

REMOTE EMISSIONS MONITOR

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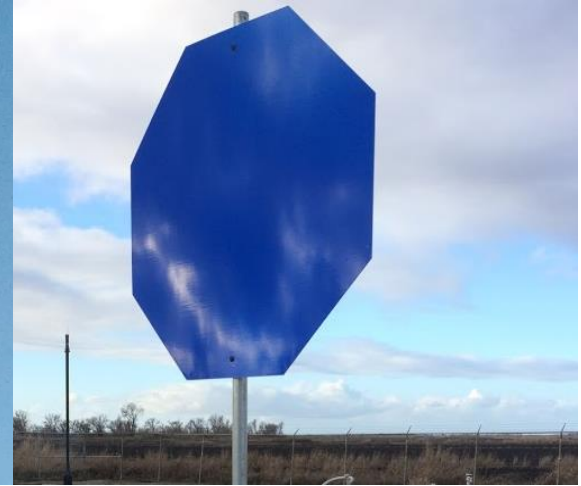
# SPECIFICATIONS

REM Technical specification	
Theory of Operation	Tunable Diode Laser Absorption Spectroscopy (TDLAS)
Detectable Gases	Methane. Others available on special order
Range	0 to 99,999 ppm.m
Sensitivity	< 10 ppm.m
Path Lengths	Up to 350 m
Speed of Response	<< 1 sec.
Digital Output	RS235, Wi-Fi, Cellular
Data Storage and access	Web portal cloud based storage
Power Option	Solar or AC



# System Components

- Laser Transceiver
  - Remotely mounted as needed
- Reflector
- Control Electronics
  - Laser and controller
  - IoT wireless access point
  - Cellular modem (optional)
  - Ultrasonic wind sensor (optional)
- Cloud data storage and analytics



# APPLICATIONS

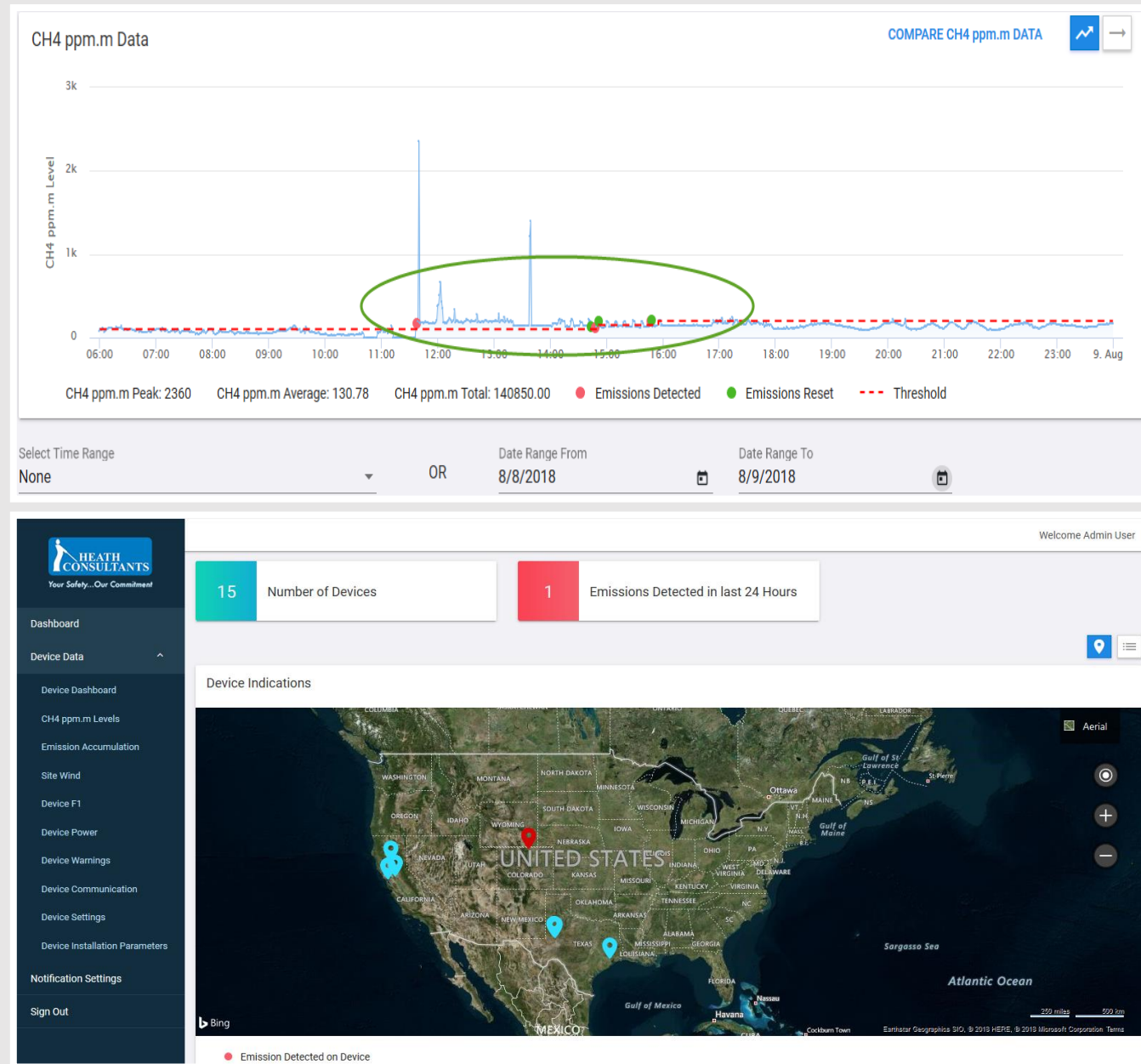
- Oil & Gas Production
- Gas storage
- High consequence pipe line segments
- Environmental emission monitoring
- Methane specific fixed open path
- Based on 10+ years of RMLD technology
- No false alarming on fog, rain, snow, vibration, high winds, partial obstruction
- Easy install and alignment
  - Single Transceiver
  - No precision required
- Internet of Things (IoT) cloud based communications and data storage
- Data Analytics and Alarming





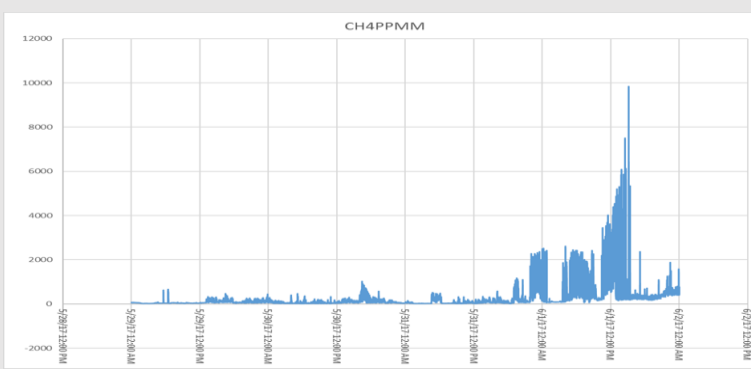
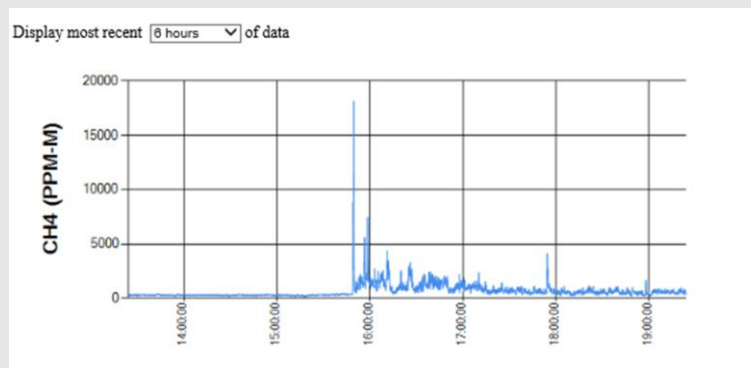
# Cloud Analytics

- Internet of Things (IoT) cloud based communications
- Microsoft Azure
- Real time notifications
- Continuous monitoring
- Continuous data logging
- Secure access control
- Data analytics & trending



# Case Studies: Oil Production

- **Initial Field Test**
  - Oil production tank facility
  - In field live for 3+ years
  - Initial validation study
- **Operational Study**
  - Live detection and notification
  - Operator investigation
- **Expanded operational use**
  - Multiple sites



Field Test: Thief  
Hatch Opening

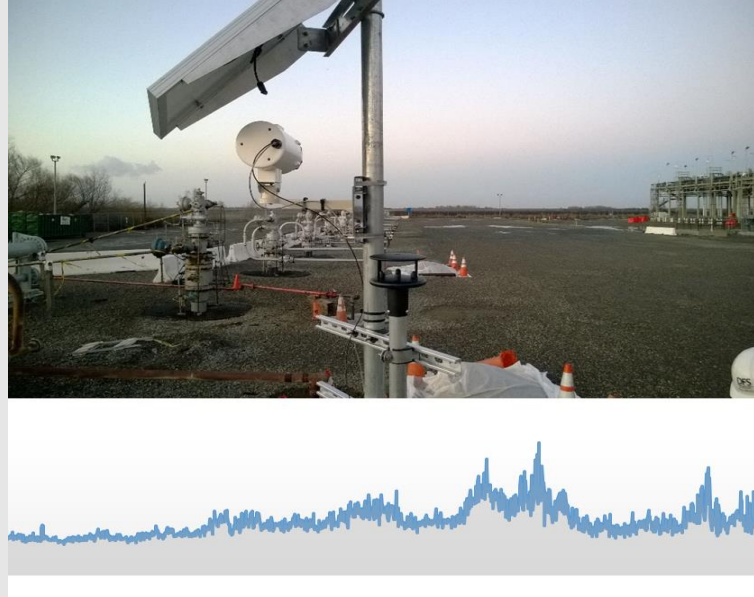
Maintenance work left  
Hatch open.

Equipment failure

# Case Studies: Gas Storage

- **Initial Field Test**
  - Well head monitoring
  - Compressors
  - Initial validation study
- **Operational Study**
  - Multiple sites
  - Continuous monitoring for 3+ years
  - Live detection and notification
  - Cumulative emission studies

Field Test: Emission levels



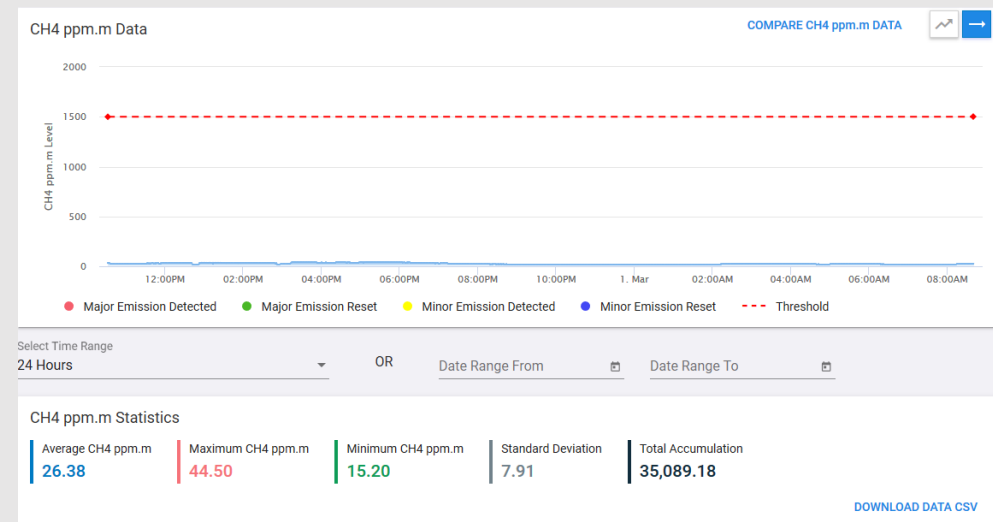


# Case Studies: Pipeline Monitor

- Initial Field Test
  - Concept tested at PG&E training facility
  - 2 years of continuous monitoring on live system
- Operational Study
  - Live detection and notification
  - Operator investigation



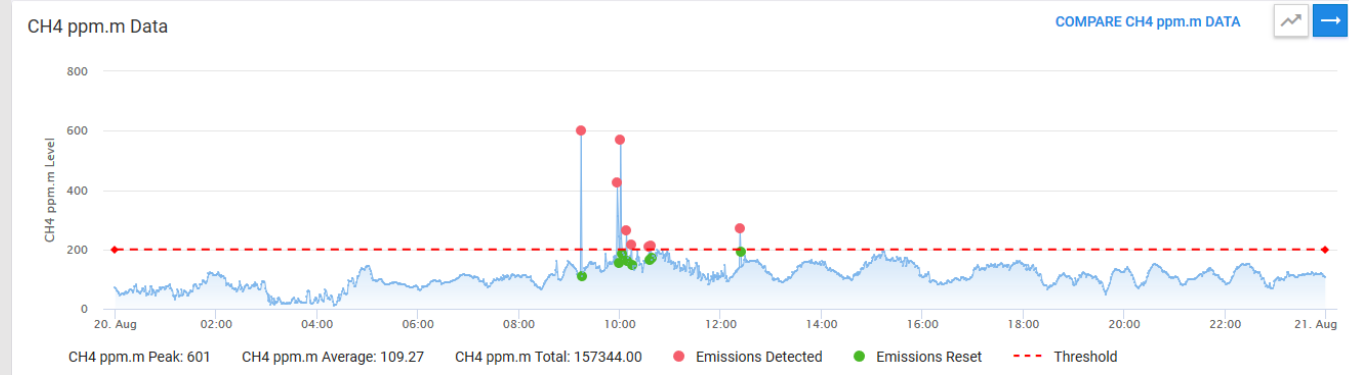
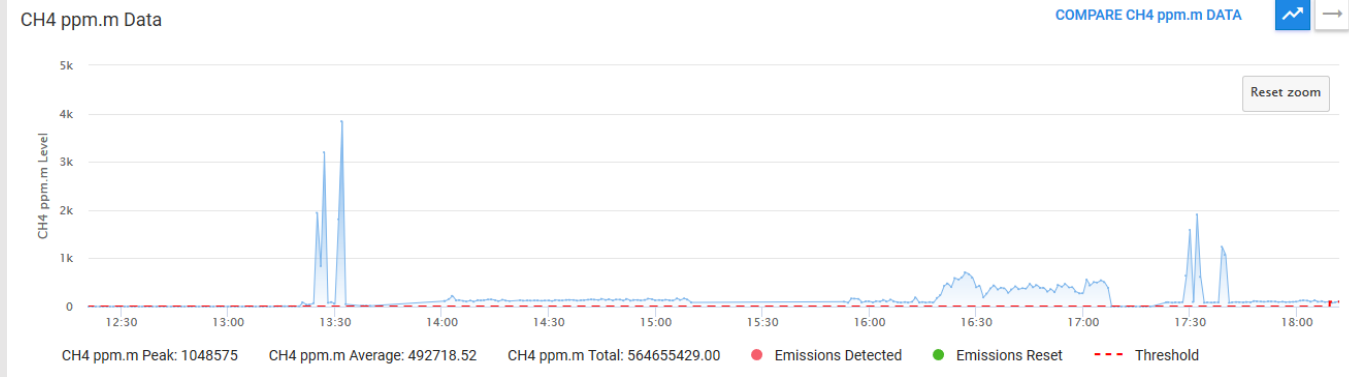
Field Test:  
Transmission line



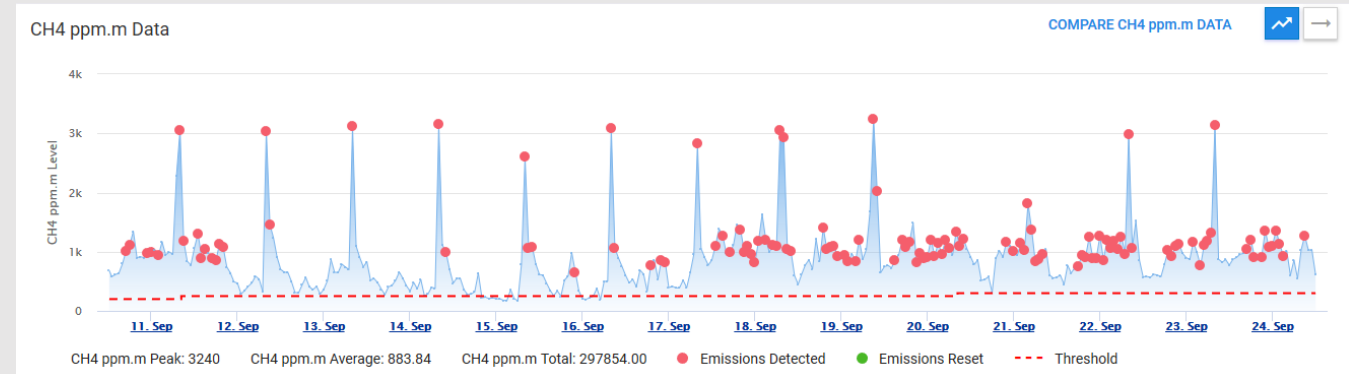
# Case Studies: METEC R2



- **METEC**
  - Oil production test facility
  - In field live for 2 years
  - Site monitoring
- **R2 Performance Study**
  - Two weeks of controlled leak events: Pad 4: North side
  - Path set up to detect Wells and Separators and not Tank emissions
  - Readily detected leaks within minutes
  - Detection of off prem. source
  - >90% detection rate



Typical Day of controlled releases



Two week daily activity