Rule 1109.1 – NOx Emission Reduction for Refinery Equipment

Working Group Meeting #12

July 17, 2020

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Meeting ID: 917 5834 9658
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Agenda

- Progress of Rule Development
- WSPA Comment Letter and Response
- BARCT Assessment Follow-Up: ICE
- BARCT Assessment: Coke Calciner
- BARCT Assessment: Thermal Oxidizers
- Next Steps

Progress of Rule Development

Summary of Working Group # 11 (5/21/20)

- Proposed BARCT limits for SMR heater sub-category and ICE category
- Proposed averaging times for source categories with proposed BARCT limits

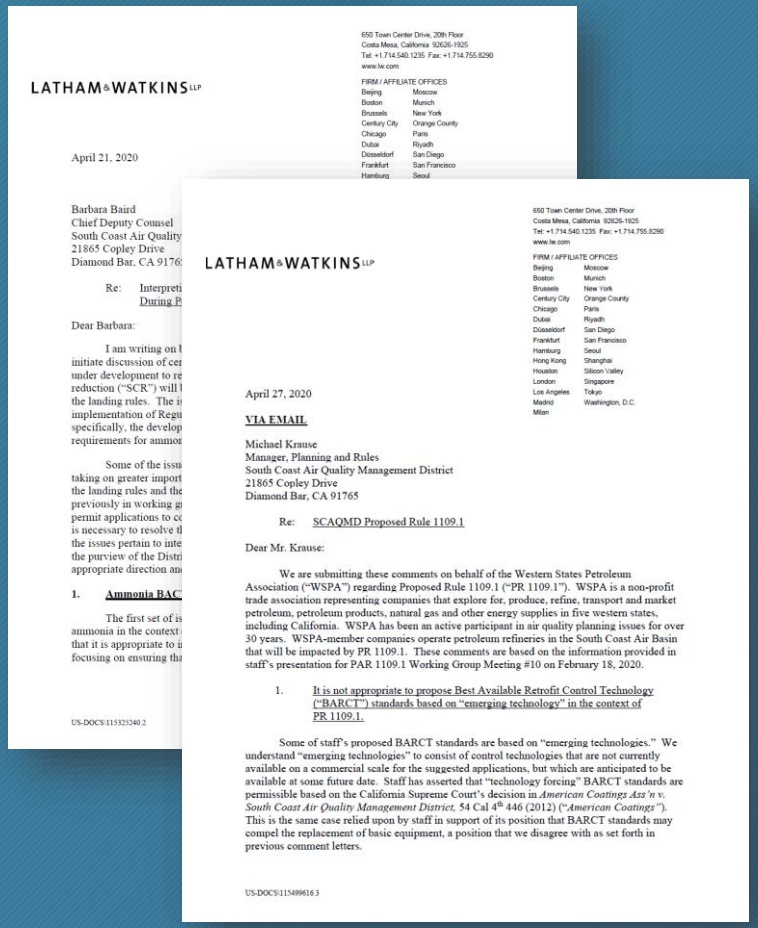
Since Last Working Group Meeting

- Most facilities submitted fuel gas sulfur survey; preliminary cost analysis
- Presented staff response to ammonia slip and PM BACT at RECLAIM/NSR meeting
- Stakeholder meetings; discuss unique challenges
- Continued discussions with control technology suppliers
- Discussions with EPA regarding start-up, shutdown, and malfunction provisions

WSPA Comment Letter

Overview of Comments from WSPA

- South Coast AQMD received letters from Regulatory Flexibility Group (RFG) and Western States Petroleum Association (WSPA)
- Both letters addressed issues related to Regulation XIII focusing on ammonia and PM BACT
  - Responses to the Regulation XIII issues were provided at the June 11th Regulation XIII Working Group Meeting (presentation available on Regulation XIII proposed rule webpage)
- The four issues specific to PR 1109.1 will be discussed at today's Working Group Meeting



LATHAM & WATKINS LLP

April 21, 2020

Barbara Baird
Chief Deputy Counsel
South Coast Air Quality
21865 Copley Drive
Diamond Bar, CA 9176

Re: Interpreti
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Dear Barbara:

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1. Ammonia BAC

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LATHAM & WATKINS LLP

April 27, 2020

VIA EMAIL

Michael Krause
Manager, Planning and Rules
South Coast Air Quality Management District
21865 Copley Drive
Diamond Bar, CA 91765

Re: SCAQMD Proposed Rule 1109.1

Dear Mr. Krause:

We are submitting these comments on behalf of the Western States Petroleum Association ("WSPA") regarding Proposed Rule 1109.1 ("PR 1109.1"). WSPA is a non-profit trade association representing companies that explore for, produce, refine, transport and market petroleum, petroleum products, natural gas and other energy supplies in five western states, including California. WSPA has been an active participant in air quality planning issues for over 30 years. WSPA-member companies operate petroleum refineries in the South Coast Air Basin that will be impacted by PR 1109.1. These comments are based on the information provided in staff's presentation for PAR 1109.1 Working Group Meeting #10 on February 18, 2020.

1. It is not appropriate to propose Best Available Retrofit Control Technology ("BARCT") standards based on "emerging technology" in the context of PR 1109.1.

Some of staff's proposed BARCT standards are based on "emerging technologies." We understand "emerging technologies" to consist of control technologies that are not currently available on a commercial scale for the suggested applications, but which are anticipated to be available at some future date. Staff has asserted that "technology forcing" BARCT standards are permissible based on the California Supreme Court's decision in *American Coatings Ass'n v. South Coast Air Quality Management District*, 54 Cal 4th 446 (2012) ("*American Coatings*"). This is the same case relied upon by staff in support of its position that BARCT standards may compel the replacement of basic equipment, a position that we disagree with as set forth in previous comment letters.

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Four PR 1109.1 Issues in WSPA Letter

Emerging Technologies

- It is not appropriate to propose BARCT standards based on “emerging technology” in the context of PR 1190.1

SOx RECLAIM

- Should comprehensively assess impacts if intention is to sunset the SOx RECLAIM program

Other Essential Elements of BARCT

- NOx BARCT standard must be accompanied by other essential elements such as schedule, averaging times, ammonia slip, etc.

Alternative Emission Compliance Plans (AECP)

- PR 1109.1 should address the availability of AECPs
  - Facilities under same ownership
  - Mass-based caps
  - BARCT targets

WSPA Comments on Emerging Technology

- Some proposed BARCT standards are based on emerging technologies that are based on control technologies not currently commercially available, but anticipated to be available at a future date
- WSPA disagrees with staff's assertion that "technology forcing" BARCT standards are permissible based on the California Supreme Court's decision in *American Coatings Ass'n v. South Coast Air Quality Management District,* 54 Cal 4th 446 (2012) (*"American Coatings"*)
- WSPA commented that Rule 1113 (architectural coatings) and Rule 1111 (residential and commercial gas furnaces) prohibit manufacturing, supplying, selling, offering for sale, or installing furnaces
  - PR 1109.1 is different because it requires installation of emission controls or physical modifications which trigger New Source Review (NSR) permitting

Background - American Coatings Assn. v. South Coast AQMD

Supreme Court Case regarding Architectural Coatings

- South Coast AQMD adopted VOC limits in Rule 1113 – Architectural Coatings in 2002 with a future effective date of July 1, 2006 based on emerging technology (e.g., reformulated coatings)
- The technology to meet the lower VOC limits was commercially available but had performance issues that had to be overcome
- American Coating Association sued the South Coast AQMD for adopting technology forcing BARCT limits
- South Coast AQMD prevailed in the Supreme Court of California upholding the ability to adopt technology forcing BARCT limits

Staff Response Regarding BARCT Limits Based on Emerging Technologies

WSPA Comment

- Supreme Court case that upheld technology forcing standards for architectural coatings does not apply to control equipment

- The Supreme Court upheld American Coatings Assn. v. South Coast AQMD, 54 Cal 4th 446, 467 (2012)
- Definition of BARCT is "…an emission limitation that based on the maximum degree of reduction achievable…"[1]
  - BARCT is not limited to technology that exists at the time the regulation is promulgated
  - BARCT can rely on emerging technology that is achievable in the future, provided the technology is available by the future effective date
  - BACT relies on achieved in practice but BARCT evolves overtime as technology improves and new technology becomes available

[1] California Health and Safety Code Section 40406

Staff Response Regarding BARCT Limits Based on Emerging Technologies *(Continued)*

WSPA Comment

- PR 1109.1 is different than Rule 1113 (architectural coatings) and Rule 1111 (residential and commercial gas furnaces) because it requires installation of emission controls or physical modifications which trigger New Source Review (NSR) permitting

- PR 1109.1 is different than Rules 1113 and 1111, but it does not preclude establishing BARCT on emerging technologies
- Staff agrees that installation of pollution controls will trigger NSR permitting
- Triggering NSR does not necessarily mean BACT is required
  - Equipment modifications with no increase in emissions or capacity will not trigger BACT
  - Replacement of burners to meet NOx emission limits under PR 1109.1 will not require BACT unless there is an increase in capacity
- Installation of SCR will trigger BACT for the increase in ammonia emissions and for some refineries for directly emitted PM

WSPA Comments Regarding SOx RECLAIM

- WSPA opposes conducting a BARCT assessment for the purpose of replacing SOx RECLAIM with command and control
- Sunsetting NOx RECLAIM is an extension of CMB-05 from the 2016 AQMP which is a NOx emission control measure
- Board has not considered full impacts of sunsetting NOx RECLAIM, much less both NOx and SOx RECLAIM
- It is not necessary to sunset SOx RECLAIM to address the co-pollutant issue that may result from NOx BARCT rules
- If staff determines to sunset SOx to address issues connected to transitioning NOx RECLAIM, PR 1109.1 should be suspended pending a comprehensive CEQA analysis to determine the full range of costs, and benefits

Staff Response Regarding SOx RECLAIM

WSPA Comment

- Sunsetting NOx RECLAIM is an extension of CMB-05 from the 2016 AQMP
- Board has not considered full impacts of sunsetting NOx RECLAIM, much less both NOx and SOx RECLAIM

- Control Measure CMB-05 from the 2016 AQMP was specific to NOx RECLAIM and NOx reductions
- Assembly Bill 617, which accelerated the BARCT implementation schedule, is not specific to NOx
- At this time, staff is focused on the transition for NOx RECLAIM and adopting and amending NOx BARCT rules
- When SOx RECLAIM is sunset, SOx BARCT rules will be needed
  - Cost and environmental impacts associated with all proposed rulemakings will be available for the Board's consideration

Staff Response Regarding SOx RECLAIM *(Continued)*

WSPA Comment

- It is not necessary to sunset SOx RECLAIM to address the co-pollutant issue that may result from NOx BARCT rules

- Staff is continuing to work with U.S. EPA regarding this issue
- Staff agrees that it is not necessary to sunset SOx RECLAIM to address the co-pollutant issue
- The two co-pollutant issues associated with SCR are related to NSR where BACT is required for:
  - Ammonia emissions associated with ammonia slip
  - Directly emitted PM associated with the ammonium sulfate formed as a result of the ammonia sulfur content in the refinery fuel gas
- All permitting costs associated with co-pollutant issues will be addressed in the cost-effectiveness analysis

Staff Response Regarding SOx RECLAIM *(Continued)*

WSPA Comment

- If staff determines to sunset SOx RECLAIM, PR 1109.1 should be suspended pending a comprehensive CEQA analysis to determine the full range of costs, and benefits

- Staff agrees that if SOx RECLAIM is sunset, rulemaking for PR 1109.1 would be delayed to either
  - Expand the scope of PR 1109.1 to include BARCT requirements for SOx sources within the refinery, or
  - Develop a separate rule to address SOx emissions at the refinery
- At this point PR 1109.1 is focused on NOx BARCT requirements
- If it is decided to initiate SOx BARCT rules for the SOx RECLAIM transition, cost and environmental impacts would be evaluated and presented to the Board for their consideration

WSPA Comment and Staff Response Regarding Considering Other Essential Elements of BARCT

WSPA Comment

- NOx BARCT standard must be accompanied by other essential elements such as schedule, averaging times, ammonia slip, etc.

- Staff agrees and has considered implementation schedule, averaging times, and ammonia slip
- Proposed averaging times for most categories were released during Working Group Meeting #11
- BARCT technology and cost assessment considered equipment achieving a the BACT ammonia slip limit of 5 ppm
- Implementation schedules will be account for
  - Need for emission reductions (focus on highest emitting sources)
  - Time needed to design, permit, install, and commission pollution controls
  - Turnaround schedules
  - Multiple BARCT projects that must be implemented

WSPA Comments Regarding an AECPs

- Early in RECLAIM transition process, industry advocated for alternatives to equipment-by-equipment BARCT standards
- California Health and Safety Code § 40920.6(f) provides for this flexibility and states that districts "…shall allow alternative means of producing equivalent emission reductions at an equal or lesser dollar amount per ton reduced…"
- WSPA is recommending the following for consideration in the development of alternative emission compliance plans (AECPs)
  - Facilities under same ownership should be eligible to be considered one entity for compliance purpose
  - Rule 1109.1 should provide for mass-based caps covering all facilities under same ownership, caps should be based on most representative of the past 5 years for each unit
  - AECP should include emission reductions targets equivalent to the 2015 NOx shave requirements through 2022, with additional reductions and timelines from Rule 1109.1

Staff Response to Use of an AECP

- Staff is still considering implementation options under PR 1109.1
- Concerned about an approach that would allow any source to circumvent BARCT requirements
- Although some flexibilities in the implementation schedule may be allowed, any approach will need to ensure that PR 1109.1 NOx BARCT limits are achieved
- Alternative implementation approaches will be discussed in a future Working Group Meeting

BARCT Assessment Follow-Up
ICE Revised Assessment

Staff's ICE Assessment from last WGM

- Three low-use ICEs in Rule 1109.1 universe
- Staff proposed low-use exemption of ≤100 hours/year
- Currently permitted as primary ICEs with <100 hours/year operating limit
- ICEs that exceed the exemption would either have to retrofit or replace
  - Retrofit may not be technically feasible due to age and minimal operation (flue gas would not meet temperatures required to reduce NOx)
  - More cost-effective to replace these old ICEs than to retrofit
  - Replacement will be subject to BACT

ICE Assessment (*cont.*)

Stakeholders comment		Staff Response	
BARCT rule cannot impose BACT requirements	BARCT limit is needed in Proposed Rule 1109.1	BARCT can require replacement as well as retrofit	Re-assessed the cost-effectiveness of ICE replacement if an ICE were to fall out of the low-use exemption (e.g., operate more than 100 hours/year)

Projected Emissions and Cost- Effective Determination

- Projected NOx emissions based on:
  - 101 hours annual usage
  - NOx emission factor for large stationary diesel engines (>600 hp)
    - AP-42 emission factor of 0.024 lb/hp-hr
- Cost-effectiveness calculated using quote from vendor for new stationary ICE with SCR system and diesel particulate filter (DPF)
  - Added 20% to account for Senate Bill 54
  - Total installed cost for Tier 4 final ICE with SCR and diesel particulate filter (DPF) ranged from $192,000 to $215,000
  - O&M assumed 30% of total installed cost
  - Reduction to proposed BARCT limit of 11 ppm

Annual Hours	Projected NOx Emissions (TPD)	Cost-Effectiveness to 11 ppm
101	0.0083	$26,482

Alternative Staff Recommendation

- Allow ICEs to be subject to Rule 1110.2 instead of Rule 1109.1
- Rule 1110.2 (i)(1)(N) does not preclude Rule 1109.1 ICE to be subject to Rule 1110.2
  - *Any engine at a RECLAIM or former RECLAIM facility* ***that is subject to a NOx emission limit*** *in a different rule for an industry specific category defined in Rule 1100 – Implementation Schedule for NOx facilities*
- Under Rule 1110.2 (i)(1)(E) *Auxiliary engines used to power other engines or* ***gas turbines during start-ups*** are exempt from the NOx, VOC, CO emission limits and MRR requirements
- Advantages to this approach:
  - ICEs not subject to Rule 1109.1
  - No change in current operation
  - Regulatory certainty for existing ICEs

BARCT Assessment for ICE

ICEs → ≤100 Hours → Low-Use Exemption

ICEs → >100 Hours → Replacement at 11 ppm

Limit if Exceeding Low-Use Exemption:

>100 hours a year, replacement at 11 ppm NOx

ICEs → Exclude from Rule 1109.1 → Subject to Rule 1110.2

Staff Recommendation:

Exclude ICEs from Rule 1109.1

BARCT Assessment Continued

Coke Calciner

Coke Calciner Background

- Improves petroleum coke quality and value for use in other in other industries
- Large process unit comprised of a rotary kiln and pyroscrubber (VOC control)
- Combusted hot air drives off moisture, impurities, and hydrocarbon from petroleum coke that is fed into rotary kiln
- NOx produced primarily from evolved hydrocarbon from coke feed in the kiln and pyroscrubber
  - Calciner is the largest single source of NOx emissions at 0.71 tpd (2017)
- Calciner currently only has SOx & PM control

Calciner NOx Control Challenges

- Location for NOx controls downstream of the pyroscrubber needs to be considered due to temperature and solids/particulate loading from process
- Each control technology will have different optimal operating temperatures and ideal location considerations
- Potential impacts of other pollutants, such as SOx and PM, will need to be considered
- Multi-pollutant control technologies can potentially replace existing control equipment

Technical Feasibility of NOx controls

- Challenging due to calciner operation and 2,200 ^{o}F temperature requirement for VOC destruction
- Controlling NOx can be achieved through combustion modification and flue gas treatment
- Combustion modification (LNB/ULNB)
  - High operating temperature limits options to cool flame and reduce NOx
  - Would not result in significant NOx reductions
- Flue gas treatment is most effective NOx control option for calciner
  - Staff explored three feasible NOx flue gas treatment NOx technologies

SCR

LoTOx™

UltraCat

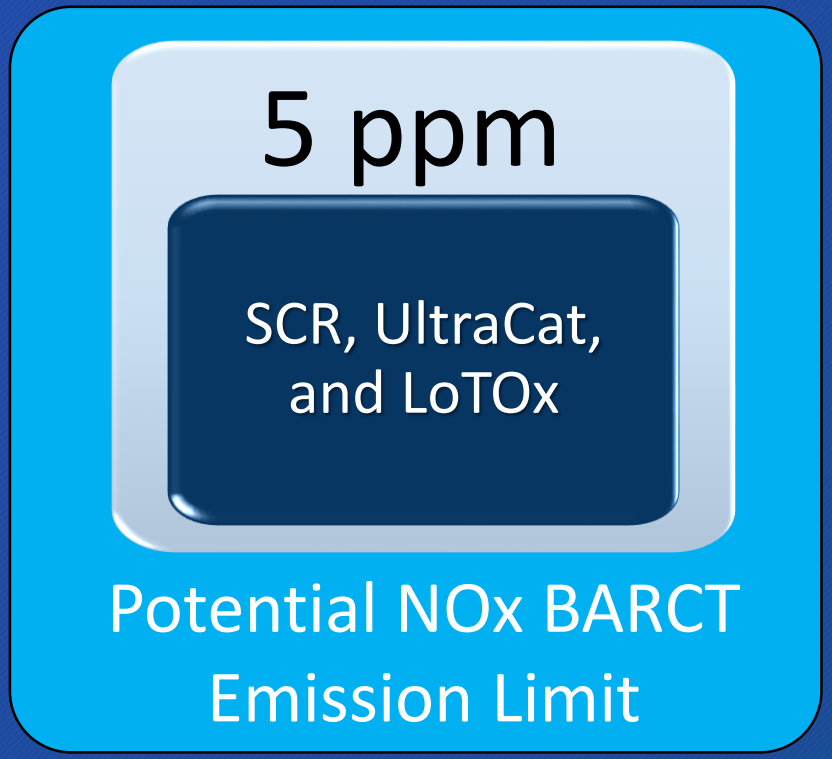
Control Technologies

- Selective Catalytic Reduction (SCR)
  - Can achieve up to 95% reduction with proper engineering and design
  - Uses ammonia, catalyst, and temperature to reduce NOx
  - Requires optimal temperature to achieve removal efficiency (600 to 1,100^{o}F)
- LoTOx™
  - Low Temperature Oxidation (200 to 300 ^{o}F)
  - Scrubbing technology that utilizes ozone injection to reduce NOx
  - >95% NOx reduction can be achieved with appropriate residence time, temperature, and ozone mixing
- UltraCat
  - Similar to SCR, technology requires catalyst and ammonia to reduce NOx
  - Similar operating temperature range of SCR for NOx removal (600 to 1,110^{o}F)
  - Catalysts are embedded in ¾” thick fibrous long ceramic filters (catalytic filters)
  - >95% reduction achievable
  - Multi-pollutant control (SOx and PM)

Coke Calciner Assessment

	2015 RECLAIM	Existing Units	Other Regulatory	Technology Assessment	Initial BARCT NOx Limit	Cost-Effectiveness
Coke Calciner	10 ppm	65 ppm	N/A	5 ppm	5 ppm	Need to conduct cost-effectiveness on initial BARCT limit

Initial BARCT NOx Limits for Cost-Effectiveness for Coke Calciner



Total NOx emission for category is 0.71 tpd

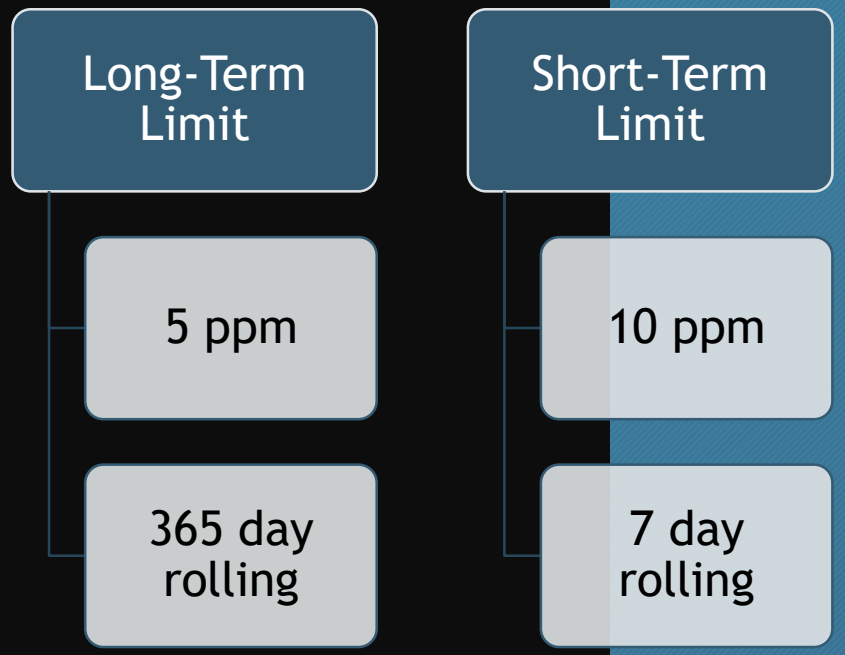
Cost-Effectiveness for Coke Calciner

- Evaluated cost-effectiveness of reducing existing units to 5 ppm
- 95% reduction efficiency
  - 0.68 tons per day
- Staff received cost estimates from manufacturers for each technology
  - Assumed installation costs to be 4.5 times capital cost
  - Added 20% to account for Senate Bill 54 labor construction rates
  - Total Installed Cost (TIC): Capital and Installation

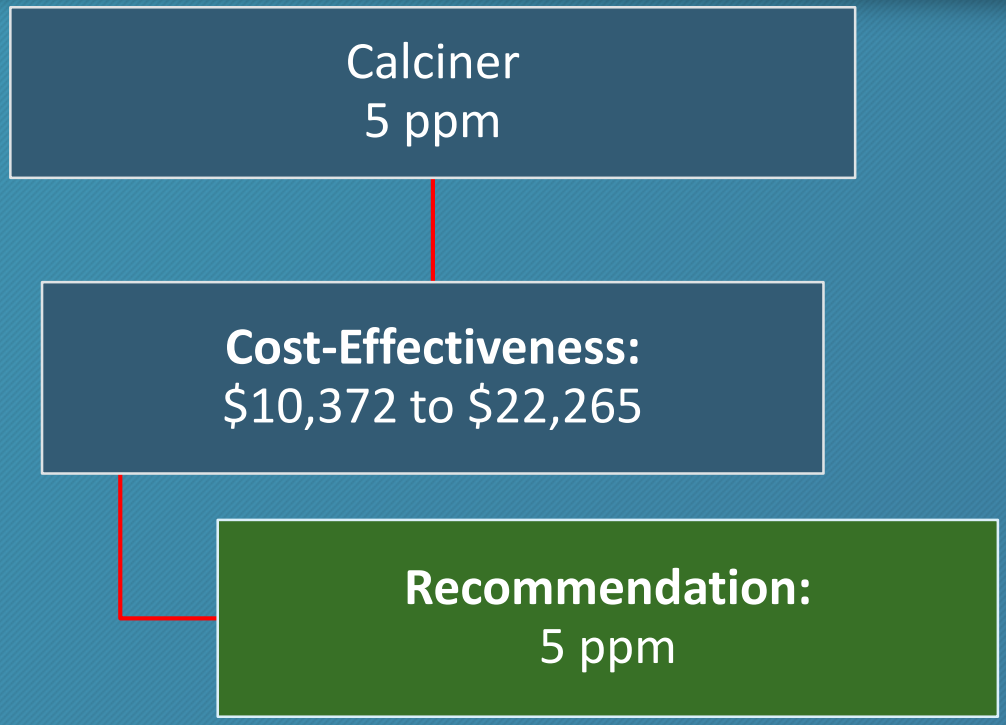
Cost-Effectiveness at 5 ppm			
Control Technology	SCR	LoTOx	UltraCat
Coke Calciner	$10,822	$22,265	$14,763

Averaging Time for Coke Calciner

- Staff is proposing a long-term and short-term averaging time due to challenges specific to the calciner:
  - NOx emissions are feed dependent and may result in more variable concentration
  - Process unit and not an individual piece of equipment
  - Response time may be slower
  - Multi-pollutant emission need to be addressed
- Long-term average will allow for NOx variabilities, a higher, short-term limits, will address process variability
- Evaluating start-up, shutdown, malfunction provision with U.S. EPA



Cost-Effectiveness for Coke Calciner

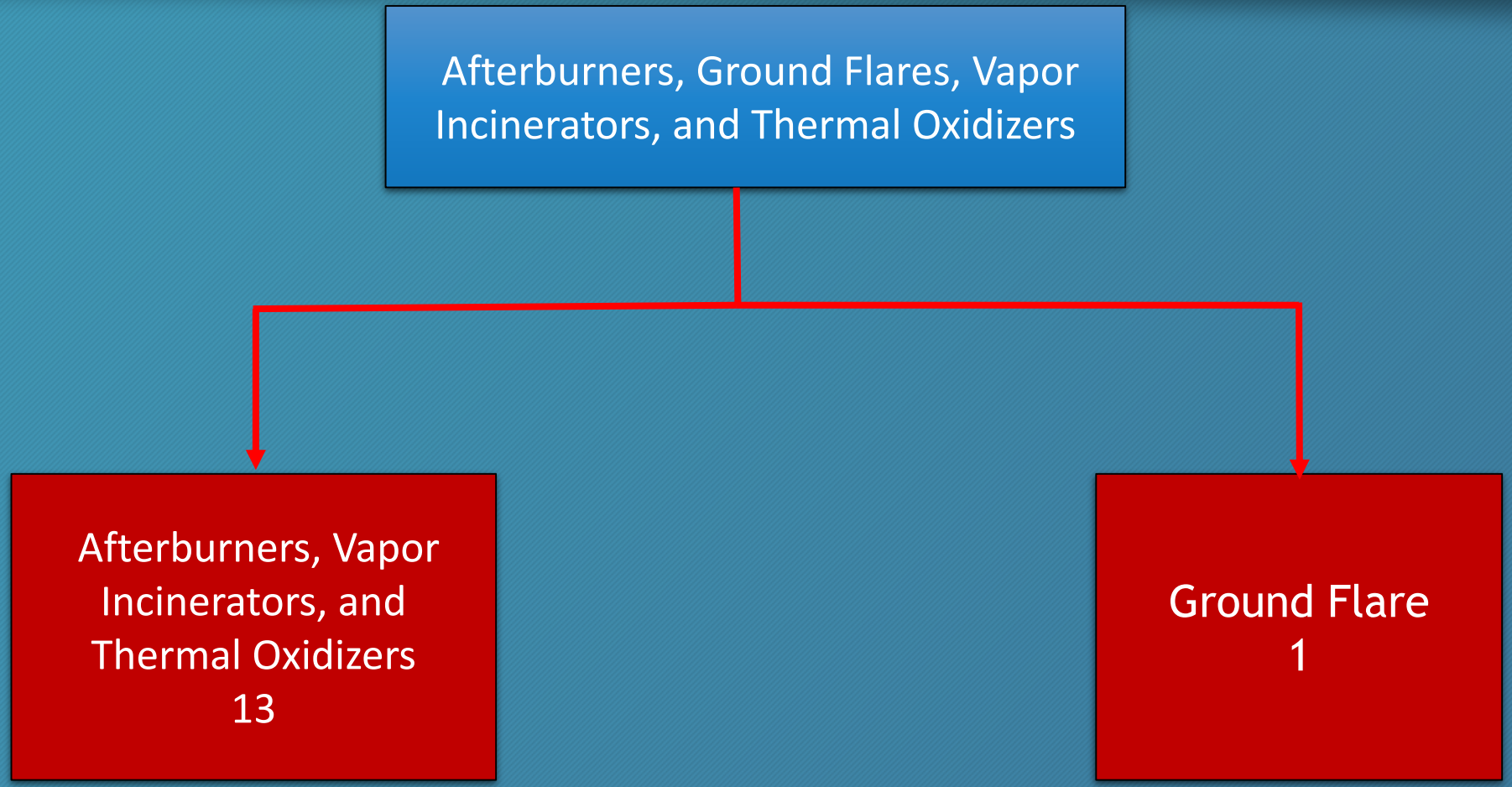


Staff Recommendation:

- 5 ppm NOx limit for the coke calciner on a 365 day rolling average
- 10 ppm on a 7 day rolling average to account for process variability

Thermal Oxidizers

Thermal Oxidizers

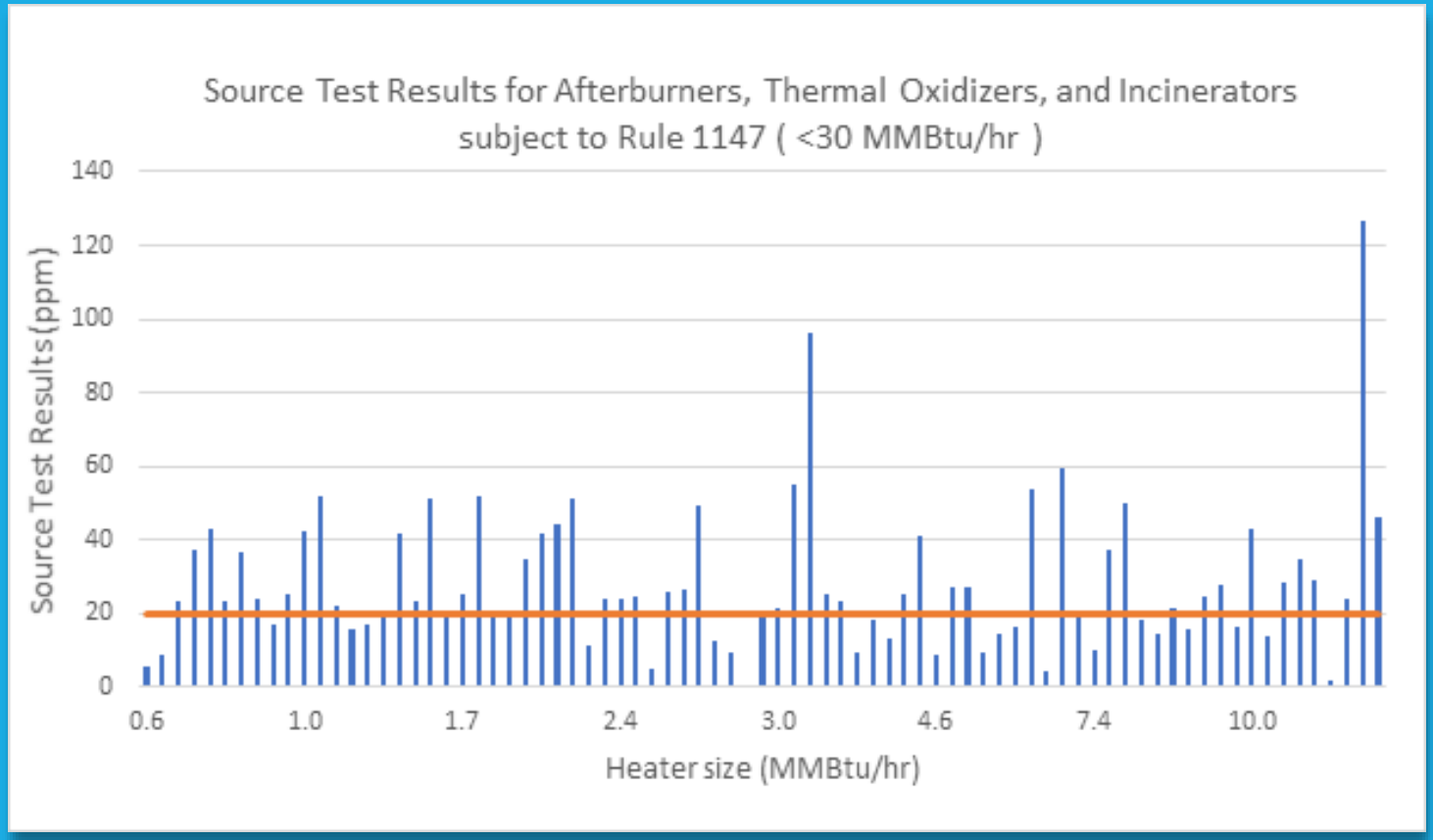


Thermal Oxidizers Background

- Category includes miscellaneous sources including afterburners, ground-level flares, thermal oxidizers, vapor incinerators
- Oxidizers generally used for air pollution control to reduce volatile organic compounds (e.g., wastewater treatment, soil vapor extraction, tank farms, truck unloading)
- Relatively small units (1 – 30 MMBtu/hr)
- Low emissions (0.05 tpd NOx for 14 units)

NOx Control Technical Feasibility Thermal Oxidizers

- Burner control is the best NOx control option
  - Units/emissions too small for SCR installation to be cost-effective
- Low-NOx burners for thermal oxidizers can achieve 20 ppm
- Staff evaluated similar units from the Rule 1147 universe to assess technical feasibility of 20 ppm
  - Thermal Oxidizers at refineries operate similarly to units at other facilities - primarily used for VOC control
  - Considered similar sized units (<30 MMBtu/hour)
  - Source test results demonstrate ~33% achieving 20 ppm or less



NOx Control Technical Feasibility – Ground-Level Flare

- One open ground-level flare in the PR 1109.1 universe
  - Open flares cannot be retrofitted with low-NOx burner
  - Consider replacement with low-NOx flare (20 ppm or 0.025 pounds/MMBtu)

Thermal Oxidizers

	RECLAIM 2015 BARCT	Existing Units	Other Regulatory	Technology Assessment	Initial BARCT NOx Limit
Afterburners, Vapor Incinerators, and Thermal Oxidizers	N/A	8 to 90 ppm	20 ppm[2]	20 ppm	Need to conduct cost-effectiveness on initial BARCT limit
Ground-Level Flares	N/A	130 pounds/MMscf[1]	Replacement with 20 ppm flare (0.025 pounds/MMBtu) if throughput capacity > 5%[3]	20 ppm	Need to conduct cost-effectiveness on initial BARCT limit

1. Default emissions factor, test open flares cannot be source tested
2. Proposed Rule 1147 – NOx Reductions from Miscellaneous Sources BARCT Assessment
3. Rule 1118.1 – Control of Emissions from Non-Refinery Flares

Initial BARCT NOx Limits for Cost-Effectiveness for Thermal Oxidizers

20 ppm

Burner Replacement

Afterburners, Vapor Incinerators, and Thermal Oxidizers

20 ppm

Flare Replacement

Ground-Level Flares

Total NOx emission for category is 0.048 tpd

Cost- Effective Determination

Thermal Oxidizers

- Staff relied on a cost curve for burner replacement developed for Proposed Amended Rule 1147 – Miscellaneous NOx Sources*
  - Total Install Costs varied from $40,000 to $120,000 depending on unit size
    - These are small, single burner units
  - Annual O&M assumed to be $2,000

Ground-Level Flares

- Staff relied on costs developed for the oil and gas industry for Rule 1118.1 – Emission Reductions for Non-Refinery Flares*
  - New Low-NOx flare costs ~$625,000
  - Annual O&M assumed to be ~$36,000

** Increased the estimated cost by 20% to account for Senate Bill 54*

Cost-Effectiveness for Thermal Oxidizers

Cost-Effectiveness to 20 ppm	
Afterburners, Vapor Incinerators, and Thermal Oxidizers	$3,500
Open Ground Flare	$310,000

Staff Recommendations

Thermal Oxidizers

- Retrofitting with low-NOx burners is cost-effective
- Several low-emitting units are outliers (>150,000/pound NOx reduced)
- Staff proposing to include a low-emitting exemption of ≤100 pounds of NOx/year

Ground Flares

- One low-use unit used for liquid unloading
- Not cost-effective to replace with low-NOx unit
- Staff proposing a low-use limit
  - ≤ 20 hours/year or the annual throughput limit Equivalent
- If flare is used >20 hours/year, it is cost-effective to replace with low-NOx unit
  - $48,000/ton NOx reduced

Cost-Effectiveness for Thermal Oxidizers

Afterburners, Vapor Incinerators, and Thermal Oxidizers

Cost-Effectiveness:
$3,500

Recommendation:
20 ppm with low-emitting exemption of 100 pounds NOx/year

Ground Flares

Cost-Effectiveness:
$ 48,000

Recommendation:
20 ppm with low-use exemption of 20 hours/year or the annual throughput limit equivalent

Staff Recommendation:

- 20 ppm at 3% Oxygen with 3 hour averaging time
- Low-use/Low-emitting exemptions

Next Steps


Sulfur Fuel Gas Survey Analysis
Continued Meeting with Stakeholders
Final Assessment Report from Consultants
Finalize BARCT Limits
Draft Rule Language
Governing Board

Rule 1109.1 Staff Contacts

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