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SAFETY AND ENFORCEMENT DIVISION
California Public Utilities Commission

OPENING TESTIMONY OF THE SAFETY AND ENFOREMENT DIVISION REGARDING

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EXHIBIT
I-18
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I. INTRODUCTION

On May 16, 2019, Blade Energy Partners (Blade) published an independent root case analysis RCA report, "Root Cause Analysis of the Uncontrolled Hydrocarbon Release from Aliso Canyon SS-25". Drawing on the Blade report and information obtained in its own investigation, this testimony identifies numerous safety [and health] violations of California Public Utilities Code Section 451[1] related to the uncontrolled release of hydrocarbon gas or methane for 111 days from Southern California Gas Company's (SoCalGas) Aliso Canyon Well SS-25 (SS-25 incident),[2] including many different causes identified in the Blade Report from which the SS-25 incident resulted. In addition, the testimony identifies multiple instances in which SoCalGas did not cooperate with the investigation of the Safety and Enforcement Division (SED), resulting in additional violations of Section 451, and certain violations of California Public Utilities Commission's Rule of Practice and Procedure (Rule) 1.1. Finally, the testimony identifies violations of Section 451 due to SoCalGas's recordkeeping problems related to the Aliso Canyon storage facility, and to the SS-25 incident.

II. BACKGROUND

A. Summary of Incident and Violations

At 3:15 PM on October 23, 2015, a leak was discovered in the Standard Sesnon 25 (SS-25) well.[3] SS-25 was shut in[4] at 3:30 PM that day, and flowed uncontrollably for 111 days. Blade Energy Partners estimates that approximately 6.6 Billion Cubic Feet (BSCF) of natural gas, or approximately 120,000 metric tons of methane had leaked.[5]

[1] California Public Utilities Code Section 451 will also be referred to as "Section 451" or "451".

[2] See "Root Cause Analysis of the Uncontrolled Hydrocarbon Release from Aliso Canyon SS-25", May 16, 2019. (Blade Report), p. 4. The Blade Report can be viewed at: ftp://ftp.cpuc.ca.gov/News_and_Outreach/SS-25%20RCA%20Final%20Report%20May%2016,%202019.pdf

[3] Root Cause Analysis of the Uncontrolled Hydrocarbon Release from Aliso Canyon SS-25, Blade Energy Partners, May 16, 2019 (Blade Report) at p. 2.

[4] The Blade Report at p. 133 uses the term "shut in" interchangeably with "not flowing".

[5] Blade Report, p. 13; Blade Report at p. 155, Table 26: Aliso Canyon Hydrocarbon Leak Estimates. According to the Blade Report, Table 26, the California Air Resources Board (CARB) estimated that 6.0 BSCF of gas, or approximately 109 cubic tons of the methane equivalent had leaked by well SS-25.

SoCal Gas and its hired well control company, Boots and Coots,[6] made seven unsuccessful attempts to kill well SS-25 by pumping down the tubing and casing.[7] [8] Ultimately, relief well P-39A was drilled, enabling SS-25 to be successfully killed in February 2016, four months after the leak had started.[9] The Los Angeles County Department of Public Health observed that, "the health of nearby residents may have been impacted by exposure to both crude oil and natural gas during the Disaster".[10] SoCalGas also failed to investigate in multiple instances with SED during the course of its investigation.

California Public Utilities Code Section 451 provides in part,

Every public utility shall furnish and maintain such adequate, efficient, just, and reasonable service, instrumentalities, equipment, and facilities. . .as are necessary to promote the safety, ***health***, comfort, and convenience of its patrons, employees, and the public. (Emphasis added.)

Table 1 below summarizes the violations found by SED associated with this incident, and identifies the section of testimony where the factual basis can be found for each violation. Except where explicitly provided in Table 1, each violation identified in Table 1 is a violation of California Public Utilities Code Section 451 (Section 451).

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[6] Southern California Gas Company Standard Services Agreement (Agreement 5660044243), Project Standard Senson (Sic) 25, October 30, 2015. (SoCalGas and Boots and Coots Well Kill Agreement).

[7] Blade Report at p. 172.

[8] According to the SoCalGas and Boots and Coots Well Kill Agreement, p. 1 of 21, the name of the well control company that SoCalGas hired is Boots and Coots. Though Boots and Coots were requested to kill the well, Halliburton Energy Services entered into the contract with SoCalGas.

[9] Blade Report at p. 172.

[10] Letter from Los Angeles County Department of Public Health, Deputy Director for Health Protection, Angelo J. Bellomo, MS, REHS, QEP, to SoCalGas Chief Executive Officer, Brett Lane, March 11, 2019, page 2. Available at:
https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/News_Room/NewsUpdates/2019/Aliso%20Canyon%20Facility.pdf

Table 1: Summary of Violations[11]

Violation Number	Summary of Violation	Begin Date	End Date	Testimony Section Number
1	No investigation of blowout from well Frew-3.	12/31/1984	10/23/2015	II.B.1.a
2	No investigation blowout from well FF-34A.	12/31/1990	10/23/2015	II.B.1.a
3	No investigation of one of four parted well casings.	12/31/1969	10/23/2015	II.B.1.a
4 through 6	No investigation of any of three parted well casings.	12/31/1994	10/23/2015	II.B.1.a
7 through 60	No investigation of 54 well leaks.	10/22/2015	10/23/2015	II.B.1.a
61 through 72	Failure to follow company's internal 1988 plan to check casing of 12 wells for metal loss.	8/31/1988	10/23/2015	II.B.1.b
73	Failure to follow company's internal 1988 plan to check casing of well SS-25 for metal loss.	8/31/1988	10/23/2015	II.B.1.b
74	Failure to implement a risk or integrity management program for Aliso Canyon storage facility (Aliso).	12/31/2009	10/23/2015	II.B.2.a
75	Failure to detect corrosion on well SS-25 resulting in part from lack of risk assessment at Aliso.	12/31/2009	10/23/2015	II.B.2.b
76	Failure to start well integrity program in 2009 because of inability to collect recovery for it in rates.	12/31/2009	10/23/2015	II.B.2.c
77	Operation of well SS-25 without backup mechanical barrier to 7-inch production casing.	8/31/1988	10/23/2015	II.B.3
78	Operation of Aliso without internal policies that required well casing wall thickness inspection and measurement.	8/31/1988	10/23/2015	II.B.4
79	Failure to successfully execute well SS-25 kill attempt numbers 2 through 7, due to lack of proper modelling.	11/13/2015	2/11/2016	II.B.5
80 through 82	Failure to provide well kill programs for relief well #2, well SS-25A and well SS-25B.	11/13/2015	2/11/2016	II.B.5
83	Prevention of surface plumbing failures on SS-25 from enabling that well to be kept filled.	11/25/2015	2/11/2016	II.B.5
84	Allowance of groundwater to cause corrosion on the 7 inch and 11 3/4 inch casings on SS-25.	8/31/1988	10/23/2015	II.B.6

[11] SED reserves the right to update these violations and the dates associated with them if SED becomes aware of information that requires doing so.

Violation Number	Summary of Violation	Begin Date	End Date	Testimony Section Number
85	Failure to assess the relationship between groundwater in and around the SS-25 wellsite and surface casing corrosion of SS-25.	8/31/1988	10/23/2015	II.B.6
86	Failure to have systematic practice to protect surface casing strings against external corrosion and failure to employ proper understanding of the consequences of corroded surface casings and uncemented production casings.	8/31/1988	10/23/2015	II.B.7
87	Failure to have continuous pressure monitoring system for well surveeillance because it prevented an immediate identification of the SS-25 leak and acurate estimation of the gas flow rate.	10/23/2015	2/12/2016	II.B.8
88	Failure to disclose to Los Angeles County Department of Public Health Known Facts that crude oil was released from well SS-25 during the incident.	11/15/2015	2/12/2016	II.C.1
89	Lack of Cooperation: Failure to completely respond to Blade Root Cause Analysis related data requests on January 31, 2016 until no sooner than March 1, 2019.	3/31/2016	3/1/2019	II.C.2 Example 1
90	Lack of Cooperation: Failure to completely respond to Blade Root Cause Analysis related data requests on February 19, 2016 until no sooner than March 1, 2019.	4/18/2016	3/1/2019	II.C.2 Example 1
91	Lack of Cooperation: Failure to completely respond to Blade Root Cause Analysis related data requests on April 7, 2016 until no sooner than March 1, 2019.	6/7/2016	3/1/2019	II.C.2 Example 1
92	Lack of Cooperation: Failure to completely respond to Blade Root Cause Analysis related data requests on February 18, 2018 until no sooner than March 1, 2019.	4/7/2016	3/1/2019	II.C.2 Example 1
93 through 94	Lack of Cooperation: Failure to produce two individuals from Boots & Coots present during the well kill efforts, despite an SED subpoena to do so.	8/8/2018	11/22/2019	II.C.2 Example 2

Violation Number	Summary of Violation	Begin Date	End Date	Testimony Section Number
95 through 189	Lack of Cooperation: Refusal to release 95 pages of communications based upon assertion of attorney-client and/or attorney work product privilege.	3/5/2018	1/3/2019	II.C.2 Example 3
190 through 284	Lack of Cooperation: Misleading SED by representing to SED that 95 pages of documents are protected by attorney-client/attorney work product privilege, when they were not.	3/5/2018	1/3/2019	II.C.2 Example 3
285 through 302	Lack of Cooperation: Refusal to release 18 additional communications based upon assertion of attorney-client and/or attorney work product privilege.	3/5/2018	5/11/2019	II.C.2 Example 3
303 through 320	Lack of Cooperation: Misleading SED by representing to SED that 18 additional communications were protected by attorney-client or attorney work product privilege, when they were not.	3/5/2018	5/11/2019	II.C.2 Example 3
321	Lack of Cooperation: Failure to produce those individuals from Boots & Coots requested for interviews by Blade Energy Partners as part of their Root Cause Analysis.	1/24/2019	5/19/2019	II.C.2 Example 4
322 through 323	Lack of Cooperation: Breach of confidentiality promise by communicating with PG&E and Southern California Edison counsel about certain aspects of SED's Examinations Under Oath of SoCalGas.	8/14/2018	6/26/2019	II.C.2 Example 5
324 through 325	Lack of Cooperation: Breach of confidentiality promise by communicating with PG&E and Southern California Edison counsel about certain aspects of SED's Examinations Under Oath of SoCalGas. (Rule 1.1 Violation)	8/14/2018	6/26/2019	II.C.2 Example 5
326	Lack of Cooperation: Intentionally not appearing at an SED deposition in spite of a Commission subpoena to do so.	11/1/2019	Pending	II.C.2 Example 6

B. Root Causes and Direct Causes Related to the Uncontrolled Release of Hydrocarbons for 111 Days from Well SS-25,[12] and Resulting Violations of Section 451

The Blade Report identifies several causes related to the SS-25 incident. In this subsection, SED identifies a number of violations of Section 451 in this section that are based upon causes identified in the Blade Report. Because SoCalGas could have requested ratepayer money to pay for safety-related Operation and Maintenance for Aliso Canyon storage facility in its General Rate Cases, its failure to implement the measures identified in this section worsens each of the identified violations of Section 451.

[redacted] **SoCalGas Failed to Perform Failure Investigations, Failure Analyses or Root Cause Analyses on Failed Aliso Canyon Wells Despite More Than 60 Well Casings Experiencing Leaks, Four Having Parted Casings, and Several Wells Having Casing Corrosion Identified. Therefore, SoCalGas Did Not Properly Understand The Extent and Consequences of the Corrosion in the Other Wells, Including Well SS-25.[13]**

SED finds multiple separate violations of Section 451 related to SoCalGas's behavior regarding its awareness of well casing metal loss and metal loss threats to Aliso Canyon well casings, as identified in this section.

a) SoCalGas Did Not Investigate or Analyze its Past Casing Leaks of Other Wells at Aliso Canyon, and the Consequences of Corrosion in these Other Wells Was Not Understood

A root cause for the SS-25 incident was the lack of detailed follow-up investigation, failure analyses, or RCA of casing leaks, parted casings, or other failure events in the field in the past.[14] There had been over 60 casing leaks at Aliso Canyon before the SS-25 incident, but no failure investigations were ever conducted.[15] Based on the data reviewed by Blade, no investigation of the causes was performed, and, therefore,

[12] If SED becomes aware of additional information that could modify SED's findings, SED reserves the right to supplement or modify its testimony with updated information, or take further actions as appropriate.

[13] Blade Report at p. 4.

[14] Blade Report at p. 4

[15] Blade Report at p. 4.

the extent and consequences of the corrosion in the other wells were not understood.[16] Furthermore, external corrosion on production casing had been identified in several wells.[17]

The Aliso Canyon storage wells had numerous casing leaks.[18] Blade reviewed 124 gas storage wells and identified 63 casing leaks, 29 tight spots,[19] 4 parted casings, and 3 other types of failures.[20] Forty percent of the gas storage wells reviewed by Blade had casing failures with an average of two casing failures per well.[21]

In addition, two Aliso Canyon wells had underground blowouts from casing leaks: Frew-3 in 1984 and FF-34A in 1990.[22] These wells were successfully killed by pumping fluid down the tubing, and the consequences of a larger leak or a near-surface casing rupture were not anticipated until the SS-25 event.[23]

Between 1969 and 1994, four wells were discovered to have parted casings.[24] However, Blade found no evidence of RCA's, failure samples collected, lab analysis, photos of failures, or failure analyses reports in the wells' files.[25] The only documents found were well operations daily reports where on-site rig activities were reported.[26] Additionally, the FF-34A well file mentioned a study of the possible external casing corrosion problems in the southeastern portion of the field, but Blade was not able to

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[16] Blade Report at pp.4, 219 and 237.

[17] Blade Report at p. 4.

[18] Blade Report at p. 2

[19] According to the Blade Report at p. 162, a "tight spot" occurs "where the casing fails to perform in the manner it was designed for".

[20] Blade Report at p. 2.

[21] Blade Report at pp. 2, 203. Page 203 quantifies this as 99 failures in 49 wells.

[22] Blade Report at p. 2.

[23] Blade Report at p. 2.

[24] Blade Report at p. 165.

[25] Blade Report at p. 165.

[26] Blade Report at p. 165.

locate any documentation related to this study.[27] Consequently, there was no insight into why these failures were happening.

SED views SoCalGas's failure to investigate or analyze the failures or root causes of casing leaks, parted casings, or other failure events as separate violations of Section 451, as follows:

- One violation for failure to investigate the blowout from well Frew-3 spanning from December 31, 1984, the last possible date of the blowout,[28] to October 23, 2015, the date of the incident.
- One violation for failure to investigate the blowout from well FF-34A, spanning from December 31, 1990, the last possible date of the blowout,[29] to October 23, 2015, the date of the incident.
- Four violations: One for failure to investigate each of the parted casings discovered between 1969 and 1994. As one of the parted casings must have been discovered in 1969 to set the beginning of the range, that first violation spans from December 31, 1969 the last possible date of its parting, to October 23, 2015, the date of the incident. Assuming that the remaining three parted casings were discovered December 31, 1994, those three separate violations each span from, at the latest, December 31, 1994 to October 23, 2015.[30]
- To avoid double counting violations, SED assumes that the 60 leaks identified before the Aliso Canyon incident included the six blowouts and parted casings identified above. As such, the remaining 54 leaks that went without investigation should constitute a separate set of up to 54 violations. At the latest, these violations began on

[27] Blade Report at p.2.

[28] If SED becomes aware of additional information that could modify SED's findings, SED reserves the right to supplement or modify its testimony with updated information as to the point in time when this blowout occurred, or take further actions as appropriate.

[29] If SED becomes aware of additional information that could modify SED's findings, SED reserves the right to supplement or modify its testimony with updated information as to the point in time when this blowout occurred, or take further actions as appropriate.

[30] If SED becomes aware of additional information that could modify SED's findings, SED reserves the right to supplement or modify its testimony with updated information as to the points in time these parted casings were discovered, or take further actions as appropriate.

October 22, 2015, the last possible date before the incident on October 23, 2015.[31]

b) SoCalGas Did Not Properly Follow Its Own 1988 Plan to Determine the Condition of the Casing in 12 Wells[32]

SoCalGas had a two-year plan in 1988 to determine the mechanical condition of the casing in 20 casing flow wells originally completed in the 1940s and 1950s.[33] The wells, including SS-25, were prioritized based on gas deliverability, operational history, and length of time since their last workover.[34] SS-25 was given a low priority.[35] Of the 20 wells, SoCalGas ran inspection logs in seven within two years of the 2 year plan window.[36] The inspection logs showed metal loss indications on the outside diameter (OD) of the casing ranging from 20% to 60% of the wall thickness in 5 of the 7 wells logged from 1988 to 1990.[37] Some of the wells had indications above the surface casing shoe, and many had indications below the casing shoe.[38] Blade found no documentation indicating that investigations into the causes of external corrosion, on any of these wells, were ever conducted.[39] SS-25 was never logged as part of this 1988 program or at any other time.[40]

SoCalGas's failure to follow its own 1988 plan to check the casing in 12 wells for metal loss, violates Section 451. The significant metal loss found on five of the wells

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[31] If SED becomes aware of additional information that could modify SED's findings, SED reserves the right to supplement or modify its testimony with updated information as to the point in time when these leaks occurred, or take further actions as appropriate.

[32] Blade Report at p. 2. The Blade Report mentions 13 such wells, but SED is identifying a separate violation for Well SS-25, the thirteenth well.

[33] Blade Report at pp. 2, 204.

[34] Blade Report at p. 2.

[35] Blade Report at p. 2.

[36] Blade Report at p. 2. To place the import of inspection logs in context, the Blade Report stated on page 183 that DOGGR later issued an Order (Order 1109) on March 4, 2016 that stated that "SoCalGas shall run a casing inspection log for all wells that were intended for future operations; otherwise the wells shall be plugged and abandoned."

[37] Blade Report at p. 2.

[38] Blade Report at p. 2.

[39] Blade Report at p. 219

[40] Blade Report at p. 3

identified in the 1988 memo presents a safety risk to the public and SoCalGas employees. Given SoCalGas's failure to check these casings in response to its own August 1988 memo,[41] twelve separate violations span from the end of August 1988 until October 23, 2015, the date of the incident.

As discussed below, SED identifies an independent violation for SS-25, which was a thirteenth well identified in the 1988 memo that went unchecked for metal loss.

c) SoCalGas Failed to Discover Specific Corrosion Problems on Well SS-25

Because SoCalGas did not attempt to understand causes of the leaks of 60 wells at Aliso Canyon,[42] and also did not follow its own 1988 plan to determine the condition of the casing in SS-25,[43] it was unable to discover corrosion problems on Well SS-25, which may have included what Blade found: that there had to be an environment that was more dynamic, created by groundwater or other water source;[44] Blade found that the fluid behind the 7-inch production casing had to be different than the original drilling fluid since there was corrosion on the production casing OD;[45] that groundwater was the only feasible source of water that could have occupied the space between[46] the 7-inch casing and the 11-3/4-inch surface casing;[47] and, that groundwater is the only water source that could have caused the 11-3/4-inch casing OD corrosion.[48] Blade found that well SS-25's 7-inch casing failure originated from 85% metal loss in the 7-inch steel casing wall due to

[41] See Blade Report at p. 217. "In August 1988, an internal SoCalGas memo recommended that a casing inspection survey be run on 20 wells to "determine the mechanical condition of each well casing."

[42] Blade Report at p. 4

[43] Blade Report at p. 3

[44] Blade Report at p. 88.

[45] Blade Report at p. 88.

[46] Blade describes this space between the seven inch and 11 ¾ inch surface casing using the term "annulus". (Blade Report at p. 88).

[47] Blade Report at p. 88

[48] Blade Report at p. 88

corrosion, which resulted in a 2-foot long axial rupture under an internal pressure of 2,791 psi in the space between (annulus) the 7-inch casing and the 2-7/8 inch tubing.[49]

Blade identified a total of 58 through-wall-metal-loss holes in the 990-foot deep, 11-3/4-inch diameter steel surface casing walls of well SS-25.[50] Fifty of the steel surface casing holes in SS-25 were identified at depths ranging between approximately 150 feet and approximately 195 feet.[51] The through-wall-metal-loss holes were identified using various technologies, including caliper, UCI and HRVRT.[52] Camera logging data were consistent with the technology logging data, with photographs matching the sensory logging tools' metal loss locations.[53]

Based on Blade's RCA, a direct cause of the SS-25 incident was outside surface corrosion of the 7-inch production casing.[54] The casing was corroding from the outside as a result of contact with groundwater.[55] Groundwater and microbes—likely methanogens, a form of Archaea[56]—caused the corrosion.[57]

Blade's analysis identified the corrosion by the nature of the corrosion surface, (striated grooves with tunnels), which precludes other forms of corrosion, thus ruling out many of the traditional corrosion mechanisms and concluding that microbial corrosion is the likely mechanism.[58] For the 7-inch casing to have corroded, it must have been in direct contact with an environment that allowed the corrosion mechanism to exist, and a corrosion protection mechanism must have been absent.[59] The presence of bonded cement outside of the 7-inch casing would have mitigated external corrosion. However,

[49] Blade Report at p. 80

[50] Blade Report at p. 119.

[51] Blade Report at p. 119.

[52] Blade Report at p. 119.

[53] Blade Report at p. 121

[54] Blade Report at p. 3

[55] Blade Report at p. 3.

[56] Methanogens are "metal eating" biological microorganisms.

[57] Blade Report at p. 3.

[58] Blade Report at p. 114

[59] Blade Report at p.215

there was no cement around the SS-25 7-inch well casing at 892 ft, because when the well was originally drilled, the cement around the 7-inch casing was intentionally brought up to 7,000 ft and not to surface.[60]

In light of the extent of the corrosion on SS-25, and the resulting incident, SED considers SoCalGas's failure to investigate the specific corrosion problems on Well SS-25 its own separate violation of California Public Utilities Code Section 451. This violation spans from August 31, 1988, the last date that the SoCalGas's 1988 memo could have identified it, to October 23, 2015.

[redacted] SoCalGas did not have any form of risk assessment focused on wellbore integrity management, including lack of assessment of qualitative probability and consequences of production casing leaks or failures.[61]

SED finds multiple, separate violations of Section 451 related to SoCalGas's failure to timely have an implement a Storage Integrity Management Program.

a) SoCalGas Did Not Implement A Risk Assessment Program or Wellbore Integrity Management Plan at Aliso Canyon Storage Facility Prior to October 23, 2015

SoCalGas's failure to implement any form of risk assessment program or wellbore integrity management plan on the Aliso Canyon storage facility prior to October 23, 2015 is a separate violation of Section 451 for each day it failed to implement the risk assessment program, beginning in 2009, the date at which it was advised by its Storage Engineering Manager, Mr. James Mansdorfer, that it should have a well integrity program.[62]

According to Blade's Root Cause Analysis

> Unlike robust transmission pipeline integrity and distribution pipeline integrity programs, there was no focus on well integrity. This was also supported by SoCalGas's GRC

[60] Blade Report at p. 215

[61] Blade Report at p. 4.

[62] For discussion about the input from Mr. Mansdorfer regarding the well integrity program, see the next subsection. SED estimates December 31, 2009 to be the start date of this violation. If SED becomes aware of additional information that could modify SED's findings, SED may modify this testimony or take further actions as appropriate.

submission in 2012. . .SoCalGas was perhaps inadequately resourced to manage Aliso Canyon prior to the 2015 incident, but because detailed data on resourcing was not available, the lack of resources was not identified as a root cause.[63]

In SoCalGas's 2016 GRC proceeding, "SoCalGas had noted an increasing trend in well integrity repairs, and without the [Storage Integrity Management Program], operation would have continued in reactive mode, addressing mainly sudden and major failures and service interruptions."[64]

Prior to the incident of October 23, 2015, SoCalGas had recognized that its well integrity program required significant changes, and had developed a plan, timeline, and budget.[65] Considering the age of the wells and the quantity of casing leaks, the Root Cause Analysis determined that a well integrity plan was necessary."[66]

Also in SoCalGas's 2016 GRC, SoCalGas testified about the required operations and maintenance expenses and capital investments for their underground storage facilities and proposed a new six-year Storage Integrity Management Program (SIMP).[67] The intent was to proactively identify and mitigate potential storage well safety and/or integrity issues before they result in unsafe conditions for the public or employees.[68] SoCalGas had noted an increasing trend in well integrity repairs as part of the well repair work.[69] As part of the well repair work from 2008 to 2013, SoCalGas explained that mechanical damage and internal and external corrosion were identified in 15 wells with the use of ultrasonic logs.[70] Also, the external corrosion had been observed at relatively

[63] Blade Report at p. 5.

[64] Blade Report at p. 182.

[65] Blade Report at p. 183.

[66] Blade Report at p. 183.

[67] Blade Report at p. 182.

[68] Blade Report at p.182.

[69] Blade Report at p.182.

[70] Blade Report at p.182.

shallow depths in the production casing.[71] SoCalGas cited P-50A,[72] where 400 psi was observed in the casing annulus during routine weekly pressure surveillance in 2008; a footnote provided additional information that a subsequent ultrasonic inspection revealed external production casing corrosion from 450 to 1,050 ft.[73]

Including P-50A, twelve wells in the SoCalGas's 2016 GRC testimony were Aliso Canyon wells.[74]

In the public records of 116 Aliso Canyon storage wells, Blade found production casing inspection logs for 76 wells.[75] The 116 wells comprised the 114 wells listed under the Comprehensive Safety Review, also known as SIMP, and 2 unique wells from the 2014 Testimony for the 2016 GRC.[76] The proposed SIMP program in SoCalGas's 2014 testimony included identifying threats and risk assessments for all wells.[77] SoCalGas testified about the required operations and maintenance expenses and capital investments for their underground storage facilities and proposed a new six-year SIMP.[78] The intent was to "proactively identify and mitigate potential storage well safety and/or integrity issues before they result in unsafe conditions for the public or employees."[79] The objective of the log review was to determine to what degree the shallow external corrosion found at SS-25 was an isolated event.[80] Out of the 76 wells with production casing inspection logs, 27 of them had indications of shallow external corrosion on the production casing.[81]

[71] Blade Report at p.182.

[72] According to Blade Report at p. 183, well P-50A was an Aliso Canyon well.

[73] Blade Report at p.182

[74] Blade Report at pp. 182-183.

[75] Blade Report at p. 183.

[76] Blade Report at p. 183.

[77] Blade Report at p. 183.

[78] Blade Report at p. 182.

[79] Blade Report at p. 182.

[80] Blade Report at p. 183.

[81] Blade Report at p. 183.

In 1994, decades prior to SIMP, SoCalGas proposed to handle well integrity management via certain types of surveys. In that year, SoCalGas proposed to DOGGR, "... the most economical and effective method to monitor casing integrity of gas storage wells is through the use of static temperature surveys."[82] DOGGR's response to SoCalGas's proposal stated in part, "Therefore, the monitoring program and static temperature surveys currently used by the Gas Company could be used to satisfy compliance of the requirements for mechanical integrity found in this section [California Code of Regulations Section 1724.10(k)(5)]."[83] However, the Root Cause Analysis found that,

> The casing leak in SS-25 showed that using temperature surveys to confirm mechanical integrity of casing was insufficient. . .[84] A temperature survey was run in SS-25 on October 21, 2014, a year before the leak on October 23, 2015, and showed no temperature anomalies.[85]
>
> Noise and temperature surveys are used to identify leaks, but the sensitivity of the instruments is limited.[86] If no leak is detected, noise and temperature data provide no indication of future integrity problems.[87] Noise and temperature logs are trailing indicators; and by no means sufficient to manage well integrity.[88] Alternatively, casing inspection can identify defects that may be growing with time and can be used to monitor integrity deterioration.[89]
>
> Numerous temperature, noise, and pressure surveys were run in SS-25 between the years of 1974 and 2014, and no major anomalies were found indicating fluid migration.[90]

[82] Blade Report at p.198.

[83] Blade Report at p. 198.

[84] Blade Report at p.198.

[85] Blade Report at p. 198.

[86] Blade Report at p.198.

[87] Blade Report at p. 198.

[88] Blade Report at p. 198.

[89] Blade Report at p.198.

[90] Blade Report at p. 198.

SoCalGas's failure to implement any form of risk assessment program or wellbore integrity management plan on the Aliso Canyon storage facility prior to October 23, 2015, beginning in 2009,[91] and continuing through October 23, 2015, constitutes a separate violation of Section 451 for each day it failed to implement the risk assessment program.

b) SoCalGas's Failure to Implement A Risk Assessment Program or Wellbore Integrity Management Plan at Aliso Canyon Storage Facility Prior to October 23, 2015 Resulted in the Failure to Detect Corrosion on the Well SS-25 Seven Inch Casing Prior to October 23, 2015

Corrosion was not detected on SS-25 because the seven inch casing wall thickness on the SS-25 had never been inspected.[92] Various tools can be run in a well with wireline to measure well thickness along the entire length of a casing or tubing string.[93] These logs were not run in the seven inch casing of well SS-25, in part because no risk assessment was performed.[94]

SED finds that the failure to detect corrosion on SS-25 that resulted in part from SoCalGas's failure to perform a risk assessment on Aliso Canyon is a separate violation of Section 451, beginning December 31, 2009, and continuing through October 23, 2015.[95] [96]

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[91] Section III.B.2.c discusses that SoCalGas's Storage Engineering Manager recommended to SoCalGas that it perform a risk assessment review in 2009, but that SoCalGas failed to do so. This is the basis for the start date of the violation. SED uses December 31, 2009 as the current beginning date of this violation. If SED becomes aware of additional information that could modify SED's testimony, SED may modify it or take further actions, as appropriate.

[92] Blade Report at p. 216.

[93] Blade Report at p. 216.

[94] Blade Report at p.216

[95] As discussed in Section III.B.2.c below, SoCalGas failed to implement a risk assessment review that had been recommended by its Storage Engineering Manager, Mr. James Mansdorfer, in 2009. This is the basis for the beginning of the violation.

[96] If SED becomes aware of additional information that could modify SED's testimony, SED may modify it or take further actions, as appropriate.

c) SoCalGas Did Not Start a Storage Integrity Management Program in 2009, Even Though It Was Recommended by Its Storage Engineering Manager at that Time, Because They Could Not Yet Collect It in Rates

SoCalGas's storage engineering manager in 2009, James Mansdorfer, recommended a storage well integrity program to SoCalGas at that time.[97] In recommending that storage well integrity program, he stated, "a structured program where [SoCalGas has] a schedule that will eventually result in a casing inspection and pressure test for every storage well."[98] He recommended to his direct supervisor that the storage integrity program include putting a rig on each of the storage wells,[99] running casing and inspection logs,[100] and pressure testing the casing.[101]

Also, according to Mr. Mansdorfer, SoCalGas knew a storage well integrity program was needed in 2009, but had not started it because the company could not yet collect the cost of the program in rates.[102]

Eight years prior to the October 23, 2015 incident , SoCalGas had recognized that its well management program required significant changes.[103] In the SoCalGas 2007 testimony for the 2008 General Rate Case (GRC), costs and details were outlined related to reservoir engineering studies, additional personnel, technological advances, and well expenses.[104] SoCalGas claimed that over a 15-year period, the number of gas storage specialists reduced from 10 to 4 for unspecified reasons, and the company "experienced a significant decline in its ability to assess the performance of individual wells due to the

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[97] Tr. Mansdorfer, September 13, 2018 at pp. 9:7 - 10:11.

[98] Tr. Mansdorfer, September 13, 2018 at pp. 124:28 - 125:14.

[99] Tr. Mansdorfer, September 13, 2018 at p. 125:19-23.

[100] Tr. Mansdorfer, September 13, 2018 at p. 125:24-26.

[101] Tr. Mansdorfer, September 13, 2018 at p. 125:27-28.

[102] Tr. Mansdorfer, September 13, 2018 at p. 126:25 – 127:23.

[103] Blade Report at p. 183.

[104] Blade Report at pp. 5, 182.

lack of recent data."[105] In 2007, SoCalGas requested two additional specialists.[106] Unlike SoCalGas's robust transmission pipeline integrity and distribution pipeline integrity programs, there was no such focus on well integrity.[107] This was also supported by the SoCalGas GRC submission in 2012.[108]

SoCalGas's failure to start the well integrity program in 2009 because it could not yet collect the cost of the program in rates constituted its own separate violation of Section 451. This violation began on December 31, 2009 and continued until October 23, 2015.[109]

[redacted] SoCalGas did not have a dual mechanical barrier system in the wellbore of SS-25, instead leaving the 7-inch production casing as the primary barrier to the gas.

In identifying the lack of a dual barrier system for SS-25, Blade stated,

> SS-25 was operated so that gas injection and withdrawal was done through the 2 7/8 in. tubing and the 7 in. casing x 2 7/8 in. tubing annulus. As such, the 7 in. casing acted as a single barrier and when it failed, there was nothing behind it to contain the wellbore pressure and fluids.[110]

To further illustrate the lack of a dual barrier in the case of SS-25, Blade added,

According to the Blade Report,

> SS-25 was drilled as a Standard Sesnon reservoir oil well in 1954. After the oil reservoir was considered depleted, SS-25 was converted to a gas storage well in 1973. Operationally, there were some key differences between the use of SS-25 in oil production mode and in gas storage mode. As an oil well, the oil was produced through a inch tubing string; the primary mechanical barrier to the oil was the tubing, and the secondary one was the casing. As a gas storage well, the gas was injected and withdrawn through the tubing and the

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[105] Blade Report at pp. 5, 182.

[106] Blade Report at p. 182.

[107] Blade Report at p. 5.

[108] Blade Report at p. 5.

[109] SED is using December 31, 2009, as the current beginning date, and October 23, 2015, as the current end date of this violation. If SED becomes aware of additional information that could modify SED's testimony, SED may modify it or take further actions, as appropriate.

[110] Blade Report at p. 233, Solution 9: Tubing Packer Completion-Dual Barrier System.

> casing, making the 7-inch casing the primary barrier for the gas during gas storage operations. . .[111]
>
> Pressure tests were conducted on the SS-25 casing in 1973 during the well's conversion from oil production to gas storage.[112] The well's integrity was monitored using yearly temperature logs and occasional noise logs.[113] If a leak in the casing had occurred, then the casing would have locally cooled, and consequently the temperature would have deviated at the leak location.[114] The SS-25 temperature and noise logs had never shown an anomaly related to casing integrity.[115] Pressure measurements, which were collected at SS-25 weekly, had not indicated a leak or failure prior to the incident. Well integrity issues went undetected until the leak event of October 23, 2015.[116]

Also as noted by SoCalGas's Storage Engineering Manager, James Mansdorfer, in 2009,

> Back in the 1970's our predecessors were concerned about this enough to install subsurface safety valves in all wells at Aliso. Unfortunately, at the time the technology was not up to the challenge and all of the valves failed and were subsequently removed. However due to deepwater high flow rate wells the technology is now available to install deep set valves that will withstand high flow rates. We have one of these in Miller 4. We could leave the wells in annular flow configuration so we don't have the cost, problems and deliverability loss associated with conversion to tubing flow.[117]

With regards to whether subsurface safety valves could work on both tubing and casing at Aliso Canyon, Mr. Mansdorfer from 2009 later clarified under oath as follows:

> Q: Okay. Subsurface safety valves very quickly. What is your understanding as to whether subsurface safety valves,

[111] Blade Report at p. 2.

[112] Blade Report at p. 2.

[113] Blade Report at p. 2.

[114] Blade Report, p. 2.

[115] Blade Report, p. 2.

[116] Blade Report, p. 2.

[117] Thursday, April 23, 2009 2:12 PM, Mansdorfer to Weibel email; I1906016_SCG_CALADVOCATES_0017314.

can they work for both tubing and casing of a well or merely tubing?

A: Well, there's different styles. PG&E has ones that work on both tubing and casing. I think they're kind of troublesome but most of them, well, almost all of them are set up to work on tubing only.

Q: I see. And that includes for deepset?

A: Right. It would have to flow through a packer and to the tubing. And then if you wanted to flow in the annulus, it would have to flow out through ports and up the annulus.[118]

On April 23, 2009, Mr. Mansdorfer stated that more than 100 storage wells were set up for annular flow in the same fashion that Blade noted SS-25 was operated. In his words, "At Aliso Canyon we have over 100 storage wells that are set up for annular flow with up to 3150 psi on the casing. A few of these wells are under 10 years old, but the majority are from 35 to 70 years old."[119]

The Aliso Canyon storage wells had numerous casing leaks.[120] Blade reviewed 124 gas storage wells and identified 63 casing leaks, 29 tight spots, 4 parted casings, and 3 other types of failures.[121] Casing leaks include both connection leaks and pipe body leaks.[122] Based on the data available to blade, no details regarding the nature of cause of these leaks and failures were available because no failure analyses were done.[123] Forty percent of the gas storage wells reviewed by Blade had casing failures with an average of two casing failures per well.[124] The FF-34A well file mentioned a study of the possible

[118] Tr. Mansdorfer, September 13, 2018 at pp. 143:21 – 144:9. If SED becomes aware of additional information that could modify SED's testimony, SED may modify it or take further actions, as appropriate. In particular, SED may propound further discovery to inform whether SoCalGas could have successfully used subsurface safety valves on both the tubing and the casing on wells in the Aliso Canyon Natural Gas Storage facility prior to October 23, 2015. If it turns out that SoCalGas could have done so, SED reserves the right to assert additional violations of California Public Utilities Code Section 451 related to this matter.

[119] Thursday, April 23, 2009 2:12 PM, Mansdorfer to Weibel email; ref-VI.B-003. 2009.0423. Aliso Testimony. JMansdorfer at p. 1.

[120] Blade Report at p. 2.

[121] Blade Report at pp. 2, 203.

[122] Blade Report at p. 203.

[123] Blade Report at p. 2.

[124] Blade Report at pp. 2, 203. This was 99 failures in 49 wells (See Blade Report at p. 203).

external casing corrosion problems in the southeastern portion of the field, but Blade was not able to locate any documentation related to this study.[125]

In addition, two Aliso Canyon wells had underground blowouts from casing leaks: Frew-3 in 1984 and FF-34A in 1990.[126] These wells were successfully killed by pumping fluid down the tubing, and the consequences of a larger leak or a near-surface casing rupture were not anticipated until the SS-25 event.[127]

As noted in Section B.1.b above, SoCalGas had a two-year plan in 1988 to determine the mechanical condition of the casing in 20 wells originally completed in the 1940s and 1950s, but did not completely follow it.[128]

Blade reviewed SS-25 noise, temperature, and pressure surveys before the incident of October 23, 2015.[129] There were not temperature, pressure, or noise anomalies in the surveys that indicated a preexisting casing failure.[130] Additionally, there were no physical observations from well inspections and weekly pressure measurements that indicated an existing problem.[131] Blade's interpretation is that SoCalGas complied with the monitoring components of the Operations Standard titled Gas Inventory – Monitoring, Verification and Reporting.[132]

The catastrophic SS-25 casing leak showed that using temperature surveys to confirm mechanical integrity of casing was a flawed concept.[133] The concept assumed that leaks would not be catastrophic, would cause a cooling anomaly, and would be detected in time to allow the well to be killed quickly and safely.[134] A temperature

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[125] Blade Report at p. 2.

[126] Blade Report at p. 2.

[127] Blade Report at p. 2.

[128] Blade Report at p. 2.

[129] Blade Report at p. 202.

[130] Blade Report at p. 202.

[131] Blade Report at p. 202.

[132] Blade Report at p. 202.

[133] Blade Report at p. 202.

[134] Blade Report at p. 202.

survey was run in SS-25 on October 21, 2014, a year before the leak on October 23, 2015, and showed no temperature anomalies.[135]

Allowing an annual temperature survey to meet the requirements of mechanical integrity test is insufficient for several reasons:[136]

- A leak and cooling must exist to develop a temperature anomaly.[137]
- Lack of an anomaly does not provide any data regarding the future integrity of the casing or remaining wall thickness.[138]
- Temperature change must be within the sensitivity of the tool.[139]
- Interpretation of the survey is subjective.[140]

A large number of production casing leaks and parted casings have occurred throughout the history of the Aliso Canyon field, with a risk of gas leaks and safety and environmental repercussions.[141] In spite of the possible consequences, no data were provided to Blade to demonstrate that measures were taken to understand the root causes of the casing and well failures.[142] The wells files and data made available to Blade are mostly void of analyses of the causes of failures.[143] An interoffice memo related to FF-34A stated that "The possible regional external casing corrosion problem in the southeastern portion of the field that was going to be further studied and a report issues"; however, Blade was not able to locate any documentation regarding this study.[144]

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[135] Blade Report at p. 202.

[136] Blade Report at p. 203.

[137] Blade Report at p. 203.

[138] Blade Report at p. 203.

[139] Blade Report at p. 203.

[140] Blade Report at p. 203.

[141] Blade Report at p. 203.

[142] Blade Report at p. 203.

[143] Blade Report at p. 203.

[144] Blade Report at p. 203.

SoCalGas has a Company Operations Standard (191.01) for the Investigation of Accidents and Pipeline Failures, but a complementary standard for the investigation of a well failure had not been identified to Blade.[145] This implied that more attention was paid to surface equipment and asset failures than to well and downhole failures.[146]

As part of interoffice correspondence, SoCalGas made a recommendation in 1988 to run casing inspection logs in the 20 wells that were of concern at the time, and the opportunity to inspect the casing in SS-25 was missed. It is not possible to determine what an inspection of the SS-25 casing would have shown in 1988, but it is possible that the corrosion was present and detectable, and steps could have been taken to avoid the leak in 2015.[147] SoCalGas logged some of the 13 remaining wells starting in 2007, resulting in a gap from 1990 to 2007 when no inspection logs were run in the 20 wells, according to the available well records.[148]

SoCalGas logged the High Priority wells and found significant penetration.[149] No documentation was found that explained why the remaining wells were not inspected as recommended in 1988.[150] Blade inquired if SS-25 was inspected based on the 1988 recommendation because it was on the list of 20 wells.[151] SoCalGas responded to a Blade information request dated December 18, 2018, that the high priority wells were logged, and SS-25 was not inspected because the Vertilog technology was less effective at identifying casing leaks than the well diagnostic tests that SoCalGas routinely performed on its underground gas storage wells.[152] However, the objective of the 1988

[145] Blade Report at p. 203.
[146] Blade Report at p. 203.
[147] Blade Report at p. 204.
[148] Blade Report at p. 204.
[149] Blade Report at p. 204.
[150] Blade Report at p. 204.
[151] Blade Report at p. 204-205.
[152] Blade Report at p. 205.

inspections was to determine the mechanical condition of the casing and not to identify casing leaks.[153]

There were 76 of 116 wells that had production casing inspection logs available, of which, 27 wells showed indications of shallow external corrosion on the production casing.[154] In almost all of these 27 wells, the external corrosion was below the depth of the surface casing shoe.[155] There were two exceptions, F-4 and P-50A.[156] The shallow corrosion in P-50A was found above the shoe and abruptly stops at the depth of the casing shoe.[157]

Although no well was found with the exact placement and pattern of corrosion as that of SS-25, Blade concluded that shallow corrosion was a common event that was found field wide, and close to the surface casing shoe.[158] Shallow casing leaks occurred in a number of wells.[159] Blade found 10 shallow casing leaks in a review of 116 wells.[160] Blade interpreted that three of these shallow casing leaks could be attributed to shallow corrosion; three were not.[161] There was no enough information to determine if the remaining shallow casing leaks were corrosion related.[162]

Surface casing corrosion was identified in several wells where casing inspection logs were run as part of the P&A (plug and abandonment) operations.[163] SS-25's surface casing had the worst condition; logs showed multiple through-wall holes in the 11 ¾ in. casing from approximately 134 to 300 ft.[164] The holes in the surface casing likely

[153] Blade Report at p. 205.

[154] Blade Report at p. 205.

[155] Blade Report at p. 205.

[156] Blade Report at p. 205.

[157] Blade Report at p. 205.

[158] Blade Report at p. 205.

[159] Blade Report at p. 205.

[160] Blade Report at p. 205.

[161] Blade Report at p. 205.

[162] Blade Report at p. 205.

[163] Blade Report at p. 205.

[164] Blade Report at p. 205.

contributed to the 7-inch production casing corrosion and allowed ground water and oxygen to enter the 11 ¾ inch x seven-inch annulus.[165]

SED finds that SoCalGas violated Section 451 by operating well SS-25 without a backup mechanical barrier to the 7-inch production casing. In August 1988, an internal SoCalGas memo recommended that a casing inspection survey be run on 20 wells to "determine the mechanical condition of each well casing."[166] Given SoCalGas's failure to inspect the casing of SS-25 in response to its own August 1988 memo,[167] this violation spans from at the latest the end of August 1988 until October 23, 2015.[168]

[redacted] SoCalGas did not have internal policies that required inspection and measurement of the wall thickness of wellbores at Aliso.[169] Instead, SoCalGas used techniques that detected and fixed leaks only after an event occurred.[170]

SoCalGas had no internal policies on wall thickness inspections because the company assumed that regulatory compliance was being adhered to by running annual temperature surveys in accordance with the Aliso Canyon Monitoring Plan and the project approval letter dated 1989 requiring an annual mechanical integrity test (MIT).[171] The MIT monitoring system did find casing leaks on other wells in the field, which were successfully repaired or remediated.[172] But, no failure analysis or risk assessment was

[165] Blade Report at p. 205.

[166] Blade Report at p. 217.

[167] See Blade Report at p. 217.

[168] If SED becomes aware of additional information that could modify SED's testimony, SED may modify it or take further actions, as appropriate. In particular, SED may propound further discovery to inform whether SoCalGas could have successfully used subsurface safety valves on both the tubing and the casing on wells in the Aliso Canyon Natural Gas Storage facility prior to October 23, 2015. If it turns out that SoCalGas could have done so, SED reserves the right to assert additional violations of California Public Utilities Code Section 451 related to this matter.

[169] Blade Report at p. 5.

[170] Blade Report at p. 5.

[171] Blade Report at p. 217. According to the Blade Report at pp. 197-198 A mechanical integrity test (MIT) must be performed on all injection wells to ensure the injected fluid is confined to the approved zones. The MIT consists of two parts. 1. Prior to commencing injection operations, each injection well must pass a pressure test of the casing-tubing annulus to determine the absence of leaks. Thereafter, the annulus of each well must be tested at least once every five years. 2. The second test of a two-part MIT shall demonstrate that there is no fluid migration behind the casing, tubing, or packer.

[172] Blade Report at p. 217.

ever done on previous wells that had leaks or corrosion.[173] In addition, there had not been an event of similar severity to what happened on SS-25.[174] Further, since no formal risk assessment was conducted regarding well integrity, wall thickness inspection was not identified as a monitoring technique.[175]

A wall thickness inspection provides a leading indicator of possible casing integrity issues.[176] The noise and temperature logs results are trailing indicators because the leak has to already have happened to be detected.[177] Seven of the 20 wells recommended for a casing wall thickness inspection in the SoCalGas 1988 memo were inspected and many of them had outside diameter (OD) metal loss indications.[178] There was no follow-up investigation of these anomalies.[179] Further, there was no 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).[180]

SoCalGas ran annual temperature surveys and periodic noise logs in SS-25 from 1974 to 2014, and no anomalies were found.[181] However, this type of monitoring program is not capable of detecting casing metal loss, corrosion or the growth of corrosion over time.[182] Temperature and noise surveys do not measure wall thickness; they will only detect a leak and are consequently after-the-fact, reactive techniques.[183]

As discussed in Section B.1.b, an internal SoCalGas memo issued in August 1988 recommended that a casing inspection survey be run on 20 wells to "determine the

[173] Blade Report at p. 217.

[174] Blade Report at p. 217.

[175] Blade Report at p. 217.

[176] Blade Report at p. 218.

[177] Blade Report at p. 218.

[178] Blade Report at p. 218.

[179] Blade Report at p. 218.

[180] Blade Report at p. 218.

[181] Blade Report at p. 216.

[182] Blade Report at p. 216.

[183] Blade Report at p. 216.

mechanical condition of each well casing."[184] Despite the number of casing failures that had occurred in the field, no failure analysis or subsequent risk assessment was done that may have led to an awareness that corrosion was a potential problem.[185] In addition, there had not been an event of similar severity to what happened on SS-25.[186] Further, since no formal risk assessment was conducted regarding well integrity, wall thickness inspection was not identified as a monitoring technique.[187] Section B.1.b discusses in more detail the number of casing failures that had occurred at Aliso, and the failure to follow each of the recommendations in the 1988 memo.[188]

Although there were no regulatory requirements for wall thickness measurements to be done,[189] SoCalGas operated its Aliso Canyon storage facility without internal policies that required well casing wall thickness inspection and measurement in violation of Section 451. The span of this violation extends from the issuance of the memo in August 1988 to October 23, 2015, the date of the incident.

[redacted] **SoCalGas did not have a well specific, well control plan that considered transient kill modeling or well deliverability. There was not quantitative understanding of well deliverability, although data were available, and well-established industry practices existed for such analysis.**

With regards to Relief Well 2, Well SS-25A, and SS-25B, SoCalGas did not have kill programs as of February 4, 2016.[190]

Between October 24 and December 22, 2015, seven kill operations were attempted to bring wells-25 under control and to stop the leak.[191] The date and a brief description of

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[184] Blade Report at p. 217.

[185] Blade Report at p. 217.

[186] Blade Report at p. 217.

[187] Blade Report at p. 217.

[188] See also Blade Report at p. 218.

[189] Blade Report at p. 217.

[190] Email from Brett Lane to Jimmie Cho et al., entitled "Randy Request" AC_CPUC_SED_DR_16_0043578. "Jimmie: Tried to make this easy for you. Attached is the latest draft of the intercept/kill procedure for relief well 1 to SS-25 and the dynamic kill analysis. I have also included the last 5 ranging run reports. We do not have a dynamic kill program developed yet for Relief well 2. We do not have kill programs for SS25A or 25B."

[191] Blade Report at p. 144.

each kill attempt are provided in Table 2, provided below.[192] The first kill operation was managed by SoCalGas and the remaining six kill operations were managed by Boots and Coots, a well-control company contracted by SoCalGas.[193] None of the attempts were successful and each attempt made the surface conditions worse.[194] Kill attempt number seven appeared to be close to killing the well, but it was terminated because of undesirable movement of the wellhead and pump lines that broke during the job.[195]

In designing a kill operation, the objective is to place a fluid of sufficient density into the wellbore such that the hydrostatic pressure exerted by this fluid is higher than the pressure of the flowing gas.[196] The two primary design variables are the fluid density and pump rate.[197] The primary constraint is that the pressure rating of the surface wellhead equipment must not be exceeded.[198] In general, the lower fluid densities require higher pump rates and result in higher pressures at the wellhead.[199]

Blade reviewed all the available data and concluded that no transient modeling was done when designing kill attempts one through six.[200] Based on the data reviewed by Blade, the well-control company appeared to have designed the kill attempts solely by calculating a kill fluid density that was higher than the static bottom hole pressure.[201] Kill operations where a fluid is being pumped into a well while the gas is escaping at a high rate requires a detailed transient model to define the operational parameters.[202]

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[192] Table 2 below is a copy of Table 18 of the Blade Report.

[193] Blade Report at p. 144.

[194] Blade Report at p. 144.

[195] Blade Report at p. 229.

[196] Blade Report at p. 144.

[197] Blade Report at p. 144.

[198] Blade Report at p. 144. In this case, the surface equipment was rated to 5,000 psi.

[199] Blade Report at p. 144.

[200] Blade Report at p. 4.

[201] Blade Report at p. 3.

[202] Blade Report at p. 4.

Mr. Mansdorfer identified calculations for flow rate and mud weight that may have successfully killed the well also, which was based on information from the website of the Division of Oil, Gas, and Geothermal Resources (DOGGR).[203]

Blade conducted detailed modeling and used the more accurate estimate of flow rate and concluded that 12 pounds per gallon (ppg) fluid weight or higher at pump rates of 10 barrels per minute (bpm) or higher would have successfully controlled the well as early as November 13 or 14, 2015.[204] Instead, a variation of the same kill attempt design with fluid densities of around 9.4 ppg and flow rates of around 5 to 13 bpm were utilized for kill attempts two through six.[205]

Meanwhile, the well site deteriorated with the continued flow of gas.[206] Blade reviewed all the available data and concluded that no transient modeling was done when designing these kill attempts, contributing to the lack of success in the kill attempts.[207] The data indicated that the well flow rate was being significantly underestimated.[208]

At the time of the first kill attempt, the estimate leak rate was 93 MMscf/D.[209] Blade's analysis indicated that the 10 ppg fluid was not dense enough to kill the well at realistic pumping rates.[210] The well could have been killed by pumping 12 ppg fluid at 10 bpm or a 15 ppg fluid at 7 bpm.[211] The first well kill attempt was a reasonable response because the extent of the failure in SS-25 was unknown.[212] Similar well kill operations had been carried out in the past on wells with casing leaks, namely Frew 3 in 1984 and Fernando Fee (FF) 34A in 1990.[213] The two wells were killed successfully by

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[203] Tr. Mansdorfer, September 13, 2018 at pp. 81:20 – 83:9.

[204] Blade Report at p. 4.

[205] Blade Report at p. 4.

[206] Blade Report at p. 4.

[207] Blade Report at p. 4.

[208] Blade Report at p. 4.

[209] Blade Report at p. 148.

[210] Blade Report at p. 148.

[211] Blade Report at p. 148.

[212] Blade Report at p. 148.

[213] Blade Report at p. 148.

pumping fluid down the tubing.[214] Gas broaching to surface from cracks in the ground following kill attempt #1 indicated that SS-25 had serious problems and that a shallow casing leak likely existed.[215]

The second through sixth well kill attempts failed because the kill fluids used were not dense enough to kill the well.[216] For example, on November 13, 2015, the well-control company executed the second well kill attempt, which was also unsuccessful.[217] During the second well kill attempt, the Blade estimated flow rate was 83 MMscf/D.[218] The 9.4 ppg kill density fluid could not kill this well;[219] however, 12 ppg at a flow rate of 9 to 10 bbl/min would have gotten the well under control.[220] Also, the well could have been killed by pumping 15 ppg fluid at 6 bpm.[221] Blade's analyses assume that kill fluids would have been pumped down the tubing; it would have been impossible to kill SS-25 by pumping down the seven inch casing.[222]

Between November 14 and November 25, 2015, the well-control company executed four other kill attempts.[223] All four kill attempts failed, and the SS-25 surface conditions worsened.[224] All four kill attempts were similar in design.[225] The main components of the kill fluids were 9.4 ppg $CaCl_2$ fluid for the third and fourth well kill attempts and fresh water (estimated 8.34 ppg density) for the fifth and sixth well kill attempts.[226] The estimated gas leak rates were 81 MMscf/D for the third and fourth well

214 Blade Report at p. 148.

215 Blade Report at p. 148.

216 Blade Report at p. 159.

217 Blade Report at p. 148.

218 Blade Report at pp. 149, 228.

219 Blade Report at pp. 149, 229.

220 Blade Report at pp. 149, 229

221 Blade Report at p. 149.

222 Blade Report at p. 149.

223 Blade Report at p. 150.

224 Blade Report at p. 150.

225 Blade Report at p. 150.

226 Blade Report at p. 150.

kill attempts and 78 MMscf/D for the fifth and sixth well kill attempts.[227] Blade analyses indicate that the fluid densities were not high enough to kill the well at realistic pump rates for any of the four kill attempts.[228] The well could have been killed with either 12 ppg or 15 ppg kill fluid at realistic pump rates (6-8 bpm).[229]

Blade indicates that at the time of the fifth kill attempt, the well was flowing at 78 MMscf/D. Blade believes that 12.0 ppg fluid pumped at 8 bpm or 15.0 ppg fluid at 6 bpm would have also stopped the gas flow.[230] The fluid would have tended to maintain a stable fluid column because of the damage to the reservoir permeability, while clear water or clear brine would not have remained stable because of fluid loss into the permeable reservoir.[231]

The sixth well kill attempt was a near repeat of the fifth well kill attempt, except that the 35 bbl barite pill was replaced with a 100 bbl 9.4 ppg LCM pill, and a higher pump rate was applied to the kill.[232] The sixth attempt appeared to have killed the well, but fluid loss into the formation kept the annular fluid column from stabilizing.[233] It is probable that continued pumping from the surface might have kept up with the fluid loss, but surface plumbing failures prevented the well from being kept filled.[234] The use of fresh water and clear brine contributed to the attempt's failure because of fluid loss into the formation and loss of hydrostatic pressure, which allowed the well to flow after the kill attempt.[235]

[227] Blade Report at p. 150.
[228] Blade Report at p. 150.
[229] Blade Report at p. 150.
[230] Blade Report at p. 151.
[231] Blade Report at p. 151.
[232] Blade Report at p. 151.
[233] Blade Report at p. 151.
[234] Blade Report at p. 151.
[235] Blade Report at p. 151.

At this point, the wellhead and surface casing were structurally unstable.[236] Gas and fluid flow around the surface location removed enough soil and formation to allow considerable oscillation of the wellhead.[237]

The final well kill attempt was executed by the well-control company on December 22, 2015.[238] After installing guy wires to reduce wellhead oscillations, the pump job for this kill attempt consisted of pumping 15.1 ppg water based mud (WBM), with LCM, at a rate of five bpm.[239] (Reports are inconsistent—the actual rate may have been 5.8 bpm.)[240] After pumping 300 bbl, the injection rate was reduced to 0.5 bpm for 15 minutes.[241] Pumping was terminated due to rocking of the wellhead and a subsequent failure of the injection connection.[242] At 10:30 AM, the well was just about to be killed, although premature shutdown of the pumps resulted in the FBHP decreasing and the influx rate increasing.[243] Pumping needed to continue for some time after the well had seemed to have been killed to ensure that the well had been effectively killed.[244] This did not happen in the field because the pumps were shut down early.[245] Blade's analysis confirms that the well should have been killed with either 12 ppg fluid pumped at 6 bpm or 15 ppg fluid pumped at 5 bpm.[246]

The seventh (last) top well kill attempt was the first attempt to utilize an engineered approach—some documents indicate that well kill modeling had been attempted prior to the job. It appears that the well was almost dead when the surface

[236] Blade Report at p. 151.
[237] Blade Report at p. 151.
[238] Blade Report at p. 151.
[239] Blade Report at p. 151.
[240] Blade Report at p. 151.
[241] Blade Report at p. 151.
[242] Blade Report at p. 151.
[243] Blade Report at p. 152.
[244] Blade Report at p. 152.
[245] Blade Report at p. 152.
[246] Blade Report at p. 152.

equipment failed, but because of the inability to continuously fill the well, the production zone resumed flowing after some (undetermined) time.[247]

The 11 ¾ inch x seven-inch annulus valve on the wellhead backed out during this kill attempt, which created an unrestricted gas flow path to the surface.[248] The gas flow out of the two-inch threaded outlet contributed to the enlargement of the crater on the south side.[249] It is likely that the crater, unsupported lines and valves, wellhead movement, and vibration contributed to the valve backing out, which made the overall surface situation worse.[250]

Blade concluded that the seventh well kill attempt was a "near kill" that failed because the pumping was terminated early due to concern for potential wellhead damage.[251] A contributing factor was the cumulative damage done by previous, unsuccessful kill attempts to the well site and wellhead, which caused this kill attempt to be terminated early.[252]

By December 22, 2015, after more than 4,000 bbl of various fluids had been pumped into the well, most fluids returned to the surface under high velocity.[253] Additionally, a large volume of gas had escaped through the surface fissures and crater.[254] The surface conditions had deteriorated to a point that it became unsafe for personnel to work near the wellhead.[255] The relief well P-39A started being drilled on December 4, 2015, and it was successful in killing SS-25 on February 11, 2016.[256]

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[247] Blade Report at p. 152.

[248] Blade Report at p. 152.

[249] Blade Report at p. 152.

[250] Blade Report at p. 152.

[251] Blade Report at p. 152.

[252] Blade Report at p. 152.

[253] Blade Report at p. 152.

[254] Blade Report at p. 152.

[255] Blade Report at p. 152.

[256] Blade Report at p. 152.

There were no data that indicated transient modeling, any modeling, or analysis was conducted to design the second through sixth well kill attempts.[257] Some calculations may have been done; however, gas flow rates were not incorporated into any kill design.[258] The decisions appeared to be based on the static reservoir pressure and this would be inadequate and inappropriate for designing kills.[259] SoCalGas-provided information suggested that the well-control company was using 30 MMscf/D[260] as the well flow rate.[261] It is unclear whether this information was ever used in any modeling.[262] Flow rate and kill fluid density have to be designed by using established industry modeling tools before preparing an operational plan to ensure the well is killed.[263] Each kill attempt caused additional damage to the wellhead and well site.[264]

The 20 days after the first unsuccessful kill attempt were spent gathering data about the well condition and preparing the site for the subsequent well kill operations.[265] An ice plug in the tubing was found to be at 473 feet.[266] A coil tubing unit was rigged up and used to clear out the plug.[267] Noise, temperature, pressure, and spinner logs were run.[268] Pressure data were recorded.[269] A bridge plug was set in the tubing at 8,393 ft,

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[257] Blade Report at pp. 159, 228.

[258] Blade Report at p. 159.

[259] Blade Report at p. 228

[260] MMscf/D stands for million standard cubic feet per day.

[261] Blade Report at p. 228.

[262] Blade Report at p. 228

[263] Blade Report at p. 228

[264] Blade Report at p. 159.

[265] Blade Report at p. 226

[266] Blade Report at p. 226.

[267] Blade Report at p. 226.

[268] Blade Report at p. 226.

[269] Blade Report at p. 226.

and holes were punched in the tubing at 8,387 ft to allow circulation down the tubing and into the annulus.[270] Gas continued to flow throughout this time.[271]

At the point in time 20 days after the first unsuccessful kill attempt, and by the time of the second well kill attempt, the scope of the well-control problem should have been better understood.[272] It was clear that there was a leak in the 7-inch casing at a shallow depth.[273] Gas was flowing from the reservoir up through the 7-inch casing × 2 7/8-inch tubing annulus and then outside of the 7-inch casing at the leak depth.[274] The gas was escaping into the surrounding formation and some was migrating to the surface.[275] The bottomhole pressure of the reservoir and the tubing and casing pressures at surface were known.[276] Annual flow test data were available for SS-25, and an inflow performance curve could have been generated.[277] These data would have allowed calculation of a reasonable estimate of the gas flow rate.[278]

There is data indicating that the design of the seventh well kill attempt was modeled ahead of time.[279] The well-control company appeared to assume a gas flow rate of around 25–30 MMscf/D, whereas Blade-estimated flow rate was 60 MMscf/D.[280] However, the annulus pressure dropped to 0 psi for a time indicating that the well had likely been killed, but pumping had to be stopped because of severe vibrations of the wellhead.[281] The wellhead movement caused pumping lines to break off, and operations

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[270] Blade Report at p. 226.

[271] Blade Report at p. 226.

[272] Blade Report at p. 226.

[273] Blade Report at p. 226.

[274] Blade Report at p. 226.

[275] Blade Report at p. 226

[276] Blade Report at pp. 226-227.

[277] Blade Report at p. 227.

[278] Blade Report at p. 227.

[279] Blade Report at p. 228.

[280] Blade Report at p. 228.

[281] Blade Report at p. 228.

were stopped to prevent damage to the wellhead itself.[282] The inability to continuously fill the well allowed the production zone to resume flowing.[283] No further attempts were made to top kill the well.[284]

It appears that the approach to killing the well was based on a static estimation of bottomhole pressure to determine the kill fluid density and concern about pump pressures exceeding the nominal wellhead pressure rating of 5,000 psi.[285] A transient kill model would have revealed that a kill fluid density of 12 ppg or higher at flow rates around 10 bpm would have successfully controlled the well with pump pressures below the wellhead rating.[286] The well could therefore have been top killed earlier. Instead, a variation of the same initial kill attempt was implemented during the second through sixth well kill attempts with low density kill fluids.[287] As shown in this section, the lack of modelling resulted in multiple unsuccessful well kill attempts, and extended the time before the release of gas could be controlled. As noted by Blade, this loss of time caused the well site to deteriorate with the continued gas flow.[288] External well-control specialists provide necessary experience and expertise; however, underground storage operators should also have personnel with the necessary skills to monitor and manage external specialists, a core skill for the gas storage operator.[289]

Commented [GD1]: Margaret. Do you have the expertise to say something along the lines of "underground storage operators, including SoCalGas, should have personnel with the skills to do XYZ, even if they rely on third party well-control specialists, such as Halliburton, to do ABC. The multiple kill attempts demonstrate.."

Table 2 below shows the descriptions and results for the well kill attempts between October 23 and December 22, 2015.[290]

Table 2: Descriptions and Results for Kill Attempts #1-7 (October 23-December 22, 2015)

[282] Blade Report at p. 228.

[283] Blade Report at p. 228.

[284] Blade Report at p. 228.

[285] Blade Report at p. 240.

[286] Blade Report at p. 240.

[287] Blade Report at p. 240.

[288] Blade Report at p. 240.

[289] Blade Report at p. 240.

[290] Blade Report at pp. 144-146, Table 18.

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Kill Attempt & Date	Description	Results	Successful
#1 (October 24)	10 ppg polymer pill (down tubing) 8.6 ppg lease water (down casing in pump-and-bleed operation)	Tubing plugged after 11.8 bbl pumped. Additional gas flow noted at surface Gas broke through at surface after 89 bbl of fluid pumped.	No
#2 (November 13)	10 bbl of 9.4 ppg polymer pill 683 bbl of 9.4 ppg CaCb 10 bbl of 9.4 ppg polymer pill 3 bbl of 8.6 ppg brine water Maximum pump rate 8 bpm Maximum pump pressure 1,526 psi	Observed increased gas flow andliquid from fissures. Pony motor went down. Shut down pumping. Brine, oil, andgas flowing from fissures on pad. Well blew out in the conventional sense. Blowout vent opened 20 ft from wellbore, shooting debris 75 ft into the air.	**No**
#3 (November 15)	170bbl of 9.4ppgCaCh 19 bbl of 18 ppg baritepill 50 bbl of 9.4 ppgCaCl2 Maximum pump rate 8 bpm Maximum pump pressure 1,645 psi	Gas rate from fissures increased, followed by oil andbrine. Flow from fissures stopped briefly and then began to flow gas.	**No**
#4 (November 18)	230 bbl of 9.4 ppg CaCl2 35 bbl of 18 ppg barite pill SO bbl of 9.4 ppg CaCli Maximum pump rate 9 bpm Maximum pump pressure 1,975 psi	Gas rate from fissures increased. Observed oil and brine from fissure. Barite to surface was reported .	**No**
#S (Novemb er 24)	50 bbl of 9.4 ppg GEO Zan pill 950 bbl of fresh water 35 bbl of 18 ppg barite pill 56 bbl of 9.4 ppg CaCh Maximum pump rate 13 bpm Maximum pump pressure 4,167 psi (Reported value. Telemetry system shows maximum tubing pressure of approximately 3,600 psi)	30ft x 10ft crater developed andgas rate increased. Recovered 700 bbl of fluid from location.	**No**
#6 (November 25)	SO bbl of 9.4 ppg GEO Zan LCM pill 910 bbl of fresh water 100 bbl of 9.4 ppg GEO Zan LCM pill 56 bbl of 9.4 ppg CaCb Maximum pump rate 13 bpm Maximum pump pressure 4,164 psi	Gas activity increased in crater. Water flow from crater increased. Flow line from 7 in. and tubing head brok e. Nipple on wellhead broke. Pump line to 7 in. casing head broke. Cratering around the wellhead increased and damaged several casing valves. Tubing pressure went to zero, and t hen started increasing.	**No**
#7 (December 22)	107 bbl of 15 ppg WBM 100 bbl of 15 ppg WBM with LCM 125 bbl of 15 ppg WBM	Mud, oil mist in crater. Liquid began to come out of the casing at surface.	No

	Maximum pump rate 5.8 bpm Maximum pump pressure 1,157 psi (at start conditions)	Shut down due to rocking of wellhead and unloading mud from crater. Pump line to top tee broke off due to movement of wellhead. Tubing pressure went to zero, and then started increasing.	

In Blade's view, the first well kill attempt was a reasonable response because the extent of the failure in SS-25 was unknown.[291] Also in Blade's view, the scope of the well-control problem should have been better understood 20 days after the first well kill attempt because that time was spent gathering the data about well condition and preparing the site for the subsequent well kill operations.[292] Given that SoCalGas had no well kill control plan in certain instances and there are no data indicating transient modeling, any modeling, or analysis conducted to design the second through sixth well kill attempts, and such modeling would have provided the necessary information to successfully kill the well, SoCalGas violated Section 451.

The Section 451 violation began November 13, 2015, the day SoCalGas unsuccessfully executed the second well kill attempt without modeling, and continued through February 11, 2016, the date of the successful relief well kill attempt. Because the second through sixth well kill attempts should have been successful with proper modeling, shareholders should be required to pay all expenses associated with each one. Also, because the relief well was started on December 4, 2015,[293] after the second well kill attempt, the relief well would not have been needed had the second well kill attempt been properly modeled. As such, shareholders should be required to pay all expenses associated with the relief well. SoCalGas's failure to provide well kill programs for relief well #2, well SS-25A and well SS-25B each constitute one violation of Section 451, for a total of three violations. Each of these violations span from November 13, 2015, the date SoCalGas unsuccessfully executed the second well kill attempt, to February 11, 2016, the date of the successful relief well kill attempt.

[291] Blade Report at p. 148.

[292] Blade Report at p. 226

[293] Blade Report at p. 13.

Because surface plumbing failures prevented the well from being kept filled and the wellhead and surface casing were structurally unstable by kill attempt 6,[294] such damage appears to have resulted from the prior unsuccessful kill attempt, thereby compromising the ability of kill attempt 7 to kill the well and end the safety consequences of the SS-25 leak. According to Blade, pumping for kill attempt 7 was terminated due to rocking of the wellhead and a subsequent failure of the injection connection.[295] In other words, the ability to succeed on the seventh kill attempt was impaired by at least certain of the prior unsuccessful kill attempts, which should have been successful. This is a violation of Section 451.

The apparent conservative start date of this violation is November 25, 2015, the date that well kill attempt #6 was made.[296] This violation continued until February 11, 2016, the date of the successful relief well kill attempt.

[redacted] SoCalGas did not employ reasonable understanding of the groundwater depths relative to the surface casing shoe and production casing of well SS-25, until two groundwater wells were drilled for RCA purposes after the October 23, 2015 incident at SS-25.

a) Groundwater Caused Corrosion on the Corrosion on the 7 Inch and 11 ¾ Inch Casings on SS-25

One of the direct causes for the uncontrolled release of hydrocarbons for 111 days from SS-25 was an axial rupture due to external microbial corrosion on the 7 inch casing outside diameter caused by the groundwater.[297] Groundwater accessed the 11 ¾ inch x 7 inch annulus and provided an environment conducive to microbial corrosion.[298]

The shallow groundwater above 400 feet accessed the poorly cemented 11¾-inch surface casing and caused localized corrosion on the outside surface of that casing.[299]

[294] Blade Report at p. 151.

[295] Blade Report at p. 151.

[296] See Blade Report at pp. 144-146, Table 18.

[297] Blade Report at p. 4.

[298] Blade Report at p. 4.

[299] Blade Report at p. 3.

The Blade RCA Report found that both the 7 inch and 11 ¾ inch metal casings were corroding from the outside as a result of contact with groundwater.[300] This groundwater and microbes—likely methanogens, a form of Archaea—caused the corrosion.[301]

The RCA field investigation stated generally that surface runoff water permeates the ground and followed fractures and faults down to various depths.[302] At the SS-9 well location, approximately 600 ft away from SS-25, Blade observed groundwater at depths above 400 ft and below 900 ft.[303] Except for runoff water, there are no other sources of groundwater at Aliso Canyon.[304]

In the SS-25 well, groundwater displaced the original drilling fluid over a period of time and caused the 7-inch production casing to corrode from the outside.[305] This groundwater and biological microbes—likely methanogens, a form of Archaea—caused the corrosion.[306] Some of the 7-inch casing connections were seeping gas to the outside of the casing.[307] The carbon dioxide in the gas was likely a nutrient for the methanogens.[308] The SS-25 casing corrosion area discovered 892 feet down the well by the RCA was 9.25 inches in length and contained grooves from tunnels created by the microbes that coalesced over a period of time.[309] The corrosion removed 85% of the wall thickness in a smaller patch of 2.13 inches within the larger 9.25-inch corroded region.[310]

The 7 inch production casing exhibited external corrosion on the outside diameter at depths higher than 700 feet.[311] For corrosion to occur, an aqueous environment had to

[300] Blade Report at p. 3.
[301] Blade Report at p. 3.
[302] Blade Report at p. 3.
[303] Blade Report at p. 3.
[304] Blade Report at p. 3.
[305] Blade Report at p. 3.
[306] Blade Report at p. 3.
[307] Blade Report at p. 3.
[308] Blade Report at p. 3.
[309] Blade Report at p. 3.
[310] Blade Report at p. 3.
[311] Blade Report at p. 87.

be present in the annulus.[312] When SS-25 was constructed, the cementing operations displaced cement to 7,000 ft, leaving drilling fluid above the top of cement.[313] This drilling fluid would have been the environment that existed behind the 7-inch production casing following construction.[314] An assessment of the drilling records revealed the possible properties of the drilling fluid that were used in 1954.[315] The fluid was water-based with some minor additions of oil.[316] One of the main factors for corrosion is the pH of the drilling fluid; the higher the pH, the lower the corrosion rate.[317] The pH was elevated, ranging from 10 to 12.5, which is normal for drilling fluid.[318] Such an environment would not corrode the carbon steel.[319] The outside diameter of the 7 inch production casing would not have exhibited outside diameter corrosion if the environment had remained the same as the drilling fluid.[320]

The fluid behind the 7-inch production casing had to be different than the original drilling fluid since there was corrosion on the production casing outside diameter surface.[321] There had to be an environment that was more dynamic, created by groundwater or another water source.[322] Water injection from water disposal and other conventional oil production operations were considered in the RCA Report; however the injection depths were significantly deeper and water injection wells were located farther away and closer to many other wells.[323] Consequently, groundwater was the only feasible source of water that could have occupied the space between the 7-inch

[312] Blade Report at p. 87.

[313] Blade Report at p. 87.

[314] Blade Report at p. 87.

[315] Blade Report at p. 87.

[316] Blade Report at p. 87

[317] Blade Report at p. 87.

[318] Blade Report at p. 87.

[319] Blade Report at p. 87.

[320] Blade Report at pp. 87-88.

[321] Blade Report at p. 88.

[322] Blade Report at p. 88.

[323] Blade Report at p. 88.

production and 11¾-inch surfaces casing (7 x 11¾-inch annulus).[324] Similarly, groundwater is the only water source that could have caused the 11¾-inch casing outside diameter wall corrosion.[325]

In order to confirm the presence of groundwater, Blade requested SoCalGas to drill a borehole to 1,100 ft to locate possible water sources.[326] The intent was to confirm the source of the water that may have impacted SS-25.[327]

Blade Figure 82 shows the elevation map around Aliso Canyon field, including SS-25.[328] The source of groundwater was found in topographic contours between 2,354-2,496 feet above sea level.[329] However, there are no surface lakes or rivers within these contours.[330] Precipitation that falls within these contours can be the only source of this water.[331]

Since precipitation is the source of groundwater, groundwater level should be related to precipitation level.[332] First, groundwater level will vary within a given rain year.[333] The groundwater level will rise during the rainy period from December to March, reaching its highest level at the end of the rainy period in March.[334] The groundwater will then fall during the dry period from March to November, reaching its lowest level at the beginning of the subsequent rainy period.[335] In addition, groundwater level will also vary from year to year.[336] Consequently, the water level in the production

[324] Blade Report at p. 88.
[325] Blade Report at p. 88.
[326] Blade Report at p. 88.
[327] Blade Report at p. 91.
[328] Blade Report at p. 96.
[329] Blade Report at p. 96.
[330] Blade Report at p. 96.
[331] Blade Report at p. 96.
[332] Blade Report at p. 97.
[333] Blade Report at p. 97.
[334] Blade Report at p. 97.
[335] Blade Report at p. 97.
[336] Blade Report at p. 97.

casing annulus will rise and fall with the seasons and the extent of precipitation.[337] Further, the water level in the annulus would have been at its lowest during the period of the incident.[338]

The groundwater resulting from run-off rainwater likely entered the annulus and replaced the drilling fluid over time; or mixed with the drilling fluid and the composition of the annulus fluid changed over time.[339] These are all possibilities, however, based on the evidence, the groundwater is ubiquitous and played a role in the external corrosion of the 7 inch casing.[340]

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[337] Blade Report at p. 98.

[338] Blade Report at p. 98.

[339] Blade Report at p. 99.

[340] Blade Report at p. 99.

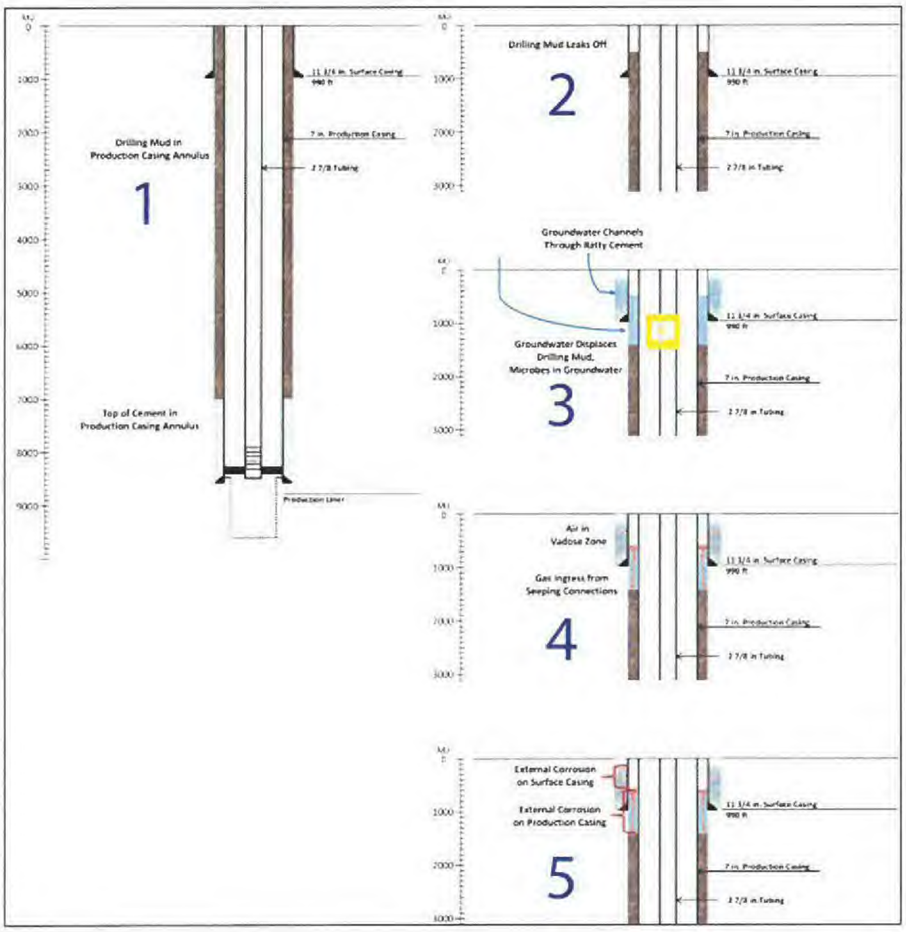

Figure 85 from RCA Report, shown above, is entitled "Likely Mechanism of Groundwater Ingress into the Surface Casing and Production Casing Annuli".[341]

Factors that control the chemical nature of the groundwater are mineralogy, transmissibility, and topography.[342] Generally, natural waters contain few dissolved

[341] Blade Report at p. 100.

[342] Blade Report at p. 91.

constituents, with cations and anions in chemical equilibrium.[343] The common cations include two alkaline earths (calcium and magnesium) and an alkali (sodium).[344] The anions are bicarbonate, sulfate, and chloride.[345] There were distinct shallow (340 to 440 feet) and deeper (900 to 1,000 feet) groundwater with slight differences in water chemistry.[346] This water likely represented the environment in the production casing annulus and outside of the surface casing.[347]

By allowing groundwater to cause corrosion on the 7 inch and 11 ¾ inch casings on SS-25, SoCalGas violated Section 451. This violation begins on August 30, 1988, the date SoCalGas produced its Interoffice memo calling for inspections of the SS-25 casing,[348] and continues to October 23, 2015, the beginning date of the incident.

b) SoCalGas Did Not Assess the Relationship Between Groundwater In and Around the SS-25 Well Site, and The Surface Casing Corrosion of That Well.

Blade did not find any SoCalGas records that identified the location and nature of the groundwater in and around the SS-25 well site.[349] Consequently, a correlation of the groundwater locations and the depth of surface casing shoes, and an assessment of the potential for surface casing corrosion were not done.[350] The possible corrosion risks to surface casings or production casings were unknown.[351] The corroded surface casing in SS-25 provided an easy pathway for gas to escape to the surface.[352] There is substantial literature regarding groundwater, and in order to understand the hydrochemical nature of

[343] Blade Report at p. 91.

[344] Blade Report at p. 91.

[345] Blade Report at p. 91.

[346] Blade Report at p. 93.

[347] Blade Report at p. 93.

[348] Blade Report at p. 218; Southern California Gas Company, "Candidate Wells for Casing Inspection, Aliso Canyon Field, Interoffice Correspondence, August 30, 1988 AC_CPUC_0000064-AC_CPUC_0000066 (SS-25 Well Documentation (from SoCalGas)_N.pdf at pp. 42-44)," 1988.

[349] Blade Report at p. 239.

[350] Blade Report at p. 239.

[351] Blade Report at p. 239.

[352] Blade Report at p. 239.

the water, it is necessary to understand the relation between the chemical character of the water, mineralogy of the environment, and circulation of the water.[353]

SoCalGas's failure to assess the relationship between groundwater in and around the SS-25 wellsite, and the surface casing corrosion of that well on SS-25 constitute a violation of Section 451. This violation begins on August 30, 1988, the date SoCalGas produced its Interoffice Memo calling for inspections of the SS-25 casing,[354] and continues to October 23, 2015, the beginning date of the incident.

[redacted] SoCalGas did not have systematic practices to protect surface casing strings against external corrosion.[355] Therefore, SoCalGas did not employ proper understanding of the consequences of corroded surface casings and uncemented production casings.[356]

During the RCA Investigation Phase 3 evaluation of the condition of the 11 ¾-inch surface casing, holes in the casing were found between 134 feet and 300 feet.[357] These holes were caused by the escaping gas pressure following external corrosion because the casing was neither fully cemented nor cathodically protected leaving the casing exposed to an environment conducive to corrosion.[358] Cathodic protection systems are commonly used to protect pipelines from corrosion and are sometimes used on well surface casing strings.[359] A cathodic protection system would have provided corrosion protection to the 11 ¾-inch casing,[360] but would not have protected the 7 inch casing inside the 11 ¾ inch casing.[361]

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[353] Blade Report at p. 91.

[354] Blade Report, p. 218; Southern California Gas Company, "Candidate Wells for Casing Inspection, Aliso Canyon Field, Interoffice Correspondence, August 30, 1988 AC_CPUC_0000064-AC_CPUC_0000066 (SS-25 Well Documentation (from SoCalGas)_N.pdf at pp. 42-44)." 1988.

[355] Blade Report at p. 5

[356] Blade Report, p. 5.

[357] Blade Report at p. 226.

[358] Blade Report at p. 226.

[359] Blade Report at p. 215.

[360] Blade Report at p. 215.

[361] Blade Report at p. 215.

The presence of bonded cement outside of the 7 inch casing would have mitigated external corrosion.[362] However, there was no cement around the 7 inch casing at 892 feet, because when the well was originally drilled, the cement around the 7 inch casing was intentionally brought up to 7,000 feet and not to surface.[363]

Surface casing cathodic protection had been applied to five other wells at Aliso Canyon, but not to SS-25.[364] The most common method for providing corrosion protection for casing strings is to manage the environment or to modify the casing metallurgy.[365]

A SoCalGas Interoffice correspondence dated August 20, 1991,[366] discussed an 8-5/8-inch casing inspection log showing metal loss and a corrosion protection log run in FF-34A.[367] A recommendation was made to equip FF-34A with cathodic protection (CP).[368] CP was implemented in FF-34A and four other wells according to SoCalGas in response to a February 18, 2018, information request.[369] The document also states that:

> …The possible regional external casing corrosion problem in the southeastern portion of the field will be further studied and a report issued. Additional investigation of well histories and well logs is required before a recommendation can be made as to whether regional CP is necessary. While casing inspection logs show shallow (1000 feet to 3000 feet ELM), casing metal loss in FF-35C, MA-1A and MA-5A, there is not enough evidence to substantiate a regional corrosion problem….[370]

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[362] Blade Report at p. 215.

[363] Blade Report at p. 215.

[364] Blade Report at p. 226.

[365] Blade Report at p. 215.

[366] Blade Report at p. 173.

[367] Blade Report at p. 173.

[368] Blade Report at p. 173.

[369] Blade Report at p. 173.

[370] Blade Report at p. 173, citing Attachment 7001-AC_CPUC_0022179: Southern California Gas Company Interoffice Correspondence, "FF-34A Casing Corrosion, Aliso Canyon", August 20, 1991, AC_BLD_0033271 (FF-34A Well Documentation from SoCal.pdf at p. 183)," 1991.

In the data provided, Blade was not able to find documentation with results of the proposed study or if the study was done or not.[371] Also, the FF-34A well file mentioned that the possible external casing corrosion problem in the southeastern portion of the field was to be further studied and a report issued,[372] but Blade was not able to locate any documentation related to this study.[373]

SoCalGas violated Section 451 because it did not have systematic practice to protect surface casing strings against external corrosion,[374] and because it did not understand the consequences of corroded surface casings and uncemented production casings.[375] This violation begins on August 30, 1988, the date SoCalGas produced its Interoffice Memo calling for inspections of the SS-25 casing,[376] and continues to October 23, 2015, the beginning date of the incident.

[redacted] SoCalGas lacked a real-time, continuous pressure monitoring system for well surveillance, which prevented an immediate identification of the SS-25 leak and accurate estimation of the gas flow rate.[377]

On October 23, 2015, the SS-25 well went back on injection between 3 AM and 4 AM.[378] The SS-25 axial rupture likely occurred after injection had started.[379] At the time of failure, SS-25 was injecting gas into the reservoir.[380] The subsequent circumferential parting occurred between 7 AM and 8 AM the same day.[381]

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[371] Blade Report at pp. 173, 203.

[372] Blade Report at p. 2.

[373] Blade Report at p. 2.

[374] Blade Report at p. 5.

[375] Blade Report at p. 5.

[376] Blade Report at p. 218: Southern California Gas Company, "Candidate Wells for Casing Inspection, Aliso Canyon Field, Interoffice Correspondence, August 30, 1988 AC_CPUC_0000064_AC_CPUC_0000066 (SS-25 Well Documentation (from SoCalGas) N.pdf at pp. 42-44)," 1988.

[377] Blade Report at p. 5.

[378] Blade Report at p. 158.

[379] Blade Report at p. 158.

[380] Blade Report at p. 158.

[381] Blade Report at p. 158.

Upon failure, the initial leak rate was 160 million standard cubic feet per day (MMscf/D).[382] 90 MMscf/D from this rate originated from the gas storage reservoir, and the remaining 70 MMscf/D originated from the injection network.[383]

The injection network was capable of supplying this additional gas rate to SS-25.[384] The pressure changes, as the injection network readjusted to supply this additional gas rate to SS-25, were too small to be detected in real time with the surveillance system in operation at the time.[385] To detect the failure in real time, a surveillance system would have had to be monitoring wellhead injection pressures between the chokes and wellheads.[386]

The lack of real-time pressure measurements prevented the immediate identification of the SS-25 7-inch casing failure.[387] The constant monitoring of the tubing, production casing and surface casing pressures will provide better insight into operational deviations in all wells.[388] If this type of system had been installed on SS-25, it would have provided insight into the time of the leak, the opportunity to shut in the well immediately, size of the leak, and the extent of the problem.[389] Furthermore, the information could have used during well-control effort improving the chances of an early success.[390]

The existing field and SS-25 well measurements were used by Blade after the event to analyze the leak.[391] Such measurements could have been analyzed before and during the leak event with models built from data available before the leak.[392]

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[382] Blade Report at p. 158.

[383] Blade Report at p. 158.

[384] Blade Report at p. 158.

[385] Blade Report at p. 158.

[386] Blade Report at p. 158.

[387] Blade Report at p. 233.

[388] Blade Report at p. 233.

[389] Blade Report at p. 233.

[390] Blade Report at p. 233.

[391] Blade Report at p. 127.

[392] Blade Report at p. 127.

Although SoCalGas performed 41 pressure surveys in 41 years, neither the *DOGGR Project Approval Letter nor the SoCalGas Gas Inventory-Monitoring, Verification, and Reporting Company Operations Standard Gas Operations* required pressure surveys.[393] The most recent SS-25 pressure survey occurred on October 21, 2014, to 8,720 feet.[394] Blade's interpretation of the pressure surveys is that they were not effective in determining the presence or location of a casing leak; small leaks would go undetected.[395] From a casing integrity perspective, pressure surveys differ from pressure tests substantially.[396] In pressure surveys, the well is open to the storage zone, and any gas that escapes into a casing leak is replenished by the storage zone.[397] This is considerably different than a pressure test where all external sources of pressure are isolated.[398] Additionally, the pressures observed during these pressure surveys are the shut-in pressures.[399] The pressure profiles during shut-in are lower than during standard gas injection operations.[400] In other words, pressure surveys are taken at times when the casing is under less pressure than during gas injection.[401]

SoCalGas operated Aliso Canyon facility according to a number of Company Operations Standards.[402] These standards provided policy and scope, definitions, responsibility, and procedures that are required to operate the facility on a day to day basis.[403] An example standard is titled Gas Inventory – Monitoring, Verification and Reporting.[404] Blade's interpretation is that SoCalGas complied with the monitoring

[393] Blade Report at p. 199.
[394] Blade Report at pp. 199-200.
[395] Blade Report at p. 199.
[396] Blade Report at p. 199.
[397] Blade Report at p. 199.
[398] Blade Report at p. 199.
[399] Blade Report at p. 199.
[400] Blade Report at p. 199.
[401] Blade Report at p. 199.
[402] Blade Report at p. 202.
[403] Blade Report at p. 202.
[404] Blade Report at p. 202.

components of the Operations Standard titled Gas Inventory – Monitoring, Verification and Reporting.[405] Blade also reviewed SS-25 noise, temperature, and pressure surveys before the incident of October 23, 2015.[406] There were no temperature, pressure, or noise anomalies in the surveys that indicated a preexisting casing failure.[407] Additionally, there were no physical observations from well inspections and weekly pressure measurements that indicated an existing problem.[408]

Figure 169 of the Blade Report, shows the Summary of the Aliso Canyon Monitoring Plan for Storage Zone Wells from the SoCalGas Annual Review Meeting with DOGGR, 1989.[409] The components and frequency of the monitoring plan are listed in Figure 169, but none of them require a real time collection of data.[410] Industry technology has evolved for real time pressure, temperature, flow, and vibration (noise) monitoring but, surprisingly, there were *no* significant differences in the monitoring plan from 1989 compared to the 2014 SCG 224.070 Operations Standard.[411] These documents fail to mention casing inspection logs, pressure testing wells, real time pressure monitoring, investigation of leaks, and RCA.[412]

SoCalGas violated Section 451 by not having a continuous pressure monitoring system for well surveillance because it prevented an immediate identification of the SS-25 leak and accurate estimation of the gas flow rate. This violation lasted from October 23, 2015 to February 12, 2016, the duration of the incident.

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[405] Blade Report at p. 202.

[406] Blade Report at p. 202.

[407] Blade Report at p. 202.

[408] Blade Report at p. 202.

[409] Blade Report at p. A-3.

[410] Blade Report at p. A-4. See Column entitled "Minimum Frequency of Data Collection". None of the entries under this column require collection of data real time. Instead, each shows a less frequent requirement for data collection.

[411] Blade Report at p. A-3. Emphasis in original.

[412] Blade Report at p. A-4.

C. Additional Violations

[redacted] SoCalGas Knew that SS-25 Released Both Crude Oil and Natural Gas During the Aliso Canyon Natural Gas Storage Incident, But Did Not Disclose This Fact to the Los Angeles County Department of Public Health

According to a letter from the Los Angeles County Department of Public Health Deputy Director for Health Protection to SoCalGas's Chief Executive Officer, SoCalGas did not disclose to the Department of Public Health that the natural gas released from October 23, 2015 to February 12, 2016 contained crude oil, thereby impairing the Department of Public Health's ability to timely study the associated health impacts.

This letter, dated March 11, 2019, noted that SoCalGas repeatedly stated during the disaster that the contents of the release were limited only to typical components of stored natural gas, despite the massive quantity of natural gas released from October 23, 2015 through February 2016 containing crude oil. The letter also pointed out that in November 2015, Public Health recommended a complete characterization of air quality using an expanded list of chemicals found in both crude oil and natural gas, but the testing was severely limited and delayed. At that time, the letter provides, SoCalGas knew that crude oil was contained in the natural gas but withheld this information from Public Health[413]

SoCalGas responded to the Department of Public Health [414] asserting "For all the above reasons, your suggestion that SoCalGas somehow withheld information or was otherwise not fully transparent with respect to the components of natural gas released

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[413] See Attachment U, Letter from Mr. Angelo J. Bellomo, MS, REHS, QEP, Deputy Director for Health Protection of Los Angeles County Department of Public Health to Mr. Brett Lane, Chief Executive Officer, Southern California Gas Company, entitled, "ALISO CANYON NATURAL GAS DISASTER FOLLOW-UP REQUEST FOR CRITICAL DATA ELEMENTS", March 11, 2019. Currently available at: https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/News_Room/NewsUpdates/2019/Aliso%20Canyon%20Facility.pdf.

[414] See Attachment V, *Available at:* https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/News_Room/NewsUpdates/2019/Letter-to-Angelo-J-Bellomo-2019-03-21-1.pdf.

during the incident, and your statements concerning DPH's ability to perform a health assessment, are simply incorrect."[415]

The statements in the Los Angeles County Department of Public Health Letter and statements related to that letter identify SoCalGas's failure to furnish reasonable service, instrumentalities, equipment and facilities as are necessary to promote the health of its patrons, employees, and the public, and constitute at least one violation of Section 451. At a minimum, this violation begins at least as early as November 2015, when "SoCalGas knew that crude oil was contained in the natural gas but withheld this information from Public Health,"[416] and continues until at least February 12, 2016, because SoCalGas "repeatedly stated during the disaster that the contents of the release were limited only to typical components of stored natural gas" through that date. These dates and the precise nature of this violation may be modified pending additional testimony from intervening parties to this proceeding with expertise in public health.

[redacted] In Multiple Instances, SoCalGas Did Not Cooperate with SED During Its Pre-Formal Investigation Following the Incident on Aliso Well SS-25 that Began on October 23, 2015

The Assigned Commissioner's Scoping Memo and Ruling (Scoping Memo) asks, "Did SoCalGas cooperate sufficiently with SED and Blade during the pre-formal investigation that preceded the issuance of the OII/OSC?[417] As shown by the list of examples below, SoCalGas has not cooperated with SED's investigation. Each example constitutes a violation of Section 451 because it impaired SED's ability to investigate SoCalGas's practices related to the safe operation of the Aliso Canyon Storage Facility, as it relates to the incident at SS-25. Where identified in the examples, the lack of cooperation also constitutes a violation of Commission Rule of Practice and Procedure Rule 1.1.

[415] See Attachment V, *Available at:* https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/News_Room/NewsUpdates/2019/Letter-to-Angelo-J-Bellomo-2019-03-21-1.pdf.

[416] Attachment U at p. 2.

[417] I.19-06-016, Assigned Commissioner's Scoping Memo and Ruling at p. 4, Question 3.

D. Example 1: SoCalGas Did Not Completely Answer the Discovery of the Aliso Root Cause Analysis Consultants, Blade Energy Partners, and Then Provided a Data Dump As a Supplement These Incomplete Responses Up to Three Years Later, and Weeks Before Blade's Announced Release Date of Its Root Cause Analysis

On March 15, 2019, Blade Energy Partners (Blade) was required to move its estimated RCA date from March 31, 2019 to May 1, 2019.[418] As stated by Blade in explanation of the move.[419]

Just prior to the week of February 27, 2019 SoCal Gas, for the first time, informed Blade that it was supplementing its data responses to certain Blade data requests that Blade issued as part of its RCA, all of which were previously thought to be complete. The original dates of these Blade data requests were Jan 31, 2016, Feb 19, 2016, April 7, 2016, and Feb 18, 2018.

On March 1, 2019 and March 6, 2019 Blade received over 25,000 Bates numbered pages along with electronic files for these 2016-2018 data requests.

Blade is currently reviewing this massive set of data to determine if it significantly impacts the RCA.

The Safety and Enforcement Division is investigating SoCal Gas's timing and practices related to this significant data dump on Blade.

In reaction to Blade's statement, on March 19, 2019, the Commission's Executive Director provided a letter to SoCalGas's Chief Executive Officer which stated in part.

I am writing regarding the Southern California Gas Company's (SoCalGas) March 1 and 6, 2019 supplemental data dump on Blade Energy Partners (Blade). . .

On March 1 and 6 of this year, SoCalGas surprised Blade with over 25,000 pages of data, plus additional electronic files in Excel and other formats. This data dump is allegedly a supplemental data response to questions submitted by Blade to SoCalGas in

[418] *See* https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/News_Room/NewsUpdates/2019/RCA%20timeline%20CPUC%20website.pdf: "Blade Energy Partner's Root Cause Analysis (RCA) – Updated Schedule (3/15/19).

[419] See https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/News_Room/NewsUpdates/2019/RCA%20timeline%20CPUC%20website.pdf: "Blade Energy Partner's Root Cause Analysis (RCA) – Updated Schedule (3/15/19).

2016 and 2018. As SoCalGas was aware, Blade intended to release its RCA of the failure of SS-25 by the end of this month. I am particularly shocked and concerned that SoCalGas would dump these additional 25,000 pages plus of documents and cause delay in the analysis of the well failure. Due to the size and extreme tardiness of SoCalGas's data dump, Blade's RCA will now be delayed as Blade attempts to review, digest, and analyze this new information for purposes of producing its report. . .

SoCalGas's lack of cooperation impaired Blade's ability to deliver a complete RCA in a timely fashion.[420] Each of the four data dumps constitutes its own separate violation of Section 451. Out of an abundance of caution, the beginning date for each violation should not start until two calendar months after Blade issued each data request. The end date of each violation is March 1, 2019, the first of SoCalGas's supplemental data dumps. In short, the violation dates are:

- Violation 1: March 31, 2016 to March 1, 2019.
- Violation 2: April 18, 2016 to March 1, 2019.
- Violation 3: June 7, 2016 to March 1, 2019.
- Violation 4: April 7, 2016 to March 1, 2019.

E. Example 2: Despite SED's Subpoenas to Do So, SoCalGas Did Not Produce Boots and Coots's Team Lead Well Kill Specialist, and Another Boots & Coots Safety Representative, Both of Whom Were Onsite for Certain of the Boots & Coots Efforts to Kill Well SS-25, for SED to Examine Under Oath

On July 11, 2018, SED issued a letter to SoCalGas entitled, "Memorialization of Southern California Gas Company's (SoCalGas) Failure to Cooperate with Safety and Enforcement Division (SED) in SED's Preliminary Investigation". In this letter, SED's director stated,

> I have been informed that SoCalGas is not producing certain of its own contractors for SED to examine under oath, even though SED has requested that SoCalGas produce them to appear at the California Public Utilities Commission

[420] See Attachment A, Letter from Ms. Alice Stebbins, California Public Utilities Commission's Executive Director, to Mr. Bret Lane, SoCalGas Chief Executive Officer, entitled, "Failure of Southern California Gas Company (SoCalGas) to Timely Provide Data to Blade Energy Partners and Request to Modify the Existing Injection and Withdrawal Protocols at Aliso", March 19, 2019.

> (Commission) headquarters in San Francisco, CA. Specifically, SED has requested SoCalGas produced its contractors from Halliburton's subsidiary, Boots and Coots, that were hired as part of SoCalGas's efforts to kill well SS-25. In response to SED's request, SED's counsel learned from SoCalGas's counsel on or about the week of June 18, 2018 that SoCalGas would produce only one of these contractors to talk with SED investigators and attorneys, either by phone, or in Houston.[421]

By not producing all of these requested individuals in person at the Commission headquarters, SoCalGas is not cooperating with SED's direction in this preliminary investigation. . .[422]

SED's letter continued,

> SED puts SoCalGas on notice that it is formally requesting SoCalGas produce at the Commission headquarters in San Francisco the following individuals from Boots and Coots:
>
> Danny Clayton
>
> Danny Walzel
>
> James Kopecky
>
> Mike Baggett[423]

On July 13, 2018, SED served four subpoenas on SoCalGas, each requiring that SoCalGas produce an individual who worked for Boots & Coots.[424] Thus, in total, the subpoenas required SoCalGas to produce four individuals on August 8th and 9th, 2018.[425] With the exception of the name, which was specific to each subpoena, in each of these subpoenas, SED attested as follows:

> [Name of subpoenaed individual-Mr. Clayton, Baggett, Walzel or Kopecky] of Boot & Coots Services, a division of

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[421] See Attachment B, Letter from Ms. Elizaveta Malashenko, Director, Safety and Enforcement Division, CPUC, to Mr. Bret Lane, President and Chief Operating Officers, Southern California Gas Company, dated July 11, 2018.

[422] Attachment B at p. 1.

[423] Attachment B at p. 3.

[424] See Attachments C, D, E, and F. These documents are subpoenas for the appearance of Danny Clayton, Mike Bagget, Danny Walzel, and James Kopecky, respectively. The date of service is shown on the proof of service in each subpoena.

[425] See Attachments C, D, E, and F. These documents are subpoenas for the appearance of Danny Clayton, Mike Bagget, Danny Walzel, and James Kopecky, respectively.

> Halliburton, may have important information that would help the CPUC as it investigates the cause of the Aliso Canyon gas leak. The CPUC understands that Mr. [Clayton, Baggett, Walzel, or Kopecky] is/was an agent of the Southern California Gas Company and was present at the Aliso Canyon facility in or around November 2015 and the ensuring days, and was actively involved in attempting to "kill" the leaking well.[426]

Also on July 13, SoCalGas responded to SED with a letter entitled, "Southern California Gas Company's Response to California Public Utilities Commission Letter dated July 11, 2018". The letter stated in part,

> I am writing on behalf of Southern California Gas Company ("SoCalGas") in response to Ms. Malashenko's letter dated July 11, 2018 regarding SoCalGas' purported failure to cooperate with the Safety and Enforcement Division's ("SED") Preliminary Investigation.
>
> First and foremost, SoCalGas has at all times cooperated—and will continue to cooperate—with SED's investigation of the SS-25 gas leak. However, as SoCalGas has previously stated, it is legally unable to produce current and former employees of an independent, out-of-state, third-party corporation for examination before SED at the California Public Utilities Commission ("Commission") in San Francisco.[427]
>
> SoCalGas has cooperated to the best of its ability with SED's request for an interview with Boots & Coots through discussions with Halliburton, Boots & Coots' parent corporation. SoCalGas has in fact obtained Halliburton's agreement to produce Boots & Coots personnel for such an interview. SoCalGas has also provided SED with contact information for Halliburton's outside counsel and worked diligently to produce non-privileged information in its custody, control or possession related to Boots & Coots' work regarding the gas leak. In fact, Halliburton has agreed that its

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[426] See Attachments C, D, E, and F, Declaration in Support of the Subpoena, point 5.

[427] SoCalGas footnote 1 of Attachment G stated, "Other than Halliburton's limited provision of services to SoCalGas as an independent contractor, SoCalGas and Halliburton are currently unaffiliated. SoCalGas does not own and holds no interest in Halliburton or any of its subsidiaries, and vice-versa."

> current employees can be interviewed via phone, video conference or in person in Houston by the Commission. . .
>
> Unlike its own currently employed employees, which SoCalGas can and must produce for SED examinations under oath (and has, in fact, done multiple times in connection with the SS-25 gas leak, including producing on short notice its President and Chief Operating Officer), SoCalGas cannot order Boots & Coots' personnel to follow SoCalGas directives. Again, SoCalGas has asked for Boots & Coots' cooperation and Boots & Coots has offered it, albeit not in precisely the manner that SED prefers. There is nothing else SoCalGas can do to compel Boots & Coots' employees or former employees to fly to California to appear for an interview. . .
>
> Next, SED contends that because SoCalGas has asserted a (limited) agency relationship with Boots & Coots, during a limited period of time, for the purposes of preserving privilege over certain communications, SoCalGas must ipso facto be required to produce Boots & Coots under section 702 [of the California Public Utilities Code]. The fact that Boots & Coots may be deemed SoCalGas' agent, during a limited period of time, for the limited purpose of assessing attorney-client privilege does not, however, make Boots & Coots SoCalGas' agent in other contexts. That does not change the fact that the two Boots & Coots employees requested by SED were, at all times during the incident, employees of Boots & Coots which was acting as an independent contractor to SoCalGas under a separate contractual agreement.
>
> Contrary to your claim that SoCalGas is trying to "evade[]" SED's investigation and discovery rights" by delegating work to contractors, SoCalGas has in fact cooperated fully with SED's request and arranged for SED to interview Boots & Coots, albeit not on SED's preferred terms. In addition, there is nothing that prevents SED from exercising its own authority to subpoena Boots & Coots directly.
>
> Because SoCalGas has in fact cooperated with SED's request and obtained Halliburton's agreement to submit to an SED

interview, and for the other reasons stated above, SoCalGas respectfully requests that SED withdraw its letter.[428]

SoCalGas's contract with Boots & Coots to do the well kill did not include a provision that required Boots & Coots to subject itself to the same provisions to cooperate with SED's pre-formal investigation that SoCalGas itself was required to follow.[429]

On August, 8, 2018, SoCalGas produced only two of the four subpoenaed Boots and Coots Services employees to be examined under oath by SED.[430] The two individuals who appeared testified that a third subpoenaed individual who did not appear, Ms. Danny Clayton, was a senior well control specialist who joined Messrs. Walzel and Kopecky on a visit to the site.[431] Mr. Clayton was also the team leader of Messrs. Walzel and Kopecky.[432] They also testified that the fourth individual, Mr. Mike Baggett, was the safety representative for Boots & Coots.[433]

As team lead, Mr. Clayton's role was to communicate with the client directly, and coordinated a plan with the client and then Messrs. Walzel and Kopecky would execute the plan.[434] As such, Mr. Clayton was the person to receive information from SoCalGas once Messrs. Walzel, Kopecky and Clayton arrived in Los Angeles to begin work on the Aliso Canyon well SS-25.[435] Mr. Clayton was the main liaison with Mr. Bret Lane of SoCalGas, and "he was in the trailer with him most of the day", and took over receiving information throughout the Aliso incident while both Messrs. Kopecky and Walzel were

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428 See Attachment G, Letter from SoCalGas Assistant General Counsel, Sabina Clorfeine, to SED counsels, Messrs. Nicholas Sher and Darryl Gruen, entitled, "Southern California Gas Company's Response to California Public Utilities Commission Letter dated July 11, 2018.

429 Attachment H, Southern California Gas Company Standard Services Agreement (Agreement 5660044243), Project Standard Senson (Sic) 25, October 30, 2015. (SoCalGas and Boots and Coots Well Kill Agreement).

430 See Attachment I, Examination Under Oath Transcript (Tr.) of Danny Walzel and James Kopecky at pp. 1, 5:10-17.

431 Attachment I, EUO Tr. Walzel and Kopecky at pp. 26:3 – 29:19.

432 Attachment I, EUO Tr. Walzel and Kopecky at p. 41:2-4.

433 Attachment I, EUO Tr. Walzel and Kopecky at p. 119:24-28.

434 Attachment I, EUO Tr. Walzel and Kopecky at p. 80:10-16.

435 Attachment I, EUO Tr. Walzel and Kopecky at pp. 134:1-7, 134:13-22.

on site.[436] Messrs. Walzel and Kopecky reported directly to Mr. Clayton, and Mr. Clayton was making the decision for Boots & Coots about how to move forward with input from the rest of the Boots & Coots team.[437]

Mr. Baggett stayed on site with Messrs. Kopecky and Walzel for approximately one month.[438] Mr. Baggett's main role was to look out after the Boots and Coots team, explain to SoCalGas if Boots & Coots is doing something in a way that might not be normal, and check people in and out of location and keep track of the personnel on location.[439]

Boots and Coots was under contract with SoCalGas to kill well SS-25.[440] SED's review of that contract shows that SoCalGas did not provide a term in that contract that would require Boots and Coots to respond to investigation related inquiries from SED or from Blade.

SoCalGas's failure to produce Mr. Clayton and Mr. Bagget in response to an SED subpoena to do so constitutes two separate violations of Section 451. The beginning date for these violations is August 8, 2018, when neither of them appeared to be Examined Under Oath by SED. As SoCalGas has not produced either of these two individuals, the violation could reasonably continue, but SED will put an end date on the due date of this testimony, November 22, 2019.

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436 Attachment I, EUO Tr. Walzel and Clayton at p. 130:8-12.

437 Attachment I, EUO Tr. Walzel and Kopecky at pp. 80:18, 81:12.

438 Attachment I, EUO Tr. Walzel and Kopecky at p. 120:20-26.

439 Attachment I, EUO Tr. Walzel and Kopecky at p. 121:3-15.

440 See Attachment H- Southern California Gas Company Standard Services Agreement (Agreement 5660044243), Project Standard Senson (Sic) 25, October 30, 2015. (SoCalGas and Boots and Coots Well Kill Agreement)

F. Example 3: Despite SoCalGas Not Producing Boots & Coots's Team Lead Well Kill Specialist, It Refused to Provide Certain Communications Between SoCalGas and Boots & Coots, Including Some Between that Individual and SoCalGas's President and CEO, Claiming Them to Be Privileged As Attorney-Client Communications. SoCalGas Later Revealed Some of the Communications It Initially Claimed to Be Privileged by Attorney-Client Communications

On February 12, 2018, SED Data Request 16 Question 10 specifically asked of SoCalGas, "Please provide any and all communications relating to Aliso Canyon between SoCalGas and Boots and Coots for the time period October 1, 2015 – January 31, 2018.[441]

On March 5, 2018, SoCalGas responded,

"SoCalGas objects to this request to the extent the response involves attorney-client privileged information and/or attorney work product." A list of the documents in response to this data request were not disclosed.[442]

Partly in response to data request 16, SED's July 11, 2018 letter to SoCalGas observed:

SoCalGas has suggested an agency relationship with Boots & Coots via he attached privilege log (Attachment A), where it specifically asserted attorney-client privilege over multiple communications between SoCalGas and Boots and Coots personnel. Then, SoCalGas refused to produce some of those same Boots and Coots personnel for examination under oath on the basis that they were neither employees nor agents of SoCalGas.[443]

[441] See Attachment J-SoCalGas' Supplemental Response Dated March 15, 2019 to Multiple SED Data Requests, Including Portions of Data Request 16 at p. 1. SED initially propounded Data Request 16 February 12, 2018.

[442] See Attachment J-SoCalGas' Supplemental Response Dated March 15, 2019 to Multiple SED Data Requests, Including Portions of Data Request 16 at p. 2. SED initially propounded Data Request 16 February 12, 2018.

[443] See Attachment G at p. 2.

SED specifically noted that "SoCalGas asserts attorney-client privilege-over communications between SoCalGas and Boots and Coots in entries 3, 5, 7, 9, 12, 13, 14, 16, 23, 29, 30, 53 and 54."[444]

As shown by this attorney-client log, several of these communications are between SoCalGas President and CEO, Mr. Bret Lane, and Mr. Clayton, the Boots & Coots team lead, and the same individual SoCalGas did not produce for examination under oath despite SED's letter and subpoena to do so.[445]

On January 3, 2019, SoCalGas supplemented its response to SED Data Request 16, stating:

> As explained in response to Question 1 of SED Data Request 34, SoCalGas has agreed to withdraw its claim of privilege and produce certain additional documents that may be responsive to this Request. Without limiting or waiving any other objections asserted, SoCalGas provides the following Supplemental Response to Data Request 16: please see electronic documents with Bates Range AC_CPUC_SED_DR_16_0043471 – AC_CPUC_SED_DR_16_0043550 (continuous) and the following documents (non-continuous).[446]

The continuous documents totaled 80 pages.[447] Making up the non-continuous documents, the response revealed 15 documents that had previously been marked attorney-client privilege-confidential.[448]

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[444] See Attachment G at p. 2, fn. 3.

[445] See Attachment K-SoCalGas Attorney-client privilege-log in response to SED Data Request 16. For example, see entries 3 and 5.

[446] See Attachment L-SoCalGas' Supplemental Response Dated March 15, 2019 to Multiple SED Data Requests, Including Portions of Data Request 16 at p. 2. SED initially propounded Data Request 16 February 12, 2018.

[446] See Attachment G at p. 2.

[447] Bates number ending in 43550 minus Bates number ending in 43471 equals 80.

[448] See Attachment L-SoCalGas' Supplemental Response Dated March 15, 2019 to Multiple SED Data Requests, Including Portions of Data Request 16 at p. 2. SED initially propounded Data Request 16 February 12, 2018.

[448] See Attachment G at p. 3, showing Bates Numbers at top of page.

On March 15, 2019, SoCalGas released its claim of privilege on a batch of additional documents, stating:

Pursuant to SoCalGas's email communication dated May 11, 2019, SoCalGas has agreed to withdraw its claim of privilege and produce certain additional documents that may be responsive to this Request. Without limiting or waiving any other objections asserted, SoCalGas provides the following Supplemental Response to Data Request 16:"[449]

By SED's count, approximately 18 additional documents were released.[450]

Each of the 95 pages that SoCalGas did not release on the grounds of attorney-client or attorney work product privilege is a Section 451 violation because it delayed SED's ability to get this information as part of its pre-formal investigation. These also constitute separate violations of Commission Rule of Practice and Procedure Rule 1.1 because SoCalGas represented to SED that these items were protected by attorney-client or attorney work product privilege, when they were not. Each of these violations begin March 5, 2018, the date SoCalGas asserted the privilege to January 3, 2019, the day SoCalGas finally released the documents to SED.

The 18 additional communications that SoCalGas did not release until May 11, 2019 each constitute their own violation of Section 451 due to the delay they caused to SED's ability to get this information as part of its pre-formal investigation. They also constituted a violation of Rule 1.1 on the grounds that SoCalGas represented to SED that these items were protected by attorney-client or attorney work product privilege, when they were not. Each of these violations begin March 5, 2018, the date SoCalGas asserted the privilege to May 11, 2019, the day SoCalGas finally released the communications to SED.

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[449] See Attachment L-SoCalGas' Supplemental Response Dated March 15, 2019 to Multiple SED Data Requests, Including Portions of Data Request 16, page 3. SED initially propounded Data Request 16 February 12, 2018.

[450] See Attachment L-SoCalGas' Supplemental Response Dated March 15, 2019 to Multiple SED Data Requests, Including Portions of Data Request 16 at p. 3, showing Bates Number ranges. SED initially propounded Data Request 16 February 12, 2018.

G. Example 4: Blade Asked for Boots and Coots to Appear for Blade to Interview Them as Part of Blade's Root Cause Analysis, But SoCalGas Failed to Produce Boots and Coots for This Purpose

On December 19, 2018, Blade requested of SoCalGas that Boots and Coots appear for questions.[451] In response to Blade's request, SoCalGas asked and re-asked Halliburton to produce Boots & Coots personnel to answer Blade's questions related to the Root Cause Analysis (RCA) investigation,[452] reminding Halliburton that Blade's RCA investigation was independent of SED's.[453]

However, on January 24, 2019, Boots and Coots's representative stated in part as follows:

> As you know, Boots and Coots has been cooperative with the California Public Utilities Commission with respect to the investigation including taking employees to interviews in California at the CPUC to provide testimony in its investigation. Additionally, Boots and Coots has provided a number of documents responded to questions and provided a multitude of information related to its work at Aliso Canyon to California agencies and Southern California Gas.
>
> After reviewing the further request for information and interviews from Blade, my client believes that it has provided all of the relevant information related to the Blade inquiry as mentioned above. . .
>
> Based on the above, my client is not willing to provide any further information as requested by Blade in its letter.[454]

Because SoCalGas failed to contract in its Master Services Agreement with Halliburton and Boots and Coots in a fashion that explicitly required Boots and Coots to address inquiries from Blade in the fashion Blade requested, Boots and Coots did not respond to a direct request from Blade that was within the course of Blade's duties to

[451] See Attachment M, "Request for Factual Data Verification Discussion December 19th, 2018-Boots and Coots".

[452] See Attachment N, "Email thread from SoCalGas outside counsel, James Dragna, to Halliburton's counsel, Michael Helsely, January 7-8, 2019. See also Attachment Q, "Email Correspondence Between James Dragna (SoCalGas counsel) and Michael Helsley.

[453] See Attachment O, "Email thread between SoCalGas outside counsel, James Dragna, Halliburton's counsels, Timothy Jones and Michael Helsley, January 25, 2019, and February 22, 2019.

[454] See Attachment P, Letter from Boots and Coots Counsel, Timothy Jones, to SoCalGas Outside Counsel, James Dragna, dated January 24, 2019.

perform its Root Cause Analysis. As such, SoCalGas's failure to contract in this fashion violated Section 451. The violation begins on January 24, 2019, the date the Boots & Coots representative refused to produce the Boots & Coots officials, and continues until May 19, 2019, the date of the release of the Blade Report.

H. Example 5: In Response to SED's Question Asking Whether SoCalGas Disclosed to Non-SoCalGas Entities Anything that Would Reveal That SED Was Conducting EUO's, SoCalGas Revealed that It Had Communicated with Counsel representing Pacific Gas and Electric Company and Counsel Representing Southern California Edison Company

SED asked SoCalGas, "Have any personnel representing or working for Southern California Gas Company disclosed to others who do not work for Southern California Gas Company anything that would reveal that SED is conducting these EUO's?"[455]

SoCalGas revealed in response to this data request that, "SoCalGas had conversations with counsel representing the Pacific Gas and Electric Company [PG&E] and counsel representing Southern California Edison Company [Edison] regarding legal principles related to the attendance of counsel at EUOs."[456]

In the first SED Examination Under Oath, counsel for SoCalGas clarified, "Just a point for the record based on our off-the record-conversation. First, it's our understanding that the transcript is and shall remain confidential."[457]

SoCalGas's discussions about the nature of the presence of counsel at SED's EUO's constitutes a violation of the understanding of SoCalGas counsel to keep the EUO contents confidential, which includes discussing with other utilities whether counsel was present for them. Revealing such information breached SoCalGas's promise to treat the EUO transcripts confidential, and compromised the ability of SED to keep the contents of its safety-related pre-formal investigation confidential, thereby violating Section 451 on two counts; one for each of the two communications with PG&E's and Edison's counsel. In addition, by breaking its promise on the record to keep the contents of SED's EUO

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[455] See Attachment Q, SoCalGas Response to SED Data Request 23, Dated August 14, 2018.

[456] See Attachment Q at p. 2.

[457] See Attachment R, Examination Under Oath of Bret Lane at p. 10:27 – 11:3.

confidential, SoCalGas violated Commission Rule of Practice and Procedure Rule 1.1. Each violation begins on August 14, 2018, the date that SoCalGas formally disclosed its breach of confidentiality until June 26, 2019, the date SED's pre-formal investigation ended, and the day before the date that the Commission opened the instant proceeding.

I. Example 6: SoCalGas Intentionally Did Not Appear for a Deposition Despite of a Commission-Issued Subpoena Requiring It to Do So[458]

SoCalGas intentionally did not appear for a deposition by Safety and Enforcement Division on November 1st, 2019. This is shown by the transcripts of that deposition,[459] and the email correspondence between SoCalGas's and SED's counsel (SoCalGas Intent to Not Appear for Deposition Email).[460]

As shown by the "SoCalGas Intent to Not Appear for Deposition Email", SED clarified that:

> . . .SoCalGas intends to file a motion to quash the subpoena for SoCalGas's person or person(s) most knowledgeable related to the PHC transcripts pages 88-90 and related documents to appear at the Commission headquarters at 505 Van Ness Avenue. . .SoCalGas's motion to quash is not sufficient to cancel the deposition. Short of the ALJ granting the motion to quash the subpoena, it is SED's position that SoCalGas is still required to attend the deposition. Failure to do so will constitute another failure on SoCalGas's part to cooperate with the investigation of Safety and Enforcement Division."[461]

In its response in the SoCalGas Intent to Not Appear for Deposition Email, SoCalGas stated,

[458] This example occurred during the OII; not the pre-formal investigation. However, SED was unaware that SoCalGas would continue to not cooperate during the OII.

[459] See Attachment S. Tr. Statement of Non-Appearance, November 1, 2019 at p. 1:5-28.

[460] See Attachment T. Email correspondence between SED Staff Counsel, Mr. Darryl Gruen, and SoCalGas Senior Counsel, Ms. Avisha Patel, dated October 30 and October 31, 2019.

[461] See Attachment T. SoCalGas Intent to Not Appear for Deposition Email.

[redacted]"*SoCalGas has consistently cooperated with SED's investigation and, in fact, that was the purpose of my call yesterday.* **I left you a courtesy voicemail letting you know that were filing our motion to quash today so that you could timely cancel the court reporter. . .To confirm your understanding:** ***we are filing the motion to quash today and we will not be attending the deposition tomorrow.***[462] **(Emphasis added).**

On October 22, 2019, SED timely served SoCalGas with a subpoena "to have the Person or Persons most knowledgeable at SoCalGas about SoCalGas' allegations that SED's "lead investigator" interfered with the RCA into the Aliso Gas leak, appear at the Commission's offices at 505 Van Ness Avenue, San Francisco at 10:00 a.m. on November 1, 2019.[463]

At SoCalGas's request, SED met and conferred with SoCalGas once, and in response to SoCalGas's request to meet again, agreed that SoCalGas could file its motion to quash.[464]

By intentionally not appearing at a deposition, SoCalGas impaired SED's safety-related inquiries in the instant proceeding, thereby violating Section 451. This violation begins November 1, 2019, the date SoCalGas did not show up for the deposition. SED views this violation as not yet having an end date as of the publication of this testimony because SoCalGas has not yet remedied it.

1. SoCalGas Did Not Keep Traceable, Verifiable, Complete or Accurate Records That Were Necessary for the Safe Operation and Maintenance of Its Wells at Aliso Canyon Natural Gas Storage Facility

[462] See Attachment T. SoCalGas Intent to Not Appear for Deposition Email.

[463] See Attachment U-Email from SED Counsel Nicholas Sher to SoCalGas Counsel Sabina Clorfeine providing service of subpoena, and attached subpoena.

[464] See Attachment V, Email Communication Between SED Counsel Nicholas Sher and SoCalGas Outside Counsel, Pejman Moshfegh, dates October 28, 2019 to October 29, 2019.