

**Potential Amendments to District  
Requirements for Leak Detection and Repair (LDAR)  
at Oil and Gas Production Facilities  
(Rules 4401, 4409, 4455, 4623, 4624)**

October 7, 2021

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# Decades of Stringent Air Quality Regulations

- District has long evaluated and implemented stringent control measures across all sources under its jurisdiction in efforts to attain federal standards
  - Adopted over 650 rules and rule amendments in order to control emissions from stationary sources and other local sources
  - District's New Source Review permitting regulation requires the use of the Best Available Control Technology (BACT)
- District stationary sources subject to Best Available Retrofit Control Technology (BARCT) since 1980s
- Robust and ongoing analysis necessary to demonstrate that District's rules continue to meet state and federal requirements, including BARCT
  - Increasingly stringent air quality standards
  - Control technologies continually evolving

# Update on AB 617 BARCT Review

- Best Available Retrofit Control Technology (BARCT) is an air emission limit for existing sources and is maximum degree of reduction achievable, taking into account environmental, energy and economic impacts
- AB 617 requires expedited BARCT review and implementation schedule for facilities in CARB's Cap-and-Trade Program
  - District adopted schedule in December 2018
  - 109 facilities in San Joaquin Valley subject to expedited BARCT review
  - 23 rules already found to meet BARCT
  - 9 rules scheduled for additional review and potential rulemaking in 2021-2022 timeframe as necessary
    - Rule 4702 (Internal Combustion Engines) amendments adopted August 2021
    - 5 rules addressed through this BARCT evaluation

# Purpose of Today's Workshop

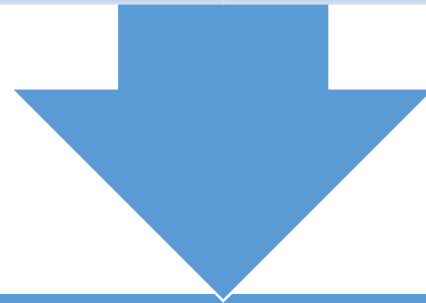
Present results of BARCT evaluation and recommendations for five (5) District rules

Overview and analysis of rules

BARCT evaluation process

Results of BARCT evaluation

Rule amendment concepts



Receive comments from the public

# Purpose of Today's Workshop (cont'd)

Rule	Title
4401	Steam-Enhanced Crude Oil Production Wells
4409	Components at Light Crude Oil Production Facilities, Natural Gas Production Facilities, and Natural Gas Processing Facilities
4455	Components at Petroleum Refineries, Gas Liquids Processing Facilities, and Chemical Plants
4623	Storage of Organic Liquids
4624	Transfer of Organic Liquids

# Rule 4401 Overview

- District Rule 4401 first adopted April 19, 1991
  - Has been subsequently amended 5 times
- Purpose of rule is to limit VOC emissions from steam-enhanced crude oil production wells
- District Rule 4401 requirements
  - VOC emissions from wells, or tanks if wells have closed vents, reduced by 99%
  - Leak detection and repair program required for minimizing leaks with specific repair thresholds and timelines
  - Vapor control required with VOC destruction or removal efficiency of at least 99%
  - Operator Management Plan describes components subject to the rule and schedule of inspections
  - Record keeping requirements
- With implementation of this rule, VOC emissions reduced by 99%



*Image credit: Anton-Paar, 2020*

# Rule 4409 Overview

- District Rule 4409 adopted April 20, 2005
- Purpose of rule is to limit VOC emissions from light crude oil production facilities, natural gas production facilities, and natural gas processing facilities
- District Rule 4409 requirements
  - Leak detection and repair program for minimizing leaks with specific repair thresholds and timelines
  - Operator Management Plan describes components subject to the rule and schedule of inspections
  - Record keeping requirements
- With implementation of this rule, VOC emissions reduced by 65%



*Image credit: BIC Magazine, Oct 2020*

# Rule 4623 Overview

- District Rule 4623 first adopted April 11, 1991
  - Has been subsequently amended 4 times
- Purpose of rule is to limit VOC emissions from the storage of organic liquid in tanks with a capacity of 1,100 gallons or greater
- District Rule 4623 requirements
  - Control of organic liquid storage tanks by utilizing a pressure vacuum vent, installation of a vapor control system with 95% control efficiency, or use of a floating roof depending on tank size and True Vapor Pressure (TVP) of organic liquids stored
  - Components must be maintained in a leak-free condition
- With implementation of this rule, VOC emissions reduced by up to 95%



Image credit: alloiltank 2020



# Rule 4624 Overview

- District Rule 4624 first adopted April 11, 1991
  - Has been subsequently amended 4 times
- Purpose of rule is to limit VOC emissions from the transfer of organic liquids
- District Rule 4624 requires
  - Use of a vapor control system to capture and reduce emissions by at least 95%
  - Leak detection and repair program required for minimizing leaks with specific repair thresholds and timelines
- With implementation of this rule, VOC emissions reduced by up to 95%



*Image credit: Schnider 2020*

# Rule 4455 Overview

- District Rule 4455 adopted April 20, 2005
- Purpose of rule is to control VOC emissions from leaking components at petroleum refineries, gas liquids processing facilities, and chemical plants
- District Rule 4455 requirements
  - Leak detection and repair program for minimizing leaks with specific repair thresholds and timelines
  - Operator Management Plan describes components subject to the rule and schedule of inspections
  - Record keeping requirements
- With implementation of this rule, VOC emissions reduced by 87%



*Image credit: Corken 2020*

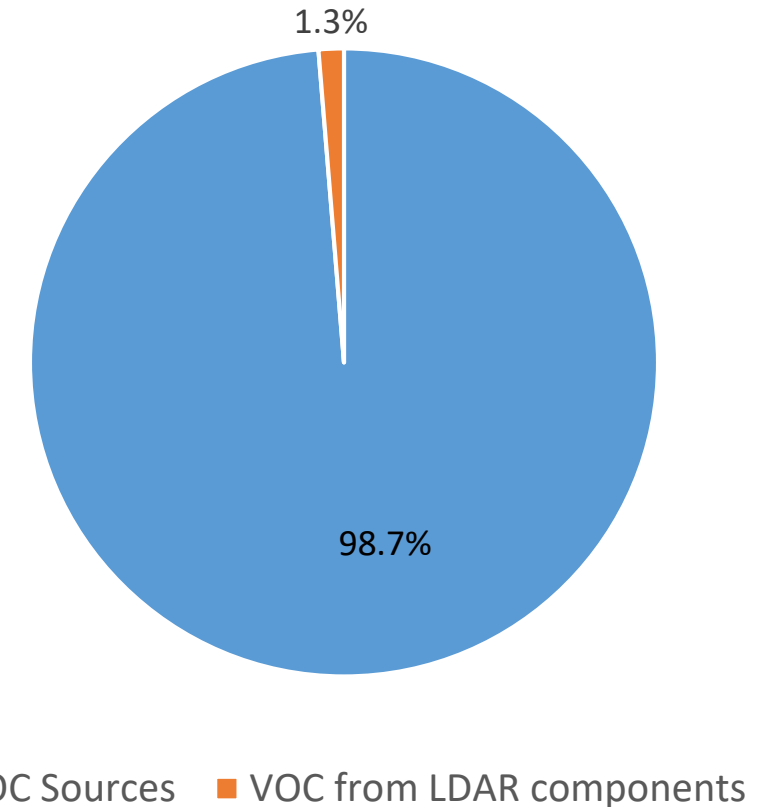
# Current Vapor Control Requirements in District Rules

District Rules	Current Vapor Control Requirements
Rule 4623 – Organic Liquid Storage	Pressure Vacuum Relief Valve, Internal Floating Roofs (IFR), External Floating Roofs (EFR), or Vapor Recovery System (VRS) with control efficiency of 95%
Rule 4624 – Transfer of Organic Liquids	Bottom loading, closed VOC emission control system, Vapor Collection and Control System (VCCS), or containers and VRS that meet Rule 4623
Rule 4401 – Steam Enhanced Wells	VOC collection and control system with 99% VOC destruction or removal
Rule 4409 – Light Oil/Gas Plants Rule 4455 – Petroleum Refineries, Gas Processing Facilities, and Chemical Plants	LDAR only rule, no vapor control requirements

# Affected Oil and Gas Production Operations

- District Rules 4401, 4409, 4455, 4623, and 4624 apply to oil and gas production facilities in the Valley
  - Rule 4401 (Steam enhanced production wells): 48 facilities
  - Rule 4409 (Components at Light Crude Oil Production Facilities, Natural Gas Production Facilities, and Natural Gas Processing Facilities): 61 facilities
  - Rule 4455 (Components at Petroleum Refineries, Gas Liquids Processing Facilities, and Chemical Plants): 17 facilities
  - Rule 4623 (Storage of Organic Liquid): 335 facilities
  - Rule 4624 (Transfer of Organic Liquid): 58 facilities
- VOC emissions from these sources: 3.97 tpd

All VOC Emissions in the Valley  
Mobile, Stationary, & Areas Sources



# Current Leak Detection and Repair Requirements

- Repair time across 5 rules varies from 2 days to 14 days and up to 12 months for critical/essential components
- LDAR inspection frequency can range between quarterly to annually and for Rule 4623 it is voluntary
- Varying component types (valves, threaded connections, flanges, etc.) have different leak thresholds and repair timeframes
  - Leak thresholds range: 1,000 – 10,000 ppmv
  - Pressure Relief Device (PRD) leak thresholds range: 200 – 400 ppmv
- Leak violation level for these rules can range from greater than 1,000 ppmv to greater than 50,000 ppmv
  - Open-ended lines are a violation under Rules 4401 and 4409

# Process for BARCT Rule Evaluation and Regulatory Development

- District staff conducting comprehensive analysis of regulatory requirements of Rules 4401, 4409, 4455, 4623, & 4624 in comparison to other air district requirements, and state and federal regulations, as well as potential costs/cost effectiveness and feasibility of implementing more stringent LDAR requirements
- District rules developed through transparent public process, with emphasis placed on providing opportunities for public engagement and feedback through workshops and comment periods
  - Public engagement process began in 2020
  - Today’s workshop to present results of BARCT evaluation, and discuss and solicit input on potential rule concepts under consideration

# BARCT Rule Evaluation

- Benchmarks for BARCT evaluation included analysis of requirements in other California air districts, and in state and federal regulations:
  - Bay Area AQMD:
    - Regulation 8 Rule 5 – Storage of Organic Liquids
    - Regulation 8 Rule 18 – Equipment Leaks
  - Sacramento Metropolitan AQMD:
    - Rule 447 – Organic Liquid Loading
  - Santa Barbara APCD:
    - Rule 325 - Crude Oil Production and Separation
    - Rule 326 - Storage of Reactive Organic Compound Liquids
    - Rule 346 - Loading of Organic Liquid Cargo Vessels
  - South Coast AQMD:
    - Rule 462 – Organic Liquid Loading
    - Rule 463 – Organic Liquid Storage

# BARCT Rule Evaluation (cont'd)

## – South Coast AQMD (cont'd):

- Rule 1148 – Thermally Enhanced Oil Recovery Wells
- Rule 1173 – Control of Volatile Organic Compound Leaks and Releases from Components at Petroleum Facilities and Chemical Plants
- Rule 1178 – Further Reductions of VOC Emissions from Storage Tanks at Petroleum Facilities

## – Ventura County APCD:

- Rule 71.2 – Storage of Reactive Organic Compound Liquids
- Rule 71.3 – Transfer of Reactive Organic Compound Liquids
- Rule 74.10 – Components at Crude Oil and Natural Gas Production and Processing Facilities

## – State & Federal Regulations:

- CARB Subarticle 13: GHG Emissions Standards for Crude Oil & Natural Gas Facilities (COGR)
- EPA 40 CFR Part 60 Subpart 0000a
- EPA 2016 Control Techniques Guideline for the Oil and Gas Industry (EPA-453/B-16-001)



# Results of BARCT Rule Evaluation

- Based on results of comprehensive analysis, District proposing to require more stringent LDAR requirements for sources subject to Rules 4401, 4409, 4623, and 4624, as well as restructuring of District LDAR regulations
- Current LDAR requirements in Rule 4455 (Components at Petroleum Refineries, Gas Liquids Processing Facilities, Chemical Plants) found to meet or exceed BARCT levels of control
  - No further requirements proposed
- Current control technology requirements in Rules 4401, 4623, and 4624 found to meet or exceed BARCT levels of control
  - No further requirements proposed

# Proposed Regulatory Updates

- District proposing to create one “combined” Leak Detection and Repair (LDAR) rule to standardize requirements
  - Rule 4623 - Storage of Organic Liquids
  - Rule 4624 - Transfer of Organic Liquids
  - Rule 4401 - Steam Enhanced Wells
  - Rule 4409 - Light Oil/Gas Plants
- District proposing to maintain stringent requirements in Rule 4455 for leak detection and repair for components at petroleum refineries, gas liquids processing facilities, and chemical plants as separate rule

# One “Combined” LDAR Rule Concepts

- Rules 4623, 4624, 4401, and 4409 would still retain current required control requirements for subject sources
- Leak Detection and Repair requirements would be removed from these rules and put into a new “combined” LDAR rule (proposed District Rule 4620) in order to:
  - Standardize leak detection and repair thresholds across different types of oil and gas production equipment, to eliminate confusion around overlapping product streams/regulatory requirements
  - Standardize repair time frames across LDAR rules
  - Require quarterly LDAR inspection frequency for affected sources

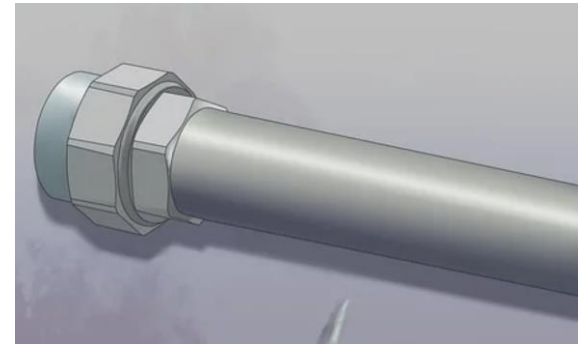
# One “Combined” LDAR Rule Concepts (cont’d)

- Open-ended lines (OELs) for Rule 4623 and 4624 proposed to have two (2) shutoff valves or an end cap
  - Currently required in Rules 4401 and 4409



Open ended line

*Image credit: Schnider 2021*



Open-ended line with end cap

*Image credit: WikiHow 2021*

- Standardize violations for Rule 4623, 4624, 4401, and 4409 at leaks  $>10,000$  ppmv and open-ended lines, discovered during District Inspections

# One “Combined” LDAR Rule Concepts (cont’d)

- Proposed concept would not differentiate between component type (i.e. valves, threaded connections, flanges)

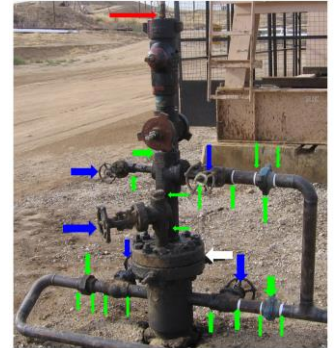
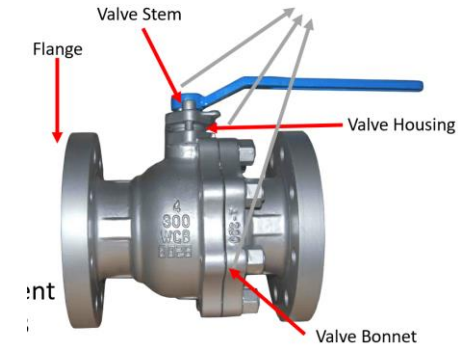
Butterfly Valve



Pressure Vacuum Relief Valve



Threaded Connections



- Allow alternative LDAR methods
  - Optical Gas Imagery & EPA Method 21 alternative screening procedure (quantification required if emissions detected)
  - Additional LDAR methods may be used, subject to APCO approval



Image credit: Mile High Drones 2021

# Voluntary Inspection and Maintenance, and Tank Cleaning Program for Rule 4623

- Replace the “Voluntary Inspection and Maintenance, and Tank Cleaning Program” within Rule 4623 for fixed roof tanks with universal tank cleaning provisions
  - Tanks would now be subject to a mandatory quarterly LDAR inspection
  - Provisions to allow for tank cleaning
- Internal/External floating roof tanks may continue to participate in existing Rule 4623 inspection & maintenance program



District LDAR tank inspection

# Proposed LDAR Leak Threshold Levels

District Rules	Current Leak Standard	Proposed Leak Standard
<b>Rule 4623 – Organic Liquid Storage</b>	10,000 ppmv	500 ppmv PRDs 200 - 400 ppmv
<b>Rule 4624 – Transfer of Organic Liquids</b>	1,000 ppmv	
<b>Rule 4401 – Steam Enhanced Wells</b>	PRDs 400 ppmv All other components 2,000 ppmv	
<b>Rule 4409 – Light Oil/Gas Plants</b>	PRDs 200 - 400 ppmv All other components 1,000 ppmv	

# Current Leak Repair Timeframes

District Rules	Current Repair Period	Extended Repair Period
<b>Rule 4623 – Organic Liquid Storage</b>	N/A	N/A
<b>Rule 4624 – Transfer of Organic Liquids</b>	72 Hours	N/A
<b>Rule 4401 – Steam Enhanced Wells</b>	400 ppmv - 2,000 ppmv (PRDs): 14 Days 2,000 ppmv - 10,000 ppmv: 14 Days 10,001 ppmv - 49,999 ppmv: 5 Days 50,000+ ppmv: 2 Days	N/A
<b>Rule 4409 – Light Oil/Gas Plants</b>	200 ppmv - 1,000 ppmv (PRDs): 7 Days 1,000 ppmv - 10,000 ppmv: 7 Days 10,001 ppmv - 49,999 ppmv: 3 Days 50,000+ ppmv: 2 Days	200 ppmv - 1,000 ppmv (PRDs): 7 Days 1,000 ppmv - 10,000 ppmv: 7 Days 10,001 ppmv - 49,999 ppmv: 2 Days 50,000+ ppmv: 0 Days



# Proposed Leak Repair Timeframes

Proposed Repair Periods		
Type of Leak	Repair Period in Calendar Days	Extended Repair Period in Calendar Days
<b>Minor Gas Leak</b> PRDs: 200 – 10,000 ppmv Other components: 500 – 10,000 ppmv	7	7
<b>Major Gas Leak</b> (Greater than 10,000 ppmv)	3	2
<b>Minor Liquid Leak</b>	3	0
<b>Major Liquid Leak</b>	2	0
<b>Open Ended Lines</b>	3	0

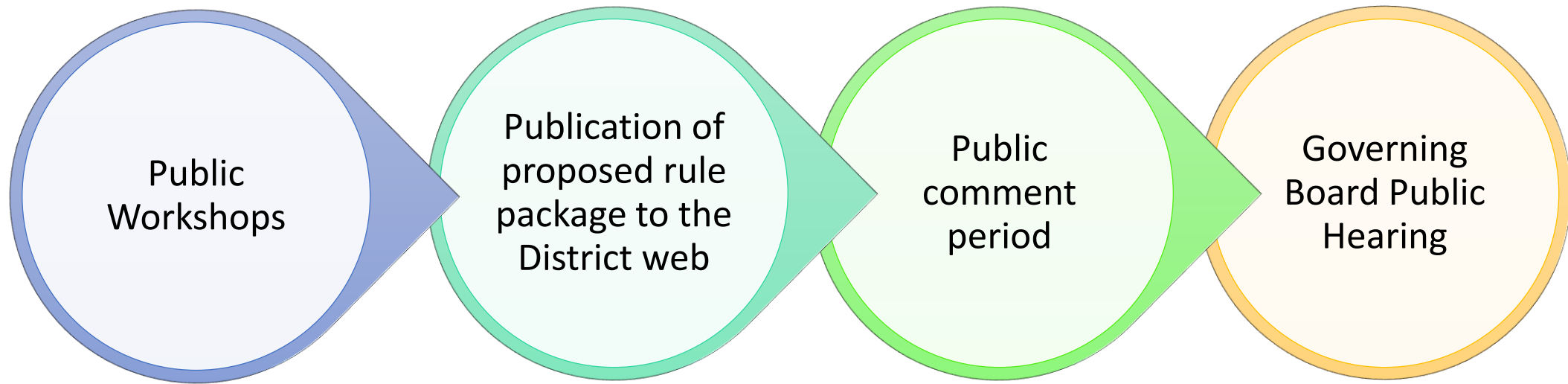
# Proposed Compliance Deadlines

- LDAR requirements from Rules 4623, 4624, 4401, and 4409 would sunset in those rules on December 31, 2023
- The combined LDAR Rule 4620, and associated LDAR requirements, would be effective starting January 1, 2024
- Initial Operator Management Plans (OMPs) for newly subject components required to be submitted no later than January 30, 2024

# Next Steps

- Requesting comment on rule concepts by October 21, 2021
  - Draft rules published in coming weeks with associated comment period
- Continued analysis of costs, cost-effectiveness of amendments, and feasibility of proposed requirements
- Socioeconomic Impact Analysis underway by third-party consultant to evaluate economic impacts of proposed amendments
  - Characterization of the Valley's economic climate
  - Evaluation of economic impacts
  - Socioeconomic Impact Analysis report
  - Results of analysis will be included with proposed rule packages
- Ongoing public engagement process

# Public Engagement Process for Rule Amendments



Public Participation and Comment Invited throughout Process

# Contact

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# Comments/Questions

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