National Ambient Air Quality Standards (NAAQS) for Particulate Matter (PM)

Informational Meeting for Tribal Community
May 9, 2012

Beth Hassett-Sipple and Scott Jenkins
US EPA/OAQPS/Health and Environmental Impacts Division

Overview

- Statutory requirements
- Current standards
- Litigation on 2006 final rule
- Overview of NAAQS review process
- Current PM NAAQS review
  - Review process to date
  - Primary PM standards
    - $PM_{2.5}$
    - PM_{10}
  - Secondary PM standards

Statutory Requirements

- 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

- 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 . . ."

Statutory Requirements (cont.)

- NAAQS, and the scientific information upon which they are based, are to be reviewed every five years
- An **independent scientific review committee**. . . shall complete a review of the science and standards . . . and "shall recommend to the Administrator any new . . . standards and revisions of existing . . . standards as may be appropriate"
  - This function performed by **Clean Air Scientific Advisory Committee** (CASAC)
- In setting NAAQS:
  - EPA is required to engage in "reasoned decision making" to translate scientific evidence 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

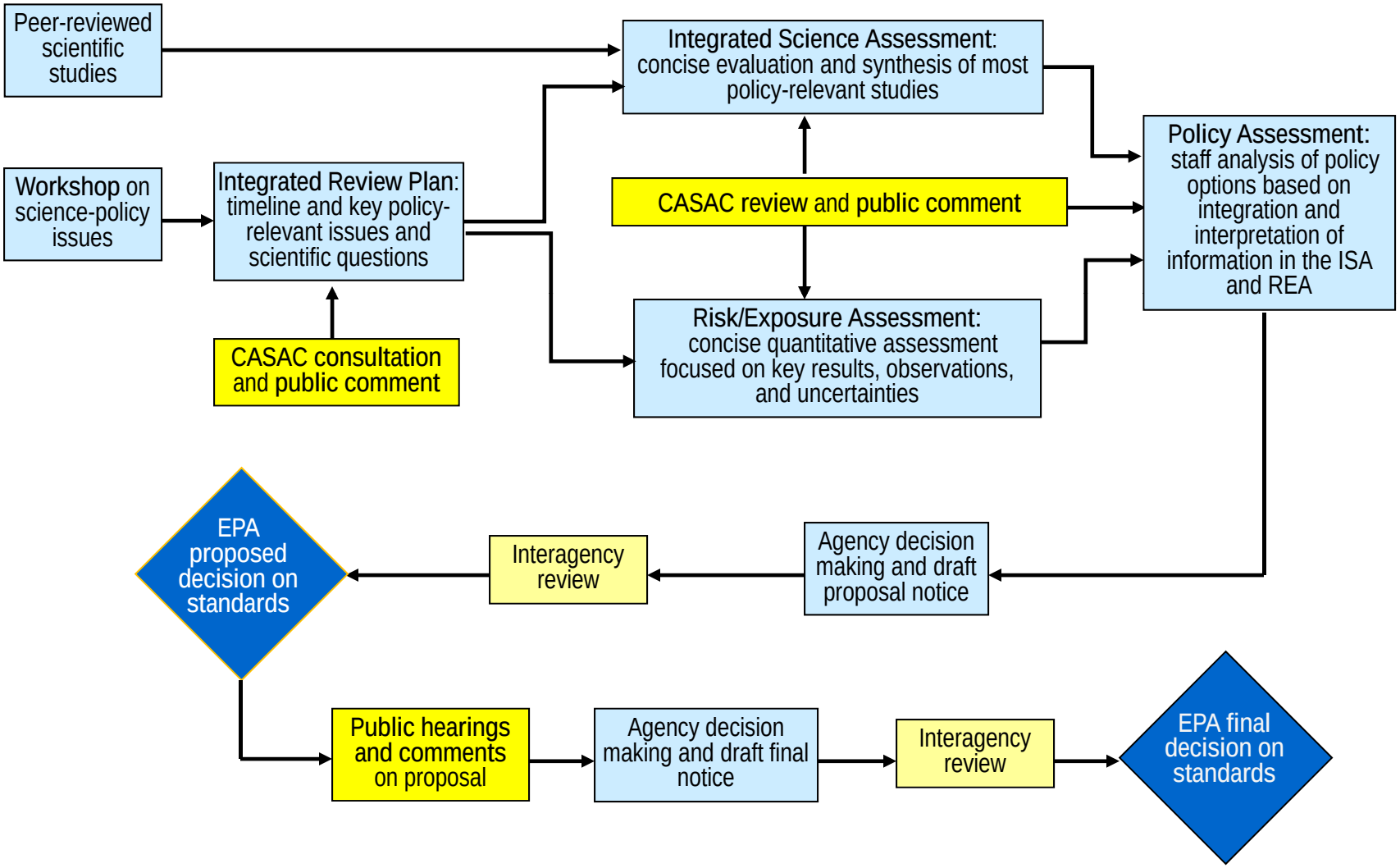
Current PM Standards: Primary and Secondary Standards are Identical Last review Completed October 2006

Indicator	Averaging Time	
	Annual	24-hour
$PM_{2.5}$ (Fine Particles)	15.0 µg/m^3 Annual arithmetic mean, averaged over 3 years	35 µg/m^3 98th percentile, averaged over 3 years
PM_{10} (Coarse Particles)	------	150 µg/m^3 not to be exceeded more than once per year on average over a three year period

Litigation on 2006 Final Rule

- States, environmental groups, and industry sued EPA over the 2006 NAAQS
- DC Circuit found EPA was **arbitrary and capricious** in its decision not to revise the primary annual $PM_{2.5}$ standard and **unreasonable and contrary to law** in its decision not to set a distinct secondary standard to address visibility impairment
- The court **remanded** these standards to EPA in 2009; EPA is responding to these remands as part of this review
- The court upheld EPA decisions to retain the 24-hour PM_{10} standard and to revoke the annual PM_{10} standard
- Primary 24-hour $PM_{2.5}$ standard, as revised in 2006, was not challenged by litigants

Overview of NAAQS Review Process



PM NAAQS Review Process to Date

- Initiated in 2007
- Integrated Science Assessment: December 2009
  - Synthesis and assessment of most policy-relevant science
- Risk/Exposure Assessments: June/July 2010
  - Focus on fine particles and did not assess risks associated with coarse particles
  - Quantitative health risk assessment and urban-focused visibility assessment
- Policy Assessment: April 2011
  - Staff conclusions of broadest range of policy options supported by the available scientific evidence, quantitative assessments, and air quality analyses
  - Staff conclusions address adequacy of current standards and potential alternative standards appropriate to consider

➢ Drafts of each document have been reviewed by CASAC and the public
  - Final documents take into consideration CASAC and public comments

Primary Standards

Considerations in Protecting Public Health

- Primary standards are to be set to protect public health, including at-risk populations, with an "adequate margin of safety"
- Important considerations:
  - Strengths and limitations of the evidence and related uncertainties and alternative approaches for translating epidemiological evidence into standards
  - Nature and severity of the health effects
  - Estimates of risks, if available, as well as uncertainties associated with these estimates
  - Size of at-risk populations
  - Lack of any discernible threshold below which effects do not occur
- Many peer-reviewed studies have been conducted to improve our understanding of PM-related effects; much of this research has been focused on $PM_{2.5}$
  - Thousands of new health studies have been considered in the current review

At-Risk Populations

- A variety of factors make people at greater risk for PM-related health effects, including:
  - Pre-existing diseases (such as heart or lung disease, including asthma) or conditions (such as obesity)
  - Lifestage
    - Older adults
    - Children
  - Persons with lower socio-economic status (SES)
    - New evidence available in this review provides stronger evidence for this population
- Emerging evidence for additional at-risk populations related to:
  - Genetic differences
  - Additional pre-existing diseases and conditions (such as diabetes)
  - Pregnancy, newborns

Summary of Health Evidence for Fine Particles

- Currently available evidence is **stronger** in comparison to information available in last review because of its **breadth** and **substantiation of previously observed effects**
- **Compelling evidence supports a "causal relationship" between $PM_{2.5}$ and premature mortality and cardiovascular effects** (long- and short-term exposures)
- Additional evidence for a **broad range of $PM_{2.5}$-related health effects** including:
  - **"Likely causal relationship"** for **respiratory effects** (long- and short-term exposures)
  - **"Suggestive of a causal relationship"** for **developmental/reproductive effects**, **cancer** (long-term exposures)
- Effects have been observed **at ambient concentrations allowed by current standards**
- **No evidence** to support existence of a **discernible threshold** below which effects would not occur
- Important uncertainties remain including understanding **relative toxicity** of different components in fine particle mixture
  - Evidence is **not sufficient** to link health effects with any **specific fine particle component or group of components** associated with any source categories of fine particles nor to exclude any component(s) from the mix of particles included in $PM_{2.5}$ indicator

Primary $PM_{2.5}$ Standards: Final Policy Assessment Conclusions and CASAC Advice

- Staff and CASAC conclude it is appropriate to consider **revising annual standard level** within a range of **13 to 11 µg/m^3** to **provide increased public health protection** (current standard is 15.0 µg/m^3)
  - Staff concludes that evidence most strongly supports range of 12 to 11 µg/m^3
- Staff and CASAC conclude it is appropriate to consider **retaining or revising 24-hour** standard level within a range of **35-30 µg/m^3** (current standard is 35 µg/m^3)
- **<u>No decisions have been made at this time</u>**

Summary of Health Evidence for Coarse Particles

- Compared to previous reviews, **more evidence** is now available for associations between short-term coarse particle concentrations and mortality, cardiovascular effects, and respiratory effects
  - This includes evidence for such associations in several urban locations that would likely have met the current PM_{10} standard during the study period
- However, **important uncertainties and limitations** remain in the coarse particle health evidence (e.g., confounding, exposure error, air quality characterization)
  - Integrated Science Assessment judged the available evidence to be **"suggestive of a causal relationship"** with short-term coarse particle exposures
  - "Suggestive," rather than "causal" or "likely causal", reflects the **greater degree of uncertainty** associated with the health evidence for coarse particles
- While most evidence for coarse particle health effects comes from studies in urban locations, a few recent dust storm studies have reported associations between **mortality or morbidity** and PM **of non-urban, crustal origin**
- As with fine particles, evidence is **not sufficient** to link health effects with specific sources or components of coarse particles

Primary PM_{10} Standard: Final Policy Assessment Conclusions, CASAC Advice, and Administrator Announcement

- **Staff** concludes scientific evidence and associated uncertainties could provide support for **either retaining or revising** the current primary 24-hour PM_{10} standard
  - To the extent consideration is given to revising the standard, Policy Assessment concludes it would be appropriate to consider a 98th percentile form in conjunction with a level within a range of 85 to 65 µg/m^3
- CASAC does not support retaining the current PM_{10} standard; **recommends revising** form and level in order to **increase public health protection**
  - CASAC recommends a 98th percentile form in conjunction with a level within a range of 75 to 65 µg/m^3

➢ Administrator announced her **intent to propose to retain the current primary PM_{10} standard** in Oct. 14, 2011 letters to Senators Klobuchar and Stabenow

  - "Based on my consideration of the scientific record, analysis provided by EPA scientists, and advice from the Clean Air Science Advisory Council, I am prepared to propose the retention - with no revision - of the current PM_{10} standard and form when it is sent to OMB for interagency review."

Secondary Standards









Considerations in Protecting Public Welfare

- Secondary standards are to be set to protect public welfare from "any known or anticipated effects"
- Nature and severity of the effects
  - What constitutes an adverse effect?
  - Over what time period?
- Strengths and limitations of the evidence and related uncertainties
- Alternative approaches for translating science into standards
  - What metrics are available to estimate adverse impacts and associated uncertainties?
    - Measured vs. modeled outcomes?
  - What tools are available to estimate impacts?

Summary of PM-Related Welfare Effects

- Good visibility is important to public welfare
  - Air quality impacts on visibility negatively affect a person's sense of personal comfort and wellbeing
  - For a given daytime scene and lighting conditions, people consistently rate visibility levels and identify the amount of haze that is unacceptable when viewing photographs within a range of visibility conditions from pristine to highly impaired
- Public perception of haze depends on **light extinction** (i.e., fractional loss of light per unit distance)
- Compelling evidence supports a "**causal relationship**" between PM and visibility impairment
  - Visibility is impaired by particles that scatter and absorb light, referred to as light extinction
  - Particle light extinction efficiency depends on particle composition, size and relative humidity
  - There is no consistent relationship between $PM_{2.5}$ mass concentration and light extinction
- Other welfare effects
  - Compelling evidence supports a "**causal relationship**" between PM and effects on climate and materials
  - Additional evidence for a "**likely causal relationship**" between PM and ecological effects

Secondary PM Standards: Final Policy Assessment Conclusions and CASAC Advice

- Staff and CASAC agree that it is appropriate to consider setting a distinct secondary PM standard to address visibility impairment primarily in urban areas
  - Recognize that visibility in Class I areas is addressed by the Regional Haze Program
- Consider setting this standard based on:
  - Calculated $PM_{2.5}$-related light extinction indicator (similar to how light extinction is calculated in the Regional Haze Program);
  - Alternative averaging times (24-hour, 4-hour);
  - 90^{th} percentile form, averaged over 3 years; and
  - Level within a range of 25 to 30 deciviews
- Staff and CASAC agree that it is appropriate to consider retaining the current secondary PM standards ($PM_{2.5}$ and PM_{10}) to address non-visibility welfare effects
- **No decisions have been made at this time**

Next Steps

- Propose Rule
  - 90-day public comment period
- Issue Final Rule
- For more information:
  - Beth Hassett-Sipple
    - hassett-sipple.beth@epa.gov
    - (919) 541-4605
  - Scott Jenkins
    - jenkins.scott@epa.gov
    - (919) 541-1167
  - http://www.epa.gov/ttn/naaqs/standards/pm/s_pm_index.html