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THE PUBLIC ADVOCATES OFFICE
CALIFORNIA PUBLIC UTILITIES COMMISSION

PREPARED TESTIMONY
ON THE ORDER INSTITUTING INVESTIGATION (OII) INTO SOCALGAS' PRACTICES AND OPERATIONS OF THE ALISO CANYON STORAGE FACILITY AND THE UNCONTROLLED RELEASE OF NATURAL GAS

San Francisco, California

322706839

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I. INTRODUCTION AND EXECUTIVE SUMMARY

(Witness: M. Botros)

This testimony presents the investigation of the Public Advocates Office at the California Public Utilities Commission (Cal Advocates) concerning the *Order Instituting Investigation (OII) on the Commission's own motion into the operations and practices of Southern California Gas Company (SoCalGas) with respect to the Aliso Canyon storage facility and the release of natural gas, and Order to Show Cause why SoCalGas should not be sanctioned for allowing the uncontrolled release of natural gas from its Aliso Canyon storage facility.* Specifically, this testimony focuses on Issues One and Four of the Assigned Commissioner's Scoping Memo and Ruling dated September 26, 2019 (Scoping Memo).[1] This testimony highlights SoCalGas' historic failure to demonstrate prudent management of the Aliso Canyon natural gas storage facility (Aliso Canyon). SoCalGas management's failure to take reasonable and prudent action ultimately led to the uncontrolled release of natural gas from the Standard Sesnon 25 (SS-25) gas storage well on October 23, 2015 (the Leak) that lasted for 111 days.[2] SoCalGas management's failure and the Leak detrimentally impacted the safety and health of the public.

In Section II, the Public Advocates Office will focus on SoCalGas management's failures to identify and resolve well integrity issues, which were ultimately responsible for the SS-25 leak. SoCalGas' management also failed to take prudent action in response to Year 1988 Vertilog results, which could have prevented the Leak.[3] Furthermore, SoCalGas' management failed to act upon the recommendations of its engineering team to perform Vertilog inspections on 20 wells (including SS-25), out of the 119 wells total

[1] September 29, 2019 Assigned Commissioner's Scoping Memo and Ruling (Scoping Memo), pp. 4-5.

[2] The 111 days are counted from October 23, 2015 to February 11, 2015.

[3] SoCalGas' 1988 Vertilog program planned to both perform casing integrity logs, and to perform pressure testing on pipe casing collars. *See* p. CalAdvocates-265.

in Aliso Canyon,[4] and instead conducted Vertilog inspections on just seven wells.[5] The seven Vertilog inspections that SoCalGas did perform uncovered integrity issues in the wells.[6] But even then, SoCalGas' management continued to ignore the existing integrity issues and chose not to inspect the rest of the wells.

In Section III, the Public Advocates Office focuses on SoCalGas' management also failing to consider warnings from its storage engineering manager, raised in 2009, about the potential for a major leak.[7] SoCalGas' management did not analyze the identified risks or consider its storage engineering manager's recommendations for "risk control" at the time.[8] Instead, SoCalGas' management did not propose preventative measures against casing failure until 2014, five years after the warnings of its own employees.[9]

In Section IV, the Public Advocates Office focuses on the fact that SoCalGas' management did not proactively perform casing failure analysis on its failed wells.[10] Rather than identifying corrosion as a systemic risk and adopting mitigation measures prior to the failures reoccurring, SoCalGas management's efforts were reactive in diagnosing and remediating leaks.

In Section V, the Public Advocates Office discusses SoCalGas' management failure to maintain accurate records of its surveys and inspections. The Public Advocates Office performed a review of SoCalGas' records pertaining to SS-25 and other nearby

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[4] The 20 wells identified in Blade Report - Root Cause Analysis of the Uncontrolled Hydrocarbon Release from Aliso Canyon, Volume 4, "Review of 1988 Candidate Wells for Casing Inspection" (Blade Report, Vol. 4), Table 1, pp. 10-14, are Porter 34, 37, 44, 46, and 47, Standard Sesnon (SS) 2, 4, 6-11, 17, 24, 25, and 29, and Frew 2, 4, and 5.

[5] Blade Report, Vol. 4, Table 1, pp. 10-14. These seven wells are Porter 34, 37 and 46, SS 8 and 9, and Frew, 2 and 4.

[6] Blade Report, Vol. 4, Table 1, pp. 10-14.

[7] April 23, 2009 Email from James Mansdorfer to Rudy Weibel, SoCalGas' response to CalAdvocates-SCG-11, q. 1, Bates No. I1906016_SCG_CALADVOCATES_0017314 to 0017315 ("2009 Email").

[8] Blade Main Report - Root Cause Analysis of the Uncontrolled Hydrocarbon Release from Aliso Canyon (Blade Report), pp. 231-233.

[9] A. 14-11-004 Test Year 2016 General Rate Case (2016 GRC).

[10] Blade Report, p. 232.

wells. Records of surveys and inspections were missing, and supporting documentation was out of compliance with Sections 4.1.2.1.1 and 4.1.2.1.5 of SoCalGas' Internal Standard 224.070 and requirement four defined by the Division of Oil, Gas, and Geothermal Resources (DOGGR).[11] Further, the Public Advocates Office found evidence indicating the existence of at least one maintenance document with problematic recordkeeping.[12]

These failures by SoCalGas management resulted in one of the biggest natural gas leaks in U.S. history.[13] SoCalGas' actions were unreasonable, imprudent, and inconsistent with Public Utilities Code Section 451;[14] DOGGR regulations; and SoCalGas' own internal standards.[15]

II. SOCALGAS' MANAGEMENT FAILED TO DEAL WITH INTEGRITY MANAGEMENT ISSUES BY TAKING PRUDENT ACTION IN RESPONSE TO THE 1988 VERTILOG RESULTS

(Witnesses: A. Bach and M. Taul)

In 1988, SoCalGas began a program to perform casing integrity logs (known as Vertilog) and hydrostatic pressure testing on 20 candidate wells, including SS-25.[16]

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[11] Section 4.1.2.1.5 of SoCalGas Internal Standard 224.070 states: "Wellhead inspections are performed on a monthly basis." Section 4.1.2.1.1 of SoCalGas Internal Standard 224.070 states: "Surface pressures on each well are measured and recorded weekly using a calibrated test gauge. These include tubing pressure, casing pressure, annuli pressures, and, if applicable, safety valve control line pressures." SoCalGas' amended response to CalAdvocates-DR-025, p. CalAdvocates-466.

DOGGR mandated the following fourth requirement for approval of continued operation: "Surface pressures on each active or idle well are measured weekly with a calibrated test gauge, and recorded. Evidence of such measurement and calibration must be made available to this Division upon request." SoCalGas' amended response to CalAdvocates-DR-025, p. CalAdvocates-486.

On December 13, 2019, SoCalGas submitted a Second Amended Response to DR-025, Question 1. The amended response is not included in Cal Advocates' Supplemental Attachment as no information provided in SoCalGas' Second Amended Response is cited in this Testimony.

[12] The Public Advocates Office's review of records took place at SoCalGas Company Tower in downtown Los Angeles from Wednesday, November 6, through Friday, November 8, 2019.

[13] https://www.nbcnews.com/news/us-news/utility-regulatory-failures-led-biggest-u-s-gas-leak-n1007256.

[14] *See* Sections II, III, and IV.

[15] *See* Section IV.

[16] Blade Report, Vol. 4, pp. 6-14.

A 1988 inter-office memorandum from M.E. Melton, SoCalGas' Senior Petroleum Engineer, to SoCalGas' management stated:[17]

> Attached is Dave Horstman's [Associate Reservoir Engineer] recommendations and priorities for inspections of casing flow wells originally completed in the 1940's and 50's.
> I agree with Dave's priorities and recommend that all 20 wells listed be logged and pressure tested over the next two-year period.[18]

SoCalGas' management, however, did not follow this guidance. Instead, Vertilog logging inspections were performed on only seven of the 20 wells, which did not include SS-25.[19] Moreover, only five of the seven logged wells have surviving Vertilog Surveys.[20]

Of the five wells with surviving Vertilog Surveys, each included corrosion indications of at least 20 percent loss in wall thickness, with one well having an indication of over 60 percent loss in wall thickness.[21] Of the two wells with Vertilog inspections but no surviving records, one had a new inner casing string installed (i.e., to provide a secondary protective barrier following the Vertilog).[22] That the well had an inner casing string installed indicates that the casing was in a poor enough condition that its integrity was compromised. In total, SoCalGas performed remediation work on four of the seven wells it inspected.[23]

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[17] SoCalGas Interoffice Correspondence regarding "Candidate Wells for Casing Inspection, Aliso Canyon Field" from M.E. Melton, Senior Petroleum Engineer, to R.W. Weibel, Manager of Underground Storage, September 2, 1988 (1988 Interoffice Memo), p. CalAdvocates-265. This document was provided to the Public Advocates Office on November 15, 2019 following its on-site review of records.

[18] The 20 wells as identified in Blade Report, Vol. 4, Table 1, pp. 10-14, are Porter 34, 37, 44, 46, and 47; Standard Sesnon (SS) 2, 4, 6-11, 17, 24, 25, and 29; and Frew 2, 4, and 5.

[19] Blade Report, Vol. 4, Table 1, pp. 10-14. These seven wells are Porter 34, 37 and 46; SS 8 and 9; and Frew, 2 and 4.

[20] That is wells that have records that are still available. Blade Report, Vol. 4, Table 1, pp. 10-14. These five wells are Porter 37 and 46; SS 8 and 9; and Frew 4.

[21] Blade Report, Vol. 4, Table 1, pp. 10-14.

[22] Blade Report, Vol. 4, p. 17.

[23] SoCalGas' response to CalAdvocates-SCG-DR-013, q. 2(a), states that 3 of the 5 wells with records had replaced inner strings. This is in addition to the one of the two wells with a Vertilog inspection but no records requiring a replaced casing string.

Of the seven wells that SoCalGas chose to inspect, over half of the wells required replacement or remediation. Given the condition of the inspected wells (as indicated by the 20 percent or greater corrosion rate and the subsequent remediation), a prudent manager would have inspected the remaining 13 candidate wells to ensure the absence of similar integrity issues.[24] SoCalGas' management, however, failed to undertake a timely inspection of these wells, including SS-25, and consequently failed to identify and address corrosion issues. This failure to act demonstrates a failure of appropriate integrity management. Had SoCalGas management acted in accordance with recommendation from its staff, corrosion issues for SS-25 could have been identified monitored and remediated decades prior to the Leak.[25]

SoCalGas' management also failed to give a satisfactory reason for why it did not perform a Vertilog inspection on SS-25. The lack of a reason is particularly concerning for several reasons: 1) SoCalGas identified SS-25 as a 1988 candidate well for the Vertilog survey; 2) SoCalGas found that four out of seven of the inspected wells required replacement; and, 3) SoCalGas did not follow through on testing SS-25.[26]

SoCalGas first attempted to explain its failure of oversight and failure to act by asserting that Vertilog inspections were not performed on the remaining 13 wells because Vertilog "proved to be less effective at identifying casing leaks" than temperature surveys and noise logs.[27] Thereafter, SoCalGas asserted that Vertilog inspections were not performed on the remaining 13 wells because "[t]he inspection log technology (Vertilog) available in 1988 proved to be less effective at gauging the mechanical integrity of the

[24] These being Porter 44 and 47; SS 2, 4, 6, 7, 10, 11, 17, 24, 25 and 29; and Frew 5.

[25] Blade Report, Vol. 4, p. 2, states: "There is no way to know what an inspection of the SS-25 casing would have shown in 1988, but it is possible that corrosion was present and detectable, and steps could have been taken to avoid the leak in 2015."

[26] SoCalGas' response to CalAdvocates-SCG-DR-013, q. 2(a), states that 3 of the 5 wells with records had replaced inner strings. This is in addition to the one of the two wells with a Vertilog inspection but no records requiring a replaced casing string.

[27] *See* Blade Report, Vol. 4, Figure 5, p. 18.

wells. In some instances, the Vertilog was known to show false positives and/or characterized the wall loss inaccurately."[28]

SoCalGas management's reasoning here is inconsistent. First, SoCalGas framed the purpose of Vertilog inspections as detecting leaks, rather than more broadly assessing the mechanical integrity of the wells. As the Blade Report pointed out, SoCalGas had previously stated that the purpose of the 1988 program was to determine the mechanical condition of the well casing, not simply to identify leaks.[29] Therefore, SoCalGas' assertion now that the Vertilog inspections did not need to be performed because they are "less effective at identifying casing leaks" is inconsistent with SoCalGas' previous concerns regarding the condition of the well casings.[30]

Second, SoCalGas' later assertion that it did not perform Vertilog inspections on the remaining 13 wells because Vertilog may result in false positives and may be inaccurate is belied by SoCalGas' actual findings and its remedial actions.[31] SoCalGas acknowledged that "3 of the 5 wells had inner-strings run as a result of the Vertilog casing inspection."[32] In other words, although SoCalGas opined that Vertilog inspections may be too inaccurate to rely upon in assessing the mechanical integrity of the wells, SoCalGas nonetheless found at least three out of seven results reliable enough to take direct action.

Even if SoCalGas' position on the inaccuracy of Vertilog inspections were valid, SoCalGas could have proceeded with testing the integrity of the 13 remaining wells through pressure testing, as originally proposed in the 1988 Interoffice Memo.[33] While SoCalGas may have originally planned for the pressure testing to identify leaks at casing

[28] SoCalGas' response to CalAdvocates-SCG-DR-013, q. 2(b).

[29] Blade Report, Vol. 4, p. 18.

[30] SoCalGas' response to CalAdvocates-SCG-DR-013, q. 2(b).

[31] SoCalGas' response to CalAdvocates-SCG-DR-013, q. 2(b).

[32] SoCalGas' response to CalAdvocates-SCG-DR-013, q. 2(a).

[33] Blade Report, Vol. 4, Figure 1, p. 6.

collars,[34] pressure testing would also have assessed the mechanical integrity of the wells.[35] Therefore, SoCalGas should have followed up with further testing of the integrity of the 13 remaining wells. Had SoCalGas done so, it may have discovered an integrity issue on SS-25 during the Vertilog and subsequent pressure-testing program and would have been able to take appropriate steps to remediate or monitor the condition of SS-25.

The Blade Report noted that despite the evidence of wall thickness loss from the seven tested wells, SoCalGas failed to perform a data analysis of the Vertilog results.[36] With the data it collected, SoCalGas could have performed a simple analysis of the rate at which external corrosion was impacting the wells in Aliso Canyon, including SS-25. Combining the data provided by SoCalGas[37] with a 1988 Vertilog results table from the Blade Report,[38] the Public Advocates Office performed the following analysis on the corrosion rate of the wells tested in the 1988-1990 period. Table 1 shows the results of this analysis.

[34] Blade Report, Vol. 4, Figure 1, p. 6.

[35] SoCalGas' response to CalAdvocates-SCG-DR-012, q. 3(c), states: "Pressure tests are used to test the mechanical integrity of a gas storage well during a workover when there is a rig on the well."

[36] "Seven of the wells were inspected, and many of them had OD metal loss indications. There was no follow-up investigation of why these wells exhibited OD corrosion and why the remaining thirteen wells did not require further analyses (the remaining thirteen wells had been ranked as medium and low priority)." Blade Report, p. 218.

[37] SoCalGas' amended response to CalAdvocates-DR-025, p. CalAdvocates-461. The table gives OD (in) and ID (in), so the Production Casing Thickness (in) measurement can be derived by subtracting these values and dividing by two (there are two casing walls per diameter). For the five wells tested the OD was 7.00 in and the ID was 6.37 in, giving the Production Casing Thickness as 0.315 in.

[38] Blade Report, Vol. 4, Table 1, p. 10. This only provides Vertilog data for the five wells where documents were found.

Table 1: Corrosion Rate of 1988 Vertilog Wells

Lease - Well	Completion Date	Production Casing Wall Thickness (in)	Priority	Date Logged (within 2 yrs.)	Vertilog Summary	MPY Corrosion Rate
Porter - 37	Aug-1946	0.315	High	Oct-1988	4 joints(jts) >20% OD Penetration 1 joint(jt) > **60% OD Penetration**	4.5
Porter - 46	Feb-1944	0.315	High	Oct-1988	10 jts >20% OD Penetration	1.4
Standard Sesnon - 8	Aug-1946	0.315	High	Jan-1989	28 jts >20% OD Penetration 5 jts > 40% OD Penetration	3.0
Standard Sesnon - 9	Feb-1947	0.315	High	Dec-1988	6 jts >20% OD Penetration	1.5
Frew - 4	Jan-1948	0.315	Workover Rig already at Wellsite	Sep-1988	12 jts >20% OD Penetration 12 jts > 40% OD Penetration 2 jts > **60% OD Penetration**	4.6

The derived column on the far right of Table 1, labeled "MPY Corrosion Rate" (Mils per Year), is the rate of localized corrosion that can be calculated from the geometry of the wells and the results of the 1988 Vertilog information. That is, the MPY Corrosion Rate is the decrease in casing wall thickness, in milli-inches per year. Using an assumption that the production casings of each well would have had 0 percent Outer Diameter (OD) penetration (wall thickness loss) at the time they were installed and the percentage of OD Penetration found by the Vertilog results in 1988, it is possible to estimate a localized linear corrosion rate in units MPY. From the results in Table 1, the wells given Vertilog inspections had a corrosion rate from 1.4 to 4.6 MPY.[39] Given the

[39] "In an open water system a corrosion rate of around 1 MPY is normal. Having corrosion rate of around 10, you should take action. Corrosion rates of 20 MPY and above, you should be concerned, as the corrosion is 'eating' the metal rather fast." Merus Oil and Gas, https://www.merusonline.com/mpy-mils-per-year/.

almost 5 MPY corrosion rate and an existing wall thickness loss exceeding 60 percent, the wall thickness would be reduced to 80 percent in as few as 14 years, or by 2002.[40]

The pressure that a production casing should be subjected to throughout its working life is proportional to the casing's remaining wall thickness.[41] As wall thickness continues to decrease due to corrosion, the well casing is more likely to fail. SoCalGas failed to perform this basic corrosion rate calculation with the 1988 Vertilog results, leaving SoCalGas' management underinformed and unable to assess the risk of casing failure events.

In summary, while SoCalGas nominated 20 wells for Vertilog inspections and hydrostatic pressure testing in 1988, it only inspected seven of the wells. The inspection results for those wells were poor, with four of the seven wells requiring remediation. Given the poor condition of the inspected wells, it would have been prudent for SoCalGas management to confirm that the remaining 13 wells did not also have compromised integrity. SoCalGas management failed to do so. Instead, it claimed that continued Vertilog inspections would not have achieved SoCalGas' intended purpose of the 1988 program. Even if this claim is correct, SoCalGas' management could still have confirmed the integrity of the remaining 13 wells through other measures, such as pressure testing, as SoCalGas had originally proposed. Finally, SoCalGas has not demonstrated that it attempted to use the 1988 Vertilog results to assess the risk of well corrosion in its seven wells specifically or the Aliso Canyon wellfield more broadly.

Had SoCalGas' management properly administered the program, the corrosion issues on SS-25 may have been timely identified. SoCalGas would then have been able to monitor or remediate or monitor the well and prevent the October 23, 2015 Leak.

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[40] If 60% Wall Thickness was lost in first 40 years of Frew-4 (or first 42 years in Porter-37), linear corrosion rate predicts 80% Wall Thickness lost would occur within 13.6 years for Frew-4 (or 14.1 years for Porter-37).

[41] As given by Barlow's formula, $\text{Pressure} = \frac{\text{2 X Allowable Stress X Wall thickness}}{\text{Outside diameter}}$.

In addition to failing to inspect SS-25 as part of the 1988 program, SoCalGas failed to properly document the reason for not inspecting the well, as well as the reason it had listed SS-25 as a candidate well for the program in the first place.[42] Moreover, SoCalGas also failed to properly document the reasons it ultimately decided not to inspect SS-25. By not possessing this documentation, SoCalGas was apparently unable to ascertain its original concern for SS-25's integrity or what specific issues could compromise SS-25's safe operations. The data that informed SoCalGas to list SS-25 as a candidate well in 1988 would have informed SoCalGas to also perform a follow-up inspection on SS-25. This follow-up inspection may have identified the failing integrity in SS-25 and enabled SoCalGas to undertake remediation that could have prevented the Leak.

III. SOCALGAS FAILED TO ACT UPON WARNINGS FROM ITS STORAGE ENGINEERING MANAGER REGARDING RISKS OF MAJOR LEAKS

(Witnesses: P. Li and T. Holzschuh)

A. SoCalGas Was Aware that Casing Corrosion Could Potentially Cause a Major Subsurface Leak.

On April 23, 2009, James Mansdorfer, the Storage Engineering Manager at SoCalGas, cautioned Rudy Weibel, SoCalGas' Director of Natural Gas Storage, that "[c]asing corrosion, landslide movement or fault movement are all potential causes of a major subsurface casing leak."[43] Mr. Mansdorfer explained how susceptible the Aliso Canyon wells were to integrity and failure risks by describing that "the majority [of over 100 storage wells at Aliso Canyon] are from 35 to 70 years old" with "no cathodic protection [against corrosion]." Mr. Mansdorfer further predicted that "[d]epending on the cause and the number of wells affected, it may be possible to control the well by pumping kill fluid into it, but if a subsurface blowout gets out of control and craters to the

[42] Blade Report, Vol. 4, p. 17, states: "Blade was not able to locate documented reasons for the recommendation [to identify wells for the 1988 Vertilog program], other than the list included all of the casing flow wells, as stated in the recommendation."

[43] 2009 Email, p. CalAdvocates-006.

surface it would probably require a relief well to control it."[44] He concluded that "[e]ven one of these happening could have severe consequences for the Company's image, and if the cause is a large landslide block or fault movement there could be multiple events at the same time."

As Mr. Mansdorfer aptly anticipated in April 2009, the casing corrosion was the direct cause behind the failure of SS-25 in October 2015.[45] Subsequently the initial leak became a blowout.[46, 47] Only the construction of a relief well[48] finally allowed control to be regained, after seven failed well-kill attempts.[49] At the time of Mr. Mansdorfer's email, SS-25 was approximately 55 years old. The fact that SS-25 was not cathodically protected, replaced, or taken out of service prior to the leak, meant that the corrosion was unmitigated.[50] SoCalGas was, or should have been, aware of this issue. However, despite the Storage Engineering Manager's warnings six and a half years prior, SoCalGas did not take the necessary steps to prevent or manage the corrosion.[51]

PU Code Section 451 mandates SoCalGas to operate its wells in a manner that promotes the safety and health of the public.[52] This may include, for example, taking proactive actions to prevent a gas leak by carrying out technical analyses, inspecting or

[44] 2009 Email, p. CalAdvocates-006.

[45] Blade Report, p. 4.

[46] A blowout is defined as an uncontrolled flow of formation fluids (which includes but not limited to hydrocarbon) from a well, according to the Schlumberger Oilfield Glossary. "Blowouts may occur during all types of well activities and are not limited to drilling operations." *See*, https://www.glossary.oilfield.slb.com/en/Terms/b/blowout.aspx, p. CalAdvocates-494.

[47] Blade Report, Table 15, pp. 126-127, indicates that SS-25 "blew out in the conventional sense." The leak was identified as a blowout on the day of the second kill attempt, November 13, 2015.

[48] On day 112, a relief well was drilled to intersect with SS-25 and this successfully stopped the leak. *See*, Blade Report, Table 15, pp. 126-127.

[49] Blade Report, Table 15, pp. 126-127, indicates seven well kills attempts which all failed.

[50] SoCalGas did not identify any mitigation measures performed specifically on SS-25. SoCalGas referred to Chapter 1 of its Opening Testimony on November 22, 2019, which describes monitoring or inspection measures, rather than mitigation measures, for the Aliso Canyon gas storage site as a whole. SoCalGas' response to CalAdvocates-DR-026, q. 1.

[51] Blade Report, pp. 231-233.

[52] "Every public utility shall furnish and maintain such adequate, efficient, just, and reasonable service, instrumentalities, equipment, and facilities, including telephone facilities, as defined in Section 54.1 of the Civil Code, as are necessary to promote the safety, health, comfort, and convenience of its patrons, employees, and the public." Pub. Util. Code § 451.

testing the wells (e.g., for well corrosion,[53] for the strength of the well casing to withstand high pressure, etc.). Had SoCalGas taken such preventative actions in due time, it may have been able to prevent the SS-25 failure, which resulted in negative consequences to the health and safety of the public. However, SoCalGas failed to do so.

B. SoCalGas Failed to Propose Preventative Measures Against Casing Failure until 2014.

Given the condition of the Aliso Canyon field in 2009, Mr. Mansdorfer's warnings, and his proposals to timely assess the corrosion that ultimately led to the Leak, SoCalGas' management should have taken appropriate actions to safeguard against such an event. In his 2009 Email, Mr. Mansdorfer suggested that SoCalGas propose to mitigate any well integrity risks in its Test Year 2012 General Rate Case (GRC) Application (A.) 10-12-006:

> We are soon to be putting together the GRC for the 2012 Rate Case…. We would pull tubing,[54] run a casing inspection log,[55] pressure test the casing,[56] and rebuild the wellhead seals prior to re-running tubing with the safety valve. My offhand guess is between $300,000 and $400,000 per well, including the control panel. We could probably complete 20 to 25 wells per year, so this would be a 5 year program at a cost of about $6 - 8 million per year.[57]

If casing inspections and pressure tests were done on SS-25, as Mr. Mansdorfer suggested, the Leak may have been averted with the aid of the additional information

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[53] Sempra General Rate Case Application (A.)10-12-006, Underground storage, p. CalAdvocates-518. James Mansdorfer stated that "[t]he combined effect of corrosion, erosion, and the effects of wide variation in temperature and pressure on elastomer seals and cement, all take their toll on storage wells over many years. In many years it is more cost-effective to replace the deliverability of a worn out well by drilling a new well rather than costly repairs of an old well."

[54] The well tubing (2 7/8-inch diameter) must be pulled out from the well casing (7-inch diameter) before inserting and running an inspection log in the well casing.

[55] According to the Schlumberger Oilfield Glossary, a casing inspection log is "[a]n in situ record of casing thickness and integrity, to determine whether and to what extent the casing has undergone corrosion."

In other words, a casing inspection log can estimate the amount of metal loss in the well casing. *See*, https://www.glossary.oilfield.slb.com/Terms/c/casing_inspection_log.aspx, p. CalAdvocates-529.

[56] Pressure tests of well casing test how much pressure (exerted by the fluids inside the casing on the annulus of the well) that the well casing can withstand.

[57] 2009 Email, p. CalAdvocates-006.

gained through the inspections and tests about SS-25's well integrity and mechanical soundness. Casing inspections can gauge the wall thickness remaining in a corroded casing, while pressure tests can give an idea of how much force a corroded casing can withstand.

However, SoCalGas did not propose this corrosion monitoring program in A.10-12-006 (where Mr. Mansdorfer was the witness regarding Natural Gas Storage).[58] Instead, SoCalGas proposed to drill two replacement wells each year during the GRC period 2012 to 2014. Although replacing wells is a "cost-effective" way to keep up with well deliverability,[59] it does not aid in discovering corrosion in operating wells. As a result, the proposal in GRC A.10-12-006 was inadequate to address existing corrosion or to prevent future corrosion.

If SoCalGas management had taken timely action based on Mr. Mansdorfer's proposal in 2009, the SS-25 Leak could have been prevented.

IV. SOCALGAS FAILED TO ADEQUATELY PERFORM POST-FAILURE ANALYSIS AND PROACTIVELY DETERMINE SYSTEMATIC RISKS

(Witness: A. Bach)

As stated in the Blade Report, SoCalGas management did not systematically perform casing failure analysis on its failed wells, i.e., identifying the cause of the well failures.[60] Determining the cause of well failures is important because by identifying the recurring cause of failures in aggregate, SoCalGas could have identified whether there are any existing systemic risks in the Aliso Canyon storage field. This would, in turn, allow SoCalGas management to mitigate against such systemic risks. For example, if

[58] *See*, *generally*, Application (A.) 10-12-006, Underground storage, Revised Prepared Direct Testimony of James D. Mansdorfer, Southern California Gas Company, July 2011, pp. CalAdvocates-496-CalAdvocates-527 (SoCalGas did not propose any well integrity measures [e.g., casing inspection logging to detect or measure the extent of casing corrosion, pressure testing the well casing for its strength, etc.]).

[59] Sempra General Rate Case Application (A.)10-12-006, Underground storage, at p. JDM-21, p. CalAdvocates-518. James Mansdorfer stated that "[t]he combined effect of corrosion, erosion, and the effects of wide variation in temperature and pressure on elastomer seals and cement, all take their toll on storage wells over many years. In many years it is more cost-effective to replace the deliverability of a worn out well by drilling a new well rather than costly repairs of an old well."

[60] Blade Report, p. 232.

corrosion was identified as a systemic risk, SoCalGas could have taken steps to mitigate against corrosion, and therefore could have prevented the Leak.

SoCalGas had made some efforts to diagnose and remediate leaks.[61] These efforts, however, do not include attempts to conduct failure analysis to identify and mitigate systemic risks. For example, regarding the failure of the Fernando Fee (FF) 34A well on September 10, 1990, SoCalGas stated that it had performed three initial surveys to diagnose the location and severity of the leak; conducted a simulation study to model the gas migration of the failure; used three different inspection tools to diagnose the leak; performed additional surveys during well workover; and, afterwards, installed cathodic protection.[62]

SoCalGas implemented mitigations against the cause of the failure of FF-34A by installing cathodic protection. However, SoCalGas' response came after the fact. While SoCalGas' actions may have been reasonable to prevent future leaks of FF-34A, this preventative factor was achieved only after an initial leak had already occurred.

SoCalGas should have taken a proactive approach by utilizing the knowledge that FF-34A failed in conjunction with other well failure data to categorize, review, and analyze all past well failures.[63] If a significant portion of the wells failed due to corrosion, SoCalGas could then identify corrosion as a systemic risk, and adopt mitigation measures prior to the failures reoccurring. However, SoCalGas has given no indication that it was capable of applying its knowledge of the FF-34A failure to further its understanding of systemic risk in the Aliso Canyon storage field.[64] As a result, SoCalGas could not, and did not, adequately identify systemic risks in the Aliso Canyon.

While failure analysis and subsequent identification of systemic risk may not have been explicitly required by regulations, it is reasonable to expect that a gas storage field

[61] SoCalGas' response to CalAdvocates-SCG-DR-007, q. 2.

[62] SoCalGas' response to CalAdvocates-SCG-DR-014, q. 2.

[63] For example, a database of past well failures is an example of how SoCalGas could have identified systemic risk, but it is not the only method.

[64] SoCalGas stated that it "has not performed a failure analysis on SS-25 since the October 23, 2015 incident." CalAdvocates-SCG-DR-016, q. 5.

operator has and maintains an understanding of its own system. As demonstrated by the failure of SS-25, SoCalGas failed to appropriately ascertain whether there were any systemic corrosion risks in the Aliso Canyon storage field.

V. SOCALGAS FAILED TO DEMONSTRATE REASONABLE AND PRUDENT RECORDKEEPING PRACTICES

(Witness: M. Taul)

The Public Advocates Office conducted an on-site review of SoCalGas records pertaining to the SS-25 well and the Aliso Canyon storage field.[65] The Public Advocates Office review aimed to determine if there were any errors in the recordkeeping practices of SoCalGas pursuant to Issue Four in the Scoping Memo.[66]

A. SoCalGas Failed to Maintain Accurate Records of Its Surveys and Inspections.

The Public Advocates Office identified seven incidents involving missed compliance actions on surveys and inspections done for SS-25. The seven instances are as follows:

1. **SS-25 Monthly Well Inspection** – The monthly well inspection scheduled for the month of June 2010 was completed at least four days late, on July 4, 2010. As a result, there was no monthly inspection performed on SS-25 well in the month of June 2010.[67] This inspection was performed out of compliance with Section 4.1.2.1.5 of SoCalGas' Internal Standard (SIS) 224.070, which

[65] The Public Advocates Office Correspondence regarding "Review of Records" from Elena Gekker, Attorney for the Public Advocates Office, to Gregory Healy, Regulatory Affairs for SoCalGas, October 11, 2019 (Cal Advocates Request for Review of Records), pp. CalAdvocates-554-CalAdvocates-555. The Public Advocates Office requested review of the following records for wells SS-25, SS-5, P-35, SS-9, and SS-17: (1) documents detailing maintenance; (2) leak surveys; (3) corrosion inspection documents; as well as documents detailing cathodic protection of gas wells located on the Aliso Canyon site and that equipment management and maintenance scheduling software used by SoCalGas be made readily available for review. From November 6 through November 8, 2019, two Public Advocates Office staff, Matthew Taul (Utilities Engineer) and James Wuehler (Regulatory Analyst) traveled to SoCalGas Tower in Los Angeles, California, for the review of records. Following the on-site review, SoCalGas provided the Public Advocates Office with electronic copies of certain documents identified during the review.

[66] Scoping Memo, p. 4. Issue Four states "Did SoCalGas violate any provisions of the Pub. Util. Code, Commission General Orders or decisions, or any other applicable regulations and/or engage in unreasonable and/or imprudent practices with respect to (i) SoCalGas's maintenance and operation of Aliso Canyon, and/or (ii) SoCalGas's related recordkeeping practices?"

[67] November 15, 2019 SoCalGas Correspondence, pp. CalAdvocates-327–CalAdvocates-330.

requires that well inspections are "…performed on a monthly basis."[68]

2. **SS-25 Monthly Well Inspection** – The monthly inspection scheduled for July 2011 was completed approximately two and a half years late, on November 6, 2013. As a result, there was no monthly inspection performed in the month of July 2011.[69] This inspection was performed out of compliance with Section 4.1.2.1.5 of SIS 224.070.[70] The note on this form claims that the inspection was "…completed prior [to November 6, 2013] but not recorded,"[71] meaning that there is no documentary evidence proving that this inspection even occurred.

3. **SS-25 Monthly Well Inspection** – The monthly inspection scheduled for May 2012 was completed over a month late, on July 1, 2012. According to the documents presented,[72] no monthly inspection was performed in the month of May 2012.[73] This inspection was performed out of compliance with Section 4.1.2.1.5 of SIS 224.070.[74]

4. **SS-25 Monthly Well Inspection** – The monthly inspection scheduled for June 2012 was completed untimely on May 25, 2012, meaning no monthly inspection was performed in the month of June 2012.[75] This inspection was performed out of compliance with Section 4.1.2.1.5 of SIS 224.070.[76]

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[68] SoCalGas' amended response to CalAdvocates-DR-025, p. CalAdvocates-466, Section 4.1.2.1.5 of SoCalGas Internal Standard 224.070 states: "Wellhead inspections are performed on a monthly basis."

[69] November 15, 2019 SoCalGas Correspondence, pp. CalAdvocates-331–CalAdvocates-334.

[70] SoCalGas' amended response to CalAdvocates-DR-025, p. CalAdvocates-466, Section 4.1.2.1.5 of SoCalGas Internal Standard 224.070 states: "Wellhead inspections are performed on a monthly basis."

[71] November 15, 2019 SoCalGas Correspondence, p. CalAdvocates-331, the monthly inspection form states "REMARKS: COMPLETED PRIOR BUT NOT RECORDED". There is no documentary proof that this survey occurred on time, leaving no other conclusion than this survey was not performed.

[72] To the extent that these completion dates are incorrect from an inputting error into a digital system, no other documents were provided to the Public Advocates during the review of records proving that the survey was completed in the correct month.

[73] November 15, 2019 SoCalGas Correspondence, pp. CalAdvocates-335–CalAdvocates-338.

[74] SoCalGas' amended response to CalAdvocates-DR-025, p. CalAdvocates-466, Section 4.1.2.1.5 of SoCalGas Internal Standard 224.070 states: "Wellhead inspections are performed on a monthly basis."

[75] November 15, 2019 SoCalGas Correspondence, pp. CalAdvocates-339–CalAdvocates-342.

[76] SoCalGas amended response to CalAdvocates-DR-025, p. CalAdvocates-466, Section 4.1.2.1.5 of SoCalGas Internal Standard 224.070 states: "Wellhead inspections are performed on a monthly basis."

5. **SS-25 Monthly Well Inspection** – The monthly inspection scheduled for July 2012 was completed nearly a year and a half late on November 4, 2013. According to the documents presented,[77] no monthly inspection was performed in the month of May 2012.[78] This inspection was performed out of compliance with Section 4.1.2.1.5 of SIS 224.070.[79]

6. **SS-25 Storage Well Safety System Inspection** – The bi-annual inspection scheduled for October 2000 was completed early on May 3, 2000, approximately five months beforehand. This contrasts with the May 2000 inspection was completed on May 9, 2000 – after the date purportedly used for the October inspection. The May 2001 inspection was completed on May 26, 2001, leaving over a full year between two consecutive bi-annual inspections.[80]

7. **SS-25 Storage Well Safety System Inspection** – The bi-annual inspection scheduled for November 2001 was completed over a month late on January 12, 2002. This inspection was done late for November 2001, leaving only one bi-annual inspection for the year 2001 as the previous May 2001 inspection completed on May 26, 2001.[81]

The first five of the seven incidents listed above identify untimely inspections, resulting in missed compliance with SoCalGas' own Internal Standards.[82] The last two incidents also identify untimely inspections, however, SoCalGas did not appear to have any internal standards for "Bi-Annual Inspection" prior to 2015.[83] Nonetheless, appropriate inspection standards, and following those standards, is crucial for well safety,

[77] To the extent that these completion dates are incorrect from an inputting error into a digital system, no other documents were provided to the Public Advocates during the review of records proving that the survey was completed in the correct month.

[78] November 15, 2019 SoCalGas Correspondence, pp. CalAdvocates-343–CalAdvocates-346.

[79] SoCalGas' amended response to CalAdvocates-DR-025, p. CalAdvocates-466, Section 4.1.2.1.5 of SoCalGas Internal Standard 224.070 states: "Wellhead inspections are performed on a monthly basis."

[80] November 15, 2019 SoCalGas Correspondence, pp. CalAdvocates-347–CalAdvocates-348.

[81] November 15, 2019 SoCalGas Correspondence, pp. CalAdvocates-349–CalAdvocates-350.

[82] The SoCalGas Internal Standards were the only standards for monthly inspection/maintenance of gas wells active before the event that the Public Advocates Office was able to identify in the time available.

[83] SoCalGas' amended response to CalAdvocates-DR-025, pp. CalAdvocates-464–CalAdvocates-485.

since inspections are meant to probe field performance and well integrity. If inspections are performed late with regards to internal standards, potentially critical information is not being captured to be used to safely maintain and operate the well. As provided by Section 4.1.2.1 of SIS 224.070, "[p]erformance reviews utilize information collected during individual well and reservoir tests. Parameters such as back pressure curve shifts, changes in deliverability, and field performance are investigated."[84] By performing its inspections late or missing them altogether, SoCalGas failed to timely collect information useful to the safe operation of its wells.

SoCalGas also failed to comply with Section 4.1.2.1.1 of SIS 224.070,[85] as well as requirement four as defined by DOGGR[86], by failing to take weekly casing pressure reading from 2009 through 2015. Multiple entries in the SS-25 weekly casing pressure indicated the documented casing pressure of "0" (psig).[87] SoCalGas acknowledged that "[t]he '0' data points are indicative of the absence of a pressure reading,"[88] which indicates that no pressure reading was taken during these weeks. Table 2 captures the 14 instances where the casing pressure was "0" from 2009 through 2015. This reflects that weekly casing pressure readings were not taken.[89] These lapses in surveys violate both SoCalGas' internal standards and one of the requirements established by DOGGR in 1989 as necessary for "the continued operation of the project."[90]

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[84] SoCalGas' amended response to CalAdvocates-DR-025, p. CalAdvocates-465.

[85] SoCalGas' amended response to CalAdvocates-DR-025, p. CalAdvocates-466, Section 4.1.2.1.1 of SoCalGas Internal Standard 224.070 states: "Surface pressures on each well are measured and recorded weekly using a calibrated test gauge. These include tubing pressure, casing pressure, annuli pressures, and, if applicable, safety valve control line pressures."

[86] SoCalGas' amended response to CalAdvocates-DR-025, p. CalAdvocates-486, states as its fourth requirement for approval of continued operation "Surface pressures on each active or idle well are measured weekly with a calibrated test gauge, and recorded. Evidence of such measurement and calibration must be made available to this Division upon request."

[87] SoCalGas' response to CalAdvocates-DR-020, q. 2, pp. CalAdvocates-562–CalAdvocates-569.

[88] SoCalGas' response to CalAdvocates-DR-020, q. 2, p. CalAdvocates-559.

[89] SoCalGas' response to CalAdvocates-DR-020, q. 2, pp. CalAdvocates-562–CalAdvocates-569.

[90] SoCalGas' amended response to CalAdvocates-DR-025, p. CalAdvocates-486, states: "The Division of Oil and Gas has responsibility for wells that inject and withdraw natural gas from an underground storage facility. Our records indicate that, although individual wells have been permitted, project approval has not been issued by the Division to conduct underground gas storage operations in the Aliso Canyon field.

Table 2: Absence of SS-25 Weekly Casing Pressure Reading

Casing Pressure		Annulus Pressure	
Date	Pressure (psig)	Date	Pressure (psig)
3/7/2009	0	3/7/2009	0
12/29/2012	0	12/29/2012	0
1/5/2013	0	1/5/2013	0
6/29/2013	0	6/29/2013	0
12/13/2013	0	12/13/2013	0
8/9/2014	0	8/9/2014	0
9/22/2014	0	9/22/2014	0
9/26/2014	0	9/26/2014	0
12/15/2014	0	12/15/2014	1
1/31/2015	0	1/31/2015	1
3/14/2015	0	3/14/2015	1
5/29/2015	0	5/29/2015	0
6/26/2015	0	6/26/2015	0
9/11/2015	0	9/11/2015	0

B. SoCalGas Failed to Provide Complete Records from the Requested Well Files.

The Public Advocates Office also identified documents that were absent from the requested well files during the on-site review. Evidence of the Pressure Surveys was not presented for SS-25 and the other four well files. The missing documents are listed in Table 3:

Therefore, continued operation of the project is approved provided that: [the listed 13 requirements are met]."

Table 3: Documents Missing from Well Files

Well	Document Description	Year
SS-25	Pressure Survey	2008, 1996-2004, 1989-1994
SS-17	Pressure Survey	2008, 1996-2004
SS-9	Pressure Survey	2008, 1989-2004, 2013
SS-5	Pressure Survey	2008, 2006, 1989-2003
P-35	Pressure Survey	2008, 1989-2004

As evidenced by Table 3, each well file was missing numerous Pressure Survey records. As to the documents missing from the SS-25 well file specifically, the missing Pressure Surveys corroborate with the years that surveys had not been performed, as discussed in the Blade Report.[91] Moreover, in 2008 in particular, wells SS-9, SS-17, and SS-25 are missing Pressure Surveys. The only available Pressure Surveys records for 2008 are for SS-5 and P-35, whereas all of the other wells reviewed are missing this survey.[92]

This lack of documentation for multiple years across all five well records examined by the Public Advocates Office reflects the inadequacy of SoCalGas' recordkeeping practices and points to a broader issue of SoCalGas management's ignorance regarding the state of its wells. Using SoCalGas' own language, Section 1.1 of SIS 224.070 states the importance of relying on multiple survey methods to accurately monitor the storage reservoir "for safe long-term management of underground gas storage operations."[93] Section 4.1.1 of SIS 224.070 similarly emphasizes that "effective

[91] Blade Report, p. 30, Figure 13.

[92] SoCalGas' amended response to CalAdvocates-DR-025, pp. CalAdvocates-429-CalAdvocates-432.

[93] SoCalGas' Internal Standard 224.070 Section 1.1 states: "Gas Storage Operations require monitoring and inventory verification for safe long-term management of underground gas storage operations. While no single method can be used to precisely monitor and verify the gas inventory in the underground storage reservoirs, the three engineering methods in general use are summarized in sections 4.1 – 4.3.8.1. Only by combining and analyzing field data can gas volume verification be obtained." SoCalGas' amended response to CalAdvocates-DR-025, p. CalAdvocates-464.

monitoring requires a thorough understanding of the reservoir system."[94] SoCalGas' internal standards reveal the importance of a variety of survey methods necessary to fully understand a well and gas reservoir.

In light of SoCalGas' understanding of the importance of the surveys to ensuring safety, SoCalGas' piecemeal approach to conducting surveys is not logical. SoCalGas admitted that it did not perform a Pressure Survey on SS-25 on 16 (or 60 percent) occasions between 1988-2015 because such a survey "was not required…."[95] However, SoCalGas performed the survey on other wells during the same time period. Thus, either the Pressure Survey was not important for a thorough understanding of the SS-25 wellsite (in which case SoCalGas should not have expended ratepayer funds to perform the survey) or the survey was necessary for a thorough understanding of the SS-25 wellsite (in which case SoCalGas should have performed the survey annually). Even if the annual Pressure Survey was not required by DOGGR, SoCalGas' failure to routinely perform these surveys is incongruous with SoCalGas' identified principles of the maintaining the storage reservoir with safety as a priority.

C. The Temperature Survey Records for Years 2008 and 2009 Are Duplicates, and an Independent Witness for 2008 Is Missing.

In addition to the fact that many of SoCalGas' well records were incomplete as discussed above, at least one survey record for SS-25 is problematic. The 2008 and 2009 SS-25 Temperature Surveys records revealed that both of the annual surveys had the same value of 59.822 BCF.[96] Nowhere else in the survey records for the 40 years of operation does a repeat value occur. Similarly, the Tubing Pressure and Casing Pressure in both the 2008 and 2009 SS-25 Temperature Surveys have identical values of 2490

[94] SoCalGas' Internal Standard 224.070 Section 4.1.1 states "Monitoring of the storage reservoir ensure the reservoir functions, according to expectations, and integrity tests verify the gas inventory is present and available for delivery. Effective monitoring requires a thorough understanding of the reservoir system. This system is defined as the reservoir rock and wellbores, which respond to pressure changes as a result of gas injection and withdrawal." SoCalGas' amended response to CalAdvocates-DR-025, p. CalAdvocates-465.

[95] SoCalGas' amended response to CalAdvocates-DR-025, p. CalAdvocates-427.

[96] November 15, 2019 SoCalGas Correspondence, pp. CalAdvocates-192-CalAdvocates-193.

PSI.[97] One notable difference, however, is that while the 2009 Temperature Survey identifies a witness to the logging event, the 2008 Temperature Survey does not.[98]

These anomalies in the records are of concern because the probability of observing identical values two years in a row is statistically extremely unlikely.[99] SoCalGas utilizes a Temperature Survey template that gathers information unique to that year's survey, including a Field Inventory figure which estimates the volume of natural gas present in the Aliso Canyon reservoir.[100] The entries are generally captured to one-decimal-place accuracy, however, from years 2008 through 2013 the field inventory value was measured to a three-decimal-place accuracy. This makes the probability of observing the same measured value—59.822 BCF—for two years in a row extremely unlikely.

The identical Field Inventory and Tubing and Casing Pressure values, combined with the fact that no witness was named for the 2008 survey, strongly suggest that the 2008 Temperature Survey was produced after the 2009 Temperature Survey was completed.

In summary, the Public Advocates Office found SoCalGas' recordkeeping, as it pertains to SS-25 and the Aliso Canyon field: (1) does not comply with Section 4.1.2.1.5 of SoCalGas' Internal Standard 224.070[101] for failure to perform timely inspections of SS-25 Monthly Well Inspections on five occasions; (2) does not comply with Section 4.1.2.1.1 of SoCalGas Internal Standard 224.070[102] and requirement four defined

[97] November 15, 2019 SoCalGas Correspondence, pp. CalAdvocates-192-CalAdvocates-193.

[98] November 15, 2019 SoCalGas Correspondence, pp. CalAdvocates-192-CalAdvocates-193.

[99] The likelihood of two identical records occurring is approximately 0.4% (p=0.004), which is about a 1 in 250 chance of duplicates occurring purely by chance. This is using assumptions weighted in favor of a smaller likelihood of occurrence.

[100] For years 1973-2015, the range of "Field Inventory" values fluctuated from 12.8 to 79.912 BCF (Billions of Cubic Feet) of Natural Gas stored in the Aliso Canyon Reservoir. This Field Inventory figure will increase as more wells complete their injections for the season and will decrease as natural gas is withdrawn later in the season. This figure is unlikely to stay constant over the timespan of a day and is very unlikely to be identical when comparing between the surveys in different years.

[101] Section 4.1.2.1.5 of SoCalGas Internal Standard 224.070 states: "Wellhead inspections are performed on a monthly basis." SoCalGas' amended response to CalAdvocates-DR-025, p. CalAdvocates-466.

[102] Section 4.1.2.1.1 of SoCalGas Internal Standard 224.070 states "Surface pressures on each well are measured and recorded weekly using a calibrated test gauge. These include tubing pressure, casing

by DOGGR[103] for failure to take SS-25 Weekly Casing Pressure Surveys on 14 occasions; and, (3) duplicate and failure to substantiate the witness logging the event for SS-25 2008 Temperature Survey.

VI. CONCLUSION

SoCalGas' management failed to take actions to address well integrity management issues, to act upon warnings from its experts, to take proactive action to deal with corrosion, and to maintain reasonable and prudent record keeping practices. SoCalGas' management failures ultimately led to the Leak, which had a negative and wide-spread impact on the health and safety of the public. Accordingly, at a minimum, SoCalGas failed to meet the requirement of PU Code Section 451.

pressure, annuli pressures, and, if applicable, safety valve control line pressures." SoCalGas' amended response to CalAdvocates-DR-025, p. CalAdvocates-466.

[103] SoCalGas' amended response to CalAdvocates-DR-025, p. CalAdvocates-486, states as its fourth requirement for approval of continued operation "Surface pressures on each active or idle well are measured weekly with a calibrated test gauge, and recorded. Evidence of such measurement and calibration must be made available to this Division upon request."

VII. WITNESSES QUALIFICATIONS

A. Witness Qualifications of M. Botros

My name is Mina Botros. My business address is 505 Van Ness Avenue, San Francisco, California, 94102. I am employed as a Senior Utilities Engineer in the Safety Branch of the Public Advocates Office. I am sponsoring the Testimony and Supporting Attachments of M. Botros.

I have a MA in Mechatronics Engineering from the Information Technology Institute. I have a BA in Mechanical Engineering from Alexandria University. I am a Professional Engineer in Mechanical Engineering in the State of California and my license number is 38305. I have also taken a graduate-level course in Managing Cracks and Seam-Weld Anomalies on Pipelines. While working for the Public Advocates Office from February 2016 until December 2017, and returning in January 2019, I have worked on the Commission's San Joaquin Valley Disadvantaged Community Order Instituting Rulemaking (R. 15-03-010); General Order 58-A (R. 16-07-006); SoCalGas and SDG&E's Pipeline Safety Enhancement Plan - Phase 2 (Application (A.)15-06-013) and Phase 3 (A. 18-11-010), Pipeline Safety Enhancement Plan – Reasonableness Review (A. 16-09-005); Wildfire Expenses Memorandum Account (A. 15-09-010); California Independent System Operator Metering Rules Enhancements, Rule 21 (R. 11-09-011), Risk Assessment and Mitigation Plan (RAMP) (I. 18-11-006), Locate and Mark Investigation (I. 18-12-007), Safety Model Assessment Proceeding (SMAP) (A. 15-05-002), Distribution Physical Security Phase II (R. 15-06-009) and Grid Safety and Resiliency Program (GSRP) (A. 18-09-002). In 2018, I worked for Safety and Enforcement Division (SED), Electric Safety and Reliability Branch (ESRB), where I investigated incidents related to electric utilities, and conducted and led audits for compliance with GO 95 and GO 167.

This completes my prepared testimony.

B. Witness Qualifications of A. Bach

My name is Alan Bach. My business address is 505 Van Ness Avenue, San Francisco, California, 94102. I am employed as a Utilities Engineer in the Safety Branch of the Public Advocates Office. I am sponsoring the Testimony and Supporting Attachments of A. Bach.

I have a MS in Civil Engineering and BS in Engineering Science, both from the University of California, Berkeley. I have a Mechanical Professional Engineer license and my license number is 39671.

I have been working for the Public Advocates Office since February 2018, and previously worked in the Gas Safety section of the Commission's Safety Enforcement Division from February 2017 to February 2018. Since joining the Public Advocates Office, I have worked on the following gas and energy safety proceedings: PG&E's Gas Transmission and Storage Rate Case (A.17-11-009); Amendments to General Order (GO) 95 (R.17-10-010); (PG&E's (I.17-11-003) and SCE's (I.18-11-006) Risk Assessment Mitigation Phase (RAMP); and Liberty's risk filing for its General Rate Case A.18-12-001). I have also extensively worked on proceedings related to energy infrastructure, transportation electrification, and rates, such as Rule 21 (R.17-07-007); SDG&E's Medium- and Heavy-Duty Vehicle Program (A.18-01-012); and PG&E's Commercial EV Rate (A.18-11-003).

This completes my prepared testimony.

C. Witness Qualifications of M. Taul

My name is Matthew Taul. My business address is 505 Van Ness Avenue, San Francisco, California, 94102. I am employed as a Utilities Engineer in the Safety Branch of the Public Advocates Office. I am sponsoring the Testimony and Supporting Attachments of M. Taul.

I have a BS in Mechanical Engineering from the University of California, Berkeley. I am a California-registered Engineer in Training (EIT), number 165894.

Prior to joining the California Public Utilities Commission, I worked for several years contracting with PG&E as an internal auditor with the goal of cleaning up the data stored in PG&E's maintenance control software and reviewing records to encourage PG&E to self-report any mis-compliant maintenance and surveys to the CPUC. I and my team of engineers travelled to 18 separate PG&E Gas Transmission and Distribution Maintenance Yards to ensure PG&E was acting in compliance with internal standards and CPUC Regulations.

This is my first proceeding for the Public Advocates Office.

This completes my prepared testimony.

D. Witness Qualifications of P. Li

My name is Pui-Wa Li. My business address is 505 Van Ness Avenue, San Francisco, California. I am employed by the Public Advocates Office as a Senior Analyst in the Safety Branch.

I have a Master's degree and a Bachelor's degree in Civil and Environmental Engineering, respectively, from Massachusetts Institute of Technology and University of California, Berkeley. I am a California-registered Engineer in Training (EIT), number 140096.

Prior to joining the California Public Utilities Commission, I worked as a research petroleum engineer at the French multinational oil company Total in the United Kingdom. I was a member of the European Association of Geoscientists and Engineers. My focus was on subsurface fluid flow modeling in porous medium (for hydrocarbon) and I have a US and overseas patents pending related to subsurface modeling.

Prior to joining the Public Advocates Office, I worked on various proceedings and projects related to General Rate Cases filed by investors' owned water utilities from 2016 to 2018. Since joining the Public Advocates Office in 2018, I have been working on proceedings related to the risk assessment, as well as the safety of natural gas transmission pipelines, including the PG&E Gas Transmission and Storage General Rate Case (A.17-11-009).

This completes my prepared testimony.

E. Witness Qualifications of T. Holzschuh

My name is Tyler Holzschuh. My business address is 505 Van Ness Avenue, San Francisco, California. I work in the Public Advocates Office as a Utilities Engineer in the Safety Branch. Before this position, I worked for a year as an engineer in the Gas Safety and Reliability Branch in the Safety and Enforcement Division of the California Public Utilities Commission. I graduated from the University of California, Los Angeles with a Master of Science in electrical engineering and from Wesleyan University with a Bachelor of Arts in mathematics and physics. I am a Professional Engineer in Mechanical Engineering in the State of California and my license number is 39545.

I have worked on PG&E's order to show cause for the 2017 wildfires (I.19-06-015), the wildfire mitigation plan proceeding (R.18-10-007), the statewide pole database proceeding (I.17-06-027) and the 2019 microgrid commercialization proceeding (R.19-09-009).