

Analysis of the Gas Companies' June 14, 2024, Natural Gas Leak and Emission Reports

CALIFORNIA PUBLIC UTILITIES COMMISSION AND
CALIFORNIA AIR RESOURCES BOARD JOINT STAFF
REPORT

December 24, 2024

SB 1371 (Leno) Natural Gas: Leakage Abatement | *R.15-01-008, D.17-06-015, D.19-08-020*



**California Public
Utilities Commission**

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Executive Summary

This is the tenth annual report (2024 Joint Report) compiled jointly by the California Public Utilities Commission (CPUC or the Commission) and the California Air Resources Board (CARB) in compliance with Senate Bill (SB) 1371 (Leno, 2014) on natural gas emissions, as ordered by the CPUC decision approving the Natural Gas Leak Abatement program (NGLA program) (D.17-06-015).

The 2024 Joint Report compiles and analyzes the 2023 natural gas emissions estimates from sources of fugitive leaks and vented emissions in the natural gas transmission and distribution system in California, as reported by California natural gas utilities and independent storage providers (ISPs) (collectively “gas companies” or “respondents”).¹ This report also presents and discusses natural gas emissions estimates by system category, source classification, and company.²

According to the companies’ self-reported data, this report demonstrates that significant progress has been made toward the NGLA Program’s statewide emission reduction goal of 40 percent by 2030. The combined emission reduction for all reporting gas companies is 34 percent as of the end of 2023.

Respondents filed their 2023 natural gas emissions estimates and related information by June 14, 2024, pursuant to the data request issued by CPUC-Safety Policy Division (SPD) Staff on March 29, 2024. The data request included reporting templates and associated guidelines for gas companies.

SPD and CARB Staff (Staff) used the respondents’ filings, including their responses to Staff follow-up questions and comments on the initial report filings, to prepare the 2024 Joint Report. Staff adjusted the 2022 natural gas emission estimates in this report, initially reported in the 2023 Joint Report, to update data corrected by the respondents.

Gas companies have developed improved methods to estimate emissions for several system categories as compared to those used since the inception of the NGLA program. Before gas companies can incorporate the improved methods into annual reporting, gas companies must receive approval from SPD staff. Gas companies have also been developing adjustments to the 2015 Baseline to account for improved methodologies, emission factor (EF) updates, and other adjustments needed to allow for a direct comparison of the 2015 Baseline with current-year emissions estimates. Gas companies must present proposed adjustments to the 2015 Baseline for SPD review and approval. Developing and approving improved emissions estimation methods and adjustments to the 2015 Baseline is an ongoing process.

¹ For the purposes of this report, “emissions” include both fugitive leaks and vented emissions of natural gas, unless otherwise noted.

² The term “system category” is used to describe the grouping of natural gas emissions based on where the emissions occur in the natural gas transmission and distribution system. The Joint Report groups emissions into seven distinct system categories (see Table 2 for the list of system categories). The term “source classification” refers to the grouping of natural gas emissions by emission type, including the way the emission occurs or the method by which emissions are estimated (see Table 3 for the list of source classifications).

SPD approved adjustments to the following gas companies' Baseline emissions in 2024: SoCalGas' Baseline adjustment on September 23, 2024, Lodi Gas Storage's (LGS) on September 26, 2024, and lastly SDG&E's on October 22, 2024. The three approval letters are included in Appendix A. SoCalGas's adjustments contribute to the large reduction from baseline compared to previously reported results, primarily from the Customer Meters category.

SPD's approval of new emission estimation methods and adjustments to 2015 Baseline emissions allows Staff to more accurately evaluate progress towards overall methane emissions reduction targets for the NGLA program and to estimate the System-wide Leak Rate more accurately, as required by SB 1371. The new emission estimation methods also assist SPD and the gas companies in estimating forecasted emissions reductions of proposed measures more accurately and more effectively, evaluating the absolute and relative cost-effectiveness of proposed measures in future compliance plans.

The reported emissions data indicate that some gas companies may approach or exceed the 2030 reduction target of 40% ahead of schedule. To verify the accuracy of emission measurement practices used in the NGLA program, the CPUC may audit gas company practices, such as through site visits and/or review of records used to determine baseline adjustments and current emissions.

Reporting Year (RY) 2024 represents the third year SPD and CARB have considered baseline adjustments in the NGLA Program. Last year, SPD and CARB discussed and implemented process improvements regarding submittal of baseline adjustments. Staff continually look for ways to improve data standards and guidelines to ensure accurate and verifiable data used for the submission of baseline adjustments. As recommended in Resolution G-3595,³ (the CPUC resolution of SoCalGas' NGLA 2022 spending proposal in Advice Letter 5950-G-B) SPD "should request that CARB work with SPD to identify options for verifying emission reduction estimates by sources independent of the utilities. A verification program would require implementation by CPUC with support from CARB and would depend on available resources." Implementation of programs to verify these emissions reduction estimates would increase the robustness of the NGLA Program.

Stakeholders should use the information in this report to help determine general emission trends over time and identify where potential emission reductions can be achieved to contribute to meeting the State's overall goal of reducing methane emissions by 40% from 2013 levels by 2030,^{4,5} while maintaining the safe, reliable, and affordable operation of the regulated natural gas storage and delivery systems, as stated in SB 1371.

³ CPUC Final Resolution G-3595, Finding: #19, pg. 22.

<https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M512/K907/512907380.PDF>

⁴ This goal was established by SB 1383 (Lara, 2016).

⁵ CPUC Decision D.17-06-015. <https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M190/K740/190740714.PDF>, specified that the 2015 baseline emissions estimates will provide the starting point to measure future natural gas emissions reductions for the NGLA program.

Key Findings

The 2023 total statewide estimated natural gas emissions from sources of fugitive leaks and vented emissions in the transmission and distribution system are 3,176 million standard cubic feet (MMscf), which is 2% lower (60 MMscf) than the 2022 adjusted emissions, and 34% below (1,619 MMscf) the updated 2015 Baseline emissions estimate (see Table 1).⁶

In three of the seven reported system categories, natural gas emissions decreased from 2022 to 2023. Reported data indicates that the Transmission Pipeline category shows the largest overall Year-Over-Year (YOY) emissions decrease (91 MMscf decrease). The emissions from Distribution Mains and Services category decreased by 37 MMscf, about half the reduction for Transmission Pipeline emissions. On the other hand, the emissions from the Customer Meters category showed the largest volume increase of 29 MMscf (3%) (see Table 2).

A detailed analysis of natural gas emissions estimates from individual system categories is provided later in this report.

The total statewide 2023 reported natural gas emissions of 3,176 MMscf equate to 1.42 million metric tonnes of carbon dioxide equivalents (MMT CO₂e) using the Intergovernmental Panel on Climate Change (IPCC), Fourth Assessment Report (AR4), 100-year methane Global Warming Potential (GWP) or 4.10 MMT CO₂e, using the 20-year methane GWP.

Table 1: Total Statewide Natural Gas Emissions Reported Under SB 1371							
Sector Emissions	2015 Baseline*	2022**	2023	2015 Baseline to 2023 Change		2022 - 2023 YOY Change	
				MMscf, MMT CO ₂ e	% Change	MMscf, MMT CO ₂ e	% Change
Volume of Natural Gas (MMscf)	4,795	3,236	3,176	(1,619)	(34%)	(60)	(2%)
Mass Equivalent, 100-Yr GWP, AR 4 (MMT CO ₂ e)	2.15	1.45	1.42	(0.72)	(34%)	(0.03)	(2%)
Mass Equivalent, 20-Yr GWP, AR 4 (MMT CO ₂ e)	6.18	4.17	4.10	(2.09)	(34%)	(0.08)	(2%)

*The CPUC approved adjustments to the 2015 baseline emissions on September 23, 2024, for SoCalGas, on September 26, 2024, for Lodi Gas Storage, and on October 22, 2024, for San Diego Gas and Electric. All approvals are listed in Appendix A.

⁶ In this report, 2015 Baseline means the updated baseline, with all the approved adjustments.

** The 2022 total has been modified from the 2023 Joint Report, which is described in the section, "2022 Data Adjustments and Corrections".

Subsequent sections of this report analyze the total natural gas emissions for 2023 by examining individual system categories and source classifications. Table 2 shows total estimated natural gas emissions and emissions trends grouped by system category, and Table 3 shows total estimated natural gas emissions and emissions trends grouped by source classification.

Natural Gas Emissions by System Category

As indicated in Table 2, there was a 2% reduction in the total from 2022 to 2023 YOY natural gas emissions.

Table 2: Total Natural Gas Emissions by System Category										
System Category	2015 Baseline		2022		2023		2015 Baseline to 2023 Change		2022 – 2023 YOY Change	
	MMscf	% Total	MMscf	% Total	MMscf	% Total	MMscf	% Change	MMscf	% Change
Transmission Pipeline	589	12%	208	6%	117	4%	(472)	(80%)	(91)	(44%)
Transmission M&R Station	777	16%	705	22%	714	22%	(63)	(8%)	9	1%
Transmission Compressor Station	187	4%	96	3%	113	4%	(74)	(40%)	17	18%
Distribution Mains & Services	1,472	31%	925	29%	888	28%	(584)	(40%)	(37)	(4%)
Distribution Metering & Regulating Stations	284	6%	269	8%	265	8%	(19)	(7%)	(3)	(1%)
Customer Meters	1,133	24%	901	28%	930	29%	(204)	(18%)	29	3%
Underground Storage	353	7%	133	4%	149	5%	(203)	(58%)	17	13%
Total	4,795	100%	3,236	100%	3,176	100%	(1,619)	(34%)	(60)	(2%)

The first system category, Transmission Pipelines, accounts for about 4% of the total 2023 emissions but showed a 44% YOY decrease of 91 MMscf from 2022. This category shows an 80% decrease against its 2015 Baseline. See more details in Summary of Gas Company– Estimated Natural Gas Emissions.

Transmission Meter and Regulation (M&R) Stations' 22% proportional share of the total 2023 emissions remained the same as the 2022 emissions. The YOY emissions increased 9 MMscf or 1% from a total of 705 MMscf in 2022 to 714 MMscf in 2023, but still shows an 8% decrease to its 2015 Baseline.

Transmission Compressor Stations' share of the 2023 total emissions increased about 1% to 4%, and remained similar to last year's percentage at 3%. Transmission Compressor Station emissions increased 17 MMscf or 18% YOY but shows a 40% decrease against its 2015 Baseline. Within this category, the Component Fugitive Leaks subcategory is described in the section of this report titled Impacts of CARB's Oil and Gas Methane Regulation.

Distribution Mains and Services pipeline emissions decreased by 37 MMscf or 4% from 925 MMscf in 2022 to 888 MMscf in 2023. This category shows a 40% decrease against its 2015 Baseline, and makes up 28% of total 2023 emissions.

Distribution Metering and Regulating (M&R) Stations emissions decreased by 3 MMscf or 1% YOY from 269 MMscf in 2022 to 265 MMscf in 2023. This category shows a 7% decrease against its baseline and makes up 8% of total 2023 emissions.

Customer Meters emissions increased by 29 MMscf or 3% YOY from 901 MMscf in 2022 to 930 MMscf in 2023. This category shows an 18% decrease against its baseline, making up 29% of total 2023 emissions. The 2022 and 2023 emissions use a Population-Based approach by four utilities (Alpine, SDG&E, Southwest Gas, and West Coast Gas) and a Leaker-Based approach by two utilities (PG&E and SoCalGas).

Underground Storage emissions increased by 17 MMscf or 13% YOY from 133 MMscf in 2022 to 149 MMscf in 2023. This category shows a 58% decrease against its baseline, making up 5% of total 2023 emissions. Within this category, the Component Fugitive Leaks subcategory and Storage Leaks & Emissions subcategory is described in the section of this report titled, Impacts of CARB's Oil and Gas Methane Regulation.

Lastly, no unusual large leaks were reported in 2023.

For more sub-category details see Table 9: Natural Gas Emissions by System Category, Emission Source, and Source Classification.

Natural Gas Emissions by Source Classification

Natural gas emissions can be grouped into the six main source classifications: Population-Based Emissions, Graded Pipeline Leaks, Leaker-Based Emissions, Blowdowns, Vented Emissions, and Damages. An additional source classification, Other Leaks, is used for emission sources that do not fit one of the six main source classifications. Table 3 shows the YOY changes by source classification.⁷

⁷ See Table 9: Natural Gas Emissions by System Category, Emission Source, and Source Classification, in the body of the report.

Table 3: Total Natural Gas Emissions by Source Classification

Source Classification	2015 Baseline		2022		2023		2015 Baseline to 2023 Change		2022 - 2023 YOY Change	
	MMscf	% Total	MMscf	% Total	MMscf	% Total	MMscf	% Change	MMscf	% Change
Population-Based Emissions	1,136	24%	1,127	35%	1,130	36%	(6)	(<1%)	3	<1%
Graded Pipeline Leaks	1,236	26%	787	24%	774	24%	(462)	(37%)	(13)	(2%)
Leaker Based Emissions	991	21%	726	22%	752	24%	(239)	(24%)	26	4%
Blowdown	603	13%	207	6%	148	5%	(455)	(75%)	(59)	(28%)
Vented	364	8%	172	5%	180	6%	(184)	(51%)	8	5%
Damages	318	7%	187	6%	145	5%	(173)	(54%)	(42)	(23%)
Other Leaks	147	3%	30	1%	46	1%	(101)	(68%)	16	54%
Total Sector Emissions	4,795	100%	3,236	100%	3,176	100%	(1,619)	(34%)	(60)	(2%)

YOY emission changes by source classification are summarized as follows:

- Consistent with the prior year, the Population-Based Emissions classification makes up the single largest source classification of emissions at 36% of the 2023 total emissions. This classification increased 10 MMscf or 1% YOY due to gradual population increases and shows less than 1% increase to its 2015 Baseline. The four individual emission sources that are part of this category are provided in Table 6, Population-Based Natural Gas Emissions.
- Graded Pipeline Leaks Emissions makes up the second largest source of system emissions at 24% or 774 MMscf decreasing 2% or 13 MMscf from 787 MMscf reported in 2022. This category shows a 37% or 462 MMscf decrease from its 2015 Baseline.
- The Leaker-Based Emissions increased from 726 MMscf in 2022 to 752 MMscf in 2023, by 4% or 26 MMscf. This classification decreased 239 MMscf or 24% from its 2015 Baseline.
- Blowdowns decreased by 28% YOY from 207 MMscf in 2022 to 148 MMscf in 2023. This category has emissions that are cyclical and vary with annual operating conditions. None the less, the 2023 data shows a 75% decrease to its 2015 Baseline. For a more detailed analysis, see Table 7, Blowdown Natural Gas Emissions.
- Vented Emissions remained nearly constant at 5% of the percentage share 2023 total emissions with 172 MMscf in 2022 and 6% percentage share with 180 MMscf in 2023. Overall, this category increased YOY by 5% or 8 MMscf, and shows a 51% decrease to its 2015 Baseline. For a more detailed analysis, see Table 8, Vented Natural Gas Emissions.

- Emissions from Damages decreased 42 MMscf or 23% YOY from 187 MMscf in 2022 to 145 MMscf in 2023 and shows a 54% decrease from its 2015 Baseline.
- Other Leaks increased 15 MMscf or 54% from 30 MMscf in 2022 to 46 MMscf in 2023. This classification shows a 68% decrease from its 2015 Baseline.

Introduction and Background

On September 14, 2014, Governor Jerry Brown signed into law SB 1371 (Leno, 2014) requiring reporting and mitigation of emissions from CPUC-regulated gas pipeline facilities.⁸ The bill requires gas corporations to file a report summarizing utility leak management practices, a list of new natural gas leaks by grade, a list of open leaks that are being monitored or are scheduled to be repaired, and a best estimate of gas loss due to leaks. In accordance with SB 1371, the CPUC and CARB jointly prepared this Natural Gas Leak Abatement (NGLA) annual report (2024 Joint Report), which analyzes and accounts for natural gas from leaks and vented emissions from natural gas transmission, distribution, and storage in California.⁹

SB 1371 also requires the adoption of rules and procedures to minimize natural gas leakage from Commission-regulated natural gas pipeline facilities consistent with Section 192.703(c) of Subpart M of Title 49 of the Code of Federal Regulation, the Commission's General Order (GO) 112-F, and the State's goal of reducing GHG emissions.

In January 2015, the Commission opened an Order Instituting Rulemaking (R.) 15-01-008 to implement the provisions of SB 1371.

On June 15, 2017, the Commission in decision (D.)17-06-015 approved the NGLA Program consistent with SB 1371. This decision established Best Practices (BPs) and reporting requirements for the NGLA Program to be developed by the CPUC in consultation with CARB.¹⁰ The decision implements the following to support the State's goal of reducing 2015 Baseline natural gas emissions 40% by 2030:

1. Annual reporting for tracking natural gas emissions,
2. Twenty-six mandatory BPs for minimizing natural gas emissions pertaining to policies and procedures, recordkeeping, training, experienced trained personnel, leak detection, leak repair, and leak prevention,
3. Biennial Compliance Plan (CP) incorporated into the respondents' annual Gas Safety Plans, beginning in March 2018, and
4. Cost recovery process to facilitate Commission review and approval of incremental expenditures to implement BPs, Pilot Programs and Research & Development.

In D.17-06-015, the Commission affirms that the 2015 Baseline emissions estimates will provide the starting point to measure future natural gas emissions reductions.¹¹

⁸ Leno, Chapter 525, Statutes of 2014.

⁹ Unless specified as a fugitive leak or vented emission, for the purposes of this report "emissions" include both fugitive leaks, and vented emissions of natural gas.

¹⁰ Leno, 2014; Pub. Util. Code §§ 975, 977, 978.

¹¹ <https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M190/K740/190740714.PDF>, Findings of Fact #13, Pg. 145.

To culminate the second phase of R.15-01-008, on August 15, 2019, the Commission approved D.19-08-020 establishing additional policies and mechanisms for the NGLA program pursuant to SB 1371 and SB 1383 (Lara, 2016).¹² This decision requires:¹³

- Utility Proposed Cost-Effectiveness Methodology and two Cost-Benefit Analyses for evaluating proposed methane reduction measures and the Biennial Methane Leaks Compliance Plans (Compliance Plans).
- Adopting a restriction on rate recovery beginning in 2025, for emissions greater than 20% below the 2015 Baseline levels for Pacific Gas and Electric Company (PG&E) and Southern California Gas Company (SoCalGas) to ensure they achieve their intended emissions reductions.¹⁴
- Two workshops to refine the scope and detail of the Compliance Plans and Tier 3 Advice Letters pertaining to cost-effectiveness, cost-benefit analysis, and other elements as directed in D.17-06-015.
- Developing a process that gas companies can rely on, before submittal of the next Compliance Plans in March 2020, to adjust Emission Factors (EFs) used for annual reports to account for methane reduction measures in consultation with CARB.
- Extending the timeframe from 2020 to 2021 for the CPUC's Safety and Enforcement Division¹⁵ and Energy Division Staff to complete a written program evaluation of the NGLA program after Commission approval of the second set of Compliance Plans in late 2020. In June 2021, the due date for this program evaluation was further extended to December 2022.
- The Commission directed the NGLA program to continue evaluating the Best Practices Biennial Compliance Plans, most recently submitted by gas companies in March 2024.
- The CPUC/SPD completed the NGLA program evaluation December 29, 2022. The evaluation resulted in the following recommendations:¹⁶
 - Adopt cost-effectiveness threshold guidance for future reduction proposals.
 - Allow utilities to continue reducing emissions under current policy framework without imposing a hard target.
 - Verify emission measurement data with selective audits by mid-2024.
 - Adopt cost-accounting modifications in resolutions or rate case proceedings related to NGLA funding.

¹² Lara, Chapter 395, Statutes of 2016.

¹³ D.19-08-020: <https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M311/K449/311449621.PDF>

¹⁴ D.20-05-038, Order Correcting Error in D.19-08-020, states at pg. 1 that: "For SoCalGas, any necessary reductions in rate recovery for methane emissions for 2025 and beyond as directed in this Decision should be identified in its Annual Regulatory Account Balance Update for rates effective January 1, 2027."

¹⁵ Since the Decision was issued, the SED RASA Staff who have responsibility for preparation of the NGLA program evaluation have moved to the Safety Policy Division (SPD).

¹⁶ Staff Evaluation of the Natural Gas Leak Abatement Program, CALIFORNIA PUBLIC UTILITIES COMMISSION SAFETY POLICY DIVISION REPORT, December 29, 2022; Pg. 3: <https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/safety-policy-division/reports/ngla-staff-evaluation-report.pdf>

All directives of D.17-06-015 remain in effect unless they are superseded by directives and/or guidance provided by this decision. Lastly, in D.19-08-020 the Commission closed R.15-01-008.

In addition, SB 32 (Pavley, 2016), which sets a 40% GHG reduction target from 1990 levels by 2030, was passed and signed into law in 2016.¹⁷ SB 605 (Lara, 2014)¹⁸ directed CARB to develop plans to reduce statewide emissions of short lived climate pollutants, which it did in the Short-Lived Climate Pollutant Reduction Strategy.¹⁹ SB 1383 (Lara, 2016) required CARB to implement the Short-Lived Climate Pollutant Reduction Strategy and specified certain emissions reduction goals.²⁰

Purpose of the Annual Natural Gas Leak Abatement Report

This report estimates natural gas emissions from the storage and delivery systems in aggregate, by company, system category, source classification, and leak grade. The information should help determine where emission reductions can be achieved while maintaining safe and reliable operation of commission-regulated natural gas pipelines and other facilities. The metrics used to compile this report provide operators, the Commission, and the public with information about the type, number, and severity of natural gas emissions and the leaked quantity of natural gas emitted to the atmosphere over time.

This report provides a summary of the 2023 emissions submitted to CPUC by the gas companies on June 14, 2024.

1. With the issuance to the service list on March 29, 2024, regarding reporting templates:
 - General Update
 - Timetable for 2024:
 - Requests for baseline adjustments, methodology changes, including new emission factors: February 5 through April 30, 2024.
 - Any requests must also be included in the Supplemental Questionnaire to be submitted on June 14, 2024.
 - Agency Review Meetings: April 30 through July 31, 2024.
 - Final Decision: August 31, 2024.
 - General Update for Leaker-Based Methodologies
 - All utilities reporting emissions with a Leaker-Based methodology must review all previous years' submissions to correct for any leaks reported in all previous years that are not accounted for as repaired or continuing in the current reporting year.
 - If previously reported leaks had been removed from the reporting year data set for any reason other than leak repair as recorded in a subsequent filing, the affected years' data sets must be revised.

¹⁷ Pavley, Chapter 249, Statutes of 2016.

¹⁸ Lara, Chapter 523, Statutes of 2014.

¹⁹ CARB, 2017: <https://ww2.arb.ca.gov/resources/documents/slcp-strategy-final>.

²⁰ Lara, Chapter 395, Statute of 2016.

- Erroneous data/leaks must be removed. Removed data/leaks must be accounted for in a separate tab of the data file. These instructions apply to all years, including years such as 2015 that were used to calculate a baseline adjustment.
- As a reminder, revisions to annual reporting data, which result in significant emission reductions are subject to further review through documentation and/or underlying data sets, and significant changes in reporting may trigger a review of the approved baseline adjustment or methodology.
- Approval of reported data or other submissions may be rescinded if data are deemed inaccurate, or methodologies for estimating emissions are not followed accordingly.
- Submittals should not include unapproved methodology changes, including significant changes to emission factors.
- Appendix 3 – Transmission Compressor Station
 - For the worksheet, “Compressor and Component Fugitive Leaks,” Staff have included a note on Line 9, “Please include emissions from leaks found with concentrations below 10,000 ppm and add them in the total emissions column. Please use the associated emission factors, provided in Appendix 9, Emission Factors.”
- Appendix 4 – Distribution Mains and Services
 - For the worksheet, “Unknown Leaks” Staff have included the following notes on Lines 8-10.
 - Line 8: The number of miles surveyed (Column C) should be the number of unique miles surveyed and should not account for repeated miles surveyed multiple times per year.
 - Line 9: To clarify the definition of O&M Leaks (Column O), the following criteria for O&M Leaks should be met: (1) occur stochastically across the whole territory, (2) are reported by customers, (3) found quickly after occurring, (4) found independently of survey activities, but would have been found later by surveyors, and (5) considered a small number of leaks.
 - Line 10: To clarify the definition of Survey Leaks (Column G), the following criteria should be met: (1) found by company employees or contractors actively searching for leaks (2) including, but not limited to, compliance survey leaks and non-compliance survey leaks (e.g., Super Emitter Programs, Aerial Methane Mapping, Corrosion Survey.)
 - Line 94: The portion of the survey mileage that includes mileage that is surveyed multiple times per year. Repeated mileage will not be accounted for in the unknown leak calculation.
- Appendix 6 – Meter Set Assembly (MSA) Systems
 - The changes to Appendix 6, are similar to the changes to Appendix 4. In Appendix 6, “Meter Leaks, Leak Count, Leaker” worksheet, Staff have included the following notes on Lines 9-11.
 - Line 9: The number of miles surveyed (Column C) should be the number of unique miles surveyed and should not account for repeated miles surveyed multiple times per year.
 - Line 10: To clarify the definition of O&M Leaks (Column K), the following criteria for O&M Leaks should be met: (1) occur stochastically across the whole territory, (2) are reported by customers, (3) found quickly after occurring, (4) found independently of survey activities but would have been found later by surveyors, and (5) considered a small number of leaks.
 - Line 11: To clarify the definition of Survey Leaks (Column G), the following criteria for Survey Leaks should be met: (1) found from company employees or contractors actively searching for leaks (2) including, but not limited to, compliance survey leaks and non-

- compliance survey leaks (e.g. Super Emitter Programs, Aerial Methane Mapping, Corrosion Surveying.)
- In the “Meter Leaks, Leak Count, Leaker” worksheet, Staff have added the note on Line 12: “Please provide the additional information requested on Lines 58-62.”
- Line 58: The number of MSA's which were within the surveyed areas but were not able to be surveyed (or Cannot Get-ins).
- Line 59: The number of MSAs which were estimated to be surveyed by the walking compliance survey but were inaccessible to surveyors in the reporting year.
- Line 60: The portion of the survey mileage that includes mileage that is surveyed multiple times per year. Repeated mileage will not be accounted for in the unknown leak calculation. In the “Identified MSA Leaks, Leaker” worksheet Staff have included the following columns:
 - Column L: The bubble-size classification for all collected leaks (if the information is available).
 - Column M: The leaking MSA identification number.
- Appendix 7 – Underground Storage
 - For the worksheet, “Compressor and Component Fugitive Leaks,” Staff have included the note on Line 9, “Please include emissions from leaks found with concentrations below 10,000 ppm and add them in the total emissions column. Please use the associated emission factors, provided in Appendix 9, Emission Factors.”
- Appendix 8 – Summary
 - For the worksheet, “Year Over Year Comparison,” Staff included the note in Line 7, “As a reminder, please use the latest version of each of the worksheets.”
- Supplemental Questionnaire Revision
 - The Supplemental Questionnaire has been revised to include question 2: Does the utility propose a 2015 baseline adjustment or emission factor change? If so, please describe. Can the utility adhere to the following timeline:
 - Solicit Baseline Proposals: February 5 through April 30, 2024.
 - Agency Review Meetings: April 30 through July 31, 2024.
 - Final Decision by August 31, 2024.

This report includes general discussions of operational practice changes, new leak and emission detection methods, and mitigation programs. Lastly, Staff included information on improvements in the data capture resulting from gas company efforts (e.g., verification of asset inventory, integrating system databases, etc.), changes to methodology for estimating emissions (e.g., calculating emissions for all blowdowns not just those above a specific threshold), and corrections to the classification of data or errors in the data that may provide greater accuracy in reporting.

Basis for the Annual Natural Gas Leak Abatement Report

On March 30, 2023, Staff issued a data request to CPUC jurisdictional natural gas utilities and independent storage providers (ISPs) in California to collect the information required by Article 3, Section 975 (c) and (e)(6), using templates jointly developed by CPUC and CARB Staff (See Appendix C for detailed wording).

The data were tabulated into the following seven systems categories (which included subgroupings by type):

1. Transmission Pipelines (leaks, damages, blowdowns, components, and odorizers),
2. Transmission M&R stations (station leaks and emissions, and blowdowns),
3. Compressor stations (compressor leaks and emissions, blowdowns, components leak and emissions, and storage tanks),
4. Distribution Mains and Services (M&S) (leaks, damages, and blowdowns),
5. Distribution M&R stations (station leaks and emissions, and blowdowns),
6. Customer Meters (leaks, and venting), and
7. Underground Storage Facilities (leaks, compressors leaks and emissions, blowdowns, and component leaks and emissions).

The respondents provided contextual information and explanations for their data to help Staff understand the composition of the emissions, emission sources, and related calculations underlying the emission estimates. The respondents summarized the data and provided information on system-wide leaks.

Staff analyzed the data and requested supplementary information needed for clarification. The “Lessons Learned” section of this report identifies insights Staff acquired about potential improvements to the process and opportunities to enhance future data requests.

Basis for Updating Emissions Methodologies and Adjusting the 2015 Baseline Values

Since the NGLA reporting process began, Staff and respondents identified opportunities for improving reporting methodology, emission factors, and record keeping. Had some of these improved emissions data been known or used at the time of the 2015 reporting year they would have had a material impact on the level of 2015 Baseline emissions in the Joint Report.

While the June 2017 Commission D.17-06-015 does not order a process for updating the 2015 Baseline, it does order that:

“The Natural Gas Leak Abatement Program Annual Reporting Framework contained in Section 5.2 ... of this decision is adopted consistent with the process detailed below: The Commission’s Safety and Enforcement Division (SED)²¹, in consultation with the Air Resources Board [C](ARB), shall direct the annual report process...”²²

²¹ Since the Decision was issued, the SED RASA Staff who have responsibility for directing the annual report process have moved to the Safety Policy Division (SPD) and maintained this responsibility.

²² D.17-06-015, Pg. 157.

This is interpreted to include the consideration and evaluation of any changes to 2015 Baseline emissions based on new methods of emissions accounting, better record keeping and information, and updated EFs used for estimating emissions.

D.19-08-020 modifies the approach to updating EFs by allowing gas companies to propose EF changes that more accurately account for the emissions from their Compliance Plan emissions mitigation programs. In addition, changes to 2015 Baseline EFs may be warranted based on the supporting data and evidence used to develop EFs for emission mitigation programs included in their Compliance Plans.

The discussion within D.17-06-015 further clarifies the roles and responsibilities for managing the emissions reporting processes.

“...[T]he development of EFs and an official Baseline to manage this initiative in the long term is still in flux. Therefore, while, [C]ARB is ultimately responsible for the development of EFs in collaboration with stakeholders, both [C]ARB and CPUC should continue to collaborate to ensure that updates to EFs are completed in a timely fashion consistent with the Commission’s annual reporting process. Following this year’s example, if changes are required to the annual reporting template, [C]ARB and CPUC Staff will conduct a workshop to discuss EFs and ongoing changes to the reporting template. This workshop should take place during the first quarter of each year before SED²³ issues the annual data request at the end of the first quarter.”²⁴

On June 6, 2022, the CPUC/SPD approved new estimation methods for the 2020 and 2021 emission data. The CPUC/SPD approved Leaker-Based methodologies developed by PG&E and SoCalGas to replace Population-Based methodologies for estimation of natural gas emissions from Distribution M&R Stations and Customer Meters systems categories. Population-Based emissions estimates are calculated based on the number of units within a system category (e.g., number of Distribution M&R stations) multiplied by an EF. Therefore, Population-Based emissions stay constant from year to year unless a change is made to the number of units or to the EFs. Population-Based emissions estimates generally cannot capture emissions changes associated with the gas companies’ emissions mitigation practices. On the other hand, Leaker-Based emissions estimates are calculated by using surveyed or estimated number of leaks. They are more effective in capturing emissions changes associated with gas companies’ mitigation practices. Accurately estimating emissions reduction is critical to measuring progress toward the targeted goal and evaluating the mitigation process’s cost-effectiveness.

On October 26, 2022, CPUC/SPD approved adjustments to the 2015 Baseline emissions for PG&E and SoCalGas to account for methodological changes, EF updates, and other adjustments that are needed to allow for a direct comparison of 2015 Baseline emissions with current-year emissions estimates. Letters

²³ Since Decision D.17-06-015 was issued, the SED RASA Staff who have responsibility for issuing the annual data request have moved to the Safety Policy Division (SPD) and maintained this responsibility.

²⁴ Ibid, Pg. 39.

from the CPUC/SPD to PG&E and SoCalGas approving the adjustments to 2015 Baseline emissions are included in the 2022 Joint Report.²⁵

On July 19, 2023, CPUC/SPD approved two adjustments to the 2015 Baseline emissions for PG&E. For the first adjustment, PG&E has made several improvements in the accounting of component vented emissions on Transmission Pipelines since the original reporting of this category. This 2015 Baseline adjustment for this category aligns the baseline to match the improvement in reporting via the GIS system of the pressure relief valves (Calendar Year (CY) 2019) emissions and to account for the addition of automated valve emissions (CY 2020/2021). For the second adjustment to Distribution Mains and Services, PG&E collected pipeline leak data in 2014-2020 that aligns with Washington State University (WSU) study data and finds that the WSU study best characterizes leaks on the PG&E system overall, compared to the initial set of EFs used to establish a baseline and measure performance. CPUC/SPD in consultation with CARB met with PG&E several times to evaluate the methodologies, and reached a final approval of the WSU Adjusted methodology as proposed by PG&E. The letter from the CPUC/SPD to PG&E approving the adjustments to 2015 Baseline emissions is included in Appendix A of the 2024 Joint Report.

On August 21, 2023, CPUC/SPD approved a single adjustment to the 2015 Baseline emissions for West Coast Gas Company (WCGC). In the utility's original 2015 Baseline data for Customer Meters (Appendix 6) – Meter Leaks, West Coast Gas reported a value of 2.8 Mscf based on an estimation of the number of leaks for the year 2015. This, however, was contrary to the Population-Based methodology established as the standard by participating parties. Following the submittal of 2022 emissions data on June 15, 2023, SPD staff, in consultation with CARB, identified and resolved the discrepancy between West Coast Gas's original 2015 Baseline emissions value (of 2.8 Mscf) and the 194.177 Mscf value that West Coast Gas was now providing as the 2015 Baseline in its annual data submittals. The letter from the CPUC/SPD to WCGC approving the adjustments to 2015 Baseline emissions is included in Appendix A of the 2024 Joint Report.

On September 23, 2024, CPUC/SPD approved adjustments to the 2015 Baseline emissions for SoCalGas Appendices 3, 4, 6, and 7, as well as an adjustment to the EF used to calculate emissions from non-hazardous leaks in meter set assemblies (Appendix 6). The letter from the CPUC/SPD to SoCalGas approving the adjustments to the 2015 Baseline and the EF is included in Appendix A of the 2024 Joint Report.

On September 26, 2024, CPUC/SPD approved adjustments to the 2015 Baseline emissions for LGS for Underground Storage (Appendix 7). LGS originally reported a Compressor Vented Emissions baseline of 99 Mscf based on an estimated utility specific EF for the pressurized operating state of each of its four compressors, however subsequent measurements taken in following years yielded significantly higher results. Working with a third-party contractor, LGS updated the EF to reflect these measurements, also updating the 2015 Baseline value to 2,383 Mscf. Additionally, LGS corrected an error where the 2015 Baseline of 1,144 Mscf for Compressor and Component Fugitive Leaks had been mistakenly reported in the

²⁵ Analysis of the Gas Companies' June 15, 2022, Natural Gas Leak and Emissions Report (2022 Joint Report), Appendix A. [2022-ngla-joint-report.pdf](#)

Component Vented Emissions category. The letter from the CPUC/SPD to LGS approving the adjustments to the 2015 Baseline is included in Appendix A of the 2024 Joint Report.

On October 22, 2024, CPUC/SPD approved an adjustment to the 2015 Baseline emissions for SDG&E Transmission Compressor Stations (Appendix 3). Per changes to the CARB Oil and Gas Regulation (COGR) in 2020, SDG&E began including leaks with concentration measures of less than 10,000 ppm in the Component Fugitive Leaks category. SDG&E updated its 2015 Baseline value of 2,919 Mscf by adding emissions from leaks with concentration measures of less than 10,000 ppm recorded in 2020 (the first year SDG&E began reporting said data), resulting in a new 2015 Baseline value of 3,512 Mscf. The letter from the CPUC/SPD to SDG&E approving the adjustments to the 2015 Baseline is included in Appendix A of the 2024 Joint Report.

CPUC/SPD's approval of new emission estimation methods and adjustments to 2015 Baseline emissions allows the CPUC and CARB to more accurately estimate the System-wide Leak Rate, as required by SB 1371, and to evaluate progress towards goals of the NGLA program and the State to reduce methane emissions (i.e., a 20% reduction in methane emissions for PG&E and SoCalGas by 2025 relative to 2015 for the NGLA program, and a 40% reduction in methane emissions by 2030 relative to 2015 across all sectors state-wide). These approvals will also assist CPUC and the gas companies in estimating forecasted emissions reductions of proposed measures more accurately and more effectively evaluate the absolute and relative cost-effectiveness of proposed measures in future Compliance Plans.

Findings and Discussion

Natural Gas Leaks and Emissions

As described in the Executive Summary, the 2023 estimated natural gas emissions totaled approximately 3,176 MMscf, which equates to 1.42 MMTCO_{2e} using the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4) 100- year methane Global Warming Potential (GWP) factor of 25, or 4.10 MMTCO_{2e} using the 20-year methane GWP factor of 72 (see Table 1). This is a 2% YOY decrease from the 2022 estimated natural gas emissions of 3,236 MMscf.

System-wide Leak Rate

The System-wide Leak Rate is an important metric that shows the relative natural gas emissions to throughput from all respondents. SB 1371 requires annual reporting of the System-wide Leak Rate for the transmission and distribution system.^{26,27}

The 2023 System-wide Leak Rate was 0.15% and is lower than the previous year's 2022 System-wide Leak Rate of 0.17%. The System-wide Leak Rate is calculated by dividing the Total Emissions by the Total Throughput, as shown in Table 4. Accordingly, the consistent percentage in System-wide Leak Rate from 2022 to 2023, can be attributed to the increase in Total Throughput from 1,907,011 MMscf in 2022 to 2,062,987 MMscf in 2023, and a decrease in Total Emissions from 3,236 MMscf in 2022 to 3,176 MMscf in 2023.

System-wide Leak Rates for the intermediate years (i.e., 2016 to 2021) are not shown because updated emission estimation methodologies have not been applied to emissions for these years.

²⁶ For the purposes of SB 1371, the definitions of “leak” and “gas loss” and the formula for calculating a “System-wide Leak Rate” were defined in a different manner than elsewhere. For the purposes of calculating the System-wide Leak Rate, a “leak” was defined as any breach, whether intentional or unintentional, whether hazardous or non-hazardous, of the pressure boundary of the gas system that allows natural gas to leak into the atmosphere. Any vented or fugitive emission to the atmosphere is considered a “leak.” See Appendix B.

²⁷ Refer to Appendix C for Public Utilities Code Section 975(e)(6), Article 3.

Table 4: System-wide Throughput, Emissions, and Leak Rate - 2015, 2022, and 2023

Throughput Category	Natural Gas Volume (MMscf)		
	2015 Baseline	2022	2023
Total Storage Annual Volume of Injections to Storage	199,522	144,321	242,960
Total Storage Annual Volume of Gas Used by the Gas Department	N/A	1,687	2,114
Total Transmission Annual Volume of Gas Used by the Gas Department	7,717	6,185	9,934
Total Transmission Volume of Annual Gas transported to or for Customers in state	1,832,676	1,739,384	1,792,246
Total Transmission Volume of Annual Gas transported for Customers out of state	16,775	14,894	15,086
Total Distribution Annual Volume of Gas Used by the Gas Department	261	540	647
Total Throughput	2,056,950	1,907,011	2,062,987
Total Emissions	4,795	3,236	3,176
System-wide Leak Rate $\left(\frac{\text{Total Emissions}}{\text{Total Throughput}}\right)$	0.23%	0.17%	0.15%

2022 Data Adjustments and Corrections

This report reflects adjustments to the 2022 data reported in the 2024 Joint Report. The change in emissions accounting in the 2022 respondent filings was updated for consistency and comparability with the current 2023 data.

The corrections made to 2022 emissions include:

- Pacific Gas & Electric (PG&E):
 - The Blowdowns category of Distribution Mains and Services pipelines, decreased from 100 Mscf to 99 Mscf. This resulted from further review of the data.
- Southern California Gas (SoCalGas):
 - The Component Leaks category of Transmission Compressor Station increased from 1,335 Mscf to 4,149 Mscf. SoCalGas updated this category to include emissions from leaks less than 10,000 ppm.
 - The Pipeline Leaks category of Distribution Mains and Services increased from 465,687 Mscf to 470,517 Mscf. In accordance with the new requirements, SoCalGas updated leak discovery methods, as well as the carry-over leak details in the pipeline leak and damages tabs from 74,785 Mscf to 76,001 Mscf.
 - Staff also note that in the 2023 Joint Report, this category used the 2021 data for both 2021 and 2022. However, it corrected this in the 2024 data filing so that the 2022 data shows the emission total that it submitted for that year.

- The Meter Leaks category of Customer Meters increased from 410,637 Mscf to 463,695 Mscf. SoCalGas updated leak discovery methods in accordance with the new requirements. It also updated the latest information on the carry-over leak details in the identified MSA Leaks tabs.
 - Staff also note that in the 2023 Joint Report, this category used the 2021 data for both 2021 and 2022. However, it corrected this in the 2024 data filing so that the 2022 data uses the emission total that it submitted for that year.
- The Storage Leaks and Emissions category of Underground Storage increased from 34 Mscf to 268 Mscf. SoCalGas updated this category to include emissions from leaks less than 10,000 ppm.
- The Compressor and Component Fugitive Leaks category of Underground Storage increased from 1,802 Mscf to 9,231 Mscf. SoCalGas updated this category to include emissions from leaks less than 10,000 ppm.
- As a result of these changes, the total emissions for SoCalGas increased by 69,581 Mscf or 6% from 1,180,099 Mscf to 1,249,680 Mscf.
- San Diego Gas & Electric (SDG&E):
 - The Component Fugitive Leaks category of Transmission Compressor Stations increased from 136 Mscf to 580 Mscf. SDG&E updated this category to include emissions from leaks less than 10,000 ppm.
 - The Pipeline Leaks category of Distribution Mains and Services decreased from 12,020 Mscf to 12,004 Mscf. SDG&E updated its leak discovery methods in accordance with the new requirements. Also, the carry-over leak details in the pipeline leak tab were updated with the latest information.
 - As a result of these changes, the total emissions for SDG&E increased from 250,077 Mscf to 250,505 Mscf.

Impacts of CARB's Oil and Gas Methane Regulation

CARB's Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities, also known as the Oil and Gas Methane Regulation²⁸ (COGR) was adopted in 2017 and amended in 2023. The regulation impacts SB 1371 related efforts by requiring quarterly leak survey frequency at transmission compressor stations and storage facilities. The regulation also requires repairs within specified timeframes for components found to be leaking above the allowed thresholds.

²⁸ The CARB Oil and Gas Methane Regulation is promulgated under 17 California Code of Regulations (CCR), Division 3, Chapter 1, Subchapter 10, Article 4, Subarticle 13.

Both the NGLA program and COGR require descriptive reporting entries, such as compressor facility name, types of compressors, and facility address. The data collected under the NGLA program are used to determine the total annual emissions, whereas COGR collects and evaluates quarterly reports of compressor component leaks to determine compliance with the program requirements including whether the reported leaks exceed the concentration thresholds. COGR also requires annual emissions flow rate measurements from reciprocating compressor rod packing and centrifugal compressor wet seals to determine whether emissions stay below the allowable emission flow rates. If component leaks or compressor emission flow rates exceed the COGR thresholds, operators are required to complete repairs within the specified timeframes.

Both PG&E's and SoCalGas's NGLA data report benefits from the COGR due to the increased granularity of the data collected. CPUC/CARB Staff reviewed both of the companies' submittals and provide the following summary of their respective reporting of Transmission Compressor Stations and Underground Storage.

The Compressor and Component Fugitive Leaks subsection of Transmission Compressor Stations includes the leaks from the transmission compressor units, such as connectors, valves, and pressure relief valves. For PG&E, the emissions from this category decreased from 5,571 Mscf in 2022 to 5,525 Mscf in 2023. The leak count also decreased from 438 leaks identified in 2022 to 348 leaks in 2023. PG&E provided the explanation for the change with, "PG&E saw a decrease in emissions due to a decrease in the number of leaks, however the decrease was not significant due to a 20% increase in the number of days leaking."

The Storage Fugitive Leaks and Emissions subsection of Underground Storage includes the leaks from wellhead valves, surface casing leakage, and downhole safety valve tests. For PG&E, the emissions from this category increased from 2,064 Mscf in 2022 to 3,175 Mscf in 2023. The leak count also increased from 229 leaks identified in 2022 to 434 leaks in 2023. PG&E provided the explanation for the change with, "PG&E experienced an increase in emissions due to an increase in the number of leaks for storage. However, PG&E reduced the average number of days to repair leaks from 77 days to 67 days."

The Compressor and Component Fugitive Leaks subsection of Underground Storage includes the valves on the underground storage compressor units, such as from connectors, valves, and pressure relief valves. For PG&E, the emissions from this category decreased from 5,341 Mscf in 2022 to 3,353 Mscf in 2023. The leak count also decreased from 258 leaks identified in 2022 to 185 leaks in 2023. PG&E provided the explanation for the change with, "PG&E experienced a decrease in emissions due to a decrease in the number of leaks."

For Compressor and Component Fugitive Leaks subsection of Transmission Compressor Stations, SoCalGas reported an emissions increase from 4,149 Mscf in 2022 to 8,658 Mscf in 2023. The leak count also increased from 548 leaks identified in 2022 to 599 leaks in 2023. SoCalGas explained the change with:

"The increase in emissions year-over-year is driven by a longer average estimated leak duration during Emission Year 2023 relative to 2022. The average estimated leak duration in 2022 was 57 days, and the average duration in 2023 was 124 days. Although leak repair durations can vary based on a variety of factors, the current equation for estimating leak-days is also contributing to the

increase in leak-days year-over-year. In the 2023 Emission Year data set, the current equations are estimating more than 365 leak-days for 90 leaks, whereas there aren't any in the Emission Year 2022 data set with more than 365 leak-days.”

In SoCalGas’s Storage Fugitive Leaks and Emissions subsection of Underground Storage, the emissions increased from 268 Mscf in 2022 to 327 Mscf in 2023. While the leak count decreased from 641 leaks identified in 2022 to 594 leaks in 2023. SoCalGas explained the change with, “Emissions from surface equipment increased year-over-year because the average number of days leaking increased from 5 to 7 days.”

For SoCalGas’s Component Fugitive Leaks subsection of Underground Storage, the emissions increased from 9,231 Mscf in 2022 to 21,366 Mscf in 2023. The leak count also increased from 654 leaks identified in 2022 to 1,139 leaks in 2023. SoCalGas explained the change with, “The year-over-year increases in leaks and emissions from surface equipment are driven by increased leak survey activities at the storage fields during 2023 relative to 2022.”

Summary of Gas Company– Estimated Natural Gas Emissions

In 2022, the overall natural gas emissions decreased 2% from 2022. Table 5 shows the YOY change in natural gas emissions for each gas company from 2022 to 2023. Table 5 also highlights that the four largest gas companies are responsible for approximately 99% of the total natural gas emissions in 2022 and 2023, while the remaining six gas companies account for approximately 1% of the total natural gas emissions. Changes in natural gas emissions for individual gas companies from 2022 to 2023 are described in this section.

Table 5: Total Natural Gas Emissions by Gas Company

Entity	2015 Baseline		2022		2023		2015 Baseline to 2023 Change		2022-2023 YOY Change	
	Mscf	% Total	Mscf	% Total	Mscf	% Total	Mscf	% Change	Mscf	% Change
Pacific Gas & Electric	2,204,823	46%	1,490,564	46%	1,367,005	43%	(837,818)	(38%)	(123,559)	(8%)
Southern California Gas	2,057,487	43%	1,249,680	39%	1,311,294	41%	(746,193)	(36%)	61,614	5%
San Diego Gas & Electric	285,355	6%	250,505	8%	258,754	8%	(26,601)	(9%)	8,249	3%
Southwest Gas	214,307	4%	229,905	7%	218,187	7%	3,880	2%	(11,718)	(5%)
Wild Goose Storage	24,003	0.50%	7,392	0.23%	7,149	0.23%	(16,854)	(70%)	(243)	(3%)
Gill Ranch Storage	3,636	0.08%	4,368	0.13%	4,309	0.14%	673	18%	(59)	(1%)
Lodi Gas Storage	3,919	0.08%	2,494	0.08%	8,114	0.26%	4,195	107%	5,620	225%
Central Valley Gas Storage	806	0.02%	432	0.01%	721	0.02%	(85)	(11%)	289	67%
West Coast Gas	700	0.01%	257	0.01%	204	0.01%	(496)	(71%)	(53)	(21%)
Alpine Natural Gas	6	<0.01%	275	0.01%	263	0.01%	257	>100%	(12)	(4%)
Total	4,795,042	100%	3,235,872	100%	3,176,000	100%	(1,619,042)	(34%)	(59,872)	(2%)

While natural gas emissions are expressed in units of MMscf in Tables 1 through 4 to provide a high-level overview of emissions, Tables 5 through 18 use units of thousands of standard cubic feet (Mscf) to provide additional detail, consistent with the units that gas companies reported in their submittals for Appendix 8 of the reporting template. Staff have directed respondents to report units rounded to the nearest 1 Mscf in submittals for Appendix 8 of the reporting template to mitigate any rounding errors.

The following subsections provide a summary of the changes in natural gas emissions for each company by system category from 2022 to 2023. These summaries are based on information provided by respondents as part of their report filings, including gas company responses to Staff follow-up questions.

Pacific Gas and Electric (PG&E)

PG&E's 2023 emissions decreased 123,559 Mscf from 1,490,564 Mscf in 2022 to 1,367,005 Mscf in 2023 (an 8% decrease).

This 2024 Joint Report is the second year of implementing the change for Distribution Mains and Services to no longer use the 1996 US EPA/GRI emission factors, but instead to use the Washington State University (WSU) Adjusted methodology, with the consequent set of emission factors. Effectively, the 2015 Baseline and the recent years of 2022 and 2023 are all on the same basis for this category and can provide meaningful comparisons.

Additionally, the 2024 Joint Report is the third year after implementing the change for both distribution meter and regulating stations and meter set assemblies to use Leaker-Based emission factors instead of Population-Based emission factors. Effectively, the 2015 Baseline and the recent years of 2022 and 2023 are all on the same basis for these two source categories and can provide meaningful comparisons.

The YOY changes in emissions or changes in inventory counts are summarized below by reporting source category:

- Transmission Pipeline
 - For the Blowdowns category, the emissions decreased 67,246 Mscf or 55% from 122,745 Mscf in 2022 to 55,499 Mscf in 2023. While there was an increase in the count of blowdowns from 375 blowdowns in 2022 to 460 blowdowns in 2023, the emissions decreased due to abatement strategies. PG&E explained it "...had an increase in the number of in-line inspection blowdowns in 2023. However, overall, emissions from blowdown activities decreased because there were less high pressure and large diameter pipeline blowdowns. In 2023, PG&E achieved 83% abatement for Transmission Pipeline, Transmission M&R and Compressor Station Activities. The abatement was performed through drafting, cross-compression, flaring and project bundling." Additionally, Staff noted the methane abatement strategies resulted in a total of 580,043 Mscf of emissions captured for 2022 and 339,078 Mscf of emissions captured for 2023.
- Transmission M&R Stations
 - For the Station Leaks & Emissions category, the emissions increased 4,603 Mscf or about 1% from 554,619 Mscf in 2022 to 559,222 Mscf in 2023. PG&E explained that the increase in emissions was due to a reclassification of seven interconnects, with five large volume customer regulators that were downrated or retired.
 - For the Blowdowns sub-category, the emissions increased 4,401 Mscf or 647% from 680 Mscf in 2022 to 5,081 Mscf in 2023. Staff confirmed the increase in the count of blowdown events from 28 events in 2022 to 62 events in 2023.
- Transmission Compressor Stations
 - For the Blowdowns category, the emissions increased 12,371 Mscf or 47% from 26,253 Mscf in 2022 to 38,624 Mscf in 2023. Staff confirmed the increase in the number of blowdown events from 607 events in 2022 to 758 events in 2023.
- Distribution Mains and Services Pipelines

- For the Pipeline Leaks category, the emissions decreased 19,080 Mscf or 6.3% from 302,684 Mscf in 2022 to 283,604 Mscf in 2023. PG&E explained with, “PG&E saw a decrease in emissions due to a 23% decrease in the average number of leaking days for all leaks.”
- For the All Damages category, the emissions decreased 12,371 Mscf or 23% from 53,569 Mscf in 2022 to 41,225 Mscf in 2023. Staff confirmed the decrease in the count of damage events from 1,894 events in 2022 to 1,428 events in 2023.
- Distribution M&R Stations
 - For the Station Leaks & Emissions, Leak-Based category, the emissions decrease 962 Mscf or 27% from 3,585 Mscf in 2022 to 2,572 Mscf in 2023. PG&E explained that the decrease in emissions was due to a decrease in the number of identified leaks, as well as the improvement in data reporting and reclassification of M&R stations.
- Customer Meters
 - For the Meter Leaks – Leak Based category, the emissions decreased 41,385 Mscf or 17% from 250,445 Mscf in 2022 to 209,060 Mscf in 2023. PG&E explained it “... experienced a decrease in emissions due to a decrease in the number of leaks. PG&E also continued to prioritize the larger meter set assembly (MSA) leaks (Class A and B) for repair. Finally, PG&E continued to work to classify uncategorized leaks.”
- Underground Storage
 - For the Compressor Vented Emissions category, the emissions increased 601 Mscf or 68% from 885 Mscf in 2022 to 1,486 Mscf in 2023. This change resulted from an increased volume of natural gas injected into storage from 24.4 BCF in 2022 to 35.3 BCF in 2023.
 - For the Component Vented Emissions category, the emissions stayed the same at 80,319 Mscf for 2022 and 2023.
- Supplemental Questionnaire
 - PG&E provided a summary table of the changes in their Supplemental Questionnaire, which Staff have included in Appendix E.

Southern California Gas (SoCalGas)

SoCalGas's emissions increased 61,614 Mscf or 5% from 1,249,680 Mscf in 2022 to 1,311,294 Mscf in 2023. Most of the increase came from the meter leaks category, which increased by 70,566 Mscf or 15%, which as SoCalGas explained the “... significant year-over-year increase in emissions is driven by the increase in leak counts. MSA inspection/survey activities did not significantly increase year-over-year. Variations in leak counts can occur without particular operational drivers.”

For comparison, the category with the next largest increase was compressor and component fugitive leaks in underground storage, which was considerably less with 12,135 Mscf. There were no other categories with an increase of more than 10,000 Mscf.

On the other hand, there were two categories with a decrease of more than 10,000 Mscf. The Transmission Pipelines sub-category for All Damages decreased by 17,619 Mscf or 70%, and the Distribution Mains and Services Pipelines sub-category for All Damages decreased by 11,904 Mscf or 16%.

The only methodology change occurring in the reporting of 2023 data was to include leaks below 10,000 ppm in the category's compressor and component fugitive leaks in both transmission compressor stations

and underground storage compressor stations. SoCalGas revised the 2022 data to also include leaks with these concentrations, so comparisons between 2022 and 2023 are fair and on the same basis.

Staff also revised the 2022 data for the categories of customer meters and distribution mains and services pipelines from the 2024 Joint Report. For more details, see the section, “2022 Data Adjustments and Corrections.”

The YOY changes in emissions or changes in inventory counts are summarized below by reporting category:

- Transmission Pipeline
 - For the All Damages category, the emissions decreased 17,619 Mscf or 70% from 25,100 Mscf in 2022 to 7,481 Mscf in 2023. While there was an increase in the count of one event in 2022 to two events in 2023, the single event in 2022 was considerably larger even though it was repaired in one day. The events in 2023 were repaired in three days and 130 days. From further correspondence with SoCalGas, Staff learned that environmental conditions prevented a more immediate repair of the leak.
 - The emissions decreased 7,034 Mscf or 37% for the Blowdowns category from 18,819 Mscf in 2022 to 11,785 Mscf in 2023.
 - SoCalGas explained, "The reduction in blowdown emissions year-over-year can be attributed to SoCalGas's continued efforts to release less gas during planned Transmission Pipeline projects."
 - Staff confirmed that fewer large (greater than 1,000 Mscf) blowdown events occurred in 2023 than in 2022. The largest blowdown in 2022 had a release of 2,495 Mscf, while the largest blowdown in 2023 had a release of 1,734 Mscf.
 - Staff noted 272,555 Mscf of Blowdown methane abatement occurred in 2023.
- Transmission M&R Stations
 - The emissions stayed the same for the Station Leaks & Emissions category from 114,838 Mscf in 2022 and 2023. Staff confirmed that the number of transmission-to-transmission interconnects, transmission-to-distribution connections (70), and tap facilities (492) remained unchanged. These facilities' emissions are population-based, not leaker-based, and will not change unless the equipment or number of stations changes.
- Transmission Compressor Stations
 - The emissions of the Component Fugitive Leaks category increased 4,509 Mscf or 109% from 4,149 Mscf in 2022 to 8,658 Mscf in 2023.
 - SoCalGas explained, "(t)he increase in emissions year-over-year is driven by a longer average estimated leak duration during Emission Year 2023 relative to 2022. The average estimated leak duration in 2022 was 57 days, and the average duration in 2023 was 124 days. Although leak repair durations can vary based on a variety of factors, the current equation for estimating leak-days is also contributing to the increase in leak-days year-over-year. In the 2023 Emission Year data set, the current equations are estimating more than 365 leak-days for 90 leaks, whereas there aren't any in the Emission Year 2022 data set with more than 365 leak-days."

- Staff confirmed the number of leaks increased from 548 in 2022 to 599 in 2023. Both reporting years include leaks of less than 10,000 ppm.
- Distribution Mains and Services Pipelines
 - The Pipeline Leaks category's emissions increased 7,414 Mscf or 2% from 470,517 Mscf in 2022 to 477,931 Mscf in 2023.
 - SoCalGas explained, “(t)he year-over-year change in emissions is minimal after the updates to the Emission Year 2022 data were completed during August 2024. The updates corrected for leaks that were not reported as repaired in the initial Emission Year 2022 filing and were not reported as continuing or repaired in the Emission Year 2023 filing. Updates were also completed to move leaks to different Appendix sections based on additional details that were collected since the Emission Year 2022 Report was initially filed. Because the Emission Year 2022 data have undergone these updates, there is not currently a true apples-to-apples comparison between Emission Years 2022 and 2023.”
 - For the All Damages category, the emissions decreased 11,904 Mscf or 16% from 76,001 Mscf in 2022 to 64,097 Mscf in 2023.
 - SoCalGas explained, “(t)he decrease in emissions year-over-year can be attributed to SoCalGas's Damage Prevention Program.”
 - Staff confirmed that the number of damage events decreased by 514 or 14%, from 3,688 in 2022 to 3,174 events in 2023.
- Distribution Metering and Regulating Stations
 - For the Station Leaks & Emissions, Leak Based category, Staff combined emissions reported by SoCalGas as “Component Vented Emissions” and “Component Fugitive Leaks,” the combined emissions decreased 354 Mscf or 5% from 6,687 Mscf reported in 2022 to 6,333 Mscf in 2023. Since SoCalGas does not include a single category for “Station Leaks & Emissions, Leak Based,” Staff summed the two categories of “Component Vented Emissions” and “Component Fugitive Leaks” to ensure reporting consistency and integrity.
- Meter Set Assembly Systems
 - The Meter Leaks – Leak Based category's emissions increased 70,566 or 15% from 463,695 Mscf in 2022 to 534,261 Mscf in 2023.
 - SoCalGas explained, “(t)he significant year-over-year increase in emissions is driven by the increase in leak counts. MSA inspection/survey activities did not significantly increase year-over-year. Variations in leak counts can occur without particular operational drivers.”
- Underground Storage
 - For the Compressor and Component Fugitive Leaks category, emissions increased by 12,135 Mscf or 131% from 9,231 Mscf in 2022 to 21,366 Mscf in 2023.
 - SoCalGas explained, “(t)he year-over-year increases in leaks and emissions from surface equipment are driven by increased leak survey activities at the storage fields during 2023 relative to 2022.”
 - Staff confirmed the number of leaks increased from 654 in 2022 to 1,139 in 2023. Both reporting years include leaks less than 10,000 ppm.

San Diego Gas & Electric (SDG&E)

SDG&E's 2023 emissions increased 8,249 Mscf or 3% from 250,505 Mscf in 2022 to 258,754 Mscf in 2023. Most of the increase can be attributed to the station leaks and emissions category in distribution M&R stations, which increased by 9,898 Mscf. For comparison, the category with the next largest increase was blowdowns in transmission pipelines, which was considerably less with 1,137 Mscf.

On the other hand, the All Damages category in Distribution Mains and Services Pipelines decreased by 1,138 Mscf.

Also, CPUC approved SDG&E's first 2015 baseline change, the approval letter can be found in Appendix A.

One methodology change occurred in the reporting of 2023 data, which includes leaks below 10,000 ppm in Transmission Compressor Stations's sub-categories Compressor and Component Fugitive Leaks.

The YOY changes in emissions or changes in inventory counts are summarized below by reporting category:

- Transmission Pipeline
 - For the Blowdowns category, the emissions increased 1,137 Mscf or 628% from 181 Mscf in 2022 to 1,318 Mscf in 2023.
 - SDG&E explained, “(t)he increase in emissions year-over-year can be attributed to one large blowdown that contributed approximately 1,200 Mscf.”
 - Staff noted a sum of 6,465 Mscf of methane abatement occurred in 2023.
- Transmission M&R Stations
 - For the Station Leaks & Emissions category, the emissions stayed the same at 21,792 Mscf in 2022 and 2023. Staff confirmed the number of transmission-to-transmission and transmission-to-distribution connections (14) and tap facilities (2) remained the same. These facilities' emissions are population based not leaker based and will not change unless the equipment or number of stations changes.
- Transmission Compressor Stations
 - For the Compressor and Component Fugitive Leaks category, the emissions decreased 78 Mscf or 13% from 580 Mscf in 2022 to 502 Mscf in 2023.
 - SDG&E explained, “(t)he decrease in emissions can be attributed to the continued efforts to detect and repair leaks >1,000 ppm during quarterly CARB Oil and Gas Rule surveys.”
 - Staff confirmed the decrease from 75 leaks in 2022 to 42 leaks in 2023. Both reporting years include leaks less than 10,000 ppm.
- Distribution Mains and Services Pipelines
 - For the Pipeline Leaks category, the emissions decreased 925 Mscf or 8% from 12,004 Mscf in 2022 to 11,079 Mscf in 2023.

- SDG&E explained, “(t)he year-over-year reduction in emissions can be attributed to the leveling of leak survey cycles. Leak surveys were increased from 5 to 3 years on protected steel and state of the art plastic during 2020, and 2023 is the first year that the cycles have leveled.”
- For the All Damages category, the emissions decreased 1,138 Mscf or 15% from 7,845 Mscf in 2022 to 6,707 Mscf in 2023.
 - SDG&E explained, “(t)he year-over-year decrease in emissions can be attributed to reductions in Excavation and Natural Force damages. SDG&E's Damage Prevention Program is helping to reduce excavation damages.”
 - Staff confirmed damage events decreased from 347 events in 2022 to 320 events in 2023.
- Distribution Metering and Regulating Stations
 - For the Station Leaks & Emissions (i.e. population-based category), the emissions increased 9,898 Mscf or 14% in emissions from 70,595 Mscf in 2022 to 80,493 Mscf in 2023.
 - SDG&E explained that “Emissions increased year-over-year because the station count increased and the emission estimates are completed using a Population-Based methodology.”
 - Staff confirmed of the number of stations increased from 463 stations in 2022 to 467 stations in 2023.
- Meter Set Assembly Systems
 - For the Meter Leaks (i.e. population-based category), the emissions increased 725 Mscf or 1% from 131,592 Mscf in 2022 to 132,317 Mscf in 2023.
 - SDG&E explained that “Emissions increased year-over-year because the number of meters increased, and the emission estimates are completed using a Population-Based methodology.”

Southwest Gas (SWG)

SWG's 2023 emissions decreased by 11,718 Mscf or 5% from 229,904 Mscf in 2022 to 218,187 Mscf in 2023. Staff noted that 2023 reported emissions increased by 3,872 Mscf or 3% above the 2015 Baseline. The majority of 2023 emissions are made up of the following:

- For the Station Leaks & Emissions category of Transmission M&R Stations (i.e., Population-Based category), Transmission-to-Transmission Interconnects (7) remained the same from the previous year, and emissions remained constant at 10,884 Mscf.
- In Distribution M&R Stations sub-category Station Leaks & Emissions, the emissions decreased by 11,370 Mscf or 6% from 186,793 Mscf in 2022 to 175,423 Mscf in 2023 due to the decrease in the station count from 230 stations in 2022 to 225 stations in 2023.
- In Customer Meters' sub-category Meter Leaks, the emissions increased 171 Mscf or 1% from 29,612 Mscf in 2022 to 29,783 Mscf in 2023 due to the increase in the meter count from 206,764 meters in 2022 to 207,645 meters in 2023.

Wild Goose Storage (WGS)

WGS's 2023 emissions decreased 243 Mscf or 3% from 7,392 Mscf in 2022 to 7,149 Mscf in 2023. The emissions come from the following Underground Storage sub-categories:

- Compressor Emissions decreased 55 Mscf or 4% from 2022 to 1,454 Mscf in 2023.
- Blowdown emissions decreased 915 Mscf or 21% from 4,423 Mscf in 2022 to 3,508 Mscf in 2023. The change was due to the number of blowdown events decreasing from 5 events in 2022 to 2 events in 2023.
- Compressor and Component Leak emissions increased by 727 Mscf or 55% from 1,334 Mscf in 2022 to 2,061 Mscf in 2023. WGS explained that they found "...leaks on pressure relief valve" using LDAR.

Gill Ranch Storage (GRS)

GRS's 2023 emissions decreased 59 Mscf or 1% from 4,368 Mscf in 2022 to 4,309 Mscf in 2023). The emissions come from the following Underground Storage sub-categories:

- Compressor Emissions increased 404 Mscf or 97% from 418 Mscf in 2022 to 822 Mscf in 2023. The change was due to increased pressurized operating hours from 2,901 hours in 2022 to 4,619 hours in 2023, along with an increased volume of natural gas injected into storage from 6.5 BCF in 2022 to 16.8 BCF in 2023.
- Blowdown emissions decreased 346 Mscf or 9% from 3,749 Mscf in 2022 to 3,403 Mscf in 2023. The change was due to the decrease in the count of blowdowns from 261 events in 2022 to 154 events in 2023.
- Component Fugitive Leaks emissions decreased 118 Mscf or 59% from 202 Mscf in 2022 to 84 Mscf in 2023. The change was due to the decrease in the average number of days leaking per leak from 214 days in 2022 to 89 days in 2023.

Lodi Gas Storage (LGS)

LGS's 2023 emissions increased 5,620 Mscf or 225% from 2,494 Mscf in 2022 to 8,114 Mscf in 2023. The emissions come from the following Transmission Pipelines and Underground Storage sub-categories:

Transmission Pipelines

- Blowdown emissions increased 393 Mscf or 4,367% from 9 Mscf in 2022 to 402 Mscf in 2023. The change was due to the increased number of blowdown events, going from 17 events in 2022 to 20 events in 2023, as well as increased emissions per event.

Underground Storage

- Storage Leaks & Emissions decreased by 447 Mscf or 100% from 448 Mscf in 2022 to 1 Mscf in 2023. The change was due to virtually all the 2022 emissions coming from a single leak.

- Blowdown emissions increased 214 Mscf or 196% from 109 Mscf in 2022 to 323 Mscf in 2023. The increase was due to blowdowns from preventative maintenance.
- Compressor Vented Emissions increased by 5,056 Mscf or 436% from 1,159 Mscf in 2022 to 6,215 Mscf in 2023. The change was due to an increase in the company specific emission factor for the pressurized operating states, increasing from around 200 scfh in 2022 to around 400 scfh in 2023. LGS also collaborated with Staff to re-evaluate the 2015 baseline for this category, which can be found in Appendix A.
- Component Fugitive Leaks emissions increased 404 Mscf or 53% from 769 Mscf in 2022 to 1,173 Mscf in 2023.

Central Valley Gas Storage (CVGS)

CVGS's 2023 emissions increased 289 Mscf or 67% from 432 Mscf in 2022 to 721 Mscf in 2023. The emissions mostly come from the following Underground Storage sub-categories:

- Compressor Vented Emissions increased 460 Mscf or 276% from 167 Mscf in 2022 to 627 Mscf in 2023. The change was due to the 28% increase in pressurized operating hours, from 15,893 hours in 2022 to 20,331 hours in 2023.
- Blowdown emissions decreased 171 Mscf or 70% from 244 Mscf in 2022 to 73 Mscf in 2023. Most of the emissions for this category in 2022 were from two emergency shutdown events totaling 238 Mscf. In contrast, 2023 had one emergency shutdown event totaling 25 Mscf.

West Coast Gas (WCG)

WCG's 2023 emissions decreased 53 Mscf or 21% from 257 Mscf in 2022 to 204 Mscf in 2023. The emissions mainly come from the following Distribution Mains and Services Pipeline sub-category:

- Pipeline Leaks emissions decreased by 53 Mscf or 84% from 63 Mscf in 2022 to 10 Mscf in 2023. The change was due to the decrease in the number of leaks found, from five leaks in 2022 to one in 2023.

Alpine Natural Gas (ANG)

ANG's 2023 emissions decreased 12 Mscf or 4% from 275 Mscf in 2022 to 263 Mscf in 2023. The emissions mainly come from the following Distribution Mains and Services Pipeline sub-category:

- Component Leaks emissions decreased 18 Mscf or 100% from 18 Mscf in 2022 to zero emissions in 2023. The change was due to finding one leak in 2022 and no leaks in 2023.

Summary of Natural Gas Emissions Grouped by Source Classification

As described in the Executive Summary, the natural gas emissions were grouped and evaluated by source classification, which has been useful for helping gas companies identify strategies to reduce emissions. For example, natural gas emissions reductions in Population-Based source classifications can only be achieved through reducing the number of pieces of equipment or changing how the emissions are measured (e.g. emissions factors). However, in other source classifications where discrete leaks are measured, natural gas emissions reductions can be achieved through strategies that reduce the number of leaks while keeping the same number of pieces of equipment.

Population-Based

Population-Based emissions are historically the largest source classification and in 2023 amounted to 1,130,172 Mscf. To provide a more detailed analysis of Population-Based emissions, Table 6 shows the four individual emission sources that are part of this source classification.

Population-Based emissions, which are calculated based on the number of units within a system category multiplied by an emission factor, stay constant unless a change is made to the number of units, the emission factor, or both. The categories of Customer Meters and Distribution M&R Stations have undergone significant changes by the larger utilities with their development of leak measurement methods, rather than population counts. Table 6 includes emissions from those categories that are still estimated by the population count method.

Table 6: Population-Based Natural Gas Emissions

System Category, Population-Based Emissions	2015 Baseline [Mscf]	2022 [Mscf]	2023 [Mscf]	2015 Baseline to 2023 Change		2022 - 2023 YOY Change	
				Mscf	% Change	Mscf	% Change
Transmission Pipelines, Pipeline Leaks	5,238	4,988	4,943	(295)	(6%)	(45)	(1%)
Transmission M&R Stations, Station Leaks & Emissions	711,797	702,154	706,757	(5,040)	(1%)	4,603	1%
Distribution M&R Stations, Station Leaks & Emissions	265,057	257,895	255,920	(9,137)	(3%)	(1,975)	(1%)
Customer Meters, Meter Leaks	153,832	161,653	162,522	8,720	6%	899	1%
Total Population-Based Emissions	1,135,924	1,126,690	1,130,172	(5,752)	(1%)	3,482	<1%

Graded Pipeline Leaks

The following source classification, Graded Pipeline Leaks, with emissions of 773,736 Mscf in 2023, is described later in the report in the section that analyzes the results of Distribution Mains and Services.

Leaker-Based

The third source classification, Leaker-Based emissions, includes only two categories applying this methodology. They are distribution meters, regulating stations, and customer meters, accounting for 752,226 Mscf in 2023, or 24% of the inventory.

Blowdowns

The fourth source classification with 148,496 Mscf in 2023 is Blowdowns. Table 7 shows Blowdown emissions by system category. Blowdowns experienced a 28% decrease of 58,690 Mscf from 2022. The reduction from the 2015 Baseline emissions of 454,889 Mscf or 75% is primarily due to project bundling and implementation of cross-compression practices, which move natural gas that would otherwise be vented to an adjacent pipeline.

Table 7: Blowdown Natural Gas Emissions							
System Category	2015 Baseline [Mscf]	2022 [Mscf]	2023 [Mscf]	2015 Baseline to 2023 Change		2022 - 2023 YOY Change	
				Mscf	% Change	Mscf	% Change
Transmission Pipeline	455,055	141,754	69,004	(386,051)	(85%)	(72,750)	(51%)
Transmission M&R Stations	65,582	2,961	7,350	(58,232)	(89%)	4,389	148%
Transmission Compressor Stations	31,088	39,745	50,169	19,081	61%	10,424	26%
Distribution Mains and Services	5,046	569	1,503	(3,543)	(70%)	934	164%
Distribution M&R Stations	256	372	420	164	64%	48	13%
Underground Storage	46,358	21,785	20,050	(26,308)	(57%)	(1,735)	(8%)
Total	603,385	207,186	148,496	(454,889)	(75%)	(58,690)	(28%)

Vented Emissions

The fifth largest source classification with 180,104 Mscf in 2023 is Vented Natural Gas Emissions. Table 8 shows the detailed composition of Vented emissions. This classification includes the controlled release of natural gas from pneumatic devices (e.g., compressors, valves and meters) across the transmission, storage, and distribution stages.

Table 8: Vented Natural Gas Emissions							
System Category	2015 Baseline [Mscf]	2022 [Mscf]	2023 [Mscf]	2015 Baseline to 2023 Change		2022 – 2023 YOY Change	
				Mscf	% Change	Mscf	% Change
Transmission Pipelines, Components, Vented	44,095	30,529	30,411	(13,684)	(31%)	(118)	(<1%)
Transmission Pipelines, Odorizers	2,570	3,137	3,117	547	21%	(20)	(1%)
Transmission Compressors Stations, Compressors	106,257	22,737	23,789	(82,468)	(78%)	1,052	5%
Transmission Compressors Stations, Components, Vented	15,360	23,006	23,997	8,637	56%	991	4%
Customer Meters, Vented	2,363	1,619	942	(1,421)	(60%)	(677)	(42%)
Underground Storage, Compressors	98,597	8,344	12,273	(83,324)	(85%)	6,929	83%
Underground Storage, Components, Vented	95,084	82,087	82,571	(12,513)	(13%)	(236)	(<1%)
Underground Storage, Dehydrator Vented	13	0	4	(9)	(69%)	4	N/A
Total	364,339	172,179	180,104	(184,235)	(51%)	7,925	5%

All Damages

The next category, All Damages, decreased by 42,161 Mscf or 23% from 187,032 Mscf in 2022 to 144,871 Mscf in 2023. This includes damages from individuals and construction companies to transmission pipelines, distribution pipelines, and customer meters. In their best practices submittal, gas companies mentioned that they conduct communication and educational campaigns to encourage individuals to contact the company before digging.

Other Leaks

The final source classification, Other Leaks, increased 16,256 Mscf or 54% from 30,139 Mscf in 2022 to 46,395 Mscf in 2023. This category includes Component Leaks and Storage Leaks in Transmission Compressor Stations and Underground Storage.

Detailed Natural Gas Emissions

Natural Gas Emissions by System Category, Emission Source, and Source Classification

Table 9 summarizes and compares the 2015 Baseline, 2022, and 2023 natural gas emissions by system category, emission source, and source classification. In some cases, “N/A” is designated to show under a reporting year that the category was not available due to not being part of the template at that time. In other cases, “N/A” is used under the four rightmost columns to show that the emission total or percent change could not be calculated due to division by zero or because a category was not part of the template.

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Table 9: Natural Gas Emissions by System Category, Emission Source, and Source Classification

System Category	Emission Source	Source Classification	2015 Baseline	2022	2023	2015 Baseline to 2023 Change		2022 - 2023 YOY Change	
			Mscf	Mscf	Mscf	Mscf	%	Mscf	%
Transmission Pipelines	Pipeline Leaks	Population-Based	5,238	4,988	4,943	(295)	(6%)	(45)	(1%)
	All Damages	Damages	81,793	27,234	9,265	(72,528)	(89%)	(17,969)	(66%)
	Blowdowns	Blowdown	455,055	141,754	69,004	(386,051)	(85%)	(72,750)	(51%)
	Component V. Emissions	Vented	44,095	30,529	30,411	(13,684)	(31%)	(118)	(<1%)
	Odorizers	Vented	2,570	3,137	3,117	547	21%	(20)	(1%)
Transmission M&R Stations	Station Leaks & Emissions	Population-Based	711,797	702,154	706,757	(5,040)	(1%)	4,603	1%
	Blowdowns	Blowdown	65,582	2,961	7,350	(58,232)	(89%)	4,389	148%
Transmission Compressor Stations	Compressor Emissions	Vented	106,257	22,737	23,789	(82,468)	(78%)	1,052	5%
	Blowdowns	Blowdown	31,088	39,745	50,169	19,081	61%	10,424	26%
	Component Ven. Emissions	Vented	15,360	23,006	23,997	8,637	56%	991	4%
	Component Fugitive Leaks	Other Leaks	34,090	10,300	14,685	(19,405)	(57%)	4,385	43%
	Storage Tank Leaks & Emissions	Other Leaks	278	165	170	(108)	(39%)	5	3%
Distribution Mains & Services	Pipeline Leaks	Pipeline Leaks	1,235,602	786,574	773,736	(461,866)	(37%)	(12,838)	(2%)
	All Damages	Damages	230,912	137,967	112,671	(118,241)	(51%)	(25,296)	(18%)
	Blowdowns	Blowdown	5,046	569	1,503	(3,543)	(70%)	934	164%
	Component Fugitive Leaks	Other Leaks	0	18	0	18	N/A	(18)	(100%)
Distribution M&R Stations	Station Leaks & Emissions	Population-Based	265,057	257,895	255,920	(9,137)	(3%)	(1,975)	(1%)
	Station Leaks & Emissions	Leaker-Based	18,671	10,272	8,905	(9,766)	(52%)	(1,367)	(13%)
	Blowdowns	Blowdown	256	372	420	164	64%	48	13%
Customer Meters	Meter Leaks	Population-Based	153,832	161,653	162,552	8,720	6%	899	1%
	Meter Leaks	Leaker-Based	972,061	715,801	743,321	(228,740)	(24%)	27,520	4%
	All Damages	Damages	5,233	21,831	22,935	17,702	>100%	1,104	5%
	Vented Emissions	Vented	2,363	1,619	942	(1,421)	(60%)	(677)	(42%)
Underground Storage	Storage Leaks & Emissions	Other Leaks	5,182	2,780	3,503	(1,679)	(32%)	723	26%
	Compressor Emissions	Vented	98,597	8,344	15,273	(83,324)	(85%)	6,929	83%
	Blowdowns	Blowdown	46,358	21,785	20,050	(26,308)	(57%)	(1,735)	(8%)
	Component Ven. Emissions	Vented	95,084	82,807	82,571	(12,513)	(13%)	(236)	(<1%)
	Component Fugitive Leaks	Fugitive	107,572	16,876	28,037	(79,535)	(74%)	11,161	66%
	Dehydrator Ven. Emissions	Vented	13	0	4	(9)	(69%)	4	N/A
Total			4,795,043	3,235,872	3,176,000	(1,619,043)	(34%)	(59,873)	(2%)

Description of the Seven System Categories

Transmission Pipelines

PG&E, SoCalGas, SDG&E, LGS, and CVGS reported Transmission Pipeline emissions. The total emissions decreased 90,902 Mscf or 44% from 207,642 Mscf in 2022 to 116,740 Mscf in 2023, with most of the decrease attributed to reductions in blowdown emissions.

- Pipeline Leaks decreased by 45 Mscf from 4,988 Mscf in 2022 to 4,943 Mscf in 2023. Typically, emissions for this category have remained constant because the emissions are based on the miles of transmission pipelines, which does not vary much YOY.
- In 2023, All Damages decreased by 17,969 Mscf or 66% from 27,234 Mscf in 2022 to 9,265 Mscf in 2023. These emissions are event-based and can fluctuate significantly YOY.
- Blowdowns showed a YOY reduction of 72,750 Mscf or 51% from 141,754 Mscf in 2022 to 69,004 Mscf in 2023. There are several factors affecting blowdowns and the potential for YOY fluctuations, including the cyclical nature of O&M; the ability to bundle projects; the amount of pipeline replacement; the size, length and pressure of the pipelines affected; and the number of safety events occurring.
- Component Vented Emissions decreased by 118 Mscf from 30,529 Mscf in 2022 to 30,411 Mscf in 2023.
- Odorizer emissions remained relatively constant with 3,137 Mscf in 2022 and 3,117 Mscf in 2023.

Table 10: Transmission Pipelines Natural Gas Emissions								
Source	2015 Baseline		2022		2023		2022 - 2023 YOY Change	
	Mscf	% Total	Mscf	% Total	Mscf	% Total	Mscf	% Change
Pipeline Leaks	5,238	1%	4,988	2%	4,943	4%	(45)	(1%)
All Damages	81,793	14%	27,234	13%	9,265	8%	(17,969)	(66%)
Blowdowns	455,055	77%	141,754	68%	69,004	59%	(72,750)	(51%)
Component Vented Emissions	44,095	7%	30,529	15%	30,411	26%	(118)	(<1%)
Odorizers	2,570	<1%	3,137	2%	3,117	3%	(20)	(1%)
Total	588,751	100%	207,642	100%	116,740	100%	(90,902)	(44%)

Transmission M&R Stations

PG&E, SoCalGas, SDG&E, SWG, and CVGS reported total Transmission M&R Stations emissions of 714,107 Mscf in 2023. This system category is largely Population-Based, except for the blowdowns, which are activity-based.²⁹

²⁹ Population-Based emissions in this category are calculated based on the number of Transmission M&R stations multiplied by an EF to obtain the emission estimate.

- Station Leak & Emissions increased 4,603 Mscf or 1% from 702,154 Mscf in 2022 to 706,757 Mscf in 2023.
- In 2023, Blowdowns increased 4,389 Mscf or 148% YOY from 2,961 Mscf in 2022 to 7,350 Mscf in 2023.

Table 11: Transmission M&R Stations Natural Gas Emissions								
Source	2015 Baseline		2022		2023		2022 - 2023 YOY Change	
	Mscf	% Total	Mscf	% Total	Mscf	% Total	Mscf	% Change
Station Leaks & Emissions	711,797	92%	702,154	99%	706,757	99%	4,603	1%
Blowdowns	65,582	8%	2,961	<1%	7,350	1%	4,389	148%
Total	777,379	100%	705,115	100%	714,107	100%	8,992	1%

Transmission Compressor Stations

PG&E, SoCalGas, and SDG&E reported 2023 total Transmission Compressor Station emissions of 112,810 Mscf, which is an 16,857 Mscf or 16% increase from 2022 emissions of 95,953 Mscf.

- Compressor Emissions increased by 1,052 Mscf or 5% YOY from 22,737 Mscf in 2022 to 23,789 Mscf in 2023. The decrease in emissions is due to variances in pressurized operating hours and compressor-specific emission factors.
- In 2023, Blowdowns increased by 10,424 Mscf or 26% from 39,745 Mscf in 2022 to 50,169 Mscf in 2023.
- Component Vented Emissions increased by 991 Mscf or 4% from 23,006 Mscf in 2022 to 23,997 Mscf in 2023.
- Compressor and Component Fugitive Leaks increased by 4,385 Mscf, or 43% from 10,300 Mscf in 2022 to 14,685 Mscf in 2023. Compressor and Component Leaks are further described in the section, “Impacts of CARB’s Oil and Gas Methane Regulation.”
- Storage Tank Leaks and Emissions increased by 5 Mscf, from 165 Mscf reported in 2022 to 170 Mscf in 2023.

Table 12: Transmission Compressor Stations Natural Gas Emissions								
Source	2015 Baseline		2022		2023		2022 - 2023 YOY Change	
	Mscf	% Total	Mscf	% Total	Mscf	% Total	Mscf	% Change
Compressor Emissions	106,257	60%	22,737	24%	23,789	21%	1,052	5%
Blowdowns	31,088	18%	39,745	41%	50,169	44%	10,424	26%
Component Vented Emissions	15,360	9%	23,006	24%	23,997	21%	991	4%
Compressor and Component Fugitive Leaks	24,090	14%	10,300	11%	14,685	13%	4,385	43%
Storage Tank Leaks & Emissions	278	<1%	165	<1%	170	<1%	5	3%
Total	177,073	100%	95,953	100%	112,810	100%	16,857	18%

Distribution Mains & Services

PG&E, SoCalGas, SDG&E, SWG, and WCG reported total Distribution M&S Emissions of 887,910 Mscf in 2023, which is a decrease of 37,200 Mscf or 4% from 925,110 Mscf in 2022.

- Pipeline Leaks decreased 12,838 Mscf or 2% from 786,574 Mscf in 2022 to 773,736 Mscf in 2023. This category is the single largest category in the whole inventory and is further described in the section below, “Detailed Description of Distribution Mains and Services Leaks and Emissions.”
- All Damages decreased by 25,296 Mscf from 137,967 Mscf in 2022 to 112,671 Mscf in 2023.
- Blowdowns increased 934 Mscf or 164% from 569 Mscf reported in 2022 to 1,503 Mscf reported in 2023.
- Lastly, Component Fugitive Leaks showed a decrease of 18 Mscf in 2022 to no emissions in 2023.

Source	2015 Baseline		2022		2023		2022 - 2023 YOY Change	
	Mscf	% Total	Mscf	% Total	Mscf	% Total	Mscf	% Change
Pipeline Leaks	1,235,602	84%	786,574	85%	773,736	87%	(12,838)	(2%)
All Damages	230,912	16%	137,967	15%	112,671	13%	(25,296)	(18%)
Blowdowns	5,046	<1%	569	<1%	1,503	<1%	934	164%
Component Fugitive Leaks	0	0%	18	<1%	0	0%	(18)	(100%)
Total	1,471,560	100%	925,110	100%	887,910	100%	(37,200)	(4%)

Detailed Description of Distribution Mains and Services Leaks and Emissions

The data provided by gas companies include leak discovery date, repair date, leak grade, pipeline classification as either main or service, pipeline material, method of discovery, and emissions calculation.

Table 14 shows the count of each leak grades 1 – 3, Above Ground Hazardous leaks, and Above Ground Non-Hazardous leaks. Grade 3 leaks make up 82% of the Distribution mains and services leaks inventory that is not repaired by the end of the year. A significant amount of the grade 3 leaks carryover from previous years. In addition, PG&E uses an approved protocol where it prioritizes the repair of its “Super Emitters” to maximize the emissions reduction and as a result more grade 3 leaks are carried over to subsequent years.

Leak Grade	Carried Over from 2022	Discovered in 2023	Repaired in 2023	Estimated Un-surveyed	Remaining Total	% of Total
Grade 1	130	7,118	(7,046)	N/A	202	1%
Grade 2	1,852	5,581	(4,442)	N/A	2,991	17%
Grade 3	12,804	8,288	(6,268)	N/A	14,824	82%
Above Ground – Hazardous	0	0	0	0	0	0%
Above Ground - Non-Hazardous	0	0	0	0	0	0%
Total	14,786	20,987	(17,756)	0	18,017	100%

For further analysis on the repairing of the leaks, Table 15 shows the average days to repair per gas company and per grade, along with a weighted average for 2023.

As shown on Table 15, the Grade 1 leaks are repaired quickly, taking a weighted average of two days to fix. Grade 2 leaks show more variability across the four gas companies with a range from 10 to 182 days to repair, with a weighted average of 163 days to repair. Finally Grade 3 leaks show the most variability with a range from 58 to 957 days to repair, and a weighted average of 420 days to repair.

Table 15: Average Days to Repair by Gas Company, 2023			
Entity	Average Repair Days		
	Grade 1	Grade 2	Grade 3
Pacific Gas & Electric	3	170	957
Southern California Gas	1	182	257
San Diego Gas & Electric	1	20	N/A
Southwest Gas	0	10	58
2023 - Weighted Average	2	163	420

Distribution M&R Stations

PG&E, SoCalGas, SDG&E, SWG, and ANG reported 2023 total emissions in this category of 265,245 Mscf, which decreased by 3,294 Mscf or 1% from the 268,539 Mscf reported in 2022 (see Table 16).

- The Station Leaks & Emissions is a Population-Based category for SDG&E and SWG and decreased 1,975 Mscf or 1% from 257,895 Mscf in 2022 to 255,920 Mscf in 2023.
- PG&E and SoCalGas reported Station Leaks & Emissions using Leaker-Based methodologies, which showed a decrease 1,367 Mscf or 13% from 10,272 Mscf in 2022 to 8,905 Mscf in 2023.
- The Blowdowns emission increased by 48 Mscf or 13% from 372 Mscf reported in 2022 to 420 Mscf in 2023.

Table 16: Distribution M&R Stations Natural Gas Emissions

Source	2015 Baseline		2022		2023		2022 - 2023 YOY Change	
	Mscf	% Total	Mscf	% Total	Mscf	% Total	Mscf	% Change
Station Leaks & Emissions, Population-Based	265,057	93%	257,895	96%	255,920	96%	(1,975)	(1%)
Station Leaks & Emissions, Leaker-Based	18,671	7%	10,272	4%	8,905	3%	(1,367)	(13%)
Blowdowns	256	<1%	372	<1%	420	<1%	48	13%
Total	283,984	100%	268,539	100%	265,245	100%	(3,294)	(1%)

Customer Meters

PG&E, SoCalGas, SDG&E, SWG, WCG, and ANG reported Customer Meter emissions totaling 929,749 Mscf in 2023, which increased by 28,845 Mscf or 3% from 900,904 Mscf in 2022.

- Meter Leaks reported using Population-Based methods, as reported by ANG, SDG&E, SWG, and WCGC increased by 899 Mscf or 0.6% from 161,653 Mscf in 2022 to 162,552 Mscf in 2023.
- Meter Leaks reported using Leaker-Based methods, as reported by PG&E and SoCalGas increased by 27,520 Mscf or 4% from 715,801 Mscf in 2022 to 743,321 Mscf in 2023.
- The All Damages category was not part of the 2015 reporting but was added in 2019. This category increased by 1,104 Mscf or 5% from 21,831 Mscf in 2022 to 22,935 Mscf in 2023.
- Vented Emissions decreased by 677 Mscf or 42% YOY from 1,619 Mscf in 2022 to 942 Mscf in 2023. These blowdown emissions are a function of O&M activity levels and vary YOY due to a variety of repair work and maintenance performed on Customer Meters.

Table 17: Customer Meters Natural Gas Emissions								
Source	2015 Baseline		2022		2023		2022 - 2023 YOY Change	
	Mscf	% Total	Mscf	% Total	Mscf	% Total	Mscf	% Change
Meter Leaks, Population-Based	153,832	14%	161,653	18%	162,552	17%	899	1%
Meter Leaks, Leaker-Based	972,061	86%	715,801	79%	743,321	80%	27,520	4%
All Damages	5,233	<1%	21,831	2%	22,935	2%	1,104	5%
Vented Emissions	2,363	<1%	1,619	<1%	942	<1%	(677)	(42%)
Total	1,133,489	100%	900,904	100%	929,749	100%	28,846	3%

Underground Storage

PG&E, SoCalGas, CVGS, GRS, LGS, and WGS reported Underground Storage systems emissions for 2023. As seen in Table 18 below, Underground Storage emissions increased by 16,846 Mscf or 13% from 132,592 Mscf in 2022 to 149,438 Mscf in 2023.

- Storage Leaks and Emissions increased by 723 Mscf or 26% from 2,780 Mscf in 2022 to 3,503 Mscf in 2023. This emission source is further described in the section, “Impacts of CARB’s Oil and Gas Methane Regulation.”
- Compressor Emissions increased by 6,929 Mscf or 83% from 8,344 Mscf in 2022 to 15,273 Mscf in 2023.
- Blowdown emissions decreased by 1,735 Mscf or 8% from 21,785 Mscf in 2022 to 20,050 Mscf in 2023.
- Component Vented Emissions remained relatively constant with a decrease of 236 Mscf or less than 1% from 82,807 Mscf in 2022 to 82,571 Mscf in 2023.
- Compressor and Component Fugitive Leaks increased by 11,161 Mscf or 66% from 16,876 Mscf in 2022 to 28,037 Mscf in 2023. The component leaks sub-category is further described in the 2021 Joint Report section, “Impacts of CARB’s Oil and Gas Methane Regulation.”
- Dehydrator Vented Emissions increased 4 Mscf or 100% from zero emissions in 2022 to 4 Mscf in 2023.

Table 18: Underground Storage Natural Gas Emissions								
Source	2015 Baseline		2022		2023		2022 - 2023 YOY Change	
	Mscf	% Total	Mscf	% Total	Mscf	% Total	Mscf	% Change
Storage Leaks & Emissions	5,182	2%	2,780	2%	3,503	2%	723	26%
Compressor Emissions	98,597	28%	8,344	6%	15,273	10%	6,929	83%
Blowdowns	46,358	13%	21,785	16%	20,050	13%	(1,735)	(8%)
Component Vented Emissions	95,084	27%	82,807	62%	82,571	55%	(236)	(<1%)
Compressor and Component Fugitive Leaks	107,572	30%	16,876	13%	28,037	19%	11,161	66%
Dehydrator Vented Emissions	13	<1%	0	0%	4	0%	0	N/A
Total	352,806	100%	132,592	100%	149,438	100%	16,846	13%

Unusual Large Leaks

There were no unusual large leaks reported in 2023. For this category, the 2019 Winter Workshop included a review of the definition for categorizing this type of emission, and it was determined that each discrete event depends on situational factors that should be reviewed and evaluated for inclusion in Unusual Large Leaks.

Lessons Learned and Conclusion

Lessons Learned

In 2024, Staff worked with gas companies to evaluate and approve emission estimation methodologies and adjustments to the 2015 Baseline emissions, refine the reported annual data, and determine YOY changes in emissions. Processes for the submittal and review of the annual reported data collection were the same as previous years. As in prior years, there were lessons learned from this year's submittal and review process, some of which include:

- Staff asked that beginning in 2024, utilities submit a proposal for 2015 Baseline adjustments by certain scheduled dates. To eliminate the need for continuous meetings spanning multiple years, Staff also laid out dates for review and a final decision on the requested adjustments. This process was initiated at the 2024 Winter Workshop and has proven effective thus far. Staff received three proposals from April through June 2024, discussed them from April through August, and resolved these in September and October.
- Methodologies to estimate emissions continue to improve and methods based on the population size of components and associated emission factors are being replaced as these improved methods are developed. To fully evaluate and approve such proposals, Staff require gas companies to provide comprehensive descriptions and justifications for proposals related to new or revised emission estimation methodologies and adjustments to baseline emissions. As appropriate, justifications include supporting data, calculation files, and field documentation.
- As data come in, Staff continue to find improvements to the reporting templates and in data reported processes. Staff will aim to finalize all template revisions by the issue date of March 31, 2025, to minimize multiple template updates.
- Staff continue to see different interpretations of reporting requirements. Staff aim to clarify requirements within the reporting templates and in the responses to the accompanying survey questionnaire.

The 2025 Winter Workshop will be the appropriate venue for further collaboration and discussion among CPUC, CARB, and gas companies on the following topics:

- The current formula for “Compressor and Component Fugitive Leaks” in the Transmission Compressor Stations and Underground Storage Appendices allows leak durations to exceed 365 days. Staff will: (1) Provide guidance by including a note in the template to not allow leaks to exceed a duration of 365 days, (2) revise the template to include additional columns, and (3) develop an EXCEL formula without nested IF functions.
- Regarding the utilities data submittals for “Compressor Vented Emissions,” in both the Transmission Compressor Stations and Underground Storage categories, one utility entered a

quantity under the column header “ID” while other gas companies entered a description. Staff propose replacing the column header “ID” with “Quantity.”

- For “Compressor Vented Emissions,” in both the Transmission Compressor Stations and Underground Storage, Staff propose (1) adding a note to specify the ID should include the initials of the facility name along with the unit number, or (2) the zip code column should include the full facility name.
- Update the “Distribution Mains and Services, Summary” worksheet to remove unnecessary fields or to designate them as optional.
- Revise the “Leak Rate Data” worksheet categories with more descriptive names. Discuss an alternative to “Total Annual Volume of Gas Used by the Gas Department” to omit the phrase “by the Gas Department” for the on-site usage.

Conclusion

CPUC and CARB Staff continue to work together with gas companies to provide for the public the total estimated natural gas emissions associated with fugitive leaks and vented emissions from the natural gas transmission and distribution system in California and the system-wide natural gas leak rate while maintaining safety as the highest priority, as ordered by the CPUC decision approving the Natural Gas Leak Abatement Program, consistent with Senate Bill 1371 (D.17-06-015).

Total reductions in the 2023 estimated natural gas emissions resulted from the application of best practices, the COGR, and changes in the reporting templates. The NGLA program successfully focused resources that resulted in positive emissions reductions to date of 34% from the 2015 Baseline and is on track to achieve the net 40% reductions by 2030.

Appendices

Appendix A: California Public Utilities Commission/Safety Policy Division Approval of Adjusted 2015 Baseline Emissions

In the current reporting year, Southern California Gas (SoCalGas), San Diego Gas & Electric (SDG&E) and Lodi Gas Storage (LGS) proposed adjustments to the 2015 Baseline to account for improved methodologies, emission factor (EF) updates, and other adjustments that are needed to allow for a direct comparison of 2015 Baseline emissions with current-year emissions estimates. CPUC and CARB worked collaboratively with SoCalGas, SDG&E, and LGS to evaluate their proposed adjustments. On September 23, 2024, CPUC sent the first approval letter to SoCalGas approving several adjustments to their 2015 Baseline emissions. Following this, CPUC sent the second and third approval letters to LGS and SDG&E on September 26, 2024, and October 22, 2024, respectively, approving adjustments to their 2015 Baseline emissions.

CPUC/SPD's letters approving the adjusted 2015 Baseline emissions for SoCalGas, LGS, and SDG&E are provided in Sections A.1, A.2 and A.3, respectively, of this appendix.

A.1 CPUC/SPD Letter Approving Adjusted Emission Factors and 2015 Baseline Emissions for SoCalGas

Safety Policy Division
Approval of Adjusted 2015 Baseline Emissions for Southern California Gas Company.
SB 1371, R.15-01-008

September 20, 2024

1. Background

Decision (D.)19-08-020 specified that the California Public Utilities Commission's (CPUC) Safety Enforcement Division (SED), in consultation with the California Air Resources Board (CARB), may approve adjustments to the utilities' emission factors (EFs) and 2015 Baseline Emission Levels for the purpose of measuring emission reduction performance. The CPUC's Safety Policy Division (SPD) has inherited this responsibility from SED.

2. Introduction

Over the course of the Natural Gas Leak Abatement (NGLA) Program, SPD has approved adjustments to the 2015 Baseline Emission Levels to align the baseline with evolving measurement and reporting methods. The current adjustments are a continuation of that process, involving four system categories (i.e., Appendices 3, 4, 6, and 7) reported by Southern California Gas Company (SoCalGas), as shown below. SoCalGas has also proposed an emission factor (EF) change for approval.

In the following tables and discussion, the term “Mscf” is an abbreviation for thousand standard cubic feet of gas, and “scfh-NG” means standard cubic feet per hour of natural gas.

3. Summary of the 2015 Baseline Emission Level Adjustments

Appendix No.	System Category	Emission Source Category	Current 2015 Baseline Emissions (Mscf)	Adjusted 2015 Baseline Emissions (Mscf)
3	Transmission Compressor Stations	Component Fugitive Leaks	10,784	13,650
4	Distribution Main and Services Pipeline	Pipeline Leaks	576,261	719,581
6	Customer Meters	Meter Leaks	415,362	726,154
7	Underground Storage	Compressor and Component Fugitive Leaks	21,989	30,474

4. Summary of Emission Factor Adjustments

Appendix No.	System Category	Emission Source Category	Current Emission Factor (scfh-NG)	Adjusted Emission Factor (scfh-NG)
3	Customer Meters	Meter Leaks	0.2824	0.3460

5. Explanation of Adjustments

A. Appendix 3 – Transmission Compressor Stations – Component Fugitive Leaks Baseline

SoCalGas is currently approved to use a baseline of 10,784 Mscf, based on reported data of all Appendix 3 Component Fugitive Leaks with concentration measurements of 10,000 ppm (parts per million) or greater in Emission Year 2018 (i.e., the first year SoCalGas began reporting such data per the CARB Oil and Gas Regulation). In 2020, this regulation was expanded to include leaks with concentration measurements of less than 10,000 ppm.

The NGLA program has correspondingly expanded its reporting requirement to include leaks with concentration measurements of less than 10,000 ppm. In response, SoCalGas submitted a proposal and dataset on April 30, 2024, to adjust the reported baseline to also include leaks of concentrations less than 10,000 ppm. Because SoCalGas did not have data for the lower concentration leaks from 2018 available, it proposed to use Emission Year 2020 data for leaks less than 10,000 ppm and continue to use Emission

Year 2018 data for leaks of 10,000 ppm or greater. As such, the proposed baseline will be the result of the following sum:

$$\text{Baseline} = (\text{Leaks} \geq 10,000 \text{ ppm})_{\text{EY 2018}} + (\text{Leaks} \geq 10,000 \text{ ppm})_{\text{EY 2020}}$$

Following concerns stated by SPD and CARB regarding apparent duplicates in the leak data, SoCalGas provided an updated dataset on August 30, 2024, that removed potential duplicates, resulting in a final baseline proposal of 13,650 Mscf.

SPD finds SoCalGas' request reasonable and approves the change of the 2015 baseline for Transmission Compressor Stations - Component Fugitive Leaks from 10,784 Mscf to 13,650 Mscf.

B. Appendix 4 – Distribution Main & Services Pipeline – Pipeline Leaks Baseline

SoCalGas is currently approved to use a baseline of 576,261 Mscf, based on reported data of Pipeline Leaks from Emission Year 2015. In the leaker-based methodology, leaks can be identified as either “O&M” (Operations and Maintenance) or “Survey,” based on their discovery method. These discovery methods impact emissions reporting by determining the date from which the leak is considered open, as well as the unknown leaks calculation.

During the 2024 NGLA Winter Workshop, SPD and CARB provided clarification on what kinds of leaks should be classified as discovered by O&M or by Survey activities, that differed from the existing definition. PG&E and SoCalGas also jointly proposed a similar clarification at the same workshop. SoCalGas submitted a reclassified data set and baseline change proposal on April 30, 2024, to comply with the clarification. The effect is to change the classification of many O&M leaks to Survey leaks, which increases the assumed leak duration and thus the emissions estimate. The baseline adjustment also incorporates a correction to the Appendix 4 emission factor, which had not yet been applied to the 2015 dataset but was already in use for current year reports.

During review of the April 30, 2024, 2015 baseline leak dataset, CPUC and CARB identified potentially anomalous entries and referred them to SoCalGas for review and correction. SoCalGas submitted a corrected dataset on August 19, 2024. The correction changes the existing baseline of 576,261 Mscf to a new baseline of 719,581 Mscf.

SPD finds SoCalGas' request reasonable and approves the change of the 2015 baseline for Distribution Main & Services Pipeline – Pipeline Leaks from 576,261 Mscf to 719,581 Mscf.

C. Appendix 6 – Customer Meters – Meter Leaks Emission Factor

Starting in 2022, SoCalGas replaced the existing population-based leak estimation approach with a leaker-based methodology for the Meter Leaks section of Appendix 6 – Customer Meters. This methodology leverages existing categorizations required by the Pipeline and Hazardous Materials Safety Administration (PHMSA) of a leak on a meter set assembly as either “hazardous” or “non-hazardous,” and applies an EF to every identified leak based on this categorization. The method was developed

from an extensive study which has recently been published in the Environmental Science and Technology³⁰ journal.

SoCalGas has been using a Non-Hazardous EF of 0.2824 scfh (standard cubic feet per hour) based on its original EF study. However, SoCalGas later determined that the EF calculation had included erroneous data and needed to be corrected. On September 12, 2023, SoCalGas submitted a proposal to update the Non-Hazardous EF to 0.346 scfh, referencing an updated version of the EF study report, and explaining that the calculations to obtain the original EF had incorrectly included “Non-Detected” leak sample data.

SPD finds SoCalGas’ request reasonable and approves the change of the AG Non-Hazardous Emission Factor for Customer Meters – Meter Leaks from 0.2824 scfh to 0.346 scfh.

D. Appendix 6 – Customer Meters – Meter Leaks Baseline

SoCalGas is currently approved to use a meter set assembly (MSA) interim baseline of 415,362 Mscf, based on the 2021 leak data, which was the year SoCalGas began use of the leaker-based methodology. In initial communications on the possibility of a baseline supported by 2015 leak data, SoCalGas indicated that it could not extract sufficient data from 2015 to establish a baseline. As the next best option, on July 15, 2022, SoCalGas submitted an extraction of 2016 MSA data, intended to support extrapolation back to an estimated 2015 baseline.

On September 9, 2022, SPD and CARB staff informed SoCalGas of data quality issues identified within the July 15, 2022, submission. In response, SoCalGas revised its database extraction and QA/QC procedures and submitted a revised data set and an updated baseline change request on November 16, 2022. In the request, SoCalGas indicated that its improved data extraction process had produced a complete 2015 dataset from which a baseline could be determined, eliminating the previous need to perform an extrapolation from 2016 data.

On November 18, 2022, SPD and CARB staff identified data quality concerns related to the November 16, 2022, submission. On March 7, 2023, SoCalGas responded by submitting a revised data set to address those data quality concerns.

CARB and SPD evaluated the March 7, 2023, submission and identified a concern with the way leaks had been classified by discovery method (whether found from a survey, or from operations and maintenance “O&M” activity), which is an important part of the leaker-based method of estimating emissions from identified leaks. This concern was discussed with SoCalGas, who had also become aware of the possibility of errors from the definition of leak discovery type. The reason is that in the leaker-based method, leaks can be identified as either “O&M” or “Survey”, based on their discovery method. These discovery methods impact emissions reporting by establishing the date from which the leak is considered open, as well as the estimation of unknown leaks.

³⁰ Env. Sci. and Tech. Volume 58, Issue 16. April 5, 2024, [Development of Company-Specific Emission Factors with Confidence Intervals for Natural Gas Customer Meters in Southern California.](#)

During the 2024 NGLA Winter Workshop, SPD and CARB provided clarification on what should be classified as an O&M or Survey leak. At the same workshop, SoCalGas and PG&E jointly presented their proposal for a similar change in the discovery method definition. In response to the classification change, SoCalGas submitted an updated data set and a request for a baseline change on February 21, 2024, proposing a new baseline of 726,154 Mscf.

While considering the February 21, 2024, baseline change proposal, SPD and CARB expressed concern that there could be accuracy problems with the extracted 2015 data, since there had been some data quality issues identified with previous submittals. SoCalGas' proposal asserted that it had resolved all previously identified issues, but for additional vetting SoCalGas chose to engage Trinity Consultants (Trinity) to audit its data submission. Trinity followed ISO (International Organization for Standardization) protocols to perform an audit using a statistical sampling of the data in the Appendix 6 dataset. Trinity's audit provided reasonable assurance that the reporting of leaks found by survey and by O&M practices agreed with the underlying data and that the emissions estimates were reasonable.

Another concern with the SoCalGas data has been the proportion of O&M leaks, since the leaker-based method considers them to be a small number, while the SoCalGas proportion has been about 35 percent from 2015 to present. The issue is that O&M leaks are assumed to have started leaking from the date of discovery, since they are based on odor reports from customers, rather than from the first of the year, as is done for leaks discovered by survey. Some O&M leaks may certainly have been leaking for a longer time than from the date called in by a customer, but it would be a larger error to assume they had been leaking from the first of the year.

With the above considerations in mind, SPD determined that the data provided in the February 21, 2024, proposal is of sufficient quality from which to construct a baseline.

SPD finds SoCalGas' request reasonable and approves the change of the 2015 base for Distribution Main & Services Pipeline – Pipeline Leaks from 415,362 Mscf to 726,154 Mscf.

E. Appendix 7 – Underground Storage – Compressor and Component Fugitive Leaks Baseline

SoCalGas currently uses a baseline of 21,989 Mscf, based on the 2018 reported data of Appendix 7, Compressor and Component Fugitive Leaks, with concentration measurements of 10,000 ppm or greater (2018 is the first year SoCalGas began reporting such data per the CARB Oil and Gas Regulation). In 2020, the regulation was expanded to include leaks with concentration measurements of less than 10,000 ppm.

The NGLA program correspondingly expanded its reporting requirement to include leaks with concentration measurements of less than 10,000 ppm. In response, SoCalGas submitted a proposal on April 30, 2024, to adjust the reported baseline to include leaks of concentrations less than 10,000 ppm. Because SoCalGas did not have data for that category of leaks from 2018 available, it proposed to use the first year available, Emission Year 2020, data for leaks less than 10,000 ppm and continue to use Emission Year 2018 data for leaks of 10,000 ppm or greater. As such, the new baseline of 30,474 Mscf will be the result of the following sum:

$$\text{Baseline} = (\text{Leaks} \geq 10,000 \text{ ppm})_{\text{EY } 2018} + (\text{Leaks} \geq 10,000 \text{ ppm})_{\text{EY } 2020}$$

SPD finds SoCalGas' request reasonable and approves the change of the 2015 baseline for Transmission Compressor Stations - Component Fugitive Leaks from 21,989 Mscf to 30,474 Mscf.

6. Conclusion

The above adjustments to the 2015 baseline are subject to CPUC audit and verification. The CPUC may decide to audit elements of the NGLA Program in the future, including site visits and/or review of records used to determine baseline adjustments. Additional adjustments to the 2015 baseline emissions may be made in the future as a result of utility requests, or audit and verification activities.

SPD approves Southern California Gas Company's proposed adjustments of its 2015 baselines for Appendices 3, 4, 6 and 7 and the EF adjustment for Appendix 6, as described herein.



Director, Safety Policy Division

A.2 CPUC/SPD Letter Approving Adjusted 2015 Baseline Emissions for Lodi Gas Storage

Safety Policy Division
Approval of Adjusted 2015 Baseline Emissions for Lodi Gas Storage, L.L.C.
SB 1371, R-15-01-008

September 26, 2024

1. Background

Decision D.19-08-020 specified that the CPUC's Safety Enforcement Division (SED), in consultation with CARB, may approve adjustments to the utilities' emission factors and 2015 baseline emissions for the purpose of measuring emission reduction performance. The Safety Policy Division (SPD) has inherited this responsibility from SED.

1.1 Compressor Vented Emissions

In its original 2015 baseline data for Underground Storage (Appendix 7) – Compressor Vented Emissions, Lodi Gas Storage (LGS) reported a value of 99 Mscf based on an estimation of the utility specific emission factor (EF) for the pressurized operating state of each of its four compressors. This, however, was significantly lower than the measured emissions from subsequent years. LGS began measuring compressor emissions in 2017 in preparation for the CARB Oil & Gas Methane Regulation, which subsequently prescribed annual compressor emissions beginning in 2018.

LGS submitted a proposal on May 31, 2024, to SPD to adjust the reported value of 99 Mscf to 2,383 Mscf. The adjusted value was calculated by applying the most recent measured EFs from August 2023 to the 2015 data to determine the adjusted baseline values. Measured emissions have varied between 2017 – 2023, but the most recent measurements from August 2023 incorporated lessons learned from prior measurement events (e.g., best place to take the measurement) and likely represents a more accurate compressor emissions baseline condition.

SPD and CARB Staff (Staff) had a conference call with LGS on June 14, 2024, to discuss the proposal. Staff learned that the EFs were determined by an independent third-party contractor. Staff also learned that the emissions are typically measured on the blowdown valves, isolation valves and rod packing vents.

SPD, in consultation with CARB, finds the LGS request reasonable and approves the baseline adjustment to 2,383 Mscf.

1.2 Component Vented Emission, Compressor and Component Fugitive Leaks

On June 14, 2024, Staff received the data submittal from LGS, which showed in the Summary Appendix 8 that the emissions of 1,144 Mscf that were previously placed in the category "Component Vented Emissions" in 2015, was moved to "Compressor and Component Fugitive Leaks" for 2015. LGS provided the following note in the explanation column: "The category 'Component Leaks & Emissions' from baseline year was split. LGS captures emissions in this row."

Staff reviewed the 1,144 Mscf shift and noted that the 2015 template did not separate vented emissions from the fugitive emissions. Staff observed similar data shifts in other utilities' previous 2015 baseline adjustments which were subsequently approved.

SPD, in consultation with CARB, finds the LGS request reasonable and approves the requested shift of 1,144 Mscf from Component Vented Emissions to Compressor and Component Fugitive Leaks.

2. Summary of the 2015 Baseline Adjustments

Appendix #	System Category	Emission Source Category	Original 2015 Baseline Emissions (Mscf)	Adjusted 2015 Baseline Emissions (Mscf)
7	Underground Storage	Compressor Vented Emissions	99	2,383
7	Underground Storage	Component Vented Emissions	1,144	0
7	Underground Storage	Compressor and Component Fugitive Leaks	0	1,144

3. Conclusion

The above adjustments to the 2015 baseline are subject to CPUC audit and verification. The CPUC may decide to audit elements of the NGLA Program in the future, including site visits and/or review of records used to determine baseline adjustments. Additional adjustments to the 2015 baseline emissions may be made in the future as a result of audit and verification activities.

SPD approves Lodi Gas Storage's requested adjustments of their 2015 baseline emissions.



Director, Safety Policy Division

A.3 CPUC/SPD Letter Approving Adjusted 2015 Baseline Emissions for San Diego Gas and Electric

STATE OF CALIFORNIA

GAVIN NEWSOM, Governor

PUBLIC UTILITIES COMMISSION

505 VAN NESS AVENUE
SAN FRANCISCO, CA 94102-3298



Safety Policy Division
Approval of Adjusted 2015 Baseline Emissions for San Diego Gas & Electric Company.
SB 1371, R.15-01-008

SEP 27, 2024

1. Background

Decision (D.)19-08-020 specified that the California Public Utilities Commission’s (CPUC) Safety Enforcement Division (SED), in consultation with the California Air Resources Board (CARB), may approve adjustments to the utilities’ emission factors (EFs) and 2015 Baseline Emission Levels for the purpose of measuring emission reduction performance. The CPUC’s Safety Policy Division (SPD) has inherited this responsibility from SED.

2. Introduction

Over the course of the Natural Gas Leak Abatement (NGLA) Program, SPD has approved adjustments to the 2015 Baseline Emission Levels to align the baseline with evolving measurement and reporting methods. The current adjustment is a continuation of that process, involving one system category (Appendix 3) reported by San Diego Gas & Electric Company (SDG&E), as shown below.

In the following tables and discussion, the term “Mscf” is an abbreviation for thousand standard cubic feet of gas, and “schf-NG” means standard cubic feet per hour of natural gas.

3. Summary of the 2015 Baseline Emission Level Adjustments

Appendix No.	System Category	Emission Source Category	Current 2015 Baseline Emissions (Mscf)	Adjusted 2015 Baseline Emissions (Mscf)
3	Transmission Compressor Stations	Component Fugitive Leaks	2,919	3,512

4. Explanation of Adjustments

Appendix 3 – Transmission Compressor Stations – Component Fugitive Leaks Baseline.

SDG&E is currently approved to use a baseline of 2,919 Mscf, based on reported data of all Appendix 3 Component Fugitive Leaks with concentration measurements of 10,000 parts per million (ppm) or greater in Emission Year 2018 (i.e., the first year SDG&E began reporting such data per the CARB Oil and Gas Regulation). In 2020, this regulation was expanded to include leaks with concentration measurements of less than 10,000 ppm.

The NGLA program has correspondingly expanded its reporting requirement to include leaks with concentration measurements of less than 10,000 ppm. In response, SDG&E submitted a proposal and dataset on April 30, 2024, to adjust the reported baseline to also include leaks of concentrations less than 10,000 ppm. Because SDG&E did not have data for the lower concentration leaks from 2018 available, it proposed to use Emission Year 2020 data for leaks less than 10,000 ppm and continue to use Emission Year 2018 data for leaks of 10,000 ppm or greater. As such, the proposed baseline will be the result of the following sum:

$$\text{Baseline} = (\text{Leaks} \geq 10,000 \text{ ppm})_{\text{EY 2018}} + (\text{Leaks} < 10,000 \text{ ppm})_{\text{EY 2020}}$$

SPD and CARB reviewed the proposed baseline data set and have found a systemic error that is occurring across all the Appendix 3 templates. The error is in the calculation of the number of days leaking, which in some cases produces a leak duration estimate of longer than 365 days for the reporting year. This error will be addressed with all NGLA participants in the upcoming 2025 Winter Workshop and corrected in the next iteration of the appendix instructions in March 2025.

It is important to update the baseline to include leaks of less than 10,000 ppm for comparison with currently reported emissions, even with the known error discussed above. SPD finds SDG&E's request reasonable and approves the change of the 2015 baseline for Transmission Compressor Stations - Component Fugitive Leaks from 2,919 Mscf to 3,512 Mscf. After the leak duration formula is corrected in 2025, SPD will require a revision of the baseline data set.

5. Conclusion

The above adjustments to the 2015 baseline are subject to CPUC audit and verification. The CPUC may decide to audit elements of the NGLA Program in the future, including site visits and/or review of records used to determine baseline adjustments. Additional adjustments to the 2015 baseline emissions may be made in the future as a result of utility requests, or audit and verification activities.

SPD, in consultation with CARB, approves San Diego Gas & Electric Company's proposed adjustment of its 2015 baseline for Appendix 3, as described herein.



Director, Safety Policy Division

Appendix B: Definitions

For the purposes of SB 1371, the definitions of “leak” and “gas -loss” and the formula for calculating a “system-wide gas leak rate” were defined in a different manner than elsewhere. A “leak” was defined as any breach, whether intentional or unintentional, whether hazardous or non-hazardous, of the pressure boundary of the gas system that allows natural gas to leak into the atmosphere. Any vented or fugitive emission to the atmosphere is considered a “leak”. Examples of leaking components include defective gaskets, seals, valve packing, relief valves, pumps, compressors, etc. Gas blowdowns during operations, maintenance, and testing (including hydro-testing) were also included as leaks. Consequently, this leak definition is broader than the Pipeline Hazardous Material and Safety Administration’s (PHMSA) definition.

The gas respondents are required by Federal Law, 49 CFR 192, to survey their systems for leaks, which could be hazardous to public safety or property. To accomplish this, the gas companies developed graded leak programs to detect, prioritize and repair the safety related types of leaks. The same definitions are used within this report and are as follows:

- Graded Leaks – hazardous leaks or, which could potentially become hazardous as described below:³¹
 - A "grade 1 leak" is a leak that represents an existing or probable hazard to persons or property and requiring prompt action, immediate repair, or continuous action until the conditions are no longer hazardous.
 - A "grade 2 leak" is recognized as being non-hazardous at the time of detection but justifies scheduled repair based on the potential for creating a future hazard.
 - A "grade 3 leak" is a leak that is not hazardous at the time of detection and can reasonably be expected to remain not hazardous.
- Vented Emissions are releases of gas to the atmosphere, which occur during operations or maintenance, for a safety reason. Some examples are:
 - Purging (i.e., “blowdown”) gas prior to hydro-testing a line.
 - Gas releases designed into the equipment function, such as gas emitting from relief valve vents or pneumatic equipment.
 - Gas releases caused by operations, maintenance, testing, training, etc.
 - Ungraded Leaks are the remaining leaks, which are not hazardous to persons and/or property.

For further information please see CPUC GO 112-F.

Lastly, in 2014 the system-wide gas leak rate was calculated as a percent of total input for the 12 months ending June 30 of the reporting year. However, Staff determined that there were problems with this

³¹ Refer to GO 112-F for more information on grade 1, grade 2, and grade 3 leaks.

calculation and opted not to report a leak rate using this formula. The formula for calculating a system-wide gas leak was written as follows:

Pipeline Hazardous Material and Safety Administration (PHMSA) Modified Equation for Lost and Unaccounted for (LAUF) Gas:

$$\frac{[(\text{Purchased gas} + \text{produced gas} + \text{transported gas entering the gas system}) \text{ minus } (\text{customer use} + \text{company use} + \text{appropriate adjustments} + \text{gas injected into storage} + \text{transported gas leaving the gas system})]}{(\text{Purchased gas} + \text{produced gas} + \text{transported gas entering the gas system})} = \text{System Wide Gas Leak Rate.}$$

Note: transported gas includes gas purchased by customers and transported in common carrier pipelines.

In section 5 of the 2015 Joint Report, “Baseline System-Wide Emissions Rate,” Staff determined the value for 2015 to be 0.32% by using the total emissions from all source categories (6,601.2 MMscf) divided by the Total Annual Volume of Gas Transported (2,056,950 MMscf). The five sources for Total Annual Volume of Gas Transported include:

- Gas Injected into Storage
- Storage – Gas Used by the Gas Department
- Gas Transported to Customers in the State
- Gas Transported to Customers out of State
- Distribution – Gas Used by the Gas Department

Appendix C: Article 3, Section 975 (c) and (e)(6)

Article 3. Section 975

(c) As soon as practicable, the commission shall require gas corporations to file a report that includes, but is not limited to, all the following:

- (1) A summary of utility leak management practices.
- (2) A list of new natural gas leaks in 2013 by grade.
- (3) A list of open leaks that are being monitored or are scheduled to be repaired.
- (4) A best estimate of gas loss due to leaks.

(e) The rules and procedures adopted pursuant to subdivision (d) shall accomplish all the following:

- (6) to the extent feasible, require the owner of each commission-regulated gas pipeline facility that is an intrastate transmission or distribution line to calculate and report to the commission and the State Air Resources Board a Baseline system-wide leak rate, to periodically update that system-wide leak rate calculation, and to annually report measures that will be taken in the following year to reduce the system-wide leak rate to achieve the goals of the bill.

Appendix D: Conversion of Natural Gas to Carbon Dioxide Equivalents

The conversion of natural gas volume to carbon dioxide equivalent mass requires the use of a GWP value. CARB used a methane GWP value of 25 (100-year value) from the IPCC, AR4, which was utilized in CARB's 2022 GHG Inventory. The following calculations show the conversion of the total emissions from this report. The conversion was done in two steps. In the first step, the calculation shows the volumetric natural gas that contains exactly one metric ton of methane.

$$1 \text{ MT CH}_4 * \frac{2,204.62 \text{ lbs CH}_4}{1 \text{ MT CH}_4} * \frac{1 \text{ lb mole}}{16.04246 \text{ lb CH}_4} * \frac{379.48 \text{ scf of CH}_4 \text{ gas}}{1 \text{ lb mole}}$$

$$* \frac{1.0 \text{ scf of natural gas}}{0.934 \text{ scf of CH}_4 \text{ gas}} * \frac{1 \text{ Mscf}}{1,000 \text{ scf}} = 55.835 \text{ Mscf of natural gas}$$

Using this volumetric unit, the 2023 total emissions, 3,176,000 Mscf, is equivalent to about 1.42 MMTCO_{2e}, as shown below:

$$3,176,000 \text{ Mscf natural gas} * \frac{1 \text{ MT CH}_4}{55.835 \text{ Mscf of natural gas}} * \frac{25 \text{ CO}_2e}{1 \text{ CH}_4} = 1,422,047 \text{ MT CO}_2e$$

CARB has also used the GWP value of 72 (AR4, 20-year) in the Short-Lived Climate Pollutant Reduction Strategy and Oil and Gas Methane Regulation to emphasize the outsized, short-term impacts of methane emissions. Based on the higher GWP, the 2023 total emissions, 3,176,000 Mscf is about 4.10 MMTCO_{2e}, as follows:

$$3,176,000 \text{ Mscf natural gas} * \frac{1 \text{ MT CH}_4}{55.835 \text{ Mscf of natural gas}} * \frac{72 \text{ CO}_2e}{1 \text{ CH}_4} = 4,095,496 \text{ MT CO}_2e$$

The use of 1.0 scf of natural gas per 0.934 scf of CH₄ gas accounts for composition of natural gas being not 100% methane. The American Gas Association (AGA) published a value of 93.4% to be used as a default

methane concentration that is comparable to what respondents reported.³² The standard cubic foot “scf” for measuring gas is based on 60 degrees Fahrenheit at atmosphere pressure.

In addition, respondents reported trace amounts of concentration for ethane, inert gases, and other elements and compounds. There was not an entry for carbon dioxide explicitly, and so it cannot be assumed that all the inert gas was carbon dioxide. A calculation was performed that showed CO₂ emissions from the inert gases would be less than 0.1% of the total and is excluded in this report.

³²AGA, GHG Guidelines, Pg. 39, April 18, 2008.

Appendix E: PG&E, Effect of 2023 Changes on Total Reported Emissions

The table below was submitted by PG&E on page 6 and 7 as part of their SB 1371 Supplemental Questionnaire.

Table 2: Effect of 2023 Changes on Total Reported Emissions

2023 Reporting Change	Change in Emissions Compared to Reporting Year 2022 (Mscf)	Percent Change in Emissions Compared to Reporting Year 2022
Advances in Abatement Efforts		
Transmission Pipelines - Blowdowns	-67,246	-32%
Transmission M&R Stations - Blowdowns	4,336	
Transmission Compressor Stations - Blowdowns	12,375	
Underground Storage - Blowdowns	-735	
Distribution Main & Service Pipelines - Pipeline Leaks	-18,974	-6.3%
Transmission Compressor Stations - Compressor Emissions	-1,928	-19%
Underground Storage - Compressor Vented Emissions	597	
Transmission Compressor Stations - Component Leaks	-46	-0.83%
Transmission Pipelines - Odorizers	-24	-15%
Change in Annual Activity		
Transmission Pipelines - Pipeline Leaks	-53	-1.4%
Transmission Compressor Stations - Storage Tank Leaks & Emissions	5	1292%
Distribution Main & Service Pipelines - All Damages	-12,330	-23%
Distribution M&R Stations - Station Leaks & Emissions	-962	-27%
Distribution M&R Stations - All Damages	-51	-100%
Customer Meters - Meter Leaks	-41,385	-17%
Customer Meters - All Damages	-2,089	-37%
Customer Meters - Vented Emissions	-34	-17%
Underground Storage - Compressor and Component Leaks	-1,988	-37%
Underground Storage - Storage Leaks & Emissions	1,111	54%
Improvements in Reporting Practices		
Transmission Pipelines - All Damages	-350	-16%
Transmission Pipelines - Component Vented Emissions	-118	-0.41%
Transmission M&R Stations - Station Leaks and Emissions	4,603	0.83%
Transmission Compressor Stations - Component Vented Emissions	991	5.0%
Distribution Main & Service Pipelines - Blowdowns	772	780%
Distribution M&R Stations - Blowdowns	41	21%
Underground Storage - Dehydrator Vent Emissions	4	19900%
<i>Total Change</i>	-123,477	-8.3%