

Staff Evaluation of the Natural Gas Leak Abatement Program

CALIFORNIA PUBLIC UTILITIES COMMISSION
SAFETY POLICY DIVISION REPORT

December 29, 2022

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



**California Public
Utilities Commission**

INTRODUCTION

This Staff Evaluation of the Natural Gas Leak Abatement (NGLA) Program was directed in the Phase One Decision¹ of Rulemaking R.15-01-008 (Order Instituting Rulemaking to Adopt Rules and Procedures Governing Commission-Regulated Natural Gas Pipelines and Facilities to Reduce Natural Gas Leakage Consistent with Senate Bill 1371), originally due in 2020, but extended² to December 2022. The Second Phase Decision³ added a list of topics to be addressed in the evaluation. The Safety Policy Division (SPD) inherited the NGLA Program from Safety Enforcement Division (SED) and prepared this report with input from Energy Division (ED) staff.

EXECUTIVE SUMMARY

The NGLA Program has succeeded in reducing emissions by 23 percent from the 2015 baseline during the first five years of the program, just over halfway to the Statewide 2030 reduction goal. Safety Policy Division recommends some modifications to the program but otherwise supports the continuation of policies outlined in the First and Second Phase Decisions.

The most recent NGLA Joint Emissions Report⁴ (attached in Appendix 1) examines the contributions from source categories such as transmission pipeline blowdowns, distribution pipeline leaks, and compressor station venting. Most of the reduction was achieved by the two largest suppliers, PG&E and SoCalGas. Both IOUs have exceeded their 20 percent by 2025 target mandated in the Second Phase Decision, four years ahead of schedule. Additionally, both companies have forecasted a 40 percent or greater reduction by 2030. These results have been achieved by close collaboration between SPD, Air Resources Board (CARB) staff, and engineering teams at the utilities to develop new leak measurement methods.

While this achievement is a success for the NGLA Program, the results should be understood in the context of total Statewide greenhouse gas emissions (GHGs). The NGLA Program emissions of 1.5 MMT⁵ CO₂(eq) today contribute only 0.4 percent of the Statewide 369.2 MMT of GHG emissions.⁶ Further reduction proposals or requirements, such as the recently adopted Statewide 50 percent goal established in the 2022 Scoping Plan⁷, should be evaluated considering their relatively small potential impact.

Responses to the evaluation topics, with recommendations, are provided in the body of the report.

¹ D.17-06-015, “First Phase Decision” or “Phase One Decision”.

² Letter granting extension of due date from Executive Director Petersen to SPD dated June 28, 2021.

³ D.19-08-020, “Second Phase Decision”, or “Phase Two Decision”.

⁴ November 15, 2022, Draft [Analysis of the Gas Companies June 15, 2022, Natural Gas Leak and Emission Reports](#), “Joint Emissions Report” by Safety Policy Division and the California Air Resources Board (CARB). The draft report is out for comments with final publication expected in January 2023, but no change in the emission results is anticipated. Pending studies by PG&E and SoCalGas may allow further reductions to be credited in future years.

⁵ MMT = million metric tons.

⁶ [Current California GHG Emission Inventory Data | California Air Resources Board](#)

⁷ On December 15, 2022, CARB approved the 2022 Scoping Plan, which includes a 50% emission reduction target from the natural gas transmission and distribution sector by 2030 to support carbon neutrality by 2045:

<https://ww2.arb.ca.gov/our-work/programs/ab-32-climate-change-scoping-plan/2022-scoping-plan-documents>

RECOMMENDATION SUMMARY

1. Adopt cost-effectiveness threshold guidance for future reduction proposals.
2. Allow utilities to continue reducing emissions under current policy framework without imposing a hard target.
3. Verify emission measurement data with selective audits by mid-2024.
4. Adopt cost-accounting modifications in resolutions or rate case proceedings related to NGLA funding.

These recommendations can be acted upon in a Safety Policy Division staff resolution proposed to the Commission in 2023.

BACKGROUND

Ordering Paragraph 8 in the Second Phase Decision states: “The California Public Utilities Commission Safety and Enforcement Division, with support from Energy Division, shall conduct a comprehensive evaluation of the Natural Gas Leak Abatement Program consistent with the requirements outlined in this decision by no later than June 2021 and file its report as a compliance report in this proceeding with recommendations to the Commission.” SPD inherited the NGLA Program from the Safety and Enforcement Division (SED) when it was created in 2019.

Section 9 of the Second Phase Decision concludes that:

“The First Phase Decision originally directed that the Staff Evaluation occur in 2020. Based on the record, more time is needed to gather and evaluate information related to 2020 Compliance Plans, recent annual report data, and to update emission factors. Therefore, we direct that this evaluation be completed no later than June 2021 to allow time for the CPUC to evaluate potential modifications to the Compliance Plan content and templates and allow utilities to make appropriate changes to March 2022 Compliance Plans. Based on 2021 Staff recommendations, the CPUC will determine whether another proceeding is necessary to address any issues that cannot be addressed by the SED and ED staff in cooperation with CARB”.

In June 2021, SPD received an extension of the report due date until December 2022⁸ to allow for the evaluation and adoption of improved emission measurement methods.

The Second Phase Decision also provides a list of topics to be addressed in the Staff Evaluation. Staff notes that the proceeding is closed, so the report cannot be filed in the proceeding. This report will be circulated to the Service List in the proceeding.

REVIEW OF EVALUATION TOPICS

Each prompt from the Second Phase Decision is indicated in bold, followed by the Staff response.

- **Summarize emission reductions achieved through the measures approved in the first Compliance Plans;**

⁸ Letter granting extension of due date from Executive Director Petersen to SPD dated June 28, 2021.

The November 15, 2022, Joint Emissions Report⁹ documents an overall emissions reduction of 23 percent from the 2015 baseline for all jurisdictional natural gas companies,¹⁰ which is solid progress towards the Statewide goal of a 40 percent reduction by 2030.¹¹ This performance resulted from the measures approved in the 2018 and 2020 Compliance Plans. Emission levels have improved from the 2015 Baseline of 4,437 MMSCF (million standard cubic feet) to the 2021 level of 3,420 MMSCF. Pacific Gas and Electric and Southern California Gas, the two most significant contributors, have already reached the Commission target of 20 percent by 2025 established for them in the Phase Two Decision.¹²

While this achievement signals success for the NGLA Program, emissions should be considered in the context of total Statewide greenhouse gas emissions (GHGs). When the NGLA program was being developed, the magnitude of natural gas leaks was poorly understood. Now, because of the improved measurement methods developed under the program, the picture is clearer. The NGLA Program result of 3,420 MMSCF, equivalent in global warming potential to 1.5 MMT CO₂eq (million metric tons CO₂ equivalent), is about 0.4 percent of the Statewide GHG emissions of 369.2 million metric tonnes CO₂eq.¹³ Further NGLA Program progress to the Statewide goal of 40 percent would move NGLA emissions from 0.4 percent to 0.3 percent of the Statewide total.

As the NGLA Program requires, natural gas utilities have filed Compliance Plans, and the Commission approved the reduction measures in 2018 and 2020. Until this year, it has been impossible to fully account for the reductions achieved because the original method for estimating emissions used the population count of devices¹⁴ multiplied by a fixed emission factor for some source categories. With that method, if the number of devices remains constant, no change in emissions can be demonstrated. The NGLA Decisions¹⁵ anticipated modifications to the leak measurement methods would be needed and authorized Staff to make appropriate adjustments. Since 2018, the utilities have conducted engineering studies to develop new methods of quantifying actual leak volumes from leaks found on their systems. After extensive reviews of those methods by SPD in consultation with CARB engineering staff, SPD adopted many of the utilities' proposed measurement methods and adjusted the original baseline estimates to match those methods in the fall of 2022. These changes have allowed the NGLA Program to demonstrate actual performance.

• Identify refinements made to the annual reporting template, including technical definitions as necessary through the technical working groups and workshops, and discuss whether additional refinements should be considered;

In consultation with CARB, SPD has refined annual reporting templates throughout the years, which are reviewed with the IOUs at an annual working group called the Winter Workshop. The refinements are

⁹ November 15, 2022, Draft [Analysis of the Gas Companies June 15, 2022, Natural Gas Leak and Emission Reports](#). Joint Report by Safety Policy Division and the California Air Resources Board (CARB) "Joint Emissions Report". The draft report is out for comments with final publication expected in early 2023. No significant change in the emission figures is anticipated in the final version.

¹⁰ The companies are PG&E, SoCalGas, Southwest Gas, San Diego Gas and Electric, Central Valley Gas Storage, Wild Goose Storage, Gill Ranch Storage, Lodi Gas Storage, West Coast Gas, and Alpine Natural Gas.

¹¹ SB 1383, Lara, Chapter 395, Statutes of 2016.

¹² Reduction targets established for PG&E and SoCalGas in D.19-08-020, OP 4 and OP 5.

¹³ [Current California GHG Emission Inventory Data | California Air Resources Board](#)

¹⁴ Devices such as customer meter sets and pressure regulating stations.

¹⁵ Phase One in D.17-06-015 and Phase Two in D.19-08-020.

made to respond to new information about the nature of emissions from the different source categories. SPD will consider additional refinements in the same way.

- **Identify additional Best Practices-related metrics to be reported in annual reports;**

SPD does not recommend additional metrics for the annual reports. The current report metrics are sufficient to convey the performance of the program.

- **Identify additional refinements to the Biennial Compliance Plan Framework that should be considered;**

SPD does not recommend additional refinements to the Compliance Plan framework. The current framework was developed in a series of working group sessions and has been used effectively by the gas companies since 2020 to present the necessary information to support staff evaluation of the plans.

- **Discuss whether modifications should be considered to the process for evaluating the cost-effectiveness of Best Practices and future rules, including consideration of the social costs of methane;**

SPD recommends modifications to the process for evaluating cost-effectiveness and has observations on the social cost of methane. The Phase II Decision did not adopt a cost-effectiveness threshold value, allowing consideration of qualitative factors while accommodating compliance with best practices. Now that three cycles of the Compliance Plan have been completed and all best practices have been implemented to the current level of performance, SPD recommends that threshold guidance be considered for adoption.

For cost-effectiveness guidance, SPD recommends that future proposed reduction measures, at a minimum, break even from a cost-benefit perspective. The 2025 program target was already met in 2021, and current forecasts expect to meet or exceed the 2030 Statewide goal based on measures already approved by Safety Policy Division. Additional investments of ratepayer dollars will have a low marginal benefit from a GHG emissions standpoint, and more cost-effective means of reducing emissions are likely available; the 2022 Statewide Scoping Plan¹⁶ states that over half of the targeted methane reduction measures have mitigation costs below \$21/MT CO₂eq, or \$9.40/MSCF of natural gas. The break-even cost-effectiveness for the NGLA Program is higher, at \$22/MSCF currently.

A break-even cost is achieved when the standard cost-effectiveness (direct cost savings of avoided loss) can be offset to zero by the cap-and-trade and social cost tests defined in the Phase Two Decision. For future measures, PG&E has voluntarily adopted a break-even standard in their 2022 Compliance Plan. Consideration of proposals that may not break even but offer significant benefits could be continued, but the break-even point should be the standard for new measures.

SPD does not recommend program modifications related to the social costs of methane. SPD observes that the Phase Two Decision¹⁷ requires adjustment of the value of the social cost of methane depending on the year of benefit using a 3 percent discount rate. However, in the most recent compliance plans submitted in March 2022, SoCalGas used the 2020 value of \$21/MSCF rather than a 2022 value or future years' values as provided in the Decision.¹⁸ The value for 2025 is \$25/MSCF and for 2030 is \$29 MSCF.

¹⁶ [2022 Scoping Plan Update \(ca.gov\)](#) at 225.

¹⁷ Second Phase Decision Ordering Paragraph 2b.

¹⁸ Second Phase Decision at 16, Table of Social Cost of Methane Estimates.

These figures are expressed in 2007 dollars, which should be adjusted for inflation. While the current impact of the error is small, it will be important for future compliance plans to account for the social cost of methane more accurately when basing decisions more heavily on net cost-effectiveness.

- **Provide guidance for collection of cost and emissions data in 2020 and beyond;**

- a. *COST DATA*

The First Phase Decision requires the larger gas utilities to establish a Natural Gas Leak Evaluation Program Balancing Account (NERBA) for incremental program expenditure and a separate memorandum account for incremental administrative costs associated with the program.

SPD expects utilities to improve their ability to accurately forecast leak management costs over time into their GRCs in a transparent manner, without the need for continued use of NERBA.

- b. *EMISSIONS DATA*

SPD recommends that emissions data should continue to be collected in the same way as in all previous years, via the annual data request from SPD to the utilities for their emissions data using the reporting templates developed and periodically refined by SPD in consultation with CARB.

SPD notes that all emissions data provided in response to formal CPUC data requests were validated after joint CARB and SPD staff review for data entry errors and compliance with the reporting templates. In addition, the First Phase Decision does not require that utility leak data should be audited or verified, stating:¹⁹ “According to parties, utility responses and annual reports have accurately documented trends and reduction of emissions consistent with SB 1371 goals.”

Nonetheless, CARB and SPD agree that some level of leak data verification should be carried out, especially considering the financial incentive of PG&E and SoCal Gas for meeting the 20 percent target in 2025. To that end, SPD recommends that the Commission should perform verification audits by mid-2024 of the leak measurement processes and leak data. Should the audit find issues with the leak measurements, the utilities would need to correct those to assure credit for the 2025 reporting year. SPD would consult with Energy Division and CARB to develop a verification plan.

- **Examine current processes for cost forecasting, cost limits, and cost recovery and make recommendations regarding any needed modifications;**

SPD and Energy Division are satisfied with current processes.

- **Recommend whether the CPUC should consider adopting further limitations on rate recovery for the Class A Utilities for years following 2025, and/or extending the limits to other utilities;**

SPD recommends that future rate recovery should be limited to the funding of currently approved measures, and only those incremental reduction measures that forecast break-even cost-effectiveness. The currently approved measures from the 2022 Compliance Plans are expected to meet or exceed the Statewide goal by 2030, so any additional ratepayer-funded expenditures should be cost-effective.

- **Whether the Commission should consider adopting a hard target for 2030;**

¹⁹ First Phase Decision at 42.

SPD does not recommend adoption of a hard target for 2030. PG&E and SoCalGas have voluntarily forecasted a 40 percent or greater reduction by 2030 with the currently approved compliance plans. Should the companies fall short of a 40 percent hard target, there would be very little impact on the already low emissions from this sector. Additional measures to achieve the hard target might not be cost-effective. As noted, the current emission level of 1.5 MMT is a fraction of the Statewide 369 MMT emissions. The incremental reduction to a 40 percent target would produce only a further 0.1 percent of Statewide emissions.

- **Identify opportunities to further harmonize 26 Best Practices with other state and federal agency existing and emerging regulations (e.g., CalGEM, CARB, EPA) if appropriate and practical;**

SPD has identified and harmonized opportunities resulting from other agency regulations. For example, the 2018 CARB Oil and Gas Rule requires a lower threshold for leak reporting from transmission compressor stations and gas storage facilities than initially adopted in the NGLA Program reports. In consultation with CARB, SPD has adopted the lower leak threshold for emissions reporting and adjusted the baseline levels to match this added category of leaks. SPD expects to continue to identify further opportunities as they arise.

- **Consider incorporation of mandatory 26 Best Practices into existing or separate CPUC GO 112-F; and**

SPD does not recommend incorporating the 26 Best Practices into existing or separate General Orders, which would require a time-consuming but unnecessary rulemaking proceeding. The gas companies have implemented the best practices in their standard operating procedures and policies. The significant reductions demonstrated in the annual Joint Report confirm that implementation of the practices was successful without the need for incorporation into General Orders. As confirmation that the Best Practices are incorporated into standard operating procedures, the Gas Safety and Reliability Branch (GSRB) of the Safety Enforcement Division conducted audits of PG&E and SoCalGas this year. GSRB confirmed compliance with Section 114 of the Federal PIPES Act of 2020²⁰, which requires gas companies to have greenhouse gas reduction policies and procedures.

- **Recommend further consultation with CARB to update EFs [emission factors], if necessary, collaborate to institutionalize an interagency process to timely update EFs to ensure more accurate methane emissions reporting over time.**

SPD has been actively consulting with CARB to update EFs and has developed a collaboration process. The process begins with presentations of proposed EF changes at the annual Winter Workshop. The timeliness of updates depends on each EF change under consideration. Some require more intensive technical review than others. SPD recommends that the consultation process should continue.

CONCLUSION

The NGLA Program has achieved the CPUC target in accordance with the policies established in the Phase Two Decision. Going forward, SPD recommends some modifications to the NGLA Program considering the progress to date. These recommendations primarily address cost-effectiveness.

²⁰ The **Protecting Our Infrastructure of Pipelines and Enhancing Safety (PIPES) Act** of 2020 was signed on December 27, 2020.

APPENDIX 1

Draft Analysis of the Gas Companies June 15, 2022, Natural Gas Leak and Emissions Reports.

DRAFT

Analysis of the Gas Companies' June 15, 2022, Natural Gas Leak and Emission Reports

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

November 15, 2022

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



**California Public
Utilities Commission**

Table of Contents

EXECUTIVE SUMMARY.....	1
Key Findings.....	2
INTRODUCTION AND BACKGROUND.....	8
Purpose of the Annual Natural Gas Leak Abatement Report	10
Basis for the Annual Natural Gas Leak Abatement Report.....	11
Basis for Updating Emissions Methodologies and Adjusting the 2015 Baseline Values	12
FINDINGS AND DISCUSSION	14
Natural Gas Leaks and Emissions.....	14
System-wide Leak Rate	14
2020 Data Adjustments and Corrections.....	15
Impacts of CARB's Oil and Gas Methane Regulation.....	16
Summary of Gas Company– Estimated Natural Gas Emissions.....	18
Summary of Natural Gas Emissions Grouped by Source Classification	27
DETAILED NATURAL GAS EMISSIONS.....	31
Natural Gas Emissions by System Category, Emission Source, and Source Classification	31
Description of the Seven System Categories	32
LESSONS LEARNED AND CONCLUSION.....	40
Lessons Learned	40
Conclusion	40
APPENDICES	42
Appendix A: California Public Utilities Commission/Safety Policy Division Approval of Adjusted 2015 Baseline Emissions for Pacific Gas & Electric and Southern California Gas Company	42
Appendix B: Definitions	57
Appendix C: Article 3, Section 975 (c) and (e)(6)	59
Appendix D: Conversion of Natural Gas to Carbon Dioxide Equivalent.....	60
Appendix E: PG&E, Effect of 2021 Changes on Total Reported Emissions.....	62

Tables & Figures

Table 1: Total Statewide Natural Gas Emissions Reported Under SB 1371	3
Table 2: Total Natural Gas Emissions by System Category	4
Table 3: Total Natural Gas Emissions by Source Classification.....	6
Table 4: System-wide Throughput, Emissions, and Leak Rate - 2015, 2020, and 2021	15

Table 5: Total Natural Gas Emissions by Gas Company	18
Table 6: Population-Based Natural Gas Emissions	28
Table 7: Blowdown Natural Gas Emissions	29
Table 9: Natural Gas Emissions by System Category, Emission Source, and Source Classification	31
Table 10: Transmission Pipelines Natural Gas Emissions	32
Table 11: Transmission M&R Stations Natural Gas Emissions	33
Table 12: Transmission Compressor Stations Natural Gas Emissions	34
Table 13: Distribution Mains and Services Natural Gas Emissions.....	35
Table 14: Leak Count by Grade in 2021	36
Table 15: Average Days to Repair by Gas Company, 2021	36
Table 16: Distribution M&R Stations Natural Gas Emissions.....	37
Table 17: Customer Meters Natural Gas Emissions	38
Table 18: Underground Storage Natural Gas Emissions.....	39

Executive Summary

This is the eighth annual report (2022 Joint Report) compiled jointly by the California Public Utilities Commission (CPUC) 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 2022 Joint Report compiles and analyzes the 2021 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

Respondents filed their 2021 natural gas emissions estimates and related information by June 15, 2022, pursuant to the data request issued by CPUC Staff on March 31, 2022. The data request included reporting templates and associated guidelines to gas companies.

Staff used the report filings, including gas company responses to Staff follow-up questions and comments related to the initial report filings, to prepare the 2022 Joint Report. Staff also adjusted the 2020 natural gas emissions estimates reported in the 2021 Joint Report to correct misstatements identified by respondents for this report.

Gas companies have been developing improved methods to estimate emissions for several system categories since the inception of the NGLA program. Before gas companies can incorporate improved emission estimation methods into the annual reporting, gas companies must present the improved methods to CPUC and receive CPUC approval. Gas companies have also been developing 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. Gas companies must present proposed adjustments to the 2015 baseline for CPUC review and approval. The development and approval of improved emissions estimation methods and adjustments to the 2015 baseline is an on-going process.

On June 6, 2022, the CPUC/SPD approved new estimation methods for the 2020 and 2021 emission data for PG&E and SoCalGas. On October 26, 2022, CPUC/SPD approved adjustments to the 2015 baseline emissions for PG&E and SoCalGas.

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 manner in which the emission occurs or the method by which emissions are estimated (see Table 3 for the list of source classifications).

CPUC/SPD's approval of new emission estimation methods and adjustments to 2015 baseline emissions will allow CPUC and CARB to estimate the System-wide Leak Rate more accurately, as required by SB 1371, and to evaluate progress towards overall methane emissions reduction targets for the NGLA program and the State. These approvals will also assist CPUC and the gas companies to estimate 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. To verify the accuracy of emission measurement practices used in the NGLA program, the CPUC may audit gas company practices through site visits and/or review of records used to determine baseline adjustments.

The information in this report should be used by stakeholders to help determine general emission trends over time and identify where potential emission reductions can be achieved to meet the State's overall goal of reducing methane emissions 40% from the 2013 levels by 2030,^{3,4} while maintaining the safe, reliable, and affordable operation of the regulated natural gas storage and delivery systems, as stated in SB 1371.

Key Findings

The 2021 total statewide estimated natural gas emissions from sources of fugitive leaks and vented emissions in the transmission and distribution system are 3,430 million standard cubic feet (MMscf) which is 5% lower (178 MMscf) than the 2020 adjusted emissions, and 23% below (1,007 MMscf) the 2015 Baseline emissions estimate (see Table 1).

Comparing 2020 to 2021, natural gas emissions decreased in six of the seven reported system categories. Most of the overall YOY decrease is the result of emission reductions reported in Transmission Pipelines (87 MMscf decrease), and large decreases also seen in both Distribution Mains and Services (M&S) (40 MMscf decrease) and Transmission Metering and Regulating (M&R) Stations (44 MMscf decrease) system categories (see Table 2). A detailed analysis of natural gas emissions estimates from individual system categories is provided later in this report.

The total statewide 2021 reported natural gas emissions of 3,430 MMscf equate to 1.54 million metric tonnes of carbon dioxide equivalents (MMT CO₂e) using the Intergovernmental Panel on Climate Change (IPCC) Forth Assessment Report (AR4) 100-year methane Global Warming Potential (GWP) of 25 or 4.42 MMT CO₂e using the 20-year methane GWP of 72.

³ This goal was established by SB 1383 (Lara, 2016).

⁴ CPUC Decision D.17-06-015 specified that the 2015 baseline emissions estimates will provide the starting point to measure future natural gas emissions reductions for the NGLA program.

Table 1: Total Statewide Natural Gas Emissions Reported Under SB 1371							
Sector Emissions	2015 Baseline*	2020*	2021	2015 Baseline to 2021 Change		2020 - 2021 YOY Change	
				MMscf, MMT CO2e	% Change	MMscf, MMT CO2e	% Change
Volume of Natural Gas (MMscf)	4,437	3,608	3,430	(1,007)	(23%)	(178)	(5%)
Mass Equivalent, 100-Yr GWP, AR 4 (MMT CO2e)	1.99	1.62	1.54	(0.45)	(23%)	(0.08)	(5%)
Mass Equivalent, 20-Yr GWP, AR 4 (MMT CO2e)	5.72	4.65	4.42	(1.30)	(23%)	(0.23)	(5%)

* The adjustments to the 2015 baseline emissions approved by the CPUC on October 26, 2022 reduced the 2015 baseline emissions reported in the 2021 Joint Report by 2,164 MMscf (approximately 33%).

** The 2020 total has been modified from the 2021 Joint Report, which is described in the section, "2020 Data Adjustments and Corrections" of this 2022 Joint Report.

Subsequent sections of this report analyze the total natural gas emissions for 2021 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 5% reduction in the total 2020 to 2021 YOY natural gas emissions. Table 2 also shows that there were larger changes in 2020 to 2021 YOY natural gas emissions in one system category (i.e., Transmission Pipelines) and smaller changes in other system categories.

Table 2: Total Natural Gas Emissions by System Category⁵										
System Category	2015 Baseline		2020		2021		2015 Baseline to 2021 Change		2020 - 2021 YOY Change	
	MMscf	% Total	MMscf	% Total	MMscf	% Total	MMscf	% Change	MMscf	% Change
Transmission Pipeline	557	13%	261	7%	174	5%	(383)	(69%)	(87)	(33%)
Transmission M&R Station	777	18%	760	21%	716	21%	(61)	(8%)	(44)	(6%)
Compressor Station	181	4%	143	4%	141	4%	(40)	(22%)	(2)	(1%)
Distribution Mains & Services	1,473	33%	1,184	33%	1,144	33%	(329)	(22%)	(40)	(3%)
Distribution Metering & Regulating Stations	284	6%	270	7%	267	8%	(17)	(6%)	(3)	(1%)
Customer Meter	823	19%	843	23%	851	25%	28	3%	8	0.9%
Underground Storage	342	8%	146	4%	137	4%	(205)	(60%)	(9)	(6%)
Total	4,437	100%	3,608	100%	3,430	100%	(1,007)	(23%)	(178)	(5%)

The first system category, Transmission Pipelines, accounts for about 5% of the total 2021 emissions but showed a 33% YOY decrease of 87 MMscf from 2020. As described later in the report for the company specific descriptions, the change was mainly due to the sum of blowdown reductions and All Damages reductions from PG&E and SoCalGas.

Transmission M&R Stations' 21% proportional share of the total 2021 emissions remained similar to the 22% share from 2020 emissions. The YOY emissions decreased 44 MMscf or 6% from the total of 760 MMscf in 2020 to 716 MMscf in 2021.

The share of the 2021 total emissions from Compressor Stations remained constant at 4%. The 2021 Compressor Station emissions decreased by 2 MMscf YOY from 2020. The Component Fugitive Leaks

⁵ For more sub-category details see Table 7: Detailed Emissions by Category, Source, and Classification 2015-2021. In addition, in 2015 and 2016 the Aliso Canyon storage well leak was excluded from Unusual Large Leaks because it was accounted for by other state agencies.

subcategory is also described in the section of this report titled, “Impacts of CARB’s Oil and Gas Methane Regulation.”

Distribution M&S pipeline emissions decreased by 40 MMscf from 1,184 MMscf in 2020 to 1,144 MMscf in 2021.

Distribution Metering and Regulating (M&R) Stations emissions decreased by 3 MMscf YOY from 270 MMscf in 2020 to 267 MMscf in 2021.

Customer Meters emissions increased by 8 MMscf YOY from 843 MMscf in 2020 to 851 MMscf in 2021. This reporting of 2020 and 2021 emissions uses both the population-based approach by some utilities (Alpine, SDG&E, Southwest Gas, and West Coast Gas Storage) and the leaker-based approach by others (PG&E and SoCalGas).

Underground Storage emissions decreased 9 MMscf or 6% YOY from 146 MMscf in 2020 to 137 MMscf in 2021. The Component Fugitive Leaks subcategory and Storage Leaks & Emissions subcategory are also 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 2021.

Natural Gas Emissions by Source Classification

Natural gas emissions can be grouped into the six main source classifications, from largest to smallest in 2021: 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.⁶

Table 3: Total Natural Gas Emissions by Source Classification										
Source Classification	2015 Baseline		2020		2021		2015 Baseline to 2021 Change		2020 - 2021 YOY Change	
	MMscf	% Total	MMscf	% Total	MMscf	% Total	MMscf	% Change	MMscf	% Change
Population-Based Emissions	1,136	26%	1,108	31%	1,103	32%	(33)	(3%)	(5)	(0.4%)
Graded Pipeline Leaks	1,237	28%	1,060	29%	1,028	30%	(209)	(17%)	(32)	(3%)
Leaker-Based Emissions	680	15%	680	19%	680	20%	0	N/A	0	(0%)
Blowdown	603	14%	360	10%	248	7%	(355)	(59%)	(112)	(31%)
Vented	332	7%	215	6%	198	6%	(134)	(40%)	(17)	(8%)
Damages	318	7%	159	4%	141	4%	(177)	(56%)	(19)	(12%)
Other Leaks	131	3%	26	1%	31	1%	(100)	(76%)	5	21%
Total Sector Emissions	4,437	100%	3,608	100%	3,430	100%	(1,007)	(23%)	(178)	(5%)

YOY emission changes by source classification are summarized as follows, ordered by largest emissions to smallest:

- Consistent with the prior year, the Population-Based Emissions classification makes up the single largest source classification of emissions at 32% of the 2021 total emissions. The four individual emission sources that are part of this category are provided in Table 6, Population-Based Natural Gas Emissions.
- Graded Pipeline Leaks remained relatively constant at 30% of the percentage share, with 1,060 MMscf in 2020 and 1,028 MMscf in 2021. Overall, this category decreased YOY by 3% or 32 MMscf.
- The Leaker-Based Emissions classification makes up the third largest source classification of emissions at 20% of the 2021 total emissions. There was a variation that is not shown when

⁶ See Table 7: Detailed Emissions (by Category, Source, and Classification) 2015, 2020-2021, in the body of the report.

rounded to units of MMscf. The emissions changed from 2015 with 679,940 Mscf to 2020 with 679,902 Mscf, and the total was 680,068 Mscf in 2021.

- Blowdowns decreased by 31% YOY from 360 MMscf in 2020 to 248 MMscf in 2021. This category has emissions that are cyclical and vary with annual operating conditions. For a more detailed analysis, see Table 7, Blowdown Natural Gas Emissions.
- Vented Emissions also remained relatively constant at 6% of the percentage share with 215 MMscf in 2020 and 198 MMscf in 2021. Overall, this category decreased YOY by 82% or 17 MMscf. For a more detailed analysis, see Table 8, Vented Natural Gas Emissions.
- Emissions from Damages have also remained relatively constant with the previous year, decreasing from 159 MMscf in 2020 to 141 MMscf in 2021.
- Other Leaks increased from 26 MMscf in 2020 to 31 MMscf in 2021. Overall, this was the only category to increase in YOY emissions, which was by 21% YOY or 5 MMscf.

Introduction and Background

On September 14, 2014, Governor Jerry Brown signed into law SB 1371 (Leno, 2014) requiring reporting and mitigation of emissions from California Public Utilities Commission (CPUC)-regulated gas pipeline facilities.⁷ 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 California Air Resources Board (CARB) prepared this annual report, which analyzes and accounts for natural gas from leaks and vented emissions from natural gas transmission, distribution, and storage in California.⁸

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 Natural Gas Leak Abatement (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.⁹ 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.¹⁰

⁷ Leno, Chapter 525, Statutes of 2014.

⁸ 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.

⁹ Leno, 2014; Pub. Util. Code §§ 975, 977, 978.

¹⁰ docs.cpuc.ca.gov/SearchRes.aspx?DocFormat=ALL&DocID=190740714, Finding 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).¹¹ This decision requires:¹²

- 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 reductions¹³.
- Two workshops to refine the scope and detail of the Compliance Plans and Tier 3 Advice Letters pertaining to cost-effectiveness and cost-benefit analysis and other elements as directed in D.17-06-015.
- Developing a process that gas companies can rely on, prior to 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 Division¹⁴ 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.
- Commission direction of the NGLA program moving forward, following submission of the third set of Best Practices Biennial Compliance Plans submitted in March 2022 and the NGLA program evaluation, which is due by the end of 2022.

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 2013 levels by 2030, was passed and signed into law in 2016.¹⁵ SB 605 (Lara, 2014) directed CARB to develop plans to reduce statewide natural gas emissions, which it did in the Short-Lived Climate Pollutants strategy.¹⁶

¹¹ Lara, Chapter 395, Statutes of 2016: docs.cpuc.ca.gov/PublishedDocs/Published/G000/M311/K449/311449621.PDF.

¹² D.19-08-020: <https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M311/K449/311449621.PDF>

¹³ 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."

¹⁴ Since the Decision was issued, the SED RASA Staff who have responsibility for preparation of the NGLA program evaluation have moved to the the Safety Policy Division (SPD).

¹⁵ Pavley, Chapter 249, Statutes of 2016.

¹⁶ Lara, Chapter 523, Statutes of 2014; CARB, 2017: <https://ww2.arb.ca.gov/resources/documents/slcp-strategy-final>.

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, by system category, by source classification, and by grade. The information should be used to help determine where emission reductions can be achieved while maintaining the 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 2021 emissions inventory reports submitted to CPUC by the gas companies on June 15, 2021 and differs from prior year reports as a result of the following three communications from CPUC to the list serve or gas companies.

With the issuance to the list serve of the March 30, 2022, reporting templates:

- Staff updated the previous tab name of “Component Leaks,” which is found in Appendices 1, 3, 4, 5 and 7, to “Component Fugitive Leaks.”
- Staff informed utilities that the population-based reporting of distribution metering and regulating stations is the required method. If a utility also has leaker-based information for Distribution M&R emissions, they may additionally include the leaker-based method and the corresponding Emission Factors.
- Staff informed utilities that the population-based reporting of farm taps has been updated to include the categories of “F1, F2 and F3” to correspond with inlet pressure ranges of less than 100 psi, in between 100 and 300 psi, and greater than 300 psi.
- Staff changed the prior column heading of “M&R Stations” to “M&R Stations and Farm Tap Classification” so that the leaker-based reporting of farm taps is better identified
- Staff informed utilities that the population-based reporting of MSAs for utilities is the required method. If a utility has company-specific EFs for their MSA emissions, they may additionally include the company-specific method and the corresponding EFs.
- Staff added to the Summary Appendix the note, “Round all estimated natural gas emissions to nearest Mscf.”
- Staff added a column to the Summary Appendix for 2015 Proposed Adjusted Baseline Emissions (Mscf) for utilities to record any baseline adjustment proposals for specific emissions categories.

With the email to PG&E and SoCalGas on June 6, 2022:

- The CPUC/SPD approved the use of company-specific EFs for Distribution Mains and Services (Appendix 4) and the use of leaker-based methods for Customer Meters (Appendix 6) for SoCalGas. Staff notes that the CPUC/SPD approved the use of leaker-based methods for Distribution Metering and Regulating Stations (Appendix 5) for all gas companies on April 15, 2021.

- CPUC/SPD indicated that it expected to approve the use of company-specific EFs for Distribution Mains and Services (Appendix 4) and the use of leaker-based methods for Distribution Metering and Regulating Stations (Appendix 5) and Customer Meters (Appendix 6) for PG&E.
- CPUC/SPD provided a revised Summary file (Appendix 8) for the Adjusted Baseline in Appendix 8. PG&E and SoCalGas were informed to enter leaker-based data and those adjusted baseline values in the revised Summary file (Appendix 8) for 2020 and 2021. PG&E and SoCalGas were also informed to provide the population-based data as supplemental information in tabs of the corresponding appendices.

With the emails to PG&E and SoCalGas on October 26, 2022, the following was updated:

- The CPUC/SPD approved adjusted 2015 baseline emissions for PG&E and SoCalGas. The letters include a background description of the regulation, an introduction, a summary of CPUC/SPD Approvals of Adjusted 2015 Baseline Emissions, and an Explanation of Adjustments to 2015 Baseline Emissions. The two letters are included in Appendix A.

This report includes general discussions of changes to operational practices, new methods for leak and emission detection, and mitigation programs. Lastly, Staff tried to include information on any 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 31, 2022, 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 their system-wide leak information.

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 beginning of the NGLA reporting process, Staff and respondents have 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)¹⁷, in consultation with the Air Resources Board [C](ARB), shall direct the annual report process...”¹⁸

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 factors 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

¹⁷ 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.

¹⁸ D.17-06-015, Pg. 157.

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 SED¹⁹ issues the annual data request at the end of the first quarter."²⁰

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 emission factor. 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 are generally unable to capture emissions changes associated with the gas companies' emissions mitigation practices. Leaker-based emissions estimates, on the other hand, are calculated by using surveyed or estimated number of leaks and are more effective in capturing emissions changes associated with gas companies' mitigation practices. The CPUC/SPD also approved company-specific EFs developed by SoCalGas for Distribution M&S.

On October 26, 2022, CPUC/SPD approved adjustments to the 2015 baseline emissions for PG&E and SoCalGas to account for methodological changes, 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. Letters from the CPUC/SPD to PG&E and SoCalGas approving the adjustments to 2015 baseline emissions are included in Appendix A.

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 2013 across all sectors state-wide). These approvals will also assist CPUC and the gas companies to estimate 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.

¹⁹ 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.

²⁰ Ibid, Pg. 39.

Findings and Discussion

Natural Gas Leaks and Emissions

As described in the Executive Summary, the 2021 estimated natural gas emissions totaled approximately 3,430 MMscf, which equates to 1.54 MMTCO₂e using the Intergovernmental Panel on Climate Change (IPCC) Forth Assessment Report (AR4) 100- year methane Global Warming Potential (GWP) of 25, or 4.42 MMTCO₂e using the 20-year methane GWP of 72 (see Table 1). This is a 5% YOY decrease from the 2020 estimated natural gas emissions of 3,608 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.^{21,22}

The 2021 System-wide Leak Rate was 0.17%, comparable to the 2020 System-wide Leak Rate of 0.18%. The System-wide Leak Rate is calculated by the dividing the Total Emissions by the Total Throughput, as shown in Table 4. Accordingly, the slight reduction in system-wide leak rate from 2020 to 2021 can be attributed to an approximately 5% decrease in Total Emissions and an approximately 0.7% increase in Total Throughput for 2021 relative to 2020.

A breakdown of the Total Throughput is directly reported by individual utilities and varies year over year. The Total Throughput reported in 2021 is within the bounds that reported in previous years. However, the Total Throughput is comprised of individual reporting totals. The most significant subtotal to change was the Total Distribution Annual Volume of Gas Used by the Gas Department reported to be 428 MMscf, the highest volume since the beginning of the NGLA reporting process. However, this total comprises the smallest fraction of Total Throughput, approximately 0.02% of the 1,964,000 MMscf of natural gas moved in the throughput of 2021.

While little changed from 2020 to 2021, the 2021 and 2020 System-wide Leak Rates are approximately 18% and 23% lower, respectively, than the 2015 baseline due to reductions in emissions. System-wide leak rates for the intermediate years (i.e., 2016 to 2019) are not shown because updated emission estimation methodologies have not been applied to emissions for these years.

²¹ 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.

²² Refer to Appendix C for Public Utilities Code Section 975(e)(6), Article 3.

Table 4: System-wide Throughput, Emissions, and Leak Rate - 2015, 2020, and 2021			
Throughput Category	Natural Gas Volume (MMscf)		
	2015 Baseline	2020	2021
Total Storage Annual Volume of Injections to Storage	199,522	182,841	166,893
Total Storage Annual Volume of Gas Used by the Gas Department	N/A	1,803	1,732
Total Transmission Annual Volume of Gas Used by the Gas Department	7,717	6,951	7,018
Total Transmission Volume of Annual Gas transported to or for Customers in state	1,832,676	1,745,839	1,775,141
Total Transmission Volume of Annual Gas transported for Customers out of state	16,775	12,567	13,335
Total Distribution Annual Volume of Gas Used by the Gas Department	261	362	428
Total Throughput	2,056,950	1,950,363	1,964,547
Total Emissions	4,437	3,608	3,430
System-wide Leak Rate $\left(\frac{\text{Total Emissions}}{\text{Total Throughput}}\right)$	0.22%	0.18%	0.17%

2020 Data Adjustments and Corrections

This report reflects adjustments to the 2020 data reported in the 2021 Joint Report. The change in emissions accounting in the 2020 respondent filings was updated for consistency and comparability with the current 2021 data. Staff reviewed with gas companies to confirm changes to the 2020 data.

The corrections made to 2020 values include:

- SWG changed the following 2020 value:
 - Transmission M&R Stations, Blowdowns subcategory increased by 1 Mscf from 6 Mscf to 7 Mscf. SWG discovered that a formula had not been carried over to all cells.
 - As a result of this change, the total emissions for SWG changed from 222,328 Mscf to 222,329 Mscf.
- PG&E changed the 2020 values:
 - Distribution M&R Stations, Station Leaks & Emissions subcategory changed from 883,459 Mscf with the population-based reporting, to 9,440 Mscf with the leaker-based reporting. This change resulted from the approval noted in the email from CPUC/SPD on June 6, 2022.
 - Customer Meters, Meter Leaks subcategory changed from 650,385 Mscf with the population-based reporting, to 245,907 Mscf with the leaker-based reporting. This change resulted from the approval noted in the email from CPUC/SPD on June 6, 2022.
 - As a result of these two changes, the total emissions for PG&E changed from 3,045,879 Mscf to 1,767,382 Mscf.

- SoCalGas changed the following 2020 values:
 - Distribution M&R Stations, Station Leaks & Emissions subcategory changed from 346,494 Mscf with the population-based reporting, to 9,192 Mscf with the leaker-based reporting. This change resulted from the approval noted in the email from CPUC/SPD on June 6, 2022.
 - Customer Meters, Meter Leaks subcategory changed from 871,235 Mscf with the population-based reporting, to 415,362 Mscf with the leaker-based reporting. This change resulted from the approval noted in the email from CPUC/SPD on June 6, 2022.
 - As a result of these two changes, the total emissions for SoCalGas changed from 2,121,920 Mscf to 1,328,746 Mscf.
- San Diego Gas & Electric (SDG&E) changed the following 2020 values:
 - Distribution Mains and Services Pipelines, Pipeline Leaks subcategory changed from 3,582 Mscf to 9,547 Mscf. This change resulted from the approval noted in the email from CPUC/SPD on June 6, 2022.

Impacts of CARB's Oil and Gas Methane Regulation

CARB's Oil and Gas Methane Regulation²³ (COGR) became effective January 1, 2018, and 2021 was the fourth year of implementation. The regulation has impacted SB 1371-related efforts by increasing leak survey frequency at transmission compressor stations and storage facilities to a quarterly cycle and requiring repair within specified timeframes of components found to be leaking above the allowed threshold. In 2020, the COGR leak concentration threshold decreased from 10,000 ppm to 1,000 ppm.

Both the NGLA program and COGR require descriptive 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 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 verify emissions are below the allowable emission flow rates. If component leaks or compressor emission rates exceed the thresholds in COGR, operators are required to complete repairs within the timeframes specified in the rule.

In the reporting of data for the NGLA program, both PG&E and SoCalGas reporting are affected by COGR. The following provides a summary of the two companies' reporting of Transmission Compressor Stations and Underground Storage.

²³ 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.

For PG&E's Component Fugitive Leaks subsection of Transmission Compressor Stations, the emissions increased from 11,356 Mscf in 2020 to 12,436 Mscf in 2021. The leak count also decreased from 1,025 leaks identified in 2020 to 579 leaks in 2021. PG&E provided the explanation for the change with, "In 2021, there was a decrease in the number of leaks, however, an increase in the overall emissions due to a longer repair time interval. Please note that this value includes the leaks between 1,000 to 10,000 ppm."

In PG&E's Storage Fugitive Leaks and Emissions subsection of Underground Storage, the emissions decreased from 2,584 Mscf in 2020 to 2,526 Mscf in 2021. The leak count also decreased from 947 leaks identified in 2020 to 817 leaks in 2021. PG&E provided the explanation for the change with, "There was a slight decrease in the emissions due to a decrease in the number of storage leaks."

For PG&E's Component Fugitive Leaks subsection of Underground Storage, the emissions increased from 2,222 Mscf in 2020 to 8,836 Mscf in 2021. The leak count also increased from 71 leaks identified in 2020 to 301 leaks in 2021. PG&E provided the explanation for the change with, "There was an increase in the emissions due to an increase in the number of leaks. Please note that this value includes the leaks between 1,000 to 10,000 ppm."

SoCalGas described in their data reporting that, "CARB Oil & Gas Rule decreased the leak detection threshold from 10,000 ppm to 1,000 ppm. Consequently, leaks > 10,000 ppm (Appendix 9 threshold) count is lower due to addressing and repairing leaks when detected at 1,000 ppm."

SoCalGas reported an emissions decrease from 2,527 Mscf in 2020 to 1,587 Mscf in 2021 in its Component Fugitive Leaks subsection of Transmission Compressor Stations. The leak count also decreased from 153 leaks identified in 2020 to 124 leaks in 2021.

In SoCalGas's Storage Fugitive Leaks and Emissions subsection of Underground Storage, the emissions increased from 59 Mscf in 2020 to 94 Mscf in 2021. While the leak count decreased from 134 leaks identified in 2020 to 131 leaks in 2021, there was an increase in emissions overall due to two larger leaks in 2021 that were more than 30 Mscf each and no leaks of this size in 2020.

For SoCalGas's Component Fugitive Leaks subsection of Underground Storage, the emissions decreased from 4,073 Mscf in 2020 to 2,956 Mscf in 2021. The leak count also decreased from 284 leaks identified in 2020 to 223 leaks in 2021.

Summary of Gas Company– Estimated Natural Gas Emissions

In 2021, the overall natural gas emissions decreased 5% from 2020. Table 5 shows the YOY change in natural gas emissions for each gas company from 2019 to 2020. Table 5 also highlights that the four largest gas companies are responsible for approximately 99% of the total natural gas emissions in 2020 and 2021, 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 2020 to 2021 are described in this section.

Entity	2015 Baseline		2020		2021		2015 Baseline to 2021 Change		2020-2021 YOY Change	
	Mscf	% Total	Mscf	% Total	Mscf	% Total	Mscf	% Change	Mscf	% Change
Pacific Gas & Electric	2,318,454	52%	1,767,382	49%	1,765,965	51%	(552,489)	(24%)	(1,417)	(0.1%)
Southern California Gas	1,592,024	36%	1,328,746	37%	1,156,566	34%	(435,458)	(27%)	(172,180)	(13%)
San Diego Gas & Electric	282,041	6%	251,636	7%	254,000	7%	(28,041)	(10%)	2,364	1%
Southwest Gas	214,307	5%	222,329	6%	222,979	7%	8,672	4%	650	0.3%
Wild Goose Storage	24,003	0.54%	19,676	0.55%	15,108	0.44%	(8,895)	(37%)	(4,568)	(23%)
Gill Ranch Storage	3,636	0.08%	14,401	0.40%	9,777	0.29%	6,141	169%	(4,624)	(32%)
Lodi Gas Storage	1,638	0.04%	2,438	0.07%	3,687	0.11%	2,049	125%	1,249	51%
Central Valley Gas Storage	806	0.02%	852	0.02%	821	0.02%	15	2%	(31)	(4%)
West Coast Gas Company	509	0.01%	224	0.01%	343	0.01%	(166)	(33%)	119	53%
Alpine Natural Gas	6	0.00%	247	0.01%	256	0.01%	250	4,471%	9	4%
Total	4,437,424	100%	3,607,931	100%	3,429,502	100%	(1,007,922)	(23%)	(178,429)	(5%)

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 2020 to 2021. 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 reported natural gas emissions of 1,765,965 Mscf in 2021, a 1,417 Mscf YOY decrease or approximately 0.1% from 1,767,382 Mscf reported for 2020.

These totals include the use of two different methodologies from previous Joint Reports. First, the leaker-based emission factors are used in the calculation of distribution metering and regulating station leaks, instead of population-based emission factors. Second, the leaker-based emission factors with bubble size leaks are used in the calculation of meter set assemblies, instead of population-based emission factors. However, the Distribution Mains and Services have continued to use emission factors from the 1996 US EPA/GRI, while other options will be evaluated in the coming year.

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

- Transmission Pipelines
 - For the All Damages category, most of the total emissions of 2,534 Mscf in 2021 can be attributed to one event with a release of 1,500 Mscf. Similarly, most of the emissions in the previous reporting of 2020 can be attributed to a single damage event of 2,584 Mscf. PG&E also described efforts that are made to reduce pipeline dig-ins as part of Best Practice - 24.
 - PG&E reported in the Blowdowns category that they were able to abate more emissions from various techniques such as drafting, cross-compression, flaring, and project bundling. The total emissions for this category decreased from 128,670 Mscf in 2020 to 115,818 Mscf in 2021.
 - For the Component Vented Emissions category, the increase in emissions from 27,518 Mscf in 2020 to 32,566 Mscf in 2021 was due to the addition of 97 automated valves that were not previously reported. Staff will evaluate whether those additional valves should be added to the baseline in next year's report.
- Transmission M&R Stations
 - Transmission M&R Station leaks and emissions changed from 547,290 Mscf reported for 2020 to 542,205 Mscf reported for 2021 (a 1% decrease). This change in emissions was attributed to the reported decrease of one interconnect and three intraconnects, as well as the inclusion of 93 Large Value Customers that were reported under Distribution M&R Stations in 2020.
 - For Blowdowns, the year over year decrease of 37,299 Mscf was the greatest decrease by a single category in the full reporting of PG&E. The total emissions for this category decreased by about half from 68,293 Mscf in 2020 to 30,994 Mscf in 2021 (a 55% decrease).

- In the previous year reporting, there were seven blowdowns with releases greater than 3,000 Mscf while there were no blowdowns in 2020 above that volume threshold.
- As well, in comparing leaks between 1,000 Mscf and 3,000 Mscf there were 14 blowdowns in this range in 2020, while only 9 blowdowns in this range in 2021.
- In the current reporting year of 2021, PG&E reported that they were able to abate more emissions from various techniques such as drafting, cross-compression, flaring, and project bundling.
- Transmission Compressor Stations
 - For Compressor Vented Emissions, the decrease in YOY emissions from 19,342 in 2020 to 17,305 Mscf in 2021 was due to measuring rod packing regularly and replacing rod packing that was previously leaking.
 - The number of leaks for the subcategory Compressor Station Component Leaks changed by about half from 1,025 leaks in 2020 to 579 leaks in 2021. PG&E provided the following explanation in their reporting, “In 2021, there was a decrease in the number of leaks, however, an increase in the overall emissions due to a longer repair time interval. Please note that this value includes the leaks between 1,000 to 10,000 ppm.”
- Distribution Main & Services Pipelines
 - PG&E provided both a calculation using the 1996 US EPA GRI emission factors as well as using Washington State University emission factors.
 - With the use of the 1996 US EPA GRI emission factors, the emission total increased by 9% from 502,727 Mscf in 2020 to 548,175 Mscf in 2021. In 2021, there was an increase in emissions due to an increase in the backlog of prior leaks. In addition, the compliance survey territory in 2021 was smaller than the compliance survey territory in 2020. This increased the number of unknown leaks, therefore, increasing the emissions, as compared to 2020.
 - For the Blowdowns category, the emission total decreased by 60% from 169 Mscf in 2020 to 68 Mscf in 2021. PG&E sufficiently explained that the reduction was due to a new process that utilized a GIS database to better capture the data.
- Distribution M&R Stations
 - In the Station Leaks & Emissions category using Leak-Based emission factors, the total emissions decreased by 9,440 Mscf in 2020 to 6,269 Mscf in 2021. PG&E explained that the emissions reduction was due to no open-ended line station leaks and fewer leaks found from surveys. Staff note that PG&E reported an overall increase in the count of leaks in 2021 relative to 2020 due to an increase in O&M leaks found in 2021.
- Customer Meters
 - For the Meter Leaks category using Leak-Based emission factors, the total emissions increased from 245,907 Mscf in 2020 to 255,977 Mscf in 2021. This change was due to an increased backlog of leaks. PG&E also described that they have improved the prioritizing of larger MSA leaks for repair.
- Underground Storage

- The emission total decreased for the Compressor Emissions category by 53% from 4,681 Mscf in 2020 to 2,193 Mscf in 2021. The reduction was due to measuring rod packing leaks regularly and replacing them.
- For the Compressor & Component Leaks category, the total emissions increased by about a factor of three from 2,222 Mscf in 2020 to 8,836 in 2021. The count of leaks increased by about a factor of three as well from 71 leaks in 2020 to 301 leaks in 2021. PG&E provided the explanation, “There was an increase in the emissions due to an increase in the number of leaks. Please note that this value includes the leaks between 1,000 to 10,000 ppm.”
- Supplemental Questionnaire
 - PG&E provided a summary table of the changes in their Supplemental Questionnaire, which Staff asked for permission to include in this 2022 Joint Report. Since PG&E approved, it is included in Appendix E.

Southern California Gas (SoCalGas)

SoCalGas reported natural gas emissions of 1,156,566 Mscf in 2021, a decrease of 172,180 Mscf from 1,328,746 Mscf reported for 2020.

This approximately 13% YOY decrease in emissions was mostly attributed to SoCalGas’s efforts to reduce transmission blowdown emissions (a 63,249 Mscf YOY reduction) and reduce distribution mains and services pipeline leaks(a 79,742 Mscf YOY reduction).

The total emissions for 2020 and 2021 include the use of two different methodologies from previous Joint Reports. First, the leaker-based emission factors are used in the calculation of distribution meter and regulating station leaks, instead of population-based emission factors. Second, the leaker-based emission factors with two categories of hazardous and non-hazardous are used in the calculation of meter set assemblies, instead of population-based emission factors.

Large YOY changes in emissions and changes in inventory counts are included in the following, summarized by system category:

- Transmission Pipelines
 - For the All Damages category, the Year-over-year (YOY) emission change from 9,692 Mscf in 2020 to 24 Mscf in 2021 was due to one large damage event that occurred in 2020. SoCalGas described in the 2020 reporting that an excavation damage event resulted in a release of 9,471 Mscf and that the leak was made non-hazardous within a day. There was not a damage event of similar size that occurred in 2021.
 - In the Blowdowns category, the YOY emission change from 76,006 Mscf in 2020 to 12,757 Mscf in 2021 was due to a few factors. First, there were two substantial blowdown events in 2020 as compared with 2021. The largest emission release was reported as 22,320 Mscf and described as being associated with a leak repair. The second largest emission release was 17,891 Mscf. In comparison, the largest blowdown in the 2021 reporting was 2,848 Mscf.

- Also within the Blowdowns Category, SoCalGas described many emission efforts in the Supplemental Questionnaire and the Summary Appendix 8, such as the procurement and implementation of cross compressions and gas capture technologies, revised internal processes, and the bundling of work on high-pressure lines when it was practical and safe to do so.
- For the Component Vented Emissions, the YOY emission change was from 6,370 Mscf in 2020 to 1,198 Mscf in 2021, due to the decrease in the count from 303 components in 2020 to 57 components in 2021. SoCalGas described in their reporting that an asset verification project of transmission pipeline components resulted in a more accurate inventory count and improved capabilities of identifying service vs. monitor components. Recent discussions with SoCalGas suggest that some of those baseline devices may have been operated as monitors rather than in control, and that these devices were not actively venting gas when operated as monitors. Staff notes that a further baseline correction may be required when SoCalGas clarifies the monitor/control status of the baseline devices.
- Transmission M&R Stations
 - In the Station Leaks & Emissions category, the YOY emission change from 108,741 Mscf in 2020 to 109,930 Mscf in 2021 was primarily due to the increase of one transmission to distribution connection. There was also a decrease in the count of tap facilities, but the emission factor with the other category is substantially larger. The emission factor is 1554.8 Mscf for transmission-to-distribution-connection, as compared to the smaller emission factor of 12.2 Mscf for farm-tap. SoCalGas also provided the description that the asset verification project of Transmission M&R Stations results in a more accurate inventory of tap facilities.
 - For the Blowdowns category, the YOY emission change from 11 Mscf in 2020 to 289 Mscf in 2021 was primarily due to one larger emission release that occurred in 2021. SoCalGas described the 175 Mscf blowdown event as resulting from a tie-in project.
- Transmission Compressor Stations
 - Reported in the Blowdowns category, the YOY emission change from 17,166 Mscf in 2020 to 22,809 Mscf in 2021 (a 33% increase). This was primarily due to one larger emission release that occurred in 2021. A blowdown emission of 4,045 Mscf was more than twice the volume of the next largest release of 1,566 Mscf for a tie-in project. In comparison, the largest release in 2020 was 1,527 Mscf for an emergency shutdown event.
 - In the Component Vented Emissions category, the YOY emission changed from 5,340 Mscf in 2020 to 2,922 Mscf in 2021. This was due to the decrease in the component count from 254 in 2020 to 139 in 2021. SoCalGas also described that the Asset Verification Projects of Transmission Compressor Station components resulted in a more accurate component inventory.

- Distribution Mains & Services Pipelines
 - For the Pipeline Leaks category, the YOY emission change from 545,429 Mscf in 2020 to 465,687 Mscf in 2021. SoCalGas provided the following description:
 - “SoCalGas’s effort to reduce leak inventory. SoCalGas achieved 24 months leak inventory, meaning no leak older than 24 was carried to 2022.”
 - “Increased the capabilities of Decision Tree (DT) approach. DT approach helped identifying large emitting leaks and accelerating their repairs time based on their measured flow. Leaks that meet the DT criteria were accelerated to be repaired within 3 months rather than 24 months.”
- Distribution M&R Stations
 - In the Station Leaks & Emissions, Leaker-based category using Leak-Based emission factors, the total emissions decreased from 9,192 Mscf in 2020 to 7,185 Mscf in 2021. While SoCalGas provided two subcategories for this category with Component Vented Emissions and Component Leaks, these two are summed together in this report in the one category, Station Leaks & Emissions, Leaker-based.
- Customer Meters
 - SoCalGas thoroughly reviewed their internal database to remove duplicate entries of the mileage used in the calculation of meters surveyed annually versus surveyed on their 5-year cycle. For the Meter Leaks category using Leak-Based emission factors, the YOY emissions changed from 415,362 Mscf in 2020 to 410,637 Mscf in 2021.
- Underground Storage
 - In Blowdown emissions, the YOY emission change from 1,783 Mscf in 2020 to 2,154 Mscf in 2021. There were changes in the number of maintenance blowdown events from 2020 to 2021.
 - For Component Fugitive Emissions, the YOY emission change from 2,773 Mscf in 2020 to 2,439 Mscf in 2021. SoCalGas described that emission reductions can be attributed to decommissioning components, converting components to operate via compressed air.
 - SoCalGas reported the YOY emission change from 4,073 Mscf in 2020 to 2,956 Mscf in 2021 for Component Vented Leaks. SoCalGas provided the following description in the Summary Appendix 8:
 - “CARB Oil & Gas Rule decreased the leak detection threshold from 10,000 ppm to 1,000 ppm. Consequently, leaks > 10,000 ppm (Appendix 9 threshold) count is lower due to addressing and repairing leaks when detected at 1,000 ppm.”

San Diego Gas and Electric (SDG&E)

SDG&E reported natural gas emissions of 181,603 Mscf in 2021, an increase of 5,297 Mscf from 176,307 Mscf reported for 2020 (a 3% increase).

Large YOY changes in emissions included the following, summarized by reporting category.

- Transmission Pipelines
 - For the Blowdowns category, the Year-over-year (YOY) emissions changed from 531 Mscf in 2020 to 75 Mscf in 2021. This was due to there not being larger blowdown events in 2021 as compared to the previous year. To explain, the largest blowdown events in 2021 were only 20 Mscf, which was considerably smaller than the events that occurred in 2020. The previous reporting in 2020 included blowdown events that were measured as 161 Mscf, 111 Mscf and 67 Mscf.
 - SDG&E provided the description of changes to blowdown practices in the Supplemental Questionnaire, which included bundling work on high-pressure lines when practical and safe to do so, as well as using cross compression and gas capture technologies.
- Transmission M&R Stations
 - Station leaks and emissions remained constant from 2020 to 2021 with 21,767 Mscf.
- Transmission Compressor Stations
 - In the Compressor Vented Emissions section the YOY emission changed from 867 Mscf in 2020 to 2,065 Mscf in 2021. SDG&E described that the increase can be attributed to the normal variation and fluctuation.
 - For Blowdowns emissions, the YOY emission change from 1,707 Mscf in 2020 to 3,201 Mscf in 2021. There were two large emergency shutdown events in 2021 with emissions of 669 Mscf and 667 Mscf, while there were no blowdowns of this type in the previous year's reporting.
 - Within Component Vented Emissions, the YOY emission changed from 401 Mscf in 2020 to 336 Mscf in 2021. This is due to the decrease in the number of devices from 2020 to 2021. SDG&E described that the decrease in emissions is also due to field verification projects of Compressor Stations Components, which resulted in lower but more accurate component counts.
 - For Compressor and Component Fugitive Leaks, the YOY emission change from 368 Mscf in 2020 to 144 Mscf in 2021. This difference was explained by noting that for those leaks with a non-zero emission, the average was 7 Mscf in 2021, while the average was larger at 16 Mscf in 2020.

- Distribution Mains & Services

- For Distribution Mains and Services Pipelines, the YOY emission changed from 9,547 Mscf in 2020 to 12,291 Mscf in 2021. SDG&E described that the increase can be attributed to the following:
 - “In 2020, SDG&E increased leak surveys of Protected Steel and SOTA Plastic from five (5) year to three (3) year and the Protected Steel pre-1950 and NSOTA Plastic from three (3) year to annually resulted in sporadic leak survey anniversary dates. Due to the increased surveys, there were more leaks discovered via surveys compared to previous year, which influence the number of days leaking and the number unknown leaks estimation. Once survey portions are levelized, the number of leaks is expected to drop and stay consistent.”
- In the All Damages category, the YOY emission change from 9,329 Mscf in 2020 to 8,827 Mscf in 2021. The number of damages was the same in both years with 385 damage events, however there were damage events in the previous year with larger emissions per event. The largest emission per event in the previous year was 145 Mscf.

- Distribution Metering & Regulating Stations

- On April 15, 2021, CPUC approved the reporting of leaker-based emissions for Distribution M&R Stations - Component Fugitive Leaks for all gas companies. However, because CPUC had not approved adjustments to the 2015 baseline emissions for San Diego Gas and Electric prior to the issuance of the 2022 data request and reporting template, Staff requested that gas companies that have developed leaker-based methodologies for Distribution M&R Stations – Component Fugitive Leaks report natural gas emissions for this Emission Source Category using both leaker-based and population-based methodologies for 2020 and 2021. Staff note that within the tables, figures, and text in this report, SDG&E emissions for Distribution M&R Stations – Component Fugitive Leaks in 2020 and 2021 are provided as population-based estimates. This ensures consistency with the methods used to estimate the 2015 Baseline emissions for SDG&E for this Emissions Source Category, which also used population-based reporting.
- Consistent with CPUC’s approval on April 15, 2021 allowing gas companies to report leaker-based emissions for Distribution M&R Stations - Component Fugitive Leaks, SDG&E also reported leaker-based emissions for this Emissions Source Category. SDG&E’s reporting of leaker-based emissions for Component Fugitive Leaks indicated a YOY emission change from 269 Mscf in 2020 to 219 Mscf in 2021.

- Customer Meters

- In Meter Leaks, the YOY emission change from 130,298 Mscf in 2020 to 131,036 Mscf in 2021. There was a small increase in the count of residential meters from 869,518 to 874,463 and commercial/industrial meters from 31,546 to 31,673.

- In the All Damages category, the YOY emission change from 963 Mscf in 2020 to 795 Mscf in 2021. This was due to the reduction in the count of damage events from 191 to 145.

Wild Goose Gas Storage (WGGS) WWGS's natural gas emissions decreased from 19,676 Mscf reported in 2020 to 15,108 Mscf reported in 2021, a 4,568 Mscf reduction, or a 23% YOY reduction. All natural gas emissions from WGGS are associated with underground storage, and summarized as follows:

- Compressor emissions decreased from 6,190 Mscf in 2020 to 3,281 Mscf in 2021, which was explained by WGGS as due to “low emissions packing installed on select compressors.” (a 47% decrease).
- Blowdown emissions of the underground storage changed from 12,061 Mscf in 2020 to 10,560 Mscf in 2021. There were also four events in both years that WGGS describes with “piping within the compressor station that’s blown down to accommodate a mode change” (a 12% decrease).

Gill Ranch Gas Storage Company (GRGC)

In 2021, GRGC reported natural gas emissions of 9,777 Mscf, a 4,624 Mscf decrease from the 14,401 Mscf reported for 2020. This approximately 32% YOY reduction was due to the following changes in emission subcategories:

- Underground storage compressor emissions decreased from 10,019 reported for 2020 to 6,033 reported for 2021 (a 40% reduction). GRGC described the change as due to maintenance completed on compressors that resulted in improved emission factors.
- Underground storage blowdowns emissions decreased from 4,259 Mscf for 2021 to 3,515 Mscf reported for 2020 (39% reduction). Even though there was an increase in the count of blowdowns from 188 events in 2020 to 244 events in 2021, the relative emissions per event decreased.
- Underground storage component leaks increased from 123 Mscf reported for 2020 to 229 reported for 2021 (an 86% increase). This was due to the count of leaks increasing from 11 leaks in 2020 to 17 leaks in 2021.

Lodi Gas Storage (LGS)

LGS observed an increase of 1,249 Mscf in natural gas emissions from 2,438 Mscf in 2020 to 3,687 Mscf in 2021 (a 51% change). This increase was due to the following change in emissions:

- Underground storage compressor emissions increased by 1,232 Mscf from 1,629 Mscf in 2020 to 2,861 Mscf in 2021 (a 76% increase). LGS noted the increased compressor runtime in 2021. The data showed the total hours of pressurized operating mode of the compressors increased from 7,436 hours in 2019 to 12,780 hours in 2021.

Central Valley Gas Storage (CVGS)

CVGS reported natural gas emissions of 852 Mscf for 2021, a YOY 31 Mscf decrease from the 821 Mscf reported for 2020. This approximately 4% reduction was due to the following changes in emissions:

- Blowdown emissions of the underground storage changed from 207 Mscf in 2020 to 101 Mscf in 2021 (a 51% decrease). This was due to the decrease in the number of blowdown events from 17 events in 2020 to 12 events in 2021.
- Compressor emissions increased from 612 Mscf in 2020 to 689 Mscf in 2021 (a 13% increase). This was due to changes in both the hours of operation in the pressurized mode for the three compressors, and the equipment specific emission factor for the operating mode.

West Coast Gas Company (WCGC)

WCGC's natural gas emissions increased from 224 Mscf reported from 2020 to 342 Mscf reported for 2021 (a 53% increase). This YOY change was due to two more pipeline leaks discovered in 2021 and one excavation damage event.

Alpine Natural Gas

Alpine Natural Gas reported natural gas emissions of 256 Mscf in 2021, a 4% increase from 246 Mscf reported in 2020. This YOY increase in emissions can be largely attributed to an increased number of meter leaks in 2021. Most of Alpine Natural Gas' emissions continued to be from customer meter fugitive leaks, which is consistent with prior reporting years.

Summary of Natural Gas Emissions Grouped by Source Classification

As described in the Executive Summary, the natural gas emissions can be 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 in population-based source classifications can only be achieved through reducing the number of pieces of equipment. However, in other source classifications in which leaks are measured, natural gas emissions reductions can be achieved through strategies that reduce the measured leaks while keeping the same number of pieces of equipment. Table 3 in the Executive Summary provides a data analysis with 2021 natural gas emissions data.

Population-based natural gas emissions are the largest source classification with 1,103,367 Mscf in 2021. 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 natural gas 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 with the development of leak measurement methods, rather than population counts, for the larger utilities. 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]	2020 [Mscf]	2021 [Mscf]	2015 Baseline to 2021 Change		2020 - 2021 YOY Change	
				Mscf	% Change	Mscf	% Change
Transmission Pipelines, Pipeline Leaks	5,238	5,047	5,030	(208)	(4%)	(17)	(0.3%)
Transmission M&R Stations, Station Leaks & Emissions	711,797	691,812	684,807	(26,990)	(4%)	(7,005)	(1%)
Distribution M&R Stations, Station Leaks & Emissions	265,057	251,117	252,794	(12,263)	(5%)	1,677	1%
Customer Meters, Meter Leaks	153,641	160,017	160,736	7,095	5%	719	0.4%
Total Population-Based Emissions	1,135,733	1,107,993	1,103,367	(32,366)	(3%)	(4,626)	(0.4%)

The next largest source classification, Graded Pipeline Leaks, is described later in the report in the section that analyzes the results of Distribution Mains and Services.

The third largest source classification, Leaker-Based emissions includes only two categories of applying this methodology. They are distribution meter and regulating stations and customer meters, but still accounted for 680,068 Mscf in 2021 or 20% of the inventory.

The fourth largest source classification with 248,096 Mscf in 2021 is Blowdowns. Table 7 shows Blowdown emissions by system category. This source classification experienced a 31% decrease of 111,719 Mscf from 2020. The decrease from the 2015 Baseline emissions of 355,329 Mscf or 59% 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]	2020 [Mscf]	2021 [Mscf]	2015 Baseline to 2021 Change		2020 - 2021 YOY Change	
				Mscf	% Change	Mscf	% Change
Transmission Pipeline	455,055	205,220	128,665	(326,390)	(72%)	(76,555)	(37%)
Transmission M&R Stations	65,582	68,313	31,292	(34,290)	(52%)	(37,021)	(54%)
Transmission Compressor Stations	31,088	55,956	63,044	31,956	103%	7,088	13%
Distribution Mains and Services	5,046	492	327	(4,719)	(94%)	(165)	(34%)
Distribution M&R Stations	256	435	423	167	65%	(12)	(3%)
Underground Storage	46,358	29,399	24,345	(22,013)	(47%)	(5,054)	(17%)
Total	603,385	359,815	248,096	(355,289)	(59%)	(111,719)	(31%)

The fifth largest source classification with 198,410 Mscf in 2021 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 across the various stages of the transmission, storage, and distribution.

Table 8: Vented Natural Gas Emissions							
System Category	2015 Baseline [Mscf]	2020 [Mscf]	2021 [Mscf]	2015 Baseline to 2021 Change		2020 – 2021 YOY Change	
				Mscf	% Change	Mscf	% Change
Transmission Pipelines, Components, Vented	12,774	33,888	34,353	29,761	169%	465	1%
Transmission Pipelines, Odorizers	2,570	2,888	2,925	355	14%	37	1%
Transmission Compressors Stations, Compressors	106,257	48,060	41,704	(64,553)	(61%)	(6,356)	(13%)
Transmission Compressors Stations, Components, Vented	15,558	24,189	21,983	6,425	41%	(2,206)	(9%)
Customer Meters, Vented	2,363	884	1,131	(1,232)	(52%)	247	28%
Underground Storage, Compressors	96,313	24,621	16,559	(79,754)	(83%)	(8,062)	(33%)
Underground Storage, Components, Vented	96,228	80,694	79,775	(16,473)	(17%)	(939)	(1%)
Underground Storage, Dehydrator Vented	13	13	0	(13)	(100%)	(13)	(100%)
Total	332,076	215,237	198,410	(133,666)	(40%)	(16,827)	(8%)

The next category, All Damages, remained decreased from 159,301 MMscf in 2020 to 31,153 Mscf in 2021. This includes damages from individuals and construction companies to transmission pipelines, distribution pipelines, and customer meters. Gas companies have mentioned in their best practices submittal that they fund communication and educational campaigns to encourage individuals to contact the company before digging.

The final source classification, Other Leaks, increased from 25,773 Mscf in 2020 to 31,153 in 2021. This category includes Component Leaks in Distribution M&S, and Underground Storage, as well as Storage Leaks and Emissions in 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, 2020, and 2021 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.

Table 9: Natural Gas Emissions by System Category, Emission Source, and Source Classification									
System Category	Emission Source	Source Classification	2015 Baseline	2020	2021	2015 Baseline to 2021 Change		2020 - 2021 YOY Change	
			Mscf	Mscf	Mscf	Mscf	%	Mscf	%
Transmission Pipelines	Pipeline Leaks	Population-Based	5,238	5,047	5,030	(208)	(4%)	(17)	(0%)
	All Damages	Damages	81,793	13,714	2,558	(79,235)	(97%)	(11,156)	(81%)
	Blowdowns	Blowdown	455,055	205,220	128,665	(326,390)	(72%)	(76,555)	(37%)
	Component V. Emissions	Vented	12,774	33,888	34,353	21,579	169%	465	1%
	Odorizers	Vented	2,570	2,888	2,925	355	14%	37	1%
Transmission M&R Stations	Station Leaks & Emissions	Population-Based	711,797	691,812	684,807	(26,990)	(4%)	(7,005)	(1%)
	Blowdowns	Blowdown	65,582	68,313	31,292	(34,290)	(52%)	(37,021)	(54%)
Transmission Compressor Stations	Compressor Emissions	Vented	106,257	48,060	41,704	(64,553)	(61%)	(6,356)	(13%)
	Blowdowns	Blowdown	31,088	55,956	63,044	31,956	103%	7,088	13%
	Component Ven. Emissions	Vented	15,558	24,189	21,983	6,425	41%	(2,206)	(9%)
	Component Fugitive Leaks	Other Leaks	27,712	14,251	14,167	(16,545)	(49%)	(84)	(1%)
	Storage Tank Leaks & Emissions	Other Leaks	278	470	170	(108)	(39%)	(300)	(64%)
Distribution Mains & Services	Pipeline Leaks	Pipeline Leaks	1,237,234	1,059,910	1,027,660	(209,574)	(17%)	(32,250)	(3%)
	All Damages	Damages	230,912	123,878	115,974	(114,938)	(50%)	(7,904)	(6%)
	Blowdowns	Blowdown	5,046	492	327	(4,719)	(93%)	(165)	(34%)
	Component Fugitive Leaks	Other Leaks	0	1	378	378	N/A	377	>100%
Distribution M&R Stations	Station Leaks & Emissions	Population-Based	265,057	251,117	252,794	(12,263)	(5%)	1,677	1%
	Station Leaks & Emissions	Leaker-Based	18,671	18,633	13,454	(5,217)	(28%)	(5,179)	(28%)
	Blowdowns	Blowdown	256	435	423	167	65%	(12)	(3%)
Customer Meters	Meter Leaks	Population-Based	153,641	160,017	160,736	7,095	5%	719	0%
	Meter Leaks	Leaker-Based	661,269	661,269	666,614	5,345	1%	5,345	1%
	All Damages	Damages	5,233	21,709	22,196	22,196	424%	487	2%
	Vented Emissions	Vented	2,363	884	1,131	(1,232)	(52%)	247	28%
Underground Storage	Storage Leaks & Emissions	Other Leaks	5,182	2,669	2,647	(2,535)	(49%)	(22)	(1%)
	Compressor Emissions	Vented	96,313	24,621	16,559	(79,754)	(83%)	(8,062)	(33%)
	Blowdowns	Blowdown	46,358	29,399	24,345	(22,013)	(47%)	(5,054)	(17%)
	Component Ven. Emissions	Vented	96,228	80,694	79,775	(16,453)	(17%)	(919)	(1%)
	Component Fugitive Leaks	Fugitive	97,946	8,382	13,791	13,791	14%	5,409	65%
	Dehydrator Ven. Emissions	Vented	13	13	0	(13)	(100%)	(13)	100%
Total			4,437,425	3,607,931	3,429,502	(1,007,922)	(23%)	(178,429)	(5%)

Description of the Seven System Categories

Transmission Pipelines

PG&E, SoCalGas, SDG&E, LGS, and CVGS reported Transmission Pipelines natural gas emissions. The total natural gas emissions decreased from 260,757 Mscf in 2020 to 173,531 Mscf in 2021, with most of the decrease attributed to reductions in blowdown emissions.

- Pipeline Leaks decreased 17 Mscf from 5,047 Mscf in 2020 to 5,030 Mscf in 2021. 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 2021, All Damages decreased by 11,156 Mscf from 13,714 Mscf in 2020 to 2,558 Mscf in 2021. These emissions are event-based and can fluctuate significantly from year-to-year.
- Blowdowns showed a noticeable YOY reduction of 76,555 Mscf from 205,220 Mscf in 2020 to 128,665 Mscf in 2021. 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 increased by 465 Mscf from 33,888 Mscf in 2020 to 34,353 Mscf in 2021.
- Odorizer emissions remained relatively constant with 2,888 Mscf in 2020 and 2,925 Mscf in 2021.

Table 10: Transmission Pipelines Natural Gas Emissions

Source	2015 Baseline		2020		2021		2020 - 2021 YOY Change	
	Mscf	% Total	Mscf	% Total	Mscf	% Total	Mscf	% Change
Pipeline Leaks	5,238	1%	5,047	2%	5,030	3%	(17)	0%
All Damages	81,793	15%	13,714	5%	2,558	1%	(11,156)	(81%)
Blowdowns	455,055	82%	205,220	79%	128,665	74%	(76,555)	(37%)
Component Vented Emissions	12,774	2%	33,888	13%	34,353	20%	465	1%
Odorizers	2,570	1%	2,888	1%	2,925	2%	37	1%
Total	557,430	100%	260,757	100%	173,531	100%	(87,226)	(33%)

Transmission M&R Stations

PG&E, SoCalGas, SDG&E, SWG, and CVGS reported total Transmission M&R Stations emissions of 716,099 Mscf in 2021. This system category is largely population-based, except for the blowdowns, which are activity-based.²⁴

- Station Leak & Emissions decreased 7,005 Mscf from 691,812 Mscf in 2020 to 684,807 Mscf in 2021. This reduction is due to the change in reporting structure, as issued in the March 31, 2021, directions, that respondents may record farm taps in Distribution M&R Stations instead of Transmission M&R Stations.
- In 2021, Blowdowns decreased by about half from 68,313 Mscf in 2019 to 31,292 Mscf in 2020.

Source	2015 Baseline		2020		2021		2020 - 2021 YOY Change	
	Mscf	% Total	Mscf	% Total	Mscf	% Total	Mscf	% Change
Station Leaks & Emissions	711,797	92%	691,812	91%	684,807	96%	(7,005)	(1%)
Blowdowns	65,582	8%	68,313	9%	31,292	4%	(37,021)	(54%)
Total	777,379	100%	760,125	100%	716,099	100%	(44,026)	(6%)

Transmission Compressor Stations

PG&E, SoCalGas, and SDG&E reported 2021 total Transmission Compressor Station emissions of 141,068 Mscf, which is a 1,858 Mscf decrease from 2020 emissions of 142,926 Mscf.

- Compressor Emissions decreased 6,356 Mscf or 13% YOY from 48,060 Mscf in 2020 to 41,704 Mscf in 2021. The decrease in emissions is due to variances in pressurized operating hours and compressor-specific emission factor.
- In 2021, Blowdowns increased 7,088 Mscf from 55,956 Mscf in 2020 to 63,044 Mscf in 2021.
- Component Vented Emissions decreased by 2,206 Mscf from 24,189 Mscf in 2020 to 21,983 Mscf in 2021.
- Compressor and Component Fugitive Leaks decrease by 84 Mscf, from 14,251 Mscf in 2020 to 14,167 Mscf in 2021. Compressor and Component Leaks are further described in the 2021 Joint Report section, “Impacts of CARB’s Oil and Gas Methane Regulation (COGR).”

²⁴ 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.

- Lastly, Storage Tank Leaks and Emissions decreased by 300 Mscf, from 470 Mscf reported in 2020 to 170 Mscf in 2021.

Table 12: Transmission Compressor Stations Natural Gas Emissions								
Source	2015 Baseline		2020		2021		2020 - 2021 YOY Change	
	Mscf	% Total	Mscf	% Total	Mscf	% Total	Mscf	% Change
Compressor Emissions	106,257	59%	48,060	34%	41,704	30%	(6,356)	(13%)
Blowdowns	31,088	17%	55,956	39%	63,044	45%	7,088	13%
Component Vented Emissions	15,558	9%	24,189	17%	21,983	16%	(2,206)	(9%)
Compressor and Component Fugitive Leaks	27,712	15%	14,251	10%	14,167	10%	(84)	(1%)
Storage Tank Leaks & Emissions	278	0.2%	470	0.3%	170	0.1%	(300)	(64%)
Total	180,893	100%	142,926	100%	141,068	100%	(1,858)	(1%)

Distribution M&S

PG&E, SoCalGas, SDG&E, SWG, and WCGC reported total Distribution M&S Emissions of 1,144,339 Mscf in 2021, which is a decrease of 39,942 Mscf from 1,184,281 Mscf in 2020.

- The emissions from Pipeline Leaks showed a decrease of 32,250 Mscf from 1,059,910 Mscf in 2020 to 1,027,660 Mscf in 2021. This category is the single largest category in the whole inventory and is further described in the section below, “Detailed Description of Distribution M&S Leaks and Emissions.”
- All Damages decreased by 7,904 Mscf from 123,878 Mscf in 2020 to 115,974 Mscf in 2021.
- In 2021, Blowdowns showed a decrease of 165 Mscf from 492 Mscf reported in 2020 to 327 Mscf reported in 2021.
- Lastly, Component Fugitive Leaks showed an increase of 377 Mscf in 2021 relative to 2020. Since this reporting was due to only utility, Staff will correspond with this utility next year to see if the emissions should be placed in pipeline leaks.

Table 13: Distribution Mains and Services Natural Gas Emissions								
Source	2015 Baseline		2020		2021		2020 - 2021 YOY Change	
	Mscf	% Total	Mscf	% Total	Mscf	% Total	Mscf	% Change
Pipeline Leaks	1,237,234	84%	1,059,910	89%	1,027,660	90%	(32,250)	(3%)
All Damages	230,912	16%	123,878	12%	115,974	10%	(7,904)	(6%)
Blowdowns	5,046	0.3%	492	0.05%	327	0.03%	(165)	(34%)
Component Fugitive Leaks	0	0%	1	0%	378	0.03%	377	>100%
Total	1,473,192	100%	1,184,281	100%	1,144,339	100%	(39,942)	(3%)

Detailed Description of Distribution M&S 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. Respondents also provided other parameters for informational purposes that were not used in any calculations, such as zip code location of leak, pipe size, pressure, and scheduled date of repair.

Table 14 shows the count of each leak grades 1 – 3, Un-surveyed leaks, and Above Ground Non-Hazardous leaks. The number of Un-surveyed (i.e., Unknown) leaks are estimated based on respondent’s leak rate, and as such, Staff does not proportionately allocate the un-surveyed leaks by the proportion of graded leaks found in respondent’s service territory.

Grade 3 leaks make up most of the Distribution M&S leaks with 50% of the inventory. 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. While the estimated un-surveyed leaks cannot be graded, these leaks make-up 41% of the leak inventory by count.

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 2021.

Leak Grade	Carried Over from 2020	Discovered in 2021	Repaired in 2021	Estimated Un-surveyed	Total	% of Total
Grade 1	27	7,491	(7,161)	N/A	357	0.9%
Grade 2	2,457	5,638	(4,799)	N/A	3,296	8%
Grade 3	19,146	9,337	(8,621)	N/A	19,862	50%
Un-surveyed - No grade	N/A	N/A	N/A	16,081	16,081	41%
Above Ground - Hazardous	0	0	0	0	0	0%
Above Ground - Non-Hazardous	0	0	0	0	0	0%
Total	21,630	22,466	(20,581)	16,081	39,596	100%

As shown on Table 15, the Grade 1 leaks are repaired quickly, taking a weighted average of five days to fix. Grade 2 leaks show more variability across the four gas companies with a range from six days to fix to 237 days to fix, with a weighted average of 154 days to repair. Finally grade 3 leaks show the most variability with a range from 13 to 825 days, and a weighted average of 818 days to repair.

Entity	Average Repair Days		
	Grade 1	Grade 2	Grade 3
Pacific Gas & Electric	3	137	873
Southern California Gas	1	272	452
San Diego Gas & Electric	2	30	64
Southwest Gas	1	6	34
2020 - Weighted Average	2	184	604

Distribution M&R Stations

PG&E, SoCalGas, SDG&E, SWG, and Alpine Natural Gas reported 2021 total emissions in this category of 266,671 Mscf, which decreased by 3,514 Mscf or 1% from the 270,185 Mscf reported in 2020 (see Table 16).

- The Station Leaks & Emissions, Population-Based category for SDG&E and SWG increased by 1,677 Mscf from 251,117 Mscf in 2020 to 252,794 Mscf in 2021.
- PG&E and SoCalGas reported Distribution M&R Station Leaks & Emissions using leaker-based methodologies, which showed a decrease from 18,633 Mscf in 2020 to 13,454 Mscf in 2021
- The Blowdowns emission reported in 2021 were similar to the previous year, around 430 Mscf.

Table 16: Distribution M&R Stations Natural Gas Emissions								
Source	2015 Baseline		2020		2021		2020 - 2021 YOY Change	
	Mscf	% Total	Mscf	% Total	Mscf	% Total	Mscf	% Change
Station Leaks & Emissions, Population-Based	265,057	93%	251,117	93%	252,794	95%	1,677	1%
Station Leaks & Emissions, Leaker-Based	18,671	7%	18,633	7%	13,454	5%	(5,179)	(28%)
Blowdowns	256	0.1%	435	0.2%	423	0.2%	(12)	(3%)
Total	283,984	100%	270,185	100%	266,671	100%	(3,514)	(1%)

Customer Meters

PG&E, SoCalGas, SDG&E, SWG, WCGC, and Alpine Natural Gas reported Customer Meter emissions totaling 850,677 Mscf in 2021 which increased by 6,798 Mscf or 0.8% from 843,879 Mscf in 2020.

- Meter Leaks, Population-Based, as reported by SDG&E increased by 719 Mscf from 160,017 Mscf in 2020 to 160,736 Mscf in 2021.
- The utilities PG&E, SoCalGas estimated Customer Meter emissions using a leaker-based reporting which showed an increase of 5,345 Mscf from 661,269 Mscf in 2020 to 666,614 Mscf in 2021.
- The All Damages category was not part of the 2015 reporting but was added in 2019. This category increased 487 Mscf from 21,709 Mscf in 2020 to 22,196 Mscf in 2021.
- Vented Emissions decreased by 247 Mscf or 28% YOY from 884 Mscf in 2020 to 1,131 Mscf in 2021. 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		2020		2021		2020 - 2021 YOY Change	
	Mscf	% Total	Mscf	% Total	Mscf	% Total	Mscf	% Change
Meter Leaks, Population-Based	153,641	19%	160,017	19%	160,736	19%	719	0.4%
Meter Leaks, Leaker-Based	661,269	80%	661,269	78%	666,614	78%	5,345	1%
All Damages	5,233	1%	21,709	3%	22,196	3%	487	2%
Vented Emissions	2,363	0.1%	884	0.1%	1,131	0.1%	247	28%
Total	1,638,274	100%	843,879	100%	850,677	100%	6,798	1%

Underground Storage

PG&E, SoCalGas, CVGS, GRGS, LGS, and WGGC reported Underground Storage systems emissions for 2021. As seen in Table 18 below, Underground Storage emissions decreased by 8,661 Mscf from 145,778 Mscf in 2020 to 136,567 Mscf in 2021.

- The Storage Leaks and Emissions decreased 22 Mscf from 2,669 Mscf in 2020 to 2,647 Mscf in 2021. This emission source is further described in the 2021 Joint Report section, “Impacts of CARB’s Oil and Gas Methane Regulation.”
- Compressor Emissions decreased by 8,062 Mscf from 24,621 Mscf in 2020 to 16,559 Mscf in 2021.
- Blowdown emissions decreased by 5,054 Mscf from 29,399 Mscf in 2020 to 24,345 Mscf in 2021.

- Component Fugitive Emissions remained relatively constant with a decrease of 919 Mscf or 1% from 80,694 Mscf in 2020 to 79,775 Mscf in 2021.
- Compressor and Component Leaks increased by 5,409 Mscf from 8,382 Mscf in 2020 to 13,791 Mscf in 2021. The component leaks subsection is further described in the 2021 Joint Report section, “Impacts of CARB’s Oil and Gas Methane Regulation (COGR).”
- In the dehydrator source category, all 13 Mscf of the emissions in 2020 decreased to zero emissions in 2021. This is due to all dehydrator facilities using either a vapor recovery unit to reinject gas into the pipeline and/or thermally oxidize the glycol/methane mixture after dehydration, and therefore have no reported emissions.

Table 18: Underground Storage Natural Gas Emissions

Source	2015 Baseline		2020		2021		2020 - 2021 YOY Change	
	Mscf	% Total	Mscf	% Total	Mscf	% Total	Mscf	% Change
	Storage Leaks & Emissions	5,182	2%	2,669	2%	2,647	2%	(22)
Compressor Emissions	96,313	28%	24,621	17%	16,559	12%	(8,062)	(33%)
Blowdowns	46,358	14%	29,399	20%	24,345	18%	(5,054)	(17%)
Component Vented Emissions	96,228	28%	80,694	55%	79,775	58%	(919)	(1%)
Compressor and Component Fugitive Leaks	97,946	29%	8,382	6%	13,791	10%	5,409	65%
Dehydrator Vent Emissions	13	0%	13	0%	0	0%	(13)	(100%)
Total	192,797	100%	145,778	100%	136,567	100%	(8,661)	(6%)

Unusual Large Leaks

There were no unusual large leaks reported in 2021. 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 2022, 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 understand 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:

- Methodologies to estimate emissions continue to improve and methods that are based on the population size of components and emission factors are being replaced as improved methods are developed. 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, including supporting data, calculation files, and field documentation, as appropriate. This information and data are necessary for Staff to fully evaluate and approve such proposals.
- Staff continue to find unanticipated improvements in the reporting templates and in the data reported once the data come in. This year, Staff sent a reporting template revision in June, and respondents revised submitted data from July through October to correct inadvertent errors. In the future, Staff will aim to finalize all template revisions by the issue date of March 31 to avoid sending multiple reporting template updates.
- Staff continue to see different interpretations of reporting requirements. Staff will aim to clarify what is needed both within the reporting templates and in the responses to the accompanying survey questionnaire. If gas companies include thorough explanations of significant YOY changes and associated causes within their original submittal, this would lessen the need for Staff follow-up questions to understand the previous year's emissions.

Conclusion

CPUC and CARB Staff have continued 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).

Changes in the 2021 estimated natural gas emissions are a result of application of best practices, field verification efforts, implementation of a new leak detection threshold in CARB's Oil and Gas Methane Regulation, and changes in the reporting templates. Gas companies also began application of new methodologies for estimating Distribution M&R Station and Customer Meter emissions.

Finally, we anticipate that the 2023 Winter Workshop will be an appropriate venue for further collaboration and discussion among CPUC, CARB, and gas companies on the following topics:

- Potential additional adjustments to the 2015 baseline emissions.
- Updates to the Annual Questionnaire to facilitate responses that are included in Summary Appendix.
- Updates to the reporting template, including:
 - Changing the term “component leaks” to the more descriptive term, “component fugitive leaks.”
 - Updating the notes section in the header of the reporting template. Specifically, Appendix 7 (Compressor Vented Emissions) currently includes about four paragraphs of column header notes that may not be necessary.
 - Updating or removal of the tab “column Description and Explanations” that appears with the appendices.
 - Ensuring consistency among the tab names that appear in Appendix 7 (Storage Facilities), the names in the rows of Appendix 8, (Template Summary), and the rows of Appendix 9 (Emission Factors and Categorization Requirements). For example, Appendix 7 has a tab with the name of “Compressor and Component Leaks” but this name is different in Appendix 8 and Appendix 9.

Appendices

Appendix A: California Public Utilities Commission/Safety Policy Division Approval of Adjusted 2015 Baseline Emissions for Pacific Gas & Electric and Southern California Gas Company

PG&E and SoCalGas developed 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 PG&E and SoCalGas to evaluate their proposed adjustments. On October 26, 2022, CPUC sent separate letters to PG&E and SoCalGas approving adjustments to their 2015 baseline emissions.

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

A.1 CPUC/SPD Letter Approving Adjusted 2015 Baseline Emissions for PG&E

California Public Utilities Commission/Safety Policy Division Approval of Adjusted 2015 Baseline Emissions for Pacific Gas & Electric,

SB 1371, R-15-01-008

October 25, 2022

1. Background

On September 14, 2014, Governor Jerry Brown signed into law SB 1371 (Leno, 2014) requiring reporting and mitigation of emissions from California Public Utilities Commission (CPUC)-regulated gas pipeline facilities.²⁵ 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.

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.

²⁵ Leno, Chapter 525, Statutes of 2014.

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 Natural Gas Leak Abatement (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 the California Air Resources Board (CARB).²⁶ The decision implements these and other practices and requirements to support the State's goal to reduce methane emissions 40% by 2030 relative to 2013, established in SB 1383 (Lara, 2016).²⁷ This decision also affirmed that the 2015 Baseline emissions estimates will provide the starting point to measure future natural gas emissions reductions.²⁸

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. This decision adopted 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.

This decision also specified that CPUC, in consultation with CARB, may approve adjustments to the utilities' 2015 baseline emissions, and that the new baseline shall be used for determining rate recovery for methane emissions.

2. Introduction

CPUC, CARB, and PG&E have been collaborating to adjust the 2015 baseline emissions to incorporate improved measurement and estimation methods and to reflect reporting adjustments and corrections. An adjusted baseline will help CPUC and PG&E to more accurately estimate forecasted emissions reductions of proposed measures and more effectively evaluate the absolute and relative cost-effectiveness of proposed measures in future Compliance Plans. Baseline adjustments and improved emissions estimates will also better align with the Annual CPUC Joint Reports, resulting in more cohesive public reporting of data.

²⁶ Leno, 2014; Pub. Util. Code §§ 975, 977, 978.

²⁷ Lara, Chapter 395, Statutes of 2016: docs.cpuc.ca.gov/PublishedDocs/Published/G000/M311/K449/311449621.PDF.

²⁸ docs.cpuc.ca.gov/SearchRes.aspx?DocFormat=ALL&DocID=190740714, Finding of Fact #13, Pg. 145.

3. Summary of CPUC/SPD Approvals of Adjusted 2015 Baseline Emissions

CPUC/Safety Policy Division (SPD) approves the following adjusted 2015 baseline emissions for PG&E:

Appendix #	System Category	Emission Source Category	Original 2015 Baseline Emissions (Mscf)	Adjusted 2015 Baseline Emissions (Mscf)
3	Transmission Compressor Stations	Component Vented Emissions	N/A	10,172
		Component Fugitive Leaks	15,823	16,928
4	Distribution Mains and Services Pipelines	All Damages (Fugitives)	146,335	141,102
5	Distribution Metering and Regulating Stations	Station Leaks & Emissions (Fugitives)	741,986	9,440
6	Meter Set Assemblies	Meter Leaks (Fugitives)	636,034	245,907
		All Damages (Fugitives)	N/A	5,233
7	Underground Storage	Storage Leaks & Emissions (Fugitives)	11,870	2,036
		Component Vented Emissions	N/A	86,681
		Component Fugitive Leaks	10,574	75,957
		Dehydrator Vent Emissions (Fugitives)	6,761	13

The CPUC may decide to audit emission measurement practices of the NGLA Program in future, including site visits and/or review of records used to determine baseline adjustments.

4. Explanation of Adjustments to 2015 Baseline Emissions

- a. Appendix 3 – Transmission Compressor Stations

i. Component Vented Emissions, Component Fugitive Leaks

PG&E proposed adjustment of the baseline emissions for Component Vented Emissions and Component Fugitive Leaks at Transmission Compressor Stations and at Underground Storage Facilities to reflect the additional measurements that PG&E has been reporting since 2017 in preparation for the CARB Oil and Gas Methane Regulation, for which CARB began implementation in 2018. CARB’s Oil and Gas Methane Regulation increased the reporting requirements for emissions at those facilities. Without an adjustment, the annual reported emissions cannot be compared to the 2015 baseline emissions on equal terms. Additional details are provided in the discussion of baseline adjustments for Appendix 7.

CONCLUSION: CPUC/SPD approves the use of 2017 emissions to adjust the 2015 baseline emissions, as indicated in the table below.

Emission Source Category	Original 2015 Baseline Emission (Mscf)	Adjusted 2015 Baseline Emissions (Mscf) – Based on 2017 NGLA Data
Component Vented Emissions	N/A	10,172
Component Fugitive Leaks	15,823	16,928

b. Appendix 4 – Distribution Mains and Services Pipelines

i. All Damages

In 2015, PG&E included MSA damage emission in Appendix 4. PG&E began reporting those emissions in the Appendix 6 “All Damages” category in 2018, so a baseline adjustment is needed for Appendix 4. PG&E has confirmed that MSA damage emissions had been recorded as part of Appendix 4 in 2015 and were designated by classification label “DA”, so that those emissions can be identified. The 2015 emissions value attributed to MSA damage in Appendix 4 is 5,233 MSCF.

CONCLUSION: CPUC/SPD approves an adjustment to reduce the Appendix 4 emissions for All Damages from 146,335 Mscf to 141,102 Mscf.

c. Appendix 5 – Distribution Metering and Regulating Stations

i. Station Leaks & Emissions

Since 2015, the annual reporting template has used population-based emission factors to calculate emissions from Distribution Metering and Regulating Stations - Station Leaks & Emissions.

PG&E informed CPUC that the magnitude of the emissions from population-based emission factors (EF) did not fit with observations in the field, and these EFs did not account for the specific leaks and components that have the potential to emit. In addition, the population-based EFs did not allow operators to account for emission abatement efforts such as increased survey frequency and repair prioritization.

This emissions measurement method was revised for the 2022 data reporting of emissions from 2021 to a leaker-based approach. In order to have a common basis for comparison, PG&E has proposed to adjust the 2015 baseline reporting year emissions to be the same as reporting year 2020 emissions, because that is the first year that the leaker-based method can be applied.

CONCLUSION: CPUC/SPD approves an adjustment to decrease the 2015 baseline emissions for Station Leaks & Emissions from 741,986 Mscf to 9,440 Mscf.

d. Appendix 6 – Meter Set Assemblies
i. Meter Leaks

In 2015, the annual reporting template used population-based emission factors (EFs) to estimate emissions from Meter Set Assemblies (MSA) from the approximately 4.5 million MSAs in the PG&E service territory.

However, the population-based EFs did not allow for future improvement in reducing MSA emissions. Thus, PG&E recommended using leaker-based EFs developed based on an updated leak survey procedure implemented in 2020 to improve the accuracy of MSA emissions accounting and aid PG&E in prioritizing repairs to reduce methane emissions.

PG&E has proposed to adjust the 2015 baseline reporting year emissions to be the same as reporting year 2020 emissions in their paper: “Adjusted Baseline for Customer Meter Sets.”

CONCLUSION: CPUC/SPD approves an adjustment to decrease the 2015 baseline emissions for Meter Leaks from 636,034 Mscf to 245,907 Mscf.

ii. All Damages

In 2015, PG&E did not report emissions from MSA damage in Appendix 6, but included them in Appendix 4. PG&E began reporting those emissions in the Appendix 6 “All Damages” category in 2018, so a baseline adjustment is needed for Appendix 6. PG&E has confirmed that MSA damage emissions had been recorded as part of Appendix 4 in 2015 and were designated by classification label “DA”, so that those emissions can be identified. The 2015 emissions value attributed to MSA damage in Appendix 4 is 5,233 MSCF.

CONCLUSION: CPUC/SPD approves an adjustment to increase the Appendix 6 2015 baseline emissions for All Damages from 0 Mscf to 5,233 Mscf.

e. Appendix 7 – Underground Storage

i. Storage Leaks & Emissions, and Component Fugitive Leaks

In 2015, CARB's Oil and Gas Methane Regulation had not yet been adopted, and requirements under this regulation did not come into effect until 2018. The regulation includes requirements for emission controls on natural gas compressor stations and underground storage facilities.

In 2020, the regulation lowered the concentration threshold for leak survey reporting from 10,000 ppm to 1,000 ppm. This resulted in an increase in the number of leaks and emissions within the following categories:

1. Component Fugitive Leaks (for Transmission Compressor Stations, discussed above in the baseline adjustments for Appendix 3, and for Underground Storage reported here in Appendix 7).
2. Storage Leaks & Emissions (for Underground Storage reported here in Appendix 7).

PG&E has proposed to include estimated emissions for leaks greater than 1,000 ppm in these categories, replacing 2015 baseline emissions with emissions estimates for 2017 for Component Fugitive Leaks and replacing 2015 baseline emissions with emissions estimates for 2019 for Storage Leaks & Emissions. Without these adjustments, the annual reported emissions cannot be compared to the baseline emissions on equal terms.

CONCLUSION: CPUC/SPD approves an adjustment to decrease the 2015 baseline emissions for Storage Leaks & Emissions from 11,870 Mscf to 2,036 Mscf.

And CPUC/SPD approves an adjustment to increase the 2015 baseline emissions for Component Fugitive Leaks from 10,574 Mscf to 75,957 Mscf.

ii. Component Vented Emissions

Prior to 2017, PG&E utilized a corporate database of emissions data for venting components associated with Underground Storage. Beginning in 2017, in preparation for implementation of CARB's Oil and Gas Methane Regulation, PG&E began collecting emissions data for all venting components from individual Underground Storage facilities. PG&E requested an adjustment to the baseline emissions for Component Vented Emissions to use the 2017 emission in place of the 2015 emissions to account for implementation of the CARB Oil and Gas Methane Regulation.

CONCLUSION: CPUC/SPD approves an adjustment to increase the 2015 baseline emissions for component vented emissions from 0 Mscf to 86,681 Mscf.

iii. Dehydrator Vent Emissions

In 2015, the Appendix 7 reporting template had a different formula for dehydrator vented emissions. The template was revised in subsequent years to include the reporting of 0 Mscf for facilities that had glycol-based dehydrators.

CONCLUSION: CPUC/SPD approves an adjustment to decrease the 2015 baseline emissions for dehydrator emissions from 6,761 Mscf to 13 Mscf.

The CPUC may decide to audit elements of the NGLA Program in 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 because of audit and verification activities.

A.2 CPUC/SPD Letter Approving Adjusted 2015 Baseline Emissions for SoCalGas

California Public Utilities Commission/Safety Policy Division Approval of Adjusted 2015 Baseline Emissions for Southern California Gas Company

SB 1371, R-15-01-008

October 25, 2022

1. Background

On September 14, 2014, Governor Jerry Brown signed into law SB 1371 (Leno, 2014) requiring reporting and mitigation of emissions from California Public Utilities Commission (CPUC)-regulated gas pipeline facilities.²⁹ 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.

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 Natural Gas Leak Abatement (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 the California Air Resources Board (CARB).³⁰ The decision implements these and other practices and requirements (e.g., annual reporting of natural gas emissions and preparation of biennial Compliance Plans) to support the State's target to reduce methane emissions 40% by 2030 relative to 2013, established in SB 1383 (Lara, 2016).³¹ This decision also affirmed that the 2015 Baseline emissions estimates will provide the starting point to measure future natural gas emissions reductions.³²

²⁹ Leno, Chapter 525, Statutes of 2014.

³⁰ Leno, 2014; Pub. Util. Code §§ 975, 977, 978.

³¹ Lara, Chapter 395, Statutes of 2016: docs.cpuc.ca.gov/PublishedDocs/Published/G000/M311/K449/311449621.PDF.

³² docs.cpuc.ca.gov/SearchRes.aspx?DocFormat=ALL&DocID=190740714, Finding of Fact #13, Pg. 145.

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 1383.³³ This decision adopted 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.

This decision also specified that CPUC, in consultation with CARB, may approve adjustments to the utilities' 2015 baseline emissions, and that the new baseline shall be used for determining rate recovery for methane emissions.

2. Introduction

CPUC, CARB, and SoCalGas have been collaborating to adjust the 2015 baseline emissions to incorporate improved measurement and estimation methods and to reflect reporting adjustments and corrections. An adjusted baseline will help CPUC and SoCalGas to more accurately estimate forecasted emissions reductions of proposed measures and more effectively evaluate the absolute and relative cost-effectiveness of proposed measures in future Compliance Plans. Baseline adjustments and improved emissions estimates will also better align with the Annual CPUC Joint Reports, resulting in more cohesive public reporting of data.

3. Summary of CPUC/SPD Approvals of Adjusted 2015 Baseline Emissions

CPUC/Safety Policy Division (SPD) approves the following adjusted 2015 baseline emissions for SoCalGas, as reported by category appendices in the annual emission reports:

Appendix #	System Category	Emission Source Category	Original 2015 Baseline Emissions (Mscf)	Adjusted 2015 Baseline Emissions (Mscf)
1	Transmission Pipelines	Component Vented Emissions	0	8,182
		Component Fugitive Leaks	N/A	0
2	Transmission Metering and Regulating Stations	Station Leaks & Emissions (Fugitives)	340,142	110,296
3	Transmission Compressor Stations	Component Vented Emissions	N/A	4,301
		Component Fugitive Leaks	8,430	10,784
		Storage Tank Leaks & Emissions (Vented)	0	275

³³ Lara, Chapter 395, Statutes of 2016: docs.cpuc.ca.gov/PublishedDocs/Published/G000/M311/K449/311449621.PDF.

4	Distribution Mains and Services Pipelines	Pipeline Fugitive Leaks	797,426	576,261
		Component Fugitive Leaks	3,281	0
5	Distribution Metering and Regulating Stations	Station Leaks & Emissions (Fugitives)	340,729	0
		Component Vented Emissions	N/A	295
		Component Fugitive Leaks	N/A	8,898
6	Meter Set Assemblies	Meter Leaks (Fugitives)	846,235	415,362
7	Underground Storage	Component Vented Emissions	N/A	5,281
		Component Fugitive Leaks	107	21,989
		Dehydrator Vent Emissions (Fugitives)	13,402	0

The CPUC may decide to audit emission measurement practices of the NGLA Program in future, including site visits and/or review of records used to determine baseline adjustments.

4. Explanation of Adjustments to 2015 Baseline Emissions

- a. Appendix 1 – Transmission Pipelines
 - i. Blowdowns

CPUC and CARB Staff were concerned that, because blowdown emissions reported for 2015 include projects labeled as PSEP (Pipeline Safety Enhancement Program), those emissions may need to be removed from the baseline if the PSEP projects were a one-time occurrence rather than routine operations carried into the following years. PSEP blowdown emissions occur when a pipeline must be evacuated for safety enhancement projects such as pipe replacement, pressure testing, and valve automation.

SoCalGas responded that their PSEP program has proceeded through all the years since 2015 and expects the program to continue. In support of their response, SoCalGas provided a link to the list of monthly PSEP reports submitted to the CPUC during those years and provided monthly PSEP reports for 2015. Staff examined those reports and confirmed that PSEP projects were occurring regularly during and after 2015.

CONCLUSION: CPUC/SPD does not require an adjustment to 2015 baseline emissions for blowdowns.

ii. Component Vented Emissions and Component Fugitive Leaks

In 2015, the Appendix 1 reporting template combined Component Vented Emissions and Component Fugitive Leaks. SoCalGas proposed separating these two Emission Source Categories for 2015 to be consistent with changes made to reporting templates for subsequent years.

SoCalGas also proposed an adjustment to Component Vented Emissions to add 8,181 Mscf of emissions for pneumatic devices that had been erroneously left out in 2015. That error had been recognized by Staff but had not yet been corrected with a baseline adjustment. However, recent discussions with SoCalGas suggest that some of those baseline devices may have been operated as monitors rather than in control, and that these devices were not actively venting gas when operated as monitors. Staff notes that a further correction may be required when SoCalGas clarifies the monitor/control status of the baseline devices.

CONCLUSION: CPUC/SPD approves an adjustment to increase the 2015 baseline for Component Vented Emissions from 0 Mscf to 8,181 Mscf.

b. Appendix 2 - Transmission Metering and Regulating Stations

i. Station Leaks & Emissions

In 2015, the Appendix 2 reporting template had included farm taps in Transmission Metering and Regulating (M&R) Stations. However, SoCalGas explained that approximately 95% of farm taps were miscategorized and in fact were located on distribution main lines. SoCalGas recommended moving the emissions associated with these farm taps to Appendix 5 (Distribution Metering and Regulating (M&R) Stations). Also, SoCalGas reviewed the results of their Assets Field Verification Projects and determined that there were duplicate entries in the reporting of their Transmission M&R Stations inventory. SoCalGas has implemented a nomenclature governance policy update to prevent this error from recurring. Finally, SoCalGas determined that their direct sales facilities had been reported in both Appendix 2 and Appendix 6. SoCalGas has corrected this overreporting by only entering these emissions in Appendix 6.

CONCLUSION: To account for these corrections, CPUC/SPD approves an adjustment to decrease the 2015 baseline emissions for Transmission M&R Stations from 340,142 Mscf to 110,296 Mscf.

c. Appendix 3 – Transmission Compressor Stations

i. Component Vented Emissions, Component Fugitive Leaks, and Storage Leaks & Emissions

In 2015, the Appendix 3 reporting template did not have a separate tab for Component Vented Emissions. The template was revised in subsequent years.

SoCalGas proposed adjustments to the baseline emissions for Transmission Compressor Stations and Underground Storage Facilities to reflect the template change described above, the additional measurements that SoCalGas has been reporting since 2018, and an updated method for estimating leak duration. The additional measurements are due to compliance with the CARB Oil and Gas Methane Regulation, which includes additional reporting requirements for emissions at those facilities. Gas corporations have been adding those measurements to their reporting since 2018. In 2015, leak duration was estimated based on the assumption that a leak started on the day the leak was detected. However, in the subsequent years, CPUC required gas corporations to include the period between the detection date and the last survey date of the leaking component. Without these adjustments, the annual reported data cannot be compared to the 2015 baseline on equal terms.

CONCLUSION: CPUC/SPD approves the use of 2018 emissions to adjust the 2015 baseline emissions for Transmission Compressor Stations, as indicated in the table below.

Emission Source Category	Original 2015 Baseline Emission (Mscf)	Adjusted 2015 Baseline Emissions (Mscf) – Based on 2018 NGLA Data
Component Vented Emissions	N/A	4,301
Component Fugitive Leaks	8,420	10,784
Storage Tank Leaks & Emissions	0	275

d. Appendix 4 – Distribution Mains and Services Pipelines

i. Pipeline Leaks

In 2015, the Appendix 4 reporting template had required SoCalGas to use 1996 US EPA/GRI emission factors. CPUC Staff approved the use of company-specific emission factors, developed by SoCalGas in their Decision Tree Study, for reporting beginning in calendar year 2019. For comparison on an equal basis, the company-specific emission factors are now also applied to the 2015 leak data to estimate adjusted baseline emissions. The 2015 baseline emissions are also adjusted for improved accounting of leak discovery type (i.e., leaks discovered via operations and maintenance versus survey) that has been used subsequent to the baseline year, and which impacts leak duration and estimated number of unknown leaks.

CONCLUSION: CPUC/SPD approves an adjustment of the 2015 baseline emissions for Pipeline Leaks from 797,426 Mscf to 576,261 Mscf.

ii. Component Fugitive Leaks

In 2015, SoCalGas reported emissions from 55 pneumatic devices on distribution pipelines. After field verification efforts were conducted, SoCalGas discovered that there were no pneumatic devices on distribution pipelines in 2015.

CONCLUSION: CPUC/SPD approves an adjustment to decrease the 2015 baseline emissions for Component Fugitive Leaks from 3,281 Mscf to 0 Mscf.

e. Appendix 5 – Distribution Metering and Regulating Stations

i. Station Leaks & Emissions

In 2015, the reporting template used population-based emission factors to estimate Station Leaks & Emissions, with each station assigned estimated emissions. SoCalGas conducted research projects at Distribution M&R Stations to develop leaker-based emission factors. SPD Staff approved this leaker-based estimation method for the 2022 data reporting period because it more accurately accounts for leaks on components within each station. The 2015 baseline emissions must be adjusted to align with the leaker-based method by setting Station Leaks & Emissions to zero and replacing those emissions in the Component Vented Emissions and Component Fugitive Leaks categories using the leaker-based method. CONCLUSION: CPUC/SPD approves an adjustment to decrease the 2015 baseline emissions for Station Leaks & Emissions from 340,729 Mscf to 0 Mscf.

ii. Component Vented Emissions and Component Fugitive Leaks

In 2015, the Appendix 5 reporting template did not include these categories because population-based estimation was used instead and reported in the category Station Leaks & Emissions. SPD Staff approved a change for the 2022 data reporting period to a component leaker-based method, so emissions are now entered in these two new categories (i.e., Component Vented Emissions and Component Fugitive Leaks). After review with SoCalGas about possible baseline adjustments for this change, the 2015 baseline for these categories will be set to the emissions from 2020, the first year that data are available for the leaker-based method.

CONCLUSION: CPUC/SPD approves an adjustment to the 2015 baseline emissions for Component Vented Emissions from N/A Mscf to 295 Mscf, and Component Fugitive Leaks from N/A Mscf to 8,898 Mscf.

f. Appendix 6 – Meter Set Assemblies

i. Meter Leaks

SoCalGas completed a research study in 2022 to develop a leaker-based method for estimating leakage rates from Meter Set Assemblies (MSA). The leaker-based method included the development of emission factors (EF) based on the current Pipeline Hazardous Materials and Safety Administration safety reporting categories for Hazardous and Non-Hazardous leaks. The original baseline estimate used a population count of the total MSAs to calculate an emission volume, but this population-based method cannot demonstrate emission reductions. SPD Staff approved the use of the leaker-based method for reporting emissions. A baseline adjustment is required to align with the leaker-based method.

To estimate the 2015 baseline emissions according to this leaker-based method, SoCalGas performed a linear regression analysis of the data from 2016 onwards because the 2015 dataset was incomplete for this purpose. The linear fit of the annual emissions totals was extrapolated to 2015 as a way of estimating a 2015 baseline number. However, Staff is concerned that the assumption of linear behavior may not be a good model of utility emission reduction practices in place during the 2015-2021 period; the linear fit may overestimate the 2015 number. CARB Staff also found errors in the historical data set that led to incorrect results from this analysis.

Another concern about applying the research study results to historical data is that while hundreds of data points were taken overall, the Hazardous Leak EF was established from only 12 of those data points. Additional emissions measurements collected over multiple years are necessary to demonstrate stability of EFs for Hazardous and Non-Hazardous leaks in order to apply those to study time period. The study comments that SoCalGas intends to continue to collect data to further refine the EF values. Staff is concerned is that future refinement of EF values could require a new calculation of the baseline.

Until a more robust method for estimation of 2015 baseline emissions can be provided, the preferred solution is to use data from 2020, the first year that data were collected according to the leaker-based research study method, as the interim baseline.

CONCLUSION: CPUC/SPD approves an adjustment to decrease the 2015 baseline emissions for MSA leaks from 846,235 Mscf to 415,362 Mscf.

g. Appendix 7 – Underground Storage

i. Component Vented Emissions and Component Fugitive Leaks

In 2015, the Appendix 7 reporting template did not have a separate tab for Component Vented Emissions. The template was revised in subsequent years.

As described above in the baseline adjustments for Appendix 3, SoCalGas proposed adjustments to the baseline emissions for Transmission Compressor Stations and

Underground Storage Facilities to reflect the template change noted above, the additional measurements that SoCalGas has been reporting since 2018, and an updated method for estimating leak duration. Without these adjustments, the annual reported data cannot be compared to the 2015 baseline on equal terms.

CONCLUSION: CPUC/SPD approves adjustments to increase the 2015 baseline emissions for Component Vented Emissions from N/A Mscf to 5,281 Mscf and for Component Fugitive Leaks from 107 Mscf to 21,989 Mscf.

ii. Dehydrator Vent Emissions

In 2015, the Appendix 7 reporting template had a different formula for Dehydrator Vented Emissions. The template was revised in subsequent years to include the reporting of 0 Mscf for facilities that had glycol-based dehydrators. SoCalGas confirmed that through further field verification, all the company glycol dehydrators were either equipped with a closed vented system that was connected to a flare or had process vents connected to natural gas process lines. SoCalGas also confirmed that there were no natural gas emissions vented to the atmosphere.

CONCLUSION: CPUC/SPD approves an adjustment to decrease the 2015 baseline emissions for Dehydrator Vent Emissions from 13,402 Mscf to 0 Mscf.

The CPUC may decide to audit elements of the NGLA Program in 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 because of audit and verification activities.

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:³⁴
 - 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 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:

³⁴ Refer to GO 112-F for more information on grade 1, grade 2, and grade 3 leaks.

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

[(Purchased gas + produced gas + transported gas entering the gas system) minus (customer use + company use + appropriate adjustments + gas injected into storage + transported gas leaving the gas system)] divided by (Purchased gas + produced gas + transported gas entering the gas system) = 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 the GWP value of 25 (100-year value) from the IPCC, AR4, for previous GHG emissions 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 2021 total emissions, 3,429,502 Mscf, is equivalent to about 1.54 MMTCO_{2e}, as shown below:

$$3,429,502 \text{ Mscf natural gas} * \frac{1 \text{ MT CH}_4}{55.835 \text{ Mscf of natural gas}} * \frac{25 \text{ CO}_2e}{1 \text{ CH}_4} = 1,535,552 \text{ MT CO}_2e$$

CARB has also used the GWP value of 72 (AR4, 20-year) in the Short-Lived Climate Pollutant Plan and Oil and Gas Regulation. Based on the higher GWP, the 2021 total emissions, 3,429,502 Mscf is about 4.42 MMTCO_{2e}, as follows:

$$3,429,502 \text{ Mscf natural gas} * \frac{1 \text{ MT CH}_4}{55.835 \text{ Mscf of natural gas}} * \frac{72 \text{ CO}_2e}{1 \text{ CH}_4} = 4,422,390 \text{ MT CO}_2e$$

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 published a value of 93.4% to be used as a default methane

concentration that is comparable to what respondents reported.³⁵ 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.

³⁵AGA, GHG Guidelines, Pg. 39, April 18, 2008.

Appendix E: PG&E, Effect of 2021 Changes on Total Reported Emissions

The table below was submitted by PG&E on page 9 as part of their SB 1371 Supplemental Questionnaire. Staff corresponded with PG&E's and the utility approved including the table in the 2022 Joint Report. In the body of this report, the emissions with the green category were used, along with Distribution Mains & Services, Pipeline Leaks – GRI (orange), Customer Meters Aboveground MSA Leaks, Leak Based (yellow) and Distribution M&R Station Leaks and Emissions, Leak-Based (yellow).

Table 3. Effect of 2021 Changes on Total Reported Emissions

2021 Reporting Change	Change in Emissions Compared to RY2020 (Mscf)	Percent Change in Emissions Compared to RY 2020
Advances in Abatement Efforts		
Transmission Pipeline Damages	-1,488	-37%
Transmission Pipeline Blowdowns	-12,852	-22%
Transmission M&R Station Blowdowns	-37,299	
Transmission Compressor Station Blowdowns	-49	
Underground Storage Blowdowns	-3,123	
Distribution Main & Service Pipelines, Pipeline Leaks - GRI	45,448	
Distribution Main & Service Pipelines, Pipeline Leaks - WSU	29,406	8%
Distribution All Damages Emissions	-2,074	-5%
Customer MSA Damages	823	18%
Customer Meters Aboveground MSA Leaks, Leak-Based	10,070	4%
Transmission Compressor Station Compressor Emissions	-2,037	-19%
Underground Storage Facility Compressor Emissions	-2,488	
Transmission Compressor Stations Component Leaks	1,080	10%
Underground Storage Component Leaks	6,614	298%
Change in Annual Activity		
Transmission Pipeline Leaks	-53	-1%
Transmission Pipeline Component Leaks	-	-
Transmission Compressor Station Component Emissions	277	1.5%
Transmission Compressor Station Storage Tank Emissions	-298	-100%
Distribution M&R Station Leaks and Emissions, Leak-Based	-3,171	-34%
Customer Meters Aboveground MSA Leaks, Population-Based	2,640	0.4%
Customer MSA Vented and Blowdown Emissions	28	18%
Underground Storage Leaks & Emissions	-58	-2%
Underground Storage Component Emissions	-585	-1%
Underground Storage Dehydrator Vent Emissions	-13	-100%
Improvements in Reporting Practices		
Transmission Pipeline Component Vented Emissions	5,048	18%
Transmission Pipeline Odorizers	-26	-14%
Transmission M&R Station Leaks and Emissions	-5,085	-1%
Distribution Main & Service Blowdown Emissions	-101	-60%
Distribution M&R Station Leaks and Emissions, Population-Based	9,316	1%
Distribution M&R Station Blowdown Emissions	-5	-2%
<i>Total Change using Original Emission Values (Green + Orange)</i>	3,640	0.1%
<i>Total Change using Adjusted Emissions Values (Green + Yellow)</i>	-17,459	-1.1%

Not shown in this table since the emissions are N/A, are Transmission Compressor Station Compressor Leaks, Distribution Main & Service Component Emissions, Distribution Main & Service Component Leaks, Distribution M&R Stations All Damages, and Underground Storage Compressor Leaks.