Proposed Rule (PR) 1147.2

NOx Reductions from Metal Processing Equipment

Working Group Meeting #2
August 6, 2019

Call-In Number / Passcode
913-227-1201 / 225465

Agenda

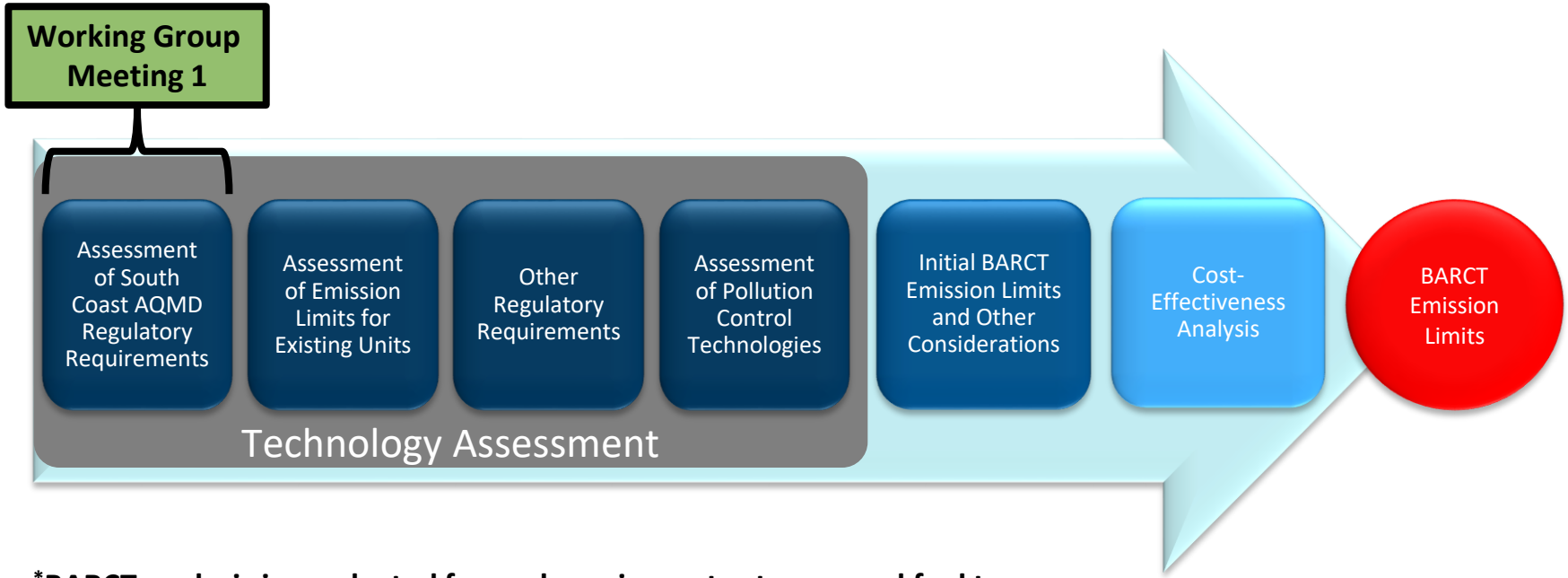
- Summary of Working Group Meeting #1
- Summary of Stakeholder Meetings
- Rule 1147 Equipment Data Request
- BARCT Analysis
  - Assessment of Emission Limits for Existing Units
    - Metal Melting Furnaces
    - Metal Heat Treating Furnaces
  - Other Regulatory Requirements
- Next Steps

Summary of Working Group Meeting #1

Summary of Working Group Meeting #1

- Background
- Overview of Rule Development Process
- Overview of Rule 1147
- Proposed Rule 1147.2
- Equipment Data

Status of Working Group Meeting #1



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

Summary of Stakeholder Meetings

Assessment of South Coast AQMD Regulatory Requirements

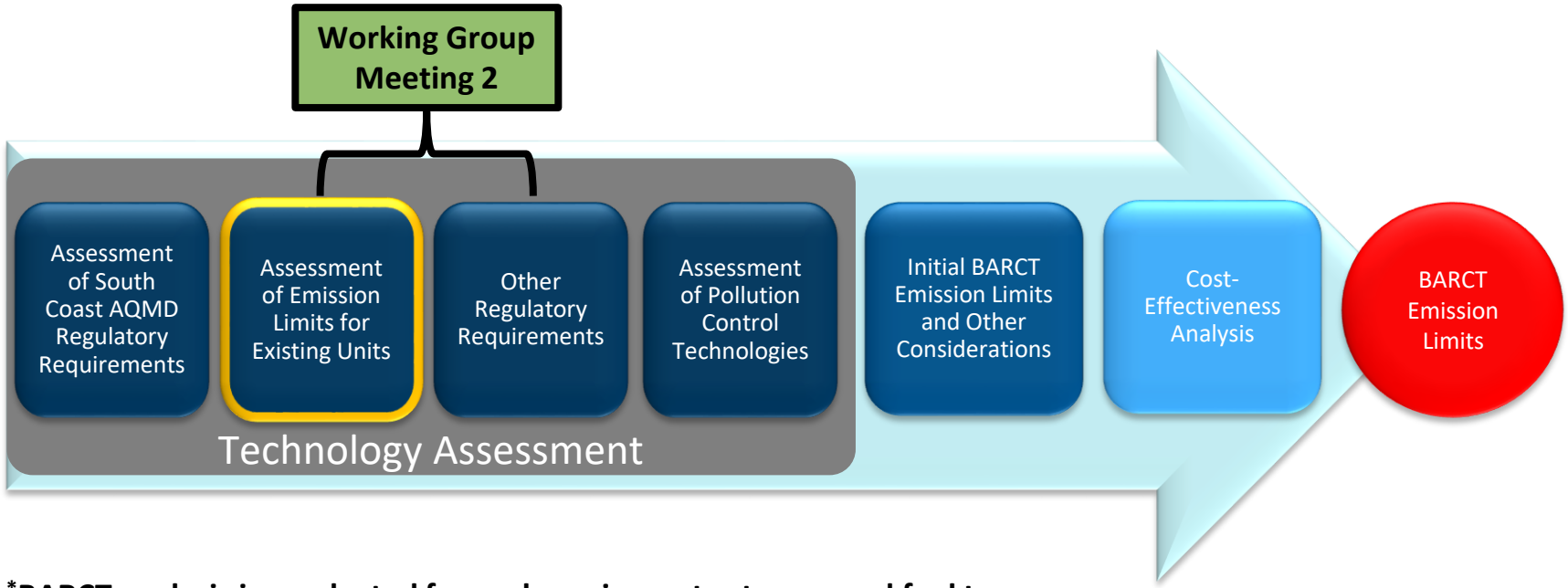
- 13 stakeholder meetings
  - RECLAIM and non-RECLAIM facilities
  - Consultants
  - Vendors
- Discussed
  - Proposed applicability
  - Equipment
    - Configurations
    - Retrofits
    - Permit-exempt
  - Facility operations
  - NOx control technologies
  - Source testing considerations

Rule 1147 Equipment Data Request

- ~240 surveys sent to facilities with metal processing equipment
  - 26 surveys have been returned (~11%)
  - Survey can be completed electronically and submitted via email http://www.aqmd.gov/home/rules-compliance/rules/scaqmd-rule-book/proposed-rules#1147.2
- Staff plans to send a supplemental survey to gather data on permit-exempt equipment
  - Many pieces of equipment are permit-exempt
  - Equipment inventory is underrepresented
  - Equipment does not have a NOx rule or permit emission limit

BARCT Analysis

Working Group Meeting #2: Current Progress



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

Methodology & Approach

For metal melting and metal heat treating furnaces, identified:

- Total number of units
- NOx permit limit and source test (if available)
- Heat input
- Control technology (if any)
- Replacement or retrofit and corresponding dates

Analyzing data to:

- Identify low emitting units
- Segment possible groupings of equipment (heat input, type, other parameters such as temperature)
- Summarize NOx permit limits and source test performance relative to current Rule 1147 limit

Assessment of Emission Limits for Existing Units

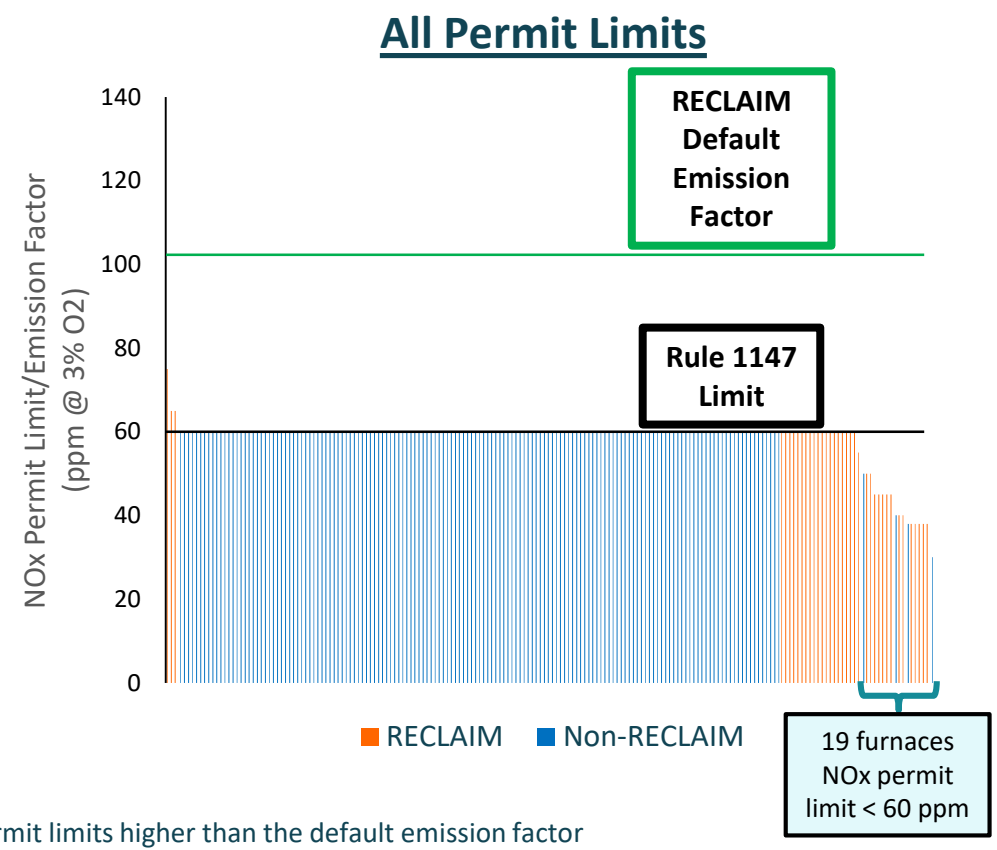
Metal Melting Furnaces

Metal Melting Furnaces – Assessment of Permitted NOx Levels

- Staff evaluated all permitted NOx concentration limits for metal melting furnaces
  - Electric furnaces were excluded for evaluation of combustion NOx
  - All NOx limits were corrected to 3% O2
- Based on the South Coast AQMD permit database, 204 permitted metal melting furnaces were evaluated
- Permit limit data organized to determine:
  - Permit limit distribution
  - Permit limits of units not using Rule 1147 limit or RECLAIM default NOx emission factor
  - Correlation to heat input data
- Staff has identified approximately 92 unpermitted furnaces (exempt from permitting)
  - Unpermitted furnaces have not been included in the proposed universe

Analysis of Permitted Data for RECLAIM and Non-RECLAIM Metal Melting Furnaces

- RECLAIM default NOx emission factor is 102 ppm*
  - Applied to identified RECLAIM units without an emission factor
- Rule 1147 NOx permit limit is 60 ppm
- Of the 204 metal melting furnaces, 19 have NOx permit limits below 60 ppm
  - 15 at RECLAIM facilities
  - 4 at non-RECLAIM facilities
- NOx permit limits below 60 ppm range from 30 to 55 ppm



* Converted from 130 lb NOx/mmscf natural gas, units can have permit limits higher than the default emission factor

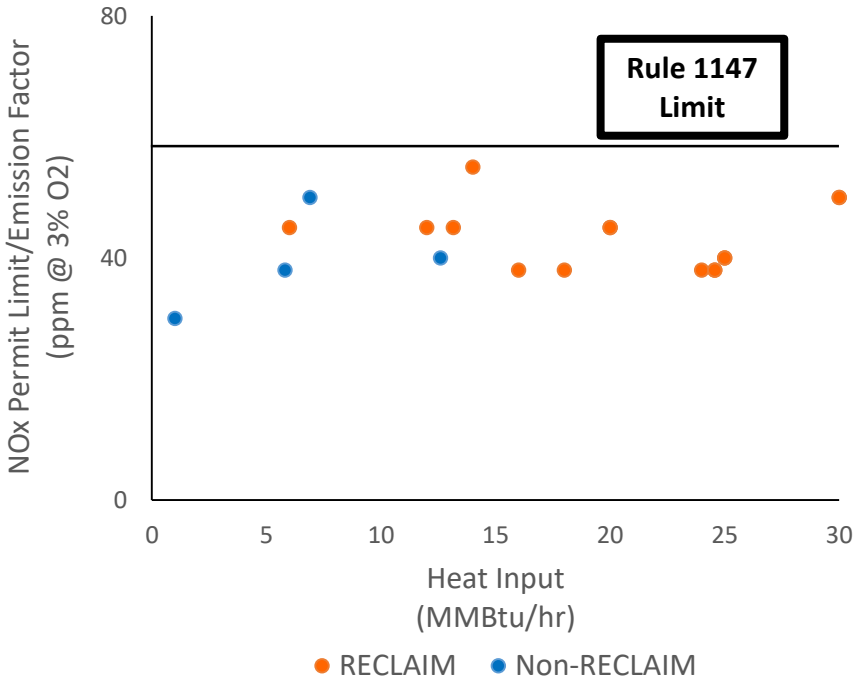
Size Distribution of Metal Melting Furnaces with Permitted Levels < 60 ppm

- Of the 19 metal melting furnaces with NOx permit limits < 60 ppm, heat inputs range between 1.0 - 30.0 MMBtu/hr
  - Only 1 unit < 5 MMBtu/hr
  - For units greater than 5 MMBtu/hr, even distribution of heat inputs for units with NOx permit limits < 60 ppm

Heat Input Distribution for 19 Units Permitted at < 60 ppm

Heat Input (MMBtu/hr)	# of Units
≤ 5	1
> 5 to < 20	9
≥ 20	9

Permit Limits (< 60 ppm) vs. Heat Input



Assessment of Source Test Results for Metal Melting Furnaces

- Staff reviewed source tests of metal melting furnaces to identify tested emissions
- Staff identified source tests for:
  - 25 RECLAIM metal melting furnaces
  - 29 non-RECLAIM metal melting furnaces
- Only certain units are required to source test
  - RECLAIM units that do not use the default NOx emission factor (102 ppm)
  - Non-RECLAIM units (Rule 1147), when the unit reaches:
    - 35 years old: If emit < 1 lb/day NOx; or
    - 15 years old: If emit > 1 lb/day NOx

Metal Melting Furnaces – Source Test Result Summary

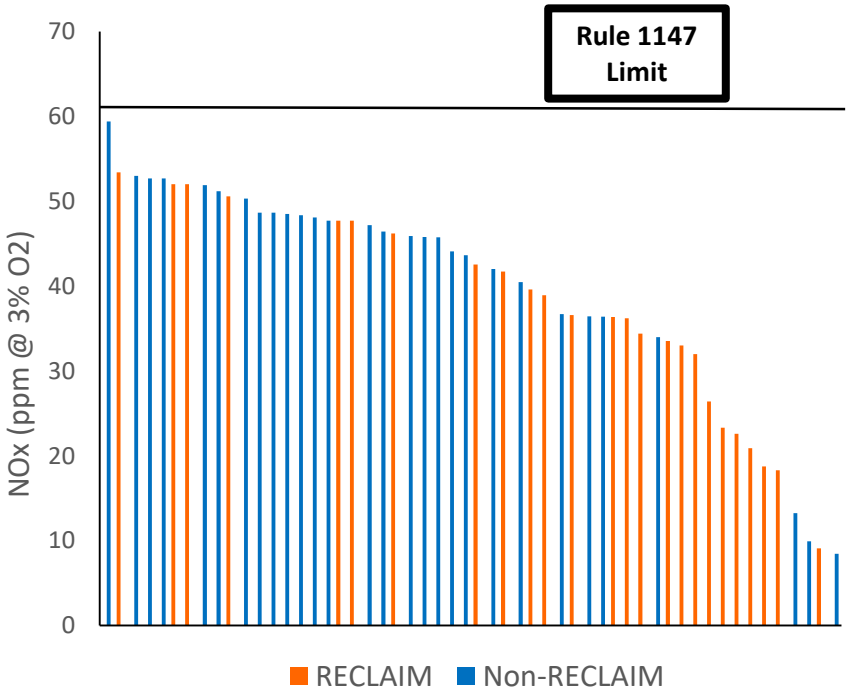
- 54 NOx source tests identified
  - Results range from 8.4 to 59.6 ppm NOx from RECLAIM and non-RECLAIM facilities
  - Average source test is 44 ppm

Source Tests for 19 Units Permitted at < 60 ppm

Source Test Result (ppm)	# of Units*
50 to 60	1
40 to 50	3
30 to 40	7
< 30	6

* 2 units did not have source test data

All Source Test Results



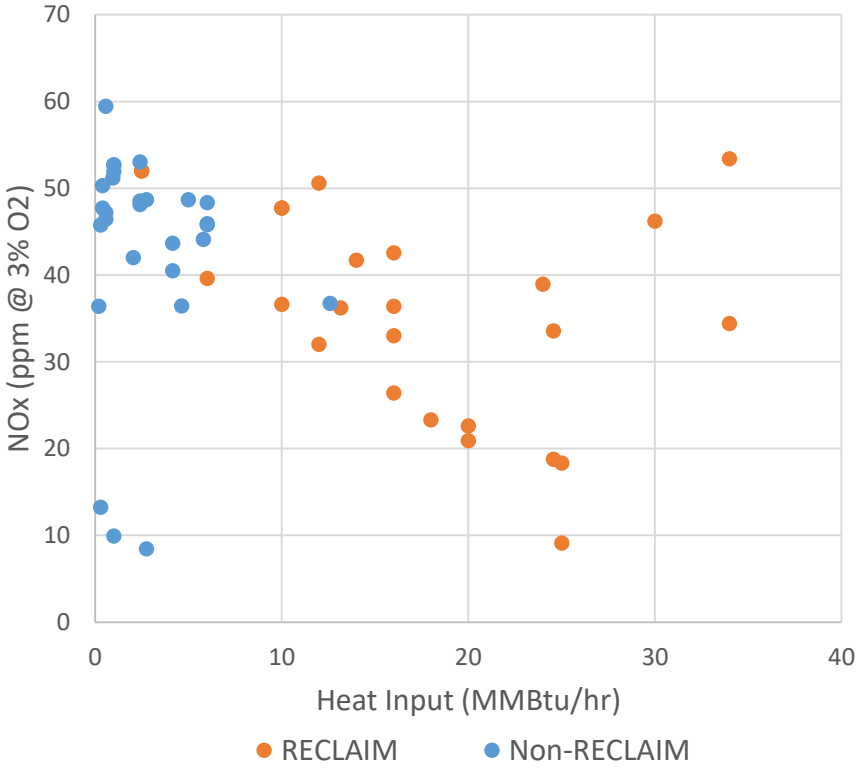
Metal Melting Furnaces – Source Test Result Summary

- All 54 metal melting furnaces with source tests are below 60 ppm NOx
  - Heat inputs range between 0.2 and 34 MMBtu/hr
  - 26 units less than 5 MMBtu/hr
  - Even distribution of heat inputs

Units vs. Heat Input Ranges

Heat Input (MMBtu/hr)	Units with Source Test < 60 ppm
≤ 5	26
> 5 to < 20	18
≥ 20	10

Source Test Results vs. Heat Input

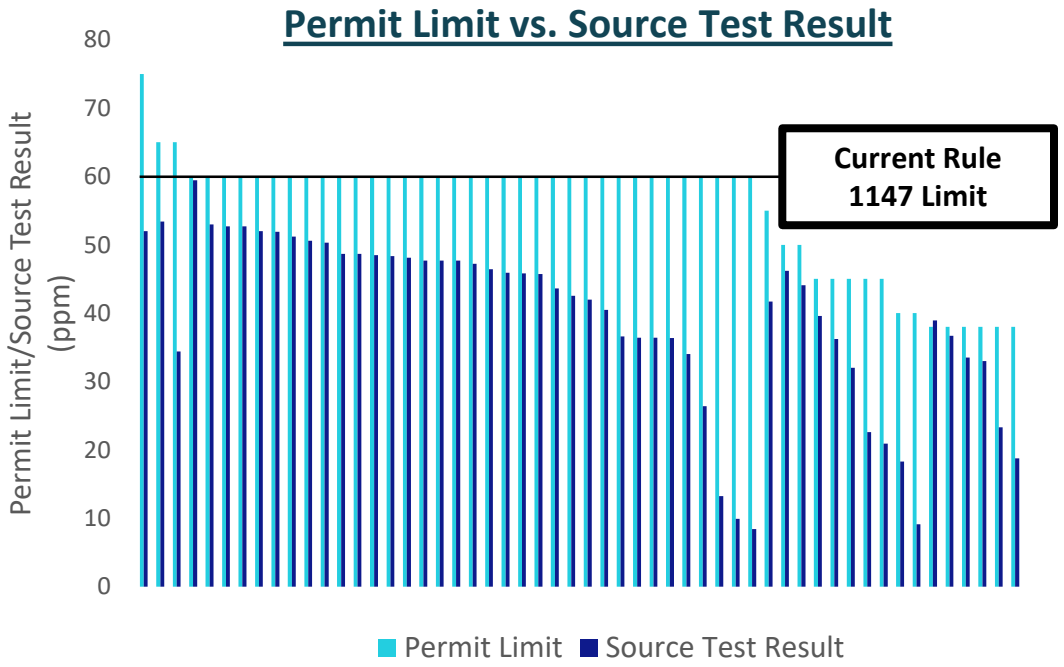


Metal Melting Furnaces – Permit Limits vs. Source Test Results Evaluation

- Staff compared NOx permit limit data with NOx source test results to determine metal melting furnace performance relative to permitted levels
- Confirmed “compliance margin” between permitted and source tested NOx levels

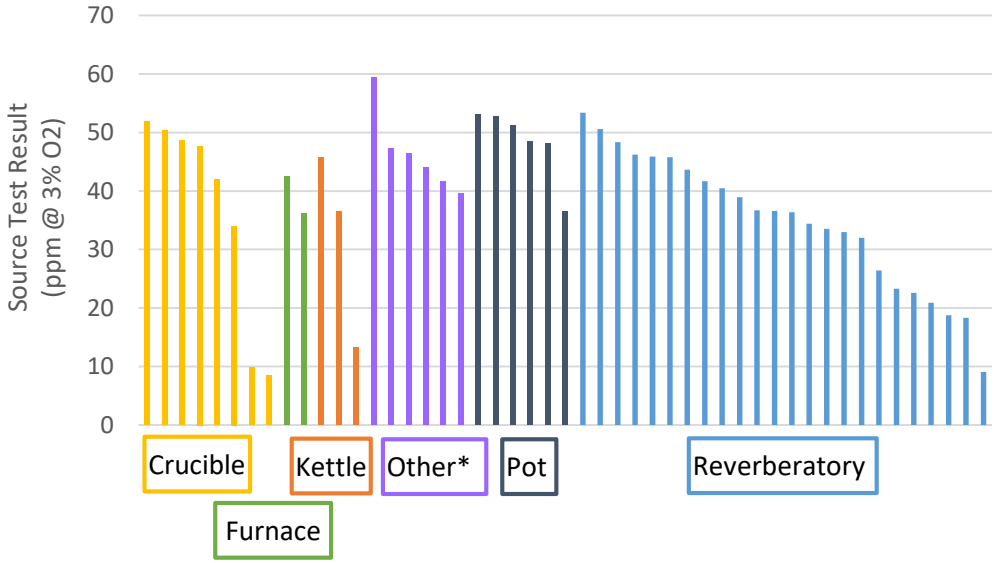
Metal Melting Furnaces – Permit Limits vs. Source Test Results Evaluation

- Difference between NOx permit limit and NOx source test result
  - Source test result ranges from 0.6 - 51.6 ppm lower than permit limit
  - Average Difference: 16 ppm (29% lower)



Metal Melting Furnaces – Source Test Result by Furnace Type

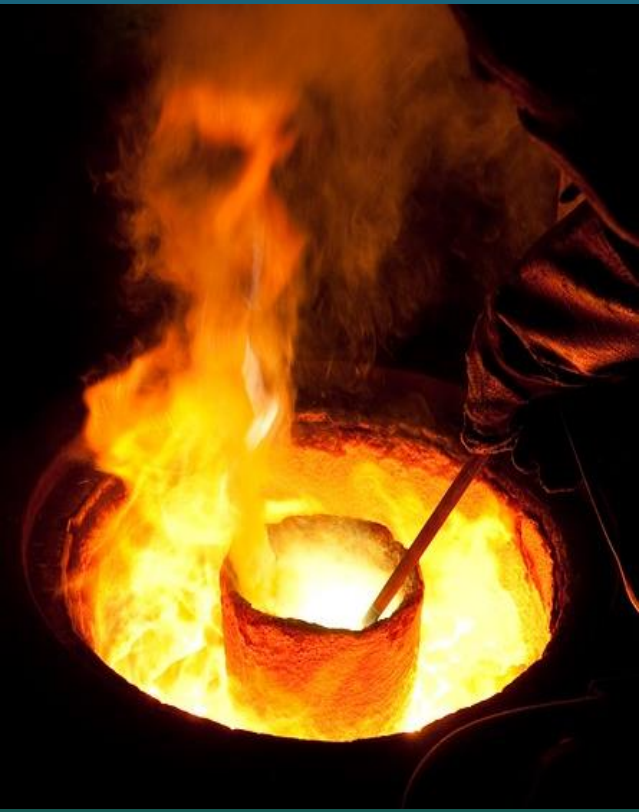
- Staff categorized source test data by furnace type
  - Reviewed data to determine correlation between source test result and furnace type
  - Based on source test results, all furnace types have one or more furnaces with NOx levels < 40 ppm



* Other: Pit, Box, Stack, and Rotary (Non-Sweating

Metal Melting Furnaces – Equipment Data Summary

- Permitted - NOx Concentration Level:
  - RECLAIM: 29% units permitted < 60 ppm
  - Non-RECLAIM: 3% units permitted < 60 ppm
  - RECLAIM units that that do not use the default emission factor (102 ppm) are permitted at a much lower limit (≤ 60 ppm)
- Source Tests - NOx Concentration Level:
  - NOx concentration levels range from 8.4 to 59.6 ppm
  - Based on 54 source tests, average concentration is 44 ppm (~25% below 60 ppm – Rule 1147 emission limit)
  - Crucible, Kettle, and Reverberatory types have the lowest source test results



Assessment of Emission Limits for Existing Units

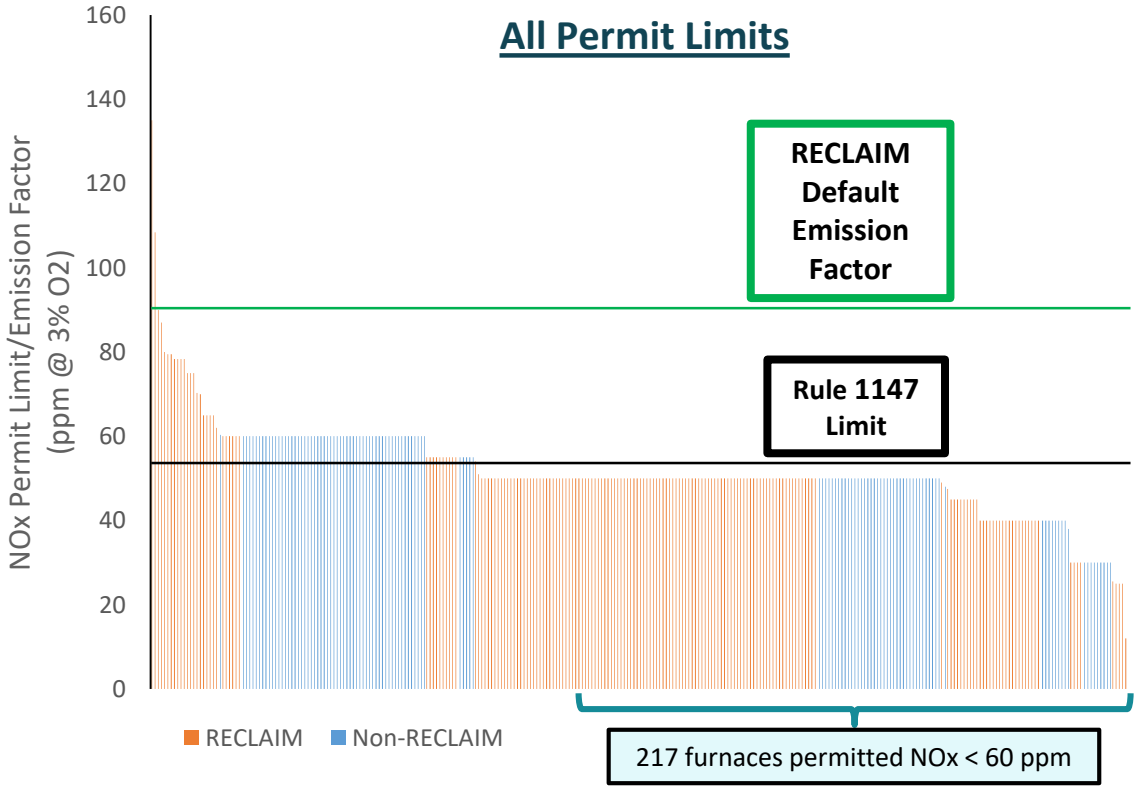
Metal Heat Treating Furnaces

Assessment of Permitted NOx Levels for Metal Heat Treating Furnaces

- Staff evaluated all permitted NOx concentration limits for metal heat treating furnaces
  - Electric furnaces were excluded for evaluation of combustion NOx
  - All NOx limits were corrected to 3% O2
- Based on the South Coast AQMD permit database, 385 permitted metal heat treating furnaces were evaluated
- Permit limit data organized to determine limit distribution and permit limits of units not using Rule 1147 limit or RECLAIM default emission factor
- Heat input data was also organized to determine any correlations to permit limit data
- Staff has identified approximately 254 unpermitted furnaces (Exempt from permitting)
  - Unpermitted furnaces were not included in the proposed universe

Analysis of Permitted Data for RECLAIM and Non-RECLAIM Metal Heat Treating Furnaces

- RECLAIM default NOx emission factor is 102 ppm*
- Rule 1147 NOx emission limit is 60 ppm
- Of the 385 metal heat treating furnaces, 217 have permitted NOx limits below 60 ppm
  - 155 furnaces at RECLAIM facilities
  - 62 furnaces at non-RECLAIM facilities
- Permitted NOx limits below 60 ppm range from 12 to 55 ppm
- 20 furnaces have a permit limit above the RECLAIM default emission factor



* Converted from 130 lb NOx/mmscf natural gas

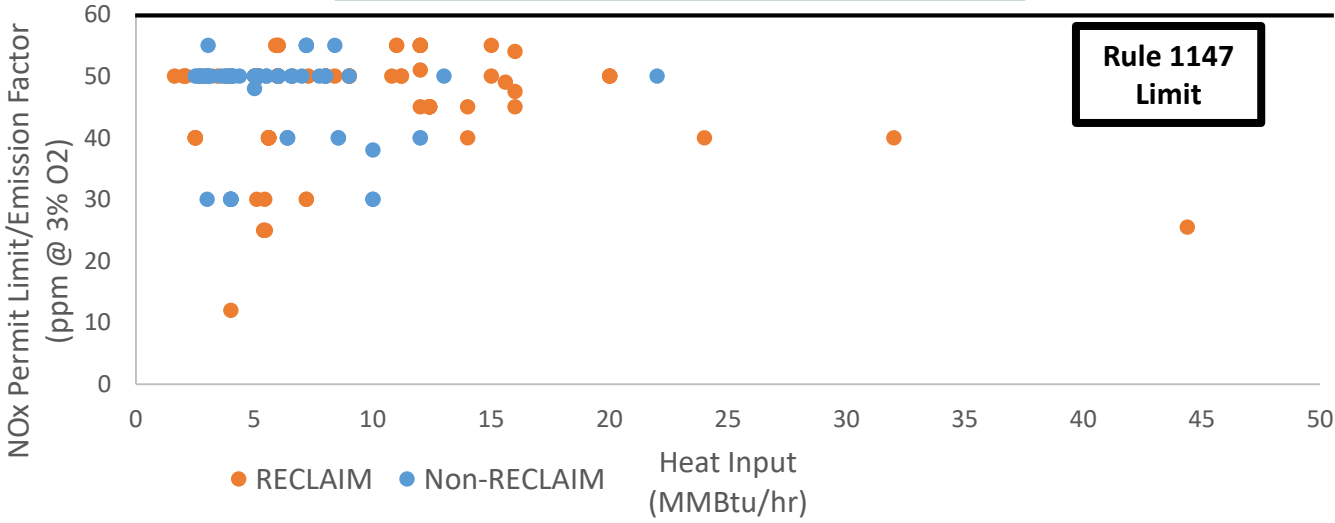
Size Distribution of Metal Heat Treating Furnaces with Permitted Levels < 60 ppm

- Of the 217 metal heat treating furnaces below 60 ppm, heat inputs range between 1.6 and 44.4 MMBtu/hr*
- 95% of metal heat treating furnaces with NOx permit limits below 60 ppm are less than 20 MMBtu/hr

Heat Input Distribution for 217 Units Permitted at < 60 ppm

Heat Input (MMBtu/hr)	Units with Permitted NOx Limit < 60 ppm
≤ 5	67
> 5 to < 20	142
≥ 20	8

Permit Limits (< 60 ppm) vs. Heat Input



* Excludes one outlier of 500+ MMBtu/hr

Metal Heat Treating Furnaces – Source Test Results

- Staff reviewed source tests of metal heat treating furnaces to identify tested emissions
- Staff identified source tests for:
  - 129 RECLAIM metal heat treating furnaces
  - 67 non-RECLAIM metal heat treating furnaces
- Only certain units are required to source test
  - RECLAIM units that do not use the default NOx emission factor (102 ppm)
  - Non-RECLAIM units (Rule 1147), when the unit reaches:
    - 35 years old: If emit < 1 lb/day NOx; or
    - 15 years old: If emit > 1 lb/day NOx

Metal Heat Treating Furnaces – Source Test Results

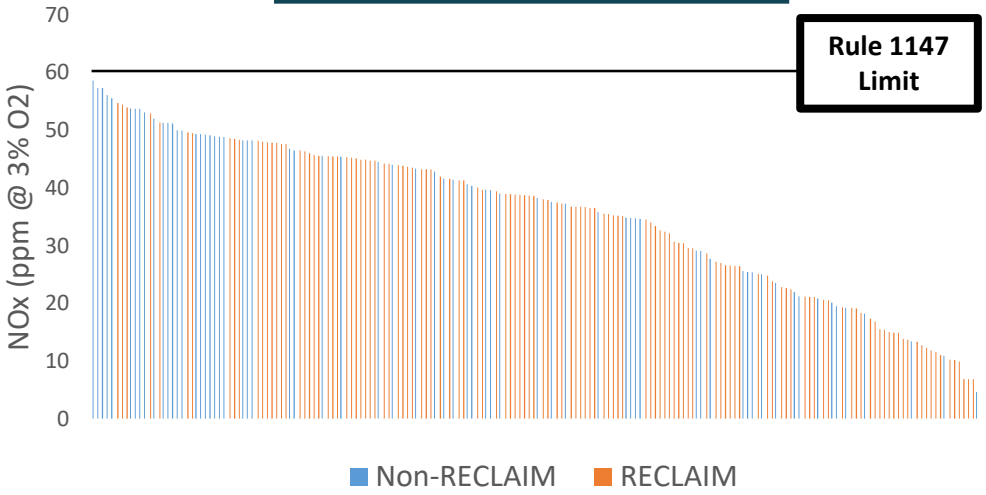
- 197 source tests with NOx emission results ranging from 4.6 to 115.0 ppm
- Combination of metal melting furnaces at RECLAIM and non-RECLAIM facilities
- 96% of the 197 units with source tests have results < 60 ppm

Source Test Results for Units Permitted at < 60 ppm*

Source Test Result Range (ppm)	# of Units
50 to < 60	5
40 to < 50	48
30 to < 40	36
20 to < 30	28
< 20	28

* 217 total units permitted at < 60 ppm:
72 units permitted at < 60 ppm did not have a source test result

Source Test Results < 60 ppm



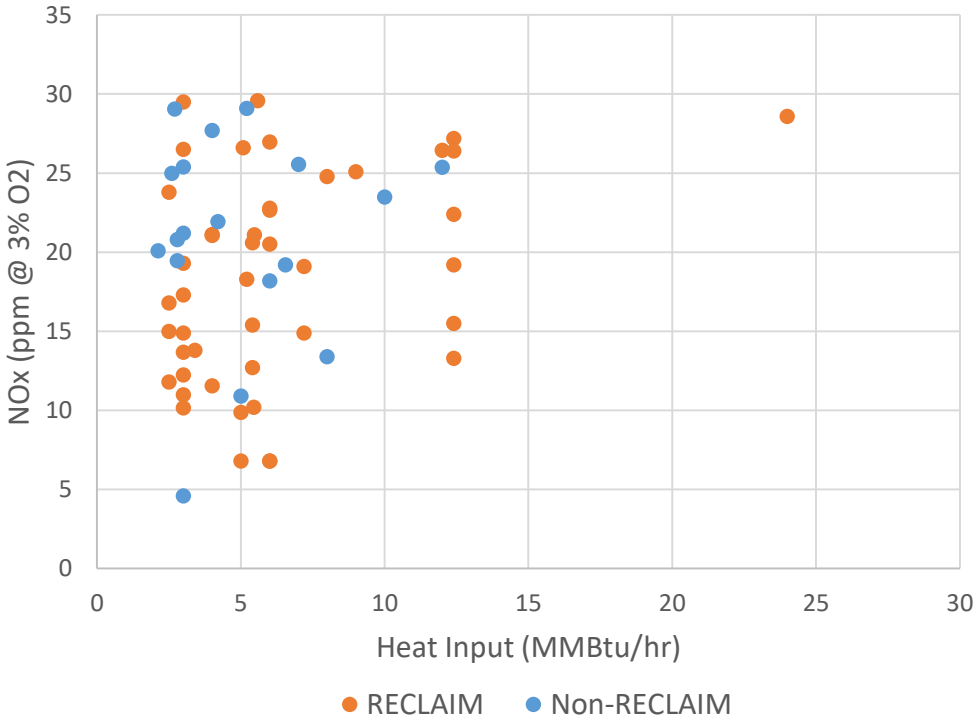
Metal Heat Treating Furnaces – Source Test Result Summary

- Of the 63 metal heat treating furnaces with source tests below 30 ppm, heat inputs range between 2.1 and 24 MMBtu/hr
- 30 units are ≤ 5 MMBtu/hr
- Even distribution of heat inputs for metal heat treating furnaces with NOx source tests below 30 ppm are < 20 MMBtu/hr

Units vs. Heat Input Ranges

Heat Input (MMBtu/hr)	Units with Source Test < 60 ppm
≤ 5	30
> 5 to < 20	32
≥ 20	1

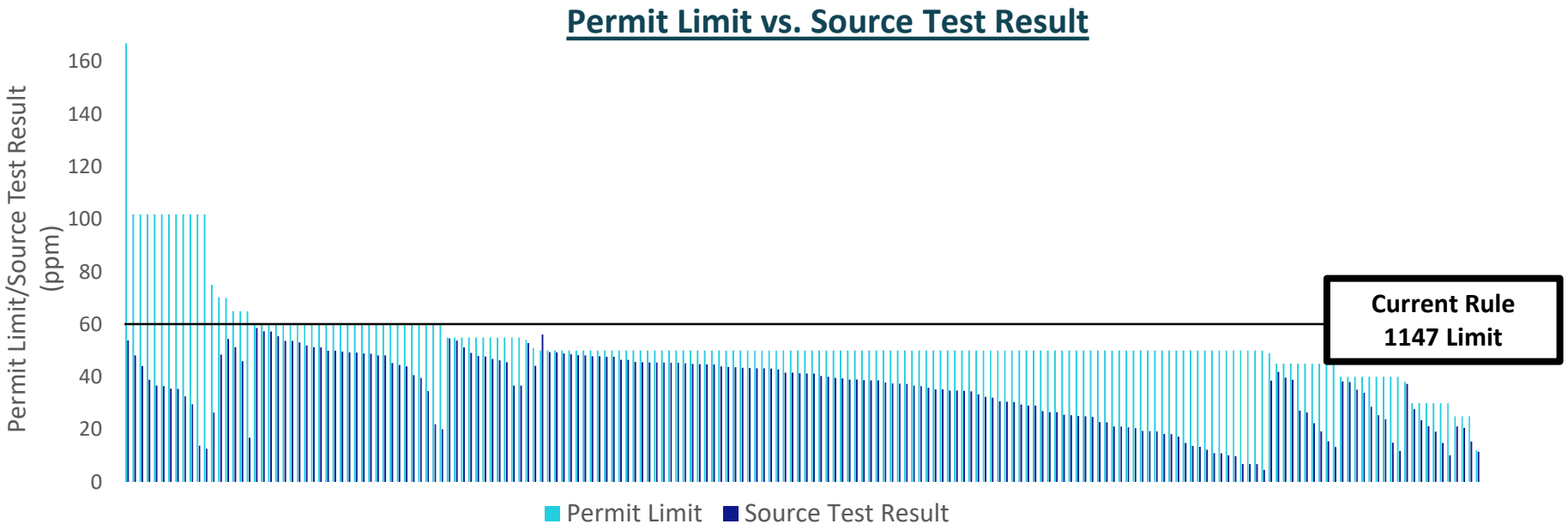
Source Test Results vs. Heat Input



Metal Heat Treating Furnaces – Permit Limits vs. Source Test Results Evaluation

- Staff compared NOx permit limit data with NOx source test results to determine metal heat treating furnace performance relative to permitted levels
- Confirmed “compliance margin” between permitted and source tested NOx levels

Metal Heat Treating Furnaces – Permit Limits vs. Source Test Results Evaluation

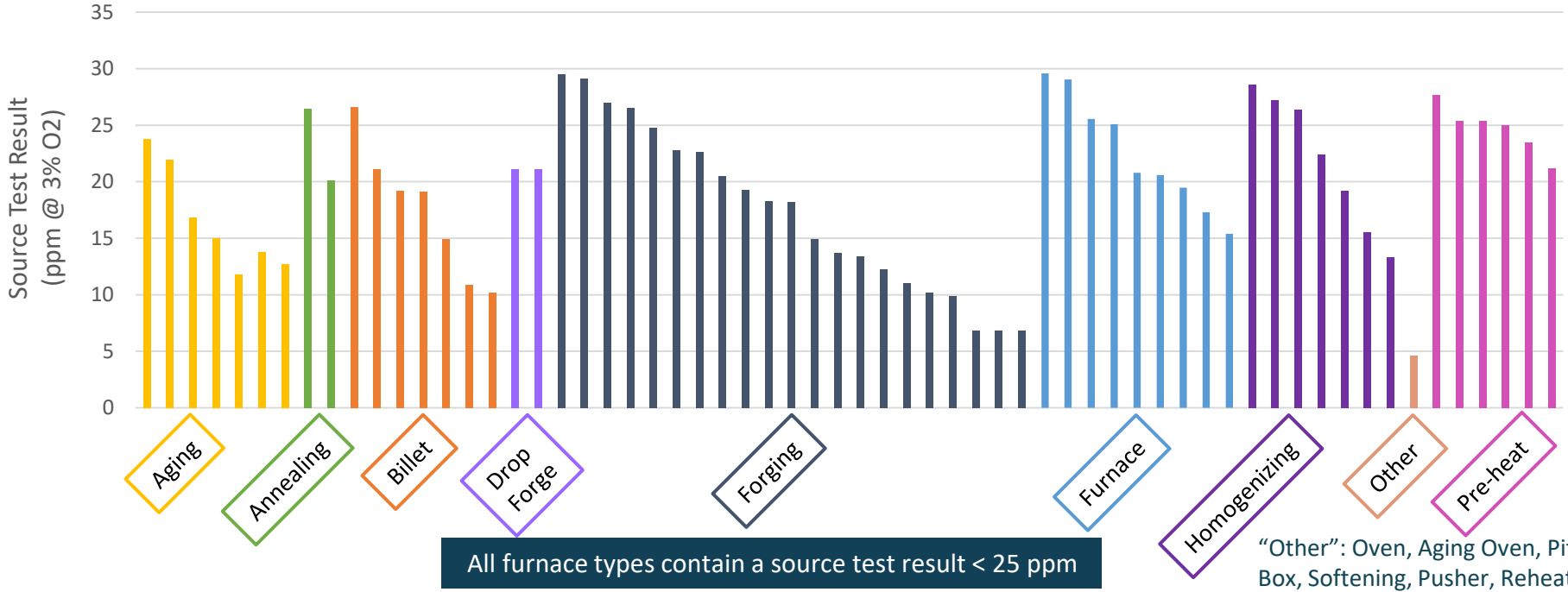


- Difference between NOx permit limit and NOx source test result
  - Source test result ranges from 0.3* - 113 ppm lower than permit limit
  - Average Difference: 18 ppm (32% lower)

* Outlier: One source test 6.1 ppm above unit's permit limit

Metal Heat Treating Furnaces – Source Test Result by Furnace Type

- Staff categorized source test data by furnace type
  - Reviewed data to determine correlation between source test result and furnace type



All furnace types contain a source test result < 25 ppm

"Other": Oven, Aging Oven, Pit, Box, Softening, Pusher, Reheat

Metal Heat Treating Furnaces – Equipment Data Summary

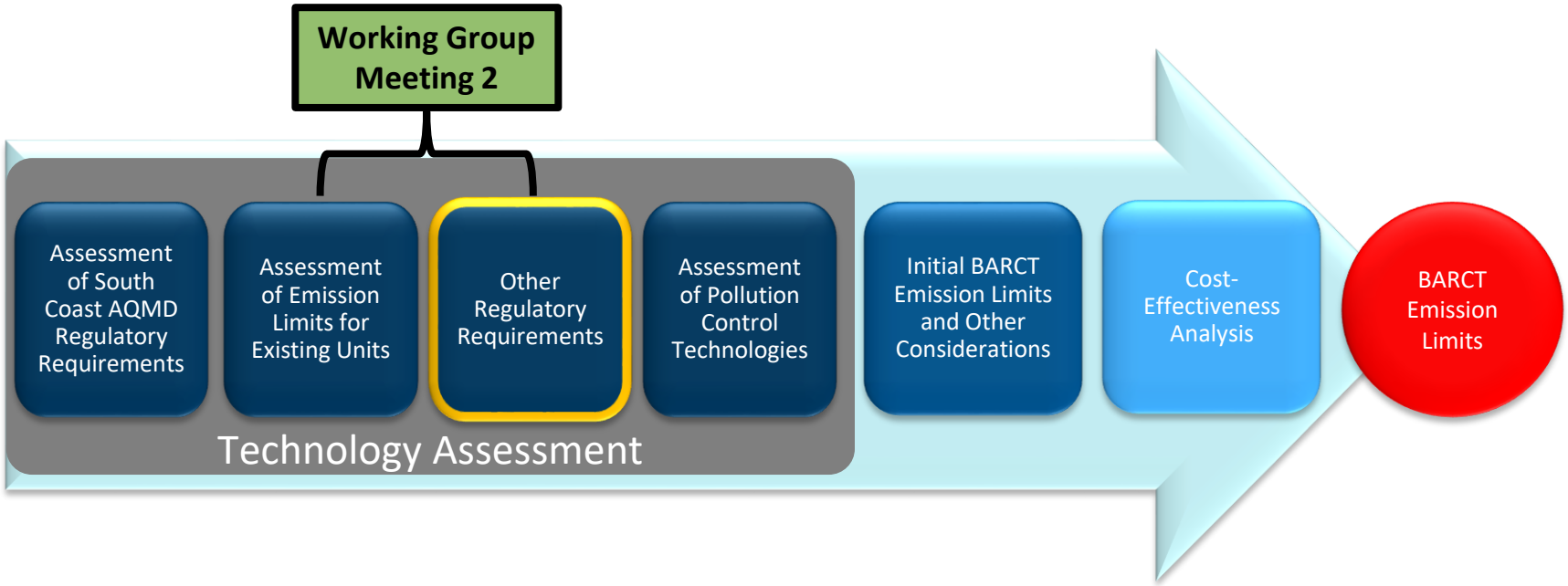
- All Permitted: 56% units permitted < 60 ppm
  - RECLAIM: 58% units permitted < 60 ppm
  - Non-RECLAIM: 52% units permitted < 60 ppm
  - RECLAIM units that that do not use the default emission factor (102 ppm) are permitted at a much lower limit (≤ 60 ppm)
- Source Tests: - NOx Concentration Level:
  - All Source Tests: 96% of the units with source tests have results < 60 ppm
  - Based on 197 source tests, 47% are below 40 ppm

Observations

- Source test results appear promising for potential emission reductions
  - Average source test result for metal melting furnaces is ~ 44 ppm
  - Average source test result for heat treating furnace is ~ 40 ppm
  - Further review necessary to examine applicability across equipment type
- Recent retrofits to be considered in rule development approach

Other Regulatory Requirements

Working Group Meeting #2: Current Progress



Objective

- Objective is to assess existing units on a local, state, and national level to:
  - Evaluate permit limits of other air districts and facility equipment across the country
  - Specify current BACT for furnaces within the South Coast AQMD
- Use data to assess potential BARCT NOx concentration limit with respect to other established limits

Staff Assessment of Emission Limits for Existing Units – South Coast AQMD (BACT)

Facility Name	Equipment Type	Heat Input (MMBtu/hr)	NOx Emission Limit (ppm @ 3% O2)
International Extrusion Corp. (Alhambra, CA)	Reverberatory Furnace (Melting Furnace)	12.8	37
Carlton Forge Works (Paramount, CA)	Forging Furnace (Heat Treating Furnace)	5.0	30

Staff Assessment of Emission Limits for California Air Districts (BARCT)

Air District	Rule #	Rule Date	Emission Limit	Equipment Category
Ventura County Air Pollution Control District	Rule 74.34	12/13/2016	60 ppm	Metal Heat Treating/ Metal Melting Furnace
Sacramento Metro Air Quality Management District	BACT Clearinghouse Determination #: 211	BACT Determination Date: 12/12/2018	60 ppm	Pot Furnace – Bronze Melting
Great Basin Unified Air Pollution Control District	Rule 404-B	9/5/1974; Amended 5/8/1996	Natural Gas: 125 ppm	Combustion Equipment
Bay Area Air Quality Management District	Regulation 9 Rule 3	3/17/1982	Natural Gas: 125 ppm	Heat Transfer Operations
Amador Air District	SIP Rule 19	9/14/1971	140 lbs/hr	Non-mobile Fuel Burning Equipment
San Joaquin Valley Air Pollution Control District	Rule 4301	12/17/1992	140 lbs/hr	Fuel Burning Equipment

Staff Assessment of Emission Limits for Existing Units – Other Air Districts (BACT)

Facility Name	Equipment	Heat Input (MMBtu/hr)	NOx Emission Limit
Vista Metals (Fontana, CA)	Billet Furnace	8.0	40
Commonwealth Aluminum Concast (Long Beach, CA)	Reverberatory Furnace	31.5	60
International Extrusion Corporation (Alhambra, CA)	Metal Heating Furnace	8.8	40
Superior Industries International (Van Nuys, CA)	Reverberatory Furnace	12.6	43
Custom Alloy Sales (Lynwood, CA)	Reverberatory Furnace	6.0	39
International Extrusion Corporation (Alhambra, CA)	Reverberatory Furnace	12.8	37

Staff Assessment of Emission Limits for Existing Units – U.S. EPA (BACT)

Facility Name	Equipment Type	Heat Input (MMBtu/hr)	Calculated NOx Emission Limit (ppm @ 3% O2)*
Constellium – Element 13 (Colbert County, AL)	Melting/Sidewell Furnace 8	36.0	33
Nucor Steel – Berkeley (Berkeley County, SC)	Galvanneal Furnace 2	22.0	39
Big River Steel (Osceola, AR)	Annealing Furnace	85.0	83
Nucor Steel Kankakee (Kankakee County, IL)	Reheat Furnace	126.0	58
Gerdau Sayreville (Middlesex County, NJ)	Billet Reheat Furnace	173.0	83
Constellium – Alloys Plant (Colbert County, AL)	Annealing Furnace	8.0	66
Constellium – Alloys Plant (Colbert County, AL)	Two Heat Treat Furnaces	25.0	50

Facility Name	Equipment Type	Heat Input (MMBtu/hr)	Calculated NOx Emission Limit (ppm @ 3% O2)*
Benteler Steel Tube (Caddo County, LA)	Annealing Furnace - S10	14.0	50
Nucor Steel Tuscaloosa (Tuscaloosa County, AL)	Austenitizing Furnace	41.0	162
Nucor Steel Tuscaloosa (Tuscaloosa County, AL)	Tempering Furnace	35.0	55
Big River Steel (Mississippi County, AR)	Annealing Coating Line Furnace Section	50.0	83
Thyssenkrup Steel USA – Mount Vernon Mill (Mobile County, AL)	Annealing Furnace	120.0	50
Allegheny Ludlum – Brackenridge Facility (Allegheny County, PA)	Four Annealing Furnaces	21.0/each	62
Allegheny Ludlum – Brackenridge Facility (Allegheny County, PA)	Four Car Bottom Furnaces	21.0/each	73

* Reported values were converted from lb/MMBtu rating to ppm rating

Reference: U.S. EPA. RACT/BACT/LAER Clearinghouse (RBLC).

Other Regulatory Data Summary

- South Coast AQMD: BACT Review
  - Metal Melting Furnaces: 37 ppm
  - Metal Heat Treating Furnaces: 30 ppm
- Other California Air Districts
  - BARCT: 60 ppm for both metal melting and metal heat treating furnaces
  - BACT: 37 ppm (metal melting) and 40 ppm (metal heat treating)
    - Lowest 6 emitters all located within the South Coast AQMD
- U.S. EPA: BACT Review
  - Metal Melting Furnace: 33 ppm
  - Metal Heat Treating Furnace: 39 ppm

Next Steps

- Continue site visits
- Continue meetings with burner manufacturers
- Examine process NOx from metal melting and heat treating
- Gather preliminary cost data for retrofit technology implementations

Rule Development Activity	Tentative Schedule
Next Working Group Meeting	September 2019
Public Workshop	September 2019
Set Hearing	October 4, 2019
Public Hearing	November 1, 2019

Contacts

PR 1147.2	PAR 1147	RECLAIM Questions	General Questions
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