California Air Resources Board
Oil and Gas Emissions and Mitigation

April 6, 2015
Outline

• AB 32 Background
  – History of ARB work in NG Transmission and Distribution

• Short Lived Climate Pollutant Plan
  – Covers additional reductions in methane

• Oil and Gas Production, Processing, Storage, and Compressor Station Regulation
  – Inclusion of Transmission and Distribution Sources

• Natural Gas Transmission and Distribution Emissions and Mitigation

• Potential options to reduce fugitive greenhouse gases

• Current and upcoming activities at ARB
The Global Warming Solutions Act of 2006 (AB 32)

- Scoping Plan for GHG emission reductions
  - Maximum technologically feasible
  - Cost-effective
  - Real, permanent, quantifiable, verifiable, and enforceable

- Original Plan identified two Oil and Gas sector measures
  - Oil and Gas Production, Processing, and Storage; and
  - Natural Gas Transmission and Distribution (NG T&D)

- Working as partners with CPUC to provide emissions and mitigation knowledge to shape final regulation.
  - NG T&D measure analysis to date
Short Lived Climate Pollutant (SLCP) Plan

- Includes methane, black carbon, and HFCs
- Draft Plan to Board by end of year
- Survey results: Emissions are about 5 MMTCO2e
- Work ongoing to incorporate survey into ARB GHG inventory estimates
- Plan will consider significant methane reductions
The Natural Gas Production Industry
Oil and Gas

Natural gas systems encompass wells, gas gathering and processing facilities, storage, and transmission and distribution pipelines.

Production & Processing
1. Drilling and Well Completion
2. Producing Wells
3. Gathering Lines
4. Gathering and Boosting Stations
5. Gas Processing Plant

Natural Gas Transmission & Storage
6. Transmission Compressor Stations
7. Transmission Pipeline
8. Underground Storage

Distribution
9. Distribution Mains
10. Regulators and Meters for:
   a. City Gate
   b. Large Volume Customers
   c. Residential Customers
   d. Commercial Customer
11. Distribution Services

Source: Adapted from American Gas Association and EPA Natural Gas STAR Program
Greenhouse Gas Emission Controls from Crude Oil and Natural Gas Operations

• Covers oil and gas production, processing, storage, and transmission compressor stations

• Two workshops completed

• Third workshop tentatively planned for late April
  – Draft regulatory language

• Board Hearing tentatively in September
Oil and Gas Proposal

• Establishes emissions limits and control technology requirements
  – separator and tank systems,
  – well stimulation treatment,
  – natural gas compressors,
  – pneumatic devices and pumps,
  – liquids unloading of gas wells,
  – Leak Detection and Repair (LDAR).

• Draft regulatory language expected in late April
  – Proposal may change based on stakeholder input
Oil and Gas Proposal
Components most relevant to T&D

• Current Proposal for compressors
  – Reciprocating: change seals based on time/usage or route vent gas
  – Centrifugal: use dry seals or route gas
  – Considering alternatives that have been submitted

• Current proposal for tanks
  – Flash testing required
  – If above standard must install vapor recovery

• Pneumatics (storage and compressors) and LDAR (storage)
Natural gas systems encompass wells, gas gathering and processing facilities, storage, and transmission and distribution pipelines.

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*Source: Adapted from American Gas Association and EPA Natural Gas STAR Program*
Natural Gas T&D 2009 Survey of 2007 Activity Data

- Collected detailed activity data specific to California
- Included fugitive, vented, and combustion sources
- Focused on fugitive and vented emissions
- Received 100% response from natural gas entities
2007 Snapshot of Natural Gas T&D Activities

- Transported about 2.2 trillion-standard-cubic-feet of natural gas
- Used over 13,000 miles of transmission and 200,000 miles of distribution pipelines
- Served about 10.5 million industrial, commercial, and residential customers
Emissions Calculation Methodology

• GHG Emissions Inventory =
  \[ \sum (\text{Activity Data} \times \text{Emission Factors} \times \text{GWP}) \]
  \[ \downarrow \]
  - Survey
  \[ \downarrow \]
  - INGAA, AGA
  \[ \downarrow \]
  - IPCC
  \[ \downarrow \]
  - GRI/EPA study
Preliminary 2007 Survey Results

Total GHG Emissions
(4.5 MMTCO$_2$e, AR4)

Combustion (12%)

Fugitive (88%)
# Total Fugitive Emissions

## Natural Gas T&D Survey

<table>
<thead>
<tr>
<th>Fugitive Source</th>
<th>Activity</th>
<th>Emissions* (MMTCO2e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipelines</td>
<td>210,000+ miles</td>
<td>3.0</td>
</tr>
<tr>
<td>M&amp;R Stations</td>
<td>15,000 stations</td>
<td>0.6</td>
</tr>
<tr>
<td>Comp. Stations</td>
<td>28 stations</td>
<td>0.3</td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td>0.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>4.0</strong></td>
</tr>
</tbody>
</table>

* Estimated using IPCC Fourth Assessment GWP
## Transmission and Distribution Pipeline Emissions

<table>
<thead>
<tr>
<th>Pipeline</th>
<th>Miles</th>
<th>Estimated Emissions (MMTCO2e)*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>AR4 (100 Yr)</td>
</tr>
<tr>
<td>Transmission</td>
<td>10,000+</td>
<td>0.15</td>
</tr>
<tr>
<td>Distribution</td>
<td>200,000+</td>
<td>2.82</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>~3.0</strong></td>
<td><strong>~4.0</strong></td>
</tr>
</tbody>
</table>

*Include emissions from customer meters, dig-in, and venting.
Mandatory Reporting Regulation (MRR)

- ARB will be updating inventory based on MRR and survey results

- Utilities report annually if emissions greater than or equal to 25,000 MTCO2e.
  - Threshold based on combustion, process, fugitive and vented emissions

- New sources added, reporting 2014 data and beyond
  - Customer meters
  - Pipeline dig-ins
Additional Efforts to Improve Estimates

• Contract with GTI to develop CA-specific emission factors
  – Access to CA emission data from other GTI contracts
• Includes main and service distribution pipelines
  – Above & below ground leak measurements
  – Facilitated by PG&E, SoCalGas, and SDG&E
  – Visited more than 15 cities
  – Need more below ground measurements
• CA specific EFs could be used for estimates if deemed robust and appropriate
• Contract ends Dec 2015
• New studies to examine, including CA specific measurements
Potential Options to Reduce Fugitive Emissions

• Reduce methane leaks and venting
  – Utilize new leak detection tools
  – Install cost-effective technologies
  – Implement pipeline cross-compression to reduce venting
• Implement best management practices
  – Practice enhanced directed I&M
• Replace pipelines
  – Based on material or other parameters
  – Based on historical patterns of leaks
• Compressor stations covered in oil and gas regulation
• Pneumatic devices outside compressor stations:
  – Low-bleed (6 scfh), no bleed, or gas capture
• Require measurements of leaks when repaired to better analyze and target in future
Next Steps

• Analyze incoming data
  – Most recent MRR data
  – GTI, Argonne and WSU Studies
  – Utility data request

• Finish and potentially expand field measurements

• Plan to submit upstream Oil & Gas proposal to Board tentatively in September 2015

• Coordinate with CPUC
  – Work as partners on emissions, mitigation and rule development
ARB Points of Contact

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Discussion

Questions or Comments?