



# Proposed Rule (PR) 1147.2

## NOx Reductions from Metal Melting and Heating Furnaces

Working Group Meeting #9

September 2, 2021

Zoom URL: <https://scaqmd.zoom.us/j/91810732436>

Dial-In: 1 669 900 6833

Meeting ID: 918 1073 2436

# Agenda

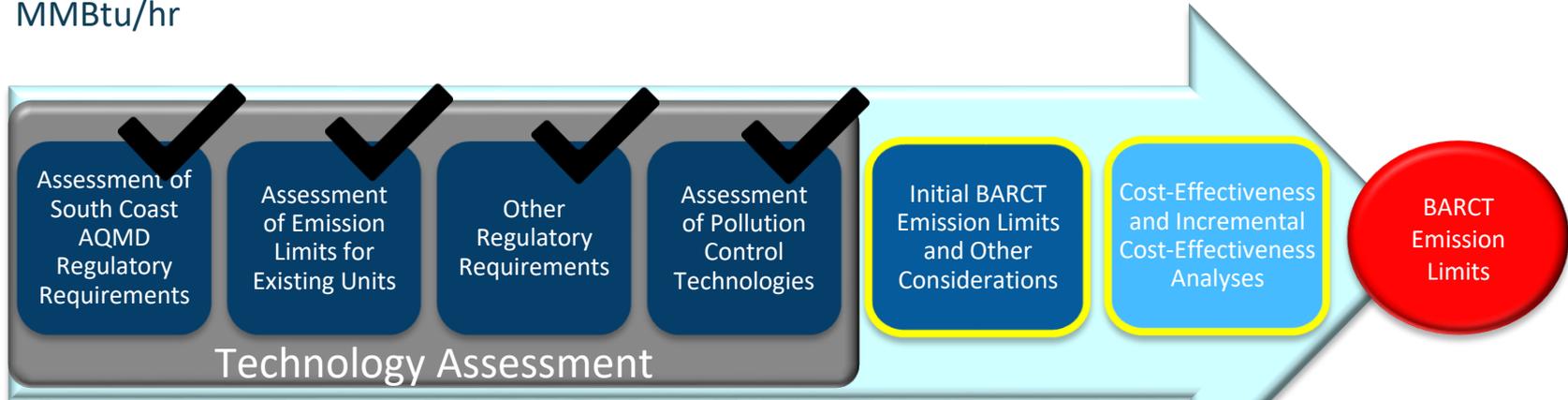
- 
- Summary of Previous Working Group Meeting
  - Stakeholder Comments
  - Revised Emission Limits
  - Revised Cost-Effectiveness
  - Proposed Rule Language
  - Next Steps



# Summary of Previous Working Group Meeting

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- Meeting focused on analyzing updated cost data and conducting updated cost-effectiveness for metal melting, metal heat treating, and metal heating and forging units
- Proposed multiple implementation paths for metal heat treating and metal heating and forging units
- Provided staggered implementation schedule for facilities with multiple impacted units
- Conducted incremental cost-effectiveness between burner and SCR control options for units  $\geq 40$  MMBtu/hr



**\*BARCT analysis is conducted for each equipment category and fuel type**



# Stakeholder Comments

# Stakeholder Comments

## Comment

- Radiant-tube burners may have difficulty meeting 30 ppm (low temperature) or 40 ppm (high temperature) limits because of burner flame characteristics different from other burner types

## Response

- Stakeholders have noted radiant-tube burners are present on about 20 furnaces, all under 1,100 °F
- Burner vendors have stated emission guarantees no lower than 50 ppm for retrofit
- Stakeholders have stated that 40 ppm is technically feasible for new installs
- Staff is proposing the following limits for units with radiant-tube burners across all temperatures: new units (40 ppm); existing units (50 ppm)

# Stakeholder Comments (cont.)

## Comment

- There are a large number of unpermitted furnaces that may not be accounted for by staff

## Response

- Survey sent in September, 2019 requesting permit-exempt unit information; received an 8% response rate
- Staff recognizes the potential for a substantial number of unpermitted units that are not documented in the permit database
- Unpermitted units have a rated heat input of  $\leq 2$  MMBtu/hr and may have NOx concentrations greater than Rule 1147 limits
- To be exempt from the proposed emission limits, units must demonstrate that they emit  $< 1$  lb/day NOx
- Staff will provide a schedule based on operating hours or fuel consumption to demonstrate less than 1 lb/day NOx emissions

# Stakeholder Comments (cont.)

## Comment

- Some units may submit a permit application for Path 1 but then the unit's burners reach the burner age threshold for Path 2 (metal heat treating and heating and forging units)

## Response

- For existing units, staff is replacing the Path 1 and Path 2 approach with a Alternative NOx Limit (previously referred to as "Near Limit") provision similar to that for the metal melting category
- Staff is also proposing NOx limits for new installs for the metal heat treating and heating/forging category

## Comment

- The aerospace industry is still in the midst of a recession and will be 2-3 years before operating capacity returns to normal levels

## Response

- Staff is considering the cost impacts in 2022, and will propose a final multiple unit implementation schedule for facilities with multiple affected 2022 units

# Stakeholder Comments (cont.)

## Comment

- Choosing a 0-2000 ppm CO span on Test Method 100.1 may lead to severe rounding errors that lead a unit to appear in excess of 400 ppm

## Response

- To address this issue, staff is revising the CO limit to 800 ppm

## Comment

- Useful life of burners of 25 years is not appropriate
- Burner modules are repaired until repairs are no longer feasible, but some burners can operate much longer.

## Response

- Modified expected use of a burner to 35 years
- Proposed implementation schedule reflecting 35-year burner life applies to all near-limit units (staff is changing “near-limit” to “alternative NOx limit”)



## **Revised Emission Limits – Metal Heat Treating and Heating/Forging**

# Revised Approach for Emission Limits for Metal Heating and Heating and Forging

- At the previous Working Group Meeting, staff presented a two-path approach for metal heat treating and heating/forging
- California Metals Coalition and other stakeholders commented that operators that selected Path 1, may be subject to Path 2 when the burner reaches 22 years

## Staff's Revised Approach for Metal Heat Treating and Heating/Forging

- Based on the revised cost data, the average cost-effectiveness to achieve 30 ppm and 40 ppm for metal heat treating and heating/forging is \$71,000 to \$101,000 per ton of NOx reduced
- Staff is proposing for these categories to achieve the most emission reductions possible while recognizing the high retrofit costs
- Staff is proposing two pathways:
  - **Path 1:** On or before July 1, 2022 meet 40 ppm ( $\leq 1,200$  °F) and 50 ppm ( $> 1,200$  °F)
  - **Path 2:** Submit permit application to meet 30 ppm ( $\leq 1,200$  °F) and 40 ppm ( $> 1,200$  °F) when the burner reaches 22 years old

# Revised Proposed Emission Limits

- Based on input from stakeholders, staff is proposing to eliminate the two path implementation approach
- PR 1147.2 will allow operators to meet an Alternative NOx Limit (previously referred to as “near-limit” )
- Similar to other provisions discussed for PR 1147.2, the Alternative NOx Limit will be 10 ppm above the Proposed NOx Limit
- The Alternative NOx Limit provision is designed to address two issues:
  - Recognize units that are meeting the current Rule 1147 NOx limits
  - Eliminate units with a high cost-effectiveness due to either high costs for to meet the NOx limit with marginal emission reductions

# Provisions for Units that Can Meet the Alternative NOx Limit

- Operators with a unit that is performing below the Alternative NOx Limit shall:
  - Submit a permit application by July 1, 2022 to establish a condition that limits the NOx concentration to the Alternative NOx Limit, unless an existing permit for the unit has such a condition
  - When the burner reaches 32 years of age (instead of when the burner reaches 12 years of age), the operator must submit a permit application to meet the Proposed NOx Limit

# Provisions for Units that Cannot Meet Alternative NOx Limit

- Units that are operating above the Alternative NOx Limit shall:
  - When the burner reaches 12 years of age, the operator must submit a permit application to meet the Proposed NOx Limit

# Revised Proposed NOx Limits and Alternative NOx Limits – Existing Units

Category (Existing Units)	Proposed NOx Limit†	Alternative NOx Limit	Submit Permit Application
Metal Heat Treating and Heating/Forging	Units ≤ 1,200 °F: 40 ppm Units > 1,200 °F: 50 ppm	Units ≤ 1,200 °F: 50 ppm Units > 1,200 °F: 60 ppm	All Units: On or before July 1 after the burner turns 12 years old* Alternative NOx Limit Units: On or before July 1 after the burner turns 32 years old*
Metal Heat Treating and Heating/Forging with Radiant-Tube Burners	All Temperatures: 50 ppm	All Temperatures: 60 ppm	All Units: On or before July 1 after the burner turns 12 years old* Alternative NOx Limit Units: On or before July 1 after the burner turns 32 years old*

† All ppm values corrected to 3% oxygen, dry

\* Multiple unit implementation schedule provided for facilities with multiple impacted units in 2022

# Revised Proposed NOx Limits – New Units

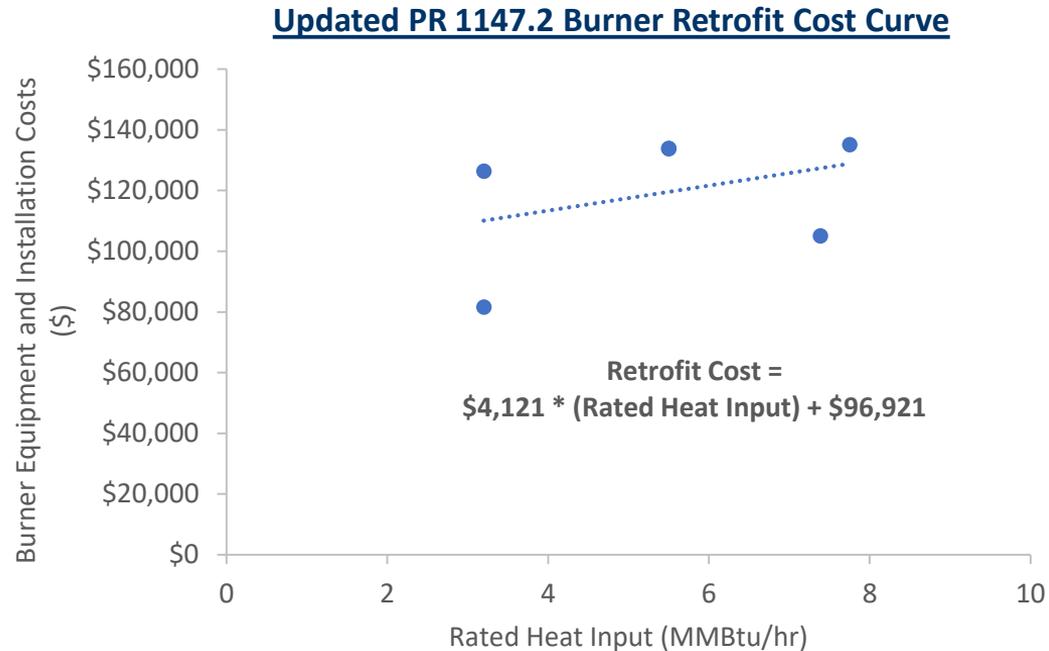
Category (New Units)	NOx Emission Limit*	Submit Permit Application
Metal Heat Treating and Heating/Forging	Units $\leq$ 1,200 °F: 30 ppm Units > 1,200 °F: 40 ppm	Required prior to whenever a new or replacement unit is proposed
Metal Heat Treating and Heating/Forging with Radiant-Tube Burners	All Temperatures: 40 ppm	Required prior to whenever a new or replacement unit is proposed



# Revised Cost- Effectiveness

# Revised Burner Retrofit Cost Curve

- Based on technical information received from burner vendors, an updated cost curve was developed
- Updated cost curve utilizes the burner equipment and installation portions of a PR 1147.2 retrofit quote that was chosen for its consistency across several units



# Impact of Revised Cost Curve for Metal Heat Treating and Heating/Forging Retrofits

- Updated cost curve applies only to those units that do not qualify as an Alternative NOx unit
- Alternative NOx Limit and multiple unit implementation schedule provisions retained for these categories
- Emission reductions timeline of burners revised to 35 years

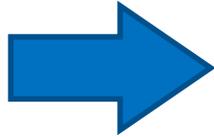
Furnace Type	Emission Limit	Cost-Effectiveness (\$/ton)
Metal Heat Treating (Existing Units)	≤ 1,200 °F: 40 ppm	\$17,100
	> 1,200 °F: 50 ppm	\$5,400
Metal Heating/Forging (Existing Units)	≤ 1,200 °F: 40 ppm	\$19,900
	> 1,200 °F: 50 ppm	\$7,200
Metal Heat Treating and Heating/Forging with Radiant-Tube Burners (Existing Units)	All Temperatures: 50 ppm	\$40,100



# Proposed Rule Language

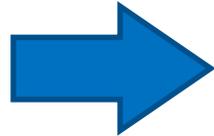
# Title, Purpose (a), and Applicability (b)

Title



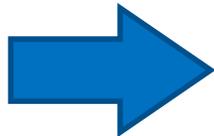
NO<sub>x</sub> Reductions from  
Metal Melting and Heating Furnaces

Purpose



To reduce nitrogen oxide emissions from metal melting, metal heat treating, and metal heating and forging furnaces

Applicability



Shall apply to units that are  $\geq 325,000$  Btu/hr

# Definitions (c)

- Continuous Emission Monitoring System (CEMS)
- Decommission
- Former RECLAIM Facility
- Metal Forging Furnace
- Metal Heat Treating Furnace
- Metal Heating Furnace
- Metal Melting Furnace
- Modification
- Non-RECLAIM Facility
- Operating Hours
- Radiant-Tube Burner
- RECLAIM Facility
- Rated Heat Input
- Refractory Dry-Out
- Shutdown
- Startup

# Requirements (d)

- Interim emission limits are required before units meet the proposed NO<sub>x</sub> limits and are different for Non-RECLAIM facilities and Former RECLAIM facilities
- Interim limit for Non-RECLAIM facilities: 60 ppm
  - Based on Rule 1147 limits
- Interim limit for Former RECLAIM facilities: 102 ppm (130 lbs/MMScf)
  - Based on RECLAIM default emission factor

# Requirements (d) – Proposed NOx Emission Limits

**Table 1 – NOx Emission Limits**

## Emission Limits

- All burner retrofit units shall meet the proposed BARCT limits 12 months after permits are issued as set in the implementation schedules
- All units subject to CO limit of 800 ppm\* once become subject to emission limits in Table 1

Furnace Type	Furnace Type	Temperature	NOx Limit*
< 40 MMBtu/hr	Metal Melting	All Temperatures	40 ppm
	Metal Heat Treating and Heating/Forging (Existing Units)	≤ 1,200 °F	40 ppm
		> 1,200 °F	50 ppm
	Metal Heat Treating and Heating/Forging with Radiant-Tube Burners (Existing Units)	All Temperatures	50 ppm
	Metal Heat Treating and Heating/Forging (New Units)	≤ 1,200 °F	30 ppm
		> 1,200 °F	40 ppm
Metal Heat Treating and Heating/Forging with Radiant-Tube Burners (New Units)	All Temperatures	40 ppm	
≥ 40 MMBtu/hr	All Units	All Temperatures	15 ppm

\* All ppm values corrected to 3% oxygen, dry

# Requirements (d) – Alternative NOx Limits

## Alternative NOx Limits (Units < 40 MMBtu/hr)

- Existing units may elect to meet the Alternative NOx Limit submitting a permit application to modify permit limit to the Alternative NOx Limit in Table 2 by July 1, 2022
- All units are only subject to CO limit of 800 ppm\* once become subject to emission limits in Table 1

**Table 2 – Alternative NOx Limits**

Furnace Type	Furnace Type	Temperature	NOx Near-Limit*
< 40 MMBtu/hr	Metal Melting	All Temperatures	50 ppm
	Metal Heat Treating and Heating/Forging (Existing Units)	≤ 1,200 °F	50 ppm
		> 1,200 °F	60 ppm
	Metal Heat Treating and Heating/Forging with Radiant-Tube Burners (Existing Units)	All Temperatures	60 ppm

\* All ppm values corrected to 3% oxygen, dry

# Requirements (d) – Implementation Schedule

- Implementation schedule for existing units complying with the emission limits in Table 1
- New heat treating and heating/forging units will be required to comply with the BACT limits immediately after Permit to Operate is issued

**Table 3 – Implementation Schedule**

Furnace Type	Furnace Type	Submit Application for Permit*	Compliance Date
< 40 MMBtu/hr	Metal Melting	On or before July 1 after the burner turns 12 years old	Within 12 months after Permit to Construct is Issued; Upon issuance of Permit to Operate
	Metal Heat Treating and Heating/Forging (Existing Units)		
	Metal Heat Treating and Heating/Forging with Radiant-Tube Burners (Existing Units)		
	Metal Heat Treating and Heating/Forging (New Units)	Required per Rule 201 prior to whenever a new or replacement unit is proposed (Permit to construct must be granted prior to beginning of construction)	
	Metal Heat Treating and Heating/Forging with Radiant-Tube Burners (New Units)		
≥ 40 MMBtu/hr	All Units	On or before July 1, 2022	Within 18 months after Permit to Construct is Issued; Upon issuance of Permit to Operate

\* Multiple unit implementation schedule provided for facilities with multiple impacted units in 2022

# Requirements (d) – *Implementation Schedule for Alternative NOx Limit*

- Implementation schedule for existing units complying with the emission limits in Table 2
- New heat treating and heating/forging units will be required to comply with the limits for New units upon issuance of Permit to Operate

**Table 4 – Alternative NOx Implementation Schedule**

Furnace Type	Furnace Type	Submit Application for Permit*	Compliance Date
< 40 MMBtu/hr	Metal Melting	On or before July 1 after the burner turns 32 years old	Within 12 months after Permit to Construct is Issued; Upon issuance of Permit to Operate
	Metal Heat Treating and Heating/Forging (Existing Units)		
	Metal Heat Treating and Heating/Forging with Radiant-Tube Burners (Existing Units)		

\* Multiple unit implementation schedule provided for facilities with multiple impacted units in 2022

# Requirements (d) – *Unit Decommission*

## Unit Decommission

- Facilities may decommission a unit by sending a notification in advance
- Facilities that later decide to not decommission must meet the emission limits no later than 30 months after the permit application was due

# Requirements (d) – *Multiple Unit Implementation Consideration*

- Facilities with multiple units
  - Operators have commented business challenges due to COVID-19
  - Staff is proposing phased implementation for facilities with multiple units
  - Staff is also sensitive to the requirements of AB 617 which requires BARCT by December 2023
- Based on total impacted heat input of units required to submit permit applications by July 1, 2022 for retrofit
- Units that are permanently decommissioned can be credited toward the facility's multiple unit implementation schedule quota
- Staff is working on detail for a final multiple unit implementation schedule

# Demonstration of Less than 1 Pound NOx per Day (e)

Units < 1 lb/day NOx subject only to labeling and recordkeeping requirements and must demonstrate < 1 lb/day by:

- Install a timer and operate less than the hours specified in Table 5; or
- Install a fuel meter and use less than 2,400 therms per month

**Table 5 – Less than 1 Pound per Day Monthly Operating Limits**

Unit Rated Heat Input (Btu/hr)	Monthly Hour Limit
≥ 325,000 to < 500,000	480
≥ 500,000 to < 1,000,000	240
≥ 1,000,000 to < 1,500,000	160
≥ 1,500,000 to < 2,000,000	120

# Demonstration of Less than 1 Pound NOx per Day (e) (cont.)

Units may also demonstrate < 1 lb/day NOx by using Equation 1:

$$\text{Monthly Operating Hours} = 1 \div \left( R * \frac{EF}{HHV} \right) \times 30 \quad (1)$$

Where,

R = Rated Heat Input (MMBtu/hr)

EF = Emission Factor (lb NOx/MMScf)<sup>1</sup>

1,050 = Natural Gas Higher Heating Value (Btu/Scf)<sup>2</sup>

<sup>1</sup> If the unit does not have a permit emission factor, multiply the unit's permit limit (ppm @ 3% oxygen on a dry basis) by 1.275 to use as the EF

<sup>2</sup> Used in Rule 2012 for RECLAIM units

# Demonstration of Less than 1 Pound NOx per Day (e) (cont.)

Units may also demonstrate < 1 lb/day NOx by using Equation 2:

$$\text{Therms of Natural Gas Per Pound of NOx} = \frac{1}{EF} * 1,033 * 10 \quad (2)$$

Where,

EF = Emission Factor (lb NOx/MMScf)<sup>1</sup>

1,033 = Natural Gas Higher Heating Value (Btu/Scf)<sup>2</sup>

10 = Conversion from MMBtu to Therms

<sup>1</sup> If the unit does not have a permit emission factor, multiply the unit's permit limit (ppm @ 3% oxygen on a dry basis) by 1.275 to use as the EF

<sup>2</sup> May be obtained from the U.S. Energy Information Association: [https://www.eia.gov/dnav/ng/ng\\_cons\\_heat\\_a\\_EPG0\\_VGTH\\_btucf\\_a.htm](https://www.eia.gov/dnav/ng/ng_cons_heat_a_EPG0_VGTH_btucf_a.htm)

# Determination of Burner Age (f)

Multiple options available to determine burner age, based on Rule 1147's framework

Invoice of burner purchase

Prior permit application information

Unit's original identification or rating plate

Default assignment of 32 years as of July 1, 2022

# Compliance Determination (g)

- Periodic source test frequency will be similar to RECLAIM testing schedule
  - Units  $\leq 10$  MMBtu/hr: source test every 5 years
  - Units 10-40 MMBtu/hr: source test every 3 years
    - Units using  $\leq 23$  billion Btu per year may test every 5 years
- Units that have conducted a source test between January 1, 2018 and rule adoption date may use that source test as the basis for establishing subsequent source test frequency
- Units that have not conducted a recent source test shall conduct a source test within 12 months of rule adoption and use that source test as the basis for establishing subsequent source test frequency

# Monitoring and Testing Requirements (h) – *Units < 40 MMBtu/hr*

- A source test protocol shall be submitted no later than 90 days prior to the scheduled source test
- The source test shall be conducted using an approved source test protocol
- A source test shall only be conducted after 40 operating hours subsequent to unit tuning and after 15 days subsequent to a prolonged unit shutdown
- Source test shall be conducted at maximum temperature at which the unit normally operates

# Monitoring and Testing Requirements (h) – *Units $\geq 40$ MMBtu/hr*

- Larger units must operate a CEMS to measure NO<sub>x</sub> and O<sub>2</sub>
  - Non-RECLAIM Facilities and Former RECLAIM Facilities: Operate and certify CEMS pursuant to Rules 218.2 and 218.3
  - RECLAIM Facilities: Operate and certify CEMS pursuant to Rule 2012
  - NO<sub>x</sub> source testing not required
- RATAs (Relative Accuracy Test Audits) shall be conducted annually
- If unit is equipped with CEMS to measure CO and O<sub>2</sub>, source testing for CO is not required

# Monitoring and Testing Requirements (h) – *Ammonia Monitoring*

- Ammonia monitoring shall be conducted per permit conditions, as applicable
  - If no emission control system utilizing ammonia is installed, no ammonia monitoring is required
- Source tests conducted according to Method 207.1 – Determination of Ammonia Emissions from Stationary Sources
- Within the first 12 months of an exhaust emission control system installation or permit issuance, whichever is sooner, conduct quarterly source testing
  - If 4 consecutive quarterly source tests are passed, unit may source test annually
  - Failure to demonstrate compliance on an annual schedule requires reversion to quarterly source testing
- Installation of CEMS to measure ammonia and O<sub>2</sub> may be used in lieu of ammonia source testing
  - Non-RECLAIM Facilities and Former RECLAIM Facilities: Operate and certify CEMS pursuant to Rules 218.2 and 218.3
  - RECLAIM Facilities: Operate and certify CEMS pursuant to Rule 2012

# Labelling Requirements (h)

- Existing units
  - A permanent rating plate displaying the unit's model number and rated heat input must be placed in an accessible location
- Altered units
  - A new permanent rating plate displaying the unit's model number and new rated heat input must be placed in an accessible location
  - The date of unit alteration must be determined pursuant to subdivision (f) (*Determination of Burner Age*)

# Recordkeeping (i)

- Records used to determine compliance with the emission limits shall be kept on-site for at least 5 years, and include:
  - Source test reports
  - Monthly records demonstrating compliance with 1 pound NO<sub>x</sub> per day (if applicable)
  - CEMS data (if applicable)
- Records identifying the rated heat input, including unit alterations, shall be kept on-site for as long as the unit is on-site, and include a calculation of the rated heat input
- Unit modification records shall include:
  - Descriptions of the modification work
  - Name of the company and person performing the modification
  - Date of modification

# Exemptions (k)

- The emission limits shall not be applicable to units during periods of refractory dry-out and will be subject to provisions to be implemented in Proposed Amended Rule 429
- The provisions of the rule shall not be applicable to electrically-powered units
- Units emitting  $< 1$  lb/day NO<sub>x</sub> are exempt from the emissions limits in the rule and only subject to labeling and recordkeeping requirements



**Next Steps**

# Next Steps

October  
2021

Public  
Workshop

December  
2021

Set  
Hearing

January  
2022

Public  
Hearing

# Contacts

PR 1147.2	PAR 1147	RECLAIM Questions	General Questions
<p><b>James McCreary</b> Air Quality Specialist <a href="mailto:jmccreary@aqmd.gov">jmccreary@aqmd.gov</a> 909-396-2451</p> <p><b>Rodolfo Chacon</b> Program Supervisor <a href="mailto:rchacon@aqmd.gov">rchacon@aqmd.gov</a> (909)396-2726</p> <p><b>Mike Morris</b> Planning and Rules Manager <a href="mailto:mmorris@aqmd.gov">mmorris@aqmd.gov</a> 909-396-3282</p>	<p><b>Shawn Wang</b> Air Quality Specialist <a href="mailto:swang@aqmd.gov">swang@aqmd.gov</a> 909-396-3319</p> <p><b>Gary Quinn, P.E.</b> Program Supervisor <a href="mailto:gquinn@aqmd.gov">gquinn@aqmd.gov</a> 909-396-3121</p> <p><b>Michael Krause</b> Planning and Rules Manager <a href="mailto:mkrause@aqmd.gov">mkrause@aqmd.gov</a> 909-396-2706</p>	<p><b>Gary Quinn, P.E.</b> Program Supervisor <a href="mailto:gquinn@aqmd.gov">gquinn@aqmd.gov</a> 909-396-3121</p>	<p><b>Susan Nakamura</b> Assistant Deputy Executive Officer <a href="mailto:snakamura@aqmd.gov">snakamura@aqmd.gov</a> 909-396-3105</p>