

Proposed Rule 1150.3

Emissions of Oxides of Nitrogen from Combustion
Equipment at Landfills

Public Workshop

Date: October 7, 2020

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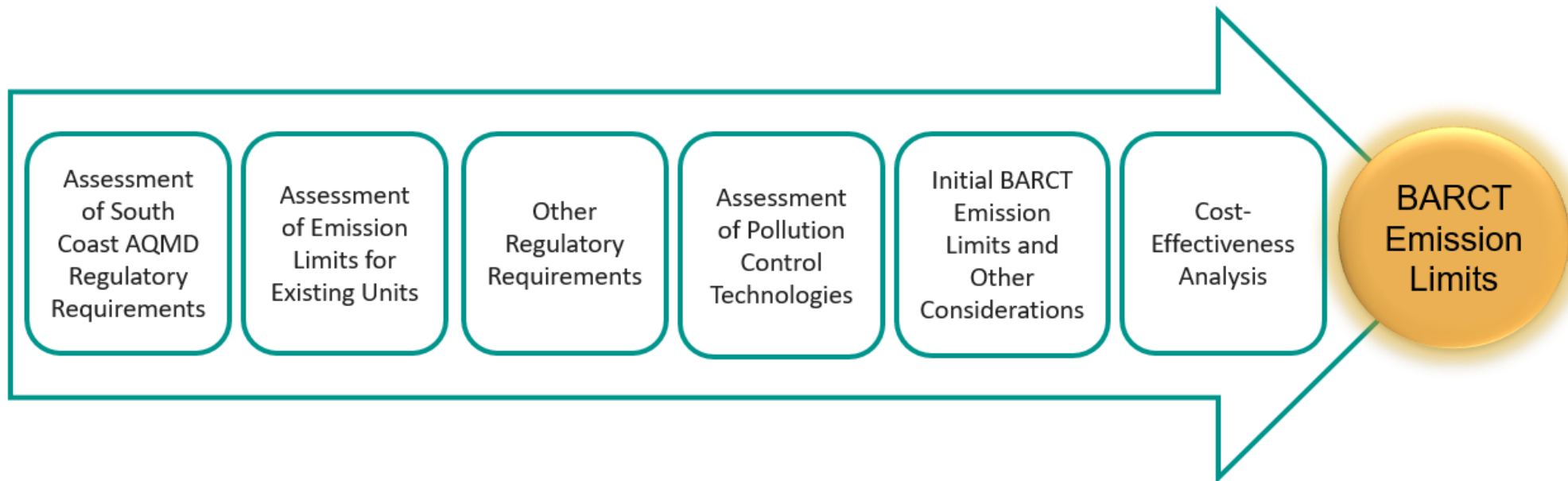
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Background

- 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 Assessment

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_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

Definitions (c)

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)

Boilers and Process Heaters	Equipment Category	Compliance Schedule	NOx (ppmv) ¹	CO (ppmv) ¹
	Landfill gas	On or before [Date of Adoption]	25	400
		On or before January 1, 2030	9	
	Rated heat input capacity > 2 MMBtu/hr and < 75 MMBtu/hr and firing other fuel	On or before [Date of Adoption]	5	400
Rated heat input capacity ≥ 75 MMBtu/hr and firing other fuel				

- 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

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

Turbine Emission Limits (d)(1)

Turbines	Equipment Category	Compliance Schedule	NOx (ppmv) ²	CO (ppmv) ²
	Rated output < 0.3 MW and firing landfill gas, landfill gas with other gaseous fuel, or other gaseous fuel	On or before [Date of Adoption]	9	130
	Rated output ≥ 0.3 MW with post-combustion control and firing 75% landfill gas or more ³		25	
	Rated output ≥ 0.3 MW without post-combustion control and firing 75% landfill gas or more ³		12.5 ⁴	
Rated output ≥ 0.3 MW and firing 75% landfill gas or more ³	Upon turbine replacement			

- 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

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.

Turbine Emission Limits (d)(1) - Continued

	Equipment Category	Compliance Schedule	NOx (ppmv) ²	CO (ppmv) ²
Turbines	Combined cycle with a rated output \geq 0.3 MW and firing 100% natural gas or other gaseous fuel, excluding landfill gas	On or before [Date of Adoption]	2	130
	Simple cycle with a rated output \geq 0.3 MW and firing 100% natural gas or other gaseous fuel, excluding landfill gas		2.5	

- 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

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

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

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

Unit Type	Requirement	Change from Source-Specific Rule
Boilers (d)(4)(A)	1 clock hour	Changed from 15 minutes under Rules 1146/1146.1
Turbines (d)(4)(B)	1 hour rolling average	Consistent with Rule 1134

Emission Limits (d)(5)-Startup and Shutdown

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

Unit Type	Requirement	Change From Source-Specific Rule
Boilers (d)(5)(A)	Not longer than 6 hours	Consistent with Rule 1146.1
Turbines without post-combustion control (d)(5)(D)	Not longer than 30 minutes	Consistent with existing landfill gas turbine permits
Turbines with post-combustion control (d)(5)(D)	Not longer than 1 hour	

Emission Limits (d)(5)- Startup and Shutdown (continued)

- 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)

Equipment Category	Frequency	Pollutant	Elapsed Time Prior to Conducting Test ¹
Boilers and process heaters >2 MMBtu/hr and <10 MMBtu/hr ¹	Every 5 years from the date the previous source test was required ²	NOx and CO	At least 250 operating hours or at least 30 calendar days
Boilers and process heaters ≥ 10 MMBtu/hr ¹	Every 3 years from the date the previous source test was required ²		At least 40 operating hours or at least 7 calendar days
Turbines < 2.9 MW	Every 3 years from the date the previous source test was required ² or every 8,760 operating hours, whichever occurs later		
Turbines ≥ 2.9 MW	Every calendar year from the date the previous source test was required ²		

- 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

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.

Overview of Source Testing Procedures for Boilers and Turbines

- 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)

Source Test Methods (e)(6)

Pollutant	Test Methods
NO _x	South Coast AQMD Test Methods 100.1 or 7.1
CO	South Coast AQMD Test Methods 100.1 or 10.1, or EPA Test Method 10
CO ₂ and O ₂	South Coast AQMD Test Method 3.1 or 100.1

CEMS (f)

Equipment Type	Threshold	Pollutant
Boilers	Rated heat input capacity ≥ 40 MMBtu/hr and Annual heat input $> 200 \times 10^9$ Btu per calendar year	NOx
Turbines	Rated output ≥ 2.9 MW	

- Table 4 contains the thresholds for all equipment where CEMS is required
- Consistent with requirements under Rules 1146 and 1134

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

Recordkeeping (h)

- 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

Schedule for Permit Revisions (j)

- 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

Boilers	Turbines \geq 0.3 MW with Post Combustion Control	Turbines \geq 0.3 MW without Post Combustion Control	Turbines $<$0.3 MW
<ul style="list-style-type: none">• Applications due by next Title V permit renewal	<ul style="list-style-type: none">• Applications due by next Title V permit renewal	<ul style="list-style-type: none">• Applications due by next Title V permit renewal	<ul style="list-style-type: none">• Applications due by July 1, 2024

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

Boilers	Turbines \geq 0.3 MW with Post Combustion Control	Turbines \geq 0.3 MW without Post Combustion Control	Turbines $<$0.3 MW
<ul style="list-style-type: none">• Retrofit with ultra-low NOx burners to meet 9 ppmv by January 1, 2030• Existing boilers expected to shutdown by 2030 due to landfill gas decline	<ul style="list-style-type: none">• Four existing turbines are already permitted at proposed limit of 25 ppmv	<ul style="list-style-type: none">• Ten turbines are permitted at or meeting proposed limit of 12.5 ppmv	<ul style="list-style-type: none">• Four existing turbines are already permitted at proposed limit of 9 ppmv

- 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 \geq 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

PR 1150.3 NOx Emission Reductions (tons per day)		
Emissions Type	Boilers	Turbines \geq 0.3 MW without Post-Combustion Control
Baseline Emissions	0.17	0.12
Emissions at Proposed Limit	0.06	0.08
Emission Reductions	0.11	0.04

* 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.

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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

Cost- Effectiveness Summary for Boilers

- 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 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)

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

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

Contacts

Isabelle Shine

Air Quality Specialist

Phone: 909-396-3064

Email: ishine@aqmd.gov

Melissa Gamoning

Air Quality Specialist

Phone: 909-396-3115

Email: mgamoning@aqmd.gov

Michael Morris

Planning & Rules Manager

909-396-3282

Email: mmorris@aqmd.gov