

Rule 1109.1 - Landing Rule for Refineries

Working Group Meeting #1

02/21/18

Agenda

2

- Background
- Key Topics
- Potential Universe
- Overview of equipment types and NOx emissions at crude refineries
- Next Steps

Background

3

- 2016 AQMP CMB-05 (Further NO_x Reductions from RECLAIM Assessment)
 - Achieve 5 tpd of NO_x emission reductions by 2025
 - Transition NO_x RECLAIM to command-and-control (C&C) regulatory structure requiring *Best Available Retrofit Control Technology* (BARCT)
- Assembly Bill 617
 - Develop a schedule for implementing BARCT by January 1, 2019
 - BARCT implementation by December 31, 2023

Key Topics

4

- Includes most NO_x equipment operated at facilities (applicability to be determined during rulemaking)
- Conduct BARCT determination for NO_x equipment, including cost-effectiveness
 - Reference NO_x limit in applicable source-specific rule, with considerations for fuel type, size, age of equipment, unique operating conditions, etc.
 - New BARCT analysis for other sources
- Explore implementation approaches
 - Traditional command and control
 - Alternative approaches - mass emissions, greatest reductions early, etc.
- Establish compliance schedule
- Monitoring, Reporting, and Recordkeeping

Rule Applicability Concepts

5

- Evaluating options for applicability
 - Crude processing refineries
 - Smaller independent refineries
 - Non-crude processing refineries - biodiesel
 - Related operations - hydrogen plant, sulfur recovery plant, etc.

Universe and Potential Applicability

6



9 Refinery Facilities

- Crude Oil Processing



5 Small Refineries

- Asphalt Plants
- Biodiesel Plant



17 Related Operation

- Hydrogen Plants
- Polypropylene Plant
- Sulfuric Acid Plants
- Storage and Bulk Loading Terminal
- Crude Pipeline Transportation

Potential Universe

7

Related Operations

ID	Name	Facility Type
800372	Equilon Enter	Bulk Loading Terminal
800129	SFPP, L.P.	
137520	Plains West Coast Terminals	Crude Pipeline Transportation
800416	Plains West Coast Terminals	
800417	Plains West Coast Terminals	
800419	Plains West Coast Terminals	
800420	Plains West Coast Terminals	
182049	Torrance Valley Pipeline	
182050	Torrance Valley Pipeline	
182051	Torrance Valley Pipeline	Hydrogen Plant
148236	Air Liquide Large Industries	
3417	Air Prod & Chem	
101656	Air Products and Chemicals	
42630	Praxair	Polypropylene
124808	Ineos Polypropylene	
7416	Praxair	Industrial Gas
178639	Eco Services Operations	Sulfuric Acid

Small Refineries

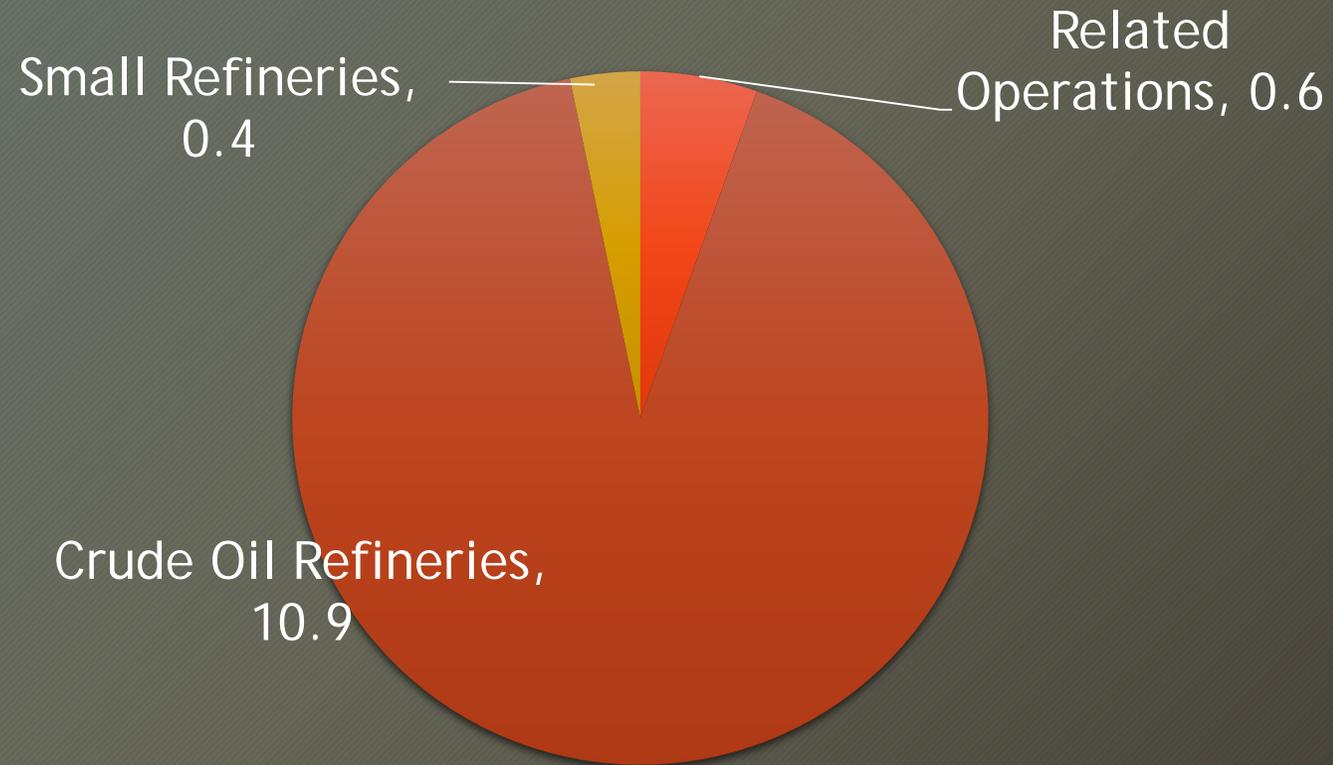
ID	Name	Facility Type
800037	Demunno/ Kerdoon	Waste Oil Refinery
800264	Edgington Oil	Asphalt Refinery
800080	Lunday-Thagard dba World Oil Refining	
800393	Valero Wilmington Asphalt Plant	
800183	Paramount	Biodiesel Refinery

Crude Oil Processing

ID	Name
151798	Andeavor - Sulfur Recovery Plant
171107	Phillips 66 Wilmington
171109	Phillips 66 Carson
174591	Andeavor - Calciner
174655	Andeavor Carson
181667	TORC
800026	Valero
800030	Chevron
800436	Andeavor Wilmington

NOx Emissions - tons per day

8



Applicability Considerations

9

- Include all equipment within the boundaries of the refineries?
 - Feedstock supply via pipeline
 - Sulfur recovery plant, hydrogen plant, sulfuric acid regeneration
- Also include similar operations outside a refinery?
- Include equipment within the boundaries of a refinery that is independent of the refinery?
- Larger universe includes similar equipment
 - Consistency between facilities
 - Refinery gas fueled equipment
 - Crude oil processing

Crude Oil Refineries

10

Evaluation of NOx Emissions

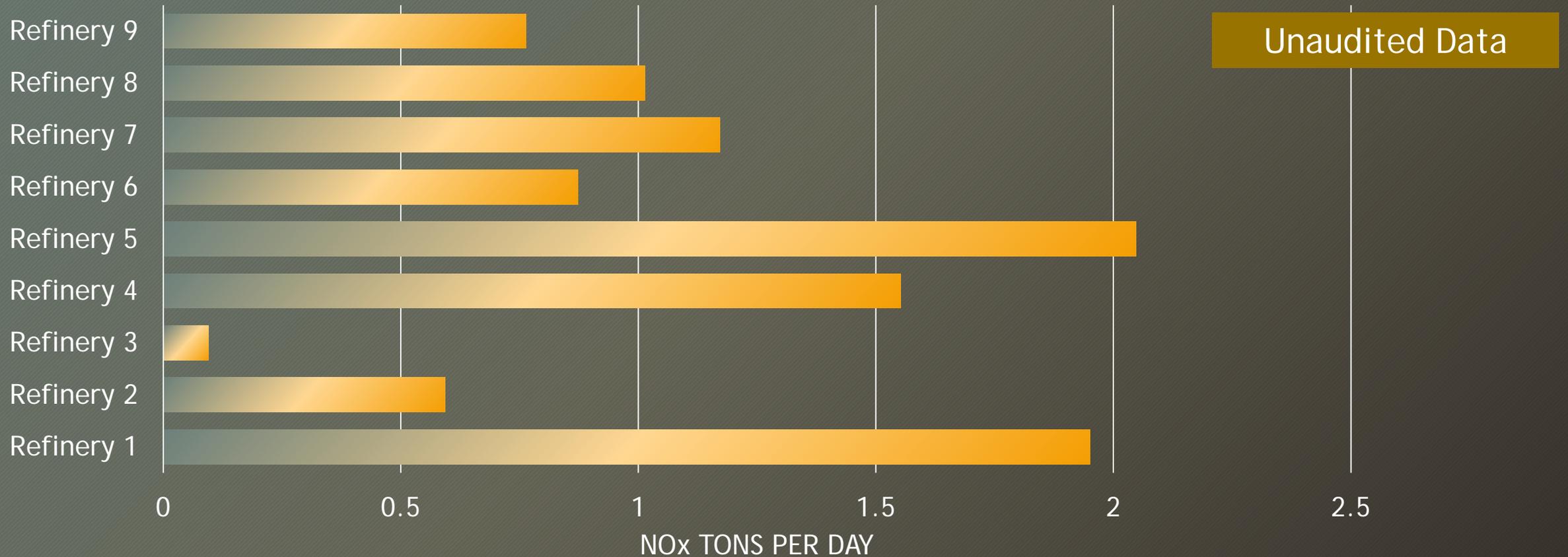
11

- Compared current NOx concentration levels to 2015 RECLAIM BARCT levels
- Data analysis
 - NOx concentration levels based on permit conditions, CEMS data, and source tests
 - Mass emissions based on unaudited data reported from facilities
 - Not a complete dataset, will complete in future analysis
- Used the 2015 RECLAIM BARCT levels to provide a reference point
- Basic analysis - more refined analysis in future Working Group meetings
 - Fuel type
 - Equipment size
 - Refined categories
- Staff will reanalyze BARCT levels for all equipment - further discussions in future Working Group meetings

2016 NOx Emissions By Refinery

Total NOx: 10 tons/day

12



Universe of Equipment

13

6 broad categories of equipment at the 9 crude oil processing refineries

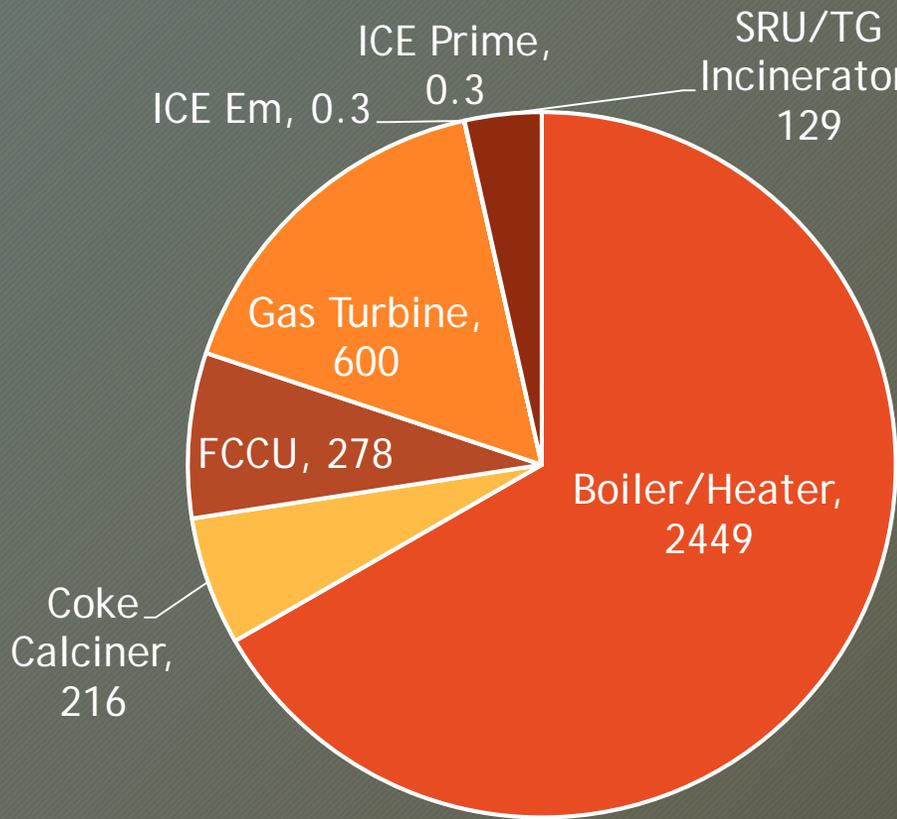
Equipment Type	Total Number
Sulfur Recovery Unit/Tail Gas Incinerator	22
ICE Prime	4
Gas Turbine/Duct Burner	23
FCCU ⁽¹⁾	7
Coke Calciner ⁽²⁾	2
Boiler/Heater	212
Total	270

⁽¹⁾ FCCU related devices; ⁽²⁾ One Coke Calciner system (2 devices)

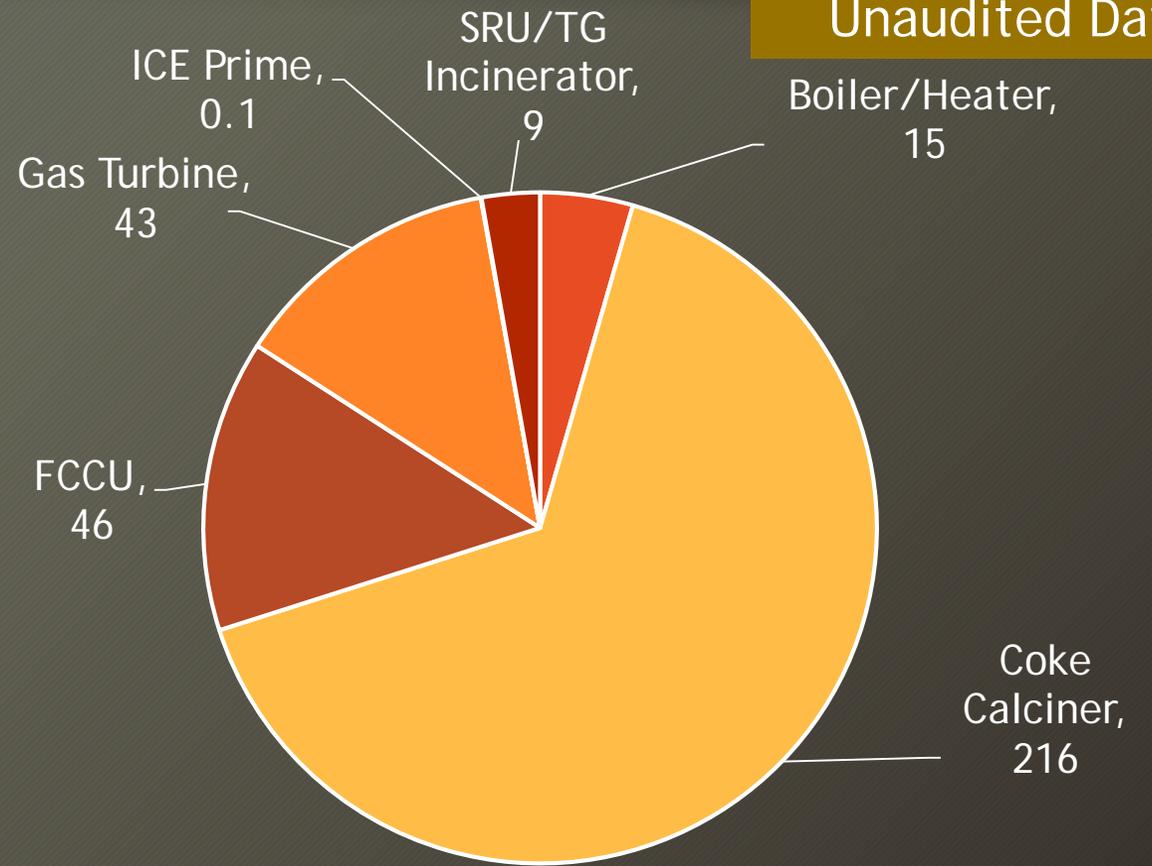
2016 NOx Emissions (tons/year) by Equipment Type

14

Unaudited Data



NOx Emissions by Equipment Type



Approximate NOx per Equipment

2015 RECLAIM BARCT Analysis (Reference Only)

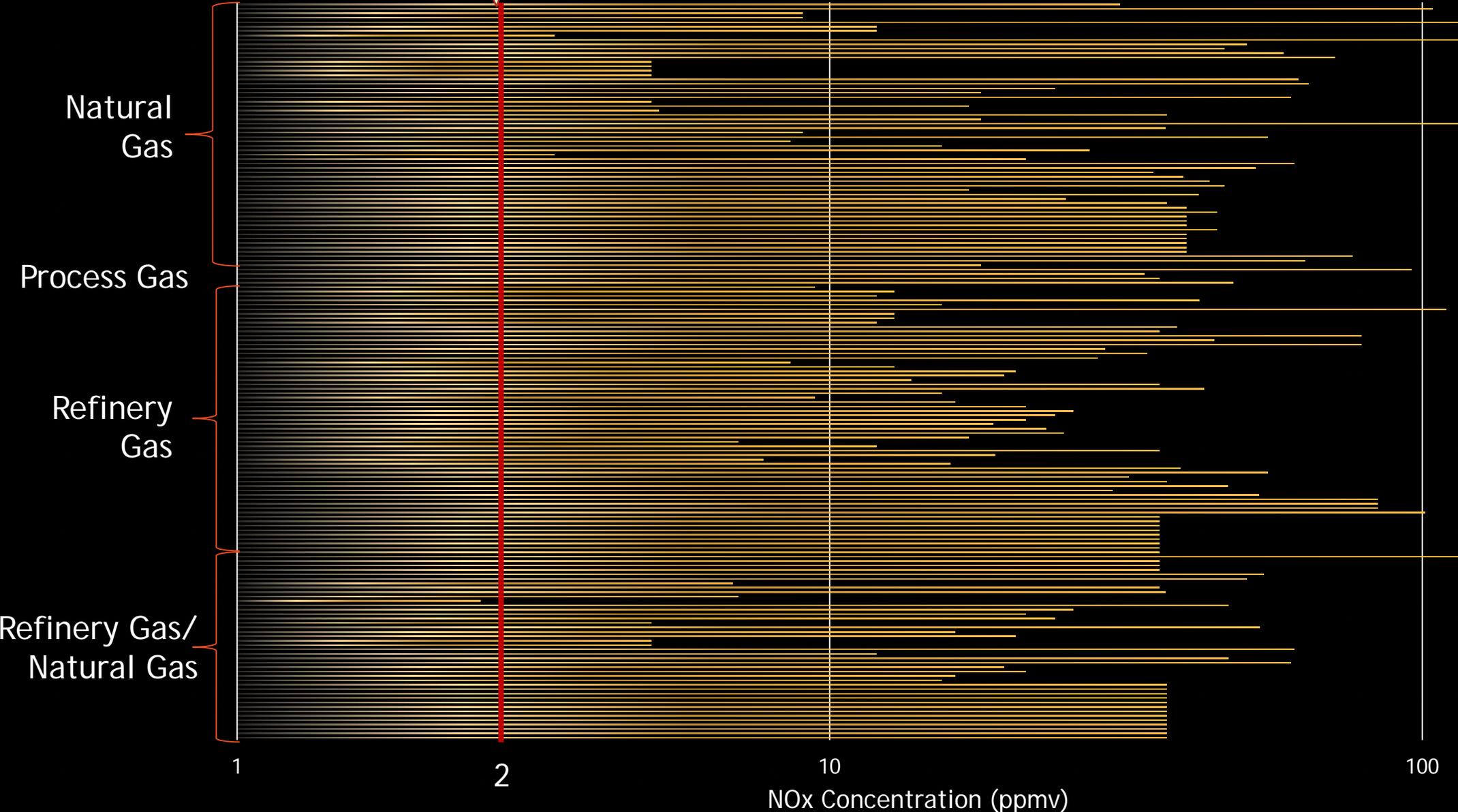
15

Equipment	RECLAIM BARCT	Technologies
Boiler/Heater	2 ppmv	LNB, ULNB, SCR (more common); LoTOx w/WGS, SNCR, Flameless Heaters, Clear Sign (less common)
Coke Calciner	10 ppmv @ 3% O ₂	LoTOx, UltraCat
FCCU	2 ppmv @ 3% O ₂	SCR, SCR w/ASC, LoTOx w/WGS, NOx Reduction Additives
Gas Turbine	2 ppmv @ 15% O ₂	Water/steam injection, SCR, SCR w/ASC, DLE/DLN, CLN
SRU/TG Incinerator	2 ppmv @ 3% O ₂	SCR, LoTOx w/WGS
ICE Prime	11 ppmv @ 15% O ₂	SCR for lean burn, NSCR (3-way catalyst) for rich burn

2015 RECLAIM
BARCT

Boilers/Heaters (167)

16

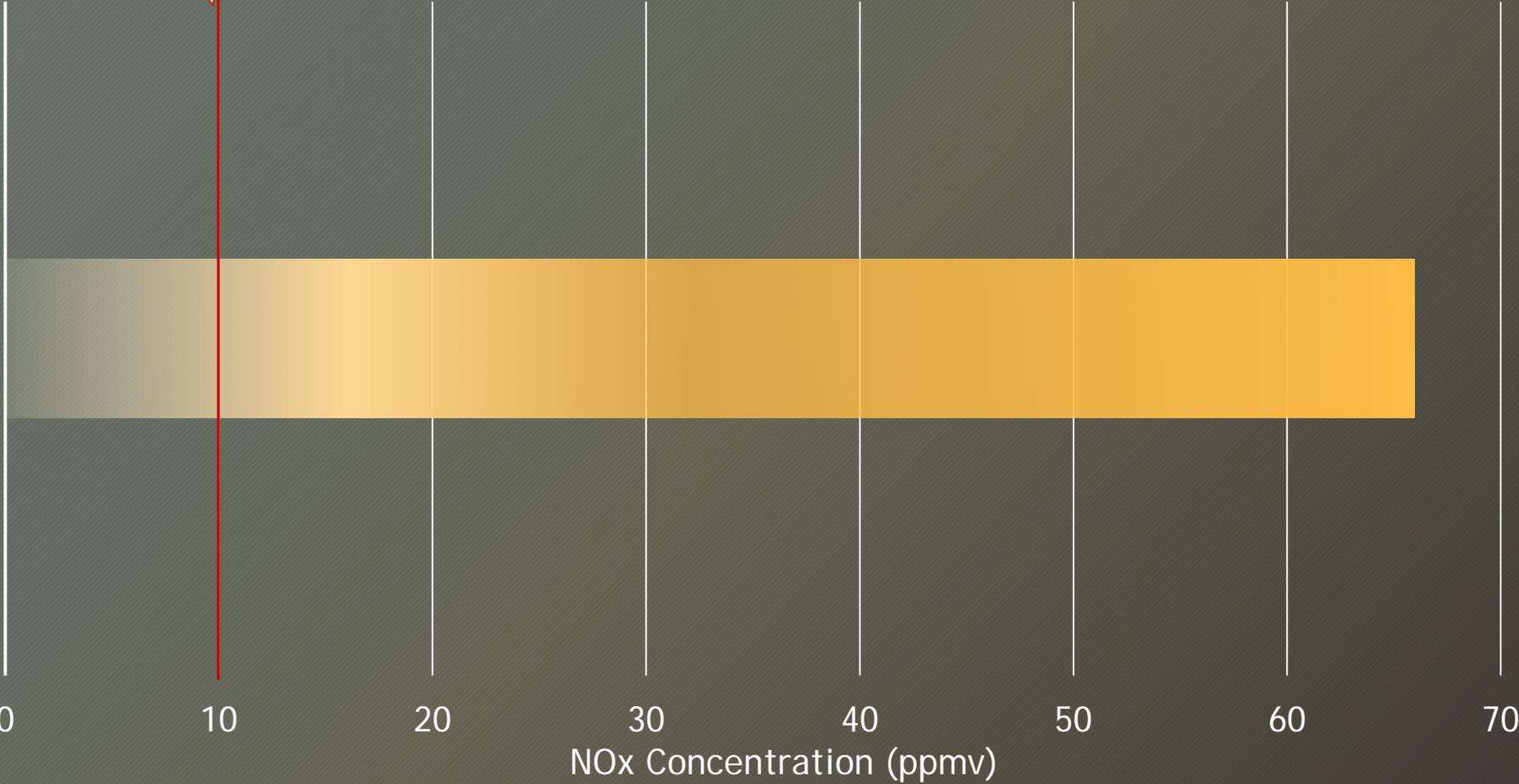


NOx Concentration (ppmv)

Coke Calciner (1)

2015 RECLAIM
BARCT

Diesel



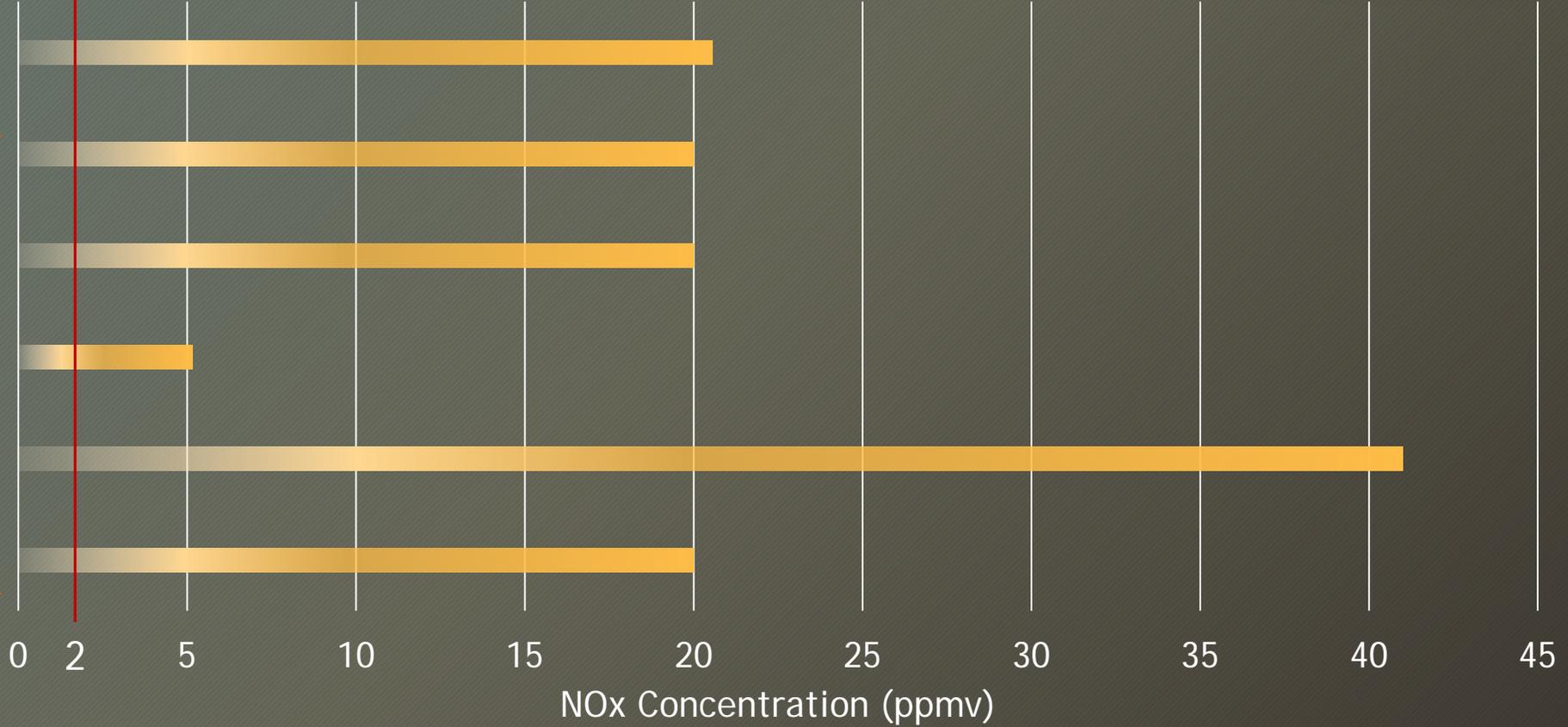
FCCU (6)

18

2015 RECLAIM
BARCT

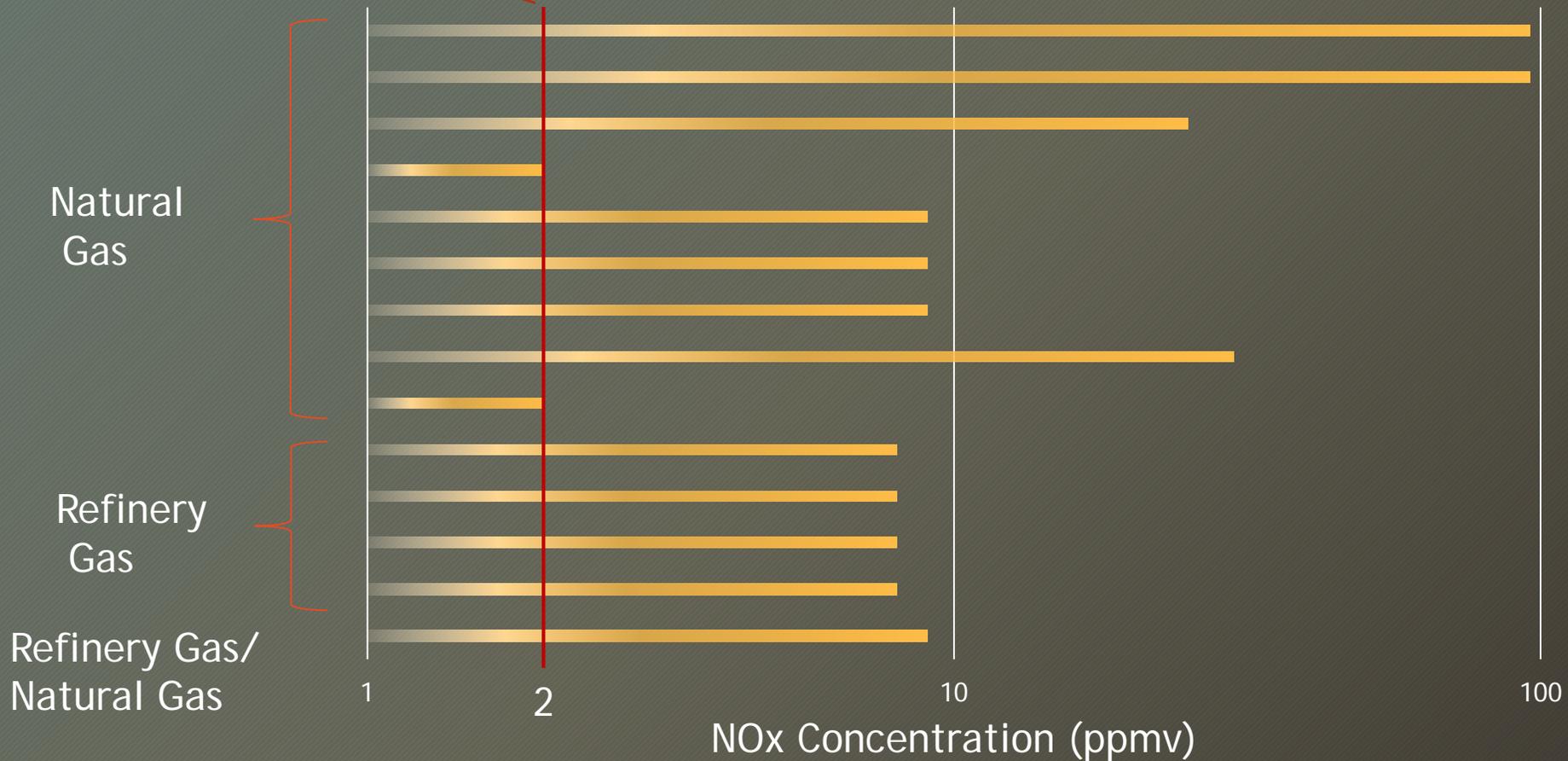
Refinery Gas/
Natural Gas

Unknown



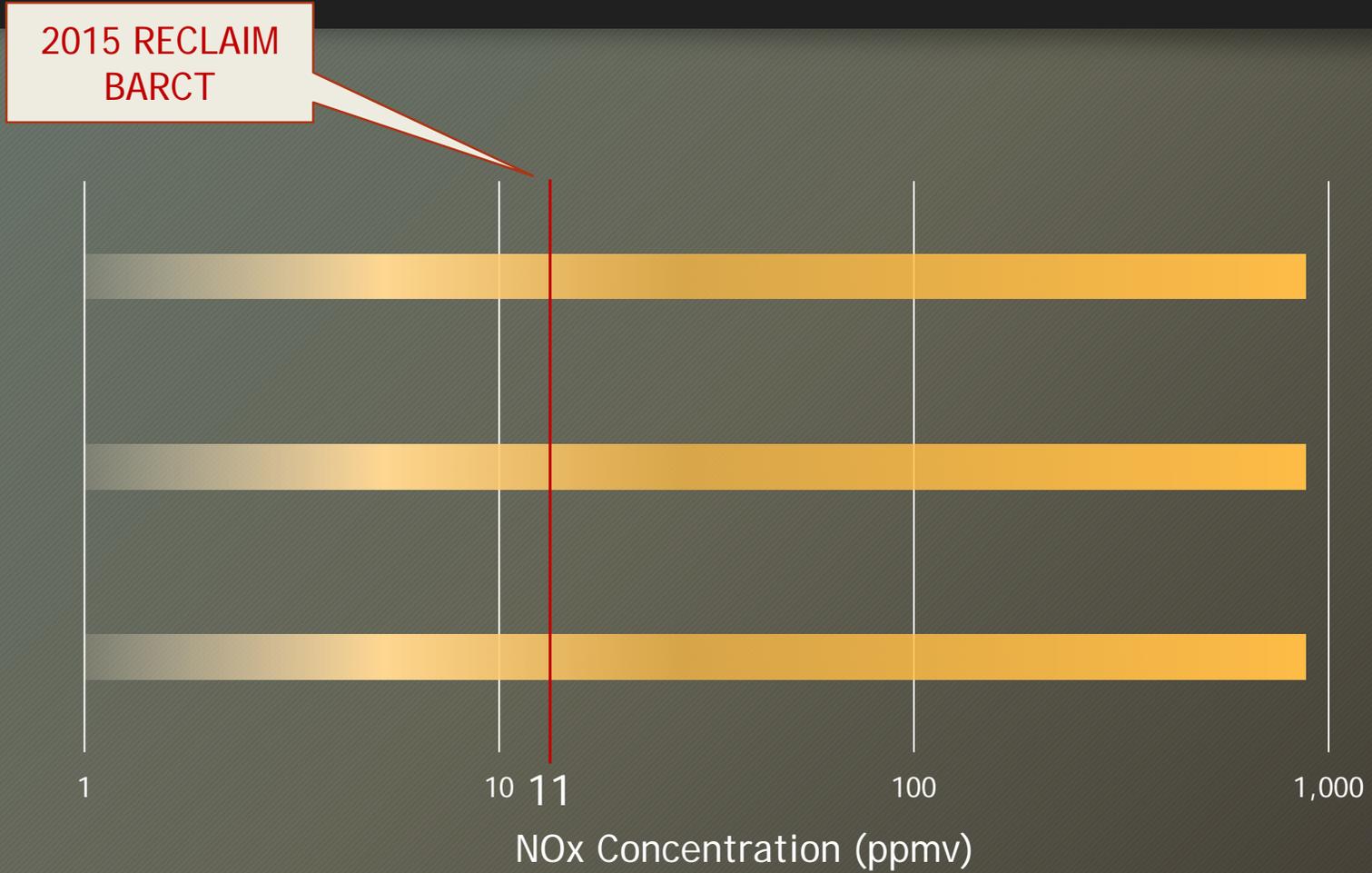
2015 RECLAIM
BARCT

Gas Turbines/Duct Burners (14)



DIESEL ICE Prime (3)

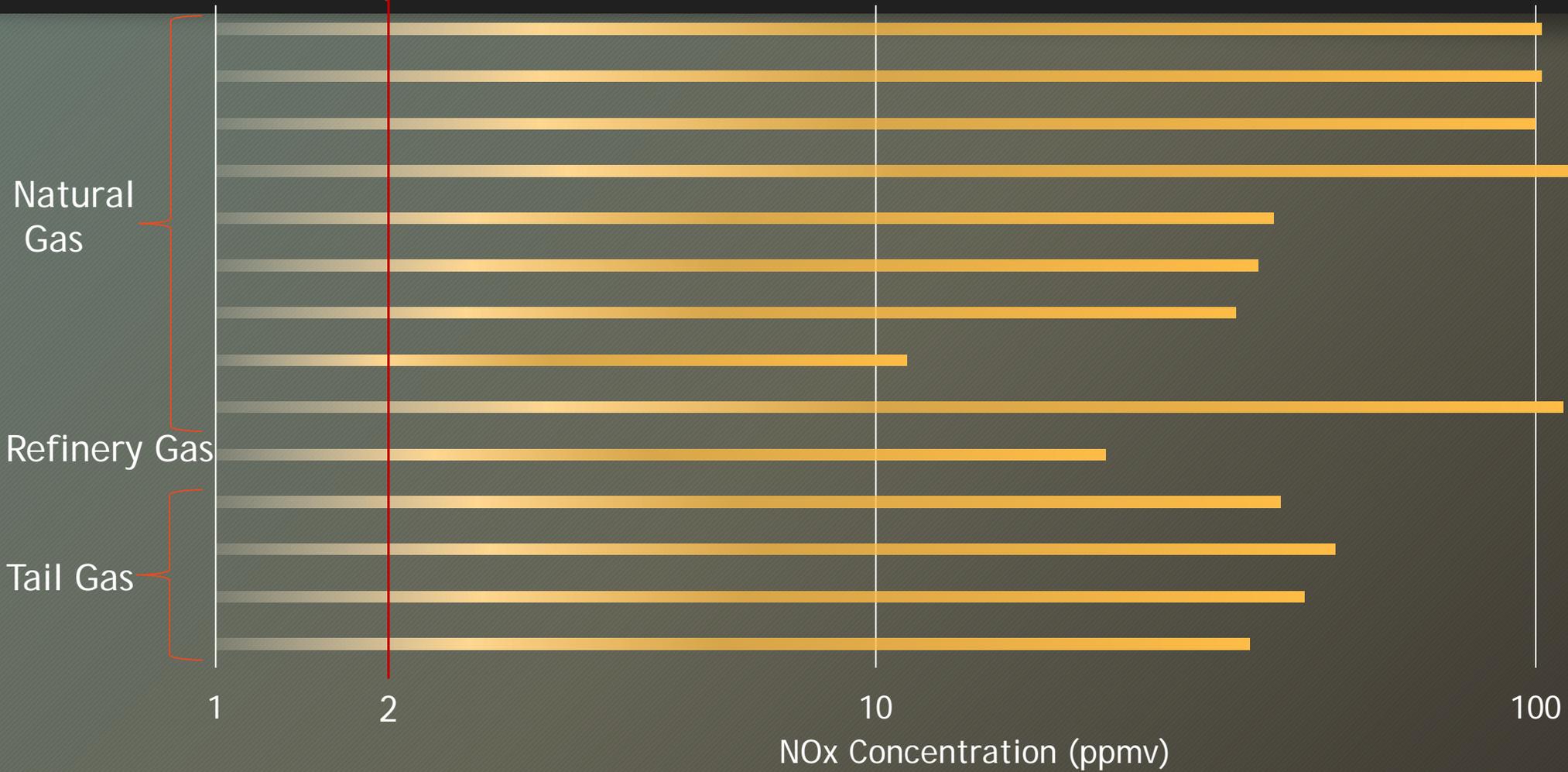
20



2015 RECLAIM
BARCT

SRU/TG Incinerator (14)

21



Next Steps

22

- Develop survey and/or spreadsheet for BARCT re-assessment
- Schedule next Working Group meeting
 - Meetings every 4 to 6 weeks
- Continue site visits and individual meetings
- Further refine the data

Rule Development Staff Contacts

23

Michael Krause
Planning & Rules Manager
mkrause@aqmd.gov
909-396-2706

Heather Farr
Program Supervisor
hfarr@aqmd.gov
909-396-3672

Jong Hoon Lee
AQ Specialist
jhlee@aqmd.gov
909-396-3903