RULE 1146.2 - EMISSIONS OF OXIDES OF NITROGEN FROM LARGE WATER HEATERS AND SMALL BOILERS AND PROCESS HEATERS

WORKING GROUP MEETING #1

DECEMBER 16, 2021, THURSDAY

ZOOM MEETING: HTTPS://SCAQMD.ZOOM.US/J/94399626657

MEETING ID: 943 9962 6657

CONFERENCE CALL: +1 (669) 900-6833

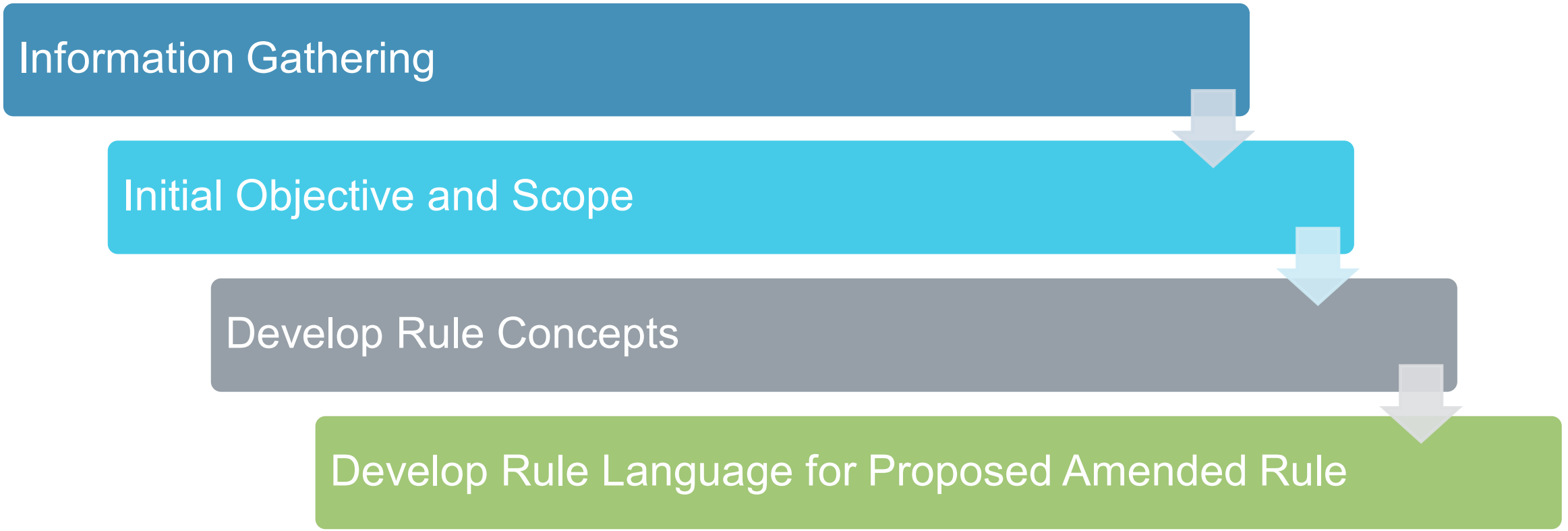
AGENDA

- Background
- Rulemaking Process
- Rule 1146.2 Background
  - Unit Classification
  - Timeline of NOx Limits
  - Comparison with Other Rules
- 2018 Amendment to Rule 1146.2
- Technology assessment
  - Affected units
  - Current technology
  - Feedbacks from manufacturers
- Staff recommendation

BACKGROUND

- Rules 1146 and 1146.1 were amended in 2018, when the updated NOx limits became applicable to RECLAIM and non-RECLAIM units
- Rule 1146.2 was amended along with Rules 1146 and 1146.1 in 2018, requiring:
  - 20 ppm NOx limit for new installations in RECLAIM and non-RECLAIM facilities; and
  - Conducting a technology assessment and reporting to the Governing Board by January 1, 2022, addressing existing units in RECLAIM and non-RECLAIM facilities and BARCT
- Staff started to meet with vendors for the assessment in August 2021
- Initial findings of the technology assessment will be reported to the Stationary Source Committee in January 2022

RULE DEVELOPMENT PROCESS



RULE 1146.2 BACKGROUND

- Adopted in 1998 and was amended in 2006 to lower NOx emission limit from 30 to 20 ppm
- Regulates NOx emissions from natural gas-fired water heaters, boilers, and process heaters with a rated heat input capacity less than or equal to 2,000,000 BTU per hour
- Applicable to manufacturers, distributors, retailers, re-furbishers, installers and operators

UNIT CLASSIFICATION

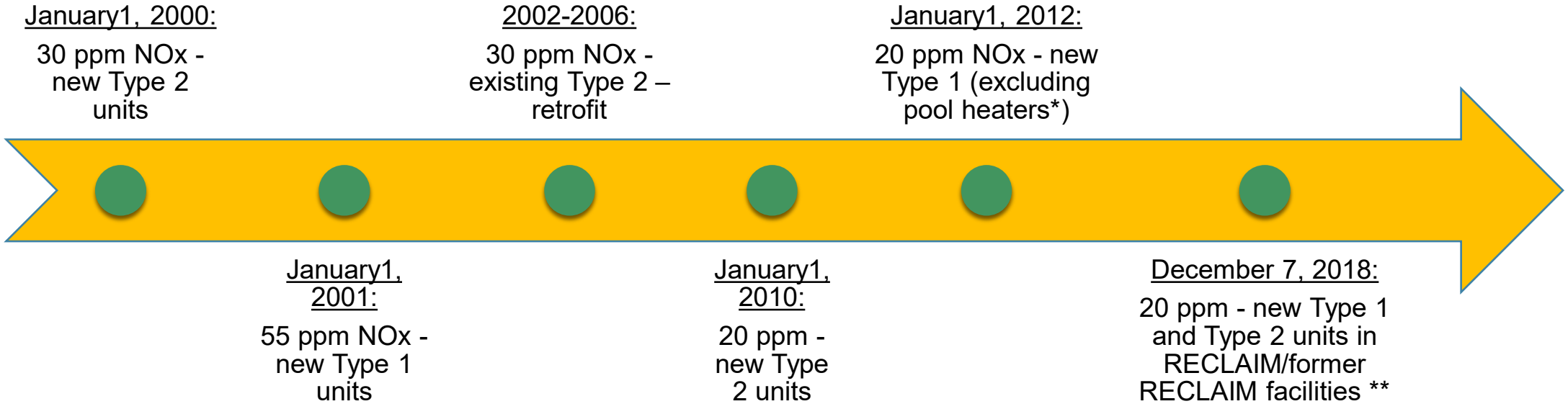
Type 1

- Units ≤400,000 BTU/hr excluding water heaters subject to Rule 1121

Type 2

- Units >400,000 BTU/hr and ≤2,000,000 BTU/hr

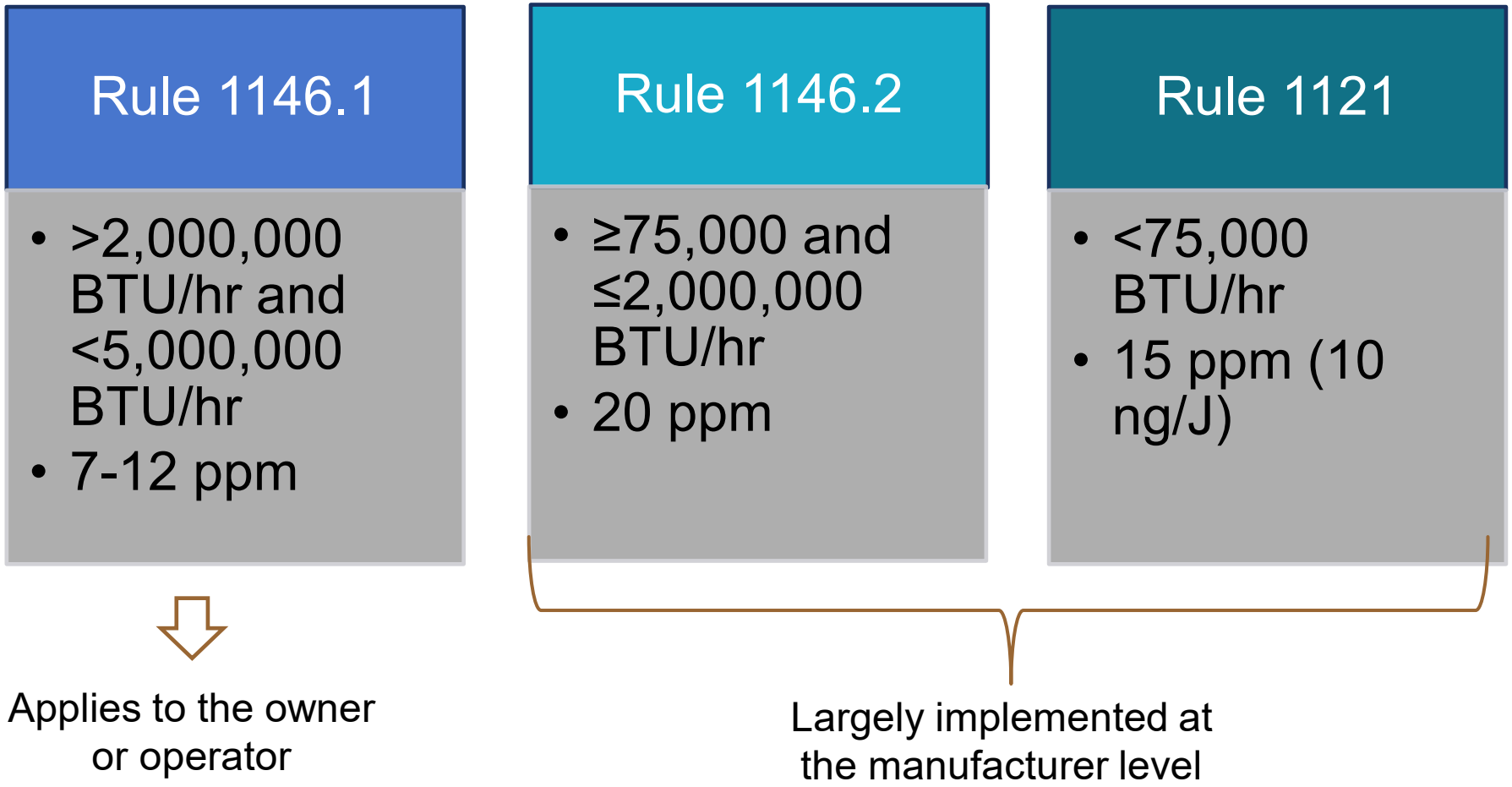
IMPLEMENTATION OF NOX LIMITS



* *New Type 1 pool heaters continue to be subject to 55 ppm*

** *Existing Type 2 units in RECLAIM/former RECLAIM facilities are subject to technology assessment*

COMPARISON TO OTHER WATER HEATER/BOILER RULES

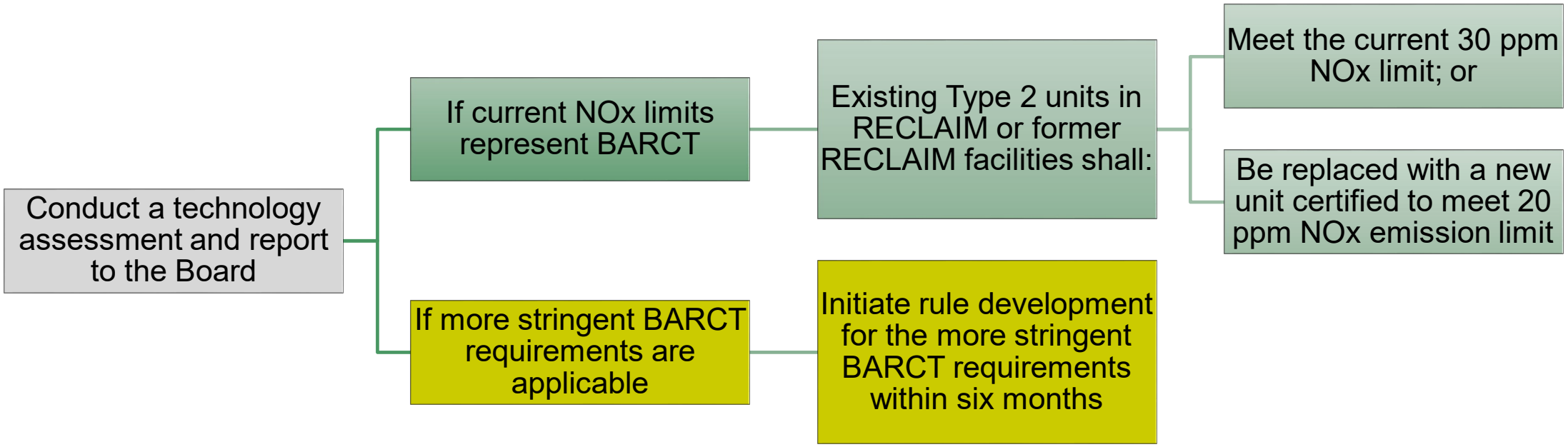


RULE 1146.2 AMENDMENT IN 2018

Applicability	Applicability expanded to include RECLAIM, non-RECLAIM and former RECLAIM facilities
Technology Assessment	Paragraph (c)(13) included for conducting a BARCT technology assessment for applicable Rule 1146.2 units and report to the Board no later than January 2022
Exemptions	Provision included for any unit at a RECLAIM or former RECLAIM facility that is subject to a NOx emission limit in a different industry specific category as defined in Rule 1100 Provision included for any unit at a municipal sanitation service facility that is subject to a NOx emission limit in a different Regulation XI rule

RULE 1146.2 TECHNOLOGY ASSESSMENT REQUIREMENT

- The technology assessment requirement included under Rule 1146.2 (c)(13) is summarized below:



RULE 1146.2 TECHNOLOGY ASSESSMENT

- Evaluate water heaters and boilers rated ≤2,000,000 BTU/hr in both non-RECLAIM and RECLAIM facilities
- Review certification test reports submitted in recent years
- Understand the actual emission levels of certified models and the potential for lower NOx emissions
- Meet with stakeholders for status and input

AFFECTED UNITS

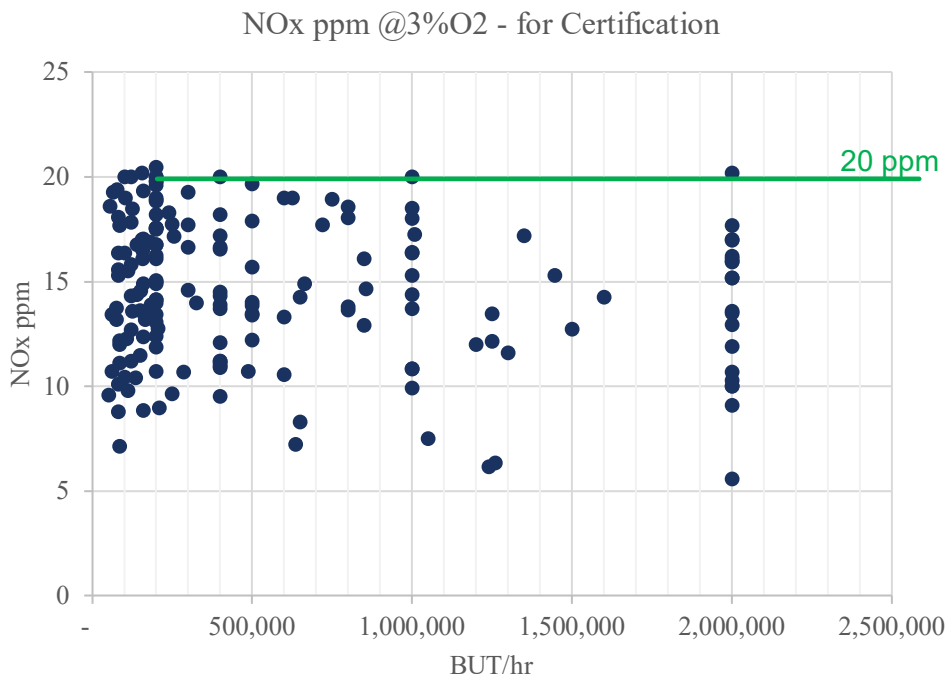
Units at Non-RECLAIM facilities

- Analysis during 2006 amendment estimated 43,600 Type 1 units and 22,000 Type 2 units in the South Coast AQMD based on data provided by the Gas Company

Units at RECLAIM/former RECLAIM facilities

- Not subject to Rule 1146.2 until December 7, 2018
- Previously not individually identified - grouped with other types of Rule 219 units for emission reporting
- About 80 RECLAIM facilities identified one or more R1146.2 units in their 2020-2021 Annual Emission Reporting (AER)

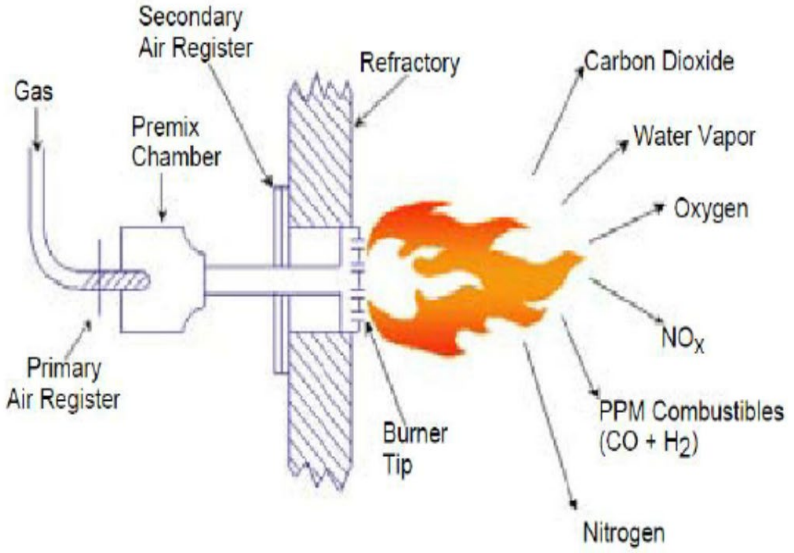
CURRENT TECHNOLOGY



- There are two general designs of natural gas combustion systems that are used to meet current 20 ppm NOx emission limit
  - Atmospheric burners (e.g., in-shot burners)
  - Fuel air premix
- Staff reviewed 181 source tests conducted in 2017 - 2021 for models certified at 20 ppm for NOx emissions
  - 50 models were tested <12 ppm
  - 25 models were tested <10 ppm

PREMIX COMBUSTION SYSTEM

- Majority of Rule 1146.2 units complying with 20 ppm NOx limit utilize premix systems
- The key components of a premix system include a premix blower, negative regulation gas valve, air-gas mixer and burner head
- NOx emissions primarily depend on the pre-formation of combustion, specifically on the fuel and air ratio and how well they are mixed
- Further development for lower NOx emissions would be focusing on the enhancement of combustion pre-formation
  - For example, one South Coast AQMD funded project on commercial space heating furnace development is currently on burner head redesign to:
    - Promote the mixing process even after the formation of the flame; and
    - Achieve 5-6 ng/J NOx emission rate (10 ppm)



https://www.researchgate.net/figure/2Premix-burner-with-products-of-combustion_fig2_257728119

RECENT FEEDBACK FROM MANUFACTURERS

- With more stringent energy efficiency requirements from the Department of Energy, current combustion systems could not meet a lower NOx emission limit (e.g., 12 ppm)
- Lower NOx emissions could be achievable with further development of premix combustion systems
- Manufacturers' request:
  - Sufficient time for development and implementation;
  - Cost effectiveness being evaluated; and
  - Multiple pathways (e.g., lower NOx, zero-emission, and dual fuel) to emission reductions
- Some manufacturers prefer to focus on zero-emission technologies following California's all-electric movement

STAFF RECOMMENDATIONS AND NEXT STEPS

- Based on source test results potential for further NOx reductions from small boilers and large water heaters
- Staff recommends to initiate a rulemaking process to conduct a full BARCT analysis
- Rulemaking process will evaluate and address:
  - Technology development
  - Feasible and cost-effective lower emission limit
  - Potential implementation timeline
  - Impact assessment
  - Upcoming state and federal regulations
  - Stakeholder's concerns
- Report to Stationary Source Committee January 2022

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