

Infrastructure Changes to Reduce Methane Emissions

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Emission Detection Cost Effectiveness

Leak Surveys by Pipe Classification

Increase the frequency of leak survey allows utilities to find leaks faster, repair leaks more quickly, and reduce emissions

01

Unprotected Steel

(No Cathodic Protection)

- 3 year to 1 year survey
- \$34/MCF

“State of the Art” Plastic

- 5 year to 3 year survey
- \$421/MCF

02

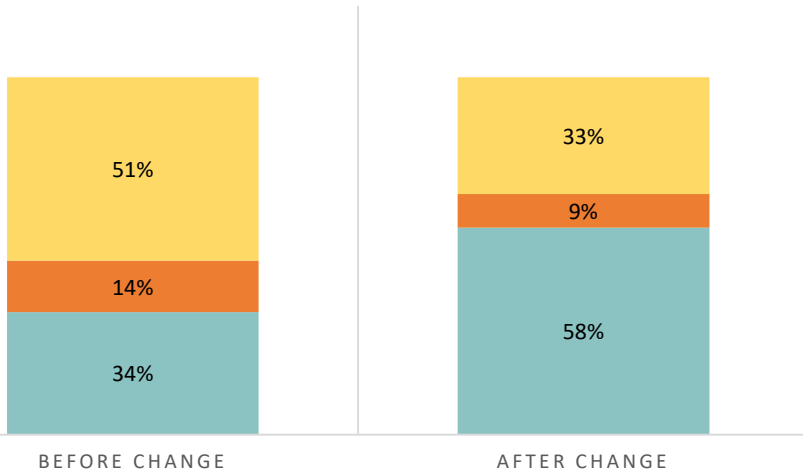
03

Protected Steel

- 5 year to 3 year survey
- \$611/MCF

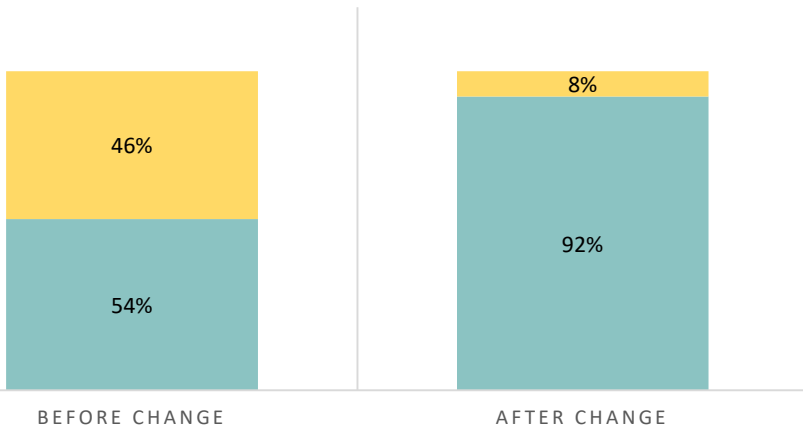
INCREASED ANNUAL LEAK SURVEY

■ Annual ■ Multi-Year ■ Unsurveyed



INCREASED % OF LEAKS DETECTED

■ Detected Leaks ■ Estimated Unknown*



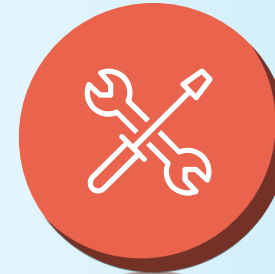
* Number of leaks are estimated in areas not surveyed in the report year

ACCELERATED SURVEY



STRATEGY

- Reduce number of unknown leaks



SOLUTION

- Change in survey rate from 3 years to annual



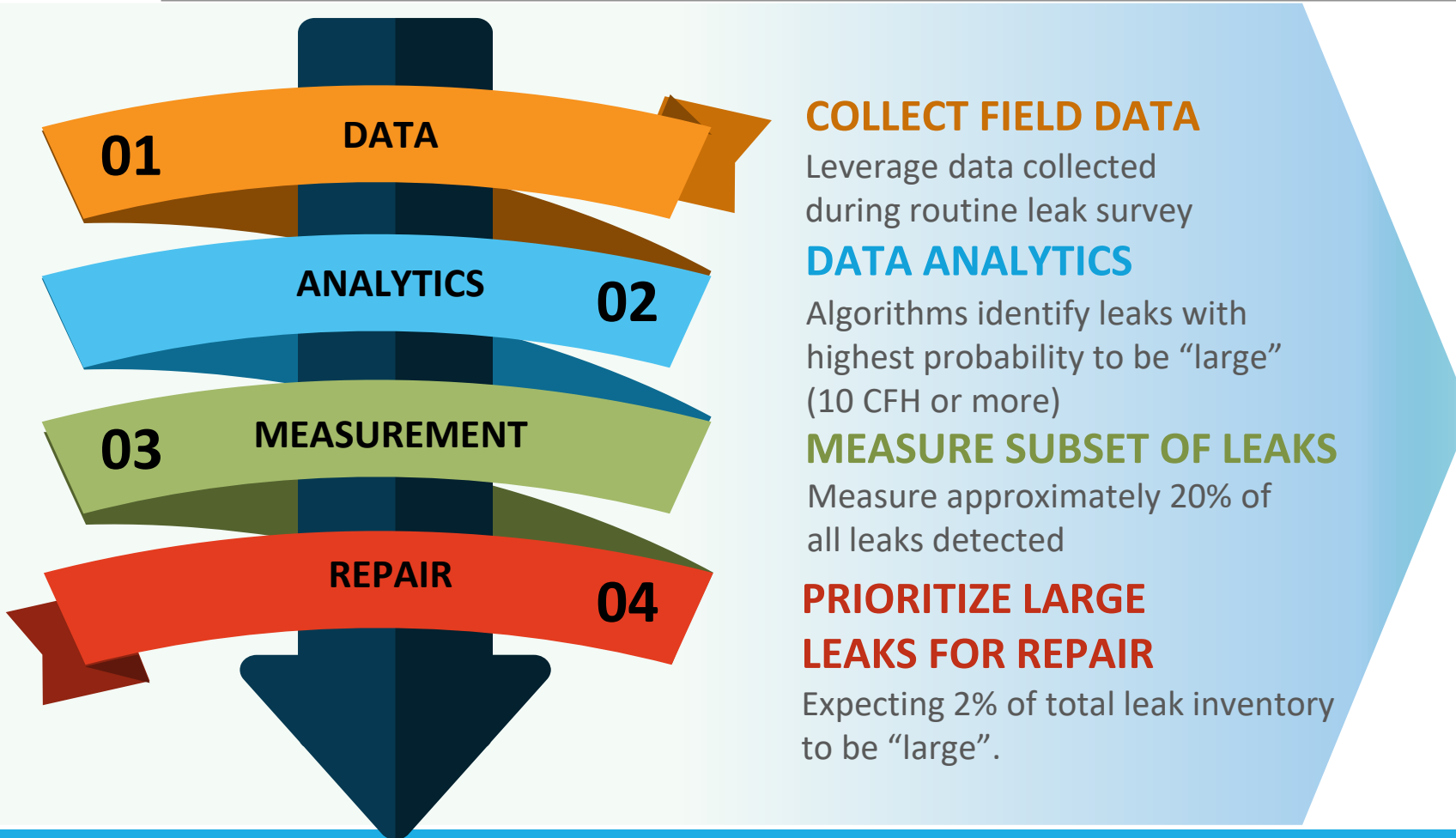
RESULTS

- Reduction in inventory of unknown leaks
- Reduction in associated emissions
- Allows for analysis of potential locations of large leaks



A Sempra Energy utility

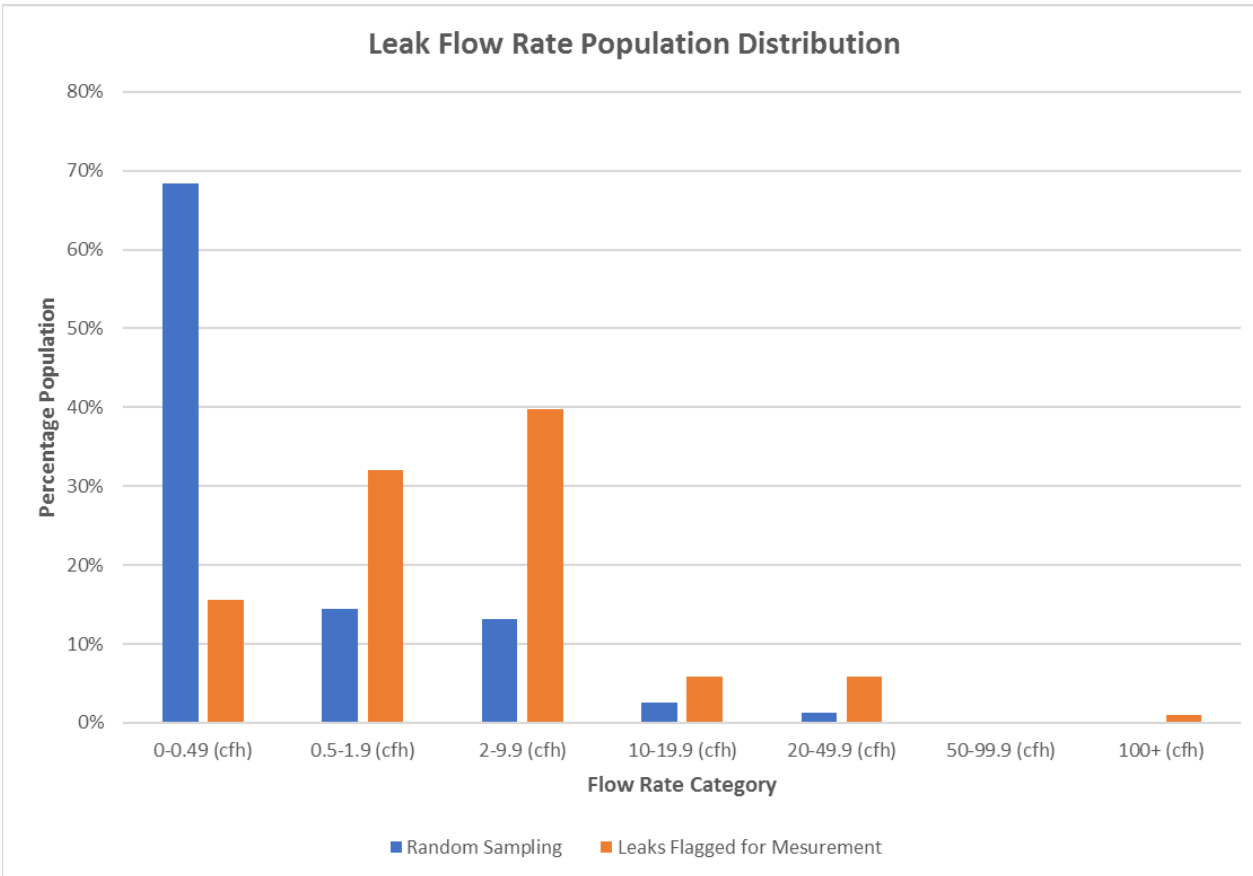
Large Leak Mitigation Strategy



BENEFITS

- 1 Avoid measuring 80% of leaks detected
- 2 Minimize cost of implementation
- 3 Leverage accurate leak measurement methods

Progress to Date



SUCCESSFULLY BIASED THE SAMPLE POPULATION DISTRIBUTION

R&D completed developing data analytics approach to screen leak data

650+ leaks processed through data analytics with 102 leaks flagged for measurement (16%)

14 large leaks found out of 102 leaks measured (2% of the 650+ leaks processed)

Additional 180 leaks measured that were not flagged for measurement with only 2 large leaks found (1% - both on low end of “Large”)

sUAS Methane Applications Summary

Leak Survey Application

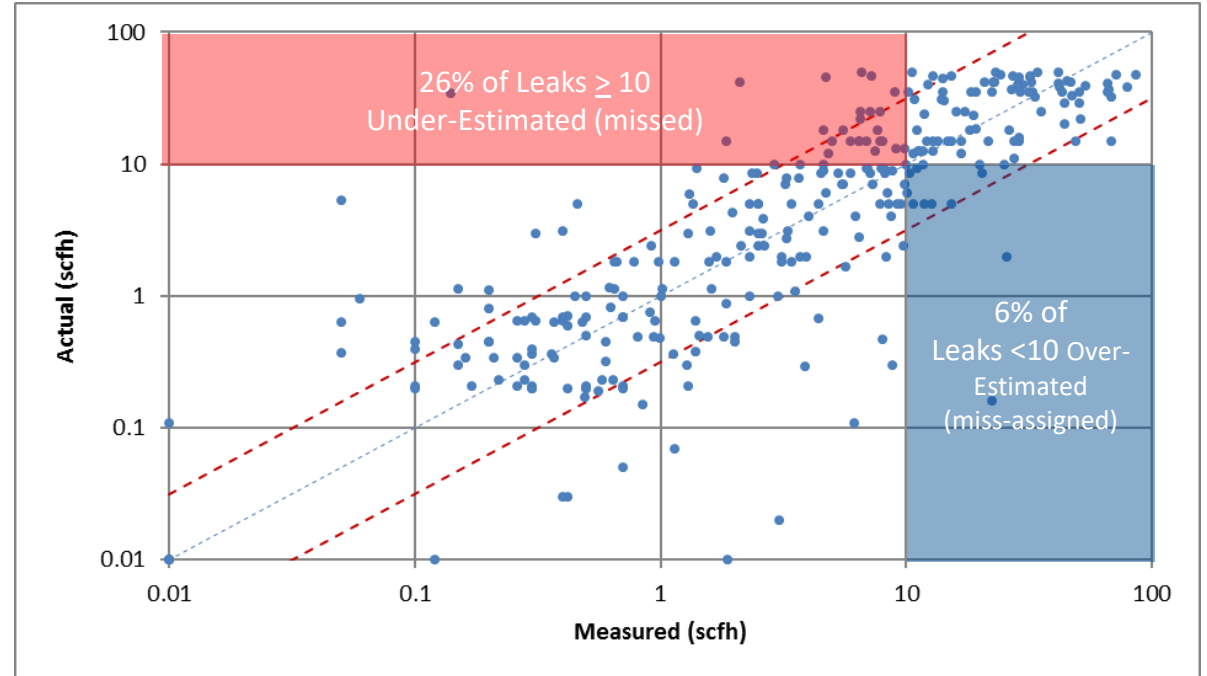
- » Reliable Leak Detection
 - Requires post data processing
- » Reliable Leak Pin-Pointing
 - Requires alignment of emissions data with high-resolution imagery

Emissions Quantification

- » Requires validation protocol
- » Use of low statistical confidence levels will limit application
 - Increases number of outliers
- » System accuracy dependent on number of measurements and knowledge of source locations
 - Effective for remote and difficult to access locations



Remote & Indirect Methane Quantification
(Large' Leak Estimation (≥ 10 CFH))



Average Leak Flux Population % for Buried Distribution Leaks*

- 66.7% are between 0.0 - 0.5 cfh
- 16.3% are between 0.5 - 2.0 cfh
- 14.7% are between 2.0 -10.0 cfh
- 2.3% are 10 cfh and above

*Derived from WSU study data

Example Based on 4000 Leaks	<10 CFH	>10 CFH
Population % from WSU	97.7%	2.3%
Actual Leak Rate Population	3907	93
6% of Leaks < 10 Overestimated	108	0
26% of Leaks ≥ 10 Underestimated	0	25
Observed Leaks ≥ 10 CFH	$93 - 25 + 108 =$	176



ADVANCEDmeter

**ANALYTICS TO SUPPORT QUANTIFICATION AND
MITIGATION OF NATURAL GAS EMISSIONS ON
CUSTOMER SIDE OF METER**

Background

For over 100 Years Odorant in Gas has been and continues to be the primary safety defense for indoor gas leak detection

- *Department of Transportation's Pipeline & Hazardous Materials Safety Administration (PHMSA) regulations require odorant to be added to natural gas so a person with reasonable sense of smell can detect a leak at 1/5 of the Lower Explosive Limit of natural gas.*

Rapid Company response to Customer Odor Complaints (*within 1 hour*)

~47,000 leaks on customer piping and appliances (2017 data)

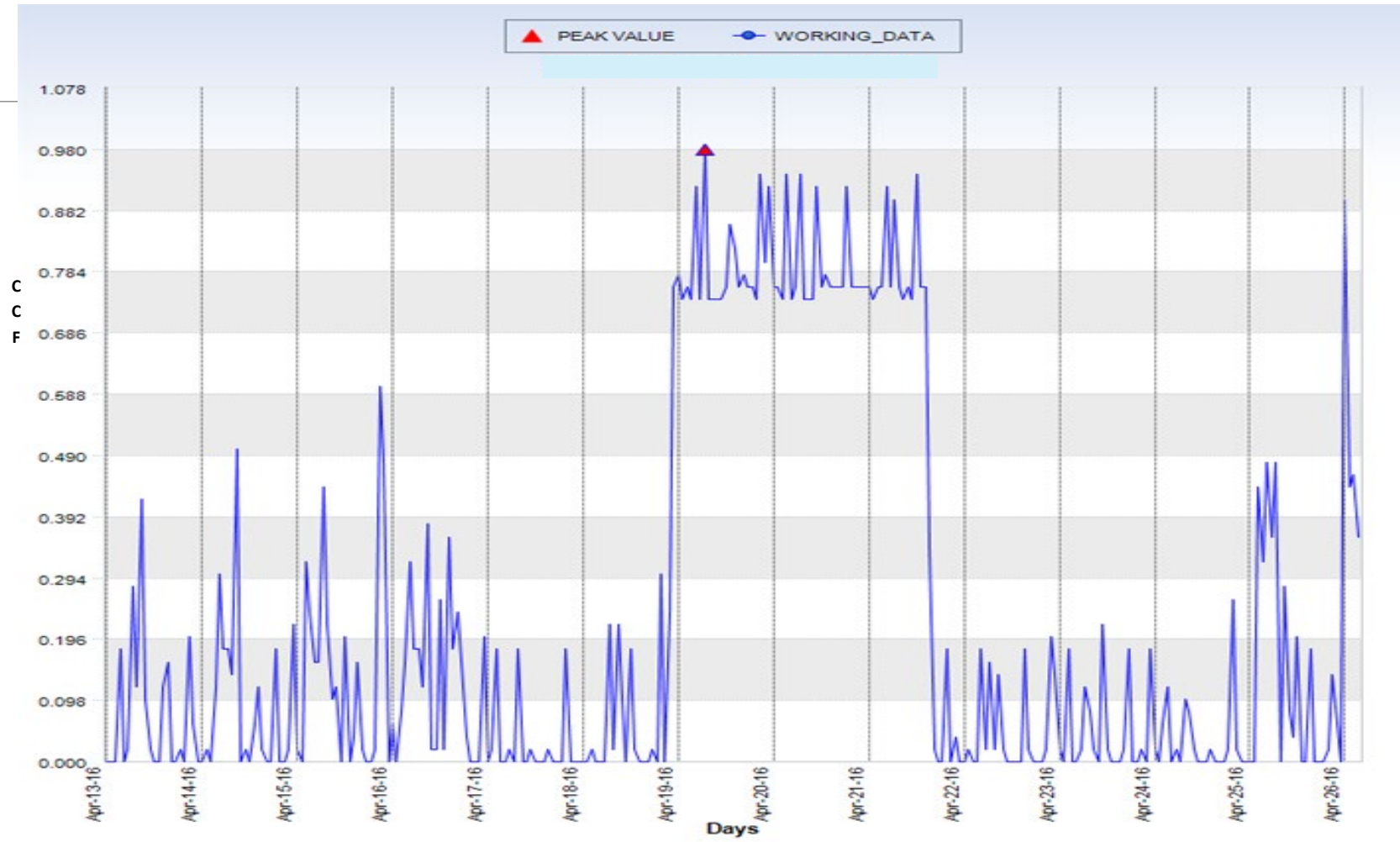
- 97% detected by the Customer smelling gas
- 3% detected through Advanced Meter Analytics (1,457 leaks)

Advanced Meter Analytics allows for detection of leaks on customer's facility in instances where leaks go undetected

- *Typically, where someone is not around to smell the gas*

Advanced Meter Analytics allows for direct measurement of excessive consumption from leaks and from other reasons, such as gas appliances being left on

Consumption Patterns Appliance(BBQ) Left on in error



CCF/Hr, Hundreds of Cubic Feet per Hour

Case Review – Meter Capacity Leak

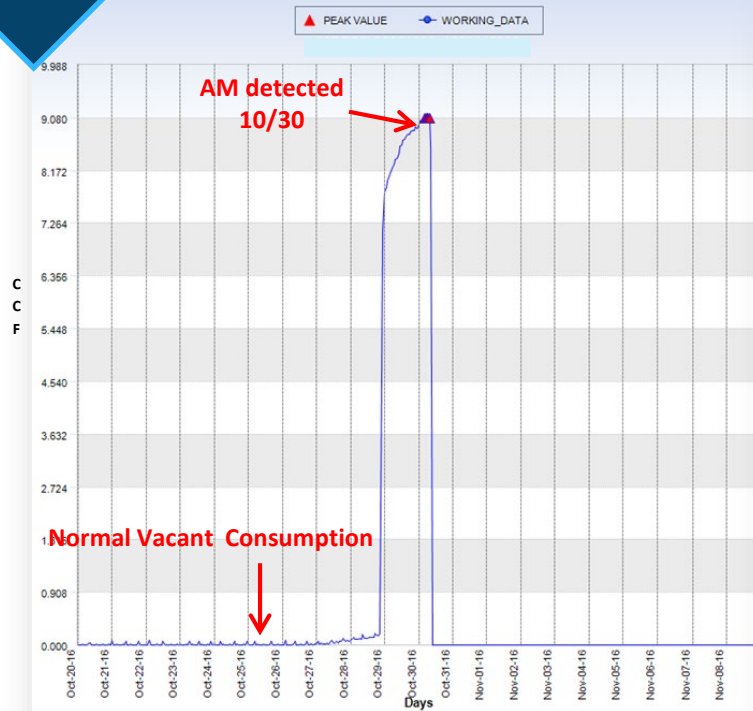
Use Case: Occupied | Gas: 980 CFH

Analytics

- **Analytics:** a facility was identified as having 780 CFH continuously going through the meter for a minimum of 24 hours.
- **Field action:** The on-call technician was dispatched and excessive registration was found upon arrival and the meter was left off. The leak peaked at 980 CFH before being turned off.

Results

- **Analytics findings:** 11 days later the customer called to have the gas turned back on. The source of excessive registration was a downed tree that caused a break in the yard line. The odor from the leak was not detected due to the remote location of the meter, the distance between homes, and the fact that the customer was away on vacation. It is possible that it could have blown for at 11 days or more.



Case Review – Hot Water Leak

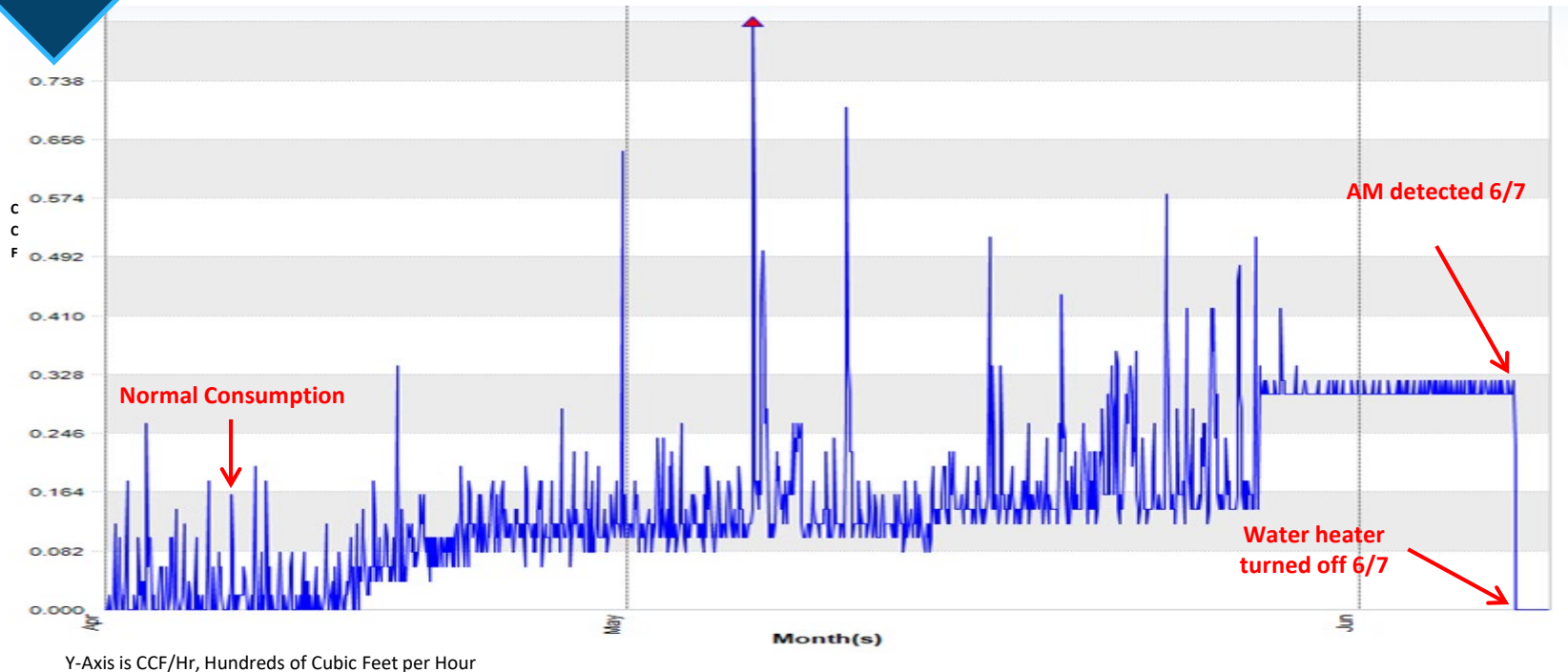
Use Case: Occupied | Gas: 32 CFH

Analytics

- **Analytics:** a facility detected as having a high consumption of 32 CFH (cubic feet per hour) for 5 days (per day average).
- **Field action:** the technician found a water leak that was causing the water heater to constantly stay on. The customer was contacted by phone to let them know about the hot water leak. The customer arrived shortly afterwards, the water was shut off at the main and the water heater was left off.

Results

- **Analytics findings:** In contacting the customer it was determined that although there was a customer of record and the facility was considered occupied, there was no one actually living here. As noted by the employee “The customer was very grateful for our company being proactive”.



Summary

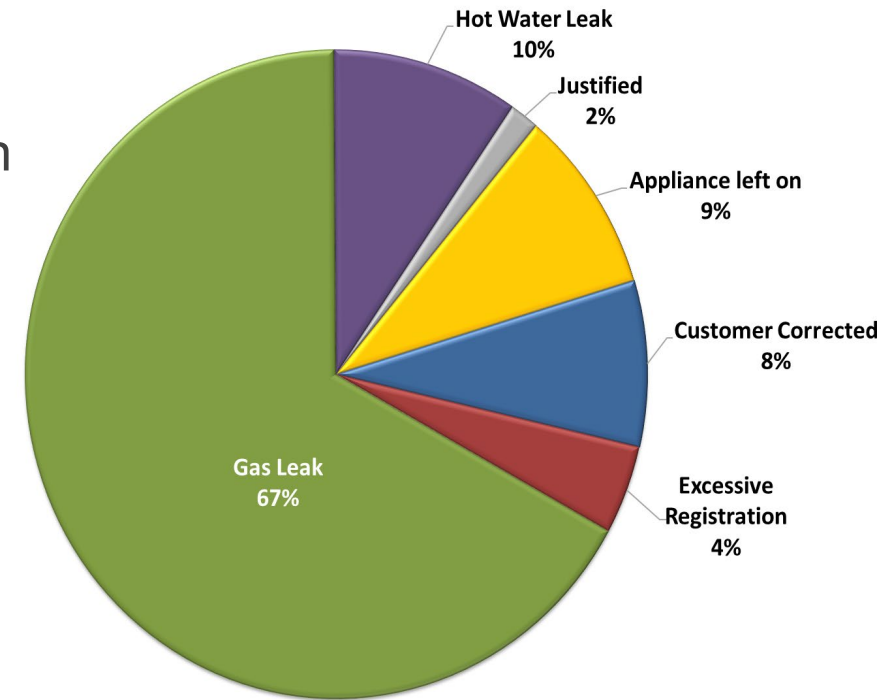
Odorant in natural gas has been and continues to be the primary safety defense for customer piping and appliance gas leak detection

The Advanced Meter system allows for direct measurement of gas usage, which facilitates faster detection of leaks on customer facilities, in instances where leaks go undetected

Estimated emissions and emissions mitigation (2017)

- Natural Gas Emissions from known leaks = 42,086 MCF
- Natural Gas Saved from AM Analytics* = 37,371 MCF

**When compared to practices prior to Advanced Meter consumption data analytics*



AM Consumption Analysis

- 2017 data based on actual orders where Company identified and resolved reason for high consumption at occupied facilities
- Percentages have been rounded



A Sempra Energy utility®



Thank you!

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