

CERTIFIED GASLIGHTING:

HOW GAS CERTIFICATION HAS GAINED A POLICY
FOOTHOLD, EVEN AS IT FAILS TO PROVE IT CAN
ACCURATELY DETECT EMISSIONS.



This report was researched and written by Dakota Raynes, Andrew Klooster, and Josh Eisenfeld of Earthworks and Gabrielle Levy of Oil Change International. It was copyedited by Meara Kirwin.

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Lorne Stockman, Allie Rosenbluth, Al Johnson-Kurts, and Myriam Douo of Oil Change International; Lauren Pagel, Rachel Kerr, Justin Wasser, and Rebekah Staub of Earthworks; Tom Owens of The Center for Oil and Gas Organizing; Alan Zibel of Public Citizen; and Phoebe Sweet of Acadia Strategies.

Design: paul@hellopaul.com

Cover Image: Earthworks 2023: OGI video documenting significant pollution coming from a malfunctioning separator at the Bayswater Topaz well site.

Earthworks is an international NGO dedicated to protecting communities and the environment from the adverse impacts of mineral and energy development while promoting sustainable solutions.

Earthworks

1612 K Street NW, Suite 904
Washington, DC, 20006
www.earthworks.org

Oil Change International is a research, communications, and advocacy organization focused on exposing the true costs of fossil fuels and facilitating the coming transition towards clean energy.

Oil Change International

714 G Street SE, Unit 202
Washington, DC, 20003
www.priceofoil.org

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If you have any questions or information you would like to share about Project Canary or Certified Gas, please contact priceofoil@proton.me.

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EXECUTIVE SUMMARY

In the year since Earthworks and Oil Change International released the first investigative report¹ into the efficacy of Project Canary and other so-called “gas certification” schemes, certification’s influence within the oil and gas industry has grown. Fossil fuel companies are under substantial pressure to show they are taking action to reduce methane emissions from their operations. In response, they are increasingly turning to certifiers that claim they can provide the means to generate the evidence of low-emissions gas production. But no matter the label – “natural” gas, “responsibly sourced,” “differentiated,” “certified,” or “next-gen” – the truth remains the same. Methane gas is a threat to people and the planet.

This report builds on the research from the first *Certified Disaster* report, providing additional evidence that Project Canary, one of the leaders in the certification industry, uses unreliable technology and methods that allow companies to make unfounded claims about the methane gas they bring to market. Over a period of 10 months in 2023, we conducted a total of 81 surveys of 38 different oil and gas production sites in Colorado, recording and analyzing pollution events and assessing the efficacy of monitoring equipment. Our key findings are as follows:

- **Monitors still miss nearly all pollution events.** Earthworks’ trained oil and gas thermographers captured alarming evidence of continuous emissions monitors (CEMs) failing to detect emissions in the field. Although we documented evidence of pollution events at one of every four site visits over a 10-month period, on-site monitors detected just a single one of the events we recorded. These findings



Fulcrum - Surprise site in Jackson County, CO. ©Earthworks.

mirror the results of the 2023 study, in which monitors failed to capture every pollution event recorded by Earthworks thermographers. This suggests that operators have made minimal changes to monitoring efforts to account for the findings in our report.

- **Project Canary’s “continuous” monitors are frequently offline.** Project Canary remains one of the leading purveyors of certification services. Monitors sold and deployed by Project Canary were

offline more than a quarter of the time on average, resulting in substantial data loss. This basic technological failure calls into question the overall accuracy of the data upon which certification relies. The absence of any real regulatory oversight of certification schemes means there is nothing to ensure operators’ claims to sell gas meeting a certain emissions threshold are based in fact.

- **Companies rarely take action to address detected pollution.** Most of

the emissions events recorded by Earthworks thermographers during this study occurred over the course of normal operations – not due to malfunctions – and therefore companies were not required either under Colorado law or certification standards to take action to halt them. Yet these emissions are no less harmful to communities exposed to the pollution nor less impactful with respect to the climate crisis. This dangerous loophole undermines certifiers' claims that certification schemes encourage operators to improve their operations beyond minimum legal requirements.

- **Industry and regulators see opportunity in certification schemes.** Developments over the course of 2023 indicate that both the industry and government regulators are turning to certification to demonstrate progress towards emissions reduction commitments and compliance with stronger regulations. The significant weaknesses in certification schemes, however, mean that in practice, their application will open the door to the production and sale of more gas, without any guarantee of reduced emissions.

RECOMMENDATIONS

- **Methane reduction must only happen under government oversight and regulation that puts community and consumer protection first.** Federal oversight must protect consumers from certifiers' and producers' misleading claims. Regulatory agencies must prioritize protecting communities, improving public health, and limiting the worst impacts of the climate crisis in their oversight of emissions reduction activities. Regulators should set strict standards for oversight and monitoring of CEMs, data collection, technologies, methods, and programs. All these should also be subject to independent analysis to ensure accountability at all levels.
- **Certification should not be a part of regulatory frameworks.** Measurement, monitoring, reporting, and verification within a regulatory framework are essential tools to ensure real reductions in methane. However, certification must not be applied in place of independent or government oversight for the purposes of permitting or legally mandated reporting, or in regulated markets. Subcontracting environmental oversight

to entities prolonging fossil fuel use is not an effective strategy. Using certification as a proxy for regulatory oversight and commitment to phase-out is simply a dangerous distraction that will lead to climate catastrophe.

- **Effective deployment of continuous emissions monitors requires full transparency, public availability of monitoring data, and real world deployment that matches peer-reviewed test conditions.** CEMs are one of many tools that can support the enforcement of methane emissions reduction. Regulators, however, must enforce a strict regime for their deployment to minimize the failures exposed in this report.

PDC - Ottesen site in Weld County, CO. ©Earthworks



INTRODUCTION

In April 2023, Earthworks and Oil Change International released an investigative report, *Certified Disaster: How Project Canary and Gas Certification are Misleading Markets and Governments*,² which examined the emergent technology and processes associated with industry attempts to label methane gas as “responsible,” “certified,” “differentiated,” or “next generation.”

The findings of that report exposed deeply troubling flaws in the emerging certification services industry. After researchers used optical gas imaging (OGI) cameras to capture footage of 22 emissions events at sites across Colorado, analysis of company reports to the state found the continuous emissions monitors (CEMs), which are often used for certification, detected none of the events recorded by the research team.

The data belied the contradiction at the heart of companies like Project Canary. Project Canary claims to “measure what matters” with integrity and “radical transparency” while simultaneously operating on the explicit premise of maintaining “a social license [for the industry] to operate ... for many decades to come.”³ While Colorado has sunshine laws that allow the research team to directly compare data captured by CEMs to data captured via OGI, in most states where the oil and gas industry operates, little information is available to verify their claims. Currently, no regulatory body is tasked with assessing the efficacy of CEMs, appraising the methodological robustness of certification programs, or prohibiting blatant conflicts of interest. Evidence documented in our previous report suggests that at least one Project



Cub Creek Energy - Knight site in Weld County, CO. ©Earthworks

Canary director and several advisory board members have direct financial interests in the same gas companies that Project Canary certifies.⁴

The upshot is that certification has given the industry a new tool for greenwashing, where oil and gas companies police themselves and are able to push the false narrative that methane gas is an energy source compatible with climate goals. Certification has allowed producers to make this claim because their products allegedly meet a certain emissions threshold, in spite of the wealth of scientific evidence that a managed decline in the production and consumption of fossil fuels is immediately necessary.

METHANE AND THE MYTH OF CERTIFIED GAS

Methane, the primary constituent in what is known as natural gas, is routinely vented and leaked from the oil and gas supply chain, in addition to emitting significant amounts of carbon pollution when burned. Methane, or CH₄, is a climate super-pollutant^a on its own and, when combusted, produces heat and carbon dioxide (CO₂). The industry makes much of the fact that methane gas creates less CO₂ per unit of energy produced when burned than coal or oil, even as burning methane gas emitted 7.3 billion metric tons of CO₂ in 2022.⁵ However, measuring gas' climate impact only at the point of combustion ignores the significant amount of uncombusted methane emitted deliberately and accidentally throughout the oil and gas supply chain. Together, the uncombusted and combusted methane

^a Over 20 years, methane gas is over 80 times more powerful than CO₂ and, as such, has been labeled a climate super-pollutant. See “Super Pollutants,” Clean Air Task Force,” accessed May 31 2024, [\[link\]](#).

from the oil and gas system has an impact on global warming equal to or worse than coal.⁶

It is this fact that undermines the industry's efforts to portray gas as a "clean" fossil fuel. The vast majority of oil and gas sector methane emissions are thought to come from the production, processing, and distribution stages.⁷ Methane is vented in routine operation and maintenance, and through leaks from faulty equipment, unlit flares, and improperly sealed and abandoned wells; along distribution lines; at storage and compression stations; and when transported on ships. In the United States alone, there are likely millions of point sources of methane associated with the oil and gas sector.

The International Energy Agency (IEA) estimates that the global oil and gas sector released over 79.5 million metric tons of methane in 2023.⁸ On a 20-year basis, this is equivalent to over 6.6 billion tons of CO₂, or roughly the emissions of 1,737 coal power plants.⁹ It is an absolutely vast pollution problem, endemic across the oil and gas sector and accelerating the climate crisis at an alarming rate.

Moreover, research¹⁰ shows most official national and global methane estimates, including the U.S. Environmental Protection Agency's (EPA) Greenhouse Gas Inventory (GHGI) and international reporting under the Paris Agreement, vastly underestimate the true level of methane emitted each year. This is due to these estimates utilizing "bottom-up" inventories that rely on emissions factors (using averages based on various types of equipment and activities) multiplied by total equipment or activity counts.^b "Top-down" studies, which rely on aircraft, satellite, or other field measurements, find much larger methane emissions from oil and gas activity – as much as three times greater than the GHGI in major oil- and gas-producing regions in the United States.¹¹ However, these studies are also estimates, generally taking snapshots of methane levels and modeling gathered data over wider periods. Therefore, neither bottom-

up nor top-down methods systematically measure the totality of emissions coming from oil and gas infrastructure. The Inflation Reduction Act of 2022 created the Methane Emissions Reduction Program (MERP), which prompted the EPA to update Subpart W¹² of the U.S. Greenhouse Gas Reporting Program. The program now requires more accurate background data for the development and utilization of emissions factors, as well as collection and reporting of empirically measured emissions data from a host of advanced technology options (e.g. optical gas imaging, on-site sensor networks, ground-based mobile monitoring, aerial remote sensing, and satellites). This represents a substantial effort to better combine "top-down" and "bottom-up" approaches to methane measurement and reporting protocols. However, the quality of the data collected and reported will depend on the accuracy, credibility, and reliability of the technologies used, effective deployment of those technologies, robust and transparent data analysis, and effective enforcement of the regulations that undergird this effort.

Since 2005, U.S. oil and gas production has more than doubled. This production boom was enabled by the emergence of hydraulic fracturing and horizontal drilling, also known as fracking. In particular, in the Permian Basin in Texas and New Mexico, producers that focus on oil production treat gas as a waste product to be flared off when no market can be found or when the price of processing and transporting it to market is higher than the price received. As a result, the Permian produces some of the highest methane emissions in the world, belying the industry's claims of superior operations. Faced with unfavorable economics, operators are unlikely to ever employ voluntary certification at their dirtiest facilities.¹³

The Industry Strikes Back

Certification typically involves a process where the certifying entity assesses a gas production or processing site – a gas well, a processing plant, or a pipeline compressor station – and tracks reported emissions over

time to determine the level of emissions associated with the gas produced (often referred to as methane intensity). Certifiers frequently claim to work with operators to identify emissions sources and reduce or eliminate them. Once a site (or selection of sites) has been determined to meet the minimum requirements of the certification process, that site receives a rating and the gas produced or handled at that site is certified. The operator can then trade an equivalent amount of gas using the certificate to validate claims made about the emissions associated with it. To date, these transactions have focused only on certifying gas at the point of production and fail to account for leakage that may occur further down the transmission, storage, and distribution supply chains.^c

Certifiers use a variety of different criteria, technologies, and methodologies to certify a client's gas. Project Canary, for example, deploys a network of three or four CEMs at the site level, which are meant to upload readings to a central dashboard every minute, enabling clients to access real-time data and, ostensibly, catch and repair leaks. On average, Project Canary's certification process takes one to three months.¹⁴ Certification status is typically renewed annually.

In a matter of a few years, certified gas has gone from a cottage industry to a major factor in oil and gas markets and regulations. Independent Energy Standards (IES), first conceived in 2013 by ex-banker Jory Caulkins, launched the TrustWell verification scheme in 2018, which monitors and analyzes a wide range of a gas production site's environmental impacts, including methane emissions, air and water quality, and safety.¹⁵ IES merged with Project Canary in 2020.

Founded as a Public Benefit Corporation in Colorado in 2018, Project Canary describes itself as a software-as-a-service (SaaS) company that "measure[s], analyze[s], and visualize[s] environmental risk assessments and emission profiles."¹⁶ It claims to be "the data-driven foundation of the energy ESG marketplace"¹⁷ and to "accelerate progress

b For example, if a site uses 10 valves of a certain type and those valves are documented as emitting, on average, 10 kilograms (kg) of methane per year, then the valves on that site are listed as emitting 100kg per year. The EPA inventory consists of thousands of such calculations to derive its total emissions estimate.

c In March 2024, MiQ announced its Supply Chain Protocol, which "strives to provide buyers and end-users with complete emissions intensity data for the natural gas supply chain so they may make informed decisions on what gas they chose to source." As with its well certification program, MiQ does not sell its own measurement tools but instead analyzes and "verifies" data from other sources, including emissions factors. Accessed June 8, 2024, [\[link\]](#).

to net-zero with continuous monitoring and uncompromising certification technology.”¹⁸ In addition to methane monitoring, Project Canary also provides services that measure volatile organic compounds (VOCs), ethane, benzene, water use, and other environmental indicators.

Project Canary, MiQ,¹⁹ and Equitable Origin²⁰ are among the biggest players in certification, but a plethora of technology providers, certification companies, and several new blockchain platforms designed to facilitate registering, managing, trading, and retiring of various environmental commodities, including certificates associated with oil and gas production, are now operating within the certification space.

In May 2024, Project Canary’s website disclosed it was undertaking over 600 million monthly measurements from more than 60 customers in 13 basins across 3 countries. It collected almost 1.3 trillion methane measurement data points in 2023.²¹ Together, Equitable Origin, MiQ, and Project Canary claim to certify nearly 40% of U.S.-produced gas. CG Hub and Xpansiv are the emergent leaders of blockchain trading platforms; CG Hub is “the primary trading centre for some 6bn [billion] certificates in MiQ’s digital registry,” while Xpansiv “has registered more than 1.5bn ft³/day of Canadian production.”²² Furthermore, an increasing number of methane gas distribution companies and utility providers are considering and entering into contracts to purchase and sell certified gas, often at premium prices, a cost they then seek to pass on to consumers.²³

Certification remains entirely unregulated. Certifying companies set their own standards for what qualifies as certified. “Platinum” or “Grade A” and other top certification levels frequently align with the federal requirements for emissions rather than pushing operators to improve beyond legal minimums.²⁴ Further, operators are readily able to manipulate the market by choosing which facilities are inspected, potentially avoiding the most problematic elements of their operations.²⁵

Some companies are also “shopping the market,” getting Project Canary to certify one part of their operations and its competitor another.²⁶ There is precious little detail available on what the parameters are for certified gas across companies, production basins, or the supply chain. Yet oil and gas producers and operators are able to market their products as “responsibly sourced” and charge a premium to their customers or trade emissions credits, with little regulatory oversight.

Certification Goes Global

In the year since the original *Certified Disaster* report was released, a number of related developments have shown the extent to which the industry has grabbed onto certification as a liferaft amid increasing public and policy pressure to demonstrate its commitment to reduce its climate impact:

- **Evidence is growing that certified gas markets are maturing.** Producers see certification as a means to profit, and customers are lining up. Despite the lack of evidence that certification reduces emissions from gas, an increasing number of utility companies are seeking approval in various states to purchase certified gas and charge customers a premium²⁷ for the privilege. These utilities use these purchasing agreements to promote their climate bona fides, a clear case of greenwashing in which ratepayers are left holding the bag. In February 2024, seven Senate Democrats sent a letter²⁸ to the chair of the Federal Trade Commission (FTC) suggesting gas certifications programs may violate federal consumer protection laws²⁹ and urging the agency to investigate.
- **Regulatory policies increasingly rely on certification for reporting mechanisms.** After the publication of the original *Certified Disaster* report and following the release of a letter signed by nearly 150 civil society organizations,³⁰ the U.S. Department of Energy (DOE) backed off its plan to consider endorsing a specific standard for certified gas. Nevertheless, the federal government continues

to elevate certification programs. In response to the backlash against setting a certification standard, the DOE has shifted its efforts³¹ to the creation of an international working group³² whose goal is to “develop an agreed approach to MMRV [monitoring, measurement, reporting, and verification] that provides consistency and accountability in the marketplace.” While the effort may provide tools for improved methane emissions reduction in the industry, there remains the potential for the oil and gas industry to use a voluntary MMRV framework as a bulwark against calls for a phase-out of oil and gas, jeopardizing climate commitments and the Paris Agreement. At the same time, the oil and gas industry is feverishly lobbying for inclusion of certified gas in many of the Biden administration’s efforts to tackle the climate crisis. For example, as the Treasury Department works out the details of the 45V tax credit program for hydrogen projects,³³ a massive lobbying campaign is underway with the following four goals: (a) to undermine the “three pillars” approach for effective evaluation of the energy demanded by and produced via such projects; (b) to define “clean hydrogen” as loosely as possible; (c) to lock in emission estimation models that are known to undercount emissions; and (d) to include certified gas as a low emission feedstock.³⁴

- **Industry is pushing for certification to create opportunities to sell more gas.** The Differentiated Gas Coordinating Council (DGCC), whose members include both oil and gas majors and certification companies, has been in conversation with the EPA³⁵ and the DOE³⁶ as both agencies make key decisions about the measurement and impact of emissions from the gas system. Gas producers are under significant pressure following the finalization of new EPA rules governing methane emissions from oil and gas extraction, on top of the provisions in the MERP and the associated Waste Emissions Charge (WEC) passed as part of the Inflation Reduction Act. In response, producers are eying gas certification as a means to lessen the



Berry Farms site in Weld County, CO - April, 2023. ©Earthworks

pressure of strengthened regulations. Though the EPA has yet to offer public information about how new methane monitoring, measurement, and mitigation technologies and methodologies will be evaluated and approved for use, it has shared that the rule “expands options for using advanced methane detection technologies, like satellite monitoring, aerial surveys, and continuous monitors, to find leaks.”³⁷ The industry also hopes certification will open the door to approvals for new liquefied natural gas (LNG) export terminals following the Biden administration’s announcement that it is reviewing its evaluation process for new export terminals. The Progressive Policy Institute, which is funded^d in part by EQT,^e made this case plainly, calling

for the DOE to “design an environmental public interest test for LNG exports ... built around a third-party verification of methane performance for the entire supply chain.” The Institute release goes on to say, “Current certification standards cover roughly one third of U.S. gas production, and ensuring a high environmental standard across exports would benefit both the environment and U.S. companies, especially at a time when major trading partners are implementing similar requirements.”³⁸

Since the release of the original **Certified Disaster** report, Project Canary has made significant changes to its leadership.³⁹ The public face of the company, founder and CEO Chris Romer, stepped aside from his

position as Chief Executive and handed the reins over to his brother in August 2023. On March 12, 2024, Project Canary announced it had hired Silver Spring Networks founder Scott Lang as its new chairman and CEO.⁴⁰

The company continues to market itself as a magic bullet for an industry under fire. Despite the very significant concerns exposed by the **Certified Disaster** report, the industry, with buy-in from governments and utility companies, continues to treat certification schemes as legitimate tools for reducing emissions. In that light, this update builds on the original investigation. The new findings in **Certified Gaslighting** demonstrate the imperative for policymakers to reverse this credulous course and treat certification with the skepticism it richly deserves.

d EQT, a major U.S. producer largely operating in the Appalachian basin, paid \$250,000 in corporate membership dues to Progressive Policy Institute in 2022, according to its most recent ESG report. *Purpose. Power. Prosperity. EQT ESG Report Calendar Year 2022*, EQT, accessed May 2, 2024, [link].
e In 2022, EQT claimed to be “not only the nation’s largest natural gas producer, but also the nation’s largest producer of certified natural gas.” See: “EQT Becomes Nation’s Largest Producer of Certified Natural Gas,” Hart Energy, January 14, 2022, [link].

FIELD EVIDENCE

- Pollution events were documented at one of every four sites surveyed.
- Only one of the 23 documented pollution events was detected by site-based monitors.
- Project Canary's allegedly "continuous" Canary-S emissions monitors were down on average more than a quarter of the time.
- Even when monitors detect pollution, action may not be taken to address pollution.

Colorado's regulatory environment uniquely allows for direct comparison of officially reported emissions with data collected by the research team. In 2021, the Colorado Department of Public Health and Environment (CDPHE) implemented Regulation 7, which includes the following requirements for all new oil and gas wells:⁴¹ (a) continuous emissions monitoring during pre-production operations on new oil and gas well pads; (b) an approved Air Quality Monitoring Plan explaining the technical details of how monitoring will be conducted; and (c) monthly reporting of monitoring data. While company-sponsored studies show CEMs can be reliable in controlled test settings,⁴² these tests represent a significant simplification of field conditions.⁴³ Comparing Earthworks' field observations with data reported to the CDPHE under Regulation 7 provides an opportunity to gain insight into the practical capabilities of CEMs, which are often a key component of gas differentiation or certification schemes.

PDC - Ottesen site in Weld County, CO. ©Earthworks



RESULTS

In the period between January and October 2023, Earthworks thermographers conducted 81 site surveys across 38 Colorado locations owned by nine operators.^f Using OGI cameras, we documented pollution events during 23 of the 81 site visits, a rate of more than one in every four visits. When compared with air quality monitoring reports filed by operators for each of these sites, only **one of the 23 documented pollution events** was detected by CEMs at the surveyed sites. That single detected event nevertheless went unmitigated by the operator until we filed a complaint with Colorado’s Air Pollution Control Division (APCD) based on our OGI documentation.

Not only did monitors regularly fail to document emissions events when operational, some also experienced substantial downtime. Analysis of hourly monitor readings revealed significant data loss issues. All nine operators used at least one of the following three CEMs: Aeroqual’s AQS-1, Project Canary’s Canary-S, or Sensit’s SPOD. In total, we reviewed 61,392 hours of monitoring data from 54 monitors (7 AQS-1, 24 Canary-S, and 23 SPOD) at sites where OGI documented emission events. Monitors were not operational a total of 7,926 hours, or approximately 13% of the time. However, there is significant variability in monitor reliability – AQS-1 and SPOD monitors had relatively little downtime (with failure rates of 1.22% and 0.29%, respectively), while Canary-S monitors were frequently down, with an overall failure rate of 26.34%. Across 11 months of Canary-S monitoring data, Canary-S monitors were down anywhere from 24% to 51% per month in seven of those months. The primary cause of monitor downtime was reported as unknown (49%). Despite significant data



Image illustrating size and placement of a monitor in relation to a soundwall surrounding an O&G site in Colorado.

loss issues, records indicated only one monitor was replaced during the 10 months of our survey. Based on the failure rate of monitoring equipment, the accuracy of the data on which the entire certification scheme rests is called into question.

Certifying Nothing

Our surveys and field observations of oil and gas sites where continuous emissions monitoring was occurring in Colorado in 2023 continue to demonstrate that monitoring is being conducted in a manner that is unlikely to capture the same emissions events we routinely capture using OGI. There are often barriers, such as sound walls, between the monitor and the equipment it is monitoring and most well pads we surveyed only employ three to four monitors along their perimeter, which leaves large gaps in coverage. Monitors can also experience significant downtime and data loss.

Inspections using OGI cameras and monitoring performed by CEMs are both intended to detect emissions events that are the possible result of leaks or equipment malfunctions and to therefore inform necessary repairs or modifications. The data we reviewed shows that reported leaks are being identified via leak detection and repair (LDAR)⁴⁴ not CEMs. This indicates a substantial flaw in certification methodology, as LDAR is done at intervals rather than continuously. In a review of all self-reported leaks during the survey period at the sites where we detected emissions events, LDAR inspections identified the leak in every instance (nine leaks reported across all sites). None were detected by a CEM, indicating CEMs have an extremely poor performance track record compared to LDAR.

Further, our research identified a potential breakdown in the reporting process that suggests operators may be failing to

Table 2.1 Summary table of monitor data loss by type of monitor.

| Monitor Type | Number of Monitors | # of Monthly Monitoring Reports Reviewed | # of Recorded Hours Expected | # of Recorded Hours Reported | # of Hours of Downtime | Monitor Failure Rate |
|----------------|--------------------|--|------------------------------|------------------------------|------------------------|----------------------|
| Aeroqual AQS-1 | 7 | 4 | 9672 | 9554 | 118 | 1.22% |
| Canary-S | 24 | 11 | 29400 | 21657 | 7743 | 26.34% |
| Sensit SPOD | 23 | 5 | 22320 | 22255 | 65 | 0.29% |

^f The companies include: Axis Exploration, Bayswater Exploration and Production, Crestone Peak Resources, Extraction Oil and Gas, Kerr-McGee Oil and Gas Corporation, Noble Energy, PDC Energy, POCO Operating, and Verdad Resources.

respond to emissions events when they are detected by their monitors. In the one case where an operator's monitor detected a leak from a malfunction, our evidence showed the operator only acted to inspect and repair the malfunctioning equipment after we contacted them with our video of the emissions event.

Many of the emissions events detected across this study occurred during pre-production (primarily emissions associated with temporary or mobile sources which are not required to obtain air permits) or maintenance activities. These activities

produce significant emissions that are not truly quantified, not classified as leaks or malfunctions, and therefore do not fall under requirements for repair, even when they are detected by CEMs. The absence of real regulatory oversight, either through the Regulation 7 reporting program or certification schemes, means there's nothing to ensure operators use the monitoring technology the way they claim to be using it. While operators in practice typically act only to meet – not exceed – current government regulations, certification allows them to profit from their claims.

Project Canary founder Chris Romer often described his company's work and certification programs using the popular business axiom "if you can't measure [emissions], you can't improve it."⁴⁵ It's clear Project Canary struggles to measure emissions at the sites they monitor. What is unclear is whether they are actually able to induce operators to clean up operations beyond minimum compliance.

Bayswater - Almont-Dotsero site in Weld County, CO - April, 2023. ©Earthworks



A CLOSER LOOK

Two particular incidents highlight some key concerns and questions about the efficacy of CEMs and associated monitoring programs.

Bayswater Exploration and Production – Topaz 6-I Pad

(40.600989, -104.714343)

Weld County, Colorado

[Well Info](#)

[Air Quality Monitoring Plan](#)

[Monitoring Reports](#)

Table 2.2 Bayswater Topaz 6-I Visit Log

| Date | OGI Detection? | CEMs Detection? |
|---------|----------------|-----------------|
| 4/27/23 | N | N/A |
| 7/21/23 | Y | Y |
| 8/14/23 | N | N/A |
| 8/16/23 | N | N/A |

On July 21st, 2023, Earthworks' thermographer filmed a plume of uncombusted hydrocarbon emissions from a separator burner on the Topaz 6-I Pad, an indication of a possible pilot light malfunction. That same day, we filed a complaint with APCD. On July 27th, we received the following response from the APCD staff assigned to the complaint:

The company did an investigation after being informed of the complaint. The investigation found that the pilot for the heater was malfunctioning. Took necessary steps to address the issue and confirm repair. (emphasis added)

Review of the monthly monitoring report revealed that this particular site has four monitors and the NW monitor at this site had elevated total volatile organic compounds (tVOC) readings for 3 hours on the date of our site survey. While the other three monitors had readings ranging

from 0.414–0.622 parts per million (ppm) during OGI filming (in the noon hour), the NW monitor had a reading of 3.98 for the 10:00 am hour, 4.27 for the 11:00 am hour, and 2.61 for the noon hour. Despite evidence of elevated readings from one of the site monitors, according to the information we received from the APCD investigation, the operator only discovered the malfunction and repaired the heater in response to our OGI evidence.

In July, the company also reported that a regulator on an enclosed combustor was malfunctioning at this site from July 10th to July 13th. In this instance, the malfunction was detected during a routine LDAR inspection, not by the CEMs at the site.

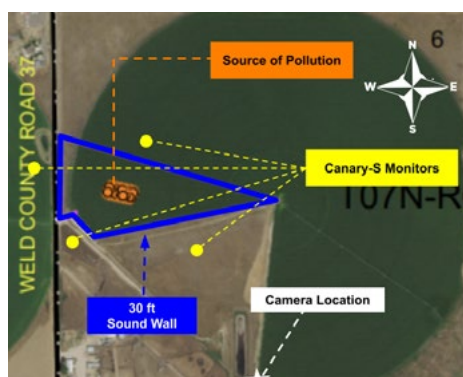


Figure 2.1 Layout of Bayswater Topaz site, Canary-S monitors, and camera position during our July 21, 2023 site survey.

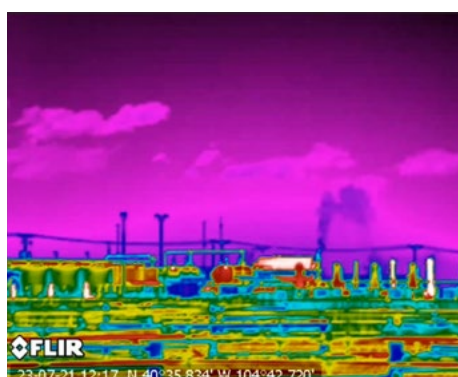


Figure 2.2 OGI video documenting uncombusted emissions from an unlit separator burner at the Bayswater Topaz well site. Filmed by Earthworks in Weld County, CO on July 21, 2023.

Table 2.3

| Monitor | Monitor Readings for tVOC (ppm) During Site Visit | | | Avg tVOC (ppm) for Month of July | | | Event Response Level |
|---------|---|-------|-------|----------------------------------|--------|-------|----------------------|
| | Min | Max | Mean | Min | Max | Mean | |
| ESE | 0.382 | 0.414 | 0.398 | 0.116 | 6.740 | 0.346 | 3 ppm |
| NW | 0.200 | 2.610 | 0.531 | 0.130 | 11.360 | 0.212 | 3 ppm |
| SSE | 0.398 | 0.419 | 0.407 | 0.255 | 7.661 | 0.382 | 3 ppm |
| SSW | 0.522 | 0.622 | 0.554 | 0.231 | 10.035 | 0.579 | 3 ppm |

Bayswater Exploration and Production – Ruby 7-J Pad

(40.589694, -104.707111)

Weld County, Colorado

[Well Info](#)

[Air Quality Monitoring Plan](#)

[Monitoring Reports](#)

Table 2.4 Bayswater Ruby 7-J Visit Log

| Date | OGI Detection? | CEMs Detection? |
|---------|----------------|-----------------|
| 4/27/23 | Y | N |
| 6/25/23 | N | N/A |
| 7/21/23 | N | N/A |
| 8/14/23 | Y | N |
| 10/5/23 | N | N/A |

On August 14, 2023, our thermographer identified a significant pollution event, a geyser of uncombusted hydrocarbon emissions from near a workover rig on a well pad more than a quarter mile away from the filming location. We first detected the ongoing event at approximately 12:02 pm and were able to detect it from our vantage point until approximately 12:15 pm.

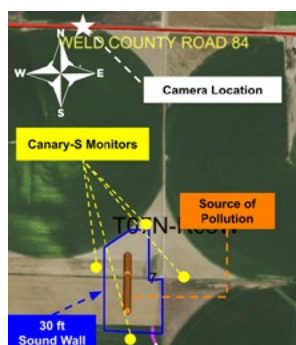


Figure 2.3 Layout of Bayswater Ruby 7-J well site, Canary-S monitors, and camera position during our August 14, 2023 site survey.

Though the presence of the workover rig indicated that maintenance was likely occurring on the well pad, we opted to file a complaint with APCD due to the presence of hydrocarbon emissions that were clearly observable from a substantial distance and because the emissions appeared not to be routed through any control devices on the pad, such as the enclosed combustion devices. The complaint was filed on August 17th, and on August 23rd, we received the following response from the APCD staff assigned to the complaint:

*Bayswater has reviewed the video from Earthworks. Bayswater was conducting a workover on this well in trying to recover coil tubing that is downhole on 8/14/2023. During the time of the video, Bayswater was pumping a brine water mixture into the well to **depressurize the well to 0 psi**. As a best management practice, we route the gas through the facility's production equipment as the well is being depressurized. (emphasis added)*

According to Bayswater's report to APCD, pumping of the brine water into the well to depressurize it began at noon on August 14th and proceeded until 1:30 pm the same day, after which there would have been no

gas present in the well until the maintenance work was concluded and production resumed.

A review of the monthly monitoring report for this site revealed that all four monitors had elevated tVOC readings in the 11:00 am hour on August 14th. The E monitor recorded a 10.27 ppm reading, the NNE monitor a 9.72 ppm reading, the S monitor a 7.75 ppm reading, and the W monitor a 9.2 ppm reading. However, none of the monitors had elevated readings in the noon or 1:00 pm hours, which is when Bayswater reported conducting the brine pumping and when we documented the emissions event. We therefore cannot determine if the CEMs recorded the emissions from the depressurization event.

Following additional communication with APCD, we discovered that the site is permitted for uncontrolled maintenance venting, and therefore the operator was not required to attempt to control emissions. In the case of an intentional release of emissions, not a leak or malfunction, no follow up action was required by the APCD or the operator, and would not have resulted in a reported leak under either Regulation 7 or certification schemes.



Figure 2.4 OGI video documenting a significant pollution event at Bayswater Ruby 7-J well site. Filmed by Earthworks in Weld County, CO on August 14, 2023.

Table 2.5

| Monitor | Monitor Readings for tVOC (ppm) During Site Visit | | | Avg tVOC (ppm) for Month of August | | | Event Response Level |
|---------|---|-------|-------|------------------------------------|--------|-------|----------------------|
| | Min | Max | Mean | Min | Max | Mean | |
| E | 0.381 | 0.388 | 0.385 | 0.201 | 10.268 | 0.567 | 3 ppm |
| S | 0.311 | 0.318 | 0.315 | 0.301 | 7.752 | 0.533 | 3 ppm |
| W | 0.218 | 0.381 | 0.305 | 0.208 | 9.208 | 0.527 | 3 ppm |
| NNE | 0.448 | 0.541 | 0.463 | 0.422 | 9.720 | 0.582 | 3 ppm |

WHO GETS HURT WHEN “CERTIFICATION” FAILS

The rules governing operators’ responsibility to report, prevent, or repair emissions – and whether these emissions are considered under certification schemes – are designed to leave out emissions under a number of normal, frequent circumstances. But emissions events that take place during maintenance or pre-production nevertheless can cause substantial harm to communities and the environment. Carol Hawkins, who lives in Ault, Colorado, just a few miles from the Bayswater Ruby 7-J well pad, accompanied our thermographer on the visit during which we captured the depressurization event. Their eyewitness perspective:

I was welcomed to Ault six years ago with a forced pooling notice from PDC Energy, which I followed with many attempts to protest fracking near my home, but my protests were unsuccessful. I testified against Bayswater’s proposed Ruby and Topaz sites just east of town before the state regulatory agency that issues drilling permits, only to be dismissed after two or three minutes while Bayswater held court with promises of “best practices.”

Impacts on citizens didn’t matter in this hearing, even though Physicians for Social Responsibility states that I’ll die younger, more than likely get dementia, and am sure to suffer from respiratory and heart issues because I now lived near well pads. This has proven to be true as I face my sixth year in Ault. For me, the nosebleeds came first, then the high blood pressure, insomnia, increased anxiety, nasal infection, inflamed breathing tubes, and sinus congestion. Lung nodules were discovered on

an MRI for chronic migraines. My grandson’s recent experience is worse, as his partner went into labor early, and the baby had a lower birth weight. They too live in Ault.

My first look through one of Earthworks’ OGI cameras was like entering the Twilight Zone. [Earthworks thermographer] Andrew [Klooster] guided the lens to focus on the sound wall at the Ruby site. I found seeing the VOCs – but only through the camera – a chilling cognitive dissonance. Pinks, purples, yellows, oranges against a black sky. But when I moved away from the lens and took a look at the same site, with the naked eye, blue skies and white clouds, and the ugly brown sound wall. Welcome to fracking emissions, up close and personal. The OGI camera was no kaleidoscope. Those psychedelic colors weren’t bouncing off mirrors and glass and they don’t delight; they horrify. A complaint using that footage was filed with CDPHE, an air quality regulator for the state of Colorado, but it also fell on deaf ears.

I had grown accustomed to touring these sites and filing complaints. I learned that it’s while drilling that a lot of pollution occurs. Indeed, Ruby was casting off major emissions, a thick black cloud hovered and then trailed across the horizon, visible through the OGI camera. It’s bittersweet “luck” to have been at the wrong place (Who wants to hang out at a drilling site?) at the right time (to catch Bayswater in the act) to film this “major emission event” – a major VOC dump on an unknowing public. So much for “best practices.”

Methodology

Throughout 2023, Earthworks thermographers, certified by the Infrared Training Center (ITC), continued the field work we began for **Certified Disaster**, surveying oil and gas sites with CEMs in Colorado’s Front Range. As mentioned in our previous report, Earthworks field advocates prioritize surveys of oil and gas sites where we can assist communities in documenting concerns or exposing possible compliance issues. Therefore, we limited our visits to sites based on factors such as: (a) convenience of access; (b) proximity to sites we planned to survey due to community concerns; (c) sites subject to air quality monitoring and reporting requirements; and (d) sites with valid monitoring plans. These same factors also played into whether or not we conducted multiple surveys of the same site.

Earthworks uses industry-standard FLIR GF320 Optical Gas Imaging (OGI) cameras designed to detect and visualize 20 volatile organic compounds that cannot

be detected by the naked eye, including methane and the carcinogens benzene and toluene. The cameras are routinely calibrated by FLIR in accordance with their standards for accurate recording.

Over a period of 10 months in 2023 (January to October), Earthworks’ ITC-certified thermographers conducted a total of 81 surveys of 38 different oil and gas production sites in the Front Range where Photoionization Detector (PID) based CEMs were deployed. These sites were selected because at the time of our surveys they were subject to Regulation 7’s pre-production air quality monitoring requirements (from the commencement of pre-production activities through the first six months of production).

Earthworks recorded 23 pollution events (12 sites with Project Canary-S monitors, 4 sites with SENSE-IT SPOD monitors, and 2 sites with Aeroqual AQS-1 monitors) from a wide variety of well site activities spanning production phases – including

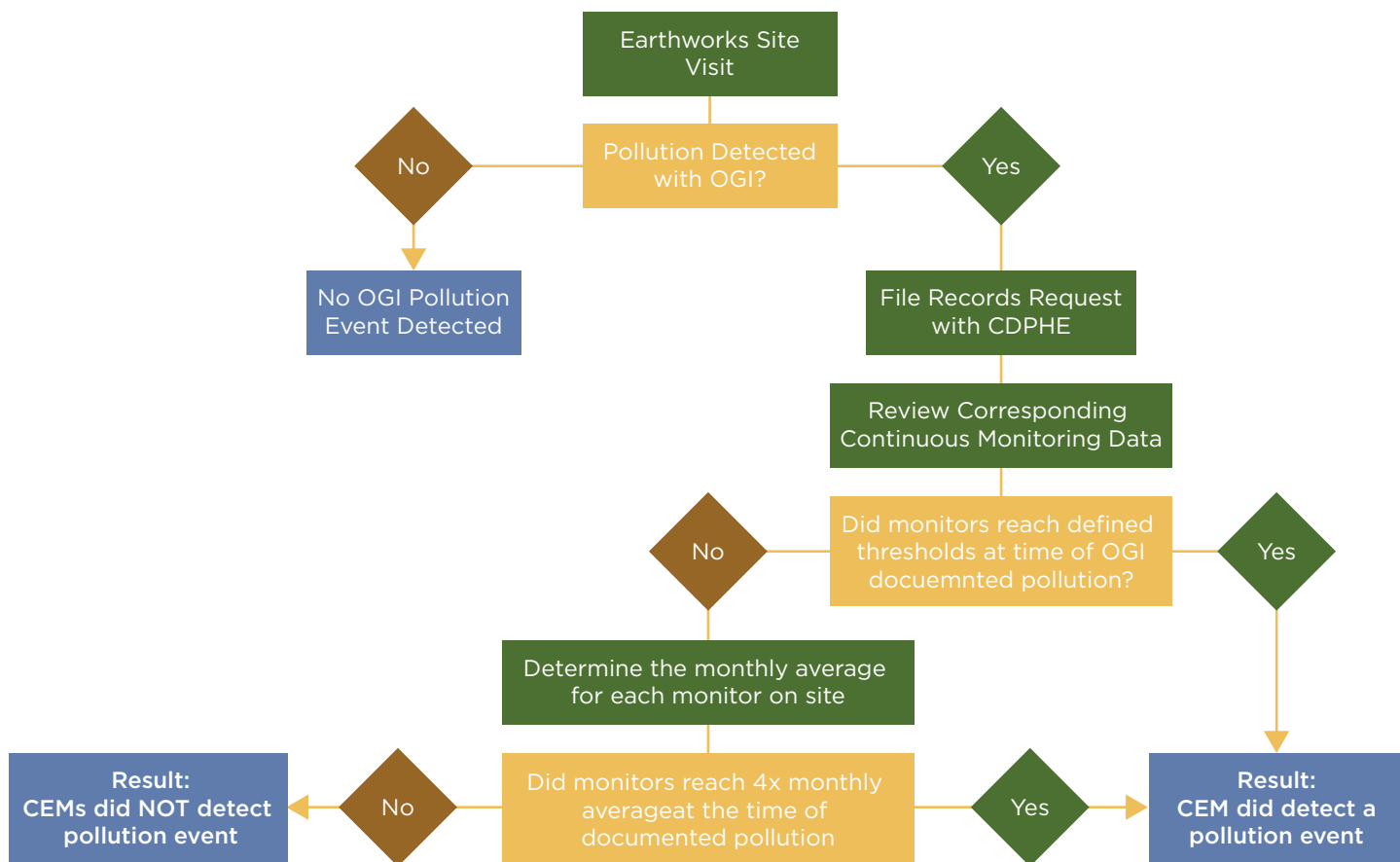
emissions from drilling, fracking, flaring, venting, and maintenance. The team then verified that footage with independent industry professionals and, when necessary, submitted that footage as an official complaint to the CDPHE.

Limitations

Due to the limitations of Regulation 7, the research team does not know precise monitor readings at the exact moment Earthworks documented a pollution event. Regulation 7 only requires operators to provide hourly aggregate readings for each metric they record rather than the minute-by-minute data that should come from **continuous** emission monitors.

Regulation 7 also allows operators flexibility on which pollutants and metrics they record. However, it requires at least one of the following: “total VOCs, methane, benzene or BTEX (benzene, toluene, ethylbenzene, and xylenes), or other indicators of hydrocarbon emissions from pre-production and early production operations.”⁴⁶ Although there

Figure 2.5 Visualization of Earthworks' Case Study Process



Source: Earthworks

was some variation in which metrics were recorded from site to site and even from month to month, all of the sites in this study included total VOC (tVOC) emissions readings from their monitors. This metric also worked well for comparison with Earthworks' FLIR GF320 OGI camera, which is designed to detect and visualize the infrared signature of methane and VOCs but does not specify the different hydrocarbon emissions it detects.

Comparing the Data - Aggregate CEM Readings vs. OGI

Under Regulation 7, operators are also required to define response levels for the pollutants they monitor and the actions they will take if elevated levels are exceeded. Earthworks researchers chose to use these operator-defined thresholds as one of the criteria used to determine whether monitors detected pollution events. Pollution events detected in the monitoring data were

compared to the pollution events detected during our OGI surveys. We define pollution events as instances in which we identified hydrocarbon plumes from sources that would indicate a leak, malfunction, or other compliance issue, or instances in which the source was not identifiable but hydrocarbon plumes extended beyond site fence lines.⁹

⁹ For a full description of methodology, see the original Certified Disaster report.

RECOMMENDATIONS

The major findings here are remarkably similar to the findings in our initial investigative report, *Certified Disaster*, indicating a damning lack of responsiveness from certifiers to make substantive changes to deep flaws in their technologies and processes. The bottom line of this report is simple and direct: In our view, certification's failures are delegitimizing and certification must not be used as part of any public policy decision, legally mandated reporting, or regulated markets. However, so long as such certification schemes exist, they should be treated with extreme skepticism.

The certification market and its influence, both domestically and globally, continues to rapidly grow. Proponents claim that as much as 50% of U.S. gas could be certified in the next few years,⁴⁷ reaching 100% by 2030,⁴⁸ yet IEA data⁴⁹ show U.S. methane emissions rose 4% in 2023.^h Some companies are already using certification status to convince ESG-minded investors and the public of their progress toward climate goals. Others are now selling certified gas to utilities at a premium, a cost which is then passed on to end-use consumers.⁵⁰ In the United States, LNG exporters are currently leaning on certifications to woo global purchasers who want lower-emissions methane gas.⁵¹

We find it likely that many of these decisions – which have global implications – are being made under dangerous pretenses. Our investigations continue to demonstrate that, at this point in time, gas certification is not

the “organic certification” of gas it claims to be. Rather, it is more often than not a means for industry to reap financial and reputational benefits based on distorted data collection, analysis, and reporting in an environment where there is little to no oversight. At present, certifiers and their customers view certification as a way to avoid any meaningful cuts to production and a pathway for the U.S. gas industry to lay claim to the “cleanest gas in the world.”⁵² Significant gaps in emissions monitoring obfuscate the true impact of increased production but cannot hide it entirely. IEA data⁵³ show the U.S. oil and gas industry ranks 20th among producing countries for methane emissions intensity⁵⁴ – hardly a global leader for “clean” gas. These trends will continue as long as certification remains an industry-led, market-driven approach.

Effective pollution reduction requires robust and rigorously enforced regulations for emissions minimization, monitoring, and maintenance of existing sites. Our continued investigation into the efficacy of CEMs provides significant evidence that this monitoring technology, as currently deployed in real world field conditions, fails to adequately capture methane and VOC pollution at well sites. Conversations with experts and other ongoing studies further support our evidence from the field. Substantial improvements to the technology of CEMs and strict standards for their deployment are needed before CEMs can be used to make any assessments of methane intensity – especially those

required for legal reporting to the EPA under the MERP, in association with the WEC, and as related to the forthcoming 45V tax credit. Without significant changes, certification programs' reliance on CEMs in any manner means that data between routine LDAR intervals cannot be trusted.

The certification industry and the operators it certifies recognize that transparency is an important principle for regulators and customers to have confidence in the product they're selling. But they are not matching words with action. Peer-reviewed studies show that sufficient transparency is critical to the validity of any certification process and demonstrate a clear correlation between transparency and quality of product – companies can and will offer low-quality products at premium rates when consumer knowledge is restricted.⁵⁵ One example of this is the VW “clean diesel” scandal.⁵⁶ As part of a major campaign to sell more diesel cars, VW touted them as “low emissions” vehicles, which was a successful marketing strategy, until investigations revealed nearly 11 million such vehicles sold worldwide contained a “defeat device” that essentially gamed regulatory emissions tests. VW has since paid more than \$30 billion in regulatory fines and remedies in addition to settlements in investor and consumer lawsuits.⁵⁷ Given the significant barriers to publicly accessible information in current gas certification schemes, the questionability of their data, and the current focus on getting premium returns for clients, it is easy to see how

h From direct communication with IEA staff. The IEA updated its methodology leading to slightly lower estimates of oil and gas methane emissions for previous years compared with last year's data. When comparing U.S. data from last year's tracker with this year's tracker, the apparent emissions reduction is misleading. As IEA has not yet published previous years' country level data using this year's methodology, we requested a figure for U.S. oil and gas methane in 2022 using this year's methodology to understand how much of the apparent reduction was due to methodology revisions over improved performance. The IEA stated in an email that estimated U.S. emissions from oil and gas operations (excluding end-use sectors) was 12.8Mt using this year's methodology. For 2023, this figure is 13.3 Mt, a 4% increase.

i For example, back in 2021 NextDecade and Project Canary formed a pilot to monitor emissions from the Rio Grande LNG Project [\[link\]](#), Engie signed a deal with NextDecade to purchase 1.75 million metric tonnes of LNG per year [\[link\]](#), and the Rio Grande LNG export terminal is now under construction and expected to start commercial operations as early as 2026 [\[link\]](#).

a comparable level of obfuscation is playing out here too. For this reason, our recommendations aim to peel back the curtain to better protect consumers where certification schemes are already in play.

To date, overwhelming evidence shows certification schemes have failed to reduce emissions from current oil and gas operations. Even as operators claim to have received certification on higher and higher percentages of their oil and gas, methane emissions from the industry have continued their relentless rise. That, by itself, is reason enough to consider certification greenwashing.

It is for these reasons we recommend that governments, regulators, utilities, and others holding decision-making power over the use of gas strictly limit the application of certification on legal or regulatory grounds.

Accurately measuring and reducing the prolific pollution associated with oil and gas production, processing, transportation, and use is fundamental to slowing the climate crisis. But simply reducing this pollution is not enough. All credible climate scenarios show that methane emissions reduction must happen alongside a fast, fair, full, and funded phase-out⁵⁸ of oil and gas production, not instead of it.

Detailed Recommendations

The most important action for oil and gas companies to take is to align with global climate goals to phase out oil and gas. The phase-out process must be accompanied by a robust, effective, and transparent clean-up of the industry's profligate methane emissions, enabled by robust monitoring, measurement, reporting, and verification. Certification is not a substitute for this. Pursuing clean-up without phase-out is doomed to fail.^j Oil and gas companies will not phase out their own products or plan their own decline. The government and civil society must intervene.

Regulators should enforce the following recommendations to protect consumers, communities, and the climate:

Methane reduction must only happen under government oversight and regulation that puts community and consumer protection first.

Federal oversight must protect consumers from certifiers' and producers' misleading claims. Regulatory agencies must prioritize protecting communities, improving public health and limiting the worst impacts of the climate crisis through oversight of emissions reduction activities. Regulators should set strict standards for oversight and monitoring of CEMs, data collection, technologies, methods, and programs. All these should also be subject to independent analysis to ensure accountability at all levels.

- **Consumer protection laws:** The FTC should investigate whether certification or other claims about emissions reduction violate consumer protection laws. The forthcoming update to the FTC Green Guides⁵⁹ should include guidance barring oil and gas producers, traders, marketers, utilities, etc., from making claims that gas is "clean," "safe," or a "climate solution," and does not need to be phased out.

- **Duty of vigilance:** Federal and state regulators should strengthen rules requiring operators to act immediately to investigate and resolve any issues with site equipment detected by CEMs, including during pre-production and maintenance.

- **CEMs and emissions rules:** State regulations (such as Colorado's Regulation 7 and others enacted under the 2023 EPA methane emissions rule) and federal regulations (such as the Waste Emissions Charge) should require regulatory bodies to enact oversight to ensure CEMs meet operational minimum requirements before allowing data to be

used for mandatory emissions reporting. Updated greenhouse gas reporting requirements should be strengthened to require empirically collected, representative data. Any data used for regulatory compliance should be publicly available for independent and/or peer-reviewed analysis.

Certification should not be part of regulatory frameworks.

Measurement, monitoring, reporting, and verification within a regulatory framework are essential tools to ensure real reductions in methane emissions. However, certification must not be applied in place of independent or government oversight for the purposes of permitting or legally mandated reporting, or in regulated markets. Subcontracting environmental oversight to entities prolonging fossil fuel use is not an effective strategy. Using certification as a proxy for regulatory oversight and commitment to phase-out is simply a dangerous distraction that will lead to climate catastrophe.

- **LNG:** The DOE's Public Interest Determination authorization process cannot fall to the dangerous distraction of using gas certification to justify LNG export expansion.

- **Utilities:** Public service commissions should not approve utilities passing on premiums for purchasing certified gas to ratepayers. Utilities should not rely on purported emissions reduction claims of producers, and they should not include purchases of certified gas in their net zero planning in lieu of actual decarbonization and managed phase-out of gas infrastructure.

- **Global frameworks:** Certification should not be considered a valid form of emissions verification under legally binding climate targets nor voluntary international frameworks, or in national export or import emissions caps.

^j The IEA's "Net Zero Emissions by 2050 Scenario" clearly shows that gas production must decline 20% by 2030 while methane emissions are reduced by 75% in the same timeframe. To date, the industry has made no progress toward either goal. See *Net Zero Emissions by 2050 Scenario (NZE)*, International Energy Agency, September 26, 2023, [\[link\]](#).

Emissions reduction programs must operate in tandem with mandatory regulatory oversight and requirements to ramp down production, not as a justification for the gas industry to grow.

Effective deployment of CEMs requires full transparency, public availability of monitoring data, and real world deployment that matches peer-reviewed test conditions.

CEMs are one of many tools that can support the enforcement of methane emissions reduction. Regulators, however, must enforce a strict regime for their deployment to minimize the failures exposed in this report. Regulators should demonstrate products and services are capable of achieving minimum levels of accuracy through independent analysis of CEMs and other technologies.

● **CEM efficacy:** Manufacturers and distributors of CEMs should subject products and services to independent, peer-reviewed studies to ensure an accurate assessment of their capabilities. Such studies must be publicly available. Where regulators allow for the use of CEMs, the CEMs must meet the following minimum requirements:

- provide minute-by-minute reading of methane emissions measured in mass over time (kilograms/hour [kg/hr]);
- demonstrate accurate detection and quantification of point source emissions of 0.1 kg/hr or higher with 90% confidence; and
- maintain a 12-month rolling average of less than 10% operational downtime in field conditions.

● **Deployment should match peer-reviewed study practice:** Regulators must require certain operational minimums, including verification that implementation of monitors in the field matches conditions tested in peer-reviewed studies (e.g., number and placement of monitors related to type, size, and location of the site), and the replacement of malfunctioning monitors immediately.

● **Transparency and public availability of monitoring data:** Operators and regulators should make all CEM-acquired data publicly available (i.e. type, quantity, and placement of monitors) and grouped by company. Regulators should require operators to submit monthly site-specific monitoring reports for all sites monitored with CEMs. These reports must be publicly available and include the following:

- evidence of calibration;
- description of monitoring equipment deployed, including manufacturer and model;
- number and placement (including height) of monitors and meteorological measurement devices;
- topographic map of site;
- raw stream of minute-by-minute monitor data for all parameters measured;
- number and date of pollution threshold exceedances;
- full list of monitor failures, power outages, connection losses, and details of replacement when such occurs; and
- verified chain of custody for data.

APPENDIX

| Site Name (Bold indicates sites included in case study section.) | Date | OGI Detection | CEM Detection | Monitor Used |
|--|---------|---------------|---------------|----------------|
| Bayswater Garnet Monitoring Plan | 6/25/23 | Y | N | Canary-S |
| | 7/21/23 | Y | N | |
| | 8/14/23 | Y | N | |
| Bayswater Reeman Monitoring Plan | 7/21/23 | Y | N | Aeroqual AQS-1 |
| | 8/14/23 | Y | N | |
| | 8/16/23 | Y | N | |
| | 10/5/23 | Y | N | |
| Bayswater Ruby 7-J Monitoring Plan | 4/27/23 | Y | N | Canary-S |
| | 6/25/23 | Y | N | |
| | 8/14/23 | Y | N | |
| Bayswater Topaz 6-I Monitoring Plan | 7/21/23 | Y | Y | Canary-S |
| Crestone Cosslett East Monitoring Plan | 5/23/23 | Y | N | Aeroqual AQS-1 |
| Crestone Shelton Monitoring Plan | 6/25/23 | Y | N | Canary-S |
| Crestone Warner Monitoring Plan | 3/28/23 | Y | N | Canary-S |
| Noble Johnson Monitoring Plan | 3/28/23 | Y | N | Canary-S |
| PDC California Monitoring Plan | 7/21/23 | Y | N | Sensit SPOD |
| | 8/14/23 | Y | N | |
| PDC Gus Monitoring Plan | 1/24/23 | Y | N | Sensit SPOD |
| PDC Kortum Monitoring Plan | 1/21/23 | Y | N | Sensit SPOD |
| | 1/22/23 | Y | N | |
| | 1/25/23 | Y | N | |
| PDC Ocho Monitoring Plan | 3/28/23 | Y | N | Sensit SPOD |
| Verdad Kiwi Monitoring Plan | 5/23/23 | Y | N | Canary-S |
| Verdad Onion 1918 Monitoring Plan | 10/6/23 | Y | N | Canary-S |

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Oil Change International
714 G Street SE, Unit 202
Washington, DC, 20003
www.priceofoil.org



EARTHWORKS

Earthworks
1612 K Street NW, Suite 904,
Washington, DC, 20006
www.earthworks.org