Deployment of New Technologies for Leak Detection and Quantification at PG&E

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Pacific Gas and Electric Company, incorporated in 1905, is one of the largest combination natural gas and electric utilities in the United States.

- The company provides natural gas and electric to approximately 15 million people throughout a 70,000-square-mile service area in northern and central California.
- Service area stretches from Eureka in the north to Bakersfield in the south, and from the Pacific Ocean in the west to the Sierra Nevada in the east.

**Gas Operation Key Statistics**

- **5,800 miles** of gas transmission pipeline
- Approx. **42,000 miles** of gas distribution main
- 4.3 million natural gas customer accounts.
- Deliver 820 BCF/year (2.62 CF/daily average)
Mobile Leak Detection

- PG&E was the first gas utility in the USA to use high-sensitivity mobile leak detection system
- It is today deployed as part of PG&E’s safety leak survey process
Re-inventing the process

• Compliance survey:
  – Redefined the leak survey process around mobile technology
    • Driving protocol
    • Investigation around methane indications
    • Coverage and gap investigations
    • The “5 foot rule”
  – Adapted resources to leak found rate
    • Leak investigation
    • Leak repair

Asset coverage with mobile leak detection, indication of higher methane concentration, coverage gaps
Continuous Improvement

• Data collected through mobile survey and leak repair are systematically analyzed to optimize:
  – Leak indication filtering
  – Coverage modeling
  – Investigation areas

Coverage gaps are surveyed by foot using traditional technologies

Percent Leaks Found

Percent Services Searched
New Applications

- Methane abatement:
  - Accelerated detection and repair of large leaks of the distribution system
- Risk based leak survey:

WSU study: Only 2% of leaks were > 10 scfh but accounted for 56% of total emissions
Stationary Systems to address variable Sources

- In facilities, methane emissions are a function of operations
- Stationary detectors help to correlate emissions and operations
- We are also exploring quantification possibilities

*Heath (right) and Sensit/Acutect (left) detectors installed at PG&E storage and regulation facilities*
Towards light and versatile systems

- Based on NASA’s device used to detect methane on Mars.
- The detector has **superior sensitivity (parts per billion)** and is lightweight (150g) compared to existing technologies.

![Prototype of the handheld methane-ethane detector.](image1)

![UAV mounted detector being tested at UC Merced.](image2)
New aerial survey system

- Quick detection of sizeable leaks on the transmission system
- Differential Absorption LiDAR DIAL system on a fix wing single engine aircraft
  - 150 - 900 ft. swath
  - Altitude: 3,000 ft.
  - Speed: 125 m/h
- Field tests in 2017
- Pre-deployment pilot in 2018

Controlled release of ~133 SCFH methane on October 3rd 2017
Exploring new technologies

• Inexpensive distributed leak detectors
  - Bioinspira
    - Reactive protein
  - Stanford
    - Electrochemical potential

• Optical Gas Imaging
  - Control and field testing

• Open-path Laser Comb technology
  - Demonstration at our storage facility

University of Colorado’s methane sensor trailer at McDonald Island and a map of their plan
Take away

• Advanced Technology is a key part of PG&E’s leak management strategy

• Mobile leak detection deployment has been a several year process that led successively to:
  - Vetting through controlled and field testing
  - Design and optimization of a new leak management process
  - Continuous improvement using data collection capabilities
  - Additional applications

• Beyond mobile leak detection a broad range of technologies are being explored and developed in collaboration with many organizations
Thank you

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