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VIA Electronic Filing

Chair Liane Randolph
California Air Resources Board
1001 I Street
Sacramento, CA 95814

RE: Potential Amendments to the Oil and Gas Methane Regulation

Dear Chair Randolph,

Project Canary appreciates the opportunity to provide public comments regarding potential changes to the Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities as presented at the January 20, 2023 California Air Resources Board (CARB) Public Workshop to discuss Potential Amendments to the Oil and Gas Methane Regulation. Project Canary supports California's continued efforts to decarbonize the energy system and its commitment to address methane and short-lived pollutants. Project Canary provides these comments in support of the state's potential amendments to Title 17, California Code of Regulations, Division 3, Chapter 1, Subchapter 10 Climate Change, Article 4, Subarticle 13, Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities.

Project Canary applauds CARB for its actions and continued drive to improve the Oil and Gas Methane Regulations Subarticle 13. While this is the first step to create alignment with the US Environmental Protection Agency (EPA) Control Technique Guidelines, we believe CARB can go further to set a standard with respect to the measurement and monitoring, and ultimately enable the quick and decisive actions that stop methane leaks. Other states are taking action by implementing stringent air quality regulations. Colorado and New Mexico are requiring operators to measure emissions with increased frequencies and higher standards.

There have been dramatic advancements in leak detection, monitoring, and measurement technology that are now available to identify leaks and allow energy producers to quickly locate, mitigate, and eliminate emission sources. The final regulation should identify and encourage the use of direct measurement and continuous monitoring technology in monitoring plans and for Leak Detection and

Repair (LDAR) requirements. And consideration should also be given to ensure that new and emerging technologies can be utilized by operators to meet the variety of existing and pending air quality regulations at the state and federal level.

In support of this, Project Canary provides comments on two primary areas:

1. Suggested modifications to the proposed draft language including a broader definition for inspection standards, additional considerations for inspection and repair of remotely detected leaks, a modification to Table A8, and minor technical changes.
2. Encouragement for CARB to address alternative LDAR methods, technologies, and programs in the near term to expand opportunities for operators through the adoption of direct, site-level continuous monitoring.

About Project Canary

Project Canary, based in Denver, Colorado, is a mission-driven B Corporation accountable to a triple bottom line of people, planet, and profit. Our goal is to mitigate climate change by enabling the energy production sector to operate on a cleaner, more efficient, more sustainable basis. Our proven technologies provide real-time emissions monitoring and rigorous, independent certification of oil and gas well sites for responsible operations. Project Canary solutions help energy companies collect, manage, operationalize, and benefit from real-time environmental data so that they can mitigate impacts now.

Project Canary is a technology and data company that offers a suite of services designed to help lower the environmental impact of natural gas production, transportation, and distribution, including the rigorous, independent emissions monitoring and operational certification. Our thesis is that methane leaks in upstream energy facilities are preventable, and we can stop the leaks. The foundation of Project Canary's solutions is continuous monitoring technologies. When combined with an integrated, real-time dashboard, our technology provides companies with rapid detection and notifications related to unintentional releases from energy production locations, significantly reducing the duration of leaks and thereby reducing losses of valuable product. The monitoring technology we provide has been in use since 2019 on facilities across the United States in every major producing basin. Our technology alerts companies as soon as a leak threshold is reached. Companies then determine the cause of the leak and take further action as appropriate. The use of continuous real-time monitoring in this manner significantly reduces emissions from the energy production when compared with traditional intermittent Optical Gas Imaging (OGI) camera inspection programs.

Proposed Modifications to Draft Regulations

The current draft of potential changes issued on January 13, 2023 (the Draft Regulations) contains significant improvements from the original version while also leaving opportunities for progress. Significantly, the Draft Regulations do not fully recognize and take advantage of widely available, cost-effective technology that would help CARB fulfill its statutory obligation and mission through the effective reduction of air pollutants.

The landscape of state and federal oil and gas regulations is shifting towards rulemakings with site-level measurement at its core. The objectives of recent, related federal rulemakings—including the Environmental Protection Agency's Supplemental Rule regarding air emissions in the oil and gas sector, the imposition of a charge on avoidably lost gas in the Inflation Reduction Act (IRA), the climate disclosure requirement proposals from the Securities and Exchange Commission (SEC) and the Department of Defense (DOD)—would all be advanced by site-level measurement and continuous monitoring technology. Operators using these technologies could efficiently and cost-effectively provide consistent and accurate data under multiple regulatory regimes, including at the state level. CARB and other agencies can move towards requiring the use of more precise measurement technology, and at minimum to allow the data collected by operators who are already using continuous monitoring to qualify under these Draft Regulations. For example, the new framework outlined in the IRA Methane Emissions Reduction Program relies on measurement-based performance metrics rather than previous practices that allowed emission estimates.[1]

The term "direct measurement" is used throughout the Draft Regulations and is typically defined as follows: "(high volume sampling, bagging, calibrated flow measuring instrument)"[2]. This language is included in compliance requirements for various components of the production process. However, this language is also carried into newly proposed language in §95670.1 Delay of Repair. These have been recognized methods for direct measurement for many years, and while this is the current standard, we encourage CARB to modify this language where appropriate to include additional existing and emerging advanced methane measurement and leak detection technologies.

[1] IRA section 60113 requires EPA to levy a waste emissions charge on a per-ton methane intensity basis, which is not possible without highly accurate measurement of both emissions and throughput at affected facilities. The Congressional emphasis on improved quantification can also be found in the directive to EPA to develop new and improved empirical methodologies for emissions reporting under the Subpart W program. This directive makes clear that continued reliance on emission factors under Subpart W is not appropriate. Under an emissions factor methodology, two facilities with widely disparate actual emissions but similar emission factors could incur equivalent waste emissions charge liability. Such an outcome would undermine the intent of Congress to incentivize reductions by constructing a per-ton waste emissions charge.

[2] § 9566.8(b) page 22, § 9566.8(c) page 24, § 9566.8(d) page 25, § 9566.8(e) page 27, § 9566.8(f) page 29, § 95670.1 (a)(4)(C) page 58 (new)

Project Canary suggests revising in the following Proposed Rules:
§ 9566.8(b) Circulation Tanks for Well Stimulation Treatments,
§ 9566.8(c) Reciprocating Natural Gas Compressors,
§ 9566.8(d) Centrifugal Natural Gas Compressors,
§ 9566.8(e) Natural Gas Powered Pneumatic Controllers and Pumps,
§ 9566.8(f) Liquids Unloading of Natural Gas Wells, and
§ 95670.1 (a)(4)(C) Delay of Repair as follows:

> Direct measurement (high volume sampling, bagging, calibrated flow measuring instrument) or by advanced methane monitoring technology,

The ability to mitigate methane in upstream energy production facilities stands to make an immediate and material impact on climate change, today. Enabling the use of alternative Leak Detection and Repair methods and technologies, such as advanced methane detection and monitoring technologies, in addition to the modification of the proposed language, will enable operators to take advantage of tools and technology available for maximum impact.

We believe that the regulations should allow for advanced technologies to be utilized. As operators propose leak detection and repair programs, site-level measurement and continuous monitoring should be identified as an allowable alternative to OGI. Older detection methods such as periodic OGI provide a snapshot from a specific time frame and must be deployed at the exact moment a leak forms to capture the full extent of the release. In contrast, continuous monitoring detects intermittent leaks quickly, allowing the operator to quickly identify and mitigate the leak. Continuous monitoring technologies are widely available, cost-effective methods to prevent and avoid emissions, and capturing potential lost revenue for operators. This technology is currently state of the art and is being increasingly adopted by energy producers. Given the ability of site-level continuous monitoring to accurately identify lost gas and help operators avoid emissions, it should be an allowable option for operators to maintain compliance and included in record keeping forms.

The current Draft Regulation proposes annual and quarterly inspection and reporting across various components. Many important energy producing states – including Colorado, Pennsylvania, Ohio, and New Mexico – require more frequent LDAR inspections. Colorado, with perhaps the leading program, requires inspections as frequently as monthly. Given the highly variable nature of leaks from upstream energy production sources, more frequent inspections will inevitably find more leaks. However, research shows, and our own experience confirms, that periodic inspections—whether annual, semi-annual, or quarterly—significantly underestimate emissions and lost gas.[3] This finding underscores the importance

[3] House of Representatives Committee on Science, Space, & Technology, *Seeing CH4 Clearly: Science Based Approaches to Methane Monitoring in the Oil and Gas Sector*, at 17 (June 2022) ("Infrequent handheld LDAR surveys largely do not capture malfunctions and abnormal operating conditions, which give rise to persistent and

of incentivizing continuous monitoring technology within LDAR programs as an alternative to periodic inspections. As discussed throughout our comments, site-level measurement and continuous monitoring technology collects data on a continuous basis, allowing operators to quickly identify and repair leaks. This cost-effective technology is widely adopted, given the benefit to operators in minimizing emissions and making a significant impact for the climate.

We recommend that a LDAR program, with continuous monitoring technology be an option to fulfill an operator's annual inspection obligation, as well as provide the support and follow-up for reconciliation of remotely detected leaks. Continuous monitoring involves far more frequent observations and much more accurate leak detection than traditional annual inspection methods. Operators using continuous monitoring technology are alerted to leaks in real-time and some systems can pinpoint specific areas of releases. This rapid, localized detection allows operators to isolate leaks, quickly institute remedial measures, and avoid further emissions. Requiring operators that already use such technology to conduct an additional annual inspection for compliance purposes or for reconciliation of remotely detected leaks with OGI or US EPA Method 21 would be duplicative. By allowing the annual inspection compliance and remote leak reconciliation to be satisfied through continuous monitoring technology, CARB achieves two objectives: (1) alleviating operator compliance burdens and (2) promoting superior gas conservation in alignment with CARB's mission. EPA has already acknowledged this in its current proposed Supplemental Proposed Methane Rule by also recognizing that an operator using a continuous monitoring approach can use that method in lieu of OGI (and other) requirements.[4]

For the same reasons, operators should be able to use continuous monitoring technology to determine if a leak repair is effective. Continuous monitoring allows operators to quickly verify if leaks are correctly repaired. For example, Project Canary's continuous monitoring software includes rapid leak verification by confirming that levels have fallen back below a given threshold for a set period of time. This eliminates the need for operators to expend more labor in determining if a repair is effective. Thus, such technology should be recognized as an adequate system to assess leak repairs.

Continuous monitoring is significantly more effective than periodic inspections at facilitating leak detection and repair.[5] Incentivizing the use of continuous monitoring technology through these

intermittent super-emitting leaks. Innovative LDAR technologies, from aerial flyover and satellite sensors to drones and ground-based continuous monitoring sensors, hold tremendous promise for increasing the frequency of methane detection surveys and quantifying methane leaks.")

[4] Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review; [EPA–HQ–OAR–2021–0317; FRL–8510–04– OAR], section 60.5398b(d) an owner or operator that meets the requirements for using a valid alternative test method may use that method "in lieu of the requirements for fugitive emissions components at affected facilities."

[5] Operations - Chen_et_al_2022_Assessing detection efficiencies for CEMS.pdf - All Documents (sharepoint.com)

recommendations furthers conservation of gas resources to a far greater extent than periodic survey and repair inspections, further illustrating its cost-effectiveness.

As CARB attempts to reconcile remotely detected leaks using satellites and fly-over devices, with bottom-up leak detection at the site level, the use of site-level measurement and continuous monitoring represent the best, and most ideal, solution. The current Draft Regulations identify OGI or US EPA Method 21 as the tools an operator can use to inspect a facility for leaking or venting components and equipment. As explained above, the use of, continuous monitoring can be an alternative to OGI, and we recommend that operators have the option to use additional technologies to confirm the location of an emission source, or alternatively, verify that the leak was not part of the operator's facility.

Specifically, Project Canary suggests the following revisions:

Proposed § 95669.1 Inspection and Repair of Remotely Detected Leaks

(a) Beginning January 1, 2024, if CARB notifies an owner or operator of a methane or hydrocarbon emission identified at their facility using a satellite or other remote monitoring technology (e.g., a plane), the owner or operator shall inspect the facility for leaking or venting components and equipment within 3 calendar days of the notification using optical gas imaging instruments, ~~or~~ US EPA Reference Method 21 (October 1, 2017) as specified in section 95669(b), or advanced methane monitoring technology (as proposed as an alternative test method in EPA OOOOb and c).

(1) If no emission source is identified, the owner or operator shall perform one additional inspection of the facility for leaking or venting components and equipment using optical gas imaging instruments, ~~or~~ US EPA Reference Method 21 (October 1, 2017) as specified in section 95669(b), or advanced methane monitoring technology (as proposed as an alternative test method in EPA OOOOb and c).

on a subsequent day within 3 calendar days of the initial inspection.

(3) If the emission source is identified as an unintentional emission source, the owner or operator shall measure the leak concentration using US EPA Reference Method 21 (October 1, 2017) as specified in section 95669(b), or quantification using advanced methane monitoring technology (as proposed as an alternative test method in EPA OOOOb and c). through within 2 calendar days of conducting the inspection or within 14 calendar days of conducting the inspection if the component is inaccessible or unsafe to monitor.

Proposed Rule Table A8 as follows:

*Instrument used should be optical gas imaging (OGI), Method 21, or advanced methane monitoring technology (as proposed as an alternative test method in EPA OOOOb and c) and include make and model.

The Draft Regulations seek to modify the previously referenced Air Resources Board (ARB) to the California Air Resources Board (CARB). As such we recommend the following revision:

§ 9566.8(b)(A)(1) Individual owners or operators may conduct a technology assessment and emissions testing within one or more production fields and submit the results to CARB, which will be combined with technical assessments performed by other owners or operators, until at least three reports are submitted from three different production fields.

Continuous Monitoring and the Case for Alternative LDAR

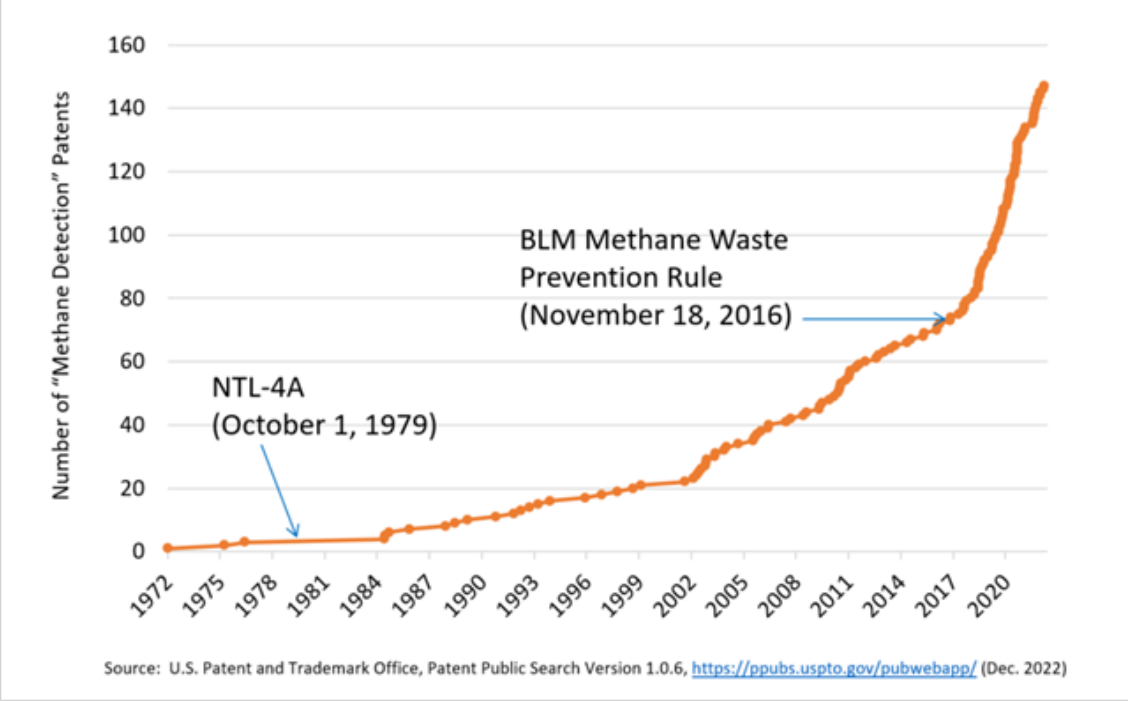
Advancements in technology have substantially expanded the capabilities and availability of site-level measurement and continuous monitoring services. The chart below illustrates that the number of "methane detection" patents has doubled since the proposed 2016 Waste Prevention Rule ("the 2016 Rule") and has increased fifty-fold since the publication of NTL-4A in 1979. Indeed, last year, the U.S. House Committee on Science, Space, and Technology acknowledged that "[r]ecent technological advances" have allowed scientists "to use newly sophisticated methane detection and quantification technologies to actually measure methane emissions from oil and gas operations."[6] Operators in the oil and gas industry are voluntarily taking actions to reduce methane emissions from oil and gas development, including by using continuous monitoring technologies to detect methane emissions.[7] Project Canary alone has installed over one thousand five hundred continuous monitoring units (with hundreds more under contract) across the United States, Canada, and the United Kingdom at over five dozen major oil and gas and midstream companies.

Moreover, the gas sensing technology in systems like Project Canary's has rapidly developed to provide increased detection accuracy and opportunities for miniaturization and portability of devices that can be implemented at the site level.[8] Oil and gas operators today have access to widely available, highly accurate, and cost-effective site-level measurement and continuous monitoring options to identify and mitigate leaks.

[6] House of Representatives Committee on Science, Space, & Technology, *Seeing CH4 Clearly: Science Based Approaches to Methane Monitoring in the Oil and Gas Sector*, at 13-14 (June 2022).

[7] U.S. Government Accountability Office, *Oil and Gas: Federal Actions Needed to Address Methane Emissions from Oil and Gas Development*, at 15–16 (Apr. 2022), https://www.gao.gov/assets/gao-22-104759.pdf.

[8] University field testing of Project Canary's onsite continuous monitoring units demonstrated that the devices detect methane leaks with nearly perfect accuracy and can measure the volume of those leaks with minimal quantification error (6%). *See* METEC Testing Results August 2021; Project Canary, A Quantitative Overview to Continuous Monitoring of Methane Emissions (2021); Shan Lin et al., *Improvement of the Detection Sensitivity for Tunable Diode Laser Absorption Spectroscopy: A Review*, Frontiers in Physics (Mar. 1, 2022), https://www.frontiersin.org/articles/10.3389/fphy.2022.853966/full.



The broad adoption evident in the energy sector is driven in part by cost-effectiveness. For example, the cost of deployment of Project Canary's systems at well sites represents a fraction of one percent of the price operators realize from the commodities produced.[9] Operators with this technology earn increased revenue from recapturing potentially lost gas. Indeed, given recent commodity prices, quickly stemming the loss of gas from leaks is even more economically desirable for operators than in the past.[10] The use of continuous monitoring also can enable operators to produce "certified" or "responsibly sourced" gas, which can earn a premium over commoditized gas prices.[11] Investment in site-level measurement and continuous monitoring technology can generate cost savings not only by reducing leaks but also by streamlining compliance with existing and proposed reporting laws and regulations.

[9] Based on Project Canary business experience, monitoring can be less than $0.01 for high volume dry gas basins and $0.06-0.08 per barrel of oil equivalent for more liquids-rich basins on a per mcf basis.

[10] "Pathways for reducing methane emissions from the oil and gas sector are well known and understood. A large proportion of the abatement options come at a low cost ... In many cases, the cost of mitigating methane from oil and gas operations is lower than the recent market value of the captured gas [even] based on average prices from 2017-2021 rather than the elevated price levels seen in late 2021 and early in 2022." IEA Methane Tracker Data Explorer (February 23, 2022).

[11] Based on Project Canary business experience, premiums paid in the market for "certified" or "responsibly sourced gas", which usually requires continuous monitoring, typically range in the $0.01 – 0.05 per mcf.

In short, there are many technology options available to operators that offer high-fidelity, site-level measurement and continuous monitoring. This sets a higher standard for operators that can quickly identify, mitigate, and reconcile emissions utilizing a bottom-up approach. As CARB moves forward with versions of the Draft Regulation it should open a dialogue and quickly develop its own process for approval of alternative LDAR technologies, such as advanced methane detection and monitoring technologies. Other states have created their own programs, including Colorado's AIMM and Alt-AMM programs and New Mexico's ALARM program. The option for alternative LDAR enables an operator to use one source of technology to maintain compliance and exceed in best-in-class operations at both the state and federal level. The adoption of an alternative LDAR program benefits the state of California and its residents and sets a clear standard that CARB expects operators to perform at their best with minimal emissions. The adoption of an alternative LDAR program should be done in an expedited time frame.

Conclusion

CARB can re-examine the current regulations and take advantage of technological advances that are rapidly occurring in this sector to set a higher standard when it comes to the operation and monitoring of oil and gas facilities in the state of California. The agency is poised to take advantage of site-level measurement and continuous monitoring technology to ensure the maximum volume of short-lived pollutants are identified and quickly mitigated. Operators can also greatly benefit from using this technology as it recaptures potentially lost revenue and streamlines compliance among multiple regulatory frameworks. We encourage CARB to consider the proposed language that recognizes advancing, available technology and allow those tools for annual and quarterly inspection obligations, as appropriate, as well as for reconciliation of remotely detected leaks. Going further in this process, we encourage CARB to quickly develop its own alternative LDAR program by which technologies can be authorized in an efficient manner, taking full advantage of new and developing technologies which benefit both energy producers and our climate.

Project Canary appreciates the opportunity to provide these comments and looks forward to further participation in this process. Should you have questions about any of the material or concepts included herein, please feel free to contact me directly (michelle.applegate@projectcanary.com).

Sincerely,

Michelle Moorman Applegate
Project Canary
Sr. Director of Public Policy