

DOCKETED

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New Technologies and R&D Efforts on Leak Detection and Methane Emissions

François Rongere

CEC Workshop on Methane Emissions AB 1257

Sacramento, June 1st, 2015





Company Profile

■ **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 pipe
- 4.3 million natural gas customer accounts.
- Deliver 970 BCF/year (2.6 BCF/daily average)





Methane Emission Abatement



Current Methane Emission Abatement



Ref: Steve Redding, Glenda Blaze. "Revolutionizing Leak Management", 26th World Gas Conference, Paris June 1-5, 2015

Steve Redding "Introduction of Picarro Surveyor Technology at PG&E" 2013 AGA Operations Conference Orlando, FL May 23rd, 2013

- Replacement of bleeding controllers with no or low-bleeding controllers.
- Reordering of compressor sequencing to base load compressors with the largest blowdown at shut down.
- Cross-compression to avoid gas release during Hydrotests.
- Conversion of all centrifugal compressors to dry gas seals.
- Conversion of compressor gas starters to air or electric.
- Reduced number of open grade 3 leaks by 32% thanks to leak management practices and the use of advanced leak detection technology.
- Retirement of cast iron pipelines completed in 2014



R&D and Innovation

Leak Detection



Stationary Methane Laser Sensor



Installed Remote Methane Leak Detector at PG&E Livermore Training Center (February 2013)

- Continuously monitors its line of sight above pipelines and provides rapid warning for leaks.
- System consists of sensor, weather station, camera and computer station.
- Testing of the system co-funded with the California Energy Commission:
 - Demonstration of sensor efficacy
 - Evaluation of sensor response to leaks in typical operating scenarios and weather conditions
 - Elimination of false alarms
- Project is completed. Results were presented at the 2014 AGA Spring Conference.

Ref: Paul Wehnert et al. "Continual 24/7 Pipeline Monitoring System for Leakage", 2014 AGA Operations Conference Pittsburgh, PA May 21st, 2014

2013

Design

Develop

Test

Deploy



Handheld Methane Detector



Using the handheld methane detector to pinpoint simulated leaks at Livermore training center (December 2014)

- The handheld methane detector utilizes the same laser based technology that NASA has installed on its planetary rovers to detect methane on Mars.
- The tool has superior sensitivity (parts per billion) compared to other commercial handheld detectors. It is also lightweight (150g).
- When completed, the tool is expected to reduce time taken to locate leak in association with vehicle based survey.



Prototype of handheld methane detector (December 2014)

<http://www.pgecurrents.com/2014/11/04/video-pge-adapts-mars-rover-technology-for-gas-leak-detection-tool/>





sUAS Methane Detector



JPL methane detector mounted on a small quadrotor

- JPL lightweight methane detector mounted on a small drone to detect methane and locate leak.
- In preparation of FAA's regulation of commercial applications of drones in September 2015.
- Totally automated drone that can be launched by utility crew in the field to survey portions of pipeline or facilities and locate leaks.





R&D and Innovation

Methane Emission Quantification



New Techniques to quickly estimate leak flow rates in urban environment



Controlled Natural Gas releases at the PSE&G training facility in Edison, NJ

- Broad call for ideas through an RFP.
- Selection of most promising existing technologies and testing them in controlled environment and in the field.
- Propose validated methods that may be deployed to assess methane emissions of non-hazardous leaks.
- Expand repair programs to include non-hazardous leaks based on methane emissions.

2015 ▼

2016

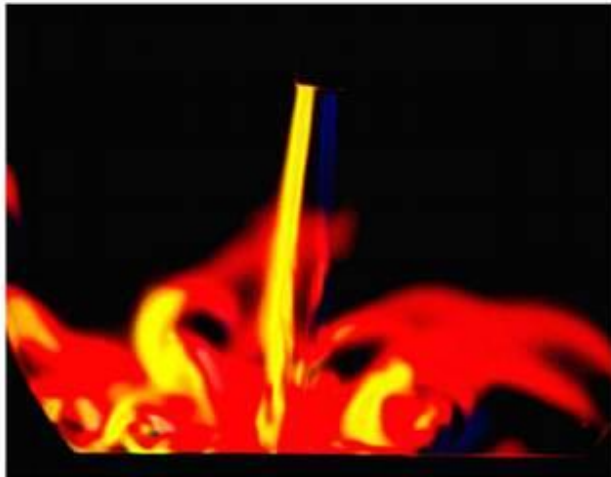
Design

Develop

Test

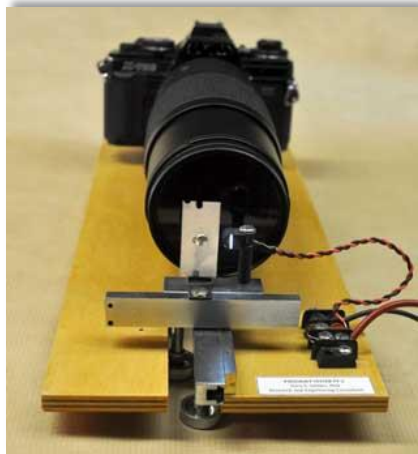
Deploy

Schlieren Gas Imaging



Using Schlieren optical imaging to visualize propane gas flow

- Schlieren technique offers a visual method to observe leak flow remotely.
- Contrast is achieved based on differences in refractive indexes of gases.
- This NYSEARCH project explores the potential that Schlieren imaging holds for leak *quantification* by measuring fluid flow properties of gas plumes.



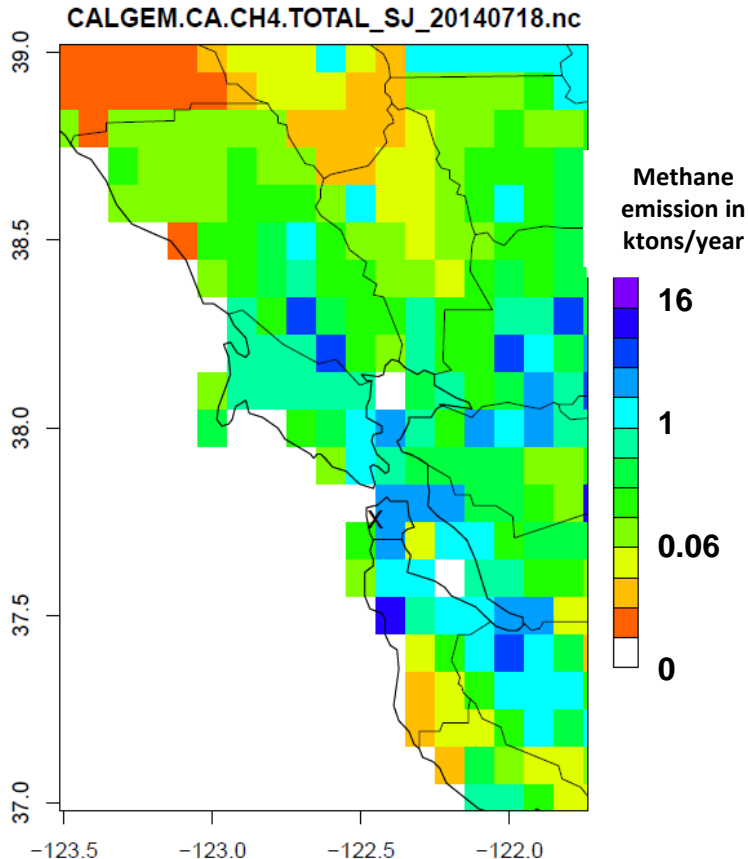
A simple Schlieren system set-up



Lab Schlieren image of helium flow



Support (No funding by PG&E) to: BAAQMD's methane emissions inventory



- In-kind support to Lawrence Berkeley Laboratory in charge of establishing a baseline map of methane emissions in the Bay Area.
- Based on the CALGEM¹ mapping technique developed by LBL.
- Simple model based on a percentage of gas delivery: 0.3% of delivery.
- PG&E provided core customer consumptions aggregated by Zip code.

¹ CALGEM: California Greenhouse Gas Emissions Measurement Project aims to improve inventory estimates of non-CO₂ GHG emissions by performing statistical comparisons of predicted and measured GHG mixing ratios.

<http://calgem.lbl.gov/about.html>

2015

Q3 2015

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Support (No funding by PG&E) to: NASA-JPL to test airborne technologies



- In-kind support to NASA-JPL (Jet Propulsion Laboratory) to perform aerial quantification of large methane emissions.
- Combination of two techniques developed by NASA-JPL:
 - Atmospheric methane concentration measurement: CARVE
 - Ground infrared emission measurement above the source location: HYTES
- PG&E performed controlled releases of natural gas at a regulation station in Bakersfield in February 2015.



2014

Q3 2015

Design

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Support (No funding by PG&E) to: UC Davis to test airborne technologies



Source is within the circles, the aircraft flew in circles from 100 m of altitude to the limit of methane detection

- In-kind support to UC Davis to perform aerial quantification of large methane emissions.
- It is funded by the California Energy Commission through its project: Improvement of an Airborne Natural Gas Leak-Detection System PON CEC-500-13-005.
- Uses Picarro and LGR technologies mounted in an aircraft.
- Includes testing Ethane detector for Natural Gas source identification.
- PG&E performed controlled releases of natural gas at a regulation station at Rio Vista on November 3-4, 2014.

2014

Q3 2015

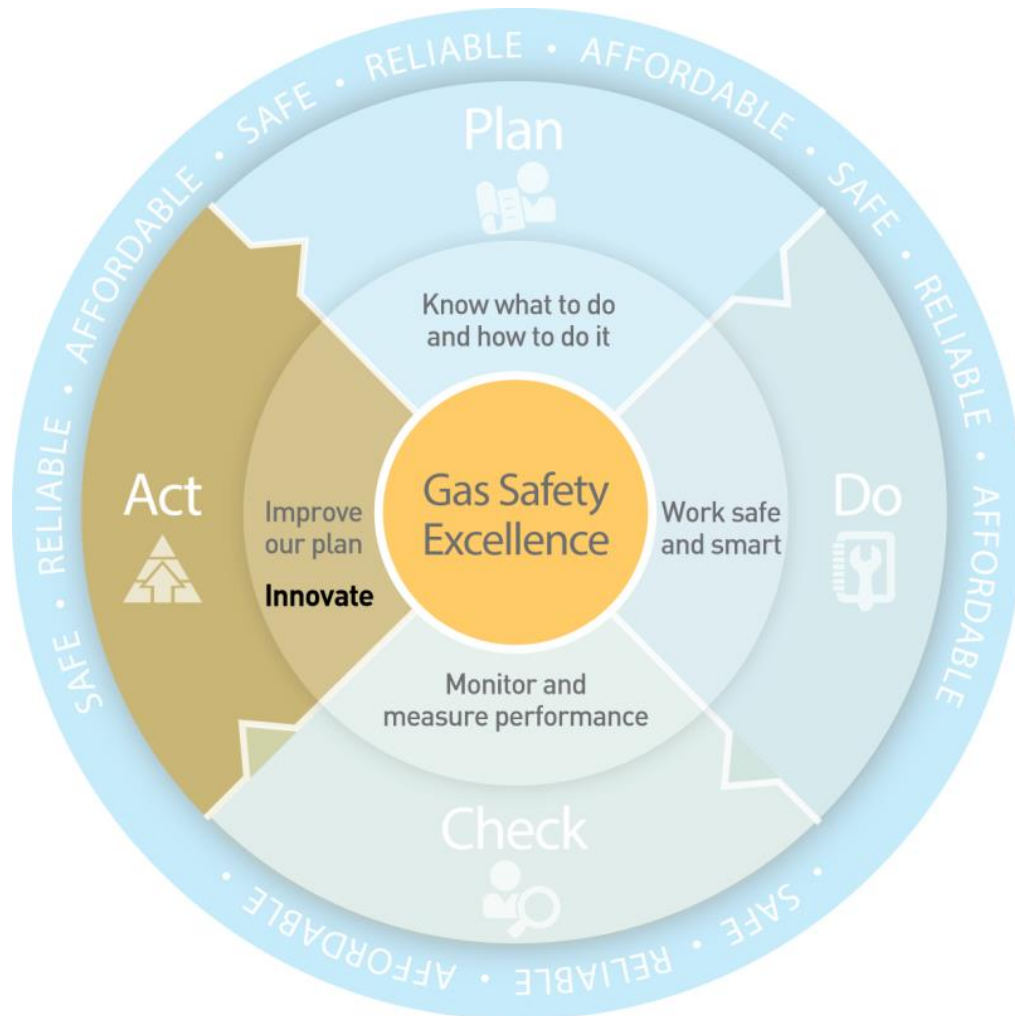
Design

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Thank you



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