Permitting & Modeling Requirements for New Standards – PM$_{2.5}$, NO$_2$, & SO$_2$

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Background Information

- The Clean Air Act requires EPA to set and **revise** National Ambient Air Quality Standards (NAAQS) for certain common and widespread pollutants (criteria pollutants), and provides authority for EPA to **add additional pollutants** (Sections 108 & 109 of the CAA).

- **Every five years**, the Act requires EPA to review scientific data, and determine whether to revise the standards for a pollutant.

- Implementation of these standards are a **joint responsibility** of states and EPA.
Background Information

• In 2006, EPA
  ▫ revised the 24-hr PM2.5 to 35 µg/m³, and
  ▫ retained the annual PM2.5 standard at 15 µg/m³

• In 2010, EPA
  ▫ established the 1-hr NO2 = 100 ppb, and
  ▫ established the 1-hr SO2 = 75 ppb

• NDEP Public workshop held in March 2014 to receive comment on Nevada Implementation

• NV SEC approved NV implementation in June, 2014; EPA final approval in October 2014.
Particles less than 2.5 micrometers in diameter (PM$_{2.5}$) are referred to as "fine" particles and are believed to pose the largest health risks. Because of their small size (less than one-seventh the average width of a human hair), fine particles can lodge deeply into the lungs.” - EPA

“...is made up of a number of components, including acids, organic chemicals, metals, and soil or dust particles.” - EPA
### Pollutant Averaging Time

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging Time</th>
<th>Concentration</th>
<th>Primary</th>
<th>Secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nitrogen dioxide</strong></td>
<td>Annual arithmetic mean</td>
<td>0.053 ppm (100 µg/m(^3))</td>
<td>53 ppb</td>
<td>Same as primary</td>
</tr>
<tr>
<td></td>
<td>1 hour</td>
<td>100 ppb</td>
<td>100 ppb</td>
<td>None</td>
</tr>
<tr>
<td><strong>Sulfur dioxide</strong></td>
<td>Annual arithmetic mean</td>
<td>0.030 ppm (80 µg/m(^3))</td>
<td>0.03 ppm (1971 standard)</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>24 hours</td>
<td>0.14 ppm (365 µg/m(^3))</td>
<td>0.14 ppm (1971 standard)</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>3 hours</td>
<td>0.5 ppm (1,300 µg/m(^3))</td>
<td>None</td>
<td>0.5 ppm</td>
</tr>
<tr>
<td></td>
<td>1 hour</td>
<td>75 ppb</td>
<td>75 ppb</td>
<td>None</td>
</tr>
<tr>
<td><strong>Particulate matter as PM(_{2.5})</strong></td>
<td>Annual arithmetic mean</td>
<td>15.0 µg/m(^3)</td>
<td>15.0 µg/m(^3)</td>
<td>Same as primary</td>
</tr>
<tr>
<td></td>
<td>24 hours</td>
<td>35 µg/m(^3)</td>
<td>35 µg/m(^3)</td>
<td>Same as primary</td>
</tr>
</tbody>
</table>
PM$_{2.5}$ in Permit Applications

- Permit application’s emissions inventory **must now include** PM$_{2.5}$.
- In the *Emission Units Application Forms*, PM$_{2.5}$ must be recognized as a pollutant for each emission unit with potential-to-emit values in rates of pounds-per-hour (lb/hr) and tons-per-year (tpy). Similarly, PM$_{2.5}$ values must be included in the *Facility-Wide Potential to Emit Tables*.
- As always, please cite the source of your emission factors and do not use PM$_{10}$ emission factors for PM$_{2.5}$, as it will greatly over estimate emissions.
NO₂ and SO₂ in Permit Applications

- Permit application’s emissions inventory will continue to require NO₂ & SO₂.
- If you are required to provide an air dispersion model, please make sure that model runs are performed for all current Nevada Standards including the new 1-hour standards (NO₂ & SO₂).
- If you do not meet the assignment threshold (PTE < 40 tpy per pollutant) to provide an air dispersion model, the NDEP will perform this modeling to ensure compliance with those new 1-hr standards. (NAC 445B.308 (2))
Modeling Requirements

- PM2.5 – *Non-PSD actions* should use the BAPC Guidelines with default AERMOD settings for **direct PM2.5**. PSD actions must use direct and secondary PM2.5 and should submit a model protocol.

- SO2 – PSD and non-PSD actions should use the BAPC Guidelines with default AERMOD settings.

- EPA has developed guidance memos and are available on our website (www.ndep.nv.gov/bapc)
Let’s Take A Look

Air \( (O_2 + 3.76\, N_2) \)

\[ \text{Emission Source} \]

\[ 2\, NO + O_2 \rightarrow 2\, NO_2 \]  
\[ (NO_2 / NOx) \]

\[ O_3 \]

\[ O_2 \]

\[ O_{3} \]

\[ NO_2 + \text{Sunlight} \rightarrow NO + O \]
For PM2.5 (non-PSD)

Emission Source → PM$_{2.5}$ → PM$_{2.5}$

AERMOD

[PM$_{2.5}$]
For SO₂

$\dot{SO}_2$ → $\dot{SO}_2$

Emission Source

AERMOD

[SO₂]

NEVADA DIVISION OF ENVIRONMENTAL PROTECTION protecting the future for generations
NO2 – EPA has proposed a three-tiered evaluation process for quantifying NO2 mass emission rates for air dispersion modeling.

- **Tier 1** assumes full conversion of NOx to NO2. That is, the applicant assumes all NOx is emitted in the form of NO2.
- **Tier 2** employs an empirically-derived conversion ratio (NO2/ NOx), whereby the result from the Tier 1 value is multiplied by 0.80 for the ambient air (known as the ‘Ambient Ratio Method’). This tier (2) is available to a source when low-level releases occur with limited plume rise and ozone concentrations are likely to be relatively low. When using a ratio value other than 0.80, the analysis would be considered a Tier 3 evaluation.
- **Tier 3** represents a general category of “detailed screening methods” which may be considered on a case-by-case basis.
Air (O₂ + 3.76 N₂)

NO₂ + Sunlight → NO + O

O₃

NO

NO₂

2 NO + O₂ → 2 NO₂
(NO₂ / NOx)

Emission Source

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NDEP- BAPC
NO2 Tier I

Emission Source

\[ \text{NO} \xrightarrow{\text{NOx}} \text{NO}_2 \]

\[ \text{NO}_2 \]

AERMOD

\[ [\text{NO}_2] \]
NO\textsubscript{2} Tier II

\[ \text{Emission Source} \]

\[ \text{NO}_x \rightarrow \text{NO}_2 \]

\[ \text{NO}_2 + \text{Sunlight} \rightarrow \text{NO} + \text{O}_2 \]

\[ \text{AERMOD} \]

\[ \text{ARM} = 0.8 \]

\[ [\text{NO}_2] \]

\[ F_L \]
Emission Source

\[ 2 \text{NO} + \text{O}_2 \rightarrow 2 \text{NO}_2 \]

(NO\textsubscript{2} / NO\textsubscript{x})

\[ \text{NO}_2 + \text{Sunlight} \rightarrow \text{NO} + \text{O} \]

\[ \text{O}_3 \]

\[ \text{O}_2 \]

\[ \text{O}_3 \]

AERMOD

OLM / PVMRM

[NO\textsubscript{2}]

\[ F_L \]
Modeling Requirements

- **Tier 1** approach may be used for all permit applications without additional support documentation with default AERMOD settings.
- **Tier 2** approach will require additional support documentation for all applications. Documentation would include acknowledgement of source-surrounding characteristics that meet applicable assumptions (as noted by the EPA in their June, 2010 memo).
- **Tier 3** approach will require substantial background information, and pre-approval via a model protocol is required.
Permit Emission Limits

- Enforceable permit emission limits will be added to Class I and Class II permits for PM2.5 and NOx where applicable, and may include permit requirements for monitoring, recordkeeping, reporting, and potentially compliance testing (stack tests).
Annual Reporting and Fees

- Facilities that have permits with PM2.5 emission limits will have to include actual PM2.5 emissions data in their annual emissions report.
- Pursuant to NAC 445B.327(5) Class I permit facilities must pay an annual emissions fee for each regulated pollutant for which a standard is established in NAC 445B.22097 or a National Ambient Air Quality Standard.
- Please note that carbon monoxide and greenhouse gases are excluded by regulation.
- Applicable billable pollutants include: Volatile Organic Compounds (VOCs) as a precursor to Ozone, Nitrogen Oxides (NOx), Sulfur Dioxide (SO2), Particulate Matter as PM10, Particulate Matter as PM2.5, Lead, and Hydrogen Sulfide.
- Class II, III and IV permits do not have “per ton” emissions fees.
Questions?