Proposed Rule 1109.1 – Emissions of Oxides of Nitrogen for Petroleum Refineries and Related Operations

Working Group Meeting #23

July 14, 2021

Join Zoom Webinar

https://scaqmd.zoom.us/j/92162272441

Webinar ID: 921 6227 2441

Teleconference Dial-In: +1 669 900 6833

Agenda

- Progress and Status Since Working Group Meeting #22
- Bridge Limit Considerations
- PM/Co-Pollutant Discussion: PM Measurement
- BARCT Reassessment for Vapor Incinerators
- BARCT Equivalent Mass Cap Plan (B-Cap) Considerations

Progress and Status Since WGM #22

Status and Progress Since Last WGM

- Completed BARCT reassessment for Vapor Incinerators
- Continued meetings with stakeholders, WSPA, and environmental representatives
- Continued to develop rule language and alternative compliance options

Revised

Stakeholder Meetings in 2021

5

Chevron

- February 19
- February 26
- April 1
- May 20
- June 16

Marathon

- January 27
- February 17
- February 24
- March 9
- March 23
- May 13
- May 27

Phillips 66

- February 16
- March 4
- March 31
- May 28

Torrance

- January 29
- February 12
- February 26
- March 12
- March 24
- April 9
- April 28
- May 18
- June 1
- June 16
- July 1
- July 13

Valero

- January 29
- February 24
- April 16
- May 5
- May 19
- June 2

Revised

Stakeholder Meetings in 2021 (*cont.*)

Environmental Groups[1]
- February 26
- March 17
- April 2
- April 16
- April 30
- May 14
- May 28
- June 11
- June 25
- July 9

WSPA
- May 20
- May 28 with Ramboll
- June 18
- June 24
- July 1
- July 8

AltAir
- January 15
- March 10
- May 11
- May 25

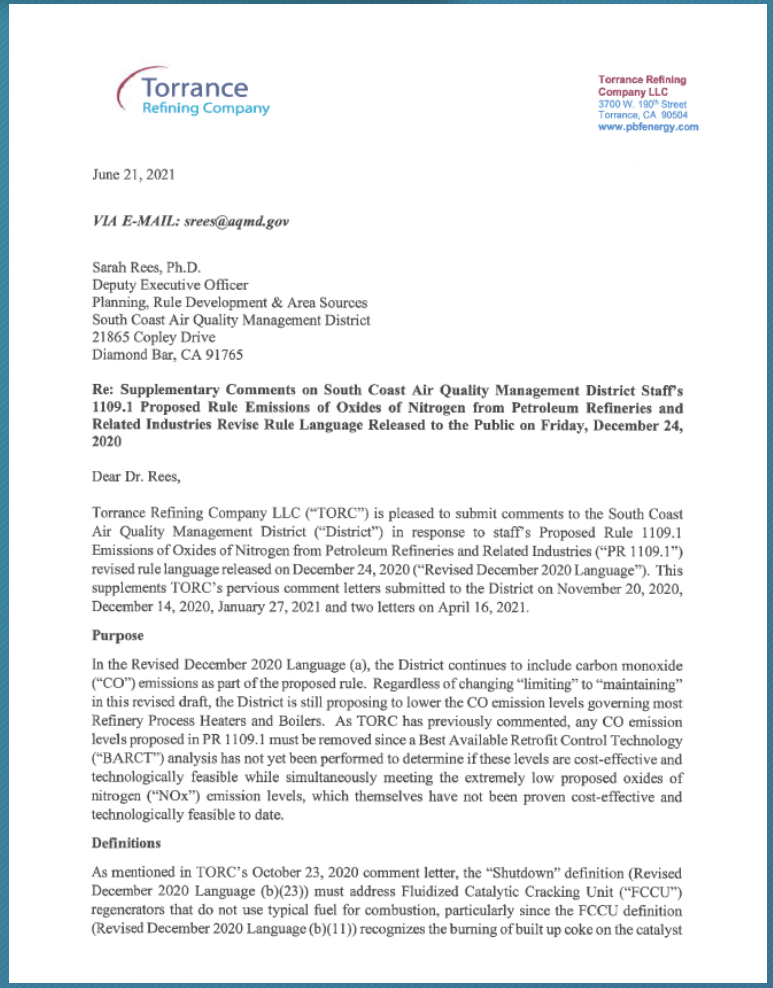
World Oil
- January 13
- April 28

Eco Services
- June 11

[1] Biological Diversity, Coalition for Clean Air, Earth Justice, Communities for a Better Environment, Natural Resources Defense Council and East Yard Communities for Environmental Justice

Received Comment Letter

- Torrance Refining Company submitted a comment letter on June 21, 2021 in response to staff's revised rule language released on December 24, 2020
- The letter provided comments stating:
  - Carbon monoxide emission limits have not been demonstrated to be technically feasible or cost-effective
  - Start-up/shutdown definitions must be revised to reflect the operation of the FCCU
  - Flares should be excluded from PR 1109.1
  - 30 ppm NOx limit for the SRU/TG Incinerator is not technically feasible
  - Averaging times in the rule should be consistent with source test methodology for units <40 MMBtu/hr
  - Daily operating logs serve no purpose and should not be required
  - Proposed implementation schedule is arbitrary and infeasible, staff should meet with facilities when establishing the implementation schedules



Torrance Refining Company

Torrance Refining Company LLC
3700 W. 190th Street
Torrance, CA 90504
www.pbfenergy.com

June 21, 2021

VIA E-MAIL: srees@aqmd.gov

Sarah Rees, Ph.D.
Deputy Executive Officer
Planning, Rule Development & Area Sources
South Coast Air Quality Management District
21865 Copley Drive
Diamond Bar, CA 91765

Re: Supplementary Comments on South Coast Air Quality Management District Staff's 1109.1 Proposed Rule Emissions of Oxides of Nitrogen from Petroleum Refineries and Related Industries Revise Rule Language Released to the Public on Friday, December 24, 2020

Dear Dr. Rees,

Torrance Refining Company LLC ("TORC") is pleased to submit comments to the South Coast Air Quality Management District ("District") in response to staff's Proposed Rule 1109.1 Emissions of Oxides of Nitrogen from Petroleum Refineries and Related Industries ("PR 1109.1") revised rule language released on December 24, 2020 ("Revised December 2020 Language"). This supplements TORC's pervious comment letters submitted to the District on November 20, 2020, December 14, 2020, January 27, 2021 and two letters on April 16, 2021.

Purpose

In the Revised December 2020 Language (a), the District continues to include carbon monoxide ("CO") emissions as part of the proposed rule. Regardless of changing "limiting" to "maintaining" in this revised draft, the District is still proposing to lower the CO emission levels governing most Refinery Process Heaters and Boilers. As TORC has previously commented, any CO emission levels proposed in PR 1109.1 must be removed since a Best Available Retrofit Control Technology ("BARCT") analysis has not yet been performed to determine if these levels are cost-effective and technologically feasible while simultaneously meeting the extremely low proposed oxides of nitrogen ("NOx") emission levels, which themselves have not been proven cost-effective and technologically feasible to date.

Definitions

As mentioned in TORC's October 23, 2020 comment letter, the "Shutdown" definition (Revised December 2020 Language (b)(23)) must address Fluidized Catalytic Cracking Unit ("FCCU") regenerators that do not use typical fuel for combustion, particularly since the FCCU definition (Revised December 2020 Language (b)(11)) recognizes the burning of built up coke on the catalyst

Considerations for Bridge Concept

- Staff proposed concentration-based bridge limits in Working Group Meeting #21 and #22
- Bridge limits will apply once facilities exit RECLAIM before units meet the Proposed Rule 1109.1 limits
- Stakeholders have expressed concern over the transition from RECLAIM, an annual mass-based program, to concentration-based mass limits with distinct averaging times
- Staff is considering provisions that will allow longer averaging time for:
  - The first 18 months after a unit meets a NOx limit that is at or below limits in NOx limits in Table 1 and the Near Limits in Table 2
  - The interim limits in Table 3
- Longer averaging times
  - Allows operators to adjust to lower NOx limit
  - Allows for a smoother transition

PR 1109.1 Re-Cap

PR 1109.1 Table 1

- Table 1 lists NOx and CO limits, averaging times, and oxygen correction
  - Compliance dates have been moved to a different section

TABLE 1: NOx AND CO EMISSION LIMITS(1)

Unit	NOx (ppmv)	CO (ppmv)	Percent O_2	Rolling Averaging Time[2]
Boilers <40 MMBtu/hour	Pursuant to paragraph (d)(2)	400	3	2-hour
Boilers ≥40 MMBtu/hour	5	400	3	24-hour
Flares	20	400	3	2-hour
FCCU operating <10 ppm (365 day rolling average)	8	500	3	365-day
	10			7-day
FCCU operating ≥10 ppm (365 day rolling average)	2	500	3	365-day
	5			7-day
Gas Turbines fueled with Natural Gas	2	130	15	24-hour
Gas Turbines fueled with Refinery Fuel Gas	3	130	15	24-hour
Petroleum Coke Calciner	5	2,000	3	365-day
	10			7-day
Process Heaters <40 MMBtu/hour	Pursuant to paragraph (d)(3)	400	3	2-hour
Process Heaters ≥40 MMBtu/hour	5	400	3	24-hour

1 Emissions limits are in parts per million volume (ppmv) on a dry basis.

2 Averaging times apply to all units with CEMS, emission limits for units that do not require CEMS must be averaged over the sampling time required by the source test method.

PR 1109.1 Table 2

Table 2 lists units with the near limits

TABLE 2: NOx EMISSION LIMITS NEAR TABLE 1 NOx LIMITS

Unit	NOx (ppmv)	CO (ppmv)	Percent O_2	Rolling Averaging Time[1]
Gas Turbines fueled with Natural Gas	2.5	130	15	24-hour
Process Heaters 40 – 110 MMBtu/hour	18	400	3	24-hour
Process Heaters >110 MMBtu/hour	22	400	3	24-hour
Vapor Incinerators	40	400	3	-

1 Averaging times apply to all units with CEMS, emission limits for units that do not require CEMS must be averaged over the sampling time required by the test method.

BARCT re-assessment discussed later in presentation

Revised

PR 1109.1 Table 3

Table 3 lists the interim bridge limits

TABLE 3: INTERIM NOx AND CO EMISSION LIMITS

Unit	NOx	CO (ppmv)	Percent O2
Boilers and Process Heaters <40 MMBtu/hour	40 ppmv	400	3
Boilers and Process Heaters ≥40 MMBtu/hour	Pursuant to paragraph (d)(10)	400	3
FCCU	40 ppmv	500	3
Gas Turbines	20 ppmv	130	15
Petroleum Coke Calciner	70 ppmv	2,000	3
SRU/TG Incinerators	TBD	400	3
SMR Heaters	20 ppmv[1]	400	3
	60 ppmv[2]		
SMR Heaters with Gas Turbine	5 ppmv	130	15
Sulfuric Acid Furnaces	30 ppmv	400	3
Vapor Incinerators	130 lb/MMscf	400	3

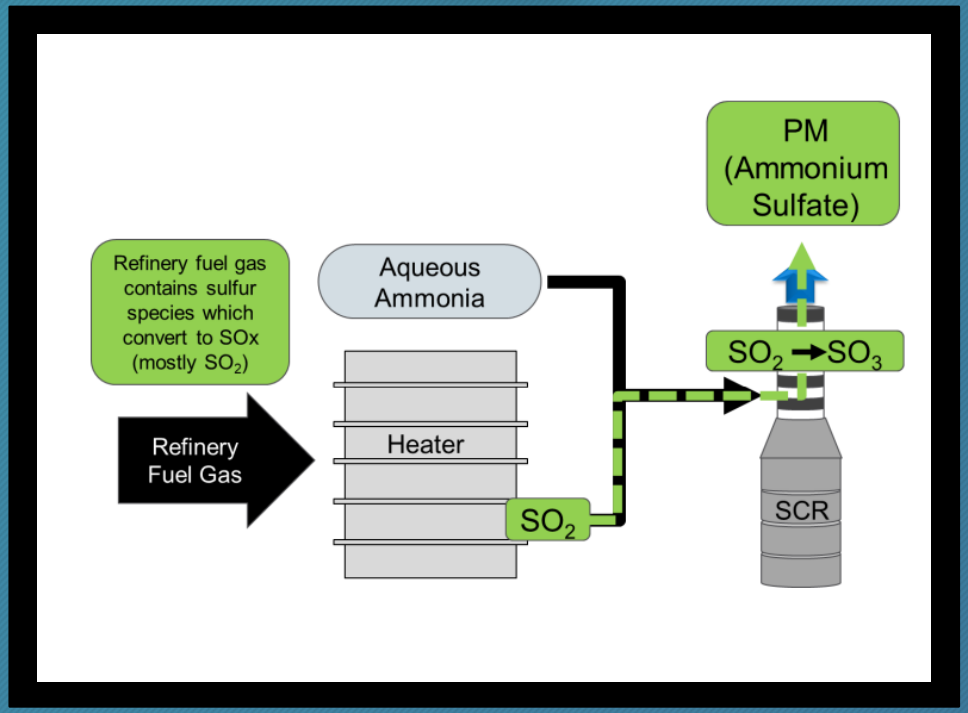
1 SMR Heaters with post-combustion air pollution control equipment installed before [DATE OF RULE ADOPTION].

2 SMR Heaters without post-combustion air pollution control equipment installed before [DATE OF RULE ADOPTION]

PM/Co-Pollutant Discussion – Source Test

PM/Co-Pollutant Issue Background

- Refinery fuel gas contains various levels of sulfur species which are converted to SOx during combustion
- PR 1109.1 will require installation of selective catalytic reduction (SCR) technology to achieve NOx reductions which results in ammonia slip emissions
- SCR catalyst converts SO_2 to SO_3 which reacts with ammonia to form secondary PM as a co-pollutant
- If the PM emissions exceed the Rule 1304 threshold of one pound per day, BACT will be triggered requiring sulfur fuel gas clean-up; which could be a barrier to achieving significant NOx reductions
- To address the PM emission increase, staff is proposing to amend Rule 1304 to allow for a narrow allowance to apply the 10 ton per year Federal NSR threshold for projects transitioning from RECLAIM to a command-and-control structure



Comments on Secondary PM Formation and Measurements

- WGM #21, staff presented a comment letter from Marathon that expressed concern that certain SCR projects could exceed the federal PM threshold
- Staff's presented example calculations of maximum firing rate where the federal PM threshold would be exceeded at various SO_2 to SO_3 conversion rates
- Several stakeholders stated Method 5.2, the Source Test Method used to demonstration post-SCR PM emissions, overestimates the PM emission in the condensable fraction of the test
- South Coast AQMD's position has always been that those PM emissions will eventually form in the atmosphere so test results are valid
- Federal threshold standard only considers emissions at the stack

Firing Rate (MMBTU/hr) @ varying total sulfur concentrations required to exceed Federal PM threshold (10 tons per year)

Catalyst Conversion SO_2 to SO_3	40 ppm Sulfur	110 ppm Sulfur	150 ppm Sulfur	179 ppm Sulfur
0.5%	39,152	14,237	10,441	8,749
1.0%	19,576	7,119	5,220	4,375
1.5%	13,051	4,746	3,480	2,916
2.0%	9,788	3,559	2,610	2,187
2.5%	7,830	2,847	2,088	1,750
3.0%	6,525	2,373	1,740	1,458
3.5%	5,593	2,034	1,492	1,250
4.0%	4,894	1,780	1,305	1,094
4.5%	4,350	1,582	1,160	972
5.0%	3,915	1,424	1,044	875

No single boiler/heater or group of boilers and heaters project would exceed the threshold

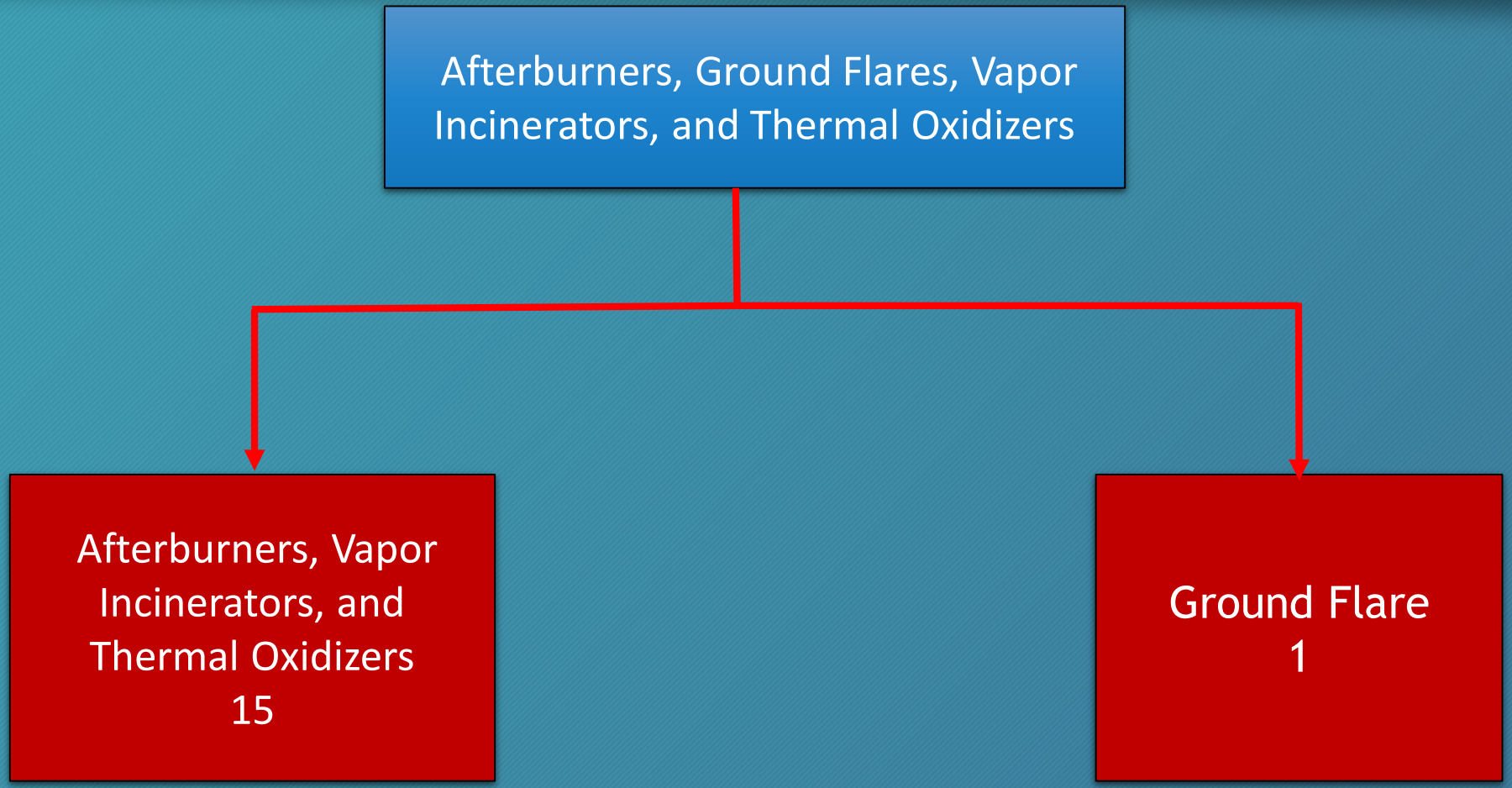
Staff Response on Secondary PM Formation and Measurements

- Staff acknowledges some of the PM that is measured in the source test would not have formed in the stack, but would be formed regionally
- For the federal threshold, only the PM that is formed in the stack for NSR purposes
- Staff is proposing to allow the PM emission limits to be calculated based on engineering parameters:
  - SO_2 to SO_3 conversion rate in the catalyst based on vendor performance specification
  - Sulfur content in the fuel
  - Unit firing rate
- Staff has demonstrated that based on the calculated PM emissions, the federal threshold will not be exceeded
- Facilities will be allowed to demonstrate compliance with the limit by calculating the daily emissions
  - Only applies to units subject to the Federal NSR threshold in PR 1304

Vapor Incinerators Follow-Up

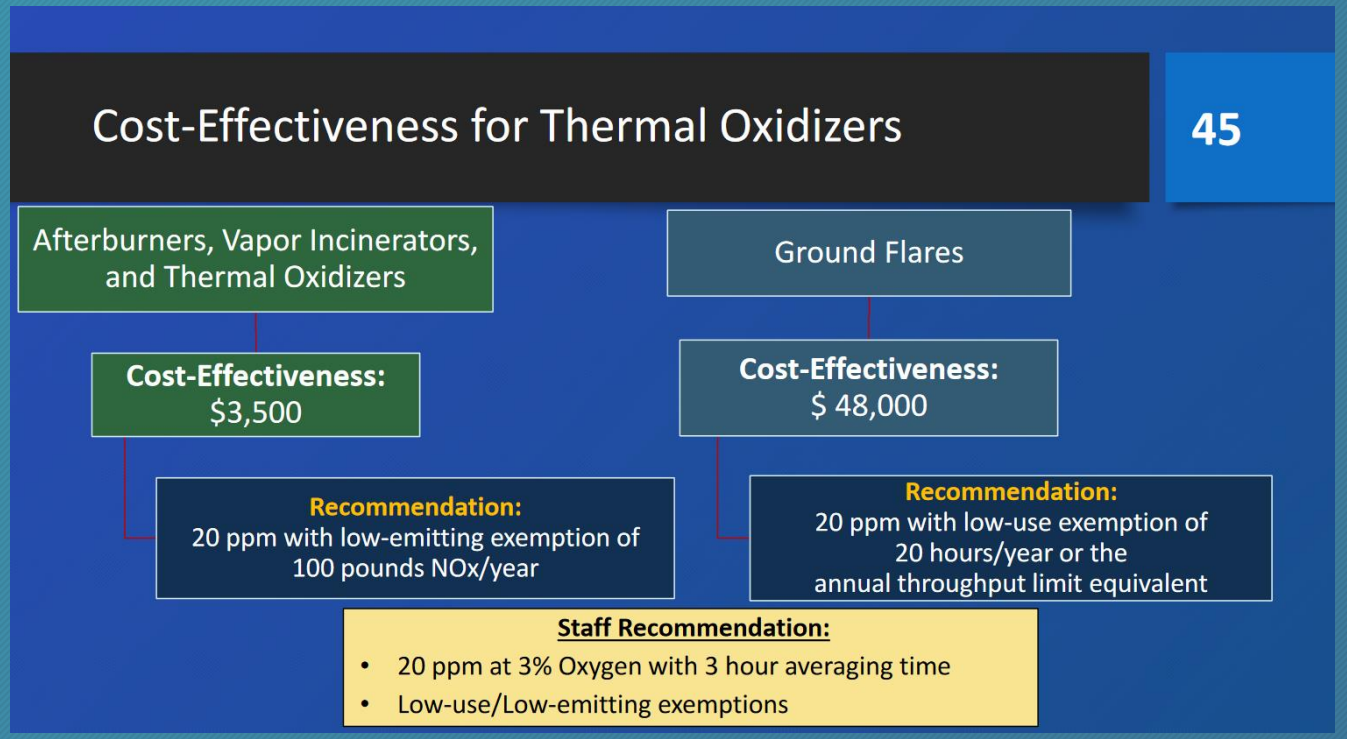
17

Vapor Incinerators



Vapor Incinerator Background

- At WGM #12, staff proposed a BARCT NOx limit of 20 ppm at 3% with burner control
- Total of 15 units in category
- Used for air pollution control to destruct volatile organic compounds and other waste gas streams
- Relatively small units (most units <10 MMBtu/hr)
- Low emissions (0.078 tpd baseline for all units)

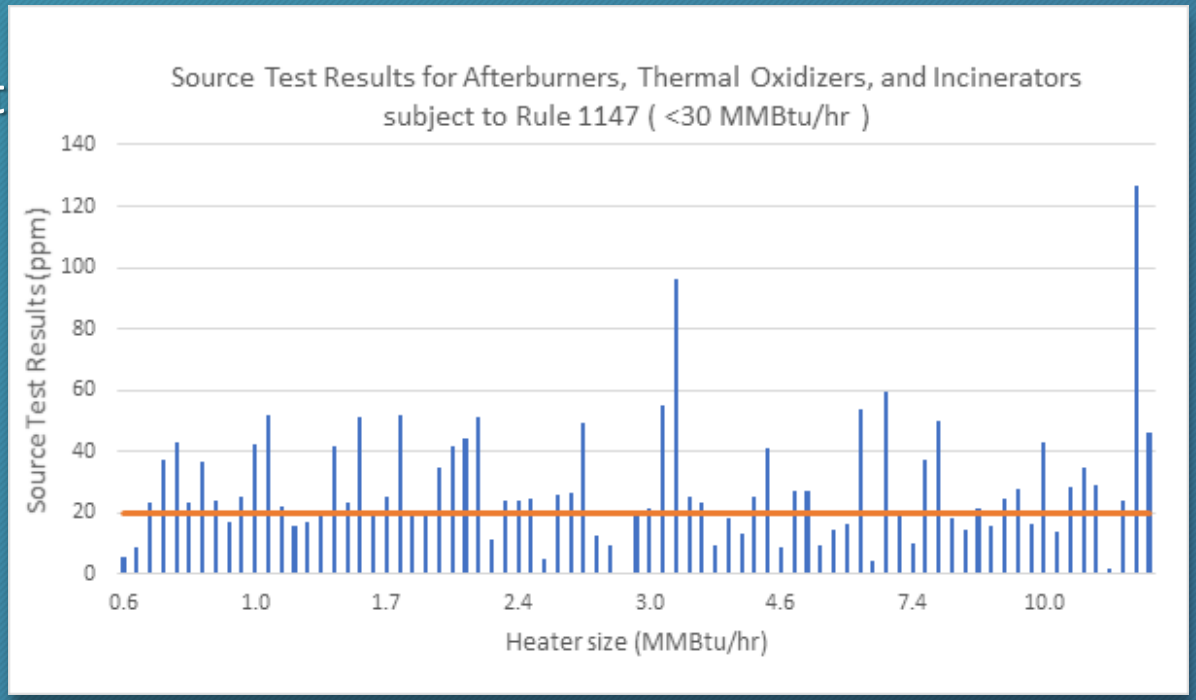


Stakeholder Feedback on Vapor Incinerator BARCT Assessment

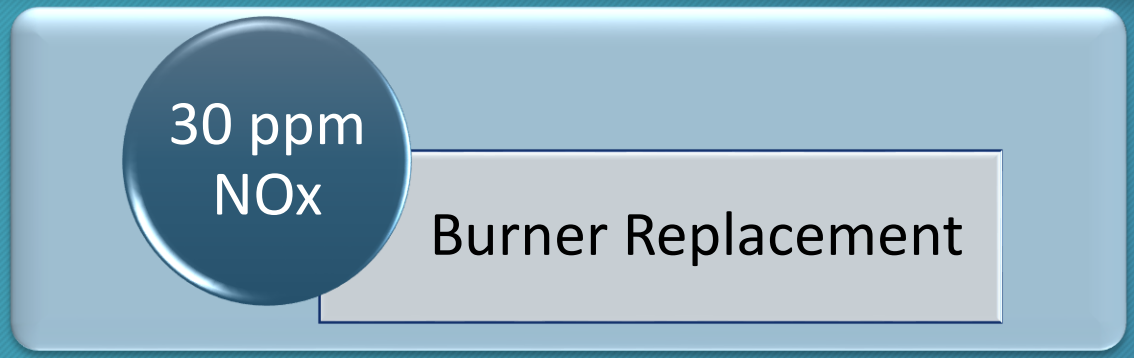
- Several stakeholders expressed concerns about the technical feasibility of achieving 20 ppm
  - Waste stream and units fired on process gas could contribute to the NOx emissions
  - Some advanced retrofit burner technology options may require redesign/re-engineering of the entire system
  - Unit replacement may be required to achieve 20 ppm
- Staff reached out to several burner manufacturers to re-assess the technical feasibility of the 20 ppm NOx limit

Vapor Incinerator BARCT Reassessment

- Technology vendors indicated they would guarantee 30 ppm NOx for burner replacements
  - Some units can be tuned to achieve <20 ppm but it is dependent on the unit, application and fuel
  - Not all units can achieve 20 ppm
- Initial BARCT assessment was based on emission levels of existing units subject to Rule 1147
- Based on the technology vendor feedback, staff will reassess the cost effectiveness to achieve 30 ppm for burner upgrades



BARCT Reassessment for Vapor Incinerators



- Based on vendor feedback, thermal oxidizers can achieve 30 ppm with burner replacement
- 15 units classified as vapor incinerators[1]
  - 3 units emitting less than 100 pounds/year will be exempt due to low-emissions based on previous assessment
  - 1 SCR project planned for project with multiple units going to common stack

[1] Number of units changed since initial assessment - several units formerly classified as SRU/TG Incinerators now included as vapor incinerators

Vapor Incinerator Assessment

	RECLAIM 2015 BARCT	Existing Units	Other Regulatory	Technology Assessment	Initial BARCT NOx Limits	Cost-Effectiveness and Incremental Cost-Effectiveness
Afterburners, Vapor Incinerators, and Thermal Oxidizers	N/A	8 to 90 ppm	20 ppm[1]	30 ppm	30 ppm	Need to assess cost-effectiveness and incremental cost-effectiveness

1. NOx limit in Proposed Rule 1147 – NOx Reductions from Miscellaneous Sources BARCT Assessment

Initial BARCT NOx Limits for Cost-Effectiveness for Vapor Incinerators

30 ppm

Burner Replacement

Potential NOx BARCT Emission Limits

Emissions for this category is low
Total NOx emission for category is 0.078 tpd

Vapor Incinerators – Cost Submission

- Received revised costs for 8 units, including:
  - Burner replacement
  - SCR Installation
  - Unit replacement where burner retrofit not feasible
- Generated cost curve based on revised burner cost to estimate cost for remaining units
  - Burner replacement estimated between $300k - $7.2MM
- Used facility provided data where available, including cost of unit replacement

Cost-Effectiveness for Vapor Incinerators

- Staff evaluated cost-effectiveness for vapor incinerators to achieve 30 ppm based on revised costs
  - Estimated Present Worth Value ranged from: ~$300k - $7MM
  - Potential emission reductions: 0.048 tpd

Cost-Effectiveness
30 ppm NOx Limit
$35,000

Staff Recommendation:

- BARCT limit of 30 ppm for Vapor Incinerators

Staff Comment:

Multiple potential control options to achieve emission reduction objectives were not identified; therefore, an incremental cost-effectiveness not conducted

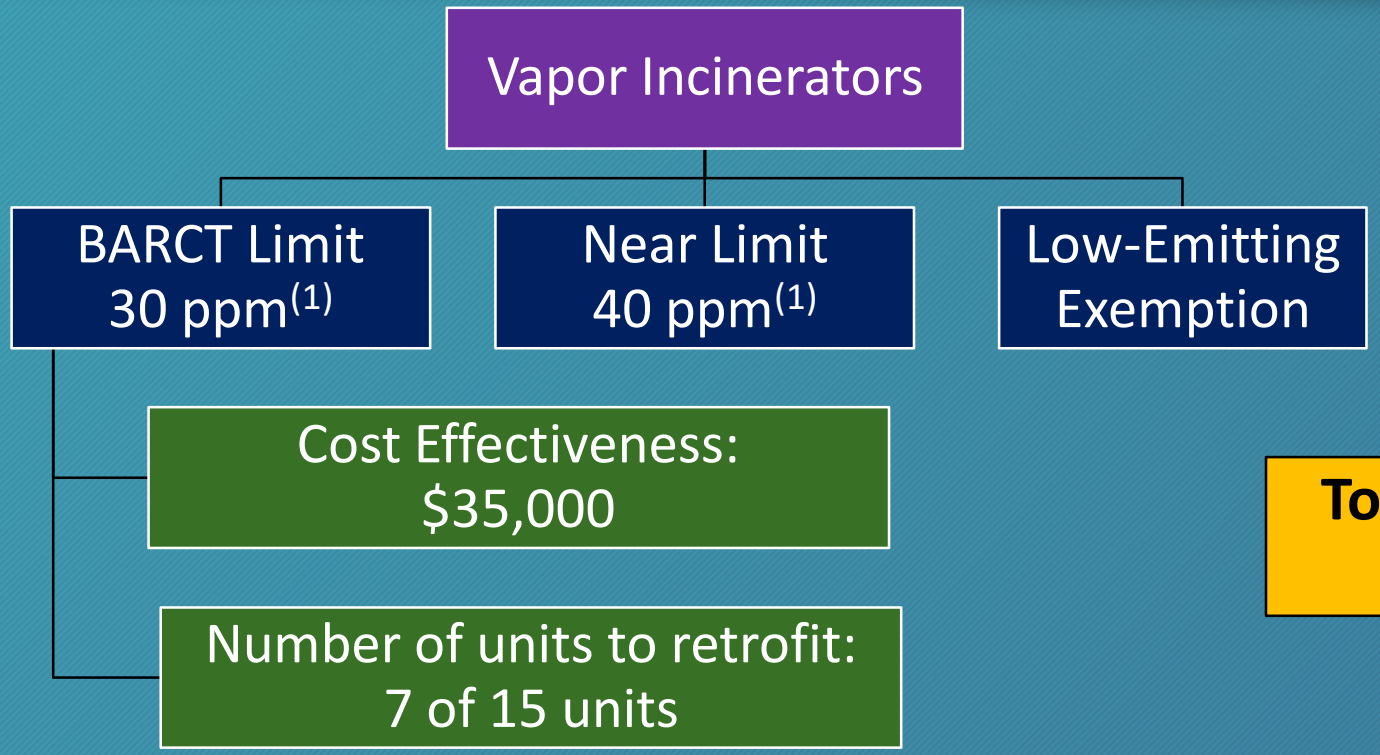
Outliers Assessment for Vapor Incinerators

- Cost-effectiveness of vapor incinerators is below the established $50k threshold but several units have very high cost-effectiveness
- 4 unit with cost-effectiveness of ~$100k - $500k
  - Units preforming between 38 – 40 ppm
- High cost-effectiveness due to low emission reductions
  - Total potential emission reduction for those units is 0.0025 tpd

Staff Recommendation:

- Include near limit of 40 ppm for vapor incinerators

Staff Recommendation Regarding Vapor Incinerators



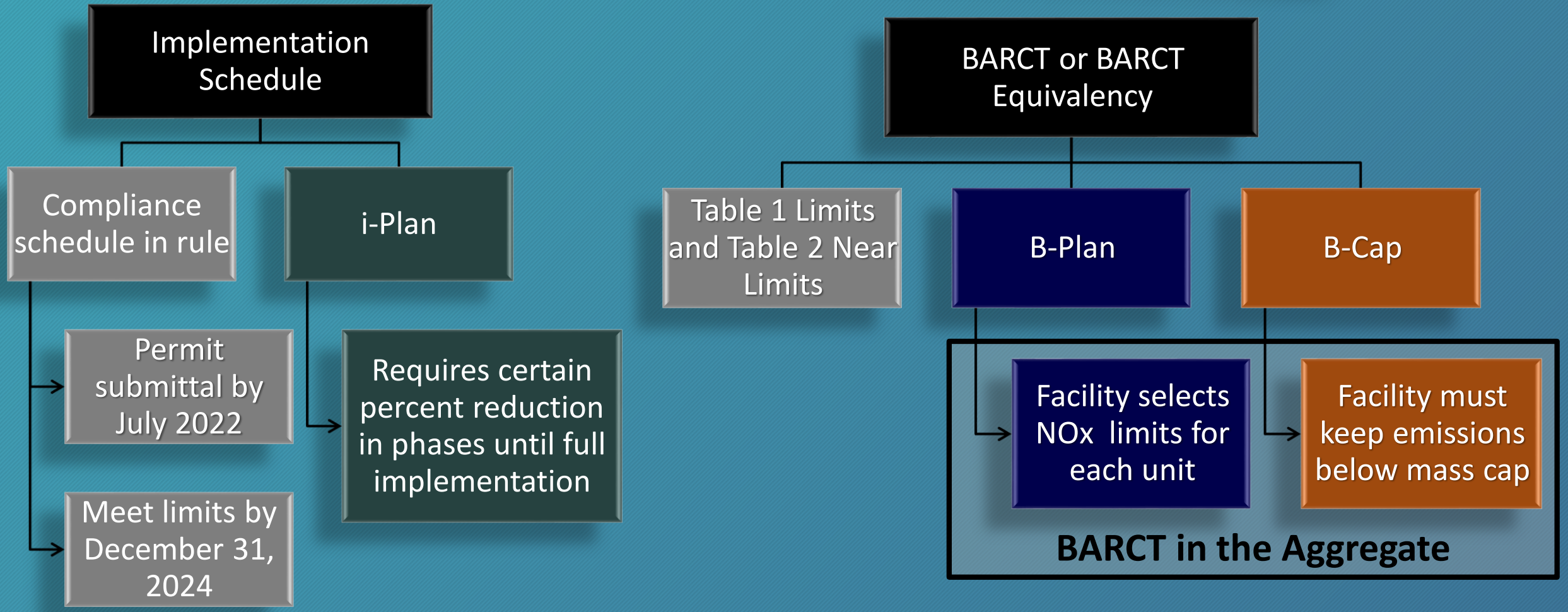
Total Emission reductions: 0.045 tpd(2)

(1) 400 ppm Carbon Monoxide, 3% Oxygen Correction, 3-hour average

(2) Previously estimated emission reduction to 20 ppm without near limits: 0.058 tpd

Alternative Compliance Plans

Compliance Pathways



Implementation Plan (i-Plan) and BARCT Equivalent Compliance Plans (B-Plan and B-Cap)

- Staff is proposing three approaches to address the complexity of PR 1109.1
- i-Plan provides an alternative implementation schedule
- B-Plan and B-Cap provides options to achieve BARCT in the aggregate

- i-Plan is a phased implementation schedule
- Allows operators to tailor the implementation schedule to meet NOx limits to minimize operational disruptions

- b-Plan is a BARCT equivalent plan
- Allows operators to select a NOx emission limit for each unit that will achieve equivalent BARCT reductions in aggregate

- B-Cap is a BARCT equivalent mass cap
- Requires operators to accept a “not to exceed” NOx emission limit for each unit
- Allows facilities to take credit for equipment that is shutdown

WSPA Comments on Baseline Emissions for Alternative Compliance Plans

WSPA

- WSPA expressed concern over using the 2017 for baseline emissions
- Stated it is arbitrary to select specific year
- Prefer using maximum permitted firing rate to establish the baseline

South Coast AQMD

- Staff does not support using maximum firing rate to establish a baseline
- Using permitted firing rates for each unit can skew the contribution of sources when establish BARCT equivalent concentration levels for the B-Plan
- Using permitted firing rates for the B-Cap will artificially inflate the Facility BARCT Emission Target for units that operate below the permitted levels

B-Cap Provisions for New Units

- At the last Working Group Meeting staff discussed that staff is proposing that emissions from new units must stay within the Facility BARCT Emission Target under the B-Cap
- WSPA has expressed concern this approach will limit future growth and new units must be offset under New Source Review
- Staff has responded that:
  - The approach is not growth limiting and is designed to ensure that operators control existing sources before increasing emissions above the Facility BARCT Emission Target
  - It is inequitable for a facility that is complying directly with Table 1 and Table 2 or with the B-Plan where all units meet the Table 1 and 2 limits in aggregate
  - The emissions accounting under New Source Review should not be comingled with PR 1109.1 requirements

Additional Considerations for New Sources for the B-Cap

- Staff does believe that there are certain situations where the addition of new units can increase the Facility BARCT Emission Target
- Staff is considering to require that the addition of a new unit stay within the Facility BARCT Emission Target with the exception of the following, provided the new unit is not functionally the same as a unit that was shutdown:
  - The new unit does not increase the overall throughput of the facility
  - The total amount of NOx emission used from units that were shutdown, represents 15 percent or less of the B-Cap Facility Emission Target; or
  - All units existing and new units in the approved B-Cap meet Table 1 and Table 2 NOx concentrations in aggregate
- Staff is discussing this approach with CARB and U.S. EPA

Next Steps

- Continue Discussions with Stakeholders
- Complete Cost-Effectiveness and BARCT Reassessment
- Release Preliminary Draft Staff Report and Rule Language
- Public Workshop
- Public Hearing November 2021

Proposed Rule 1109.1 Staff Contacts

Susan Nakamura
Assistant DEO
snakamura@aqmd.gov
909.396.3105

Michael Krause
Planning & Rules Manager
mkrause@aqmd.gov
909.396.2706

Heather Farr
Program Supervisor
hfarr@aqmd.gov
909.396.3672

Sarady Ka
AQ Specialist
ska@aqmd.gov
909.396.2331

Mojtaba Moghani, Ph.D.
AQ Specialist
mmoghani@aqmd.gov
909.396.2527

Zoya Banan, Ph.D.
AQ Specialist
zbanan@aqmd.gov
909.396.2332

South Coast AQMD

RECLAIM Staff Contacts

Susan Nakamura
Assistant DEO
snakamura@aqmd.gov
909.396.3105

Michael Morris
Planning & Rules Manager
mmorris@aqmd.gov
909.396.3282

Uyen-Uyen Vo
Program Supervisor
uvo@aqmd.gov
909.396.2238

Lizabeth Gomez
AQ Specialist
lgomez@aqmd.gov
909.396.3103

Isabelle Shine
AQ Specialist
ishine@aqmd.gov
909.396.3064

South Coast AQMD

Rule 429.1 Staff Contacts

Susan Nakamura
Assistant DEO
snakamura@aqmd.gov
909.396.3105

Michael Morris
Planning & Rules Manager
mmorris@aqmd.gov
909.396.3282

Rudy Chacon
Acting Program Supervisor
rchacon@aqmd.gov
909.396.2206

Isabelle Shine
AQ Specialist
ishine@aqmd.gov
909.396.3064

South Coast AQMD