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Ozone Air Quality Standards: EPA's 2015 Revision

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Summary

On November 26, 2014, the Environmental Protection Agency (EPA) announced proposed revisions to the National Ambient Air Quality Standards (NAAQS) for ground-level ozone. If finalized, the proposal would set more stringent standards, lowering both the primary (health-based) and secondary (welfare-based) standards from the current 75 parts per billion (ppb) to somewhere in a range of 65 to 70 ppb. This report discusses the standard-setting process, the specifics of the current and past reviews, and issues raised by the proposal.

NAAQS are standards for outdoor (ambient) air that are intended to protect public health and welfare from harmful concentrations of pollution. If EPA changes the primary standard for ozone to a lower level, it would be concluding that protecting public health requires lower concentrations of ozone pollution than were previously judged to be safe. In high enough concentrations, ozone aggravates heart and lung diseases and may contribute to premature death. Ozone also can have negative effects on forests and crop yields, which the secondary (welfare-based) NAAQS is intended to protect.

NAAQS do not directly limit emissions of a pollutant; rather, they set in motion a long process in which states and EPA identify areas that do not meet the standards, and states prepare implementation plans to demonstrate how emissions will be lowered sufficiently to reach attainment.

Ground-level ozone, or "smog," is a widespread pollutant: as of July 2014, 123 million people (40% of the U.S. population) lived in areas classified "nonattainment" for the current 75 ppb ozone NAAQS. A more stringent standard might affect more areas. If the nonattainment designations were made using current data, 358 counties would be in nonattainment with a 70 ppb NAAQS (rather than 155 counties at 75 ppb); at 65 ppb, 558 counties would have monitors showing nonattainment. Emission sources in these areas might have to adopt more stringent controls.

EPA maintains that most areas will be able to reach attainment of the new standards—whether at 65 or 70 ppb—as a result of already promulgated regulations for gasoline, autos, power plants, and other sources of emissions. Thus, the agency's estimates of the cost of NAAQS compliance are substantially lower than many earlier estimates. EPA estimates the cost of meeting a 70 ppb standard in all states except California at $3.9 billion annually in 2025; the cost of meeting a 65 ppb standard in the same states is estimated at $15 billion annually. Because most areas in California would have until the 2030s to reach attainment, EPA provided separate cost estimates for California ($0.80 billion to $1.6 billion annually in 2038). EPA's cost estimates are substantially less than one from the National Association of Manufacturers that was widely circulated before the release of EPA's proposal.

Members of Congress have shown particular interest in the whether the expected benefits of the proposed standards would justify their costs—a perennial issue raised by stakeholders when EPA considers revising NAAQS. Both nationwide and in California, the agency expects the benefits of attainment to exceed the costs, but there is controversy over the methods used to estimate both. More importantly, as the Clean Air Act is currently written, the agency is prohibited from weighing costs against benefits in setting the standards. The statute simply states that the Administrator is to set the primary standard at a level requisite to protect public health, allowing an adequate margin of safety.

Because of the potential cost, various interest groups have lobbied against strengthening the standards. In the 113th Congress, H.R. 4947/S. 2514, H.R. 5505/S. 2833, and H.R. 5665 were introduced to delay the promulgation of a revised NAAQS or to change EPA's authority to revise the standards. No action was taken on these bills.

EPA's November 26 proposal is not a final action. Publication of the proposal in the *Federal Register*, December 17, began a 90-day public comment period. EPA will hold three public hearings on January 29 and February 2. The agency must address significant public comments when it publishes a final standard, currently scheduled for October 1, 2015.

Contents

Figures

Tables

Contacts

Introduction

The Environmental Protection Agency (EPA), nearing completion of a statutorily required review, announced, on November 26, 2014, a proposal to reduce the National Ambient Air Quality Standards (NAAQS) for ground-level ozone[1] from the current level of 75 parts per billion (ppb) to somewhere in the range of 65 to 70 ppb. The formal proposal appeared in the *Federal Register* on December 17.[2] The proposal is based on a review of 2,300 scientific studies by EPA staff, which itself was reviewed by a panel of 20 outside scientific experts, a group known as the Clean Air Scientific Advisory Committee (CASAC).[3] The EPA Administrator was under a court order to sign any proposed changes to the standards by December 1, 2014. A comment period, public hearings, and interagency review follow publication of the proposal in the *Federal Register*. The standards are to be finalized by October 1, 2015.

Ground-level ozone (often referred to as "smog") is associated with potentially serious health effects when present in high enough concentrations. These health effects include aggravated asthma, chronic bronchitis, and heart attacks, and in some cases premature death. In the Regulatory Impact Analysis accompanying the proposed standards, EPA states that reducing concentrations to 65 parts per billion (ppb) versus the current standard of 75 ppb[4] would avoid 710 to 4,300 premature deaths annually in 2025 nationwide (excluding California).[5] [Note: California was excluded from EPA's estimate of both costs and benefits of the nationwide standard, because most areas of the state will have until the 2030s to reach attainment of the NAAQS.[6] California costs and benefits are presented separately in the "Costs and Benefits" section of this report.]

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[1] Ground-level (tropospheric) ozone can be a lung irritant with serious adverse health effects. In the stratosphere, however, ozone protects the Earth from harmful ultraviolet rays of the sun. For more information, see U.S. EPA, "Ozone—Good Up High Bad Nearby," at http://www.epa.gov/airquality/gooduphigh/.

[2] 79 *Federal Register* 75234, available at http://www.gpo.gov/fdsys/pkg/FR-2014-12-17/pdf/2014-28674.pdf. As of this writing, the link to the proposal on EPA's website still connects the reader to a pre-publication copy of the proposal. Footnotes citing the proposal in this report will give both citations.

[3] See "EPA Assessment Underscores Relationship Between Ozone Exposure, Respiratory Effects," *Daily Environment Report*, February 19, 2013. The Integrated Science Assessment is 1,251 pages long and is available at http://www.epa.gov/ncea/isa/ozone.htm. CASAC's review of the ISA, dated November 14, 2012, can be found at http://yosemite.epa.gov/sab/sabproduct.nsf/60C2732674A5EEF385257AB6007274B9/$File/EPA-CASAC-13-001+unsigned.pdf.

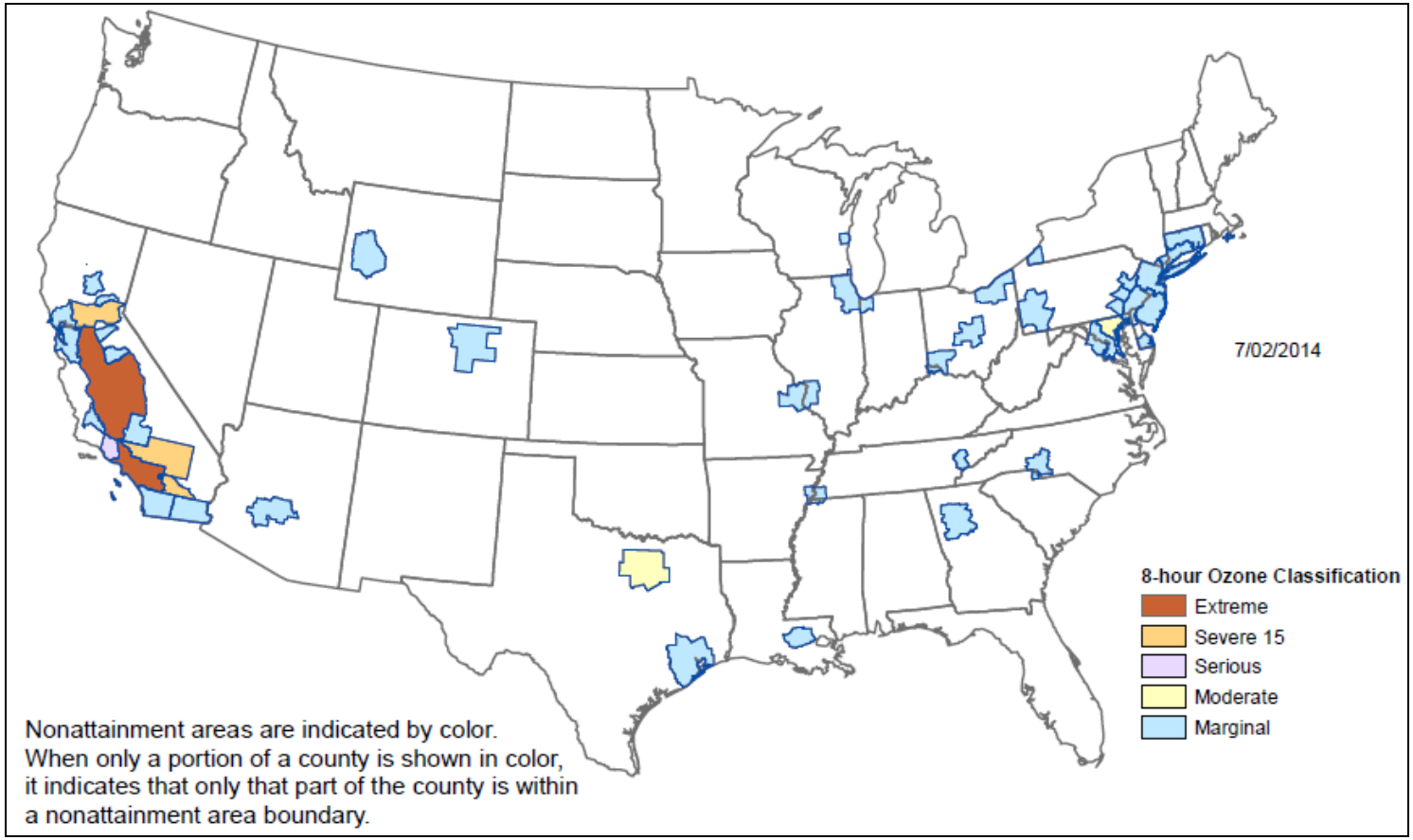
[4] The ozone NAAQS is also frequently expressed in terms of parts per *million* rather than parts per *billion*. A standard of 0.075 parts per million (ppm) would be the same as a standard of 75 parts per billion (ppb), and is often referred to as such. This report uses parts per billion in most cases, as does EPA in most of the explanatory materials accompanying the proposed standard. The proposed standard itself, as seen in the pre-publication *Federal Register* notice, is expressed in ppm, however.

Until 2008, the standard was expressed in parts per million with two decimal places (e.g., 0.08 ppm from 1997 to 2008). Without a third decimal place, concentrations as high as 0.084 ppm (or 84 ppb) could be rounded to 0.08 and considered to be in attainment of the standard. The 2008 standard added greater precision to the standard by adding a third decimal place (0.075 ppm).

[5] U.S. EPA, *Regulatory Impact Analysis of the Proposed Revisions to the National Ambient Air Quality Standards for Ground-Level Ozone*, November 2014, pp. ES-13 to ES-17, at http://www.epa.gov/air/ozonepollution/pdfs/20141125ria.pdf. Hereafter, "2014 RIA." A separate estimate for California shows a 65 ppb NAAQS resulting in 789-990 premature deaths avoided annually post-2025.

[6] Most of California's population lives in areas classified as Severe or Extreme for their nonattainment, under the Clean Air Act's statutory categorization scheme. These areas have more stringent emission control requirements and more time to reach attainment, so EPA provided separate cost-benefit estimates for the state.

Figure 1. Current Ozone Nonattainment Areas, 2014 (2008 Standard, 0.075 ppm)



Source: U.S. EPA Green Book, http://www.epa.gov/airquality/greenbk/map8hr_2008.html. Map shows areas designated nonattainment by EPA as of July 2, 2014.

Notes: Nonattainment designations were based on 2008-2010 monitoring data in most cases. Some areas that attain the 2008 standard are also designated nonattainment for the less stringent 1997 standard. These areas may have more recent monitoring data that demonstrate attainment with the 1997 (and the 2008) standards, but they must have an approved maintenance plan in place before they will be removed from the list of nonattainment areas.

High ozone concentrations also affect the growth of plants, causing damage to both forests and field crops. In 2006, the U.S. Forest Service examined 380 monitoring sites in the Mid-Atlantic and Southeastern states and found visible injury to forest plants from ozone at 121 (32%) of them. At 20 of the sites, the damage was described as "severe."[7] In addition, EPA found that "several economically important crop species are sensitive to ozone levels typical of those found in the United States," and estimated that crop losses could be reduced by $400 million to $620 million annually by implementation of a more stringent ozone standard.[8]

While EPA's analysis has found that there would be substantial health and welfare benefits to reducing ozone, the agency also has concluded that there could be substantial costs. EPA estimates these costs (for areas other than California) at $3.9 billion annually in 2025 to achieve a 70 ppb NAAQS, or $15 billion if the standard is set at 65 ppb.[9]

The ozone NAAQS are among EPA's most far-reaching standards. At the current level, set in March 2008 (75 ppb), 123 million people live in areas that have not attained the standards (see **Figure 1**).[10] These 46 areas (referred to as "nonattainment areas") generally coincide with metropolitan areas, but may be larger or smaller.

The agency states that if the most recent available monitoring data (for the years 2011-2013) were used to identify nonattainment areas for the proposed standards, the number of counties showing nonattainment would increase from 155 for the current 75 ppb standard to 358 if the standard were set at 70 ppb, and to 558 if it were set at 65 ppb[11] (see **Figure 2**).

Nonattainment designations will not be made until 2017 at the earliest, however, and EPA notes that the decisions will most likely be based on 2014-2016 monitoring data. In the intervening years, the emissions that contribute to ozone formation are likely to decline, in response to already promulgated standards for motor vehicles, gasoline, power plants, and other sources of emissions. Thus, EPA expects the number of counties showing nonattainment to be less than the estimate shown in **Figure 2**.[12]

The potential economic, health, and environmental impacts of a change in the ozone NAAQS have led to great interest in EPA's ongoing review of the standards. To assist Members and staff in evaluating EPA's review, this report provides background on NAAQS, the process used to establish them, the current ozone standards, the remaining controversy over the most recent revision, and issues that may be raised as EPA brings the current review to completion.

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[7] U.S. EPA, *Regulatory Impact Analysis, Final National Ambient Air Quality Standard for Ozone*, July 2011, p. 64, at http://www.epa.gov/glo/pdfs/201107_OMBdraft-OzoneRIA.pdf.

[8] Ibid., p. 74.

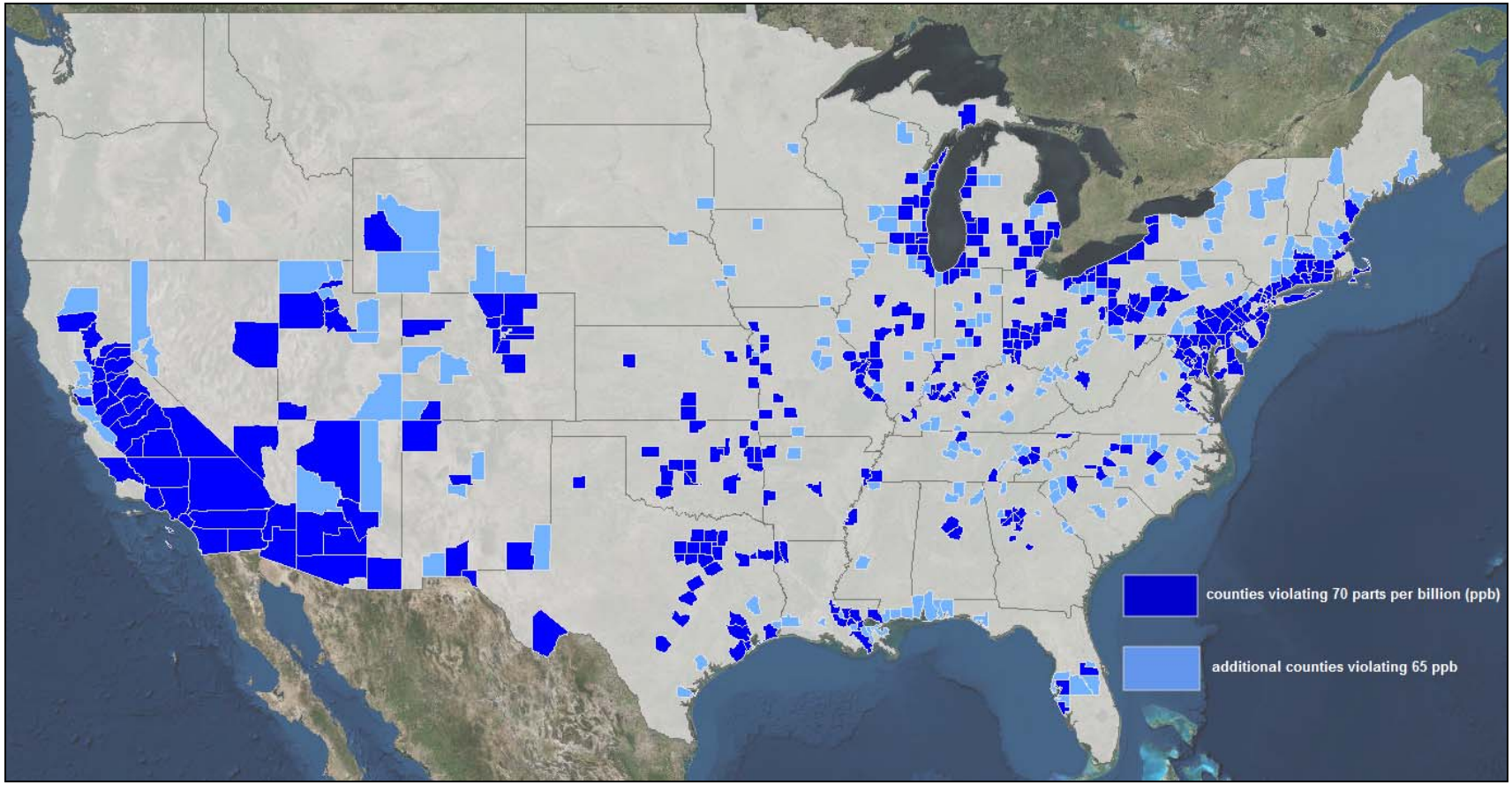
[9] 2014 RIA, p. ES-14. Most of California's population lives in areas classified as Severe or Extreme for their nonattainment, under the Clean Air Act's statutory categorization scheme. These areas have more stringent emission control requirements and more time to reach attainment, so EPA provided separate cost-benefit estimates for the state.

[10] For specifics, see EPA's "Green Book," at http://www.epa.gov/oaqps001/greenbk/hntc.html.

[11] U.S. EPA, "Ozone by the Numbers: EPA's Proposal to Update the Air Quality Standards for Ground-Level Ozone," p. 2, at http://www.epa.gov/air/ozonepollution/pdfs/20141125fs-numbers.pdf.

[12] When the agency last promulgated a revision to the ozone NAAQS in March 2008, it identified 345 counties with monitors showing nonattainment of the new standard. By the time the agency designated nonattainment areas in May 2012, the number of nonattaining counties had declined to 221.

Figure 2. Counties Where Measured Ozone Is Above the Proposed Range of Standards, Based on 2011-2013 Monitoring Data



Source: U.S. EPA, http://epa.maps.arcgis.com/apps/StorytellingSwipe/index.html?appid=a3c9f378699045749a85e9c04728fc79&webmap=3b3e0960060141c7828fc93b14e3d4d2#.

What Are NAAQS?

NAAQS are standards that apply to ambient (outdoor) air. Section 109 of the Clean Air Act directs EPA to set both primary NAAQS, which are standards, "the attainment and maintenance of which in the judgment of the [EPA] Administrator ... are requisite to protect the public health," with "an adequate margin of safety," and secondary NAAQS, which are standards necessary to protect public welfare, a broad term that includes damage to crops, vegetation, property, building materials, climate, etc.[13]

The pollutants to which NAAQS apply are generally referred to as "criteria" pollutants. The act defines them as pollutants that "endanger public health or welfare," and whose presence in ambient air "results from numerous or diverse mobile or stationary sources."[14] Six pollutants are currently identified as criteria pollutants: ozone, particulates, carbon monoxide, sulfur dioxide, nitrogen oxides, and lead. The EPA Administrator can add to this list if she determines that additional pollutants meet the definition, or delete pollutants from the list if they no longer meet the definition. There have been no changes to the list, however, since the late 1970s.

NAAQS are at the core of the Clean Air Act, even though they do not directly regulate emissions. In essence, they are standards that define what EPA considers to be clean air for the pollutant in question. Once a NAAQS has been set, the agency, using monitoring data and other information submitted by the states, identifies areas that exceed the standards and must reduce pollutant concentrations. This designation process is often delayed by litigation over the standards, by EPA's agreement to reconsider aspects of them, or by consultations with the states over the specifics of the areas to be designated. Designation of nonattainment areas for the 1997 NAAQS, for example, took seven years. Designations under the 2008 standards took four years.

After nonattainment areas are designated, state and local governments have up to three years to produce State Implementation Plans (SIPs), which outline the measures that will reduce emission levels and attain the standards. Finalizing SIPs, through EPA review and approval, often takes longer. Under the statute, actual attainment of the standards is allowed to stretch over a 3-year to 20-year period, depending on the severity of the area's pollution. Ozone nonattainment areas are designated as Marginal, Moderate, Serious, Severe, or Extreme, depending on the level of pollution. Each of these classifications comes with required pollution control measures: the more severe the pollution, the more stringent are the required controls, and the longer the area is allowed before it must demonstrate attainment.[15]

Thus, establishment or revision of a NAAQS is not an event that requires immediate compliance with an air quality standard; rather, it sets in motion a long and complicated implementation

[13] The Clean Air Act's definition of welfare is found in Section 302(h) of the act (42 U.S.C. 7602(h)).

[14] Authority to establish NAAQS comes from both Sections 108 and 109 of the act; this definition of criteria pollutants is found in Section 108. The authority and procedures for controlling the sources of criteria pollutants are found throughout Titles I, II, and IV of the act. Many pollutants that are less widely emitted are classified as "hazardous air pollutants" and are regulated under a different section of the act (Section 112). That section lists 187 pollutants or groups of pollutants as hazardous and establishes different authorities and requirements for controlling their emissions.

[15] For a more detailed discussion, see CRS Report RL30853, *Clean Air Act: A Summary of the Act and Its Major Requirements*.

process. That process may ultimately have far-reaching impacts for public health and welfare, for sources of pollution in numerous economic sectors, and for states and local governments.

EPA has several tools available to get areas to comply with a NAAQS. The most frequently mentioned of these is the potential for highway-fund sanctions: failure to submit or implement a SIP adequate to attain or maintain compliance with the NAAQS can lead to the temporary suspension of federal highway funds for non-safety-related projects. Ultimately, EPA can impose a federal implementation or maintenance plan (a FIP) in an area that does not have an approved SIP. Imposition of sanctions or FIPs is relatively rare, however: generally the states avoid sanctions by submitting plans that require sufficient emission reductions to be deemed adequate by EPA.

In addition to state and local actions to address ambient concentrations of NAAQS pollutants, EPA itself acts to control emissions and concentrations of criteria pollutants, through national standards for products that contribute to ozone pollution (particularly mobile sources, such as automobiles) and standards for new stationary sources (such as power plants). These standards lead to emission reductions that states can factor into their implementation plans, reducing the need for local air pollution control measures.

Reviewing the Ozone NAAQS

Section 109(d) of the Clean Air Act requires the agency to review each NAAQS every five years. That schedule is rarely met, but it often triggers lawsuits that force the agency to undertake a review.[16] In June 2013, the Sierra Club and three other groups filed suit over EPA's failure to complete the current ozone review by the March 2013 deadline, and a court subsequently ordered EPA to propose any changes to the standards by December 1, 2014, and complete the review, with promulgation of any revisions by October 1, 2015.[17]

An historical review of the ozone NAAQS and their revisions is presented in **Table 1**.

The NAAQS Review Process

Reviewing an existing NAAQS is generally a long process. To begin the process, EPA scientists compile the scientific literature published since the last NAAQS revision, and summarize it in a report known as a Criteria Document or Integrated Science Assessment (ISA). The ISA for ozone, completed in February 2013,[18] reviewed 2,300 scientific studies.

[16] CRS Report R41563, *Clean Air Issues in the 112th Congress*, summarized EPA's recent efforts to review the NAAQS and implement revisions, including the next steps for each of the six criteria pollutants. Reviews of all six pollutants (ozone, PM, lead, NO_2, carbon monoxide, and SO_2) have been completed since 2006, with the standards being made more stringent for five of the six.

[17] Sierra Club v. EPA, No. 13-2809 (N.D. Cal., Apr. 30, 2014). (unpublished)

[18] U.S. EPA, Office of Research and Development, *Integrated Science Assessment of Ozone and Related Photochemical Oxidants*, Final Report, February 2013, at http://www.epa.gov/ncea/isa/ozone.htm.

Table 1. History of the National Ambient Air Quality Standards for Ozone

1971-2014

Year	Final Rule/Decision	Primary/ Secondary	Indicator	Averaging Time	Level	Form
1971	36 *FR* 8186 Apr 30, 1971	Primary and Secondary	Total photochemical oxidants	1-hour	0.08 ppm	Not to be exceeded more than one hour per year.
1979	44 *FR* 8202 Feb 8, 1979	Primary and Secondary	Ozone	1-hour	0.12 ppm	Attainment is defined when the expected number of days per calendar year, with maximum hourly average concentration greater than 0.12 ppm, is equal to or less than one.
1993	58 *FR* 13008 Mar 9, 1993	EPA decided that revisions to the standards were not warranted at the time.				
1997	62 *FR* 38856 Jul 18, 1997	Primary and Secondary	Ozone	8-hour	0.08 ppm	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years.
2008	73 *FR* 16483 Mar 27, 2008	Primary and Secondary	Ozone	8-hour	0.075 ppm	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years.
2014	pre-publication copy of proposal is available at http://www.epa.gov/air/ozonepollution/actions.html	Primary and Secondary	Ozone	8-hour	0.065-0.070 ppm	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years.

Source: U.S. Environmental Protection Agency, http://epa.gov/ttn/naaqs/standards/ozone/s_o3_history.html. For 2014 proposal, http://www.epa.gov/air/ozonepollution/actions.html.

Ozone ISAs cover topics as wide-ranging as the physics and chemistry of ozone in the atmosphere; environmental concentrations, patterns, and exposure; dosimetry; animal-to-human extrapolation; toxicology; interactions with co-occurring pollutants; controlled human exposure studies; epidemiology; effects on vegetation and ecosystems; effects on UVB (ultraviolet light) exposures and climate; and effects on man-made materials.

Following completion of the ISA, EPA prepares a Risk and Exposure Assessment to identify exposure pathways, at-risk populations, and health endpoints. This document was completed for the current review in August 2014.[19]

A final document prepared by EPA staff, the Staff Paper or Policy Assessment, summarizes the information compiled in the ISA and Risk Assessment and provides the Administrator with options regarding the indicators, averaging times, statistical form, and numerical level (concentration) of the NAAQS. A Policy Assessment was completed and publicly released on August 29, 2014.[20]

To ensure that NAAQS reviews meet the highest scientific standards, the 1977 amendments to the Clean Air Act required the Administrator to appoint an independent Clean Air Scientific Advisory Committee (CASAC). CASAC has seven members, largely from academia and from private research institutions. In conducting NAAQS reviews, their expertise is supplemented by panels of the nation's leading experts on the health and environmental effects of the specific pollutants that are under review. These panels can be rather large. The panel for the current ozone review, for example, has 20 members. CASAC and the public make suggestions regarding the membership of the panels on specific pollutants, with the final selections made by EPA. The panels evaluate the agency's work during NAAQS-setting and NAAQS-revision, rather than conducting their own independent review of the standards.

Recent Reviews of the Ozone Standard

EPA last changed the NAAQS for ozone in March 2008, from 0.08 ppm (effectively 84 ppb) to 0.075 ppm (75 ppb). Although the standard was strengthened, the level chosen at that time was subject to controversy. A 23-member CASAC Review Panel unanimously recommended a range of standards more stringent than what the Administrator chose.[21]

In September 2009, EPA agreed to reconsider the 2008 standard. As a result, a more stringent primary standard and a different version of the secondary standard were proposed in January 2010. After a year and a half of public comment and review, EPA sent what it considered a final set of standards to the Office of Management and Budget (OMB) for interagency review. The process was short-circuited, however, by a presidential decision to await conclusion of the next regular review—the review now nearing completion—before promulgating any change.

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[19] U.S. EPA, *Ozone (O_3) Standards - Documents from Current Review - Risk and Exposure Assessments*, at http://www.epa.gov/ttn/naaqs/standards/ozone/s_o3_2008_rea.html.

[20] U.S. EPA, Office of Air and Radiation, *Policy Assessment for the Review of the Ozone National Ambient Air Quality Standards*, August 2014, at http://www.epa.gov/ttn/naaqs/standards/ozone/data/20140829pa.pdf. Hereinafter "U.S. EPA, 2014 Policy Assessment."

[21] In a letter to the Administrator sent after promulgation of the NAAQS, the panel's chair stated, "Nevertheless, the members of the CASAC Ozone Review Panel do not endorse the new primary ozone standard as being sufficiently protective of public health. The CASAC—as the Agency's statutorily-established science advisory committee for advising you on the national ambient air quality standards—unanimously recommended decreasing the primary standard to within the range of 0.060–0.070 ppm. It is the Committee's consensus scientific opinion that your decision to set the primary ozone standard above this range fails to satisfy the explicit stipulations of the Clean Air Act that you ensure an adequate margin of safety for all individuals, including sensitive populations." Letter of Rogene F. Henderson, Chair, Clean Air Scientific Advisory Committee, to EPA Administrator Stephen L. Johnson, April 7, 2008, at http://yosemite.epa.gov/sab/sabproduct.nsf/4AF876432433128885257425006 9E494/$File/EPA-CASAC-08-009-unsigned.pdf.

The Primary Standard

The review completed in 2008 found evidence of health effects, including mortality, at levels of exposure below the then-current 0.08 ppm standard. As a result, both EPA staff and CASAC recommended strengthening the standard. CASAC stated: "There is no scientific justification for retaining the current [0.08 ppm] primary 8-hr NAAQS."[22] The panel unanimously recommended a range of 0.060 to 0.070 ppm (60 to 70 parts per billion) for the primary (health-based) 8-hour standard.

EPA staff also recommended strengthening the primary standard. They recommended "considering a standard level within the range of somewhat below 0.080 parts per million (ppm) to 0.060 ppm."[23]

Based on these recommendations, and his own judgment regarding the strength of the science, Stephen Johnson, the Bush Administration's last EPA Administrator, chose to finalize the standard at 0.075 ppm (75 parts per billion).[24] That revision led to designation of nonattainment areas in April and May 2012, as shown above in **Figure 1**.[25]

The Regulatory Impact Analysis that accompanied the final 2008 standard identified 345 counties in 36 states in exceedance of the 0.075 ppm standard, using data for 2004-2006 (the most recent available at the time). By May 2012, when the nonattainment areas were actually designated, the number of counties in nonattainment had fallen to 221 in 27 states, based mostly on data for 2008-2010.[26] In the intervening years, emissions declined in most areas as more stringent standards for both mobile and stationary sources took effect. The recession and other economic factors also contributed to the lower numbers. When the economy is operating well below capacity, emissions generally decline; and changes in the economy (e.g., fewer vehicle miles traveled and a switch to cleaner fuels) have resulted in lower emissions.

Reconsideration of the 2008 Standard

As noted, EPA began a process to reconsider the 2008 ozone NAAQS in September 2009, and proposed a more stringent primary NAAQS in January 2010. The reconsideration process, which generally relied on the same data as that used to set the 2008 standard, led EPA to recommend a primary NAAQS of 0.070 ppm (70 ppb), within the range recommended by the CASAC Ozone Review Panel in 2008. A draft final standard was prepared and sent to OMB for final interagency review in the summer of 2011, but was withdrawn at the President's request in September 2011.

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[22] Letter of Rogene Henderson, Chair, Clean Air Scientific Advisory Committee, to Hon. Stephen L. Johnson, EPA Administrator, October 24, 2006, available at http://yosemite.epa.gov/sab/sabproduct.nsf/AB290E0DB8B72A33852572120055858F/$File/casac-07-001.pdf.

[23] "Review of National Ambient Air Quality Standards for Ozone Final Staff Paper, Human Exposure and Risk Assessments and Environmental Report," Fact Sheet, at http://www.epa.gov/ttn/naaqs/standards/ozone/data/2007_01_finalsp_factsheet.pdf.

[24] All of EPA's references to the 2008 standard are expressed as parts per million (e.g., 0.075 ppm), but many references in the press convert this to a more readable parts per billion (i.e., 75 parts per billion).

[25] Detailed information on the designations, including links to *Federal Register* notices, can be found on EPA's website at http://www.epa.gov/airquality/ozonepollution/designations/2008standards/regs.htm#may12.

[26] A few states had certified monitoring data for 2009-2011, and their designations were based on that three-year period.

The Current Review

The current review, after assessing hundreds of new studies, has reached conclusions similar to those of the 2008 process:

> The available scientific evidence and exposure/risk information provide strong support for considering a primary O_3 [ozone] standard with a revised level in order to increase public health protection, including for at-risk populations and lifestages. Staff concludes that it is appropriate in this review to consider a revised primary O_3 standard level within the range of 70 ppb to 60 ppb. A standard set within this range would result in important improvements in public protection, compared to the current standard, and could reasonably be judged to provide an appropriate degree of public health protection, including for at-risk populations and lifestages. In its advice to the Administrator, CASAC also concluded that the scientific evidence and exposure/risk information support consideration of standard levels from 70 to 60 ppb. Within this range, CASAC concluded that a level of 70 ppb would provide little margin of safety and, therefore, provided the policy advice that the level of the O_3 standard should be set below 70 ppb.[27]

Based on these recommendations, the EPA Administrator proposed revising the primary NAAQS on November 26, 2014, to a level somewhere in the range of 65 to 70 ppb. She also asked for comments on retaining the current 75 ppb standard or promulgating a standard of 60 ppb.

The Secondary Standard

As part of the review completed in 2008, the 2009-2011 reconsideration process, and the current review, EPA has also assessed the secondary NAAQS for ozone. As explained above, secondary NAAQS are standards necessary to protect public welfare, a broad term that includes damage to crops, vegetation, property, building materials, climate, etc.[28] Prior to 2008, the secondary standard was identical to the primary standard—0.08 ppm beginning in 1997.

Ozone affects both tree growth and crop yields, and the damage from exposure is cumulative over the growing season. In order to address this damage, EPA staff recommended in the 2008 review that the Administrator establish a new form for the secondary standard: a seasonal (three-month) average that would cumulate hourly ozone exposures for the daily 12-hour daylight window (termed a "W126 index").[29] The staff initially recommended a standard in a range of 7-21 parts per million-hours (ppm-hours). CASAC's ozone panel agreed unanimously that the form of the secondary standard should be changed as the staff suggested, but it did not agree that the upper bound of the range should be as high as 21 ppm-hours, suggesting that the upper bound be no higher than 15 ppm-hours.[30]

[27] U.S. EPA, 2014 Policy Assessment, p. ES-5.

[28] The Clean Air Act's definition of welfare is found in Section 302(h) of the act (42 U.S.C. 7602(h)).

[29] The index gives greater weight to higher concentrations of ozone. For a detailed explanation of how it is calculated, see U.S. EPA, "June 2007 Proposal to Revise the National Ambient Air Quality Standards for Ground-level Ozone, General Overview," pp. 14-15, at http://www.epa.gov/groundlevelozone/pdfs/20070627slides.pdf.

[30] Letter of Rogene Henderson, Chair, Clean Air Scientific Advisory Committee, to Hon. Stephen L. Johnson, EPA Administrator, March 26, 2007, p. 3, available at http://yosemite.epa.gov/sab/sabproduct.nsf/FE915E916333D776852572AC007397B5/$File/casac-07-002.pdf.

The Administrator's June 2007 proposal was in line with the staff recommendation, 7-21 ppm-hours, but his final March 2008 choice was to duplicate the primary standard he promulgated at that time. He set a secondary standard at 0.075 ppm averaged over 8 hours, rejecting the advice of both CASAC and his staff.

The secondary standard carries no deadline for attainment and has never been the subject of penalties or sanctions for areas that failed to meet it, but there was substantial disagreement between the Bush Administration EPA and the Office of Management and Budget over the form in which this standard should be set. OMB maintained that EPA had failed to consider or evaluate the effects of a W126 standard on "economic values, personal comfort, and well-being"—terms that are also included in the Clean Air Act's definition of welfare—and thus did not provide a balanced consideration of welfare effects, as required by the act. OMB also maintained that EPA had not adequately demonstrated that the proposed secondary standard would be more protective than one set equal to the primary standard.[31] Ultimately, OMB prevailed.[32]

Upon reconsideration, the 2011 draft final standards would also have adopted the W126 index and would have set the secondary standard at 13 ppm-hours, in line with CASAC's recommendations. With the President's request to withdraw the draft standard and await completion of the current five-year review, a seasonal standard has yet to be implemented.

EPA's August 2014 Policy Assessment renewed this debate, this time with an additional thumb on the scale. The agency's staff again recommended that the Administrator set a secondary standard using the W126 index. The staff recommended a standard somewhere in the range of 7 to 17 ppm-hours, similar to CASAC's recommended range of 7 to 15 ppm-hours.[33] In the interim, the D.C. Circuit Court of Appeals also weighed in. In a July 23, 2013, decision, *Mississipi v. EPA*, the court remanded the 2008 secondary standard to EPA for further explanation or reconsideration: the court found that "EPA must expressly 'determine what level of ... protection is requisite to protect the public welfare,' [citation omitted] and explain why this is so."[34]

The November 2014 proposal is something of a hybrid: it describes the protection offered by the proposed secondary standard in terms of a cumulative seasonal approach, but retains the practice of making the standard identical to the primary standard. The overview of the agency's proposal states:

- EPA is proposing that the secondary standard should provide protection against the cumulative exposures that can damage plants and trees during the consecutive

[31] See "Ozone Secondary Standard," Memorandum of Marcus Peacock, EPA Deputy Administrator, to Susan Dudley, OMB, March 7, 2008, p. 2, at http://oversight-archive.waxman.house.gov/documents/20080520091448.pdf. The House Oversight and Government Reform Committee made this and other relevant documents from the 2008 review available, two months after the review's completion. See House Oversight and Government Reform Committee, "Supplemental Information on the Ozone NAAQS," Memorandum from Majority Staff to Members of the committee, May 20, 2008, in *White House Overruled EPA Administrator on Ozone Regulation*, at http://oversight-archive.waxman.house.gov/story.asp?id=1958. For additional discussion, also see CRS Report RL34057, *Ozone Air Quality Standards: EPA's March 2008 Revision*, by James E. McCarthy.

[32] Letter of Susan E. Dudley, Administrator, Office of Information and Regulatory Affairs, OMB, to Stephen L. Johnson, EPA Administrator, March 13, 2008, at http://oversight-archive.waxman.house.gov/documents/20080520092019.pdf.

[33] See U.S. EPA, 2014 Policy Assessment, pp. ES-9 to ES-12.

[34] Mississippi v. EPA, 723 F.3d 246, 272, 273 (D.C. Cir. 2013) (ellipses in original).

three months in the growing season when daytime ozone concentrations are the highest and plant growth is most affected.

- The Agency is proposing to define this necessary protection in terms of a "W126 index" in a range of 13 to 17 parts per million-hours (ppm-hours), averaged over three years. A "W126 index," named for the formula used to calculate it, is a seasonal index often used to assess the impact of ozone on ecosystems and vegetation.
- To achieve a level of protection equivalent to 13 to 17 ppm-hours based on the W126 metric, EPA is proposing to set an 8-hour secondary standard at a level within the range of 65 to 70 ppb. EPA analyzed data from air quality monitors and found that setting a standard in a W126 form would not provide additional protection beyond an 8-hour standard.[35]

Whether the last bullet is sufficient to address the D.C. Circuit decision in the *Mississippi* case is an open question, and may depend on the final level chosen for the standard. CASAC, in its review of the EPA staff recommendations, made two points that might argue against it being sufficient. First, they stated:

> The CASAC does not support a level higher than 15 ppm-hrs. For example, at 17 ppm-hrs, the median tree species has 6% relative biomass loss, and the median crop species has over 5% yield loss. These levels are unacceptably high. ... Furthermore, there are specific economically significant crops, such as soybeans, that may not be protected at 15 ppm-hrs but would be protected at lower levels. A level below 10 ppm-hrs is required to reduce foliar injury. A level of 7 ppm-hrs is protective of relative biomass loss for trees and offers additional protection against crop yield loss and foliar injury.[36]

Second, CASAC specifically did not recommend a three-year average for the secondary standard, stating that if the agency chose a three-year average, "then the level of the standard should be revised downward such that the level for the highest three-month summation in any given year of the three-year period would not exceed the scientifically recommended range of 7 ppm-hrs to 15 ppm-hrs."[37]

Controlling Ozone Pollution

Controlling ozone pollution is more complicated than controlling many other pollutants, because ozone is not generally emitted directly by pollution sources. Rather, it forms in the atmosphere when volatile organic compounds (VOCs) and nitrogen oxides (NOx) react in the presence of sunlight. The ozone concentration is as dependent on the temperature and amount of sunshine as it is on the presence of the precursor gases.

[35] U.S. EPA, "Overview of EPA's Proposal to Update the Air Quality Standards for Ground-Level Ozone," December 1, 2014, p. 3, at http://www.epa.gov/air/ozonepollution/pdfs/20141125fs-overview.pdf. The preamble to the proposed rule, on pages 413-428 (or 79 *Federal Register* 75347-75351), provides a similar, but more detailed explanation, at http://www.epa.gov/air/ozonepollution/pdfs/20141125proposal.pdf.

[36] Letter of Dr. H. Christopher Frey, Chair, Clean Air Scientific Advisory Committee, to Hon. Gina McCarthy, Administrator, U.S. EPA, June 26, 2014, p. iii, at http://yosemite.epa.gov/sab/sabproduct.nsf/5EFA320CCAD326E885257D030071531C/$File/EPA-CASAC-14-004+unsigned.pdf.

[37] Ibid., pp. iii-iv.

In general, ozone is a summertime pollutant. Other factors being equal, a cool, cloudy summer will produce fewer high ozone readings than a warm, sunny summer.

There are also complicated reactions that affect ozone formation. In general, lower emissions of precursor gases (particularly lower emissions of VOCs) lead to less ozone. But under some conditions, *higher* emissions of NOx lead to lower ozone readings. This makes modeling ozone air quality and predicting attainment more difficult and contentious than the modeling of other air pollutants, and can affect consultations between EPA and the states to determine the boundaries of nonattainment areas and the adequacy of SIPs.

Most stationary and mobile sources are considered to be contributors to ozone pollution. Thus, there are literally hundreds of millions of sources of the pollutants of concern, and control strategies require implementation of a wide array of measures. Among the sources of VOCs are motor vehicles (about one-fourth of total emissions), industrial processes, particularly the chemical and petroleum industries, and any use of paints, coatings, and solvents (about 40% for these sources combined). Service stations, pesticide application, dry cleaning, fuel combustion, and open burning are other significant sources of VOCs. Nitrogen oxides come overwhelmingly from motor vehicles and fuel combustion by electric utilities and other industrial sources.

Wintertime Ozone

An emerging set of issues has arisen in regard to wintertime ozone pollution in rural areas of the Western United States. Ozone is generally considered a summertime pollutant, but winter exceedances of the ozone NAAQS have recently been found to occur near oil and gas fields in rural areas of Wyoming, Utah, and Colorado.[38] At times, ozone concentrations as high as those in Los Angeles, the nation's smoggiest city, have been found in these areas—principally the Upper Green River Basin of Wyoming, the Uintah Basin of Utah, and a nearby area of Colorado. Thus far, only one of these areas, the Upper Green River Basin area of Wyoming, has been designated nonattainment.

The mechanism of ozone formation in the areas is still being studied, but recent studies have found that the thousands of oil and gas wells in the two basins release volatile organic compounds (VOCs) that react with nitrogen oxides (NOx) from oil and gas operations and coal-fired power plants to create ozone. A study of the Uintah Basin by the National Oceanic and Atmospheric Administration, EPA, the Bureau of Land Management, the Western Energy Alliance, the Utah Department of Environmental Quality, and seven universities found that sources external to the basin are not major sources of the ozone found within it, and that among inventoried sources within the basin, 98% to 99% of the VOCs and 57% to 61% of the NOx come from oil and gas operations.[39] The sunlight necessary for ozone to be created is magnified when it is reflected off

[38] Wintertime ozone levels are occasionally elevated in urban areas, as well, when concentrations of pollution become trapped in cold stagnant air near the Earth's surface. What is unusual about the rural areas discussed in this section of the report is that they do not experience high ozone concentrations in warm weather. In addition, elevated ozone in Western rural areas is a newly observed phenomenon, whereas pollution episodes associated with temperature inversions in urban areas have been observed for decades.

[39] *2012 Uintah Basin Winter Ozone & Air Quality Study*, Final Report, February 1, 2013, p. 2, at http://rd.usu.edu/files/uploads/ubos_2011-12_final_report.pdf. The remaining NOx comes primarily from the Bonanza Power Plant.

of heavy snow cover. Snow cover also helps create temperature inversions that trap polluted air in the basins. In winters with little snow, there have been few exceedances of the standards.[40]

EPA has recently promulgated standards requiring the reduction of VOC emissions from oil and gas production and transmission operations, including a requirement to use "green completions" on hydraulically fractured onshore natural gas wells. (For a discussion, see CRS Report R42986, *An Overview of Air Quality Issues in Natural Gas Systems*, by Richard K. Lattanzio.) The impact of these regulations on wintertime ozone concentrations is yet to be determined.

Costs and Benefits of Control

As noted elsewhere in this report ("The Role of Cost," below), EPA is prohibited by statute from taking cost into account in setting NAAQS. Despite that prohibition, in order to comply with an executive order (E.O. 12866) and guidance from the Office of Management and Budget, the agency produces a Regulatory Impact Analysis (RIA) analyzing in detail the costs and benefits of new or revised NAAQS standards.[41]

EPA's Cost Estimates

The RIA for the 2014 proposed NAAQS shows a range of estimates for three possible standards: 70 ppb (the high end of the range for the proposed NAAQS); 65 ppb (the low end of the range for the proposed NAAQS); and 60 ppb (which EPA did not propose, but on which EPA seeks comment). EPA's estimates of the nationwide benefits and costs of the three options for all areas except California are summarized in **Table 2**. The table shows projected annual costs and benefits for the year 2025. The RIA states: "We selected 2025 as the primary year of analysis because most areas of the U.S. will likely be required to meet a revised ozone standard by 2025.... "[42]

Table 2. Estimated Annual Costs and Health Benefits of Ozone NAAQS Options, Nationwide Except California, in 2025

(in billions of 2011 dollars)

Option	Costs	Health Benefits
70 ppb	$3.9	$6.4 to $13.0
65 ppb	$15	$19 to $38
60 ppb*	$39	$34 to $70

Source: U.S. EPA, RIA of the Proposed Revisions to the NAAQS for Ground-Level Ozone, November 2014.

* EPA did not propose a 60 ppb standard, but sought comment on that option and provided cost and benefit estimates for it.

[40] Ibid. In the Uintah Basin, for example, winter 2011-2012 measurements indicated no exceedance of the 75 ppb NAAQS for ozone: the highest 8-hour average reading was 63 ppb. In 2010-2011, by contrast, there were 25 winter days with ozone levels exceeding the 75 ppb standard, with the highest 8-hour reading being 139 ppb.

[41] http://www.archives.gov/federal-register/executive-orders/pdf/12866.pdf.

[42] 2014 RIA, p. ES-2, at http://www.epa.gov/air/ozonepollution/pdfs/20141125ria.pdf.

Notes: The data reflect annualized costs and annual monetized benefits of achieving the standard in 2025 for all areas of the United States except California. Because of more severe pollution, the Clean Air Act will give most areas of California until the 2030s to reach attainment. The estimates assume a 7% discount rate.

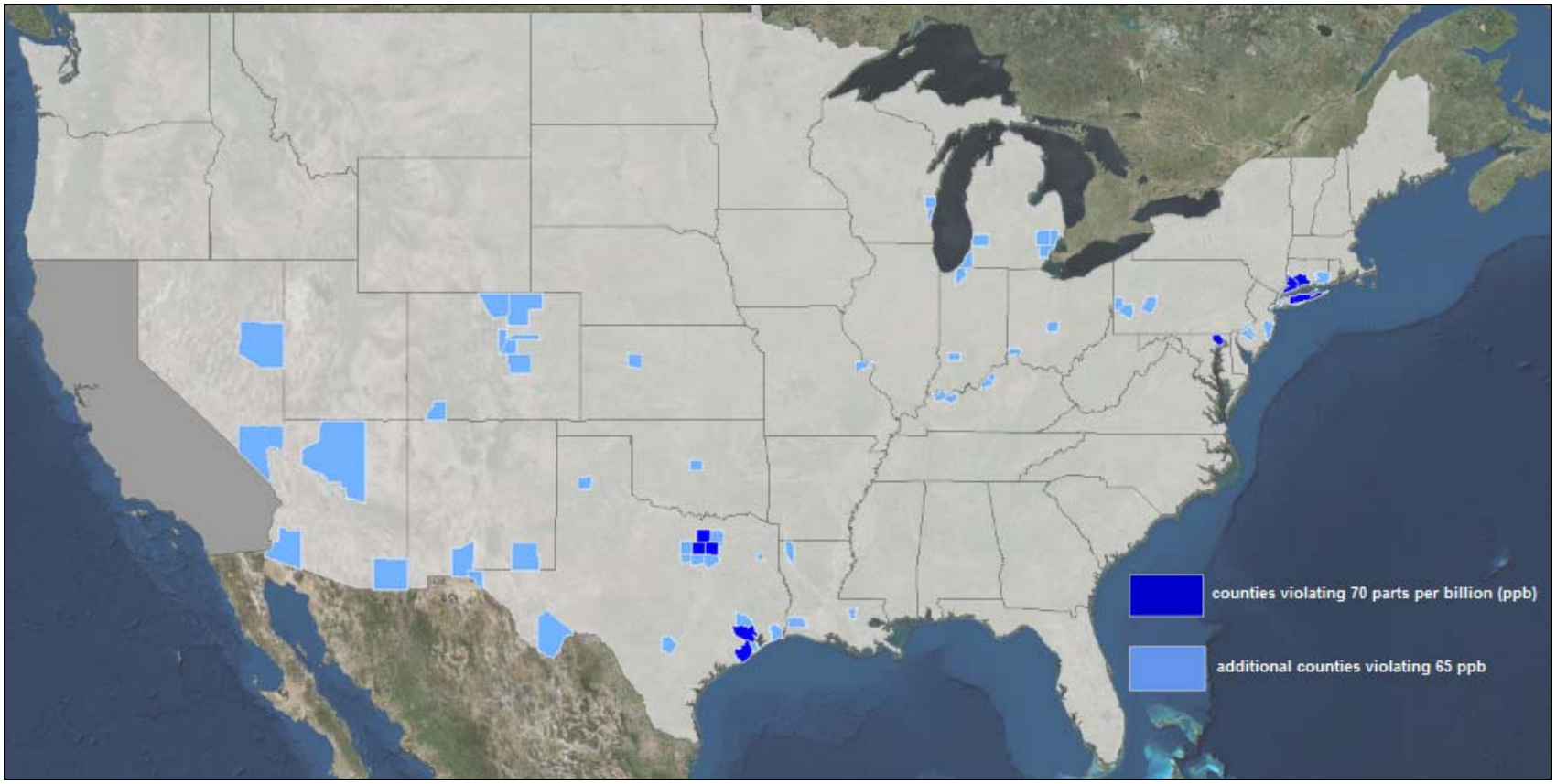
The estimated annual nationwide costs are $3.9 billion in 2025 for a 70 ppb standard or $15 billion for a 65 ppb standard. Although these are large sums, they are substantially less than cost estimates EPA provided for the same range of standards in 2008 and 2011. At that time, EPA projected costs of $19 billion to $25 billion to attain a 70 ppb standard, or $32 billion to $44 billion to attain a 65 ppb standard. Three factors account for the reduction in cost:

1. The baseline from which additional costs are projected is now set at 75 ppb (the current standard). In 2011, EPA projected $7.6 billion to $8.8 billion in costs to reach what is now the baseline.
2. Other rules promulgated since 2011 (notably the Tier 3 auto emission and gasoline standards and two rules affecting power plants) are expected to reduce ozone precursors whether or not EPA revises the NAAQS. In fact, as shown in **Figure 3**, the RIA projects that, by 2025, these other (already promulgated) rules will bring monitored ozone levels to 70 ppb or below in all but 9 of the 358 counties outside California currently showing nonattainment with the proposed 70 ppb level. Similarly, the agency states that all but 68 of the 558 counties currently showing nonattainment with a 65 ppb standard would reach attainment by 2025 as a result of already promulgated EPA and state standards.[43]
3. As a result of factors 1 and 2, most areas can reach attainment through the application of "known" controls, the average cost of which in EPA's estimation is $2,300 to $3,000 per ton of emission reduction.[44] In the 2008-2011 analysis, on the other hand, EPA had to assume "unknown" controls, costing at least $15,000 per ton of emission reduction, would be needed in many more areas. So, the average cost of assumed emission controls is far lower in the current RIA.

[43] See "Ozone by the Numbers," p. 2, at http://www.epa.gov/air/ozonepollution/pdfs/20141125fs-numbers.pdf.

[44] 2014 RIA, p. 7-7.

Figure 3. EPA Projects That Most Counties Would Meet the Proposed Ozone Standards in 2025 Without Promulgation of Additional Emission Controls



Source: U.S. EPA, http://epa.maps.arcgis.com/apps/StorytellingSwipe/index.html?appid=a3c9f378699045749a85e9c04728fc79&webmap=3b3e0960060141c7828fc93b14e3d4d2#.

Notes: EPA did not include areas in California. Because of more severe pollution, the Clean Air Act will give many areas in California until the 2030s to reach attainment.

EPA's Benefit Estimates

EPA's estimate of monetized nationwide benefits (excluding those in California) range from $6.4 billion to $13.0 billion annually in 2025 for a 70 ppb standard to a range of $19 billion to $38 billion for a 65 ppb standard. The public health benefits of setting a more stringent ozone standard are the monetized value of such effects as fewer premature deaths, fewer hospital admissions, fewer emergency room visits, fewer asthma attacks, less time lost at work and school, and fewer restricted activity days.[45] The RIA for the proposed standard states that the nationwide benefits of a revised standard (excluding California) would include the avoidance of 710 to 1,400 premature deaths annually in 2025 (at 70 ppb) or 2,000 to 4,300 deaths annually (at 65 ppb).[46] The dollar value of the avoided premature deaths accounts for 94% to 98% of EPA's total monetized benefits.[47]

The benefit estimates include benefits of reduced fine particle ($PM_{2.5}$) concentrations associated with ozone controls, in addition to the benefits of reduced ozone itself. The RIA states that: "$PM_{2.5}$ co-benefits account for approximately two-thirds to three-quarters of the estimated benefits, depending on the standard analyzed and on the choice of ozone and PM mortality functions used."[48] Including these co-benefits is consistent with the methodology EPA has used in valuing benefits of many other proposed and promulgated standards, but some observers are critical of this approach, noting that including these co-benefits results in a net benefit, whereas an analysis that considered the costs and benefits of ozone reductions in isolation would not. The control technologies used to capture ozone precursors do capture particles and their precursors, however. Since they do so at no additional cost, EPA considers this a benefit of the controls.

Other stated benefits of a 65-70 ppb standard in 2025 would include preventing the following, annually:

- 64-1,700 nonfatal heart attacks,
- 2,090-6,330 hospital admissions and emergency room visits,
- 790-2,300 cases of acute bronchitis,
- 44,000 cases of upper and lower respiratory symptoms,
- 320,000-960,000 cases of exacerbated asthma,
- 395,000-1,180,000 days when people miss work or school, and
- 1.3 million-4.0 million minor restricted activity days.[49]

[45] For a full discussion of these variables and their monetized values, see Chapter 6 of the 2008 RIA at http://www.epa.gov/ttn/ecas/regdata/RIAs/452_R_08_003.pdf.

[46] 2014 RIA, p. ES-14.

[47] EPA's estimate uses an approach called the Value of a Statistical Life (VSL). See 2014 RIA, p. 5-87 and pp. 5-56 to 5-66. For additional information on VSL, see archived CRS Report R41140, *How Agencies Monetize "Statistical Lives" Expected to Be Saved By Regulations*, by Curtis W. Copeland. (The author of that report is no longer with CRS. Questions on it should be directed to Maeve Carey, Analyst in Government Organization and Management.)

[48] 2014 RIA, p. ES-13, at http://www.epa.gov/air/ozonepollution/pdfs/20141125ria.pdf.

[49] 2014 RIA, p. ES-15. Implementing emissions controls to reach some of the alternative ozone standard levels would also reduce other ambient pollutants, according to EPA. However, because the methods used in the RIA to simulate attainment did not account for changes in ambient concentrations of other pollutants, the RIA does not to quantify the (continued...)

California and Other Regional Costs and Benefits

EPA provided separate cost and benefit estimates for California. Because of the statutory classification scheme for ozone nonattainment areas, under which more polluted areas have more stringent emission control requirements and more time to reach attainment, most areas of California will have until the 2030s to reach attainment. EPA's California estimates use projections for 2038 (see **Table 3**). The agency concluded: "Because of these differences in timing related to California attaining a revised standard, the separate costs and benefits estimates for post-2025 should not be added to the primary estimates for 2025."[50]

EPA also estimated the costs of the proposed NAAQS separately for the eastern United States (defined as Texas and the 36 states to its north and east) and the western United States (Montana, Wyoming, Colorado, New Mexico, and other states to the west, excluding California). These regional estimates show that all of the $3.9 billion estimated cost to achieve a 70 ppb standard is incurred by emission sources in the eastern United States. At 65 ppb, about 3% of the $15 billion cost would be incurred in the west, with 97% incurred in the east.

Table 3.Estimated Annual Costs and Health Benefits of Ozone NAAQS Options in California, Post-2025

(in billions of 2011 dollars)

Option	Costs	Health Benefits
70 ppb	$0.80	$1.1 to $2
65 ppb	$1.6	$2.2 to $4.1
60 ppb*	$2.2	$3.2 to $5.9

Source: U.S. EPA, RIA of the Proposed Revisions to the NAAQS for Ground-Level Ozone, November 2014.

* EPA did not propose a 60 ppb standard, but sought comment on that option and provided cost and benefit estimates for it.

Notes: The data reflect annualized costs and annual monetized benefits of achieving the standard post-2025 in California. Because of more severe pollution, the Clean Air Act will give most areas of California until the 2030s to reach attainment. The agency states that "estimates of costs and benefits for California in a post-2025 time frame are likely to be relatively more uncertain than the national attainment estimates for 2025." In particular, the agency did not project emissions and air quality for any year other than 2025, although it assumed that emission controls and associated costs would occur through the beginning of 2038; benefits for California were modeled using population demographics in 2038. The estimates assume a 7% discount rate for future costs and benefits.

Industry Estimates

Industry sources have generally estimated the future cost of emission controls necessary to attain a revised ozone NAAQS to be greater than does EPA. A recent study by the National Association of Manufacturers, for example, which was published four months before EPA's proposal,

(...continued)

co-benefits of reduced exposure to these pollutants. See 2014 RIA, p. ES-11.

[50] 2014 RIA, p. ES-3.

projected the cost of attaining a more stringent ozone NAAQS, as measured in reduced Gross Domestic Product, at up to $270 billion annually from 2017 to 2040.[51]

In reaching these conclusions, the NAM study made a number of assumptions different from those in EPA's Regulatory Impact Analysis:

- The study looked only at the most stringent option under consideration in the review process (60 ppb). As noted earlier, EPA has proposed a standard in the range of 65 to 70 ppb.
- The study used data and assumptions generated by EPA in its 2008-2011 RIAs for its analysis, although it stressed the need for EPA to provide updated information. In proposing the standard, the agency has now provided updated information in the 2014 RIA.
- The study's baseline didn't account for some recently promulgated EPA regulations that will reduce NOx emissions (e.g., the Cross State Air Pollution Rule).
- A combination of these factors resulted in the NAM study concluding that two-thirds of the emission reductions needed to reach attainment would have to come from "unknown controls," which it estimated could cost as much as $500,000 per ton of emissions reduced.[52] EPA's modeling of the rule's costs found that unknown controls would play a much smaller role: both the number of tons to which such controls would apply and the cost per ton would be substantially less.
- NAM's analysis focused exclusively on emissions of NOx, without any consideration of VOC controls. VOC emissions from petroleum and related industries have more than quadrupled since 2005, according to EPA, while emissions from most other sources have declined.[53] Recent EPA analyses suggest that there are low cost emission control options in the oil and gas sector.[54]

Issues

The current ozone NAAQS review is likely to raise issues regarding the cost of attainment, background ozone levels, the adequacy of the ozone monitoring network, and the role of federal versus state and local pollution control measures.

[51] NERA Economic Consulting for the National Association of Manufacturers, *Assessing Economic Impacts of a Stricter National Ambient Air Quality Standard for Ozone*, July 2014, p. S-1, at http://www.nam.org/Special/Media-Campaign/EPA-Overregulation/Ozone-Regulations.aspx. Hereinafter, "NAM Report."

[52] NAM Report, pp. 12-19.

[53] See U.S. EPA, National Emissions Inventory (NEI) Air Pollutant Emission Trends Data, at http://www.epa.gov/ttn/chief/trends/.

[54] See, for example, U.S. EPA, Regulatory Impact Analysis, Final New Source Performance Standards and Amendments to the National Emissions Standards for Hazardous Air Pollutants for the Oil and Natural Gas Industry, April 2012, at http://www.epa.gov/ttnecas1/regdata/RIAs/oil_natural_gas_final_neshap_nsps_ria.pdf.

The Role of Cost

Because of its wide reach and potential cost, a proposed revision to the ozone NAAQS is likely to be among the most controversial rules EPA will consider in the coming year. In past reviews, industries that emit ozone precursors and broadly-based business groups have complained forcefully that a more stringent standard would be too costly to attain.

The issue of cost is a perennial one in NAAQS decisions, even though EPA is prohibited by the Clean Air Act from considering costs in setting the standards. The Clean Air Act's §109 has been so interpreted since the NAAQS provisions were added to the act in 1970; in 2001, this interpretation was affirmed in a unanimous Supreme Court decision, *Whitman v. American Trucking Associations*.[55] The Court pointed to numerous other CAA sections where Congress had explicitly allowed consideration of economic factors, concluding that if Congress had intended to allow such factors in the setting of a primary NAAQS, it would have been more forthright—particularly given the centrality of the NAAQS concept to the CAA's regulatory scheme. The court concluded that §109(b)(1) "unambiguously bars cost considerations from the NAAQS-setting process."[56]

This is not to say that cost considerations play no role in Clean Air Act decisions, including in *implementation* of a NAAQS. Cost-effectiveness is considered extensively by EPA and the states in selecting emission control options to meet the standards. Also, as discussed above, the agency prepares cost and benefit estimates at the time it proposes or promulgates a NAAQS, both for information purposes, and in order to comply with Executive Order 12866, under which the OMB requires cost-benefit analysis of economically significant rules. But in deciding what level of ambient pollution poses a health threat, the statute bars consideration of costs.

Many in Congress would like to change this, by revising the CAA to require consideration of cost in NAAQS decisions. In the 112th Congress, the House twice passed legislation that would have done so: H.R. 2401 and H.R. 3409 would have required the EPA Administrator to take feasibility and costs into consideration in setting National Ambient Air Quality Standards. The Senate did not pass either bill. In the 113th Congress, H.R. 5505/S. 2833 and H.R. 5665 would have required EPA to take into consideration feasibility and cost in setting ozone NAAQS, as well as establishing several other conditions on the Administrator's ozone-NAAQS-setting authority.

Background Ozone Levels

A number of states, particularly in the inter-mountain west, experience what are termed high "background" levels of ozone. As EPA explains:

> Any ozone formed by processes other than the chemical conversion of local or regional ozone precursor emissions is generically referred to as "background" ozone. Background ozone can originate from natural sources of ozone and ozone precursors, as well as from manmade international emissions of ozone precursors. Natural sources of ozone precursor emissions such as wildfires, lightning, and vegetation can lead to ozone formation by

[55] 531 U.S. 457 (2001).

[56] For further discussion of the American Trucking case, see CRS Report RS20860, *The Supreme Court Upholds EPA Standard- Setting Under the Clean Air Act: Whitman v. American Trucking Ass'ns*, by Robert Meltz and James E. McCarthy.

> chemical reactions with other natural sources. Another important component of background is ozone that is naturally formed in the stratosphere through interactions of ultraviolet light with molecular oxygen. Stratospheric ozone can mix down to the surface at high concentrations in discrete events called intrusions, especially at higher-altitude locations. The manmade portion of the background includes any ozone formed due to anthropogenic sources of ozone precursors emitted far away from the local area (e.g., international emissions). Finally, both biogenic and international anthropogenic emissions of methane, which can be chemically converted to ozone over relatively long time scales, can also contribute to global background ozone levels.[57]

In its RIA, EPA identifies three definitions of background ozone:

- natural background (ozone that would exist in the absence of any manmade emissions of ozone precursors);
- North American background (ozone that would exist in the absence of any manmade emissions of ozone precursors in North America); and
- United States background (ozone that would exist in the absence of any manmade emissions of ozone precursors within the United States).

What the definitions have in common is that they identify ozone levels that cannot be influenced by actions within the jurisdiction of concern.

EPA modeling of *natural background* ozone at high elevation levels in the western United States found a median value of 24 ppb, with a maximum 8-hour value of 34 ppb.[58] *U.S. background* ozone had higher values: since it includes more sources of ozone precursors in the definition of "background," it had median values in the 30-35 ppb range, with concentrations greater than 40 ppb in Colorado, Nevada, Utah, Wyoming, northern Arizona, eastern California, and parts of New Mexico.[59]

EPA noted in the preamble to the proposed rule that, "A number of commenters [on the agency's Integrated Science Assessment] expressed the view that the EPA should not lower the level of the standard because a lower level would be closer to background O_3 [ozone] concentrations."[60] The agency did not agree.

In response to the comments, the proposed rule's preamble states that "there can be events where O_3 levels approach or exceed the concentration levels being proposed in this notice." When this happens, according to agency modeling, it is typically the result of stratospheric intrusions of ozone, wildfire plumes, or long-range transport of ozone from sources outside the United States. "In most locations in the U.S., these events are relatively infrequent and the CAA contains provisions that can be used to help deal with certain events, including providing varying degrees of regulatory relief."[61]

[57] 2014 RIA, pp. 2-10 and 2-11.

[58] 2014 RIA, p. 2-13.

[59] 2014 RIA, pp. 2-13 and 2-14.

[60] Proposed Rule, pre-publication copy, p. 196 (79 *Federal Register* 75287).

[61] Proposed Rule, pre-publication copy, pp. 537-538 (79 *Federal Register* 75382).

Regulatory relief can include the exclusion of data affected by exceptional events, relief from more stringent requirements in areas designated as "rural transport areas," and the application of CAA Section 179B, which allows EPA to approve state SIP submissions that demonstrate an area would have met the ozone NAAQS by the attainment date if not for international emissions contributing to the area.[62]

The invocation of these regulatory relief measures, as even EPA admits, is not burden-free: each would require some level of assessment or demonstration by a state and/or EPA.[63] States that have tried to invoke the "exceptional event" exceptions have expressed frustration with the lack of clarity and the burden involved in meeting EPA's data requirements and, thus, may not be confident in the agency's offer of regulatory relief.[64] But, as noted earlier (in **Figure 3**), EPA does not believe it will be necessary in most cases to invoke such measures. EPA modeling shows only nine counties outside of California exceeding a 70 ppb standard without any emission control measures additional to those already promulgated as of this date. A 65 ppb standard imposes a somewhat greater burden, but in that case, too, the modeling shows most areas reaching attainment without additional controls and without invocation of statutory relief provisions.

EPA continues to seek comment on background ozone and related implementation issues. For a more detailed discussion, see "EPA's Proposal to Update the Air Quality Standards for Ground-Level Ozone: Additional Information for States Regarding Background Ozone."[65]

Monitoring

The existing network of ozone monitors is concentrated in urban areas, because of the larger population potentially affected, and because most of the sources of ozone precursor emissions are located in such areas. But, as noted earlier, ozone is not generally emitted directly by pollution sources. It forms in the atmosphere, often downwind of emission sources. Thus, rural areas can have high ozone concentrations. The new form of the secondary NAAQS discussed by EPA suggested a need for additional monitoring in rural areas to detect impacts of ozone on forests and agricultural production. Both EPA and state monitoring budgets are constrained, however, raising questions as to how any additional monitoring requirement would be funded.

The agency, in a 2009 rulemaking separate from the NAAQS, proposed changing the minimum ozone monitoring requirements for both urban and non-urban areas.[66] That proposal would have required that each state operate at least three ozone monitors in non-urban areas. It would also have required at least one ozone monitor in each urban area with a population between 50,000 and 350,000. The requirements were not finalized. Although EPA has proposed to change some of the monitoring requirements as part of the current ozone NAAQS proposal (in particular, extending the number of months during which ozone must be monitored in 31 states and the

[62] See, U.S. EPA, "EPA's Proposal to Update the Air Quality Standards for Ground-Level Ozone: Additional Information for States Regarding Background Ozone," at http://www.epa.gov/groundlevelozone/pdfs/20141203-background-ozone-states.pdf.

[63] Proposed Rule, pre-publication copy, p. 538 (79 *Federal Register* 75383).

[64] See, for example, the comments of state and local officials on EPA's proposed 2012 Exceptional Events guidance, at http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OAR-2011-0887-0051.

[65] http://www.epa.gov/groundlevelozone/pdfs/20141203-background-ozone-states.pdf.

[66] 74 *Federal Register* 34525, July 16, 2009.

District of Columbia), the agency's current proposal would not require additional monitors in smaller urban or rural areas.

The absence of ozone monitors in rural areas is another factor that should help mitigate concerns of western states that background levels of ozone will cause rural areas in their states to be designated nonattainment. EPA's policy in designating ozone nonattainment areas has always relied on the submission of EPA-certified monitoring data. Areas without monitors (unless they are contributing to an area with monitored nonattainment) have generally been termed "unclassifiable." When non-regulatory monitors indicate exceedance of the ozone NAAQS, designation as nonattainment does not automatically follow. Rather, the state must first establish regulatory monitors[67] and collect three years of data before submitting a proposed designation to EPA.[68]

The Role of Federal Versus State and Local Pollution Control Measures

EPA has promulgated more stringent standards for most of the major sources of ozone precursors, including Tier 3 auto emission and fuel standards that will begin to take effect in 2017 and more stringent standards for power plants that begin to take effect in 2015. (For additional information on these standards, see CRS Report R43497, *Tier 3 Motor Vehicle Emission and Fuel Standards* and CRS Report R42144, *EPA's Utility MACT: Will the Lights Go Out?*) These standards should make the task of demonstrating attainment with a more stringent ozone NAAQS substantially easier. As noted earlier, EPA estimates that nationwide (except in California) already promulgated EPA and state regulations would bring all but nine counties into attainment of a 70 ppb ozone NAAQS by 2025. Many in Congress objected to the standards for motor vehicles, fuels, power plants, and other sources when they were under consideration, but at this date, the net effect of repealing them would be to shift the burden of attaining the ozone NAAQS more squarely in the direction of state and local governments.

A tighter ozone NAAQS has frequently raised the issue of how to control emission sources that contribute to pollution downwind, in other states. Ozone, which forms in the atmosphere from chemical reactions of precursor emissions, is the prime example of such downwind pollution. Under both the Bush and Obama Administrations, EPA has addressed this interstate air pollution issue—through the Clean Air Interstate Rule (CAIR, 2005) and the Cross State Air Pollution Rule (CSAPR, 2011). The D.C. Circuit Court of Appeals found fault with both rules, although it allowed CAIR to take effect pending promulgation of an acceptable replacement.[69]

[67] Ambient air monitors used to determine whether an area is in attainment of a NAAQS (a "regulatory monitor") must meet three criteria: it must use methods specified in 40 C.F.R. Part 58, Appendix C; it must meet siting criteria specified in 40 C.F.R. Part 58, Appendix E; and it must meet quality assurance criteria specified in 40 C.F.R. Part 58, Appendix A.

[68] The Uintah Basin in Utah provides an example. Non-regulatory monitors indicated ozone levels that exceeded the NAAQS in December 2009, January-March 2010, and January-March 2011. The state began collecting regulatory monitoring data in April 2011. As of December 2014, the state has not submitted to EPA data with which to designate the area nonattainment, and the area has not been designated nonattainment.

[69] For a discussion of the Bush and Obama Administration regulations and the D.C. Circuit decisions remanding them, see CRS Report R42895, *Clean Air Issues in the 113th Congress: An Overview*.

Whether EPA had correctly interpreted its authority to control emissions leading to downwind pollution ultimately reached the Supreme Court. On April 29, 2014, in a 6-2 decision (*EPA v. EME Homer City Generation, LLP*), the Court upheld the methodology at the heart of EPA's CSAPR standard-setting process.[70] The rule was remanded to the D.C. Circuit for consideration of additional issues, however, and has still not been implemented.

The complexity of establishing controls on air pollution that crosses state lines has suggested to many stakeholders that Congress should revisit the Clean Air Act sections that authorize or require such controls, and numerous bills have been introduced on the subject over the years. Since the last major CAA revision in 1990, however, none of those bills has made it to the floor of the House or Senate. The Supreme Court's decision in the *Homer City* case may have further reduced the odds of congressional action on the subject. With pollution transport issues still to be resolved by the D.C. Circuit, though, and states expressing continued interest, the issue should perhaps not be considered dead yet.

Next Steps

The ozone NAAQS proposal appeared in the *Federal Register* on December 17, 2014. The publication of the proposal began a public comment period that is scheduled to run until March 17, 2015. Public comment periods are frequently extended beyond the original time period in the case of controversial or complicated rules, such as the ozone NAAQS; but the agency does face a time constraint (a court order to complete the review by October 1, 2015), which argues against a longer comment period.

EPA will hold three public hearings: in Arlington, TX, and Washington, DC, on January 29; and in Sacramento, CA, on February 2.

Congress had already taken an interest in the ozone proposal before it was released. Three bills were introduced in the 113th Congress that would have affected the timing and/or EPA's authority to promulgate an ozone NAAQS:

- H.R. 4947/S. 2514 would have delayed the review and revision of the standard for three years and required future reviews at 10-year rather than 5-year intervals;
- H.R. 5505/S. 2833 would have prohibited a more stringent standard until at least 85% of the counties in nonattainment areas as of January 1, 2014, attained the current standard, and would have required EPA to consider feasibility and cost in setting an ozone NAAQS, among other provisions; and
- H.R. 5665 would also have required EPA to consider feasibility and cost in setting a new or revised ozone NAAQS, and would have required a detailed report to Congress at least 180 days before a new or revised standard could be proposed and congressional approval before a final standard could take effect.

No action was taken on these bills, but it is likely that these or other bills to address the ozone NAAQS will be introduced in the 114th Congress.

[70] EPA v. EME Homer City Generation, L.P., 134 S. Ct. 1584 (2014).

The Senate Environment and Public Works Committee Subcommittee on Clean Air and Nuclear Safety held a hearing on the proposed ozone NAAQS on December 17, 2014.

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