



Measuring Methane Emissions in the U.S. Oil & Gas Industry: Commercial Capabilities

Datu Research
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Summary



Summary

Concern about the oil and gas industry's contribution to climate change is spurring efforts to require operators to measure their methane emissions. Whether these measurements are for compliance with federal and state regulations, or for earning certification for producing oil and gas sustainably, operators will need to accurately measure their methane emissions using validated technologies.

This survey of methane measurement companies that serve the U.S. oil and gas industry shows the following:

- Several providers of technologies and services are capable of measuring operators' methane emissions, including 9 companies that have achieved a Minimum Detection Level under 1 kg/hr.
- The technologies are being tested and validated by third parties.
- Companies in the sample are working with many oil and gas operators in all major U.S. basins and in much of the world.
- Several respondent companies have plans to develop new technologies and scale up their commercial offerings for measuring methane emissions.



Method



Definition

In this survey, **measuring methane emissions refers to quantifying the methane flow rate**, as expressed in kilograms per hour (kg/hr).



Survey

We conducted a survey via video calls with representatives of relevant companies.

- Open from May 1, 2023 through May 25, 2023
- Questions about capabilities, clients, pricing models, and scale
- 25 pre-identified, relevant companies were contacted
- 15 of those companies agreed to complete the survey
- Optional comment box accompanied each question to give respondents the opportunity to provide additional input



Limitations

This survey is subject to a few limitations.

First, we had limited ability to gain access to individuals appropriately authorized to respond on behalf of each relevant company.

Second, respondents may have self-selected to participate based on their personal or corporate viewpoints or other industry factors.

These two conditions limited our ability to create a random sample.

In addition, the survey's small sample size makes it difficult to generalize results to the total of all relevant companies.



Companies



Roles

Role	Number of Companies
Manufacturer	9
Distributor	3
Technology Developer	6
System Integrator	4
Service Provider	12

- 12 companies in the sample are service providers.
- Each company plays an average of 3 distinct roles.
- 7 service providers are also manufacturers.

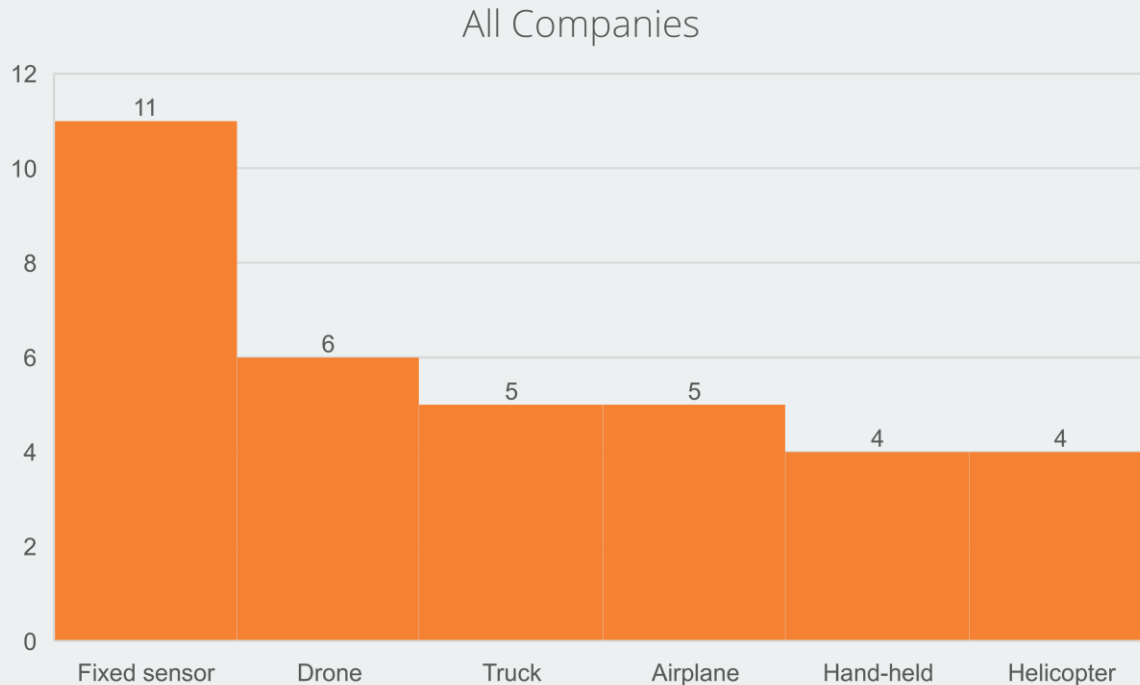


Capabilities

Capability	Number of Companies
Monitoring	14
Detection	15
Localization	14
Quantification	14

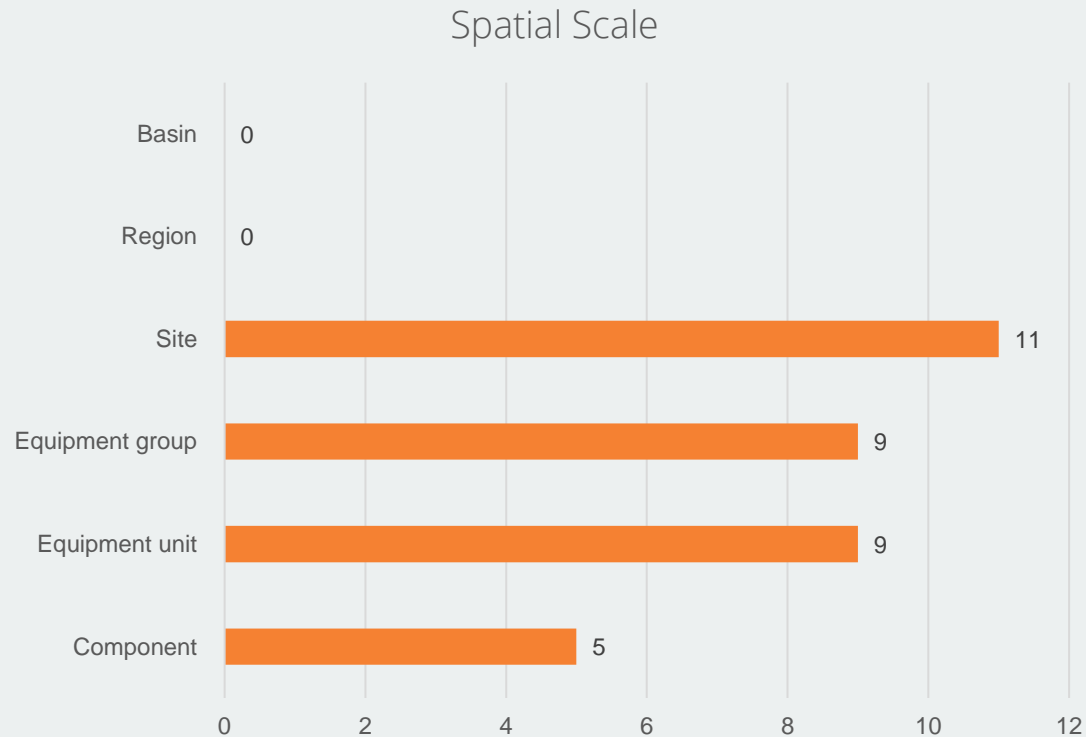
- 14 companies' technologies quantify methane emission rates.
- One company that uses aerial data from airplane flyovers does more of its work with satellite data.
- One company is currently not in the space but wants to re-enter.

Deployment Platforms



- The deployment platform most often cited by the companies is fixed sensor.
- The least often cited deployment platforms were hand-held and helicopter.

Spatial Scale



- 11 companies can measure emissions at the site level.
- 9 companies can measure emissions at the level of an equipment group.
- 9 companies can measure emissions at the level of an equipment unit.
- 5 companies can measure emissions at the level of a component.
- 2 companies commented that they can aggregate multiple measurements to get to the scale of a region or basin.



10 Findings

1

Data analytics play an important role in quantifying methane emission rates.

Quantification	Number of Companies
Analytics-driven	13
Q-OGI	4
Measure sampling stream	2

- 13 companies' technologies quantify emission rates by using data analytics.
- 4 companies that checked the box for Quantitative OGI are technology developers and/or manufacturers; 2 of those 4 are also service providers.*
- 2 companies' technologies measure the sampling stream; both are manufacturers that also provide services.*

*One provides services in upstream O&G; the other, in gas distribution. In this survey, all other references to service provision refer to the upstream segment.

2

To convert raw data from the sensor into an emission rate (kg/hr), most companies combine concentrations with **weather data and dispersion modeling**.

Steps	Number of Companies
Measure flow rate of the sampling stream	2
Combine concentrations with weather data and dispersion modeling	8
Quantify IR intensity at pixel level	1
Combine images, mass balance approach, and wind data	4
Combine calibration and dispersion model or mass balance approach	1

- 2 companies' technologies measure the flow rates of the sampling stream.
- One service provider gave 3 different responses, one for each of its relevant technologies.

3

11 companies reported achieving a **Minimum Detection Level (MDL)** of 3.8 kg/hr or lower.

Company	kg/hr	% POD
H	0.001	
B	0.01	
E	0.02	
D	0.02	
F	0.091	
L	0.1	
K**	0.2	90
I	0.2	
M**	0.89	90
J**	3.00	90
O**	3.8	90
N**	10.00	90

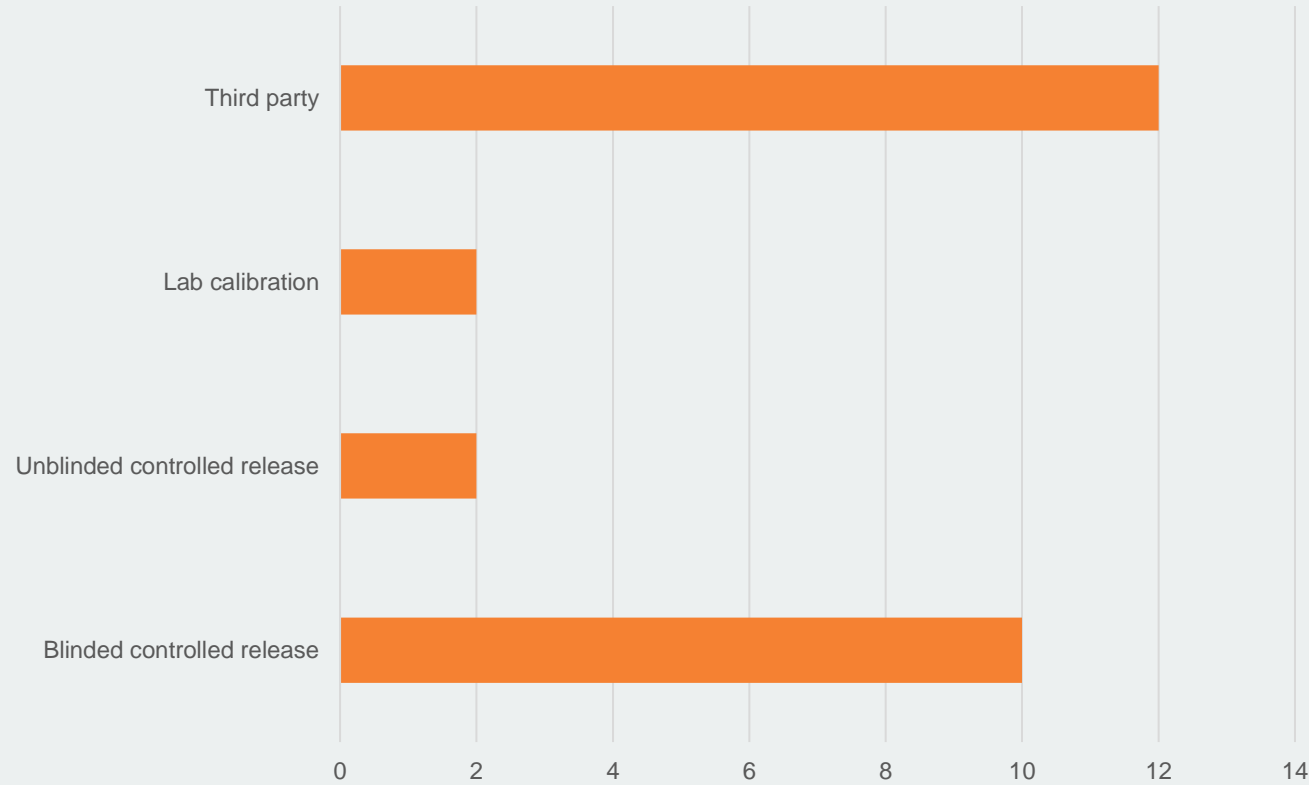
- 9 companies have achieved an MDL under 1 kg/hr.
- For at least 5 companies, the MDL was at 90% Probability of Detection.*

* This survey did not ask for POD, but 5 companies proactively provided it.

4

10 companies have performed blinded controlled release studies, and 12 have done **third party testing**.

Testing and Validation



5

Companies reported working with at least **15 different entities** to perform third-party testing and validation of their technologies.

Entity	Number of Companies
METEC (Methane Emissions Technology Evaluation Center) at Colorado State University	12
Stanford University	5
GTI Energy (formerly Gas Technology Institute)	2
TOTAL Energies SE	2
iPIPE Consortium (intelligent Pipeline Integrity Program)	1
SLB (formerly Schlumberger)	1
Cheniere QMRV (Quantification, Monitoring, Reporting and Verification)	1
Shell Netherlands	1
UK National Physical Laboratory	1
UK National Grid Gas Transmission	1
UK Severn Trent Water	1
NGIF (Natural Gas Innovation Fund) Emissions Testing Centre (in Canada)	1
Carleton University EERL (Energy and Emissions Research Lab)	1
McGill University	1
AMEP (Alberta Methane Emissions Program)	1

- Some of the entities named might be customers rather than third parties.
- One company said, "We also do controlled release studies on a regular basis, e.g., with research institutes contracted by utilities, midstream companies, operators."

6

Operators' use of frameworks to **certify emissions** is still evolving.

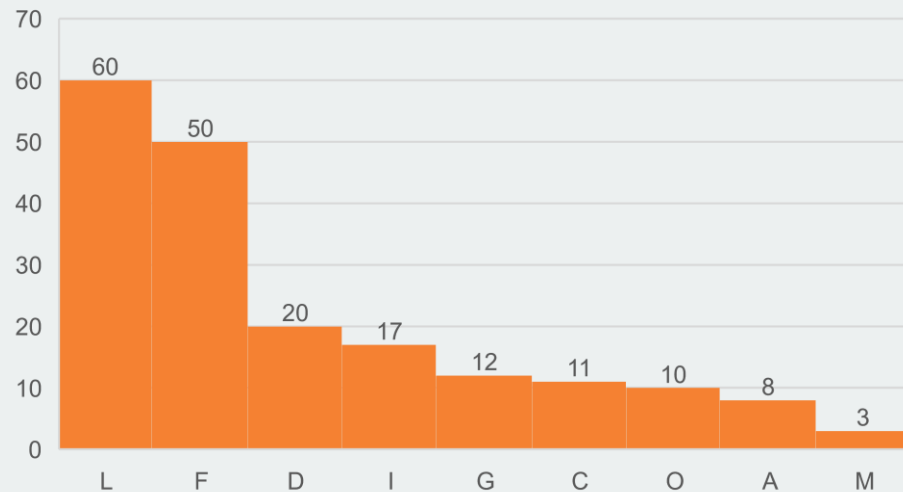
Framework	Type	Number of Respondents
Don't know		10
MiQ	Certifier	5
OGMP 2.0	Reporting framework	4
Veritas	Set of measurement Protocols	1

- It is unclear which certification frameworks operators are using, if any.
- Each framework uses different methods to collect data and calculate methane intensity and has different requirements for third-party verification.
- There is no uniform standard for certification, which creates confusion in differentiated gas markets and hinders certainty for operators and certifiers.

7

Service providers in our sample each work with between 3 and 60 **oil and gas operator clients**.

Service Companies, Number of Clients



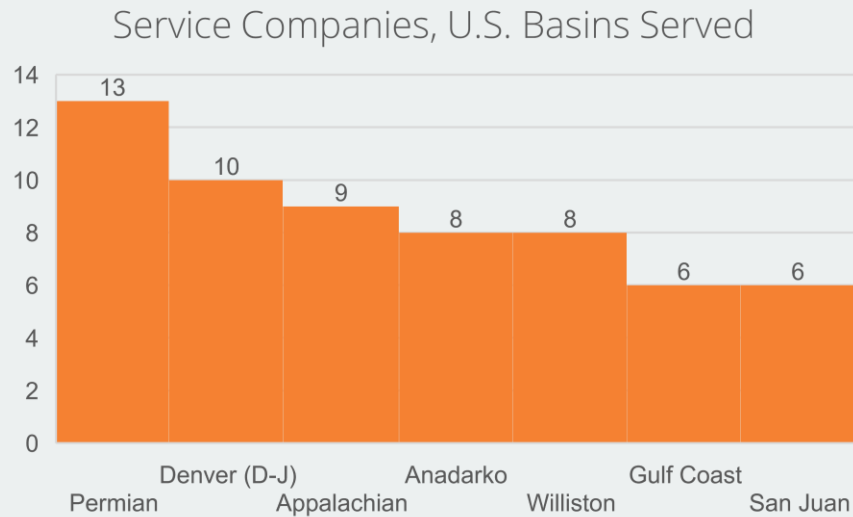
The median number reported by service providers is 12 operator clients.

Data for manufacturers:

- One manufacturer estimated it sells to all operators in the United States.
- Another manufacturer reported selling to all operators in Canada.
- One company said, "We sell more equipment to operators that do it themselves rather than have us provide services, by a ratio of 10 or 15 to 1."

8

These companies are well established in all the **major basins** in the US, and for several companies, in much of the world.



- Respondents also reported serving Arkoma, Bakken, Barnett, Eagle Ford, Haynesville, Los Angeles, and Uintah basins.
- Respondents reported serving geographies in Canada, Europe, Australia, Latin America, Iraq, Oman, United Arab Emirates, and Saudi Arabia.

9

The industry has yet to determine definitive **pricing models or rates** for emission measurement.

Pricing Model	Number of companies that use this pricing model	Those companies' deployment platforms	Estimate A	Estimate B	Estimate C
\$ per hour	2	Handheld, Fixed, Truck, Drone	\$200 for the high end of the range.	\$75-\$360 depending on customer contracts and skillset of the technician.	
\$ per site	3	Fixed, Drone	\$400-\$1,000	\$20-\$1,000 per site for a drone inspection.	
\$ per well pad	1	Fixed	\$6,000-\$10,000 per pad per year on a dense oil field w/ good participation across operators.		
\$ per sensor per month	3	Fixed	\$150 including capex and subscription to service.	\$30-100,000 per sensor for imaging solutions, plus \$1-2k per site per month for software/service.	\$50-200/device/mo depending on whether hardware is leased or purchased.

- Companies were asked to estimate the *going rate industry-wide* for detection and measurement.
- Estimates depend on factors such as technology, deployment platform, technician skillset, density of assets, and whether hardware is leased or purchased.
- Companies that provide SaaS (software as a service) reported including a monthly subscription.

10

Several companies highlighted their **active plans to scale up** commercial offerings for measuring methane emissions.



Company Roles	Quote on Scaling
Manufacturer	Initially, fixed, on-site sensors, but airborne, handheld, vehicle platform solutions are being planned. Trials in 2023 with dozens of [O&G operator clients], with plans for full implementation in 2024-25 to begin measuring their methane emissions at scale.
Manufacturer/ Distributer/ Technology Developer	We are currently doing a trial of continuous monitoring in Europe.
Manufacturer/ Distributer/ Service Provider	We are working on drone, helicopter and airplane. We've built prototypes for all these choices and used them in the field, but not yet [provided] them as a commercial offering.
Manufacturer/ Technology Developer/ Service Provider	We are highly scalable. We know how to produce large numbers of sensors; production capacity is 1,000 sensors/month easily. Could easily double or triple that if needed. 25 years experience.



Conclusion



Conclusion

The oil and gas industry's impact on climate change is driving efforts to accurately measure methane emissions.

This survey shows that several providers of technologies and services are capable of measuring methane emissions and are currently working with operators.

The relevant technologies are being tested and validated by third parties and are being used by many oil and gas operators in all major U.S. basins and much of the world.

In addition, several companies have plans to develop new technologies and scale up their commercial offerings for measuring methane emissions.

