

NESCAUM Recommendations on the Use of an Interim Significant Impact Level (SIL) in Modeling the 1-Hour NO₂ NAAQS

Background and Importance of SILs

On February 9, 2010, the U.S. Environmental Protection Agency (EPA) published a new 1-hour nitrogen dioxide (NO₂) National Ambient Air Quality Standard (NAAQS) at a level of 100 ppb (approximately 188 µg/m³). This new standard became effective on April 12, 2010, which means that permits issued under EPA's prevention of significant deterioration rules (40 CFR 52.21) on or after April 12, 2010, must contain a demonstration that allowable emissions from any new major stationary source or major modification will not cause or contribute to a violation of the new 1-hour NO₂ NAAQS (see EPA's Fact Sheet). EPA has not yet proposed a significant impact level (SIL) for the 1-hour NO₂ NAAQS, yet states are expected to begin implementing the standard immediately. It is EPA's policy to exempt sources from conducting comprehensive, multisource modeling if their estimated maximum ambient impacts for a given pollutant are less than the SIL.

Therefore, it is important for NESCAUM states to allow permit applicants to use an interim 1-hour NO₂ SIL in the permitting process. EPA-defined SILs currently exist for PM₁₀, CO, SO₂ and the annual NO₂ NAAQS. The NESCAUM Permit Modeling Committee previously developed and recommended interim SILs for the PM_{2.5} NAAQS (see *NESCAUM Technical Guidance on Significant Impact Levels (SILs) for PM_{2.5}*, dated December 8, 2006; <http://www.nescaum.org/topics/permit-modeling>).

In practice, if the modeled ambient impacts from a proposed project are less than the respective SIL, the project:

- is presumed to not cause or significantly contribute to a PSD increment or NAAQS violation, and
- is not required to perform multiple source cumulative impact assessments.

Without a 1-hour NO₂ SIL, permit applicants would be obligated to perform a cumulative modeling analysis in essentially all instances – an analysis which may unnecessarily consume regulatory agency resources, especially given the large number of NO₂ major sources that are being proposed across the region. The use of an interim 1-hour NO₂ SIL would also make the NSR process more efficient without a detrimental effect on air quality. Therefore, its use is advantageous to both permit applicants and NESCAUM state agencies.

The recommendations for the use of 1-hour NO₂ SILs, below, were developed by the NESCAUM Permit Modeling Committee to assist permit applicants and states in preparing and reviewing air quality modeling analyses. The technical basis for these recommendations is provided in the Appendix.

Summary of NESCAUM Permit Modeling Committee Recommendations on Use of an Interim 1-hour NO₂ SIL

To facilitate air quality modeling reviews of permit applications and other modeling assessments, the NESCAUM Permit Modeling Committee recommends that the following 1-hour NO₂ SIL can be used by state air agencies until such time that EPA formally adopts a 1-hour NO₂ SIL:

1-hour NO₂ SIL = 10 µg/m³, with a form based on:

- the highest five year average of modeled 1-hour maximum NO₂ concentrations predicted each year at a given receptor, if using five years of National Weather Service meteorological data; or
- the highest modeled 1-hour NO₂ concentration for one year of site-specific meteorological data.

Conversion of nitric oxide (NO) to nitrogen dioxide (NO₂) can be approximated with a three tiered screening system similar to the tiered procedures specified in Section 5.2.4 of EPA's Guideline on Air Quality Models:

- tier-1 assumes 100 percent conversion of NO to NO₂,
- tier-2 assumes a NO₂ to NO_x (NO + NO₂) ratio of 75 percent, and
- tier-3 allows case-by-case use of a site specific ratio derived using techniques such as the Plume Volume Molar Ratio (PVMRM) or the Ozone Limiting Method (OLM).

The interim 1-hour NO₂ SIL is recommended for use by permit applicants and the states in the NESCAUM region to determine if a proposed source or modification is required to perform a multiple source cumulative impact assessment. The extent and complexity of any cumulative analysis conducted when the interim SIL is exceeded will be determined by individual states. The interim SIL can also be used at the discretion of individual NESCAUM states to determine if a source is causing or significantly contributing to a violation of the 1-hour NO₂ NAAQS.

Appendix

NESCAUM Recommendations on the Use of an Interim Significant Impact Level (SIL) in Modeling the 1-Hour NO₂ NAAQS

Basis for the Recommended Interim 1-Hour NO₂ SIL

The NESCAUM Permit Modeling Committee considered three issues when developing a recommendation for the 1-hour NO₂ SIL: (1) the value of the SIL, (2) the form of the SIL, and (3) the use of a default, or a tiered system of NO to NO₂ conversion rates.

1) Value of Interim 1-Hour NO₂ SIL

Option 1 – Use the existing annual NO₂ SIL (1 µg/m³).

Option 2 – Use a value based on the ratio of the annual NO₂ SIL to the annual NO₂ NAAQS ((1 µg/m³ / 100 µg/m³) x 188 µg/m³ = 1.9 µg/m³).

Option 3 – Develop a value based on the only other criteria pollutant with a 1-hour NAAQS, carbon monoxide (CO), using the ratio of the 1-hour CO SIL to the 1-hour CO NAAQS ((2000 µg/m³ / 40,000 µg/m³) x 188 µg/m³ = 10 µg/m³ (rounded up from 9.4 µg/m³)).

Option 4 – Use a value based on the EPA's draft July 23, 1996, NSR Reform proposal recommending 4% of the Class I increment as the Class I SIL, where the 4% value was based on EPA's definition of de minimis emission rates for NAAQS impact demonstration purposes (see 45 FR 52676, August 8, 1980). (188 µg/m³ x 0.04 = 7.5 µg/m³).

The spatial and temporal variations of short-term 1-hour impacts tend to be much more volatile than longer averaging times such as an annual average. In addition, the new 1-hour NO₂ NAAQS will be applied to hot spot type modeling near major roadways, not unlike the 1-hr CO NAAQS. A very low SIL will result in frequent multisource cumulative modeling for NO₂, a resource intensive activity that in many cases will have limited usefulness.

Recommendation: Option 3, Interim 1-Hour NO₂ SIL = 10 µg/m³

2) Form of 1-Hour NO₂ Interim SIL

Option 1 – Use the highest modeled 1-hour NO₂ concentration using five years of NWS meteorological data or using one year of site-specific meteorological data. This form is similar to many of EPA's current SILs.

Option 2 – Use the highest modeled 1-hour NO₂ concentration predicted each year at a receptor, then average over five years if using NWS meteorological data; or use the highest modeled 1-hour NO₂ concentration for one year of site-specific data. This option is similar in form to the 24-hour PM_{2.5} NAAQS, another permit modeled criteria pollutant with a probabilistic, not deterministic, NAAQS (see Stephen Page memo *Modeling Procedures for Demonstrating Compliance with the PM_{2.5} NAAQS*, dated March 23, 2010;

<http://www.epa.gov/scram001/Official%20Signed%20Modeling%20Proc%20for%20Demo%20Compli%20w%20PM2.5.pdf>).

Option 3 – Use the highest of the modeled 8th highest daily maximum 1-hour average concentrations in a year predicted over five years. This option reflects the approximate form of the 1-hour NO₂ NAAQS (i.e., highest of the 98th percentile of the annual distribution of daily maximum 1-hour average concentrations predicted over five years).

Given the similarities in the form of the 1-hour NO₂ NAAQS with that of the 24-hour PM_{2.5} NAAQS, it would seem likely that when a 1-hour NO₂ SIL is promulgated by EPA it will reflect the form of option 2.

Recommendation: Option 2: The form of the interim 1-hour NO₂ SIL would be the highest five year average of the modeled maximum 1-hour NO₂ concentrations each year at a receptor, if using five years of NWS meteorological data. For one year of site-specific meteorological data, it would be simply the highest modeled 1-hour NO₂ concentration.

3) NO_x to NO₂ conversion rate

Option 1 – Assume 100 percent conversion of exhaust gas NO to NO₂.

Option 2 – A two tiered screening approach, where tier-1 assumes 100 percent NO to NO₂ conversion, and tier-2 assumes a NO₂ to NO_x (NO + NO₂) ratio of 75 percent (this is EPA's ambient ratio method, ARM, annual national default conversion).

Option 3 – A three tiered system, where tier-1 assumes 100 percent NO to NO₂ conversion, tier-2 assumes a 75 percent NO₂/NO_x ratio, and tier-3 allows a case-by-case use of a site specific ratio derived using more refined techniques such as the Ozone Limiting Method (OLM) or the Plume Volume Molar Ratio Method (PVMRM). Both are in AERMOD. Option 3 is similar to the tiered procedures specified for modeling annual NO₂ impacts in Section 5.2.4 of the Guideline on Air Quality Models.

There is also an EPA Clearinghouse memo endorsing application of the 75 percent NO₂/NO_x ratio when modeling the annual NO₂ SIL (see Daniel J. deRoeck memo: *Use of the Ambient Ratio Method for Modeling Significant Ambient Impacts of NO₂*, dated March 15, 2002; <http://www.epa.gov/region07/air/nsr/nsrmemos/m200203.pdf>)

Option 3 would give the States the most flexibility. It should be noted that PVMRM is a non-Guideline technique, so if used in PSD permit modeling, EPA Regional Office approval should be obtained.

Recommendation: Option 3: A three tiered system would provide maximum flexibility.