

EPSC Webinars on Early Leak Detections



# Early Methane Leak Detection with Gas Imaging



November 2025

[qlmtec.com](http://qlmtec.com)

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## QUANTUM GAS LIDAR

### A **unique** laser-imaging for gas leaks

QLM's lidar methane cameras pinpoint exactly where emissions originate and accurately quantify them, with single-photon sensitivity, over-200 m stand-off range, real-time detection, and site-wide coverage that meet and exceed the standards.

They run autonomously and continuously, in real time and at low cost, so operators can understand and control methane emissions, drive efficiency, improve health and safety, enable rapid leak repair, identify unknown sources, and deliver accurate carbon accounting at scale.

**It's time to change the rules on methane emission.**



DRIVING  
EFFICIENCY



ENSURING  
SAFETY



PROTECTING  
THE PLANET

# QLM Company Profile



## Who We Are

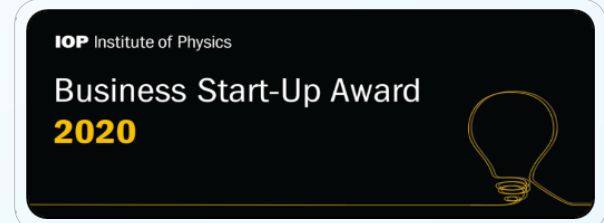
- › QLM Technology Ltd
- › Founded in 2017
- › Strategic partner with SLB since 2022
- › £20M+ investment into product development



## QLM partnership with SLB

- › SLB handle upstream and midstream Oil & Gas deployments of the QGL
- › They have widespread global capability and experience in O&G deployments
- › Effectively getting the QGL into the facilities of oil & gas majors

## Select Accolades



THE COMPLETE SOLUTION

# Control, Data Access, Security & Reporting All Configured Any Way You Want



## QLM LIDAR CAMERAS

Patented LiDAR technology which outperforms competitors



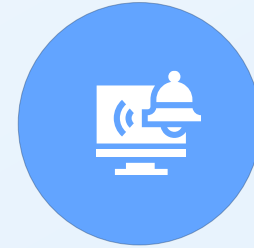
## QLM EDGE CONTROLLERS

On-site server & data storage, analytics, API, local control



## QLM CLOUD

AWS data storage, analytics, API's automated control

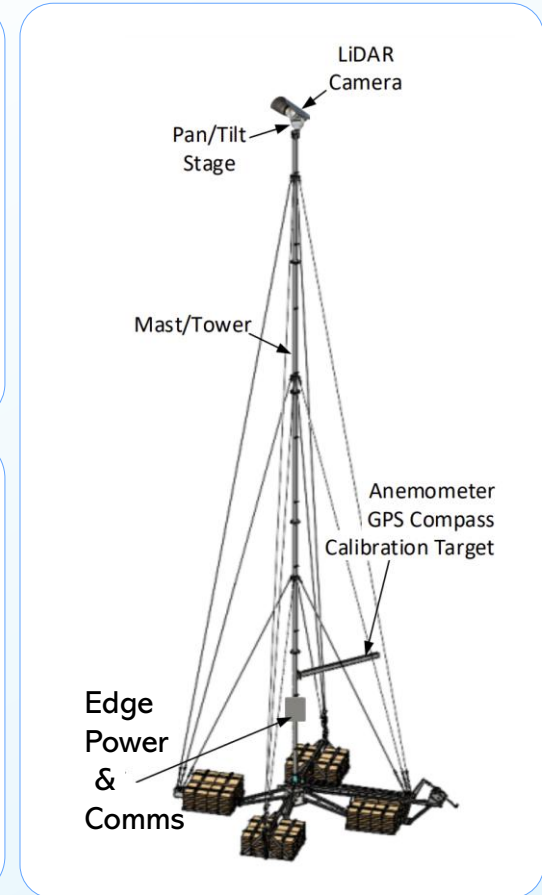
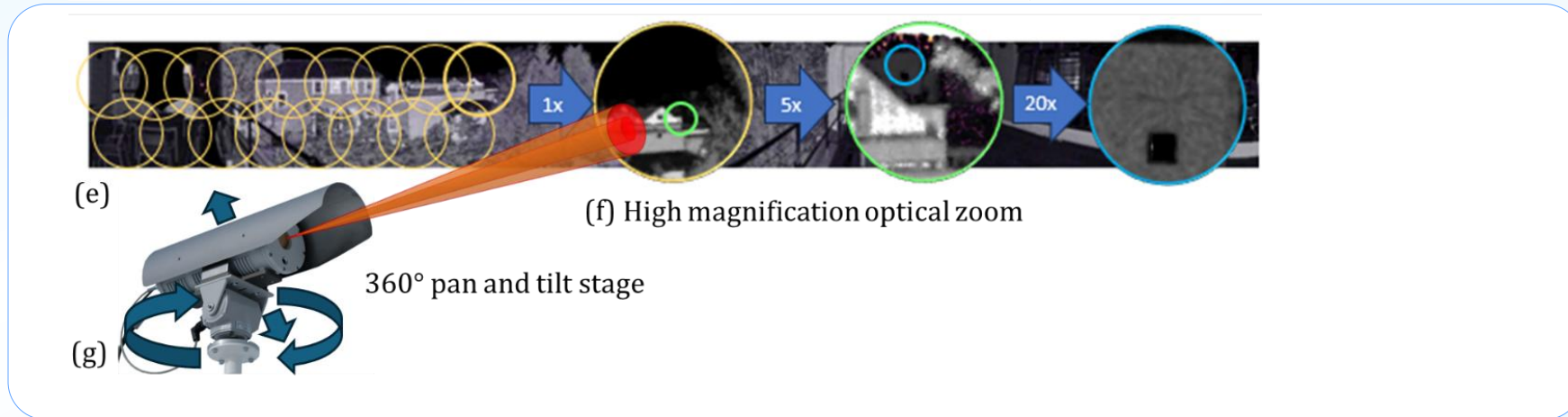
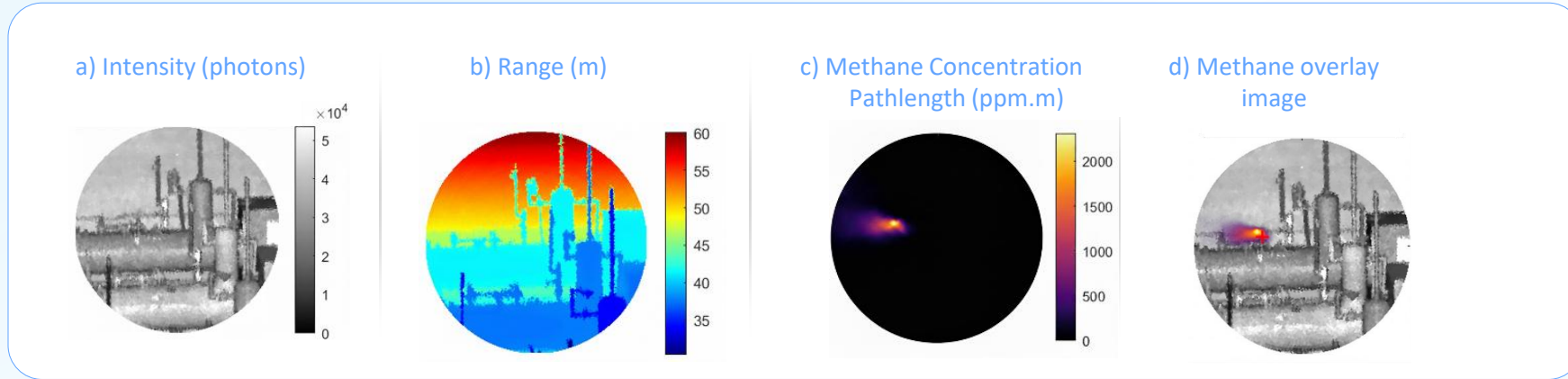


## USER SYSTEMS

Live control and data feed, settings, alerts, reports



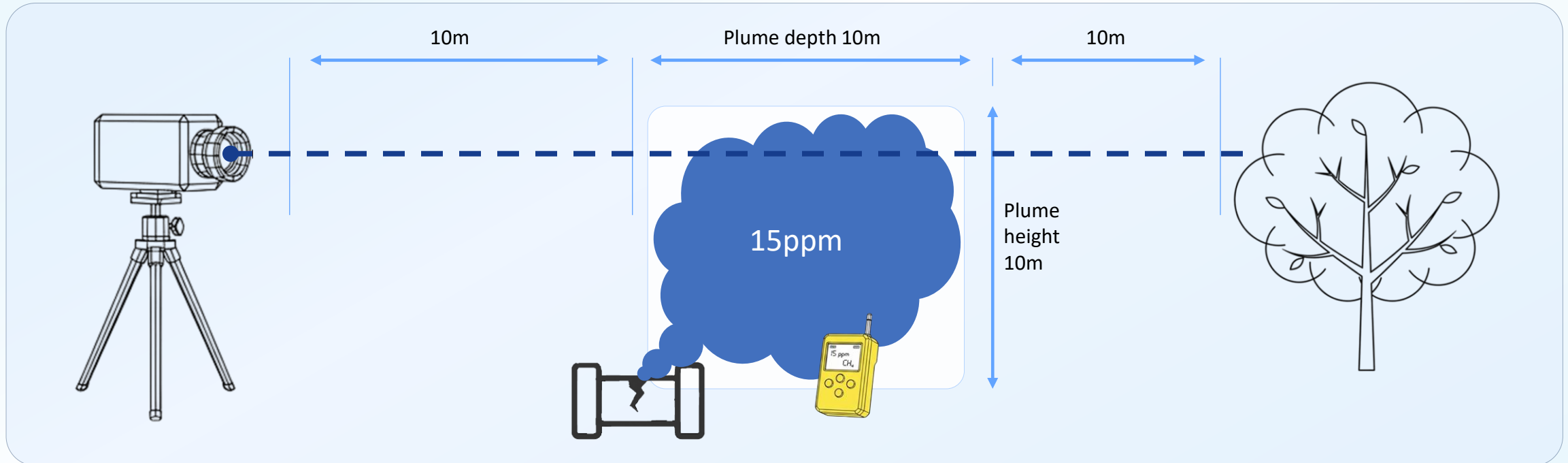
# We Can Measure Exactly Where Gas is Being Emitted



Panoramic site-wide coverage of methane emissions

Deployments on a mast or an existing structure

# Remote measurement of concentration – PPM and PPM.M



- ▶ **Point sensor:** Measures gas concentration in ppm or %LEL at a single location.
- ▶ **QLM lidar:** Remotely estimates gas concentration in ppm or %LEL in a 200m radius.
  - ▶ The lidar measures path-integrated concentration along the beam ( $15\text{ppm} \times 10\text{m} = 150\text{ppm}\cdot\text{m}$ ).
  - ▶ If the plume depth is known (approximated from the plume height), an average ppm can be estimated as:
  - ▶  $\text{ppm} \approx (\text{ppm}\cdot\text{m}) / \text{plume depth (m)}$ .

# Leak Rate from PPM·M via Mass Balance



Wind transports the methane plume through a curtain; the leak rate is the amount of methane crossing this curtain each second.

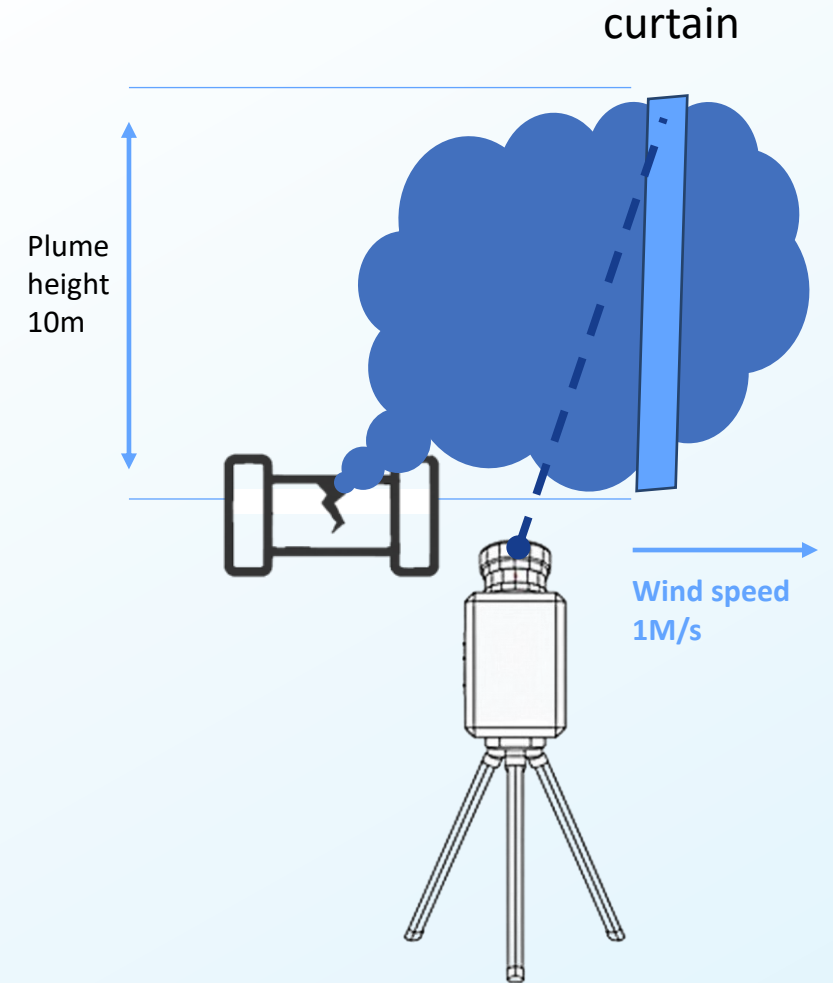


Mass Balance Principle:

**Leak Rate (Q)**

$\propto \text{PPM} \times \text{Plume}(\text{curtain}) \text{ Area} \times \text{Wind Speed}$

$\propto (\text{PPM} \cdot \text{M}) \times \text{Plume height (M)} \times \text{Wind Speed (M/S)}$



# METEC 2023 Findings & Validated Quantification

Methane Emissions Technology Evaluation Centre Colorado State University, USA



## Continuous Methane Monitoring Trial

- › 8-acre test facility with 150 release points
- › Typical Oil & Gas Industry infrastructure



## Continuous blind trial over 11 weeks [2023]

- › 10 commercial offerings
- › 565 separate leak events on 20 different pieces of equipment
- › -23°C to +27°C
- › wind >30mph, average 6mph
- › snow, rain, fog, frost



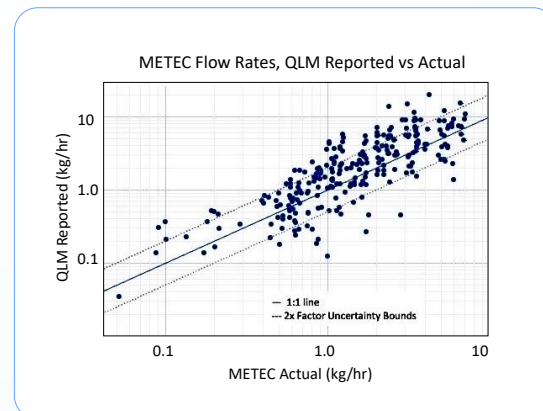
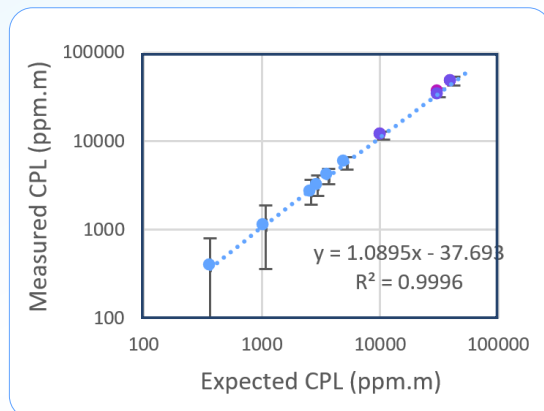
**METEC**  
METHANE EMISSIONS  
TECHNOLOGY  
EVALUATION CENTER

# METEC 2023 Findings & Validated Quantification (Blind Results)



## METEC 2023 findings [1]

- QLM 1st in Quantification Accuracy
- QLM 1st in Source Location Accuracy
- QLM 1st in Time to Detection
- QLM Limit of detection <<0.4 kg/hr EPA requirement



[1] Competitive industrial trial evaluation by METEC 2023 - Chiemezie Ilonze, Ethan Emerson, Aidan Duggan, and Daniel Zimmerle "Assessing the Progress of the Performance of Continuous Monitoring Solutions under a Single-Blind Controlled Testing Protocol", J. Environmental Science & Technology, Am. Chem. Soc. 2024 58 (25), 10941-10955, DOI: 10.1021/acs.est.3c08511

Leak Rate :  
0.4kg/h

Distance :  
60m

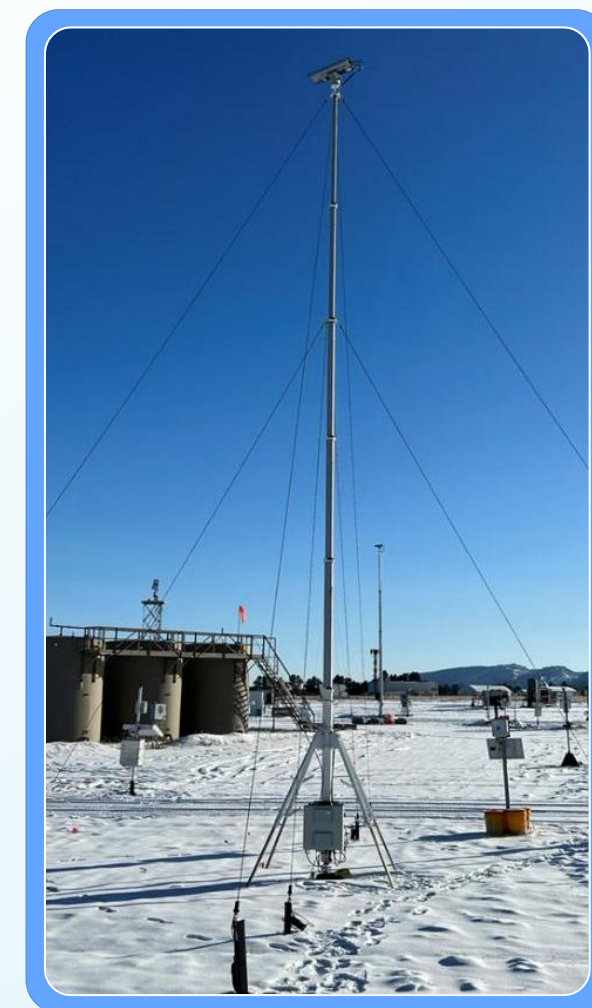
Leak Rate :  
0.2kg/h

Distance :  
50m

No snow

Light snow

Heavy snow

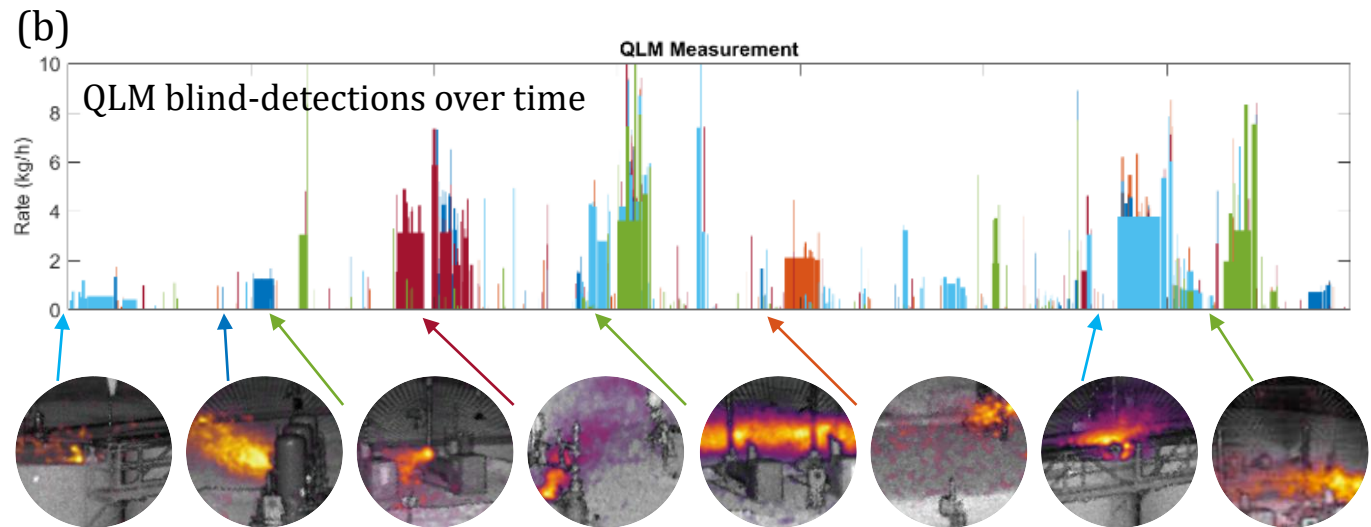
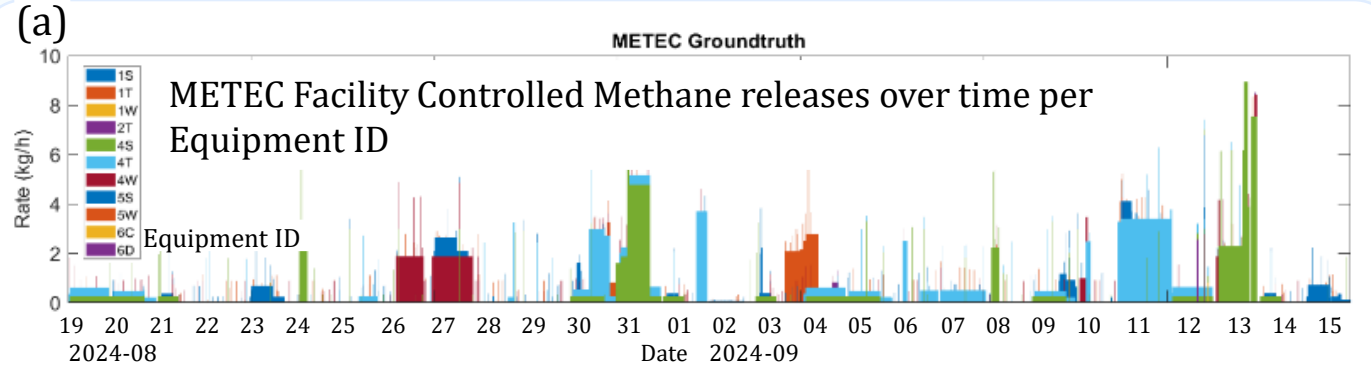


# METEC 2024 (Non-blind Results)



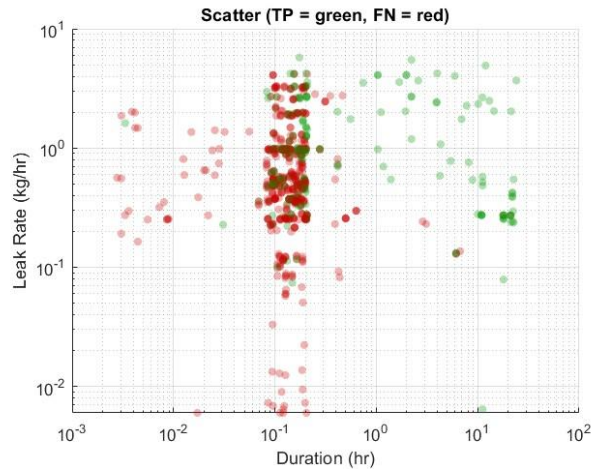
## METEC in August-September 2024,

- › ADED 2.0 protocols
- › shorter duration intermittent emissions
- › mimic real-world operational facility emissions
- › 4 weeks
- › 797 emission events recorded
- › continuously varying background noise [many 0.35kg/hr events]

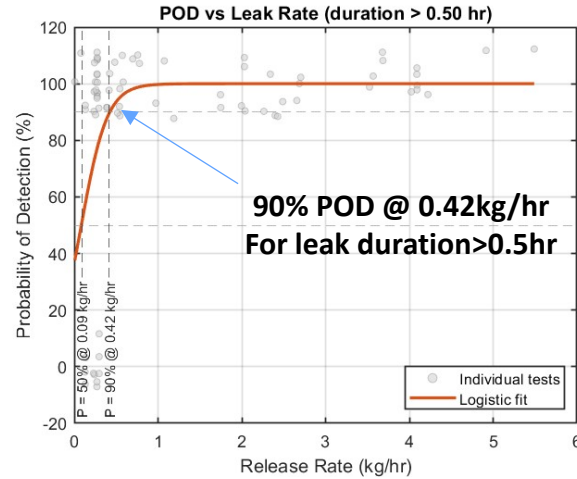


(c) Examples of methane plume images for the blind-detections over time [color-coded to equipment IDs, approximate time-axis alignment]

# METEC 2024 (Non-blind Results)



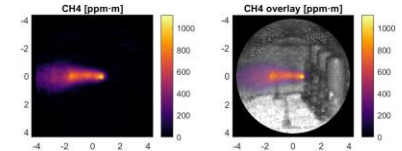
METEC 2024 includes a large number of small, short-duration leaks to simulate realistic site conditions.



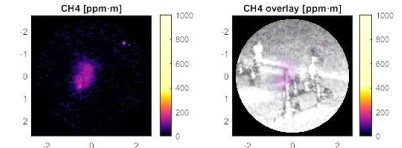
Even in this highly complex environment, the QLM system still achieves a high probability of detection for small leaks:  
**90% POD @ 0.42kg/hr**  
**For leak duration > 0.5hr**

## GT rates

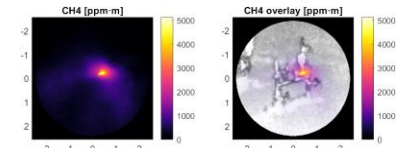
1kg/hr:



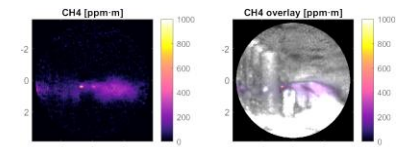
0.57kg/hr:



0.48kg/hr:



0.532kg/hr:

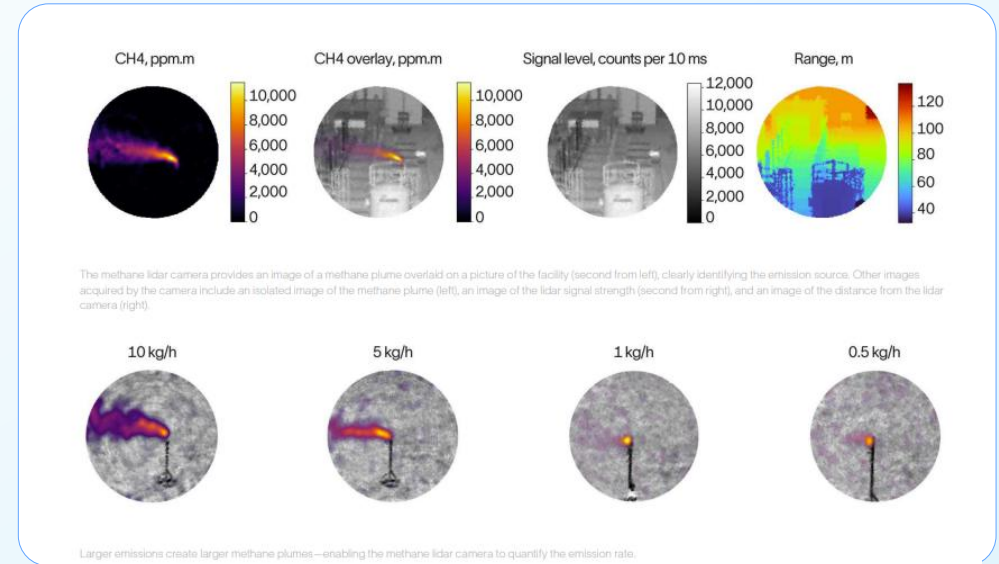


# EPA Approval: Alternative Test Method for Methane Detection



QLM SLB's Methane LiDAR Camera approved by the U.S. EPA as an Alternative Test Method (ATM) for methane detection under the OOOO regulations.

- ▶ Approved by U.S. EPA as an Alternative Test Method for methane detection
- ▶ Standalone LDAR — replaces labor-intensive OGI surveys
- ▶ Component-level resolution pinpoints sources; separates leaks vs. permitted vents
- ▶ All-condition operation: day/night, other gases; not  $\Delta T$ -dependent
- ▶ Quantifies rate, duration, location, persistence, timing
- ▶ Digital workflow with remote images/measurements
- ▶ Proven: 100 cameras, 4 continents



# Fugitive Emissions - Oil & Gas



## Upstream

Real-time methane monitoring on platforms and well pads; catches intermittent drilling/flowback leaks; improves safety, cuts product loss, supports compliance.



## Midstream

Continuous remote surveillance of pipelines and compressor/pump stations; rapid leak localization along long corridors; reduces O&M costs and incident risk.

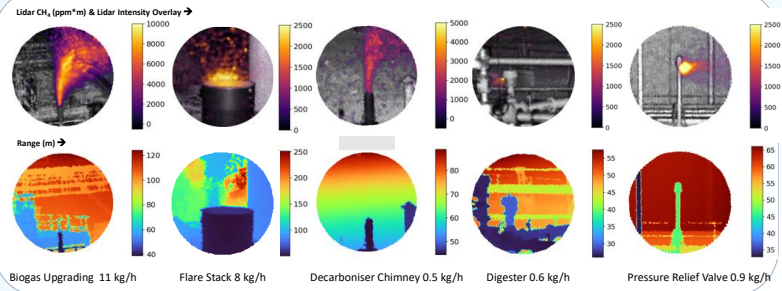


## Downstream

Refineries, storage, and loading terminals; continuous quantification with automated alerts; pinpoints sources for targeted maintenance and verified emissions reporting.

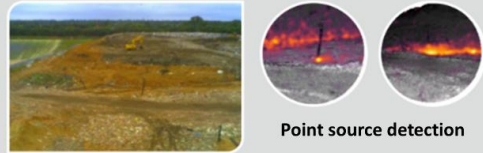


# Environmental Monitoring

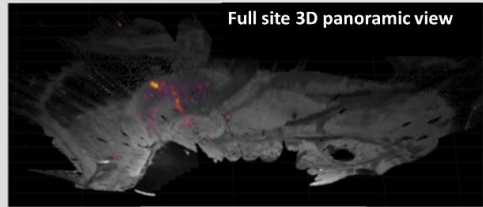


## Landfills: Managing a Major Diffuse Hazard

- Real-time, site-wide methane maps reveal hidden risks.
- Instantly locate high-concentration hotspots.
- Protect worker safety during remediation.

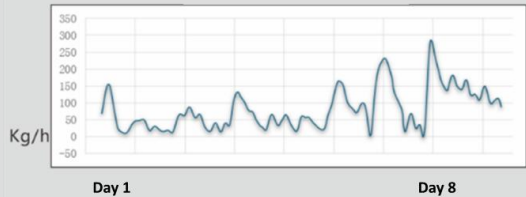


Point source detection



Full site 3D panoramic view

Full site leak rate time series



## Wastewater Plants: Ensuring Enclosure Safety

- Quantifies process emissions from all sources.
- Maintains safe atmospheric conditions in enclosed spaces.
- Prevents dangerous gas build-up and immediate health impacts.



## Refineries & Storage: Continuous Incident Prevention

- Provides continuous, compliant 24/7 monitoring.
- Precisely localizes any release.
- Allows maintenance teams to intervene before leaks become incidents.

# Other Industry & Utilities



## Chemicals & Manufacturing: Protecting Assets and Personnel

- › Real-time leak detection across storage and production.
- › Enables teams to stop hazards quickly and keep operations safe.
- › Reduces losses and supports high operational efficiency.



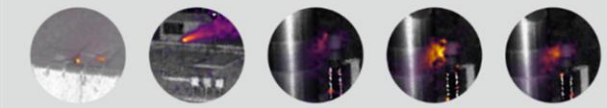
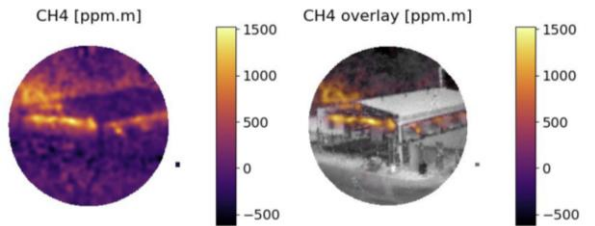
## City Gas Networks: Building Safer Infrastructure

- › Wide-area, continuous monitoring for entire networks.
- › Precisely localizes leaks, even in difficult terrain.
- › Speeds up maintenance response and improves.



## Power Generation: Mitigating Hidden Risks

- › Continuous quantification with instant alerts for turbines and storage.
- › Strengthens safety protocols and helps meet tightening compliance targets with verified data.



Monitoring stack emissions



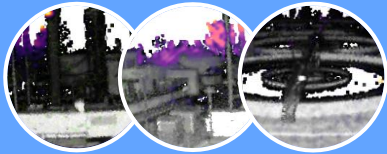
Stack emission time series

# New Operation Modes



## Frames

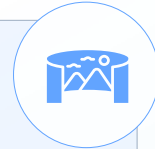
(Scheduled Spotlight)



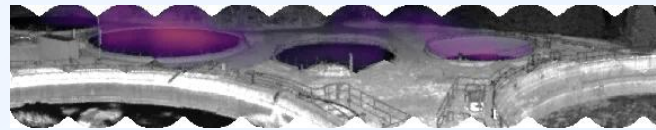
- › Sequence of 2-minute spot measurements at pre-defined locations.
- › Zoom in if leak detected.
- › Track and sum emissions (from Analyzer), linked to equipment.

**Focus on specific equipment.**  
Good for small, point emissions

**Relatively slow, incomplete coverage** Potential to double-count large emissions.



## Panoramic



- › Sequence of 2-minute spot measurements that covers the whole site in ~2 hours.
- › Site-level emission rate calculation.

**Complete coverage.**  
Highest detail. Captures large diffuse emissions.

**Longest survey time (~2hrs);**  
Diffuse quant method not verified.



## Searchlight



- › Measure while moving the pan-tilt stage to cover a whole site in ~10 minutes.
- › Requires robust denoising.
- › Follow up hotspots with Spotlight measurements to confirm and quantify.

**Complete coverage in shortest time.**

Lower resolution

# Periodic Site Measurements

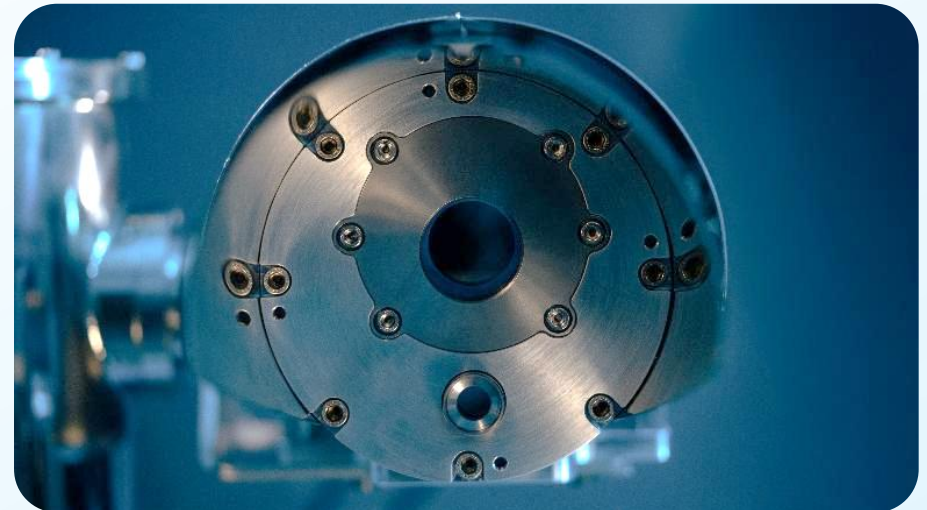
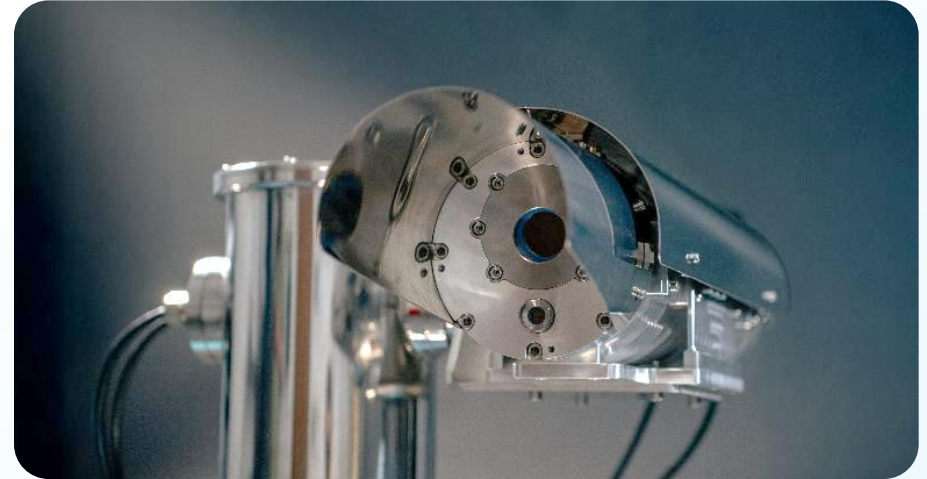
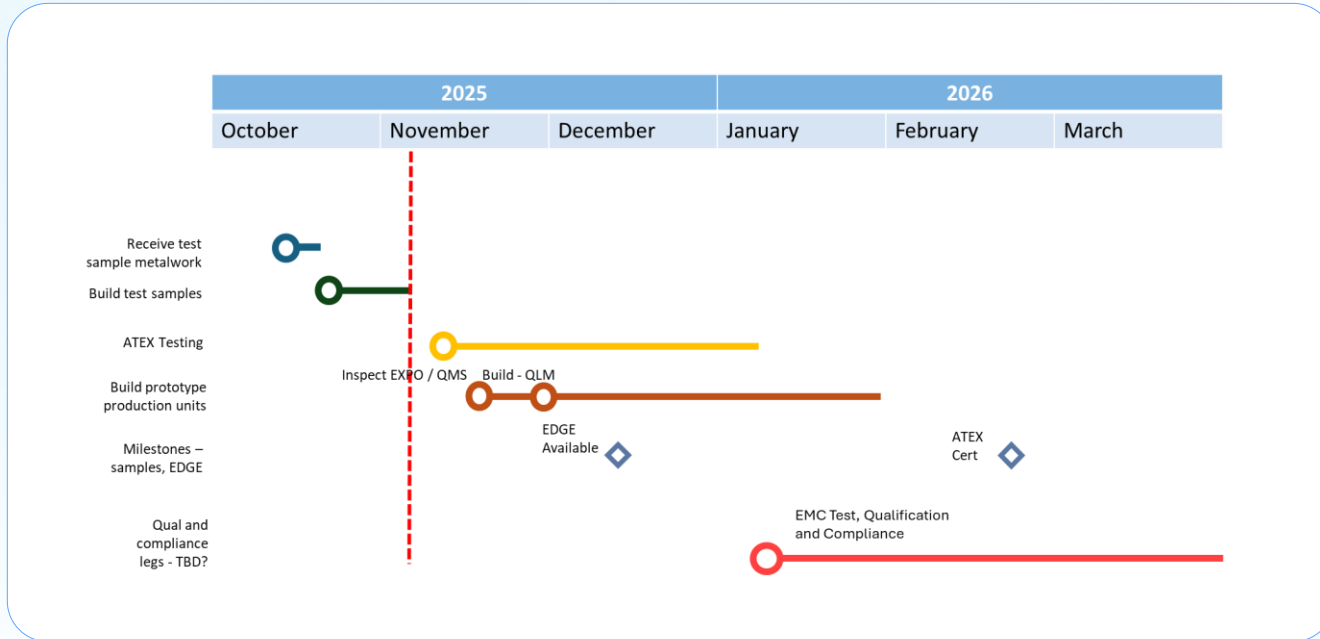


## Trailer-mounted Solution

- › Telescopic mast
- › Battery powered
- › Solar-panel charging
- › Quick deployment
- › Anemometer
- › Edge computer
- › Site-wide emissions measurements



# ATEX Plan



- ▶ 2025–2026 roadmap for our ATEX design
- ▶ ATEX design and integration in progress (dec)
- ▶ **Next:** certification, testing, and deployment in early 2026

## MISSION CRITICAL

# The Time is Now



Quantitative methane data reveals real risk and turns process improvements into safer sites and high ROI from saved gas.



The major governments and energy companies of the world have pledged to reduce methane emissions by **30%, by 2030.**



QLM can provide the technology to achieve this whilst also delivering independent value through operational efficiency.

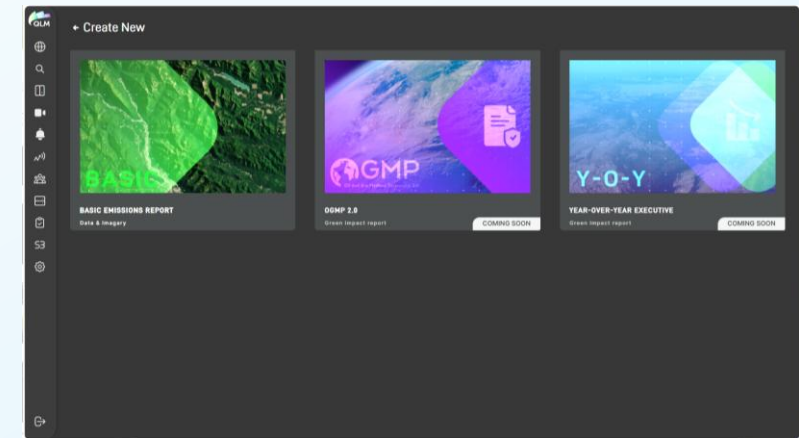
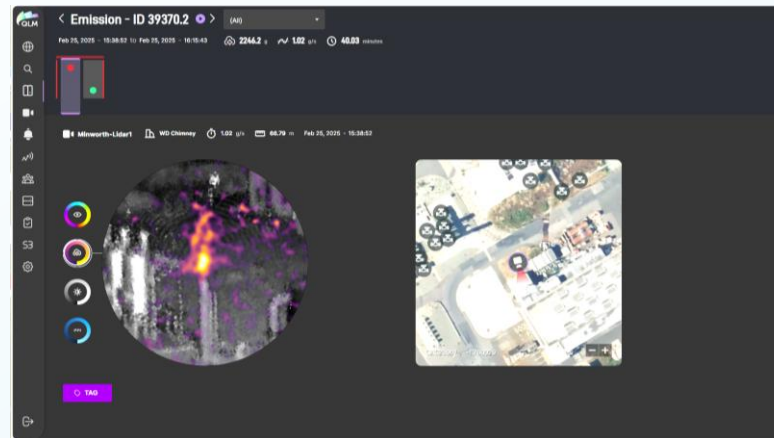
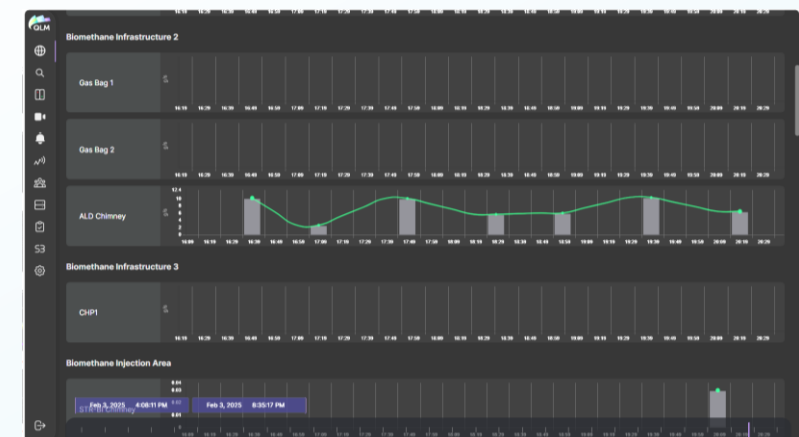
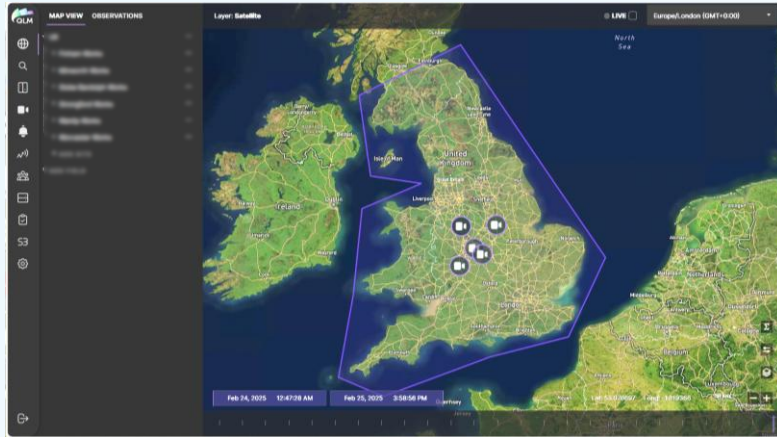
Understand your methane emissions. Protect people and the planet. Raise the standard.



For more information, please contact:  
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# Appendix: Cloud Interface



# Appendix: Manufacturing & Compliance

## Product Compliance Marks

### Environmental Robustness

- ▶ day and night operation
- ▶ -40C to +60°C operation
- ▶ -55C to + 85°C storage
- ▶ All-weather
- ▶ 0-100% humidity
- ▶ UV & sunlight to 2.5kW/m<sup>2</sup>
- ▶ IP-67 Ingress Protection
- ▶ 30g shock, 5-500Hz, 1.6g vibration

### Safety Standards

- ▶ Laser Safety Class 1 (IEC 60825)
- ▶ Electrical Safety EN (IEC 61010)

