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Via online submission: www.regulations.gov

The Honorable Michael S. Regan
Administrator
U.S. Environmental Protection Agency
Mail Code 28221T
1200 Pennsylvania Avenue NW
Washington, D.C. 20460

Re: Docket ID Number: EPA-HQ-OAR-2023-0234

Chevron Corporation ("Chevron" or "we") is one of the world's leading integrated energy companies. We believe affordable, reliable, and ever-cleaner energy is essential to enabling human progress. In the United States, Chevron produces crude oil and natural gas in multiple states and the Gulf of Mexico; manufactures transportation fuels, lubricants, petrochemicals, and additives; and develops technologies that enhance our business and the industry. We aim to grow our traditional oil and gas business, lower the carbon intensity of our operations, and grow new lower carbon businesses in renewable fuels, hydrogen, carbon capture, offsets, and other emerging technologies. Our strategy is clear – leverage our strengths to safely deliver lower carbon energy to a growing world. Effective methane management is important for lower carbon intensity in oil and gas production and in other key sectors.

Through the Greenhouse Gas Reporting Program (GHGRP), the U.S. Environmental Protection Agency (EPA) has been a global leader in mandatory reporting and transparency for greenhouse gas (GHG) emissions across sectors. Chevron has reported to the GHGRP including under Subpart W for Petroleum and Natural Gas Systems and appreciates the opportunity to provide public comments on the proposed Subpart W changes. The GHGRP includes important elements regarding:

- *Comparability* – Emissions reporting under the GHGRP requires the use of specific emission calculation methods and factors that are the same for all reporters in the segment.
- *Transparency* – Nearly all reported GHG emissions are publicly accessible through EPA's websites.
- *Relevance* – Most segments under the GHGRP include source level information for specific assets. This allows for the direct comparison of emission intensity performance across similar types of assets and provides granular emission information for interested stakeholders at the asset or facility level.

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Requirements to report methane emission data under Subpart W over the last decade have helped Chevron focus on specific methane emission sources within our operations, inform our efforts to reduce methane emission intensity through facility design changes and implementation of best practices, and benchmark performance directly against peers through publicly available data. We continue to design, construct, and operate facilities with strategies to help prevent methane emissions. We agree with EPA that there are opportunities to improve the quality of data provided under the GHGRP. For the proposed revisions to Subpart W, we appreciate EPA's efforts to update methane emission factors using the latest field measurement studies, including work on equipment leaks and pneumatic controllers that was co-authored by our expert. If there are questions on studies in which Chevron has participated, we would be pleased to meet with EPA during the rulemaking process.

In our view and based on our experience, methane reporting under the GHGRP should move toward the use of empirical data for measurement-informed reporting, including the use of available advanced quantitative technologies. This shift would require the use of both advanced technologies for direct measurement of methane that work at-scale across dispersed assets in the U.S. oil and gas sector and data processing and reporting protocols for consistent incorporation of data from advanced technologies into emission inventories. At Chevron, we have trialed fourteen advanced methane detection devices across aircraft, drone, satellite, and continuous monitoring platforms to understand how these devices work across different assets and geographic locations. We have also supported a multi-stakeholder initiative with Veritas, a GTI Energy Methane Emissions Measurement and Verification Initiative[1], that aims to develop the technical protocols for measurement, reconciliation, and verification that would enable consistent, measurement-informed emission reporting. We believe that the GHGRP will need the flexibility to include multiple options for the collection of empirical data, including updated emission factors based on new information from studies (e.g., gas-driven pneumatic controllers), operator-specific source information, and data collected using advanced technologies such as flyovers (where they can be deployed) to increase the quality, accuracy, and transparency of data collected as part of the program.

Use of Advanced Technology for Emission Quantification

We are concerned that the current proposal disincentivizes the use of advanced technologies that are becoming more prevalent and are being used by industry through voluntary programs to effectively detect and mitigate emissions from sources such as flares, tanks, and compressors. In recent years, advanced methane detection technologies, like flyovers, have improved and become more accessible, which has resulted in more effective detection, localization, and quantification of emissions. In 2022, Chevron conducted methane detection flyovers for approximately 950 facilities in the U.S. Through collaborations like The Environmental Partnership[2], many operators of different sizes and site types have found that, when properly applied, aerial technologies are an effective tool to monitor emissions from operations.

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[1] https://veritas.gti.energy/
[2] https://theenvironmentalpartnership.org/

EPA also included a framework for the use of advanced technologies in its proposed OOOOb/c rule[3]. As part of our analysis of the advanced technology provisions of the proposed OOOOb/c rule, Chevron's comment letter[4] provided the results of a modeling study where we recommended that EPA revise its equivalency table for compressor stations and central tank batteries, to include a single category for all low detection limit technologies (≤4 kg/hr) with a minimum screening frequency of quarterly (4x/year) for advanced technologies, combined with an annual (1x/year) OGI survey. We believe the use of advanced technologies can bridge EPA's proposed OOOOb/c rule monitoring requirements with GHGRP's measurement-informed methane reporting needs for the Methane Emissions Reduction Program (MERP), provided that EPA aligns the requirements allowing the use of advanced methane detection technologies across related rules. A combined approach that uses multiple types of empirical data, advanced detection technologies, emission factors from field studies for smaller sources (e.g., pneumatics), engineering estimates for sources like blowdowns, and the use of site-specific parametric data (discussed in more detail below) will result in a more robust and comprehensive inventory of methane emissions while advancing detection and monitoring capabilities further to facilitate emission mitigation efforts.

We anticipate that several types of technologies can be used to collect data for measurement-informed emission inventories. Our direct experience with onshore aircraft-based survey technologies has pointed to multiple benefits that would support EPA's methane reporting and reduction goals:

- *Mapping to source types* – Certain aerial surveys have sufficient resolution to map detected plumes to individual pieces of equipment on a site. We believe this type of granular information would be helpful in updating emissions by source category in the GHGRP.
- *Existing voluntary use by operators* – Many leading operators, including Chevron, have increasingly incorporated aerial surveys into their voluntary methane reduction programs.
- *Detection limits* – For the onshore production sector, an aerial service provider (Bridger Photonics) advertises a detection limit of 3 kg/hr with a 90% probability of detection. When combined with emission-factor based estimates for smaller individual emission sources (e.g., pneumatics), we believe that this approach would cover most emissions from oil and gas production operations, based on Bridger Photonics' claims.
- *Compatibility with annual reporting cycles* – With appropriate timing for aerial survey vendors to scale-up their services, we believe that the survey speed and timelines for information receipt for operators would be compatible with annual GHGRP reporting cycles at reasonable cost to reporting entities.

Subpart W updates should incorporate advanced technologies such as aerial and drone monitoring that can detect and measure methane emissions most efficiently, within a framework based on realistic current capabilities of measurement technologies. We are happy to meet with EPA during the rulemaking process for further discussion of this important topic.

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[3] https://www.epa.gov/system/files/documents/2022-11/8510_OilandGasClimate_OOOObRegText_Supplemental_20221005.pdf
[4] https://www.chevron.com/-/media/shared-media/documents/chevron-2023-EPA.pdf

We would like to highlight a few areas where EPA could improve the proposed rule to allow for the more accurate and inclusive reporting of emissions:

Other Large Release Events

We support the intent of the new reporting category of 'Other Large Release Events', which is defined in the proposed rule as at least 250 metric ton CO_2e per event or 100 kg/hr CH_4 emissions, and the ability to use engineering estimates, previous monitoring data, and facility process or parametric data associated with such large release events.

Other Large Release Events - Event Duration Estimation

EPA is seeking feedback on the proposed estimation of duration for Other Large Release Events. Different types of information, such as previous monitoring data, can be used to bound the estimated duration of the event. An innovative approach to estimating the duration of such emissions involves the integration of details from operational data and parametric monitoring information collected at the facility. These sources of data can provide invaluable insights into methane emission duration by offering a more continuous and comprehensive data source. Higgins et al. 2023[5] presents an advanced approach to estimating the duration of an emission event detected from aircraft-based sensors that relies on parametric data, through systems like Supervisory Control and Data Acquisition (SCADA), and other types of operational records. The study provides a framework for the use of parametric data for event duration estimation and offers examples of parametric or other operational information that may be available at some oil and gas operations to showcase the potential for utilizing such information. Additionally, a discussion of the estimated duration of emissions where monitoring and parametric data are not available is included in the paper. Specifically, the development of empirical estimates based on the average duration per type of emission source is proposed and discussed. Consequently, we encourage EPA to include the use of parametric data and other operational records in the list of tools used to estimate the duration of emissions from Other Large Release Events.

Other Large Release Events - Third-party Monitoring

For the inclusion of third-party monitoring data as part of the "Other Large Release Events", when credible information of emissions of that magnitude from our assets is available, Chevron would like to be notified as soon as possible. We have gained experience with notification programs through voluntary technology trials with multiple operators, such as a project with the Oil and Gas Climate Initiative for satellite-based monitoring in Iraq[6], The Environmental Partnership[7], and Project Astra[8], as well as receiving third-party data through the Permian Methane Analysis Project (PermianMAP)[9].

The proposed Super-Emitted Response Program (SERP) in EPA's proposed OOOOb/c, included the use of third-party monitoring results. As with Chevron's comments on the proposed

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[5] https://chemrxiv.org/engage/chemrxiv/article-details/6511c17db927619fe7cd60ee
[6] https://www.ogci.com/wp-content/uploads/2023/01/OGCI_Iraq_Whitepaper_jan23.pdf
[7] https://theenvironmentalpartnership.org/
[8] https://www.projectastra.energy/
[9] https://www.permianmap.org/

OOOOb/c rule, we are sharing some specific elements that we believe should be included in the development of a third-party monitoring reporting framework to increase the effectiveness and accuracy of the detected events:

- *Qualifications of third-party reporter* – The proposed SERP program included language on EPA-approval of third parties who use EPA-approved remote methane detection technologies[10]. Similarly, detection data for Other Large Release Events should be from qualified third parties who are able to include the details of the detection (e.g., uncertainty with emission rate and localization) as part of their report.
- *Time from detection to reporting* – The utility of the screening data for an operator decreases as more time passes after the detection. In our experience with past third-party monitoring, data received a month or more after the detection occurred is harder for operators to understand and assess. Timely receipt of detection data from third parties is also important in the availability of the operational data that can be used to estimate the duration of the emission.
- *Emission source attribution* – Technologies that can localize emissions to specific pieces of equipment will be more useful for direct follow-up activities than approaches that provide only site-level or regional information. Detection data that cover multiple operators and/or multiple sites cannot be attributed easily or accurately, which would present challenges with reporting. While remote sensing technologies provide information on methane emissions, identification of the operator and emission source often requires additional sources of data and information. In our experience with multi-operator campaigns, the operator of a detected emission event can be initially misidentified due to asset transfer, plume drift from a nearby site, or other factors. Additionally, unlike well locations, national, widely available databases of other components, such as tank batteries or compressor stations, do not exist. This could lead to a situation where operators are routinely in a position to prove a negative.
- *Uncertainty associated with emission detection sensors* – There is some uncertainty associated with the quantification of emissions from all remote sensing data that will depend on the type of equipment used and the environmental conditions at the time. The magnitude of the uncertainty value varies widely across technologies, so notifications should include the uncertainty associated with the measurement and quantification.

Flare – Combustion Efficiency Reporting

The proposed rule specifies a tiered combustion efficiency (CE) value for flares which includes extensive monitoring requirements for Tier 1 (CE=98%) and Tier 2 (CE=95%). The default CE for flares is proposed at 92%. While EPA's stated intention is to ensure more accurate reporting of flare CEs, the proposed tiers and monitoring methodology are not the most effective means of correctly monitoring and reporting flare combustion efficiencies. Other, more direct, monitoring technologies such as flyover surveys or multi-spectral cameras can be used for periodic flare combustion efficiency monitoring. Advanced technologies such as aerial surveys can provide a more comprehensive overview of flare emissions, especially for unlit flares or

[10] https://www.epa.gov/system/files/documents/2022-11/Oll%20and%20Gas%20Supplemental.%20Overview%20Fact%20Sheet.pdf

those with lower combustion efficiencies, particularly when combined with parametric and operational data from each site. Additionally, EPA should carefully consider the unintended consequences of the proposed changes to reported flare CEs on other state and federal permitting or reporting requirements.

EPA has used a single study, Plant et al. (2022)[11], to develop the proposed tiers of flare CE reporting under Subpart W. Plant et al. used aerial flights to intercept airmasses downwind of flares to estimate flare CEs which is not a direct measurement of CEs. The CE of 92% is not supported by the data presented by the Plant et al. study. The study estimates flare CEs indirectly based on measurements of concentrations through downwind aerial transects and assumptions they made where direct measurements were unavailable. We have concerns about the use of this single study for the development of the tiered approach by EPA:

- *Methodology* – The method used by the Plant et al. was adapted from two previous flare plume measurement studies (Caulton et al., 2014[12] and Gvakharia et al., 2017[13]), but the new method of flare CE estimation is different from the previous studies (e.g., aircraft flight patterns and the methodology for the identification of the plumes). Plant et al.'s paper and the supplemental information do not discuss any validation for the method used nor provide any information on the QA/QC of the measurements and data processing. In addition, there is increased uncertainty associated with the reported CE values as part of the adapted use of aerial flux estimation methodology using a point sensor on the aircraft combined with modeling based on assumptions made by Plant et al., instead of the use of more direct multi-spectral cameras or flyovers using laser-based solutions.
- *Flare selection* – Including unlit and flaming flares in the same dataset to estimate average CEs is not a correct representation of flare CEs. This approach adds further uncertainty to the interpretation of the results as the statistical spread of the collected data may result in a significant difference between the use of mean and median values derived from the measurements.

In addition, other studies (e.g., Caulton et al. 2014) have presented data that support 98% CE for most flares. Caulton et al. note that methane emissions from unlit flares may be a bigger contributor to overall observed flare emissions than flares with lower CEs. Unlit flares can be detected through surveys using advanced detection technology or the use of continuous flare pilot monitoring sensors.

Aerial surveys using the appropriate monitoring technology can be an effective tool in observing emissions from flares. When combined with the use of parametric data, this can be a more effective approach to monitoring flares than the current proposed tiered approach. For instance, gas volumetric rates to flares may be well understood through design parameters or measurements, and sufficiently large such that appropriate monitoring technologies will be able

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[11] Plant, Genevieve, et al. "Inefficient and unlit natural gas flares both emit large quantities of methane." Science 377.6614 (2022): 1566-1571.
[12] Caulton, Dana R., et al. "Methane destruction efficiency of natural gas flares associated with shale formation wells." Environmental science & technology 48.16 (2014): 9548-9554.
[13] Gvakharia, Alexander, et al. "Methane, black carbon, and ethane emissions from natural gas flares in the Bakken Shale, North Dakota." Environmental Science & Technology 51.9 (2017): 5317-5325.

to detect methane emissions from flares with CEs either above or below 98%. Because of this, advanced technologies would be effective in identifying less efficient flares, especially within the set of flares operating at high rates and high frequency.

Conclusion

Chevron believes methane management is critical to a lower carbon future and that methane reductions are possible in the energy industry and other key sectors.

Thank you for the opportunity to submit these comments. If you have any questions, please contact Jay Thompson at (202) 812-2440, or thompsonjr@chevron.com.

Sincerely,

Karen Knutson