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## PROPOSED AMENDED RULES 1147, 1100, & PROPOSED RULE 1147.1 WORKING GROUP MEETING #4

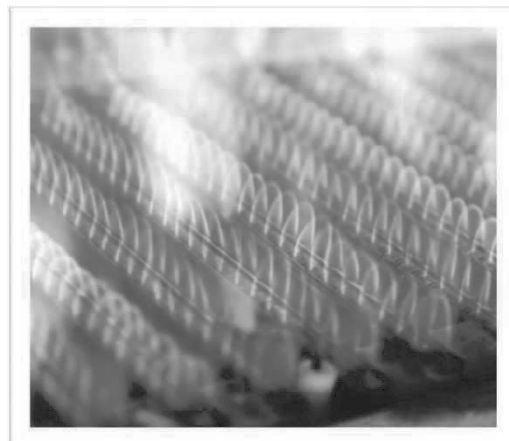
OCTOBER 23, 2019  
SOUTH COAST AQMD  
DIAMOND BAR, CA

Call-in Number: (866) 705-2554  
Passcode: 381514

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## AGENDA

- Previous Working Group Recap
- Stakeholder Comment Regarding Micro-turbines
- Summary of Survey Results
- BARCT Technology Assessment for non-RECLAIM equipment
- Next Steps



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## PREVIOUS WORKING GROUP RECAP AND STAKEHOLDER COMMENT

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## PREVIOUS WORKING GROUP RECAP

### Working Group #1

- Background on Rule 1147 and initial concepts for Proposed Amended Rule 1147 & Proposed Rule 1147.1
- Overview on RECLAIM facilities potentially impacted by PAR 1147 and PR 1147.1
- Introduced Facility Equipment Survey



### Working Group #2

- Overview of Rule 1147 RECLAIM equipment universe
- Presented emission limit assessments
- Additional considerations on emission limits for category impacting Afterburner/Thermal Oxidizer/Regenerative Thermal Oxidizer



### Working Group #3

- Presented overview of Rule 1147 non-RECLAIM equipment universe
- Proposed initial approach for PAR 1147 and PR 1147.1
- Announced beginning of emissions sampling program for RECLAIM equipment with reporting factor of 130 lb/mmscf

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## STAKEHOLDER COMMENT

**Comment:**

Micro-turbine systems that do not meet Rule 1134 applicability (under 0.30 MW) or exemption in Rule 219(b)(1) will not be covered by a landing rule in order to exit RECLAIM

**Response:**

All micro-turbines <0.3 MW would be included in Proposed Rule 1147.1

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Assessment of Emission  
Limits of Existing Units

## ANALYSIS OF SURVEY RESULTS

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# ANALYSIS OF SURVEY RESULTS

Assessment of Emission Limits of Existing Units

- ❑ Total of 2,944 surveys were mailed to RECLAIM and non-RECLAIM facilities with permitted equipment that could be applicable to Rule 1147
- ❑ Approximately 410 surveys were completed and returned (~14% of 2,944)
  - 21 surveys returned from RECLAIM facilities
  - 389 surveys returned from non-RECLAIM facilities
- ❑ From surveys returned, data from 601 pieces of equipment were analyzed
  - 90 pieces of RECLAIM equipment
  - 511 pieces of non-RECLAIM equipment
- ❑ Out of the returned surveys, 147 source test results from various source categories were received and analyzed



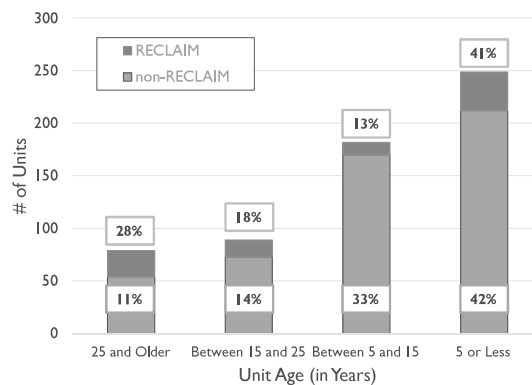
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# ANALYSIS OF UNIT AGE FROM SURVEY RESULTS

Assessment of Emission Limits of Existing Units

- ❑ Equipment from returned surveys provided insight into equipment universe
- ❑ About half of RECLAIM equipment are older than 15 years
- ❑ 75% of non-RECLAIM equipment are less than 15 years (or newer)

Survey Data – Unit Age

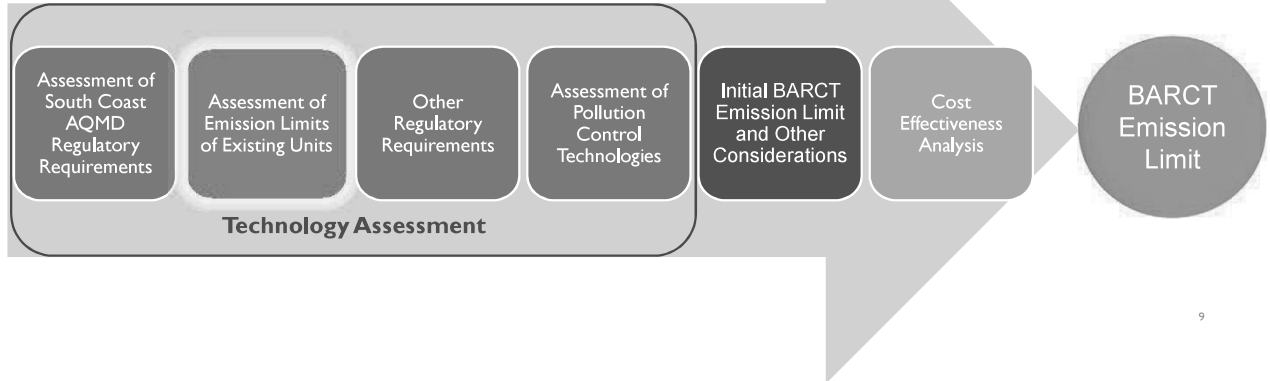


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# BARCT ANALYSIS\*+ OVERVIEW

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

+Analysis excludes equipment from PR 1147.2 and 1147.3 universe



Assessment of Emission Limits of Existing Units

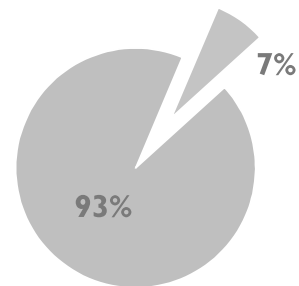
## ASSESSMENT OF PERMITTED EQUIPMENT STAFF METHODOLOGY

## ANALYSIS BACKGROUND

- ❑ Working Group #3 an initial approach for applicability for PR 1147.1 was for equipment with total heat input of greater than or equal to 5 MMBtu/hr (based on RECLAIM facilities)
- ❑ Staff has been analyzing data from non-RECLAIM facilities
- ❑ Universe from non-RECLAIM facilities is much larger than RECLAIM facilities and may provide more insight on the correlation between NO<sub>x</sub> concentration limits and equipment size

### Rule 1147 Universe

■ RECLAIM ■ Non-RECLAIM



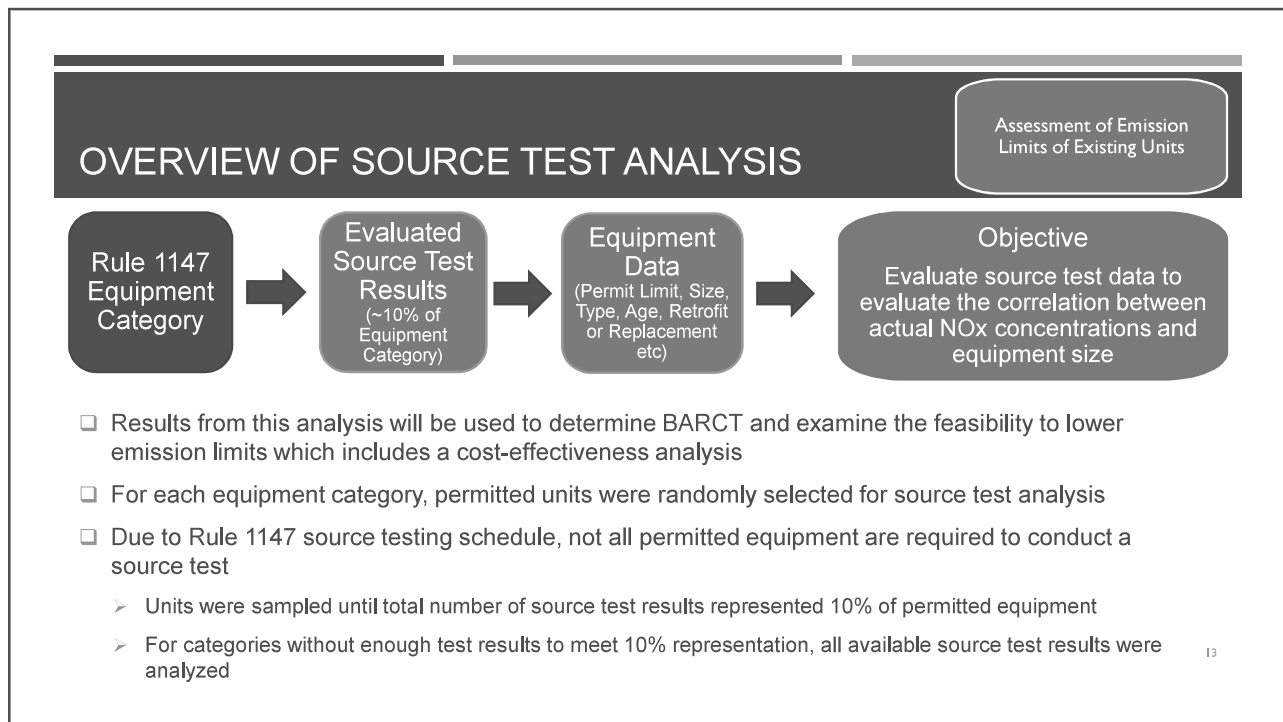
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## OVERVIEW OF STAFF METHODOLOGY

Assessment of Emission  
Limits of Existing Units

- ❑ Today's Working Group: Presenting further analysis conducted on **non-RECLAIM** equipment universe subject to Rule 1147 which includes approximately 4,800 pieces of equipment located at approximately 3,000 facilities
- ❑ Analysis conducted for each\* equipment category in Rule 1147 Table 1 – NO<sub>x</sub> Emission limit for Unit Heat Ratings >325,000 BTU/hr
  - Permitted equipment from each category will be randomly selected and analyzed by size, age, permit limit, and source test results (if available)
  - Equipment with multiple burners will be evaluated by total BTU per piece of permitted equipment
  - Additional analysis will be conducted for autoclaves and micro-turbines (new equipment categories)

\*Equipment category for "Make-Up Air Heater or other Air Heater" were evaluated during 2017 Technology Assessment for Rule 1147 equipment and were not evaluated during this rulemaking 12



## SUMMARY OF PERMITTED AND EVALUATED NON-RECLAIM EQUIPMENT

Assessment of Emission Limits of Existing Units

Equipment Description	Total Permitted Equipment	Evaluated Source Tests
Oven/Dryer/Heater/Furnace/Kiln/Heated Process Tank	1,511	174
Afterburner/Thermal Oxidizer/RTO/Oxidizer	268	68
Autoclave	-	-
Evaporator, Fryer, Heated Process Tank, or Parts Washer*	361	13
Burn-off Furnace, Burnout Oven, Incinerator or Crematory with or without Integrated Afterburner	315	68
Make-Up Air Heater or other Air Heater*	2,384 (est)	-
Tenter Frame or Fabric or Carpet Dryer	37	15
Micro-Turbines	15	11

*\*Equipment category for "Make-Up Air Heater or other Air Heater" were evaluated during 2017 Technology Assessment for Rule 1147 equipment and were not evaluated during this rulemaking*

## ASSESSMENT OF PERMITTED EQUIPMENT

OVEN/DRYER/HEATER/FURNACE/KILN/HEATED PROCESS TANK

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## EQUIPMENT CATEGORY OVERVIEW

OVEN/DRYER/HEATER/FURNACE/KILN/HEATED PROCESS TANK

### Equipment Category Analysis

- Equipment category consists of 1,511 pieces of permitted **non-RECLAIM** equipment located in 809 facilities
- Rule limit of 30 or 60 ppm depending on process temperature

### Source Test Result Analysis

- Approximately 200 source test reports were identified for further analyzed
  - Source test reports with noncompliant results or unacceptable protocols were removed
  - Final analysis consists of 174 source test results
- Identified 99 original burners and 75 burner replacements
- No heated process tanks with source tests were found for this analysis

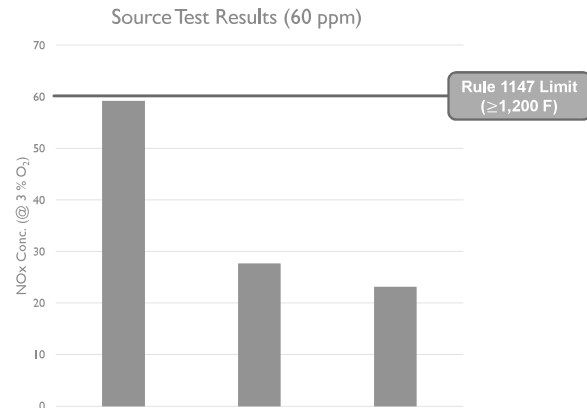
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### SOURCE TEST RESULT ANALYSIS (60 PPM LIMIT) OVEN/DRYER/HEATER/FURNACE/KILN/HEATED PROCESS TANK

Assessment of Emission Limits of Existing Units

- All three pieces of equipment are rated at 0.42 MMBtu/hr with operating temperature of 1200°F
- Two out of three units demonstrated actual NOx concentrations below 30 ppm

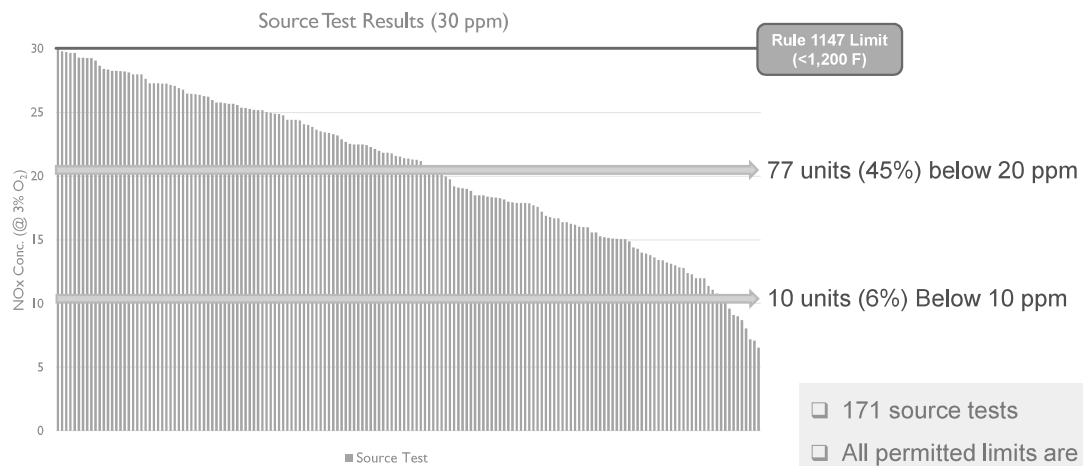


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\* NOx concentrations are corrected to 3% O<sub>2</sub> dry

### SOURCE TEST RESULT ANALYSIS (30 PPM LIMIT) OVEN/DRYER/HEATER/FURNACE/KILN/HEATED PROCESS TANK

Assessment of Emission Limits of Existing Units



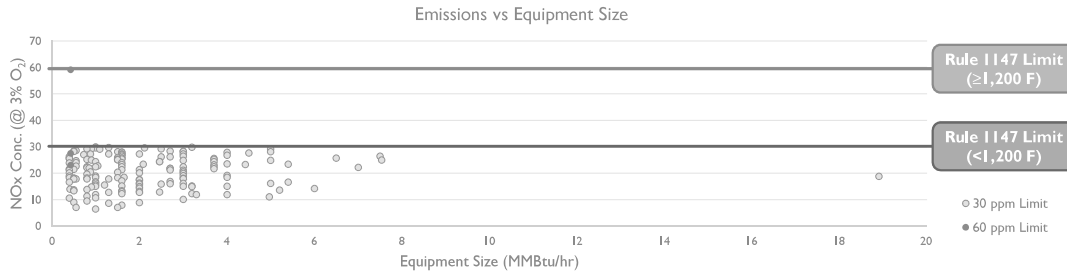
- 171 source tests
- All permitted limits are 30 ppm

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\* NOx concentrations are corrected to 3% O<sub>2</sub> dry

## ANALYSIS OF EQUIPMENT SIZE AND EMISSIONS OVEN/DRYER/HEATER/FURNACE/KILN/HEATED PROCESS TANK

Assessment of Emission Limits of Existing Units

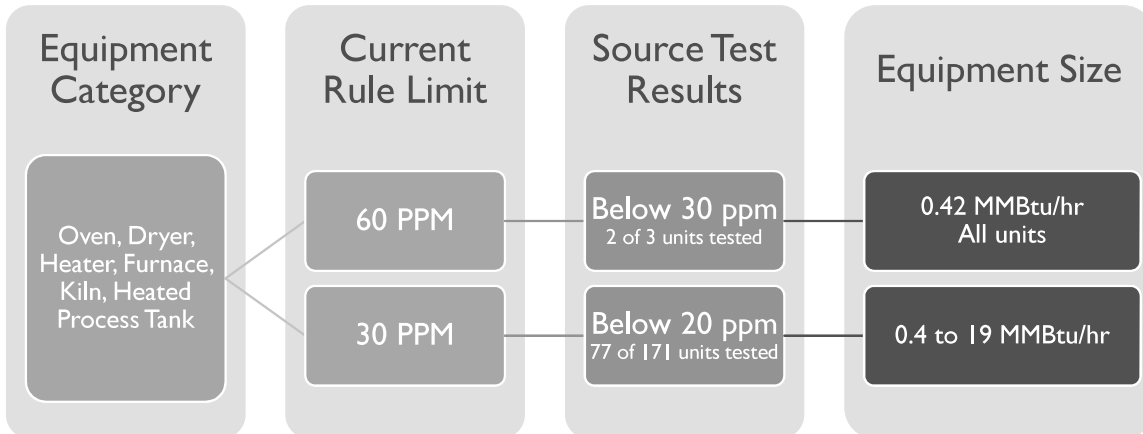


- ❑ Equipment size range from 0.4 MMBtu/hr to 19 MMBtu/hr
- ❑ At measured NOx concentrations below 10 ppm, equipment size range from 0.5 to 4 MMBtu/hr
  - At measured NOx concentrations between 10 to 20 ppm, equipment size range from 0.4 to 6 MMBtu/hr
    - One outlier rated to 19 MMBtu/hr
  - At measured NOx concentrations between 20 to 30 ppm, equipment size range from 0.4 to 7.5 MMBtu/hr
- ❑ Observed data suggests equipment size does not impact NOx concentration potential

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## SUMMARY OF SOURCE TEST ASSESSMENT OVEN/DRYER/HEATER/FURNACE/KILN/HEATED PROCESS TANK

Assessment of Emission Limits of Existing Units



Observed data suggests equipment size does not impact NOx concentration potential

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\* NOx concentrations are corrected to 3% O<sub>2</sub> dry

## ASSESSMENT OF PERMITTED EQUIPMENT

### AFTERBURNER/THERMAL OXIDIZERS/RTO/OXIDIZER

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## EQUIPMENT CATEGORY OVERVIEW

### AFTERBURNER/THERMAL OXIDIZERS/RTO/OXIDIZER

#### Equipment Category Analysis

- Equipment category consists of 268 pieces of permitted **non-RECLAIM** equipment located in 202 facilities
- 2017 Rule Amendment changed category emission limit from 30 ppm to 60 ppm
- BACT for this equipment category is currently 30 ppm

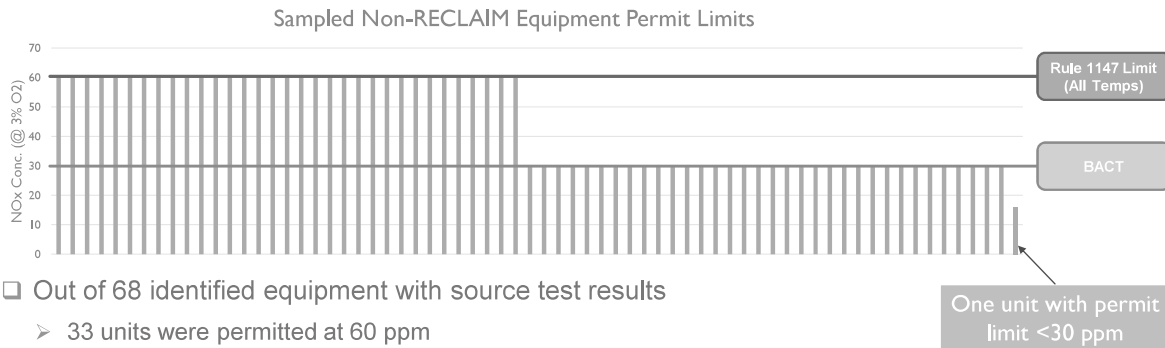
#### Source Test Result Analysis

- Approximately 93 source test reports were identified for further analysis
  - Source test reports with noncompliant results or unacceptable protocols were removed
  - Final analysis consists of 68 source test results
- Identified 42 original installations and 25 retrofits

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## OVERVIEW OF NON-RECLAIM PERMIT LIMITS AFTERBURNERS/THERMAL OXIDIZERS/RTO/OXIDIZER

Assessment of Emission  
Limits of Existing Units

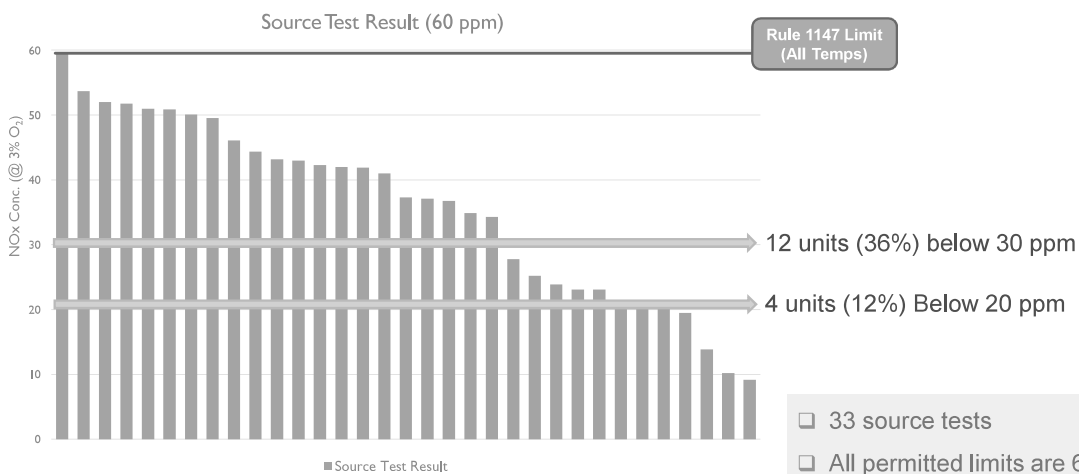


- ❑ Out of 68 identified equipment with source test results
  - 33 units were permitted at 60 ppm
  - 34 units were permitted at 30 ppm
  - 1 unit was permitted at 16 ppm (equivalent to LAER requirement of 0.02 lb/MMBtu)
- ❑ Equipment size range from 0.55 MMBtu/hr to 20.0 MMBtu/hr

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## SOURCE TEST RESULT ANALYSIS (60 PPM LIMIT) AFTERBURNER/THERMAL OXIDIZERS/RTO/OXIDIZER

Assessment of Emission  
Limits of Existing Units

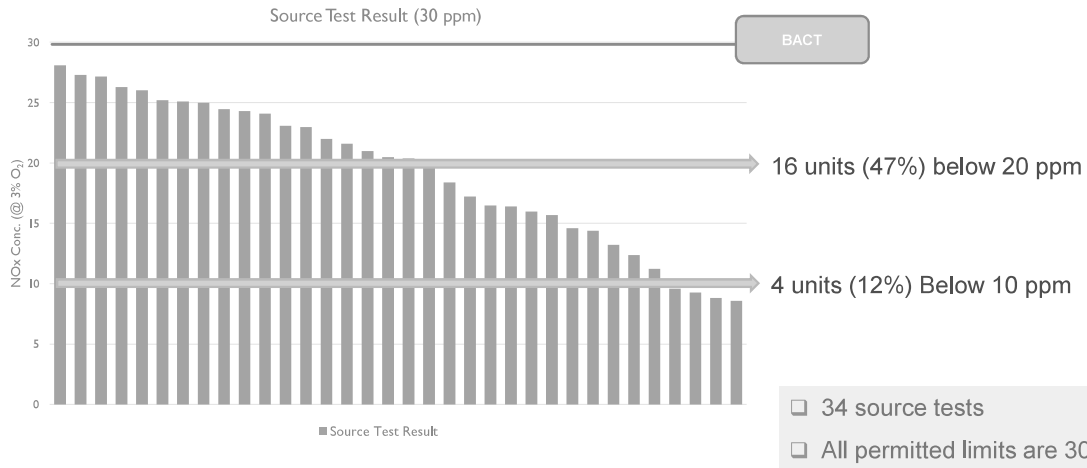


\* NOx concentrations are corrected to 3% O<sub>2</sub> dry

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## SOURCE TEST RESULT ANALYSIS (30 PPM LIMIT) AFTERBURNER/THERMAL OXIDIZERS/RTO/OXIDIZER

Assessment of Emission Limits of Existing Units

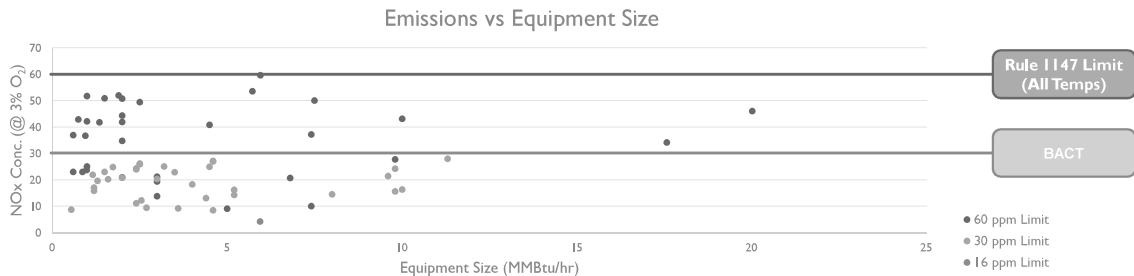


\* NOx concentrations are corrected to 3% O<sub>2</sub> dry

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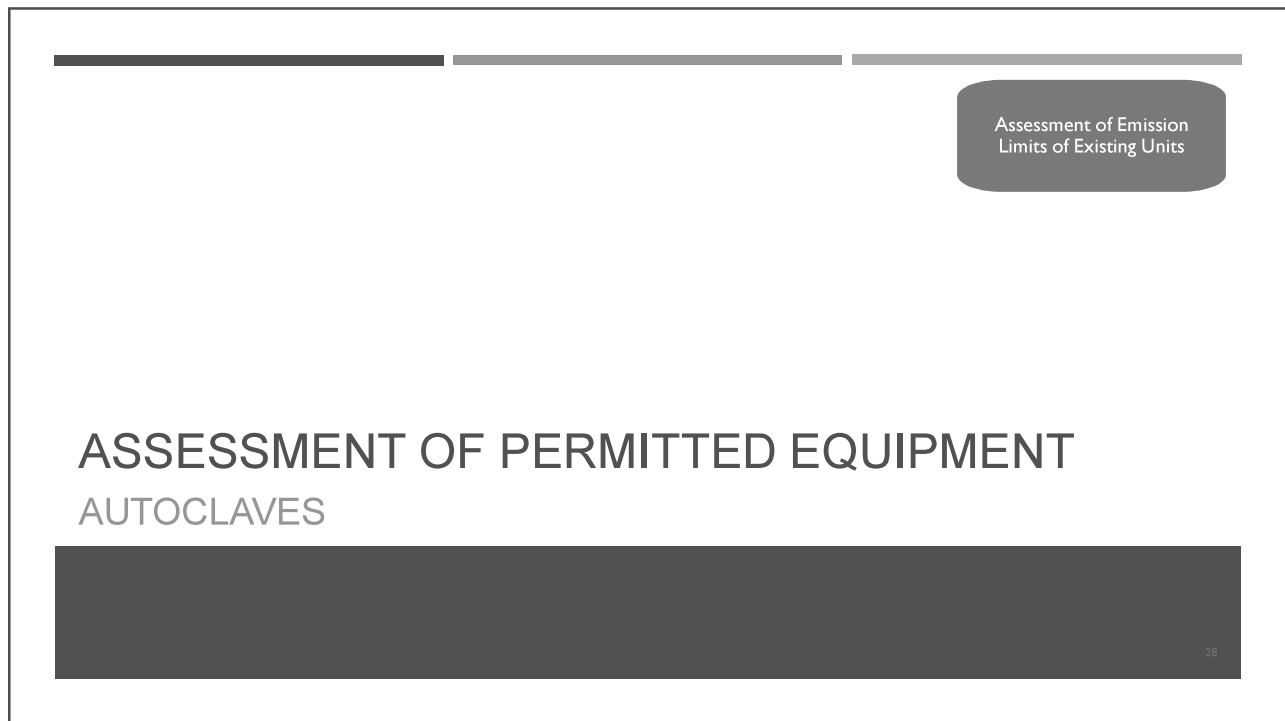
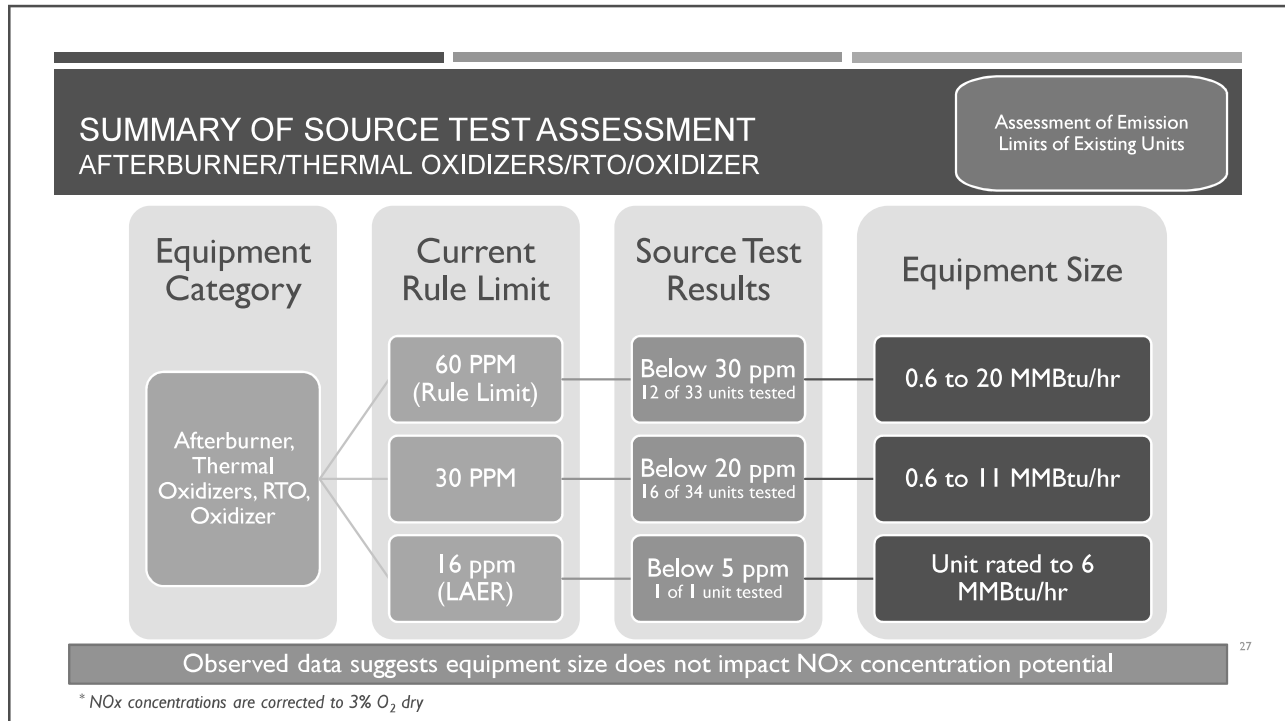
## ANALYSIS OF EQUIPMENT SIZE AND EMISSIONS AFTERBURNER/THERMAL OXIDIZERS/RTO/OXIDIZER

Assessment of Emission Limits of Existing Units



- Equipment size range from 0.6 MMBtu/hr to 20 MMBtu/hr (Average: 4.2)
  - At measured NOx concentrations below 20 ppm, equipment size range from 0.6 to 10 MMBtu/hr
  - At measured NOx concentrations between 20 to 30 ppm, equipment size range from 0.6 to 11 MMBtu/hr
  - At measured NOx concentrations between 30 to 60 ppm, equipment size range from 0.6 to 10 MMBtu/hr
    - Two outliers at 18 and 20 MMBtu/hr
- Observed data suggests equipment size does not impact NOx concentration potential

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## EQUIPMENT CATEGORY OVERVIEW

### AUTOCLAVES

Assessment of Emission  
Limits of Existing Units

#### Equipment Category Analysis

- Autoclaves are currently under the category regulating oven/dryer/heater/furnace/kiln/heated process tank
- Identified five non-RECLAIM autoclaves
  - Four units are heated with electric heaters
  - One unit is indirectly heated with steam
- All identified autoclaves subject to Rule 1147 are located in RECLAIM
  - Additional analysis to be conducted on RECLAIM units

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Assessment of Emission  
Limits of Existing Units

## ASSESSMENT OF PERMITTED EQUIPMENT

### EVAPORATOR/FRYER/HEATED PROCESS TANK/PARTS WASHER

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## EQUIPMENT CATEGORY OVERVIEW EVAPORATOR/FRYER/HEATED PROCESS TANK/PARTS WASHER

Assessment of Emission Limits of Existing Units

### Equipment Category Analysis

- Equipment category consists of 361 pieces of permitted **non-RECLAIM** equipment located in 192 facilities
- Many units in this category are heated indirectly or with electric heaters
- Current Rule 1147 limit is 60 ppm and does not have a compliance date for existing evaporator, heated process tank or parts washer permitted and in operation prior to January 1, 2014
- Equipment installed after 2008 are required to demonstrate compliance with rule requirements

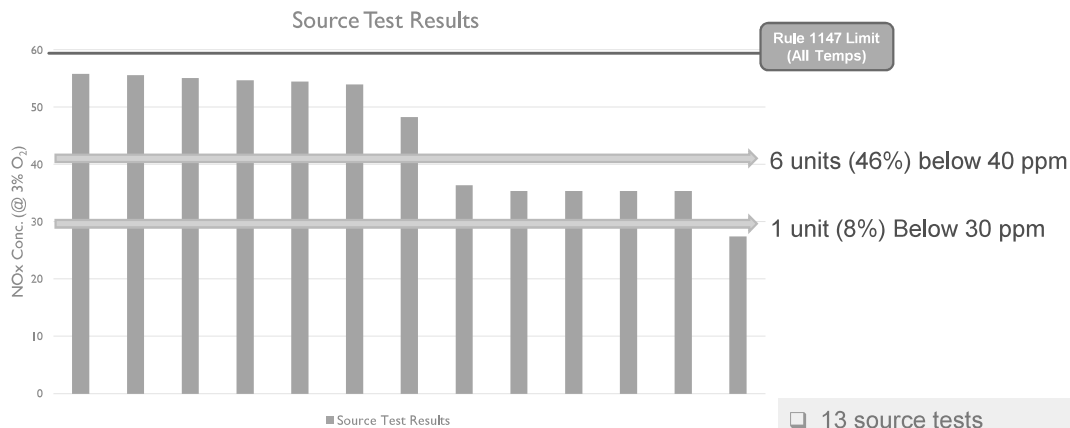
### Source Test Result Analysis

- Approximately 14 source test reports were identified for further analysis
  - Source test reports with noncompliant results or unacceptable protocols were removed
  - Final analysis consists of 13 source test results
- All units analyzed were original installations

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## SOURCE TEST RESULT ANALYSIS EVAPORATOR/FRYER/HEATED PROCESS TANK/PARTS WASHER

Assessment of Emission Limits of Existing Units



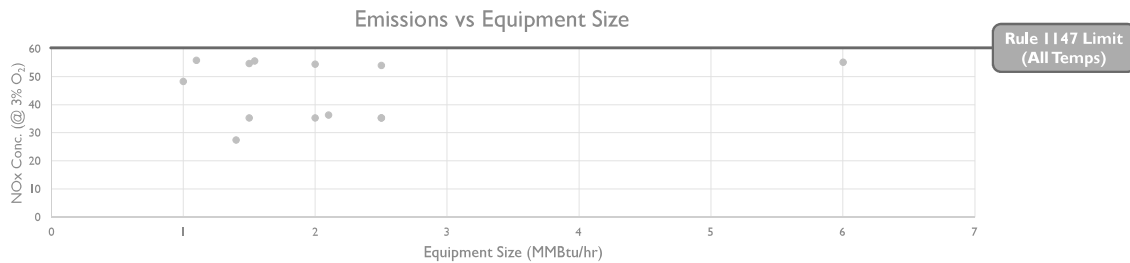
\* NOx concentrations are corrected to 3% O<sub>2</sub> dry

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## ANALYSIS OF EQUIPMENT SIZE AND EMISSIONS EVAPORATOR/FRYER/HEATED PROCESS TANK/PARTS WASHER

Assessment of Emission Limits of Existing Units

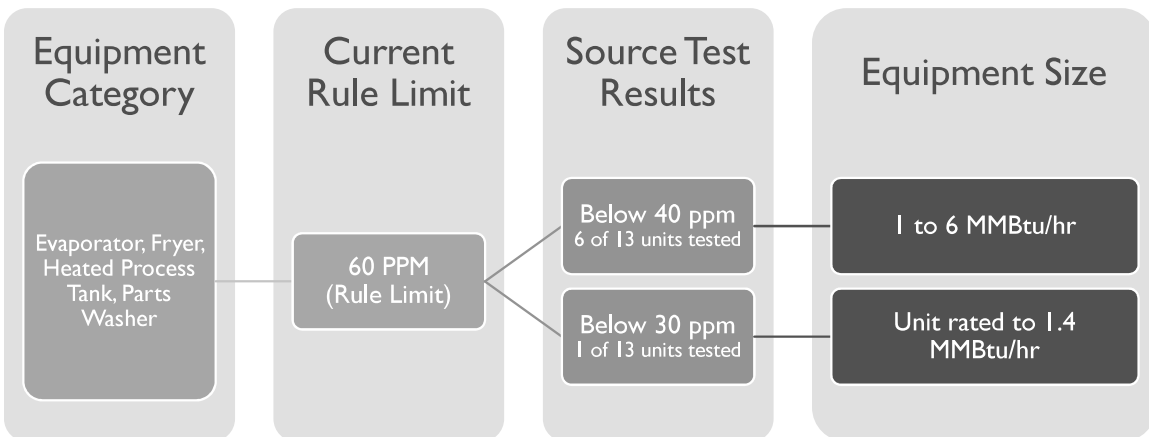


- ❑ Equipment size range from 1 MMBtu/hr to 6 MMBtu/hr (Average: 2.1 MMBtu/hr)
  - One unit with measured NOx concentration below 30 ppm rated at 1.4 MMBtu/hr
  - At measured NOx concentrations between 30 to 45 ppm, equipment size range from 1.5 to 2.5 MMBtu/hr
  - At measured NOx concentrations between 45 to 60 ppm, equipment size range from 1.0 to 2.5 MMBtu/hr
    - One outlier at 6 MMBtu/hr
- ❑ Observed data suggests equipment size does not impact NOx concentration potential

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## SUMMARY OF SOURCE TEST ASSESSMENT EVAPORATOR/FRYER/HEATED PROCESS TANK/PARTS WASHER

Assessment of Emission Limits of Existing Units



Observed data suggests equipment size does not impact NOx concentration potential

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\* NOx concentrations are corrected to 3% O<sub>2</sub> dry

## ASSESSMENT OF PERMITTED EQUIPMENT

BURN-OFF FURNACE/BURNOUT OVEN/INCINERATOR/CREMATORY WITH OR WITHOUT INTEGRATED AFTERBURNER

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## EQUIPMENT CATEGORY OVERVIEW

BURN-OFF FURNACE/BURNOUT OVEN/INCINERATOR/CREMATORY WITH OR WITHOUT INTEGRATED AFTERBURNER

### Equipment Category Analysis

- Equipment category consists of 315 pieces of permitted **non-RECLAIM** equipment located in 174 facilities
- Some units have multiple burners and chambers with different process temperatures
- 2017 Rule Amendment changed category emission limit of process temperatures below 800 °F from 30 ppm to 60 ppm
- Rule limit for this category is currently 60 ppm across all process temperatures

### Source Test Result Analysis

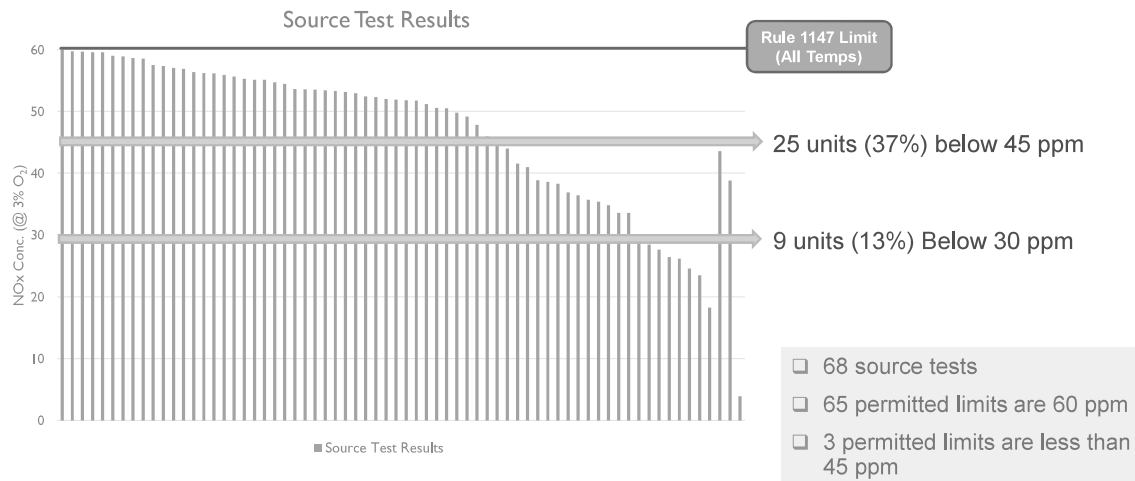
- Approximately 69 source test reports were identified for further analysis
  - Source test reports with noncompliant results or unacceptable protocols were removed
  - Final analysis consists of 68 source test results
- Identified 49 original installations and 19 retrofits

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## SOURCE TEST RESULT ANALYSIS

BURN-OFF FURNACE/BURNOUT OVEN/INCINERATOR/CREMATORY WITH OR WITHOUT INTEGRATED AFTERBURNER

Assessment of Emission Limits of Existing Units



\* NOx concentrations are corrected to 3% O<sub>2</sub> dry

## ANALYSIS OF EQUIPMENT SIZE AND EMISSIONS

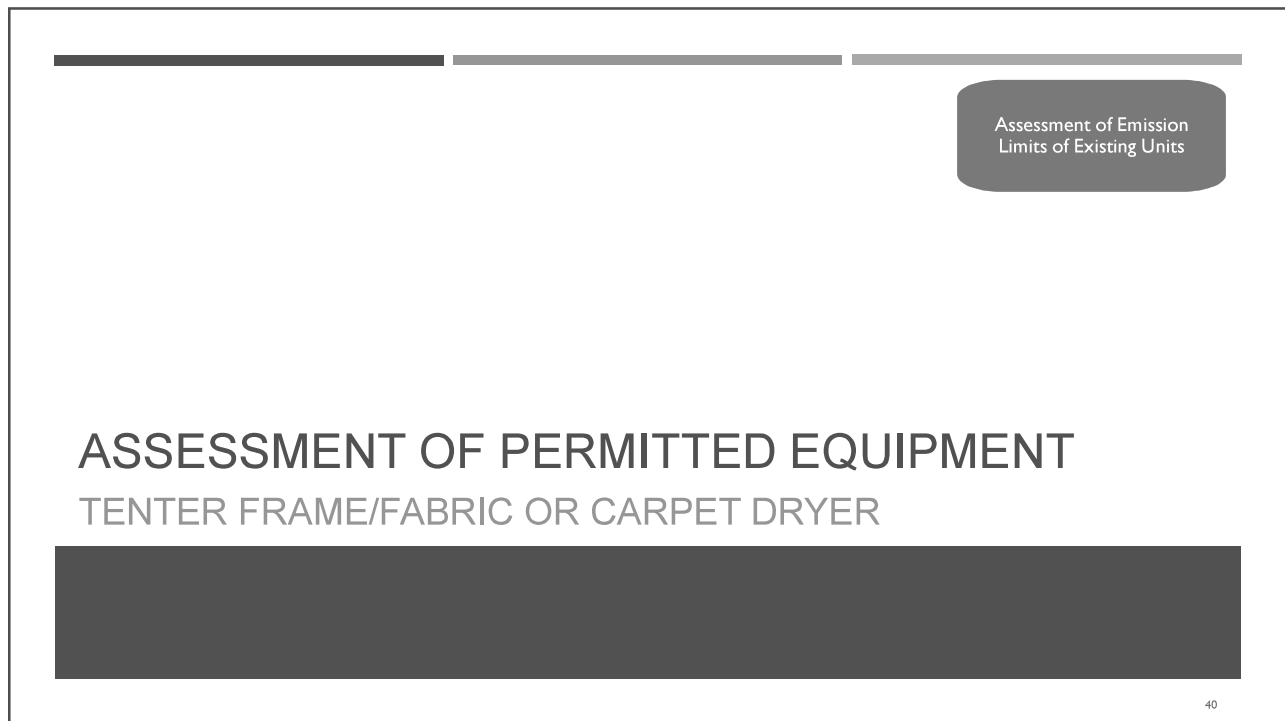
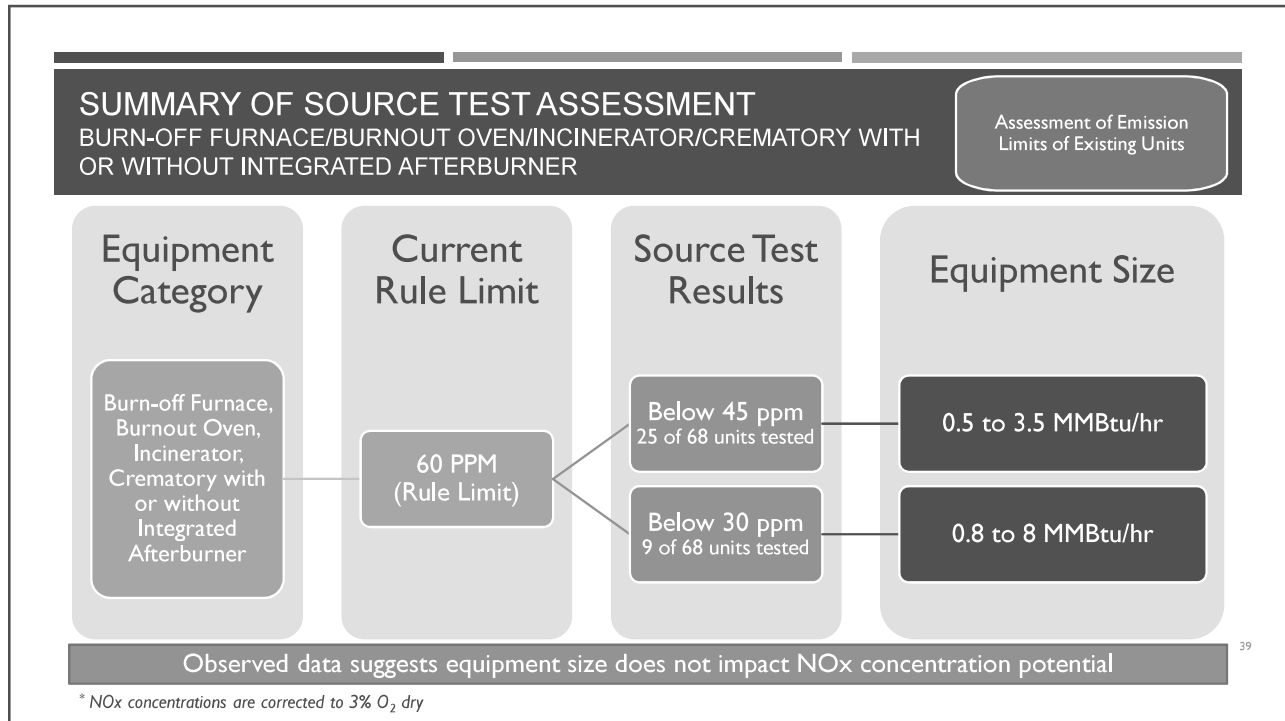
BURN-OFF FURNACE/BURNOUT OVEN/INCINERATOR/CREMATORY WITH OR WITHOUT INTEGRATED AFTERBURNER

Assessment of Emission Limits of Existing Units



- Equipment size range from 0.5 MMBtu/hr to 8 MMBtu/hr (Average: 2.1 MMBtu/hr)
  - At measured NOx concentrations below 30 ppm, equipment size range from 0.8 to 8 MMBtu/hr
  - At measured NOx concentrations between 30 to 45 ppm, equipment size range from 0.5 to 3.5 MMBtu/hr
  - At measured NOx concentrations between 45 to 60 ppm, equipment size range from 0.7 to 6 MMBtu/hr
- Observed data suggests equipment size does not impact NOx concentration potential

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## EQUIPMENT CATEGORY OVERVIEW TENTER FRAME/FABRIC OR CARPET DRYER

Assessment of Emission  
Limits of Existing Units

### Equipment Category Analysis

- ❑ Equipment category consists of 37 pieces of permitted **non-RECLAIM** equipment located in 10 facilities
- ❑ Units installed during or prior to 2008 were subject to the permit limit of 60 ppm
- ❑ Rule limit for this category is currently 30 ppm across all process temperatures
  - Units in this category all operate below 800°F

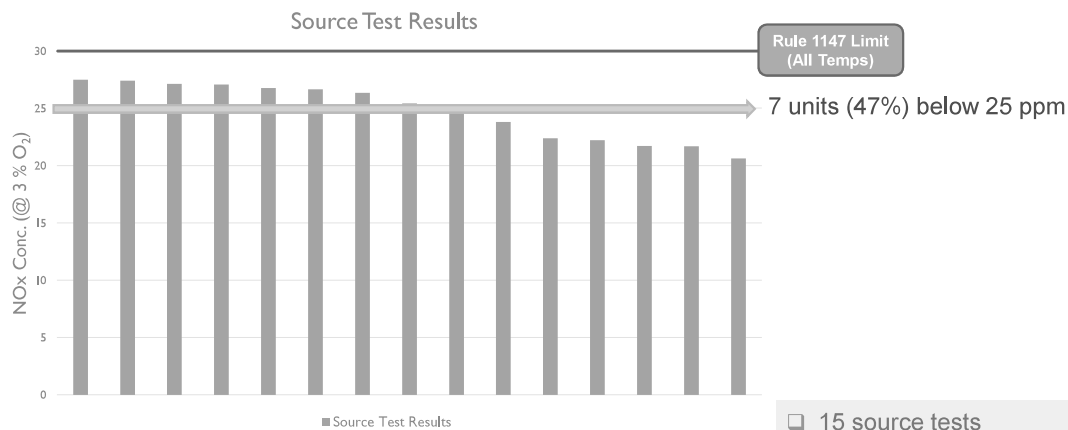
### Source Test Result Analysis

- ❑ Approximately 20 source test reports were identified for further analysis
  - Source test reports with demonstrating compliance to 60 ppm limit were removed
  - Final analysis consists of 15 source test results
- ❑ Identified 8 original installations and 7 retrofits

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## SOURCE TEST RESULT ANALYSIS TENTER FRAME/FABRIC OR CARPET DRYER

Assessment of Emission  
Limits of Existing Units

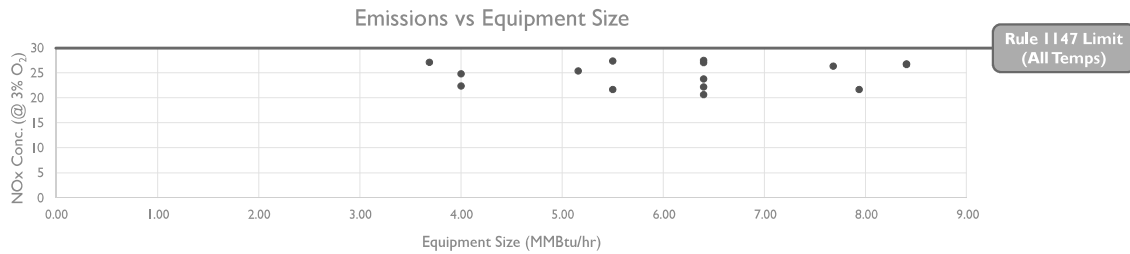


- ❑ 15 source tests
- ❑ All permitted limits are 30 ppm

\* NOx concentrations are corrected to 3% O<sub>2</sub> dry

## ANALYSIS OF EQUIPMENT SIZE AND EMISSIONS TENTER FRAME/FABRIC OR CARPET DRYER

Assessment of Emission Limits of Existing Units

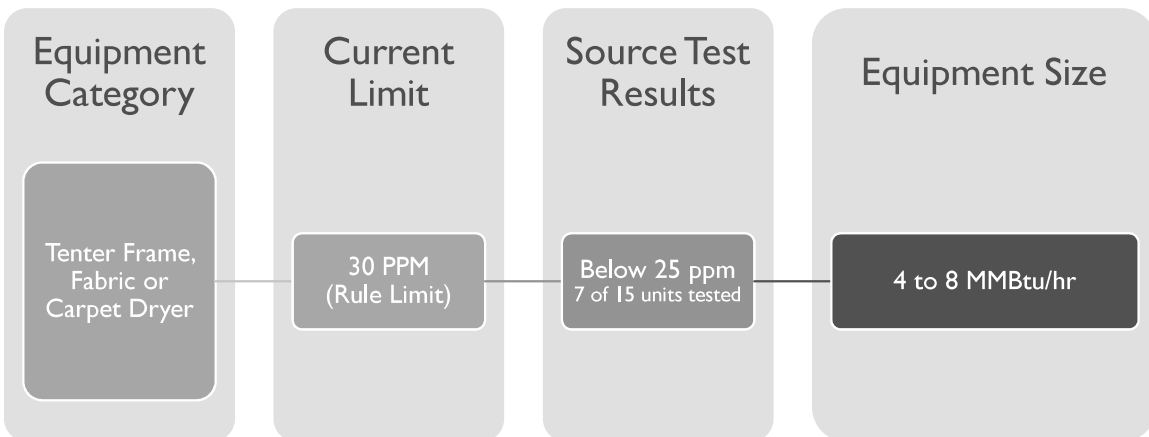


- ❑ Equipment size range from 4 MMBtu/hr to 8.5 MMBtu/hr (Average: 6.2 MMBtu/hr)
  - At measured NOx concentrations below 25 ppm, equipment size range from 4 to 8 MMBtu/hr
  - At measured NOx concentrations between 25 to 30 ppm, equipment size range from 4 to 8.5 MMBtu/hr
- ❑ Observed data suggests equipment size does not impact NOx concentration potential

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## SUMMARY OF SOURCE TEST ASSESSMENT TENTER FRAME/FABRIC OR CARPET DRYER

Assessment of Emission Limits of Existing Units



Observed data suggests equipment size does not impact NOx concentration potential

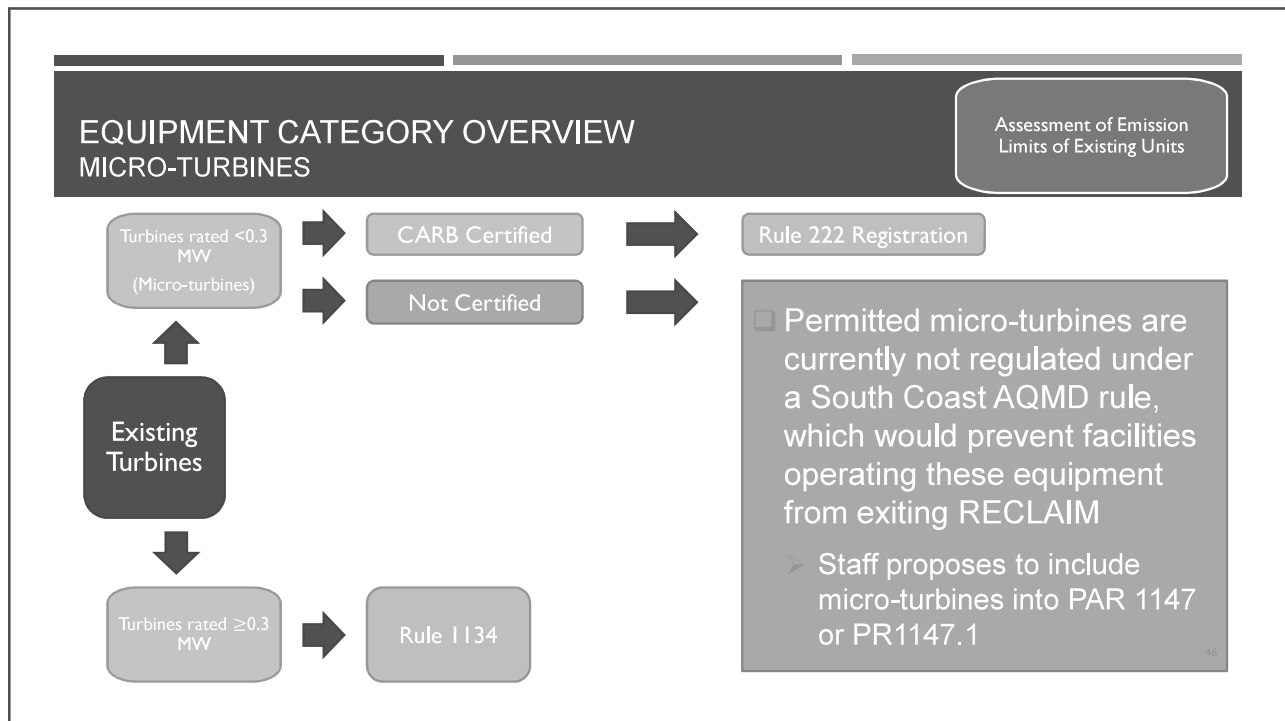
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\* NOx concentrations are corrected to 3% O<sub>2</sub> dry

Assessment of Emission Limits of Existing Units

## ASSESSMENT OF PERMITTED EQUIPMENT

### MICRO-TURBINES



## SOURCE TEST RESULT ANALYSIS MICRO-TURBINES

Assessment of Emission  
Limits of Existing Units

### Equipment Category Analysis

- ❑ Equipment category consists of 15 pieces of permitted **non-RECLAIM** equipment located in 10 facilities
- ❑ Micro-turbines are not currently regulated under any South Coast AQMD rule
- ❑ Permit limits of equipment in this category is 9 ppm (*corrected to 15% O<sub>2</sub>*) and require periodic source testing every 3 to 5 years
  - Limit based off of OEM guarantees

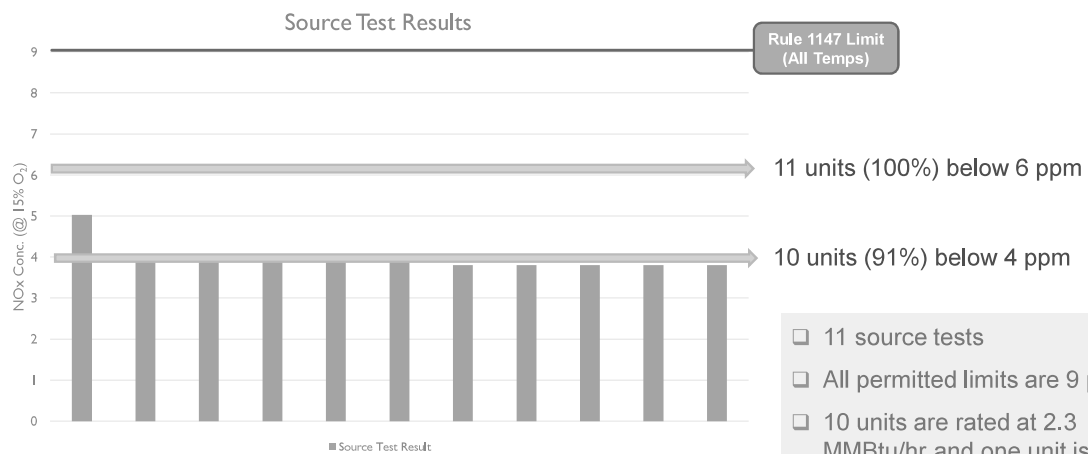
### Source Test Result Analysis

- ❑ Approximately 11 source test reports were identified for further analysis
  - Analysis considers all available source test results
  - Sampled equipment are all located in the same facility
- ❑ All units are original installations and natural gas fired

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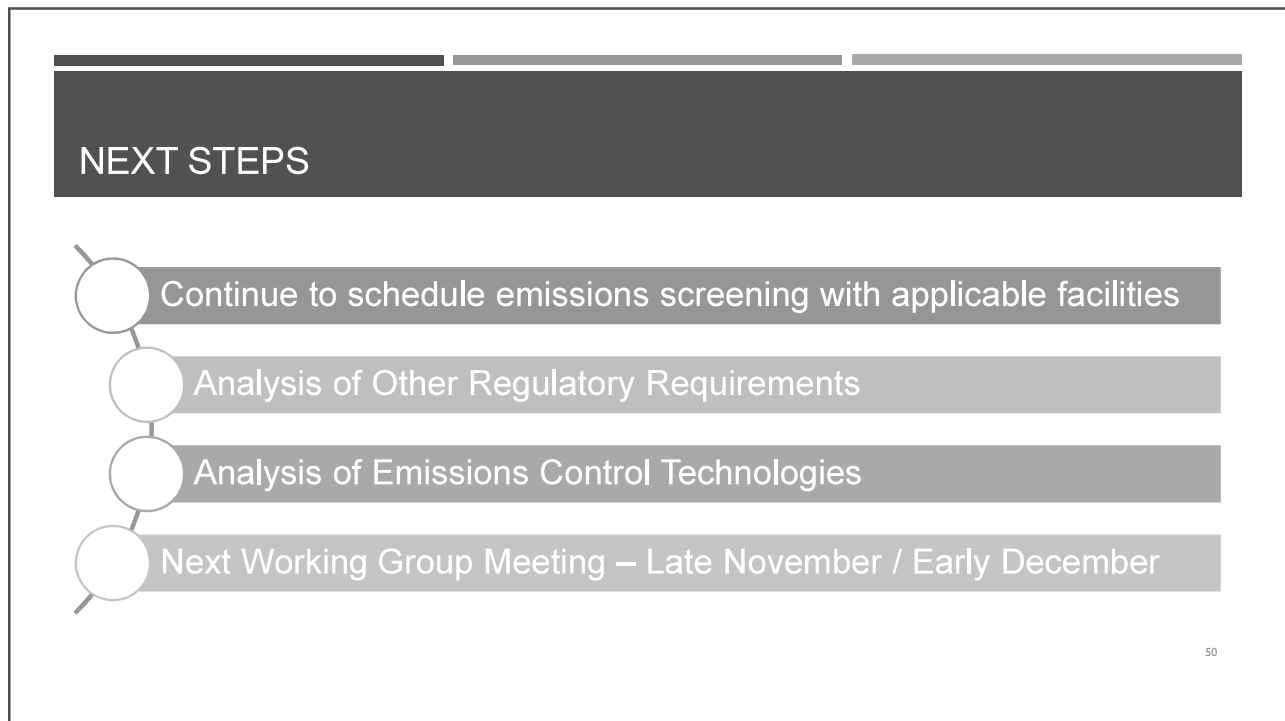
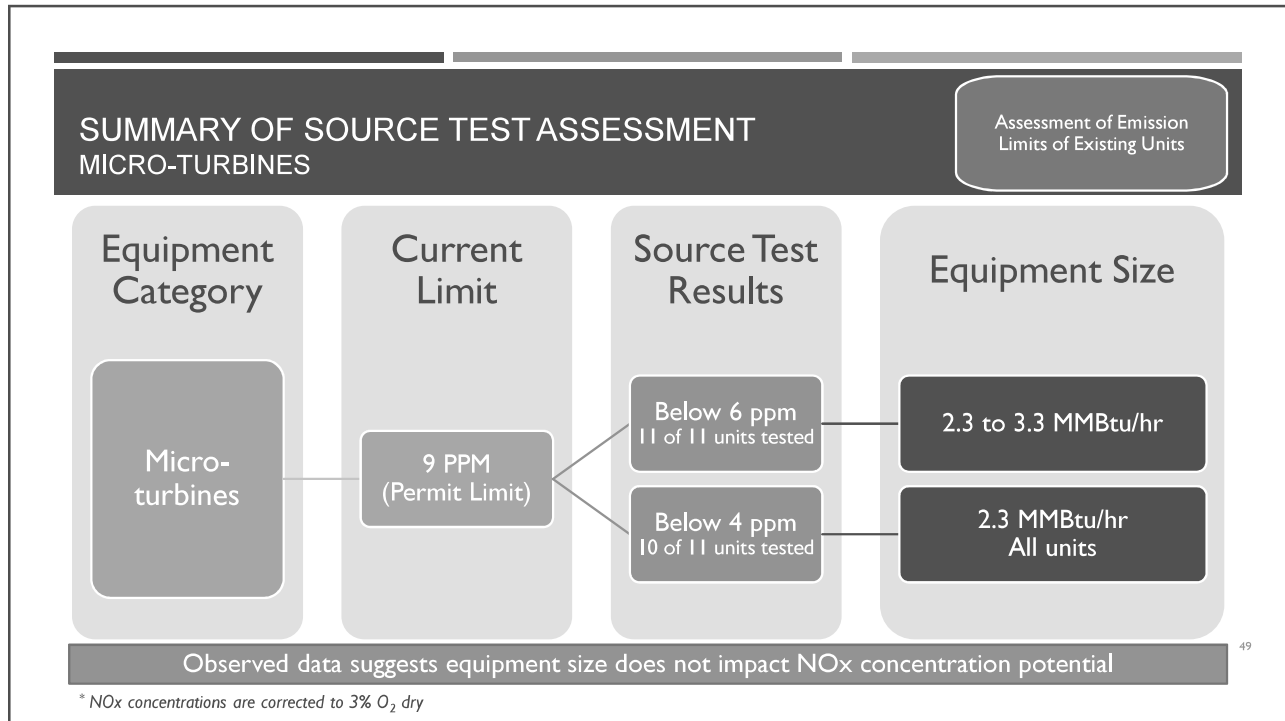
## SOURCE TEST RESULT ANALYSIS MICRO-TURBINES

Assessment of Emission  
Limits of Existing Units



\* NOx concentrations are corrected to 15% O<sub>2</sub> dry





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