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Ozone Air Quality Standards: EPA's 2015 Revision

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Summary

The Environmental Protection Agency (EPA) is nearing the end of a statutorily required review of the National Ambient Air Quality Standards (NAAQS) for ground-level ozone. The agency is under a court order to propose any revisions to the standard by December 1, 2014.

NAAQS are standards for outdoor (ambient) air that are intended to protect public health and welfare from harmful concentrations of pollution. If the EPA Administrator changes the primary standard to a lower level, she 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.

As of July 2014, 123 million people (40% of the U.S. population) lived in areas classified “nonattainment” for the primary ozone NAAQS. A more stringent standard might affect more areas, and sources that contribute to nonattainment might have to adopt more stringent emission controls. This could be costly: in 2011, EPA concluded that the annual cost of emission controls necessary to attain a primary NAAQS of 0.070 ppm (as opposed to the then-current standard of 0.075 parts per million, which remains in place today) would be at least \$11 billion in 2020.

EPA last revised the ozone standard in March 2008, but the standards chosen at that time remain subject to controversy. A 23-member panel of EPA science advisers, chosen from outside the agency, unanimously recommended a more stringent range of standards than the Administrator chose. In 2009-2011, the agency reconsidered the 2008 standard, but the process was short-circuited by a presidential decision to await conclusion of the next regular review—the review now nearing completion.

The agency begins a NAAQS review by compiling an Integrated Science Assessment, which summarizes the science surrounding the standards. The current assessment, released in February 2013, finds that evidence associating ozone exposure with morbidity and mortality has strengthened since the 2008 review. This would appear to support more stringent standards. The next steps in the process, completion of a Risk Analysis and Policy Assessment, completed in August 2014, recommended a revised primary standard in the range of 0.060 to 0.070 ppm.

Proposed standards might raise a number of issues, including:

- Whether their expected benefits justify their costs. This is a perennial issue raised by stakeholders when EPA considers revising the NAAQS. As the Clean Air Act is currently written, the agency is prohibited from weighing costs against benefits in setting these 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. A unanimous Supreme Court has found that the absence of language mentioning cost means that costs are not to be considered in setting these standards. Many in Congress would like to change this to require a cost-benefit consideration.
- How nonattainment areas would lower emissions sufficiently to comply with more stringent standards. Currently implemented federal standards for cars, trucks, nonroad vehicles and engines, power plants, and other pollution sources are not strong enough to

bring many areas into attainment, thus requiring local pollution control measures in those cases. EPA has recently promulgated more stringent emission standards for motor vehicles, power plants, and other sources, to take effect between now and 2025. Whether these will be sufficient to help areas reach attainment is a key question.

- Monitoring issues. At present, only 675 of the nation's 3,000 counties have ozone monitors in place. New standards might suggest a need for additional monitoring, but both EPA and state monitoring budgets are constrained, raising questions as to how additional monitoring would be funded.

This report discusses the standard-setting process, the specifics of the current and most recent reviews, and issues that may be raised as EPA brings the current review to completion.

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Introduction

The Environmental Protection Agency (EPA) is nearing completion of a statutorily required review of the National Ambient Air Quality Standards (NAAQS) for ground-level ozone.¹ The agency has already completed the science assessment that will serve as the review's foundation,² and the agency's staff recommendations regarding the form and level of the standards have been sent to the Administrator for her decision.³ The agency is under a court order to formally propose standards by December 1, 2014. A comment period, public hearings, and interagency review will follow. The standards are to be finalized by October 1, 2015.

Ground-level ozone (often referred to as "smog") is associated with 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 its 2010 proposal to reconsider the ozone standard, EPA said that reducing concentrations to 0.060 parts per million (versus the then-implemented primary standard of 0.08 parts per million⁴) would avoid 4,000 to 12,000 premature deaths annually.⁵

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."⁶ 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.⁷

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 Availability of the assessment was announced at 78 *Federal Register* 11172, February 15, 2013. For a summary, see "EPA Assessment Underscores Relationship Between Ozone Exposure, Respiratory Effects," *Daily Environment Report*, February 19, 2013. The assessment itself is 1,251 pages long and is available at <http://www.epa.gov/ncea/isa/ozone.htm>.

³ 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."

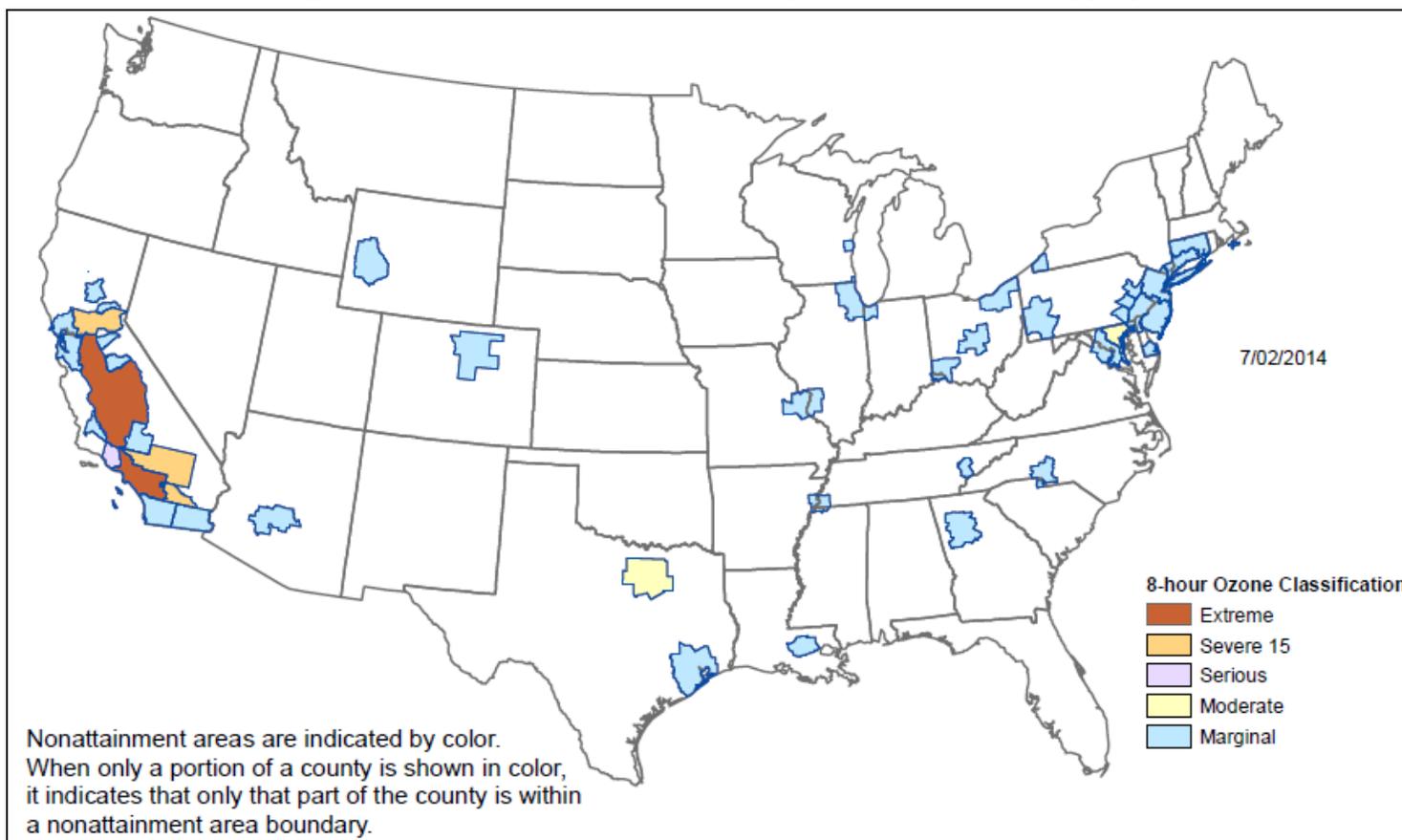
⁴ The ozone NAAQS is also frequently expressed in terms of parts per *billion* rather than parts per *million*. A standard of 0.060 parts per million would be the same as a standard of 60 parts per billion, and is often referred to as such. Until 2008, the standard was expressed in parts per million 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, "Supplement to the Regulatory Impact Analysis for Ozone," Fact Sheet, January 7, 2010, at <http://www.epa.gov/glo/pdfs/fs20100106ria.pdf>.

⁶ 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.

⁷ *Ibid.*, p. 74.

Figure 1. Ozone Nonattainment Areas (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. As shown in **Figure 2**, some areas that attain the 2008 standard are still designated nonattainment for the less stringent 1997 standard. These areas may have 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.

While EPA's analysis has found that there would be substantial benefits to reducing ozone, the agency also has concluded that there could be substantial costs. At the time it promulgated its 2008 revision of the standard, EPA projected the cost of attaining the standard at \$7.6 billion to \$8.8 billion annually.⁸ Tightening the standard further might add additional billions to that cost.

The ozone NAAQS are among EPA's most far-reaching standards. At the current level, set in March 2008 (0.075 ppm), 123 million people live in areas that have not attained the standards (see **Figure 1**).⁹ These 46 areas (referred to as "nonattainment areas") generally coincide with metropolitan areas, but may be larger or smaller.

States are required to develop plans (State Implementation Plans, SIPs) that demonstrate how emissions will be reduced sufficiently in those nonattainment areas to attain the standards. SIPs are submitted to EPA for approval. Depending on the severity of pollution, the areas have from 3 to 20 years to reach attainment.

In addition to the 46 nonattainment areas for the 2008 standard, 37 areas with 105 million people (mostly the same areas) are still considered nonattainment for the less stringent 1997 ozone NAAQS, and 77 areas with 60 million people are classified as "maintenance areas" for that standard.¹⁰ (See **Figure 2**.) Some of these nonattainment areas may have monitoring data that demonstrate attainment with the 1997 standards; but they must have an EPA-approved maintenance plan in place before they will be removed from the nonattainment list and placed in the "maintenance" category. An approved maintenance plan includes enforceable measures demonstrating how an area will control emissions sufficiently to maintain compliance with the NAAQS.

EPA has several carrots or sticks 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.

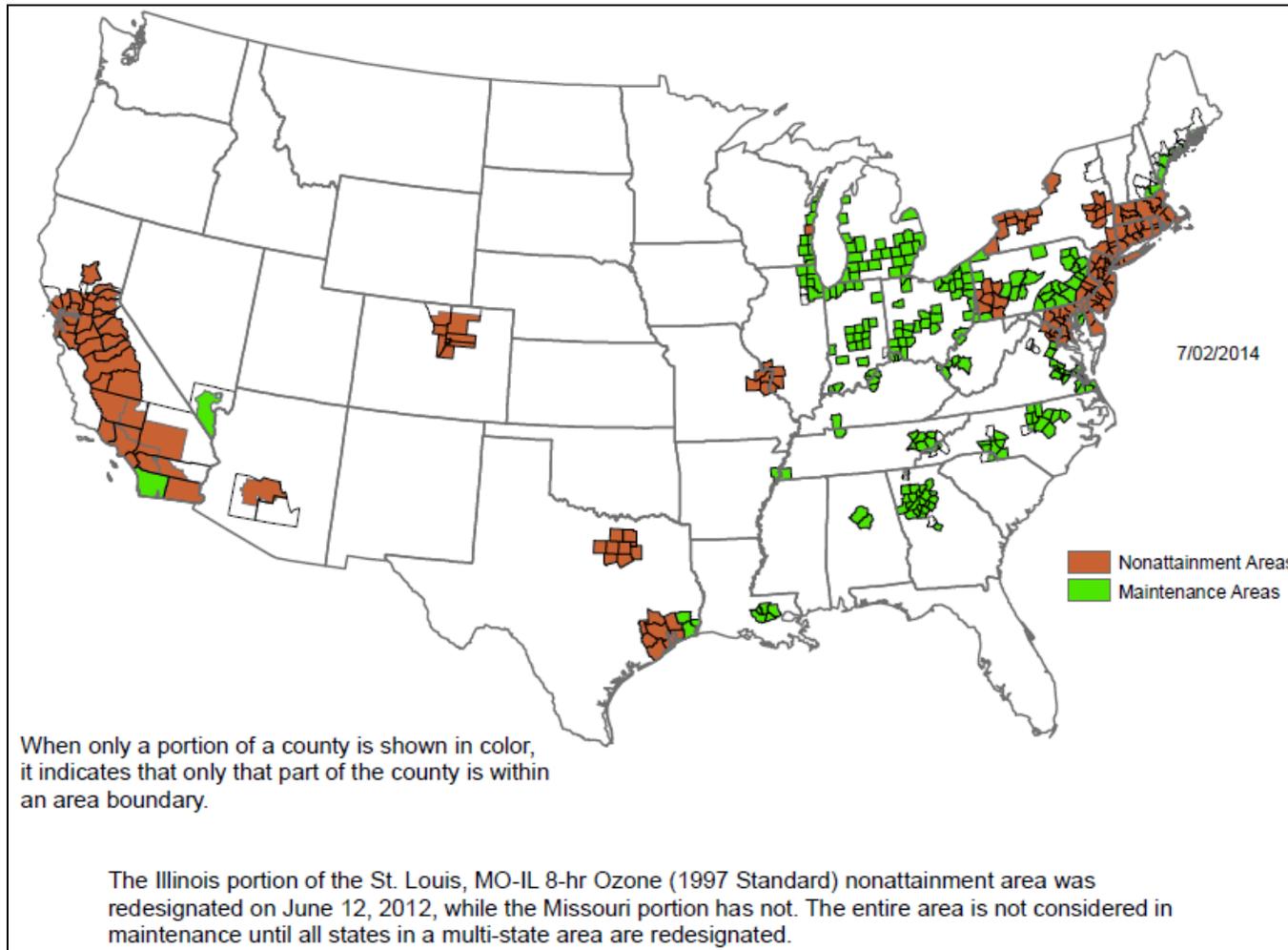
The potential economic, health, and environmental impacts of a change in the ozone NAAQS have led to great interest in EPA's ongoing review of the standards. To assist Members and staff in evaluating EPA's review, this report provides background on NAAQS, the process used to establish them, the current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

⁸ U.S. EPA, "Final Revisions to the National Ambient Air Quality Standards for Ozone," Fact Sheet, March 12, 2008, at http://www.epa.gov/glo/pdfs/2008_03_factsheet.pdf.

⁹ For specifics, see EPA's "Green Book," at <http://www.epa.gov/oaqps001/greenbk/hntc.html>.

¹⁰ A listing of these areas, as well as areas still designated nonattainment for the 1997 standard, can be found at <http://www.epa.gov/oaqps001/greenbk/o8index.html>.

Figure 2. Ozone Nonattainment and Maintenance Areas (1997 Standard, 0.08 ppm)



Source: U.S. EPA Green Book, <http://www.epa.gov/airquality/greenbk/map8hrnm.html>. Map shows areas designated nonattainment or maintenance as of 7/2/2014.

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.¹¹

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.”¹² 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. 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 which outline the measures that will reduce emission levels and attain the standards. Actual attainment of the standards can 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.¹³

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

¹¹ The Clean Air Act's definition of welfare is found in Section 302(h) of the act (42 U.S.C. 7602(h)).

¹² 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 defines specifically lists 187 pollutants or groups of pollutants and establishes different authorities and requirements for controlling their emissions.

¹³ 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.

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.¹⁴ 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, 2015.¹⁵

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 2013,¹⁶ reviewed 2,300 scientific studies. Ozone ISAs cover topics as wide-ranging as the physics and chemistry of ozone in the atmosphere; environmental concentrations, patterns, and exposure; dosimetry and 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 2014.¹⁷

¹⁴ 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, NO₂, carbon monoxide, and SO₂) have been completed since 2006, with the standards being made more stringent for five of the six.

¹⁵ The agency missed the March 2013 deadline for review of the 2008 standard. The suit is *Sierra Club v. EPA*, No. 13-2809 (N.D. Cal., filed 6/19/13).

¹⁶ 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>.

¹⁷ U.S. EPA, *Ozone (O3) Standards - Documents from Current Review - Risk and Exposure Assessments*, at http://www.epa.gov/ttn/naaqs/standards/ozone/s_o3_2008_rea.html.

Table I. History of the National Ambient Air Quality Standards for Ozone
1971-2008

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.

Source: U.S. Environmental Protection Agency, http://epa.gov/ttn/naaqs/standards/ozone/s_o3_history.html.

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, 2014.¹⁸

¹⁸ 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."

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 to 0.075 ppm. 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.¹⁹

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 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.

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.”²⁰ 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.

¹⁹ 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/4AF8764324331288852574250069E494/\\$File/EPA-CASAC-08-009-unsigned.pdf](http://yosemite.epa.gov/sab/sabproduct.nsf/4AF8764324331288852574250069E494/$File/EPA-CASAC-08-009-unsigned.pdf).

²⁰ 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](http://yosemite.epa.gov/sab/sabproduct.nsf/AB290E0DB8B72A33852572120055858F/$File/casac-07-001.pdf).

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.”²¹

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).²² That revision led to designation of nonattainment areas in April and May 2012, as shown above in **Figure 1**.²³

The Regulatory Impact Analysis that accompanied the 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 2008-2010.²⁴ In the intervening years, emissions declined in most areas as more stringent standards for both mobile and stationary sources took effect. The recession may also have contributed to the lower numbers: when the economy is operating well below capacity, emissions generally decline.

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.

Although the draft final standard was withdrawn at the President’s request before being promulgated, the agency subsequently made available documents prepared in support of its recommendation, including a Supplement to the 2008 Regulatory Impact Analysis.²⁵ The Supplemental RIA is discussed below, in the section on “Costs and Benefits of Control.”

The Current Review

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

²¹ “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.

²² All of EPA’s references to the 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). In order to avoid confusion when quoting from EPA sources, this report generally uses the more cumbersome parts-per-million form.

²³ 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>.

²⁴ A few states had certified monitoring data for 2009-2011, and their designations were based on that three-year period.

²⁵ See “EPA Releases Documents on the National Ambient Air Quality Standard for Ozone,” at <http://www.epa.gov/glo/actions.html>.

The available scientific evidence and exposure/risk information provide strong support for considering a primary O₃ [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 O₃ 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 O₃ standard should be set below 70 ppb.²⁶

These recommendations are now in the hands of the EPA Administrator, who will propose retaining or revising the NAAQS by December 1, 2014.

The Secondary Standard

As part of the review completed in 2008 and the 2010-2011 reconsideration process, EPA 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. 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”).²⁷ 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.²⁸

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 (unless they also violated a primary standard), but there was substantial disagreement between the Bush Administration EPA and the

²⁶ U.S. EPA, 2014 Policy Assessment, p. ES-5.

²⁷ 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>.

²⁸ 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](http://yosemite.epa.gov/sab/sabproduct.nsf/FE915E916333D776852572AC007397B5/$File/casac-07-002.pdf).

Office of Management and Budget (OMB) 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.²⁹ Ultimately, OMB prevailed.³⁰

Upon reconsideration, the 2011 draft 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 renews this debate, this time with an additional thumb on the scale. The agency’s staff has 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.³¹ In the interim, the D.C. Circuit Court of Appeals also weighed in. In a July 23, 2013, decision, 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.”³²

A total of 163 counties would have exceeded the draft seasonal standard sent to OMB in 2011.³³ All but 11 of these counties also would have exceeded the draft primary standard and would have had to address emissions of ozone precursors whether or not they exceeded the secondary standard.³⁴

As discussed further below, however, few rural counties have ozone monitors, so the true extent of nonattainment with a seasonal secondary standard is currently unknowable. EPA proposed additional ozone monitoring requirements for both urban and non-urban areas in 2009;³⁵ as of this writing, the agency has not issued a final monitoring rule.

²⁹ 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.

³⁰ 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>.

³¹ See U.S. EPA, 2014 Policy Assessment, pp. ES-9 to ES-12.

³² *Mississippi v. EPA*, 723 F.3d 246, 272, 273 (D.C. Cir. 2013) (ellipses in original).

³³ For additional information, including a map of the potential nonattainment areas for the draft secondary standard, see U.S. EPA, *Regulatory Impact Analysis, Final National Ambient Air Quality Standard for Ozone*, July 2011, pp. 48-49, at http://www.epa.gov/glo/pdfs/201107_OMBdraft-OzoneRIA.pdf.

³⁴ The 11 counties that would have exceeded only the draft secondary standard were in Arizona, Colorado, New Mexico, and Utah. Supplemental RIA, p. 49.

³⁵ For information on the proposed monitoring rule, see “Fact Sheet: Proposal to Revise the National Ambient Air (continued...)”

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) react with nitrogen oxides (NO_x) 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.

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 NO_x 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 40% 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.³⁶ 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.

(...continued)

Quality Standards for Ozone,” p. 4, at <http://www.epa.gov/air/ozonepollution/pdfs/fs20100106std.pdf>.

³⁶ 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.

The mechanism of ozone formation in the areas is still being studied, but it appears that the thousands of oil and gas wells in the two basins release volatile organic compounds (VOCs) that react with nitrogen oxides (NO_x) 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 NO_x comes from oil and gas operations.³⁷ The sunlight necessary for ozone to be created is magnified when it is reflected off of heavy snow cover. Snow cover also helps create temperature inversions that trap polluted air in the basins. In winters with little snow, there are few exceedances of the standards.³⁸

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, 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 generally produces a Regulatory Impact Analysis (RIA) analyzing in detail the costs and benefits of new or revised NAAQS standards. The agency produced an RIA for its 2008 ozone NAAQS, and it released an 87-page draft supplement to that RIA in conjunction with the 2010-2011 reconsideration.³⁹ The supplemental RIA showed a range of estimates for three possible standards: 0.065 ppm; 0.070 ppm (the standard chosen by EPA at the conclusion of the reconsideration process, but not promulgated); and 0.075 ppm (the standard promulgated in 2008, and currently being implemented). EPA's estimates of the benefits and costs of the three options are summarized in Error! Reference source not found..

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.⁴⁰ The supplement to the RIA stated that the benefits of a 0.070 ppm primary standard would include the avoidance of 1,500 to 4,300 premature deaths annually in 2020.⁴¹

³⁷ *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 NO_x comes primarily from the Bonanza Power Plant.

³⁸ 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.

³⁹ Links to the RIAs and other information related to the 2008 and draft 2011 ozone NAAQS can be found at <http://www.epa.gov/glo/actions.html>.

⁴⁰ 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.

⁴¹ U.S. EPA, Draft Supplemental RIA, p. 7.

Table 2. Estimated Costs and Quantifiable Benefits of Ozone NAAQS Options, in 2020

(in billions of 2006 dollars)

Option	Costs	Quantifiable Benefits
0.075 ppm	\$7.6 to \$8.8	\$6.4 to \$15
0.070 ppm	\$19 to \$25	\$11 to \$31
0.065 ppm	\$32 to \$44	\$19 to \$53

Source: U.S. EPA, Draft Supplemental RIA, July 2011.

Notes: The data reflect annualized costs and annual monetized benefits of achieving the standard in 2020. Numerous benefits and disbenefits remain unquantified and are not included in the benefits estimates. The estimates assume a 7% discount rate for future costs and benefits and what EPA terms “a particular trajectory of aggressive technological change.” According to the RIA, “An alternative storyline might hypothesize a much less optimistic technological trajectory, with increased costs, or with decreased benefits in 2020 due to a later attainment date.”

The estimates include benefits of reduced fine particle (PM_{2.5}) concentrations associated with ozone controls applied to meet each ozone standard option. Also, estimates only include areas assumed to meet the standard by 2020: they do not include the costs or benefits of attaining the alternate standards in the San Joaquin Valley and South Coast air basins in California, because the agency expects that nonattainment designations under the Clean Air Act for those areas would place them in categories afforded extra time beyond 2020 to attain the ozone NAAQS.

Other stated benefits of a 0.070 ppm standard in 2020 would include preventing the following, annually:

- 2,200 nonfatal heart attacks
- 6,600 hospital and emergency room visits
- 2,980 cases of acute or chronic bronchitis
- 44,000 cases of upper and lower respiratory symptoms
- 23,000 cases of aggravated asthma
- 770,000 days when people miss work or school
- 2.6 million days when people must restrict their activities.⁴²

In the RIA supplement, the agency noted that “there are significant uncertainties in both cost and benefit estimates for the full range of standard alternatives.”⁴³ Among the uncertainties are unquantified benefits (the effects of reduced ozone on forest health and agricultural productivity, for example) and unquantified disbenefits (reduced screening of UVB radiation and reduced nitrogen fertilization of forests and cropland). The benefits will also vary, depending on which of

⁴² Ibid.

⁴³ Ibid., p. 17.

the precursor pollutants nonattainment areas choose to control. The RIA also states, “Of critical importance to understanding these estimates of future costs and benefits is that they are not intended to be forecasts of the actual costs and benefits of implementing revised standards.”⁴⁴

Industry sources generally estimate 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, projects 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 2040.⁴⁵

In reaching these conclusions, the NAM study made a number of simplifying assumptions:

- The study looked only at the most stringent option under consideration (60 ppb).
- It used data and assumptions generated by EPA in its 2008 and 2010 RIAs for its analysis, although it stressed the need for EPA to provide updated information.
- The study’s baseline didn’t account for some EPA regulations promulgated since 2010 that will reduce NO_x emissions (e.g., the Cross State Air Pollution Rule).
- The analysis focused exclusively on emissions of NO_x, 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.⁴⁶ Recent EPA analyses suggest that there are low cost emission control options in the oil and gas sector.⁴⁷

EPA, in its 2008 and 2011 RIAs, concluded that its cost estimates are likely to overstate the eventual figures. In the agency’s words, “Technological advances over time will tend to increase the economic feasibility of reducing emissions, and will tend to reduce the costs of reducing emissions.”⁴⁸

Issues

The current ozone NAAQS review is likely to raise issues regarding the cost of compliance, the role of science in standard-setting, the interagency review process, the role of federal versus state and local pollution control measures, and the adequacy of the ozone monitoring network.

⁴⁴ Ibid.

⁴⁵ 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.”

⁴⁶ See U.S. EPA, National Emissions Inventory (NEI) Air Pollutant Emission Trends Data, at <http://www.epa.gov/ttn/chief/trends/>.

⁴⁷ 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.

⁴⁸ U.S. EPA, *Regulatory Impact Analysis, Final National Ambient Air Quality Standard for Ozone*, July 2011, p. 19, at http://www.epa.gov/groundlevelozone/pdfs/201107_OMBdraft-OzoneRIA.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*.⁴⁹ 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.”⁵⁰

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 Office and Management and Budget (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 would require 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.

The Role of Science and Interagency Review

Another major issue raised by proposed NAAQS standards may concern whether the Administrator's choices for the primary and secondary standards are backed by the scientific studies and recommendations of the agency's science advisers. One issue in recent years has concerned the form of the secondary ozone NAAQS: as discussed, the agency's staff and the independent CASAC review panel recommended a seasonal (rather than hourly) form of secondary ozone standard, to more adequately measure the impact of monitored ozone levels on

⁴⁹ 531 U.S. 457 (2001).

⁵⁰ 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.

forests and crops. This recommendation was dropped from the final decision in 2008. The seasonal form of the secondary standard was resurrected in the 2010-2011 reconsideration process, but it died a second time when the reconsidered standards as a whole were withdrawn.

More broadly, in the last two ozone NAAQS reviews, EPA (under both Republican and Democratic control) has been at odds with the Office of Management and Budget over the form and/or numerical level of the primary and secondary standards. As noted earlier, in 2008, OMB insisted on changes to EPA's recommended standards, at the completion of the multi-year agency review process. The result was promulgation of a secondary standard that was identical to the primary standard, rather than the new seasonal form of standard that the Administrator had chosen and that was unanimously recommended by the agency's science advisers.⁵¹ In 2011, OMB and the President returned the draft final standard to EPA for "reconsideration," stating that the President did not support finalizing the rule "at this time."

Many in Congress and in the executive branch have decried the politicization of science in recent years. It has become a common complaint that EPA and other agencies that make regulatory decisions on scientific issues have done so based on false premises or on an inadequate review of the available research. The NAAQS process addresses this concern more directly than most aspects of the air pollution regulatory structure, by establishing an independent scientific advisory committee (CASAC) and by requiring the Administrator to discuss that committee's recommendations when a NAAQS standard is proposed or promulgated. But the Administrator remains free to disregard CASAC's conclusions, provided that the *Federal Register* notice summarizes any difference between the rule and CASAC's recommendation and explains the reasons for any difference.⁵² This requirement has not prevented controversy over the scientific basis of NAAQS standards. It would seem likely that such controversy will arise again when the ozone NAAQS is proposed.

The Role of Federal Versus State and Local Pollution Control Measures

If the ozone NAAQS is made more stringent as a result of the current review, nonattainment areas will have to lower emissions sufficiently to comply with the new standard. This can be done through implementation of federal, state, and/or local measures. Current federal standards for cars, trucks, fuels, nonroad vehicles and engines, power plants, and other stationary pollution sources are reducing emissions. At current levels, however, they are not strong enough to bring many areas into attainment, thus requiring state and local pollution control measures in addition.

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 could make the task of demonstrating attainment with a more stringent ozone NAAQS substantially easier. 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

⁵¹ See the section on The Secondary Standard, above.

⁵² CAA Section 307(d)(3) and (d)(6).

them would be to shift the burden of attainment more squarely in the direction of state and local governments.

A tighter ozone NAAQS might provide reason for Congress to revisit 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.⁵³

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.⁵⁴ The rule was remanded to the D.C. Circuit for consideration of additional issues, however, and has still not been implemented.

In proposing CSAPR, the agency stated that it intended it to be the model for future regulations to assist downwind states in meeting more stringent NAAQS; so the *Homer City* case sets an important precedent. But EPA has found it difficult to address interstate transport of air pollution under the CAA's existing provisions. Key statutory terms are undefined, leaving it to EPA and the courts to interpret the statute. This generally leads to delays in implementation and uncertainty in the regulated community. Congress could play a useful role in revisiting the issues posed by interstate air pollution to clarify its intent, providing clearer authority. In the meantime, interested parties await the resolution of numerous issues by the courts, three years after CSAPR's promulgation.

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, unless they are located a substantial distance from any urban area or other source of emissions. The new form of the secondary NAAQS discussed by EPA also suggests 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.⁵⁵ That proposal would have required that each state operate at least three ozone monitors in non-urban areas. It would also

⁵³ 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*.

⁵⁴ *EPA v. EME Homer City Generation, L.P.*, 134 S. Ct. 1584 (2014).

⁵⁵ 74 *Federal Register* 34525, July 16, 2009.

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, but according to an agency spokesperson,⁵⁶ elements of the 2009 proposal can be expected to be incorporated into the December 2014 ozone NAAQS proposal.

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