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To Ms. Scheehle,

Pacific Gas and Electric Company (PG&E) appreciates the opportunity to provide feedback on the proposed modifications to the Air Resources Board's (ARB) Proposed Regulation for Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities (Proposed Regulation), as released on February 3, 2017.

PG&E is committed to helping California achieve its ambitious climate goals while maintaining its vibrant economy, and supports ARB's efforts to establish regulatory and market mechanisms to achieve greenhouse gas (GHG) emissions reductions. PG&E appreciates many of modifications to the Proposed Regulation put forth by ARB to address the concerns expressed by various stakeholders but several key issues still remain.

These comments supplement and incorporate by reference previous comments submitted to ARB on July 21, 2016, and February 26, 2016. PG&E's key recommendations are as follows:

- Enforcement of leak thresholds should be delayed until 2022 to allow time for development of a more accurate methodology than Method 21 to determine emissions violations.
- ARB should approve ambient air monitoring equipment specifications in the air monitoring plans and remove the 250 ppb accuracy requirement from the regulation.
- ARB should include provisions to allow a delay of repair for equipment-related issues for natural gas storage facility sensors.
- The notification requirements for natural gas storage facilities should allow verification of the severity of a leak based on a flow-rate threshold prior to notification, exclude wellhead component leaks from notification, and exclude alarms set off during planned operational work.

- ARB should also include a delay of repair provision to enable operators to reduce emissions by bundling work.
- ARB should continue working closely with the CPUC to coordinate clear roles and responsibilities for implementation across the Proposed Regulation and the Leak Abatement rulemaking.
- Additional suggestions for clarifications to the regulation.

I. General Comments on Draft Changes

1. Enforcement

a. Enforcement Criteria Should Not be Based on Concentration Measurements

The Proposed Regulation includes criteria specifying the number or percentage of allowable leaks based on concentration thresholds.[1] Starting in 2020, any leak detected with a concentration measurement of 50,000 parts per million volume (ppmv) or greater constitutes a violation of the regulation. PG&E appreciates the proposed changes which modify this provision so that only leaks exceeding the thresholds discovered during an ARB Executive Officer inspection or during the 4th quarter of the year would be violations. However PG&E remains very concerned with allowable leak thresholds set on a concentration basis, and believes that applying this threshold may trigger numerous violations for small-emission leaks in the 4th quarter of each year, as outlined in more detail below.

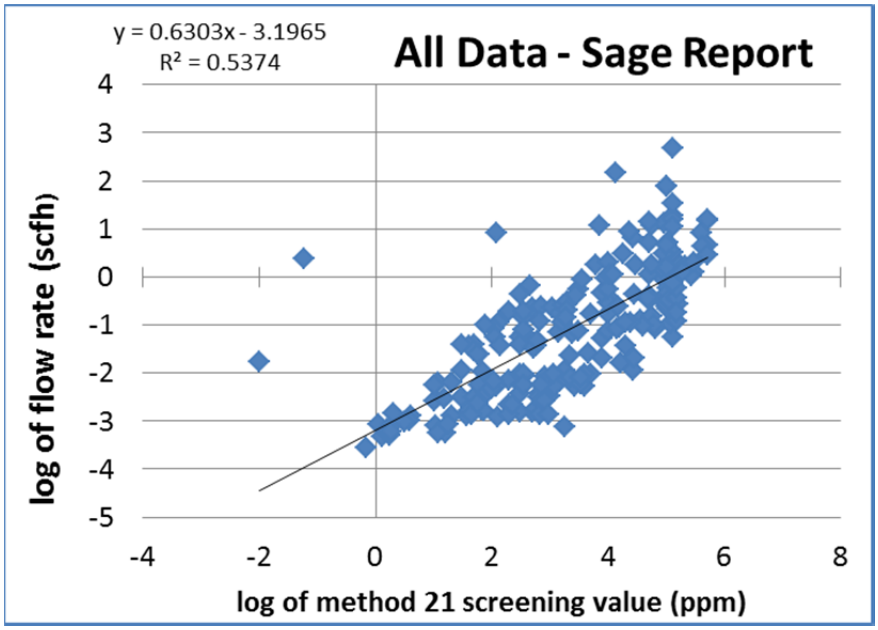
As PG&E has pointed out in prior comments, high concentration measurement does not always correlate to a high-emission leak and there is a strong likelihood that low-emission but high-concentration leaks could trigger violations.[2] The Proposed Regulation requires operators to use Method 21 to measure concentrations of methane. However, the Method 21 concentration measurement is not a good predictor of the actual amount of methane being released to the atmosphere. Due to the limited flow rate of Method 21 instruments, the portion of methane from the leak that is sampled varies greatly depending on leak dispersion. Leak dispersion is influenced by many factors, such as: component type, pressure, wind speed, position and orientation of the instrument nozzle, etc. As a result, for the same value of measured concentration, the actual flow rate of the leak can vary greatly.

The report recently released by ARB from Sage Environmental Consulting supports this point and demonstrates that the correlation between concentration and flow-rate measurements is not strong: the correlation coefficient varies widely across the different categories of natural gas equipment that were tested, as can be seen in Figure 1 below.[3] The spread of data around the line of best fit means that at a concentration of 50,000 ppm the measured flow rate can vary from

[1] § 95669 (i)
[2] Pacific Gas and Electric Company, "Re: Comments on the Proposed Regulation for Greenhouse Gas Emissions Standards for Crude Oil and Natural Gas Facilities," July 21, 2016.
[3] "Enhanced Inspection & Maintenance for GHG and VOCs at Upstream Facilities," SAGE Environmental Consulting, December 2016, p. 2-12

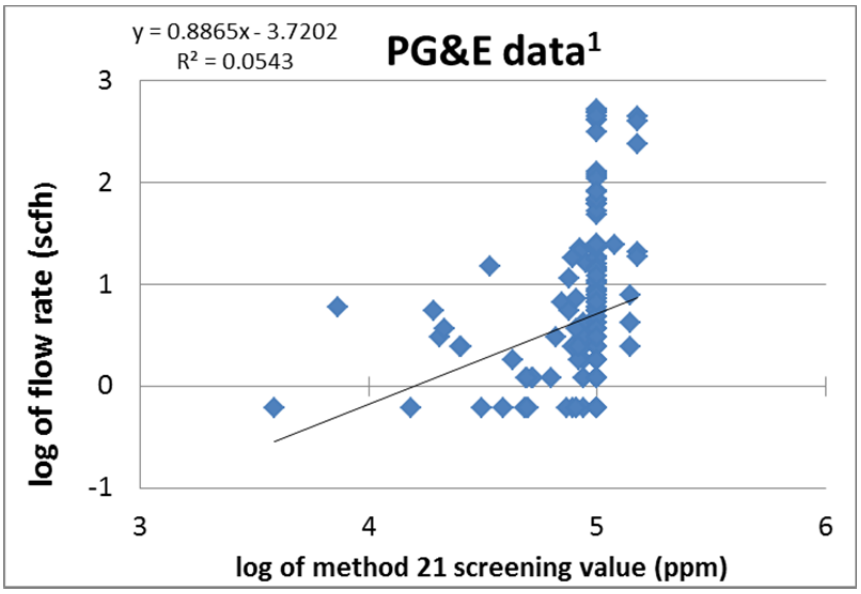
0.01 standard cubic feet per hour (scfh) to more than 100 scfh (i.e. a range of 10,000). In addition, the comparison of concentration to flow-rate measurements in the Sage report is done on a $\log_{10}$- $\log_{10}$ scale which gives the impression that errors in the estimated flow rate are diminished, even though the error could be larger than the actual value of the flow rate. This further weakens the confidence in the correlation relationship.

Figure 1



PG&E's results from recent leak surveys conducted in 2016 at its compressor stations and underground storage facilities with both concentration and flow-rate measurements similarly demonstrate a weak correlation relationship. As can be seen in Figure 2 below, there is a wide vertical spread of flow-rate measurements for a given concentration.

Figure 2

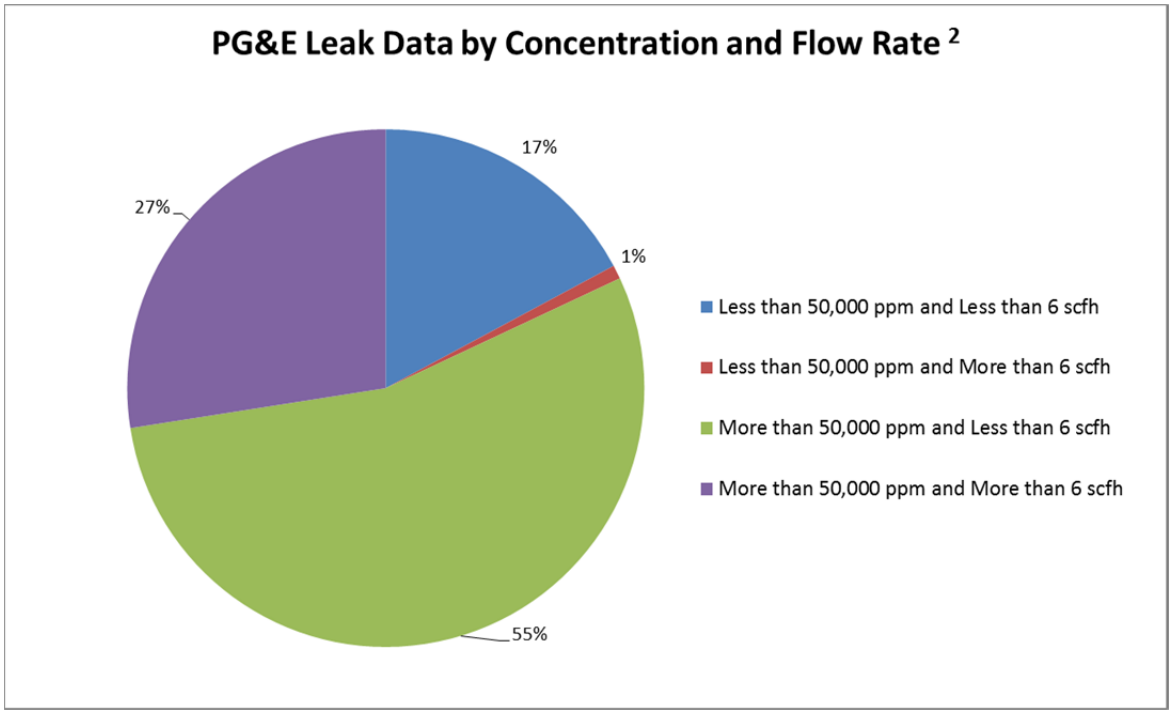


[1] Leak measurements with no detectable flow were excluded.

The relationship between concentration and flow is important because it is the basis on which the Proposed Regulation determines the severity of a leak for notification, repair and enforcement action. In Figure 3, PG&E's leak survey data is displayed to show the percentage of leaks above and below 50,000 ppm concentration with a flow rate above and below 6 cubic feet per hour (the threshold used by ARB in the Proposed Regulation to determine if a pneumatic device is considered "high-bleed" or a large emitter).[4] Fifty-five percent of the leaks found were measured at a concentration above 50,000 ppm but with a flow rate less than 6 scfh, and a small number of leaks were found that measured below 50,000 ppm with greater than 6 scfh flow rate. Using Method 21 concentration measurements alone would incorrectly prioritize those leaks as being high-emission leaks when they are not, or vice versa, incorrectly identify them as being low-emission leaks when they are high.

[4] For reference, 6 scfh leak flow rate equates to 21.19 metric tons of carbon dioxide equivalent per year (MT CO2e/year)

Figure 3



[2] This data includes leaks too small to be measured with Hi-flow sampler instrument.

As demonstrated above, Method 21 is not a good predictor of actual methane emissions. Therefore PG&E proposes ARB work with it and other stakeholders to better quantify emissions, and use data from more than just Method 21 concentration measurements at each of the regulated facilities to inform a meaningful threshold on the allowable number of leaks. PG&E recommends waiting until 2022 to implement a leak threshold subject to enforcement based on this data. This will allow operators two years once the regulation is implemented to gather sufficient data on the number of leaks and trends on their systems for various types of equipment and components that ARB and stakeholders can then use to set realistic benchmarks against which to require future improvement. The rulemaking process to modify this regulation to set new leak threshold criteria could take up to an additional year, which is the basis for the three-year delay in enforcement of leak thresholds that PG&E recommends above.

b. Inaccurate Information

As currently proposed, Section 95674(f) would trigger a violation for submission of inaccurate information required by the regulation. This does not take into consideration "intent" – an operator may unknowingly provide inaccurate information due to instrumentation error for example, or a measurement of a leak may have different results on one date versus another. This provision should be modified to clarify that an operator must "knowingly" submit inaccurate information for there to be a violation, or the provision should be removed since Section 95674(g) already covers falsification of information.

2. Natural Gas Underground Storage Facility Monitoring

PG&E appreciates the revisions ARB has made to the Proposed Regulation to incorporate greater flexibility for operators to specify how they will meet the requirements of the regulation through their air monitoring plans. The same flexibility should be applied to equipment specifications. The proposed modifications increase the accuracy requirements for ambient air monitors from 100 parts per billion (ppb) to 250 ppb. However, the ambient concentrations of methane and the variations in those concentrations that PG&E has measured at its facilities are in parts per million (ppm). Requiring accuracy levels three orders of magnitude greater than the current range of background concentrations is unnecessary and could cause continuous indications or "false positives" that would take time and resources to continually clear, as well as requiring unnecessary notifications. It would not improve detection of changes in ambient air methane levels that would require an emergency or urgent response to potentially hazardous leaks. In addition, equipment at the ppb range of sensitivity is not widely available and it is unclear if such instruments would work at storage fields in this context. Therefore, PG&E recommends removing the 250 ppb accuracy requirement for monitoring sensors and allowing ARB to approve equipment proposals within the monitoring plans.

In addition, PG&E recommends explicitly including delay of repair provisions for equipment orders for the ambient air monitoring equipment. A provision similar to the one added to section § 95669(h)(4)(A) would be appropriate. Many of the vendors for ambient air monitoring equipment are located out of state and could take longer to ship replacement pieces than the required repair timelines. It should also be noted that this technology has only recently been made commercially available, and therefore provisions that allow for additional time for troubleshooting potential errors with new technology should also be included, if an operator or owner provides documentation showing the ongoing issue is pending resolution with the equipment vendor.

3. Notification and Reporting Requirements

As currently written, the Proposed Regulation requires operators to notify ARB, the Division of Oil, Gas and Geothermal Resources (DOGGR), and the local air district any time a leak is identified at an underground storage facility that exceeds the concentration-based leak thresholds. PG&E's concerns about the use of concentration-based measurement are highlighted above in Section 1. This provision will likely lead to excessive notifications for small leaks with high concentrations, which is counter to PG&E's interpretation of the intended purpose of this provision, i.e. notifications for large, potentially hazardous leaks. Using this concentration data to notify regulators and agencies may incorrectly burden these agencies, and inappropriately prioritize repairs on low-emission leaks. PG&E recommends allowing an operator to verify the severity of a leak with a flow-measurement threshold before requiring notification. Additionally, leaks that are confirmed as only wellhead-component leaks should be excluded from the

notification requirements as they would not fall under the classification of large, potentially hazardous leaks, which is the intended target of the regulation.

PG&E also recommends including language that exempts operators from the notification requirements if an alarm from the ambient air sensors or automated wellhead assembly sensors goes off during a planned operational activity at an underground storage facility. Many of PG&E's storage wells are located within 25 feet of each other and various well remediation operations result in some releases of emissions which would then require notification.

4. Delay of Repair Provisions

PG&E believes that effective regulations provide sufficient flexibility for operators to continue operations while following the intent of the regulation, and thus appreciates the addition of provisions allowing for the delay of leak repair under certain conditions. These provisions will be critical in facilitating the continued operation of systems while still meeting the intent of the Proposed Regulation.

In addition to allowing a delay of repair for equipment orders and systems critical for reliability, ARB should also allow delay of repair to reduce emissions by bundling work. Without such a provision, there will be situations in which the amount of gas that will have to be released (blown down) to repair a leak will be greater than the emissions from the leak itself. Allowing these leaks to be bundled with other work reduces the overall vented emissions. This would also be consistent with proposed best practices from the California Public Utilities Commission (CPUC) in its Leak Abatement Order Instituting Rulemaking (R.15-01-008) to bundle work whenever possible to prevent multiple ventings of the same piping.[5]

5. Coordination with the CPUC's Leak Abatement Rulemaking

PG&E appreciates the ARB's participation and continued focus on emission reduction efforts, as well as ensuring consistency between its regulations and the CPUC's Leak Abatement OIR Proceeding (R.15-01-008), as directed by Senate Bill 1371. The Proposed Regulation and the Leak Abatement OIR regulations currently both cover natural gas underground storage and gas transmission compressor stations. Clarification is still needed on which agency owns implementation and reporting when there is overlap. PG&E recommends that ARB take this need for coordination into account as it works to finalize the Proposed Regulation in order to ensure that the jurisdictional boundaries of the ARB and CPUC regulations are clear.

[5] See Administrative Law Judge's Ruling Entering California Air Resources Board and California Public Utilities Commission Joint Staff Annual Report on Analysis of June 17, 2016 Utilities' Reports and Commission Staff Proposal on Best Practices Into the Record and Seeking Comments, issued in R.15-01-008 on January 19, 2017, at Attachment 2, Best Practice (BP) 7 ("Bundling Work Policy. Written company policy requiring bundling of work, whenever practicable, to prevent multiple venting of the same piping consistent with safe operations and considering alternative potential sources of supply to reliably serve customers. Company policy shall define situations where work bundling is not practicable. Exact wording TBD by the company and approved by the CPUC, in consultation with CARB, as part of the Compliance Plan filing. A company may request an exemption with appropriate justification.")

6. Additional Feedback

PG&E has also suggested areas for additional clarification as follows:

- Section 95668 (a)(2)(H) Separator and Tank Systems: include "pipeline liquids" as there may be non-petroleum based products that could be subject to the exemption.
    - Suggested language: "Tanks that recover an average of less than 10 gallons per day of any petroleum or pipeline liquid waste product from equipment provided that the owner or operator maintains, and can make available at the request of the ARB Executive Officer, a record of the amount of liquid recovered. The average daily production shall be determined by using annual production and dividing by 365 days."
- Sections 95668 (h)(5)(A)(4) and 95668 (h)(5)(B)(2), Natural Gas Underground Storage Facility Monitoring Requirements: Clarify the different requirements for unmanned vs. continuously manned facilities.
    - Suggested language: "The monitoring system for unmanned facilities must have an integrated alarm system that is audible and visible continuously in the control room at the facility and in remote control centers. The monitoring system for continuously manned facilities must have an integrated alarm system that is audible and visible continuously in the control room at that facility."
- Section 95669 (i)(4) Leak Detection and Repair: Add "planned" to the provision.
    - Suggested language: "Critical components or critical process units shall be successfully repaired by the end of the next planned process shutdown or within 12 months from the date of initial leak detection, whichever is sooner."

II. Conclusion

Thank you for the opportunity to provide feedback on ARB's draft changes to the Proposed Regulation. PG&E looks forward to participating in continued discussions with ARB in the rulemaking process.

Sincerely,

/s/

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