

United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA CIRCUIT

Argued December 18, 2001 Decided March 26, 2001

No. 97-1440

American Trucking Associations, Inc., et al.,
Petitioners

v.

Environmental Protection Agency,
Respondent

Commonwealth of Massachusetts, et al.,
Intervenors

Consolidated with

97-1546, 97-1548, 97-1551, 97-1552, 97-1553, 97-1555,
97-1559, 97-1561, 97-1562, 97-1565, 97-1567, 97-1571,
97-1573, 97-1574, 97-1576, 97-1578, 97-1579, 97-1582,
97-1585, 97-1586, 97-1587, 97-1588, 97-1592, 97-1594,
97-1596, 97-1597, 97-1598

No. 97-1441

American Trucking Associations, Inc., et al.,
Petitioners

v.

Environmental Protection Agency,
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Commonwealth of Massachusetts, et al.,
Intervenors

Consolidated with
97-1502, 97-1505, 97-1508, 97-1509, 97-1510, 97-1512,
97-1513, 97-1514, 97-1518, 97-1519, 97-1526, 97-1531,
97-1539, 97-1566, 97-1568, 97-1570, 97-1572, 97-1575,
97-1584, 97-1589, 97-1591, 97-1595, 97-1619

On Remand from the United States Supreme Court

F. William Brownell and Norman W. Fichthorn argued the causes for State and Business Petitioners, Non-Environmental Petitioners, and Petitioners on Ozone Issues in 97-1440 and 97-1441. With them on the briefs were Henry V. Nickel, Thomas Richichi, Betty D. Montgomery, Attorney General, Judith L. French and Bryan F. Zima, Assistant Attorneys General, State of Ohio, Jennifer M. Granholm, Attorney General, Thomas Casey, Solicitor General, Alan F. Hoffman and Pamela J. Stevenson, Assistant Attorneys General, State of Michigan, Mark J. Rudolph, Senior Counsel,

State of West Virginia Department of Environmental Protection, Robert R. Gasaway, Daryl Joseffer, David E. Menotti, Jeffrey A. Knight, G. William Frick, M. Elizabeth Cox, Robin S. Conrad, Jan Amundson, Beth L. Law, Robert S. Digges, Harold P. Quinn Jr., David M. Flannery, Gale Lea, Russell S. Frye, Richard Wasserstrom, Julie C. Becker, Jeffery L. Leiter, Chet M. Thompson, Douglas I. Greenhaus, Maurice H. McBride, Gary H. Baise, David F. Zoll, Ronald A. Shipley, Peter S. Glaser, Grant Crandall, Timothy L. Harker, Eugene M. Trisko, Thomas J. Graves, Kurt E. Blase, Erika Z. Jones, Timothy S. Bishop, Adam C. Sloane, Duane J. Desiderio, and David M. Friedland.

Robert E. Yuhnke argued the cause for Environmental Group and Citizen Petitioners in 97-1440. With him on the briefs was Joy E. Herr-Cardillo.

James M. Rinaca, Robert R. Gasaway and Daryl Joseffer were on the brief of intervenors Atlantic City Electric Company and American Road and Transportation Builders Association in 97-1440 and 97-1441.

Norman L. Rave Jr. and David J. Kaplan, Attorneys, U.S. Department of Justice, argued the causes for respondent in 97-1440 and 97-1441. With them on the briefs were John C. Cruden, Assistant Attorney General, Thomas A. Lorenzen, Attorney, John Hannon, Gerald Gleason, Carol S. Holmes and Steven Silberman, Attorneys, U.S. Environmental Protection Agency.

Thomas F. Reilly, Attorney General, Edward G. Bohlen, Assistant Attorney General, Commonwealth of Massachusetts, John J. Farmer Jr., Attorney General, Howard Geduldig, Deputy Attorney General, State of New Jersey, Eliot Spitzer, Attorney General, J. Jared Snyder, Assistant Attorney General, State of New York, Philip T. McLaughlin, Attorney General, Maureen D. Smith, Senior Assistant Attorney General, State of New Hampshire, William Sorrell, Attorney General, Erick Titrud, Assistant Attorney General, State of Vermont, Richard Blumenthal, Attorney General, Kimberly Massicotte, Assistant Attorney General, State of

Connecticut, and Howard I. Fox were on the brief for intervenors Massachusetts, New Jersey and American Lung Association, and amici curiae New York, et al. in 97-1440 and 97-1441.

Before: Ginsburg, Chief Judge, Tatel, Circuit Judge, and Williams, Senior Circuit Judge.

Opinion for the Court filed by Circuit Judge Tatel.

Tatel, Circuit Judge: In these consolidated cases, we consider challenges to the Environmental Protection Agency's National Ambient Air Quality Standards for particulate matter and ozone. Petitioners originally raised a broad range of issues, including the constitutionality of the Clean Air Act, the contours of EPA's authority to promulgate air quality standards, and the lawfulness of the challenged standards. We addressed many of these issues in an earlier ruling that the Supreme Court subsequently reversed in part and affirmed in part. On remand, only Petitioners' specific challenges to the air quality standards remain unresolved. Rejecting the argument that the language and reasoning of our earlier decision determine the outcome of these remaining claims, and finding the challenged air quality standards neither arbitrary nor capricious, we deny the petitions for review except to the extent the Supreme Court's and our earlier decisions require further action by EPA.

I.

The Clean Air Act, 42 U.S.C. ss 7401-7671q, directs the Environmental Protection Agency to establish and periodically review primary and secondary National Ambient Air Quality Standards ("NAAQS"), id. s 7409, for any pollutant the "emissions of which ... cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare," id. s 7408(a)(1)(A). Section 109(b)(1) of the Act directs EPA to set the primary NAAQS at levels "the attainment and maintenance of which in the judgment of the

Administrator, ... allowing an adequate margin of safety, are requisite to protect the public health." Id. s 7409(b)(1). Secondary NAAQS must be set at "level[s] ... the attainment and maintenance of which in the judgment of the Administrator ... [are] requisite to protect the public welfare from any known or anticipated adverse effects...." Id. s 7409(b)(2). Under the Act, secondary NAAQS protect such aspects of the public "welfare" as "soils, water, crops, vegetation, manmade materials, [domesticated] animals, wildlife, weather, visibility, ... climate," and property values. Id. s 7602(h).

The Act calls for the appointment of "an independent scientific review committee," the Clean Air Scientific Advisory Committee ("CASAC"), and tasks this committee with periodically reviewing the NAAQS and advising EPA of any need for new standards or for revisions to existing standards. 42 U.S.C. s 7409(d)(2)(A), (B); see also Nat'l Ambient Air Quality Standards for Particulate Matter, 62 Fed. Reg. 38,652, 38,653 (Jul. 18, 1997) (codified at 40 C.F.R. s 50.7 (1999)) ("Particulate Matter NAAQS"). The seven-member committee comprises "at least one member of the National Academy of Sciences, one physician, and one person representing State air pollution control agencies." 42 U.S.C. s 7409(d)(2)(A). The Act directs CASAC to "advise the [EPA] Administrator of areas in which additional knowledge is required to appraise the adequacy and basis of existing, new, or revised [NAAQS]," and to "describe the research efforts necessary to provide the required information[.]" Id. s 7409(d)(2)(C). When EPA proposes to issue new or revise existing NAAQS, it must "set forth or summarize and provide a reference to any pertinent findings, recommendations, and comments by [CASAC]." Id. s 7607(d)(3). If the proposed rule "differs in any important respect from any of [CASAC's] recommendations," the Agency must provide "an explanation of the reasons for such differences." Id.

Once EPA establishes NAAQS for a particular pollutant, the standards become the centerpiece of a complex statutory regime aimed at reducing the pollutant's atmospheric concentration. EPA and the States must first designate areas of

the country that fail to meet the standards--that is, areas in which atmospheric concentrations of the pollutant exceed allowable levels. 42 U.S.C. s 7407(d)(1)-(2). Each State must then adopt a plan that "provides for implementation, maintenance, and enforcement of [the] primary" NAAQS, id. s 7410(a)(1), through, for example, regulation of wood fires or automobile or power plant emissions. States must submit their plans to EPA for approval, and may have to make revisions if the Agency finds the plans inadequate. States that fail to develop adequate plans are subject to sanctions, id. s 7509, or to imposition of a federal implementation plan, id. s 7410(c)(1).

These consolidated cases concern NAAQS for particulate matter and ozone, two ubiquitous atmospheric pollutants. The term "particulate matter," or "PM," refers to all "solid particles and liquid droplets found in air." Office of Air & Radiation, U.S. Env'tl. Prot. Agency, EPA-454/R-00-005, Air Quality Index: A Guide to Air Quality and Your Health 11 (2000) ("EPA, Air Quality Index"). Although these particles and droplets come in varying sizes, only particulate matter less than 2.5 micrometers in diameter--so-called "fine PM" or "PM2.5"--is relevant here. As originally filed, these cases also concerned "coarse" particulate matter, or particles and droplets between 2.5 and 10 micrometers in diameter, but we resolved all issues relating to this "coarse particulate matter" in our earlier ruling. See *Am. Trucking Ass'ns v. EPA*, 175 F.3d 1027, 1053-55 (D.C. Cir. 1999) ("ATA I"), reh'g granted in part and denied in part, 195 F.3d 4 (D.C. Cir. 1999) ("ATA II"), aff'd in part and rev'd in part, *Whitman v. Am. Trucking Ass'ns*, 531 U.S. 457 (2001) ("Whitman").

PM2.5 is associated with a range of adverse health effects such as coughing; shortness of breath; aggravation of existing respiratory conditions like asthma and chronic bronchitis; increased susceptibility to respiratory infections; and height-ened risk of premature death. EPA, Air Quality Index at 11. High PM2.5 concentrations also impair visibility, reducing people's "well-being . . . , both where they live and work, and in places [like national parks and wilderness areas] where they enjoy recreational opportunities." Particulate Matter

NAAQS, 62 Fed. Reg. at 38,680. Sources of fine PM include vehicle engines, power plants, and wood fires. EPA, Air Quality Index at 11.

Unlike PM, ozone is a colorless, odorless gas. EPA, Air Quality Index at 7. Not a direct product of human activity, ozone forms when other atmospheric pollutants--ozone "precursors"--react in the presence of sunlight. Office of Air Quality Planning & Standards, U.S. Env'tl. Prot. Agency, EPA/451-K-97-002, Ozone: Good Up High, Bad Nearby 2-3, (1997) ("EPA, Ozone Facts"). Significant health effects associated with ozone pollution include coughing; throat irritation; aggravation of existing conditions like asthma, bronchitis, heart disease, and emphysema; and lung tissue damage. *Id.* Ozone pollution can also interfere with plants' ability to produce and store food, rendering them more susceptible to disease, insect pests, and other stressors. *Id.* EPA estimates that ozone "is responsible for 500 million dollars in reduced crop production in the United States each year." *Id.* Ozone levels tend to be highest in urban areas, in part because cars, power plants, and chemical solvents are the principal sources of ozone precursors. *Id.*

In EPA's judgment, ozone is, and PM may be, a non-threshold pollutant--that is, a pollutant that causes adverse health effects at any non-zero atmospheric concentration. Nat'l Ambient Air Quality Standards for Ozone, 62 Fed. Reg. 38,856, 38,863 (July 18, 1997) (codified at 40 C.F.R. ss 50.9, 50.10 (1999)) ("Ozone NAAQS") ("Nor does it seem possible, in the Administrator's judgment, to identify [an ozone concentration] level at which it can be concluded with confidence that no 'adverse' effects are likely to occur."); Nat'l Ambient Air Quality Standards for Particulate Matter: Proposed Rule, 61 Fed. Reg. 65,638, 65,651 (Dec. 13, 1996) ("Particulate Matter NPRM") ("[T]he single most important factor influencing the uncertainty associated with the risk estimates [for PM] is whether or not a threshold concentration exists below which PM-associated health risks are not likely to occur."); see also ATA I, 175 F.3d at 1034 (making the same point). The lack of a threshold concentration below which these pollutants are known to be harmless makes the task of setting

primary NAAQS difficult, as EPA must "select ... standard level[s] that ... reduce risks sufficiently to protect public health" even while recognizing that "a zero-risk standard is [not] possible." Ozone NAAQS, 62 Fed. Reg. at 38,863.

On July 18, 1997, EPA revised the primary and secondary NAAQS for particulate matter and ozone. See Particulate Matter NAAQS, 62 Fed. Reg. 38,652; Ozone NAAQS, 62 Fed. Reg. 38,856. For particulate matter, the Agency abandoned its approach of regulating both coarse and fine particles and droplets under the same standards. Observing that the "epidemiological evidence suggest[s] stronger associations of mortality and some morbidity effects with fine particles than with ... coarse particles," Nat'l Ambient Air Quality Standards for Ozone and Particulate Matter, Advance Notice of Proposed Rulemaking, 61 Fed. Reg. 29,719, 29,723 (June 12, 1996) ("Advance NPRM"), the Agency adopted new, PM_{2.5}-specific standards: an annual primary standard of 15 micrograms per cubic meter ("ug/m³"); a daily primary standard of 65 ug/m³; and secondary standards equal to the primary standards. Particulate Matter NAAQS, 62 Fed. Reg. at 38,652.

EPA also made significant changes to the ozone NAAQS. Citing new information that suggests a positive correlation between prolonged (six-to eight-hour) exposures to relatively low levels of ozone and "a wide range of health effects," Ozone NAAQS, 62 Fed. Reg. at 38,861, the Agency adopted new primary and secondary standards under which eight-hour-average ozone concentrations may not exceed 0.08 parts per million ("ppm"), in place of the old, one-hour-average standards of 0.12 ppm, *id.* at 38,856.

Soon after EPA issued the revised particulate matter and ozone NAAQS, various parties, including American Trucking Associations, other businesses and business associations, environmental groups, citizens, and several States, petitioned for review of the revised standards. Other parties intervened (some supporting Petitioners and others supporting EPA), four additional States filed amicus briefs supporting EPA, and Senator Orrin Hatch and Representative Thomas Bliley

filed amicus briefs supporting Petitioners. Petitioners and supporting Intervenors and Amici challenged the NAAQS from all sides, arguing (among other things) that the Clean Air Act delegates excessive legislative authority to EPA in violation of Article I of the Constitution and that the Agency failed to consider certain relevant factors, including implementation costs, prior to setting the NAAQS. Invoking Clean Air Act section 307(d)(9), which directs federal appeals courts to vacate Agency action "found to be ... arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law," 42 U.S.C. s 7607(d)(9)(A), Petitioners also challenged specific aspects of the new particulate matter and ozone NAAQS ("the 307(d)(9) claims").

We addressed most of these arguments in ATA I and II. With respect to the nondelegation argument, we agreed with Senator Hatch and Representative Bliley that neither the Act's requirement that EPA "set each [primary] standard at the level 'requisite to protect the public health' with an 'adequate margin of safety,'" ATA I, 175 F.3d at 1034 (quoting 42 U.S.C. s 7409(b)(1)), nor the Agency's interpretation of that requirement in the challenged rules, see *id.*, identified an "intelligible principle" limiting EPA's rulemaking authority, *id.* at 1034-40 (internal quotation marks omitted). But see *id.* at 1057-62 (Tatel, J., dissenting); ATA II, 195 F.3d at 14-16 (Silberman, J., dissenting from denial of rehearing en banc); *id.* at 16-17 (Tatel, J., same). Although we concluded that the Clean Air Act, as interpreted by EPA, effected an unconstitutional delegation of Congress's legislative authority, we struck down neither the Act nor the challenged NAAQS, choosing instead to remand the standards to the Agency to give it an opportunity to identify a determinate standard that would limit its discretion. ATA I, 175 F.3d at 1038; see also ATA II, 195 F.3d at 6-8.

Having remanded the challenged NAAQS for other reasons, we never addressed Petitioners' 307(d)(9) claims. We did, however, address Petitioners' more general claims, holding that EPA: may not consider either the implementation costs or the indirect environmental consequences of NAAQS prior to setting the standards, ATA I, 175 F.3d at 1040-41;

has no obligation to comply with certain requirements of the National Environmental Policy Act, the Unfunded Mandates Reform Act, or the Regulatory Flexibility Act before issuing NAAQS, *id.* at 1041-45 (citing NEPA, 42 U.S.C. s 4332(2)(C)-(D); UMRA, 2 U.S.C. ss 1532, 1535; and RFA, 5 U.S.C. ss 603(a), 605(b)); should have considered any beneficial effects of ozone before revising the ozone NAAQS, *id.* at 1051-53; has only limited statutory authority to enforce the new ozone NAAQS, *id.* at 1046-51; see also ATA II, 195 F.3d at 8-10; need not identify the specific biological mechanism by which fine particulate matter affects human health, ATA I, 175 F.3d at 1055-56; and has no obligation to set secondary NAAQS at levels "sufficient to eliminate all adverse visibility effects" of a pollutant, *id.* at 1056-57 (emphasis added).

The Supreme Court granted certiorari with respect to four questions: whether the Clean Air Act violates the nondelegation doctrine; whether EPA may consider implementation costs in setting NAAQS; whether this court had jurisdiction to review the Agency's interpretation of the Clean Air Act provisions governing implementation of the ozone NAAQS; and if this court had jurisdiction, whether the Agency's interpretation of those provisions was permissible. *Whitman*, 531 U.S. at 462. Disagreeing with our nondelegation ruling, the Supreme Court held that the Clean Air Act requirement that EPA "set air quality standards at the level that is 'requisite'--that is, not lower or higher than is necessary--to protect the public health with an adequate margin of safety, fits comfortably within the scope of [Agency] discretion permitted by [Court] precedent." *Id.* at 475-76. Writing for the Court, Justice Scalia next confirmed our long-held view that " 'economic considerations [may] play no part in the promulgation of ambient air quality standards,' " *id.* at 464 (quoting *Lead Indus. Ass'n v. EPA*, 647 F.2d 1130, 1148 (D.C. Cir. 1980)); see also ATA I, 175 F.3d at 1040-41 (making the same point), and agreed with ATA I that this court had jurisdiction to review EPA's interpretation of the Act's provisions governing implementation of the ozone NAAQS, *Whitman*, 531 U.S. at 477-80. Turning to the merits of the latter issue, the Court found the Agency's ozone NAAQS "imple-

mentation policy to be unlawful" and indicated that after this court's final disposition of the parties' 307(d)(9) claims "it is left to the EPA to develop a reasonable interpretation of the nonattainment implementation provisions insofar as they apply to revised ozone NAAQS." *Id.* at 486.

The Supreme Court remanded the cases for us to consider Petitioners' as-yet-unaddressed 307(d)(9) challenges to the particulate matter and ozone NAAQS. On remand, three sets of Petitioners filed additional briefs, two addressing the particulate matter NAAQS and one addressing the ozone NAAQS. With respect to the particulate matter NAAQS, one group of Petitioners, led by American Trucking Associations ("State and Business Petitioners"), urges us to vacate the NAAQS under section 307(d)(9) because EPA "[f]ailed" either "to [a]rticulate and [a]pply" the Act's "requisite to protect" standard as elucidated in *Whitman, State & Bus. Pet'rs'* Br. at 35, or to determine PM2.5 levels "at which [the] public health risk is acceptable," *id.* at 40. The second group of PM2.5 Petitioners, led by Citizens for Balanced Transportation ("Environmental Petitioners"), believes that the daily primary standard is too lenient to protect against known adverse health effects of fine particulate matter and that the annual and daily secondary standards are insufficient to reduce visibility impairment. The third set of Petitioners, again led by American Trucking Associations ("Ozone Petitioners"), challenges the ozone NAAQS on grounds similar to those raised by State and Business Petitioners in their attack on the particulate matter NAAQS.

In considering these section 307(d)(9) claims, we apply the same highly deferential standard of review that we use under the Administrative Procedure Act, 5 U.S.C. s 706(2)(A). See, e.g., *Allied Local & Reg'l Mfrs. Caucus v. EPA*, 215 F.3d 61, 68 (D.C. Cir. 2000) ("To determine whether [the Agency's] rules are 'arbitrary and capricious,' we apply the same standard of review under the Clean Air Act as we do under the Administrative Procedure Act."). Thus, we presume the validity of agency action as long as "a rational basis for it is presented." *Lead Indus. Ass'n*, 647 F.2d at 1145. That said, however, we perform a "searching and careful" inquiry into

the underlying facts. *Id.* (internal quotation marks and citations omitted). In a similar case involving a challenge to ambient air quality standards, *Lead Industries*, we elaborated on this standard of review as follows:

It is not our function to resolve disagreement among the experts or to judge the merits of competing expert views. Our task is the limited one of ascertaining that the choices made by the [EPA] Administrator were reasonable and supported by the record. That the evidence in the record may also support other conclusions, even those that are inconsistent with the Administrator's, does not prevent us from concluding that [her] decisions were rational and supported by the record.

Id. at 1160 (internal citations omitted).

II.

Before evaluating the merits of Petitioners' claims, we must address State, Business, and Ozone Petitioners' argument that the language and reasoning of ATA I and II "govern[]" "the outcome of th[ese] case[s]." *State & Bus. Pet'rs' Br.* at 32. In essence, these Petitioners argue that ATA I and II signal this court's belief that EPA failed to apply the Clean Air Act's "requisite to protect the public health" standard in setting the primary NAAQS. 42 U.S.C. s 7409(b)(1). Because EPA chose not to appeal this purported "holding" to the Supreme Court, Petitioners reason, the holding has become the law of these cases and constrains our review of all remaining claims.

Petitioners base this law of the case argument primarily on our statement in ATA II that although EPA's "petition for rehearing ... argue[d] that s 109 of the Clean Air Act contains [a] principle limiting the agency's discretion"--namely, that the NAAQS must be set at levels "necessary for public health protection: neither more nor less stringent than necessary, but 'requisite' "--EPA never "identif[ied]" this principle "as a limit upon its discretion" anywhere in the challenged rules. 195 F.3d at 6-7 (internal quotation marks and citations omitted). In addition, Petitioners point to a

later passage in ATA II in which we declined to "express [an] opinion upon the sufficiency of [the newly identified limiting] principle," choosing to wait until "after the [Agency] itself has applied [the principle] in setting a NAAQS" to determine "whether the principle, in practice, fulfills the purposes of the nondelegation doctrine." Id. at 7 (emphasis added). Finally, Petitioners cite the following sentences from ATA I:

[The Agency's] explanations for its decisions amount to assertions that a less stringent standard would allow the relevant pollutant to inflict a greater quantum of harm on public health, and that a more stringent standard would result in less harm. Such arguments only support the intuitive proposition that more pollution will not benefit public health, not that keeping pollution at or below any particular level is "requisite" or not requisite to "protect the public health" with an "adequate margin of safety," the formula set out by [Clean Air Act section 109(b)(1)'s definition of a primary NAAQS].

175 F.3d at 1035. According to Petitioners, these passages express our view that EPA failed to follow the Clean Air Act in setting the PM and ozone NAAQS, and that the NAAQS themselves are therefore "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." 42 U.S.C. s 7607(d)(9)(A).

Petitioners misread ATA I and II. Both decisions address the broad claim that the Clean Air Act effects an unconstitutional delegation of legislative authority. To evaluate that claim, we looked first to the Act for an "intelligible principle" limiting the Agency's "application of the[] factors" it "uses in determining the degree of public health concern associated with different levels of ozone and PM[.]" ATA I, 175 F.3d at 1034 (internal quotation marks omitted). Finding none, we next looked to see whether the Agency developed "binding standards for itself." ATA I, 175 F.3d at 1038 (emphasis added). Again finding none, we remanded the NAAQS to EPA to give it "an opportunity to extract [from the Act] a determinate standard" that would "channel" its rulemaking authority. Id. at 1034, 1038; see also ATA II, 195 F.3d at 6-

8 (affirming that holding). At no point in either ATA I or II, however, did we address the narrower question now before us: Did EPA abuse its discretion or otherwise violate the Clean Air Act in setting the challenged NAAQS? Indeed, in ATA I we emphasized this very distinction:

[The Agency] cites prior decisions of this Court holding that when there is uncertainty about the health effects of concentrations of a particular pollutant within a particular range, EPA may use its discretion to make the "policy judgment" to set the standards at one point within the relevant range rather than another.... We agree. But none of those panels addressed the claim of undue delegation that we face here, and accordingly had no occasion to ask EPA for ... a "principle[]" ... in making its "policy judgment."

175 F.3d at 1037. As this language makes clear, we recognized that the search for a binding principle guiding Agency policy judgments differs in kind and degree from the familiar administrative law inquiry into whether an agency abused its discretion. When we stated that EPA failed to "appl[y]" its newly identified limiting principle "in setting [the] NAAQS," therefore, we spoke in constitutional terms: In our pre-Whitman view, EPA never agreed that it "could not (or in a later rulemaking would not)" promulgate a NAAQS either "more []or less stringent than necessary." ATA II, 195 F.3d at 6-7 (emphasis removed). We in no way implied, however, that the particulate matter and ozone NAAQS themselves are either more or less stringent than necessary.

In short, ATA I and II address only whether the Act (or EPA's reading of the Act) adequately limits the Agency's discretion. Here, we ask whether EPA reasonably exercised that discretion--an entirely different question that we now answer differently.

III.

We start with Petitioners' challenge to the PM2.5 NAAQS. Fulfilling our obligation to "undertake a 'substantial inquiry' into the facts" underlying challenged agency actions, Lead

Indus. Ass'n, 647 F.2d at 1146 (quoting *Citizens to Preserve Overton Park v. Volpe*, 401 U.S. 402, 415 (1971), overruled on other grounds by *Califano v. Sanders*, 430 U.S. 99, 105 (1977)), we first summarize the Agency's rulemaking process with respect to both the primary and secondary NAAQS and then consider State, Business, and Environmental Petitioners' specific arguments.

The Rulemaking

In late 1996, EPA issued a public notice of proposed rulemaking that announced possible changes to the particulate matter NAAQS. Particulate Matter NPRM, 61 Fed. Reg. 65,638. Most relevant to these cases, EPA said it planned to supplement the existing primary NAAQS, which regulated both coarse particulate matter and PM_{2.5} under a single set of standards, by adding two new primary standards specific to fine PM: an annual PM_{2.5} standard of 15 ug/m³ and a daily PM_{2.5} standard of 50 ug/m³. *Id.* EPA sought comment on that proposal and on a range of alternative values for the new standards, from 12 to 20 ug/m³ for the annual standard, and 20 to 65 ug/m³ for the daily standard. *Id.* at 65,658-61. According to EPA, an annual standard of 12 ug/m³ and a daily standard of 20-50 ug/m³ would be "maximally precautionary," *id.*, at 65,659; by comparison, an annual standard of 20 ug/m³ and a daily standard of 65 ug/m³ would reflect "the judgment that the current scientific evidence has not demonstrated adverse public health effects from fine particle concentrations ... below those corresponding to the [old, composite, PM] standard," *id.* Between those extremes, the proposed annual and daily levels of 15 and 50 ug/m³, respectively, would reflect an effort "to limit annual PM_{2.5} concentrations to somewhat below those where the body of epidemiological evidence is most consistent and coherent." *Id.* at 65,660.

To facilitate public input on the proposed changes, EPA established a toll-free telephone hotline and a system for submission of comments via the Internet. Particulate Matter NAAQS, 62 Fed. Reg. at 38,654. In addition, Agency staff

conducted public hearings in communities across the country and held two national satellite telecasts. *Id.* By the end of the comment period, EPA had received more than 50,000 comments. *Id.*

In setting the final NAAQS, EPA considered these public comments, in addition to CASAC's recommendations and Agency staff's "thorough review ... of the latest scientific information on known and potential human health effects associated with exposure to PM." *Id.* at 38,655-56. EPA also considered an independent (though partially Agency-funded) research institute's study of the correlation between particulate matter levels and mortality in six urban areas, the same institute's extended analyses of the mortality data for Philadelphia alone (the "Philadelphia studies"), see *id.* at 38,660, and Agency staff's quantitative assessment of other PM-related health risks in Philadelphia and Los Angeles ("risk assessment"), see *id.* at 38,656 (citing Office of Air Quality Planning & Standards, U.S. Env'tl. Prot. Agency, A Particulate Matter Risk Assessment for Philadelphia and Los Angeles (1996) ("Risk Assessment")). EPA emphasized, however, that it "place[d] greater weight on the overall conclusions derived from the[se] studies--that PM air pollution is likely causing or contributing to significant adverse effects at levels below those permitted by the [old] standards--than on the [more uncertain] concentration-response functions and quantitative risk estimates derived from them." *Id.*

Ultimately, EPA adopted the proposed annual PM_{2.5} standard of 15 g/m³, explaining that it would assess compliance based on the three-year average of annual arithmetic mean PM_{2.5} concentrations at monitoring stations in a given area. See Particulate Matter NAAQS, 62 Fed. Reg. at 38,652. For the daily standard, EPA chose a less restrictive level than it had originally proposed, setting the standard at 65 ug/m³, with a "form"--or method of assessing compliance--based on the three-year average of the 98th percentile of daily PM_{2.5} concentrations at each monitoring site. *Id.* EPA provided a lengthy explanation of its selection of these new standards, four aspects of which are relevant here: its discussions of (1) the need to revise the old NAAQS for particulate matter; (2)

the reasons for adopting both annual and daily standards; (3) the grounds for choosing 15 and 65 ug/m³, respectively, as the levels for the new standards; and (4) the rationale behind the new daily standard's rather peculiar form.

Explaining the first point--the need for the new PM_{2.5} NAAQS--EPA began by documenting evidence of the old PM standards' inadequacy. Examination of an "extensive ... epidemiological data base," EPA observed, showed that children, as well as the elderly and other "sensitive populations," were experiencing adverse, PM-related health effects--sometimes including mortality--even "in areas [and] at times when the levels of the [old] ... standards [were] met." Id. at 38,657. In addition, a majority of CASAC members recommended strengthening "the health protection[s] provided by the [old] PM standard[s]." Id. at 38,666. Finally, a majority of commenters agreed that "based on the available scientific information, the [old PM] standards [were] not of themselves sufficient to protect public health." Id. at 38,657.

Responding to more critical commenters, EPA acknowledged that in several of the cited epidemiological studies, the effects of particulate matter were difficult to isolate from those of other air pollutants. The Agency soundly rejected, however, "the suggestion that such multi-pollutant studies are in any way 'negative' with respect to [the] conclusion[] that PM, alone or in combination with other pollutants, is associated with adverse effects at levels below those allowed by the current standards." Particulate Matter NAAQS, 62 Fed. Reg. at 38,661. "This conclusion is based not only on the consistency of PM effects across areas with widely varying concentrations of potentially confounding copollutants," EPA explained, "but also on the extended analyses of the Philadelphia studies," in which "PM can reasonably be distinguished from potential effects of all pollutants except [sulfur dioxide]." Id. Moreover, various characteristics of fine particulate matter, including its greater ability to "penetrate and remain indoors where ... sensitive population[s] reside[]," id., and to infiltrate "to the airways and gas exchange regions of the lung," id. at 38,662, convinced the Agency that even in

Philadelphia, PM rather than sulfur dioxide "play[ed] an important direct role in the observed mortality effects," id.

Turning to the specific characteristics of the new PM_{2.5} NAAQS, EPA gave only a brief explanation of its decision to adopt a primary standard with a twenty-four-hour averaging period: The standard is "consistent with [most] community epidemiological studies," which suggest that same-day and previous-day PM concentrations correlate positively with adverse health effects. Particulate Matter NAAQS, 62 Fed. Reg. at 38,668. EPA dismissed as insufficiently quantitative the few studies suggesting an association between health effects and shorter-term (minutes to hours) PM exposures, noting that in any case, regulating daily-average PM concentrations would also reduce shorter-term-average concentrations in most areas. Addressing the studies reporting "stronger associations [between PM and] multiple-day[-]average concentrations," EPA decided that a twenty-four-hour-average standard would effectively prevent both single-day and multi-day PM "episodes." Id. (emphasis added).

EPA then discussed the annual NAAQS' one-year averaging time, explaining that it adopted the standard to reduce the likelihood of long-term and cumulative PM exposures, which "appear" to pose "larger" risks than shorter-term exposures. Id. Although EPA recognized that either a multi-year or a single-season standard would also be effective against long-term exposures, it concluded that the annual standard would provide adequate protection against multi-year PM events and that "the current evidence does not provide a satisfactory quantitative basis for setting a national fine particle standard in terms of a seasonal averaging time." Id. at 38,669.

Explaining its decision to establish both annual and daily standards, EPA indicated that although "either standard could be viewed as providing both short-and long-term protection" from PM_{2.5}, the use of two standards with very different averaging times would "serv[e] to address situations where the daily peaks and annual averages are not consistent-

ly correlated." Particulate Matter NAAQS, 62 Fed. Reg. at 38,669. In such situations, the annual standard would "lower[] both short- and long-term PM_{2.5} concentrations," while the daily standard would "protect[] against ... localized 'hot spots,' and ... seasonal emissions," neither of which would be "well controlled by a national annual standard" alone. Id.

EPA next made a number of key points about the levels it selected for the new NAAQS. Implementing its view that the annual standard should do most of the work in mitigating the risks of PM_{2.5}, EPA selected the level of the standard "so as to protect against the range of effects associated with both short-and long-term exposures to PM." Id. at 38,675. In those studies reporting statistically significant correlations between health effects and PM exposures of any duration, the mean annual PM concentrations ranged from 16 to 21 ug/m³, while in those studies reporting nearly significant correlations, the mean annual concentrations ranged from 11 to 30 ug/m³. Id. at 38,676. "[P]lacing greatest weight on those studies that were clearly statistically significant," therefore, the Agency adopted an annual standard level of 15 ug/m³--just "below the range of annual data most strongly associated with both short- and long-term exposure effects," id., and in the lower half of the 12 to 20 ug/m³ range mentioned in the Particulate Matter NPRM, 61 Fed. Reg. at 65,658-61. Although EPA acknowledged it could not rule out "the possibility of [health] effects at lower annual concentrations," it nevertheless decided not only that the evidence for such effects is "highly uncertain," but that "the likelihood of significant health risk" decreases as annual-average PM concentrations approach background levels. Particulate Matter NAAQS, 62 Fed. Reg. at 38,676 (emphasis added).

Having settled on a moderate level for the annual NAAQS, EPA selected the level of the daily standard "to provide supplemental protection against peak concentrations that might occur over limited areas and/or for limited time periods." Id. This selection process posed difficult questions because in all of the available studies in which short-term exposures correlated positively with adverse health effects, the long-term annual-average PM_{2.5} concentration exceeded

the new 15 ug/m³ NAAQS. EPA thus had no way to evaluate the "incremental risk associated with single peak exposures to PM_{2.5} in areas where the [new] annual standard is met." *Id.* at 38,677. Because it did not yet know how effective the new annual standard would be in reducing the risk of peak short-term exposures, therefore, EPA decided it could not justify a restrictive daily standard, instead selecting 65 ug/m³--a level "at the upper end of the range recommended by [Agency] staff and most CASAC ... members." *Id.*

In justifying the chosen levels for the new NAAQS, EPA made one final point relevant to these cases. Responding to commenters who advocated lower levels for both the daily and annual standards, EPA emphasized that considerable uncertainty remains about whether PM_{2.5} is a threshold pollutant--that is, whether there is a concentration below which PM_{2.5} is harmless. See *id.* at 38,675. As a result, EPA could not be sure that lowering the NAAQS would produce corresponding reductions in health risks. "[T]he inherent scientific uncertainties are too great to support" lower levels for the NAAQS, the Agency explained. *Id.*

EPA also gave a lengthy explanation for the form of the primary standards. Only one aspect of that form is relevant here: the Agency's decision to base compliance with the daily standard on the average of the 98th percentile of daily PM_{2.5} concentrations at each monitoring station. See Particulate Matter NAAQS, 62 Fed. Reg. at 38,652. This form permits monitoring stations to exceed the 65 ug/m³ level of the standard two percent of the time, or about seven days each year assuming the stations monitor PM levels every day. EPA justified these authorized exceedances on the ground that they will increase the "stability" of the standard by permitting States to design long-term PM_{2.5} control programs without worrying about the effects of "single high exposure event[s] that may be due to unusual meteorological conditions alone." *Id.* at 38,673. In addition, EPA pointed out that "the [Clean Air] Act provides for emergency State or Federal action to address" any such high exposure events. *Id.* That said, EPA rejected alternative daily-standard forms (such as a 90th percentile form) that would have allowed more

exceedances per year, on the ground that a daily standard that permitted such "a large number of days with peak PM2.5 concentrations above the standard level" would not "serve as an effective supplement to the annual standard." *Id.*

Turning finally to the secondary PM2.5 NAAQS, EPA focused primarily on the impact of particulate matter on visibility, "an important welfare effect [that] has direct significance to people's enjoyment of daily activities in all parts of the country." *Id.* at 38,680. EPA predicted that attainment of the new PM2.5 primary standards would improve visibility in the eastern United States. Conceding that the new standards would have little or no effect in the west "except in and near certain urban areas," *id.* at 38,681, EPA observed that no single suite of secondary standards would solve visibility problems everywhere in the country because, due to regional differences in relative humidity, natural background PM levels, and other factors, "a national secondary standard intended to maintain or improve visibility conditions [in] ... the West would have to be set at or even below natural background levels in the East," while a national secondary standard intended to "achieve an appropriate degree of visibility improvement in the East would permit further degradation in the West," *id.* at 38,680. EPA therefore decided simply to establish secondary PM2.5 NAAQS identical to the new primary NAAQS, and to establish a regional haze program under Clean Air Act section 169A, 42 U.S.C. s 7491, to improve visibility in those areas where the new national standards prove ineffective. *Id.* at 38,679.

State and Business Petitioners' Claims

State and Business Petitioners urge us to vacate the primary NAAQS because EPA "did not apply any legal standard, much less the correct standard." *State & Bus. Pet'rs' Br.* at 35. In support of this argument, they cite two passages in the final PM2.5 rule. In one, Petitioners claim, EPA asserted that it had no obligation to determine a "safe level" of PM2.5 prior to adopting a primary NAAQS. *Id.* at 36 (internal quotation marks omitted). In the other, EPA allegedly acknowledged that "its approach 'might result in

regulatory programs that go beyond those that are needed to effectively reduce risks to public health.' " Id. at 38 (quoting Particulate Matter NAAQS, 62 Fed. Reg. at 38,675 (emphasis added)). As Petitioners see it, these "concessions" prove that EPA failed to set the primary NAAQS at levels " 'requisite'-- that is, not lower or higher than ... necessary--to protect the public health with an adequate margin of safety," as mandated by Whitman. 531 U.S. at 475-76.

Petitioners' argument suffers from two significant flaws. First, the final PM rule makes neither alleged concession. In the first passage, which Petitioners cite as evidence that EPA failed to identify a "safe level" of PM2.5, the Agency merely disclaimed any obligation to set primary NAAQS by means of a two-step process, identifying a "safe level" and then applying an additional margin of safety. Instead, EPA stated, it "may take into account margin of safety considerations throughout the process as long as such considerations are fully explained and supported by the record." Particulate Matter NAAQS, 62 Fed. Reg. at 38,688. Nothing in this statement implies that EPA failed to determine "safe levels" for fine particulate matter; indeed, the Agency's establishment of new primary NAAQS demonstrates that it did reach a conclusion regarding "safe" daily- and annual-average PM2.5 levels. State and Business Petitioners obviously disagree with that conclusion, but they have no basis for arguing that EPA failed to identify levels of PM2.5 that the Agency considers safe.

Viewed in its proper context, EPA's other alleged "concession"--that the new NAAQS "go beyond" what is necessary to protect public health--proves equally chimerical. In the final PM2.5 rule, EPA said only that "a number of ... commenters [to the proposed NAAQS] strongly supported standard levels more stringent than those proposed by" the Agency, but that "setting such [lower] standards ... might result in regulatory programs that go beyond those that are needed to effectively reduce risks to public health." Id. at 38,675 (emphasis added). This passage in no way supports Petitioners' argument that EPA failed to set the primary PM2.5 NAAQS at levels " 'requisite' ... to protect the public

health with an adequate margin of safety." Whitman, 531 U.S. at 475-76. Instead, the passage documents EPA's rejection of lower standards, demonstrating that the Agency not only recognized, but acted upon, its statutory obligation to set the primary NAAQS at levels no lower than necessary to reduce public health risks.

Petitioners' argument that EPA neither identified nor applied the proper legal standard also exaggerates the Agency's obligation to quantify its decisionmaking. The argument relies on two statements from the rulemaking and one from ATA I: EPA's assertion that it need not "determine a 'safe level' " of PM_{2.5} before calculating a margin of safety, State & Bus. Pet'rs' Br. at 36 (quoting Particulate Matter NAAQS, 62 Fed. Reg. at 38,688 (internal quotation marks omitted)); the Agency's "disavow[all]" of certain "specific risk estimates," id. at 37 (citing Particulate Matter NAAQS, 62 Fed. Reg. at 38,656); and finally, the Agency's claim that "there is no threshold 'amount of scientific information or degree of certainty' required to promulgate or revise a NAAQS," id. (quoting Resp't's 1998 Br. at 49). According to Petitioners, these three assertions prove that EPA failed to "describe[] the standard under which [it] ... arrived at [its] conclusion" regarding the appropriate level for the NAAQS, as required by our decision in *American Lung Ass'n v. EPA*, 134 F.3d 388, 392-93 (D.C. Cir. 1998). Petitioners misread *American Lung Ass'n*, however, if they think it requires EPA, prior to setting primary NAAQS, to identify perfectly safe levels of pollutants, to rely on specific risk estimates, or to specify threshold amounts of scientific information.

Although we recognize that the Clean Air Act and circuit precedent require EPA qualitatively to describe the standard governing its selection of particular NAAQS, we have expressly rejected the notion that the Agency must "establish a measure of the risk to safety it considers adequate to protect public health every time it establishes a [NAAQS]." *Natural Res. Def. Council, Inc. v. EPA*, 902 F.2d 962, 973 (D.C. Cir. 1990), vacated in part, 921 F.2d 326 (D.C. Cir. 1991) (vacating a later part of the court's decision). Such a rule would compel EPA to leave hazardous pollutants unregulated unless

and until it completely understands every risk they pose, thus thwarting the Clean Air Act's requirement that the Agency err on the side of caution by setting primary NAAQS that "allow[] an adequate margin of safety[.]" 42 U.S.C. s 7409(b)(1). The Act requires EPA to promulgate protective primary NAAQS even where, as here, the pollutant's risks cannot be quantified or "precisely identified as to nature or degree," Particulate Matter NAAQS, 62 Fed. Reg. at 38,653; see also Ozone NAAQS, 62 Fed. Reg. at 38,857 (explaining that section 109(b)(1)'s "margin of safety requirement was intended to address uncertainties associated with inconclusive scientific and technical information ... as well as to provide a reasonable degree of protection against hazards that research has not yet identified"). For its part, American Lung Ass'n requires only that EPA "engage in reasoned decision-making," 134 F.3d at 392, not that it definitively identify pollutant levels below which risks to public health are negligible.

Thus, EPA's inability to guarantee the accuracy or increase the precision of the PM2.5 NAAQS in no way undermines the standards' validity. Rather, these limitations indicate only that significant scientific uncertainty remains about the health effects of fine particulate matter at low atmospheric concentrations. As the exhaustive rulemaking process makes clear, see supra pp. 15-21, EPA set the primary NAAQS notwithstanding that uncertainty, just as the Act requires.

We are equally unpersuaded by State and Business Petitioners' argument that EPA should have considered whether reducing atmospheric concentrations of fine particles would increase levels of " 'ozone or ... a different fine particle component,' potentially increasing [overall] health risk[s]." State & Bus. Pet'rs' Br. at 37 (quoting Advance NPRM, 61 Fed. Reg. at 65,768). Petitioners apparently believe EPA may not regulate one pollutant without determining how that regulation would affect the levels of all other pollutants with which the first could react. Given the complexity of atmospheric chemistry, see Advance NPRM, 61 Fed. Reg. at 65,768 (noting "multiple nonlinearities and positive and negative feedbacks"), however, imposing such a requirement

would hamstring the Agency, preventing it from complying with the Clean Air Act's mandate to set protective primary NAAQS. We might feel differently about EPA's obligations in this regard had Petitioners pointed to clear evidence that lowering atmospheric PM_{2.5} levels will necessarily increase levels of other pollutants. Petitioners cite no such evidence, however, instead relying on an obscure passage from the Advance NPRM in which EPA said only that the complicated interactions among different atmospheric pollutants, including PM, make "integrated implementation" of pollution controls "far from a straightforward exercise." *Id.* As EPA observes, this "general discussion of the interrelationship[s]" among pollutants hardly constitutes a finding that regulating PM_{2.5} levels will increase health risks from ozone and other pollutants. *Resp't's Particulate Matter Br.* at 31-32 n.23.

State and Business Petitioners' remaining substantive claims merit little discussion. They argue that EPA "failed to determine whether attainment of the [old particulate matter] standard would leave unacceptable public health risk." *State & Bus. Pet'rs' Br.* at 40. As EPA notes, however, the final PM rule explicitly states:

[T]he extensive PM epidemiological data base provides evidence of serious health effects (e.g., mortality, exacerbation of chronic disease, increased hospital admissions) in sensitive populations (e.g., the elderly, individuals with cardiopulmonary disease), as well as significant adverse health effects (e.g., increased respiratory symptoms, school absences, and lung function decrements) in children. Moreover, these effects associations are observed in areas or at times when the levels of the [old PM] standards are met.

Particulate Matter NAAQS, 62 Fed. Reg. at 38,657 (emphasis added). Most CASAC members, moreover, recognized the need to strengthen "the health protection[s] provided by the [old] PM standards." *Particulate Matter NAAQS*, 62 Fed. Reg. at 38,666. Finally, in ATA I, we found "ample support for EPA's decision to regulate coarse particulate pollution above the 1987 levels," particularly given the lenient standard of review. 175 F.3d at 1054. Though we referred only to

coarse particulate matter, the statement nevertheless indicates our belief--which Petitioners give us no reason to reconsider--that the Agency substantiated its judgment regarding the inadequacy of the old particulate matter standards.

ATA I also forecloses Petitioners' "confounder" argument--that factors "such as the presence of other pollutants in the ambient air, temperature, humidity, and indoor air pollution might account for some or all of the associations reported in the studies on which EPA relied." State & Bus. Pet'rs' Br. at 46-47. "[T]he growing empirical evidence demonstrating a relationship between fine particle pollution and adverse health effects," we said in ATA I, "amply justifies establishment of new fine particle standards." 175 F.3d at 1056. We could not have reached that conclusion had we agreed with the Non-State Petitioners in ATA I that "EPA's ... [s]tudies failed adequately to address the confounding effect of other pollutants." Non-State Pet'rs' 1998 Br. at 28. Even if we did not think ourselves bound by ATA I, though, we would defer to EPA's entirely plausible reasoning regarding the confounder issue: According to the Agency, the "consistency of PM effects across areas with widely varying concentrations of potentially confounding copollutants," together with Agency staff's "extended analyses of the Philadelphia studies," amply justify the conclusion that "PM, alone or in combination with other pollutants, is associated with adverse effects at levels below those allowed by the current standards." Particulate Matter NAAQS, 62 Fed. Reg. at 38,661.

Next, Petitioners argue that the PM_{2.5} NAAQS are arbitrary and capricious because "EPA conceded that public health risks would decline with more stringent standards only if" the Agency correctly assumed "that (1) there is 'a continuum of health risks down to the lower end of the ranges of air quality' at issue, and (2) 'the reported associations are, in fact, causally related to PM_{2.5} at the lowest concentrations measured.'" State & Bus. Pet'rs' Br. at 45 (quoting Particulate Matter NAAQS, 62 Fed. Reg. at 38,675). EPA made this alleged concession, however, only in the context of rejecting standards "more stringent than those proposed" in the

NPRM, Particulate Matter NAAQS, 62 Fed. Reg. at 38,675; the Agency never "conceded" that the actual NAAQS rely on questionable assumptions or associations.

Petitioners mount several specific challenges to the daily and annual NAAQS. To begin with, they contend that EPA failed to justify the daily PM_{2.5} standard, but because this argument appears nowhere in their ATA I briefs, see Non-State Pet'rs' 1998 Reply Br. at 1 ("We focus on the lack of justification for setting the annual standard at 15 ug/m³."); see also id. at 1 n.3 ("Of the two new primary standards, the annual standard imposes the more stringent 'controlling' requirement."), we decline to consider it. See Order of the United States Court of Appeals for the District of Columbia Circuit at 1 (May 29, 2001) (No. 97-1440) ("The [post-remand] briefs shall address only 'preserved challenges' not hitherto resolved by the Supreme Court or by this court[.]" (quoting *Whitman*, 531 U.S. at 476)). Challenging the annual NAAQS, Petitioners argue the record does not support setting the standard at 15 ug/m³. Contrary to Petitioners' assertion, however, EPA staff never recommended a higher, 20 ug/m³ level. Rather, staff recommended that EPA consider a range of levels from 12.5 to 20 ug/m³, making no specific recommendation within this range. Office of Air Quality Planning & Standards, U.S. Env'tl. Prot. Agency, EPA-4521E0R-96-013, Review of the National Ambient Air Quality Standards for Particulate Matter: Policy Assessment of Scientific and Technical Information VII-36 to VII-37 (1996). Moreover, EPA ultimately set the standard just below the range of mean annual PM_{2.5} concentrations observed in studies showing a statistically significant association between fine particulate matter and health effects. See *supra* p. 19. While we cannot say those studies necessitated a standard level of 15 ug/m³, neither have we any basis for concluding that EPA's decision was unreasonable or unsupported by the record. We repeat: "That the evidence in the record may also support other conclusions, even those that are inconsistent with the Administrator's, does not prevent us from concluding that [her] decisions were rational and supported by the record." *Lead Indus. Ass'n*, 647 F.2d at 1160 (internal citations omitted).

This brings us finally to Petitioners' argument that EPA "denied the public essential procedural rights" by failing to obtain and make public the data underlying certain "key studies" relating to the "confounder" issue. Claiming neither that they were unable to obtain the studies, nor that the studies were improperly published or peer reviewed, Petitioners instead urge us to impose a general requirement that EPA obtain and publicize the data underlying published studies on which the Agency relies. The Clean Air Act imposes no such obligation; it merely directs EPA to include in any notice of proposed rulemaking "data, information, and documents ... on which the proposed rule relies." 42 U.S.C. s 7607(d)(3) (emphasis added). Here, EPA explained that it "relied on the scientific studies cited in the rulemaking record, rather than on the raw data underlying" those studies. Particulate Matter NAAQS, 62 Fed. Reg. at 38,689. In addition, Agency counsel advised us at oral argument that on those few occasions when EPA requested underlying data from an investigator, the Agency included those data in the record, Tr. of Oral Arg. at 74-75. More generally, we agree with EPA that requiring agencies to obtain and publicize the data underlying all studies on which they rely "would be impractical and unnecessary." Particulate Matter NAAQS, 62 Fed. Reg. at 38,689. As EPA persuasively stated in denying Petitioners' original request for the information:

If EPA and other governmental agencies could not rely on published studies without conducting an independent analysis of the enormous volume of raw data underlying them, then much plainly relevant scientific information would become unavailable to EPA for use in setting standards to protect public health and the environment.... [S]uch data are often the property of scientific investigators and are often not readily available because of ... proprietary interests ... or because of [confidentiality] arrangements [with study participants].

Id.

State and Business Petitioners' challenge to the secondary NAAQS hinges on the proposition that the identical primary

NAAQS are arbitrary and capricious. Having just rejected the latter argument, we need not consider the former.

Environmental Petitioners' Claims

Environmental Petitioners' central argument regarding the primary NAAQS is straightforward: EPA should have set a stricter daily PM_{2.5} NAAQS rather than relying almost exclusively on the stringent annual standard. Petitioners contend that because "adverse health effects [of] ... PM_{2.5} occur after single-day exposures[,] ... the NAAQS must prevent most, if not all, such daily exposures in order to" reduce health risks. *Envtl. Pet'rs' Br.* at 10. A strategy that focuses on the annual rather than the daily standard, Petitioners argue, will do little to prevent short-term pollution "events," in which PM_{2.5} concentrations exceed healthy levels for days or weeks. Questioning the level of the daily NAAQS, Petitioners note that EPA evaluated three possible levels (65, 50, and 25 ug/m³), ultimately choosing the highest even though the risk assessment study indicates that in some cities, a lower daily standard would greatly reduce the risks of both short- and long-term exposures. *Risk Assessment* at 113-18. Finally, with respect to the form of the daily standard, Petitioners argue that focusing on the 98th percentile value allows about seven days per year (two percent of 365 days) to escape regulation. The 15 ug/m³ annual standard, Petitioners observe, will do almost nothing to limit PM_{2.5} levels on these seven otherwise unregulated days.

Responding to these arguments, EPA observes that there are "significant uncertainties in identifying the extent of the incremental risk associated with single peak exposures to PM_{2.5} in areas where the annual standard is met." *Particulate Matter NAAQS*, 62 *Fed. Reg.* at 38,677. As we understand the problem, existing data are insufficient to permit EPA to separate health effects of long-term-average PM_{2.5} concentrations from those of short-term peak concentrations because in all cities in which the Agency found a positive correlation between short-term exposures and adverse health effects, the long-term-average PM_{2.5} concentrations exceeded

the new annual NAAQS. Thus, EPA cannot determine "what risks might have been associated with [short-term] peak [PM2.5] levels had the long-term averages in these areas been below that selected for the [new] annual standard." *Id.* This uncertainty, together with evidence suggesting that "the ... risk over the course of a year associated solely with a limited number of peak exposures is ... considerably smaller than that associated with the entire air quality distribution," *id.* at 38,677, convinced EPA to focus its attention on the annual NAAQS. We think this expert judgment worthy of deference, at least until formerly polluted areas come into compliance with the new annual PM2.5 standard and new health effects data from those areas become available.

Moreover, EPA provides a convincing justification for its decision to place little faith in the quantitative results of the risk assessment, which Petitioners cite for the proposition that setting a restrictive daily standard would provide benefits beyond those of the annual standard. Although Petitioners' position finds some support in the numerical results of the risk assessment, see Risk Assessment at 113-18 (detailing the results of the study, which suggest that lowering the daily standard would reduce health effects even if the annual standard were held steady), EPA contends that uncertainties in the assumptions underlying that study render the quantitative predictions insufficiently "reliable to serve as the basis for establishing any more stringent standards than were warranted based directly on EPA's analysis of the epidemiological evidence." *Resp't's Particulate Matter Br.* at 51; see also *Particulate Matter NAAQS*, 62 Fed. Reg. at 38,656 ("EPA emphasizes that it places greater weight on the overall conclusions derived from the studies ... than on the specific concentration-response functions and quantitative risk estimates derived from them."). Specifically, in the relevant portions of the risk assessment, Agency staff apparently used a model that assumed imposition of a new daily standard would prompt States to restrict PM-generating activities on all days, not just days that would otherwise exceed the standard. Consequently, stricter daily standards in the model drove down both short-term and annual-average PM2.5

concentrations. "In other words," EPA explains, "even though the annual standard was held constant[,] ... the model drove all daily values, including those at or below the annual mean, to levels lower than those calculated from compliance with the annual standard alone," and it was this drop in annual PM2.5 levels, not the drop in daily levels, that produced the projected health benefits. Resp't's Particulate Matter Br. at 53. Not only do we owe deference to an agency's determination regarding the reliability of scientific evidence, but Petitioners give us no reason to question EPA's judgment regarding the reliability of the risk assessment. See *Troy Corp. v. Browner*, 120 F.3d 277, 283 (D.C. Cir. 1997) ("As we have said, we review scientific judgments of [an] agency 'not as the chemist, biologist, or statistician that we are qualified neither by training nor experience to be, but as a reviewing court exercising our narrowly defined duty of holding agencies to certain minimal standards of rationality.' " (quoting *Ethyl Corp. v. EPA*, 541 F.2d 1, 36 (D.C.Cir. 1976))).

We recognize that EPA's reasoning leaves two unanswered questions, but neither proves fatal. First, one might argue from EPA's discussion of the risk assessment results that the Agency should have adopted a lower annual NAAQS. On this point, EPA persuasively explains that it discounted the quantitative predictions of the risk assessment in light of "inherent scientific uncertainties," including the "possibility of ... thresholds" below which PM2.5 has little or no effect. Particulate Matter NAAQS, 62 Fed. Reg. at 38,675. In other words, although the model predicted that dropping annual-average PM2.5 levels below 15 ug/m3 would reduce adverse health effects, those predictions relied on untested--and hence unreliable--assumptions about the incidence of health effects at low particulate matter levels.

Second, EPA's skepticism about the quantitative results of the risk assessment, together with the Agency's repeated assertions that the evidence does not justify a strict daily NAAQS, lead one to wonder why a daily standard is even necessary. EPA's position on this issue seems incongruous,

emphasizing on the one hand the need for a daily standard to "provid[e] supplemental protection against peak exposures not addressed by the annual standard," Particulate Matter NAAQS, 62 Fed. Reg. at 38,677, and on the other the lack of evidence establishing that "peak exposures not addressed by the annual standard" pose "incremental" risks over and above those associated with high annual-average PM2.5 levels, *id.* None of the parties, however, challenges the daily NAAQS in precisely these terms: State and Business Petitioners focus on the annual NAAQS, while Environmental Petitioners primarily cite the evidence supporting a stricter daily NAAQS. Even if the parties had raised this issue, however, we would neither vacate nor remand the daily NAAQS. Reviewing the record ourselves, we find support for the following explanation of the existence and form of the daily standard: (1) Some daily NAAQS is necessary to prevent deadly, short-term PM2.5 episodes of the sort that occurred during the famous 1952 London Fog, *id.* at 38,659; but (2) in areas that meet the new 15 ug/m3 annual standard, such events, though "theoretically possible," are "unlikely," *id.* at 38,673; so (3) each year, States should be permitted to address one or a few such events through statutorily-authorized "emergency episode plans" rather than longer-term pollution control measures, *id.* at 38,673 & n.35; (4) otherwise States would have to design their pollution control programs around "single high exposure events that may be due to unusual meteorological conditions alone," rendering the programs less "stable"--and hence, we assume, less effective--than programs designed to address longer-term average conditions, *id.* at 38,673. We cannot fault this strategy. As Justice Breyer noted in his *Whitman* concurrence, because "[a] rule likely to cause more harm to health than it prevents is not a rule that is 'requisite to protect the public health,' " the Clean Air Act must permit EPA to "consider whether a proposed rule promotes safety overall." 531 U.S. at 495 (Breyer, J., concurring) (emphasis added). Therefore, to promote development of more "effective [pollution] control programs," EPA was entirely justified in permitting a few days to escape regulation under the daily

NAAQS. Particulate Matter NAAQS, 62 Fed. Reg. at 38,673. Having no basis to question EPA's choice of seven (rather than, for example, four or ten) unregulated days, our deferential standard of review requires that we leave the daily NAAQS in place.

Finally, unlike State and Business Petitioners, Environmental Petitioners mount an independent challenge to the secondary standards, contending that EPA expressly recognized the standards were inadequate to improve visibility in much of the western United States. See supra p. 21 (citing Particulate Matter NAAQS, 62 Fed. Reg. at 38,680-81). In ATA I, however, we concluded that "Congress did not intend the secondary NAAQS to eliminate all adverse visibility effects and, therefore, that the EPA acted within the scope of its authority in deciding to rely upon the regional haze program to mitigate some of the adverse visibility effects caused by" PM2.5. 175 F.3d at 1056-57. Moreover, EPA provides a plausible explanation for its decision not to set lower secondary NAAQS: National standards adequate to improve visibility in the west "would have to be set at or even below natural background levels in the East." Particulate Matter NAAQS, 62 Fed. Reg. at 38,680. Petitioners give us no reason to question this explanation.

IV.

Turning to the ozone standards, we again begin with a summary of the rulemaking process, and then consider Petitioners' challenges.

The Rulemaking

EPA first announced its plan to revise the ozone NAAQS in late 1996, issuing a public notice of proposed rulemaking. Ozone NAAQS, 62 Fed. Reg. at 38,858 (discussing NAAQS for Ozone: Proposed Decision, 61 Fed. Reg. 65,716 (proposed Dec. 13, 1996)). In that notice, EPA indicated that it intended to replace the existing, one-hour-average, primary ozone

standard of 0.12 ppm with a new, eight-hour-average standard. It sought comments on this change and also on three possible levels for the new standard--0.09, 0.08, and 0.07 ppm. According to EPA, a level of 0.09 ppm would afford about the same protection as the old, one-hour-average standard, id. at 38,858; 0.08 would replicate the lowest exposure level actually tested in clinical studies, id. at 38,861; and 0.07 would be "highly precautionary in nature," id. at 38,858.

As in connection with the particulate matter NAAQS, EPA took account of CASAC's recommendations, Agency staff's assessment of the available information regarding human exposure and risk, and tens of thousands of comments submitted in response to the NPRM. Id. at 38,858-59. EPA also conducted risk assessments in nine representative urban areas (the "nine area study") to estimate the correlation between ozone exposure and health risks for the general population and for two groups at higher risk, "outdoor workers" and a group EPA calls "outdoor children." Id. at 38,860 (internal quotation marks omitted). Moreover, EPA developed quantitative risk estimates for those specific health effects for which sufficient concentration-response data were available. Id. Finally, in deciding when certain observed physiological effects of ozone "become so significant that they should be regarded as adverse" to individuals' health, EPA looked to guidelines published by the American Thoracic Society. Id.

In the end, EPA adopted an eight-hour-average, 0.08 ppm standard. Ozone NAAQS, 62 Fed. Reg. at 38,856. Two aspects of this new standard require discussion here: averaging time and level.

Explaining its switch from a one- to an eight-hour averaging time, EPA first noted that the one-hour-average standard reflected the belief--since refuted--that the most serious health effects of ozone result from short-term (one- to three-hour) exposures. According to EPA, however, new studies clearly "demonstrate[] associations between a wide range of health effects and prolonged (... [six]- to [eight]-hour) expo-

tures" to concentrations less than that of the old standard. Id. at 38,861. Citing the nine area study, EPA indicated that an averaging time of eight hours not only reduces risk associated with short-term exposures, id. at 38,862 & n.11, but also limits cumulative exposure, id. at 38,861. The longer averaging time, moreover, reduces variability in ozone levels across geographic areas. Id. at 38,862. EPA also emphasized that CASAC unanimously agreed with the proposed change. Id. at 38,861; see also U.S. Env'tl. Prot. Agency, EPA-SAB-CASAC-LTR-96-002, Letter Re: CASAC Closure on the Primary Standard Portion of the Staff Paper for Ozone 2 (1995) ("CASAC Ozone Letter") ("The Panel was in unanimous agreement that the present [one]-hour standard be eliminated and replaced with an [eight]-hour standard."). Acknowledging some individual CASAC members' comments to the effect that "choosing between a [one]- or [eight]-hour averaging time is a 'policy' choice" not dictated by science, EPA declined to view "these individual statements during the course of CASAC's review" as in any way "contradict[ing] []or supersed[ing] the clear and unanimous agreement" on the issue "conveyed ... in [CASAC's] closure letter." Ozone NAAQS, 62 Fed. Reg. at 38,862. In EPA's opinion, "the fact that an averaging time of [eight] hours results in a significantly more uniformly protective national standard than the current [one]-hour standard is an important public health policy consideration that supports the selection" of the former averaging time. Id. at 38,862.

Turning to the 0.08 ppm level of the primary standard, EPA first explained that because ozone is--or is thought to be--a non-threshold pollutant, "it is not possible to select a level below which absolutely no [health] effects are likely to occur." Id. at 38,863. Nevertheless, EPA undertook to select a standard level that would "reduce risk sufficiently to protect public health with an adequate margin of safety." Id. In deciding among the proposed levels (0.09, 0.08, and 0.07 ppm), EPA took into account a number of "key observations and conclusions," id., including:

- . CASAC's conclusion that the old standard "provided little, if any, margin of safety," id. (internal quotation marks and citations omitted);
- . Numerous epidemiological studies attributing "excess hospital admissions" to ozone exposure at concentrations below that of the old standard, id. at 38,864;
- . Evidence that an eight-hour-average, 0.09 ppm standard would constitute only a modest improvement over the old standard, id.;
- . "[C]lear evidence from human clinical studies" that prolonged exposure to 0.08 ppm of ozone, at moderate exertion, correlates positively with health effects like coughing, pain with inhalation, and reduced lung function, id. at 38,863-64;
- . Clinical studies suggesting that "[w]hile group mean responses ... at ... 0.08 ppm"--the "lowest exposure level tested"--are usually "small or mild in nature, responses of some sensitive individuals are sufficiently severe ... to be considered adverse," id.;
- . Indications from the nine area study that "statistically significant reductions in exposure and risk ... result from alternative [eight]-hour standards as the level [is lowered] from 0.09 ppm to ... 0.07 ppm," but that "there is no ... bright line that differentiates between acceptable and unacceptable risks within this range," id. at 38,864; and finally,
- . Evidence from the same study that "a standard set at 0.09 ppm would allow approximately 40 percent to 65 percent more outdoor children to experience [decreases in lung function and pain with inhalation] than would a 0.08 ppm standard," id. at 38,868.

Despite some "inherent uncertainties," EPA viewed these observations and conclusions, taken together, as indicating that the "public health impacts" of ozone at levels lower than the one-hour, 0.12 ppm standard are "important and suffi-

ciently large as to warrant a standard set at a level of 0.08 ppm." Id.

Acknowledging that numerous public comments advocated a level of 0.07 ppm, EPA offered several explanations for its decision to reject a more stringent standard. Most important, EPA pointed out that not one CASAC panel member "supported a standard set lower than 0.08 ppm, specifically after considering a range of alternative standards that included 0.07 ppm." Ozone NAAQS, 62 Fed. Reg. at 38,868. In addition, EPA contended that the "most certain" adverse health effects of ozone "are transient and reversible" at low ozone levels, while "the more serious ... impacts on health are less certain," id.--presumably in part because no human clinical studies have evaluated concentrations lower than 0.08 ppm. Finally, EPA noted that a 0.07 ppm standard "would be closer to peak background levels that infrequently occur in some areas due to nonanthropogenic sources of [ozone] precursors." Id.

One final aspect of EPA's discussion of the primary NAAQS level is relevant here: The Agency's response to certain comments questioning its reliance on specific field, epidemiological, and clinical studies. According to EPA, the comments "did not reflect an integrative assessment of the evidence--the approach CASAC has historically urged [the Agency] to follow--but rather a piecemeal look at each individual study." Id. at 38,866. EPA therefore dismissed the comments, arguing that such an incremental critique "tends to miss the strength of the entire body of evidence taken together." Id.

In setting the secondary NAAQS, EPA "focused on [ozone] effects on vegetation[,] since these public welfare effects are of most concern at [ozone] concentrations typically occurring in the United States." Ozone NAAQS, 62 Fed. Reg. at 38,874-75. The NPRM identified two possible changes to the secondary standard: replacing the old, one-hour-average 0.12 ppm standard with an eight-hour-average standard identical to the new primary standard, or adopting an entirely new "seasonal standard" that would regulate the cumulative sum

of hourly ozone concentrations during the three consecutive months of the year with highest ozone levels. Id. at 38,858. In deciding between these options, EPA again took account of public comments, CASAC's recommendations, and Agency staff's assessment of the available information. Id. at 38,874. Citing statements by CASAC panel members, id. at 38,875, EPA first concluded that "a secondary NAAQS more stringent than the [old, 0.12 ppm] primary standard, was necessary to protect vegetation from [ozone]," id. at 38,877 (internal quotation marks and citations omitted). "[I]nadequate rural and remote [ozone] air quality data," however, limited EPA's ability to evaluate the potential benefits of a seasonal standard. Id. ("[G]iven the present limits of the scientific evidence ..., the Administrator has decided that it is not appropriate to move forward with a seasonal secondary standard at this time."). Ultimately, therefore, EPA rejected the seasonal standard (at least until better data become available), choosing instead to set the secondary standard equal to the primary standard. Id. at 38,877-78.

Ozone Petitioners' Claims

American Trucking Associations and the other Ozone Petitioners challenge the NAAQS along several lines. To begin with, just as State and Business Petitioners argued with respect to the NAAQS for particulate matter, Ozone Petitioners contend that EPA neither identified nor applied "any legal standard" in setting the ozone NAAQS. Ozone Pet'rs' Br. at 38. Petitioners cite EPA's statements that it need not identify a "safe level" of ozone, and that "margin of safety determinations ... may not be amenable to quantification in terms of what risk is 'acceptable' or any other metric," Ozone NAAQS, 62 Fed. Reg. at 38,883, as evidence that EPA failed to set the primary ozone NAAQS "at the level that is ' requisite' ... to protect the public health with an adequate margin of safety," Whitman, 531 U.S. at 475-76. As we discussed earlier, however, EPA has no obligation either to identify an accurate "safe level" of a pollutant or to quantify precisely the pollutant's risks prior to setting primary NAAQS. See supra pp. 23-24. Rather, EPA must err on the side of caution, just

as it did here--setting the NAAQS at whatever level it deems necessary and sufficient to protect the public health with an adequate margin of safety, taking into account both the available evidence and the inevitable scientific uncertainties.

Petitioners raise two specific arguments regarding the primary ozone NAAQS. First, they assert that EPA "failed to determine whether attainment of the [old, one-hour-average, primary ozone] standard would leave unacceptable public health risk," Ozone Pet'rs' Br. at 43, and relatedly, that "none of the alternative [eight]-hour standards [considered by EPA] is significantly more protective of the public health than the [old] [one]-hour NAAQS," id. at 47-48. We disagree. As noted earlier, not only is the record replete with references to studies demonstrating the inadequacies of the old one-hour standard, see supra p. 39, but EPA discussed at length the advantages of a longer averaging time, including reduced risk of prolonged exposures to unhealthy ozone levels and increased uniformity of protection across different urban areas, see Ozone NAAQS, 62 Fed. Reg. at 38,861. Moreover, EPA specifically cited CASAC's "consensus ... that an [eight]-hour standard [is] more appropriate for a human health-based standard than a [one]-hour standard" and its recommendation that "the present ... standard be eliminated and replaced with an [eight]-hour standard." CASAC Ozone Letter at 2; see also Ozone NAAQS, 62 Fed. Reg. at 38,861 ("In proposing to change the averaging time of the primary standard from [one] to [eight] hours, the Administrator was concurring with the unanimous recommendation of CASAC."). Given this record evidence, our deferential standard of review, and the Clean Air Act's requirement that EPA must either follow CASAC's advice or explain why the proposed rule "differs ... from ... [CASAC's] recommendations," 42 U.S.C. s 7607(d)(3), Petitioners cannot seriously expect us to second-guess EPA's conclusion regarding the inadequacy of the old, one-hour-average standard.

Though somewhat more persuasive, Petitioners' second specific challenge also falls short. They argue that in selecting a level of 0.08 ppm rather than 0.09 or 0.07, EPA reached "inconsistent conclusions regarding specific health risks,"

thus "demonstrat[ing] that [the Agency's] decision to revise the NAAQS lacks a rational basis and therefore is arbitrary and capricious." Ozone Pet'rs' Br. at 48. In support of this point, Petitioners challenge EPA's three justifications for selecting 0.08 rather than 0.07: that no CASAC member supported a standard below 0.08; that health effects at ozone levels below 0.08 are transient and reversible; and that 0.07 would be too close to peak background levels. See supra p. 37 (noting these arguments). As to the first point, Petitioners observe that "most members of the CASAC panel who expressed an opinion on standard level supported a level above ... 0.08 ppm," and that "CASAC ultimately concluded that there is 'no bright line' distinguishing any of the alternative standards ... as significantly more protective of public health." Ozone Pet'rs' Br. at 49-50 (quoting CASAC Ozone Letter at 3). In addition, Petitioners point out, ATA I expressly discredits the contention that ozone health effects are more transient and reversible at concentrations below 0.08 ppm than at concentrations between 0.08 and 0.09. 175 F.3d at 1035 ("[The record evidence] does not make the categorical distinction the dissent says it does, and it is far from apparent that any health effects existing above [0.08 ppm] are permanent or irreversible."). Petitioners finally note that proximity to peak background levels is an indeterminate standard that points to no particular level for the primary NAAQS.

Although we think Petitioners' individual criticisms have some force, we are satisfied that in selecting a level of 0.08 rather than 0.07 (or, for that matter, 0.09), EPA "engage[d] in reasoned decision-making." American Lung Ass'n, 134 F.3d at 392. For one thing, CASAC's inability to reach consensus is hardly dispositive; EPA is entitled to give "significant weight" to the fact that no committee member advocated a level of 0.07 ppm, Ozone NAAQS, 62 Fed. Reg. at 38,868, particularly as eight of the ten panel members who expressed opinions advocated a level of 0.08 ppm or greater, while the remaining two simply "endorsed the [0.07-0.09 ppm] range presented by the Agency ... and stated that the [final] selection should be a policy decision," CASAC Ozone Letter

at 3. Also, although relative proximity to peak background ozone concentrations did not, in itself, necessitate a level of 0.08, EPA could consider that factor when choosing among the three alternative levels. Most convincing, though, is the absence of any human clinical studies at ozone concentrations below 0.08. See *id.* at 38,863. This lack of data amply supports EPA's assertion that the most serious health effects of ozone are "less certain" at low concentrations, *id.* at 38,868, providing an eminently rational reason to set the primary standard at a somewhat higher level, at least until additional studies become available. Cf. *Natural Res. Def. Council, Inc.*, 902 F.2d at 974 (declining to require EPA "to explain the risk it considered tolerable" in setting the challenged NAAQS "because of the uncertainty of the data upon which the Administrator needed to rest his assessment"). Overall, therefore, we disagree with Petitioners that in selecting 0.08 ppm rather than a lower or higher level, EPA reached "inconsistent conclusions." The Agency could reasonably conclude that existing data support a standard below 0.09 but do not yet justify a standard below 0.08.

This brings us, finally, to Petitioners' challenges to the secondary ozone NAAQS. According to Petitioners, the secondary NAAQS are unlawful because EPA failed to account for factors other than ozone--including "temperature, rainfall, and pests"--that affect crop-yield. *Ozone Pet'rs' Br.* at 56 (internal quotation marks and citations omitted). This is unreasonable. EPA had no more obligation to consider climatic conditions and pests in "evaluat[ing] whether its new [secondary] standard would measurably improve crop yield," *id.*, than to consider automobile accidents and malnutrition in evaluating whether its new primary standard would measurably improve public health. The Clean Air Act directs EPA to protect public welfare from adverse effects of ozone and other pollutants; the Agency cannot escape that directive simply because ozone wreaks less havoc than temperature, rainfall, and pests.

Citing various CASAC comments regarding the "'lack of relevant plant exposure studies,'" Petitioners next argue that EPA estimated the crop-related risks of ozone "crude[ly]."

Id. (quoting U.S. Env'tl. Prot. Agency, EPA-SAB-CASAC-LTR-96-006, Letter Re: Closure by [CASAC] on the Secondary Standard Portion of the Staff Paper for Ozone 4 (1996) ("Second CASAC Ozone Letter")) (internal quotation marks and citations omitted). CASAC, however, found more than enough data to justify revising the existing secondary NAAQS. Second CASAC Ozone Letter at 2 ("[I]t was agreed that a secondary NAAQS, more stringent than the present primary standard, was necessary to protect vegetation from ozone."). Moreover, nothing in the Clean Air Act requires EPA to wait until it has perfect information before adopting a protective secondary NAAQS. Rather, the Act mandates promulgation of secondary standards requisite to protect public welfare from any "anticipated adverse effects associated with" regulated pollutants, 42 U.S.C. s 7409(b)(2) (emphasis added), suggesting that EPA must act as soon as it has enough information (even if crude) to "anticipate[]" such effects--just as it did here.

V.

The petitions for review are denied except to the extent ATA I, ATA II, and Whitman require further action by EPA.

So ordered.