Public Workshop for Rules 4306 and 4320 (Boilers, Steam Generators, and Process Heaters Greater than 5.0 MMBtu/hr) and Rule 4311 (Flares)

July 30, 2020

webcast@valleyair.org

Rule 4306 (Boilers, Steam Generators, and Process Heaters – Phase 3) and Rule 4320 (Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters Greater than 5.0 MMBtu/hr)

Valley's Air Quality Challenges – Ozone & PM2.5

- Valley's challenges in meeting federal air quality standards unmatched due to unique geography, meteorology, and topography
- Valley designated as "Extreme" non-attainment of the 8-hour Ozone NAAQS; "Serious" non-attainment of federal standards for fine particulate matter (PM2.5)
  - Substantial emission reductions needed to achieve federal standards – need to go beyond already strict control limits
- Combustion is a significant source of NOx emissions, primary precursor to ozone and PM2.5 formation
  - *2018 PM2.5 Plan* includes commitment to evaluate opportunities to further reduce emissions from boilers, steam generators, & process heaters

Rule 4306 and Rule 4320 Overview

- Rules 4306 and 4320 apply to any gaseous fuel- or liquid fuel- fired boiler, steam generator, or process heater with a total rated heat input greater than 5 MMBtu per hour
- Boilers are external combustion equipment used to produce hot water or steam
- Steam generators are external combustion equipment that convert water to steam; most commonly used in thermally enhanced crude oil production
- Process heaters are combustion equipment that transfer heat from combustion gases to liquid or gas process streams

Image credit: US EPA, 2013

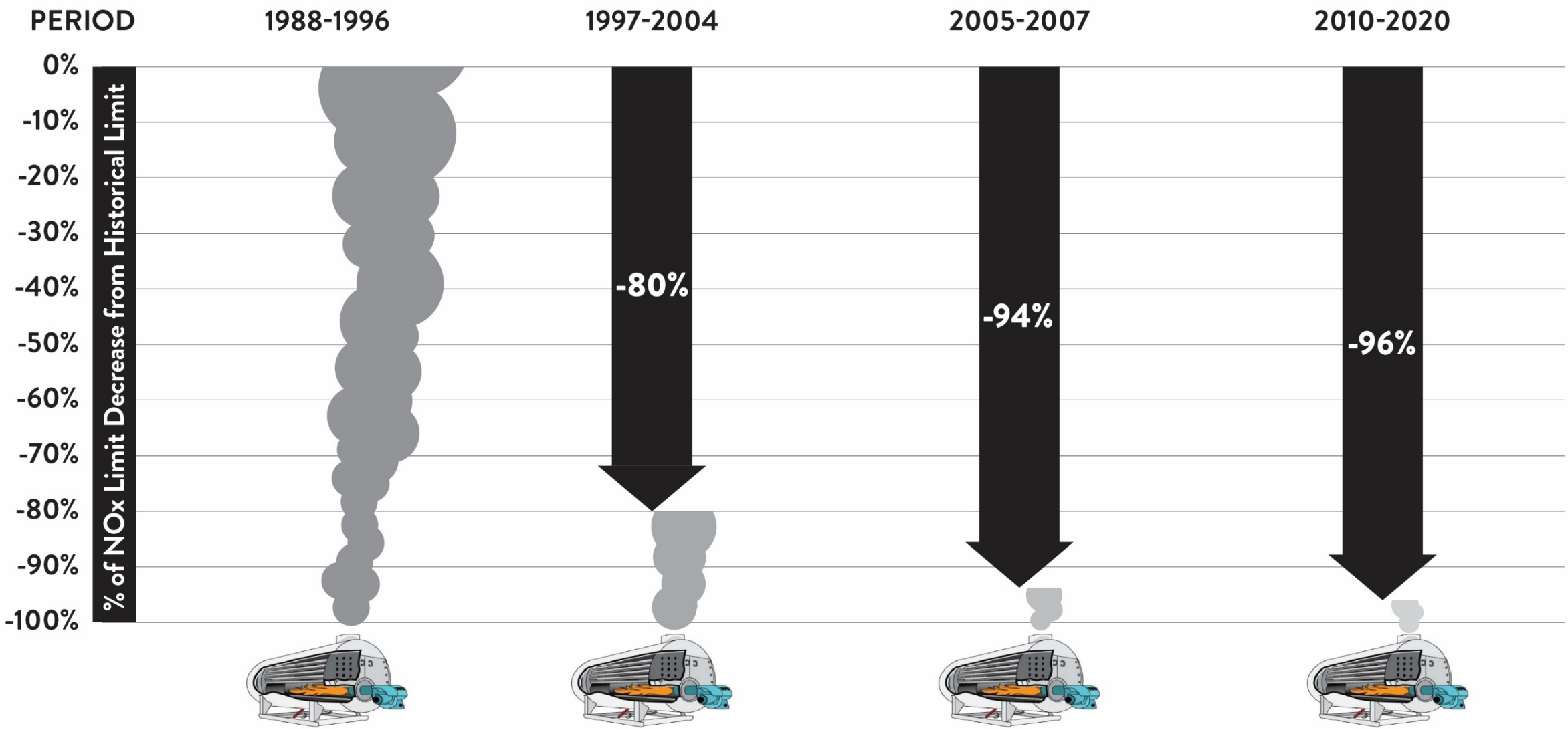
Where do Boilers, Steam Generators, and Process Heaters Operate?

- These units are used at a wide range of facility types in Valley including:
  - Oil and gas production facilities
  - Petroleum refineries
  - Food and agricultural product processing operations
  - Schools, Universities
  - Ethanol Production
  - Hospitals
  - Livestock husbandry operations (dairies, cattle feedlots, etc.)
  - Manufacture and industrial facilities

Current Rule 4306 and Rule 4320 Requirements

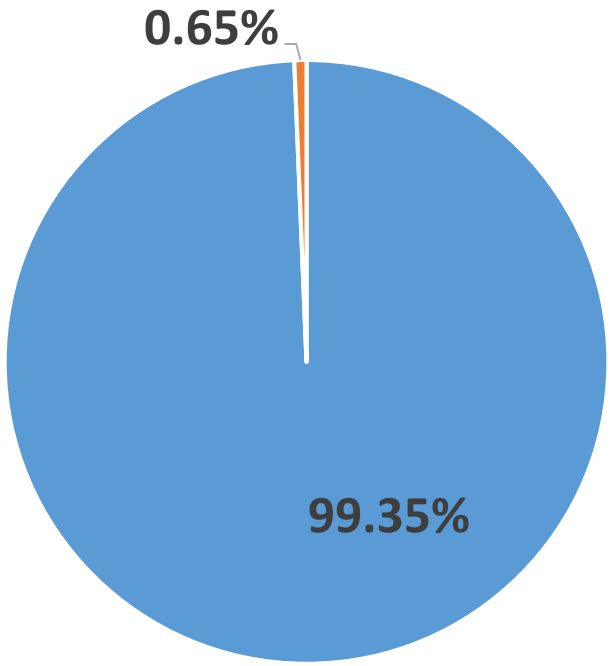
- Rule 4306 establishes specific NOx limits for many categories of boiler/steam generator/process heater units
  - NOx limits must be met in order to legally operate in District
  - Facilities generally control emissions from sources through combustion modification or exhaust gas treatment
- Rule 4320 establishes more strict NOx limits for units in this source category. Operators are given three options to comply:
  - Meet specified emission limits, or
  - Pay emissions fee annually to the District, or
  - Comply with low-use provision (fuel limit of ≤ 1.8 billion Btu/yr)
- Through these rules, NOx emissions from these sources already reduced by 96%

Decrease in NOx Emission Limits from Boilers, Steam Generators, and Process Heaters with Heat Input Greater than 5 MMBtu/hr

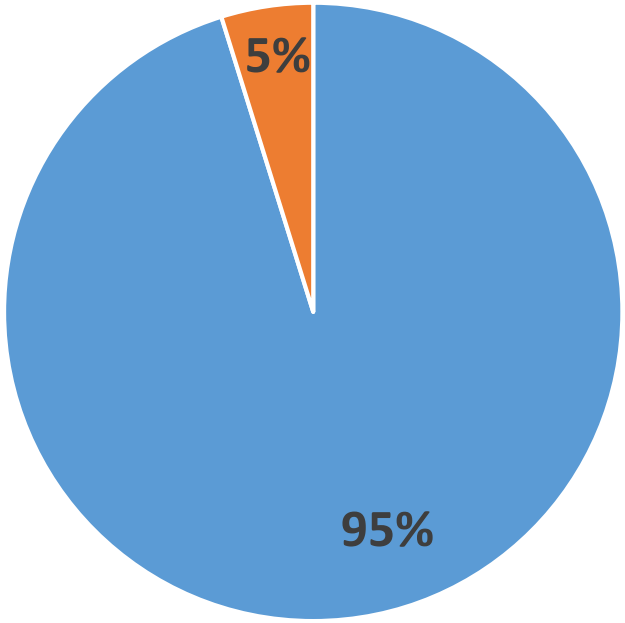


NOx Emissions from Boilers, Steam Generators, and Process Heaters in the Valley

All NOx Emissions in the Valley (Mobile, Stationary, & Area Sources)



NOx Emissions from Stationary Sources



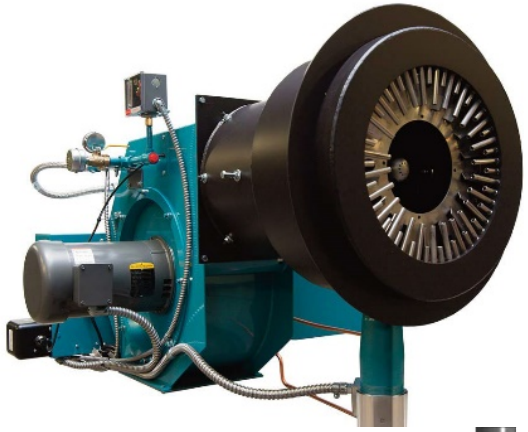
Units in the San Joaquin Valley

Rule 4320 Category	# Units
Group A. Units 5-20 MMBtu/hr except for Categories C-G Units	302
Group B. Units >20 MMBtu/hr except for Categories C-G Units	226
Group C.1 Oilfield Steam Generators 5-20 MMBtu/hr	10
Group C.2 Oilfield Steam Generators >20 MMBtu/hr	504
Group C.3 Oilfield Steam Generators firing on less than 50% PUC quality gas	48
Group D.1 Refinery Units 5-20 MMBtu/hr	4
Group D.2 Refinery Units 20-110 MMBtu/hr	2
Group D.3 Refinery Units >110 MMBtu/hr	0
Group D.4 Refinery Units 5-20 MMBtu/hr firing on less than 50% PUC quality gas	23
Group E. Units with an annual heat input 1.8-30 billion Btu/yr	65
Group F. Wastewater Treatment Facilities firing on less than 50% PUC Quality Gas	0
Total	**1184**

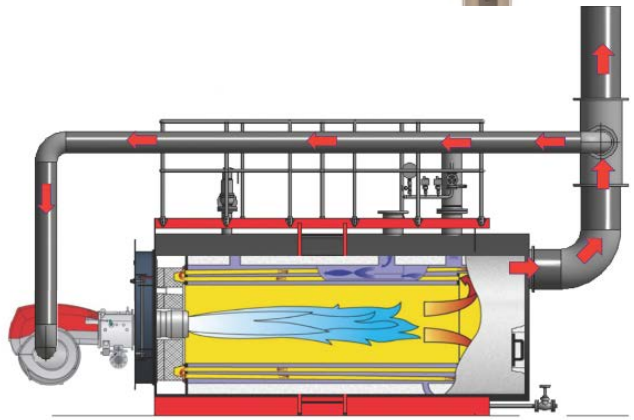
Additional Emission Reductions Needed

- Substantial emission reductions needed to achieve PM2.5 standards – need to go beyond already strict limits
- Commitment in *2018 PM2.5 Plan* to evaluate further emissions reduction opportunities from sources including boilers, steam generators, and process heaters
  - Reduce NOx emissions by lowering the NOx emission limits and lowering the more stringent Advanced Emission Reduction Option (AERO) limit for specific classes and categories of units
- District staff have conducted comprehensive review of requirements in other air districts, lowest emission limits being achieved in installations statewide, and costs and feasibility of most effective emission control technologies available

Potential NOx Control Technologies



- Ultra-low NOx burners (ULNBs)
  - ULNBs control fuel and air mixing to improve flame structure resulting in less NOx formation
  - Can be installed on most units
- Additional oxygen flow controls, flue gas recirculation, and tuning
- Selective Catalytic Reduction
  - Converts NOx to N_2 and water with catalyst by adding a reactant such as ammonia or urea to exhaust gas



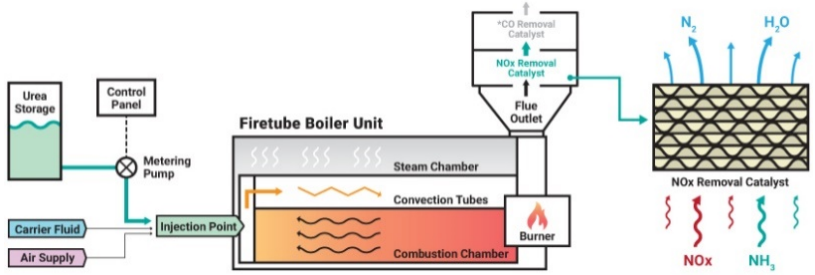


Image credits (from top): Webster Combustion Technology, LLC; Robert Bosch, LLC; RF MacDonald Co.

Proposed Rule 4306/4320 Amendment Concepts

- Tiered Rule 4306 requirements for some classes or categories of units being considered
  - Dirtier units must comply with proposed lower Rule 4306 emission limits sooner (by Dec. 2023)
  - Depending on emission limits, cleaner units may have extended timeframe to comply with lower Rule 4306 limits
- Existing Rule 4306/4320 Categories to be further divided to allow for different limits based on cost-effectiveness analysis and tech feasibility
- Strengthened Rule 4320 limits would take effect in Dec. 2023
  - Rule 4320 NOx Limits being evaluated based on technological feasibility to encourage implementation of cleanest technologies
  - Proposed limits to be discussed at future workshop

Rule 4306 Limits Under Consideration

- Group A - Units 5-20 MMBtu/hr
  - Water Tube Units: Lower NOx Limit from 15 ppm to as low as 9 ppm
  - Fire Tube Units: Lower NOx Limit from 15 ppm to as low as 7 ppm
- Group B - Units >20 MMBtu/hr
  - Units 20-75 MMBtu/hr: Lower NOx Limit from 9 ppm to as low as 5 ppm
  - Units >75 MMBtu/hr: Lower NOx Limit from 9 ppm to as low as 5 ppm
- Group C - Oilfield Steam Generators
  - Units 5-20 MMBtu/hr: Lower NOx Limit from 15 ppm to as low as 9 ppm
  - Units 20-75 MMBtu/hr: Lower NOx Limit from 15 ppm to as low as 9 ppm
  - Units >75 MMBtu/hr: Lower NOx Limit from 15 ppm to as low as 7 ppm
  - Units fired on <50% PUC quality gas: Lower NOx Limit from 15 ppm to as low as 9 ppm

Rule 4306 Limits Under Consideration (cont'd)

- Other Groups in rule still being evaluated
- Potential lower emission limits continuing to be evaluated based on economical and technological feasibility
- Cleaner units may be allowed longer compliance schedule
- District staff also evaluating feasibility of solar and electric boiler technology
- District to conduct socioeconomic impact analysis

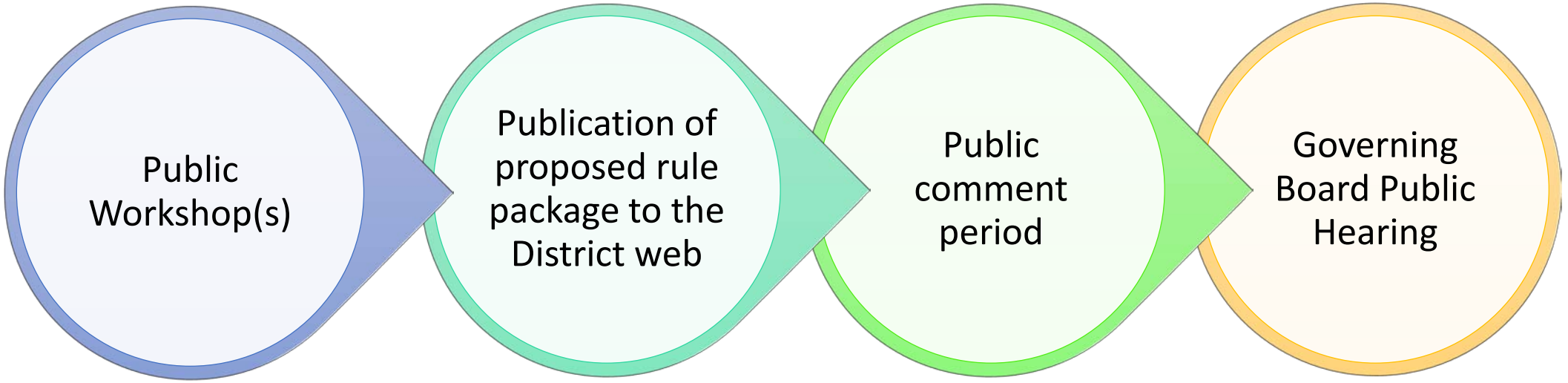
Socioeconomic Impact Analysis for Rules 4306 and 4320

- Socioeconomic Impact Analysis will be conducted to support feasibility analysis
  - Characterize the Valley's economic climate
  - Evaluate economic impacts
  - Prepare Socioeconomic Impact Analysis report
  - Present to Governing Board
- Results of analysis to be publicly available and included with proposed rule amendment packages

Key Questions and Considerations

- What are the costs and technological feasibility issues associated with meeting the proposed Rule 4306 NOx limits?
  - Specific considerations for different industries/types of applications and types/sizes of units
- Potential NOx limits for Rule 4320 are being evaluated
- What is the lowest NOx limit achievable for different unit categories?
- What are the socioeconomic impacts associated with proposed requirements?

Next Steps: Public Engagement Process for Rule 4306 & 4320 Rule Amendment Development



Public Participation and Comment Invited throughout Process

Rule 4306 and 4320 Contact

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Open Discussion

webcast@valleyair.org

SJVAPCD Workshop:

Rule 4311 - Flares

Is scheduled to start shortly, please stand by…




Rule 4311 (Flares)

Valley's Air Quality Challenges – Ozone & PM2.5

- Valley's challenges in meeting federal air quality standards unmatched due to unique geography, meteorology, and topography
- Valley designated as "Extreme" non-attainment of the 8-hour Ozone NAAQS; "Serious" non-attainment of federal standards for fine particulate matter (PM2.5)
  - Substantial emission reductions needed to achieve federal standards – need to go beyond already strict control limits
- Combustion is a significant source of NOx emissions, primary precursor to ozone and PM2.5 formation
  - *2018 PM2.5 Plan* includes commitment to evaluate opportunities to further reduce emissions from flares

What is Flaring?

Image credit: Getty Images, 2018

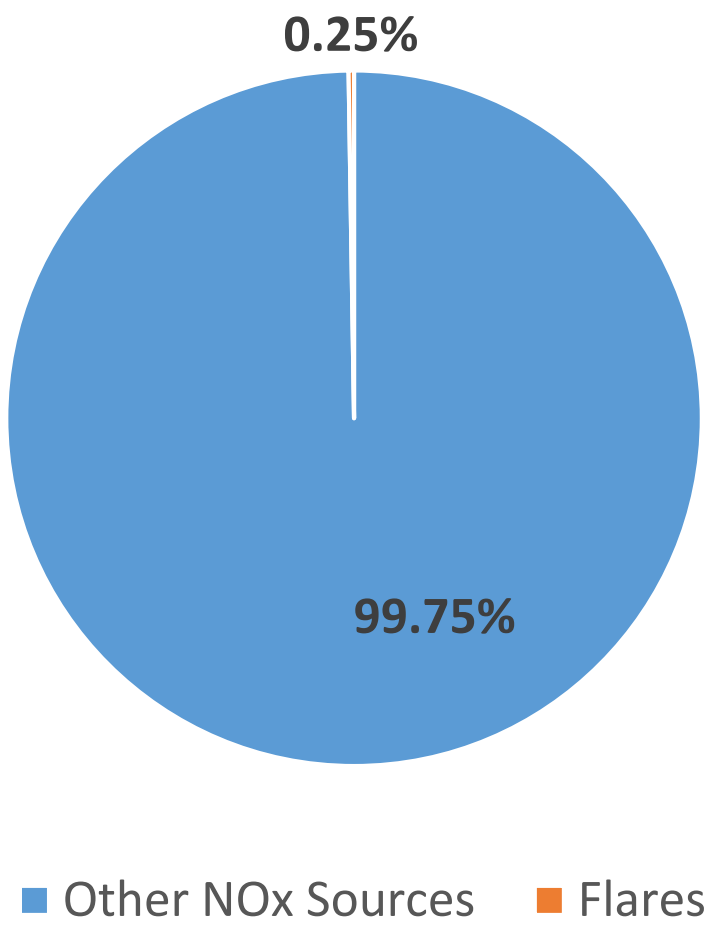
- Flaring is a high temperature oxidation process used to burn primarily hydrocarbons of waste gases from industrial operations
  - Flares typically have a destruction efficiency of 98% or higher
- Flares act as a safety device during unforeseeable and unpreventable situations, and as an emission control device for air toxics and VOCs
- Two general types of flares: elevated and ground flares
- Operators avoid flaring due to high costs, and implement alternatives where feasible

Current District Flare Requirements

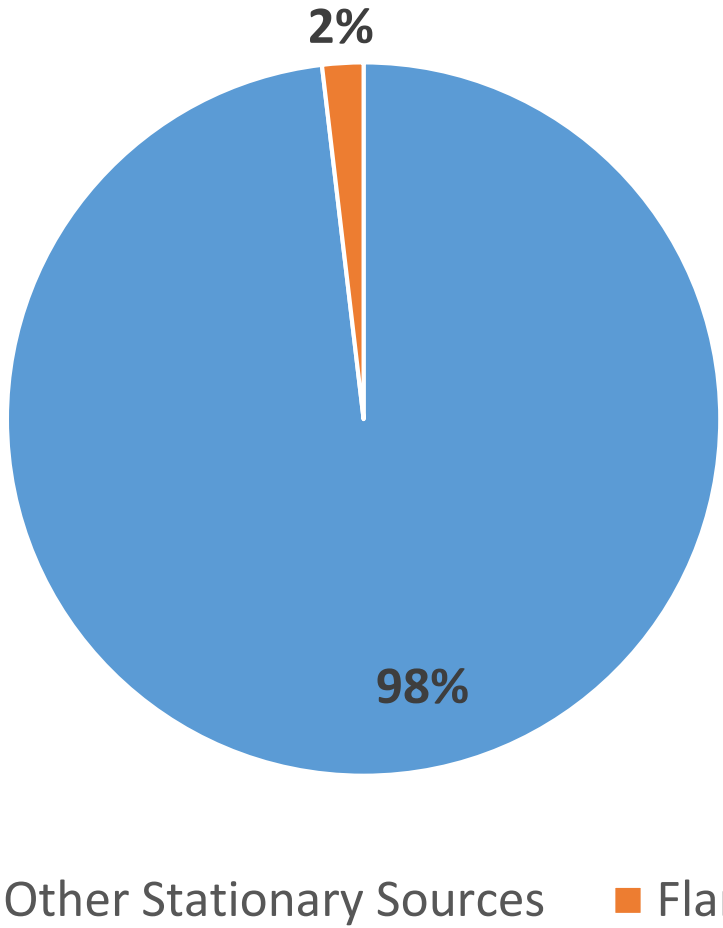
- District Rule 4311 (Flares) adopted June 2002, amended in 2006, again in 2009 to add new requirements, including annual reporting and flare minimization practices
  - Rule limits emissions of NOx, VOCs, and SOx from the operation of flares
- Current requirements for operations with flares include:
  - NOx limits as low as 0.068 lbs-NOx/MMBtu (53 ppmv NOx)
  - Proper operation requirements (i.e., ignition system, heat sensors, etc.)
  - Flare minimization plans
  - Reporting of unplanned flaring event within 24 hours, annual reporting, and reporting of when monitoring system is not operating
  - Vent gas composition monitoring
  - Video monitoring

NOx Emissions from Flares in the Valley

All NOx Emissions in the Valley (Mobile, Stationary, & Area Sources)



NOx Emissions from Stationary Sources



San Joaquin Valley Flare Inventory

Category	# Flares
Chemical Production and/or Distribution	6
Gas Plants	11
Landfills (Open)	17
Landfills (Closed)	11
Oil and Gas Production	161
Other	6
Propane Backup System	6
Refinery	7
Wastewater Treatment	22
Agriculture Related Digester	16
Organic Liquid Handling	4
Total	**267**

Attainment Plan Commitments to Minimize Flaring

- *2018 PM2.5 Plan* commitments
  - Additional low NOx flare emission limitations for existing and new flaring activities at Valley facilities to the extent that such controls are technologically achievable and economically feasible
  - Additional flare minimization requirements to the extent that such controls are technologically achievable and economically feasible
  - Expand applicability of the rule by removing the exemption for non-major sources
  - Plan evaluation estimated 0.05 tpd NOx emission reduction through implementation of low NOx flare installation requirements

Public Process to Amend Rule 4311

- Scoping Meeting held August 17, 2017
- *2018 Plan for the 1997, 2006, and 2012 PM2.5 Standards*
  - Adopted: November 15, 2018
  - Included updated commitments
- Flare Operator Workgroup Meetings
  - October 2017, April 2019, and July 2019
- Public workshop held November 13, 2019
- Ongoing opportunities for public input throughout rule development process

Ultra-low NOx Flare Technology

- District has been conducting extensive evaluation of ultra-low NOx flare technologies for potential use in further reducing emissions under Rule 4311
  - High destruction efficiency of non-methane hydrocarbons (manufacturers guarantee 99%+)
  - Minimizes emissions of NOx (0.024 lb-NOx/MMBtu)
  - Emissions controlled through burner system and precise air/gas mixture in enclosed flare
- Costs, infrastructure requirements, and technological considerations of technology under evaluation
  - Operation with low Btu oilfield gas not proven
  - Increased operation and maintenance requirements
  - Emission control technology not as effective for emergency or short duration releases

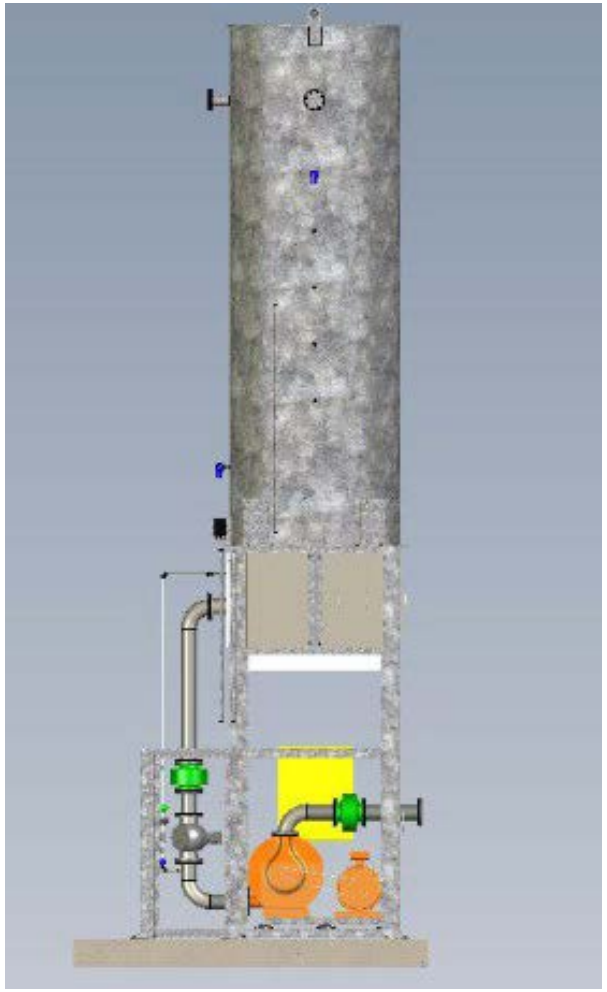


Image Credit: Lfgtech, 2019

Proposed Rule Concepts

- Remove non-major source exemption
- Remove landfill exemption
- Ultra-low NOx proposal (consistent with South Coast Rule 1118.1)
  - 0.018 lb-NOx/MMBtu limit for flares at oil and gas operations
  - 0.025 lb-NOx/MMBtu limit for flares fired on digester gas at major source facilities, and landfill gas
  - 0.06 lb-NOx/MMBtu limit for digester gas at non-major source facilities
- Ultra-low NOx requirement exemptions for
  - Units used less then 200 hr/yr @ capacity
  - Various Location Permits
  - Units that burn propane only

Proposed Rule Concepts (cont'd)

- Add performance standard to require ultra-low NOx technology for new and existing flares
  - Oil and Gas Related Flares: 20,000 MMBtu/yr threshold
    - Controls 58.4% of gas flared, 29.2% NOx reduction
  - Landfill Flares: 90,000 MMBtu/yr threshold
    - Controls 69.6% of gas flared, 18.8% NOx reduction
  - Digester/Wastewater Treatment Flares: 100,000 MMBtu/yr threshold
    - Controls 55.4% of the gas flared, 21.2% NOx reduction
- Proposed concept would require installation of ultra-low NOx flares associated with 62% of total gas flared from all categories
- New ultra-low NOx requirements would be in addition to current requirements, including flare minimization plans

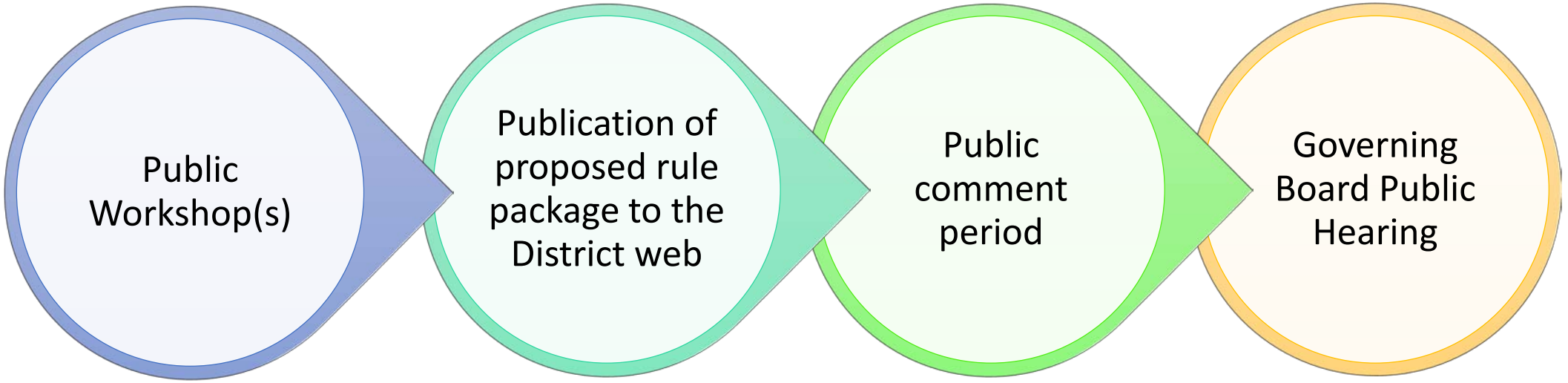
Socioeconomic Impact Analysis for Rule 4311

- Socioeconomic Impact Analysis will be conducted to support feasibility analysis
  - Characterize the Valley's economic climate
  - Evaluate economic impacts
  - Prepare Socioeconomic Impact Analysis Report
  - Present to Governing Board
- Results of analysis to be publicly available and included with proposed rule amendment packages

Key Questions and Considerations

- Appropriate applicability threshold for ultra-low NOx flare technology installation requirements
- Continuing to evaluate costs and technological feasibility associated with ultra-low NOx flares
- What are the socioeconomic impacts associated with proposed requirements?

Next Steps: Public Engagement Process for Flare Rule Amendment Development



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Open Discussion

webcast@valleyair.org