

Proposal to Revise the Primary National Ambient Air Quality Standard for Nitrogen Dioxide (NO₂)



General Overview

Office of Air and Radiation
Office of Air Quality Planning and Standards
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Proposal Overview

- On June 26, 2009 EPA proposed to strengthen the primary national ambient air quality standard (NAAQS) 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 is proposing to:
 - add a **1-hour** NO₂ standard at a level between 80-100 ppb; and
 - retain an **annual** average NO₂ standard at a level of 53 ppb
 - This is consistent with recommendations from the Clean Air Scientific Advisory Committee (CASAC).
 - EPA is taking comment on other standard levels.
- The proposal would not affect the secondary NO₂ standard, set to protect public welfare, which is currently set at the same level as the primary annual standard - 53 ppb
 - Under a separate review, EPA is considering the need for changes to the secondary NO₂ standard

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Proposal Overview (cont.)

- EPA is also proposing changes to the NO₂ air quality monitoring network including monitors to measure:
 - Peak, short-term concentrations to support the proposed 1-hour standard - typically near major roads in urban areas, and
 - highest concentrations of NO₂ that occur over wider areas
- The public is invited to comment on this proposal
 - A 60-day public comment period for this proposal will end in late August 2009
 - In August 2009, EPA will host two public hearings in Los Angeles, CA and Arlington, VA
- For more information go to <http://www.epa.gov/air/nitrogenoxides>

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Proposed NO₂ Standard Levels

- ☞ EPA is proposing that the current annual average NO₂ standard of 53 ppb alone is not sufficient to protect public health with an adequate margin of safety
- ☞ EPA is proposing to establish a **new 1-hour NO₂ standard** at a level between 80 – 100 ppb
 - This standard would define the maximum allowable NO₂ concentration in an area, including near a major roadway
 - EPA is taking comment on alternative levels for the 1-hour standard down to 65 ppb and up to 150 ppb
- ☞ EPA is also proposing to **retain the current annual average NO₂ standard** of 53 ppb
- ☞ This proposed suite of primary standards would:
 - Protect public health by reducing people's exposure to high, short-term concentrations of NO₂ which generally occur near major roads, and
 - Assure community-wide NO₂ concentrations remain below levels that epidemiologic studies have associated with public health problems
- ☞ As an alternative to the proposed approach, EPA is requesting comment on supplementing the current annual standard with a community-wide 1-hour NO₂ standard in the range of 50 – 75 ppb.

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Proposed NO₂ Standard Form and Averaging Time

- In addition to proposing an averaging time and a range of levels for the standard, EPA is also proposing a “form” for the standard. The form is the air quality statistic that is compared to the level of the standard to determine if an area meets the standard.
- EPA is proposing the form of the new 1-hour NO₂ standard be expressed as a 3-year average of either:
 - The 4th highest daily maximum 1-hour average concentration in a year, OR
 - The 99th percentile of the annual distribution of daily maximum 1-hour average concentrations

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Updating the Monitoring Network

- A central concept in the design of the monitoring networks for NAAQS pollutants is a **focus on monitoring in locations of maximum concentrations**
- EPA is proposing to change the monitoring network to capture both peak NO₂ concentrations such as those that occur near roadways AND community-wide NO₂ concentrations
 - EPA is proposing specific minimum requirements to guide placement of new monitors:
 - At least one monitor would be located near a major roadway in any urban area with a population greater than or equal to 350,000 people.
 - A second monitor would be required near a major road in areas with either:
 - population greater than or equal to 2.5 million people, or
 - one or more road segments with an annual average daily traffic count greater than or equal to 250,000 vehicles
 - A minimum of 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 is proposing to require all new NO₂ monitors to be operational by January 1, 2013
- EPA estimates the proposal 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.

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Setting the Air Quality Standard for NO₂

- The Clean Air Act requires EPA to set two types of national ambient air quality standards (NAAQS) for “criteria” air pollutants:
 - **Primary standards** to protect public health with an adequate margin of safety
 - **Secondary standards** to protect public welfare (visibility, wildlife, crops, vegetation, national monuments and buildings)
- EPA has set NAAQS for six common air pollutants:
 - **Nitrogen dioxide**
 - Carbon monoxide
 - Lead
 - Particulate matter
 - Ground-level ozone (smog)
 - Sulfur dioxide
- The law requires EPA to review the scientific information and the standards for each pollutant every five years, and to obtain advice from the Clean Air Scientific Advisory Committee (CASAC) on each review
- Different considerations apply to setting NAAQS than to achieving them
 - **Setting NAAQS:** based on scientific evidence of health and environmental effects
 - **Achieving NAAQS:** account for cost, technical feasibility, time needed to attain
- EPA is reviewing the NO₂ standard established in 1971
 - EPA reviewed the NO₂ standard in 1985 and 1996 and decided to retain the 53 ppb annual average standard

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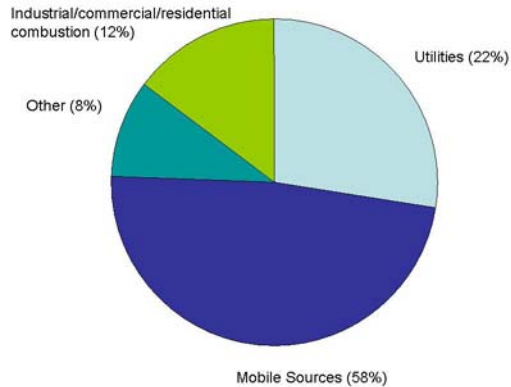
NO₂ is the Indicator for Entire NO_x Group of Gases

- NO₂ is one of a group of highly reactive gasses known as oxides of nitrogen (NO_x)
 - Other oxides of nitrogen include nitrous acid and nitric acid
- NO₂ is the component of NO_x of greatest interest and serves as the indicator for the entire NO_x family
- NO_x forms when fuel is burned at high temperatures
- Control measures that reduce NO₂ can generally be expected to reduce population exposures to all NO_x gases
 - This may have the important co-benefit of reducing the formation of ozone and fine particles both of which pose significant public health threats

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Sources of NO_x Pollution

- Primary sources of NO_x include:
 - mobile sources,
 - electric utilities,
 - and other industrial, commercial, and residential sources that burn fuels



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Reducing NO_x Pollution in the U.S.

- All areas in the U.S. comply with the current (1971) NO₂ standards
 - Annual average ambient NO₂ concentrations, as measured at community-wide monitors, have decreased by more than 40% since 1980
 - The range of current annual average NO₂ concentrations is approximately 10-20 ppb
- The EPA, states and tribes have been working together since the 1970's to reduce emissions of NO_x from a range of sources. Key efforts include:
 - Emission Standards for Motor Vehicles and Power Plants
 - Regulating Regional Transport of NO_x
- EPA anticipates NO_x concentrations will continue to decrease as a result of mobile source regulations
 - Tier 2 standards for light-duty vehicles began phasing in in 2004, and new NO_x standards for heavy-duty engines are phasing in between 2007 and 2010 model years
 - As these standards continue to be phased in, NO_x from motor vehicles are expected to be lower

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New Health Evidence in this Review

- Current scientific evidence links short-term NO₂ exposures, ranging from 30 minutes to 24 hours, with an array of adverse respiratory effects including increased asthma symptoms, worsened control of asthma, and an increase in respiratory illnesses and symptoms. These effects are particularly important for asthmatics.
 - These health effects have been associated with exposure to the range of NO₂ levels across an area, which includes both the higher short-term exposures than can occur on or near major roadways, and the lower concentrations that can occur away from such roadways.
- Studies also show a connection between short-term exposure and increased visits to emergency departments and hospital admissions for respiratory illnesses, particularly in at-risk populations including children, the elderly, and asthmatics.

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Nitrogen Oxides Also Contribute to the Formation of Fine Particle Pollution and Ozone

- NO_x react with ammonia, moisture, and other compounds to form small particles, exposure to which results in health effects including:
 - Premature death
 - Effects on breathing and the respiratory system,
 - Damage to lung tissue,
 - Small particles that penetrate deeply into sensitive parts of the lungs and can cause or worsen respiratory disease, such as emphysema and bronchitis, and aggravate existing heart disease
- NO_x is also a precursor of ground-level ozone
 - Ozone is formed when NO_x and volatile organic compounds (VOC) react in the presence of heat and sunlight
 - Children, the elderly, people with lung diseases such as asthma, and people who work or exercise outside are susceptible to adverse effects of ozone such as damage to lung tissue and reduction in lung function

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Near and On Roadway NO₂ Exposures

- NO₂ concentrations in vehicles and on or near major roads are appreciably higher than those measured at monitors in the current network
 - In-vehicle concentrations can be 2-3 times higher than measured at nearby community-wide monitors
 - Near-roadway concentrations have been measured to be approximately 30 to 100% higher than away from major roads
- Individuals who spend time on or near major roads can experience short-term NO₂ exposures considerably higher than measured by the current network, which are of particular concern for at-risk populations, including people with asthma, children, and the elderly.

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CASAC Recommendations

- The Clean Air Scientific Advisory Committee (CASAC) provides independent advice to the EPA Administrator on the NAAQS
- CASAC recommended the EPA:
 - Set a 1-hour standard at a level no higher than 100 ppb
 - Consider the implications of how NO₂ concentrations decrease as distance from roadways increases (known as the NO₂ concentration gradient) for standard setting and for monitor siting requirements
- In light of evidence suggesting an association between *long-term exposures* to NO₂ and adverse health effects, CASAC also recommended retaining the current annual standard of 53 ppb
 - They concluded the evidence is too limited to suggest any change to the level of the annual average standard

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Anticipated Implementation Schedule

Milestone	Date
State Designation Recommendations to EPA	January 2011: One year following promulgation (Based on existing network data)
Designations	January 2012: EPA designates all/most areas as "unclassifiable" (because near road monitors not in place)
New NO ₂ Monitoring Network	January 1, 2013: All monitors in place
Next NO ₂ NAAQS Review Completed	January 2015: Anticipated time frame
Nonattainment Re- Designations (discretionary)	January 2017/2018 (depending on date that sites become operational)
Attainment Date	January 2022/2023 (5 years after date of nonattainment designations)