EPA must ignore all non-health factors, including costs, when setting NAAQS.

On February 27, 2001, the U.S. Supreme Court decided *Whitman v. American Trucking Ass'n.,* which held the EPA's action in setting NAAQS was not an unconstitutional delegation of authority.[117] The Court held "[s]ection 109(b) does not permit the Administrator to consider implementation costs in setting NAAQS. Because the CAA often expressly grants the EPA the authority to consider implementation costs, a provision for costs will not be inferred from its ambiguous provisions."[118] The Court also held that the EPA's approach, which did not provide a role for Subpart 2 in implementing the eight-hour NAAQS, was unreasonable. The Court said the EPA could not ignore the Subpart 2 requirements that limit the discretion given to the Agency by Subpart 1. The Court went on to identify parts of the CAA's classification scheme that are "ill-fitted" to the revised standard and then remanded the implementation strategy to the EPA to develop a reasonable approach for implementing a revised ozone standard.

This case is commonly considered to prohibit consideration of costs when establishing NAAQS. However, Professors Livermore and Revesz point out that the attorney for both sides of the argument, as well as the Court assumed that a cost-***437** benefit analysis would result in less stringent requirements.[119] Livermore and Revesz make a compelling argument that consideration of costs would result in more stringent NAAQS for lead, particulates, nitrogen dioxide, and sulfur dioxide, but not for ozone.[120] They argue the EPA should use both a health-based analysis and a cost-benefit analysis and select the more stringent result as the NAAQS.[121] In a subsequent blog, they argue that the benefits of ozone are so great that a more stringent ozone rule would be economically justified.[122]

The case was remanded to the D.C. Circuit to address the issues remaining in the case. Numerous parties participated in a

consolidated case. The D.C Circuit, on March 26, 2002, in ATA III, rejected the specific challenges made by petitioners that remained unresolved by the prior litigation and upheld the EPA's selection of the 0.08 ppm numerical value for the eight-hour-average ozone NAAQS in the 1997 ozone rule. The court found the challenged air quality standards were neither arbitrary nor capricious and denied "the petitions for review except to the extent the Supreme Court's and our earlier decisions require further action by the EPA."[123] The court made clear that the support for the standard was the health evidence of insufficient protection afforded by the then-existing standard and the information supporting the change to an eight-hour averaging time.[124] The court upheld the EPA's decision not to select a more stringent level for the primary standard because health effects of ozone are less certain at low concentrations.[125] After additional study of the health effects of ozone, the EPA reaffirmed the eight-hour ozone NAAQS set in 1997 on January 6, 2003.[126]

On April 30, 2004, the EPA promulgated a final rule that listed each AQCR and its status as attainment or nonattainment for the new eight-hour ozone standard.[127] On the same day the EPA promulgated a Final Rule To Implement the Eight-Hour ***438** Ozone National Ambient Air Quality Standard Phase I.[128] The 2004 rule to implement the eight-hour ozone standard was vacated and remanded by the D.C. Circuit in *South Coast Air Quality Management District v. EPA*.[129] State and environmental petitioners challenged the EPA's resolution of the gap between Subparts 1 and 2. The court held the EPA's rule violates the CAA insofar as it subjects areas in excess of the one-hour standard to Subpart 1. The court, however, upheld the EPA's eight-hour values as not being arbitrary or capricious. The EPA's use of the bump-up provision of § 181(b)(3) for areas that cannot meet the attainment deadline was upheld, and the Agency's authority to revoke the one-hour standard was upheld, as long as adequate anti-backsliding provisions were included. The court went on to conclude that the controls subject to the backsliding requirement of § 172(e) include the one-hour penalties, rate-of-progress milestones, contingency plans, motor vehicle conformity demonstrations, and NSR requirements.

On June 15, 2005, the EPA revoked the one-hour ozone standard for all areas except fourteen areas that were Early Action Compact Areas as provided in 40 C.F.R. § 50.9(b). All other one-hour designations were removed from 40 C.F.R. Part 81 but were retained in Subpart C of Part 81 for purposes of the anti-backsliding provisions of 40 C.F.R. § 51.905. On July 26, 2005, the EPA issued a final rule identifying the designation and classification status of areas throughout the country covered by the one-hour ozone NAAQS as of June 15, 2004.[130] The designations of attainment/nonattainment status under the more health protective eight-hour ozone standard became effective for most areas of the country. The rule also codifies the revocation of the national air quality standards for one-hour ozone. On June 8, 2007, the D.C. Circuit denied five petitions for a rehearing on the remand of the final rule implementing the eight-hour ozone NAAQS. The court, however, did clarify and modify the scope of its decision concerning the 2004 rule.[131]

The EPA commenced the fourth periodic review of the ozone NAAQS in September 2000.[132] On July 11, 2007, the EPA proposed to revise the level of the primary standard within a range of 0.070 to 0.075 ppm.[133] The Agency's scientific ***439** advisors urged the EPA to adopt a 0.060 ppm standard. However, the EPA promulgated a final rule on March 27, 2008 that revised the NAAQS by lowering the level of the eight-hour primary ozone standard from 0.08 ppm to 0.075 ppm (adopting a standard expressed to three decimal places for the first time) and adopting a secondary standard identical to the revised primary standard.[134] In May 2008, fourteen states, as well as environmental organizations and industry groups filed a lawsuit that challenged the ozone rule.[135] However, on January 19, 2010, the EPA issued a notice of proposed rulemaking to reconsider the 2008 final decision.[136] The Agency proposed to decrease the level of the 2008 eight-hour primary standard from 0.075 ppm to a level within the range of 0.060 to 0.070 ppm, and to change the secondary standard to protect plants and animals. It proposed a new cumulative, seasonal standard expressed as an annual index of the sum of weighted hourly concentrations, cumulated over twelve hours per day (8 a.m. to 8 p.m.), during the consecutive three-month period within the ozone season. The maximum index value is to be set at a level within the range of seven to fifteen ppm-hours. After delays within the Administration, the EPA decided to defer the decisions involved in the reconsideration until it completed a new periodic review.

In 2012, the EPA designated forty-six areas as being in violation of the 2008 NAAQS standard.[137] Thirty-six areas were classified as Marginal, which requires compliance with the 2008 standard by July 20, 2015.[138] This resulted in challenges to the designation, which included claims that the EPA ignored updated air quality data and the requirements imposed on the states violated the Tenth Amendment.[139] The D.C. Circuit rejected the challenges on June 2, 2015.[140] The court's decision also upheld the designation of the Uinta Basin in Utah as unclassifiable because the data is incomplete.[141] However, because the basin is the location of much of the state's oil and gas operations, it is likely the area will soon be designated nonattainment for ozone.[142]

***440** On July 23, 2013, the D.C. Circuit, in *State of Mississippi v. EPA,* finally ruled on litigation challenging the 2008 final rule that had been stayed pending the EPA's further consideration.[143] The court upheld the 2008 primary ozone standard, but remanded the 2008 secondary standard to the EPA. It held the EPA reasonably determined that the existing standard was not requisite to protect public health with an adequate margin of safety, and consequently required revision, and it approved the weight of the evidence approach utilized by the EPA in its deliberations.[144] Moreover, the court rejected the need for the EPA to adopt a more stringent primary standard.[145] However, the court held the secondary standard did not comply with the CAA because the EPA failed to identify a level of air quality requisite to protect public welfare, which resulted in the remand of the standard to the EPA.[146] The Supreme Court denied *cert* on October 6, 2014.

The EPA's final rule addressing a range of implementation requirements for the 2008 ozone NAAQS was promulgated on March 6, 2015.[147] The implementation rule also deals with the aspects of the 2008 ozone NAAQS that was held to exceed the EPA's authority.[148] Environmentalists have filed a lawsuit in the D.C. Circuit questioning the legality of various provisions in the implementation rule.[149] In addition, environmentalists are threatening to sue the EPA for its failure to approve or disapprove state SIP revisions of the interstate transport requirement as well as its failure to promulgate Federal Implementation Plans for states that failed to meet their SIP submission obligations.[150] Moreover, a consent decree concerning the 2008 ozone NAAQS was announced February 5, 2015, which provides for the Agency to act on twenty-four SIP revisions for ozone on specified dates in 2015 and 2016.[151]

Although the 2008 ozone NAAQS has yet to be fully implemented, the EPA announced a proposed rule for a revised ozone NAAQS on December 17, 2014.[152] ***441** The Agency is acting pursuant to a federal court order to make a final determination by October 1, 2015.[153] The 2014 proposed rule would revise the ozone NAAQS of 0.075 ppm to better protect public health with an adequate margin of safety. The EPA proposed to retain the ozone averaging time (eight-hours) based on the annual fourth-highest daily maximum, averaged over 3 years, but it proposed to revise the standard within the range of 0.065 ppm to 0.070 ppm in to increase public health protection for "at-risk" populations such as children, older adults, and people with asthma or other lung diseases. Because the CASAC recommended a range of levels from 0.060 ppm to 0.070 ppm, and levels as low as 0.060 ppm could potentially be supported, the EPA asked for comments on retaining the existing standard as well as on alternative standard levels below 0.065 ppm, and as low as 0.060 ppm.[154] The EPA also proposed changes to the Air Quality Index (AQI) that would make an AQI value of 100 equal to the level of the eight-hour primary ozone standard, and it proposed adjustments to the AQI values of 50, 150, 200 and 300.[155]

The proposed rule would also revise the secondary standard to provide increased protection against vegetation-related effects on public welfare.[156] The EPA proposed to use a three-year average seasonal W126 index value, based on the three consecutive month period within the ozone season with the maximum index value, with daily exposures cumulated for the twelve-hour period from 8:00 a.m. to 8:00 p.m., within the range from thirteen ppm-hrs to seventeen ppm-hrs. This would be achieved by revising the secondary standard level to a value within the range of 0.065 to 0.070 ppm.[157]

To meet the proposed standards, the EPA plans to continue its efforts to impose controls on existing power plants, implement the Tier 3 motor vehicle emissions standards, and to work with states to address interstate transport of ozone and its precursors. The proposed rule would revise data handling conventions for ozone and revise regulations for the Prevention of Significant Deterioration (PSD) permitting program to grandfather some pending permits from the proposed revisions to the ozone NAAQS. It would also remove obsolete regulatory language associated with expired exceptional event deadlines for historical standards for both ozone and other NAAQS pollutants.[158] Because of the high costs associated with the proposed regulation, bills were introduced in the House and Senate to delay the imposition of a ***442** new ozone NAAQS or block a new rule until 85% of the nation's counties classified as nonattainment attain the 2008 standard.[159]

On August 19, 2015, the EPA proposed to take one of three actions for the thirty-six nonattainment areas classified in 2012 as Marginal for the 2008 ozone NAAQS. EPA proposed to recognize seventeen areas as being in compliance with the 2008 ozone standard.[160] However, these areas remain nonattainment until a state requests redesignation to attainment, prepares a ten-year maintenance plan, and obtains the EPA's approval. Eight areas failed to attain the 2008 ozone standard, but the EPA proposed to grant one-year extensions for compliance. Eleven areas did not attain the 2008 ozone standard and would be reclassified as Moderate with an attainment date of July 20, 2018.[161]

On October 1, 2015, the EPA Administrator concluded that the 2008 ozone standard of 75 ppb does not protect the public health and was changing the ozone NAAQS to 70 ppb, which will meet the legal requirement to set standards with an adequate margin of safety.[162] EPA acknowledged it cannot consider costs, but provided an analysis of the benefits and costs as

required by Executive Orders 12866 and 13653 and guidance from the White House Office of Management and Budget (OMB).[163] The Agency estimates the benefits at $2.9 to $5.9 billion annually in 2025 with estimated costs of $1.4 billion.[164] California benefits and costs were calculated separately with costs estimated post-2025 at $800 million and benefits estimated at $1.4 billion.[165] The EPA plans to prepare implementation rules and guidance documents over the next year. In addition, the EPA is developing guidance to address the Exceptional Events Rule criteria for wildfires.[166] The EPA also strengthened the secondary standard to 70 ppb based on the fourth highest maximum daily eight-hour ozone concentration per year, averaged over three years.[167] This "will limit the ***443** cumulative, seasonal exposures above a W126 index level of seventeen ppm hours."[168] Averaged over three years. The EPA claims that states will be able to meet the ozone targets by complying with existing and proposed federal rules.[169]

IV. Costs

The CAA's language concerning NAAQS is ambiguous concerning costs; the statute does not mention costs but provides for standards that in the judgment of the Administrator allow an adequate "margin of safety" "requisite to protect public health."[170] However, the D.C. Circuit in 1999 addressed the role of costs in *American Trucking Ass'n v. EPA* when it held they were not to be considered,[171] and its holding was affirmed by the U.S. Supreme Court.[172] Nevertheless the issue has reemerged as a major concern of the regulated community because the EPA's revisions of the NAAQS results in difficult compliance problems as well as high costs to the regulated community.[173]

There can be little argument that the CAA has improved air quality. Ambient ozone levels in the U.S. decreased by 33%, according to the EPA, from 1980 to 2013, based on an eight-hour measurement; they decreased by 18 % since 2000. At the same time, precursor emissions of nitrogen oxides decreased 52% and volatile organic compounds (VOCs) decreased 53%.[174] Between 2003 and 2013 air toxic emissions declined by 53%,[175] and some of this decline represents reductions in toxics that are VOCs. The decrease in emissions occurred while the U.S. population grew by 39% from 1980 to 2012, vehicle miles traveled increased 94%, and total U.S. energy use increased 24%.[176] The success of the program, however, has resulted in high costs for marginal additional improvement in air quality. This has resulted in efforts to change the law concerning the evaluation of costs when developing NAAQS.

***444** CAA § 312(a) requires the EPA to perform a cost-benefit analysis to assess the effects of the Act on the "public health, economy, and the environment of the United States."[177] The EPA's first report to comply with § 312, THE BENEFITS AND COSTS OF THE CLEAN AIR ACT, 1970 TO 1990, was released in October 1997. Its major conclusion was that the CAA was responsible for a decline of 40% in electric utility SO_2 emissions from 1970 to 1990, a 75% reduction of total particulate emissions from industrial and utility smokestacks, reductions from motor vehicles of 50% for CO, 30% for NO_x, 45% for VOCs, and a near elimination of lead emissions.[178] The estimated value of these benefits ranged from $5.6 to $49.4 trillion with a mean of $22.2 trillion. The costs of compliance with the CAA, including both private and public sectors cost, totaled $523 billion. Both benefits and costs were expressed in 1990 dollars. The EPA claims benefits exceeded costs from 1970 to 1990 by a factor of more than forty-two.[179]

The 1997 report was followed by a March 2011 report titled THE BENEFITS AND COSTS OF THE CLEAN AIR ACT FROM 1990 TO 2020.[180] This report projects the costs of meeting CAA requirements will rise to $65 billion by 2020, and the economic value for health and welfare benefits will rise to $2 trillion.[181] The most significant benefits and costs are related to the control of fine particulates and ground-level ozone, with an additional $6 billion expected to be expended for local controls by 2020 to meet NAAQS.[182] The road motor vehicle and fuel program will cost $28 billion ($11.2 billion to meet fuel composition requirements) in 2020, which is the dominant cost. This is nearly three times the cost of the second most costly program--control of electric generating units that is projected to cost a little over $10 billion.[183] Meeting the eight-hour ozone standard was estimated to be particularly expensive with an estimated cost of $15,000 per ton for additional reductions using control technology that is unknown at an incremental cost estimated at $13 billion.[184] Nevertheless, the EPA concluded the benefits of the CAA's programs exceed the costs by a wide margin.[185]

***445** The October 1, 2015 change to the ozone NAAQS will significantly increase the cost of compliance. The cost of the 70 ppb ozone NAAQS is estimated by the EPA at $1.4 billion annually in 2025, excluding California,[186] which is considerably less than the $3.9 billion estimated in the proposed rule.[187] In California post-2025 costs would add $800 million for a 70 ppm standard, which is the same estimate as the proposed rule.[188] The cost estimates, however, may be affected by technological improvements over the time allowed for implementation, which can be up to twenty years. In addition, overall costs are

affected by the costs attributable to the unknown technologies that will be needed to meet the standards.

Costs to state air quality agencies will also increase because the EPA expanded the length of the ozone season. Monitoring ozone levels is only required during the seasons of the year that are conducive to its formation, which differ by location based on factors such as ambient temperature, strength of solar insolation, and length of day differ by location. In some states the ozone season is four months long. In states with warm climates such as California, Nevada, and Arizona, ozone monitoring is required year-round. The EPA proposed extending the time that states must monitor ambient levels of ozone based on whether there is a reasonable possibility that ozone levels will approach the threshold levels of 0.060 ppm.[189] The season would be extended one month for twenty-two states and the District of Columbia, one and one half months for Wisconsin, and two months for Indiana, Michigan, Montana, Florida, and North Dakota. South Dakota would have the monitoring season extended by four months; Colorado's season would be extended by five months; Wyoming's season would be extended two months by adding three months at the beginning of the ozone season and removing one month at the end of the season; Utah's season would be extended by seven months.[190] Colorado, Wyoming, and Utah will have an extended ozone season because these states have high wintertime ozone levels when snow is on the ground.[191] These changes are found in the final regulation.[192] However, the EPA ***446** estimates the incremental cost of extending the ozone season at only $230,000 per year.[193] At this time, the details of the new monitoring requirements are not clear, but the EPA intends to finalize rules and guidance to assist areas needing to implement the revised standards by October 1, 2017.

Despite the high costs of controlling ozone precursors, the EPA claims the benefits vastly exceed the costs based on the significant health benefits that it valued in the proposed regulation at at $6.4 to $13 billion annually in 2025 for a 70 ppb standard[194] and $2.9 to 5.9 billion in the final regulation.[195] Meeting the standards in California would add to the nationwide benefits after 2025 benefits valued by the EPA at $1.1 to $2 billion annually for the 70 ppb standard[196]and valued at $1.2 to $2.1 billion annually in the final rule.[197] The benefits include the prevention of several detrimental effects: 320 to 660 premature deaths; 340 cases of acute bronchitis in children; 630 asthma-related emergency room visits; 230,000 asthma attacks in children; 160,000 days when children miss school; and 28,000 missing work days.[198] These numbers differ from the adverse health effects found in the proposed regulation.[199] After the EPA estimates the health injuries prevented, it monetizes the benefits by adopting a dollar value for each type of injury prevented and then adjusts the total benefits to present values using a discount rate of 3% and 7%.[200] For example, a nonfatal myocardial infarction of a patient age 55-65 is estimated to have a cost of $210,000 in 2011 dollars.[201] A minor restricted activity day is valued at $71 in 2011 dollars.[202] The EPA has a sophisticated protocol for making these estimates, but they remain educated guesses. However, there may be some double counting of benefits because many of the emission control programs, discussed below, are justified based on the benefits of reduced ozone precursor emissions used to justify the NAAQS standard.

Lowering the ozone NAAQS to 70 ppb will result in more counties becoming ***447** nonattainment areas for ozone.[203] This will require SIPs to be revised to address the need to reduce emissions in the new nonattainment areas. Increases in temperature due to climate change are expected to lead to increased atmospheric ozone concentrations.[204] The largest seasonal average values of background occur in the intermountain western U.S. and modeling indicates that U.S. anthropogenic emission sources are the dominant contributor to the majority of modeled ozone exceedances of the NAAQS across the U.S.[205]

For much of the West, background levels for ozone are between 55 and 60 ppb.[206] However, background ozone levels can exceed 70 ppb due to stratospheric intrusions of ozone, wildfire ozone plumes, or long-range transport of ozone from sources outside the U.S.[207] Stratospheric ozone intrusions occur when stratospheric air that has a high ozone concentration descends toward the earth's surface, which frequently occurs in the spring at high altitudes in the West following La Nina conditions in winter in the Pacific Ocean.[208]

A long history of fire suppression by the federal government has led to a six-fold increase in the past four decades of the number of acres burned in Western U.S. wildfires, and the annual acreage burned is expected to increase due to climate change.[209] Between 1984 and 2011 there were nearly 7,000 wildfires in the area from Nebraska to the West Coast that burned at least 1,000 acres.[210] In 2011 there were 507 large wildfires in the West that burned 5.4 million acres, and both the number and the size of the fires are increasing.[211] The 2015 fire season may be the worst on record. Local activity plays a less significant role in determining the ozone concentration in the Western states than it does in the Eastern states because emissions from Asia, Mexico, and Canada contribute to ozone formation in the region.[212] A nonattainment area that would have met the NAAQS but for international transport of air pollutants ***448** can petition the EPA to designate the area as attainment.[213] However, this provision has been used in only two border areas.[214] As the NAAQS become more stringent the

percentage of the emissions transported from outside the state increases, which makes it increasingly difficult for the states to find intrastate sources to control.[215]

In the Eastern United States, background ozone levels are modest.[216] Where background concentrations are large relative to the impact of controllable man-made sources of NOX and VOC emissions within the U.S. effective control is difficult or impossible, especially in locations with few remaining opportunities for local emission reductions.[217] The CAA does not authorize a blanket exclusion from the basic application of an air quality management regime because an area is significantly impacted by background ozone.[218] However, because the ozone standards have been lowered to 70 ppb, the areas that would most likely be affected are rural locations in the western U.S.[219] Moreover, the D.C. Circuit has held the EPA need not tailor the NAAQS to fit each region or locale, pointing out that Congress was aware of the difficulty in meeting standards in some locations and had addressed this difficulty through various compliance related provisions in the CAA.[220]

While costs are not to be considered in developing NAAQS, most federal emission standards, applicable to stationary or mobile sources, require compliance requirements be based on a consideration of costs. For example, new or modified stationary sources are required to meet a standard of performance "through the application of the best system of emission reduction which (taking into account the cost of achieving such reduction and any non-air quality health and environmental impact and energy requirements) the Administrator determines has been adequately demonstrated."[221]

Major new or modified sources in nonattainment areas are subject to the New Source Review (NSR) construction permit program.[222] This includes the need to ***449** comply with the lowest achievable emission rate (LAER) and offset their emissions.[223] LAER is an emission standard that reflects the most stringent standard contained in the SIP of any state or the most stringent standard achieved in practice, whichever is the more stringent.[224] As new nonattainment areas are created due to more stringent ozone NAAQS, major sources that have major modifications will need to comply with NSR program, although they may have been originally permitted under the less stringent Prevention of Significant Deterioration Program. Moreover, new and modified major sources in nonattainment areas are required to obtain offsetting reductions from another facility in the area that have voluntarily reduced emissions below the permitted level.[225] Such offsets, particularly in rural areas, may be unavailable or very costly.

Existing sources in nonattainment areas are subject to reasonably available control technology (RACT) requirements.[226] Sources in areas that previously were in attainment will now face the need to comply with new emissions reduction requirements. Information concerning available emission control technology is available from the EPA through its RACT/BACT/LAER clearinghouse.[227] For VOC sources, the EPA is to issue control techniques guidelines that reflect the best available control measures.[228] For ozone nonattainment areas the EPA is to provide guidance to the states concerning the cost-effectiveness of various options for the control of emissions from stationary sources that contribute to the nonattainment status.[229]

The National Emissions Standards for Hazardous Air Pollutants is a CAA program aimed at regulating over 180 hazardous air pollutants emitted by stationary sources.[230] Major new and existing stationary sources of hazardous air pollutants must meet emission limits based on the maximum degree of emissions reduction achievable (known as MACT) that are achievable based taking into considerations the cost and any nonair quality health and environmental impacts and energy requirements.[231] Major sources are those that emit or have the potential to emit ten tons per year (tpy) of a hazardous air pollutant (HAP) or twenty-five tpy of any combination of HAPs.[232] MACT standards for new sources must reflect the emissions limitations achieved by ***450** the best controlled similar sources; existing sources must control emissions as effectively as the best-performing 12% of the sources within their industrial category or subcategory, which is known as the floor.[233] The EPA can impose more stringent beyond the floor requirements but must consider costs. Before November 15, 1996, the Administrator must report on the risk to the public remaining after the promulgation of the MACT standards and promulgate additional standards after considering costs and other factors.[234] The use of this provision is controversial and is being litigated.[235] In addition, costs can be limited through the use of source subcategories and provisions allowing facilities to average emissions from various sources within the facility.[236]

Steam generating electric power plants are subject to a separate procedure under the CAA's HAP program.[237] The EPA is to study the hazards to public health that occur as a result of emissions of HAPs by power plants "after imposition of the requirements of this chapter" and regulate the power plants if it is "appropriate and necessary."[238] The Administrator is also required to report to Congress information concerning mercury emissions from steam generating electric utilities that include the technologies needed to control mercury emissions and their cost.[239] The EPA found regulation that was "appropriate and

necessary" in 2000 and reaffirmed its decision in 2012.[240] It did not consider costs, but the accompanying Regulatory Impact Analysis issued pursuant to Executive Orders 12,866 and 13,563, estimated the costs to the electric power industry of the mercury and air toxics rule to be $9.6 billion a year, and the benefits were estimated at $4 to $6 million a year.[241] However, the EPA found that the ancillary benefits from reductions in particulate matter and sulfur dioxide would increase the benefits of the regulation to $37 to $90 billion per year.[242] The EPA's MACT standards regulating hazardous air pollutants emitted by electric utilities ***451** (particularly mercury) were issued April 24, 2013.[243]

This HAP rule was challenged in the D.C. Circuit by petitioners, which included twenty-three states. In April 2014, the D.C. Circuit held the EPA did not need to consider costs when it decided to regulate power plant emissions of mercury and other hazardous pollutants.[244] The Agency did not consider costs when it made its appropriate and necessary finding, but it did consider costs when it developed the MACT standards.[245] The case was appealed to the Supreme Court, now titled *Michigan v. EPA*, and was decided June 29, 2015. The Court in a five to four decision written by Justice Scalia held the EPA unreasonably deemed cost irrelevant when it made its "appropriate and necessary" finding, which started the process to regulate power plant HAP emissions.[246] "The Agency must consider cost--including, most importantly, cost of compliance--before deciding whether regulation is appropriate and necessary."[247] The dissent written by Justice Kagan argued the EPA should not need to consider costs in its preliminary determination to begin the regulatory process when it made an extensive evaluation of costs in the rulemaking process.[248]

The case was reversed and remanded, but it is not clear what the EPA must do to comply with the Supreme Court's decision. The deadline for compliance with the mercury rule was April 16, 2015, although more than 160 facilities have received a one-year compliance extension, and an administrative consent order can be used to extend the time for compliance.[249] Nevertheless, at the time the Court issued its decision most existing power plants had complied with the rule or shut down.[250] An interesting issue that was not addressed by the Court concerns the EPA's use of co-benefits from reductions in criteria pollutants. If the EPA is to use the benefits from reductions in criteria pollutants to justify regulation of HAPs, should it be required to consider the costs of reducing criteria pollutants by more traditional means?

***452** The Cross State Air Pollution Rule (Transport Rule) aims to assist states impacted by emissions from upwind states. The D.C. Circuit vacated the rule on August 24, 2012.[251] Subsequently, the U.S. Supreme Court, in a six to two decision, upheld the Rule.[252] The Court approved the EPA's cost-effective allocation of emission reductions among upwind states as a permissible, workable, and equitable interpretation of the CAA that did not require invalidation of the Rule "on its face."[253] It held the EPA was not required to disregard costs when allocating responsibility for reducing emissions among multiple contributing upwind states. The Court remanded the case to the D.C. Circuit to address challenges to the rule as applied.[254] After the remand many states challenged the EPA's emissions budgets for SO_2 and NO_x (the precursor to ozone) claiming the required expenditures result in over-control. The D. C. Circuit on July 28, 2015 agreed and vacated the emissions budgets for many states.[255] In particular, the court vacated the 2014 ozone season NO_x budget for ten eastern states and Texas.[256]

The EPA is working to reinstate the trading program and appears to be developing a new approach that will give states more control over the required reductions in NO_x. The reductions will apply in the twenty-seven states in the eastern half of the country and the District of Columbia, but because of the tightening of the ozone standard, the Western states of Arizona, California, Utah, and Wyoming will likely be required to develop "good neighbor" SIPs to protect downwind states. Upwind states may be required to impose more emissions reduction requirements on ozone precursor sources (VOCs and NO_x).[257] The EPA estimates that there will be eleven nonattainment areas and eighteen maintenance areas in 2018 because of air pollution transport.[258]

***453** Congress included in the CAA provisions to reduce regional haze in order to protect the visibility of pristine areas of the country identified as Class I areas.[259] States subject to regional haze requirements are required to submit a haze reduction plan as part of their State Implementation Plan.[260] Major sources that became operational between 1962 and 1977 must install the best available retrofit technology (BART) if they emit any air pollutant reasonably anticipated to contribute to visibility impairment.[261] This includes control of ozone precursors. In determining what is BART and what is reasonable progress the costs of compliance must be considered.[262] On June 9, 2015, the Ninth Circuit held that a BART determination for coal-burning power plant in Montana was arbitrary and capricious because its determination of the technology that was cost-effective was inadequately explained.[263]

New motor vehicles and new motor vehicle engineers are subject to federal regulations that "reflect the greatest degree of emissions reduction achievable through the application of technology which the Administrator determines will be available

for the model year to which such standards apply, giving appropriate consideration to cost, energy, and safety factors ..."[264] New motor vehicle emissions standards are preempted by the federal government.[265] This resulted in a comprehensive federal regulatory program to control emissions from light-duty vehicles that over the years expanded to cover all mobile source air pollution.[266] In recent years, the EPA has focused more attention on truck emissions.[267] This attention is needed because trucks remain one of the largest sources of NO_x emissions and the requirements have not been updated since 2010.[268] The EPA issued a proposed rule in July 13, 2015, to require reductions in GHG emissions from medium- and heavy-duty engines, which includes reductions ***454** in nitrous oxide (N_2O) and methane (CH_4).[269] The regulation include extensive coverage of costs and benefits.[270] Motor vehicles in states with ozone nonattainment areas may have California standards imposed on new motor vehicles, which also is an indirect cost-based standard.[271]

Both nonattainment areas and maintenance areas must comply with the CAA's transportation conformity requirements. The CAA's conformity provisions require the adoption, funding or approving transportation plans, transportation improvement programs (TIPs), and federally supported highway and transit projects ensure that federal actions are consistent with the SIP.[272] Transportation planning requires consideration of costs and environmental impacts.[273] Conformity requirements are to assure that federal activities will not cause new air quality violations, worsen existing violations, or delay timely attainment of the relevant NAAQS or interim reductions and milestones.[274] The EPA's Transportation Conformity Rule establishes the criteria and procedures for determining whether transportation activities conform to the SIP.[275] Conformity applies to both the primary and secondary NAAQS for all criteria pollutants. States with new nonattainment areas may also need to revise conformity SIPs in order to ensure the state regulations apply in any newly designated areas if the existing SIP does not include current conformity provisions.[276] If this is the first time that transportation conformity will apply in a state, the state is required by the EPA to submit a SIP revision that addresses conformity requirements including consultation procedures and written commitments to control or mitigation measures associated with conformity determinations for transportation plans, TIPs or projects.[277] The EPA's effort to allow ozone nonattainment or maintenance areas to avoid complying with the conformity requirements was rejected by the D.C. Circuit in *NRDC v. EPA*.[278]

***455 V. Conclusion**

As professors Livermore and Revesz have shown, the concept of an impartial scientific determination being used to determine the proper level to set NAAQS is a myth.[279] The EPA continuously makes assumptions based on policy considerations for its health-based analysis that shape the final NAAQS determination. The Agency makes assumptions concerning the link between exposure and health. It makes assumptions concerning the population used to determine health effects (*e.g*. the sick, the elderly, children, etc.). It determines the degree of risk it will allow (*e.g*. 1/100,000, 1/million). It makes assumptions concerning the relative risk due to exposure through multiple pathways.[280] It selects an averaging period that varies for the various criteria pollutants, with longer averaging periods having the effect of reducing the strictness of the standard. The EPA does not usually consider ancillary health benefits although it does consider such benefits when doing its regulatory impact analysis.[281] For many pollutants the only safe exposure is zero, but a standard based on this assumption is politically unacceptable. Most people are exposed to many pollutants through multiple pathways but this is rarely considered when developing NAAQS.

Another flaw in the NAAQS implementation process is the national uniformity approach for air quality goals that results in a one size fits all approach to state air quality programs. This means that areas of the nation with high natural background concentrations of a pollutant are required to reduce pollution even if doing so is difficult or impossible. Areas of the country subject to inversions because they are located in valleys surrounded by mountains are held to the same reduction requirements as areas of Hawaii that are far from upwind sources and are swept by wind.

Although costs are not openly considered when developing NAAQS, the measures adopted to protect health do consider costs. This allows each potential subject of regulatory controls to argue it is too expensive to comply, which results in a political battle to see which sources will be selected to carry the burden of reducing emissions. One result is that mobile sources have more effective reductions because they are subject to federal control while politically powerful stationary sources subject to state control often are subject to less effective control requirements.

***456** As NAAQS become more stringent, the increasing marginal cost of improvements in air quality make it important to have a more open discussion of the costs of pollution and the costs of control. A more transparent regulatory approach is needed in which cost information is provided by the EPA as part of the proposed rule and subjected to the notice and

comment regulatory process. Transparency should begin by recognizing that a cost-benefit analysis is inherently flawed because it does not properly consider who bears the various costs. Reducing air emissions is considered a cost, but the adverse health and welfare impact of pollution is not considered a cost to those being impacted. Instead, the reduction of the adverse effects of air pollution is treated as a benefit. A more honest approach would begin by recognizing air pollution as a cost to society to be reduced by imposing costs on those responsible for emissions.

Footnotes

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[1] Clean Air Act, Pub. L. No. 90-148, 81 Stat. 485 (1967).

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[260] Clean Air Act §§ 110(a), 169(b)(2), 42 U.S.C. §§ 7410(a), 7491(b)(2) (2015). The regulations allow for approved alternative provisions.

[261] Clean Air Act § 169A(b)(2)(A), 42 U.S.C. § 7491(b)(2)(A)(July 14, 1955). An alternative procedure is available if it provides greater reasonable progress than BART and meets the criteria of 40 C.F.R. § 51.308(e)(2).

[262] Clean Air Act § 169A(g)(1) & (2), 42 U.S.C. § 7491(g)(1) & (2)(July 14, 1955). EPA has Guidelines for BART at 70 Fed. Reg. 39,104 (July 6, 2005).

[263] Nat'l Parks Conservation Ass'n v. EPA, 788 F.3d 1134 (9th Cir. 2015).

[264] Clean Air Act § 202(a)(3)(A)(i), 42 U.S.C. § 7521(a)(3)(A)(i) (2015).

[265] Clean Air Act § 109(a), 42 U.S.C. § 7543(a) (2015).

[266] Arnold W. Reitze, Jr., *Mobile Source Air Pollution Control*, 6 ENVTL. LAW. 309 (2000).

[267] *See* Arnold W. Reitze, Jr., *Federal Control of Emissions From New Heavy-Duty Road Vehicles*, 44 ENVTL L. REP. 10216 (2014).

[268] Stuart Parker, *OTC Eyes Stricter EPA Air Rules For Coatings, Trucks To Meet Ozone NAAQS*, 26 CLEAN AIR REP. 13:17 (June 1, 2015).

[269] U.S. Envtl. Prot. Agency & U.S. Dept. of Transp., *Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles- Phase 2*, 80 Fed. Reg. 40,138.

[270] *Id.* at 40,143.

[271] Clean Air Act § 177, 42 U.S.C. § 7507 (2015).

[272] Clean Air Act § 176(c), 42 U.S.C. § 7506(c)(July 14, 1955); *see* Sierra Club v. EPA, 129 F.3d 137 (D.C. Cir. 1997).

[273] *See generally* Arnold W. Reitze, Jr., *Improving Transportation Related Air Quality Under the Clean Air Act's Conformity Requirements and the Intermodal Transportation Efficiency Act of 1991*, 3 ENVTL. LAWYER 631 (1997).

[274] Clean Air Act § 176(c)(1), 42 U.S.C. § 7506(c)(1)(July 14, 1955).

[275] 40 C.F.R. § 51.390.

[276] U.S. Envtl. Protection Agency, *National Ambient Air Quality Standards for Ozone*, 79 Fed. Reg. 75,234, 75,382 (Dec. 17, 2014).

[277] 40 C.F.R. § 51.390.

[278] 777 F.3d 456 (D.C. Cir. 2014).

[279] Livermore & Revesz, *supra* note 119.

[280] *Id.* at 1201.

[281] *Id.* at 1247.