



Setting and Revising the National Ambient Air Quality Standards (NAAQS) and Understanding Climate Linkages



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Overview

- Review of Statutory Requirements for Reviewing and Revising NAAQS
- Status of NAAQS Reviews Currently in Progress
- Linkages between Air Quality and Climate: Short-Lived Climate Forcers



Statutory Requirements for NAAQS (CAA §109)

- **Primary (health-based) standards** . . . in the “judgment of the Administrator” are “requisite” to protect public health with an “adequate margin of safety”
 - “Requisite” – sufficient but not more than necessary
 - “Adequate margin of safety” – intended to address uncertainties associated with inconclusive evidence, and to provide a reasonable degree of protection against hazards that research has not yet identified
- In addressing the margin of safety requirement, EPA has consistently based its judgments on the science, taking into consideration:
 - Nature of health effects
 - Size of populations at risk and degree of exposure
 - Degree of scientific uncertainty that such effects will occur
- Public health protection intended for:
 - Adverse health effects, not all identifiable effects
 - Sensitive, at-risk population groups

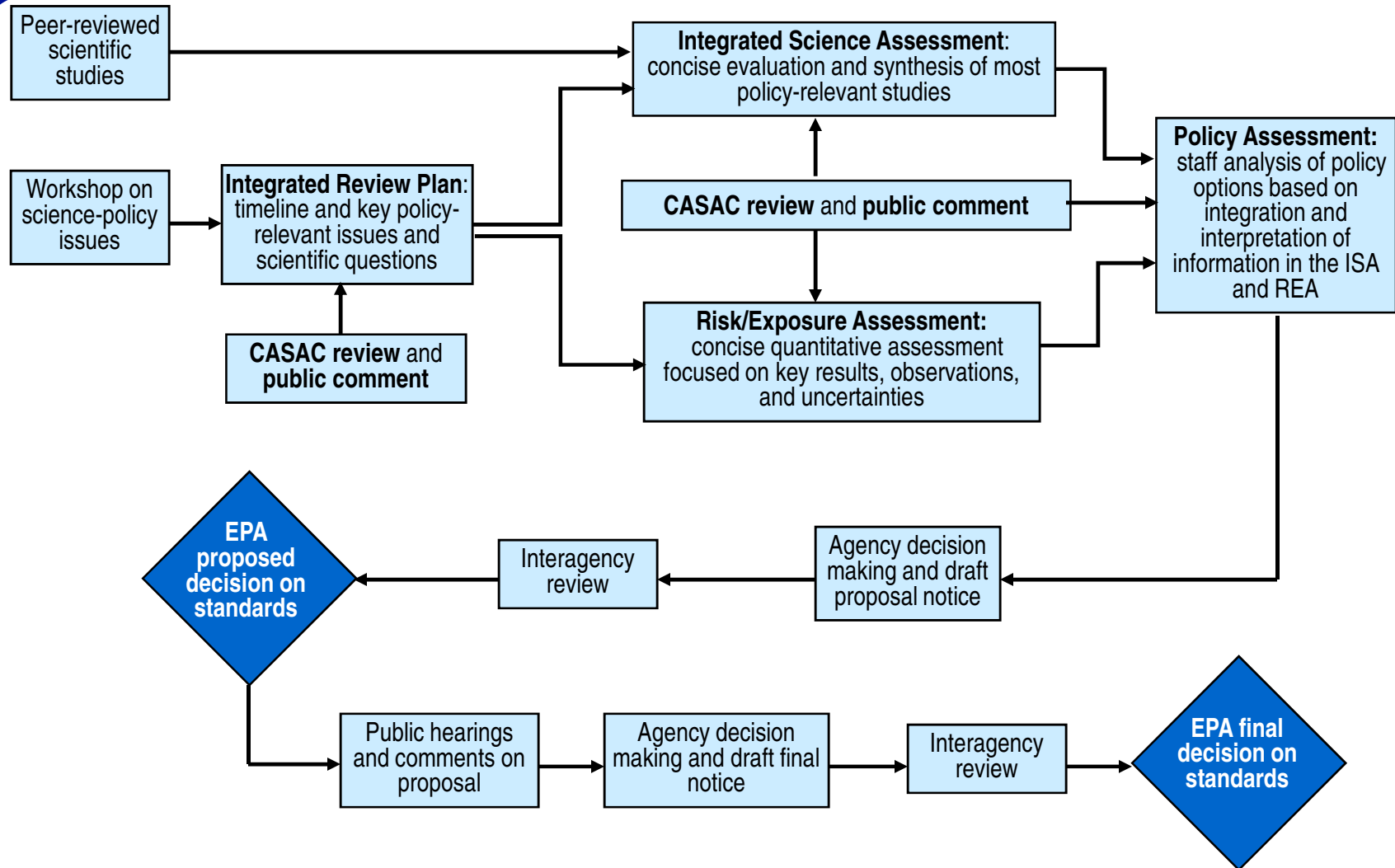


Statutory Requirements (cont.)

- **Secondary (welfare-based) standards** . . . in the “judgment of the Administrator” are “requisite to protect the public welfare from any known or anticipated adverse effects”
 - Welfare effects include . . . “effects on soils, water, crops, vegetation, man-made materials, animals, wildlife, weather, visibility and climate . . .” (Clean Air Act §302)
- Primary and secondary standards, and the scientific information upon which they are based, are to be reviewed every five years
- The Clean Air Scientific Advisory Committee (CASAC), an independent scientific review committee, is charged with reviewing the science and the standards, and recommending to the Administrator any new standards, or revisions to existing standards, as appropriate
- In setting primary and secondary standards:
 - EPA is required to engage in “reasoned decision making” to translate scientific uncertainty into standards
 - In so doing, EPA may not consider cost in setting standards . . . rather, cost is considered in developing control strategies to meet the standards



NAAQS Review Process





Ongoing NAAQS Reviews: Current Schedule

MILESTONE	POLLUTANT						
	Lead	NO ₂ Primary	SO ₂ Primary	Ozone	NO ₂ /SO ₂ Secondary	CO	PM
NPR	New schedule being developed	<u>Jun 26, 2009</u>	<u>Nov 16, 2009</u>	Dec 21, 2009	<u>Feb 12, 2010</u>	<u>Oct 28, 2010</u>	Jan 2011
NFR	<u>Oct 15, 2008</u>	<u>Jan 22, 2010</u>	<u>Jun 2, 2010</u>	Aug 31, 2010	<u>Oct 19, 2010</u>	<u>May 13, 2011</u>	Oct 2011

NOTE:

Underlined dates indicate court-ordered or settlement agreement deadlines

Schedule for PM subject to change pending Administrator's decisions on how to respond to remand of 2006 PM decisions



NO₂ NAAQS: Proposal Overview

- On June 26, 2009 EPA proposed to strengthen the primary standard for nitrogen dioxide (NO₂) to increase protection of public health
 - The existing NO₂ standard is an annual average of 53 parts per billion (ppb)
 - EPA proposed that this standard alone is not requisite to protect public health with an adequate margin of safety
- Specifically, EPA proposed to:
 - Add a **1-hour** NO₂ standard at a level between 80-100 ppb
 - Retain an **annual** average NO₂ standard at a level of 53 ppb
- EPA also solicited comment on alternative levels for the 1-hour standard down to 65 ppb and up to 150 ppb
- The revised standards would define the maximum allowable NO₂ concentration anywhere in an area
 - In many urban areas, this maximum is likely to occur around a major road



NO₂ Proposal Overview (Cont.)

- EPA also proposed changes to the monitoring network to capture both peak NO₂ concentrations, such as those that occur near roadways, AND community-wide NO₂ concentrations
 - At least one monitor would be located near a major roadway in any urban area with a population \geq 350,000 people
 - A second monitor would be required near a major road in areas with either:
 - Population \geq 2.5 million people, or
 - One or more road segments with an annual average daily traffic count \geq to 250,000 vehicles
 - At least one monitor would be placed in any urban area with a population greater than or equal to 1 million people to assess community-wide concentrations
- EPA estimates the proposed approach would require approximately 165 NO₂ monitoring sites near major roads in 142 urban areas
 - An additional 52 monitoring sites would be required to assess levels across wider urban areas
- EPA proposed to require all new NO₂ monitors to be operational by January 1, 2013
- As an alternative to the proposed approach, EPA requested comment on supplementing the current annual standard with a community-wide 1-hour NO₂ standard with a level in the range of 50 – 75 ppb
 - This approach to setting the standard would be coupled with a requirement that monitors be sited to measure community-wide NO₂ concentrations, with no monitors sited near major roads



CASAC Comments on NO₂ Proposal

- August 10, 2009 CASAC teleconference on the proposal: focused on the NO₂ concentration gradient around roadways and the implications of this gradient for how we set the standard
- CASAC did not make a consensus recommendation:
 - Most CASAC Panel members supported the proposed approach, concluding that this approach would be more effective than the alternative at limiting roadway-associated exposures
 - A few CASAC Panel members favored the alternative approach, noting that the strongest health evidence for NO₂ (i.e., epidemiologic studies) did not use near-roadway exposure data and noting the difficulties associated with designing a roadside monitoring network at this time
- If the final rule reflects the proposed approach, CASAC recommended a 1-hour standard with a 3-year average 98th percentile form and a level within the range of 80 to 100 ppb
- If the final rule reflects the alternative approach, CASAC recommended setting a 1-hour standard with a level from 50 to 75 ppb



SO₂ NAAQS

- Last review completed in 1996: retained the 24hr standard at 0.14 ppm and the annual std at 0.03 ppm; considered, but did not set, a short-term standard
- ALA challenged decision not to set a short-term standard and court remanded to EPA in 1998
- Review currently ongoing– schedule:
 - Risk and Exposure Assessment – July 2009
 - Proposal signed by November 16, 2009 (court-ordered)
 - Public hearing: early January 2010
 - Public comment period: December 2009 to January 2010
 - Final rule signed by June 2, 2010



Staff Conclusions from the SO₂ Risk and Exposure Assessment

- Based on the health evidence, as well as the air quality, exposure, and risk analyses, risks associated with just meeting the current 24-hour and annual standards are large and can reasonably be judged important from a public health perspective
- Strongest support is for consideration of an alternative 99th percentile 1-hour daily maximum standard in the range of 50 to 75 ppb
 - A standard in this range would provide adequate protection against the array of health effects observed in both 1 to 24-hour epidemiologic studies, as well as controlled human exposure studies of 5-10 minutes



Secondary Standards for NO_x and SO_x

- Conducting an independent, multi-pollutant secondary standard review
- Court-ordered deadlines for proposal Feb 12, 2010 and final Oct 19, 2010
- Completed the Integrated Science Assessment and the Risk and Exposure Assessment (available at www.epa.gov/ttn/naaqs)
- Clean Air Scientific Advisory Committee view:
 - There is sufficient information to set separate standards; necessary to do so to protect against aquatic and terrestrial acidification and terrestrial nutrient enrichment effects
 - Given the insufficient time to complete new secondary standards under the court-ordered schedule, recommends closing out this review and proceeding with a new review on an accelerated schedule (< 2 yrs) to develop new ecologically relevant standards
- EPA agrees and will therefore likely propose in February either retaining the current secondary standards, revising the standards to be equal to new primary standards, or revoking the current standards
- EPA then intends to move forward with an accelerated review to complete the work begun under this review



Ozone NAAQS

- March 2008 standards: 0.075 ppm, 8-hour average (primary and secondary)
 - Standards were not as protective as recommended CASAC
- On September 16, 2009 EPA announced that the Administrator will reconsider the standards to ensure they are clearly grounded in science, protect public health with an adequate margin of safety, and are sufficient to protect the environment
- Reconsideration will be based on the scientific and technical record used in the March 2008 review (including more than 1,700 scientific studies)
- EPA is also conducting a provisional assessment of the latest science on ozone as a check – to ensure that new studies don't raise issues that significantly change the state of the science
 - Will include provisional assessment in the docket at proposal
 - Will not rely on provisional assessment as part of the reconsideration
- Expected schedule for reconsideration: NPR Dec. 21, 2009, and NFR Aug. 31, 2010
- The next review of the ozone NAAQS will continue as planned



PM NAAQS

- Last review of PM standards completed Oct. 2006
- D.C. Circuit Court issued decision on February 24, 2009
- PM_{2.5} standards:
 - Remanded primary annual PM_{2.5} standard (retained at 15 µg/m³) and secondary PM_{2.5} standards (set identical to primary standards)
 - Primary 24-hour PM_{2.5} standard (revised to 35 µg/m³) not challenged
- PM₁₀ standards:
 - Upheld decisions to retain 24-hour PM₁₀ standard and revoke annual PM₁₀ standard
 - Based on finding EPA reasonably explained decision to regulate all coarse PM (including nonurban PM) and use of PM₁₀ as indicator for coarse PM



PM NAAQS Remand

- Court concluded EPA failed adequately to explain why annual PM_{2.5} standard is sufficient to protect public health with an adequate margin of safety
- Remanded annual PM_{2.5} standard for further consideration of:
 - Whether it provides an adequate margin of safety from the risk of *short-term* exposure to PM_{2.5}
 - Whether it provides an adequate margin of safety against *morbidity in children and other vulnerable subpopulations*
- Court concluded decision to set secondary standards identical to primary standards was unreasonable and contrary to the law



Current PM NAAQS Review Well Underway

- CASAC meeting – October 5-6, 2009, Chapel Hill, NC to review:
 - Second draft Integrated Science Assessment
 - First Draft Health Risk Assessment and Urban-Focused Visibility Assessment
 - Preliminary draft of Policy Assessment
- Rulemaking schedule under discussion in light of remand



Lead NAAQS

- New standard issued in November 2008
- Standard set at 0.15 ug/m³
- On July 22, 2009, EPA announced reconsideration of certain portions of the monitoring requirements for lead:
 - Requirement that monitors be placed near sources that emit 1 or more tons of lead each year
 - Requirement that monitors be operated in urban areas of 500,000 or more
 - Proposal expected Oct 2009; final rule ~ April 2010
- Also 3 lawsuits pending w/ U.S. Court of Appeals (D.C. Circuit)



PM_{2.5} and Ozone as Short-Lived Climate Forcers



What is a “Short-Lived Climate Forcer”?

- A “climate forcer” is any gas or particle that alters the Earth’s energy balance by absorbing or reflecting radiation:
 - Greenhouse gases (e.g. carbon dioxide, methane, ozone) warm the climate by trapping outgoing radiation from earth’s surface
 - Aerosols (i.e., particles such as black carbon and sulfates) can be either warming or cooling, depending on composition
 - Sulfates and nitrates scatter and reflect incoming solar radiation, producing a cooling effect
 - Black carbon warms the atmosphere by absorbing incoming sunlight and by darkening snow and ice, reducing “albedo” (reflectivity)
- Some climate forcers—like ozone and black carbon— are considered “short-lived” because they only stay in the atmosphere for a few days or weeks
 - By contrast, “long-lived” climate pollutants like CO₂ and HFCs can stay in the atmosphere for hundreds of years or longer



Why Should We Control SLCF?

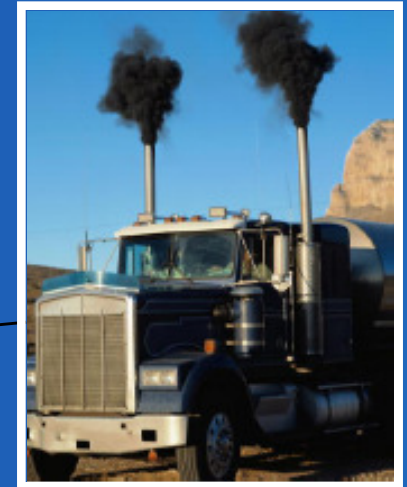
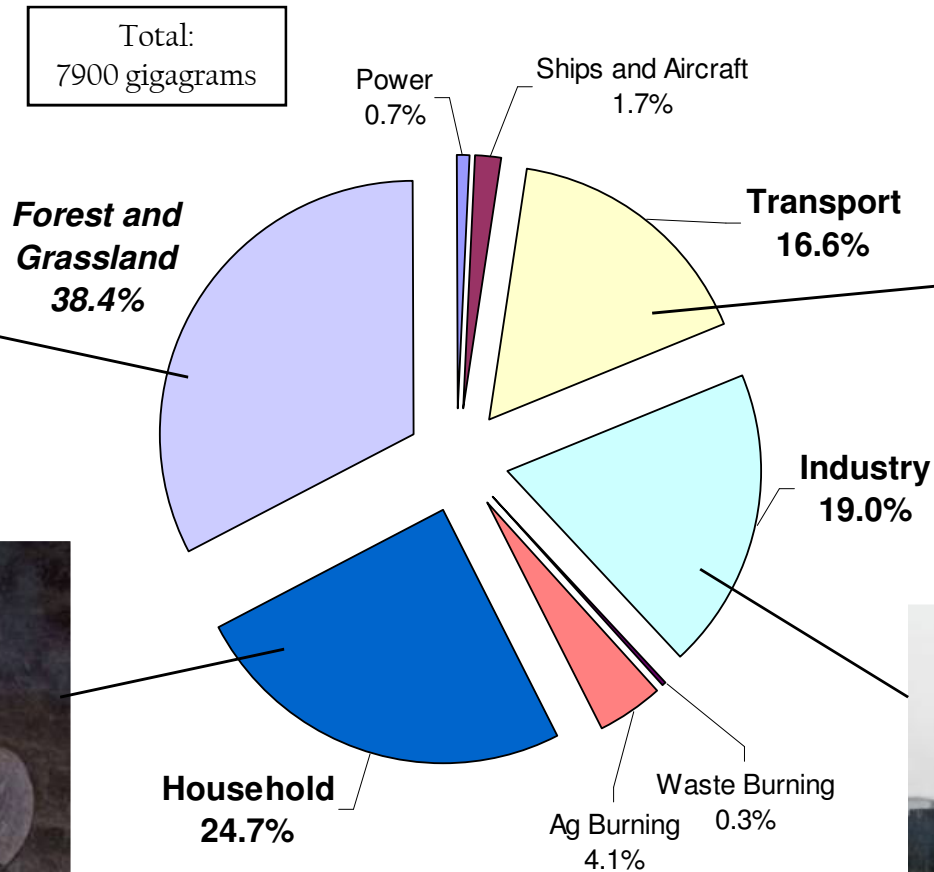
- Reducing “short-lived” climate forcers (SLCF) can lead to immediate climate benefits
 - The Earth’s climate system responds quickly to reductions in these pollutants, which may help us slow the overall rate of warming and avoid climate “tipping points”, such as melting of ice sheets
 - Also, reducing SLCFs may be particularly important for protecting sensitive regions such as the Arctic and the Himalayan glaciers
- Reductions in SLCF’s– esp. ozone and black carbon– can also provide significant public health benefits
 - Clean Air Act has already led to controls on these pollutants (e.g., existing diesel rules are expected to decrease mobile-source BC emissions by ~65% by 2020)
- Reducing SLCF is a global challenge: U.S. emissions are only ~6% of global total
- Controls on SLCF will not eliminate need for rapid action on GHGs: controls on both long-lived and short-lived climate forcers are necessary

Sources of Black Carbon:

Global Emissions by Sector

Total Black Carbon Emissions in 2000

Source: T Bond Database, V 7.1.1 Feb 2009
Plus Bond et al., 2004



Pie Chart from Kirk Smith, UC Berkeley



Issues to Consider in Relation to SLCF

- Location of reductions matters because these pollutants are more local/regional in nature than long-lived GHGs
- BC's warming effect is offset somewhat by cooling from reflective pollutants emitted at the same source, especially organic carbon (OC)
 - Diesel engine exhaust is mostly BC
 - Residential wood smoke is mostly OC
- Some ozone precursors lead to warming (CH_4 , CO , and nmVOC), but NO_x emissions lead to cooling, so the net climate effect of controls on ozone precursors varies
- Significant uncertainties remain: additional research needed on emission inventories and assessing net climate impacts of reductions from particular source categories





Recent Congressional Action on Black Carbon

- Strong congressional interest in BC, but so far legislation has provided only limited mandate for action
 - H.R. 2454 Waxman-Markey Climate & Energy Bill:
 - Requires EPA to issue 2 reports to Congress within a year on domestic and international sources, impacts, and control opportunities for BC,
 - Requires EPA to issue additional regulations to reduce black carbon emissions (using existing CAA authorities) or find that existing regulations are adequate
 - Senate also interested in black carbon, so similar provisions may appear in any Senate version of a Climate & Energy bill if one is released this fall