Proposed Rule 1150.3
Emissions of Oxides of Nitrogen from Combustion Equipment at Landfills

Public Workshop

Date: October 7, 2020
Join Zoom Meeting: https://scagmd.zoom.us/j/93948524432
Meeting ID: 939 4852 4432
Password: 182064
Teleconference Dial-In: +1 669 900 6833
Proposed Rule 1150.3 is designed to address emissions from combustion equipment at Municipal Solid Waste (MSW) landfills and landfill gas to energy facilities.

MSW landfills are:
- Entire disposal facilities in a contiguous geographical space where solid waste is placed in or on land
- May be active, inactive, or closed

Landfill gas to energy facilities receive and process landfill gas to generate electricity for sale.

Seven MSW landfills or landfill gas to energy facilities subject to proposed rule.

Staff developed PR 1150.3 in response to comments received during the 2018 rule amendments to the Rule 1146 series.

Addressing combustion equipment in a rule that is specific to MSW landfills and landfill gas to energy facilities can better tailor requirements to address unique issues at these facilities.
- Excludes engines burning landfill gas which will remain subject to Rule 1110.2
BARCT assessments were conducted for landfill gas boilers and turbines.
Proposed Rule 1150.3
Preliminary Draft Rule Language
Purpose (a) and Applicability (b)

- **Purpose**
  - The purpose of this rule is to reduce emissions of oxides of nitrogen (NO\textsubscript{x}) and carbon monoxide (CO) from boilers, process heaters, and turbines located at Municipal Solid Waste (MSW) landfills and landfill gas to energy facilities.

- **Applicability**
  - Landfill gas and dual fuel boilers and process heaters >2 MMBtu/hr
  - Landfill gas and dual fuel turbines <0.3 MW
  - Landfill gas, dual fuel, and other gaseous fuel turbines ≥ 0.3 MW
Key Definitions:

- **DUAL FUEL UNIT** means any combustion equipment subject to this rule permitted to fire landfill gas and another fuel.
- **TURBINE REPLACEMENT** means installing new equipment with the same function in place of currently installed equipment. Replacement does not include turbine overhauls that do not trigger New Source Performance Standards requirements, and overhauls in which the original turbine unit returns to operation at the facility within 90 days.
Emission Limits (d)

- NOx and CO emission limits for boilers fueled with landfill gas and other fuels
  - Emission limits established based on BARCT analysis
  - Boilers that are permitted for natural gas or another fuel only will continue to be subject to Rules 1146 and 1146.1

- NOx and CO emission limits for turbines fueled with landfill gas, natural gas, and other gaseous fuels
  - Emission limits established based on BARCT analysis
  - Since turbines at landfills are exempt from Rule 1134, PR 1150.3 includes limits for natural gas or other gaseous fuel turbines

- Emission limits do not apply during periods of startup or shutdown

Rule 1146 – Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters
Rule 1146.1 – Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters
Rule 1134 – Emissions of Oxides of Nitrogen from Stationary Gas Turbines
### Boiler and Process Heater Emission Limits (d)(1)

<table>
<thead>
<tr>
<th>Equipment Category</th>
<th>Compliance Schedule</th>
<th>NOx  (ppmv)(^1)</th>
<th>CO   (ppmv)(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landfill gas</td>
<td>On or before [Date of Adoption]</td>
<td>25</td>
<td>400</td>
</tr>
<tr>
<td>On or before January 1, 2030</td>
<td></td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Rated heat input capacity &gt; 2 MMBtu/hr and &lt; 75 MMBtu/hr and firing other fuel</td>
<td>On or before [Date of Adoption]</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Rated heat input capacity ≥ 75 MMBtu/hr and firing other fuel</td>
<td></td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\)All parts per million volume (ppmv) emission limits are referenced at 3% volume stack gas oxygen on a dry basis and averaged over 15 minutes.

- Existing boilers required to meet 25 ppmv
  - Limit is consistent with Rules 1146/1146.1
  - Existing boilers expected to shut down due to decline in landfill gas
- Any boilers replaced after January 2030 must meet a NOx limit of 9 ppmv
- CO limits are consistent with limits in Rules 1146/1146.1
## Turbine Emission Limits (d)(1)

<table>
<thead>
<tr>
<th>Equipment Category</th>
<th>Compliance Schedule</th>
<th>NOx (ppmv)²</th>
<th>CO (ppmv)²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated output &lt; 0.3 MW and firing landfill gas, landfill gas with other gaseous fuel, or other gaseous fuel</td>
<td>On or before [Date of Adoption]</td>
<td>9</td>
<td>-</td>
</tr>
<tr>
<td>Rated output ≥ 0.3 MW with post-combustion control and firing 75% landfill gas or more³</td>
<td>-</td>
<td>25</td>
<td>130</td>
</tr>
<tr>
<td>Rated output ≥ 0.3 MW without post-combustion control and firing 75% landfill gas or more³</td>
<td>-</td>
<td>12.5⁴</td>
<td>-</td>
</tr>
<tr>
<td>Rated output ≥ 0.3 MW and firing 75% landfill gas or more³</td>
<td>Upon turbine replacement</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

- **Turbines < 0.3 MW consistent with current permits**
- **Two categories for NOx limits for existing turbines ≥ 0.3 MW:**
  - Turbines *with* post-combustion controls (SCR): NOx limit of 25 ppmv
  - Turbines *without* post-combustion controls: NOx limit of 12.5 ppmv
- **New turbines ≥ 0.3 MW must meet a NOx limit of 12.5 ppmv**
- **CO limits consistent with existing permit limit**

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²All parts per million volume (ppmv) emission limits are referenced at 15% volume stack gas oxygen on a dry basis and averaged over 1 hour.
³Percent of landfill gas is based on the total heat input on an annual basis.
⁴Concentration limit applicable to turbines operating at a load of 60% rated output or greater.
Natural gas or other gaseous fuel turbines would be subject to lower NOx limits than landfill gas fired turbines

- Limits are the same as natural gas limits in Rule 1134
- No existing natural gas turbines at landfills

CO limit consistent with permit limit

<table>
<thead>
<tr>
<th>Equipment Category</th>
<th>Compliance Schedule</th>
<th>NOx (ppmv)²</th>
<th>CO (ppmv)²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combined cycle with a rated output ≥ 0.3 MW and firing 100% natural gas or other gaseous fuel, excluding landfill gas</td>
<td>On or before [Date of Adoption]</td>
<td>2</td>
<td>130</td>
</tr>
<tr>
<td>Simple cycle with a rated output ≥ 0.3 MW and firing 100% natural gas or other gaseous fuel, excluding landfill gas</td>
<td></td>
<td>2.5</td>
<td></td>
</tr>
</tbody>
</table>

²All parts per million volume (ppmv) emission limits are referenced at 15% volume stack gas oxygen on a dry basis and averaged over 1 hour.
Weighted Limit for Dual Fuel Turbines (d)(2)

- Applies to turbines that fire landfill gas and natural gas or other gaseous fuel simultaneously
  - More than 25%, but less than 100% natural gas or other gaseous fuel
  - Based on the total heat input on a rolling 12-month basis

Weighted Limit = \[
\frac{(CL_A \times Q_A \times V_A) + (CL_B \times Q_B \times V_B)}{(Q_A \times V_A) + (Q_B \times V_B)}
\]

Where:
- \( CL_A \) = compliance limit in Table 1 when firing 75% landfill gas or more
- \( Q_A \) = higher heating value of landfill gas in Btu per standard cubic foot (scf)
- \( V_A \) = flow rate of landfill gas in scf per unit of time
- \( CL_B \) = compliance limit in Table 1 when firing 100% natural gas or other gaseous fuel
- \( Q_B \) = higher heating value of natural gas or other gaseous fuel in Btu per scf
- \( V_B \) = flow rate of natural gas or other gaseous fuel in scf per unit of time
Turbine NOx Emission Limits for Low Load (d)(3)

- Applicable to turbines ≥ 0.3 MW without post-combustion control and new turbines ≥ 0.3 MW
- NOx concentration limit of 25 ppmv at loads less than 60% rated output for no more than 250 hours per calendar year
- Beyond 250 hours, must meet NOx concentration limit of 12.5 ppmv
- NOx limits are effective at the Date of Adoption

All parts per million volume (ppmv) emission limits are referenced at 15% volume stack gas oxygen on a dry basis
### Emission Limits (d)(4)-Averaging Times for Units with CEMS

<table>
<thead>
<tr>
<th>Unit Type</th>
<th>Requirement</th>
<th>Change from Source-Specific Rule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boilers (d)(4)(A)</td>
<td>1 clock hour</td>
<td>Changed from 15 minutes under Rules 1146/1146.1</td>
</tr>
<tr>
<td>Turbines (d)(4)(B)</td>
<td>1 hour rolling average</td>
<td>Consistent with Rule 1134</td>
</tr>
</tbody>
</table>
Emission Limits (d)(5)-Startup and Shutdown

- NOx and CO emission limits do not apply during startup and shutdown

<table>
<thead>
<tr>
<th>Unit Type</th>
<th>Requirement</th>
<th>Change From Source-Specific Rule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boilers (d)(5)(A)</td>
<td>Not longer than 6 hours</td>
<td>Consistent with Rule 1146.1</td>
</tr>
<tr>
<td>Turbines without post-combustion control (d)(5)(D)</td>
<td>Not longer than 30 minutes</td>
<td>Consistent with existing landfill gas turbine permits</td>
</tr>
<tr>
<td>Turbines with post-combustion control (d)(5)(D)</td>
<td>Not longer than 1 hour</td>
<td></td>
</tr>
</tbody>
</table>
The number of scheduled startups/shutdowns for boilers allowed is consistent with Rule 429
- Maximum of 10 per year for boilers >40 MMBtu/hr
- Maximum of 10 per month for boilers 5 – 40 MMBtu/hr

A plan of scheduled startup and shutdown events is due January 1 of each year
- An example of a scheduled startup/shutdown event is planned maintenance or construction known prior to beginning of year
- Startup/shutdown due to load variation is not considered a scheduled event

A notification of scheduled startups and shutdowns is required if seeking exemption from emission limits and contain the following information
- Dates, times, and duration
- Any other process variables that are appropriate as determined by the South Coast AQMD
Prohibition of Liquid Fuel (d)(6)

- Turbines
  - Cannot burn any liquid fuel, such as diesel
  - Does not apply to emergency use turbines
Source Testing (e)

- Boiler schedule is consistent with Rules 1146/1146.1
- Turbine schedule is based on Rule 1134 CEMS criteria
- Turbines < 0.3 MW would have source test frequency

<table>
<thead>
<tr>
<th>Equipment Category</th>
<th>Frequency</th>
<th>Pollutant</th>
<th>Elapsed Time Prior to Conducting Test¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boilers and process heaters &gt;2 MMBtu/hr and &lt;10 MMBtu/hr¹</td>
<td>Every 5 years from the date the previous source test was required²</td>
<td>NOx and CO</td>
<td>At least 250 operating hours or at least 30 calendar days</td>
</tr>
<tr>
<td>Boilers and process heaters ≥ 10 MMBtu/hr¹</td>
<td>Every 3 years from the date the previous source test was required²</td>
<td></td>
<td>At least 40 operating hours or at least 7 calendar days</td>
</tr>
<tr>
<td>Turbines &lt; 2.9 MW</td>
<td>Every 3 years from the date the previous source test was required² or every 8,760 operating hours, whichever occurs later</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turbines ≥ 2.9 MW</td>
<td>Every calendar year from the date the previous source test was required²</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹Time elapsed or unit operating hours, subsequent to any tuning or servicing, unless it is an unscheduled repair
²Source test is due no later than the last day of the calendar month.
• Other source testing requirements are based on source-specific rules

• Overview of PR 1150.3 Source Testing Procedures
  • Initial source test (e)(2)
  • Protocol submittal and scheduling (e)(3)
  • Source test protocol requirements (e)(4)
  • Source test date notification (e)(5)
  • Approved contractor and test methods (e)(6)
  • Source testing infrastructure (e)(7)
  • Operating conditions during testing (e)(8)
  • Submittal of completed source test (e)(9)
  • RATA in lieu of source test (e)(10)
Provisions for Revised Protocol Submittals

- Subparagraph (e)(3)(A) – Revised protocol submittal requirement
  
- A new submittal is required for the following:
  - Any equipment alteration resulting in a change to the permit
  - Any change to the emission limits
  - At the request of the South Coast AQMD (e.g., outdated protocols)
<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Test Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOx</td>
<td>South Coast AQMD Test Methods 100.1 or 7.1</td>
</tr>
<tr>
<td>CO</td>
<td>South Coast AQMD Test Methods 100.1 or 10.1, or EPA Test Method 10</td>
</tr>
<tr>
<td>CO₂ and O₂</td>
<td>South Coast AQMD Test Method 3.1 or 100.1</td>
</tr>
</tbody>
</table>
Table 4 contains the thresholds for all equipment where CEMS is required

Consistent with requirements under Rules 1146 and 1134

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Threshold</th>
<th>Pollutant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boilers</td>
<td>Rated heat input capacity ≥ 40 MMBtu/hr and Annual heat input &gt; 200 x 10^9 Btu per calendar year</td>
<td>NOx</td>
</tr>
<tr>
<td>Turbines</td>
<td>Rated output ≥ 2.9 MW</td>
<td></td>
</tr>
</tbody>
</table>
Diagnostic Emission Checks for Boilers and Process Heaters (g)

- Diagnostic emission check requirements under PR 1150.3 are consistent with those from Rules 1146 and 1146.1
- Testing shall be conducted pursuant to the Combustion Gas Periodic Monitoring Protocol
  - Protocol requires 15 minute sampling
- No violation for excess emissions if the problem is identified by the facility and compliance is demonstrated within 72 hours
PR 1150.3 harmonizes recordkeeping requirements from other rules into one rule
- Requires retaining records for 5 years for all equipment types
  - The 5 year requirement would be effective upon rule adoption to account for a facility that currently has a 2 year requirement

PR 1150.3 requires data and monitoring records for applicable units (e.g., CEMS data, source test reports, diagnostic emission checks), as well as:
- Maintenance and tuning records
- Operating logs
- Startup and shutdown records
Other Requirements (i)

- Paragraph (i)(1) prohibits derating boilers to less than or equal to 2 MMBtu/hr
  - Consistent with Rules 1146 and 1146.1
  - Based on manufacturer’s identification or rating plate or permit condition

- Paragraph (i)(2): Install and maintain non-resettable hour meter
Applications are required for each unit subject to this rule to reflect the applicability of PR 1150.3

- Title V facilities
  - Due by the next Title V permit renewal
- Non-Title V facilities
  - Due on or before July 1, 2024

<table>
<thead>
<tr>
<th>Boilers</th>
<th>Turbines ≥ 0.3 MW with Post Combustion Control</th>
<th>Turbines ≥ 0.3 MW without Post Combustion Control</th>
<th>Turbines &lt;0.3 MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Applications due by next Title V permit renewal</td>
<td>• Applications due by next Title V permit renewal</td>
<td>• Applications due by next Title V permit renewal</td>
<td>• Applications due by July 1, 2024</td>
</tr>
</tbody>
</table>
Exemptions (k)

- PR 1150.3 contains exemptions for the following:
  - Paragraph (k)(1): Special use turbines
    - Turbines operated exclusively for firefighting and/or food control
    - Emergency backup power turbines
      - Operation limit of 200 hours per calendar year
      - Includes requirements if hour-per-year limit is exceeded
  - Paragraph (k)(2): Boilers, process heaters, or turbines <0.3 MW that are not permitted to fire landfill gas or landfill gas and another fuel
    - Those equipment will remain subject to other source-specific rules
Proposed Rule 1150.3

Impact Assessment
Applicable Facilities and Equipment

7 Facilities

- 3 Boilers
- 14 Turbines ≥ 0.3 MW
- 4 Turbines <0.3 MW
Emission Reductions

<table>
<thead>
<tr>
<th>Boilers</th>
<th>Turbines ≥ 0.3 MW with Post Combustion Control</th>
<th>Turbines ≥ 0.3 MW without Post Combustion Control</th>
<th>Turbines &lt;0.3 MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Retrofit with ultra-low NOx burners to meet 9 ppmv by January 1, 2030</td>
<td>• Four existing turbines are already permitted at proposed limit of 25 ppmv</td>
<td>• Ten turbines are permitted at or meeting proposed limit of 12.5 ppmv</td>
<td>• Four existing turbines are already permitted at proposed limit of 9 ppmv</td>
</tr>
<tr>
<td>• Existing boilers expected to shutdown by 2030 due to landfill gas decline</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Emission reductions from three boilers and five turbines
  - Calculated from permitted NOx emission limit to proposed NOx emission limit

* All parts per million volume (ppmv) emission limits are referenced at 3% oxygen for boilers and 15% for oxygen for turbines, on a dry basis.
Emission Reductions

• PR 1150.3 will reduce NOx emissions from boilers and turbines by 0.15 tons per day
  • Five turbines ≥ 0.3 MW without post-combustion control from 18.75 ppmv to 12.5 ppmv
  • One boiler from 21 ppmv to 9 ppmv
  • Two boilers from 24 ppmv to 9 ppmv

<table>
<thead>
<tr>
<th>Emissions Type</th>
<th>Boilers</th>
<th>Turbines ≥ 0.3 MW without Post-Combustion Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline Emissions</td>
<td>0.17</td>
<td>0.12</td>
</tr>
<tr>
<td>Emissions at Proposed Limit</td>
<td>0.06</td>
<td>0.08</td>
</tr>
<tr>
<td>Emission Reductions</td>
<td>0.11</td>
<td>0.04</td>
</tr>
</tbody>
</table>

* All parts per million volume (ppmv) emission limits are referenced at 3% oxygen for boilers and 15% for oxygen for turbines, on a dry basis.
Proposed Rule 1150.3

Cost-Effectiveness
Cost-Effectiveness

- Threshold is $50,000/ton NOx reduced
  - 2016 Air Quality Management Plan
- Calculated using Discounted Cash Flow Method
- Costs were obtained from cost-estimation tools:
  - South Coast AQMD Biogas Toolkit
  - Staff report for the December 2018 amendments to the Rule 1146 series
- Cost-effectiveness was calculated from source test results to proposed NOx limits
Boilers would be subject to the proposed limit of 9 ppmv.
Emission reductions are 0.08 tons per day over 15 years.
Cost-effectiveness to meet 9 ppmv is $26,952 per ton of NOx reduced.

* All parts per million volume (ppmv) emission limits are referenced at 3% oxygen for boilers and 15% for oxygen for turbines, on a dry basis.
Cost-Effectiveness Summary

- Turbines ≥ 0.3 MW with post-combustion control are subject to the proposed limit of 25 ppmv at the Date of Adoption
  - Existing turbines are permitted at proposed limit
  - Only costs are permit revision fees
- Turbines ≥ 0.3 MW without post-combustion control are subject to the proposed limit of 12.5 ppmv at the Date of Adoption
  - Existing turbines already meet proposed limit
  - Only costs are permit revision fees
- Turbines <0.3 MW are subject to the proposed limit of 9 ppmv at the Date of Adoption
  - Existing turbines are permitted at proposed limit
  - Only costs are permit revision fees
- **Total cost-effectiveness for PR 1150.3 is $27,033 per ton of NOx reduced**

* All parts per million volume (ppmv) emission limits are referenced at 3% oxygen for boilers and 15% for oxygen for turbines, on a dry basis
Proposed Rule 1150.3
California Environmental Quality Act (CEQA)
• PR 1150.3 is not expected to require physical modifications that would cause a significant adverse effect on the environment

• PR 1150.3 is exempt from CEQA and a Notice of Exemption will be prepared pursuant to:
  • CEQA Guidelines Section 15061 (b)(3) exempts actions where it can be seen with certainty that there is no possibility that the proposed project may have a significant adverse effect on the environment
Proposed Rule 1150.3
Scope of Socioeconomic Impact Assessment
California Health and Safety Code Section 40440.8
  • Requires socioeconomic impact assessment for proposed rule or rule amendment which “will significantly affect air quality or emissions limitations”

Socioeconomic impact assessment shall consider:
  • Type of affected industry
  • Impact on employment and regional economy
  • Range of probably costs, including costs to industry or business
Rulemaking Schedule

- November 20, 2020 - Close of Comment Period
- November 20, 2020 - Stationary Source Committee
- January 8, 2021 - Set Hearing
- February 5, 2021 - Public Hearing
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