Pacific Gas and Electric Company®

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February 1, 2011

Paul Clanon, Executive Director
California Public Utilities Commission
505 Van Ness Avenue
San Francisco, CA 94102-3298

Re: PG&E's Accelerated Gas Transmission System Aerial and Ground Leak Survey Trends Report

Dear Mr. Clanon:

In your letter to PG&E dated September 13, 2010 (Item 3), and in the Commission's Resolution L-403 adopted on September 23, 2010 (Ordering Paragraph 12), PG&E was directed to conduct an accelerated system survey of all natural gas transmission pipelines, giving priority to segments in Class 3 and Class 4 locations.

On October 25, 2010, PG&E provided the Commission with its Initial Report on its Accelerated Gas Transmission Leak Survey ("Accelerated Leak Survey"). PG&E completed the Accelerated Leak Survey on November 19, 2010. Enclosed is PG&E's report, which provides an update on Grade 1 leaks discovered and repaired immediately during the survey, identifies transmission leaks repaired as of November 30, 2010, evaluates the trends associated with those leaks, and presents PG&E's analysis and recommendations based upon the survey results.

Please contact me should you have any questions.

Sincerely,

Brian K. Cherry
VP Regulatory Relations

cc: Michael R. Peevey, President
Mike Florio, Commissioner
Catherine Sandoval, Commissioner
Timothy A. Simon, Commissioner
Julie Fitch, Energy Division
Richard Clark, Consumer Protection Safety Division
Julie Halligan, Consumer Protection Safety Division
Frank Lindh, General Counsel
Harvey Y. Morris, Legal Division
Patrick S. Berdge, Legal Division
Joe Como, Division of Ratepayer Advocates

Accelerated Natural Gas Transmission System Aerial and Ground Leak Survey Trends Report

Pacific Gas and Electric Company

February 1, 2011

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Summary

Pacific Gas and Electric Company (PG&E) completed its 2010 Accelerated Gas Transmission Leak Survey ("Accelerated Leak Survey") on November 19, 2010. During this survey, PG&E identified and investigated all hazardous leak indications. If an actual leak was discovered requiring an immediate response, PG&E responded. If a potential or actual leak turned out not to be hazardous, PG&E scheduled the indication for further investigation and the actual leak for future repair in accordance with industry and PG&E standards.

On October 25, 2010, PG&E submitted an initial report on the results of its Accelerated Leak Survey. This report will complete PG&E's information submittals regarding the survey. It will: (1) provide an update on hazardous, or Grade 1[1], leaks discovered during the survey that were repaired immediately; (2) identify all transmission leaks repaired as of November 30, 2010; (3) evaluate the trends associated with the transmission leaks repaired during the Accelerated Leak Survey; and (4) present PG&E's recommendations based on its review of the Accelerated Leak Survey data and analysis.

Background

By letter dated September 13, 2010, and Ordering Paragraph 12 of Resolution L-403, the California Public Utilities Commission (CPUC or Commission) directed PG&E to conduct an accelerated leak survey of all natural gas transmission pipelines, giving priority to segments in Class 3 and Class 4 locations, within one month of the date of the letter and to take corrective action as required.

In response, on September 23, 2010, PG&E committed to:

1) Conduct an immediate aerial leak survey of its entire gas transmission system using aerial laser detection technology, followed by a field evaluation wherever there was an indication of a possible leak indentified by the aerial instrumentation;
2) Conduct an accelerated ground leak survey of the entire gas transmission system using traditional ground methods first by surveying all Class 3 and Class 4 locations and High Consequence Areas (HCAs) in Class 1 and Class 2 locations by October 12, 2010, and then by surveying the remaining Class 1 and Class 2 location pipelines by December 15, 2010; and
3) Analyze all leak information gathered through both the aerial and ground leak surveys to identify any trends, and review any recommendations with the Commission by January 31, 2011.

[1] Gas leaks are graded based on their risk. The most serious are Grade 1. Grade 2 and 3 leaks are non-hazardous. See page 5 for a more detailed discussion.

On October 25, 2010, PG&E provided the CPUC with its Initial Report on the Accelerated Leak Survey. It discussed the aerial and ground leak surveys, and identified thirty-eight (38) Grade 1 leaks that required immediate response and repair during the first phase of the accelerated survey.

Update on Grade 1 Leaks Found and Repaired (Transmission, Gathering and Distribution)

Since making its October 25, 2010, Initial Report, PG&E has confirmed an additional twenty-one (21) Grade 1 leaks.[2] This brings the total number of leaks that required immediate action, or Grade 1 leaks, to fifty-nine (59), all of which have been repaired.

Eight of the additional twenty-one (21) Grade 1 leaks not previously reported were on transmission facilities.[3] The remaining thirteen (13) were on either gathering[4] facilities or distribution facilities.

Transmission Facilities. In addition to the leaks previously identified, PG&E identified and repaired eight Grade 1 leaks on transmission facilities as follows:

1. On November 4, 2010, a leak was found on an 8 inch diameter pipe on Line 220 near Redacted The leak was repaired by replacing a section of pipeline.
2. On October 11, 2010, a leak was found on a 12 inch diameter pipe on Line 177A near Fortuna in Humboldt County. This leak was not initially considered a Grade 1 leak requiring immediate response. However, on October 14, 2010, PG&E determined that an immediate response was necessary and the leak was repaired by welding a sleeve on the pipe.
3. On October 20, 2010, a leak was found on a 1¼ inch valve on Line 300B near Redacted The leak was repaired by cleaning the threads and re-installing the valve.
4. On October 28, 2010, a leak was found on a pilot regulator in Redacted Redacted Station in Redacted. The leak was repaired by replacing the regulator.
5. On September 30, 2010, a leak was found on a valve on Line 118B near the City of Madera. The leak was repaired by replacing the valve gasket.

[2] Many of the additional Grade 1 leaks reported here were repaired prior to the October 25, 2010, Initial Report but were not processed in time to be included in the Initial Report.

[3] See 49 CFR 192.3, which defines a transmission line as "a pipeline, other than a gathering line, that: (1) Transports gas from a gathering line or storage facility to a distribution center, storage facility, or large volume customer that is not down-stream from a distribution center; (2) operates at a hoop stress of 20 percent or more SMYS [Specified Minimum Yield Strength]; or (3) transports gas within a storage field."

[4] A gathering line is a pipeline that transports gas from a current production facility to a transmission line or main. See 49 CFR 192.3.

6. On October 20 and 21, 2010, three leaks were found in close proximity to Line 109 in South San Francisco. The leaks were repaired by tightening the cap on a fitting, applying grease to a 6 inch valve, and tightening the plug on a ½ inch valve.

Gathering Facilities and Distribution Lines. PG&E identified and immediately repaired three Grade 1 leaks on gathering facilities and ten Grade 1 leaks on distribution lines, distribution feeder mains operating above 60 pounds per square inch gauge (psig), or other facilities appurtenant to transmission mains. Table 1, below, lists these other leaks, showing the location, facility and corrective action:

Table 1 – Grade 1 Leaks on Gathering Facilities and Distribution Lines

City	Facility	Corrective Action
Arbuckle*	Orifice Meter	Tighten/Lubrications/Adjusting
Capay*	Orifice Meter	Tighten/Lubrications/Adjusting
Concord	Regulator	Tighten/Lubrications/Adjusting
Folsom	Fitting	Tighten/Lubrications/Adjusting
Livermore	Regulator	Replaced Regulator
Newark	Main	Installed Clamp
Sacramento	Fitting	Tighten/Lubrications/Adjusting
Sacramento	Main	Removed from service
Sacramento	Main	Replaced pipe
Sacramento	Fitting	Tighten/Lubrications/Adjusting
Sacramento	Main	Installed Clamp
Vacaville	Regulator	Tighten/Lubrications/Adjusting
Williams*	Orifice Meter	Tighten/Lubrications/Adjusting

* Leak on gathering facility

Non-Grade 1 Leaks (Transmission and Gathering System)[5]

Leak Grading. As indicated in our Initial Report, Grade 1 leaks are repaired immediately. Indications of potential leaks that do not require immediate repair are assessed and scheduled for any necessary corrective action. PG&E categorizes or grades leaks as Grade 1, Grade 2+, Grade 2 and Grade 3:

[5] This section and the following sections of this report focus on transmission and gathering pipelines, as defined by the Department of Transportation (DOT) regulations and utilize the definition of a leak as set forth in the Pipeline and Hazardous Materials Safety Administration (PHMSA) instructions for submitting the Annual Reports for Gas Transmission and Gathering Systems. In particular, PHMSA defines a leak as follows: "Leaks are unintentional escapes of gas from the pipeline. A non-hazardous [non-Grade 1] release that can be eliminated by lubrication, adjustment, or tightening is not a leak." See Instructions for Completing Form PHMSA F7100.2-1, page 3. PG&E will report on its distribution leak repairs on March 15, 2011, in its Annual Report for Calendar Year 2010.

Grade 1 leaks (also referred to as "hazardous" leaks) represent existing or probable hazards to persons or property and require immediate repair or continuous action until conditions are no longer hazardous.

Grade 2+ (Priority Grade 2) leaks fall below Grade 1 criteria and above Grade 2 criteria. These leaks are non-hazardous to persons or property at the time of detection, but still require a scheduled priority repair within 90 days or less.

Grade 2 leaks are non-hazardous to persons or property at the time of detection, but still require a scheduled repair because they present probable future hazards. Grade 2 leaks must be repaired within 18 months.

Grade 3 leaks are non-hazardous at the time of detection and can reasonably be expected to remain non-hazardous. They are monitored, but not scheduled for repair.

PG&E's grading rules exceed industry standards, as set by the American Society of Mechanical Engineers (ASME) Gas Piping and Technology Committee (GPTC)'s Guide for Gas Transmission and Distribution Piping systems, in that PG&E uses a Grade 2+ category with a scheduled priority repair within 90 days. However, where the ASME GPTC guide allows 15 months to address non-priority Grade 2 leak indications, PG&E allows 18 months. One of the recommendations in this report that PG&E has already begun implementing is to align with the ASME GPTC 15-month guideline, while keeping the more stringent Grade 2+ priority repair schedule.

Trends Based on Transmission and Gathering Facility Leaks Found During the Accelerated Leak Survey and Repaired as of November 30, 2010[6]

Reported below in Table 2 are all leaks repaired, of any grade, on the transmission system and the gathering system as of November 30, 2010. To provide consistency with annual PHMSA leak repair reporting, this section of the report follows the PHMSA reporting definitions and reporting guidelines as described in Footnote 5.

Fifty-three (53) transmission and gathering system leaks found during the Accelerated Leak Survey were repaired by November 30, 2010. Seven of the fifty-three leak repairs were on gathering pipelines, and forty-six were on transmission lines.[7] The majority of the leaks repaired were attributable to service lines and appurtenances associated with the transmission lines.

[6] PG&E chose November 30, 2010, in order to have the time to perform a thorough analysis and review of the data generated by its Accelerated Leak Survey. PG&E will report on all transmission leaks repaired or eliminated in the entire calendar year 2010, whether found through the Accelerated Leak Survey or the normal, annual leak surveys, when PG&E submits its Annual Report for Calendar Year 2010 on Gas Transmission & Gathering Systems to PHMSA and the CPUC on Form 7100.2-1 on June 15, 2011.

[7] Twenty of these fifty-three repairs were Grade 1 leak repairs.

Table 2 – Transmission and Gathering System Leaks Found & Repaired

City	Facility	Corrective Action[8]
American Canyon *	Flange	Tighten/Lubrications/Adjusting
Arbuckle***	Meter	Tighten/Lubrications/Adjusting
Capay***	Meter	Tighten/Lubrications/Adjusting
Chico	Fitting	Weld Repair
Chico *	Service Tee	Tighten/Lubrications/Adjusting
Chico	Service Tee	Replaced Pipe
Daly City	Valve	Appurtenance Repair
Davis**	Main	Replaced Pipe
Dixon	Valve	Replace Valve
Firebaugh***	Valve	Removed from service
Fortuna**	Main	Weld Repair
Fresno	Regulator	Replaced Regulator
Gridley *	Main	Replaced Pipe
Grimes***	Main	Installed Clamp
Grimes***	Regulator	Replaced Regulator
Grimes***	Meter	Appurtenance Repair
Hinkley	Fitting	Appurtenance Repair
Hollister	Regulator	Replaced Regulator
Hollister *	Valve	Tighten/Lubrications/Adjusting
Hollister	Regulator	Replaced Valve Packing
Hollister**	Valve	Tighten/Lubrications/Adjusting
Hughson	Fitting	Replaced Regulator
Huron	Main	Weld Repair
Lathrop	Regulator	Replaced Regulator
Livermore**	Regulator	Replaced Regulator
Lodi	Regulator	Appurtenance Repair
Madera**	Valve	Tighten/Lubrications/Adjusting
Millbrae[9]	Fitting	Tighten/Lubrications/Adjusting
Monterey	Valve	Replaced Valve
Morgan Hill[9]	Valve	Tighten/Lubrications/Adjusting
Morgan Hill	Regulator	Replaced Regulator
Napa *	Valve	Tighten/Lubrications/Adjusting
Napa	Valve	Replaced Valve
Needles	Valve	Removed from service
Needles	Fitting	Weld Repair

[8] Appurtenance repair is referencing leak repairs on components (equipment) associated with the transmission pipeline such as sensing line, gage taps, and pilot regulators. These are small diameter facilities. The repairs where the Corrective Action was Tighten/Lubrications/Adjusting are all Grade 1 repairs, as a release of gas repaired by Tighten/Lubrications/Adjusting is not considered a leak by PHMSA unless it was hazardous.

[9] PG&E initially designated these three leak repairs as distribution in the October 25, 2010 Initial Report due to the size of facility. However, after a more detailed review PG&E has determined these three facilities were operating above 20% Specified Minimum Yield Strength (SYMS), which means they qualify as transmission under the definition in 49 CFR 192.3.

City	Facility	Corrective Action[8]
Oakland	Main	Replaced Pipe
Palo Alto*	Valve	Tighten/Lubrications/Adjusting
Penngrove	Valve	Removed from service
Redwood Valley	Regulator	Replaced Regulator
Sacramento[9]	Fitting	Tighten/Lubrications/Adjusting
Sacramento	Service Tee	Replaced O-ring
Santa Nella	Valve	Replaced O-ring
Sheridan	Main	Replaced Pipe
South San Francisco**	Valve	Tighten/Lubrications/Adjusting
South San Francisco**	Valve	Tighten/Lubrications/Adjusting
South San Francisco**	Valve	Tighten/Lubrications/Adjusting
South San Francisco	Fitting	Tightened Fitting/ replaced Control Loop
Stockton	Valve	Weld Repair
Stockton	Valve	Replaced Valve
Tracy	Main	Weld Repair
Wheatland	Regulator	Replaced Regulator
Williams***	Meter	Tighten/Lubrications/Adjusting
Woodbridge	Valve	Valve Body Bleed Repair

Note: As of November 30, 2010.
* Included in the October 25, 2010, Initial Report on Grade 1 leak repairs.
** Included on pages 4-5 regarding Grade 1 leak repairs.
*** Leak repair on the gathering system.

Transmission and Gathering System Leak Trends

Based on the foregoing data, PG&E has identified some general trends.

In PHMSA's Annual Transmission Report (Form 7100.2), leaks repaired are reported by the following seven categories:

- Corrosion
- Natural Forces
- Excavation
- Other Outside Force Damage
- Material and Welds[10]

[10] PHMSA classifies a leak as "Material and Welds" where it is a "leak resulting from failure of original sound material from force applied during construction that caused a dent, gouge, excessive stress, or other defect that eventually resulted in a leak. This includes leaks due to faulty wrinkle bends, faulty field welds, and damage sustained in transportation to the construction or fabrication site. PHMSA also includes leaks resulting from a defect in the pipe material, component, or the longitudinal weld or seam due to faulty manufacturing procedures. Leaks from material deterioration, other than corrosion, after

- Equipment and Operations[11]
- Other[12]

This report analyzes these 53 leaks repaired using the PHMSA Annual Report categories and by the diameter of facilities, as shown in Figures 1 and 2 below. In addition, third-party industry experts reviewed PG&E's data and compared it to data for other similar transmission operators.

Leaks by Cause

The 53 transmission/gathering system leaks found during the Accelerated Leak Survey and repaired by November 30, 2010, are broken out in Table 3 below by PHMSA category.

Table 3 – Repaired Transmission/Gathering Leaks by PHMSA Category

PHMSA Category	Leak Repaired	Percent of Leak Repair
Corrosion	5	9.4%
Natural Forces	0	0%
Excavation	0	0%
Other Outside Force Damage	0	0%
Material and Welds	6	11.3%
Equipment and Operations	26	49.1%
Other	16	30.2%
Total	**53**	**100.0%**

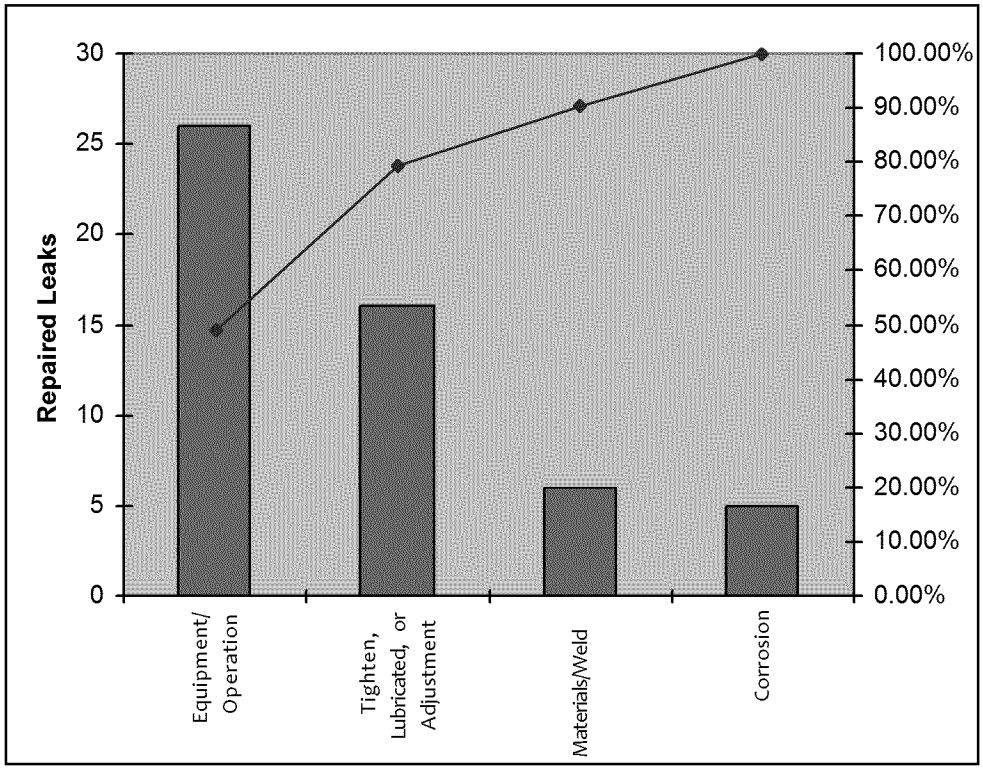
Figure 1 below conveys the same data in chart form. The chart displays the 53 leaks from the category with the highest number of leaks to the category with the lowest number of leaks. The y-axis to the left of the chart identifies the number of leaks per category. The y-axis to the right of the chart identifies the cumulative percentage of total leaks.

exceeding the reasonable service life, are reported under 'Other'." See Instructions for Completing Form PHMSA F7100.2-1, page 4.

[11] PHMSA classifies a leak as "Equipment and Operations" where it is a "leak resulting from malfunction of control/relief equipment including valves, regulators, or other instrumentation; stripped threads or broken pipe couplings on nipples, valves, or mechanical couplings; or seal failures on gaskets, O-rings, seal/pump packing, or similar leaks. Also include leaks resulting from inadequate procedures or safety practices, or failure to follow correct procedures, or other operator error." See Instructions for Completing Form PHMSA F7100.2-1, page 4. None of the leaks in this category were due to inadequate safety practices or failure to follow correct procedures (operator error).

[12] PHMSA classifies as "Other" a leak "resulting from any other cause, such as exceeding the service life, not attributable to the above causes." As noted above, PHMSA also states that "Leaks from material deterioration, other than corrosion, after exceeding the reasonable service life" should be reported under "Other." See Instructions for Completing Form PHMSA F7100.2-1, page 4. PG&E placed 16 immediate response leaks repaired either by lubricating, tightening, or adjustment in this category to provide additional granularity. These 16 leaks could have been included in the equipment category as they are leak resulting from a malfunction of threads, lubrication, etc.

Figure 1 - Leaks by Cause



Conclusions

* Equipment-related leaks were the leading cause of leaks repaired as part of this Accelerated Leak Survey. Equipment leaks occur on transmission appurtenances and include failures at threaded components, gaskets, valve packing, etc. PG&E found that most of these equipment leaks were associated with PG&E high pressure regulator (HPR) sets serving one to two customers and on facilities generally less than 1 inch in diameter.

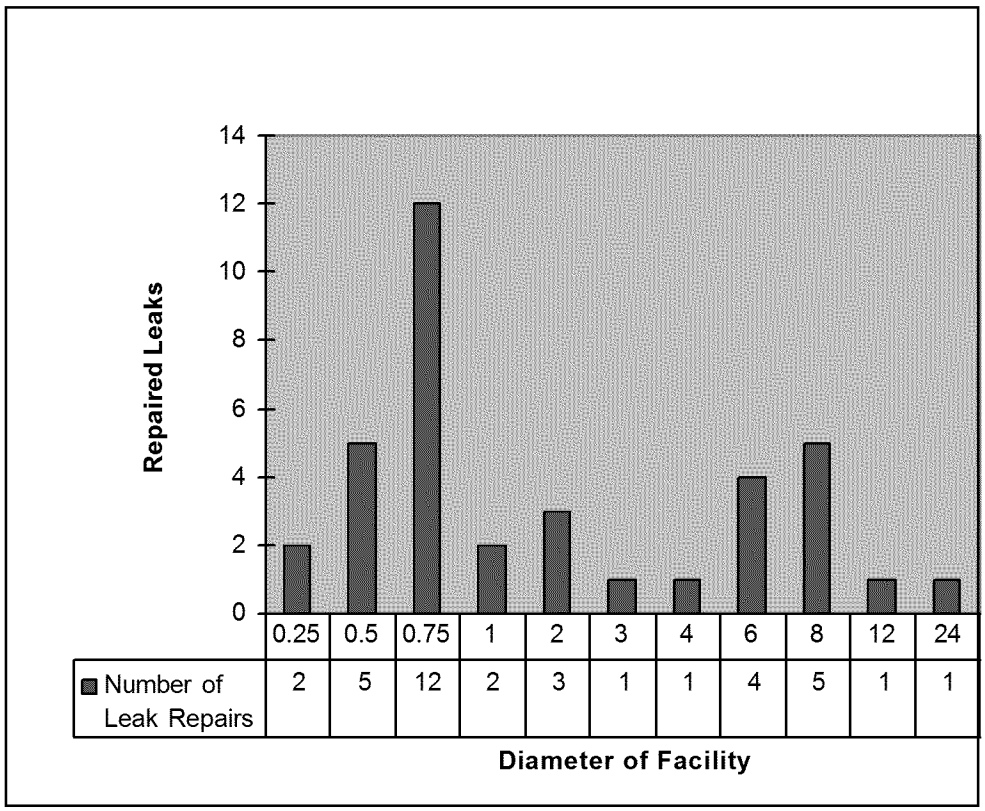
* The next highest cause of leaks fell within the category "Other." These are leaks where PG&E performed an immediate response and repaired the leak by tightening, lubricating, or adjusting. The 16 leaks identified in this category could have been considered equipment leaks as they are associated with thread and lubrication components failure. These leaks are also ones that, as discussed below and in the attached expert consultant's report, may not even have been reportable in the first place.[13]

[13] As previously discussed, if not initially considered hazardous, a release of gas repaired by tightening, lubricating or adjusting is not considered a leak under PHMSA instructions. See Instructions for Completing Form PHMSA F7100.2-1, page 3.

Diameter

Reviewing the size of the facility where the leak occurs can provide insight on leaks where additional focus may be needed. Figure 2, below, includes all transmission/gathering leaks with the exception of leaks repaired by tightening, lubrication, or adjustment.

Figure 2 - Size of Facility



Note: Excludes the 16 leaks designated as leaks repaired by tightening, lubrication, or adjustment.

Conclusions

As shown by Figure 2 above, ninety-five percent of the leaks found and repaired (excluding the 16 leaks repaired by tightening, lubrication or adjustment) were on facilities less than 12 inches in diameter. Two leaks were found on facilities equal to or greater than 12 inches in diameter, as follows:

* On October 6, 2010, an indication of a potential leak was identified via the Accelerated Leak Survey on Line 153 in the City of Oakland. The leak was caused by external corrosion along a welded seam of pipe. A 25-foot section of 24 inch diameter pipeline was removed and replaced to complete the repair.

* On October 11, 2010, an indication of a potential leak was identified via the Accelerated Leak Survey on Line 177A near PG&E's Cumming Creek Pressure Limiting Station near Fortuna in Humboldt County. The leak was found to be caused by a pin-hole within a girth weld. A sleeve was welded into place to complete the repair.

Industry Comparison /Trends

PG&E hired third-party industry experts ViaData LP and Oleksa and Associates to provide insight on PG&E's leak reporting practices and results and how PG&E compares to the industry. A copy of their report is attached as Appendix A.

As explained in the Executive Summary of the attached report, ViaData LP and Oleksa and Associates' analysis shows:

* "PG&E's five-year average for leak rate (leaks per 1000 pipeline miles) is well below the national average for all transmission operators and compares favorably with similar large transmission pipeline operators."
* "PG&E's leak classification and reporting practices are overly conservative and PG&E regularly reports more leak repairs than required according to the PHMSA instructions. Removing these non-reportable leaks from the reports would further lower PG&E's overall average for the five-year period."

PG&E's consultants' analysis indicates that PG&E is both aligned and comparable with other similar transmission operators with the exception of "other" and "equipment" related leaks. In those categories, PG&E tends to over-report repair practices. In other words, the consultants' analysis concludes that PG&E's interpretation of a reportable leak, definition of transmission pipeline, and overall reporting of leaks to PHMSA err on the side of over-reporting.

Recommendations

PG&E has identified four recommendations based on the Accelerated Leak Survey and the associated leak repair data.

Recommendation #1

A number of leaks were in Class 1 and 2 locations. PG&E has historically performed aerial vegetation surveys in portions of Class 1 and 2 locations. Although the regulations permit visual aerial vegetation surveys[14], PG&E proposes to shift to instrument based leak surveys. This enhancement will be implemented in 2011.[15]

[14] Since natural gas leaks tend to kill vegetation near the leak location, aerial leak surveys look for signs of dead vegetation.

[15] In a limited number of areas, such as water crossings or extremely steep terrain, a ground leak survey simply cannot be performed.

Recommendation #2

As discussed above, a significant number of leaks are associated with small diameter (i.e., usually ¾ inch) regulator sets served off of a transmission pipeline (PG&E refers to these installations as an HPR set). These facilities are considered transmission because they meet the PHMSA transmission definition of operating above the 20% specified minimum yield strength (SMYS). Over time, many of the components associated with service lines deteriorate, including valves and HPR sets for one or two customers.

PG&E will begin an aggressive program to rebuild or replace both transmission and some distribution HPR-Type stations. PG&E has approximately 4,700 such HPR sets and approximately 1,000 small district regulator stations. PG&E will target rebuilding or replacing approximately 1,000 of these HPR sets and/or small district regulator stations each year over the next several years to address potential atmospheric corrosion and equipment deterioration.

Recommendation #3

As discussed above, PG&E is enhancing its leak repair scheduling for both transmission and distribution. PG&E will retain its Grade 2+, which goes beyond industry standards to require certain priority leaks that are not hazardous to be repaired or cleared within 90 days. PG&E is enhancing its standards by reducing the permissible time to repair Grade 2 leak indications from the current "no later than 18 months" to "repaired or cleared within one calendar year not to exceed 15 months from the date the leak was reported." PG&E is also enhancing its Grade 3 leak monitoring from the current "re-evaluate during the next scheduled survey not to exceed 5 years from the date the leak was reported" to "re-evaluate during the next scheduled survey or within 15 months of date reported, whichever comes first," which aligns with the ASME GPTC guidelines. This change is effective for all Grade 2 and Grade 3 indications of potential leaks found during the Accelerated Leak Survey, and for all indications of potential leaks found starting January 1, 2011.

Recommendation #4

The Accelerated Leak Survey that PG&E completed in November marks the first time PG&E had utilized the helicopter-mounted light detection and ranging (LIDAR) laser leak detection technology. PG&E will perform an assessment of the data obtained by aerial leak surveys.

The objective of the assessment will be to 1) compare the results of the relatively new LIDAR technology for leak detection against traditional leak survey techniques, and 2) evaluate the capability of this laser detection technology with an emphasis on the limitations of the technology, and where it might best be deployed to complement an overall leak survey strategy.

Appendix A

Review of Pacific Gas and Electric Company
Annual Leak Reporting
PHMSA Annual Report 7100.2-1

Review of Pacific Gas and Electric Company

Annual Leak Reporting

PHMSAAnnual Report 7100.2-1

Prepared by

ViaData LP

Oleksa and Associates

January 26, 2011

Introduction

Pacific Gas and Electric Company (PG&E) operates natural gas and electric transmission and distribution systems in California. The company is based in San Francisco and serves 4.3 million gas customers. PG&E operates approximately 5,764 miles of gas transmission pipeline from the Oregon border to the Arizona border. Transmission pipelines extend throughout this area, including lines running to San Francisco on the west side of San Francisco Bay.

PG&E is a regulated utility under the California Public Utilities Commission (CPUC) and must comply with pipeline safety requirements found in CPUC General Order No. 112-E. This order adopts the U.S. Department of Transportation (DOT) pipeline safety regulations at 49 CFR Parts 190, 191, 192, 193 and 199. Section 123.1 of GO 112-E specifies that pipeline operators must comply with 49 CFR 191.11 and 191.17 requiring the submission of annual reports to DOT. Copies of these reports must also be submitted to the CPUC.

In 2008 PG&E determined its leak detection program should be enhanced and PG&E modified the work procedures, training, and qualification processes associated with the program. In particular, PG&E required that leak surveyors demonstrate proficiency and qualify on each type of leak detection instrument to be used. Also, PG&E tightened its leak grading criteria expanding the definition of leaks that require immediate or scheduled repair and establishing grades for above-ground equipment leaks. All leak detection personnel were required to be re-qualified according to the company's new Operator Qualification Program. In addition a "double blind" Quality Control program was implemented to audit the actual leak surveys and surveyors were subject to positive discipline for missing leaks.

The PG&E Annual Reports submitted according to the regulations above for 2008 and 2009 showed an increase for leaks eliminated/repaired during the year. This project was undertaken to review the PG&E leak reporting process and to determine, if possible, if the number of leaks reported by PG&E is consistent with the natural gas transmission industry.

The following documents were provided by PG&E to ViaData for review.

- Leak reports as of December 10, 2010 from the Accelerated Gas Transmission Leak Survey (AGTLS)
- PG&E DOT Annual Reports 7100.2-1 for 2005-2009
- UO Standard S4110 Leak survey and Repair of Gas Transmission and Distribution Facilities
- DOT Annual Report for Gas Transmission & Gathering System 7100.2-1 and Instructions

This report covers the findings of this review.

Executive Summary

This project reviewed DOT Annual Reports for transmission operators for the period 2005 to 2009. Reports incorporating data from all transmission pipeline operators are available from the Pipeline and Hazardous Materials Safety Administration (PHMSA) website. This data was compared to the PG&E annual reports for the same time period. The analysis shows:

- PG&E's five-year average for leak rate (leaks per 1000 pipeline miles) is well below the national average for all transmission operators and compares favorably with similar large transmission pipeline operators.
- PG&E's leak classification and reporting practices are overly conservative and PG&E regularly reports more leak repairs than required according to the PHMSA instructions. Removing these non-reportable leaks from the reports would further lower PG&E's overall average for the five-year period.

PG&E has made several conservative assumptions regarding classification of a pipeline as a transmission line and this review identified a number of pipelines that are classified as transmission but may actually be distribution, non-regulated gathering, or production piping. PG&E has used a historical classification as transmission for its numbered pipelines and has assumed a conservative yield strength of 24,000 psi (from §192.107) for other pipelines. This leads to an overly conservative classification of transmission lines and regulated gathering lines (based on definitions in 49 CFR §§192.3 and 192.8) and the inclusion of possibly more leak repairs than comparable utilities. (See Appendix A for additional information on classifying transmission pipelines.)

- Using a historical classification (all pipelines operating at pressures over 60 psig) may be too conservative in relationship to present code definitions, and the application of §192.107 may lead to over-classifying some pipelines as transmission. This has the overall effect of increasing reported transmission mileage, and should leaks occur on these systems, and an increase in the reported transmission leaks.

- The document review found transmission pipelines identified with the nomenclature "service" and Distribution Feeder Main (DFM) that is typically used to describe distribution facilities. This too will contribute to an over-classification as transmission pipelines and over-reporting of transmission leaks.
- A number of stations and other piping are located on lateral connections to a transmission line. In most cases, these laterals are smaller diameter pipe and may operate at pressures less than 20% SMYS. Again, this conservative approach may lead to an over-classification as transmission pipelines and over-reporting of transmission leak repairs.
- PG&E has routinely reported above ground leaks inside regulator stations that are eliminated by tightening, lubrication or adjustment (TLA) and represent no hazard to the public. The instructions for the DOT annual report exclude leaks of this nature and therefore such leaks are generally not reported.

The re-qualification of leak survey personnel, change in leak grading criteria, and addition of a QA program in 2008 created an increased emphasis on leak classification and reporting. This can be seen in the data provided for non-reportable leaks by the inclusion in the annual report of "Grade 0" leaks and as well as non-hazardous leaks repaired by TLA. Further to this point, the review of 50 leaks found on the AGTLS identified more than half (26 leaks) that would not be reportable for 2010 due to repairs by TLA. The majority of these leaks were found on above ground facilities such as valves, regulators, and station piping that represent no hazard to the public. Many of these and other leaks were identified as over-classified, causing leaks to be repaired on an accelerated schedule.

The instructions for the DOT annual report includes the following definition for leaks:

> "Leaks are unintentional escapes of gas from the pipeline. A non-hazardous release that can be eliminated by lubrication, adjustment, or tightening is not a leak."

For the purposes of this report, leaks meeting this criterion and that are listed in PG&E documents or included on annual reports will be referred to as “non-reportable leaks.”

Five Year Leak Rate Comparison

Top 10 Transmission Companies by Mileage from DOT Annual Reports, 2005-2009

Five Year Average

Table 2 through Table 6 below compare the leaks per 1000 miles of pipeline, as reported on the DOT Annual Report 7100.2-1, for the top ten transmission companies (by mileage). The reports were obtained from the PHMSA website, Data and Statistics section. PG&E is in this top ten list for all years, its mileage ranks it as number two or three for all transmission operators. The five-year average for all transmission operators was also calculated and compared with PG&E.

The operators were sorted by total mileage of pipeline, most to least. PG&E (Operator ID 15007) does not report any offshore mileage in the annual report. Consequently the comparisons were made using only onshore mileage and leaks for transmission and gathering pipelines.

Even with the conservative assumptions regarding transmission mileage and the consequent over-reporting of transmission leaks due to changes in leak grading criteria, PG&E's leak rates are comparable to the industry as a whole, with a five-year average of 6.48 leaks per 1000 miles -- well below the national average 8.62 leaks per 1000 miles for all transmission operators. PG&E's annual leak rate per 1000 miles also compares favorably with other pipeline operators of similar size, ranking in the middle to lower half of the top ten operators.

A review of the category "Other" for all years, and in particular 2008 and 2009, found a number of leaks listed as "Grade 0" as well as non-hazardous leaks repaired by tightening, lubrication, or adjustment (TLA). Pursuant to the PHMSA reporting instructions, leaks meeting these criteria should not be included on the DOT annual report. Eliminating these non-reportable leaks from the reports would lower PG&E's leaks per 1000 miles for each year and its overall average for the five-year period. Table 1 shows the industry five-year average in comparison to PG&E for all PG&E reported leaks and PG&E corrected leak totals after removing non-reportable leaks from the original reported leaks.

Table 1: 2005-2009 Leak Averages and five-year average for All Transmission Pipeline Operators.**

Year	Total Transmission Miles	Total Transmission Leaks	Leaks/1000 miles	PG&E Reported	PG&E Corrected*
2009	309871	2320	7.49	10.93	7.8
2008	310481	2800	9.01	7.72	5.83
2007	307551	2365	7.69	3.77	3.43
2006	306839	2777	9.05	4.23	3.06
2005	310841	3062	9.85	5.77	3.22
5 year average	309117	2665	8.62	6.48	4.66

* Leak rate calculated after removing non-reportable leaks from leak totals.

** Source: 2009 DOT Annual Report 7100.2-1, obtained from PHMSA website.

Reporting Above Ground Leaks

DOT includes this definition in the annual report instructions.

> "Leaks are unintentional escapes of gas from the pipeline. A non-hazardous release that can be eliminated by lubrication, adjustment, or tightening is not a leak."

Several current transmission operators and a former transmission operator were contacted to discuss classification, repair, and reporting of above ground leaks. All relayed different processes for handling these types of leaks and indicated no written procedures could be provided. However, certain generalizations were apparent. Routine maintenance activities on station piping, leaks eliminated and above ground leaks are generally regarded as non-hazardous minor or Grade 2 or 3 type leaks that would not be reported, meeting the exception definition for the annual report and representing no hazard to the general public. However, any hazardous (Grade 1) leaks and any leaks within a High Consequence Area (HCA) would be reported.

The American Gas Association (AGA) reviewed reporting of above ground leaks and developed a "Proposed Definition and Reporting of Hazardous Aboveground Leaks". (See Appendix B). The AGA proposal defines "Hazardous Above Ground Leak" and "Reportable Above Ground Leak. It further states

> "Minor escapes of gas (non-hazardous releases) at threads on sound piping *or* at fittings that are detectable only with instruments in direct proximity *or* that give only slight indications with leak detection soap need not be considered as leaks if they could be eliminated by lubrication, adjustment or tightening, even if the operator elects to reconstruct the piping or replace parts in order to eliminate the minor escape of gas."

This definition coincides with comments made by other operators contacted as part of this review.

On the other hand, PG&E has included in its annual reports a number of leaks that are not generally reported by other pipeline operators. In each of the five years studied, PG&E's annual

reports include leaks that meet the DOT exception and the AGA definition in that they are non-hazardous leaks (Grade 2+, 2 or 3 as classified according to PG&E procedures) and were repaired by tightening, lubrication, or adjustment. Following each table below is specific information on included leaks that would not be reported under this exception. The new leak rate per 1000 miles is shown in the last column of the table.

Leak Classification, Survey, and Reporting Procedures

A review of PG&E leak classification found a number of Grade 2 and 2+ leaks on above ground piping indicating that above ground leaks may be over classified. Over classification of leak grades has additional affects on the leaks reported to DOT. Grade 3 leaks are non-hazardous leaks and are not scheduled for repair, but are monitored at the time of next survey or other intervals determined by operating headquarters. An over classification of Grade 3 leaks to Grade 2 or 2+ requires that the leak must be repaired rather than monitored. This has the effect of increasing the number of reported leaks. When leaks are over classified to Grade 1 as a hazardous leak, it must be reported on the annual report regardless of the type of repair.

During 2008 PG&E reviewed and revised leak survey procedures and equipment for leak survey. Personnel involved in leak survey were re-qualified and a QC program was added to audit the leak surveys. Approximately two-thirds of the company leak surveyors did not re-qualify under the new program. A disciplinary process was also instituted if Grade 1 leaks were missed or a leak surveyor's results showed large variances from the QC audit.

This placed increased emphasis on leak grading and reporting. This can be seen by an increase in the number of reportable leaks in 2008 and 2009, primarily due to the inclusion of Grade 0 leaks, and leaks repaired by TLA as indicated. The 2010 leak reports also included over classified leaks and leaks repaired by TLA. These changes to leak survey procedures makes comparisons of year-to-year data questionable until two full reporting cycles are completed that incorporate all changes to the leak survey and reporting procedures.

The "Other" reportable category for 2008 and 2009, which showed the largest increase in reported leaks, included leaks with the cause listed as "other" or "unknown", and repair as "other" or no repair type listed. The information provided was insufficient to determine if these leaks actually should have been reported and additional detail is needed to verify the accuracy of this category.

Leak reports from 2010 have a number of above ground leaks with combustible gas indicator (CGI) readings. The PG&E leak classification scheme does include CGI readings as a criteria for classification, however throughout the pipeline industry CGI's are not normally used to classify above ground outside leaks. The common use of a CGI is to confirm underground leaks and to assess atmospheres to determine if hazardous conditions exist in buildings, confined spaces or an outside area where the gas may pose a danger to people or property.

CGI readings on above ground leaks taken at the leak on the pipe or fitting can be misleading as it is not uncommon to get LEL or percent gas indications right at the leak source. The AGA definition above also addresses this same situation. Readings in close proximity to the piping may not truly indicate the severity of the leak as gas dissipates rapidly in the open atmosphere as distance increases from an above ground fitting leak. Using CGI readings directly at the leak source on exposed fittings can easily lead to over classification.

A more accepted method is to use a "leak soap" to spray the fitting and observe the size of the bubbles and the speed at which they form. Additional considerations such as facility location, type of leak (thread leaks, valve cores, broken pipe), noticeable smell in the air, sound or hissing, and proximity to other facilities and public are then considered for leak classification. Evaluation of all these factors will lead to a truer classification of leak severity.

Reportable Leak Verification

The process of final verification of a reportable leak was reviewed during this project. It starts with leak reports prepared by the leak technician for leaks found on the PG&E system that are entered into the PG&E IGIS database. The reports are to be reviewed monthly and "non-leaks", or those leaks meeting the DOT exception are to be flagged and not included on the DOT annual report.

All 2010 leaks reviewed included an "A Form Review Worksheet". This worksheet is used to review the leak grade, cause, repair type, HCA classification, and calculation of % specified minimum yield strength (SMYS) used in classifying transmission lines. Pipelines operating over 20% SMYS are considered transmission line by definition in §192.3. The % SMYS calculation was done on all piping associated with the leak, including control lines, and small diameter piping at above ground facilities.

The calculation of % SMYS for the control lines and other small diameter station piping is not necessary to determine if this piping meets the definition of a transmission line. Facilities located on a transmission line, such as relief valves, regulators, or other components would also be considered to be part of the transmission pipeline and, by default, would be transmission facilities.

The verification process using the IGIS database confirms the type of pipeline facility where the leak was found, i.e., transmission or distribution. This includes reviewing PG&E facility maps, records, and the percent of SMYS. The conservative approach PG&E uses in classifying transmission facilities may have identified some distribution lines, such as laterals to regulator stations, as transmission lines. Again, this increases the reportable transmission mileage and the over reporting of transmission leaks.

At the completion of this process those verifiable leaks on transmission lines that have not been eliminated as non-leaks (see DOT Exception definition above) are considered reportable leaks. The review of reportable leaks for 2005 to 2009 indicates this process was not effective in

evaluating how the leak was repaired and whether or not the exception under the above DOT definition was applicable. Numerous leaks that should have been eliminated from the pool of reportable leaks were included in the DOT annual leak reporting. Further detail on these leaks follows each table below.

Comparison of Annual Leak Rates

Table 2: 2009 Top Ten Transmission Operators Leaks, per 1000 miles*

Transmission Operator	Reported Miles	No. of reported leaks	Leaks per 1000 miles
ATMOS PIPELINE - TEXAS	5924	199	33.59
COLUMBIA GAS TRANSMISSION CORP	4466	77	17.24
PACIFIC GAS & ELECTRIC CO	5764.279	63	10.93/7.8[1]
EL PASO NATURAL GAS CO	4893	20	4.09
GULF SOUTH PIPELINE COMPANY, LP	3606.217	13	3.60
NORTHERN NATURAL GAS CO	4373.5	10	2.29
ENTERPRISE PRODUCTS OPERATING LLC	4321	2	0.46
TENNESSEE GAS PIPELINE CO (EL PASO)	2243	1	0.45
ENERGY TRANSFER COMPANY	6413	2	0.31
SOUTHERN CALIFORNIA GAS CO	3989	1	0.25

*Source: 2009 DOT Annual Report 7100.2-1, obtained from PHMSA website.

1. Leak rate calculated after removing non-reportable leaks from leak totals.

In 2009 PG&E reported 63 leaks. This review found 18 leaks that are non-reportable; 16 leaks are listed as a Grade 0 (no leak according to PG&E procedures), one leak is reported as repaired by redoping (re-application of pipe dope to fitting threads), and one leak is on an unregulated gathering line. Removal of these leaks from the annual PHMSA report leaves 45 reportable leaks and a new rate of 7.8 leaks per 1000 miles.

Moreover, in 2009 PG&E reported 19 additional leak repairs that will require further review to determine if they actually meet the PHMSA reporting criteria. These are leaks having an unknown cause and repair type of "other" or no information on repair type. Should any or all of these leaks meet the PHMSA exception criteria, exclusion of those leaks from the annual PHMSA report will further lower the PG&E leak rate.

Table 3: 2008 Top Ten Transmission Operators Leaks, per 1000 miles*

Transmission Operator	Reported Miles	No. of reported leaks	Leaks per 1000 miles
ATMOS PIPELINE - TEXAS	5950	138	23.19
NORTHERN NATURAL GAS CO	4322	72	16.66
COLUMBIA GAS TRANSMISSION CORP	4468	56	12.53
PACIFIC GAS & ELECTRIC CO	5831.525	45	7.72/5.83[1]
GULF SOUTH PIPELINE COMPANY, LP	3997.583	25	6.25
EL PASO NATURAL GAS CO	4893	12	2.45
ENERGY TRANSFER COMPANY	6444	4	0.62
ENTERPRISE PRODUCTS OPERATING LLC	4878	3	0.62
SOUTHERN CALIFORNIA GAS CO	3999	1	0.25
WILLIAMS GAS PIPELINE - TRANSCO	2348.23	0	0.00

*Source: 2008 DOT Annual Report 7100.2-1, obtained from PHMSA website.

1. Leak rate calculated after removing non-reportable leaks from leak totals.

In 2008 PG&E reported 45 leaks. This review found seven leaks were listed as Grade 0 and four listed as repaired by TLA. Removal of these leaks from the annual PHMSA report leaves 34 reportable leaks and a new rate of 5.83 leaks per 1000 miles.

Moreover, in 2008 PG&E reported 7 additional leak repairs that will require further review to determine if they actually meet the PHMSA reporting criteria. These are leaks having an unknown cause and repair type of "other" or no information on repair type. Should any or all of these leaks meet the PHMSA exception criteria, exclusion of those leaks from the annual PHMSA report will further lower the PG&E leak rate.

Table 4: 2007 Top Ten Transmission Operators Leaks, per 1000 miles*

Transmission Operator	Reported Miles	No. of reported leaks	Leaks per 1000 miles
ATMOS PIPELINE - TEXAS	6069	185	30.48
NORTHERN NATURAL GAS CO	4284	51	11.90
COLUMBIA GAS TRANSMISSION CORP	4682	53	11.32
GULF SOUTH PIPELINE COMPANY, LP	3828	40	10.45
EL PASO NATURAL GAS CO	4892	34	6.95
SOUTHERN CALIFORNIA GAS CO	3961	20	5.05
PACIFIC GAS & ELECTRIC CO	5828.351	22	3.77/3.43[1]
WILLIAMS GAS PIPELINE - TRANSCO	2094	3	1.43
ENTERPRISE PRODUCTS OPERATING LLC	4770	6	1.26
ENERGY TRANSFER COMPANY	6055	3	

*Source: 2007 DOT Annual Report 7100.2-1, obtained from PHMSA website.

1. Leak rate calculated after removing non-reportable leaks from leak totals.

In 2007 PG&E reported 22 leaks. This review found two non-reportable leaks included on the annual report. One leak is shown as repaired by TLA and one leak (#07-31801-1) is listed twice. Removal of these leaks from the annual PHMSA report leaves 20 reportable leaks and a new rate of 3.43 leaks per 1000 miles.

There are two Grade 1 reported leaks listed as repaired by "replace grease fitting" and "grease valve". It is questionable that leaks repaired by simply greasing or replacing a grease fitting would truly be hazardous leaks and reportable on the PHMSA annual report. The leaks may be over classified and further review is suggested. If these are not leaks that are hazardous to the general public, they should be removed from the annual PHMSA report, further lowering the PG&E leak rate.

There is one additional leak repair in 2007 that should be reviewed to determine if it is reportable, having a repair type of "removed broken grease plug". If this leak could have been eliminated by tightening the grease plug, the leak would meet the PHMSA exception criteria and would not be reportable. If this leak is not reportable, removing it from the annual PHMSA report will further lower the PG&E leak rate.

Table 5: 2006 Top Ten Transmission Operators, Leaks per 1000 miles*

Transmission Operator	Reported Miles	No. of reported leaks	Leaks per 1000 miles
ATMOS PIPELINE - TEXAS	6290	390	62.00
NORTHERN NATURAL GAS CO	4268	101	23.66
COLUMBIA GAS TRANSMISSION CORP	4682	61	13.03
EL PASO NATURAL GAS COMPANY	4867	28	5.75
GULF SOUTH PIPELINE COMPANY, LP	3841	19	4.95
PACIFIC GAS & ELECTRIC CO	5878.084	25	4.25/3.06[1]
WILLIAMS GAS PIPELINE - TRANSCO	2094	7	3.34
ENERGY TRANSFER COMPANY	5762	16	2.78
SOUTHERN CALIFORNIA GAS COMPANY	3926	9	2.29
ENTERPRISE PRODUCTS OPERATING L.P.	5024	5	1.00

*Source: 2006 DOT Annual Report 7100.2-1, obtained from PHMSA website.

1. Leak rate calculated after removing non-reportable leaks from leak totals.

In 2006 PG&E reported 25 leaks. This review found seven leaks reported as repaired by TLA. Removal of these leaks from the annual PHMSA report leaves 18 reportable leaks and a new rate of 3.06 leaks per 1000 miles.

There is one additional leak in 2006 that will require further review to determine if it is reportable. This leak has unknown cause and repair type is listed as "other." If this leak could have been eliminated by TLA, the leak would meet the PHMSA exception criteria and would not be reportable. If this leak is not reportable, removing it from the annual PHMSA report will further lower the PG&E leak rate.

Table 6: 2005 Top Ten Transmission Operators, Leaks per 1000 miles*

Transmission Operator	Reported Miles	No. of reported leaks	Leaks per 1000 miles
ATMOS PIPELINE - TEXAS	6127	525	85.69
COLUMBIA GAS TRANSMISSION CORPORATION	4689	113	24.10
NORTHERN NATURAL GAS CO	4297	93	21.64
EL PASO NATURAL GAS CO	4837	55	11.37
GULF SOUTH PIPELINE COMPANY, LP	3845	31	8.06
PACIFIC GAS AND ELECTRIC Co.	5895.769	34	5.77/3.22[1]
TENNESSEE GAS PIPELINE CO (EL PASO)	2391	4	1.67
ENTERPRISE PRODUCTS OPERATING LP	5009	4	0.80
ENERGY TRANSFER COMPANY	5332	4	0.75
SOUTHERN CALIFORNIA GAS CO	3825	0	0.00

*Source: 2005 DOT Annual Report 7100.2-1, obtained from PHMSA website.

1. Leak rate calculated after removing non-reportable leaks from leak totals.

In 2005 PG&E reported 34 leaks. This review found 15 leaks shown as repaired by TLA, all are listed in the Equipment and Operations category. Removal of these leaks from the annual PHMSA report leaves 19 reportable leaks and a new rate of 3.22 leaks per 1000 miles.

There is one additional leak in 2005 that will require further review to determine if it is reportable. This leak is listed with an unknown cause and no there is no information on repair type. If this leak could have been eliminated by TLA, the leak would meet the PHMSA exception criteria and would not be reportable. If this leak is not reportable, removing it from the annual PHMSA report will further lower the PG&E leak rate.

Conclusion

PG&E compares favorably with the industry and would not be considered an outlier with a five-year average for leaks per 1000 miles well below the national average for all transmission operators.

PG&E's annual average leak rate per 1000 miles compares favorably with other pipeline operators of similar size and would not be considered an outlier in comparison, ranking in the middle to lower half of the top ten operators.

In addition, it appears that PG&E's leak repair reporting has been extremely conservative. In the five years analyzed here, PG&E reported a total of 189 leak repairs. Numerous leaks listed as "Grade 0" as well as non-hazardous leaks repaired by tightening, lubrication, or adjustment (TLA) have been included in the PG&E reportable leak totals. Leaks meeting these criteria should not be included on the PHMSA annual report. Removing these non-reportable TLA leaks from the annual reports would have lowered PG&E's leaks per 1000 mile average for those years and its overall average for the five-year period. Excluding only the obviously non-reportable leaks would have reduced that to 136 leak repairs – an over-reporting rate of 39%. If all the questionable leak repairs were ultimately eliminated, the total would be further reduced to just 105 reportable leaks in five years – an over-reporting rate of 80%.

This over-reporting does not include whether PG&E has been overly conservative in reporting leak repairs on "transmission" lines that are actually operating at less than 20% of specified minimum yield strength (SMYS) and should have been reported as distribution lines rather than transmission. (See Appendix A attached.)

Appendix A

OVERLY CONSERVATIVE CLASSIFICATION OF PIPE AS TRANSMISSION PIPE

OVERLY CONSERVATIVE CLASSIFICATION OF PIPE AS TRANSMISSION PIPE

Classification of Transmission Lines

A review of several "A form" leak reports indicates that PG&E has over-reported transmission line leaks. One of the reasons for this over-reporting is that several of the leaks are probably not really on transmission pipe.

By definition (Code of Federal Regulations (CFR) Title 49, Part B, §192.3), any steel pipeline that operates over 20 percent of the specified minimum yield strength (SMYS) is a transmission pipeline. A steel pipeline that operates at less than 20 percent SMYS may or may not be transmission line, depending on the specific function of the pipeline.

To determine whether a steel pipeline is operating over 20 percent of SMYS, it is necessary to determine the design pressure of the pipe (CFR, Title 49, Part 192, §192.105). To determine the design pressure, it is necessary to know the yield strength of the pipe (S).

Many of the leaks reported on the "A Forms" are on older pipe, for which there are incomplete records. Documentation for the yield strength of the steel in this older pipe is not available. The CFR, Title 49, Part 192, §192.107(b)(2) requires that, if the strength of the steel is not known, and the steel has not been tensile-tested, the yield strength of the pipe must be assumed to be 24,000 psi. This is a very conservative assumption, and in most cases, not representative of the actual strength of the steel in the pipeline. The 24,000 value is based on the yield strength of Grade A pipe, which has seldom been used in the industry. More typically, older pipe was manufactured as Grade B (having a yield strength of 30,000 psi) or Grade X-42 (having a yield strength of 42,000 psi). Thus the actual strength of the steel in the pipeline is very likely much greater than that calculated by using the 24,000 psi value that is required by the regulations.

Analysis of Regulatory Requirements and Use of Emerging Technology

The use of a yield strength value of 24,000 psi is based on the facts that:

(1) The yield strength is "unknown", and

(2) The steel has not been tensile tested.

Clearly, then, if the value of the yield strength were known, the known value would be used in the determination. Note that the regulations do not specify how the yield strength value must be known. The regulations do not specify what records are necessary to "know" what the value is.

Traditionally, the minimum specified yield strength of steel has been based on mill test reports supplied by the manufacturer of the pipe. The pipe manufacturer specifies the value for the specified minimum yield strength of the steel in the pipe. This value is used as "S" in the calculation of the design pressure of the pipe (CFR Title 49, Subpart C, §192.105). If the "S" value, as reported by the pipe manufacturer, is not known, then an "S" value of 24,000 psi is assumed (see discussion above).

However, emerging technology being developed by the ASME (American Society for Mechanical Engineers) Gas Pipeline Safety Research Committee (GPSRC) has developed a process by which the yield strength of in-place steel pipe can be determined using measurements obtained in the field.

The Gas Pipeline Safety Research Committee (GPSRC) has published the report "Applications Guide for Determining the Yield Strength of In-Service Pipe by Hardness Evaluation", and it is available for purchase from ASME in Paperback or Digital (PDF) download for $50 List/$40 Member. The ASME Order Number is 802915. The direct link is: "catalog.asme.org/books/PrintBook/Applications_Guide.cfm". This new document supplements an earlier ASME report titled "Determining the Yield Strength of In-Service Pipe, CRTD Vol. 57," which is available directly from the ASME–CRTD office in Washington, DC at (202) 785-3756.

Three companies are performing field-testing of this new technology. One of the three companies is PG&E.

Reclassification

Reclassification of pipelines using this process may reduce the mileage of transmission pipeline and eliminate or minimize the number of reportable transmission leaks where the classification of the transmission line is based on estimated data for the yield strength of the pipe. This is not required as part of the DOT reporting process, but suggested to more accurately identify transmission pipeline according to 192.3.

To do this, the pipe at each such leak should be tested using the GPSRC hardness measurement process, and the hardness should be determined. The "known" hardness can then be used to determine the actual yield stress of the pipe, and a more accurate SMYS value can be calculated.

Note that, for this purpose, it is not necessary to calculate the precise yield strength of the steel in the pipe. It is sufficient to know whether that yield strength results in a pipeline that operates at greater than or less than 20 percent of the SMYS.

Regulatory Agency Considerations

PHMSA personnel have traditionally relied on documentation from the manufacturer that pipe has been manufactured according to a listed specification or on tensile test records to establish the yield strength of pipe. Discussion with personnel involved in developing and implementing this new technology indicate that at this time PHMSA personnel indicate that an operator must submit an application for a special permit to use this method. A second opinion is that, since the code does not specify how the knowledge of the yield strength is to be obtained, an application for special permit for this purpose is not required by the regulations. For intrastate pipelines this application, if made, would be made to the state regulatory agency (CPUC). If approved at the state level, the state must submit the application to PHMSA for final approval.

Appendix B

American Gas Association

Proposed Definition and Reporting of Hazardous Aboveground Leaks

Proposed Definition and Reporting of Hazardous Aboveground Leaks

What is a "Hazardous Aboveground Leak?" — A Hazardous Aboveground leak is an unintentional escape of gas from above ground piping or related gas facilities that requires immediate make-safe action, because:

On Outside Piping, it:

- can be seen, heard, or felt (e.g.- causes the blowing-off of leak detection soap); and
- is in a location that mayendanger the general public or property(e .g. - requires an immediate evacuation to protect public safety).

On Inside Piping, it:

- can be seen, heard, or felt (e.g.- causes the blowing-off of leak detection soap); and
- is in a location that may endanger the general public or property (e.g. - requires an immediate evacuation to protect public safety) or it generates a reading of 20% LEL or more in the general atmosphere of the structure.

What is a "Reportable Aboveground Leak?" — An aboveground leak determined to he hazardous based on the criteria defined above is reportable.

Minor escapes of gas (non-hazardous releases) at threads on sound piping *or* at fittings that are detectable only with instruments in direct proximity *or* that give only slight indications with leak detection soap need not be considered as leaks if they could be eliminated by lubrication, adjustment or tightening, even if the operator elects to reconstruct the piping or replace parts in order to eliminate the minor escape of gas.