LEAK DETECTION – REMOTE SENSING

PHMSA R&D Forum - Sept 12, 2018

Ed Newton

Overview

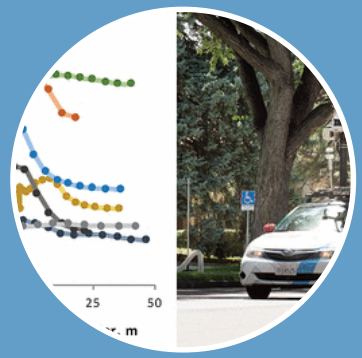
- Summarize SoCalGas Evaluation Projects of Mobile Methane Mapping technologies
- Provide observation of technology sensing capabilities & limitations
- Discuss Emissions Reduction Perspective

Research and Demonstration Projects

SoCalGas Verification Study of EDF/CSU Methane Mapping in Four California Cities (2014)

NYSEARCH PICARRO Mobile Leak Quantification (2015)

SoCalGas Field Evaluation of Mobile Methane Mapping systems (2017)



NYSEARCH Rapid Vehicle-Based Identification of Location and Magnitude of Urban Natural Gas Pipeline Leaks (2017)

SDGE A Sempra Energy utility®

SoCalGas A Sempra Energy utility®

Verification Study of EDF/CSU Methane Mapping of Four California Cities (2014)

Technologies and Background

- Evaluate ability to cost-effectively find and repair leaks, and confirm methane indications and volumes from SoCalGas system are accurate
- CSU analysis and algorithms were proprietary. Equipment included a Picarro analyzer, but not the Picarro Surveyor™ technology

Testing Methodology

- SoCalGas shared information about areas with petrogenic or biogenic methane emissions, as well as known system leaks
- CSU/EDF and SoCalGas surveyed system independently
- SoCalGas measured the surface expression on a sample of the locations where a leak was confirmed

Findings

- CSU/EDF identified 338 locations where atmospheric methane readings indicated a leak. Actual system leaks were found at only 53.6% of the suspected leak locations.
- Compared CSU quantification estimate to surface expression measurement method; very poor leak rate correlation

NYSEARCH Technology Verification Early PICARRO EQ™ System (2015)

Technologies and Background

Verify technical feasibility of quantifying near-ground methane emissions using PICARRO's EQ™ concept System

Controlled release conducted at:

SoCalGas

ConEd

National Grid

Testing Methodology

Controlled leakage flow rates ranging from 4 to 42 cfh.

Study included tests in varying wind conditions from 2 to11 mph

Simulations included discharges from point and distributed sources, and considered barriers and obstacles

Findings

Overall average within 10% of total emissions from all releases combined and 1240 measurements.

Precision of the overall nominal methane emissions ratios:

0.65 to 1.56
(67% Confidence)

0.42 to 2.42
(95% Confidence)

SoCalGas Field Evaluation of Mobile Methane Mapping Technologies (2014-2017)

Technologies and Background

- Field evaluation of Mobile Mapping Technologies to validate functionality, and compare to traditional Leakage Survey process
- Both systems measured methane and ethane and included wind and GPS data integration

Testing Methodology

- Approximately 17 miles of Distribution pipelines were surveyed covering a range of residential and commercial building densities, and climate zones.
- Part 1 evaluated ethane-to-methane ratio to known and unknown sources. Part 2 conducted a double-blind study comparing Mobile Methane Mapping to traditional Leakage Survey

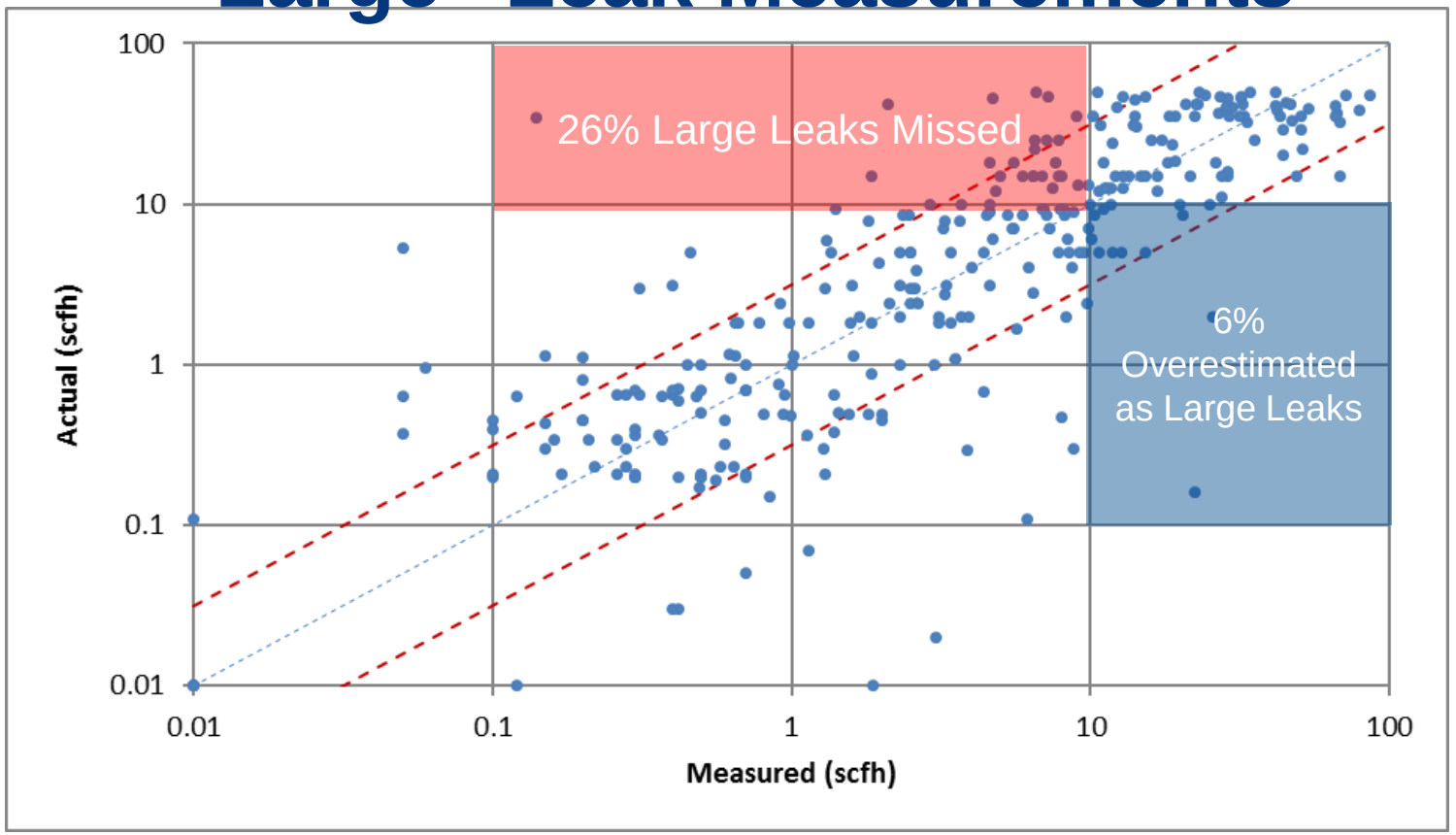
Findings

- Methane Mapping systems detect methane emissions from a variety of sources within the environment
- All approaches missed a small percentage of leaks, walking survey found some leaks not identified by Mobile and Mobile found some missed by walking
- Mobile Mapping had a high rate of false positives (40-50%). Winds and potential methane sources at PPB level are complex in urban environment

Challenges Identifying and Quantifying Large Emitters for Prioritization

- Feb 2018 NYSEARCH article in Pipeline & Gas Journal called “Measurement Technologies look to Improve Methane Emissions”
- Emission Quantification capabilities of multiple mobile technology providers were evaluated
- Measured Emission rate compared against actual emission rate

NYSEARCH Mobile Quantification & "Large" Leak Measurements

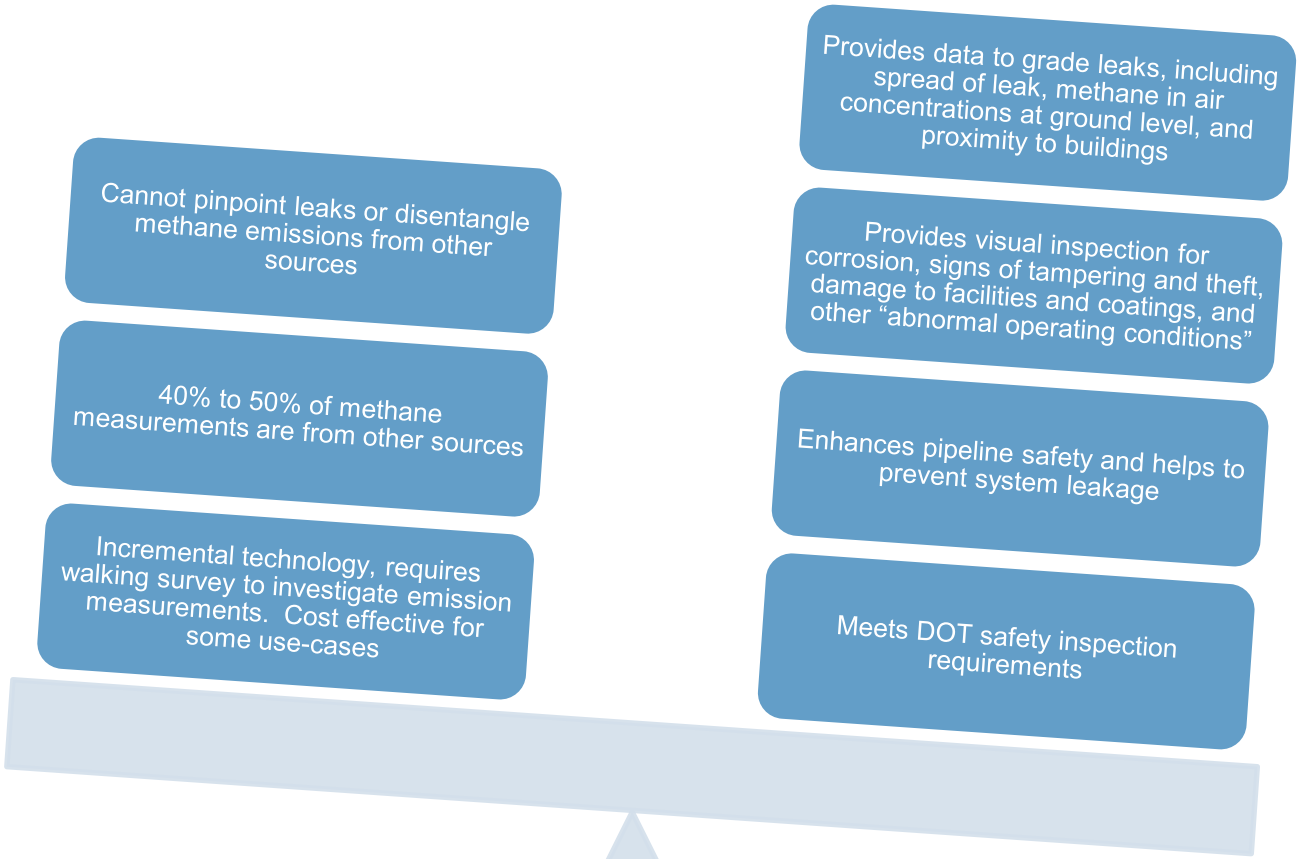


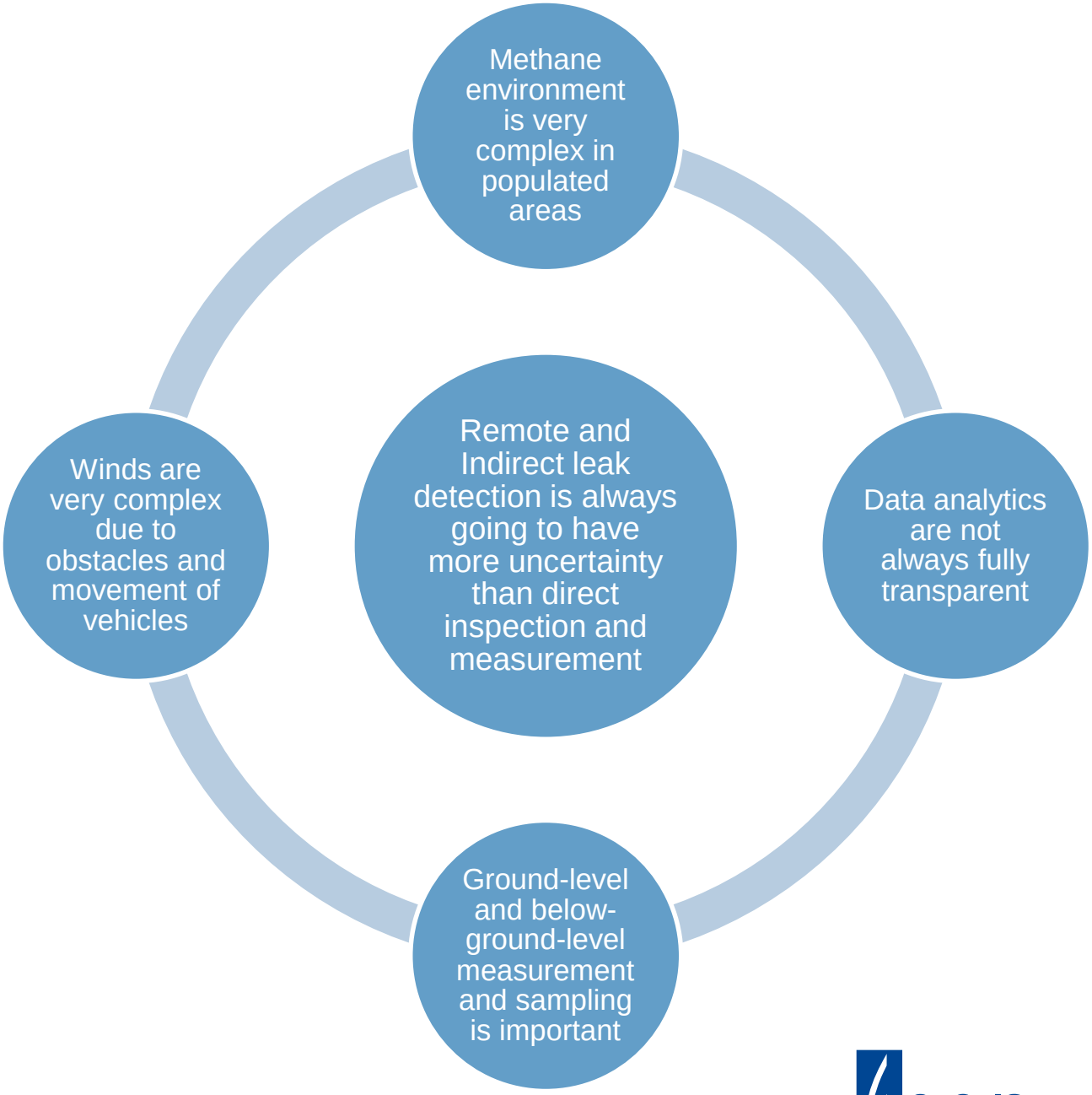
- WSU Study - Leak Flux Populations
  - 70% are between 0.0 - 0.5 cfh
  - 13% are between 0.5 - 2.0 cfh
  - 15% are between 2.0 - 10 cfh
  - 2% are 10 cfh and above

Example Based on 4000 Leaks	<10	10+
% from WSU	98%	2%
Population	3907	93
Population Overestimated	108	N/A
Population Underestimated	N/A	25

Mobile Methane Mapping

Traditional Leak Survey




Methane environment is very complex in populated areas
Data analytics are not always fully transparent
Ground-level and below-ground-level measurement and sampling is important
Winds are very complex due to obstacles and movement of vehicles
Remote and Indirect leak detection is always going to have more uncertainty than direct inspection and measurement