MSA BASELINE IMPACTS STUDY
Shift from Facility-Based EFs to Company-Specific Leaker-Based EFs
2021 Winter Workshop – January 22, 2021
Overview of Proposed Approach Adjusting 2015 Baseline

- Background
- Development of Emission Factors
- Approach for Analyzing Reported Customer Meter Leak Data
- Approach for Calculating Emissions from Customer Meter Leaks
- Approach for Adjusting 2015 Baseline for Appendix 6
Background & Prior Work

» Background:
  ▪ In 2012, PHMSA implemented the Distribution Integrity Management Program regulations requiring reporting of leaks as either “Hazardous” or “Non-Hazardous”, including MSA leaks.
  ▪ Minor leaks were not required to be reported to PHMSA.
  ▪ SoCalGas/SDG&E conducted laboratory tests to validate AGA guidance regarding “seen, heard, or felt” criteria, and correlation with “blowing-off of leak detection soap”.

» Results:
  ▪ Determined soap bubbles begin to be blown-off at ~4 SCFH
  ▪ Study validated rapid dissipation of natural gas above-ground and good safety factor for concern of above ground accumulation

» Implementation:
  ▪ Customer Meter leak data provide in SB-1371 Annual reports

<table>
<thead>
<tr>
<th>SB-1371 Report</th>
<th>&quot;Hazardous&quot; (Qty)</th>
<th>&quot;Hazardous&quot; (%)</th>
<th>&quot;Non-Hazardous&quot; (Qty)</th>
<th>&quot;Non-Hazardous&quot; (%)</th>
<th>Total (Qty)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>2,503</td>
<td>7.3%</td>
<td>32,019</td>
<td>92.7%</td>
<td>34,522</td>
<td>Implemented policy changes</td>
</tr>
<tr>
<td>2016</td>
<td>3,025</td>
<td>4.4%</td>
<td>65,009</td>
<td>95.6%</td>
<td>68,034</td>
<td></td>
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<tr>
<td>2017</td>
<td>2,791</td>
<td>4.1%</td>
<td>65,282</td>
<td>95.9%</td>
<td>68,073</td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>2,913</td>
<td>4.2%</td>
<td>67,145</td>
<td>95.8%</td>
<td>70,058</td>
<td></td>
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</table>
EF Development Methodology Summary Flowchart

**CARB MSA Study Data, OTD Industrial Meter Study Data, SoCalGas Preliminary MSA Data**

**Sampling Plan**
- System-Wide Stratified Random Sample of Leakers as Defined By Operations (Soap Test Done in Field)
- Set sample size to achieve statistically robust EFs (95% Confidence)
- System-Wide Stratified Random Sample of Non-Leaking MSA's as Defined By Operations

**Confirm Bubble Category and Measure CH₄ ppm and Leak Rate (scfh)** Provides Leak Flow Rates Populations and Bubble Category Percentiles
- No Foam or No Bubbles (Non-Haz)
- Foam (Non-Haz)
- Bubbles (Non-Haz)
- Soap Blown Off (Haz)

**Measure CH₄ ppm, Confirm Bubble Category, Measure Emission Flow Rate** Provides Emission Flow Rate Population and Percentile of Emitting MSA's
- Non-Leaking MSA's per Operations with Detectable Emissions per CARB protocol (>100ppm w/CGI)

**Statistical and Probabilistic Analysis**
- Descriptive Statistics of:
  - Bubble Categories
  - Leak Flow Rates
  - CH₄ Concentrations
- Bootstrap Leak Averages and Confidence Intervals
- Lognormal Distribution Fits Leak Averages and Confidence Intervals
- Sensitivity Analysis of:
  - Geographic Regions
  - MSA/Meter Categories
  - Leaking Components
- Logistic Regression Probability Margins Between Flow Rate and EF Categories

**Emission Factors**
1) Soap Solution Blown Off (Haz)
2) Bubbles (Non-Haz)
3) Foam (Non-Haz)
4) No Bubbles (Non-Haz)
5) Non-leaking MSA Emissions (CH₄ > 100 ppm)
Note: for prior Non-Haz data combine EFs for 2, 3, and 4
Approach for Analyzing Reported Customer Meter Leak Data

» Statistically analyze 2015-2020 System Leak Data
  ▪ Normalize Leak data to MSA asset inventories
  ▪ Test for statistical differences in year-over-year leak populations
  ▪ Trend analysis

» Identify reason(s) for changes in number of leaks reported
  ▪ Changes in operational policy
  ▪ Changes in reporting practices or PHMSA reporting requirements

» Estimate 2015 leak volume by EF category and associated emissions
# Approach for Calculating Emissions from Customer Meter Leaks

## Summary of Data by Meters Survey Interval and Results for Annual System Leak Rate and Resulting Number of Unknown Leaks for Each Meter

<table>
<thead>
<tr>
<th>Facility/Material</th>
<th>Total System Meters per survey Cycle</th>
<th>Meters on Annual Survey Cycle (M_{x,A})</th>
<th>Meters on Multi-Year Survey Cycles (M_{x} \text{Tot})</th>
<th>Survey Interval ((\text{yrs})) (I)</th>
<th>Meters Surveyed Annually from Multi-Year Survey Cycles (M_{x,I})</th>
<th>Total # of Leaks Detected from Survey (N_{x,I})</th>
<th>Annual Leak Rate [Leaks / Meter] (R_x = \frac{N_{x,I}}{M_{x,I} = (I \times M_{x,I})})</th>
<th># of Unknown Leaks (N_{x,O})</th>
<th>Total # of Leaks Detected from O&amp;M* (N_{x,O})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cust Meters</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Cust Meters</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Cust Meters</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td>N/A</td>
<td>0</td>
<td>0</td>
<td>N/A</td>
<td>0</td>
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</table>

## Estimated Emissions by Leak Code

<table>
<thead>
<tr>
<th>Leakage Category</th>
<th>Emission Factor (Mscf/day/leak)</th>
<th>Emissions from Leaks Detected from Survey (Mscf)</th>
<th>Emissions from O&amp;M* Leaks Detected (Mscf)</th>
<th>Estimated Emissions from Unknown Leaks (Mscf)</th>
<th>Total Estimated Emissions from Distribution Pipelines (Mscf)</th>
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<tbody>
<tr>
<td>AG-Haz</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>AG-Non Haz</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Miniscule</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td><strong>Total</strong></td>
<td>N/A</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</table>
Approach for Adjusting 2015 Baseline for Appendix 6

» CPUC/CARB Publish Revised Templates

» SoCalGas/SDG&E Summarize Approach and Justification
  ▪ Provide summary of identified changes that effected reported Customer Meter Leaks
  ▪ Provide methodology and calculations to determine number of leaks by EF category in 2015

» Prepare Revised 2015 Appendix 6 and Appendix 8
Questions?

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