Agenda

• Background
• Studies and Research
• Oil & Natural Gas Methane
• Well Stimulation
• Next Steps
Background
ARB and Air Districts

• Local Air Districts
  – 35 county or multi-county agencies
  – Stationary sources, including oil and natural gas production facilities

• Air Resources Board
  – State agency
  – Motor vehicles, fuels, consumer products, AB 32
  – Can include stationary sources when greenhouse gases or toxic air contaminants are involved
Oil & Natural Gas Sectors

- Oil and Natural Gas Production
- Oil and Natural Gas Processing
- Oil Storage and Underground Natural Gas Storage
- Refineries
- Natural Gas Transmission
- Natural Gas Distribution
• California has both crude oil and dry natural gas wells.

• Generally, gas wells are found in northern California and oil wells further south.

• Gas produced with crude oil is called associated gas.
Oil & Gas Well Stages

- Site Preparation & Drilling
- Well Completions/Well Stimulation
- Production
- Well Workovers
- Well shut-in
Oil & water are pumped to the surface as an emulsion and separated. Associated gas is captured if present.
In gas fields, water and gas are separated and gas is compressed into a pipeline.
Pollutants of Concern

• Oxides of Nitrogen (NOx) (Combustion)
• Volatile Organic Compounds (VOCs) (Venting, Leaks)
• Particulate Matter (PM) (Fugitive dust, Combustion)
• Methane (Venting, Leaks)
• Toxic Air Contaminants (TACs) (Combustion, Venting, Leaks)
Local Air District Regulations

- Stationary combustion
- Prohibition of gas venting
- Vapor recovery on tanks
- Covered sumps and pits
- Leak Detection and Repair (LDAR) for component leaks
- Fugitive dust during site preparation
- Equipment permitting
- Regulations vary by district
ARB Regulations

- On road trucks
- Off road equipment
- Drilling rig engines
- Well stimulation pump engines
- Well completion/workover engines
Pollutants Addressed

• NOx, PM, and TACs from combustion during all well stages covered by District and ARB rules.

• PM from site preparation covered by District rules.

• VOCs from production, processing, and storage covered by District rules. (Methane and TAC co-benefits.)
Possible Pollutants Still to Address

- Methane emissions, which are not already covered by Districts’ VOC rules, due to methane’s low reactivity.
- VOC, TAC, or methane emissions from short-duration handling of drilling mud and well completion, stimulation, and workover fluids.
- Fugitive dust PM from mixing dry materials for drilling mud and well stimulation fluids.
Planned Approach to Address

- Developing control measure to address methane emissions, pursuant to AB 32.

- Conducting well stimulation emission measurements of VOCs, TACs, and methane; will determine if any additional concerns not addressed by the methane measure.
Studies and Research
Methane Efforts

• Short Lived Climate Pollutants (SLCP) Strategy will address methane comprehensively.

• Technology and fuel assessment considers methane leakage from all oil and gas sectors.
  – Workshop September 3, 2014
Both atmospheric ("top-down") and source level ("bottom-up") research

• Top-down
  – Stationary tower measurements across state with inverse modeling and speciation
  – Collaboration on satellite, aircraft measurements, etc.
• **Bottom-Up**
  – Surveys and source specific measurements and testing
  – From the larger source (e.g. a landfill) to a specific equipment piece (e.g. a pipeline) or event (e.g. well stimulation)

• **Goal:** to reconcile top-down and bottom-up state-wide and regionally
  – Result in improved inventory for all sources
ARB Oil & Gas Survey

• 2009 ARB Survey of Oil & Natural Gas Production, Processing, and Storage Facilities in California

• Survey of equipment, activity, and production.

• Emissions calculated using established emission factors, mass balances, etc.

• GHG emissions estimated at 17.7 MMT CO2e
  – 16.4 MMT CO2e from Combustion (~93%)
  – 1.3 MMT CO2e from Venting and Fugitive (~7%)
• Top methane emission sources from survey:
  – Compressor Seals: 373,000 MT CO2e
  – Uncontrolled Storage Tanks: 204,000 MT CO2e
  – Pneumatic Devices: 120,000 MT CO2e

• Other smaller methane sources include compressor blowdowns, well workovers, and wellheads.
Flash Emissions Test Procedure

• Liquid samples collected in field under pressure and “flashed” in a laboratory to obtain maximum volatile emissions from liquids.

• Adopted as part of 2013 amendments to ARB’s Mandatory Greenhouse Gas Emissions Reporting Regulation.
ARB has contracted with testing company to collect in-field methane, VOC, and TAC measurements from well stimulation activities in California.

Draft Report expected by early 2015.
Methane LDAR Study

• Evaluate instruments for effectiveness at locating and measuring fugitive methane and VOC leaks.

• Develop new correlation equations for methane-specific natural gas equipment.

• Draft Report expected mid-2015
Oil & Natural Gas
Methane
Oil & Natural Gas Methane

• ARB is working with Districts to develop strategies to limit methane emissions from oil and natural gas facilities.

• The EPA’s NSPS Subpart OOOO and other states’ rules are being incorporated into ARB’s list of potential control strategies.

• Standards would apply to new and existing oil and natural gas facilities and equipment.
Potential Control Strategies

• Crude Oil and Produced Water Vessels:
  – Vapor recovery on uncontrolled tanks and separators above a methane standard or above a discharge water standard
Potential Control Strategies

• Reciprocating Compressors:
  – Rod packing changed every 36 months or 26,000 hours of operation.

• Gas Powered Pneumatic Devices:
  – Low-bleed (6 scfh) or gas capture required
Potential Control Strategies

• Leak Detection and Repair:
  – Methane incorporated into existing district LDAR programs (possible new standard for some facilities).
  – Field testing can be conducted using the same current instruments, or other optional instruments pending results of current ARB testing contract.
Potential Control Strategies

• Liquids Unloading (Dry Gas Wells):
  – Plunger Lift System or similar “no vent” standard required.

• Well Completions and Well Stimulation:
  – Best practices, e.g., no vent standard, such as requiring vapor recovery, or Reduced Emission Completions.
• ARB seeking information on costs associated with each control strategy, such as:
  – Costs for installing vapor recovery
  – Costs to replace pneumatic devices
  – LDAR cost impacts
  – Any other cost impacts
Implementation

- ARB and District Working Group discussing ways to implement and enforce new standards.

- New standards could become new permit conditions in districts with permits.

- In districts without permits, ARB could require thorough operator reporting.
Well Stimulation
SB 4 Coordination

• SB 4 directs DOGGR to develop reporting and notification regulations for well stimulation.

• ARB, Districts, and DOGGR developing MOA to outline respective authorities.

• Department of Conservation undertaking statewide EIR for well stimulation.

• Natural Resources Agency undertaking an Independent Scientific Study.
• ARB well stimulation emissions testing ongoing.
• Chemical constituent data being collected by DOGGR and SCAQMD.
• SCAQMD also collecting some air emissions data from well stimulation sites.
ARB’s Concerns and Goals

- Understand Emissions and Risks
- Protect Public Health
- Reduce Greenhouse Gas Emissions
Anticipated Approach

• Proceed with development of oil & natural gas methane control measure, which would include well stimulation.

• Continue well stimulation emissions study, and analyze chemical constituent data.

• Depending on results, could propose additional controls for well stimulation.
Next Steps
Next Steps

• Continue working with Districts and DOGGR on SB 4 MOA.

• Continue to collect well stimulation air emission measurements, and to analyze reported chemical constituent data.

• Finalize methane emissions and emission reduction estimates.
Next Steps (continued)

• Continue collecting control cost information.
• Continue working with Districts on methane regulation implementation approach.
• Hold additional workshop(s) this year.
• Anticipate bringing methane measure to the Board in Spring 2015.
Feedback

• ARB seeking feedback on potential requirements, including cost of controls.
• Feedback by September 12, 2014
• Send feedback to Johanna Levine at jlevine@arb.ca.gov
ARB Oil & Gas Web Site

Web Site: http://www.arb.ca.gov/oil-gas/oil-gas.htm

List Serve:

http://www.arb.ca.gov/listserv/listserv_ind.php?listname=oil-gas
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