SCG RAMP REPORT

Risk Assessment Mitigation Phase

(SCG/SDG&E-RAMP-A)

Overview and Approach

May 17, 2021

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RAMP-A: OVERVIEW AND APPROACH

I. RAMP OVERVIEW

A. Introduction

San Diego Gas & Electric Company (SDG&E) and Southern California Gas Company (SoCalGas) (individually, Company, and collectively, Companies) present their respective 2021 Risk Assessment Mitigation Phase (RAMP) Reports (or Report). The 2021 RAMP Reports continue the Companies' risk-informed decision-making framework processes and the journey of the California investor-owned utilities' (IOUs) efforts over the past several years by incorporating in this Report the "quantitative approach to risk assessment and risk prioritization"[1] approved by the Commission in D.18-12-014, the Safety Model Assessment Proceeding (S-MAP) Settlement Agreement Decision (Settlement Decision).

The instant RAMP proceedings are considered the first phase of each Company's next General Rate Case (GRC), Test Year (TY) 2024. "The purpose of the RAMP is 'to examine the utility's assessment of its key risks and its proposed programs for mitigating those risks.'"[2] Consistent with this purpose, the 2021 RAMP Reports focus on each Company's key safety risks and the current and proposed activities to help mitigate those risks. Specifically, SDG&E's Report presents nine risk chapters (eight of which are specific to SDG&E), SoCalGas's Report presents seven risk chapters (six of which are specific to SoCalGas), and each Company's Report contains one joint risk chapter (Cybersecurity).

RAMP-A provides an overview of

- the requirements for the Companies' RAMP Reports (including the ten major components and the workshop requirement);
- how the Companies have met the requirements;
- changes and updates to the Companies' 2021 RAMP Reports, along their development timeline, including responses to intervenor comments and workshop feedback;
- the guiding principles behind the Reports; and
- the organization of each risk chapter.

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1 Decision (D.)18-12-014 at 28.

2 D.14-12-025 at 31 (citation omitted).

The selection of RAMP risks is described in each Company's RAMP Chapter B. Each identified RAMP risk is discussed in detail in the individual risk chapters associated with a particular risk event[3] and complies with the directives in the Settlement Decision, as discussed below and in Chapter C.

B. Summary of RAMP Requirements

Although these are not the Companies' first RAMP Reports implementing the methodologies and processes adopted in the Settlement Decision,[4] the 2021 RAMP Reports will be the first associated with a subsequently filed GRC Application for the Companies.[5] The 2021 RAMP Reports were developed in accordance with Commission guidance and the directives adopted in D.14-12-025, D.16-08-018, the Settlement Decision, and D.20-09-004.[6] The Reports also reflect lessons learned from the Companies' 2019 RAMP Reports as well as from the RAMP filings of Pacific Gas and Electric Company (PG&E) and Southern California Edison Company (SCE). As required by the RAMP 2019 Final Decision, the Reports also "address and consider…the comments and suggestions by intervenors regarding the 2019 RAMP Report and further improvement of the RAMP process."[7]

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[3] D.18-12-014 at Attachment A, A-2 – A-4, provides a glossary of the terms used in this 2021 RAMP Report.

[4] *See* D.18-12-014, which adopted the S-MAP Settlement Agreement with modifications and contains the minimum required elements to be used by the utilities for risk and mitigation analysis in the RAMP and GRC.

[5] D.20-09-004 (2019 RAMP Final Decision) closed the Companies' 2019 RAMP proceedings and clarified that the Companies' respective 2019 RAMP Reports would not be integrated into each Company's next GRC Application.

[6] In addition to the RAMP requirements set forth in various risk-related proceeding directives, the Companies' TY 2019 GRC Decision (D.19-09-051) required inclusion of a re-testing implementation plan related to pipelines under the Pipeline Safety Enhancement Plan (PSEP) Phase 2B as part of SoCalGas's 2019 RAMP filing, and provides specific items to be included in this plan. (D.19-09-051, Ordering Paragraph 15 at 779-780.) As discussed in SoCalGas's 2019 RAMP Report (at page RAMP A-3), SoCalGas requested and received approval from the CPUC Executive Director for an extension of time to comply with this requirement. In compliance with the authorized extension (*see* Letter from CPUC Executive Director Alice Stebbins, dated November 14, 2019), SoCalGas will include the required re-testing implementation plan as part of its TY 2024 GRC Application.

[7] D.20-09-004 at 18-19 (Ordering Paragraph 1). This chapter (RAMP-A) includes discussion of intervenor feedback that has been incorporated into the Companies' RAMP Reports. RAMP-E includes discussion of all types of feedback, including feedback that has been considered but has not been incorporated into the Companies' RAMP Reports.

In brief, the Settlement Decision adopted the following required steps:[8]

- Building a Multi-Attribute Value Function (MAVF) (Step 1A);
- Identifying Risks for Investor-Owned Utilities' Enterprise Risk Register (Step 1B);
- Risk Assessment and Risk Ranking in Preparation for RAMP (Step 2A);
- Selecting Enterprise Risks for RAMP (Step 2B); and
- Mitigation Analysis for Risks in RAMP (Step 3).

The Companies' compliance with Steps 1A and 3 of the Settlement Decision are set forth in detail in Chapter SCG/SDG&E RAMP-C. The Companies addressed the requirements in Steps 1B and 2B of the Settlement Decision in Chapters SCG/SDG&E RAMP-B. The workshop requirement in Step 2A of the Settlement Decision is discussed in this Chapter. Addressing the feedback received, as discussed in Step 2A of the Settlement Decision, is addressed in this chapter and also in detail in Chapter SCG/SDG&E RAMP-E.

In addition to the above, the Settlement Decision also required utilities to satisfy the "Ten Major Components of RAMP Filings."[9] A roadmap demonstrating compliance with the ten components of RAMP filings is provided below.

II. SUMMARY OF APPROACH TO MEET RAMP REQUIREMENTS

This section explains how the Companies have complied with the Settlement Decision's "Ten Major Components of RAMP Filings"[10] and the requirement to host a publicly noticed workshop. This section also describes where the Companies have changed and updated their 2021 RAMP Reports, including changes and updates in response to intervenor comments, consistent with the Commission's directive in the 2019 RAMP Final Decision as well as workshop feedback.[11]

A. Approach to Complying with the Settlement Decision's Ten Major Components of RAMP Filings and Roadmap.

The Companies' approach to compliance with the Settlement Decision's enhanced ten major components and a roadmap explaining where these components are addressed in the

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8 D.18-12-014 at Attachment A, A-4.

9 *See* D.18-12-014 at 33-35 (citing D.16-06-018).

10 D.18-12-014 at 33-35.

11 Intervenor comments and workshop feedback are also addressed in SCG/SDG&E RAMP-E.

Reports is provided below. Together with the enterprise risk management framework presented in Chapters SCG RAMP-B and SDG&E RAMP-B, this approach satisfies the Cycla ten-step evaluation process, as enhanced by the Settlement Decision.[12]

1. **Identify top risks.** The Companies identified their respective top risks as part of developing their respective 2020 Enterprise Risk Registries (ERR), which were used as the starting points for the RAMP Reports. Details of the ERR process are described in each Company's respective RAMP-B chapters.
2. **Describe the controls or mitigations currently in place.** Consistent with the GRC methodology of starting with the last year of recorded information, the Companies generally consider mitigations that were in place as of the end of 2020 to be controls and denotes these existing mitigations with a control ID. The baseline costs represent actual costs incurred for controls in 2020. The controls are identified and discussed in Section III of each risk chapter. Baseline and forecasted costs and units for the controls are identified in Section V of each risk chapter.
3. **Present plan for improving the mitigation of each risk.** Section IV of each risk chapter includes a table identifying the existing and planned new mitigating activities that represent the risk mitigation plan for that risk. Planned new mitigations, *i.e.*, mitigations that are planned to begin after the start of 2021, are denoted with a mitigation ID. Controls that are expected to continue maintain their control ID. The Companies plan to request funding for the risk mitigation plans described in each of the individual risk chapters in their next GRC applications, which will be filed by May 15, 2022.[13]
4. **Present two alternative mitigation plans that were considered.** Section VI within each of the individual risk chapters present at least two considered alternative mitigations with associated costs and Risk Spend Efficiencies (RSEs). The Companies' alternative mitigation plans presented in the RAMP Reports are

[12] D.18-12-014 at 33-35.

[13] The risk mitigation plans are contingent on resource availability, permitting, operational compliance, unanticipated events, and other factors, and therefore the Companies' identified mitigations may be subject to constraints and/or delays.

specific individual activities that were considered in the process of determining the Companies' risk management efforts but are not currently proposed.[14]

5. **Present an early stage "risk mitigated to cost ratio" or related optimization.** The Companies calculated an RSE for each mitigation at the identified tranche, where feasible, and provided a summary of the post-mitigation Likelihood of Risk Event (LoRE), Consequence of Risk Event (CoRE), and risk score analysis within each individual risk chapter. Details of the pre- and post-mitigation analysis are included in the workpapers. As discussed further in Chapter SCG/SDG&E RAMP-C, an explanation is provided in Section V of the applicable risk chapter where an RSE is unavailable for a particular mitigation (consistent with SPD guidance).[15] In addition, Appendix C-1 provides a ranking of each Company's mitigations by RSE, where an RSE analysis is performed, consistent with the Settlement Decision.[16] Mitigations with RSEs are listed in descending order by RSE.

6. **Identify lessons learned in the current round to apply in future rounds.** Consistent with the approach the Companies took when preparing their 2019 RAMP Report under the current S-MAP framework, "lessons learned" from the Companies' 2019 RAMP proceeding, as well as from the RAMP filings of PG&E and SCE are discussed in Chapter SCG/SDG&E RAMP-E. The SCG/SDG&E RAMP-E discussion also meets the RAMP 2019 Final Decision's requirement to "address and consider … the comments and suggestions by intervenors regarding the 2019 RAMP Report and further improvement of the RAMP process."[17]

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[14] Although an increase/decrease in the scope of activities may be a feasible approach to alternatives, the individual risk chapters (with the exception of the Cybersecurity risk chapter) do not take this approach, based on feedback from the Commission's Safety and Policy Division (SPD).

[15] *See* Safety Policy Division Staff Evaluation Report on PG&E's 2020 Risk Assessment and Mitigation Phase (RAMP) Application (A.) 20-06-012 (November 25, 2020) at 5 ("SPD recommends PG&E and all IOUs provide RSE calculations for controls and mitigations or provide an explanation for why it is not able to provide such calculations.").

[16] D.18-12-014 at Attachment A, A-14 (Mitigation Strategy Presentation in the RAMP and GRC).

[17] D.20-09-004 at 18-19 (Ordering Paragraph 1).

7. **Move toward probabilistic calculations, to the maximum extent possible.** The 2021 RAMP Reports apply the probabilistic analysis required by the Settlement Decision, and make strides toward incorporating more probabilistic analysis than in the 2019 Report. The Companies will continue working toward a more probabilistic analysis in future RAMP reports, as further discussed in Chapter SCG/SDG&E RAMP-C.
8. **For those business areas with less data, improve the collection of data and provide a timeframe for improvement**. The Companies continue to position themselves to continually improve data collection efforts and therefore improve the risk assessment process. Further discussion on data collection can be found in Chapters SCG/SDG&E RAMP-C and E.
9. **Describe the company's safety culture, executive engagement, and compensation policies.** Chapters SCG RAMP-D and SDG&E RAMP-D are dedicated to describing the Companies' respective safety cultures, executive engagement, and compensation policies.
10. **Respond to immediate or short-term crises outside of the RAMP and GRC process.** Although the 2021 RAMP Reports identify the Companies' respective key safety risks, the Companies respond to immediate or short-term needs outside of the RAMP efforts and continually manage risk. An example is the unexpected and unprecedented need for the Companies to assess and reprioritize certain resources beginning in early 2020 to address the health and safety issues associated with the COVID-19 Pandemic, as described in SCG-CFF-3 and SDG&E-CFF-3.

B. RAMP Workshop Requirement

The Settlement Decision requires the Companies to host a publicly noticed workshop in preparation for the RAMP filing. Based on interest, the Companies hosted two workshops that were properly noticed and held on October 15, 2020, and January 27, 2021. The Companies also held a pre-filing technical sub-workshop on November 17, 2020. The intent of the workshops was to inform and educate stakeholders and SPD regarding the Companies' upcoming filings and

gather input from stakeholders. As required by the Settlement Decision,[18] the Companies provided the following information to the interested parties on October 1, 2020, in advance of the first workshop:

- their preliminary list of RAMP risks;
- the safety risk score for each risk in the ERRs; and
- the multi-attribute risk score for the top ERR risks.

The Companies appreciate the input received during the workshops, which has been incorporated or otherwise addressed, as described below, in the 2021 RAMP Reports.[19]

C. Changes from the 2019 RAMP

The Companies informed stakeholders during the October 15, 2020 workshop of the following broader changes made from the 2019 RAMP Reports, primarily based on stakeholder feedback up to that point.

1. Change to Risk Spend Efficiency Approach

The Companies informed stakeholders at the workshop of their intention to review all current and newly planned activities to evaluate the usefulness and ability to create an RSE, and that an RSE value would be included when meaningful data or SME judgment is available. The Companies will provide an explanation for each mitigating activity without an RSE value. This approach incorporates feedback on the Companies' 2019 RAMP Reports, in which the Companies generally did not calculate RSE values for mitigations that are performed to maintain compliance with state and federal mandated requirements that were controls.

The Companies also informed workshop participants that a single RSE value would reflect the forecast cost of a mitigation and not a range of RSE values (as the Companies presented in their 2019 RAMP Reports), in response to previous stakeholder feedback.

2. Incorporation of Additional Attributes

The workshops also provided information regarding the Companies' intent to include a fourth attribute to the MAVF that would focus on the impacts to customers, employees, public,

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[18] D.18-12-014 at Attachment A, A-10.

[19] For example, the Companies considered input received from SPD and other interested parties in determining the modeling of a fourth MAVF attribute (*see* SCG/SDG&E RAMP C). In accordance with the Settlement Agreement (D.18-12-014 at Attachment A, A-10), the Companies also considered input in determining a final list of risks to be addressed in the RAMP Report.

government and/or regulators from a risk event, based in part on previous stakeholder feedback. The idea of incorporating this fourth attribute is to provide a means to capture how risk events affect customers, employees, public, government and/or regulators that are not captured in the other attributes. By adding an attribute to their MAVF, the Companies are the first in the State to apply a fourth attribute beyond the minimum attributes of safety, financial, and reliability in their RAMP Reports. Discussed below (Section II-D-2) are additional details regarding the evolution of that fourth attribute. The Companies also updated lower level attributes of the MAVF. An "acres burned" sub-attribute was added to the safety attribute.

3. Modeling Public Safety Power Shut-off (PSPS) De-Energizations

SDG&E informed stakeholders that within its Wildfire risk chapter (SDG&E-Risk-1), PSPS impacts would be modeled as a risk that impacts the overall total wildfire risk score, as well as a mitigation to the wildfire risk. Although PSPS might be considered by some stakeholders as a separate risk, PSPS events are directly tied to wildfire mitigation and would not otherwise independently exist. Furthermore, without PSPS, the wildfire risk would be significantly higher. SDG&E thus calculates PSPS impacts as an aspect to the wildfire risk and calculates an RSE for PSPS as a mitigation. SDG&E informed stakeholders that, because PSPS as a mitigation has an impact to customers, the overall wildfire risk assessment comprises two components: the risk of a catastrophic wildfire and the PSPS impacts to customers. Thus, the impact of PSPS is incorporated into the mitigation and the risk assessment.

4. Additional Number of Tranches

The Companies informed workshop participants of their intent to subdivide to a greater degree the risk-reducing activities into tranches. As in the previous RAMP, and as described in more detail below in Section D.3 and RAMP-E, this current RAMP filing reflects the subdivision of risk-reduction activities via a multi-tiered methodology. In addition to some of the risks in the 2021 RAMP now having more tranched mitigations than similarly scoped risks in the 2019 RAMP, the Companies have also identified a larger number of mitigations with additional tiers in the 2021 RAMP.

Many of the additional first tier tranched mitigations – mitigations that have their own risk profiles – are the result of an increased understanding of RAMP qualifying criteria by members of the business units and quantitative analysis teams who have been through multiple RAMP and risk spend accountability report cycles. An example of a first-tier tranched

mitigation is in the Electric Infrastructure Integrity (EII) chapter, where underground cable is discussed and quantified separate from electrical switching equipment. In this regard, the mitigation discussed is considered a tranched mitigation.

A second tier occurs among a particular asset class where the risk profiles of that asset can be subdivided further. Using the same example as above, and new for the 2021 RAMP, electrical switching equipment has been tranched into three separate subdivisions, each with its own quantitative analysis, including cost, risk reduction, and RSE. Similarly new for the 2021 RAMP, for some gas instances, pipeline assets have been further tranched into two separate subdivisions, each with its own quantitative analysis, including cost, risk reduction, and RSE.

5. Consolidation of Dig-In Risks Into One Risk Chapter

The Companies informed workshop participants of their intent to consolidate risks associated with dig-ins on the medium pressure pipeline system and dig-ins on the high-pressure pipeline system into one risk chapter, titled Excavation (Dig-In) Damage to the Gas System (SCG-Risk-2 and SDG&E-Risk-7). Consolidating these risks into one chapter is an efficient and effective way to show that the majority of mitigations included in the control and mitigation plan are essentially the same, streamlining the review of the risk activities for stakeholders. As applicable, the mitigations are tranched reflecting the different risk profiles associated with high and medium pressure pipelines.

6. Inclusion of Internal Labor

Internal labor for applicable baseline controls (*e.g.*, internal labor to attend training, adhering to internal protocols or standards, internal time spent at meetings, etc.) is now generally included in the baseline and forecasted cost estimates in the Reports.

7. Creation of Cross-Functional Factors

In response to feedback received, the Companies created cross-functional factor (CFF) volumes to address some of the various topics raised by parties that would not be standalone risk chapters. CFFs, similar to the cross-cutting factors first presented by PG&E in their 2020 RAMP submission, provide additional information regarding foundational, safety-related initiatives that are associated with more than one RAMP risk.

For example, the Companies have included a Safety Management Systems (SMS) CFF, in part based on Commission guidance in the TY 2019 GRC Decision that many of the Office of the Safety Advocate's (OSA) recommendations in that proceeding were "better addressed in

SoCalGas' next RAMP filing."[20] OSA offered several suggestions regarding enhancements to the Companies' respective safety culture and safety management systems, in particular, integration of American Pipeline Institute (API) Recommended Practice (RP) 1173. Accordingly, the Companies are including supplemental information on safety culture and their safety management systems in Chapter RAMP-D of their respective RAMP Reports and Safety Management Systems CFF volumes (SDG&E-CFF-7 and SCG-CFF-6).

D. Changes and Responses Subsequent to the October 15, 2020, Pre-RAMP Filing Workshop

The Companies also incorporated additional changes to their approach in the RAMP Reports following the October 15, 2020, pre-filing workshop, as described below.

1. Fourth Attribute

The Companies presented a preliminary MAVF[21] at the October 15, 2020 workshop, with the understanding that the risk quantification framework may evolve prior to filing the RAMP Report (as permitted by the Settlement Decision). Representatives from the Protect our Community Foundation (PCF) and The Utility Reform Network (TURN) both raised questions during the first workshop regarding the Companies' new fourth attribute, which at the time was called "Trust/Reputation." PCF questioned whether the attribute was – either intentionally or unintentionally – a way to consider the financial impact of a risk event on shareholders. TURN commented that it is not necessarily opposed to inclusion of the attribute but believes that specifications of the attribute are incomplete and that additional clarity is needed to avoid overlap with other attributes.

Based on this feedback, the Companies changed the name of their fourth attribute from Trust/Reputation to Stakeholder Impacts, to better reflect the attribute's intent and function, and provided information regarding this update to stakeholders at the January 27, 2021 workshop. The Companies explained that the elements of the attribute and the anticipated modeling remained the same. Stakeholders again voiced concerns similar to those expressed during the first workshop.

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[20] D.19-09-051 at 97.

[21] The Company refers to its MAVF herein as the Risk Quantification Framework (*see* discussion in SCG/SDG&E RAMP-C).

Subsequent to the second workshop, the Companies continued to review stakeholder feedback along with the intended use of this fourth attribute and again made modifications – changing the name to "Stakeholder Satisfaction," and also changing the weighting of the attribute to 2% instead of 5%, among other modifications. Additional information regarding this revised fourth attribute is provided in Chapter SCG/SDG&E RAMP-C.

2. MAVF Weights

The Companies changed the final weight of the Reliability MAVF attribute to 23% (from an initial 20% weighting estimate) and the final weight of the fourth attribute to 2% (from an initial 5% weighting estimate), to align with the changes to the fourth attribute described above. The weight of the other two MAVF attributes did not change.

3. Granularity of Tranching

As a follow-up to discussions during the October 15, 2020 workshop, the Companies held a technical sub-workshop on November 17, 2020, regarding tranching. As a result of discussions during this workshop, the Companies agreed to further examine how appropriate tranching could be applied consistently at the risk event level wherein one such result was the appropriateness to tranche mitigations that were occurring in High Consequence Area (HCA) locations separate from non-HCA locations. HCAs are areas along the gas transmission right-of-way where there is increased building density or a proximity to certain types of gathering locations where there is an expected concentration of population. Areas of known greater consequential impact to the public have different risk profiles compared to high pressure pipe not located in an HCA.

While tranches had previously been discussed, it continued to be an area of potential confusion, which warranted a separate working group discussion on November 17, 2020 and further elucidation here. Tranches are subdivisions of a group of assets or systems that align with different risk profiles.[22] As TURN indicated, "all of the assets in each tranche should be grouped so that there are no significant differences in either the LoRE or the CoRE of those assets. If there is a meaningful difference, the asset group needs to be broken out into more granular tranches."[23] The Settlement Decision states "[t]he determination of Tranches will be

[22] *See* Settlement Decision, Appendix A at A-11 ("Definition of Risk Events and Tranches").

[23] TURN Informal Comments (February 12, 2021) at 1.

based on how the risks and assets are managed by each utility, data availability and model maturity, and strive to achieve as deep a level of granularity as reasonably possible."[24] In preparing their 2021 RAMP Reports, the Companies' used a multi-step approach to subdivide assets and systems into groups of different risk profiles that align with how the risks and assets are managed by the Companies. This is discussed further in SCG/SDG&E RAMP-E.

III. GUIDING PRINCIPLES

The Companies strive to provide uniformity and transparency in their risk presentations. The section below outlines the main assumptions and guiding principles that were globally applied throughout their 2021 RAMP Reports.[25] Many of these global assumptions resulted from lessons learned and are therefore also discussed in Chapter SCG/SDG&E RAMP-E.

A. The Risk Quantification Framework Analyzed Direct and Secondary Impacts

As discussed in Chapter SCG/SDG&E RAMP-C, direct and secondary impacts were analyzed for each risk event. An example of an event with a secondary impact is a prolonged power outage which leads to inoperable traffic lights that could result in an automobile accident, the consequences of which may include a serious injury and/or fatality. Each risk has its own impact model, but data regarding impacts that happen after the initial event may be difficult to discover and to utilize.

B. Presentation of Costs to Align with Risk Reduction Benefits

The purpose of RAMP is not to request funding. Any funding requests will be made in the Companies' TY 2024 GRC applications, currently anticipated to be filed in May 2022, with supporting testimony. There, costs associated with activities presented in the 2021 RAMP Reports will be updated to, among other things, put forth specific dollar requests for funding. Accordingly, the Companies present cost information in the 2021 RAMP Reports in ranges of dollars that represent those costs for which the Companies anticipate requesting recovery in the TY 2024 GRC.

Costs are also presented in the 2021 RAMP Reports after accounting for shared service allocations to align the costs with the company that is experiencing the risk reduction benefits,

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[24] Settlement Decision, Appendix A at A-11 ("Definition of Risk Events and Tranches").

[25] Unless otherwise noted throughout the 2021 RAMP Report, these global assumptions and parameters apply to all risk areas.

consistent with RSE calculations. As explained in the TY 2019 GRC testimony, "Shared services are activities permitted by the Affiliate Transaction Rules Decision (D.) 97-12-088 that are performed by SDG&E and SoCalGas departments that are designated as utility Shared Services departments (*i.e.*, functional area) for the benefit of: (i) SDG&E or SoCalGas, (ii) Sempra Energy Corporate Center (Corporate Center), and/or (iii) any Sempra unregulated subsidiaries. Shared Assets are assets that are on the financial records of one utility, but also benefit other Sempra Energy affiliates."[26] The details providing where the costs are incurred, the shared allocation percentages, and the costs after allocations are shown in the workpapers.

As discussed in more detail in SCG/SDG&E RAMP-C, the baseline costs of controls and mitigations for the 2021 RAMP Reports are the costs incurred in 2020. This is because, at the time of finalizing these RAMP Reports, the last available recorded annual financial data was 2020. Modeled after the GRC presentation, the cost forecasts presented herein include forecasts for anticipated capital expenditures over the forecast years of the next GRC cycle (2022-2024) and estimated O&M cost forecasts for TY 2024. The 2021 RAMP Reports present capital costs as a sum of the years 2022, 2023, and 2024 as a three-year total, whereas O&M costs are presented for TY 2024. All dollars are presented in direct (*i.e.,* does not include company overhead costs such as medical), constant 2020 thousands of dollars. Costs are also, where possible, assigned to one risk chapter. However, in a few cases within the RAMP Reports, a mitigation may help mitigate more than one risk and therefore may be included in multiple chapters.

The Companies provide cost and risk reduction benefit information in a consistent manner in the 2021 RAMP Reports. As such, risk reduction benefits: (1) are estimated for years 2022, 2023, and 2024 for capital programs and TY 2024 for O&M activities; (2) represent the benefiting company (*i.e.*, after company allocations); and (3) are compared for purpose of calculating a RSE to a baseline of 2020, other than the Wildfire risk chapter.[27] Consistently providing cost and benefit information in RAMP and for the same years as the GRC is anticipated to better enable RAMP-to-GRC integration and minimize changes, to the extent

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[26] A.17-10-007 (cons.). Exhibit SCG-34-2R/SDG&E-32-2R, Testimony of James Vanderhye, Shared Services & Shared Assets Billing, Segmentation & Capital Reassignments (April 6, 2018) at JV-1.

[27] SDG&E's Wildfire risk Chapter (SDG&E-Risk-1) uses 2021 as the baseline for RSE calculations due to the significant risk reduction expected in 2021 compared to 2020.

possible, between RAMP and GRC filings. Section V of each risk chapter presents a summary of the baseline and forecasted costs, units, and RSEs for each control and mitigation by tranche.

The Companies' accounting systems are not configured to capture all costs for the level or type of risk-management activities anticipated by the RAMP process – instead, costs are tracked by cost center (O&M) and budget code (capital). Estimates, assumptions, and available accounting data were provided by SMEs where feasible. Lessons learned associated with the level of detail and specifically for tranches are provided in Chapter SCG/SDG&E RAMP-E.

1. Treatment of Risk Mitigating Activities Presented in Risk Chapters

These RAMP Reports provide analyses of activities within the scope of the risk description (as required by the Settlement Decision) and, in some instances, also provide a qualitative discussion of certain risk mitigation activities that are otherwise out-of-scope due to the risk definition, to aid the Commission and stakeholders in developing a more complete understanding of the breadth and quality of the Companies' mitigation activities. For example, compressor station modifications that are planned to occur during the 2022-2024 period but have an in-service date beyond 2024 are discussed in SoCalGas's Incidents Related to the High-Pressure System (Excluding Dig-in) risk chapter (SCG-Risk-1); electric transmission related activities that have cost recovery through a non-GRC cost recovery mechanism are discussed in SDG&E's Electric Infrastructure Integrity risk chapter (SDG&E-Risk-2). This additional information is provided in the interest of full transparency and understanding of the Companies' activities, consistent with guidance from Commission staff and stakeholder discussions.

2. RSE Analysis

The Settlement Decision directs the Company to provide a Step 3 analysis of mitigations.[28] As further discussed in Chapter SCG/SDG&E RAMP-C, for mitigations where costs are not identified or not available or where data or SME judgment to quantify a benefit is not available or meaningful, such as with communication-based mitigation activities and procurement/utilization of personnel protection equipment, no RSE calculation can be provided. As mentioned above, activities for which no RSE is available are identified with explanations within Section V of the individual risk chapters.

[28] D.18-12-014 at Attachment A, A-11 – A-13.

IV. RAMP RISK CHAPTER ORGANIZATION AND OVERVIEW

In each individual risk chapter, the Companies describe the existing controls and new and/or incremental planned mitigations for each risk, presenting at least two alternative mitigation plans for each risk. The Companies present the following sections in each risk chapter:

1. Introduction.
2. Risk Assessment – In accordance with the Settlement Decision,[29] this section describes the risk bow tie, possible drivers/triggers, and potential consequences of each identified risk.
3. 2020 Controls – This section discusses how activities with recorded costs in or prior to 2020 (denoted with a control ID) help mitigate the risk.
4. 2022 – 2024 Controls and Mitigation Plan – This section discusses both planned significant changes to existing mitigations and/or planned new mitigations (denoted with a mitigation ID) that will address the risk, and includes a table informing which existing and new mitigations are planned to occur during the TY 2024 GRC's 2022 – 2024 forecast period.[30]
5. Costs, Unit, and Quantitative Analysis Summary Tables – This section includes tables summarizing the costs, units, and RSEs for mitigations included in the risk control and mitigation plan.
6. Alternative Mitigation Plan Analysis – This section presents at least two alternative mitigation plans considered as part of the risk assessment process, including forecasted costs, units, and RSE values.
7. Appendices
    a. Appendix A provides a summary of which elements of the bow tie are addressed by which mitigations.
    b. Appendix B provides a summary of the source documents used in the quantitative analyses.

[29] D.18-12-014 at 33 and Attachment A, A-11 (Bow Tie).

[30] As discussed in some risk chapters, not all activities with a control ID or a mitigation ID are included in the risk control and mitigation plan for the 2022-2024 period.

In summary, the RAMP Reports provide information regarding how the Companies think about, plan for, and mitigate identified key safety risks. The RAMP Reports will inform the safety-related funding requests that the Companies will include in their respective TY 2024 GRC applications, currently anticipated to be filed in May 2022.

Risk Assessment Mitigation Phase

(SCG RAMP-B)

Enterprise Risk Management Framework

May 17, 2021

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RAMP B: ENTERPRISE RISK MANAGEMENT FRAMEWORK

I. INTRODUCTION

This Chapter discusses the enterprise risk management framework for Southern California Gas Company (SoCalGas or Company). For purposes of RAMP, SoCalGas integrates the directives established in Decision (D.) 18-12-014 and the Settlement Agreement adopted therein (the Settlement Decision) into the Company's enterprise risk management (ERM) framework. This Chapter describes the ERM framework utilized by the Company.

II. ENTERPRISE RISK MANAGEMENT FRAMEWORK

As described in the direct testimony of Risk Management and Policy witness Diana Day in the Test Year (TY) 2019 General Rate Case,[1] the Company's risk framework:

> is modeled after ISO [International Organization for Standardization] 31000, an internationally recognized risk management standard. This framework consists of an enterprise risk management governance structure, which addresses the roles of employees at various levels ranging up to the Companies' Board of Directors, as well as risk processes and tools. One such process is the six-step enterprise risk management process.

Figure 1 below depicts SoCalGas's ERM process, by which the Company identifies, manages, and mitigates enterprise risks and aims to provide consistent, transparent, and repeatable results.

Figure 1: Enterprise Risk Management Process

[1] A.17-10-007/-008 (cons.), Exhibit (Ex.) 03 (SCG/SDG&E Day/Flores/York Revised Direct) at DD-8.

The process illustrated in Figure 1 aligns with Cycla Corporation's 10-step evaluation method, which was adopted by the Commission in 2016 "as a common yardstick for evaluating maturity, robustness, and thoroughness of utility Risk Assessment and Mitigation Models and risk management frameworks."[2] While the lexicon used by Cycla differs slightly from that of the Company, the content is largely aligned. Table 1 below provides a side-by-side comparison of the steps in the Company's ERM process to the corresponding steps in the Cycla method.

Table 1: ERM Process Alignment with the Cycla Method

Cycla Ten-Step Method	Corresponding Risk Steps in SoCalGas Enterprise Risk Management Process
Step 1: Identify Threats	1. Risk Identification
Step 2: Characterize Sources of Risk; Step 3: Identify Candidate Risk Control Measures (RCMs)	2. Risk Analysis
Step 4: Evaluate the Anticipated Risk Reduction for Identified RCM	3. Risk Evaluation & Prioritization
Step 5: Determine Resource Requirements for Identified RCMs; Step 6: Select RCMs Considering Resource Requirements and Anticipated Risk Reduction	4. Risk Mitigation Plan Development & Documentation
Step 7: Determine Total Resource Requirement for Selected RCMs; Step 8: Adjust the Set of RCMs to be Presented in Rate Case Considering Resource Constraints; Step 9: Adjust RCMs for Implementation following CPUC Decision on Allowed Resources	5. Risk Informed Investment Decisions and Risk Mitigation Implementation
Step 10: Monitor the Effectiveness of RCMs	6. Monitoring and Review

[2] D.16-08-018 at 195 (Ordering Paragraph [OP] 4).

SoCalGas performs an enterprise risk assessment annually, resulting in an enterprise risk registry (ERR). The ERR identifies and prioritizes each of the Company's enterprise-level risks. Each risk is assigned to one or more risk owner(s), a member of the senior management team responsible and accountable for the risk, and one or more risk manager(s) responsible for ongoing risk assessments and overseeing the implementation of risk plans. The ERM organization facilitates sessions amongst the Company's risk owners to identify, evaluate, and prioritize risks, and review mitigation plans and consider how investments align with risk priorities.

As Ms. Day explained: "The enterprise risk management process is both a 'bottom-up' and 'top-down' approach, by taking input from the risk managers and the risk owners to ultimately finalize the risk registry. As with any useful risk assessment, the enterprise risk registry is not intended to be static; it must be refreshed on an annual basis. Risks are dynamic; risks that were consolidated together may be separated out, new risks may appear, and the level of the risk may change over time."[3]

Each of the steps in the ERM process is discussed further below.

A. Risk Identification

Risk identification is the process of finding, recognizing, and describing risks. As the first step in the risk management process, the ERM organization works with various business units to update existing risk information and identify enterprise-level risks that have emerged or accelerated since the prior assessment. This part of the process also includes the identification of risk events, their causes, and potential consequences. Figure 2 below provides a depiction of the risk bow tie, which is a commonly-used tool for risk analysis. The risk bow tie is a way to systematically and consistently evaluate the drivers/triggers, possible outcomes, and potential consequences of a risk event. As the sample risk bow tie (Figure 2 below) illustrates, the left side of the risk bow tie identifies potential drivers and/or triggers that may lead to a risk event (center of the risk bow tie), and the right side shows the potential consequences of a risk event. Drivers/triggers are denoted as "DT" and potential consequences are denoted as "PC."

[3] Ex. 03 (SCG/SDG&E Day/Flores/York Revised Direct) at DD-9.

Figure 2: Risk Bow Tie

Each risk in the RAMP Report includes a risk bow tie similar to that in Figure 2 above. Generally, the drivers/triggers identified in the RAMP risk Chapters are specific to the risk event. However, many of the potential consequences are common across the RAMP risks. Potential consequences that can be in the RAMP risk Chapters are described below:

- **Serious injuries and/or fatalities:** Refers to physical trauma to the body.
- **Property damage:** The potential to cause property damage which typically involves physical damage to tangible property.
- **Operational and reliability impacts:** Effects to utility operations.
- **Penalties and fines:** The risk of a compliance (*e.g.*, regulatory) failure, which results in potential penalties/fines or sanctions.
- **Adverse litigation:** Refers to litigation risk, which is the possibility that legal action will be taken because of an individual's or corporation's actions, inaction, products, services, or other events. Corporations generally employ some type of litigation risk analysis and management to identify key areas where the litigation risk is high and thereby take appropriate measures to limit or eliminate those risks**.**

- **Erosion of public confidence:** A risk event causing a potential loss to financial capital, social capital, and/or market share resulting from damages to a firm's reputation.

B. Risk Analysis

Risk analysis is the process of understanding the risk and the degree of risk. Risk analysis provides a basis for risk evaluation and decisions about risk mitigation. Risk analysis is undertaken using varying methodologies, depending on the risk and the availability of data and resources. The Company utilizes a combination of qualitative (*e.g.*, calibrated subject matter expertise) and quantitative analyses (including external data) to analyze its risks.

C. Risk Evaluation and Prioritization

Using the information from the previous steps, an evaluation and prioritization are performed. The result of this step is pre-mitigation risk scores for each risk in the ERR and a relative ranking reflecting consensus around risk priorities. This step involves a discussion of each ERR risk, including changes in the risk frequency or impact, challenges, and elements of the previous assessment's implementation of mitigants. Arriving at risk prioritization is an iterative process; risks that may be very different are compared to one another to determine a relative ranking (for example, evaluating an IT risk in comparison with a customer service risk).

In 2020, the Company completed its ERR before year-end, following the issuance of the Settlement Decision. The Settlement Decision that was adopted in December 2018 provides, among other things, a methodology to be used as the basis for this RAMP Report. In particular, the Settlement Decision established a multi-attribute value function (MAVF).[4] SoCalGas incorporated the MAVF methodology into its evaluation and prioritization process to develop its 2020 ERR. For purposes of this RAMP Report, the Company continued to refine its application of the MAVF consistent with the Settlement Decision, which resulted in revised pre-mitigation risk scores. This process, methodology, and calculations for the pre-mitigation risk scores are further discussed in Chapter RAMP-C.

D. Risk Mitigation Plan Development & Documentation

Based on the analysis and evaluation of risks in the prior steps, risk owners and managers develop and document risk mitigation plans to capture the state of the risk given current control

[4] D.18-12-014 at Attachment A, A-8 (Risk Assessment).

activities and any additional mitigations. On an annual basis, the ERM organization facilitates a risk mitigation planning session where risk owners present their key risk mitigation plans and alternatives considered to the senior management team and discuss the feasibility and prudence of those plans. This risk mitigation planning session helps shape the Company's priorities going into the annual investment planning process and helps identify gaps and/or areas of overlap in risk mitigation plans.

E. Risk-Informed Investment Decisions and Risk Mitigation Implementation

The capital planning process is the Company's annual process for prioritizing funding based on risk-informed priorities and input from operations. The capital allocation planning sessions begin with input from functional capital committees that comprise subject matter experts who perform high-level assessments of the capital requirements based on achieving the highest risk mitigation at the lowest attainable costs. These requirements are presented to a cross-functional team representing each functional area with capital requests. This committee reviews the resource requirement submissions from all functional areas, and projects are evaluated against priority by assessing a variety of metrics, including safety, cost-effectiveness, reliability, security, environmental, strategic, and customer experience. Recommendations for capital spending are then presented to an executive committee for approval. Once the capital allocations are approved, each individual operating organization is chartered to manage their respective capital needs within the capital allotted by the plan. This includes re-prioritization as necessary to address imminent safety concerns as they arise. Similar to the Company's risk evaluation processes, the capital planning process is evolving as the Company endeavors to achieve a more quantitative determination of the risk reduction per dollar invested.

F. Monitoring and Review

Monitoring and reviewing the aspects of risk management supports the Company's efforts to continuously improve its risk management practices. Periodic reviews of the ERR are performed to keep the register current and facilitate discussions on emerging risks that the Company could face. In addition to using risk scores to monitor changes in risks, the Company leverages risk metrics similar to those identified in the Phase Two S-MAP Decision 19-04-020 to hold parties accountable and improve risk oversight.

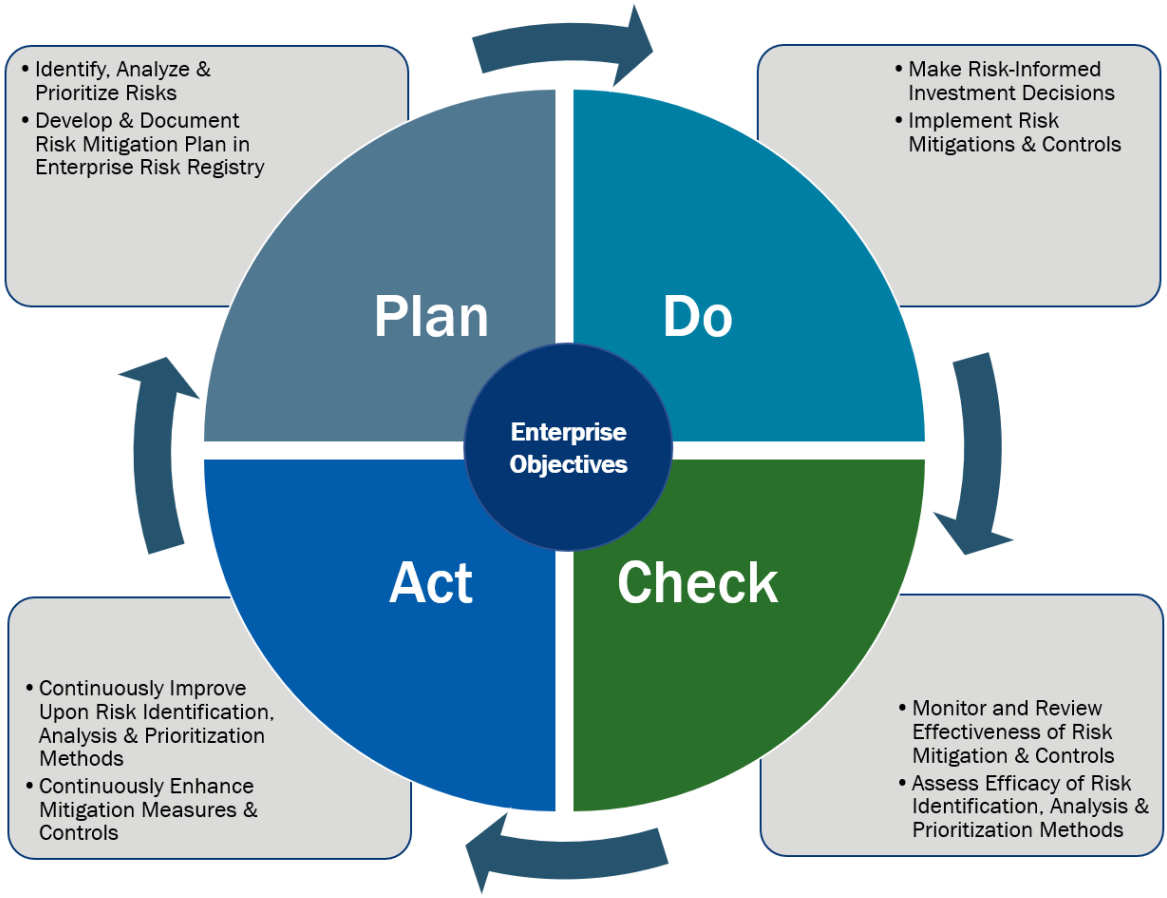
III. CONTINUOUS IMPROVEMENT OF RISK MANAGEMENT PRACTICES

SoCalGas manages risk through a structured, increasingly data-driven approach that identifies threats and hazards, assesses and prioritizes risks, implements mitigation efforts, and engages in assessments and reviews to understand risk mitigation effectiveness. The Company's risk management practices continue to mature and improve. The TY 2019 GRC Application presented a strategic planning trajectory related to integrating risk, asset, and investment management to be accomplished over future GRC cycles.[5] SoCalGas is moving on that trajectory, further integrating risk, asset, and investment management into the Company's culture.

As discussed in SMS Cross-Functional Factor Chapter, CFF-6, SoCalGas implements a comprehensive Safety Management System (SMS) to continually enhance the safety of its operations, strengthen safety culture, and improve overall safety performance. Continuous improvement is a foundational value of both the SoCalGas SMS framework and the ERM framework. With respect to continuous improvement of the ERM, SoCalGas follows the "Plan-Do-Check-Act" cycle depicted in Figure 3 below.

[5] Ex. 03 (SCG/SDG&E Day/Flores/York Revised Direct) at DD-25 (Figure DD-4).

Figure 3: ERM Plan, Do, Check, Act Cycle



Continuous improvement efforts are currently focused on more closely aligning risks with asset management practices, enhancing the Company's integration of data and metrics into its risk-informed decision-making processes, and broadening the scope of risks evaluated as part of the annual Enterprise Risk Registry development process.

Following the Plan, Do, Check, Act model for continuous improvement, SoCalGas continually seeks to implement informative metrics into its risk-based decision-making processes. Risk metrics span risk, asset, and investment management, in that they help evaluate and monitor asset health and potentially inform and demonstrate progress related to investments. D.19-04-020 approved safety performance metrics, which are reportable on an annual basis beginning in March 2020. The Company's data collection efforts and the metrics themselves will continue to support risk-based decision-making. Further, metrics help to inform investments, and the Company will provide an explanation in its annual Risk Spending Accountability Reports of how the reported safety metric data reflects progress against the safety

goals in the Company's RAMP and GRC. In addition to CPUC-reportable metrics, the Company is in the process of identifying ways in which to quantify and track effectiveness related to its mitigations from this 2021 RAMP Report, as discussed in Chapter RAMP-E.

Finally, SoCalGas and SDG&E also communicate regularly with risk management representatives at Pacific Gas and Electric Company and Southern California Edison Company to discuss and share best practices, address trends and emerging issues, and to improve risk management practices, such as managing the COVID-19 pandemic from a risk perspective.

IV. SELECTION OF RAMP RISKS

As discussed in Section II above, the Company's ERM process includes an annual ERR development process. For this RAMP Report, the Company began with the risks identified in the 2020 ERR. Using the updated Risk Quantification Framework described in Chapter RAMP-C, the Company then scored each of its 2020 ERR risks solely utilizing the safety attribute and sorted the risks in descending order by the safety risk score. For the top 40% of ERR risks with a safety risk score greater than zero, the Company then calculated a risk score using all its attributes in the Risk Quantification Framework (*i.e.*, beyond the safety attribute). The Company reviewed the outputs of this process and developed a preliminary list of RAMP risks to present at a pre-filing workshop, consistent with Settlement Decision.[6] The Company selected the preliminary list of RAMP risks based on the initial safety risk scores (*i.e.*, those top 40% of ERR risks with a safety risk score greater than zero) and added additional enterprise risks deemed to be a top priority to the Company.

As discussed in Chapter RAMP-A, pre-filing RAMP workshops were held on October 15, 2020, and January 27, 2021. Per the Settlement Decision,[7] SoCalGas determines the final list of risks to be addressed in the RAMP based on the input received from the Commission's Safety Policy Division and other interested parties. There was no opposition to the risks presented during the pre-filing workshops. Therefore, the preliminary list of RAMP risks remains unchanged and is final.

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[6] D.18-12-014 at Attachment A, A-8 (Risk Assessment).

[7] *Id.* at Attachment A, A-10 (Risk Selection Process for RAMP).

In addition to the RAMP risks, SoCalGas's RAMP Report includes cross-functional factors. Because the cross-functional factors are not "risks," they are not addressed in this chapter. (Please refer to Chapter RAMP-A for a discussion of cross-functional factors.)

V. EVOLUTION OF RISKS PRESENTED IN THE 2021 RAMP REPORT AS COMPARED TO THE 2020 ERR AND 2019 RAMP REPORT

The Settlement Decision requires that the RAMP Report highlight changes to the ERR from previous RAMP or GRC filings.[8] Pursuant to this requirement, Table 2 sets forth a comparison of the risks in this 2021 RAMP Report compared to those that were identified in the 2020 ERR and those presented in the Company's 2019 RAMP Report.

As shown in Table 2 below, there were limited changes in the scope of the risks and some slight changes to the risks' naming convention. Additionally, for this 2021 RAMP Report, some risks from the Company's prior RAMP Reports are no longer presented as distinct risk chapters.

[8] *Id.* at Attachment A, A-7 (Risk Identification and Definition).

Table 2: Comparison of 2021 RAMP Risks to the 2020 ERR and the 2019 RAMP Risks

2021 RAMP Risks	2020 ERR	2019 RAMP Risks
Excavation Damage (Dig-In) on the Gas System	Dig-in on the Distribution System	Third Party Dig-in on a Medium Pressure Pipeline
	Dig-in on the Transmission System	Third Party Dig-in on a High Pressure Pipeline
Incident Related to the High Pressure System (Excluding Dig-In)	Incident Related to the Transmission System (Excluding Dig-In)	High Pressure Gas Pipeline Incident (Excluding Dig-in)
Incident Related to the Medium Pressure System (Excluding Dig-In)	Incident Related to the Distribution System (Excluding Dig-In)	Medium Pressure Gas Pipeline Incident (Excluding Dig-in)
		Customer and Public Safety*
Incident Related to the Storage System (Excluding Dig-in)	Incident Related to the Storage System (Excluding Dig-In)	Storage Well Integrity Event
Incident Involving an Employee	Incident Involving Employee	Employee Safety
Incident Involving a Contractor	Incident Involving Contractor	Contractor Safety
Cybersecurity	Cybersecurity	Cybersecurity
	Inability to Recovery Critical Technology and Applications	
	Energy System Resiliency	
	Insufficient Supply to the Natural Gas System	
	Consumer Privacy	
	Capacity Restrictions or Disruptions to the Natural Gas Systems	
	Environmental Compliance	

* Customer and Public Safety merged into Medium Pressure Gas Pipeline Incident following the 2019 RAMP.

The remainder of this Section discusses changes (if any) in scope related to the risks shown in Table 2 above.

Excavation Damage (Dig-In) on the Gas System

Excavation Damage (Dig-In) on the Gas System has evolved from: (a) Dig-in on the Gas Distribution System, and (b) Dig-in on the Gas Transmission System in the 2020 ERR. In the 2019 RAMP, Dig-in on the Gas Distribution System was referred to as *Third Party Dig-in Medium Pressure* and Dig-in on the Gas Transmission System was referred to as *Third Party Dig-in High Pressure*.

Incident Related to the High Pressure System (Excluding Dig-In)

Incident Related to the High Pressure System (Excluding Dig-In) has evolved from Incident Related to the Gas Transmission System (Excluding Dig-In) in the 2020 ERR. In the 2019 RAMP, the risk was referred to as *High Pressure Gas Pipeline Incident*.

Incident Related to the Medium Pressure System (Excluding Dig-In)

Incident Related to the Medium Pressure System (Excluding Dig-In) has evolved from Incident Related to the Distribution System (Excluding Dig-In). In the 2019 RAMP, the Incident Related to the Distribution System (Excluding Dig-In) was referred to as *Medium Pressure Gas Pipeline Incident (Excluding Dig-In)* and *Customer and Public Safety.* Customer and Public Safety merged into in Medium Pressure Gas Pipeline Incident following the 2019 RAMP.

Incident Related to the Storage System (Excluding Dig-In)

The 2019 RAMP risk scope was defined as "the risk of an uncontrolled release of gas that occurs over an extended period due to a storage well structural integrity issue that requires complex well control operations resulting in gas reliability issues, extensive customer impacts, injuries and/or fatalities."[9] In the 2021 RAMP, the risk scope was broadened to include the risk of damage caused to the storage system, including wellheads, reservoirs, and surface equipment, at SoCalGas's four Storage Fields of Aliso Canyon, Honor Rancho, La Goleta, and Playa del Rey.

Incident Involving an Employee

Incident Involving an Employee has evolved from Employee Safety in the 2020 ERR. In the 2019 RAMP, the risk was referred to as *Employee Safety*.

Incident Involving a Contractor

Incident Involving a Contractor has evolved from Contractor Safety in the 2020 ERR. In the 2019 RAMP, the risk was referred to as *Contractor Safety.*

[9] 2019 SoCalGas RAMP, Chapter SCG-8 at SCG 8-2 (*available at https://www.socalgas.com/regulatory/documents/i19-11-010/SCG-8_RAMP_2019_SoCalGas_Storage_Risk_Chapter_Final-11-27-19.pdf*).

Risk Assessment Mitigation Phase

(SCG RAMP-C)

Risk Quantification Framework and Risk Spend Efficiency

May 17, 2021

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RAMP C: RISK QUANTIFICATION FRAMEWORK AND RISK SPEND EFFICIENCY

I. INTRODUCTION

This joint chapter provides an overview of the quantification methods used by Southern California Gas Company (SoCalGas) and San Diego Gas & Electric Company (SDG&E) (collectively, Companies). Within this chapter, the Companies: (1) provide an overview of the quantitative assessment used for risks and mitigations/controls throughout the RAMP Report, (2) explain the methodology used to create the multi-attribute value function (MAVF) and risk spend efficiencies (RSEs), and (3) demonstrate how RSEs are used in the Reports. The Companies have used the directives established in Decision (D.) 18-12-014 and the Settlement Agreement adopted therein (the Settlement Decision) to inform the quantification methods used in the RAMP Report, as discussed in this chapter.

II. OVERVIEW OF QUANTITATIVE ASSESSMENT

This section provides an overview of how the MAVF is applied to quantitatively assess risks throughout this Report (referred to herein as the Risk Quantification Framework), including illustrating hypothetical examples of risk scores (using the ranges displayed in the examples). The Risk Quantification Framework is used to analyze risk by estimating current risk scores (the Pre-Mitigation Risk Scores) and forecasting future risk scores if new activities are started or current ones are ceased (the Post-Mitigation Risk Scores).

- Section A provides a brief overview of the quantitative analysis used to analyze each risk, according to the Settlement Decision.
- Section B describes the requirements of the MAVF per the Settlement Decision, and how the Companies' Risk Quantification Framework was accordingly constructed.
- Section C describes the steps to apply the Risk Quantification Framework in accordance with the Settlement Decision.
- Section D shows a hypothetical example of a risk score calculation using the Risk Quantification Framework.

A. Overview and Approach

The quantitative analysis applied in the RAMP Reports is derived from the Settlement Decision, and can be outlined as follows:

- Develop an MAVF, which the Companies refer to as the Risk Quantification Framework;[1]
- Consider risks as defined and scoped in the Companies' Enterprise Risk Register (ERR);[2]
- Compute a Safety Risk Score using the Safety Attribute of the MAVF for each risk included in the ERR;[3]
- For each identified risk that is required to be included in the RAMP:
    - Estimate the frequency of a risk event occurring in a given year and use that value for the Likelihood of Risk Event (LoRE);
    - Estimate the average (mean) consequences if the Risk Event were to occur;
    - Apply the average consequences to the Risk Quantification Framework to create a value known as the Consequence of Risk Event (CoRE); and
    - Multiply the values of LoRE and CoRE to determine a risk score for that risk. The result of this calculation constitutes a Pre-Mitigation Risk Score.

As required by the Settlement Decision, for planned mitigations, a resulting Pre-Mitigation Risk Score will be used: (1) to demonstrate a risk score for each risk along with a ranking, and (2) as an input into the calculations to determine the change in risk scores when a risk-reducing activity is started or ceased.

B. Risk Quantification Framework

This section presents the Risk Quantification Framework that will be used throughout the RAMP Reports, as guided by the Settlement Decision. The quantitative aspects shown in this chapter are not meant to reflect precision or a comprehensive view of risk, but rather serve as a starting point on which to build. Further, as explained below, the Risk Quantification Framework is the result of many necessary assumptions. Should those assumptions change, different results would be expected.

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1 D.18-12-014 at Attachment A, A-5 – A-6 (Step 1A).

2 *Id.* at Attachment A, A-7 (Step 1B).

3 *Id.* at Attachment A, A-8 – A-9 (Step 2A).

Under the Settlement Decision, the Risk Quantification Framework requires certain "attributes," defined as "an observable aspect of a risky situation that has value or reflects a utility objective, such as safety or reliability."[4] The attributes "should cover the reasons that a utility would undertake risk mitigation activities"[5] and must be reflected in "the way the level of an attribute is measured or expressed."[6] The determination of attributes is left to each utility's discretion, with the requirement that the attributes should include safety, reliability, and financial attributes.[7] Attributes are a subset of the many criteria used to assess and manage risk.[8]

The Settlement Decision also requires construction of a scale "that converts the range of natural units … to scaled units to specify the relative value of changes within the range, including capturing aversion to extreme outcomes or indifference over a range of outcomes."[9] Attributes also must be assigned weights reflecting each attribute's relative importance to other identified attributes.[10]

The three tables below show a Risk Quantification Framework utilized in this RAMP Report. Each table shows chosen attributes and assigned weights and scales. A narrative summary of the choices examined and made in assigning values to the variables shown below (*e.g.*, attributes, scales, weights) is described in Section II.E below.

The Risk Quantification Framework (as outlined in the Settlement Decision) is a prescribed methodology that provides a data point to help inform risk-based decision making (amongst other available data points). There are numerous ways to select attributes, scaling, and weights. However, the Settlement Decision contains a prescribed methodology for selecting attributes, scaling, and weights, limiting a utility's choices in certain ways. The choices elected in accordance with the Settlement Decision's prescribed methodology should not be viewed as a precise reflection of real-world circumstances.

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4 D.18-12-014 at Attachment A, A-2.

5 *Id.*

6 *Id.* at Attachment A, A-3.

7 *Id.* at Attachment A, A-8.

8 *Id.* at Attachment A, A-14 ("Mitigation selection can be influenced by other factors including funding, labor resources, technology, planning and construction lead time, compliance requirements, and operational and execution considerations.").

9 *Id.* at Attachment A, A-5.

10 *Id.* at Attachment A, A-6.

The Settlement Decision requires the Companies to follow six principles to construct its MAVF.[11] The Companies applied these six principles to arrive at the Risk Quantification Framework summarized in Table 1 below. The top-level attributes of safety, reliability, and financial are consistent with the minimum attributes required by the Settlement Decision.[12] The Stakeholder Satisfaction attribute is a new attribute being introduced by the Companies – the first attribute to be used by a utility in the state beyond the three required by the Settlement Decision. Given that "[a]ttributes are combined in a hierarchy,"[13] the top-level attributes are further broken down into sub-attributes.[14] Measurement of each sub-attribute is also required and is based on unique characteristics.[15] These sub-attribute measurements are then rolled up to the top-level attribute. The combined measurement of each top-level attribute is represented in Table 1 below as the Measurement Unit. The scales contained in Table 1 also reflect the Settlement Decision's MAVF principles and were constructed to represent the relative value of changes in a range of the measured units.[16] Similarly, the Companies completed a weighting process in accordance with the Settlement Decision[17] to develop the weights in Table 1 below (as further described in Section III.C, *infra*).

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[11] *Id.* at Attachment A, A-5 – A-6 ("MAVF").

[12] *Id.* at Attachment A, A-8 ("Risk Assessment").

[13] *Id.* at Attachment A, A-5 ("MAVF Principle 1 – Attribute Hierarchy").

[14] *Id.* at Attachment A, A-5, ("MAVF Principle 1 – Attribute Hierarchy") and ("MAVF Principle 2 – Measured Observations") refer to lower-level attributes in the context of building a MAVF. The term "lower-level attribute" is referred to herein as "sub-attribute."

[15] *Id.* at Attachment A, A-5 ("MAVF Principle 2 – Measured Observations") and ("MAVF Principle 3 – Comparison").

[16] *Id.* at Attachment A, A-5 ("MAVF Principle 5 – Scaled Units").

[17] *Id.*, Ordering Paragraph 2 at 67-68, and at Attachment A, A-6 ("MAVF Principle 6 – Relative Importance").

Table 1: Risk Quantification Framework Top-Level Attributes

Top-Level Attribute	Measurement Unit[18]	Scale	Weight
Safety	Safety Index	0 – 20	60%
Reliability	Reliability Index	0 – 1	23%
Financial	$	$0 - $500M	15%
Stakeholder Satisfaction	Satisfaction Index	0-100	2%

Table 2 below shows the sub-attributes contained in the Safety top-level attribute from Table 1 above. The measured unit for each Safety sub-attribute, when combined, create a single Safety Index value that is used in Table 1 above.[19] The components of the Safety Index are provided in Table 2 below.

Table 2: Risk Quantification Framework Safety Index

Safety Sub-Attributes	Value
Fatality	1
Serious Injury	0.25
Acres Burned[20]	0.00005

Like Table 2 above, Tables 3 and 4 show the sub-attributes that are included in the Reliability top-level attribute from Table 1 for SDG&E and SoCalGas, respectively. Each sub-attribute is measured by its own unit. The Companies' determination of attributes, scales and weights are explained in Section III, *infra*. When all four sub-attributes for reliability are summed together, it creates a single Reliability Index value that is used in Table 1 above.

[18] "Measurement Unit" used herein is the measured attribute, also analogous to "Natural Unit" per the Settlement Decision Lexicon included in D.18-12-014 at Attachment A, A-3.

[19] MAVF Principle 1 - Attributes are combined in a hierarchy. *See* D.18-12-014 at Attachment A, A-5.

[20] Applicable only to Wildfire Involving SDG&E Equipment.

Table 3: Risk Quantification Framework Reliability Index for SDG&E

Reliability Sub-Attribute	Measurement Unit	Scale	Weight
Gas Meters	Number of Gas Meters Experiencing Outage	0 – 50,000 meters	25%
Gas Curtailment	Volume of Curtailments of Natural Gas exceeding 80 million cubic feet/day	0 – 250 MMcf	25%
Electric SAIDI	System Average Interruption Duration Index (SAIDI) minutes	0 – 100 minutes	25%
Electric SAIFI	System Average Interruption Frequency Index (SAIFI) outages	0 – 1 outages	25%

Table 4: Risk Quantification Framework Reliability Index for SoCalGas

Reliability Sub-Attribute	Measurement Unit	Scale	Weight
Gas Meters	Number of Gas Meters Experiencing Outage	0 – 100,000 meters	50%
Gas Curtailment	Volume of Curtailments of Natural Gas exceeding 250 million cubic feet/day	0 – 666 MMcf	50%

Because the Financial attribute is readily measured in dollars, sub-attributes are unnecessary for quantifying it. Similarly, the Stakeholder Satisfaction attribute is composed of only affected stakeholders; thus, sub-attributes are unnecessary.[21]

C. Application of Risk Quantification Framework

The Settlement Decision further requires that the Risk Quantification Framework use specific methods of applying statistical information. The following statistical concepts are key to understanding the Risk Quantification Framework: (a) risks are evaluated at the "risk level," as defined by the Companies' ERR; (b) each risk is evaluated for annual frequency using the risk quantification method; (c) each risk is evaluated by considering possible consequences attributed to a risk event (rather than specific scenarios); and (d) averages, or expected values, are used for LoRE and CoRE.

To calculate a risk score, there are four basic steps. First, estimate the frequency of a risk event occurring in a given year and set the LoRE to this value. If the frequency is estimated to

[21] For further detail regarding the Stakeholder Satisfaction attribute, *see* III.E.4 below.

be less than one per year, the frequency is put into decimal form. Second, estimate the average consequence for each attribute and sub-attribute based on the range of known possible consequences. Third, use the Risk Quantification Framework to obtain a single consequence value known as the CoRE. Finally, multiply the LoRE and the CoRE to calculate the risk score. To ease readability, the risk score is multiplied by 100,000, then rounded to the nearest whole number, or decimal, if less than 1.

D. Hypothetical Example Of Risk Score Calculation Using The Risk Quantification Framework

The following example will follow steps 1 - 4 shown above. All values in this example are illustrative and not representative of a specific risk.

Example: Risk XYZ

Step 1: Estimate LoRE. Internal and external data suggest that Risk XYZ will have an average of 12 risk events per year.

Step 2: Estimate consequences of attributes. Internal and external data suggest that if a risk event were to occur for Risk XYZ, the consequences would average as follows:

a. Fatalities: 0.02 (*i.e.*, 1 fatality for every 50 risk events)

b. Serious Injuries: 0.1 (*i.e.*, 1 serious injury for every 10 risk events)

c. Gas Meters: 0 meters

d. Gas Curtailment: 0 curtailment

e. SAIDI: 0 minutes

f. SAIFI: 0 outages

g. Financial: $1.5 million from damage to property

h. Stakeholder Satisfaction: 5 points from customer

Step 3: Estimate CoRE. Each of the estimates for each attribute/sub-attribute in Step 2 is used to generate top-level attribute scores. Those scores are then used to estimate a CoRE. The values from Step 2 are shown below in boldface type.

a. Safety Index: (Fatalities x 1) + (Serious Injuries x 0.25) = (**0.02** x 1) + (**0.1** x 0.25) = 0.045

b. Reliability Index: 0

c. Financial: **$1.5 million**

d. Stakeholder Satisfaction: **5**

e. CoRE $= \frac{Safety\ Index}{20}\ x\ 60\% + \frac{Reliability\ Index}{1}\ x\ 23\% +$

$\frac{Financial}{\$500M}\ x\ 15\% + \frac{Stakeholder\ Satisfaction}{100}\ x\ 2\% = \frac{0.045}{20}\ x\ 60\% +$

$\frac{0}{1}\ x\ 23\% + \frac{1.5M}{\$500M}\ x\ 15\% + \frac{5}{100}\ x\ 2\% = 0.0028$

Step 4: Calculate Risk Score. Multiply LoRE x CoRE x 100,000 and round to nearest whole number. From step 1, LoRE = 12, from step 3, CoRE = 0.0028. Risk Score = 12 x 0.0028 x 100,000 = 3,360. The Risk Score of Risk XYZ is 3,360.

III. MAVF CONSTRUCTION AND COMPONENTS

Under the Settlement Decision, each utility is required to create a multi-attribute value function that will be used in the RAMP Report for risk scoring.[22] As stated above, the MAVF is a tool for combining potential consequences of the occurrence of a risk event to create a measurement of value. This section provides a detailed description of the construction of SoCalGas and SDG&E's MAVF, including: (1) the determination of attributes, (2) the determination of scales of attributes, (3) the determination of weights of attributes, (4) how attributes were implemented, (5) details on each of the particular attributes (Safety, Reliability, Financial, Stakeholder Satisfaction), and (6) the probabilistic aspects of the MAVF.

The Companies' MAVF construction followed the steps outlined in the Settlement Decision.[23] The process of creating the MAVF is complex and should be considered a non-perfect method to enable the comparison of diverse utility risks. The complex and multilayered process to determine an effective quantitative risk methodology to enable the comparison of a broad range of risks is iterative and continually evolving, and the value functions presented in this RAMP Report should be considered in that vein. It is important to note that the construction of the MAVF discussed herein was a single effort undertaken for both SoCalGas and SDG&E. The attributes, scales, and weighting of attributes in the MAVF were determined collectively for both Companies, given the Companies' shared assets (*e.g.*, the natural gas distribution system and IT infrastructure).

[22] *Id.* at Attachment A, A-5 – A-6 (Step 1A).

[23] *Id.*

A. Determination Of Attributes

An attribute, as defined by the Settlement Decision, is "an observable aspect of a risky situation that has value or reflects a utility objective, such as safety or reliability. Changes in the levels of attributes are used to determine the consequences of a Risk Event."[24] Following this MAVF principle (principle 1), the Companies considered a large number of attributes for the Risk Quantification Framework. The method of attribute inclusion was: (a) create a list of potential attributes (this list was a composite of attributes from various sources such as current attributes, those discussed at CPUC workshops, potential attributes as proposed through the inquiry of internal subject matter experts (SMEs), and researching external entities); and (b) determine the ability to include such attributes by considering availability of data, consistency of data, commonality of the attribute across risks, and complications arising from their inclusion, among others. The attributes included in this RAMP Report are not meant to represent all dimensions of risk management that occur at the Companies but are useful for the purposes of this filing, namely, to create estimated risk quantification that can assist in decision-making.

Like all aspects of the utilities' Risk Quantification Framework, the attributes used, and how they are weighted, will continue to evolve over time. The version of the Risk Quantification Framework that is presented in the RAMP filing is not intended as a final effort, but rather the current version that will undergo improvements through lessons learned and input received from various sources.

Despite thorough consideration, the Companies did not include an environmental attribute in this cycle's Risk Quantification Framework. The Companies are focused on environmental impacts and thoughtfully consider how to reduce those impacts; however, for the purposes of quantification, the Companies were unable to determine how to express an environmental attribute that would enable meaningful comparison of utility risks while meeting the standards of the Settlement Decision. There are several dimensions of impacts related to the environment, including impacts to water, soil, air, species, and cultural. Within those dimensions, there are numerous sub-dimensions. For example, air pollution can take many

[24] *Id.* at Attachment A, A-2.

forms, such as greenhouse gas (GHG) emissions and near-ground pollution, including exhaust from vehicles and sources that have a local impact to air quality.

In addition to the various challenges related to the scope and impacts of the environmental attributes, it is also difficult to define relative weights between each of these environmental impacts. The difficulty becomes exacerbated by the sheer number of dimensions involved. The relative weights between each of them are convoluted and contradictory. The Companies will continue to review academic and governmental research regarding the impact levels of these environmental dimensions and may include updates in future Risk Quantification Frameworks. Although the Companies were unable to include an attribute specifically addressing environmental impacts for this RAMP Report, the Risk Quantification Framework does include "Acres Burned" in the Safety attribute for SDG&E to account for the detrimental impacts from pollution to human health. On a related note, the Companies discuss their dedication to environmental concerns in SoCalGas's Energy Resilience CFF (SCG-CFF-2) and SDG&E's Climate Change Adaptation, Energy System Resilience, and Greenhouse Gas Emission Reductions CFF (SDG&E-CFF-2).

Future versions of the Risk Quantification Framework may be designed with the goal of expanding and refining the number of attributes and sub-attributes in line with other key parameters used in day-to-day decision making.

B. Scales Of Attributes

The Settlement Decision directs the utility to construct a scale that converts the range of natural units to scaled units.[25] While the notion of applying scales for attributes appears to be straightforward, there are many aspects to consider, especially when applying the next step of assigning weights to each scale. The Settlement Decision states that the top of the scale approximates the maximum expected results for a risk. However, the Settlement Decision also requires expected values to be used. Expected values have very different "maximum expected results" depending on each scenario used. For example, a plane crash might lead to a few hundred deaths, but the annual expected value of fatalities for a particular airline in a given year is something far less. The Companies exercised their discretion to make a reasoned decision in choosing the top end of the scales for the attributes because not all risk scenarios involving a

[25] *Id.* at Attachment A, A-5 – A-6 (Step 1A).

particular risk yield the same maximum expected results. As discussed in the "Weights of Attributes" section below, scales and weights are strongly connected.

C. Weights Of Attributes

1. Quantitative Notes on Weights

The weight applied to each attribute is an important step in determining risk scores. Different weights can lead to different rankings of those risks. Below is a simplified, illustrative example of sample risks that show how weights can alter results.

Table 5: Illustrative Example of Weighting

	Safety Score	Financial Score	Risk Score Method 1: Safety: 90% Weight Financial: 10% Weight	Risk Score Method 2: Safety: 50% Weight Financial: 50% Weight
Risk A	0.5	0.2	4700	3500
Risk B	0.2	0.6	2400	4000

In Table 5 above, Risk A has a risk score nearly twice as large as Risk B (4700 compared with 2400) using Method 1 (90% Safety and 10% Financial), but it has a lower risk score using Method 2. This is because Risk A has more Safety risk relative to Risk B, and a weighting that favors Safety would therefore favor Risk A. This example illustrates that choosing weights can have a significant impact on the scoring that follows. The Companies are aware that the choice of weights is not perfect for all situations; therefore, scores should be thought of as estimates, rather than precise values.

2. Methodology for Determining Weights

The Settlement Decision requires that the Safety Attribute of the MAVF have a minimum weight of 40%.[26] Other than that safety minimum weight requirement, the Settlement Decision gives utilities the discretion to select weights through their own internal processes. The Companies' main method for determining weights for the Risk Quantification Framework considered alignment with the Companies' Enterprise Risk Management (ERM) ERR process (described in RAMP B). Using the ERR as a starting point, initial weights were identified and considered for use in the RAMP Report. Although the ERR is more of a qualitative than quantitative view of risk, it can lend itself to numerical comparisons. In addition, an industry-leading reliability study that comments on financial equivalences with reliability was considered

[26] D.18-12-014, Ordering Paragraph 2 at 67-68.

in the creation of the Risk Quantification Framework weights.[27] The Lawrence Berkeley study considers the amount of financial loss to customers due to loss of electric power. As mentioned in more detail below, because every electric outage is unique, the study is used as a guide rather than as a source of precise equivalences. While there is not an equivalent reliability study available that is specific to financial loss to customers due to loss of natural gas, the findings in the study can be extrapolated to generally apply to all utility customers.

The use of the ERR and the reliability study led to a rough approximation of how weights might look across all four attributes. Draft versions of the scales and weights were created and run through a series of real-world events to check the results for reasonableness. Adjustments were made after the reasonableness test runs and results were internally discussed. During the internal testing and discussions, it became clear that no set of scales and weights would lead to expected results for all situations. More refinements were made, and this RAMP Report utilized a set of scales and weights that may reflect an amalgam of SME and external source views.

To summarize how weights were attained for the Risk Quantification Framework, the Companies reconciled different values and data points and considered: a) the current ERR framework, b) an electric reliability study, c) a historical comparison of gas and electric reliability impacts to society, d) scenario testing, e) input from ERM staff and leadership, f) research into other utilities and industries, g) input from personnel of varying levels (including officers) at the Companies, and h) use of rounded numbers for readability.

3. Observations when Determining Weights

This section discusses several issues the Companies encountered when determining the final weights to use for the Risk Quantification Framework.

The Risk Quantification Framework uses four attributes – safety, reliability, financial and stakeholder satisfaction. In an ideal world, the relationship between each of the four pairwise combinations (*i.e.*, reliability vs. safety, safety vs. financial, and financial vs. reliability, stakeholder satisfaction vs. reliability, financial vs. stakeholder satisfaction and safety vs. stakeholder satisfaction) would be consistent. In mathematics, the transitive property is commonly stated as "If a=b and b=c, then a=c." For multi-attribute value functions, however,

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[27] *See* Ernest Orlando Lawrence Berkeley National Laboratory, *Estimated Value of Service Reliability for Electric Utility Customers in the United States* (June 2009) (Lawrence Berkeley study), *available at https://certs.lbl.gov/sites/default/files/lbnl-2132e.pdf.*

the transitive property is less clear. As noted above, for electric reliability, the Lawrence Berkeley study was used as a starting point to compare reliability to financial. Using that data, a blackout occurring across SDG&E's service territory for eight hours would have a financial impact to SDG&E's customers of over $1 billion. This estimate created one pairwise combination of the attributes (reliability vs. financial). Separately, a hypothetical question was posed to determine another pairwise combination (reliability vs. safety): "Which risk event would you least like to happen, a systemwide blackout for eight hours that harms no one or a safety incident at a substation that results in an employee fatality?" The Companies prioritized the elimination of the safety incident. With the two pairwise comparisons developed, the transitive property could be applied to derive the third and fourth pairwise comparison. When doing so, the third pairwise comparison (safety vs. financial) did not follow the first two pairwise comparisons and, thus, led to unhelpful values for the remaining pairwise comparisons.

In the illustrative example mentioned above, when an eight-hour systemwide outage is considered equal to a $1 billion financial loss, and the utility prefers to have an eight-hour systemwide outage versus the fatality of an employee, it could lead to the conclusion that the utility believes lives to be valued above $1 billion. This example highlights the complexity of creating multi-attribute value functions that have non-transitive pairwise comparisons.

Another issue is that the Companies are not accustomed to quantifying the value (financially or otherwise) of preventing safety incidents. Safety is a priority at the Companies as well as a reflection of our culture and the Companies' core values. Attempting to find pairwise comparisons with safety and other attributes can be difficult – especially at workplaces that hold safety to be non-negotiable.

Another concept observed during the creation of the Risk Quantification Framework relates to comparing the value of preventing an incident versus the value of remediating the impact if the incident were to happen. For example, if an employee becomes injured on the job, it might take some amount of financial effort and Human Resource involvement to make sure the employee is taken care of and that the employee's group has a trained person to temporarily fill the role. The value of trying to prevent the event is not equal to the value of the expected remediation costs.

D. Attribute Units

The Settlement Decision contemplates expression of attributes in "natural units."[28] The natural unit of an attribute is defined as follows:

> [T]he way the level of an attribute is measured or expressed. For example, the natural unit of a financial attribute may be dollars. Natural units are chosen for convenience and ease of communication and are distinct from scaled units.[29]

The top-level attributes of safety and reliability comprise sub-attributes that are used to create Safety and Reliability indices, respectively. The Safety Index has two sub-attributes, while the Reliability Index has four sub-attributes. The measurement units chosen to represent the natural units for the sub-attributes are shown in Table 6 below. The sub-attributes within safety and reliability are used to create an index for the top-level attribute.

Table 6: Attributes

Attribute	Sub-Attribute	Measurement Unit
Safety	Fatality	Number of Fatalities
Safety	Serious Injury	Number of Serious Injuries
Safety	Acres Burned[30]	Numbers of Acres Burned from a Wildfire Involving SDG&E Equipment
Reliability	Gas Meters	Number of Gas Meters Experiencing Outage
Reliability	Gas Curtailment	Volume of Curtailments of Natural Gas exceeding 250 million cubic feet/day
Reliability	Electric SAIDI[31]	System Average Interruption Duration Index (SAIDI)
Reliability	Electric SAIFI[32]	System Average Interruption Frequency Index (SAIFI)
Stakeholder Satisfaction	Stakeholders Satisfaction Index	Five sub-attributes measuring the satisfaction of the five stakeholder groups (customer, public, employee, government, and regulators)

[28] D.18-12-014 at Attachment A, A-3.

[29] *Id.*

[30] Applicable to SDG&E only.

[31] Applicable to SDG&E only.

[32] Applicable to SDG&E only.

E. Details On Particular Attributes

1. Safety Attribute

The Safety attribute consists of a Safety Index, which is calculated by assessing its two sub-attributes for every risk except Wildfire Involving SDG&E Equipment, which takes into account the additional sub-attribute of Acres Burned. SDG&E explored the defensible notion that wildfires, which result in a significant number of acres burned, have a safety impact on the general population.[33] The Company sought to capture this impact; therefore, it included this specific sub-attribute for the Wildfire risk only. The sub-attributes included are related to data that is readily available. The relative value between Fatalities and Serious Injuries is derived from information provided through the Occupational Health & Safety Administration (OSHA) and the Federal Aviation Administration (FAA).[34] Fatalities each receive a score of one, and Serious Injuries receive a score of 0.25 each. A Serious Injury is generally defined as an event that requires hospitalization or a permanent disfigurement of an individual.[35] The sum of these three sub-attributes, where applicable, create the Safety Index, which is then used as a top-level attribute in the Risk Quantification Framework.

Table 7: Safety Attributes

Safety Sub-Attribute	Value
Fatality	1
Serious Injury	0.25
Acres Burned[36]	0.00005

In the RAMP Report, safety impacts are indifferent to: (a) the cause or reason for the event that results in safety impact, (b) the characteristics of those affected, (c) the perceived fault

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[33] *See* ScienceDirect, *Quantification of pollutants emitted from very large wildland fires in Southern California, USA* (June 2006), *available at* doi:10.1016/j.atmosenv.2006.02.016; *see also Transportation Benefit-Cost Analysis, available at* http://bca.transportationeconomics.org/.

[34] *See* United States Department of Labor, *Severe Injury Reports*, *available at https://www.osha.gov/severeinjury/*; *see also* United States Department of Labor, *Reports of Fatalities and Catastrophes – Archive*, *available at https://www.osha.gov/fatalities/reports/archive*; *see also* Federal Aviation Administration, *Data & Research, available at https://www.faa.gov/data_research*.

[35] Title 8 California Code of Regulations § 330(h).

[36] Applicable to SDG&E only.

of the utilities or others, (d) the mitigating or aggravating circumstances related to any impacted person's situation, and (e) other such concerns.

2. Reliability Attribute

The Reliability attribute comprises a Reliability Index that consists of two equally weighted sub-attributes for SoCalGas and four for SDG&E. The sub-attributes with their Natural Units (Measurement Units) are shown in Table 8 below. The Reliability Index shown below is structured similarly to the overall Risk Quantification Framework and contains attributes, scales, and weights.

Table 8: Reliability Attributes for SDG&E

Reliability Sub-Attribute	Measurement Unit	Scale	Weight
Gas Meters	Number of Gas Meters Experiencing Outage	0 – 50,000 meters	25%
Gas Curtailment	Volume of Curtailments of Natural Gas exceeding 80 million cubic feet/day	0 – 250 MMcf	25%
Electric SAIDI	System Average Interruption Duration Index (SAIDI) minutes	0 – 100 minutes	25%
Electric SAIFI	System Average Interruption Frequency Index (SAIFI) outages	0 – 1 outage	25%

Table 9: Reliability Attributes for SoCalGas

Reliability Sub-Attribute	Measurement Unit	Scale	Weight
Gas Meters	Number of Gas Meters Experiencing Outage	0 – 100,000 meters	50%
Gas Curtailment	Volume of Curtailments of Natural Gas exceeding 250 million cubic feet/day	0 – 666 MMcf	50%

The Settlement Decision requires a utility to identify relative weights between sub-attributes like gas and electric reliability. Relating the gas sub-attributes to electric reliability is difficult, however, there is little industry consensus on how to do so. The rationale for the scales/weights used for the reliability attributes was therefore based on a combination of external information and internal SME judgment. "Worst case" scenarios that have occurred involving gas and electric outages were used to consider the impact from gas and electric reliability. In

1994, the Northridge earthquake affected tens of thousands of gas customers, and the Pacific Southwest blackout of 2011 affected all SDG&E's customers for several hours. As recent as 2018, the Montecito Mudslides affected thousands of gas customers. The Companies' SMEs reasoned that the respective impacts of these events could be used as a baseline to create the sub-attribute scales with the Northridge gas event approximately equaling 200 minutes of a system-wide SDG&E blackout.

The gas reliability sub-attribute of Gas Curtailment is an innovative measurement, one that the Companies believe can be useful in describing the impact to customers and society. For various reasons – such as when there is a disturbance with a major gas transmission pipeline and a coincident high demand for natural gas – there are situations when natural gas service needs to be curtailed to non-core customers. The order in which curtailments are undertaken is systematic, with a goal to prevent severe disruptions to the community. However, when large curtailments are necessary, the impact to the greater community can eventually be felt. The Companies strive to prevent all curtailments, especially those that require curtailing over 250MMcfd at SoCalGas or 80MMcfd at SDG&E. Curtailments at that higher level can impact critical infrastructure such as electric generation, major industries, and hospitals. The use of this sub-attribute helps to value the importance of keeping curtailments limited in size and duration.

In addition to considering previous historical events to estimate the potential impact of a risk event to reliability, SoCalGas and SDG&E utilized subject matter expertise. In particular, SMEs considered the probability and impact of several events occurring at once across multiple operating groups like Distribution and Transmission or Transmission and Storage. Lastly, the Companies examined peak day usages and the occurrence of critical infrastructure impacts to produce a more realistic reliability attribute both in terms of meter outages and gas curtailment.

Valuing electric reliability is a complex endeavor but requires a simplified view for the purposes of the RAMP Report. To the customer, electric reliability is a composite of at least the following items: a) having electricity when the customer wants it, b) having a high quality of electricity without flicker or dimming, c) having power restored quickly if an outage occurs, and d) having access to information about when power will be restored.

The Institute of Electrical and Electronics Engineers (IEEE) has been viewed as a leader on topics related to electric reliability. IEEE publishes a document, known as IEEE 1366-2012, that is considered the industry "best practice" for how to measure electric reliability. The IEEE

1366-2012 has twelve distinct measurements that utilities can use to express reliability, and some of those measurements have sub-measurements providing essentially infinite combinations of measurements. For example, one measurement indicates the number of customers who experience a certain number of outages in a year. That measurement can be used to evaluate customers who experience one outage, or three outages, or seven outages, and so on. The large number of possibilities of measurements is indicative of how complex the subject can be.

Within its electric reliability group, SDG&E has considered at least eight different measurements in the past few years to internally measure its reliability (SAIDI, SAIFI, Worst Circuit SAIDI, Worst Circuit SAIFI, MAIFI, CAIDI, SAIDET, and ERT).[37] For the Risk Quantification Framework, SAIDI and SAIFI were the sole indices used due to their widespread industry usage and their relative ease of use from a forecasting perspective. Future versions of the Risk Quantification Framework may include additional methods of valuing electric and gas reliability.

The electric reliability sub-attribute of Electric SAIDI measures the average duration of service loss for each utility's electric meters over the span of a year. SAIDI is a widely used index in the electric utility industry and is frequently used to compare utilities' performance. This index does not distinguish between the type of customer or the time of day of an electric outage.

The electric reliability sub-attribute of Electric SAIFI measures the average number of outages that each utility's electric meters experiences over the span of a year. This index does not distinguish between the type of customer or the time of day of an electric outage. For example, a SAIFI value of 0.8, means that, on average, 80% of customers served by the utility experienced an outage during a calendar year. But because SAIFI measures averages, using SAIFI alone is not enough to ascertain how many different customers experienced outages. If a utility had 100,000 meters, a SAIFI value of 0.8 could mean that 80,000 meters experienced one outage during one calendar year, or it could mean that 40,000 meters experienced two outages during one calendar year.

There is significant complexity when trying to determine appropriate scales and weights to SAIDI and SAIFI in the Risk Quantification Framework. Different outages have different

[37] MAIFI: Momentary Average Interruption Frequency Index; CAIDI: Customer Average Interruption Duration Index; SAIDET: SAIDI Exceeding Threshold; ERT: Estimated Restoration Time.

impacts depending on who is affected and when the outage occurred. For example, given a choice between three short outages or one long outage, a small retail store may prefer the shorter outages. Shorter outages may only temporarily affect its sales and not significantly affect its infrastructure. In contrast, a large factory may prefer one long outage, because some machinery may be negatively affected by outages, and having its equipment subjected to multiple outages could be detrimental to the factory's operations. Similarly, the impact of a three-hour electric outage at a residence would be dramatically different while cooking a Thanksgiving feast versus one while everyone at the residence is away from the home.

Although gas and electric sub-attributes give information to help understand levels of reliability risk, in the end, they are merely numbers that tell part of a story. Particularly with reliability, limited data exists to determine the equivalency of gas reliability relative to other attributes, resulting in the need to leverage electric reliability data at this time. Accordingly, there is no single combination of reliability attributes that will give the perfect answer on how to measure risk. The values shown throughout the RAMP Report should be thought of as an approximation of risk rather than a precise value.

3. Financial Attribute

The Financial attribute has no sub-attributes or index and is measured in dollars. Like the other attributes, the Financial attribute is used to estimate aspects of the impact from risk events. However, different types of costs are measured in the attribute. The two general types of costs measured include: societal damage (including physical damages, lost wages, relocation costs, etc.) and utility repair costs (labor, materials). As required by D.16-08-018, the Financial attribute does not include any direct impacts related to shareholder financial interests, such as fines to shareholders, stock price changes, changes in credit ratings, or unrecoverable legal fees.

The quantitative approach used by the Companies considered historical events as a guide for possible future impacts. But precision for the financial attribute is difficult to achieve. Risk events are rarely reported with a single summation of all financial impacts. Depending on the risk event, differing approaches were used to estimate the financial impacts. For pipeline risks, Pipeline and Hazardous Materials Safety Administration (PHMSA) data was used in combination with internal data, but the financial values provided by PHMSA do not necessarily include all financial impacts to society. For electrical outages, estimates were made for the amount of labor and cost of repair.

Financial estimates are gathered from various sources including internal estimates based on claims data or work orders, third party sources, news reporting, among others. Because these data sources rarely include all financial impacts from a risk event, estimates are used.

4. Stakeholder Satisfaction Attribute

In this RAMP cycle, SoCalGas and SDG&E are the first California utilities to implement a fourth attribute – Stakeholder Satisfaction. The Stakeholder Satisfaction attribute is a qualitative approach to measuring changes in satisfaction levels to various stakeholders during and after a risk event. SoCalGas and SDG&E recognize that risk events, whether caused by or involving the Companies, have the potential to affect various stakeholders' satisfaction in varying degrees of severity over varying amounts of time. For example, a pipeline rupture involving fatalities would not only have a direct safety, financial and reliability impact for those involved, but it would be expected to result in a decrease in satisfaction to individuals and groups within the rupture's impact zone. This could result from a loss of service downstream of the rupture or potential mental health issues for individuals that were near the risk event when it occurred. Additionally, with respect to non-customer results, the root cause analysis of an event would likely lead to not only operational changes at the Companies but could even spark new regulations to prevent a similar rupture event from occurring again. The Stakeholder Satisfaction attribute is designed to take into account the above effects of a risk event that are not succinctly delineated by safety, financial and reliability impacts alone.

Table 10 below illustrates the elements that comprise the Stakeholder Satisfaction attribute.

Table 10: Stakeholder Satisfaction Attributes

Stakeholder Sub-Attribute	Value
Stakeholders Affected	0-100 (Up to 20 points for each of the stakeholder groups – customer, public, employee, government, and regulators.

Recognizing the difficulty in measuring any particular individual's or group's satisfaction (as noted above), SoCalGas and SDG&E explored various means to quantify the notion of satisfaction during or after a risk event beyond the safety, financial and reliability impacts. One path explored was measuring the satisfaction to stakeholders through public surveys or polling; however, the determination of pre- and post-activity measurements would require consistency of

individuals and/or groups for each survey or polling, and a measurement after each activity, which could be in the thousands. The Companies determined that this would be too challenging and/or imprecise. Measuring this attribute would be further complicated by the fact that satisfaction varies between individuals and groups.

Ultimately, the Stakeholder Satisfaction attribute was determined through a qualitative assessment of risk events by ERM teams and operational SMEs. This qualitative assessment takes into consideration past events both inside and outside the Companies to determine the potential satisfaction of various stakeholders and appropriately apply that to the RAMP filing in the context of the MAVF.

F. Probabilistic Information

This section will discuss the quantitative methodologies, including statistical information and how computer software was used for this RAMP Report. The Settlement Decision requires utilization of specific quantification methods. Among those methods are the creation of LoRE and CoRE values for each current risk. These two values are then multiplied together to obtain a risk score. Additionally, LoRE and CoRE are used to calculate RSEs by estimating new LoRE and CoRE when risk-reducing activities are introduced or ceased.

1. Expected Values

As mentioned above, LoRE and CoRE utilize expected values. The term "Expected Value" is a statistical term meaning the weighted average. For example, suppose there was a casino game that paid $10 to the player 25% of the time and paid $1 to the player the other 75% of the time. The expected value of this game would $3.25 because $10 * 25% + $1 * 75% = $3.25. The term "Expected Value" is not meant to imply that the Company expects a certain outcome. Note that in the example above, the expected value of $3.25 can never occur, because only the values of $10 and $1 can be paid out. The use of expected values has known limitations in the risk management world, and great care must be taken when reviewing data that solely comprises expected values.

2. Likelihood of Risk Event (LoRE)

In the context of the Settlement Decision, the "Likelihood" is not a true likelihood in the typical statistical or probabilistic sense. In standard mathematics, a likelihood is the probability of an event occurring given a set of conditions (*e.g.*, the chance that a red jellybean is drawn from a jar of jellybeans). These standard probabilities can take a value between 0 and 1, where 0

indicates the event will never occur and 1 indicates the event will always occur. For example, in traditional terms, the probability of flipping a coin and obtaining "tails" is 0.5. The term "frequency," on the other hand, is a statistical term denoting the number of times that an event has or will occur, given a specified time frame. For purposes of the RAMP Report, the annual frequency of an event is used to estimate LoRE. An explanation of why frequency was used rather than likelihood is discussed below.

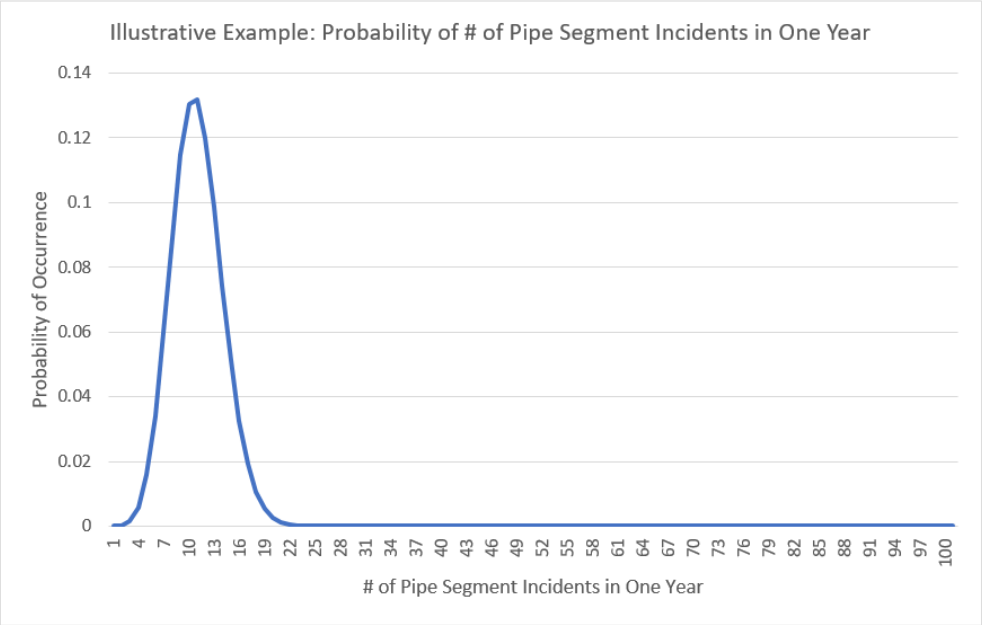
The following is an illustrative example to highlight how frequencies and likelihoods are used in the RAMP Report:

a. Example: Illustrative Gas Risk

The RAMP Report views risks at the "risk-level" over the span of a year. Suppose that a utility has an item in its ERR known as Illustrative Gas Risk. For the RAMP Report, it is necessary to determine the likelihood of that risk occurring each year. In this illustrative example, assume the following:

- The utility uses data to estimate the incident rate.
- The illustrative gas system is composed of 100 pipe segments.
- Each pipe segment has a likelihood of an event of 1/10 over a given year.
- If the pipe segment had an event, the event would cause some amount of safety, reliability, and financial impact to society and to the utility.

From a purely probabilistic point of view, and because LoRE is calculated at the risk-level, the likelihood that at least one pipe segment will have an incident in a given year is quite high (>0.999 or over 99.9%). The graph below shows the probability of the number of incidents, given the assumptions above:



For the RAMP Report, the important concept is not the *likelihood that a pipe segment will have an incident*, but rather, the number of pipe segments that are estimated to have an incident in a year. The likelihood value that is provided is the "Expected Value" of the frequency. In the example above, the expected value of pipe segments that will have an incident in a given year is determined by multiplying the number of pipe segments in the system by the likelihood of a single pipe segment incident occurring: 100 x 1/10 = 10. In this example, the LoRE for this system would be 10, which behaves like an estimated frequency of the number of incidents predicted in a year.

3. Consequence of Risk Event (CoRE)

The CoRE is determined by estimating each of the data points required by the Risk Quantification Framework, as discussed below. Like LoRE, the data points that inform CoRE are also expected values. For example, the number of serious injuries used in the calculations are the expected values of serious injuries if the risk event were to occur. Applying this to one of the RAMP risks, an illustrative example can be found in the SDG&E Employee Safety Risk Chapter (Chapter SDG&E-8), where potential safety consequences can theoretically range from one serious injury to several fatalities. The calculations used in the Risk Quantification Framework for that risk use the expected value of that range. In the case of Employee Safety, the expected value of the safety impact when a risk event occurs is 0.40.

The expected values of each of the nine attributes and sub-attributes are used as inputs into the Risk Quantification Framework to produce a CoRE for each risk. This process was undertaken many times for each risk; once to establish the current risk score, and once for each activity where the estimates of CoRE are performed as if the risk-reducing activity has been implemented, in order to calculate RSEs. As with LoRE, the data used to compute CoRE was a combination of internal data, external data, and/or SME input, depending on the particular risk.

a. Secondary Impacts

The Companies use the term "Secondary Impacts" to distinguish between the impacts that are directly caused by a risk event and the impacts that are "downstream" of the initial risk event. Because each risk has its own definition of a risk event, it is difficult to generalize the difference between the direct impacts and secondary impacts. Table 11 below provides examples, using the Companies' different RAMP risks:

Table 11: Illustrative Examples of Secondary Impacts

	Direct Impact	Secondary Impact
Electric Infrastructure Integrity	Person hurt due to touching fallen electrical wire	Vehicle driver failing to stop at traffic light that is not operating properly during electrical outage
Medium Pressure Gas Incident	Person hurt due to gas explosion	Customer experiencing gas outage decides to cook using a charcoal barbecue and is accidentally injured
Cybersecurity	Intruder uses remote attack to overload transformer, which subsequently explodes and harms individuals	Intruder uses remote attack to steal financial information from utility customer, which leads to additional downstream financial harm to customer

Secondary impacts are generally not used in risk scoring in this RAMP Report because they are difficult to estimate and track and are not always controllable by the Companies. Data sources used for risk assessments do not consistently track secondary impacts, if tracked at all. Secondary impacts will rarely be a large driver of risk scores, even if the data was well collected. One illustrative example mentioned earlier - large electrical outages that span entire cities - could have secondary impacts, but the documented history of such events lacks sufficient data to measure that risk. SDG&E experienced a systemwide blackout in 2011 due to electrical problems outside of its service territory. The blackout caused outages in all of San Diego and

Imperial counties, as well as parts of Orange County and western Arizona. The outage in SDG&E's service territory lasted nearly twelve hours, with the average customer without power for over eight hours. During that time, safety-related incidents were reported. It is clear that undesirable outcomes can occur in large electric or gas outages, but the available data is not conducive to determining expected values of impact. In future years, there may be more opportunities to determine how to effectively incorporate secondary impact information as part of risk assessments.

4. Modeling

Computer software was used for many quantitative aspects of the RAMP Report. The primary software applications used by the Companies were Microsoft Excel, Visual Basic, and @Risk. Additional work was also done with Microsoft Access, R, and Python.

Monte Carlo simulations were performed on risks. Monte Carlo analysis is a technique used to understand the impact of uncertainty related to a particular risk. Although the Settlement Decision does not specify that Monte Carlo simulations are necessary, the modeling assisted in several ways that bolstered the analysis and occasionally informed critical elements. Throughout the individual risk chapters, analytical methods are discussed, including the extent of modeling.

One of the benefits of modeling is that it can be used to demonstrate a range of outcomes that might be observed, given a set of inputs. When trying to identify ranges of outcomes or their certainty, performing Monte Carlo modeling can be easier to implement than precise statistical equations.

Considering consequence ranges is an important part of risk analysis. Consider two risks, both with an expected value of a $10 million loss, but with very different consequence ranges. Suppose Risk A rarely occurs, but when it does, it can require $1 billion of reparations; but, assuming it is a 1/100-year event, its expected value is $10 million ($1 billion x 1/100). Risk B has risk events that occur several times a year and the annual financial impact varies only slightly from $8 million to $12 million, with an expected value of $10 million. Certain stakeholders may be interested to know that, despite having similar expected values, the risks have very different consequences. Creating ranges of outcomes, whether through Monte Carlo modeling or pure statistical approaches, can illuminate differences in risks.

IV. RISK SPEND EFFICIENCIES

This section addresses how RSEs are calculated in this 2021 RAMP Report. RSEs are numerical values that attempt to portray changes in risk scores per dollar spent. The change in a risk score is one data point that can help to inform decision-making and can be due to: (a) the amount of risk reduction when a new activity is completed, or (b) the amount of risk increase if a currently on-going activity is ceased.[38] The overall guiding principle of an RSE is that it presents the difference between the risk score over a certain span of time if the activity is undertaken versus if the activity is not undertaken. However, as discussed further in sections above and below, these data points should be viewed critically. This section: (1) illustrates how RSEs are created, with examples of RSEs for both Controls and Mitigations, (2) explains how benefits over time are treated, and (3) explains the challenges presented by RSEs.

A. Determining Risk Spend Efficiencies

As discussed in the section above, each risk has a risk score, calculated using the Risk Quantification Framework. The risk score that is developed is meant to represent the current risk situation. The current situation for each risk attempts to consider existing activities (known as Controls), current work standards, and all other current characteristics, such as asset conditions, environmental conditions, etc. A risk score is calculated by multiplying the LoRE and CoRE. The risk score that results from using the Risk Quantification Framework is the baseline used when calculating RSEs. Next, a second estimate for LoRE and CoRE that considers a change in a risk-reducing activity is estimated. For Mitigations, the second LoRE and CoRE are estimated assuming the new activity is in place. For Controls, the second LoRE and CoRE reflect the estimated risk if the activity is ceased.

For purposes of this RAMP Report, the terms "pre-mitigation LoRE"[39] and "pre-mitigation CoRE" refer to the estimated risk values given current situations. The terms "post-mitigation LoRE" and "post-mitigation CoRE" refer to the estimated risk values if an activity is

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[38] It should be noted that, in reality, risk reductions could be the result of other activities that have a positive effect, the improvement of industry-wide data, or other factors not necessarily tied to the mitigation itself.

[39] The terms "pre-mitigation" and "post-mitigation" used herein (and referenced in the Settlement Decision) are not intended to suggest that all activities are Mitigations (*i.e.*, this terminology also applies to Controls).

ceased or a new activity is undertaken. The same terminology applies to the Risk Scores, which are the product of LoRE multiplied by CoRE. In short:

$$pre-mitigation\ risk\ score = (pre-mitigation\ LoRE)\ x\ (pre-mitigation\ CoRE)$$

And

$$post-mitigation\ risk\ score = (post-mitigation\ LoRE)\ x\ (post-mitigation\ CoRE)$$

The RSE is the ratio between the pre-mitigation and post-mitigation risk scores divided by the cost. In its most simplistic form, the equation is:

$$simplified\ RSE = \frac{(pre-mitigation\ risk\ score) - (post-mitigation\ risk\ score)}{\$\ cost\ of\ activity}$$

1. Illustrative Examples

Illustrative Example (One Year Mitigation)

The following is a more thorough example of a one-year mitigation. Suppose there is a risk in one Company's ERR, known as Risk X, which has been assessed using the Risk Quantification Framework. Suppose the assessment generated an assumption that a risk event related to Risk X would occur four times a year. Further, the assessment considered the potential consequences when the risk events occur. Assume, for this example, that when a risk event occurs, the assessment, consistent with methods described above, estimates a 1/10 chance that there will be four serious injuries, no reliability consequence, an average financial consequence of $15 million to repair damage to equipment, and a statewide satisfaction score of 5.

Step 1: The first step is to formulate the pre-mitigation LoRE and CoRE. In this example, LoRE is four, because the LoRE is the average annual frequency. To determine CoRE, the Risk Quantification Framework is applied. Key parameters from the Risk Quantification Framework discussed in the section above are in the following table:

Table 12: Risk Quantification Framework[40]

Attribute	Measurement Unit[41]	Scale	Weight
Safety	Safety Index	0 – 20	60%
Reliability	Reliability Index	0 – 1	23%
Financial	$	$0 - $500M	15%
Stakeholder Satisfaction	Satisfaction Index	0-100	2%

Step 2: Applying the formula explained in the section above, CoRE could be calculated as:

$$CoRE = \left[\frac{0.1}{20}\right] x\ 60\% + \left[\frac{0}{1}\right] x\ 23\% + \left[\frac{\$5}{\$500}\right] x\ 15\% + \left[\frac{5}{100}\right] x\ 2\% = .0055$$

Step 3: The final step is to multiply by 100,000, as discussed above, for readability purposes. Therefore, the pre-mitigation risk score is:

$$Risk\ Score = LoRE\ x\ CoRE\ x\ 100{,}000 = 4\ x\ .0055\ x\ 100{,}000 = 2{,}200$$

Suppose now that there is a proposed activity that will help reduce risk associated to Risk X. Perhaps the activity is replacing older equipment with newer equipment. Assume that, based upon data, it is estimated that undertaking the proposed activity will reduce the likelihood of Risk X occurring by 25%. In this example, the LoRE would therefore change from four to three. This activity, however, is not believed to affect the consequence if the risk event were to occur, so the CoRE stays the same.

Therefore, the post-mitigation risk score would be:

$$\begin{aligned} &post - mitigation\ risk\ score \\ &\quad = (post - mitigation\ LoRE)\ x\ (post - mitigation\ CoRE)\ x\ 100{,}000 \\ &\quad = 3\ x\ .0055\ x\ 100{,}000 = 1{,}650 \end{aligned}$$

[40] As discussed in the section above, because of the wide range of possible choices available to each utility in assigning attributes, weights, scales, and other variables chosen through implementing the Settlement Decision, the Companies provide a range of scoring, based upon two additional alternative Risk Quantification Framework methods.

[41] "Measurement Unit" as used herein is the measured attribute, also analogous to "Natural Unit" per the Settlement Decision Lexicon included in D.18-12-014 at Attachment A, A-3.

Suppose the useful life of this activity is for one year, and that it costs $10 million to perform. The RSE calculation would therefore be:

$$RSE = \frac{(pre-mitigation\ risk\ score) - (post-mitigation\ risk\ score)}{\$10M} = \frac{2200-1650}{\$10M}$$
$$= \frac{550}{\$10M} = 55$$

Illustrative Example (One Year Control)

A similar process is used when Control activities are considered. One important distinction for such situations is that, in the RAMP Reports, when considering the change in risk score if a control were no longer in place, the difference between the pre-mitigation risk score and the post-mitigation risk score will still be shown as a positive number because the cost of the activity in the denominator would be savings. For consistency, in the RAMP Reports, both the numerator and the denominator will be shown as positive numbers.

Suppose there is a risk in a Company's ERR known as Risk ABC and this risk has been assessed using the Risk Quantification Framework. Suppose the assessment led to the estimate that a risk event related to Risk ABC would occur once every five years. Further, the assessment estimated the consequences to be two fatalities, no reliability consequence, an average financial consequence of $50 million to repair and replace equipment damaged by the event, and a stakeholder satisfaction score of 2.

The first step is to formulate the pre-mitigation LoRE and CoRE. In this example, LoRE is 1/5 or 0.2. To determine CoRE, the Risk Quantification Framework is applied as follows:

$$CoRE = \left[\frac{2}{20}\right] x\ 60\% + \left[\frac{0}{1}\right] x\ 23\% + \left[\frac{\$50}{\$500}\right] x\ 15\% + \left[\frac{2}{100}\right] x\ 2\% = .0754$$

For readability purposes, the utilities multiply these small decimal numbers by 100,000. Therefore, the pre-mitigation risk score is:

$$Risk\ Score = LoRE\ x\ CoRE\ x\ 100{,}000 = 0.2\ x\ .0754\ x\ 100{,}000 = 1{,}508$$

Suppose there is an activity that contributes to the risk score as it stands currently. Further, suppose there is a proposal to alter the activity in some way, such as changing the frequency of inspection. An example might be to stop a Quality Assurance program. Lastly, assume that based upon available data and subject matter expertise, it is believed that the

likelihood of the risk event will be increased by 10% and save $25 million. In this example, the LoRE would therefore change from 0.2 to 0.22 (*i.e.*, 10% more than 0.2 is 0.22). Ceasing this activity is not believed to affect the consequence if the risk event were to occur, so the CoRE stays the same.

Therefore, the post-mitigation risk score would be:

$$post - mitigation\ risk\ score = (post - mitigation\ LoRE)\ x\ (post - mitigation\ CoRE)$$
$$= 0.22\ x\ .0754\ x\ 100{,}000 = 1{,}658.8$$

Suppose the useful life of this activity is for one year. The RSE calculation would therefore be:

$$RSE = \frac{(pre - mitigation\ risk\ score) - (post - mitigation\ risk\ score)}{-\$25M}$$
$$= \frac{1508 - 1658.8}{-\$25M} = \frac{-150.8}{-\$25M} = 6.032$$

The Control therefore has an RSE of 6.04.

B. Duration Of Benefits

One of the more nuanced aspects of RSEs is how to address risk-reducing activities that have long-term benefits. The RSE is a comparison between performing an activity versus not performing that activity. In some cases, the implications of an activity have long term effects: pipelines last many years, computer software can be used for several years, etc. To utilize RSEs properly, some consideration needs to be given for the length of time, or duration, of predicted benefits.

A working assumption is that activities involving assets receive benefits for the life of the asset. Other activities, such as training or inspection programs, might have shorter durations of benefits. An illustrative example is a tree trimming program, which will only have a duration of benefits that match the time it takes for a tree to grow back to its former size.

Any activity that has a duration of benefits exceeding one year requires additional data points for the RSE calculation. The Example (One Year Control) above assumes that the activity has a one-year duration of benefits. However, if the assumption increased to three years of benefits, the activity can be considered to affect three years of risk results. The two tables below

illustrate the resulting differences by assuming a duration of benefits for one year versus three years.

Table 13: Example (One Year Control)

	Year				
	2022	**2023**	**2024**	**2025**	**2026**
Risk Score with Activity	980	1078	1078	1078	1078
Risk Score without Activity	1078	1078	1078	1078	1078
Difference	98	0	0	0	0

Table 14: Example (Three Year Control)

	Year				
	2022	**2023**	**2024**	**2025**	**2026**
Risk Score with Activity	980	980	980	1078	1078
Risk Score without Activity	1078	1078	1078	1078	1078
Difference	98	98	98	0	0

As shown in these tables above, the three-year benefit stream provides more value than the one-year benefit stream. The RSE calculation needs to address these differences.

C. Discounting of Benefits

The Settlement Decision allows accounting of long-term benefits of activities but requires an extra step before inclusion into the RSE.[42] The Settlement Decision mandates that future benefits have less value than present benefits. The Companies meet this requirement by applying a "discount" rate to the difference in the risk score. In this RAMP filing, the Companies use a 3% discount rate for purposes of determining the present value of the risk reduction benefits or numerator of the RSE calculation. As shown in the example below, this

[42] D.18-12-014 at Attachment A, A-13 (Risk Spend Efficiency (RSE) Calculation).

discount rate lowers the benefits by 3%, compounded each year. The Companies applied a 3% discount rate based on federal recommendations.[43]

Table 15: Example (Three Year Control)

Year					
	2022	**2023**	**2024**	**2025**	**2026**
Risk Score with Activity	980	980	980	1078	1078
Risk Score without Activity	1078	1078	1078	1078	1078
Difference	98	98	98	0	0
Discounted Difference	98 / (1.03) = 95.1	98 / $(1.03)^2$ = 92.4	98 / $(1.03)^3$ = 89.7	0	0

As shown in the table above, the benefit decreases from 95.1 in the first year to 89.7 in the third year. The term "Present Value" is a financial concept that can also be used when discussing the future benefits of a long-term activity. For the example above, the present value of the benefit in 2022 is 95.1. For activities that have multiple years of benefits, the simplified RSE calculation changes from:

$$RSE = \frac{(pre-mitigation\ risk\ score\ ) - (post-mitigation\ risk\ score\ )}{\$\ of\ activity}$$

to:

$$RSE = \frac{\sum_i^L Present\ Value\ ((pre-mitigation\ risk\ score_i) - (post-mitigation\ risk\ score_i))}{\$\ of\ activity}$$

where *i* is the year of the project, and *L* is the duration of benefits measured in years.

D. Discounting of Costs

Similar to the discounting of benefits mentioned in the section above, the Settlement Decision requires that the cost of activities also be discounted. However, in a GRC, the

[43] *See* Centers for Disease Control and Prevention, *Economic Burden of Occupational Fatal Injuries in the United States Based on the Census of Fatal Occupational Injuries, 2003-2010* (August 2017) (citing 1996 recommendation from U.S. Department of Health and Human Services Panel on Cost-Effectiveness in Health and Medicine), available at *https://www.cdc.gov/niosh/data/datasets/sd-1002-2017-0/pdfs/CFOI-CostTables_Methods_DetailedDescription_Final-508*.

Companies present their forecasts in base year,[44] direct constant dollars. The base year for the Companies Test Year 2024 GRC is 2021. While the Companies will be seeking approval for Test Year 2024 forecasts for O&M and 2022-2024 for capital expenditures, all these forecasts will be presented in 2021 constant dollars. These direct dollar forecasts will be converted into an overall revenue requirement through the Results of Operations (RO) model. In this RAMP Report, the Companies are presenting costs in base year, direct constant dollars, consistent with the GRC framework. As of the date of these RAMP filings, the last available year of recorded data is 2020. Accordingly, the Companies used 2020 direct, constant dollars as the basis for these RAMP Reports.

Therefore, for the purposes of the RSE calculation, the costs are effectively already discounted prior to being used in the RSE calculation. Meaning, the cost for activities with multi-year expenditures does not take into account escalation prior to their usage for RSEs. For example, suppose there was a capital project that sought $10 million a year for all three years of the next GRC forecast period (2022 through 2024). In the RAMP and in the GRC, the Companies would present these costs as $10 million for each year, 2022, 2023, and 2024. No escalation is shown for those years; therefore, there is no need to further discount costs shown for years 2023 and 2024. Additional information is provided in Chapter SCG/SDG&E RAMP-E.

E. Application of Risk Spend Efficiencies

The RAMP Report includes 174 activities for SoCalGas and 275 activities for SDG&E. In the RAMP filing, of the total amount of costs discussed, 90% of the SoCalGas costs have RSEs performed, and 89% of the SDG&E costs have RSEs performed. RSEs were calculated for a wide variety of activities, including all in-scope non-mandated activities, certain mandated Controls, and all Mitigations whether they were mandated or not. RSEs were calculated for all non-mandated activities and all new activities.

Despite best efforts, in the development of particular RSEs for the many Mitigations and Controls in this RAMP Report, the Companies discovered that, in certain situations, RSEs could not be reasonably calculated in certain circumstances or were of minimal value. These situations include the following.

[44] The term "base year" refers to the last recorded year available prior to a GRC filing.

RSEs can be difficult to accurately determine where there is mandated work that is difficult to separate from other work. For example, when a particular regulation has been in place for decades, it is difficult to separate how the Control activity implemented to comply with the regulation would impact the likelihoods and consequences of risk events. It is difficult to unravel the value of that Control to determine quantitatively the benefits it currently gives, especially in any meaningful way.

It can also be difficult to calculate an RSE in circumstances where non-risk-reducing activities enable risk-reducing activities. For example, line inspections do not, by themselves, reduce risk directly, but they do provide information to operators and field personnel, which is then used to find appropriate remediations where necessary. Inspections are bundled together with their remediations, when calculating RSEs.

These above challenges are both present in the case of foundational activities. As described in this RAMP Report, foundational activities include activities prudent to the operation of the gas and electric system, where not performing them would not be an option for the Companies. Some examples of foundational activities are purchasing and employing the computers and vehicles that workers use to perform their job functions. It would be exceedingly difficult to determine how an enterprise risk score would change, along with changes to these types of activities.

The calculation of RSEs in this RAMP Report represents the Companies' best efforts and is in compliance with the Settlement Decision. The methodologies and processes herein have advanced the RSEs. As further discussed in section F below, RSEs should be considered as a single data point, rather than the sole source for risk-based decision-making.

F. RSE Shortcomings

Conceptually, RSEs could be a useful tool to assist in decision-making, and SoCalGas and SDG&E generally support their use and refinement. However, since they were first suggested to the Commission, RSEs have had critical shortcomings – shortcomings that continue with their most recent iteration. Because of these deficiencies (both continuing and those more

recently identified), RSEs remain a data point for utilities to consider, but not the deciding factor for mitigation selection.[45] Below (in no particular order) are several of these shortcomings.[46]

Lack of data: The foundation of the RSE process is the availability of broad, accurate data for every risk and mitigation. Without such data, RSEs become drastically devalued by uncertainty. To properly calculate an RSE, as required by the Settlement Decision, there must be a unique measure of the frequency and consequences of a risk, the effects of a mitigation on both the frequency and consequence of a risk, and the cost required to implement the mitigation. The problem is that for many risks and mitigations, such data is scant or incomplete. For example, the Commission requires the Companies to inspect their systems annually, but there has been little data as to how many incidents were avoided through such annual inspections.

Nevertheless, if an anomaly is observed during an inspection, the Companies would respond as needed. While the Companies may capture additional information during an inspection, the data may not always be useful for risk reduction analysis. Therefore, the Companies cannot accurately determine the risk reduction benefit associated with annual inspections at this time. This issue is further complicated where a particular control has been done for decades. All of the utilities and the Commission's staff have acknowledged the challenge with this dearth of data.[47]

Another challenge commonly experienced with data is determining which data is most appropriate. Although utility-specific data is best, it is not always available. For example, for an asset-based risk, the nationally-relied upon data could be based on a utility that had not invested as much in the safety of its infrastructure. But, at the same time, the utility's infrastructure may

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[45] California Public Utilities Commission, *Risk and Safety Aspects of Risk Assessment and Mitigation Phase Report of Pacific Gas & Electric Company* [PG&E] *Investigation 17-11-003* (March 30, 2018) at 35 (In their review of PG&E's RSE methodology, Safety and Enforcement Division (SED) agreed that RSEs were not the only factor for consideration in selecting mitigations.).

[46] Although the issues discussed in this section were discussed in the last RAMP Reports, they are included here in somewhat streamlined form because they persist.

[47] *See* Investigation (I.)16-10-015/-016 (cons.), *Order Instituting Investigation Into the November 2016 Submission of San Diego Gas & Electric Company's Risk Assessment and Mitigation Phase* (October 27, 2016), I.17-11-003, *Order Instituting Investigation into the November 2017 Submission of Pacific Gas and Electric Company's Risk Assessment and Mitigation Phase* (November 9, 2017), and I.18-11-006, *Order Instituting Investigation into the November 2018 Submission of Southern California Edison Risk Assessment and Mitigation Phase* (November 8, 2018).

be less likely to experience risk events for other reasons, such as population densities, the environment, or other factors. It is difficult to balance all of these factors with precision.

Frequency of Incidents: Related to the previous point, the lack of the availability of data is difficult to overcome in some instances, because of the infrequency of incidents for many risks. This is particularly the case with "tail" risks. Tail risks are those risks that occur very infrequently, finding themselves on the very extreme end of a probability curve (*i.e.*, the "tail"). Understanding the reduction in risk associated with infrequent catastrophic incidents is difficult to determine because of the frequency of events.

Reliance on Subject Matter Experts (SMEs): The lack of available data and frequency of tail risks leads to a reliance on SMEs to assess how much a risk will be reduced by the implementation of a mitigation and requires SMEs to determine whether the available data is appropriate and applicable to our operations. As the Commission's Safety Division has acknowledged, the RSE is a product of SME input.[48] Although SMEs can be a strong source of input, they can benefit from quantitative calibration. It is frequently beneficial to train SMEs how to think quantitatively and to perform "sanity checks" on their input, by considering scenarios to truth test their inputs. As a result, RSEs are subject to the potential issues that can occur when SME input is used without calibration, or without consistent care in how SME input is scrutinized.

Changes Occur: Conditions change over time. Consequences and frequencies of events, priorities for the Commission and utilities, and other important factors in decision-making can change, even within a rate case cycle. As a result, predictive RSEs can be of limited value and fairly speculative. One of the clearest examples of this is found when calculating RSEs for vegetation management mitigations. In such calculations, one cannot reasonably account for changes in growth rates, costs or even fluctuations in weather. The type and growth rate of vegetation can change in an area; unpredicted weather patterns can change the biological and geographical landscape. RSEs can therefore vary widely from forecast to reality. The Commission appears to recognize this, as evidenced by its acknowledgement that utilities require flexibility to adapt to changing conditions and in addressing risk.

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[48] California Public Utilities Commission, *Risk and Safety Aspects of Risk Assessment and Mitigation Phase Report of San Diego Gas & Electric Company and Southern California Gas Company Investigation* 16-10-015 and I.16-10-016 (March 8, 2017) at 16.

Changing Methodologies and Tools: Comparing past and future RSEs, even from one cycle to the next, is generally of limited value. Changes will occur in methodologies and tools over time. This is recognized in D.18-12-014, which notes that utilities' MAVFs will evolve over time.[49] This evolution can take many forms. It can result from simply refining data, but wholesale changes to the structure of the Companies' Risk Quantification Framework may also occur. As a basic example, in this RAMP cycle, the Companies have added a fourth attribute and a sub-attribute for SDG&E's reliability MAVF. These and future changes make comparing RSEs across cycles of limited value. These and future changes make comparing RSEs across rate case cycles of limited value.

Non-RSE Factors: Perhaps one of the most critical shortcomings of RSEs is that there is much they do not capture. The methodologies for determining RSEs do not take into consideration all the factors that go into the decision to select a mitigation. For example, if a utility intends to replace a bare wire conductor with insulated conductor, the RSE calculation will consider the risk reduction achieved by installing the new conductor and the cost of the new conductor. While factors such as resource availability, permitting requirements, and changing climate conditions are not considered within the RSE calculation, these factors are certainly taken into consideration for decision-making purposes. Similarly, certain human factor benefits, such as those related to training and communicating with the public, are not easily captured as part of the RSE calculation.

RSEs Cannot Be Compared Across Utilities: RSEs cannot be compared in a meaningful way across utilities. Although the Commission and Intervenors have previously expressed a desire for RSE comparability across utilities on similar risks or mitigations, that is not possible at this time.[50] Each of the utilities use different formulas and methodologies in calculating RSEs. Each utility might use different attributes, different weights and scaling, and even different frequency and consequence valuations.

Lack of Common View of Risk Tolerance: There is no shared viewpoint on risk tolerance. The Commission's Safety Division, individual intervenors, and a utility may have different views regarding the permissible number of incidents on a particular system. Some

[49] D.18-12-014 at 54.

[50] *See* D.16-08-018 at 164.

might say they want zero incidents while others may say there should be no incidents beyond a certain size. These varying tolerances lead to different mitigations and RSEs. In addition, certain outcomes may be a higher priority to avoid because of their cause – but RSEs cannot capture that type of preference. As noted in RAMP-E, the Commission is considering whether to adopt a risk tolerance standard as a statewide issue in the ongoing S-MAP OIR.[51]

Mitigation Synergy not Recognized: As the MAVF for creation of RSEs currently stands, it is incapable of accurately determining the value of RSEs when mitigations are combined or broken up. Some mitigations work best when combined with one or more mitigations. Because RSEs must presented as standalone scores, the value of combining RSEs cannot be captured. Similarly, some mitigations apply across multiple risks. The RSE calculation methodology as it currently stands does not allow for a clear recognition of such benefits. Although combining the benefits across all risks impacted improves accuracy, doing so would significantly add to the complexity of the analysis and presentation of the mitigation benefits. For example, the replacement of live front equipment mitigation impacts both the Electric Infrastructure Integrity (EII) risk and the Employee Safety risk. However, the Companies elected to assess the mitigation benefit as part of the EII risk to minimize double counting of benefits throughout this 2021 RAMP Report. Thus, the risk reduction within the Employee Safety risk is underestimated since the mitigation was assessed against the EII risk. This is another instance of RSEs not being able to capture the entire picture when it comes to the costs and benefits of mitigations or controls.

Non-Asset Mitigations/Controls: Non-Asset mitigations may also not lend themselves well to evaluation by RSEs. Because some Non-Asset mitigations cannot always be broken down into relevant, discrete data points, trying to force them into a quantitative analysis is challenging. For example, consider the benefit of training. It is difficult to ascertain the precise amount of impact a training program has. The simplest way is to attempt to compare results with and without a program. But there are likely other changes occurring within a risk, and knowing which factor contributed to a change in risk outcomes is difficult. Consider driver training for employees. All employees who exceed a certain number of driven miles using company vehicles are required to take driver training. Simultaneously, improvements to vehicles have been made,

[51] *See* Rulemaking (R.) 20-07-013, *Assigned Commissioner Scoping Memo and Ruling* (November 2, 2020) (S-MAP OIR Scoping Ruling) at 7-9.

such as the installation of back-up cameras. It is very difficult analytically to say whether an incident did or did not occur due to the training or the installation of equipment. There are a substantial number of mitigations that utilities pursue and implement that are not asset-based. Determining how to assess them within an RSE-driven framework continues to be problematic.

RSEs Do Not Reflect the Reality of Utility or Commission Priorities: Capturing actual or strategic priorities when valuing mitigations is a challenge. Although there are several shortcomings in the RSEs that are primarily data driven, one of the most challenging to quantify is related to valuing mitigations that are strongly supported by the Commission and IOUs' strategic efforts and priorities. Certain mitigations are recognized by essentially all interested parties to be important – yet their RSEs would suggest they should be treated as lower priority work. For example, in the high-pressure pipeline incident risk, the valve automation mitigation had a relatively low RSE, yet valve automation was required by the Commission in D.14-06-007.[52] The rankings of RSEs shown in Appendix C-1 contain other examples of these types of mitigations.

[52] D.14-06-007 at 21.

APPENDIX C-1

SDG&E RSE RANKING

Appendix C-1: RSE Ranking

SDG&E

Line No.	Risk Chapter	Risk	ID	Control/Mitigation Name	Total Cost ($M)	RSE
1	SDG&E-Risk-7	Digin	C28	Warning Mesh	$ 0.06	2,702
2	SDG&E-Risk-1	Wildfire	C9/M4-T1	PSPS Sectionalizing - Tier 3	$ 0.54	2,112
3	SDG&E-Risk-1	Wildfire	C3-T3	Wireless Fault Indicators - Non-HFTD	$ 0.66	1,516
4	SDG&E-Risk-3	HP	C2-T1	Cathodic Protection – Maintenance (HCA)	$ 0.03	1,075
5	SDG&E-Risk-1	Wildfire	C9/M4-T2	PSPS Sectionalizing - Tier 2	$ 4.09	1,063
6	SDG&E-Risk-2	EII	C11	Tee Modernization Program	$ 11.47	938
7	SDG&E-Risk-3	HP	C11-T1	Measurement & Regulation Station – Maintenance (HCA)	$ 0.59	841
8	SDG&E-Risk-3	HP	M1-T1.1	PSEP: Pipeline Replacement (Phase 2B, HCA)	$ 10.00	731
9	SDG&E-Risk-1	Wildfire	C30-T1	Distribution System Inspection - CMP - Annual Patrol - Tier 3	$ 1.49	684
10	SDG&E-Risk-7	Digin	C3	Locate & Mark Activities	$ 5.25	590
11	SDG&E-Risk-1	Wildfire	C15/M10-T1	Expanded Generator Grant Program - Tier 3	$ 1.45	569
12	SDG&E-Risk-8	EMPL	M1	Purchasing and testing more protective respiratory protection for wildfire smoke particulates.	$ 0.01	516
13	SDG&E-Risk-3	HP	C1-T1	Cathodic Protection – Capital (HCA)	$ 0.20	489
14	SDG&E-Risk-3	HP	M1-T1.2	PSEP: Pipeline Replacement (Phase 2B, non-HCA)	$ 10.00	468
15	SDG&E-Risk-2	EII	C10-T1	Underground cable replacement program - UG Feeder	$ 0.53	465
16	SDG&E-Risk-7	Digin	C14	Locating Equipment	$ 0.14	456
17	SDG&E-Risk-2	EII	C8	Avian Protection Program	$ 1.87	409
18	SDG&E-Risk-3	HP	C9	Compressor Stations - Maintenance	$ 2.33	403
19	SDG&E-Risk-3	HP	C1-T2	Cathodic Protection – Capital (non-HCA)	$ 0.41	388
20	SDG&E-Risk-1	Wildfire	C6/M1-T2	SCADA Capacitors - Tier 2	$ 1.79	381
21	SDG&E-Risk-1	Wildfire	C30-T2	Distribution System Inspection - CMP - Annual Patrol - Tier 2	$ 1.78	373
22	SDG&E-Risk-3	HP	C11-T2	Measurement & Regulation Station – Maintenance (non-HCA)	$ 1.19	369
23	SDG&E-Risk-3	HP	C15-T1	Integrity Assessments & Remediations (HCA)	$ 33.69	355
24	SDG&E-Risk-1	Wildfire	C24-T2	Distribution System Inspection - IR/Corona - Tier 2	$ 0.52	322
25	SDG&E-Risk-7	Digin	C6	Locate and Mark Annual Refresher Training and Competency Program	$ 0.001	317
26	SDG&E-Risk-1	Wildfire	C11/M6-T1	Advanced Protection - Tier 3	$ 30.63	309
27	SDG&E-Risk-3	HP	C15-T2	Integrity Assessments & Remediations (Non-HCA)	$ 7.90	300
28	SDG&E-Risk-8	EMPL	C14	Enhanced Safety in Action Program	$ 0.16	299
29	SDG&E-Risk-7	Digin	C16-T4	Public Awareness Compliance – Excavators	$ 0.01	287
30	SDG&E-Risk-1	Wildfire	C15/M10-T2	Expanded Generator Grant Program - Tier 2	$ 2.18	284
31	SDG&E-Risk-1	Wildfire	C34-T1	Pole Brushing - Tier 3	$ 7.91	261
32	SDG&E-Risk-2	EII	C4-T3	High Risk Switch Replacement program - Hook	$ 1.65	241
33	SDG&E-Risk-3	HP	C6-T1	Pipeline Maintenance (HCA)	$ 0.10	240
34	SDG&E-Risk-2	EII	C10-T3	North Harbor Project	$ 14.91	201
35	SDG&E-Risk-1	Wildfire	C28-T1	Distribution System Inspection - Drone Inspections - Tier 3	$ 4.50	194
36	SDG&E-Risk-1	Wildfire	C31-T1	Tree Trimming - Tier 3	$ 44.85	192
37	SDG&E-Risk-2	EII	C4-T2	High Risk Switch Replacement program - Gang	$ 0.42	190
38	SDG&E-Risk-1	Wildfire	C8/M3-T2	Expulsion Fuse Replacement - Tier 2	$ 3.08	187
39	SDG&E-Risk-7	Digin	C13	Locating Equipment	$ 0.67	179
40	SDG&E-Risk-3	HP	M4	Adobe Falls Relocation Project	$ 2.00	167
41	SDG&E-Risk-2	EII	C10-T2	Underground cable replacement program - UG Branch	$ 15.54	166
42	SDG&E-Risk-3	HP	M1-T1.3	PSEP: Hydrotesting (Phase 2B, HCA)	$ 10.00	161
43	SDG&E-Risk-6	CYBR	C1	Perimeter Defenses	$ 26.74	160
44	SDG&E-Risk-6	CYBR	A1-C1	Perimeter Defenses	$ 19.86	157
45	SDG&E-Risk-1	Wildfire	C16/M11-T1	Strategic Undergrounding - Tier 3	$ 629.68	156

46	SDG&E-Risk-6	CYBR	A2-C1	Perimeter Defenses	$ 31.30	154
47	SDG&E-Risk-1	Wildfire	C34-T2	Pole Brushing - Tier 2	$ 8.96	152
48	SDG&E-Risk-2	EII	C20-T2	Bernardo 12 kV Breakers Replacements	$ 1.00	146
49	SDG&E-Risk-1	Wildfire	C37-T1	Strategy for Minimizing Public Safety Risk During High Wildfire Conditions, PSPS and Re-Energization Protocols - Tier 3	$ 30.75	145
50	SDG&E-Risk-9	MP	C11	Gas Distribution Emergency Department	$ 27.29	144
51	SDG&E-Risk-6	CYBR	C4	OT Cybersecurity	$ 20.84	142
52	SDG&E-Risk-6	CYBR	A2-C4	OT Cybersecurity	$ 21.26	139
53	SDG&E-Risk-4	CONT	C1	Contractor Oversight Program	$ 3.18	139
54	SDG&E-Risk-8	EMPL	C13	Enhanced Mandatory Employee Training (OSHA): Certified Occupational Safety Specialist, Certified Utility Safety Professional; Certified Safety Professional	$ 0.05	138
55	SDG&E-Risk-3	HP	C4-T1	Pipeline Relocation/Replacement (HCA)	$ 1.91	131
56	SDG&E-Risk-7	Digin	C15-T4	Public Awareness Compliance – Excavators	$ 0.02	124
57	SDG&E-Risk-1	Wildfire	C14/M9-T1	Whole House Generator Program - Tier 3	$ 19.60	120
58	SDG&E-Risk-1	Wildfire	C37-T2	Strategy for Minimizing Public Safety Risk During High Wildfire Conditions, PSPS and Re-Energization Protocols - Tier 2	$ 34.80	120
59	SDG&E-Risk-1	Wildfire	C21/M14-T1	Lightning Arrester Removal / Replacement Program - Tier 3	$ 7.83	113
60	SDG&E-Risk-1	Wildfire	C33/M16-T1	Enhanced Vegetation Management - Tier 3	$ 15.01	111
61	SDG&E-Risk-1	Wildfire	C27-T1	Distribution System Inspection - QA/QC Tier 3 Inspections - Tier 3	$ 9.01	111
62	SDG&E-Risk-6	CYBR	A1-C4	OT Cybersecurity	$ 19.51	110
63	SDG&E-Risk-1	Wildfire	C31-T2	Tree Trimming - Tier 2	$ 54.07	104
64	SDG&E-Risk-3	HP	M1-T1.4	PSEP: Hydrotesting (Phase 2B, non-HCA)	$ 10.00	103
65	SDG&E-Risk-6	CYBR	C5	Obsolete IT Infrastructure and Asset Replacement	$ 25.18	102
66	SDG&E-Risk-2	EII	C4-T1	High Risk Switch Replacement program -SCADA	$ 0.62	101
67	SDG&E-Risk-2	EII	C20-T5	Miramar 12kV Replacements	$ 1.42	101
68	SDG&E-Risk-6	CYBR	A1-C5	Obsolete IT Infrastructure and Application Replacement	$ 19.04	98
69	SDG&E-Risk-6	CYBR	A2-C5	Obsolete IT Infrastructure and Application Replacement	$ 27.60	98
70	SDG&E-Risk-6	CYBR	C2	Internal Defenses	$ 36.17	95
71	SDG&E-Risk-1	Wildfire	C12/M7-T1	Hotline Clamps - Tier 3	$ 4.50	93
72	SDG&E-Risk-3	HP	C8	Compressor Stations - Capital	$ 31.72	91
73	SDG&E-Risk-2	EII	C28	RTU Modernization	$ 2.26	91
74	SDG&E-Risk-1	Wildfire	A2	Alternative 2	$ 900.87	88
75	SDG&E-Risk-6	CYBR	A2-C2	Internal Defenses	$ 44.09	88
76	SDG&E-Risk-3	HP	C10-T1	Measurement & Regulation – Capital (HCA)	$ 0.67	86
77	SDG&E-Risk-4	CONT	M2	Enhanced Verification of Class 1 Contractor Employee Specific Training	$ 0.64	86
78	SDG&E-Risk-6	CYBR	A1-C2	Internal Defenses	$ 29.43	85
79	SDG&E-Risk-7	Digin	C23	Excess Flow Valve or Curb Valve Installation	$ 0.33	83
80	SDG&E-Risk-2	EII	C20-T7	Pacific Beach Bus Tie Replacements	$ 2.29	81
81	SDG&E-Risk-1	Wildfire	A1	Alternative 1	$ 1,643.22	79
82	SDG&E-Risk-2	EII	C1	Overhead Public Safety (OPS)	$ 21.73	78
83	SDG&E-Risk-8	EMPL	C3	Strong Safety Culture	$ 0.60	78
84	SDG&E-Risk-1	Wildfire	C13/M8-T1	Backup Power for Resilience - Generator Grant Program, CRCs, HPWREN - Tier 3	$ 7.90	76
85	SDG&E-Risk-9	MP	M2	Cathodic Protection System Enhancements – Real Time Monitoring	$ 3.00	69
86	SDG&E-Risk-3	HP	C2-T2	Cathodic Protection – Maintenance (non-HCA)	$ 0.05	66
87	SDG&E-Risk-1	Wildfire	C22-T1	Distribution System Inspection - CMP - 5 year - Tier 3	$ 11.43	65
88	SDG&E-Risk-1	Wildfire	C36-T1	Wildfire Infrastructure Protection Teams - Tier 3	$ 6.18	63
89	SDG&E-Risk-2	EII	C24	Urban Substation Rebuild	$ 4.12	63
90	SDG&E-Risk-3	HP	C4-T2	Pipeline Relocation/Replacement (non-HCA)	$ 3.88	62
91	SDG&E-Risk-6	CYBR	C3	Sensitive Data Protection	$ 27.64	62
92	SDG&E-Risk-1	Wildfire	C18/M13-T1	(distribution underbuilt) Overhead Transmission Fire Hardening - Tier 3	$ 3.12	63
93	SDG&E-Risk-2	EII	C15	Corrective Maintenance Program- Service Connections and Minor Capital Units	$ 44.63	61
94	SDG&E-Risk-7	Digin	C4	Locate & Mark Activities	$ 1.49	61
95	SDG&E-Risk-1	Wildfire	C33/M16-T2	Enhanced Vegetation Management - Tier 2	$ 17.77	61
96	SDG&E-Risk-9	MP	M3	Replace Curb Valves with EFVs	$ 7.61	61

97	SDG&E-Risk-2	EII	C14	DOE Switch Replacement	$	19.43	60
98	SDG&E-Risk-2	EII	C20-T3	Chicarita 12kV Replacements	$	4.22	60
99	SDG&E-Risk-1	Wildfire	C27-T2	Distribution System Inspection - QA/QC Tier 3 Inspections - Tier 2	$	0.01	57
100	SDG&E-Risk-3	HP	C10-T2	Measurement & Regulation – Capital (non-HCA)	$	1.36	57
101	SDG&E-Risk-8	EMPL	C9	Safe Driving Programs	$	0.27	57
102	SDG&E-Risk-6	CYBR	A2-C3	Sensitive Data Protection	$	31.50	57
103	SDG&E-Risk-9	MP	C4	Regulator Station, Valve, and Large Meter Set Inspection	$	4.46	57
104	SDG&E-Risk-1	Wildfire	C36-T2	Wildfire Infrastructure Protection Teams - Tier 2	$	2.63	56
105	SDG&E-Risk-6	CYBR	A1-C3	Sensitive Data Protection	$	22.21	56
106	SDG&E-Risk-1	Wildfire	C16/M11-T2	Strategic Undergrounding - Tier 2	$	377.81	54
107	SDG&E-Risk-1	Wildfire	C17/M12-T1	Overhead Distribution Fire Hardening - Bare Conductors - Tier 3	$	5.13	53
108	SDG&E-Risk-7	Digin	C16-T2	Public Awareness Compliance - Emergency Officials	$	0.001	51
109	SDG&E-Risk-2	EII	C20-T4	Laguna Niguel 12kV Replacements	$	8.70	45
110	SDG&E-Risk-7	Digin	C11	Damage Prevention Analyst Program	$	0.25	40
111	SDG&E-Risk-7	Digin	C16-T3	Public Awareness Compliance - Local Public Officials	$	0.004	39
112	SDG&E-Risk-7	Digin	C32	Enhance Ticket Management Software	$	0.02	39
113	SDG&E-Risk-1	Wildfire	C13/M8-T2	Backup Power for Resilience - Generator Grant Program, CRCs, HPWREN - Tier 2	$	15.80	38
114	SDG&E-Risk-7	Digin	C16-T1	Public Awareness Compliance - The Affected Public	$	0.06	38
115	SDG&E-Risk-1	Wildfire	C12/M7-T2	Hotline Clamps - Tier 2	$	4.50	36
116	SDG&E-Risk-4	CONT	C2	Field Safety Oversight	$	15.79	35
117	SDG&E-Risk-2	EII	C20-T1	Batiquitos 12kV Replacements	$	7.45	34
118	SDG&E-Risk-1	Wildfire	C22-T2	Distribution System Inspection - CMP - 5 year - Tier 2	$	15.13	33
119	SDG&E-Risk-1	Wildfire	C7/M2-T1	Overhead Distribution Fire Hardening - Covered Conductors - Tier 3	$	340.51	32
120	SDG&E-Risk-1	Wildfire	C18/M13-T2	(distribution underbuilt) Overhead Transmission Fire Hardening - Tier 2	$	41.78	32
121	SDG&E-Risk-7	Digin	M2	Automate Third Party Excavation Incident Reporting	$	0.004	31
122	SDG&E-Risk-2	EII	C29	SCADA Capacitors	$	2.39	31
123	SDG&E-Risk-1	Wildfire	C10/M5-T2	Backup Power for Resilience - Microgrids - Tier 2	$	42.39	30
124	SDG&E-Risk-2	EII	C16	Manhole, Handhole and Vault Restoration Program	$	9.67	27
125	SDG&E-Risk-7	Digin	C27	Warning Mesh	$	0.24	26
126	SDG&E-Risk-8	EMPL	M3	Automate notifications and employee communications when the Air Quality Index PM2.5 reaches specific thresholds during a wildfire in our service territory	$	0.12	26
127	SDG&E-Risk-2	EII	C20-T6	Scripps 12kV Replacements	$	12.32	25
128	SDG&E-Risk-1	Wildfire	C35-T1	Aviation Firefighting Program - Tier 3	$	63.76	24
129	SDG&E-Risk-7	Digin	C5	Locate and Mark Annual Refresher Training and Competency Program	$	5.00	25
130	SDG&E-Risk-9	MP	C2	Cathodic Protection Program - Capital	$	18.73	25
131	SDG&E-Risk-3	HP	C12	Odorization	$	0.01	22
132	SDG&E-Risk-7	Digin	M4	Locate and Mark Photographs	$	0.10	20
133	SDG&E-Risk-7	Digin	C15-T2	Public Awareness Compliance - Emergency Officials	$	0.003	20
134	SDG&E-Risk-7	Digin	C10	Locate and Mark Quality Assurance Program	$	0.08	19
135	SDG&E-Risk-7	Digin	C12	Damage Prevention Analyst Program	$	0.05	19
136	SDG&E-Risk-8	EMPL	C15	Enhanced Employee Safe Driving Training	$	1.65	19
137	SDG&E-Risk-7	Digin	C15-T1	Public Awareness Compliance - The Affected Public	$	0.26	17
138	SDG&E-Risk-7	Digin	C31	Enhance Ticket Management Software	$	0.10	17
139	SDG&E-Risk-7	Digin	M1	Automate Third Party Excavation Incident Reporting	$	0.03	17
140	SDG&E-Risk-2	EII	C6	Tree Trimming	$	121.65	15
141	SDG&E-Risk-2	EII	A3	Avian Protection Program	$	12.17	15
142	SDG&E-Risk-2	EII	C23	San Mateo Substation	$	13.90	15
143	SDG&E-Risk-9	MP	C6/C7	Leak Repair & Pipeline Monitoring (Leak Mitigation, Bridge & Span, Unstable Earth and Pipeline Patrol)	$	41.19	15
144	SDG&E-Risk-2	EII	C18	Distribution Circuit Reliability Construction	$	11.70	15
145	SDG&E-Risk-1	Wildfire	C35-T2	Aviation Firefighting Program - Tier 2	$	37.60	14
146	SDG&E-Risk-3	HP	C6-T2	Pipeline Maintenance (non-HCA)	$	0.21	14
147	SDG&E-Risk-8	EMPL	C8	OSHA Voluntary Protection Program	$	1.50	14

148	SDG&E-Risk-7	Digin	C15-T3	Public Awareness Compliance - Local Public Officials	$ 0.02	14
149	SDG&E-Risk-1	Wildfire	C7/M2-T2	Overhead Distribution Fire Hardening - Covered Conductors - Tier 2	$ 74.75	14
150	SDG&E-Risk-9	MP	C9-T1	Early Vintage Program (Components) - Oil Drip Piping Removal	$ 7.16	14
151	SDG&E-Risk-9	MP	C1	Cathodic Protection Program - O&M	$ 5.85	13
152	SDG&E-Risk-1	Wildfire	C29-T1	Distribution System Inspection - Circuit Ownership - Tier 3	$ 0.13	13
153	SDG&E-Risk-7	Digin	M3	Locate and Mark Photographs	$ 0.44	13
154	SDG&E-Risk-4	CONT	A2	Use internal resources and tools to vet contractors for safety	$ 4.38	13
155	SDG&E-Risk-2	EII	A2-T1	Modernize Manual Switches - OH	$ 33.90	12
156	SDG&E-Risk-8	EMPL	C4	Employee Behavioral Accident Prevention Process Program	$ 2.58	12
157	SDG&E-Risk-2	EII	C20-T8	Coronado 69/12kV Transformer Replacement	$ 1.65	12
158	SDG&E-Risk-2	EII	C3	4kV Modernization Program- Distribution (Overhead, Underground and package Substation removal)	$ 20.58	11
159	SDG&E-Risk-9	MP	C10	Code Compliance Mitigation	$ 6.21	10
160	SDG&E-Risk-8	EMPL	C11	Jobsite Safety Programs	$ 7.34	9.3
161	SDG&E-Risk-1	Wildfire	C28-T2	Distribution System Inspection - Drone Inspections - Tier 2	$ 39.87	8.9
162	SDG&E-Risk-9	MP	C8-T3	Underperforming Steel Replacement Program – Other Steel (Post 1965 vintage).	$ 10.70	8.6
163	SDG&E-Risk-3	HP	C5-T1	Shallow/Exposed Pipe Remediations (HCA)	$ 2.94	8.6
164	SDG&E-Risk-2	EII	C21	Distribution Substation Obsolete Equipment	$ 7.84	8.1
165	SDG&E-Risk-7	Digin	C30	Ticket Risk Assessment and Evaluating City Permit Data	$ 0.01	8.0
166	SDG&E-Risk-1	Wildfire	C29-T2	Distribution System Inspection - Circuit Ownership - Tier 2	$ 0.25	7.3
167	SDG&E-Risk-8	EMPL	M2	Purchasing break/rest trailers with filtered air systems to reduce wildfire smoke exposure	$ 0.45	6.9
168	SDG&E-Risk-3	HP	M2-T1	Gas Transmission Safety Rule - MAOP Reconfirmation (HCA)	$ 37.44	6.9
169	SDG&E-Risk-1	Wildfire	C32/M15-T1	Fuel Management Program - Tier 3	$ 18.62	6.8
170	SDG&E-Risk-9	MP	C3	Piping in Vaults Replacement Program	$ 9.06	6.3
171	SDG&E-Risk-9	MP	C8-T2	Underperforming Steel Replacement Program (1934-1965 vintage).	$ 21.90	6.3
172	SDG&E-Risk-9	MP	C21	CSF Quality Assurance (QA) Program	$ 0.97	6.3
173	SDG&E-Risk-9	MP	C9-T3	Early Vintage Program (Components) - Removal of Closed Valves between High/Medium Pressure Zones	$ 0.77	6.2
174	SDG&E-Risk-3	HP	M3-T2	Gas Transmission Safety Rule – Material Verification (Non-HCA)	$ 0.03	6.2
175	SDG&E-Risk-3	HP	C5-T2	Shallow/Exposed Pipe Remediations (non-HCA)	$ 5.98	5.9
176	SDG&E-Risk-2	EII	C13	Replacement of Live Front Equipment	$ 1.75	5.7
177	SDG&E-Risk-9	MP	C8-T1	Underperforming Steel Replacement Program – Threaded Main (pre-1933 vintage	$ 27.65	5.7
178	SDG&E-Risk-3	HP	A1	Proactive Soil Sampling	$ 0.36	5.7
179	SDG&E-Risk-7	Digin	C24	Pipeline Patrol and Pipeline Markers	$ 0.72	5.7
180	SDG&E-Risk-3	HP	C3-T1	Leak Repair (HCA)	$ 2.05	5.6
181	SDG&E-Risk-3	HP	C3-T2	Leak Repair (non-HCA)	$ 4.15	5.3
182	SDG&E-Risk-9	MP	M1	Safety Control Valves	$ 7.61	4.9
183	SDG&E-Risk-9	MP	C12	Cathodic Protection System Enhancements - Base	$ 4.94	4.4
184	SDG&E-Risk-3	HP	M2-T2	Gas Transmission Safety Rule - MAOP Reconfirmation (Non-HCA)	$ 1.56	4.1
185	SDG&E-Risk-9	MP	C16-T1	DIMP – DREAMS – Vintage Integrity Plastic Plan (VIPP)	$ 174.90	3.4
186	SDG&E-Risk-9	MP	C5	Regulator Station Replacement	$ 6.00	2.7
187	SDG&E-Risk-2	EII	A2-T2	Modernize Manual Switches - UG	$ 42.30	2.5
188	SDG&E-Risk-2	EII	A1	Customer Owned E-Structure Reconfigure	$ 0.84	2.1
189	SDG&E-Risk-1	Wildfire	C25-T2	Distribution System Inspection - CMP - 10 year intrusive - Tier 2	$ 3.36	2.0
190	SDG&E-Risk-3	HP	M3-T1	Gas Transmission Safety Rule – Material Verification (HCA)	$ 0.14	1.2
191	SDG&E-Risk-9	MP	A1	Post Training Follow-up Field Evaluations	$ 0.05	1.1
192	SDG&E-Risk-7	Digin	C9	Locate and Mark Quality Assurance Program	$ 0.64	1.0
193	SDG&E-Risk-1	Wildfire	C35-T3	Aviation Firefighting Program - Non-HFTD	$ 2.85	0.9
194	SDG&E-Risk-3	HP	A2	Expanding Geotechnical Analysis	$ 0.18	0.9
195	SDG&E-Risk-3	HP	C13	Security and Auxiliary Equipment	$ 2.21	0.8
196	SDG&E-Risk-7	Digin	C29	Ticket Risk Assessment and Evaluating City Permit Data	$ 0.04	0.7
197	SDG&E-Risk-9	MP	C9-T2	Early Vintage Program (Components) - Dresser Mechanical Coupling Removal	$ 9.29	0.6
198	SDG&E-Risk-9	MP	C20	Natural Gas Appliance Testing (NGAT) or Carbon Monoxide Testing	$ 0.33	0.5

199	SDG&E-Risk-9	MP	C14	Human Factors Mitigations – Operator Qualification Training and Certification	$	12.01	0.4
200	SDG&E-Risk-9	MP	C19	Field and Public Safety	$	30.79	0.2
201	SDG&E-Risk-9	MP	A2	Soil Sampling Program	$	12.30	0.02
202	SDG&E-Risk-7	Digin	A2	Virtual Reality Training	$	0.10	0.02
203	SDG&E-Risk-7	Digin	A1	Virtual Reality Training	$	0.10	0.01
204	SDG&E-Risk-7	Digin	A4	GPS Tracking of Excavation Equipment	$	0.34	0.001
205	SDG&E-Risk-7	Digin	A3	GPS Tracking of Excavation Equipment	$	0.34	0.0002

APPENDIX C-1

SOCALGAS RSE RANKING

Appendix C-1: RSE Ranking

SoCalGas

Line No.	Risk Chapter	Risk	ID	Control/Mitigation Name	Total Cost ($M)	RSE
1	SCG-Risk-1	HP	C7-T1	Pipeline Maintenance (HCA)	$ 0.22	1,336
2	SCG-Risk-1	HP	C4-T1	Leak Survey & Patrol (HCA)	$ 0.14	901
3	SCG-Risk-1	HP	C7-T2	Pipeline Maintenance (non-HCA)	$ 0.45	856
4	SCG-Risk-2	Digin	C3	Locate & Mark Activities	$ 19.49	767
5	SCG-Risk-1	HP	C22-T4.4	PSEP: Valve Enhancement (GRC base, non-HCA)	$ 5.44	743
6	SCG-Risk-1	HP	C4-T2	Leak Survey & Patrol (non-HCA)	$ 0.29	577
7	SCG-Risk-5	EMPL	C10	Workplace Violence Prevention Programs	$ 7.70	498
8	SCG-Risk-2	Digin	C30	Warning Mesh	$ 0.19	484
9	SCG-Risk-1	HP	C23-T2	Ventura Compressor Station Modernization	$ 178.86	345
10	SCG-Risk-1	HP	C22-T4.3	PSEP: Valve Enhancement (GRC base, HCA)	$ 28.69	276
11	SCG-Risk-1	HP	C2-T1	Cathodic Protection – Maintenance (HCA)	$ 0.38	276
12	SCG-Risk-1	HP	C11	Compressor Stations - Maintenance	$ 8.24	261
13	SCG-Risk-3	MP	C22	DIMP: Gas Infrastructure Protection Program (GIPP)	$ 85.02	221
14	SCG-Risk-1	HP	C22-T3.2	PSEP: Pipeline Replacement (Phase 2A, GRC base, non-HCA)	$ 93.71	220
15	SCG-Risk-7	CONT	C3	Contractor Engagement	$ 0.01	202
16	SCG-Risk-7	CONT	C2	Third-Party Administration Tools	$ 0.05	182
17	SCG-Risk-1	HP	C2-T2	Cathodic Protection – Maintenance (non-HCA)	$ 0.77	177
18	SCG-Risk-6	CYBR	C1	Perimeter Defenses	$ 26.74	160
19	SCG-Risk-6	CYBR	A1-C1	Perimeter Defenses	$ 19.86	157
20	SCG-Risk-6	CYBR	A2-C1	Perimeter Defenses	$ 31.30	154
21	SCG-Risk-1	HP	C13-T1	Measurement & Regulation Station – Maintenance (non-HCA)	$ 3.43	129
22	SCG-Risk-2	Digin	C6	Locate and Mark Annual Refresher Training and Competency Program	$ 0.01	121
23	SCG-Risk-2	Digin	C34	Enhance Ticket Management Software	$ 0.13	115
24	SCG-Risk-3	MP	C2	Cathodic Protection- CP10 Activities	$ 3.18	115
25	SCG-Risk-6	CYBR	C4	OT Cybersecurity	$ 19.46	112
26	SCG-Risk-6	CYBR	A2-C4	OT Cybersecurity	$ 20.52	112
27	SCG-Risk-6	CYBR	A1-C4	OT Cybersecurity	$ 14.56	110
28	SCG-Risk-3	MP	C7	Electronic Pressure Monitor (EPM) Replacement & Installs	$ 1.46	107
29	SCG-Risk-2	Digin	C24	Excess Flow Valve or Curb Valve Installation	$ 2.65	105
30	SCG-Risk-6	CYBR	C5	Obsolete IT Infrastructure and Asset Replacement	$ 25.18	102
31	SCG-Risk-6	CYBR	A1-C5	Obsolete IT Infrastructure and Application Replacement	$ 19.04	98
32	SCG-Risk-6	CYBR	A2-C5	Obsolete IT Infrastructure and Application Replacement	$ 27.60	98
33	SCG-Risk-7	CONT	A2	Use a Different Third-Party Administration Tool to Vet Contractors for Safety	$ 0.03	97
34	SCG-Risk-2	Digin	C16-T3	Public Awareness Compliance - Local Public Officials	$ 0.01	97
35	SCG-Risk-6	CYBR	C2	Internal Defenses	$ 36.17	95
36	SCG-Risk-3	MP	C4	Meter & Regulator (M&R) Station and Electronic Pressure Monitors (EPM) Inspection and Maintenance	$ 3.57	93
37	SCG-Risk-3	MP	C11	Pipeline Monitoring (Pipeline Patrol, Bridge & Span Inspections, Unstable Earth Inspection)	$ 0.004	92
38	SCG-Risk-3	MP	C18	Residential Meter Protection Project	$ 27.31	91
39	SCG-Risk-6	CYBR	A2-C2	Internal Defenses	$ 44.09	88
40	SCG-Risk-1	HP	C21-T2	Integrity Assessments & Remediation (Non-HCA)	$ 427.66	86
41	SCG-Risk-2	Digin	C33	Enhance Ticket Management Software	$ 0.54	86
42	SCG-Risk-6	CYBR	A1-C2	Internal Defenses	$ 29.43	85
43	SCG-Risk-1	HP	C13-T2	Measurement & Regulation Station – Maintenance (non-HCA)	$ 6.96	83
44	SCG-Risk-1	HP	C21-T1	Integrity Assessments & Remediation (HCA)	$ 246.87	83
45	SCG-Risk-4	STOR	C6	Compressor Overhauls	$ 15.57	83
46	SCG-Risk-3	MP	C6	Meter Set Assembly (MSA) Inspection and Maintenance	$ 16.18	81
47	SCG-Risk-2	Digin	C16-T4	Public Awareness Compliance – Excavators	$ 0.06	78
48	SCG-Risk-1	HP	C1-T1	Cathodic Protection – Capital (HCA)	$ 15.21	77
49	SCG-Risk-2	Digin	M2	Automate Third Party Excavation Incident Reporting	$ 0.03	70
50	SCG-Risk-1	HP	C10	Compressor Stations - Capital	$ 61.07	67
51	SCG-Risk-3	MP	C12	Valve Inspection & Maintenance	$ 1.25	64
52	SCG-Risk-2	Digin	C15-T3	Public Awareness Compliance - Local Public Officials	$ 0.02	63
53	SCG-Risk-6	CYBR	C3	Sensitive Data Protection	$ 27.64	62
54	SCG-Risk-2	Digin	C25	Pipeline Patrol and Pipeline Markers	$ 0.09	62
55	SCG-Risk-5	EMPL	M6	Industrial Hygiene Program Expansion	$ 0.15	60
56	SCG-Risk-2	Digin	M1	Automate Third Party Excavation Incident Reporting	$ 0.14	58
57	SCG-Risk-6	CYBR	A2-C3	Sensitive Data Protection	$ 31.50	57
58	SCG-Risk-6	CYBR	A1-C3	Sensitive Data Protection	$ 22.21	56
59	SCG-Risk-2	Digin	C4	Locate & Mark Activities	$ 4.44	55
60	SCG-Risk-2	Digin	C15-T4	Public Awareness Compliance – Excavators	$ 0.23	52
61	SCG-Risk-1	HP	C1-T2	Cathodic Protection – Capital (non-HCA)	$ 30.88	51
62	SCG-Risk-3	MP	C3	Cathodic Protection- 100mV Requalification	$ 3.65	51
63	SCG-Risk-2	Digin	C11	Damage Prevention Analyst Program	$ 1.45	48
64	SCG-Risk-5	EMPL	C4	Employee Safety Training and Awareness Programs	$ 0.44	44
65	SCG-Risk-5	EMPL	C7	Near Miss, Stop the Job and jobsite safety programs	$ 0.44	41
66	SCG-Risk-2	Digin	C26	Pipeline Patrol and Pipeline Markers	$ 0.49	39
67	SCG-Risk-1	HP	C5-T1	Pipeline Relocation/Replacement (HCA)	$ 21.88	36
68	SCG-Risk-2	Digin	C12	Damage Prevention Analyst Program	$ 0.29	36
69	SCG-Risk-4	STOR	C5	Storage Field Maintenance	$ 34.35	35
70	SCG-Risk-2	Digin	C16-T1	Public Awareness Compliance - The Affected Public	$ 0.19	34
71	SCG-Risk-3	MP	C1	Cathodic Protection Base Activities	$ 11.94	34
72	SCG-Risk-5	EMPL	M1	OSHA Construction Certification Training	$ 0.05	33
73	SCG-Risk-1	HP	C6-T1	Shallow/Exposed Pipe Remediations (HCA)	$ 4.40	32
74	SCG-Risk-2	Digin	C14	Locating Equipment	$ 4.08	31
75	SCG-Risk-5	EMPL	C2	Drug and Alcohol Testing Programs	$ 0.50	29
76	SCG-Risk-3	MP	C14	Cathodic Protection – Install/Replace Impressed Current Systems	$ 20.35	28
77	SCG-Risk-2	Digin	C15-T1	Public Awareness Compliance - The Affected Public	$ 0.80	25
78	SCG-Risk-1	HP	C22-T3.4	PSEP: Hydrotesting (Phase 2A, GRC base, non-HCA)	$ 269.71	24
79	SCG-Risk-2	Digin	C35	Leverage Data Gathered by Locating Equipment	$ 17.09	24
80	SCG-Risk-1	HP	C5-T2	Pipeline Relocation/Replacement (non-HCA)	$ 44.43	23
81	SCG-Risk-3	MP	C8/C17	Leak Survey and Main & Service Leak Repair	$ 66.51	23

82	SCG-Risk-2	Digin	C5	Locate and Mark Annual Refresher Training and Competency Program	$	0.05	23
83	SCG-Risk-5	EMPL	M4	Creating of a Safety Video Library	$	0.05	22
84	SCG-Risk-2	Digin	C16-T2	Public Awareness Compliance - Emergency Officials	$	0.003	22
85	SCG-Risk-2	Digin	C10	Locate and Mark Quality Assurance	$	0.38	21
86	SCG-Risk-3	MP	C9	Pipeline Monitoring (Pipeline Patrol, Bridge & Span Inspections, Unstable Earth Inspection)	$	0.09	21
87	SCG-Risk-3	MP	C20	Distribution Integrity Management Program - Distribution Riser Inspection Program (DRIP)	$	73.51	21
88	SCG-Risk-1	HP	C6-T2	Shallow/Exposed Pipe Remediations (non-HCA)	$	8.93	20
89	SCG-Risk-2	Digin	M4	Locate and Mark Photographs	$	0.10	20
90	SCG-Risk-5	EMPL	M7	Workplace Violence Prevention Program Enhancements	$	0.73	19
91	SCG-Risk-2	Digin	C29	Warning Mesh	$	0.79	19
92	SCG-Risk-7	CONT	A1	Use Internal Resources and Tools to Vet Contractors for Safety	$	0.53	17
93	SCG-Risk-5	EMPL	M3	Proactive Monitoring	$	0.06	17
94	SCG-Risk-5	EMPL	A3	Workplace Violence Prevention Training Alternative	$	0.05	16
95	SCG-Risk-5	EMPL	A2	OSHA Voluntary Protection Program	$	0.35	15
96	SCG-Risk-2	Digin	C15-T2	Public Awareness Compliance - Emergency Officials	$	0.01	14
97	SCG-Risk-2	Digin	M3	Locate and Mark Photographs	$	0.44	13
98	SCG-Risk-3	MP	C30	Meter Set Assembly (MSA) Inspection Program	$	66.52	12
99	SCG-Risk-7	CONT	C1	Contractor Safety Oversight	$	1.67	11
100	SCG-Risk-5	EMPL	C5	Safe Driving Programs	$	1.18	11
101	SCG-Risk-3	MP	C23	DIMP: Sewer Lateral Inspection Project (SLIP)	$	73.51	11
102	SCG-Risk-1	HP	C3-T1	Leak Repair (HCA)	$	11.52	10
103	SCG-Risk-2	Digin	C21	Prevention & Improvements-Fiber Optics	$	7.98	10
104	SCG-Risk-2	Digin	C32	Ticket Risk Assessment and Evaluating City Permit Data	$	0.05	10
105	SCG-Risk-5	EMPL	M5	Expanded Safety Culture Assessments	$	0.05	8.9
106	SCG-Risk-3	MP	C28	Quality Assurance Program	$	4.06	7.6
107	SCG-Risk-5	EMPL	C8	Safety Culture Programs	$	0.85	7.4
108	SCG-Risk-4	STOR	A2	Alternate technology for methane monitoring	$	3.80	7.1
109	SCG-Risk-1	HP	C3-T2	Leak Repair (non-HCA)	$	23.40	6.8
110	SCG-Risk-1	HP	C22-T2.4	PSEP: Pipeline Replacement (Phase 1B, GRC base, non-HCA)	$	69.25	5.7
111	SCG-Risk-4	STOR	C7	Upgrade to Purification Equipment	$	20.08	5.7
112	SCG-Risk-7	CONT	C4	Construction Contractor Field Oversight	$	0.30	5.2
113	SCG-Risk-3	MP	C10	Pipeline Monitoring (Pipeline Patrol, Bridge & Span Inspections, Unstable Earth Inspection)	$	0.08	5.2
114	SCG-Risk-5	EMPL	C9	Utilizing Industry Best Practices and Benchmarking	$	1.07	4.8
115	SCG-Risk-1	HP	C12-T1	Measurement & Regulation – Capital (HCA)	$	27.81	4.7
116	SCG-Risk-3	MP	C5	Regulator Station Replacements/Installs	$	9.45	4.7
117	SCG-Risk-2	Digin	C13	Locating Equipment	$	0.40	3.5
118	SCG-Risk-3	MP	C13	Valve Installs and Replacements	$	2.71	3.4
119	SCG-Risk-1	HP	C12-T2	Measurement & Regulation – Capital (non-HCA)	$	56.47	3.2
120	SCG-Risk-3	MP	C32	Safety Related Field Orders	$	298.77	3.0
121	SCG-Risk-2	Digin	C9	Locate and Mark Quality Assurance	$	1.94	2.9
122	SCG-Risk-4	STOR	C2	Well Abandonment and Replacement	$	126.97	2.8
123	SCG-Risk-1	HP	M1-T1	Gas Transmission Safety Rule - MAOP Reconfirmation (HCA)	$	170.76	2.7
124	SCG-Risk-1	HP	C14	Odorization	$	0.69	2.6
125	SCG-Risk-2	Digin	C36	Leverage Data Gathered by Locating Equipment	$	0.09	2.1
126	SCG-Risk-3	MP	A2	Post-Training Follow-up Field Evaluation	$	1.08	2.1
127	SCG-Risk-5	EMPL	A1	Develop internal expertise for expanded safety culture assessments	$	0.23	2.0
128	SCG-Risk-5	EMPL	C3	Employee Wellness Programs	$	2.65	1.9
129	SCG-Risk-3	MP	C16	Capital CP 10 Service Replacement	$	40.20	1.9
130	SCG-Risk-1	HP	M1-T2	Gas Transmission Safety Rule - MAOP Reconfirmation (Non-HCA)	$	69.75	1.8
131	SCG-Risk-1	HP	C8-T1	Right of Way (HCA)	$	0.79	1.7
132	SCG-Risk-1	HP	C8-T2	Right of Way (non-HCA)	$	1.60	1.7
133	SCG-Risk-3	MP	A1	Technical Refresher Training	$	1.75	1.3
134	SCG-Risk-3	MP	C21-T1	DIMP – DREAMS: Vintage Integrity Plastic Plan (VIPP)	$	657.34	1.2
135	SCG-Risk-1	HP	C15	Security and Auxiliary Equipment	$	13.57	1.0
136	SCG-Risk-3	MP	C21-T2	DIMP – DREAMS: Bare Steel Replacement Program (BSRP)	$	281.72	0.9
137	SCG-Risk-1	HP	A1	Proactive Soil Sampling	$	5.63	0.8
138	SCG-Risk-4	STOR	A1	Risk-based well casing inspection frequency	$	85.60	0.8
139	SCG-Risk-1	HP	M2-T1	Gas Transmission Safety Rule – Material Verification (HCA)	$	0.54	0.7
140	SCG-Risk-2	Digin	C31	Ticket Risk Assessment and Evaluating City Permit Data	$	0.20	0.5
141	SCG-Risk-5	EMPL	M2	Industrial Hygiene Program Refresh	$	0.97	0.4
142	SCG-Risk-1	HP	M2-T2	Gas Transmission Safety Rule – Material Verification (Non-HCA)	$	1.10	0.4
143	SCG-Risk-3	MP	C25	Field Employee Skills Training	$	30.84	0.4
144	SCG-Risk-1	HP	C9-T1	Class Location – Hydrotest (HCA)	$	7.37	0.3
145	SCG-Risk-1	HP	C9-T2	Class Location – Hydrotest (non-HCA)	$	14.95	0.3
146	SCG-Risk-3	MP	C19	Main Replacements- Leakage, Abnormal Op. Conditions, CP Related	$	72.45	0.3
147	SCG-Risk-4	STOR	C1	Integrity Demonstration, Verification, and Monitoring Practices	$	308.83	0.3
148	SCG-Risk-1	HP	A2	Expanding Geotechnical Analysis	$	1.40	0.2
149	SCG-Risk-2	Digin	A2	Virtual Reality Training	$	0.10	0.1
150	SCG-Risk-2	Digin	A1	Virtual Reality Training	$	0.10	0.1
151	SCG-Risk-2	Digin	A4	GPS Tracking of Excavation Equipment	$	0.34	0.01
152	SCG-Risk-2	Digin	A3	GPS Tracking of Excavation Equipment	$	0.34	0.003

Risk Assessment Mitigation Phase

(SCG RAMP- D)

Safety Culture, Organizational Structure, Executive and Utility Board Engagement, and Compensation Policies Related to Safety

May 17, 2021

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RAMP – D: SAFETY CULTURE, ORGANIZATIONAL STRUCTURE, EXECUTIVE AND UTILITY BOARD ENGAGEMENT, AND COMPENSATION POLICIES RELATED TO SAFETY

I. INTRODUCTION

This Chapter provides supplemental information regarding SoCalGas's organizational structure, programs, culture, and compensation as they relate to safety, as required by Decision (D.)16-08-018,[1] and to areas identfied in D.19-09-051.[2] The Commission has stated that "[a]n effective safety culture is a prerequisite to a utility's positive safety performance record,"[3] and defines "safety culture" as follows:

> An organization's culture is the collective set of that organization's values, principles, beliefs, and norms, which are manifested in the planning, behaviors, and actions of all individuals leading and associated with the organization, and where the effectiveness of the culture is judged and measured by the organization's performance and results in the world (reality). Various governmental studies and federal agencies rely on this definition of organizational culture to define "safety culture."[4]

The Commission has further stated that, under the above definition, a positive safety culture includes "a clearly articulated set of principles and values with a clear expectation of full compliance," and "effective communication and continuous education and testing."[5] SoCalGas agrees and has developed values, goals, and practices for a safety culture throughout its history, advancing its programs, policies, procedures, guidelines, and best practices to continuously improve upon the safety of its operations.

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1 D.16-08-018 at 140-42 (Inclusion of Safety Culture and Organizational Structure in RAMP Filings). Additionally, the Commission stated, "[t]he company's compensation policies related to safety also should be included in the RAMP filing." *Id*. at 141. *See*, *also*, I.19-06-014 at 3.

2 D.19-09-051 at 763 (19. OSA's recommendations concerning safety culture enhancements are better addressed in SoCalGas's next RAMP filing.)

3 I.15-08-019 (Order Instituting Investigation of Pacific Gas and Electric Company's Safety Culture, August 27, 2015) at 4.

4 I.19-06-014 at 3.

5 *Id.*

As described in SoCalGas's opening comments to the safety culture order instituting investigation (OII)[6], SoCalGas has a robust safety culture which emphasizes safety as a core value. SoCalGas's approach to safety is built on the tradition of providing safe and reliable service for 150 years and is summarized in a Commitment to Safety statement, which is embraced and endorsed by every member of the senior management team:

> SoCalGas's longstanding commitment to safety focuses on three primary areas – employee/contractor safety, customer/public safety and the safety of gas delivery system. This safety focus is embedded in what we do and is the foundation for who we are – from initial employee training, to the installation, operation and maintenance of our utility infrastructure, and to our commitment to provide safe and reliable service to our customers.[7]

To promote these principles throughout, and to foster a culture of continuous safety improvement, "[t]he company continuously strives for a work environment where employees at all levels can raise pipeline infrastructure, customer safety, and employee safety concerns and offer suggestions for improvement."[8] SoCalGas encourages two-way formal and informal communication between the Company and the public, employees and management, and contractors and the Company, in order to identify and manage safety risks before incidents occur. These missions coupled with SoCalGas's safety practices, some of which are set forth briefly herein, result in a robust and positive safety culture at the utility.

In addition to addressing safety as an integral component of all the risk assessments and mitigation activities outlined in each of the individual risk Chapters of this RAMP Report, the Commission has instructed the utilities to include specific discussion in this filing regarding the following: [9]

- Safety organizational structure;
- Safety culture;
- Compensation policies related to safety;

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6 SoCalGas Response to Order Insituting Investigation I.19-06-014 (July 29, 2019).

7 SoCalGas's Natural Gas System Operator Safety Plan (2019), at 6, *available at* 2019_SoCalGas_Gas_Safety_Plan-FINAL.pdf

8 SoCalGas Response to Order Insituting Investigation I.19-06-014, at 2 (citing and quoting SoCalGas's Natural Gas System Operator Safety Plan (2019)).

9 *See* D.16-08-018 at 140-42.

- Executive and senior management engagement in the risk assessment, prioritization, mitigation, and budgeting process; and
- Utility board engagement and oversight over safety performance and expenditures.

This Chapter addresses each of these topics in the following sections below.

II. BACKGROUND

SoCalGas has described the elements of its safety culture in various proceedings. For example, numerous SoCalGas witnesses in the test year (TY) 2019 general rate case (GRC) testified regarding safety culture, as it related to the witness' subject matter area.[10] Testimony that was sponsored by approximately fifty witnesses, including by SoCalGas's then President and Chief Operating Officer J. Bret Lane, demonstrated SoCalGas's safety culture and safety management practices and SoCalGas based its GRC funding request on key safety and risk-informed RAMP risks and mitigations.[11] SoCalGas also provided TY 2019 GRC testimony and information regarding its governance, safety record, and safety culture,[12] pursuant to Commission direction in D.16-06-054.[13]

SoCalGas's testimony chapters in the TY 2019 GRC proceeding outlines various safety programs, as well as new and evolving initiatives to develop safety management systems. Furthermore, as described in SoCalGas's response to the safety culture order instituting investigation (OII),[14] following the formal release in July 2015 of American National Standards Institute/American Petroleum Institute Recommended Practice 1173 (API 1173), SoCalGas voluntarily adopted and has since been implementing the foundational principles of safety management systems therein and working with its pipeline construction contractors to do the same.[15] An important advancement at SoCalGas in 2019 was the formal documentation of seven

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[10] *See generally* A.17-10-008 (witness direct testimony submitted and entered into the proceeding record) and Exh. SCG-250 Safety Policy Testimony of David Buczkowski and David Geier.

[11] *See* A.17-10-008, Exhs. SCG-01-2R.

[12] A.17-10-008, Exhs. SCG-02-R, SCG-30.

[13] D.16-06-054 at 154.

[14] Southern California Gas Company's Response to Order Instituting Investigation I.19-06-014 (July 29, 2019).

[15] SoCalGas Response to I.19-06-014 at 3.

Safety Values and the commitment of all SoCalGas officers to those values as the foundation of SoCalGas's Safety Management System (SMS). The seven values are Leadership Commitment; Risk Management; Employee and Stakeholder Engagement; Competence, Awareness, and Training; Emergency Preparedness and Response; Safety and Compliance Assurance; and Continuous Improvement. These values are outlined in detail further within this Chapter.

SoCalGas's SMS is the framework that ties together each of the Company's existing and future safety initiatives, aligns the core operating units, integrates risk and safety, and allows for risk to be assessed across the entire organization for continued improvement and enhanced safety performance. The SMS leverages SoCalGas's already strong safety culture and establishes a systematic enterprise-wide framework and cohesive system to collectively manage and reduce risk and to promote continuous improvement in safety performance through deliberate, routine, and intentional processes. As further outlined below and separately in the SMS Cross-Functional Factor (CFF) Chapter of this RAMP Report (SoCalGas CFF-6), the SMS encompasses all of SoCalGas's safety initiatives, programs, processes, and committees and, in doing so, enhances them by providing additional oversight, awareness, and collaboration, and by connecting them at the enterprise level.

III. SAFETY ORGANIZATIONAL STRUCTURE AND CULTURE

This section provides an overview of how safety is incorporated into SoCalGas's organizational structure and is an integral part of its culture. Detailed descriptions of SoCalGas's safety organization can be found within SoCalGas's SMS CFF Chapter as well as the Employee, Contractor, and Customer and Public Safety Chapters included in this RAMP Report.

In SoCalGas's TY 2019 GRC proceeding, several executive witnesses testified to SoCalGas's longstanding commitment to operating a safe utility and enhancing the focus placed on the implementation of effective safety risk mitigations, including asset health and safety. For example, SoCalGas's then-Chief Operating Officer J. Bret Lane testified regarding "SoCalGas' deep-seated culture of employee/contractor, customer/public, and system safety," and how SoCalGas's TY 2019 GRC proposals would allow the Company "to continue to invest to enhance safety and thereby mitigate risks that could impact our employees, customers, and/or

system."[16] The following subsections further describe SoCalGas's safety organizational structure and culture.

A. Organizational Structure

SoCalGas's Chief Operating Officer also serves as the Company's Chief Safety Officer (CSO), with direct oversight of the operations of the Company. The CSO is supported by dedicated teams embedded within the organization whose primary roles are the management of safety and risks. These include SoCalGas's SMS organization, Enterprise Risk Management organization, and Integrity Management organization. Each of these organizations is further described below.

In addition to these centralized functions that promote safety and risk management across the Company, SoCalGas embeds safety practices into all of its operating groups. This is done in the form of safety processes and procedures, initiatives, and policies that are driven by various employees across the Company. SoCalGas utilizes a variety of engagement initiatives to bring employees and contractors together in forums to discuss safety concerns from the perspective of those closest to the risks. These include the Executive Safety Council engagement, Employee Safety & Health Congresses, Safety Standdowns, local safety committees, safety culture surveys, the Safety (Management/Union) Leadership Team, the Contractor Safety Congress, and Stop the Job/Near Miss reporting tools.

1. Safety Management System Organization

SoCalGas's SMS Framework aligns and integrates risk and safety across the entire organization. SoCalGas has a comprehensive set of safety plans, programs, and procedures in place that address specific infrastructure or activity areas.

In 2019, SoCalGas created a dedicated SMS organization, reporting directly to the CSO. The SMS organization was established to more clearly and transparently align employee safety, contractor safety, pipeline safety and compliance, quality management, and emergency management. The purpose is to develop and implement a comprehensive set of safety management systems, incorporating the principles of API 1173, but also expanding the scope of the system to address all aspects of safety relevant to SoCalGas's business. For example, this includes not only pipeline safety risks, but also occupational safety and health risks of

[16] A.17-10-008, Exh. SCG-01-2R (Lane) at JBL-1.

SoCalGas's employees and contractors, customer safety risks, infrastructure safety risks, and public safety risks.

The SMS organization at SoCalGas is comprised of a team of directors, managers, supervisors, and subject matter experts who have the centralized authority, accountability, and responsibility for the full execution of the Company's SMS, including designing, developing, implementing, and continuously improving the Company's SMS. The responsibilities include:

- Providing strategic guidance and establishing appropriate policies, standards, procedures, and key performance indicators, as well as technology and data analytics tools and platforms and reporting capabilities, for various elements of the Company's SMS to promote its consistent implementation and effectiveness across organizations;
- Leading incident investigations and sharing lessons learned with stakeholders to demonstrate risk reduction and improvement;
- Leading the annual management review and safety assurance functions; and
- Collaborating with employees to provide safety and compliance support, emergency preparedness and response support, capabilities to benchmark against best practices, and to conduct periodic SMS conformance reviews to measure progress.

The SMS organization includes dedicated teams for strategy, technology and analytics, and continuous improvement. More particularly, the organization includes SoCalGas's Safety department, which holds managers and subject matter expert positions. Safety Department manages both employee safety and contractor safety programs. The individuals in this department oversee the implementation of SoCalGas's various safety policies, trainings, and programs, including: the Environmental & Safety Compliance Management Program (ESCMP), the Behavior-Based Safety programs, Industrial Hygiene programs, Incident Investigations, Expanded Safety Culture Assessments, Contractor Safety programs, as well as Near Miss, "Stop the Job," and Jobsite Safety programs. These programs are described within the Incident Involving an Employee and Incident Involving a Contractor Chapters of this RAMP Report (Chapters SCG-Risk-5 and SCG-Risk-7). The SMS organization also oversees the Emergency Management team who coordinates safe, effective and risk-based emergency preparedness and response to safely and efficiently prepare for, respond to, and recover from an emergency or

disaster. The Emergency Management team sustains quality assurance and improvement processes through strategic planning, training, simulation exercises, and a comprehensive After-Action Review and Improvement program. The Emergency Management team includes: 1) business resumption, 2) emergency preparedness and response operations, 3) information and technical services, and 4) operational field emergency readiness.

The SMS organization is structured around the "PLAN-DO-CHECK-ACT" model and a robust Management of Change component and is expected to integrate over time the various existing safety management systems at the Company under one umbrella system called the Company's Safety Management System.

Figure 1: The "Plan-Do-Check-Act" Cycle

2. Enterprise Risk Management Organization

The Enterprise Risk Management organization is composed of a Chief Risk Officer/vice president, director, and risk managers, whose roles are dedicated to implementing the risk management process and the integration of risk-informed decision-making across the Company. This includes the development of transparent, repeatable, and consistent processes that are quantitative and data-driven, facilitating an annual identification and evaluation of risk, as well as supporting operational areas across the Company in the assessment of risks and development

of associated risk mitigations. SoCalGas's Enterprise Risk Management organization oversees the development and refinement of the annual Enterprise Risk Registry process, as described in RAMP A – Overview and Approach. This organization also supports functional areas across the Company in the assessment of risks and development of risk mitigations, including, for example, by creating risk registers for operating units.

3. Integrity Management Organization

SoCalGas's Integrity Management organization is comprised of dedicated directors, managers, and staff whose roles focus on the development and implementation of processes and procedures to manage transmission, distribution, and storage well integrity in compliance with regulatory requirements. SoCalGas's Transmission Integrity Management Program (TIMP) and Distribution Integrity Management Program (DIMP) are founded upon a commitment to provide safe, clean, and reliable service at reasonable rates through a process of continual safety enhancement by proactively identifying, evaluating, and reducing pipeline integrity risks for transmission and distribution pipelines. Through the TIMP, per 49 Code of Federal Regulations (C.F.R.) § 192,1 Subpart O, SoCalGas is federally mandated to identify threats to transmission pipelines in High Consequence Areas (HCAs), determine the risk posed by these threats, schedule prescribed assessments to evaluate these threats, collect information about the condition of the pipelines, take actions to minimize applicable threat and integrity concerns to reduce the risk of a pipeline failure, and report findings to regulators. Through the DIMP, under 49 C.F.R. § 192, Subpart P, SoCalGas is federally mandated to: collect information about its distribution pipelines; identify additional information needed and provide a plan for gaining that information over time; identify and assess applicable threats to its distribution system; evaluate and rank risks to the distribution system; determine and implement measures designed to reduce the risks from failure of its gas distribution pipeline and evaluate the effectiveness of those measures; develop and implement a process for periodic review and refinement of the program; and report findings to regulators.[17] SoCalGas modelled its Storage Integrity Management Program (SIMP) after elements of the federally mandated transmission integrity management program. In that regard, SoCalGas intended and designed SIMP to provide a proactive, methodical, and structured approach, using state-of-the-art inspection technologies and risk management disciplines to

[17] A.17-10-008, Exh. SCG-14.

address storage field and well integrity issues.[18] In addition, a new Enterprise Asset Management program will build off these foundational elements and continue to leverage integrity management initiatives. The EAM improves safety, integrity, transparency, and availability of pipeline asset records by integrating asset data with equipment safety and handling information, as well as validation. The implementation of the project consists of analyzing, defining, reconciling, and removing the inconsistencies of the pipeline-related data in various systems, consolidating redundant systems, redefining and updating business processes, and installing new hardware and software infrastructure.[19] Additional information is included in the Asset and Records Management CFF Chapter (SoCalGas CFF-1) which outlines how advanced analytics and a more robust operating model will expand the lens by which SoCalGas measures asset health and criticality. In turn, this enables a proactive approach on targeted investments to mitigating risks, reducing asset failure, and increasing safety.

B. Safety Management System Implementation

The Company's journey of formalizing its SMS began more than a decade ago, when it first implemented its Environmental & Safety Compliance Management Program (ESCMP) to enhance the management of its environmental and occupational health and safety risks. ESCMP is conceptually based on the International Standards Organization (ISO) 14001 Environmental Management Systems standard and includes safety components that are unique to SoCalGas. ESCMP addresses compliance requirements, awareness, and goals, as well as monitoring and verification related to all applicable environmental, health, and safety laws, rules and regulations, and Company standards. ESCMP has been refined and improved, and has matured over the years, and is still in place across the enterprise.

Similarly, SoCalGas's pipeline integrity management programs, also in place for more than a decade, are another form of safety management system that were designed to oversee and continually enhance the integrity of SoCalGas's pipeline system. Over the years, these Companywide programs have been assessed, improved, and matured to drive continuous improvement. SoCalGas has taken this knowledge and experience to establish an SMS to further enhance the safety of operations, strengthen the safety culture, and improve overall safety

[18] A.17-10-008, Exh. SCG-10.

[19] *Id.* at Exh. SCG-05.

performance. In the future, an Asset Management Program will build off of the integrity management progams to look across all asset types, asset criticality, asset health, and lifecycle inputs.

In 2015, when API 1173 was published, SoCalGas began to review the potential benefits of this new system. SoCalGas engaged with its peers, the American Gas Association (AGA) member companies, to better understand how API 1173 could benefit SoCalGas with respect to the management of its pipeline safety risks. Subsequently, SoCalGas took a more expansive view to include other industries and how the principles of API 1173 could be applied beyond pipelines and into multiple assets and functions. From 2015 through 2018, SoCalGas took several key steps towards formally adopting the principles of API 1173, harmonizing them with the structures already in place, and enhancing and expanding the same. In 2019, SoCalGas formally created its SMS based on seven Safety Values: Leadership Commitment, Risk Management, Employee and Stakeholder Engagement, Competence Awareness and Training, Emergency Preparedness and Response, Safety and Compliance Assurance, and Continuous Improvement.

These Safety Values, as further defined and described in the next sestions below, are embedded in SoCalGas's culture. SoCalGas's safety-focused culture and structure allow the Company to be proactive and accountable in the safe delivery of gas and associated business operations. SoCalGas embraces a work environment where employees and contractors are encouraged to raise concerns regarding gas system safety, customer safety, personal safety, and/or offer suggestions for improvement. To appropriately embed these safety values within the entire organization, SoCalGas formalized an SMS Responsibilities Policy, which establishes responsibilities at various levels of the Company to promote, support, develop, implement, and continuously improve SMS in an effective and efficient manner. These safety values are the foundation of SoCalGas's SMS. Each SoCalGas officer embraces and endorses the Company's commitment to safety and supports the SMS Plan.

The Company's goal is to continually strengthen its safety culture by following the values of the SMS. To that end, SoCalGas has also formalized its inaugural annual 2020 SMS Plan that assesses how SoCalGas is adhering to safety values, policies, and standards, and how it plans to continue to implement SMS going forward. Additional information is included in the SMS Cross Functional Factor Chapter (SCG-CFF-6).

SoCalGas takes a broad, holistic view of safety management and plans to continue to benchmark its practices against those of its peer companies (such as the American Gas Association, American Petroleum Institute, and Western Energy Institute member companies). As its SMS matures, SoCalGas expects to learn more from benchmarking efforts and aspires to adopt and apply other industry frameworks, as applicable, to continually enhance its SMS into the future. As discussed, SoCalGas's SMS is anchored by its' seven Safety Values, which are described in more detail in the following sections.

1. Leadership Commitment

SoCalGas leadership is fully committed to safety as a core value. SoCalGas's Executive Leadership is responsible for overseeing reported safety concerns and promoting a strong, positive safety culture and an environment of trust that includes empowering employees to identify risks and to "Stop the Job."

SoCalGas is committed to having a culture where leadership sets the example and demonstrates safe behaviors expected of employees. SoCalGas's leadership team is committed to championing people, doing the right thing, shaping the future, and executing on operational excellence. For example, all executives are required to be Occupational Safety and Health Administration (OSHA) -10 Hour certified and receive National Incident Management System (NIMS) Incident Command System (ICS) 100 and 200 certifications.

In SoCalGas's TY 2019 GRC proceeding, several executive witnesses testified to the Company's longstanding commitment to operating a safe utility and enhancing the focus placed on the implementation of effective safety risk mitigations, including asset health and safety.[20] As noted above, then-Chief Operating Officer J. Bret Lane testified in the last GRC about "SoCalGas' deep-seated culture" of safety. SoCalGas's leadership's commitment to safety is evidenced in a number of ways, including the commitment expressed in SoCalGas's Gas Safety Plan filed annually with the CPUC and more recently demonstrated in the 2020 SMS Plan.

SoCalGas has established an Executive Safety Council chaired by the Chief Safety Officer. The Company also has safety advisors, supervision, and various local safety committees to help inform, educate, and engage employees about safety values, policies, programs, and initiatives throughout the Company. In addition, the Pipeline Safety Oversight Committee has

[20] A.17-10-008, Exh. SCG-02-R, Chapter 1 (Day) at DD-26.

involvement from several executives to oversee and guide the implementation of SMS with an explicit focus on infrastructure safety.

The leadership commitment is also advanced through the support of forums to raise concerns to leadership. SoCalGas has processes, programs, and committees in place that welcome feedback on safety from employees on the management of risks and unsafe practices or incidents. To promote these principles and foster a culture of continuous safety improvement, SoCalGas continuously strives for a work environment where employees at all levels can raise pipeline infrastructure, customer safety, and employee safety concerns and offer suggestions for improvement. SoCalGas leadership has an open-door policy that promotes open communication between employees and their direct supervisors. In addition to these culture-based items, there are formal programs designed to encourage employees to speak up if they see unsafe behaviors, such as "Stop the Job." SoCalGas also holds Safety Congresses for contractors and employees, as well as safety meetings for field employees that provide safety training, share best practices, and promote leadership and employee engagement.

2. Risk Management

SoCalGas manages risk through a structured, data-driven approach that identifies threats and hazards, assesses and prioritizes risks, implements mitigation efforts, and engages in assessments and reviews to understand risk mitigation effectiveness.

Effective risk management practices help to reinforce a strong and positive safety culture. SoCalGas has undertaken a thoughtful and measured approach to the adoption of risk management structures and processes at all levels, to further the development of a risk-aware culture. As described in (then-Vice President, Enterprise Risk Management for SoCalGas) Diana Day's testimony in the TY 2019 GRC, SoCalGas's Enterprise Risk Management organization facilitates the identification, analysis, evaluation, and prioritization of risks, with an emphasis on safety, to ultimately inform the investment decision-making process, and works to integrate risk management with asset and investment management through the creation of governance structures, competencies, and tools.[21] The Enterprise Risk Management practices and processes are continuing to be used by SoCalGas's different operational and functional departments to identify safety risks, thus providing a critical element of SoCalGas's SMS.

[21] *Id.* at DD-2.

SoCalGas's risk management framework is consistent with the Cycla Corporation 10-step Evaluation Method adopted in D.16-08-018. Risk identification, as defined by ISO 31000, is the process of finding, recognizing, and describing risks. It includes the identification of risk sources, events, their causes, and potential consequences. On an annual basis, SoCalGas's Enterprise Risk Management organization facilitates the enterprise risk identification process through interviews and meetings with risk owners and managers to review and discuss potential changes to the SoCalGas's Enterprise Risk Registry. SoCalGas's risk management framework is further discussed in Chapter RAMP-B.

3. Employee and Stakeholder Engagement

Employees are encouraged and expected to take ownership, to actively engage in safety practices, and to openly share and receive information with one another, our contractors, and our external stakeholders, to continuously enhance our safety practices.

SoCalGas encourages two-way formal and informal communication between the Company and the public, employees and management, and contractors and the Company. Safety is communicated daily by supervisors in the morning before the field crews leave for work. In addition, the Company's Safety department regularly issues employee safety communications to provide supervisors with safety-related information in a timely manner regarding standards and safe work practices to be communicated and shared with their employees. These safety communications are a tool used to inform employees about safety hazards and exposures, hazard mitigation, rules, regulations, warnings, goals, and progress reports through an array of media. Safety is also communicated on a weekly basis among operations directors at the beginning of each week during a Monday morning safety call. During that call, the participants also review all incidents from the previous week and share best practices. In addition, SoCalGas communicates information through safety bulletins, emails, newsletters, electronic bulletin boards (*e.g.,* digiboards), posted signage throughout the workplace, tailgate meetings, and reports.

Further, SoCalGas conducts public awareness efforts through education and outreach to enhance the safety of its customers and the general public. These efforts are designed to engage with customers and the public to inform them about shared safety responsibilities. Of equal importance are outreach activities with local first responder agencies, county coordinators (emergency management), and other public officials which occur on a yearly basis, focusing on

how SoCalGas can partner with first responders and other agencies during an emergency incident response, including a review of infrastructure location information, hazard awareness and prevention, leak recognition and response, emergency preparedness and communications, damage prevention, and integrity/asset management. In addition, the Company also partners with these stakeholders throughout the year on joint drills, exercises, tabletops, and preparedness fairs in order to enhance coordination and response during emergencies. SoCalGas also attends California Independently Owned Utility (IOU) and Municipality annual meetings to discuss employee and contractor safety. This dedicated forum is a utility benchmarking initiative addressing new regulations, legislation, best management practices, and other safety topics of interest.

To regularly engage more broadly with employees, the Company assesses itself through the Employee Engagement Survey and is also benchmarked by the National Safety Council (NSC) Safety Barometer Survey. As described by TY 2019 GRC witnesses Diana Day and Mary Gevorkian, the Safety Barometer Survey assesses overall safety climate health and identifies areas of opportunity to eliminate injuries and improve focus and commitment to safety.[22] David Buczkowski provided the following reasons for SoCalGas's belief that the NSC Safety Barometer Survey is a leading practice approach to evaluating safety culture:

1. NSC's mission is safety – eliminating preventable deaths, through leadership, education and advocacy;
2. The NSC Safety Barometer Survey is led by third-party experts;
3. The practices included in the survey are the leading practices drawn from survey participants, allowing SoCalGas to compare itself to almost 1,000 other Companies; and
4. The survey goes well beyond the utility industry and includes other industries.[23]

Through regular participation in the surveys, the Company shares results, develops targets, implements plans, and measures progress, with the goal of increasing employee participation in, and contribution to, improvements in safety performance.

[22] A.17-07-008, Exhs. SCG-02, SCG-32.

[23] A.17-10-008, Exh. SCG-250 at DLB-12.

The Company began conducting safety culture assessments in 2013, using NSC's Safety Barometer Survey. The NSC Safety Barometer survey is an employee perception survey that engages employees and asks for their anonymous feedback on safety by measuring elements of safety excellence in the following areas:

- Organizational Climate – Probes general conditions that interact with the safety program to affect its ultimate success, such as teamwork, morale, and employee turnover;
- Management Commitment – Describes ways in which top and middle management demonstrates their leadership and commitment to safety in the form of words, actions, organizational strategy, and personal engagement with safety;
- Supervisor Engagement – Considers six primary roles through which supervisors communicate their personal support for safety: leader, manager, controller, trainer, organizational representative, and advocate for workers;
- Safety Support Climate – Asks employees across an organization for general beliefs, impressions, and observations about management's commitment and underlying values about safety;
- Employee Involvement – Specifies selected actions and reactions that are critical to making a safety program work. Emphasis is given on personal engagement, responsibility, and compliance; and
- Safety Support Activities – Probes the presence or quality of various safety program practices. This focuses on communications, training, inspection, maintenance, and emergency response.

The NSC Barometer Survey provides information and insight in the six critical areas of safety culture described immediately above. Furthermore, NSC's rich database provides SoCalGas with the ability to benchmark the results with hundreds of other companies who have conducted similar surveys with NSC and gives a comparative analysis of relative strengths and potential opportunities for organizational improvements as well as for individual work locations and departments.

SoCalGas has now completed three cycles of the NSC Safety Barometer Survey (in 2013, 2016, and 2018) and, when compared to 580 other companies who have gone through similar surveys, SoCalGas has consistently ranked high. In all three cycles, SoCalGas ranked above the 90th percentile. More important than the ranking, the NSC survey tool has helped identify safety areas of strength and alignment with other high performers, as well as opportunities for potential improvement.

As a result of NSC survey feedback from employees, both positive and constructive, the Company has made many improvements in recent years. For example, as a result of the 2013 NSC survey results, the Company worked with its union leadership to enhance its communications on its already in place "Stop the Job" policy." The Company raised awareness about this policy to emphasize that if an employee does not feel safe or if an employee sees another employee or contractor being unsafe, all employees, regardless of rank or title, are empowered to stop the work being performed to address the safety concern without fear of retribution. SoCalGas also enhanced its communication to employees about the value and importance of learning from close calls. Subsequent NSC survey results demonstrate that employees now have more confidence to "Stop the Job" and report close calls, near misses, and unsafe conditions.

Stakeholder engagement is an essential element of an effective SMS. Employees and contractors, especially operational, field, and front-line workers, are well-positioned to identify safety concerns and/or risks and raise such concerns to be addressed before a safety incident occurs. When stakeholders see that the information they provide is being utilized and appropriate feedback is provided, the Company's safety culture further improves.

4. Competence, Awareness and Training

SoCalGas is committed to providing employees the proper tools, resources, training, and oversight to promote safe operations. This includes training tailored to specific roles and educating employees on why our training, policies, and procedures are important to safety.

SoCalGas's employees and contractors receive extensive training because safety starts with proactive upstream measures to prevent a safety incident from occurring. Front-line employees are trained on behavior-based safety programs, such as "Stop the Job." A strong safety culture requires the right people at the right job with the right skills. The Human Resources function, with support from various operating organizations and the SMS organization

at SoCalGas, supports the safety culture by attracting, developing, training, and retaining employees who have the skills and abilities to perform their jobs safely. To achieve the accountability of enhancing the safety culture, the SMS organization, various operating organizations, and the Human Resources function are responsible for performance management, organizational effectiveness, and safety. SoCalGas develops training plans by job classification that include courses required to perform certain work, meet Company objectives, and satisfy required compliance training. Training plans are maintained in SoCalGas's Learning Management System (cornerstone) and accessed by supervisors and employees through the MyInfo application. Each department is responsible for maintaining training plans and confirmingthat employees complete initial and periodic refresher training requirements. Further details about SoCalGas's extensive training programs and competence assessment can be found in the Incident Involving an Employee Chapter of this RAMP Report (SCG-Risk-5)**.**

5. Emergency Preparedness and Response

SoCalGas maintains readiness to promptly respond to emergency incidents and events through an Incident Command System that incorporates response planning, training, and equipping of personnel and coordination with first responders and external stakeholders.

SoCalGas has robust emergency response plans, policies, and procedures to quickly activate, respond, and recover from crisis situations. The emergency response plans outline internal roles and responsibilities, and align with FEMA's Incident Command System (ICS) response structures to enable rapid alignment with public-sector (state and local) emergency management agencies and first responders.

As discussed above, SoCalGas conducts public awareness efforts through education and outreach to enhance the safety of its customers and the general public. These efforts are designed to engage with customers and the public to inform them about shared safety responsibilities. For example, SoCalGas's Public Safety campaigns focus on informing and educating the public about the danger of digging, planting or doing demolition work that could impact underground pipelines. The outreach campaign encourages anyone planning such work to call 811 before digging so that SoCalGas can identify pipelines and pipe material before work occurs. Of equal importance are outreach activities with local first responder agencies, county coordinators (emergency management), and other public officials which occur on a yearly basis, focusing on how SoCalGas can partner with first responders and other agencies during an

emergency incident response, including a review of infrastructure location information, hazard awareness and prevention, leak recognition and response, emergency preparedness and communications, damage prevention, and integrity management. In addition, SoCalGas also partners with these stakeholders throughout the year on joint drills, exercises, tabletops, and preparedness fairs to enhance coordination and response during emergencies. SoCalGas has also established liaisons with appropriate fire, police, and other public officials across its service territory, which includes over 100 fire agencies. Recently, SoCalGas deployed emergency response services to northern and southern California following weather-related events, and also sent assistance to the Boston area following a pipeline overpressure occurrence.

SoCalGas developed and maintains an Emergency Operations Center (EOC) for use during significant emergencies to allow Company employees to efficiently collaborate and take appropriate action for the response and mitigation of a given emergency. During an EOC activation, over 50 subject matter experts may be brought into the EOC, from across the Company, to provide strategic direction, coordination, and to facilitate all aspects of the emergency response through event duration. When activated, some basic responsibilities of the EOC include:

- Acquire and allocate critical resources;
- Consistent and aligned internal and external communications;
- Manage crisis information;
- Strategic and policy-level decision-making; and
- Provide centralized coordination of all aspects of the emergency.

The EOC is the hub from which all incident management, response, and communication is coordinated and/or directed. As such, the EOC serves a critical support function to allow SoCalGas to respond effectively and efficiently to any hazard it may encounter, thereby protecting the safety of its employees, stakeholders, customers, the public, contractors, and any other resources or individuals in its service territory. After Action Reviews (AAR) are core to our Continuous Quality Assurance and Improvement process in Emergency Management. Following an incident or an emergency, AARs are developed and facilitated to identify the following:

- What went well;
- What needs improvement; and

- Specific Action Items toward improvement (these are entered into a data base and tracked to completion).

6. Safety and Compliance Assurance

SoCalGas maintains operational policies and procedures that document safety practices and standards and compliance with applicable regulations and follows a "management of change" process to structure change when new policies and procedures are implemented.

a. Operational Controls

Operational controls lead to greater certainty that SoCalGas's systems will perform as expected. SoCalGas has a comprehensive set of operational controls executed through a framework of policies, training, documentation, and recordkeeping. This includes operational activities to maintain compliance with applicable local, state, and federal laws and regulations, and is accomplished through dedicating resources and subject matter expertise in various disciplines with the intent to track, understand, and implement regulatory requirements through developing formalized Company standards.

The policies dictate the standards, training, resources, and programs on how employees are to conduct their day-to-day tasks in a compliant and safe way. Compliance requirements that SoCalGas employees must follow are prescribed in written Company standards to facilitate compliance with regulatory requirements, bring about more efficient operations, and promote both employee and public safety. All standards are housed in a centralized SoCalGas Document Library for easy access by employees and are reviewed at a designated frequency to stay current with pertinent regulations and laws, and with changing business needs.

To further assist with effective implementation, the Company standards are consolidated into Manuals or Plans or Programs for distinct compliance disciplines. For example, the three principal categories of operational regulatory requirements that SoCalGas has to comply with are the CPUC/DOT/PHMSA[24] pipeline safety regulations, the federal and California OSHA[25] for employee safety, and CalGEM[26] for underground natural gas storage safety.

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[24] California Public Utilities Commission, Department of Transportation, Pipeline and Hazardous Materials Safety Administration.

[25] Occupational Safety and Health Administration.

[26] California Geologic Energy Management.

Specifically, the pipeline safety standards for operations and maintenance activities are consolidated into SoCalGas's Operations & Maintenance Plan, the employee safety standards are consolidated into SoCalGas's Injury & Illness Prevention Program, contractor safety requirements are consolidated into SoCalGas's Contractor Safety Manual, and underground storage safety standards are grouped into SoCalGas's SIMP Plan. These are in addition to related compliance programs, such as the TIMP, DIMP, and SIMP, as well as procedures for material specifications and traceability, design and purchase specifications, and construction, inspection and testing procedures, as needed. Operational controls also include a Management of Change (MOC) process, which is established locally within various programs. An effort is underway by the SMS organization to consolidate the various MOC processes into one electronic platform that is currently in the developmental stage.

b. Records Management

For safety and compliance purposes, SoCalGas has implemented various recordkeeping controls for its system in accordance with applicable rules and regulations. SoCalGas's records management policies include, but are not limited to, processes and systems containing records, definition and identification of records, organizational records (both paper and electronic) and document retention and disposal policy. The goal of records management policies and practices is to provide consistent responsibilities for records management, and to require the assignment of specific accountability for oversight and administration of records management. SoCalGas also has record coordinators across the Company. These record coordinators manage records and related issues and are based within each of their respective business areas. The purpose is to give each operational area day-to-day control over records for which it has responsibility and knowledge. While not their primary job function, the record coordinators work closely with Financial Systems to promote and support the Company's records policies and procedures. In effect, this means that the management of operational asset records is decentralized. Sempra Energy's Audit Services group performs periodic audits to verify compliance with policies related to records management and retention. SoCalGas management will address any identified deficiencies by Audit Services and develop management corrective actions to resolve the findings. Historically, these audits have occurred approximately every three years. Lastly, SoCalGas uses physical storage space, both on-site and off-site, for records. SoCalGas manages the records storage so that it complies with SoCalGas's policies related to retention and disposal.

Refer to the Asset and Records Management CFF Chapter (SoCalGas CFF-1) for further detail on SoCalGas's Asset Integrity Management Programs.

7. Continuous Improvement

SoCalGas strives to continuously improve and strengthen its safety performance and culture by setting clear and measurable goals, assessing safety performance through audits and self-assessments, inviting employee feedback, and applying lessons learned from incidents and near miss events. SoCalGas also shares safety best practices with peer gas utilities and best-in-class companies in other industries.

SoCalGas's continuous improvement efforts begin with the continuous assessment of risks identified through the Enterprise Risk Registry. The observations and information captured through the ERR are used to develop strategic risk mitigations. The mitigations are implemented though operating and functional units. The implementation status, results, and lessons learned are captured though on-going managerial oversight throughout all layers of management. The results of these oversight efforts are reviewed with SoCalGas's leadership on a regular basis.

The continuous improvement cycle for SoCalGas comes from three primary areas: (1) Incidents, (2), Feedback, and (3) Performance Measurement.

a. Continuous Improvement From Incidents

While SoCalGas strives for zero incidents, information from incidents is a vital source for learning and improvement. Investigations into incidents lead to improvements in policies, programs, procedures, and human behavior and prevent similar incidents from recurring. SoCalGas has formal processes in place to learn from a variety of incidents, including employee injuries and motor vehicle accidents, contractor and subcontractor injuries, and pipeline safety, environmental, and third-party claim-related incidents. These are investigated to determine underlying causes and appropriate corrective actions to prevent recurrences. Lessons learned are shared internally with employees on a regular basis and externally with contractors as appropriate.

b. Continuous Improvement From Feedback

As further described below, feedback from employees, contractors, customers, regulatory agencies, and the public provides a leading source for continuous improvement opportunities. SoCalGas provides a variety of tools and avenues for internal and external stakeholders to

provide feedback and ideas for improving safety and operational performance. Valuable feedback is also received from audits and assessments conducted periodically to assess the effectiveness of our SMS and its associated components.

Executive Safety Council Team Meeting Dialogues – The Executive Safety Council is the governing body for all safety committees. Led by SoCalGas's Chief Safety Officer and the directors of SMS and Safety and Wellness, this is a roundtable with Company officers to advance the Company safety culture, address enterprise-wide safety strategy, and give employees an opportunity to share their safety experiences with Company leadership. The Executive Safety Council represents SoCalGas's labor and represented workforce.

Gas Safety Subcommittee – This committee brings represented employee representatives from each district and management together monthly to discuss concerns and address potential gas operations safety hazards. The objective is to reduce unnecessary risk, resolve gas safety issues/concerns, and communicate information back to frontline employees.

Pipeline Safety Oversight Committee – This high-level internal committee comprises executives and directors that oversee pipeline safety programs and activities, including oversight over compliance activities and contractors. This committee meets periodically and reviews the progress made in the pipeline compliance activities and in the contractor safety area and provides direction on steps needed to continue to reduce the identified safety risks. This program serves as a proactive approach to have a senior level committee overseeing the development, implementation, and growth of the contractor safety program to address the overall safety risk associated with hiring contractors, as well as strengthening public trust.

Field and Office Safety Committees (site-specific) – These committees (approximately 50) are actively engaged in safety awareness through education, promoting a healthy lifestyle, encouraging work-life balance, and maintaining a safe work environment. To keep the committees connected, quarterly meetings are held with committee chairpersons and co-chairpersons. During these meetings safety updates are shared, training is provided, and action planning steps are identified. Like SoCalGas's other safety committees, site committees roll up to the Executive Safety Council as the governing body.

Behavior Based Safety Program – SoCalGas's Behavior Based Safety Program is a leading proactive approach to safety and health management, focusing on principles that recognize at-risk behaviors as a frequent cause of both minor and serious injuries. Behavior

Based Safety is the "application of science of behavior change to real world safety problems." This process is a safety partnership between management and employees that continually focuses attention and actions on daily safety behavior, to identify safe and at-risk behaviors. Through a job observation program, supervisors observe employees working using a critical behavior inventory checklist to track safety behaviors and have a dialog on safe and at-risk behaviors, then recommended behavioral safety changes. Field supervisors conduct documented observations with their employees to address at-risk behaviors and to attempt to modify an individual's actions and/or behaviors through these interactions. Supervisors provide quality feedback during these positive interventions aimed at developing safe work habits and improving safety culture. The purpose is to reduce recurrences of at-risk behaviors by modifying an individual's actions and/or behaviors through observation, feedback, and positive interventions aimed at developing safe work habits.

Safety Congress and Leadership Awards – Held annually, the Safety Congress provides a forum for safety committee members, safety leaders, and others to share and exchange information and ideas through networking and workshops. At this event, safety leaders are recognized for living by the Company's safety vision, turning that vision into action, embracing the SoCalGas safety culture, and demonstrating safety leadership.

The National Safety Council (NSC) Barometer Survey – As noted above, the NSC Barometer Survey is used to assess the overall health of the safety climate and helps to identify areas of opportunity to eliminate injuries and improve focus and commitment to safety. All organizations interpret their results using a three-step process to investigate, discuss, and understand where the improvement opportunities are. Organizational leaders work with their employees and decide where the attention is needed. After analysis, they identify and implement specific action-oriented strategies within their organization and carry out action plans to completion.

Environmental & Safety Compliance Management Program (ESCMP) – SoCalGas's comprehensive health and safety risk management organization and framework establishes and carries out SoCalGas's health and safety risk management policies, including SoCalGas's ESCMP. ESCMP is an environmental, health, and safety management system to plan, set priorities, inspect, educate, train, and monitor the effectiveness of environmental, health, and safety activities conceptually based on the internationally accepted standard, ISO 14001.

ESCMP addresses compliance requirements, awareness, goals, monitoring and verification related to all applicable environmental, health and safety laws, rules and regulations, and Company standards. SoCalGas also has an annual ESCMP Certification process, which involves submittal of information into the database used to collect and record employee and facility compliance. In January of each year, ESCMP information is submitted into an online system for year-end approval and certification for the prior calendar year. ESCMP has been refined, improved and matured over the years and is still in place at SoCalGas.

Audits, Assessments & Evaluations – Regularly scheduled internal audits are performed by Sempra Energy Audit Services which works directly with SoCalGas management to assist in assessing risks and evaluating business controls needed to enable SoCalGas to achieve its objectives. Audit Services has full access to all levels of management, and to all organizational activities, records, property, and personnel relevant to activities under review. The scope of work conducted by Audit Services is to ascertain (1) that processes and business controls, as designed and maintained by management, are adequate and functioning in compliance with policies, plans, procedures, laws, regulations and contracts; (2) the safeguarding of assets; (3) the effectiveness and efficiency of operations; and (4) the reliability and integrity of operating and financial information. SoCalGas's management is responsible for taking ownership of, and being accountable for, understanding, establishing, and maintaining effective business controls, which are actions that increase the likelihood of achieving the above objectives. Through this effort, Audit Services can effectively work with management to determine whether business controls are designed and functioning properly. These collective efforts provide a basis for Audit Services to provide an independent evaluation to management and the Board of Directors as to the adequacy of the Company's overall system of business control. Management addresses any identified deficiencies by Audit Services and develops management corrective actions to resolve the findings. Corrective actions are assigned a completion date and Audit Services conducts reviews to determine if identified findings are resolved prior to closing out the audit.

As demonstrated above, SoCalGas uses various methods to evaluate the growth and development, i.e., maturity of our SMS. The evaluation of the SMS on an ongoing basis is important in providing assurance that the SMS is achieving its desired goals and objectives and making progress towards enhanced safety performance and more effective risk management. SoCalGas plans to conduct SMS assessments at a frequency of once every three years beginning

2020. Based on the experience gained from the first assessment, SoCalGas may adjust the approach including to split the assessment in smaller pieces to tackle targeted elements of its SMS in a given year. SoCalGas is in the process of conducting its first comprehensive assessment, evaluating alignment with the seven core safety values, utilizing external third-party industry experts (from the American Petroleum Institute) to maintain independence and objectivity. Due to COVID-19 protective measures, the assessment is being conducted in a phased manner using a hybrid approach. The document review and virtual interviews were completed in 2020 and an on-site physical review is planned for Q3 2021. The results will be shared with the impacted stakeholders for follow-up and completion of improvement opportunities identified by the assessment.

SoCalGas's SMS also plans to use the following tools to assess the effectiveness of the SMS program on an ongoing basis:

- Reviews and assessments that are an integral part of various safety programs, such as the integrity management programs, and self-assessments and inspections performed pursuant to SoCalGas's Environmental & Safety Compliance Management Program;
- Reviews and assessments that are an integral part of various safety programs, such as the integrity management programs, and self-assessments and inspections performed pursuant to SoCalGas's Environmental & Safety Compliance Management Program;
- Annual management reviews of the SMS performed by various SoCalGas organizations led by the SMS organization under the direction of SoCalGas's Senior Management Team;
- Periodic reviews and/or audits;
- Peer reviews performed by industry associations (such as the American Gas Association); and
- External third-party audits and assessments of the SMS

c. Continuous Improvement From Performance Measurement

Continuous improvement occurs when performance is measured and quantified. This is accomplished using (a) Key Performance Indicators (KPIs), including analysis of data and trends generated from SoCalGas operations activities, and (b) benchmarking with best-in-class

companies or standards. There are numerous lagging, leading, and process KPIs that are vital to measuring the effectiveness of operations, risk management, and the SMS. Lagging KPIs include incidents involving injuries, and property damage; leading KPIs include measures demonstrating risk reduction, such as corrective actions implemented based on audits, inspections, and incident investigations; and process KPIs demonstrate completion or improvement of activities and their supporting processes and procedures. SoCalGas has worked closely with the CPUC, within the Safety Mitigation Assessment Phase (S-MAP) framework, to identify metrics that would enable us to monitor our safety performance and enable the CPUC to compare metrics areas across utilities and over time. SoCalGas maintains a process for the identification, collection, and analysis of data generated from operations and maintenance, integrity management, audits and evaluations, management reviews, and other relevant sources related to the suitability and effectiveness of our SMS. SoCalGas developed a dashboard to provide a consistent platform to visualize KPIs, which also include elements of employee safety, pipeline safety, compliance, and damage prevention, all of which are part of the S-MAP 15 metrics. Also included are other operational dashboards and reports designed to deliver and view KPI and other business reporting metrics for SoCalGas's operations. SoCalGas will continually identify leading and lagging indicators to enhance the safety of its operations. Further, SoCalGas intends to continue evaluating leading safety management system practices in the aviation, chemical manufacturing, and nuclear power generation to further enhance its SMS. SoCalGas will take a deliberate and methodical approach to benchmarking with other industry standards and gradually integrate relevant improvements to further strengthen the SMS and safety culture.

d. Annual Management Review

SoCalGas's Senior Management Team (SMT), comprising all officers, will conduct documented annual review of the SMS to incorporate results from all efforts conducted throughout the year, and to determine which conformance and implementation goals have been met and to foster continuous improvement. The Management Review Plan will document how SoCalGas will review the SMS and safety performance to determine whether performance goals and objectives are being met. SoCalGas's SMT will utilize its regularly scheduled meetings to focus on key issues impacting safety. At these regular meetings, the SMS organization, in collaboration with the operating units, will provide updates/summaries on progress, challenges,

and/or issues. SoCalGas will also periodically evaluate new technology that may enhance safety. The CSO is responsible for confirming that follow-up actions, as identified in the management review, are completed in a timely manner and are reported at the next management review cycle.

IV. COMPENSATION POLICIES RELATED TO SAFETY

SoCalGas's strong safety culture is demonstrated through use of compensation metrics and key performance indicators to drive improved safety performance. As the Commission stated in D.16-06-054:

> One of the leading indicators of a safety culture is whether the governance of a company utilizes any compensation, benefits or incentive to promote safety and hold employees accountable for the company's safety record.[27]

Benefit programs that promote employee health and welfare also contribute to SoCalGas's safety performance and culture. SoCalGas has taken a number of actions to support employee safety during the pandemic, including providing COVID-19 related leaves, engaging specialists to advise on workplace safety issues, and providing a technology reimbursement that employees working remotely can use to purchase ergonomic equipment.

In her TY 2019 GRC testimony, Compensation and Benefits witness Debbie Robinson explained how SoCalGas's compensation and benefits programs are designed to focus employees on safety, and how SoCalGas's increased emphasis on employee and operational safety measures in their variable pay plans, commonly referred to as the Incentive Compensation Plans (ICP), bolster the already strong safety culture and safety performance at SoCalGas.[28] Ms. Robinson testified that SoCalGas has increased the weighting of the employee and operational safety measures in their variable pay plans since the TY 2016 GRC.[29] These safety-related performance measures comprise a mixture of leading and lagging measures and span all lines of business – employee, customer, public, and system safety –to prevent bias. Providing even stronger alignment between SoCalGas's safety programs and the ICP helps to strengthen the Company's safety culture and signals to employees that safety is the number-one priority.

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[27] Exh. SCG-30 at DSR-10.

[28] *Id.*

[29] *Id.* at DSR-11.

V. EXECUTIVE AND SENIOR MANAGEMENT ENGAGEMENT IN THE RISK ASSESSMENT, PRIORITIZATION, MITIGATION, AND BUDGETING PROCESS

In the Company's TY 2019 GRC testimony, witness Diana Day testified that SoCalGas's executive management, and specifically the Company's Executive Safety Council, is committed to and accountable for the development and maintenance of safety culture, and that SoCalGas's leadership holds regular safety meetings at many levels, including Executive Safety Council meetings, which have been in place for over a decade, and annual Contractor Safety Congresses, which have included hundreds of participants, representatives from other California utilities, and the Safety and Enforcement Division of the CPUC.[30] SoCalGas's Executive Safety Council, comprised of top Company leadership, meets quarterly to engage directly with front-line employees and supervisors, including SoCalGas's labor and represented workforce, to listen and reinforce key safety tenets and have an open dialogue on safety issues, performance and culture. To further enhance executive engagement, in 2020, SoCalGas established a Safety Advisory Council comprising of experienced advisors from outside the Company to assist with governance over safety.

Senior management at SoCalGas is engaged in the risk assessment and mitigation process for the Company. Appendix E to Diana Day's direct TY 2019 GRC testimony describes how SoCalGas's risk management framework and the annual development and updating of the enterprise risk registry provides a structured way for the organization to reflect on different types of risk and the strategies to control or mitigate those risks, as both a "bottom up" and a "top down" process. Subject matter experts and risk managers from throughout the organization provide insight on risk drivers, impacts, and mitigants for risks that are being assessed. Risk owners and the senior management team at each utility discuss enterprise level risks and mitigants for those risks. Risk owners and risk managers then have the opportunity to confirm that mitigations for top risks are transparent in the business process and are prioritized in decision making.

The Enterprise Risk Registry (ERR) is a communication tool that is shared amongst the management team and with employees. Periodically, the Vice President of Enterprise Risk Management provides the SoCalGas Board with a risk update of its operating risks and also an

[30] A.17-10-008, Exh. SCG-02-R, Chapter 1 (Day) at DD-28.

updated focus on key enterprise-level risks and associated mitigants. The Sempra Energy Board of Directors also receives periodic risk updates based on the written reports and management presentations from its operating subsidiaries, including SoCalGas. Training and education regarding management of risks is an ongoing endeavor. Risk topics are discussed at the monthly Senior Management Team meeting and Senior executives participate in executive risk sessions each year to review top risks identified for the utilities, ranking and prioritization of the risks, and funding for the mitigations.

Senior management at SoCalGas is engaged in the financial planning process at the Company. For capital expenditures, the Executive Finance Committee (EFC) establishes a total annual capital expenditure target consistent with our authorized GRC funding for that period. From this total allocation, funding is prioritized based on risk-informed priorities and continuous input from operations.

- Step 1 – Financial Planning requests detailed lists of projects for the upcoming budgeting cycle. Each organization with a capital budget receives the request mid-way through the year for the following year's budget. Within each organization, teams of managers and subject matter experts perform assessments of capital projects and develop a list for their areas that are in line with the GRC request and that serve customers by providing safe, reliable service with effective risk mitigation at a reasonable cost. The capital projects are scored and ranked within each organization using key priority metrics. The key priority metrics include: safety, reliability, maintenance, compliance, customer experience, and productivity. Each organization reviews their projects' rankings and scorings with their Senior Management. Once approved at the Senior Management level, the projects are submitted to Financial Planning.
- Step 2 – Once Financial Planning receives the scored and ranked project lists from each organization, they consolidate and review requests against the total capital budget established by the EFC for the year. Financial Planning then brings all of the requests to the Senior Management Team-Finance (SMT-F) to discuss the requests in total as well as cross-organizationally. The key priority metrics and project rankings become a

basis for discussion and review of projects on a cross-organizational basis. The SMT-F reviews, challenges, cross-prioritizes and establishes a final ranking for proposed capital work for the next budget cycle. Projects determined to have the highest ratings on the key priority metrics will receive the highest priority for funding.

Once the capital allocations are approved, the individual operating organization is chartered to manage its respective capital needs within the allotted capital. The real-time prioritization of work within the context of the budget allocations is completed by the front-line and project managers on an ongoing and continuous basis. Regulatory compliance deadlines, customer scheduling requirements, and overall infrastructure condition are all factors taken into consideration as work elements are prioritized. Progress on existing capital projects is monitored and reviewed on a monthly basis by the EFC, and any new projects stemming from incremental Commission directives or changing business needs are evaluated and assessed throughout the year to determine whether current capital allocation should be reprioritized. Before starting a project or making any commitments, the project manager must secure specific project approval signatures in accordance with the Companies' Internal Order process and approval and commitment policies.

VI. SOCALGAS BOARD ENGAGEMENT AND OVERSIGHT OVER SAFETY PERFORMANCE

SoCalGas's Board of Directors (Board) determines safety performance measures and targets to be included in each year's ICP and reviews and approves the results. The Board meets on at least a quarterly basis where meetings begin with a safety briefing and include a regular review of year-to-date safety performance as well as current safety and risk-related topics. The members of the Board have extensive safety and employee safety processes experience. As a part of its oversight role, the Board may exercise discretion to reduce or eliminate any payout for employee and/or contractor safety measures in the event safety performance targets are not met.

SoCalGas established a Safety Committee of the Board in November 2020. SoCalGas's Safety Committee advises and assists SoCalGas's Board of Directors in the oversight of safely providing natural gas services to SoCalGas's customers.[31] The Safety Committee meets on a

[31] *See* SoCalGas Safety Committee Charter, adopted on December 18, 2020, included as Attachment B.

quarterly basis. These meetings begin with a report by the Chief Safety Officer, include a review of current safety and risk-related topics, and conclude with the Safety Committee's recommendations to SoCalGas. Per the Safety Committee Charter, the duties and responsibilities of the Safety Committee include, but are not limited to:

> Review and monitor (i) SoCalGas's safety culture, goals, and risks; (ii) significant safety-related incidents involving employees, contractors, or members of the public; (iii) the measures to prevent, mitigate or respond to safety-related incidents; (iv) periodic reports on safety audits; and (v) safety performance metrics.[32]

In addition, prior to establishing its Safety Committee in 2020, SoCalGas established a Safety Advisory Council in November 2019, comprising independent community members with deep experience and proven leadership in the areas of safety management systems, public safety, community relations, regulatory oversight, and industry safety. The Safety Advisory Council provides candid, independent perspectives on SoCalGas's SMS, as well as critical review and assessment of policies, practices, and procedures. The Safety Advisory Council meets periodically and provides recommendations and feedback to the SoCalGas Chief Safety Officer, which are in turn provided to the SoCalGas Board as part of the regular Board safety agenda item. The Safety Committee and the Safety Advisory Council are intended to provide additional safety oversight for SoCalGas with respect to safely providing natural gas services.

VII. CONCLUSION

Safety is a core value at SoCalGas. We have a strong safety culture imbedded in the organization that fosters transparency, engagement, and commitment. SoCalGas strives to continually improve processes and procedures that further enhance employee, contractor, customer, and public safety. Nothing is more important than keeping our employees, contractors, and the public safe. As demonstrated throughout the chapters of this RAMP Report, SoCalGas is making strategic investments in culture, technology, system upgrades, and community partnerships to enhance the safety of our employees, contractors, customers, and the communities we serve.

[32] *Id.* at Attachment B at 3.

Risk Assessment Mitigation Phase

(SCG/SDG&E-RAMP-E)

Lessons Learned

May 17, 2021

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RAMP-E: LESSONS LEARNED

I. INTRODUCTION

This chapter identifies lessons learned that could apply to future Risk Assessment Mitigation Phase (RAMP) filings made by other California investor-owned utilities (IOUs), pursuant to Decision (D.) 18-12-014 and D.16-08-018.[1] This chapter discusses lessons that SoCalGas and SDG&E (the Companies) have learned from feedback and experience in the 2019 RAMP Proceeding[2] and have incorporated into these 2021 RAMP Reports, as well as from the RAMP submissions of Pacific Gas and Electric Company (PG&E) and Southern California Edison Company (SCE). This chapter also addresses feedback and comments considered from the 2019 RAMP Proceeding and feedback received in connection with pre-filing activities held in advance of the Companies' 2021 RAMP Reports. RAMP-A addresses intervenor feedback that was incorporated into the Companies' RAMP Reports; this chapter summarizes feedback received and discusses how it was carefully considered in the preparation of this RAMP.

The Companies appreciate the feedback received and are committed to continuously improving by incorporating best practices and lessons learned, and collaborating and sharing knowledge with the Commission, IOUs, and other stakeholders. These lessons learned have helped make these RAMP Reports substantially more detailed, quantitative, and robust than the Companies' last RAMP filing. Incorporating feedback from stakeholders, these RAMP Reports include a new major attribute (Stakeholder Satisfaction) beyond the three required attributes for the first time in the state, add a new sub-attribute (acres burned), increase the number and percent of activities that have risk spend efficiencies, add descriptions in instances an RSE could not be calculated, and make a number of other positive changes. The Companies commit to continuing on the trajectory of improving and maturing their RAMP processes and presentations in future Reports.

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1 D.18-12-014 at 34; D.16-08-018 at 151 ("Lessons learned by one company will also inform the RAMP filings of the other companies.").

2 Investigation (I.) 19-11-010/-011 (cons.), Order Instituting Investigation into Southern California Gas Company's and San Diego Gas & Electric Company's Risk Assessment and Mitigation Phase (2019 RAMP Proceeding).

II. LESSONS LEARNED CONSIDERING THIRD PARTY INPUT

In the Companies' 2019 RAMP Proceeding, parties submitted comments providing feedback and recommendations for SoCalGas's and SDG&E's next RAMP filings. In closing the 2019 RAMP Proceedings, the 2019 RAMP Decision ordered the Companies to "address and consider in their next Risk Assessment Mitigation Phase (RAMP) applications, the comments and suggestions by intervenors regarding the 2019 RAMP Report and further improvement of the RAMP process. The utilities' next RAMP filing shall fully comply with the guidelines set forth in Decision 16-08-018 and the Safety Model Assessment Proceeding Settlement Agreement."[3]

In addition to comments on the 2019 RAMP submissions, the Companies received oral and written feedback[4] on their preliminary position explanations during pre-filing RAMP events (public workshops and working group meetings).

As demonstrated in Chapters SCG/SDG&E RAMP-A, SCG and SDG&E RAMP-B, and SCG/SDG&E RAMP-C, these 2021 RAMP Reports fully comply with Commission decisions governing the RAMP process, specifically D.18-12-014 (Settlement Decision) and D.20-09-004 (2019 RAMP Decision). The Commission decisions allow for some flexibility in how certain requirements are met, and the Companies strive for continuous improvement. Accordingly, the Companies carefully evaluated and considered the valuable comments received from parties, which in turn influenced these 2021 RAMP Reports. Some intervenor feedback was incorporated into these RAMP Reports, as discussed in Chapter SCG/SDG&E RAMP-A; other feedback was carefully reviewed and considered but may not have been incorporated. Many of the comments made during the public forums mirrored comments received on the 2019 SoCalGas and SDG&E RAMP submissions[5] or were recently made in PG&E's 2020 RAMP proceeding.[6]

A. Summary of Intervenor Feedback

Table 1 below captures and addresses feedback received from parties, including the Public Advocates Office (CalPA), The Utility Reform Network (TURN), Mussey Grade Road

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3 D.20-09-004 (the 2019 RAMP Decision) at 18-19 (Ordering Paragraph [OP] 1).

4 Written feedback was provided in "informal comments" served on February 12, 2021.

5 I.19-11-010 (cons.).

6 Application (A.) 20-06-012.

Alliance (MGRA), Utility Workers Union of America (UWUA), Protect Our Communities Foundation (PCF), and FEITA Bureau of Excellence (FEITA). For practical reasons, the table does not cover each minute issue raised in parties' comments, especially where such issues were not understandable.[7] The Companies appreciate and have carefully considered all feedback in accordance with the 2019 RAMP Decision. Table 1 covers the majority of topics raised.

Table 1 demonstrates that the Companies incorporated a majority of the feedback received into their 2019 RAMP Reports. This, as well as going through the RAMP process in general, helped the Companies to continue to evolve in their risk practices. Input that was considered but not incorporated into the 2021 RAMP Reports was generally not included because either: (1) there was a disagreement of interpretation amongst the parties, or (2) the recommendation was beyond the requirements for RAMP. Should the Commission want to consider those issues, they could be resolved in a statewide proceeding such as the ongoing Safety Model Assessment Proceeding Order Instituting Rulemaking (S-MAP OIR).[8]

Table 1

Topic	Party Comment	SoCalGas and SDG&E Response
Number of Attributes	Included only three attributes in the 2019 RAMP Report (Safety, Reliability, and Financial) even though when making investment decisions for risk mitigations, the Companies acknowledge a variety of other factors are considered.[9]	The Companies appreciate this feedback and have revised the MAVF in this RAMP report. As described in Chapters SCG/SDG&E RAMP-A and C, SoCalGas's and SDG&E's 2021 RAMP Reports include additional attributes (a top and sub-attribute). Note, feasibly incorporating additional attributes is bound by practical limitations.

[7] As an example, PCF's informal comments (at Section IV) expressed opposition to including a mitigation in the 2021 RAMP Reports to place markers on real property. SoCalGas and SDG&E are unaware of the program PCF references.

[8] Rulemaking (R.) 20-07-013, Order Instituting Rulemaking to Further Develop a Risk-Based Decision-Making Framework for Electric and Gas Utilities.

[9] I.19-11-010 (cons.), *Comments of The Utility Reform Network on Southern California Gas Company and San Diego Gas & Electric Company's Risk Assessment and Mitigation Phase Submissions* (April 6, 2020) at 3; *See also* I.19-11-010, *FEITA Bureau of Excellence Comments on SoCalGas and SDG&E 2019 RAMP Filing* (April 6, 2020) (FEITA Comments) at 17.

Topic	Party Comment	SoCalGas and SDG&E Response
New Fourth Attribute	The Companies' newly proposed attribute is incomplete, has the potential to overlap with other attributes,[10] and may result in inflated risk analyses.[11]	The Companies appreciate this feedback and have further clarified their fourth attribute proposal in their 2021 RAMP Reports to address the comments received, as discussed in Chapters SCG/SDG&E RAMP-A and C.
Equivalencies Between Attributes	Equivalencies implied by the Companies' Risk Quantification Framework are questionable, because in comparing between the financial and safety attribute, the result in terms of the statistical value of life are beyond that of the federal agencies.[12]	In both the 2019 and 2021 RAMP Reports, the Companies constructed their Risk Quantification Framework in accordance with the six principles outlined in the Settlement Decision, which do not require equivalencies to be based on a statistical value of life.[13] This is further discussed in Section III below (and in SCG/SDG&E RAMP-C). Moreover, the Commission is considering whether to adopt a risk tolerance standard as a statewide issue in the ongoing S-MAP OIR.[14]
Removal of Shareholder Financial Interest	The 2019 RAMP Report did not demonstrate that shareholders' financial interests have been removed from their risk assessment decision-making.[15]	The Companies disagree with PCF's assessment with respect to their 2019 RAMP Report. In their 2021 RAMP Reports, Chapter SCG/SDG&E RAMP-C discusses

[10] *Informal Comments of TURN In Response to the Sempra Pre-RAMP Workshops* (February 12, 2021) (TURN Informal Comments) at 6-7.

[11] *The Protect Our Communities Foundation's Comments on January 27, 2021 Pre-Filing 2021 RAMP Workshop #2 of SDG&E and SoCalGas* (February 12, 2021) (PCF Informal Comments) at Section III.

[12] TURN Informal Comments (February 12, 2021) at 5-6.

[13] *See* Settlement Decision, Appendix A at A-5 – A-6.

[14] *See* Rulemaking (R.) 20-07-013, *Assigned Commissioner Scoping Memo and Ruling* (November 2, 2020) (S-MAP OIR Scoping Ruling) at 7-9.

[15] I.19-11-010 (cons.). *The Protect Our Communities Foundation Reply in Support of its Proposal Regarding How This Proceeding Should Move Forward in Light of the Directives in D.20-01-002; and Comments on the Joint 2019 Risk Assessment and Mitigation Phase Report of Southern California Gas Company and San Diego Gas & Electric Company* (April 6, 2020) (POC Comments) at 38 (Section IX).

Topic	Party Comment	SoCalGas and SDG&E Response
		how SoCalGas's and SDG&E's financial attribute is calculated. Shareholder financial interests are not included.
Secondary Impacts	An analysis of secondary impacts was arbitrarily eliminated in the 2019 RAMP Report.[16]	The Companies explained the challenges of secondary impact analysis in their 2019 RAMP Report.[17] As explained in the 2021 RAMP Report's Chapters SCG/SDG&E RAMP-A and C, SoCalGas and SDG&E attempted to analyze certain secondary impacts from the risk events. Secondary impacts were incorporated into the Cybersecurity risk chapters. Secondary impacts remain difficult to discover, meaningfully quantify, and incorporate.
Use of Frequency versus Likelihood	Frequency effectively represents risk reduction, since it effectively handles the case of multiple risk events per year.[18] Likelihood, not frequency, should be used to calculate the likelihood of a risk event.[19]	The Companies have appropriately provided and quantified frequency and likelihood in their 2019 and 2021 RAMP Reports. The use of frequency in calculating pre-mitigation risk scores is appropriate due to the Enterprise Risk grouping used for risk quantification, as discussed in SCG/SDG&E RAMP-C, and is permitted in the Settlement Decision.[20] A more detailed discussion is included in Section III below.

[16] POC Comments (April 6, 2020) at 21.

[17] I.19-11-010 (cons.), *Joint 2019 Risk Assessment and Mitigation Phase Report* (December 2, 2019) (2019 RAMP Report), Chapters RAMP-A at A-11 – A-12 and RAMP-C at C-33 – C-34.

[18] I.19-11-010 (cons.), *Mussey Grade Road Alliance Comments on SDG&E's 2019 RAMP Filing* (April 6, 2020) (MGRA Comments) at 7.

[19] I.19-11-010 (cons.), *Comments of The Utility Reform Network on Southern California Gas Company and San Diego Gas & Electric Company's Risk Assessment and Mitigation Phase Submissions* (April 6, 2020) (TURN Comments) at 7.

[20] Settlement Decision, Appendix A, at A-8 ("Identification of the Frequency of the Risk Event").

Topic	Party Comment	SoCalGas and SDG&E Response
Risk Spend Efficiency (RSE) Calculations	In the 2019 RAMP Report, RSEs were "not calculated for mandated activities without providing a justification."[21] RSEs must be calculated for all mitigations in the 2021 RAMP filing[22] and a ranking of all mitigations by RSE must be provided.[23]	Although the Companies adopted a different approach in their 2019 RAMP Reports, the Companies have improved their process and reviewed all activities in their 2021 RAMP Reports and performed an RSE and/or evaluated the feasibility of doing so. Where performing an RSE is infeasible (*e.g.*, no meaningful data or SME judgment is available), the Companies have provided an explanation. Further details are provided in Chapters SCG/SDG&E RAMP-A and C and the risk chapters.
Use of RSE High/Low Ranges	Not clear what added value the alternative ranges for RSEs bring; additional justification should be provided if this is kept in the 2021 RAMP filing.[24]	Alternative calculations for RSEs are not included in the 2021 RAMP Reports, as discussed in Chapter SCG/SDG&E RAMP-A.
Tranches	Sufficiently granular tranches were not provided in the 2019 RAMP Report.[25] Location specific risks were not adequately considered in the 2019 RAMP Report.[26]	As explained in Chapter SCG/SDG&E RAMP-A and shown in the risk chapters, the Companies have improved their process and incorporated more tranches, where appropriate, including location-specific tranches, in the 2021 RAMP Reports. Further details are provided in Section III below.
Alternatives	Part of the alternative mitigation analysis should be to demonstrate an	The Companies have improved their process in the 2021 RAMP

[21] TURN Comments (April 6, 2020) at 4-5; POC Comments (April 6, 2020) at 24 and 26-30; *see also* PCF Informal Comments (February 12, 2021) at 2-3, TURN Informal Comments (February 12, 2021) at 3-4.

[22] TURN Comments (April 6, 2020) at 4-5.

[23] POC Comments (April 6, 2020) at 30.

[24] MGRA Comments (April 6, 2020) at 4.

[25] TURN Comments (April 6, 2020) at 5; TURN Informal Comments (February 12, 2021) at 1-3.

[26] FEITA Comments (April 6, 2020) at 28-29.

Topic	Party Comment	SoCalGas and SDG&E Response
	effort to choose a project size that maximizes the RSE.[27] Meaningful mitigation alternatives were not provided in the 2019 RAMP Report; alternatives should be analyzed in the planning process so that the most safety results are achieved.[28]	Reports, as follows: Each RAMP risk chapter presents two alternative mitigation plans that it considered, consistent with the Commission requirements in the Settlement Decision. RSE values were calculated and reviewed for alternatives. Although the alternatives were dismissed, an explanation is provided regarding why.
Discounting Costs	Costs should be discounted at the weighted average cost of capital (WACC); adjusting costs for inflation is not the same as discounting.[29]	In the 2019 and 2021 RAMP Reports, the Companies presented costs in base year (2020), constant dollars. This means that all costs are expressed in the most recent year's recorded dollars. No discounting is needed to get costs back to today's dollars, consistent with the GRC presentation. As discussed in Section III below, the Companies continue to evaluate applying a formal discount rate, such as the WACC, to all costs in the RSE calculation (including operations and maintenance costs that do not earn a rate of return at the WACC). The Companies will provide an update in the Test Year (TY) 2024 GRC.
Baseline	The baseline for risk reduction calculations in the 2021 RAMP Reports should be the risk levels at the end of 2023. [30]	As discussed in detail in Section III below, the baseline for costs and benefits should be consistent with the GRC framework, which requires the comparison point to be the last year of available recorded data.

[27] MGRA Comments (April 6, 2020) at 10.

[28] POC Comments (April 6, 2020) at 35.

[29] TURN Comments (April 6, 2020) at 6-7.

[30] TURN Informal Comments (February 12, 2021) at 4-5.

Topic	Party Comment	SoCalGas and SDG&E Response
Exclusion of Certain Internal Labor Costs	In order to accurately calculate RSEs, all benefits and costs must be incorporated, including internal labor costs.[31]	The Companies have improved their process for the 2021 RAMP Reports. As discussed in Chapter SCG/SDG&E RAMP-A, the RAMP Reports include estimates for internal labor costs, where applicable.
Data	In the 2019 RAMP Report, no explanation was provided for why there is scant or incomplete data and the criteria used to scale national data.[32] Utility-specific data was not included.[33]	The Companies perform a broad review of available data and seek ways to utilize that data – whether it be internal, state, or nationwide. The Companies have improved their process for 2021 RAMP Reports' risk chapters and their workpapers with additional discussion of data sources and how those sources are used. Data is addressed in more detail in Section III below.
Transparency	RAMP calculations are to be obtained from real, measurable data where possible.[34] Sources should be provided for estimates of LoRE and CoRE, and a justification for each estimate used should be included in workpapers.[35] Transparency requirements were not met in the 2019 RAMP Report.[36]	The Companies have improved their process in the 2021 RAMP Reports by providing in each risk chapter the type of data that was used (utility-specific, industry) and the estimates for LoRE and CoRE (both on a pre-mitigation and post-mitigation basis). Additional information, such as sources, are included in the workpapers.

[31] TURN Comments (April 6, 2020) at 7-8.

[32] POC Comments (April 6, 2020) at 24.

[33] POC Comments (April 6, 2020) at 31-34; PCF Informal Comments (February 12, 2021) at 1-2. SoCalGas and SDG&E acknowledge that utility-specific data reflects the particular circumstances of the utility; however, PCF is incorrect that utility-specific data is required. The Settlement Decision states: "Data can include company-specific data or industry data. Whether use of a type of data is appropriate depends on the issue under consideration. If a utility relies on industry data, the utility will provide justification for applying those data to the specific circumstances of the utility." *See* Settlement Decision, Appendix A at A-18 ("Data Support and Data Sources").

[34] MGRA Comments (April 6, 2020) at 2.

[35] MGRA Comments (April 6, 2020) at 8.

[36] POC Comments (April 6, 2020) at 16.

Topic	Party Comment	SoCalGas and SDG&E Response
Sensitivity Analysis for Wildfire	Use of expected value of the safety attribute may lead to underestimation of wildfire risks and underinvestment in wildfire prevention measures; 99th percentile values should be used for safety indices.[37]	SDG&E has improved its analysis for use in the 2021 RAMP Report with the development and implementation of its Wildfire Next Generation System (WiNGS) model. Additional information is discussed in Chapter SDG&E-Risk-1.
Treatment of Public Safety Power Shutoff (PSPS)	PSPS was treated only as a solution and not as a safety risk in the 2019 RAMP Report.[38]	SDG&E has improved its methodology and treatment of PSPS issues for the 2021 RAMP Report. As further discussed in SCG/SDG&E RAMP-A, SDG&E's Wildfire RAMP Chapter (SDG&E-Risk-1) consists of two components, the risk of wildfire and PSPS impacts.
Electric Grid Cybersecurity	Attempted attacks on the electric grid should be analyzed as an independent risk.[39]	The Companies have improved their process in the 2021 RAMP Reports by performing separate scenario analyses on the gas and electric systems related to cybersecurity.
Climate Change	Climate change posed by SDG&E's and SoCalGas's operations was not addressed as an individual risk chapter in the 2019 RAMP Report.[40]	The Companies have improved their presentation for the 2021 RAMP Reports. SoCalGas and SDG&E have incorporated additional information regarding climate change-related issues as a cross-functional factor (CFF) in these RAMP Reports (*see* SCG-CFF-2; SDG&E-CFF-2).
Adequate Staffing and	Understaffing is not included as a driver/trigger in the risk bow-tie for	The Companies have improved their presentation for the 2021

[37] MGRA Comments (April 6, 2020) at 4-6.

[38] MGRA Comments (April 6, 2020) at 11; *Post Workshop Comments of the Public Advocates Office on the Southern California Gas Company and San Diego Gas & Electric Company January 27, 2021 Pre-filing RAMP Workshop* (February 12, 2021) (CalPA Informal Comments) (February 12, 2021) at 1.

[39] MGRA Comments (April 6, 2020) at 12.

[40] POC Comments (April 6, 2020) at 20-21; *See* PCF Informal Comments (February 12, 2021) at 4, FEITA Comments (April 6, 2020) at 18, CalPA Informal Comments (February 12, 2021) at 1.

Topic	Party Comment	SoCalGas and SDG&E Response
Human Performance	any of the RAMP risks in the 2019 RAMP Report.[41] Human error and a discussion about personnel competency are missing from the 2019 RAMP Report.[42]	RAMP Reports by addressing Workforce Planning / Qualified Workforce issues as a CFF in these RAMP Reports (*see* SCG-CFF-7; SDG&E-CFF-8). Training to minimize human error is discussed in the Incident Involving an Employee risk chapters (*see* SCG-Risk-5, SDG&E-Risk-8).
Safety Management Systems (SMS) and Process Safety	SMS, process safety, management of change (MOC), and incident investigations should be discussed in the RAMP.[43]	SMS, including process safety, MOC, and incident investigations, is addressed as a CFF in these RAMP Reports (*see* SCG-CFF-6; SDG&E-CFF-7) and is also discussed as integral to SoCalGas's and SDG&E's safety culture in SCG RAMP-D and SDG&E-RAMP-D.
Overpressure Events, the Low Pressure System, and Gas Quality	Overpressure events and the low pressure system appear to be missing from the 2019 RAMP Report. Gas quality and contamination should be more thoroughly discussed.[44]	Activities to mitigate overpressure events are included in these RAMP Reports in SoCalGas's and SDG&E's RAMP risk chapters of Incident Related to the High Pressure System and Incident Related to the Medium Pressure System (*see* SCG-Risk-1, 3; SDG&E-Risk-3, 9). Overpressure issues are not always called out in mitigations, but apply to several activities in those chapters.
Reliability Items	Reliability of supplies (*i.e.,* availability of spare parts) and compressor stations should be discussed.[45]	The Companies have improved their presentation for the 2021 RAMP Reports. For certain RAMP risks, an execution constraint driver was added to the

[41] I.19-11-010 (cons.), *Comments of Utility Workers Local Units No. 132, 483 and 522 ("Utility Workers" or "UWUA") on 2019 RAMP Report of Southern California Gas Company* (April 6, 2020) at 12.

[42] FEITA Comments (April 6, 2020) at 11-12 and 17.

[43] FEITA Comments (April 6, 2020) at Sections 7-8, 8-9, 20-21.

[44] FEITA Comments (April 6, 2020) at Sections 10-11, 12-16.

[45] FEITA Comments (April 6, 2020) at 18-19.

Topic	Party Comment	SoCalGas and SDG&E Response
		risk bow tie to address reliability of supplies. Compressor station reliability is discussed in SoCalGas's and SDG&E's Incident Related to the High Pressure System risk chapters (see SCG-Risk-1; SDG&E-Risk-3) and SoCalGas's Incident Related to the Storage System risk chapter (*see* SoCalGas-Risk-4).
System Visibility	Gas and electric system visibility through the supervisory control and data acquisition (SCADA) network should be discussed.[46]	The Companies have improved their presentation for the 2021 RAMP Reports. Foundational Technology Systems, including SCADA, are addressed as a CFF in these RAMP Reports (*see* SCG/SDG&E-CFF-4).

The feedback received by parties influenced SoCalGas's and SDG&E's approach on these 2021 RAMP Reports, as noted above and discussed in Chapter SCG/SDG&E RAMP-A. Lessons learned from the input received is also addressed in Section III, *infra*.

B. Other Utility RAMP Filings

SoCalGas and SDG&E also reviewed the RAMP proceedings of PG&E and SCE to prepare their respective RAMP Reports. Consistent with the Commission's goal of increasing efficiency by moving toward standardizing the organization and format of RAMP submissions,[47] the Companies evaluated each IOU's organization of its RAMP risk chapters and adopted a similar structure for purposes of consistency.

In addition to striving for unity in the structure of their RAMP Reports, the Companies also considered the unique elements contained in the other IOU RAMP reports and adopted similar approaches, where appropriate. For example, PG&E introduced in its 2020 RAMP Report the concept of cross-cutting factors. SoCalGas and SDG&E further built upon this concept to create their volumes of Cross-Functional Factors, or CFFs. As stated in Chapter

[46] FEITA Comments (April 6, 2020) at 28.

[47] *See, e.g.*, D.20-01-002 (the Rate Case Plan Decision) at 3 (establishing workshops to further explore "[s]tandardizing the organization and format of GRC and RAMP filings").

SCG/SDG&E RAMP-A, CFFs are safety-related initiatives that impact several of SoCalGas's and SDG&E's RAMP risks.

PG&E used non-linear scaling functions in its multi-attribute value function (MAVF),[48] and received comments criticizing this approach.[49] SCE used a combination of linear and non-linear scaling functions.[50] SoCalGas and SDG&E monitored the RAMP proceedings of the other utilities and elected to use linear scaling functions in their Risk Quantification Framework. The Companies' lessons learned from other aspects of PG&E's and SCE's RAMP proceedings, such as additional granularity of tranches, RSE calculation, and accounting for the risk of PSPS impacts (as well as intervenor feedback), are noted in Table 1.

III. RAMP MATURITY AND ENHANCED RAMP TO GRC INTEGRATION CONSIDERATIONS

SoCalGas and SDG&E continue to improve their risk quantification methods. The 2021 RAMP Reports demonstrate improvement through the introduction of new attributes in the Risk Quantification Framework (for the first time in the State), additional granularity, the calculation of more RSEs (including for many mandated programs), and the introduction of CFFs. However, the Companies strive for continuous improvement. Accordingly, the Companies identify additional lessons learned for consideration in future RAMP submissions below. Although many of these must be addressed as longer-term goals, SoCalGas and SDG&E are beginning to plan for such efforts. The Companies also address any remaining parties' comments that were not incorporated into the 2021 RAMP Reports below, in accordance with the 2019 RAMP Decision.

Many of the lessons learned discussed in this Section stem from the Companies' belief that RAMP and GRC filings should be consistently presented to better align with and connect the information presented in the RAMP, GRC, and accountability reporting processes. The RAMP and GRC processes are not distinct; rather, they are part of the GRC process. This is evident as

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[48] A.20-06-012, *Application of Pacific Gas and Electric Company (U39M) to Submit Its 2020 Risk Assessment and Mitigation Phase Report* (June 30, 2020) at 4 and Attachment A, Chapter 3.

[49] A.20-06-012, *Safety Policy Division Safety Evaluation Report on PG&E's 2020 Risk Assessment and Mitigation Phase (RAMP) Application* (November 25, 2020) at 15-17.

[50] I.18-11-006, *Southern California Edison Company's 2018 Risk Assessment and Mitigation Phase Report* (November 15, 2018) at 1-36 (Selection of Scaling Functions).

the final step in the RAMP process is for a utility to integrate RAMP results into its GRC application.[51]

It is also consistent with the Commission Staff proposal put forth in the S-MAP OIR to "[m]atch RAMP information to the subsequent GRC."[52] This means that the years presented in GRCs should be the basis for the RAMP filings and the GRC ratemaking principles should likewise apply. For example, a utility should begin with the years that will be forecasted in the subsequent GRC and provide estimates for the same years in the RAMP filing. In addition, the comparison points (for costs and benefits) should be consistent with the requirements set forth in the Rate Case Plan for GRCs; mainly to begin with the last year of recorded information and develop estimates from that "baseline." Similarly, with respect to RSE calculations, costs should be expressed in a consistent manner with how such costs will be presented in GRCs, and risk reduction benefit assumptions should be those the utility is comfortable defending with supporting testimony in the GRC. Rather than taking one approach for RAMP and a different approach for the GRC, consistency should be pursued. This principle of consistency between RAMP and GRC filings runs through many of the items discussed below.

A. Use of Frequency

The Settlement Decision defines frequency as "the number of events generally defined per unit of time," and notes that "[f]requency is not synonymous with probability or likelihood."[53] As explained by MGRA, "frequency can represent multiple events per year."[54] Likelihood, however, is "quantified as a number between 0% and 100% (where 0% indicates impossibility and 100% indicates certainty). The higher the probability of an event, the more certain we are that the event will occur."[55] MGRA explains when commenting on the difference between frequency and likelihood:

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51 D.14-12-025 at 42.

52 R.20-07-013 and D.20-01-002, *CPUC Consolidated Workshop Presentation* Slide 9 (Workshop held on February 9, 2021) (*available at* https://www.cpuc.ca.gov/uploadedFiles/CPUC_Website/Content/Safety/Risk_Assessment/SMAP/SMAP_Tr_3_RCP_Wrkshp_4_Presentation%20--%20FINAL.pdf).

53 D.18-12-014, Appendix A at A-2.

54 MGRA Comments at 6 (April 6, 2020) (citation omitted).

55 D.18-12-014, Appendix A at A-2.

> The probability and the frequency are the same for small values but begin to deviate as the frequency approaches 1 event per year. The probability becomes effectively equal to 1.0 (100%) for larger expected values per year. For example, if we expect 100 dig-ins per year then it is virtually certain that at least some dig-ins (the risk event) will occur during the course of the year.[56]

TURN opposed the Companies' use of frequency, stating that it is not compliant with the Settlement Decision because likelihood is needed to calculate the Likelihood of a Risk Event or LoRE.[57] The Companies disagree. The Settlement Decision specifically permits the use of frequency in calculating pre-mitigation risk scores at the risk level, and therefore, use of likelihood also creates a disconnect in the approach with respect to pre-mitigation LoRE.[58] And, as MGRA comments, "SDG&E's method does effectively represent risk reduction, since it effectively handles the case of multiple risk events per year."[59] The Companies suggest the parties further explore the use of frequency and likelihood in the S-MAP OIR.

B. Baseline for Risk Reduction Activities

There have been discussions on what the "baseline," or comparison point, should be when calculating risk reduction benefits and RSEs. TURN's informal comments on the Companies' pre-filing 2021 RAMP workshop initially suggested that the baseline for risk reduction calculations in the 2021 RAMP Reports should be the level at the end of 2023. This is because the revenue requirement from the last General Rate Case is authorized through 2023, and the Test Year 2024 General Rate Case will establish the revenue requirement for years 2024 through 2027.[60] TURN claimed that risk reduction benefits would be double counted with those supposed to be achieved by the last GRC cycle, if this were not done. TURN further comments that "Rows 10 and 11 of the Settlement… require that data reflecting past results 'must be supplemented by SME judgment that takes into account the benefits of any mitigations that are expected to be implemented prior to the GRC period under review in the RAMP submission.'"[61]

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[56] MGRA Comments (April 6, 2020) at 7.

[57] TURN Comments (April 6, 2020) at 7.

[58] D.18-12-014, Appendix A at A-8 – A-9 ("Identification of the Frequency of the Risk Event").

[59] MGRA Comments (April 6, 2020) at 7.

[60] TURN Informal Comments (February 12, 2021) at 4-5.

[61] TURN Informal Comments (February 12, 2021) at 5.

The Companies initiated follow-up discussions on this topic with SPD and jointly with SPD and TURN. Through these discussions, the Companies believe that TURN is conflating the GRC cycles (*i.e.*, the years for which revenue requirement is authorized in a previous GRC) with the required framework for proposing forecasted costs (which are then used to establish the authorized revenue requirement in the next GRC). The Companies understood TURN's initial suggestion to be that the baseline for these 2021 RAMP Reports should be the end of 2023 and the Companies should forecast the years 2024-2027. This suggestion would have the Companies forecast the years of the TY 2024 GRC cycle in which revenue requirement will be authorized. In further informal discussions, the Companies came to understand that TURN is most interested in incorporating baseline RAMP benefits for the year 2023, compared to TY 2024 forecasts. The Companies disagree with TURN's position, as discussed below, because: (1) using a forecasted baseline to analyze other forecasts is illogical; (2) the Settlement Agreement must be read within the context of the Commission's GRC Rate Case Plan; (3) there is no double counting of costs or risk reduction benefits under existing Commission-adopted processes; and (4) selecting a "correct" baseline is not defined or prescribed by the Settlement Agreement, as TURN suggests.

Generating a Forecast on Top of a Forecast is Illogical.

To incorporate risk reduction benefits through 2023, as TURN suggests, the Companies would first need to take its current risk scores and somehow determine a methodology to reflect risk scores at the end of 2023. One way to do this would be to utilize the Companies' estimates in these RAMP Reports through 2023 and assume the risk reduction benefits associated with these forecasted activities are realized. The result would be lower risk scores as the starting point. However, this is illogical for several reasons.

First, 2023 has not yet occurred. Designating a future year as the baseline would unnecessarily insert uncertainty and assumptions into the analysis by basing a forecast on a forecast, with little to no value. On top of this, future forecasts would be compared against this future baseline. *Second*, as the Commission has recognized, issues arise during GRC cycles that may require a utility to re-prioritize funding to address immediate needs.[62] Reflecting reductions in risk scores before the years have occurred runs the risk of not accurately crediting (or benefiting) the correct risks based on actual events. *Third*, risks generally increase over time if

[62] *See, e.g.*, D.20-01-002 at 38 ("The Commission has always acknowledged that utilities may need to reprioritize spending between GRCs.").

mitigations are not performed. Each year, for example, assets and systems age, vegetation grows, and there are increased threats (for example, emerging cybersecurity threats) on our systems. Accordingly, risk reduction benefits cannot be realized without also recognizing the increased risk that may occur due to the passage of time.

In addition to the foregoing, performing RSEs in the manner dictated by TURN would create no apparent benefit, because changing the baseline would not likely change the relative rankings of RSEs. Simply, risk reduction compares a new risk score (LoRE x CoRE) with a mitigation to the prior risk score without the mitigation. The RSE then divides this change in risk score by the cost of the mitigation. To determine this new risk score (*i.e.*, the post-mitigation risk score), SoCalGas and SDG&E calculate a new LoRE and CoRE for the given program. This new LoRE and CoRE isolate the risk reduction benefit for that program. Therefore, the comparison point or baseline is irrelevant so long as it is consistently applied (*i.e.*, a new LoRE and CoRE compared to the same baseline LoRE and CoRE).

Contrary to TURN's suggestion of starting the analysis for risk reduction with a forecasted, future baseline, the Rate Case Plan *requires* the use of recorded data as the starting point for baseline comparisons.[63] In these RAMP Reports, the Companies use 2020 as the "baseline," which is the last year of recorded data available at the time of the instant Applications,[64] as further discussed below.

The Settlement Agreement Must Be Read within the Context of the Commission's GRC Rate Case Plan.

The Settlement Agreement's language referencing the "GRC period under review in the RAMP submission" must be interpreted within the context of the Commission's Rate Case Plan. It does not exist in a vacuum. The RAMP is the first phase of the GRC; and therefore, the RAMP Reports must be developed in such a way that they may be integrated into the GRC. From the Companies' perspective, the GRC period that is reviewed in the RAMP must align with the period reviewed in the GRC – *i.e.*, the years that the Companies will forecast in their GRC applications, which will be used to evaluate the test year revenue requirement. In this case, the

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[63] *See* D.07-07-004, Attachment A, at A-31.

[64] The Companies' risk score calculations were performed throughout August 2020 to February 2021, using the most recent set of historic data available up to that time frame. The Companies used the most recent available data, but not all data for each risk was available to the same time frame, therefore risks were scored using data up through a time period between 2019 and 2020.

GRC forecast years are 2022-2024.[65] The Companies will file their TY 2024 GRC Applications by May 15, 2022, pursuant to D.20-01-002. Accordingly, the Companies will use 2021 as a base year in the GRC (their last historical year of data prior to filing), upon which forecasts will be developed for the years leading up to the test year, 2024. Because the RAMP is filed one year before the GRC, the last year of recorded data is 2020, making that the base year or baseline for RAMP.

Using the same forecast years in both the RAMP and the GRC is also consistent with another example from the Settlement Agreement, Row 28, which requires a Step 3 supplemental analysis in the GRC based on threshold amounts for a three-year cumulative total for capital programs and a test year amount for expense programs, for the "CPUC jurisdictional *forecast cost of the program in the GRC*."[66]

From the Companies' perspective, the years 2022-2024 is the only possible "GRC period under review in the RAMP submission" for this proceeding.[67] This is because a smooth integration of RAMP into GRC requires that the comparison used for cost and benefit information should match between both proceedings. It would be illogical to compare risk reduction benefits shown in a forecasted baseline of 2023 in the RAMP filing to a 2021 GRC baseline. The result would be, among others, that the risk reduction benefits being reviewed and considered in the GRC would be compared to a different year than those included in the RAMP.

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[65] The Companies' use of a 2021 base year and 2022-2024 forecast years for their GRC presentation follows the Commission's established standard requirements for GRC presentations in the Rate Case Plan. The standard requirements include providing the last year of historical data at the time a GRC application is submitted, called the "base year" and forecasting "with evaluation of changes up to and including the test year." *Id*. For the Test Year 2024 GRC, SoCalGas and SDG&E will provide a historical base year of 2021 (because the GRC application will be filed by May 15, 2022) and forecast the years are 2022-2024.

[66] D.18-12-014, Appendix A, at A-14 – A-15 ("Step 3 Supplemental Analysis in the GRC") (emphasis added).

[67] The Companies understand that the topic of baseline and whether it should be a defined term in the lexicon is currently in scope for the open S-MAP OIR. *See* R.20-07-013, S-MAP OIR Scoping Ruling at 4-5 and 6 (Tracks 1 and 3). Any adjustments to the Companies' approach, if necessary, should be made in future filings.

There is No Double Counting of Risk Reduction Benefits.

As shown above, TURN's argument that because the Companies have been authorized a revenue requirement through 2023, the RAMP analysis should begin with 2024[68] is not supported by the GRC framework. TURN, however, claims that its proposed baseline is necessary to avoid double counting of risk reduction benefits.[69] On the contrary, the Rate Case Plan requires each GRC cycle to start with recorded information regardless of the amounts previously authorized, which does not create double counting in GRC forecasting. Any realized efficiencies or new ways of doing business are included in the history and rolled into the next GRC.

For example, the Commission generally examined costs as well as gained efficiencies for the Companies' programs shown in the TY 2019 GRC presentation only through the test year, 2019 (*i.e.*, the Commission evaluated programs for years 2017-2019).[70] The RAMP programs were similarly evaluated for the same years, 2017-2019. And in the next TY 2024 GRC, cost levels (including realized efficiencies) for the 2022-2024 programs will be evaluated, for the first time, to set future funding.[71] Thus, neither the GRC framework nor the Companies' RAMP presentation results in an overlap of program year evaluation nor a double-counting of costs.[72] And the same is true for risk reduction benefits; no double counting of realized risk reduction benefits is created by using a historic RAMP base year.

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68 TURN Informal Comments (February 12, 2021) at 5.

69 TURN Informal Comments (February 12, 2021) at 5.

70 D.20-01-002 at 8. The Rate Case Plan's requirement to use the last recorded year of data as a GRC baseline allows for the extensive review of programs by the Commission and parties for the years that are forecasted in GRCs (to set test year revenue requirement levels), while post-test year funding is established through a mechanism based on escalation factors.

71 The purpose of the evaluation of programs in a GRC, in accordance with the Rate Case Plan, is to provide levels for future funding. *See Id.*

72 Any concern of double-counting benefits is also alleviated by the additional oversight created by the Commission's reporting requirements. In D.14-12-025, the Commission created two accountability reports, the Risk Spending Accountability Report and Risk Mitigation Accountability Report to provide the opportunity to review spending and benefits after work is completed. Currently, only the Risk Spending Accountability Report has been implemented. However, the Risk Mitigation Accountability Report implementation is an open item in scope of the open S-MAP OIR (*see* Section III.D below).

Selection of a "Correct" Baseline Is Not Prescribed by the Settlement Agreement, as TURN Suggests.

Finally, selecting a baseline is not defined or mentioned in the Settlement Agreement, nor is the selection of a "correct" baseline prescribed by the Settlement Agreement, as TURN suggests. The first mention of "baseline" in the context of RAMP proceedings is in D.14-12-025, which requires RAMP filings to include, among other things, "A description of the controls *currently in place*, as well as the 'baseline' costs associated with the current controls."[73] The Commission's "currently in place" language is consistent with the Companies' understanding that the term "baseline" relates to programs that currently exist, for which there are known data, rather than a forecasted "baseline" year in the future. The Companies are unaware of any Settlement Agreement requirement or Commission decision that is inconsistent with their understanding of D.14-12-025's language.

C. Validation of Data and Assumptions

Quantitative risk analysis relies heavily on data. Therefore, the ability to locate and use meaningful data will always be a factor in risk analysis. Although many data sources are available for a wide array of uses, it is uncommon to find data that is precisely what is needed at a particular point or for a particular use. The Companies are proactive in their efforts to learn and obtain relevant data and to pivot to adapt to future needs for new and advanced data.

SoCalGas and SDG&E believe granular and robust data sets are needed to evaluate a program's effectiveness as well as to meet evolving Commission reporting requirements. In the wildfire space, extensive reporting requirements already exist and are becoming more rigorous. The Companies expect that with the implementation of the Risk Mitigation Accountability Report, which is a topic in scope of the pending S-MAP OIR,[74] additional data and validation will be required.

In an effort to improve data collection,[75] SoCalGas and SDG&E are developing processes to confirm that risk reduction metrics are understood, tracked, repeatable, and producing results. The intent is to validate, upon look-back, if risk reduction was achieved.

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[73] D.14-12-025 at 32 (emphasis added).

[74] *See* S-MAP OIR Scoping Ruling at 8 (Phase II, Track 1, x, "Risk Mitigation and Accountability Reports (RMAR)").

[75] D.16-08-018 at 146 and 193 (Conclusions of Law [COL] 38).

D. Equivalences Between Attributes in Risk Quantification Framework

The Settlement Decision requires that when building an MAVF, each attribute should reflect its relative importance to other attributes in the value framework. This is done "based on the relative value of moving each attribute from its least desirable to its more desirable level,"[76] creating equivalencies between attributes. As shown in Table 1, TURN disagrees with the Companies' preliminary equivalencies based on TURN imputing the statistical value of life and finding the values were beyond those utilized by federal agencies.[77]

SoCalGas and SDG&E did not develop their Risk Quantification Framework to imply a statistical value of life, nor should it be utilized for that purpose. Rather, the Companies constructed their Risk Quantification Framework in accordance with the six principles outlined in the Settlement Decision, which do not require equivalencies to be based on a statistical value of life.[78] Moreover, the Commission is considering whether to adopt a risk tolerance standard as a statewide issue in the ongoing S-MAP OIR.[79] SoCalGas and SDG&E agree that this issue has RAMP implications for all IOUs and should be considered and determined uniformly for all IOUs. We look forward to discussing this issue in the S-MAP OIR.

E. Granularity and Tranches

SoCalGas and SDG&E continue to advance their risk modeling and have provided risk analysis at granular levels, in accordance with the Settlement Decision, to the extent it is currently feasible. The Settlement Decision requires a utility to "subdivide the group of assets or the system associated with the risk into Tranches…based on how the risks and assets are managed by each utility, data availability and model maturity, and strive to achieve as deep a level of granularity as reasonably possible."[80] The Companies complied with this requirement by subdividing their assets and systems to align with how the assets and systems are managed, as discussed below.

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[76] Settlement Decision, Appendix A at A-6 (MAVF Principle 6 – Relative Importance).

[77] TURN Informal Comments (February 12, 2021) at 5-6.

[78] *See* Settlement Decision, Appendix A at A-5 – A-6.

[79] *See* Rulemaking (R.) 20-07-013, *Assigned Commissioner Scoping Memo and Ruling* (November 2, 2020) (S-MAP OIR Scoping Ruling) at 7-9.

[80] D.18-12-014, Appendix A at A-11 ("Definition of Risk Events and Tranches").

In the 2021 RAMP Reports, the Companies subdivided assets and systems in four ways. *First*, risk events themselves are already subdivided. For example, SoCalGas and SDG&E consider high pressure (HP) gas assets to have different risks than medium pressure (MP) gas assets. One way to demonstrate the difference in these risk profile (but not the approach used by the Companies) would be to first identify a mitigation to a risk that involves the entire gas system and to then create a tranche for the high pressure assets and a different tranche for the medium pressure assets. The result would be: Control 1; Control 1-T1 (HP), Control 1-T2 (MP). Alternatively, the Companies could first create the subdivision by risk profile and then identify a mitigation (which is the approach used by the Companies). The result would be Control 1 in the HP risk and Control 1 in the MP risk. Both approaches result in the exact same level of analysis but the mitigation with the "T" in its ID Name appears to be tranched, and the one without a "T" in its ID Name does not appear to be tranched. The Companies consider the results of both methods to be tranches.

Second, SoCalGas and SDG&E identify tranches for the risk event that are applicable to the entire risk. Expanding on the previous example, the Companies' respective high pressure pipelines traverse locations that are classified as either High Consequence Area (HCA) locations or non-HCA locations. In many cases, a mitigation on high pressure pipeline is the same regardless of its location (HCA versus non-HCA), but the risk profile of that mitigation is different because of the pipeline's location (HCA versus non-HCA). Continuing the first approach (not used by the Companies) in the previous example, the mitigation Control 1-T1 (HP) would now be tranched again, with the result being Control 1-T1-T1 (Gas pipeline-HP-HCA) and Control 1-T1-T2 (gas pipeline-HP-non-HCA). Continuing the approach used by the Companies, the results are Control 1-T1 (HP pipeline-HCA) and Control 1-T2 (HP pipeline - non-HCA). The mitigations in SDG&E's Wildfire risk for High Fire Threat District tiers could be used as another example.

Third, another way to achieve tranches is to identify separate programs for different assets. In the Companies' respective risks for Excavation Damage (Dig-In) on the Gas System, programs are presented in a manner that separates the difference in risk profiles for dig-ins on the high pressure system compared with the medium pressure system. In this example, programs are given the nomenclature Control 1 (HP) and Control 2 (MP). They could have equivalently been called Control 1-T1 (Dig-in – HP) and Control 1-T2 (Dig-in – MP). As another example, the

Companies typically develop programs associated with a specific asset, such as a distinct program for hotline clamps and lightning arresters in SDG&E's Wildfire risk or piping in vaults in SDG&E's Incident Related to the Medium Pressure System. Moreover, for circumstances where various inspections have differing cycles, such inspections are represented as separate programs, as seen in SoCalGas's Incident Related to the Medium Pressure System for its pipeline monitoring activities.

Fourth, in addition to subdividing assets or systems through separate risks, locations applicable to the risk, and program development, the Companies further subdivide assets and systems when different risk profiles exist for an activity. For example, as seen in SoCalGas's RAMP risk chapter of Incident(s) Related to the Medium Pressure System, SoCalGas subdivided its Distribution Integrity Management Program into a vintage integrity plastic plan and a bare steel replacement program to capture the different risk profile of the different types of material. Similarly, in SDG&E's Electric Infrastructure Integrity risk chapter, SDG&E subdivided its distribution overhead switch replacement program into the following types of switches: SCADA, gang, and hook to capture the different risk profiles of each type of switch.

These four ways of tranching within the Companies' respective 2021 RAMP Reports align with how the assets and systems are managed, consistent with the Settlement Decision. SoCalGas and SDG&E strive for additional granularity of tranches when feasible and when doing so reflects how SoCalGas and SDG&E manage their assets or systems; however, a number of challenges persist. Practically speaking, providing risk analysis at granular levels presents challenges. Locational differences, for example, may result in different risk profiles, or tranches, for certain risks as discussed above. However, the Companies generally do not track costs by location. Accordingly, to perform this or a similar breakdown, assumptions must be made. To accommodate the granularity of tranches for future GRCs and accountability reports, SoCalGas and SDG&E are looking into potential changes to their accounting practices to track cost information in this manner, so that the data and assumptions associated with tranches are repeatable. The Companies will continue to strive for greater granularity in their tranching as appropriate in future RAMP Reports.

F. Risk Reduction and RSEs

As explained in Chapter SCG/SDG&E RAMP-A, in these 2021 RAMP Reports, the Companies reviewed all current and newly planned activities in the RAMP risk chapters to

evaluate the usefulness of performing an RSE, and included an RSE value when meaningful data or SME opinions are available. Activities without an RSE value include an explanation. This approach addresses feedback received on the Companies' 2019 RAMP Reports that the Companies should provide RSE values for mitigations performed to maintain compliance with state and federal mandated requirements, as shown above in Table 1.

The Companies are gaining more practice in quantifying risk reduction, building on the development of these Reports. Nonetheless, estimating risk reduction can be a thought-provoking, theoretical practice. Subject matter experts are often perplexed with how exactly to quantify the benefits of a given program that, in many instances, is a longstanding best practice. For example, how much risk is reduced by performing pipeline patrols, or administering locate and mark training, or continuing a contractor oversight program?

Further, estimating risk reduction requires data to yield sound results. When data is available, less subjectivity is applied. Absent data, however, SMEs are asked to use their judgment, as required by the Settlement Agreement. The Settlement Agreement states:

> All estimates should be based on data whenever practical and appropriate. However, the available data should not restrict the application of the risk assessment methodologies. SME judgment should be used if the methodologies require use of data that is not available. Over time, SME judgment should be increasingly supplemented by data analysis as the methodologies mature.[81]

However, the Settlement Agreement does not require the Companies to guess or make things up when no SME judgment is available. Many times, particularly when no utility-specific or industry data exists, SMEs may not have a basis for knowing the amount of risk reduction provided by a mitigation or control, and providing a data point would require guesswork, rather than judgment. Despite these facts, parties have argued that if needed, utilities are absolutely required to guess as part of creating an RSE, and to state in their RAMP filings that they have little to no confidence in the "guesses."[82] The Companies disagree that providing an RSE based on guesswork is required by the Settlement Decision or would be useful to the Commission. Moreover, Rule 1.1 of the Commission's Rules of Practice and Procedure requires parties before the Commission to never "mislead the Commission or its staff by an artifice or false statement of

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[81] D.18-12-014, Appendix A at A-18 ("Data Support and Data Sources").

[82] *See* TURN Informal Comments (February 12, 2021) at 3-4.

fact or law." The Companies believe that presenting RSEs without any basis in fact or judgment has the potential to mislead.

Where RSEs are unavailable for a particular activity in the 2021 RAMP Reports, SoCalGas and SDG&E provide an explanation for why the RSE is unavailable, consistent with the Safety Policy Division's guidance in PG&E's 2020 RAMP proceeding[83] and discussions at SoCalGas's and SDG&E's pre-filing workshops. The Settlement Decision does not require forced production of an RSE where only guesswork, and no data or SME judgment, exists.

How to express a "risk score" also presents philosophical questions. Quantitative risk analyses use many methods to evaluate the seriousness of a risk, and those methods can vary depending on circumstances. At times, one might want to know the likelihood of a large event occurring or the worst expected impact over a 20-year span of time. Both of those questions require other methodologies than those used in the current RAMP to create a risk score. Those other methodologies could also be useful to communicate the reasons why the utilities chose the risk-reducing activities that they did. RSEs are just one piece of information that could help explain the efficacy of a risk-reducing activity.

G. Discounting of Costs

The Settlement Decision requires calculation of an RSE as follows:

> RSE should be calculated by dividing the mitigation risk reduction benefit by the mitigation cost estimate. The values in the numerator and denominator *should be present values* to ensure the use of *comparable measurements* of benefits and costs.[84]

The GRC Rate Case Plan also requires the use of comparable values in an IOU's GRC request, as follows: "All data for expenses shall be stated in recorded dollars and dollars inflation adjusted to a constant base year."[85] In other words, all costs in the GRC are presented in base year dollars to reflect a single year's dollars, without adjustment for escalation. The Companies believe that the "comparable measurements" and "present values" language in the Settlement Decision is consistent with the Rate Case Plan's requirement to present all costs in base year,

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[83] A.20-06-012, *Safety Policy Division Staff Evaluation Report on PG&E's 2020 Risk Assessment and Mitigation Phase (RAMP) Application* (November 25, 2020) at 5 ("SPD recommends PG&E and all IOUs provide RSE calculations for controls and mitigations or provide an explanation for why it is not able to provide such calculations.").

[84] D.18-12-014, Appendix A at A-13 ("Risk Spend Efficiency (RSE) Calculation") (emphasis added).

[85] D.89-01-040, Appendix A at A-31.

constant dollars.[86] Thus, the Companies' 2019 RAMP Report stated all costs in today's (base year) dollars, consistent with GRC filings, in compliance with the Settlement Decision's requirement to ensure comparable measurements. No further discounting is needed.

TURN, however, provided its view that all costs should be discounted at the weighted average cost of capital (WACC), on the grounds that escalation and discounting are different.[87] The Companies revisited this topic in preparing their 2021 RAMP Reports and agree with TURN that escalation and discounting are different concepts. While the Companies are not opposed to the concept of discounting, TURN's suggestion to discount all costs at the WACC does not represent differences in utility costs. For example, O&M costs are different from capital costs. One such difference is that O&M expenditures do not earn a rate of return. Therefore, it may be inaccurate to discount O&M costs at the WACC. Prior to the implementation in a RAMP or GRC filing, questions should be addressed as to the types of costs subject to discounting. The Companies maintain that their use of base year, constant dollars is appropriate and consistent with the Settlement Decision and the Rate Case Plan; however, additional discussion of discounting costs could be further discussed with interested stakeholders in the S-MAP OIR.

H. Pre-filing Workshops

As mentioned above, SoCalGas and SDG&E held three workshops/working group sessions prior to filing their 2021 RAMP Reports. PG&E similarly held several workshops/working group sessions prior to their 2020 RAMP Report submittal. SoCalGas and SDG&E found these public forums valuable and appreciate parties' investment of time and feedback. During the Companies' final public workshop, some participants expressed the view that the workshops were perfunctory and held only because they were procedurally mandated, and that the utilities had not expressly committed to incorporate recommendations from the parties into their final RAMP submissions.

As summarized in this Chapter and demonstrated throughout their Reports, SoCalGas and SDG&E have carefully evaluated and considered the oral and written feedback provided by parties. At the time of the pre-filing workshops, however, the Companies could not commit to which recommendations would be incorporated because the 2021 RAMP Reports were still

[86] Generally, present value is a financial calculation that discounts a future stream of cash flows to today's dollars to account for the time value of money.

[87] TURN Comments (April 6, 2020) at 6.

being developed or doing so would require undoing substantial work on fundamental issues that were already foundational components of the Reports. The utilities need time to develop large, complex filings such as the RAMP Reports. The Settlement Decision requires utilities to host one pre-filing RAMP workshop to gather input from stakeholders "to inform the determination of the final list of risks to be included in the RAMP."[88] More than one pre-filing workshop should not be required if it results in misaligned expectations and does not benefit the process.

IV. CONCLUSION

The lessons learned offered by SoCalGas and SDG&E are intended to be a constructive representation of the RAMP process and how to improve future filings. SoCalGas and SDG&E welcome lessons learned by others to improve the process.

[88] Settlement Decision, Appendix A at A-10 ("Risk Selection Process for RAMP").

Risk Assessment and Mitigation Phase

(Chapter SCG-Risk-1)

Incident Related to the High Pressure System (Excluding Dig-In)

May 17, 2021

TABLE OF CONTENTS

RISK: INCIDENT RELATED TO THE HIGH PRESSURE SYSTEM (EXCLUDING DIG-IN)

I. INTRODUCTION

The purpose of this Chapter is to present Southern California Gas Company's (SoCalGas or Company) risk control and mitigation plan for the Incident Related to the High Pressure System (Excluding Dig-In) risk (HP Incident risk). Each Chapter in this Risk Assessment Mitigation Phase (RAMP) Report contains the information and analysis that meets the requirements adopted in Decision (D.) 16-08-018 and D.18-12-014 and the Settlement Agreement included therein (the Settlement Decision).[1]

SoCalGas has identified and defined RAMP risks in accordance with the process described in further detail in Chapter SCG RAMP-B of this RAMP Report. On an annual basis, SoCalGas's Enterprise Risk Management (ERM) organization facilitates the Enterprise Risk Registry (ERR) process. The ERR process influenced how risks were selected for inclusion in this 2021 RAMP Report, consistent with the Settlement Decision's directives, as discussed in Chapter SCG/SDGE RAMP-C.

The RAMP Report's purpose is to present a current assessment of key safety risks and the proposed activities for mitigating those risks. The RAMP Report does not request funding. Any funding requests will be made in SoCalGas's General Rate Case (GRC) application. The costs presented in this 2021 RAMP Report are those costs for which SoCalGas anticipates requesting recovery in its Test Year (TY) 2024 GRC. SoCalGas's TY 2024 GRC presentation will integrate developed and updated funding requests from the 2021 RAMP Report, supported by witness testimony.[2] This 2021 RAMP Report is presented consistent with SoCalGas's GRC presentation, in that the last year of recorded data (2020) provides baseline costs and cost estimates are provided for years 2022-2024, as further discussed in Chapter SCG/SDG&E RAMP-A. This 2021 RAMP Report presents capital costs as a sum of the years 2022, 2023, and 2024 as a three-year total; operations and maintenance (O&M) costs are only presented for TY 2024 (consistent with the GRC). Costs for each activity that directly addresses each risk are

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[1] D.16-08-018 also adopted the requirements previously set forth in D.14-12-025. D.18-12-014 adopted the Safety Model Assessment Proceeding (S-MAP) Settlement Agreement with modifications and contains the minimum required elements to be used by the utilities for risk and mitigation analysis in the RAMP and GRC.

[2] *See* D.18-12-014 at Attachment A, A-14 ("Mitigation Strategy Presentation in the RAMP and GRC").

provided where those costs are available and within the scope of the analysis required in this RAMP Report.

Throughout this 2021 RAMP Report activities are delineated between controls and mitigations, consistent with the definitions adopted in the Settlement Decision's Revised Lexicon. A "control" is defined as a "[c]urrently established measure that is modifying risk."[3] A "mitigation" is defined as a "[m]easure or activity proposed or in process designed to reduce the impact/consequences and/or likelihood/probability of an event."[4] Activities presented in this Chapter are representative of those that are primarily scoped to address SoCalGas's High Pressure Incident risk; however, many of the activities presented herein also help mitigate other areas.

As discussed in SCG/SDG&E RAMP-A and SCG/SDGE RAMP-C, SoCalGas has endeavored to calculate a Risk Spend Efficiency (RSE) for all controls and mitigations presented in this risk Chapter. However, for controls and mitigations where no meaningful data or subject matter expert (SME) opinion exists to calculate the RSE, SoCalGas has included an explanation why no RSE can be provided, in accordance with California Public Utilities Commission (CPUC or Commission) Safety Policy Division (SPD) staff guidance.[5] Activities with no RSE value presented in this 2021 RAMP Report are identified in Section V below.

SoCalGas has also included a qualitative narrative discussion of certain risk mitigation activities that would otherwise fall outside of the RAMP Report's requirements, to aid the Commission and stakeholders in developing a more complete understanding of the breadth and quality of the Company's mitigation activities. These distinctions are discussed in the applicable control and mitigation narratives in Sections III and/or IV.

A. Risk Overview

The SoCalGas transmission and distribution system operates in 12 different counties and spans from the California-Arizona border to the Pacific Ocean and from the California-Mexico

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3 *Id*. at 16.

4 *Id.* at 17.

5 *See* Safety Policy Division Staff Evaluation Report on PG&E's 2020 Risk Assessment and Mitigation Phase (RAMP) Application (A.) 20-06-012 (November 25, 2020) at 5 ("SPD recommends PG&E and all IOUs provide RSE calculations for controls and mitigations or provide an explanation for why it is not able to provide such calculations.").

border to Fresno County. SoCalGas is the largest gas distribution operator in the nation and the second largest transmission operator in High Consequence Area (HCA) miles (as defined by the United States Department of Transportation (DOT)), with approximately 1,100 miles of HCA pipe out of 3,341 miles of transmission pipelines. In total, SoCalGas operates 6,685 miles of high-pressure pipelines in its service territory, which includes the 3,341 transmission miles.

The U.S. Department of Transportation Pipeline and Hazardous Materials and Safety Administration (PHMSA) and the American Society of Mechanical Engineers (ASME) pipeline integrity standard B31.8S,[6] "Managing System Integrity of Gas Pipelines," categorizes nine types of threats that could lead to a high pressure pipeline incident. Eight of those threat types are discussed in this Chapter and one - third party damage - is addressed in the Excavation Damage (Dig-In) on the Gas System risk Chapter. The eight types of threats covered in this Chapter include:

1) External Corrosion
2) Internal Corrosion
3) Stress Corrosion Cracking
4) Manufacturing Defect
5) Construction & Fabrication
6) Outside Forces
7) Incorrect Operation
8) Equipment Threat

These factors, also known as potential risk drivers, can work independently and/or interactively together. When a gas pipeline has a loss of product, PHMSA categorizes it as a non-hazardous release of gas or a leak. Specifically, when the loss of gas cannot be resolved by lubing, tightening or adjusting, it is defined as a "leak." A leak in and of itself may cause little-to-no risk of serious injury or fatality. Risk to the public and employees can increase when leaks are in close proximity to an ignition source and/or where there is a potential for gas to migrate into a confined space. The safety concern of the leak is addressed by SoCalGas's leak indication

[6] AMSE B31.8S is specifically designed to provide the operator with the information necessary to develop and implement an effective integrity management program utilizing proven industry practices and processes. Recorded costs and forecast ranges are rounded. Additional cost-related information is provided in workpapers. Costs presented in the workpapers may differ from this table due to rounding.

prioritization and repair schedule procedures. In most cases, a pipe with a leak will continue to transport gas, and therefore is not considered a pipeline "failure" using the definition in ASME B31.8S.

However, in some instances a pipeline may be weakened to the extent that the pipe can overload and "break open" or burst apart. This is referred to as a pipeline rupture and considered a failure of the pipeline, as it can no longer function as intended. This type of failure could release a high level of energy, and sometimes ignite, resulting in damage to the surrounding area, injury, and/or loss of life.

The leak versus rupture failure mode is generally dependent on the stress to the pipe, the pipe material properties and the geometry of the latent weak point on a pipeline. As a general rule, the rupture failure mode does not occur on a pipeline operating under 30% of Specified Minimum Yield Strength (SMYS), unless there is an egregious pipe anomaly acting as an initiation growth point and there are interacting threats involved.

Due to the nature of a potential rupture failure mode, this risk category discusses the potential consequences of a rupture event occurring on the Company's high-pressure gas system. The extent of damage of an incident can be modeled through the use of a potential impact radius (PIR) around a pipe. PHMSA has incorporated the PIR into its methods for determining an HCA along a pipeline right-of-way. In addition, the presence of HCA miles in a high pressure system can indicate certain consequences of an incident to the public because HCAs consist of highly populated areas and identified sites where people regularly gather or live.

Applying mitigative measures as outlined in Title 49 of the Code of Federal Regulations (CFR) Section 192.935, such as increased inspections and assessments, additional maintenance, participation in a one-call system, community education and consideration of the installation of additional remote-controlled valves, can help reduce the likelihood or consequence of a rupture event in both high consequence and lesser populated areas.

The SoCalGas HP Incident risk is similar to the SDG&E HP Incident risk because the threats are the same and the system is managed in an integrated manner. Since the high-pressure pipeline system is managed by two operating departments (Transmission and Distribution), it is difficult to identify costs solely dedicated to high pressure pipelines managed by Distribution Operations. Therefore, the costs in this risk Chapter are primarily related to the Transmission Operations department.

B. Risk Definition

For purposes of this RAMP Report, SoCalGas's HP Incident risk is defined as the risk of failure of a high pressure pipeline,[7] which results in serious injuries, or fatalities, and/or damage to infrastructure. For purposes of this Chapter, the failure event would be from one of eight threats identified by PHMSA. The medium pressure assets operating at a pressure of 60 psig and less are included in the RAMP Chapter for incidents involving medium pressure pipelines. Events caused by third party dig-in damage are included in the Excavation Damage (Dig-In) on the Gas System risk Chapter.

C. Scope

Table 1 below provides what is considered in and out of scope for the HP Incident risk in this RAMP Report.

Table 1: Risk Scope

In-Scope:	The risk of damage, caused by a high pressure system (maximum allowable operating pressure (MAOP) greater than 60 psig) failure event, which results in consequences such as injuries, fatalities or outages.
Data Quantification Sources:	SoCalGas engaged internal data sources for the calculation surrounding risk reduction; if data was insufficient, however, Industry or National data was supplemented and adjusted to fit the risk profile associated with the operating locations and parameters of the utilities. For example, certain types of incident events have not occurred within the SoCalGas service territory; therefore, expanding the quantitative needs to encompass industry data where said incident(s) have been recorded to provide a proximate is justified in establishing a baseline of risk and risk addressed by activities. See Appendix B for additional information.

II. RISK ASSESSMENT

In accordance with the Settlement Decision,[8] this section describes the risk bow tie, possible drivers, potential consequences, and the risk score for the HP Incident risk.

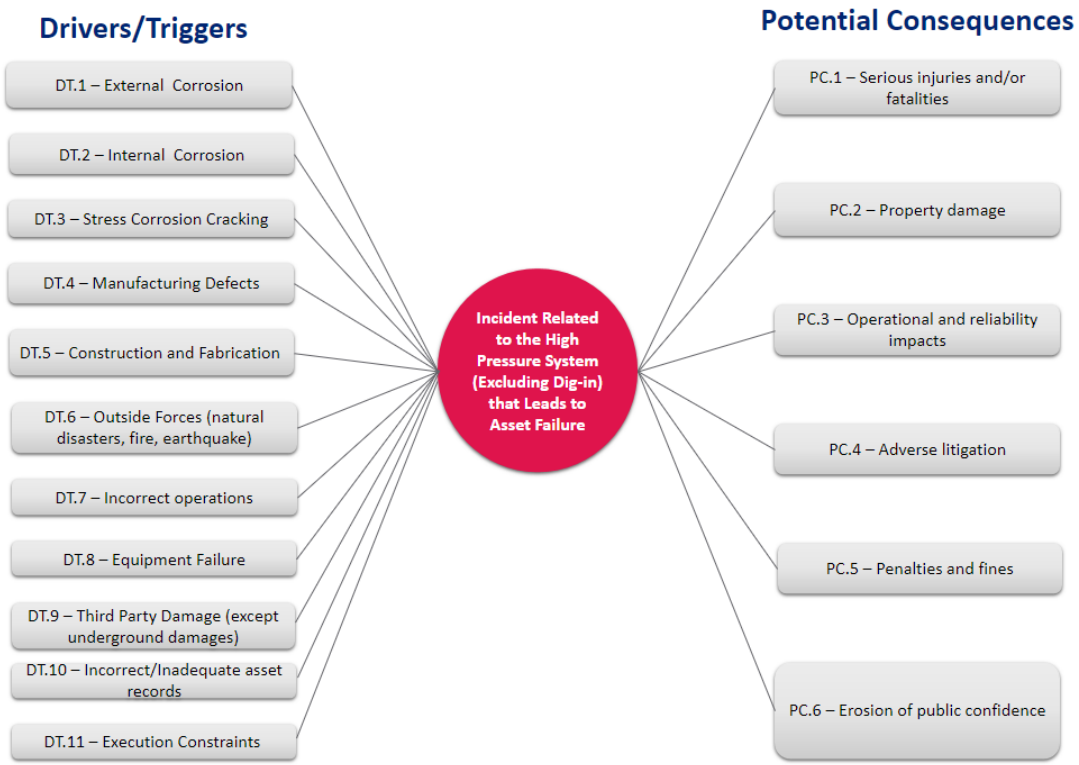
[7] Maximum Allowable Operating Pressure (MAOP) at higher than 60 psig.

[8] D.18-12-014 at 33, and Attachment A, A-11 ("Bow Tie").

A. Risk Bow Tie and Risk Event Associated with the Risk

The risk bow tie is a commonly used tool for risk analysis, and the Settlement Decision[9] instructs the utility to include a risk bow tie illustration for each risk included in RAMP. As illustrated in the risk bow tie shown below in Figure 1, the risk event (center of the bow tie) is a HP incident that leads to Asset Failure, the left side of the bow tie illustrates drivers/triggers that lead to the HP incident that Leads to Asset Failure, and the right side shows the potential consequences of the HP incident. SoCalGas applied this framework to identify and summarize the information provided in Figure 1. A mapping of each mitigation to the element(s) of the risk bow tie addressed is provided in Appendix A.

Figure 1: Risk Bow Tie



[9] *Id.*

B. Cross-Functional Factors

The following cross-functional factors have programs and/or projects that affect one or more of the drivers and/or consequences of this risk: Energy Resilience, Emergency Planning and Response and Pandemic, Foundational Technology Systems, Physical Security, Asset and Records Management, Safety Management Systems, and Workforce Planning / Quality Workforce.

C. Potential Drivers/Triggers[10]

The Settlement Decision[11] instructs utilities to identify which element(s) of the associated risk Bow Tie each mitigation addresses. When performing the risk assessment for the HP Incident risk, SoCalGas identified potential leading indicators, referred to as drivers or triggers. These include:

- **DT.1 – External Corrosion:** A naturally occurring phenomenon commonly defined as the deterioration of a material (usually a metal) that results from a chemical or electrochemical reaction with its environment.[12]
- **DT.2 – Internal Corrosion:** Deterioration of the interior of an asset as a result of the environmental conditions on the inside of the pipeline. [13]
- **DT.3 – Stress Corrosion Cracking:** A type of environmentally-assisted cracking usually resulting from the formation of cracks due to various factors in combination with the environment surrounding the pipeline that together reduces the pressure-carrying capability of the pipe.[14,]
- **DT.4 – Manufacturing Defect:** Attributable to a material defect within the pipe, component or joint due to faulty manufacturing procedures, design defects, or in-service stresses such as vibration, fatigue and environmental cracking.
- **DT.5 – Construction and Fabrication:** Attributable to the construction methodology applied during the installation of pipeline components specifically

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[10] An indication that a risk could occur. It does not reflect actual or threatened conditions.

[11] D.18-12-014 at Attachment A, A-11 ("Bow Tie").

[12] *See* AMSE B31.8S.

[13] *Id*.

[14] *Id*.

based on the vintage of the construction standards, fabrication techniques (welding, bending, etc.) and overall guiding regulations.

- **DT.6 – Outside Forces:** Attributable to causes not involving humans, but includes effects of climate change such as earth movement, earthquakes, landslides, subsidence, heavy rains/floods, lightning, temperature, thermal stress, frozen components, and high winds.
- **DT.7 – Incorrect Operations:** May include a pipeline incident attributed to insufficient or incorrect operating procedures or the failure to follow a procedure.
- **DT.8 – Equipment Failure:** Attributable to malfunction of a component, including but not limited to, regulators, valves, meters, flanges, gaskets, collars, couples, etc.
- **DT.9 – Third-Party Damage (except for underground damages[15]):** Attributable to outside force damage other than excavation damage or natural forces such as damage by car, truck or motorized equipment not engaged in excavation, etc.
- **DT.10 – Incorrect/Inadequate Asset Records:** The use of inaccurate or incomplete information that could result in the failure to (1) construct, operate, and maintain SoCalGas's pipeline system safely and prudently; or (2) to satisfy regulatory compliance requirements.
- **DT.11 – Execution Constraints:** Events (excluding those covered by outside force damages) that impact the Company's ability to perform as anticipated. Examples include, but are not limited to: Materials and operational oversight, delays in response and awareness, resource constraints, and/or inefficiencies and reallocation of (human and material) resources, unexpected maintenance, or regulatory requirements.

[15] Underground damage would fall under the Excavation Damage risk Chapters in the RAMP Report.

D. Potential Consequences of Risk Event

Potential consequences[16] are listed to the right side of the risk bow tie illustration provided above. If one or more of the drivers/triggers listed above were to result in an incident, the potential consequences, in a reasonable worst-case scenario, could include:

- **PC.1 – Serious Injuries and/or Fatalities**
- **PC.2 – Property Damage**
- **PC.3 – Operational and Reliability Impacts**
- **PC.4 – Adverse Litigation**
- **PC.5 – Penalties and Fines**
- **PC.6 – Erosion of Public Confidence**

These potential consequences were used in the scoring of the HP Incident risk that occurred during the development of SoCalGas's 2020 Enterprise Risk Registry.

E. Risk Score

The Settlement Decision requires a pre- and post-mitigation risk calculation.[17] Chapter SCG/SDG&E RAMP-C of this RAMP Report explains the Quantification Overview that underlies this Chapter, including how the Pre-Mitigation Risk Score, Likelihood of Risk Event (LoRE), and Consequence of Risk Event (CoRE) are calculated.

Table 2: Pre-Mitigation Analysis Risk Quantification Scores[18]

	LoRE	CoRE	Risk Score
Incident Related to the High Pressure System	8.64	538	4,644

Pursuant to Step 2A of the Settlement Decision, the utility is instructed to use actual results, where available, and appropriate data where actuals are not available (*e.g.*, Pipeline and Hazardous Materials Safety Administration data).[19] Historical PHMSA data and internal SME

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16 D.18-12-014 at 16, and Attachment A, A-8 ("Identification of Potential Consequences of Risk Event").

17 *Id.* at Attachment A, A-11 ("Calculation of Risk").

18 The term "pre-mitigation analysis," in the language of the Settlement Decision (Attachment A, A-12 ("Determination of Pre-Mitigation LoRE by Tranche," "Determination of Pre-Mitigation CoRE," "Measurement of Pre-Mitigation Risk Score")), refers to required pre-activity analysis conducted prior to implementing control or mitigation activity.

19 *Id.* at Attachment A, A-8 ("Identification of Potential Consequences of Risk Event").

input was used to estimate the frequency of incidents. For additional sources refer to Appendix B.

III. 2020 CONTROLS

This section "[d]escribe[s] the controls or mitigations currently in place" as required by the Settlement Decision.[20] The activities in this section were in place as of December 31, 2020. Controls that will continue as part of the control and mitigation plan (Plan) are identified in Section IV.

Pursuant to CFR Title 49 Part 192 Subpart O, HCAs must be identified by the Company and are areas along the gas transmission right-of-way where there is increased building density or a proximity to certain types of gathering locations where there is an expected concentration of population. The establishment of areas of known greater consequential impact to the public institutes a different risk profile associated with HCA pipe as compared to high pressure pipe not located in an HCA. Therefore, SoCalGas set out to appropriately tranche controls and mitigations, where feasible, for the determination of costs and activity scope. Of note is that for the majority of the controls and mitigations subject to the HCA and non-HCA tranching, the work performed in the HCA is the same as in a non-HCA and as such, there is only a single description of the control and mitigation. These are identified by C#-T1: HCA; C#-T2: non-HCA nomenclature after the control name. Because SoCalGas does not track costs or scope for high pressure activities by HCA and non-HCA, a fixed 33% multiplier for HCA and a 67% multiplier for non-HCA (representing to ratio of total miles of pipe located in HCAs vs in non-HCAs) was applied to costs and scope for activities within these two tranches, unless otherwise noted. SoCalGas recognizes that this mileage methodology is only an approximation and where this assumption was deemed too gross (*i.e.*, unreliable), the tranche was not applied to an activity.

A. C1: Cathodic Protection (CP) – Capital

- **C1-T1: HCA; C1-T2: non-HCA**

Cathodic protection activities consist of the planning, installation, construction and closeout of rectifiers/deep well anode beds, remote power and pipeline coating replacements on transmission pipelines. Rectifiers/deep well anode beds are utilized to drive the electrochemical

[20] *Id.*

reaction required for cathodic protection via an impressed current system along SoCalGas pipelines. The utilization of remote power allows SoCalGas the flexibility to install impressed current systems without having to find a power supply and instead focus on the most effective placement for an impressed current system. Pipeline coating replacements allow SoCalGas to replace the pipeline's first line of defense against corrosion related defects and lower the amount of CP current needed to protect the newly recoated portion of pipeline. These activities are necessary to maintain or improve the pipelines CP system, extend the life of the pipeline, and maintain CP compliance prescribed by 49 CFR Subpart I – Requirements for Corrosion Control Section 192.463:

- Each cathodic protection system required by this subpart must provide a level of cathodic protection that complies with one or more of the applicable criteria contained in appendix D of this part. If none of these criteria is applicable, the cathodic protection system must provide a level of cathodic protection at least equal to that provided by compliance with one or more of these criteria.
- Each segment of metallic pipe that replaces pipe removed from a buried or submerged pipeline because of external corrosion must have a properly prepared surface and must be provided with an external protective coating that meets the requirements of §192.461.
- Each segment of metallic pipe that replaces pipe removed from a buried or submerged pipeline because of external corrosion must be cathodically protected in accordance with this subpart.
- Except for cast iron or ductile iron pipe, each segment of buried or submerged pipe that is required to be repaired because of external corrosion must be cathodically protected in accordance with this subpart.

B. C2: Cathodic Protection - Maintenance

- **C2-T1: HCA; C2-T2: non-HCA**

Cathodic protection maintenance activities consist of annual electrical test station (ETS) reads, bi-monthly current source inspections and annual rectifier maintenance on transmission pipelines. The mentioned activities involve the following; read/record voltage and verify

compliance, inspect ETS for signs of damage, verifying ID tags & test leads for correct information and good condition, verify rectifier proper operation, read/record voltage and amperage across rectifier, clean and tighten all current carrying connections on rectifier, clean all ventilating screens on rectifier units, calibrate voltage and amperage meters on rectifier, repair any damaged wires, check all fuses/circuit breakers, clean off rectifier unit, replace rectifier ID tags, diagnose and troubleshoot substandard conditions or out of tolerance reads. These activities are necessary to maintain or improve the pipelines CP system, extend the life of the pipeline, and maintain CP compliance prescribed by 49 CFR Subpart I – Requirements for Corrosion Control:

1. Each pipeline that is under cathodic protection must be tested at least once each calendar year, but with intervals not exceeding 15 months, to determine whether the cathodic protection meets the requirements of § 192.463.
2. Each cathodic protection rectifier or other impressed current power source must be inspected six times each calendar year, but with intervals not exceeding 2 ½ months, to validate that it is operating.

C. C3: Leak Repair

- **C3-T1: HCA; C3-T2: non-HCA**

Leak repair activities consist of the planning, installation, construction and closeout of projects initiated due to leaks on transmission pipelines or appurtenances. Classification of leaks is based on relative degree of hazard and must be remediated in accordance with the timelines set out by General Order 112 F. Leak repair activities are necessary to uphold public safety, maintain system reliability, and meet regulatory requirements prescribed by 49 CFR 192 Subpart M – Maintenance Section 192.717:

- Each permanent field repair of a leak on a transmission line must be made by:
  - Removing the leak by cutting out and replacing a cylindrical piece of pipe; or
  - Repairing the leak by one of the following methods:

- Install a full encirclement welded split sleeve of appropriate design, unless the transmission line is joined by mechanical couplings and operates at less than 40 percent of SMYS.
- If the leak is due to a corrosion pit, install a properly designed bolt-on-leak clamp.
- If the leak is due to a corrosion pit and on pipe of not more than 40,000 psi (267 Megapascals) SMYS, fillet weld over the pitted area a steel plate patch with rounded corners, of the same or greater thickness than the pipe, and not more than one-half of the diameter of the pipe in size.
- Apply a method that reliable engineering tests and analyses show can permanently restore the serviceability of the pipe.

D. C4: Leak Survey & Patrol

- **C4-T1: HCA; C4-T2: non-HCA**

Instrument Leak Survey & Patrol activities consist of semi-annual leak and patrol surveys, quarterly patrols and special leak and patrol surveys on transmission pipelines. The mentioned activities involve the following: observe surface conditions of right-of-way, detect leaks, report conditions affecting the safety or access of the pipeline, check for right-of-way encroachments, report nearby development, replace missing or damaged pipeline markers, inspect all railroad crossings and class 3/HCA locations. These activities are necessary to maintain or improve the pipeline system, extend the life of the pipeline, maintain pipeline compliance prescribed by 49 CFR 192 Subpart M - Maintenance Sections 192.705 and 192.706:

1. Each operator shall have a patrol program to observe surface conditions on and adjacent to the transmission line right-of-way for indications of leaks, construction activity, and other factors affecting safety and operation.
2. The frequency of patrols is determined by the size of the line, the operating pressures, the class location, terrain, weather, and other relevant factors, but intervals between patrols may not be longer than prescribed in the following table:

Maximum interval between patrols		
Class location of line	**At highway and railroad crossings**	**At all other places**
1, 2	7½ months; but at least twice each calendar year	15 months; but at least once each calendar year.
3	4½ months; but at least four times each calendar year	7½ months; but at least twice each calendar year.
4	4½ months; but at least four times each calendar year	4½ months; but at least four times each calendar year.

3. Leakage surveys of a transmission line must be conducted at intervals not exceeding 15 months, but at least once each calendar year. However, in the case of a transmission line which transports gas in conformity with §192.625 without an odor or odorant, leakage surveys using leak detector equipment must be conducted:
   i. In Class 3 locations, at intervals not exceeding 7 1⁄2 months, but at least twice each calendar year; and
   ii. In Class 4 locations, at intervals not exceeding 4 1⁄2 months, but at least four times each calendar year.

E. C5: Pipeline Relocation/Replacement

- **C5-T1: HCA; C5-T2: non-HCA**

Pipeline relocation and replacement activities consist of planning, installation, construction and closeout of pipeline reroutes triggered by either weather-related external forces, municipality requests, right-of-way agreements, or class location changes. Pipeline replacements due to change in operating class are time sensitive and must be remediated within 24 months of the class location change. These relocation and replacement activities are necessary to reduce the potential for pipeline damage, uphold public safety, and maintain pipeline access.

F. C6: Shallow/Exposed Pipe Remediations

- **C6-T1: HCA, C6-T2: non-HCA**

Shallow or exposed pipe activities consist of the planning, installation, construction, and closeout of projects to add additional cover or protection to Transmission pipelines. Exposed pipelines are inspected for signs of corrosion, metallurgical flaws, construction flaws and mechanical damage. Concrete revetment mats (technology designed to help prevent shoreline erosion) and/or additional earth coverage are installed to prevent damage to exposed/shallow pipe caused by corrosion, third party damages, erosion, or other external forces. These activities

are necessary to uphold public safety, reduce the potential for pipeline damage, and extend the life of the pipeline.

G. C7: Pipeline Maintenance

- **C7-T1: HCA; C7-T2: non-HCA**

Pipeline Maintenance activities consist of class location surveys, valve inspections, vault inspections and bridge and span inspections on transmission pipelines. The mentioned activities involve the following: surveying lines to identify and report any changes in population density, verifying ID tags for correct information and good condition, partially operating the valves (*i.e.*, open/close), inspecting and servicing actuators, lubricating valves, checking for atmospheric corrosion, testing for combustible gas, inspecting covers, ventilation systems, structural condition of vaults, vault ladders, steps and handrails. These activities are necessary to maintain or improve the pipeline system, extend the life of the pipeline, maintain pipeline compliance prescribed by 49 CFR 192 Subpart M – Maintenance Sections 192.745 & 192.749:

- Each transmission line valve that might be required during any emergency must be inspected and partially operated at intervals not exceeding 15 months, but at least once each calendar year.
- Each operator must take prompt remedial action to correct any valve found inoperable, unless the operator designates an alternative valve.
- Each vault housing pressure regulating and pressure limiting equipment and having a volumetric internal content of 200 cubic feet (5.66 cubic meters) or more, must be inspected at intervals not exceeding 15 months, but at least once each calendar year, to determine that it is in good physical condition and adequately ventilated.
- If gas is found in the vault, the equipment in the vault must be inspected for leaks, and any leaks found must be repaired.
- The ventilating equipment must also be inspected to determine that it is functioning properly.
- Each vault cover must be inspected to assure that it does not present a hazard to public safety.

H. C8: Right of Way

- **C8-T1: HCA; C8-T2: non-HCA**

Right of Way activities consist of planning, installation, construction and closeout of road regrading, erosion repairs, and gate/fence installations on transmission pipelines. These activities are necessary to provide safety to SoCalGas employees and the public, allow year-round critical access in order to execute span painting, pipeline maintenance, storm damage repairs, and vegetation removals. This control helps minimize third party damage, prevent wildfire damage, extend the life of the pipeline, and identify or remediate any developing system deficiencies during the performed activities.

I. C9: Class Location (Hydrotest)

- **C9-T1: HCA; C9-T2: non-HCA**

Class Location (Hydrotest) O&M activity involves hydro-testing transmission pipeline segments operating out of class due to new development increasing population density in the area surrounding the pipeline. This activity allows an operator to verify and continue operating the pipeline with integrity and confidence knowing that the original installed pipe meets the regulatory standards prescribed by 49 CFR 192 Subpart L – Operations Section 192.609 associated with the new class location and uphold public safety.

- Whenever an increase in population density indicates a change in class location for a segment of an existing steel pipeline operating at hoop stress that is more than 40 percent of SMYS, or indicates that the hoop stress corresponding to the established maximum allowable operating pressure for a segment of existing pipeline is not commensurate with the present class location, the operator shall immediately make a study to determine:
  - The present class location for the segment involved.
  - The design, construction, and testing procedures followed in the original construction, and a comparison of these procedures with those required for the present class location by the applicable provisions of this part.
  - The physical condition of the segment to the extent it can be ascertained from available records.
  - The operating and maintenance history of the segment.
  - The maximum actual operating pressure and the corresponding operating hoop stress, taking pressure gradient into account, for the segment of pipeline involved; and
  - The actual area affected by the population density increase, and physical barriers or other factors which may limit further expansion of the more densely populated area.

J. C10: Compressor Stations - Capital

Compressor station activities consist of the planning, installation, construction and closeout of compressor upgrades, pipe replacements, valve replacements, equipment upgrades including water, oil, and air systems at the compressor station. These upgrades are required over time due to normal wear and tear of compressor station equipment. These activities are necessary to maintain or improve system reliability, extend equipment and system life, and uphold public safety.

K. C11: Compressor Station - Maintenance

Compressor Station Maintenance activities consist of compressor unit inspections, primary and backup power generator inspections, fire water system and emergency system inspections, programable logic controllers (PLC) and instrumentation inspections, valve inspections, vessel inspections, tank inspections, scrubber inspections, relief valve inspections, actuator/controller and regulator inspections, and leak surveys on Compressor Stations equipment and pipeline systems. The above-mentioned activities involve the following: complete periodic performance analysis and time-based overhauls on main compressor units and generators; function testing of fire water systems and emergency systems (including Station ESD and gas detection systems); maintenance and calibration of PLC systems, pressure and temperature transmitters, flow meters, pressure regulators, uninterruptible power supply systems and gas quality systems; verifying ID tags for correct information and good condition; examining operating valves, inspecting and servicing actuators, and lubricating valves; checks for atmospheric corrosion; tests for combustible gas; testing/recording set points and/or verifying rupture disc rating; checking supply regulators for proper operation; checking for leakage; blowing/inspecting supply filters; checking hydraulic fluid levels; checking controller for proper operation; and testing/recording set points. These activities are necessary to maintain or improve the pipeline system, extend the life of the pipelines, maintain pipeline and station compliance prescribed by 49 CFR 192 Subpart M – Maintenance Sections 192.731:

- Except for rupture discs, each pressure relieving device in a compressor station must be inspected and tested in accordance with §§192.739 and 192.743, and must be operated periodically to determine that it opens at the correct set pressure.

- Any defective or inadequate equipment found must be promptly repaired or replaced.
- Each remote control shutdown device must be inspected and tested at intervals not exceeding 15 months, but at least once each calendar year, to determine that it functions properly.

L. C12: Measurement & Regulation – Capital

- **C12-T1: HCA; C12-T2: non-HCA**

Measurement & Regulation activities consist of the planning, installation, construction and closeout of redesigns/upgrades for producer vessels, meters, stations, Company-owned facilities at customer meter set assemblies and control valve stations on transmission pipeline systems. These upgrades are required to replace aging equipment with new equipment to enhance functionality. Both the safety and reliability of SoCalGas's transmission system is dependent on the meter and regulator equipment that is used to control the flow of natural gas in transmission pipelines through the use of valves and regulator stations. These activities are necessary to maintain or improve system reliability, extend equipment and system life, and uphold public safety.

M. C13: Measurement & Regulation Station – Maintenance

- **C13-T1: HCA; C13-T2: non-HCA**

Measurement & Regulation Station activities consist of valve inspections, vault inspections, producer station inspection, pressure limiting station inspections, relief valve inspections and actuator/controller, and regulator inspections on transmission pipelines. The mentioned activity involves the following: verifying ID tags for correct information and good condition; partially operating valves; inspecting and servicing actuators; lubricating valves; checking for atmospheric corrosion; testing for combustible gas; inspecting covers, ventilation systems, structural condition of vaults, vault ladders, and test/record set points; verifying rupture disc rating; checking supply regulators for proper operation; checking for leakage; blowing/inspecting supply filters; checking hydraulic fluid levels; checking controller for proper operation; and testing/recording set points. These activities are necessary to identify or remediate any developing system deficiencies during the performed activities, to maintain or

improve the pipeline system, extend the life of the pipeline, and maintain pipeline compliance prescribed by 49 CFR 192 Subpart M – Maintenance Section 192.739:

A. Each pressure limiting station, relief device (except rupture discs), and pressure regulating station and its equipment must be subjected at intervals not exceeding 15 months, but at least once each calendar year, to inspections and tests to determine that it is—

   i. In good mechanical condition;

   ii. Adequate from the standpoint of capacity and reliability of operation for the service in which it is employed;

   iii. Except as provided in paragraph (b) of this section, set to control or relieve at the correct pressure consistent with the pressure limits of §192.201(a); and

   iv. Properly installed and protected from dirt, liquids, or other conditions that might prevent proper operation.

B. For steel pipelines whose MAOP is determined under §192.619(c), if the MAOP is 60 psi (414 kPa) gage or more, the control or relief pressure limit is as follows:

If the MAOP produces a hoop stress that is:	Then the pressure limit is:
Greater than 72 percent of SMYS	MAOP plus 4 percent.
Unknown as a percentage of SMYS	A pressure that will prevent unsafe operation of the pipeline considering its operating and maintenance history and MAOP.

N. C14: Odorization

Odorization activities consist of the delivery and safe storage of odorant at SoCalGas receipt points and the monthly odor intensity testing on transmission pipelines. Odorant deliveries are required throughout the year as the volume of odorant in the odorant tanks deplete at different rates based on gas throughput. The odorization is required to provide natural gas a readily detectable smell. The odor intensity testing involves the following: testing gas to verify a recognizable amount of gas odor is detectable, testing for any harmful components and calibrating appropriate equipment intervals. These activities are necessary to uphold public

safety, maintain system reliability, meet regulatory requirements prescribed by 49 CFR 192 Subpart L – Operations Section 192.625:

a. A combustible gas in a distribution line must contain a natural odorant or be odorized so that at a concentration in air of one-fifth of the lower explosive limit, the gas is readily detectable by a person with a normal sense of smell.

b. To assure the proper concentration of odorant in accordance with this section, each operator must conduct periodic sampling of combustible gases using an instrument capable of determining the percentage of gas in air at which the odor becomes readily detectable. Operators of master meter systems may comply with this requirement by—

   i. Receiving written verification from their gas source that the gas has the proper concentration of odorant; and

   ii. Conducting periodic "sniff" tests at the extremities of the system to confirm that the gas contains odorant.

O. C15: Security & Auxiliary Equipment

Security & auxiliary equipment activities consist of the planning, installation, construction and closeout of security cameras, lighting, gates, locks and equipment upgrades such as pipe supports, analyzers and Supervisory Control and Data Acquisitions (SCADAs) on transmission pipeline facilities. These upgrades are required to address the physical security for critical gas facilities owned and operated by SoCalGas. The loss of these facilities would have a significant impact on the normal operation of the Transmission system. These activities harden the security at pressure limiting stations, valve stations, compressor stations, increase personnel safety, and reduce the potential of system damage.

P. C16: SCADA Operation

Gas Control and the SCADA Operations group are responsible for the remote monitoring, control, and real-time operations of SoCalGas and SDG&E's combined gas-transmission system including associated pipelines, line compressor stations, and underground storage facilities. The SCADA Operations department manages the planning, operation, and maintenance of the SCADA system. The SCADA system provides for remote monitoring and

operation of valves, compressors, pressure regulation equipment, and gas flow across the system. The organization's responsibilities include compliance with Control Room Management - PHMSA rule 49 CFR § 192.631 regarding alarm management, system change management, fatigue mitigation, system operating experience, and personnel training requirements.

Q. C17: Control Room Monitoring, Operation, and Fatigue Management

Control Room Monitoring and Operation activities consist of 24/7 operation of the transmission pipeline system in a real-time control room environment. This is necessary in order to provide a centralized and holistic view of system health, and where the remote monitoring and operation of valves, compressor stations, pressure regulation equipment, and gas flow across the system enables controllers to acknowledge, react and respond to both normal and abnormal operating conditions. This allows coordination of necessary pipeline shutdowns for maintenance and/or emergency measures. The control room serves as a communication center between various departments conducting maintenance on the transmission pipeline system, upholding public safety, maintaining system reliability, and developing a daily operating plan that includes demand forecasts and facility utilization. It also allows for preparation of contingencies for changes in system conditions resulting from changes in weather patterns and loads, forecast error, and abnormal operating condition.

Fatigue management consists of implementing methods to reduce risk associated with controller fatigue that could inhibit a controller's ability to carry out their role and responsibilities. In order to validate proper fatigue management, shift lengths and schedule rotations are established that provide controllers an adequate amount of rest, train controllers and supervisors to recognize the effects of fatigue, and educate controllers and supervisors in fatigue mitigation strategies. These methods are necessary to uphold public safety, maintain system reliability and meet regulatory requirements prescribed by 49 CFR 192 Subpart L – Operations Section 192.631:

As part of fatigue mitigation, each operator must implement the following methods to reduce the risk associated with controller fatigue that could inhibit a controller's ability to carry out the roles and responsibilities the operator has defined:

i. Establish shift lengths and schedule rotations that provide controllers off-duty time sufficient to achieve eight hours of continuous sleep;

ii. Educate controllers and supervisors in fatigue mitigation strategies and how off-duty activities contribute to fatigue;

iii. Train controllers and supervisors to recognize the effects of fatigue; and

iv. Establish a maximum limit on controller hours-of-service, which may provide for an emergency deviation from the maximum limit if necessary for the safe operation of a pipeline facility.

R. C18: Gas Transmission Planning

Gas Transmission Planning is responsible for long-term planning and design of SoCalGas and SDG&E's gas transmission systems. This group continually assesses the transmission system's ability to: meet CPUC-mandated design standards, meet existing service obligations and satisfy new customer demand, provide new services and products to customers, and access new sources of natural gas supply. The department is also directly responsible for developing analysis and reporting on the system's ability to remain reliable through major system outages and making recommendations to maintain system resiliency. These activities are necessary to uphold public safety, maintain system reliability and meet regulatory requirements prescribed by 49 CFR 192.

S. C19: Engineering, Oversight and Compliance Review

Engineering, Oversight and Compliance Review activities consist of utility plan checks and review of all completed compliance orders on transmission pipeline systems. The compliance orders are the activities performed in the aforementioned controls: C2, C4, C7, C11, and C13. These activities are necessary to avoid third party damage, uphold the structural integrity of the pipeline, maintain feasible access to the pipeline system, verify we are meeting all regulatory standards prescribed by 49 CFR 192, comply with Company-issued Gas Standards, extend the life of the pipeline, uphold public safety, and maintain system reliability.

T. C20: Facilities Integrity Management Program (FIMP)

SoCalGas continues to develop a Facilities Integrity Management Program (FIMP) based on principles developed by the Canadian Energy Pipeline Association and the Pipeline Research Council International. The FIMP is not intended to duplicate any systems or processes that may already exist; rather, it is intended to supplement the already existing integrity management

programs (*e.g.*, SIMP, Transmission Integrity Management Program (TIMP), and Distribution Integrity Management Program (DIMP)) to enhance the safety and integrity of SoCalGas's facility assets. FIMP will apply integrity management principles to facilities assets to reduce risks and promote operational excellence. Initial FIMP activities include program development and data collection and data integration efforts on pressure vessels, tanks, and certain piping at storage facilities and compressor stations.

U. C21: Integrity Assessments & Remediation

1. C21-T1: Transmission Integrity Management Program

Through the TIMP, per 49 CFR 192, Subpart O, SoCalGas is federally mandated to identify threats to transmission pipelines in HCAs, determine the risk posed by these threats, schedule prescribed assessments to evaluate these threats, collect information about the condition of the pipelines, and take actions to minimize applicable threat and integrity concerns to reduce the risk of a pipeline failure. At a minimum of every seven years, transmission pipelines located within HCAs are assessed using methods such as In-Line-Inspection (ILI), Direct Assessment, or Pressure Test, and remediated as needed.

Detected anomalies are classified and addressed based on severity with the most severe requiring immediate action. Remediations reduce risk by addressing areas where corrosion, weld or joint failure, or other forces are occurring or has occurred. Post-assessment pipeline repairs, when appropriate, and replacements are intended to increase public and employee safety by reducing or eliminating conditions that might lead to an incident. ILI is the primary assessment method used to identify potential pipeline integrity threats. When a threat is identified, SoCalGas acts in accordance with 49 CFR § 192.933 to reduce risk. These actions involve removing a pipeline from service or reducing operating pressure. In cases where the assessment involves a pressure test that has failed, immediate remediation is also required as the pressure test cannot be completed until the pipeline is repaired.

TIMP reduces the risk of failure to the transmission system and on a continual basis evaluates the effectiveness of the program and scheduled assessments. TIMP Risk Assessment evaluates the Likelihood of Failure (LOF) using the nine threat categories (External Corrosion, Internal Corrosion, Stress Corrosion Cracking, Manufacturing, Construction, Equipment, Third Party Damage, Incorrect Operations, and Weather Related and Outside Force) for transmission pipelines located within an HCA. Pipeline operational parameters and the area near the pipeline

are considered to evaluate Consequence of Failure (COF). The LOF multiplied by the COF produces the pipelines Relative Risk Score. Further information is collected about the physical condition of transmission pipelines through integrity assessments. Action is taken to address applicable threats and integrity concerns to increase the safety and prevent pipeline failures.

The number and types of TIMP activities vary from year to year and are based on the timing of previous assessments done on the same locations. Approximately 1,100 miles out of 3,341 miles of SoCalGas's transmission pipelines are in HCA areas.[21]

2. C21-T2: Outside of High Consequence Area Assessments

Because a pipeline may consist of segments located inside and outside of HCAs, SoCalGas also assesses incidental non-HCA pipeline segments. Since SoCalGas does not plan assessments by consequence area, the overall assessment and remediation activities and costs have been tranched by applying a seven-year average of historical HCA versus non-HCA miles assessed.

Additionally, in October of 2019, PHMSA issued final rule of Pipeline Safety: Safety of Gas Transmission Pipelines: MAOP Reconfirmation, Expansion of Assessment Requirements, and Other Related Amendments. Published as the first of three parts, this final rule updates sections of 49 CFR §§ 191 and 192 and federally mandates gas operators to update or implement procedures accordingly.

Pursuant to 49 CFR §192.710, SoCalGas is newly required to assess transmission pipelines in medium consequence areas (MCAs) and non-HCA Class 3 and 4 locations. For reference, determination of the Class of a pipeline is dependent on the type and density of dwellings and human activity within 220 yards of the pipeline. The numbers and types of activities will vary from year to year and approximately 247 miles out of 3,341 miles of SoCalGas's transmission pipelines are located in MCAs or non-HCA Class 3 and 4 locations. At a minimum of every ten years, these transmission lines must be assessed using methods such as ILI, ECDA, and pressure testing. Like with TIMP assessments, detected anomalies will be classified and addressed based on severity. Remediations reduce risk by addressing areas where corrosion, weld or joint failure, or other forces are occurring or has occurred. Post-assessment pipeline repairs, when appropriate, and replacements are intended to increase public and

[21] SoCalGas 2020 Annual DOT Report.

employee safety by reducing or eliminating conditions that might lead to an incident. When a threat is identified, SoCalGas will act in accordance with 49 CFR §§ 192.485, 192.711, and 192.713 to reduce risk. These actions involve removing a pipeline from service or reducing operating pressure. In cases where the assessment involves a pressure test that has failed, immediate remediation is also required as the pressure test cannot be completed until the pipeline is repaired.

These assessments are incremental to TIMP and serve to further minimize the risk of failure to the transmission system. Taking into consideration the difference in the risk profiles of HCAs and non-HCAs, the evaluation of these segments is modeled after the TIMP risk assessment and prompts similar actions to address applicable threats and integrity concerns to increase the safety and preclude pipeline failures.

V. C22: Pipeline Safety Enhancement Plan

SoCalGas and SDG&E's Pipeline Safety Enhancement Plan (PSEP) is an ongoing systematic effort to replace or pressure test all of the natural gas transmission pipelines that have not been tested or for which reliable records are not available, as directed by the California Public Utilities Commission in D.11-06-017 and later codified in California Public Utilities Code Sections 957 and 958. Separate from the testing or replacement of pipeline, PSEP also includes a valve enhancement plan, as required by the Commission in D.11-06-017.[22]

The primary objectives of PSEP are to enhance public safety, comply with Commission directives, maximize cost effectiveness, and minimize customer and community impacts from these safety investments. As directed by the Commission, the program includes a risk-based prioritization methodology that prioritizes pipelines located in more populated areas ahead of pipelines located in less populated areas and further prioritizes pipelines operated at higher stress levels above those operated at lower stress levels. PSEP is divided into two phases and each phase is further subdivided into two parts resulting in four separate phases described below, Phase 1A, Phase 1B, Phase 2A, and Phase 2B.[23]

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[22] D.11-06-017, Conclusion of Law 9 at 30, and Ordering Paragraph (OP) 8 at 32.

[23] Phase 2B pipelines are those that have documentation of a pressure test that predates the adoption of federal testing regulations in 1970, specifically, Part 192 Subpart J of Title 49 of the CFR. SoCalGas has not initiated any standalone Phase 2B projects to date and does not anticipate executing Phase 2B projects during the forecast period (2022-2024). Therefore, Phase 2B has not been assigned a control ID and will not be part of this RAMP filing.

PSEP Phase 1A, Phase 1B, and Phase 2A each include projects that recorded costs in 2020 and these phases are discussed below in this section and denoted with a control ID.[24] SoCalGas has not yet initiated any standalone Phase 2B projects and does not anticipate executing standalone Phase 2B projects during the TY 2024 GRC's 2022-2024 forecast period.

SoCalGas's PSEP is comprised of projects with spending that is classified in this RAMP Report as either "refundable" or "GRC based." Cost recovery for refundable projects occurs outside of the TY 2024 GRC but SoCalGas is including a discussion of these classes of projects in this RAMP Report to inform the Commission and stakeholders of these safety risk mitigating activities and to help eliminate potential confusion with projects for which SoCalGas will be requesting cost recovery in the TY 2024 GRC. The refundable PSEP projects are not included in the Plan and the GRC based projects are included in the Plan.

1. C22-T1: Phase 1A

Phase 1A encompasses replacing or pressure testing pipelines located in Class 3 and 4 locations and Class 1 and 2 locations in HCAs that do not have sufficient documentation of a pressure test to achieve at least 125% of the MAOP of the pipeline. For reference, determination of the Class of a pipeline is dependent on the type and density of dwellings and human activity within 220 yards of the pipeline. Phase 1A projects are classified as refundable and are tranched to reflect pipeline replacement projects and hydrotesting projects.

- C22-T1.1: Pipeline Replacement (Phase 1A, refundable, HCA)
- C22-T1.2: Hydrotesting (Phase 1A, refundable, HCA)

2. C22-T2: Phase 1B

The scope of Phase 1B is to replace pipelines installed prior to 1946 that are incapable of being assessed via inline smart inspection tools (non-piggable pipelines) with new pipe constructed using state-of-the-art methods and to modern standards, including current pressure test standards. Phase 1B projects are classified as both refundable and GRC base and may occur in HCA and non-HCA areas.

- C22-T2.1: Pipeline Replacement (Phase 1B, refundable, HCA)

[24] Some Phase 2B mileage has been incorporated into Phase 1A, 1B, and 2A project scopes to realize efficiencies and to enhance project constructability.

- C22-T2.2: Pipeline Replacement (Phase 1B, refundable, non-HCA)
- C22-T2.3: Pipeline Replacement (Phase 1B, GRC base, HCA)
- C22-T2.4: Pipeline Replacement (Phase 1B, GRC base, non-HCA)

C22-T2.3 projects are expected to begin during the 2022-2024 time period but have in-service dates beyond 2024 and as such, are not part of the Plan.

3. C22-T3: Phase 2A

Phase 2A encompasses replacing or pressure testing pipelines that do not have sufficient documentation of a pressure test to achieve at least 125% of MAOP and are located in Class 1 and 2 of non-HCAs. Phase 2A projects are classified as both refundable and GRC base, with the latter being the majority of the projects.[25]

- C22-T3.1: Pipeline Replacement (Phase 2A, refundable, non-HCA)
- C22-T3.2: Pipeline Replacement (Phase 2A, GRC base, non-HCA)
- C22-T3.3: Hydrotesting (Phase 2A, refundable, non-HCA)
- C22-T3.4: Hydrotesting (Phase 2A, GRC base, non-HCA)

4. C22-T4: Valve Enhancement Plan

The valve enhancement plan focuses on the modification or addition of valve infrastructure to identify, isolate, and contain escaping gas from transmission pipelines in the event of a pipeline rupture. The modifications include installing automated shut-off capability of the valves to enable a faster response time should a failure occur due to natural forces (such as natural disasters, fires, earthquakes, landslides), third party damage, vandalism, or other causes.

[25] In D.16-08-003 at OP 5 and 6, the CPUC approved an Energy Division proposal detailing a framework to incorporate PSEP into SoCalGas and SDG&E's next GRCs. Specifically, D.16-08-003 provided for two additional standalone applications for after-the-fact review of the costs incurred to complete Phase 1A projects and one forecast application for authorization to recover the costs of Phase 2 projects. All Phase 1A projects completed after the filing of the two reasonableness reviews, as well as remaining forecasted projects not included in the forecast application, were to be submitted for approval in subsequent GRCs.

Valve enhancement projects are classified as both refundable and GRC base and are tranched to reflect that projects may occur in HCA or non-HCA areas.

- C22-T4.1: Valve enhancement (refundable, HCA)
- C22-T4.2: Valve enhancement (refundable, non-HCA)
- C22-T4.3: Valve enhancement (GRC base, HCA)
- C22-T4.4: Valve enhancement (GRC base, non-HCA)

W. C23: Compressor Station Modernization Projects

The primary objectives of the compressor station modernization projects are to replace and modernize existing compressors and associated infrastructure to comply with air quality regulations while prioritizing reliability, capacity, and system resilience. In Decision 19-09-051,[26] the Commission recognized the importance of facility modernization projects and the role of compressor stations in maintaining operational reliability and safety of the gas transmission and storage system. The Commission encouraged SoCalGas to place a high priority on critical projects with aging compressors to address key risks that need to be mitigated in this area.

1. C23-T1: Blythe Compressor Station Modernization

The Blythe Compressor Station is an integral part of the SoCalGas natural gas transmission system where natural gas enters the State of California and is compressed and cooled for delivery to downstream stations and consumers. The station has been in operation since 1947 and currently consists of three compression plants known as Plant 1, Plant 2, and Plant 3. Plant 1 currently has 10 total compressors; seven compressors have been permanently decommissioned while the other three compressors currently remain in service.

[26] D.19-09-051 at 116-117 ("With respect to the requested amounts for this GRC, we note that other large-scale projects are being planned specifically for the Ventura Compressor Station and the Honor Rancho Compressor Station (and the Moreno Compressor station for SDG&E). Because we recognize the importance of the proposed projects and the role of compressor stations in maintaining operational reliability and safety of the gas transmission system, we find that it is prudent and reasonable to authorize the proposed projects and for SoCalGas to have the necessary funding to conduct these projects (and Moreno Compressor station for SDG&E). At this point, we do not find it necessary to deviate from current GRC practice and authorize funding only for specific projects because of the large scope covered in the GRC and because of the many challenges associated with planning and executing multiple and large projects within a specified timeframe. We do however encourage SoCalGas to place a high priority on critical projects under this category as most of its compressors are over 50 years old and because of key risks that need to be mitigated in this area. Therefore, we find that the requested amounts for Compressor Stations should be authorized.")

The scope of work for the Blythe Compressor Modernization project includes the installation of Plant 4, which includes two new gas turbine compressor units and the ability to install one additional compressor at a later time, overhauling and upgrading the existing five compressor units at Plant 2 to reduce emissions, installing one new operations building, and upgrading ancillary equipment and infrastructure to support the modifications to the facility. Upon commissioning of the Plant 4 compressors, the three operational Plant 1 compressors will be permanently decommissioned.

This project has a planned 2021 in-service date and as such, it is not part of the Plan. It is included in this RAMP Report for the Commission's and stakeholders' awareness of safety risk activities being pursued by SoCalGas.

2. C23-T2: Ventura Compressor Station Modernization

The Ventura Compressor Station is in the City of Ventura and is used to transfer natural gas from Los Angeles to SoCalGas's northern service territory. The existing facility uses three Cooper Superior reciprocating compressors. The scope of work for the Ventura Compressor Modernization project includes installation of four new reciprocating gas engine-driven compressors, a compressor building, an office and warehouse building, utilities, and associated controls, electrical, instrumentation and emission control equipment, and decommissioning of the existing equipment.

IV. 2022-2024 CONTROL & MITIGATION PLAN

This section contains a table identifying the controls and mitigations comprising the portfolio of mitigations for this risk.[27]

All of the activities discussed in Section III above, except for the PSEP related activities with cost recovery via a mechanism outside of the upcoming GRC, and the Blythe Compressor Station Modernization project, are expected to continue during the TY 2024 GRC and are

included in the plan. For clarity, a current activity that is included in the plan may be referred to as either a control and/or a mitigation. For purposes of this RAMP, a control that will continue as a mitigation retains its control ID unless the size and/or scope of that activity will be modified, in which case that activity's control ID will be replaced with a mitigation ID. The table below shows which activities are expected to continue.

[27] *See* D.18-12-014, Attachment A at A-14 ("Mitigation Strategy Presentation in the RAMP and GRC")

Table 3: Control and Mitigation Plan Summary

Line No.	Control/ Mitigation ID	Control/Mitigation Description	2020 Controls	2022-2024 Plan
1	C1	Cathodic Protection – Capital	X	X
2	C2	Cathodic Protection – Maintenance	X	X
3	C3	Leak Repair	X	X
4	C4	Leak Survey and Patrol	X	X
5	C5	Pipeline Relocation/Replacement	X	X
6	C6	Shallow/Exposed Pipe Remediation	X	X
7	C7	Pipeline Maintenance	X	X
8	C8	Right of Way	X	X
9	C9	Class Location - Hydrotest	X	X
10	C10	Compressor Stations – Capital	X	X
11	C11	Compressor Stations – Maintenance	X	X
12	C12	Measurement & Regulation - Capital	X	X
13	C13	Measurement & Regulation – Maintenance	X	X
14	C14	Odorization	X	X
15	C15	Security and Auxiliary Equipment	X	X
16	C16	SCADA Operation	X	X
17	C17	Control Room Monitoring, Operation, and Fatigue Management	X	X
18	C18	Gas Transmission Planning	X	X
19	C19	Engineering, Oversight and Compliance Review	X	X
20	C20	Facility Integrity Management Plan	X	X
21	C21	Integrity Assessments & Remediation	X	X
22	C22-T1.1 C22-T1.2	PSEP, Phase 1A - Refundable	X	No
23	C22-T2.1 C22-T2.2	PSEP, Phase 1B – Pipeline Replacement (Refundable)	X	No
24	C22-T2.3	PSEP, Phase 1B – Pipeline Replacement (GRC) - HCA	No	No

Line No.	Control/ Mitigation ID	Control/Mitigation Description	2020 Controls	2022-2024 Plan
25	C22-T2.4	PSEP, Phase 1B – Pipeline Replacement (GRC) – non-HCA	X	X
25	C22-T3.1	PSEP, Phase 2A – Pipeline Replacement (Refundable)	X	No
26	C22-T3.2	PSEP, Phase 2A – Pipeline Replacement (GRC)	X	X
27	C22-T3.3	PSEP, Phase 2A – Hydrotesting (Refundable)	X	No
28	C22-T3.4	PSEP, Phase 2A – Hydrotesting (GRC)	X	X
29	C22-T4.1 C22-T4.2	PSEP, Valve Enhancement (Refundable)	X	No
30	C22-T4.3 C22-T4.4	PSEP, Valve Enhancement (GRC)	X	X
31	C23-T1	Blythe Compressor Station Modernization	X	No
32	C23-T2	Ventura Compressor Station Modernization	X	X
33	C23-T3	Honor Rancho Storage Field	No	No
34	M1	Gas Transmission Safety Rule – MAOP Reconfirmation	No	X
35	M2	Gas Transmission Safety Rule – Material Verification	No	X

For activities SoCalGas plans to perform that remain unchanged, refer to the descriptions in Section III. If changes to the various activities are anticipated, such modifications are further described in the section below.

A. Changes to 2020 Controls

1. C21-T2: Integrity Assessments & Remediation

As described above in Section III, the Integrity Assessments & Remediation mitigation has been expanded beyond TIMP to include the outside of HCA assessments required by PHMSA's Pipeline Safety: Safety of Gas Transmission Pipelines: MAOP Reconfirmation, Expansion of Assessment Requirements, and Other Related Amendments final rule. Specifically, 49 CFR § 192.710 requires operators to assess transmission pipelines in medium consequence areas (MCAs) and non-HCA Class 3 and 4 locations. At a minimum of every ten

years, these transmission lines must be assessed using methods such as ILI, ECDA, and pressure testing. Accordingly, SoCalGas has incorporated approximately 247 miles of non-HCA pipelines into the Company's assessment plan. In order to account for the difference in risk profiles between pipelines located in HCAs versus non-HCAs, SoCalGas has tranched the Integrity Assessments and Remediation control accordingly.

2. C22-T3 PSEP Phase 2A

With the submittal of its 2017 Forecast Application (A.17-03-021) and TY 2019 GRC (A.17-10-008), SoCalGas began to transition from implementing Phase 1A and Phase 1B projects to Phase 2A projects. Pursuant to Commission Decision 16-08-003, SoCalGas was ordered to submit for approval any remaining Phase 2A projects not included in the 2017 Forecast Application in the Test Year 2019 (TY 2019) and subsequent GRCs.[28] Phase 2A primarily includes pressure testing, and to a lesser degree, replacement, of transmission pipe located in less populated areas. Many of the pipeline sections that will be addressed as part of Phase 2A serve as backbone transmission lines that provide critical capacity for the overall transmission system. Aligning with a full transition to Phase 2A scoped projects, SoCalGas anticipates a significant increase in the amount of mileage and costs to execute Phase 2A projects during the TY 2024 GRC's 2022-2024 forecast period.

3. PSEP Phase 2B

Phase 2B pipelines are those that have documentation of a pressure test that predates the adoption of federal testing regulations in 1970, specifically, Part 192 Subpart J of Title 49 of the CFR. Due to the prioritization of Phase 2A (and Phase 1B) projects, SoCalGas does not currently anticipate completing any standalone Phase 2B projects during the 2022-2024 forecast period. However, as ordered in D.19-09-051, SoCalGas is currently performing an evaluation of Phase 2B pipeline mileage and plans to file certain components of its PSEP Phase 2B implementation plan, including: identified Phase 2B pipeline segments, a Phase 2B decision tree, and the results of an independent engineering review of the Phase 2B decision tree, as part of its TY 2024 GRC application.

[28] D.16-08-003 at OP 5 and 6.

B. 2022 – 2024 Mitigations

1. Gas Transmission Safety Rule Implementation

In October of 2019, PHMSA issued the final rule of Pipeline Safety: Safety of Gas Transmission Pipelines: MAOP Reconfirmation, Expansion of Assessment Requirements, and Other Related Amendments. Published as the first of three parts, the final rule updates sections of 49 CFR §§ 191 and 192 and federally mandates gas operators to update or implement procedures accordingly.

There are three new sections with which SoCalGas must comply that require new risk mitigating programs: Outside-of-HCA Assessments (49 CFR § 192.710), which has been addressed under C21, Maximum Allowable Operating Pressure (MAOP) Reconfirmation (49 CFR § 192.624), and Material Properties and Attributes Verification (49 CFR § 192.607).

- **M1: Gas Transmission Safety Rule - MAOP Reconfirmation**
  - **M1-T1: HCA; M1-T2: non-HCA**

Pursuant to 49 CFR § 192.624, SoCalGas is required to reconfirm – by July 2035 – the MAOP of transmission lines that either: 1) do not have traceable, verifiable, or complete pressure test records in accordance with 49 CFR § 192.517(a) and are located in HCAs or Class 3 or 4 locations, or 2) have an MAOP established in accordance with 49 CFR § 192.619(c), have an MAOP greater than 30% SMYS, and are located in HCAs, Class 3 or 4 locations, or – where the segment can accommodate an in-line inspection tool – MCAs.

PHMSA has required operators to document MAOP reconfirmation procedures by July 1, 2021, and SoCalGas is in the process of developing its MAOP reconfirmation program in accordance with the final rule. Separate from the state-mandated PSEP, SoCalGas has preliminarily identified approximately 1,100 miles out of 3,341 miles of SoCalGas's transmission pipelines that fall within the scope of MAOP reconfirmation per 49 CFR § 192.624. For these transmission lines, reconfirmation would be performed using one of six allowable methods: pressure testing, replacement, pressure reduction, engineering critical assessment (ECA), pressure reduction for lines with a small PIR, and alternative technology approved by PHMSA.

The MAOP reconfirmation program will include a risk-based prioritization methodology that considers, amongst other elements, pipeline location and stress level and will reduce risk of

failure to the transmission system through re-evaluation of the pipeline's MAOP and, when necessary, repair/remediation of each transmission line that is within the scope.

The MAOP reconfirmation plan and program are currently in development and SoCalGas's forecast of activities and costs are initial estimates.

- **M2: Gas Transmission Safety Rule – Material Properties and Attributes Verification**
  - **M2-T1: HCA; M2-T2: non-HCA**

Pursuant to 49 CFR § 192.607, SoCalGas is required to develop and implement procedures to opportunistically verify the material properties and attributes of transmission pipelines and associated components that do not have "traceable, verifiable, and complete"[29] records. Procedures will address nondestructive or destructive tests, examinations, and assessments, as well as sampling requirements established by 49 CFR § 192.607. If SoCalGas should find materials that are not consistent with existing information or expectations, SoCalGas will address these findings in accordance with 49 CFR § 192.607 and may re-evaluate a pipeline's MAOP.

The Material Verification plan and program are currently in development and SoCalGas's forecast of activities and costs are initial estimates

2. C23: Compressor Station Modernization Projects

In addition to the currently active modernization projects discussed above (C23-T1 and C23-T2), below is a description of a mitigation project SoCalGas plans to begin in the TY 2024 GRC's 2022-2024 forecast period but which has a scheduled in-service date after the 2024 test year. As such it is not part of the plan. It is included in this RAMP Report for the Commission's and stakeholders' awareness of safety risk activities being pursued by SoCalGas.

- **C23-T3: Honor Rancho Storage Field**

The Honor Rancho Storage Field Compressor Station is an integral part of the SoCalGas natural gas storage system that balances supply with customer demand. The station has been in operation since 1975 and consists of five Enterprise DeLaval reciprocating engine driven compressors.

[29] 49 CFR §§ 191, 192.

The scope of work for the Honor Rancho Compressor Station Modernization project includes the installation of four new gas and two new electric-driven compressors, associated building(s), electrical infrastructure, instrumentation, emissions control equipment, and associated controls. Accordingly, we will retire the existing engine-driven compressors, remove their associated ancillary systems, and demolish the existing compressor building. This project will replace gas engine-driven compressors and bring Honor Rancho Compressor Station into compliance with recently amended South Coast Air Quality Management District (SCAQMD) emissions limits.

V. COSTS, UNITS, AND QUANTITATIVE SUMMARY TABLES

The tables in this section provide a summary of the risk control and mitigation plan, including the associated costs, units, and the RSEs, by tranche. When an RSE could not be performed, an explanation is provided. SoCalGas does not account for and track costs by activity or tranche; rather, SoCalGas accounts for and tracks costs by cost center and capital budget code. The costs shown were estimated using assumptions provided by SMEs and available accounting data.

Table 4: Risk Control and Mitigation Plan - Recorded and Forecast Dollars Summary[30]
(Direct After Allocations, In 2020 $000)

ID	Control/Mitigation Name	Recorded Dollars		Forecast Dollars			
		2020 Capital[31]	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
C1-T1	Cathodic Protection – Capital (HCA)	$3932	-	$14,451	$17,493	-	-
C1-T2	Cathodic Protection – Capital (non-HCA)	$7,984	-	$29,339	$35,516	-	-
C2-T1	Cathodic Protection – Maintenance (HCA)	-	$402	-	-	$344	$440
C2-T2	Cathodic Protection – Maintenance (non-HCA)	-	$815	-	-	$699	$893
C3-T1	Leak Repair (HCA)	$3,655	-	$10,949	$13,253	-	-

[30] Recorded costs and forecast ranges are rounded. Additional cost-related information is provided in workpapers. Costs presented in the workpapers may differ from this table due to rounding. The figures provided are direct charges and do not include Company loaders, with the exception of vacation and sick. The costs are also in 2020 dollar and have not been escalated to 2021 amounts. The capital presented is the sum of the years 2022, 2023, and 2024, or a three-year total. Years 2022, 2023 and 2024 are the forecast years for SoCalGas's Test Year 2024 GRC Application.

[31] Pursuant to D.14-12-025 and D.16-08-018, the Company provides the 2020 "baseline" capital costs associated with Controls. The 2020 capital amounts are for illustrative purposes only. Because capital programs generally span several years, considering only one year of capital may not represent the entire activity.

ID	Control/Mitigation Name	Recorded Dollars		Forecast Dollars			
		2020 Capital[31]	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
C3-T2	Leak Repair (non-HCA)	$7,420	-	$22,228	$26,907	-	-
C4-T1	Leak Survey & Patrol (HCA)	-	$242	-	-	$249	$318
C4-T2	Leak Survey & Patrol (non-HCA)	-	$492	-	-	$505	$645
C5-T1	Pipeline Relocation/Replacement (HCA)	$9,607	-	$20,787	$25,164	-	-
C5-T2	Pipeline Relocation/Replacement (non-HCA)	$19,506	-	$42,205	$51,090	-	-
C6-T1	Shallow/Exposed Pipe Remediations (HCA)	$2,149	-	$4,178	$5,057	-	-
C6-T2	Shallow/Exposed Pipe Remediations (non-HCA)	$4,363	-	$8,483	$10,269	-	-
C7-T1	Pipeline Maintenance (HCA)	-	$131	-	-	$134	$171
C7-T2	Pipeline Maintenance (non-HCA)	-	$266	-	-	$272	$347
C8-T1	Right of Way (HCA)	-	$1,263	-	-	$768	$981
C8-T2	Right of Way (non-HCA)	-	$2,564	-	-	$1,559	$1,992
C9-T1	Class Location – Hydrotest (HCA)	-	$0	-	-	$214	$273
C9-T2	Class Location – Hydrotest (non-HCA)	-	$0	-	-	$434	$555
C10	Compressor Station – Capital	$94,601	-	$58,018	$70,233	-	-
C11	Compressor Station - Maintenance	-	$7,446	-	-	$7,312	$9,343
C12-T1	Measurement & Regulation – Capital (HCA)	$5,836	-	$26,421	$31,984	-	-

ID	Control/Mitigation Name	Recorded Dollars		Forecast Dollars			
		2020 Capital[31]	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
C12-T2	Measurement & Regulation – Capital (non-HCA)	$11,850	-	$53,644	$64,937	-	-
C13-T1	Measurement & Regulation Station – Maintenance (HCA)	-	$682	-	-	$601	$767
C13-T2	Measurement & Regulation Station – Maintenance (non-HCA)	-	$1,385	-	-	$1,219	$1,558
C14	Odorization	-	$818	-	-	$648	$784
C15	Security and Auxiliary Equipment	$5,416	-	$12,887	$15,600	-	-
C16	SCADA Operation	-	$730	-	-	$727	$929
C17	Control Room Monitoring, Operation and Fatigue Management	-	$4,208	-	-	$2,978	$1,056
C18	Gas Transmission Planning	-	$750	-	-	$522	$667
C19	Engineering, Oversight and Compliance Review	-	$2,881	-	-	$2,057	$2,629
C20	Facility Integrity Management Program	N/A	$715	N/A	N/A	$3,284	$6,100
C21-T1	Integrity Assessments & Remediation (HCA)	$34,008	$46,410	$158,154	$202,086	$20,581	$26,297
C21-T2	Integrity Assessments & Remediation (Non-HCA)	$42,387	$57,844	$262,520	$335,442	$33,579	$42,906
C22-T2.4	PSEP: Pipeline Replacement (Phase 1B, GRC base, non-HCA)	$34,155	N/A	$65,785	$79,634	N/A	N/A

ID	Control/Mitigation Name	Recorded Dollars		Forecast Dollars			
		2020 Capital[31]	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
C22-T3.2	PSEP: Pipeline Replacement (Phase 2A, GRC base, non-HCA)	$4,645	N/A	$88,982	$107,715	$45	$55
C22-T3.4	PSEP: Hydrotesting (Phase 2A, GRC base, non-HCA)	$8,210	$20,709	$74,845	$90,601	$181,374	$219,558
C22-T4.3	PSEP: Valve Enhancement (GRC base, HCA)	$37,902	N/A	$27,253	$32,990	N/A	N/A
C22-T4.4	PSEP: Valve Enhancement (GRC base, non-HCA)	$3,837	N/A	$5,166	$6,253	N/A	N/A
C23-T2	Ventura Compressor Station Modernization	$3,231	N/A	$169,728	$205,459	N/A	N/A
M1-T1	Gas Transmission Safety Rule - MAOP Reconfirmation (HCA)	N/A	N/A	$43,843	$140,296	$28,755	$92,016
M1-T2	Gas Transmission Safety Rule - MAOP Reconfirmation (Non-HCA)	N/A	N/A	$17,908	$57,304	$11,745	$37,584
M2-T1	Gas Transmission Safety Rule – Material Verification (HCA)	N/A	N/A	$82	$261	$72	$230
M2-T2	Gas Transmission Safety Rule – Material Verification (Non-HCA)	N/A	N/A	$167	$533	$147	$469

Table 5: Risk Control & Mitigation Plan - Units Summary

ID	Control/Mitigation Name	Units Description		Recorded Units		Forecast Units			
		Capital	O&M	2020 Capital	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 (High) O&M
C1-T1	Cathodic Protection – Capital (HCA)	# of Projects		18	-	60	76	-	-
C1-T2	Cathodic Protection – Capital (non-HCA)	# of Projects		37	-	127	158	-	-
C2-T1	Cathodic Protection – Maintenance (HCA)	# of CP and follow up reads		-	584	-	-	555	709
C2-T2	Cathodic Protection – Maintenance (non-HCA)	# of CP and follow up reads		-	1,185	-	-	1,062	1,358
C3-T1	Leak Repair (HCA)	# of Projects		14	-	31	40	-	-
C3-T2	Leak Repair (non-HCA)	# of Projects		29	-	68	85	-	-
C4-T1	Leak Survey & Patrol (HCA)	Miles of Pipeline Surveyed & Patrolled		-	2234	-	-	2,011	2,569
C4-T2	Leak Survey & Patrol (non-HCA)	Miles of Pipeline Surveyed & Patrolled		-	4536	-	-	4,082	5,216
C5-T1	Pipeline Relocation/Replacement (HCA)	# of Projects		15	-	41	53	-	-
C5-T2	Pipeline Relocation/Replacement (non-HCA)	# of Projects		31	-	87	108	-	-
C6-T1	Shallow/Exposed Pipe Remediations (HCA)	# of Projects		7	-	15	22	-	-
C6-T2	Shallow/Exposed Pipe Remediations (non-HCA)	# of Projects		17	-	38	49	-	-
C7-T1	Pipeline Maintenance (HCA)	# of pipeline orders		-	311	-	-	285	364

ID	Control/Mitigation Name	Units Description		Recorded Units		Forecast Units			
		Capital	O&M	2020 Capital	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 (High) O&M
C7-T2	Pipeline Maintenance (non-HCA)	# of pipeline orders		-	630	-	-	579	740
C8-T1	Right of Way (HCA)	# of Projects		-	8	-	-	7	9
C8-T2	Right of Way (non-HCA)	# of Projects		-	16	-	-	14	18
C9-T1	Class Location – Hydrotest (HCA)	Miles of Pipeline Hydrotested		-	0	-	-	4	6
C9-T2	Class Location – Hydrotest (non-HCA)	Miles of Pipeline Hydrotested		-	0	-	-	9	12
C10	Compressor Stations - Capital	# of Projects		66	-	226	275	-	-
C11	Compressor Stations - Maintenance	# of Compliance and Preventative maintenance work orders		-	3,843	-	-	3,651	4,419
C12-T1	Measurement & Regulation – Capital (HCA)	# of Projects		22	-	68	86	-	-
C12-T2	Measurement & Regulation – Capital (non-HCA)	# of Projects		47	-	148	181	-	-
C13-T1	Measurement & Regulation Station – Maintenance (HCA)	# of compliance and preventative work orders		-	1,030	-	-	978	1,184
C13-T2	Measurement & Regulation Station – Maintenance (non-HCA)	# of compliance and preventative work orders		-	2,090	-	-	1,986	2,404

ID	Control/Mitigation Name	Units Description		Recorded Units		Forecast Units			
		Capital	O&M	2020 Capital	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 (High) O&M
C14	Odorization	LBS of Odorant		-	146,341	-	-	139,024	168,292
C15	Security and Auxiliary Equipment	# of Projects		46	-	103	127	-	-
C16	SCADA Operation	A measurable unit for the SCADA Operations department is not practical given the multiple assets that are remotely monitored for different departments. The SCADA system provides for remote monitoring and operation of valves, compressors, pressure regulation equipment, and gas flow across the system.							
C17	Control Room Monitoring, Operation and Fatigue Management	A measurable unit is not practical given the multiple means of communications and operations used to address this risk.							
C18	Gas Transmission Planning	A measurable unit is not practical given the various types of requests the Department analyzes using different analytical tools.							
C19	Engineering, Oversight and Compliance Review	A measurable unit is not practical given the charges are coded against multiple cost elements like Labor, Material, and Purchased Services							
C20	Facility Integrity Management Plan	Number of compressor stations		-	10	-	-	1	10
C21-T1	Integrity Assessments & Remediation (HCA)	# of Miles		N/A	207	N/A	N/A	155	198
C21-T2	Integrity Assessments & Remediation (Non-HCA)	# of Miles		N/A	258	N/A	N/A	300	383
C22-T4.3	PSEP: Valve Enhancement (GRC base, HCA)	# of valve bundles		19	N/A	13	16	N/A	N/A
C22-T4.4	PSEP: Valve Enhancement (GRC base, non-HCA)	# of valve bundles		8	N/A	2	2	N/A	N/A

ID	Control/Mitigation Name	Units Description		Recorded Units		Forecast Units			
		Capital	O&M	2020 Capital	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 (High) O&M
C22-T2.4	PSEP: Pipeline Replacement (Phase 1B, GRC base, non-HCA)	# of miles		4	N/A	19	23	N/A	N/A
C22-T3.2	PSEP: Pipeline Replacement (Phase 2A, GRC base, non-HCA)	# of miles		0.03	N/A	28	33	N/A	N/A
C22-T3.4	PSEP: Hydrotesting (Phase 2A, GRC base, non-HCA)	# of miles		N/A	20	N/A	N/A	357	433
C23-T2	Ventura Compressor Station Modernization	# of facilities being modernized		N/A	N/A	1	1	N/A	N/A
M1-T1	Gas Transmission Safety Rule - MAOP Reconfirmation (HCA)	# of Miles		N/A	N/A	4	14	17	59
M1-T2	Gas Transmission Safety Rule - MAOP Reconfirmation (Non-HCA)	# of Miles		N/A	N/A	2	6	7	24
M2-T1	Gas Transmission Safety Rule – Material Verification (HCA)	The Material Verification program is currently being developed and due to it being opportunistic, the number and types of samples are unclear at this point in time.							
M2-T2	Gas Transmission Safety Rule – Material Verification (Non-HCA)	The Material Verification program is currently being developed and due to it being opportunistic, the number and types of samples are unclear at this point in time.							

Table 6: Risk Control & Mitigation Plan - Quantitative Analysis Summary

ID	Control/Mitigation Name	Forecast			
		LoRE	CoRE	Post Mitigation Risk Score	RSE
C1-T1	Cathodic Protection – Capital (HCA)	8.56	538	4,603	76.9
C1-T2	Cathodic Protection – Capital (non-HCA)	8.54	538	4,589	50.7
C2-T1	Cathodic Protection – Maintenance (HCA)	8.44	538	4,536	276.4
C2-T2	Cathodic Protection – Maintenance (non-HCA)	8.38	538	4,503	177.2
C3-T1	Leak Repair (HCA)	8.63	538	4,640	10.0
C3-T2	Leak Repair (non-HCA)	8.63	538	4,638	6.8
C4-T1	Leak Survey & Patrol (HCA)	8.15	538	4,384	901.3
C4-T2	Leak Survey & Patrol (non-HCA)	8.01	538	4,306	577.1
C5-T1	Pipeline Relocation/Replacement (HCA)	8.59	538	4,616	36.3
C5-T2	Pipeline Relocation/Replacement (non-HCA)	8.57	538	4,607	23.2
C6-T1	Shallow/Exposed Pipe Remediations (HCA)	8.63	538	4,639	32.0
C6-T2	Shallow/Exposed Pipe Remediations (non-HCA)	8.63	538	4,638	20.1
C7-T1	Pipeline Maintenance (HCA)	8.07	538	4,338	1,336.3
C7-T2	Pipeline Maintenance (non-HCA)	7.90	538	4,246	855.7
C8-T1	Right of Way (HCA)	8.64	538	4,643	1.7
C8-T2	Right of Way (non-HCA)	8.63	538	4,641	1.7
C9-T1	Class Location – Hydrotest (HCA)	8.64	538	4,644	0.3

ID	Control/Mitigation Name	Forecast			
		LoRE	CoRE	Post Mitigation Risk Score	RSE
C9-T2	Class Location – Hydrotest (non-HCA)	8.64	538	4,643	0.3
C10	Compressor Stations - Capital	8.34	538	4,485	67.1
C11	Compressor Stations - Maintenance	4.51	538	2,426	261.4
C12-T1	Measurement & Regulation – Capital (HCA)	8.63	538	4,639	4.7
C12-T2	Measurement & Regulation – Capital (non-HCA)	8.62	538	4,637	3.2
C13-T1	Measurement & Regulation Station – Maintenance (non-HCA)	8.61	538	4,626	129.3
C13-T2	Measurement & Regulation Station – Maintenance (non-HCA)	8.60	538	4,621	82.6
C14	Odorization	8.63	538	4,642	2.6
C15	Security and Auxiliary Equipment	8.64	538	4,642	1.0
C16	SCADA Operation	N/A	N/A	N/A	N/A
C17	Control Room Monitoring, Operation and Fatigue Management	N/A	N/A	N/A	N/A
C18	Gas Transmission Planning	N/A	N/A	N/A	N/A
C19	Engineering, Oversight and Compliance Review	N/A	N/A	N/A	N/A
C20	Facility Integrity Management Plan	N/A	N/A	N/A	N/A
C21-T1	Integrity Assessments & Remediation (HCA)	2.51	538	1,351	83.1
C21-T2	Integrity Assessments & Remediation (Non-HCA)	0.67	538	359	85.5
C22-T4.3	PSEP: Valve Enhancement (GRC base, HCA)	8.04	538	4,324	276.4
C22-T4.4	PSEP: Valve Enhancement (GRC base, non-HCA)	8.33	538	4,481	743.2
C22-T2.4	PSEP: Pipeline Replacement (Phase 1B, GRC base, non-HCA)	8.61	538	4,630	5.7

ID	Control/Mitigation Name	Forecast			
		LoRE	CoRE	Post Mitigation Risk Score	RSE
C22-T3.2	PSEP: Pipeline Replacement (Phase 2A, GRC base, non-HCA)	7.28	538	3,915	220.3
C22-T3.4	PSEP: Hydrotesting (Phase 2A, GRC base, non-HCA)	7.28	538	3,915	23.6
C23-T2	Ventura Compressor Station Modernization	4.18	538	2,248	344.6
M1-T1	Gas Transmission Safety Rule - MAOP Reconfirmation (HCA)	8.59	538	4,617	2.7
M1-T2	Gas Transmission Safety Rule - MAOP Reconfirmation (Non-HCA)	8.62	538	4,637	1.8
M2-T1	Gas Transmission Safety Rule – Material Verification (HCA)	8.64	538	4,644	0.7
M2-T2	Gas Transmission Safety Rule – Material Verification (Non-HCA)	8.64	538	4,644	0.4

Table 7-SCG HP: Risk Control & Mitigation Plan - Quantitative Analysis Summary for RSE Exclusions

ID	Control/Mitigation Name	RSE Exclusion Rationale
C17	Control Room Monitoring & Operation - O&M	Control Room activities are vital to the safety and reliability of operating the high pressure gas system. This control captures the operating and maintenance activities associated with the control room thereof. While SoCalGas possesses data regarding the control room, these metrics are associated with the operation of facility and personnel not directly tied to the potential reduction in likelihood or consequence of a high pressure system event. SoCalGas has utilized a central control for decades and no data exists to trend what the incident rates on the system might be without this activity. Likewise, no SME data could be utilized to draw conclusions about the risk addressed or reduced for this activity.

ID	Control/Mitigation Name	RSE Exclusion Rationale
C18	Gas Transmission Planning - O&M	Gas Transmission Planning is a key function to ensure the reliability and safety of the high pressure system. This activity establishes the design criteria of the system. Although the Company possesses data, such as capacity and system throughput, no data exists that directly relates the existence of Gas Transmission Planning to change in the likelihood or consequence of a high pressure system incident. Likewise, no SME input can be established to directly link this activity to risk reduced or addressed.
C19	Engineering, Oversight and Compliance Review - O&M	Engineering, Oversight and Compliance review is a prudent safety and reliability activity conducted by a utility. Although SoCalGas tracks data surrounding engineering approvals, compliance goals and the establishment of overall health to the pipeline design process, no data exists internally or externally, to directly relate this activity to a reduction in incident rate or the consequences thereof. Additionally, no SME could establish a quantifiable value for risk addressed by possessing proper engineering, oversight and compliance protocol.
C16	SCADA Operations - O&M	Possessing the ability to monitor and control the natural gas system is prudent for maintaining safety and reliability. SCADA facilitates that control and monitor and helps operators respond to issues or incidents that may arise. Although the Company has a vast array of telemetric data around the gas system, no data set exists to quantify the relation a SCADA system may have to increasing or decreasing the likelihood or consequence of a high pressure system incident. Likewise no SME input could be used to craft this value to risk reduction SCADA provides in this risk area.

ID	Control/Mitigation Name	RSE Exclusion Rationale
T20	Facilities Integrity Management Program	Due to the program still being in a development stage, the activities that will be included in the program are still being identified. When program scoping is completed, activities that have been included will be tracked and risk mitigations will be defined and subsequently quantified.

VI. ALTERNATIVES

Pursuant to D.14-12-025 and D.16-08-018, SoCalGas considered alternatives to the Risk Mitigation Plan for the Incident Related to the High Pressure System (Excluding Dig-In) risk. Typically, analysis of alternatives occurs when implementing activities to obtain the best result or product for the cost. The alternatives analysis for this Plan also took into account modifications to the plan and constraints, such as budget and resources.

A. A1: Proactive Soil Sampling

SoCalGas collects soil samples during TIMP-related excavations along its pipelines. These soil samples are analyzed for chemical composition and characteristics that determine the corrosivity of the soil in the vicinity of the pipeline. Expanding this soil sampling program to include collecting soil samples at regular intervals, such as every mile, along pipelines with a history of corrosive activity may allow SoCalGas to anticipate segments of pipeline that may be susceptible to accelerated corrosion between inspection events. The results of the soil sampling would be integrated into the SoCalGas pipeline GIS system and be used in a comprehensive evaluation of the SoCalGas pipeline system. Soil sample data (*i.e.*, resistivity and pipe-to-soil reads) would be used to determine corrosion rates, which is critical information in developing a mature risk assessment of corrosion threat. SoCalGas has not initiated an expanded soil sampling program since the potential benefit is related to the maturing of the risk assessment. As the risk assessment continues to mature from a relative risk model to a deterministic risk model for the corrosion threat, the benefit of additional information can be better understood. In the interim, SoCalGas will be researching available data sets and determining the benefit of additional soil property information.

B. A2: Expanding Geotechnical Analysis

SoCalGas considered expanding its geotechnical analysis of pipelines potentially exposed to landslide and debris flow hazards. This analysis includes slope stability of terrain surrounding the pipelines and evaluating the likelihood and consequence of landslides and the resulting debris flow on the pipeline. SoCalGas has performed extensive analysis and evaluation of the slope stability, landslide, and debris flow conditions of pipelines that have been impacted by severe weather events. The results of this analysis and evaluation have been used to mitigate the potential impact of future severe weather events on these pipelines. SoCalGas has considered identifying additional pipelines with potential exposure to severe weather events to perform analysis regarding slope stability, landslide, and debris flow. SoCalGas has not initiated an expanded geotechnical analysis program since the potential benefit is related to the maturing of the risk assessment. As the risk assessment continues to mature from a relative risk model to a deterministic risk model the benefit of additional information can be better understood.

Table 8: Alternate Mitigation Plan - Forecast Dollars Summary[32]
(Direct After Allocations, In 2020 $000)

ID	Control/Mitigation Name	Forecast Dollars			
		2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
A1	Proactive Soil Sampling	$0	$0	$1,692	$2,160
A2	Expanding Geotechnical Analysis	$0	$0	$419	$535

Table 9: Alternative Mitigation Plan - Units Summary

ID	Control/Mitigation Name	Units Description		Forecast Units			
		Capital	O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 (High) O&M
A1	Proactive Soil Sampling	# of Samples		0	0	2,023	2,585
A2	Expanding Geotechnical Analysis	# of Miles		0	0	95	121

[32] Recorded costs and forecast ranges are rounded. Additional cost-related information is provided in workpapers. Costs presented in the workpapers may differ from this table due to rounding. The figures provided are direct charges and do not include Company loaders, with the exception of vacation and sick. The costs are also in 2020 dollar and have not been escalated to 2021 amounts. The capital presented is the sum of the years 2022, 2023, and 2024, or a three-year total. Years 2022, 2023 and 2024 are the forecast years for SoCalGas's Test Year 2024 GRC Application.

Table 10: Risk Control & Mitigation Plan - Quantitative Analysis Summary (Direct After Allocations, In 2020 $000)

ID	Control/Mitigation Name	Forecast			
		LoRE	CoRE	Post Mitigation Risk Score	RSE
A1	Proactive Soil Sampling	8.63	538	4,639	0.8
A2	Expanding Geotechnical Analysis	8.64	538	4,644	0.2

APPENDIX A: SUMMARY OF ELEMENTS OF THE RISK BOW TIE

APPENDIX A: SUMMARY OF ELEMENTS OF THE RISK BOW TIE

Incident Related to the High Pressure System (Excluding Dig-In):

Summary of Elements of the Risk Bow Tie

ID	Control/Mitigation Name	Elements of the Risk Bow Tie Addressed
C1	Cathodic Protection – Capital	DT.1, DT.2, DT.8, DT.4, DT.6, PC.3, PC.1
C2	Cathodic Protection - Maintenance	DT.1, DT.2, DT.4, DT.8, PC.1, PC.3
C3	Leak Repair	DT.6, DT.9, PC.3
C4	Leak Survey & Patrol	DT.1, DT.2, DT.4, DT.8, DT.9, PC.1, PC.2, PC.3
C5	Pipeline Relocation/Replacement	DT.5, DT.4, DT.6, DT.9, DT.10, PC.3, PC.4, PC.5
C6	Shallow/Exposed Pipe Remediation	DT.6, DT.5, PC.3, PC.4, PC.5
C7	Pipeline Maintenance	DT.7, DT.8, PC.3
C8	Right of Way	DT.5, DT.6, PC.3, PC.5, PC.6
C9	Class Location - Hydrotest	DT.10, PC.3
C10	Compressor Stations – Capital	DT.8, DT.4, DT.5, DT.3, PC.3, PC.1, PC.5
C11	Compressor Stations - Maintenance	DT.3, DT.4, DT.5, DT.10, PC.1, PC.3, PC.5
C12	Measurement & Regulation – Capital	DT.8, DT.4, DT.7, PC.3, PC.1, PC.5
C13	Measurement & Regulation – Maintenance	DT.4, DT.7, DT.8, DT.10, PC.3, PC.5, PC.1
C14	Odorization	DT.7, DT.8, PC.4, PC.6, PC.5
C15	Security and Auxiliary Equipment	DT.5, DT.8, PC.3, PC.2
C16	SCADA Operation	DT.4, DT.6, DT.7, DT.8, PC.1, PC.2, PC.3
C17	Control Room Monitoring, Operation and Fatigue Management	DT.6, DT.7, DT.8, DT.9, PC.1, PC.2, PC.3
C18	Gas Transmission Planning	DT.4, DT.7, DT.8, PC.1, PC.2, PC.3
C19	Engineering, Oversight and Compliance Review	DT.4, DT.7, DT.6, DT.9, DT.11 PC.2, PC.3, PC.4
C20	Facilities Integrity Management Program	DT1, DT2, DT3, DT 4, DT 5, DT 6, DT 7, DT 8, DT 9, DT 10, DT 11 PC 1, PC 2, PC 3, PC 4, PC 5, PC 6

ID	Control/Mitigation Name	Elements of the Risk Bow Tie Addressed
C21	Integrity Assessments & Remediation	DT.1, DT.2, DT.3, DT.4, DT.5, DT.6, DT.9, DT.10 PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C22-T1; C-22-T2; C22-T3	PSEP: Phase 1A, Phase 1B, Phase 2A (Replacement or Hydrotesting)	DT.1, DT. 2, DT. 3, DT. 4, DT.5, DT. 6, DT. 9, DT. 10, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C22-T4	PSEP: Valve Enhancement Plan	DT.1, DT. 2, DT. 3, DT. 4, DT.5, DT. 6, DT. 9, DT. 10, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C23-T2	Ventura Compressor Station Modernization	DT.8 PC.1, PC. 3, PC. 4, PC. 5, PC. 6
M1	Gas Transmission Safety Rule - MAOP Reconfirmation	DT.1, DT.2, DT.3, DT.4, DT.5, DT.6, DT.9, DT.10 PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
M2	Gas Transmission Safety Rule – Material Verification	DT.10 PC.1, PC.2, PC.3, PC.4, PC.5, PC.6

APPENDIX B: REFERENCE MATERIAL FOR QUANTITATIVE ANALYSES

APPENDIX B: REFERENCE MATERIAL FOR QUANTITATIVE ANALYSES

The Settlement Decision directs the utility to identify Potential Consequences of a Risk Event using available and appropriate data. Provided below is a listing of the inputs utilized as part of this assessment.

Annual Report Mileage for Natural Gas Transmission & Gathering Systems

- **Agency: Pipeline and Hazardous Materials Safety Administration**
- **Link:** ***https://www.phmsa.dot.gov/data-and-statistics/pipeline/annual-report-mileage-natural-gas-transmission-gathering-systems***

Annual Report mileage for Gas Distribution Systems

- **Agency: Pipeline and Hazardous Materials Safety Administration**
- **Link:** ***https://www.phmsa.dot.gov/data-and-statistics/pipeline/annual-report-mileage-gas-distribution-systems***

Distribution, Transmission & Gathering, LNG, and Liquid Accident and Incident Data

- **Agency: Pipeline and Hazardous Materials Safety Administration**
- **Link:** ***https://www.phmsa.dot.gov/data-and-statistics/pipeline/distribution-transmission-gathering-lng-and-liquid-accident-and-incident-data***

SoCalGas high-pressure pipeline miles

- **2020 internal pipeline integrity data**

SoCalGas Probability of Exceedance (PoE) data

- **5 years of anomaly data from in-line-inspections (ILI)**

Risk Assessment and Mitigation Phase

(Chapter SCG-Risk-2)

Excavation Damage (Dig-in) On The Gas System

May 17, 2021

TABLE OF CONTENTS

RISK: EXCAVATION DAMAGE (DIG-IN) ON THE GAS SYSTEM

I. INTRODUCTION

The purpose of this chapter is to present Southern California Gas Company's (SoCalGas or Company) risk control and mitigation plan for the Excavation Damage (Dig-in) on the Gas System risk. Each chapter in this Risk Assessment Mitigation Phase (RAMP) Report contains the information and analysis that meets the requirements adopted in Decision (D.) 16-08-018 and D.18-12-014 and the Settlement Agreement included therein (the Settlement Decision).[1]

SoCalGas has identified and defined RAMP risks in accordance with the process described in further detail in Chapter SCG RAMP-B of this RAMP Report. On an annual basis, SoCalGas's Enterprise Risk Management (ERM) organization facilitates the Enterprise Risk Registry (ERR) process. The ERR process influenced how risks were selected for inclusion in this 2021 RAMP Report, consistent with the Settlement Decision's directives, as discussed in Chapter SCG/SDG&E RAMP-C.

The RAMP Report's purpose is to present a current assessment of key safety risks and the proposed activities for mitigating those risks. The RAMP Report does not request funding. Any funding requests will be made in SoCalGas's General Rate Case (GRC) application. The costs presented in this 2021 RAMP Report are those costs for which SoCalGas anticipates requesting recovery in its Test Year (TY) 2024 GRC. SoCalGas's TY 2024 GRC presentation will integrate developed and updated funding requests from the 2021 RAMP Report, supported by witness testimony.[2] This 2021 RAMP Report is presented consistent with SoCalGas's GRC presentation, in that the last year of recorded data (2020) provides baseline costs and cost estimates are provided for years 2022-2024, as further discussed in Chapter SCG/SDG&E RAMP-A. This 2021 RAMP Report presents capital costs as a sum of the years 2022, 2023, and 2024 as a three-year total; operations and maintenance (O&M) costs are only presented for TY 2024 (consistent with the GRC). Costs for each activity that directly address each risk are

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[1] D.16-08-018 also adopted the requirements previously set forth in D.14-12-025. D.18-12-014 adopted the Safety Model Assessment Proceeding (S-MAP) Settlement Agreement with modifications and contains the minimum required elements to be used by the utilities for risk and mitigation analysis in the RAMP and GRC.

[2] *See* D.18-12-014 at Attachment A, A-14 ("Mitigation Strategy Presentation in the RAMP and GRC").

provided where those costs are available and within the scope of the analysis required in this RAMP Report.

Throughout this 2021 RAMP Report, activities are delineated between controls and mitigations, consistent with the definitions adopted in the Settlement Decision's Revised Lexicon. A "control" is defined as a "[c]urrently established measure that is modifying risk."[3] A "mitigation" is defined as a "[m]easure or activity proposed or in process designed to reduce the impact/consequences and/or likelihood/probability of an event."[4] Activities presented in this chapter are representative of those that are primarily scoped to address SoCalGas's High Pressure Incident risk; however, many of the activities presented herein also help mitigate other areas.

As discussed in Chapters RAMP-A and RAMP-C, SoCalGas has endeavored to calculate a Risk Spend Efficiency (RSE) for all controls and mitigations presented in this risk chapter. However, for controls and mitigations where no meaningful data or SME opinion exists to calculate the RSE, SoCalGas has included an explanation why no RSE can be provided, in accordance with California Public Utilities Commission (CPUC or Commission) Safety Policy Division (SPD) staff guidance.[5] Activities with no RSE value presented in this 2021 RAMP Report are identified in Section V below.

SoCalGas has also included a qualitative narrative discussion of certain risk mitigation activities that would otherwise fall outside of the RAMP Report's requirements, to aid the California Public Utilities Commission (CPUC or Commission) and stakeholders in developing a more complete understanding of the breadth and quality of the Company's mitigation activities. These distinctions are discussed in the applicable control and mitigation narratives in Section(s) III and/or IV.

A. Risk Overview

SoCalGas operates and manages a natural gas system of over 101,000 miles of Distribution pipe and 3,385 miles of Transmission pipe within its 24,000 square mile service

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3 *Id*. at 16.

4 *Id.* at 17.

5 *See* Safety Policy Division Staff Evaluation Report on PG&E's 2020 Risk Assessment and Mitigation Phase (RAMP) Application (A.) 20-06-012 (November 25, 2020) at 5 ("SPD recommends PG&E and all IOUs provide RSE calculations for controls and mitigations or provide an explanation for why it is not able to provide such calculations.")

territory. Pipe mileage can be further segregated into general operating pressure categories of Medium Pressure (MP) which operates at or less than 60 psig, and High Pressure (HP) which operates above 60 psig. The expansive SoCalGas piping network and service territories have a potential for dig-in related incidents. This risk highlights the consequence and likelihood of dig-in damage that causes a release of natural gas, damages property, or causes personal injury due to excavation activity.

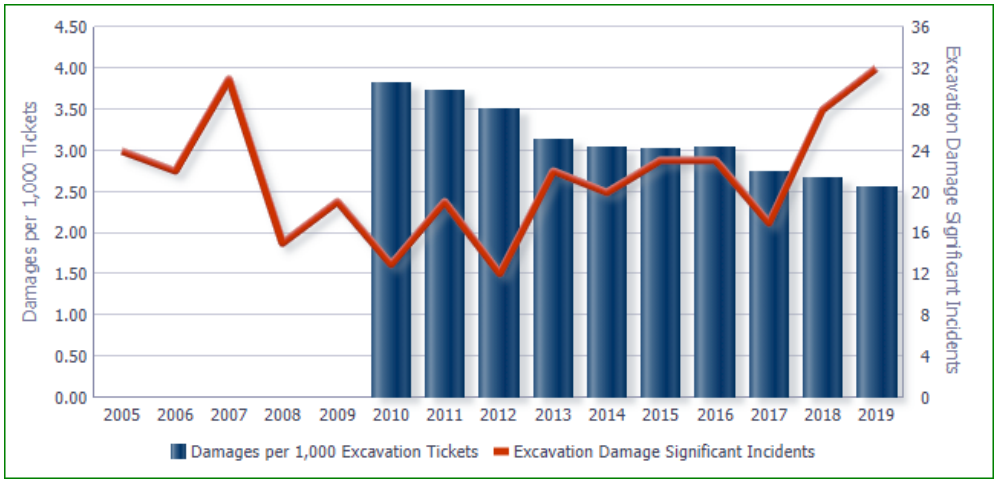
SoCalGas has been mitigating dig-in risk to its underground gas infrastructure for decades. Dig-ins are a common national problem for all utilities and industries with buried infrastructure and are not unique to SoCalGas. Excavation activities can vary widely based on project scope and size. Examples include a homeowner doing landscaping work, a plumber repairing a sewer line, or a city upgrading its aging municipal water or sewer systems. Excavation damage consequences can range from minor scratches or dents potentially leading to external corrosion, to ruptures with an uncontrolled release of natural gas. A leak or rupture may not happen immediately and can also occur after the infrastructure has sustained minor damage that has accumulated over time. Additionally, minor damages that do not result in a release of gas are often not reported by the responsible party, as required by California law. This impedes SoCalGas's ability to assess the pipe for damage and make the appropriate repairs to preserve the integrity of the pipe.

Federal and state agencies acknowledge the serious consequences of dig-in risk and have responded by adopting several regulations and industry standards and by supporting awareness efforts to help prevent dig-ins. For example, the Department of Transportation (DOT) sponsored the "Common Ground Study," completed in 1999. Subsequently, the "Common Ground Study" led to the creation of the Common Ground Alliance (CGA), a member-driven association of 1,700 individuals, organizations, and sponsors in every facet of the underground utility industry. With industry-wide support, CGA created a comprehensive consensus document that details the best practices addressing every stakeholder groups' activity in promoting safe excavation and dig-in prevention.

While these efforts are important and commendable, and the number of dig-ins per 1,000 excavation tickets has been trending down (Figure 1), the incidents continue. Excavation tickets are a common metric used throughout the industry to gauge the status of a damage prevention program. Figure 1 represents trends for dig-ins on distribution lines. Excavation data for

transmission incidents are less frequent and harder to trend. Thus, the Pipeline and Hazardous Materials Safety Administration (PHMSA) collects ticket totals in annual reports for distribution facilities, but does not collect ticket information for transmission facilities.

Figure 1: Excavation Tickets & Incidents



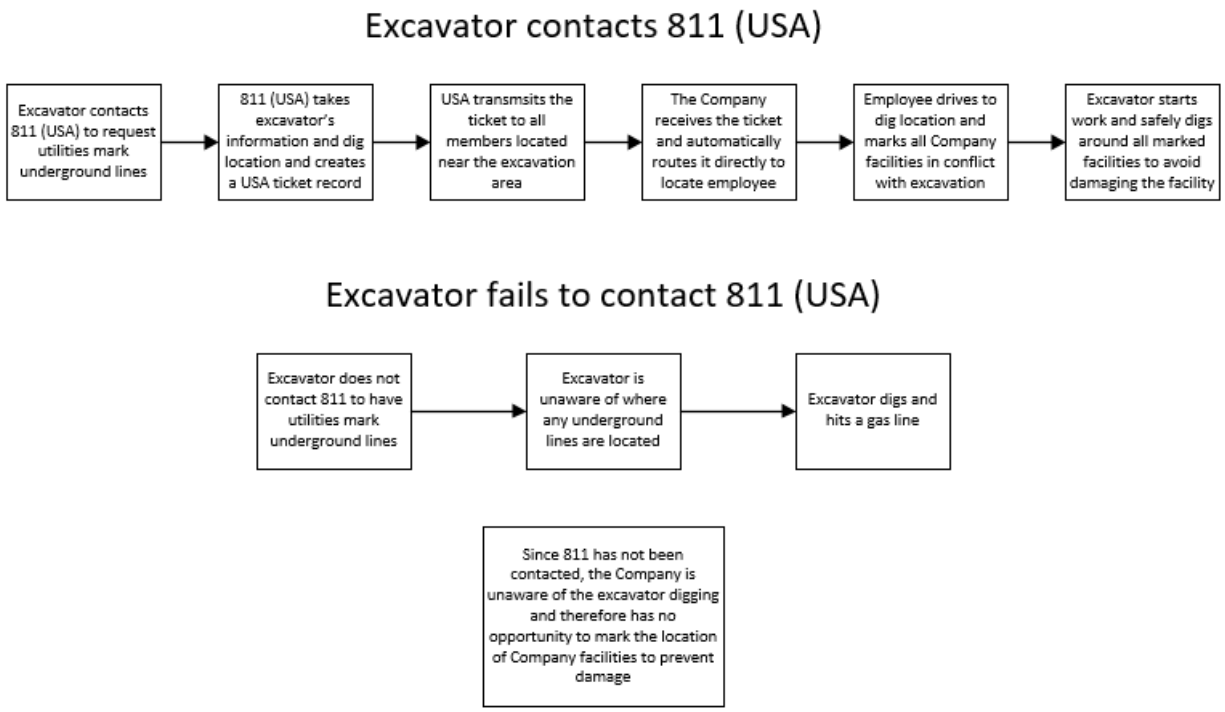
Under California State Law, an excavator planning excavation work is required to contact the Regional Notification Center for their area, also known as Eight-One-One (811) or Underground Service Alert (USA), at least two full working days prior to commencing construction excavation activities, not including the day of the notification.[6] 811 is the national phone number designated by the Federal Communications Commission (FCC) that connects homeowners or contractors who plan to dig with professionals through a local call center. California has two Regional Notification Centers, DigAlert and USA North, that split California at the Los Angeles/Kern County and Santa Barbara/San Luis Obispo County lines; USA North serves all counties north of the county lines and DigAlert serves all counties south of the county lines. DigAlert and USA North will be referenced as 811 USA for the remainder of this chapter. Once an excavator makes contact, the Regional Notification Center will issue a USA Ticket notifying local utilities and other operators of the location and areas to be inspected for potential conflicts of underground infrastructure with the pending planned excavation work. Operators are then required to provide a positive response to indicate that there are no facilities in conflict or to mark their underground facilities via aboveground identifiers (*e.g.* paint, chalk, flags, whiskers) to designate where underground utilities are positioned, thus enabling excavators, like

[6] Cal. Gov. Code § 4216.2(b).

contractors and homeowners, to know where substructures are located. The law also requires excavators to use careful, manual (hand digging) methods to expose substructures prior to using mechanical excavation tools.[7]

Figure 2 below illustrates the sequence of events that may occur when an excavator contacts 811 USA prior to conducting excavation work and, in contrast, the sequence that may occur when they do not.

Figure 2: Excavation Contact Process Flow



As can be seen in the figure above, while there may be more steps when an excavator calls 811 USA prior to commencing excavation work, it is more likely to result in a positive outcome compared to when a call is not made. When excavators call 811 USA before excavating, the risk of a dig-in is significantly reduced.

SoCalGas managed over 938,000 811 USA tickets and reported over 2,800 dig-in excavation damage incidents in 2020. Analysis of the data collected during routine damage investigations indicate that about 58% were due to a lack of notification to 811 USA for a locate

[7] Cal. Gov. Code § 4216.4(a)(1).

and mark ticket and another 26% were due to inadequate excavation practices even after the excavator called 811 USA and underground facilities were marked.

In addition to direct involvement with excavators and 811 USA, SoCalGas engages in promoting safe digging practices through its Public Awareness Program and corporate safety messaging through stakeholder outreach. The message is presented by way of multi-formatted educational materials through mail, email, social media, television, radio, events, and association sponsorships.

B. Risk Definition

For purposes of this RAMP Application, SoCalGas's Dig-in risk is defined as excavation damage on the gas system regardless of the party (1st, 2nd, 3rd) which results in significant consequences including serious injuries and/or fatalities.

Excavation Damage (Dig-In) on the Gas System has evolved from Dig-in on the Distribution System & Dig-in on the Transmission System in the 2020 ERR. In the 2019 RAMP the risk was referred to as "Third Party Dig-in Medium Pressure" and "Third Party Dig-in High Pressure." For this RAMP Application the definition of Excavation Damage (Dig-In) On the Gas System has been expanded to include all aspects and parties involved with excavation damage. The gas system is considered gas pipelines upstream of the gas meter for both medium and high-pressure systems.

C. Scope

Table 1 below provides what is considered in and out of scope for the Dig-in risk in this RAMP Application.

Table 1: Risk Scope

In-Scope:	Excavation damage on the gas system, which includes both medium and high-pressure pipelines upstream of the gas meter, regardless of the party (1st, 2nd, 3rd) that results in significant consequences including serious injuries and/or fatalities.
Data Quantification Sources:	SoCalGas engaged internal data sources for the calculation surrounding risk reduction; however, if data was insufficient, industry or national data was supplemented and adjusted to fit the risk profile associated with the operating locations and perimeter of the utilities. For example, certain types of incident events have not occurred within the SoCalGas and SDG&E territory; therefore, expanding the quantitative needs to encompass industry data where said incident(s) have been recorded can provide a proximate incident and is appropriate for establishing a baseline of risk and risk addressed by activities.

	See Appendix B for additional information.

II. RISK ASSESSMENT

In accordance with the Settlement Decision,[8] this section describes the risk bow tie, possible drivers, potential consequences, and the risk score for the Dig-in risk.

D. Risk Bow Tie and Risk Event Associated with the Risk

The risk bow tie is a commonly used tool for risk analysis, and the Settlement Decision[9] instructs the utility to include a Risk Bow Tie illustration for each risk included in RAMP. As illustrated below in Figure 3, the risk event (center of the Risk Bow Tie) is Excavation Damage (Dig-In) On The Gas System, the left side of the Risk Bow Tie illustrates drivers/triggers that lead to the Excavation Damage, and the right side shows the potential consequences of the Excavation Damage. SoCalGas applied this framework to identify and summarize the information provided in Figure 3. A mapping of each mitigation to the element(s) of the risk bow tie addressed is provided in Appendix A.

[8] D.18-12-014 at 33 and Attachment A, A-11 ("Bow Tie").

[9] *Id.* at Attachment A, A-11 ("Bow Tie").

Figure 3: Risk Bow Tie -
Excavation Damage (Dig-In) Medium Pressure

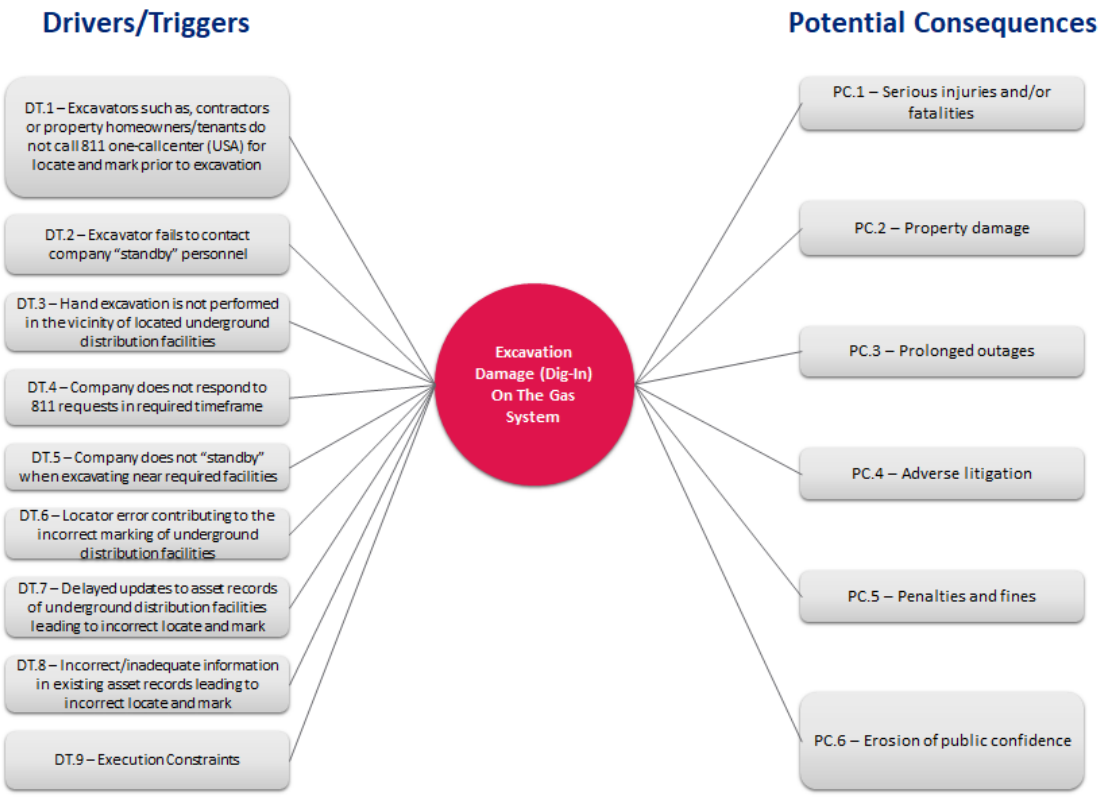
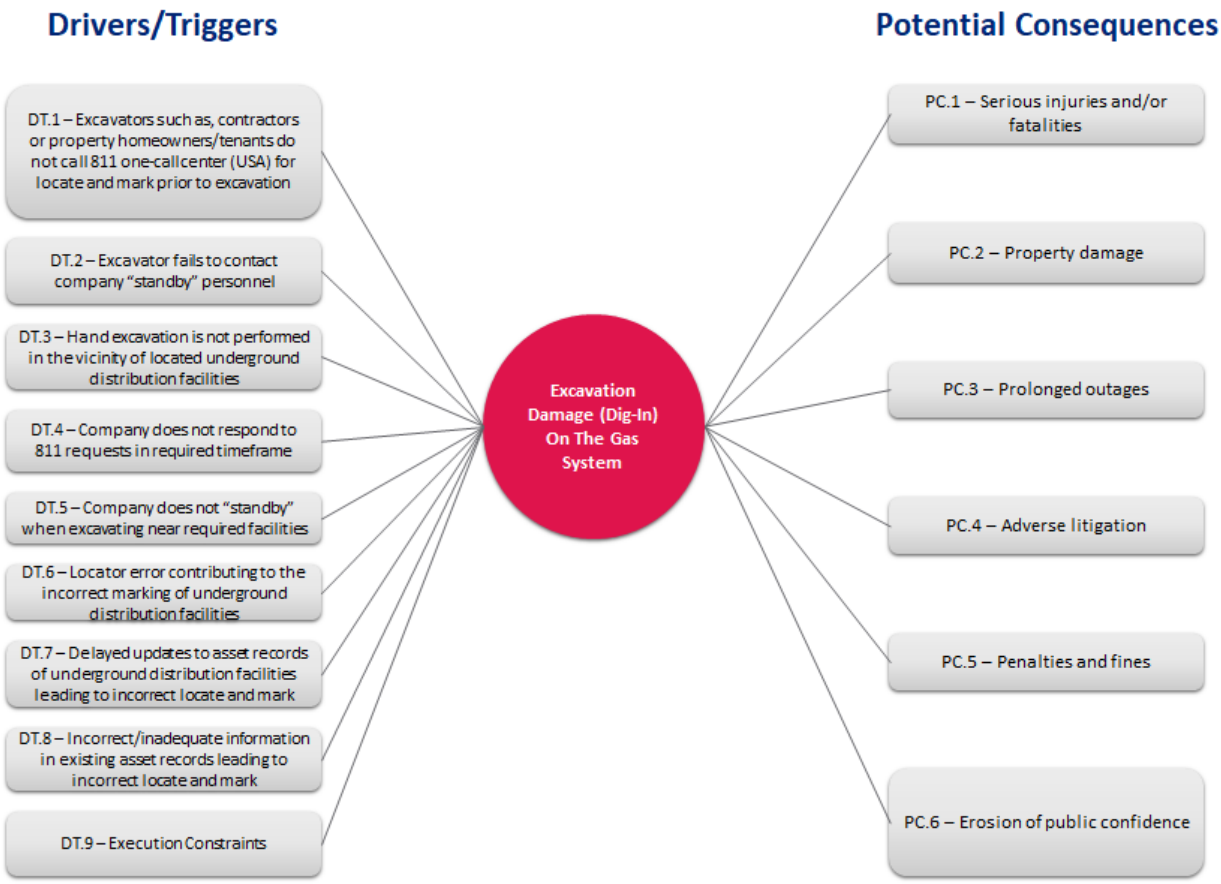


Figure 4: Risk Bow Tie -
Excavation Damage (Dig-In) High Pressure



E. Cross-Functional Factors

The following CFFs have programs and/or projects that affect this risk chapter: Workforce Planning / Quality Workforce, Emergency Preparedness and Response and Pandemic, Foundational Technology Systems, and Safety Management Systems. As an example, the training of SoCalGas emergency response personnel and activation of SoCalGas's emergency operations control center, as discussed in the Emergency Preparedness and Response and Pandemic CFF, address some of the potential consequences of this risk. The narratives for the referenced CFFs provide additional information.

F. Potential Drivers/Triggers[10]

The Settlement Decision[11] instructs the utility to identify which element(s) of the associated risk bow tie each mitigation addresses. When performing the risk assessment for dig-in on the system, SoCalGas identified potential leading indicators, referred to as drivers or triggers. These include, but are not limited to:

- **DT.1 –** Excavators such as contractors or property homeowners/tenants do not follow 811 One-Call Dig-Safe law requirements (USA) for locate and mark prior to excavation: Despite the creation of Regional Notification Centers to inform and allow excavators to have underground infrastructure located and marked, and advertising campaigns alerting the excavator of the need to do so, incidents still occur where excavations are conducted without notifying 811 USA. In fact, third party failure to contact the Regional Notification Center prior to excavating is the leading contributor of damages to Company pipelines. Third parties can damage or rupture underground pipelines and potentially cause property damage, injuries, or even death if gas lines are not properly marked before excavation activities begin. Without receiving an 811 USA ticket, the Company has no opportunity to mark its facility within the area of excavation.
- Furthermore, even when an 811 USA ticket is requested, excavators who are not knowledgeable about the details of the Dig-Safe law may still damage underground facilities by performing some of the following practices:

[10] An indication that a risk could occur. It does not reflect actual or threatened conditions.

[11] D.18-12-014 at Attachment A, A-11 ("Bow Tie").

- Excavating prior to the valid start date/time;
- Excavating after a valid ticket has expired;
- Excavating under another excavator's USA ticket;
- Improper job delineation and/or excavating beyond delineation marks.

- **DT.2 –** Excavator fails to contact company "standby" personnel: An excavator may fail to contact the utility's "standby" personnel for the prevention of damage to high pressure gas pipelines and other facilities when required, prior to excavating within 24 inches of a high-pressure gas pipeline. This would increase the risk and likelihood that the excavator damages a high-pressure pipeline or other facility.
- **DT.3 –** Hand excavation and other required excavation practices are not performed in the vicinity of located underground facilities: Before using any power-operated excavation equipment or boring equipment, the excavator is required to hand expose, using "Hand Tools,"[12] to verify the exact location and that no conflicts exist within 24 inches of either side of the gas pipeline. Excavators put themselves and others at risk for injury when they do not exercise caution when digging near natural gas pipelines. However, even when proper hand excavation is performed damages can still occur if an excavator fails to continue with unsafe excavation practices such as:
  - Maintaining proper clearance from the underground facilities;
  - Allowing the above ground locating marks to become faded or lost, rendering them ineffective;
  - Failure to provide adequate shoring, protection or support facilities;
  - Utilizing improper backfill procedures.
- **DT. 4 –** Company does not respond to 811 requests in required timeframe: The Company may fail to respond to 811 USA requests within the "legal excavation start date and time" [13] (within two working days of notification, excluding

[12] Cal. Govt. Code § 4216(i).

[13] *Id.* at § 4216(u)(l).

weekends and state holidays, not including the date of notification, or before the start of the excavation work, whichever is later, or at a time mutually agreeable to the operator and the excavator). This may happen because of human error, poor communication, or ticket reporting system failures. In these cases, the excavator may not know that the locate and mark activity was not performed and may wrongly assume that not seeing any marking at the excavation site indicates there is no gas infrastructure nearby. Without marking underground gas infrastructure, excavators may cause unintended damage.

- **DT.5 –** Company does not "standby" when requested near required facilities: High Pressure pipelines (those that operate over 60 psig) and pipelines near required facilities pose a higher risk of hazard to life and property when damaged and additional precautions are not taken by the Company to observe excavation activities in the vicinity of these facilities. Qualified Company personnel are required to be present during excavation activities within 10 feet of any high-pressure gas line (commonly referred to as "stand-by"). The stand-by employee is onsite to monitor and communicate with the excavator so safe excavation activities are followed (*e.g.*, hand-excavating near the pipeline).
- **DT.6 –** Locator error contributing to the incorrect marking of underground facilities: The Company, in some cases, inaccurately marks facilities due to incorrect operations, such as mapping/data inaccuracies, equipment signal interference, and human error. When this happens, third parties are not provided with accurate knowledge of underground pipelines in the vicinity of excavations and the risk of damaging or rupturing gas pipelines increases.
- **DT. 7** – Delayed updates to asset records of underground facilities leading to incorrect locate and mark: The Company could be delayed in updating permanent mapping records. This could result in underground infrastructure being incorrectly marked, which could lead to excavation damage. In addition, inaccurate mapping data could delay repairs if a pipeline is damaged.
- **DT. 8** – Incorrect/inadequate information in existing asset records leading to incorrect locate and mark: The use of inaccurate or incomplete information in

asset records could result in underground infrastructure being incorrectly marked, which could lead to excavation damage.

- **DT.9** - Execution Constraints: Events (excluding those from outside force damages) that impact the Company's ability to perform as anticipated. Examples include, but are not limited to: Materials and operational oversight, delays in response and awareness, resource constraints, and/or inefficiencies and reallocation of (human and material) resources, unexpected maintenance, or regulatory requirements.

G. Potential Consequences of Risk Event

Potential Consequences[14] are listed to the right side of the risk bow tie illustration provided above. If one or more of the drivers/triggers listed above were to result in an incident, the potential consequences, in a reasonable worst-case scenario, could include:

- PC. 1 - Serious injuries[15] and/or fatalities;
- PC. 2 - Property damage;
- PC. 3 - Prolonged outages;
- PC. 4 - Adverse litigation;
- PC. 5 - Penalties and fines; and
- PC. 6 - Erosion of public confidence.

These potential consequences were used in the scoring of Dig-In on the System that occurred during the development of SoCalGas's 2020 Enterprise Risk Registry.

H. Risk Score

The Settlement Decision requires a pre- and post-mitigation risk calculation.[16] Chapter SCG/SDG&E RAMP-C of this RAMP Application explains the Risk Quantitative Framework

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[14] D.18-12-014 at 16 and Attachment A, A-8 ("Identification of Potential Consequences of Risk Event").

[15] As defined by Cal/OSHA as "any injury or illness occurring in a place of employment or in connection with any employment which requires inpatient hospitalization for a period in excess of 24 hours for other than medical observation or in which an employee suffers a loss of any member of the body or suffers any serious degree of permanent disfigurement, but does not include any injury or illness or death caused by the commission of a Penal Code violation, except the violation of Section 385 of the Penal Code, or an accident on a public street or highway." *See* 8 CCR § 330(h).

[16] D.18-12-014 at Attachment A, A-11 ("Calculation of Risk").

which underlies this chapter, including how the Pre-Mitigation Risk Score, Likelihood of Risk Event (LoRE), and Consequence of Risk Event (CoRE) are calculated.

Table 2: Pre-Mitigation Analysis Risk Quantification Scores[17]

	LoRE	CoRE	Risk Score
Dig-In on the High-Pressure System	0.70	3,114	2,180

	LoRE	CoRE	Risk Score
Dig-In on the Medium Pressure System	2,914.10	0.5	1,523

Pursuant to Step 2A of the Settlement Decision, the utility is instructed to use actual results, and available and appropriate data (*e.g.,* Pipeline and Hazardous Materials Safety Administration data).[18] Historical PHMSA data, internal damage database and emergency incident reporting were used to estimate the frequency of incidents.

III. 2020 CONTROLS

This section "[d]escribe[s] the controls or mitigations currently in place" as required by the Settlement Decision.[19] The activities in this section were in place as of December 31, 2020. Controls that will continue are addressed in Section IV.

As stated above, the excavation damage on the gas system is the risk of damage caused by an excavation event, which could result in serious injuries and/or fatalities. The risk control and mitigation plan includes both controls that are expected to continue and projected mitigations for the period of SoCalGas's TY 2024 GRC cycle. The controls are those activities that were in place as of 2021, most of which are compliance driven and have been implemented over decades. These activities focus mainly on the essentials of damage prevention, including excavator's knowledge and use of the 811 one-call services and safe excavation practices, and the

[17] The term "pre-mitigation analysis," in the language of the S-MAP Settlement Agreement Decision (Attachment A, A-12 ("Determination of Pre-Mitigation LoRE by Tranche," "Determination of Pre-Mitigation CoRE," "Measurement of Pre-Mitigation Risk Score")), refers to required pre-activity analysis conducted prior to implementing control or mitigation activity.

[18] *Id.* at Attachment A, A-8 ("Identification of Potential Consequences of Risk Event").

[19] S-MAP Settlement Agreement Decision at 33.

operator's responsibility to communicate the location of underground facilities through activities such as 811 one-call ticket responses and locate and mark activities.

A. Locate and Mark Training

- **C1: MP; C2: HP**

Locate and mark training provides employees who perform locating tasks with the necessary knowledge and operator qualification to locate and mark underground gas facilities. At SoCalGas, in response to an 811-excavation request, the Energy Technician Distribution (ETD) and Lead Construction Technician (LCT) functions have the responsibility to locate and mark Distribution Operations gas facilities and the Pipeline Technician, Pipeline Specialist and Welding Specialist have the responsibility to perform the Locate and Mark duties for Transmission Operations facilities. Gas Operations Training and Development provides each trainee with the initial locate and mark training upon being newly assigned to a position. Overall, training is approximately an eight-week course with hands-on locate and mark training comprising approximately one week. The employees are not certified to locate or mark gas facilities until they have successfully completed initial training and passed locate and mark operator qualification tasks. In 2020, SoCalGas's Gas Operations Training and Development provided locate and mark training to approximately 125 employees. It is necessary to have a trained workforce to accurately locate and mark gas infrastructure and provide the necessary information to third-party excavators for safe excavation. Marked facilities provide the excavator with approximate pipeline locations within the delineated work area. Awareness of underground gas facilities allows the excavator to either avoid the areas or carefully dig with hand tools to prevent damage while excavating. Since a vast majority of SoCalGas's assets are buried below ground, it is imperative that proper action is taken to reduce the risk of accidental damage to these facilities by accurately communicating the locations to the excavators. Without a highly skilled and trained locate and mark workforce, excavators would have little knowledge and confidence of pipeline locations which could lead to third party excavation damage. By improving knowledge and competency through training, locate and mark accuracy will increase, and the number of mismarks and third-party damages should reduce. Additionally, this training reinforces the requirements to accurately locate our pipelines, the importance of two-way communication with an excavator, the completeness and thoroughness of documentation, and the timeliness of locate and mark ticket completion.

B. Locate and Mark Activities

- **C3: MP; C4: HP**

The purpose of the Locate and Mark Activities is to prevent damage to gas infrastructure caused by excavators. Three primary locate and mark activities are listed below:

(1) locating and marking underground gas facilities before excavation occurs;

(2) observing (stand-by) pipeline excavation activities; and

(3) providing staff support for compliance and improvement.

The first of these activities, locating and marking, refers to the physical act of locating and marking of underground facilities. In 2020, SoCalGas responded to over 930,000 locate and mark ticket requests. By providing a visual indication of the location of underground facilities, the excavator has the necessary information to excavate safely.

The second locate and mark activity is pipeline observation, or "stand-by", which is a critical activity that requires a qualified Company representative to be present anytime excavation activities take place near high priority pipelines. The purpose for this activity is to decrease the likelihood of a damage occurring by having a dedicated employee present to maintain the integrity of the pipeline.

The third activity is providing daily damage prevention staff support to operations by interpreting policies, tracking compliance, evaluating tools, equipment and new technologies, providing refresher training, and tracking and trending locate and mark data to proactively identify areas for improvement. This is a critical risk reduction activity that directly supports the field locator personnel in their daily activities and leads to more accurate and timely responses to locate and mark tickets and reduction in damages. This collection of Locate and Mark Activities ultimately provides the excavator with the necessary information to avoid hitting or damaging gas facilities.

C. Locate and Mark Annual Refresher Training and Competency Program

- **C5: MP; C6: HP**

All company personnel performing Locate and Mark Activities must complete an annual re-training and refresh program. This program consists of local supervisors reviewing SoCalGas Gas Standards with the locate and mark workforce. Employees are required to pass the refresher training in order to continue Locate and Mark Activities. This refresher training involves all aspects of the Locate and Mark procedures to allow personnel to be able to successfully receive

an 811 USA ticket and provide a proper positive response. Similar to the Locate and Mark training mentioned above, interactive electronic learning course modules are being developed for this refresher training with the addition of other training methods such as on-the-job training and mentoring. This is a mandated activity in order to comply with regulations and code requirements and to provide employees with the basic knowledge to satisfactorily perform this critical task.

D. Locate and Mark Operator Qualification

- **C7: MP; C8: HP**

Locate and Mark Operator Qualification (OQ) training requires employees to field-demonstrate their knowledge and competency to perform locate and mark tasks. This includes activities such as obtaining proper locating signals, interpreting the signals by placing accurate and proper markings on the ground to indicate the location of the pipe. This OQ training is in addition to Locate and Mark Training (C1), is required for employees every three years, and is administered by the Gas System Integrity - Operator Qualification department at SoCalGas. In 2020, there were approximately 215 employees at SoCalGas who participated in OQ training. OQ training is mandated by PHMSA.[20]

Maintaining resources that are trained and Operator Qualified to perform Locate and Mark functions promotes procedural knowledge and competency to perform the tasks. A prepared and qualified workforce allows SoCalGas to meet its regulatory requirements, the demands of the excavator community, and helps provide for a safe excavation environment.

E. Locate and Mark Quality Assurance

- **C9: MP; C10: HP**

The purpose of the Locate and Mark Quality Assurance (QA) Program is to validate that locators are following processes and procedures when performing locating tasks. The QA evaluators document each ticket assessment and identify opportunities for improvement. SoCalGas's Safety Assurance, Quality, and Risk department administers the QA program and visits every operating district at least once per year. During these visits, they select a prescribed number of 811 USA tickets for each Locator, check the employees' Operator Qualification status and evaluate the documentation on the ticket. Additionally, they will perform field visits, when

[20] 49 CFR §§ 192.801 - 192.809.

possible, to evaluate in-field activities such as equipment setup and use, Company Gas Standard compliance, accuracy of locate and markings, proper documentation, and proper use of the Korterra ticket management system, among other activities. Feedback on a quality assurance audit is provided to each local supervisor who is responsible for following-up with employees and providing coaching or refresher training.

The Locate and Mark QA Program provides a variety of benefits to reduce the number of and potential for damage to gas infrastructure by a third party. By evaluating Locate and Mark Activities that have been completed or are being performed, SoCalGas can address gaps in performance with additional training, or updating Company documentation or recording Company assets. Locator errors can result in a mismark, or a ticket not completed within the required timeframe. Additionally, the QA review can highlight errors in the timely and/or accurate documentation of utility assets. Adherence to proper Company policy and procedures reduces the percentage of Locate and Mark mismarks, increases the overall awareness of unsafe activity, and expedites response times.

F. Damage Prevention Analysts

- **C11: MP; C12: HP**

The Damage Prevention Analyst Program works to reduce the number of third-party damages to gas facilities by identifying at risk excavating contractors and educating them on proper one-call and safe digging techniques. The Damage Prevention Analyst Program strives to reduce the number of third-party damages to gas facilities by identifying at-risk excavating contractors through data analysis. The benefit of the damage prevention analyst is threefold. First, it enables SoCalGas to stop a job before an incident occurs if no underground markings are present or the excavator is not practicing safe digging techniques. Second, it provides an opportunity to educate contractors on the requirements before digging or when digging around gas facilities before damage is done. This education has far-reaching benefits as the contractor will perform future projects in other districts not currently part of the program, and the education can be applied to those future projects. Third, it creates a list of contractors who might be repeat offenders and/or prevalent site characteristics to improve prioritization of future construction site inspections.

The damage prevention analysts focus on six districts (out of a total 48 districts) with the greatest number of reported incidents, by driving to and physically inspecting excavation

projects with 811 USA ticket requests. The analysts stop at other construction projects to investigate if the excavator notified USA 811 and if safe excavating techniques are followed. At times, the analysts will stop the job and provide education to the contractor about safe excavating practices and procedures. SoCalGas expects to expand this program with additional analysts and broader system-wide coverage. SoCalGas's damage prevention analysts have stopped over 470 jobs since the program's inception in 2018 and have conducted over 4,500 contractor outreach and educational opportunities.

G. Locating Equipment

- **C13: MP; C14: HP**

This control involves providing hardware that is appropriate for the rugged outdoor environment that is updated with the latest software to run efficiently and provide correct information to accurately locate underground pipelines. Laptops with the applicable software are deployed across SoCalGas's territory. SoCalGas has a vast service territory that covers 24,000 square miles in diverse terrain throughout Central and Southern California, from Visalia to the Mexican border. The service territory covers 12 counties, and 220 incorporated cities in more than 500 communities. SoCalGas provides the locate and mark workforce with the tools and information needed to accurately locate and mark underground gas infrastructure, as mandated by Title 49 Code of Federal Regulation, section 192.614, and California Government Code, section 4216.

Employees who perform Locate and Mark Activities rely on laptops, 811 USA tickets, asset mapping, records data, software, and locating equipment. Using laptops in an outdoor setting, and often in construction areas, can reduce life expectancy due to the harsh environment. Therefore, employees have laptops that are designed to withstand a harsh environment. Additionally, as software and data are updated and become more sophisticated with new and more powerful features, new laptops with advanced capabilities are required to process the information. Approximately 350 laptops are replaced every five years.

Updated and ruggedized laptops provide a longer battery life and can process software faster and more efficiently. Updated hardware and software increase the effectiveness of performing Locate and Mark Activities. The ruggedized laptops can also take pictures of the area near the excavation site to update and improve asset mapping information. New laptops provide enhanced features to reduce locator errors and reduce pipeline damage.

The purpose of the Locating Equipment Program is to utilize technology to standardize locating tools to accurately locate and mark underground gas infrastructure. The Locating Equipment program will provide employees with standardized locating devices. Employee locating equipment will be replaced as new technology becomes available. Reducing the potential for damage to underground facilities that is caused by excavation activities requires correct facility markings. Excavators use these markings to know when hand-digging and other safe digging practices should be followed. Finally, providing employees standardized equipment allows for consistent training and use of the equipment to improve locate accuracy.

H. Public Awareness

- **C15: MP; C16: HP**

For the purposes of an RSE analysis, SoCalGas separated Public Awareness into four tranches. Each of the four tranches reduces the likelihood of third-party damage differently according to the RSEs.

It is important for contractors and excavators to be informed of the potential safety issues that might arise when working around natural gas pipelines. Underground pipelines can be located anywhere, including under streets, sidewalks and private property – sometimes just inches below the surface. Hitting one of these pipelines while digging, planting or doing demolition work can cause serious injury, property damage, and loss of utility service.

Title 49 Code of Federal Regulation, section 192.616 requires utilities/natural gas providers to include efforts to educate the public, appropriate government organizations, and persons engaged in excavation related activities. The four types of groups identified in section 192.616[21] are the affected public, emergency officials, local public officials, and excavators. The SCG-2-C8 – Public Awareness mitigation has been tranched to match the four groups identified in section 192.616.

[21] 49 CFR § 192.616 (emphasis added):
(d) The operator's program must specifically include provisions to educate the public, appropriate government organizations, and persons engaged in excavation related activities on:

(1) Use of a one-call notification system prior to excavation and other damage prevention activities;
(2) Possible hazards associated with unintended releases from a gas pipeline facility;
(3) Physical indications that such a release may have occurred;
(4) Steps that should be taken for public safety in the event of a gas pipeline release; and
(5) Procedures for reporting such an event.

Periodically SoCalGas participates in Distribution Public Awareness Council benchmark studies to collect and compare membership data related to the effectiveness of public awareness and community safety outreach programs managed by gas utilities. There is a clear distinction between the general level of awareness between the affected public, emergency officials, local public officials, and excavators. In order to address this gap and reduce third party damage, targeted messaging campaigns are performed for each subgroup to increase overall awareness and education. Emergency officials and local public officials are often met with in person to discuss municipal third-party damage trends. The public and excavators are informed of 811 USA notification and safe digging practices using bill inserts, media campaigns, SoCalGas damage prevention analysts, radio advertising, internet advertising, billboard advertising, and safety meetings. A summary of SoCalGas's 2019 public awareness activities is shown in the table below.

Table 5: Summary of SoCalGas's 2019 Public Awareness Activities

	Mailers	**Email messages**	**Campaigns/ Presentations**	**811 Unique Page views**
Affected Public	3.1M customers and 750K live/work near high-pressure	2.9M	26	10,946
Local Public Officials	2.2K	618	0	
Excavators	170K	6K	209	
Emergency Officials	2K	33	251	

A comprehensive public awareness program works to reduce the number of gas incidents by educating the general public how to the identify and recognize a gas leak and who to notify if a leak is suspected. This allows first responders and SoCalGas to respond in a timely manner to avoid a gas incident or minimize the impact. More specifically, the Public Awareness Program works to reduce the number of potential gas incidents due to third party excavation activities. "Third parties" refers to a broader group than just excavators, it can also include "do it yourself" home and business owners. By providing information about the 811 USA process and safe digging practices to these audiences, SoCalGas can increase the number of locates performed by the gas utility and potentially reduce the number of incidents and damage to gas infrastructure.

I. Public Awareness - Affected Public

- **C15-T1: MP; C16-T1: HP**

SoCalGas continues to promote awareness of the Underground Service Alert (811, "call-before-you dig") system to the affected public by reaching out to contractors and the general public through meetings, mailers, bill inserts, hosting events, the Company website, marketing and banners at locally broadcasted events and other methods, so pipelines are properly marked and located before excavation activities. Excavation activity includes excavating, blasting, boring, tunneling, backfilling, and removing aboveground structures by both explosive or mechanical means, and other earth-moving operations.

Additionally, to promote National Safe Digging Month, SoCalGas brings a 30-foot-tall shovel to public gatherings to raise awareness about the importance of contacting 811 USA at least 72 hours prior to the start of any excavation project. For example, SoCalGas brings the giant shovel—popular for photos—to inform area residents about pipeline safety and customer assistance programs. When residents or contractors dial 811 USA before any project that involves digging, SoCalGas marks the locations of underground lines to prevent damage, which could cause injury or service outages. This outreach is performed in compliance with Title 49 Code of Federal Regulations, section 192.616(d) subsections 1-5.

J. Public Awareness - Emergency Officials

- **C15-T2: MP; C16-T2: HP**

SoCalGas has the responsibility to train its employees on emergency procedures as well as establishing a liaison with first responders in accordance with Title 49 Code of Federal Regulations, section 192.615.[22] According to GO 112-F, SoCalGas, is an "Operator," which must comply with the requirements of sections 192, 192.615, and 192.616(e). There are significant benefits to creating strategic partnerships and promoting awareness with emergency officials. Communication and coordination are improved when it matters most. SoCalGas works to implement this requirement by establishing lines of communication between SoCalGas and first responders, by learning about the responsibility and resources available to each party in the event of a gas pipeline emergency, and by educating each other on how to best respond to a gas system emergency.

[22] 49 CFR § 192.615.

Additionally, section 192.616, implemented through GO 112-F, states that SoCalGas is required to coordinate emergency exercises or drills with first responders. To commemorate "811," August 11 (or 8/11 Day) SoCalGas, The California Regional Common Ground Alliance (CARCGA), and Orange County Fire Authority (OCFA) hold a mock utility line strike to raise awareness about the importance of contacting 811 USA at least two working days (not counting the day of notification) prior to the start of any project that involves digging. The event program includes exhibiting the 811 USA process, emergency response demonstration, investigation by the Dig Safe Board, speakers from Dig Safe Board, OCFA, plus exhibitor booths. Building relationships with emergency officials is imperative in creating awareness of safe digging practices and potential consequences if excavators are not safe.

K. Public Awareness - Local Public Officials

- **C15-T3: MP; C16-T3: HP**

Working directly with city officials involved in construction activities within their jurisdictions helps to educate external personnel to not support unsafe excavation practices that could result in damage to underground facilities. This interaction can involve several efforts. First, educating city personnel on the specific requirements of the California safe excavation laws. Second, helping officials understand their role in enforcing the laws by promoting the use of 811 USA for excavation tickets through their project review and permitting activities and through field inspections their employees perform. Third, to explain the city's potential cost savings from avoiding their emergency personnel from having to respond to a blowing gas emergency due to non-compliant excavation damage. City officials can avoid unnecessary emergency response if they promote safe excavation practices during their routine daily planning and permitting work. This outreach is performed to be compliant with Title 49 Code of Federal Regulations, section 192.616(d) subsections 1-5.

L. Public Awareness – Excavators

- **C15-T4: MP; C16-T4: HP**

Excavator awareness of 811 USA is very important. Nationwide statistics from the Common Ground Alliance indicate that when a locate request is made prior to an underground

excavation, no damage will occur 99% of the time.[23] It is important for contractors and excavators to be informed of the potential safety issues that might arise when working around natural gas pipelines. Underground pipelines are in various locations, including under streets, sidewalks and private property – sometimes just inches below the surface. Hitting one of these pipelines while conducting routine work such as digging, planting, or demolition work can cause serious injury, property damage, and loss of utility service. The benefits of calling 811 USA are communicated through awareness campaigns, such as, in-person excavator outreach events, targeted mailings, and the Big Shovel display. Excavator outreach is performed to be compliant with Title 49 Code of Federal Regulations, section 192.616(d) subsections 1-5.

M. Increase Reporting of Unsafe Excavation

- **C17: MP; C18: HP**

The purpose of Increased Reporting of Unsafe Excavation is to identify and report excavators who frequently utilize unsafe excavation practices and to report those contractors to the California Underground Safe Excavation Board (Dig-Safe Board) and/or State Licensing Board (CSLB). Reporting of unsafe excavation is applicable to the entire SoCalGas territory.

SoCalGas has increased reporting of unsafe excavation by consolidating and formalizing internal procedures for identifying and reporting excavators who frequently utilize unsafe excavation practices and to report those contractors to the Dig-Safe Board and/or (CSLB). This includes consolidating the efforts of the Damage Prevention Strategies Team with the Claims Recovery Team. Both internal groups engage in various degrees of excavator education and outreach efforts on safe digging practices. The consolidation of efforts includes a consistent methodology for identifying targeted excavators. Education and outreach efforts provide the excavators understanding of the implications of unsafe excavation practices. SoCalGas has stopped over 470 jobs and conducted over 4,500 outreach and educational opportunities.

By combining the outreach information, this program provides a more comprehensive and holistic effort to achieve the benefits of reducing third-party damage. First, it provides the names of unsafe excavators to the appropriate state boards to support the state's objectives. Second, it provides an opportunity for excavators to be educated and informed on their

[23] Common Ground Alliance, *Common Ground Alliance's 2014 DIRT Report Confirms Importance of Calling 811 Before Digging for Fifth Consecutive Year* (August 11, 2015), *available at* *https://commongroundalliance.com/sites/default/files/press_release_pdfs/2014%20DIRT%20Report%20Press%20Release%20FINAL.pdf* .

obligations, such as the contractor's requirement to call prior to any excavation activity and to perform hand excavation in the vicinity of gas pipelines. The outreach to the excavator and contractor community should reduce the number of excavation activities without location marks and reduce the number incidents on our pipelines.

The costs for these activities are not planned to be incorporated into the next GRC; therefore, these activities are not part of the risk mitigation plan.

N. Damage Prevention Policy Activities

- **C19: MP; C20: HP**

SoCalGas aims to secure greater education, compliance, and enforcement of safe excavation practices through legislation and work with other organizations. SoCalGas actively participates in the Dig-Safe Board to provide input and education from the natural gas utility perspective. Similarly, the purpose of remaining active members of the California Regional Common Ground Alliance (CARGA) is to work with all members of the excavation community in achieving the Dig-Safe Board's objectives of providing education and outreach, developing safe excavation practices, investigating violations, and supporting the Dig-Safe Board's authority. Securing greater enforcement through legislation and working with the California State Digging Board is applicable to all third-party excavations.

The purpose of this participation is to work with all members of the excavation community in achieving the Dig-Safe Board's objectives of providing education and outreach, developing safe excavation practices, investigating violations, and supporting the Dig-Safe Board's authority.

Through involvement in board meetings and workshops and collaborating to achieve common objectives related to damage prevention, SoCalGas fosters a positive and stronger working relationship with all stakeholders. By playing an active role in developing, educating and enforcing utility and contractor requirements, a collaborative and holistic environment can be achieved among all stakeholders. The Dig-Safe Board provides a forum so that effective safe excavation requirements can be cooperatively developed and disseminated to reduce third party damage.

SoCalGas is an active member of both Dig Alert and USA North. Dig Alert's territory includes nine Southern California Counties: Imperial, Inyo, Los Angeles, Orange, San Bernardino, San Diego, Santa Barbara, Riverside, and Ventura. USA North covers fifty

Northern California Counties. SoCalGas is mandated by Title 49 Code of Federal Regulation, section 192.614, and California Government Code, section 4216, to remain an active member of the California One-Call Centers.

The California 811 USA One-Call Centers serve as the communication conduit between SoCalGas and excavators to support safe digging practices. Excavators contact the 811 USA one-call centers with their intent to excavate in a specific location. This information is made available to the owners and operators of underground infrastructure to provide pipeline location information before excavation occurs. SoCalGas is an active member of local one-call centers. In calendar year 2019, SoCalGas responded to over 960,000 locate and mark requests on the system through the local one-call centers.

As a member of the 811 USA one-call centers, SoCalGas actively works with other industry stakeholders toward simplifying the process, improving its accessibility, and educating safe digging practices. The California one-call centers play a critical role in safe excavation practices and reducing the number of third-party damages. The call centers provide a single source for all excavators to contact as well as a source for utilities, simplifying the communication process between contractors and the various utilities, many of which are not known by the contractors. The one-call process also allows this communication process to take place before digging occurs, so that utilities can correctly locate and mark their facilities in the required timeframe. Excavating after pipeline marks are provided, allows the contractors to practice safe digging techniques, minimizing the potential of hitting or damaging gas pipelines.

O. Prevention & Improvements – Fiber Optics

- **C21: HP**

The fiber optic technology installed on high pressure pipelines serves as an early warning system to detect unauthorized construction work or other hazardous encroachments or external forces that could damage the pipeline. It also serves to monitor changes in pipeline trench that could indicate a leak, rupture, or pipeline movement. This program is applicable to high pressure Company facilities, and currently limited to new transmission pipeline projects with an outer diameter of 12” or greater, over one-mile in continuous length, and operating at over 20% of its specified minimum yield strength.

In 2017, SoCalGas initiated a program to install fiber optic monitoring systems designed to allow real-time monitoring of the condition of high-pressure pipelines included in the

program. The technology uses fiber optic cables, that are installed and run above and parallel to the pipeline, to detect stresses imposed on the pipeline that could have the potential to cause damage. The fiber optic cable detects changes in the pipeline trench which are analyzed by a remote monitoring station, in real time, and SoCalGas operators can interpret the data to determine potential stresses. The initial installation was along a seven-mile section of high-pressure pipeline in Bakersfield, California.

The information received from the fiber optic technology gives SoCalGas the opportunity to respond quickly to potential issues with its high-pressure transmission pipelines. It can identify a potential problem within twenty feet, and with real-time information, can be critical to early detection. Examples of some of the stresses that it can detect is construction and excavation activity near and around the pipeline. Receiving this information quickly, can alert SoCalGas to inspect the area and put a stop to any excavator that does not have an 811 USA ticket or is not practicing safe-digging techniques.

P. Gold Shovel Standard Program

- **C22: MP; C23: HP**

The Gold Shovel Standard (GSS) Program utilizes an external organization that certifies contractors' policies and procedures to protect underground facilities against an established GSS. SoCalGas requires all pipeline contractors to participate in the Gold Shovel Program. All third-party damage caused by contractors working for SoCalGas poses the same safety risk.

The GSS provides positive guidance to underground contractors, aligning their excavation practices against established safe digging practices and procedures. It helps to educate contractors about industry excavation standards and identify and address gaps in their processes. SoCalGas requires contractors who perform excavation on behalf of SoCalGas to be GSS certified. GSS serves as an additional quality check for its contractors. Actively supporting the GSS Program helps to improve use of 811 USA one-call requirement and to improve safe digging techniques, such as hand-digging when near gas pipelines.

Q. Excess Flow Valve or Curb Valve Installation

- **C24: MP**

Excess Flow Valves (EFV) are designed to prevent gas escape by automatically stopping the gas flow when a medium pressure service is damaged. Curb valves are used to quickly shut down damaged medium pressure service line.

A medium pressure service line can be damaged by several driver/triggers, such as the failure to follow the 811-notification process, a mismark by the locator, or the lack of caution during excavation. When a gas service line is severely damaged, the EFV immediately stops the flow of gas eliminating the risk of prolonged gas release and migration. EFV and curb valves mitigate the consequences associated with a damaged medium pressure gas service line.

R. Pipeline Patrol and Pipeline Markers

- **C25: MP; C26: HP**

Qualified employees patrol high-pressure pipelines, assessing the area over and around the pipeline for signs of excavation or potential excavation. Part of this patrol includes establishing and maintaining pipeline markers where required. Pipeline markers provide a visual warning to outside parties that a high-pressure gas pipeline is in the vicinity and contact must be made to 811 or SoCalGas before any excavation occurs. Pipeline patrol and pipeline markers are important for preventing damage to the pipeline. During patrol, potential excavators without a USA ticket could be identified. The patrols help prevent excavators from digging without a USA ticket or without a SoCalGas standby employee onsite when required. This mitigation is a proactive measure to alert excavators who are unaware of 811 laws and rules or standby requirements.

S. Company Excavator Training

- **C27: MP; C28: HP**

A formal training program provides excavation training to employees who are required to excavate as part of their job duties. The training reinforces safe excavating procedures, so employees know how to avoid damaging company pipelines as well as other utilities' buried facilities. The training includes the use of a pneumatic clay spade around buried facilities and backhoe training. The training is comprehensive in content, covering all operational aspects for the safe use of a particular piece of equipment including the required personal protective equipment, manufacturers recommendations and instructions, as well as additional procedures, guidelines and limitations developed internally by SoCalGas. Excavation equipment training is typically performed when an employee begins a new job position, as part of the job requirements. Once trained and qualified, employees continue to develop their safe operating skills in the field under direction of senior employees and supervision. Refresher training is available to employees on an as-needed basis. Training employees to understand the applicable

excavation regulations and safe excavating techniques around pipelines will mitigate the risk of employees damaging pipelines.

T. Warning Mesh

- **C29: MP; C30: HP**

Warning mesh is a practice to help prevent excavators from the consequences of not adhering to the 811 USA excavation safety notification requirement. Approximately 60% of Company damages are caused by excavators not contacting 811 USA before excavating. Warning mesh is installed over pipelines in open trench before backfilling. This program is applicable to all SoCalGas open trench new pipeline installations or replacements.

The purpose of installing warning mesh over pipelines is to provide a visual warning to excavators to prevent damage. Warning mesh is installed over pipelines when an open-trench installation opportunity is available for new construction, repair, and replacements projects before backfilling. The warning mesh is a visual indicator that can be exposed before the excavator damages pipelines and can mitigate locate errors or unsafe excavation techniques. It reminds the excavator to exercise safe excavation techniques, it corrects inaccurate surface locate markings, and it warns the excavator that a pipeline is nearby.

U. Ticket Risk Assessment and Evaluating City Permit Data

- **C31: MP; C32**

Ticket Risk Assessment (TRA) technology uses complex modeling software to assign risk scores to every USA ticket received by the Company. The technology also provides additional identifiers on each USA ticket for fast identification of other facility properties such as flags for high pressure pipes or regulator stations intersecting the ticket's work scope. The tool also provides integration with public information such as city and county permit data, where available. This permit data is used to help determine areas with construction or building permits that may not have a USA ticket.

The TRA provides a new way to mitigate notification issues, location issues, and excavation issues that could lead to significant consequences. The higher risk tickets are visited by field employees who communicate with the excavator to assess if excavation rules are understood to prevent damage to pipelines. Field employees review and assess the USA ticket to verify it has been adequately addressed by locators and take appropriate follow up action, if required.

V. Enhance Ticket Management Software

- **C33: MP; C34: HP**

The primary focus of system improvements to the 811 USA ticket routing and monitoring is to upgrade the ticket management system to automatically provide periodic reports on the status of ticket requests, send notifications as a ticket is approaching its deadline, and capture and report data that will be used to monitor and evaluate performance per Title 49 Code of Federal Regulation section 192.614.

As part of continuous improvement, an assessment of the current state of the 811 USA one-call ticket routing and monitoring is underway. The primary focus of system improvements to the USA ticket routing and monitoring is to upgrade the ticket management system to provide increased abilities to monitor and manage locate and mark ticket requests and to evaluate and measure performance for meeting time commitments.

SoCalGas has a time requirement to fulfill locate and mark ticket requests. If time requirements are not met, contractors might excavate and could assume no visible marks means no underground facilities conflict with their project. If this occurs, contractors could hit and damage underground gas infrastructure due to the lack of surface markings. By providing enhanced capabilities to monitor and manage ticket request workload, SoCalGas will have the ability to prioritize ticket requests, assign crews, and balance workload among the locate and mark crews. Additionally, the data capture and reporting enhancements can improve SoCalGas's ability to monitor its own processes and identify process improvements. These enhancements work toward improving SoCalGas's performance in meeting the locate and mark timeframe, thereby reducing the potential of contractors digging without knowledge of underground gas infrastructure.

W. Leverage Data Gathered by Locating Equipment

- **C35: MP; C36: HP**

The purpose of leveraging data gathered by locating equipment is to utilize technology to improve how SoCalGas mapping and asset records are updated and improve the accuracy of Locate and Mark Activities. The current locating equipment has the capability of recording information from a locate site. This information could be used to assess the quality of each locate and the relative accuracy of pipe location in the Geographic Information System (GIS). This technology allows locate and mark employees to update Company records by capturing

location coordinates found in the field, which is used to validate existing company records and identify GIS or locating errors.

Correct and accurate pipeline locations reduce the potential for damage to underground facilities caused by excavation. Excavators use markings to inform when to hand expose a pipeline or utilize other safe excavation techniques. Equipment with the latest technology provides an opportunity for more accurate pipeline location and the ability to provide latitude and longitude coordinates to update GIS records. Maintaining an accurate GIS database and records are essential to improve locate and mark quality and mitigate pipeline damage.

X. Pipeline Monitoring Technologies

- **C37: HP**

The Control Center Modernization (CCM) organization will deploy new field pipeline monitoring technologies along existing high consequence area and evacuation challenged areas as well as along new and replaced transmission pipelines. These field monitoring assets (*i.e.*, fiber, methane) will allow Gas Control to better monitor pipelines to more quickly identify and respond to abnormal operating or emergency conditions resulting from a dig-in incident.

These new field pipeline technologies will provide multiple safety and reliability benefits, including, but not limited to:

- Faster response times to incidents and the reduction of severity of incidents due to the ability to monitor and respond to unfolding incidents in real time.
- A centralized and modernized technology will increase operational efficiency and improve the speed and ability to manage incidents which will directly translate to improvement in public and employee safety.

IV. 2022-2024 CONTROL & MITIGATION PLAN

This section contains a table identifying the controls and mitigations comprising the portfolio of mitigations for this risk.[24]

As reflected in Table 6 below, all of the activities discussed in Section III above are expected to continue during the TY 2024 GRC. For clarity, a current activity that is included in the Plan may be referred to as either a control and/or a mitigation. For purposes of this RAMP, a control that will continue as a mitigation will retain its control ID unless the size and/or scope of

[24] *See* D.18-12-014, Attachment A at A-14 ("Mitigation Strategy Presentation in the RAMP and GRC").

that activity will be modified, in which case that activity's control ID will be replaced with a mitigation ID. The table below shows which activities are expected to continue.

Table 6: Control and Mitigation Plan Summary

Line No.	Control/ Mitigation ID	Control/Mitigation Description	2020 Controls	2022-2024 Plan
1	C1	Locate & Mark Training (MP)	X	X
2	C2	Locate & Mark Training (HP)	X	X
3	C3	Locate & Mark Activities (MP)	X	X
4	C4	Locate & Mark Activities (HP)	X	X
5	C5	Locate and Mark Annual Refresher Training and Competency Program (MP)	X	X
6	C6	Locate and Mark Annual Refresher Training and Competency Program (HP)	X	X
7	C7	Locate and Mark Operator Qualification (MP)	X	X
8	C8	Locate and Mark Operator Qualification (HP)	X	X
9	C9	Locate and Mark Quality Assurance Program (MP)	X	X
10	C10	Locate and Mark Quality Assurance Program (HP)	X	X
11	C11	Damage Prevention Analyst Program (MP)	X	X
12	C12	Damage Prevention Analyst Program (HP)	X	X
13	C13	Locating Equipment (MP)	X	X
14	C14	Locating Equipment (HP)	X	X
15	C15 – T1	Public Awareness Compliance - The Affected Public (MP)	X	X
16	C16 – T1	Public Awareness Compliance - The Affected Public (HP)	X	X
17	C15 – T2	Public Awareness Compliance - Emergency Officials (MP)	X	X
18	C16 – T2	Public Awareness Compliance - Emergency Officials (HP)	X	X
19	C15 – T3	Public Awareness Compliance - Local Public Officials (MP)	X	X

Line No.	Control/ Mitigation ID	Control/Mitigation Description	2020 Controls	2022-2024 Plan
20	C16 – T3	Public Awareness Compliance - Local Public Officials (HP)	X	X
21	C15 – T4	Public Awareness Compliance – Excavators (MP)	X	X
22	C16 – T4	Public Awareness Compliance – Excavators (HP)	X	X
23	C17	Increase Reporting of Unsafe Excavation (MP)	X	No
24	C18	Increase Reporting of Unsafe Excavation (HP)	X	No
25	C19	Damage Prevention Policy Activities (MP)	X	X
26	C20	Damage Prevention Policy Activities (HP)	X	X
27	C21	Prevention & Improvements - Fiber Optics (HP)	X	X
28	C22	Gold Shovel Standard Program (MP)	X	X
29	C23	Gold Shovel Standard Program (HP)	X	X
30	C24	Excess Flow Valve or Curb Valve Installation (MP)	X	X
31	C25	Pipeline Patrol and Pipeline Markers (MP)	X	X
32	C26	Pipeline Patrol and Pipeline Markers (HP)	X	X
33	C27	Company Excavator Training (MP)	X	X
34	C28	Company Excavator Training (HP)	X	X
35	C29	Warning Mesh (MP)	X	X
36	C30	Warning Mesh (HP)	X	X
37	C31	Ticket Risk Assessment and Evaluating City Permit Data (MP)	X	X
38	C32	Ticket Risk Assessment and Evaluating City Permit Data (HP)	X	X
39	C33	Enhance Ticket Management Software (MP)	X	X
40	C34	Enhance Ticket Management Software (HP)	X	X

Line No.	Control/ Mitigation ID	Control/Mitigation Description	2020 Controls	2022-2024 Plan
41	C35	Leverage Data Gathered by Locating Equipment (MP)	X	X
42	C36	Leverage Data Gathered by Locating Equipment (HP)	X	X
43	C37	Pipeline Monitoring Technologies (HP)	X	X
44	M1	Automate Third Party Excavation Incident Reporting (MP)	-	X
45	M2	Automate Third Party Excavation Incident Reporting (HP)	-	X
46	M3	Locate and Mark Photographs (MP)	-	X
47	M4	Locate and Mark Photographs (HP)	-	X
48	M5	Electronic Positive Response (MP)	-	X
49	M6	Electronic Positive Response (HP)	-	X
50	M7	Leverage Technology for Difficult Locates (MP)	-	X
51	M8	Leverage Technology for Difficult Locates (HP)	-	X
52	M9	Outreach for Latent 3rd Party Damages (MP)	-	X
53	M10	Outreach for Latent 3rd Party Damages (HP)	-	X

For activities SoCalGas plans to perform that remain unchanged, please refer to the description in Section III. If changes to the various activities are anticipated, such modifications are further described in this section below.

A. Changes to 2020 Controls

SoCalGas plans to continue each of the existing mitigations discussed above in Section III through the 2022 – 2024 period without any significant changes.

B. 2022 – 2024 Mitigations

1. Automate Third Party Excavation Incident Reporting

- **M1: MP; M2: HP**

Automating Third Party Excavation incident reporting into one system will centralize the reporting and data analysis. This will assist with meeting compliance reporting obligations, develop a better understanding of the data collected in an investigation, simplify reporting, and

enhance data analysis processes. SoCalGas is mandated by Title 49 Code of Federal Regulation section 192.614, and California Government Code, section 4216, to collect data on third Party Excavation Incidents.

Automating Third Party Excavation incident reporting is an effort to consolidate and simplify the data collection process involved in investigating a gas incident. Field supervisors complete the investigations of gas incidents. Currently, there are multiple systems and processes used to capture and report data, internally and externally, for a gas incident. All systems and processes might not be updated simultaneously, thereby creating additional manual steps when using the data for internal analysis for process improvements, or to generate reports for internal or external stakeholders. SoCalGas is undertaking an initiative to centralize these processes and systems into one system of record to minimize data quality issues, simplify reporting, and standardize data collection with field supervisors.

Standardizing data collection into one system will centralize reporting and data analysis, assist with meeting compliance reporting obligations, develop a better understanding of data collected in an investigation, simplify reporting, and enhance data analysis processes. This will facilitate improvements in SoCalGas's accuracy and timeliness in locating and marking its infrastructure.

2. Locate and Mark Photographs

- **M3: MP; M4: HP**

Recording photographs for each locate and mark ticket visited by locators is planned for all SoCalGas's above- and belowground facilities in the service territory. These pictures will help audit the quality of locates and provide an opportunity to improve future locate and mark ticket requests for previous locations.

The purpose of recording photographs of each locate and mark ticket is to improve the accuracy of the locating activity and to inform process improvements based on investigations of gas incidents and quality assurance audits. By having a record of the locate marks, SoCalGas can assess QA activities and improve investigations of gas incidents. Photographs could show incorrect markings or GIS mapping which could be used to improve employee training and update GIS data. The benefits of this mitigation are to improve locate and mark accuracy and mitigate gas infrastructure damage.

3. Electronic Positive Response

- **M5: MP; M6: HP**

Electronic positive response is an electronic response provided to the regional notification center (DigAlert and USA North) that informs the excavator, prior to the excavation date, that the facility has been marked or there is no conflict with the proposed excavation area. Electronic positive response is utilized throughout SoCalGas's territory. All excavations utilizing electronic positive response poses the same safety risk and a single tranche is appropriate.

SoCalGas is required to locate and mark its underground infrastructure within two business days after receiving an 811 USA locate and mark ticket request. Implementing a positive response feature with the regional notification centers, such as USA North and DigAlert, improves communication between SoCalGas and excavating contractors. The system will inform the contractor that the utility has completed its task or, alternatively, will inform the excavator there is no conflict with gas infrastructure in the excavation area. The system also provides a way to communicate stand-by requirements and notification if the locate task was incomplete due to weather or accessibility issues.

This program requires participation from contractors and SoCalGas. It will mitigate potential damage to gas infrastructure due to miscommunication between the contractors and SoCalGas. This is especially important in situations where the utility could not provide markings within the required timeframe and the contractor assumes no conflict with gas infrastructure because no marks are present. Without pipeline markings, the contractor may not exercise safe excavation techniques and damage gas infrastructure.

4. Leverage Technology for Difficult Locates

- **M7: MP; M8: HP**

Vacuum excavation technology is an example of a hydro excavation tool that can be deployed to find the location of pipelines when they are difficult to locate because of interference or other reasons. The technology is a safe alternative to hand tools to locate and prevent damage to unknown pipeline locations. Vacuum excavation is utilized on an as-needed, case-by-case basis during Locate and Mark Activities or in a proactive way in areas that are historically known to have pipelines that are hard to locate. Vacuum excavation is applicable to areas in

SoCalGas's territory. All excavations utilizing vacuum excavation technology address the same risk profile therefore a single tranche is appropriate.

At times, employees cannot accurately locate pipelines using standard tools available. In these instances, SoCalGas will work with the requesting contractor to help fulfill the request without creating an unsafe situation. SoCalGas will establish a process to work with the excavator to utilize various alternatives to locate gas facilities or enhance safe-digging technologies. These alternatives include standing-by and observing contractors as they perform their excavations or using other tools such as a Jameson locator or utilizing vacuum technology that can expose the pipe for visual verification.

Using locating tools that can provide the actual location of gas infrastructure by safely exposing the pipe will provide the most accurate location of the gas infrastructure. With this knowledge, the contractor is aware of when to exercise safe excavation techniques and Company records can be updated with the exact location of the pipeline. Both benefits will work toward reducing the potential for damage to underground pipelines for current and future projects.

5. Outreach for Latent 3rd Party Damages

- **M9: MP; M10: HP**

This mitigation encompasses the efforts to identify and communicate with excavators who may have damaged a SoCalGas underground facility without complying with safe excavation laws and best practices.

Occasionally, during routine activities, SoCalGas will expose a section of underground piping and upon visual inspection determine that previously unknown damage has occurred. SoCalGas was likely unaware of the excavation activity and thus was not onsite to perform the required stand-by activities. To identify excavators who may have conducted the excavation, further investigations would be required to determine if any USA tickets or excavation/construction permits had been valid in the area over a given time period. This would include communication and information requests with the Regional Notification Center and any local jurisdiction who may have issued a permit. Follow-up communications would then be made to these excavators to remind them of the safe excavation law requirements and best practices along with an offer to conduct a safe excavation training event at their facilities for their employees and management to attend. Additionally, information would be provided

regarding the potential enforcement actions that can be taken by the Dig-Safe Board Investigation department and the Contractor State Licensing Board.

The benefits for this activity would be to continue to educate the excavator community on the importance in following the laws and best practices in order to prevent unintended consequences that can be attributed to unsafe excavations.

V. COST, UNITS, AND QUANTITATIVE SUMMARY TABLES

The tables in this section provide a summary of the risk control and mitigation plan, including the associated costs, units, and the RSEs, by tranche. When an RSE could not be performed, an explanation is provided. SoCalGas does not account for and track costs by activity or tranche; rather, SoCalGas accounts for and tracks costs by cost center and capital budget code. The costs shown were estimated using assumptions provided by SMEs and available accounting data.

Table 7: Risk Control and Mitigation Plan - Recorded and Forecast Dollars Summary[25] (Direct After Allocations, In 2020 $000)

ID	Control/ Mitigation Name	Recorded Dollars		Forecast Dollars			
		2020 Capital[26]	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
C1	Locate & Mark Training (MP)	-	416	-	-	426	515
C2	Locate & Mark Training (HP)	-	37	-	-	36	43
C3	Locate & Mark Activities (MP)	-	18,395	-	-	19,062	23,076
C4	Locate & Mark Activities (HP)	-	4,113	-	-	4,346	5,261

[25] Recorded costs and forecast ranges are rounded. Additional cost-related information is provided in workpapers. Costs presented in the workpapers may differ from this table due to rounding. The figures provided are direct charges and do not include company loaders, with the exception of vacation and sick. The costs are also in 2020 dollar and have not been escalated to 2021 amounts. The capital presented is the sum of the years 2022, 2023, and 2024, or a three-year total. Years 2022, 2023 and 2024 are the forecast years for SoCalGas's Test Year 2024 GRC Application.

[26] Pursuant to D.14-12-025 and D.16-08-018, the Company provides the 2020 "baseline" capital costs associated with Controls. The 2020 capital amounts are for illustrative purposes only. Because capital programs generally span several years, considering only one year of capital may not represent the entire activity.

ID	Control/ Mitigation Name	Recorded Dollars		Forecast Dollars			
		2020 Capital[26]	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
C5	Locate and Mark Annual Refresher Training and Competency Program (MP)	-	47	-	-	49	59
C6	Locate and Mark Annual Refresher Training and Competency Program (HP)	-	13	-	-	14	16
C7	Locate and Mark Operator Qualification (MP)	-	118	-	-	120	145
C8	Locate and Mark Operator Qualification (HP)	-	28	-	-	29	35
C9	Locate and Mark Quality Assurance Program (MP)	-	2,004	-	-	1,902	2,302
C10	Locate and Mark Quality Assurance Program (HP)	-	387	-	-	367	444
C11	Damage Prevention Analyst Program (MP)	-	470	-	-	1,745	2,230
C12	Damage Prevention Analyst Program (HP)	-	112	-	-	345	440
C13	Locating Equipment (MP)	2,874	-	16,236	19,654	-	-
C14	Locating Equipment (HP)	686	-	3,877	4,693	-	-
C15-T1	Public Awareness Compliance - The Affected Public (MP)	-	327	-	-	785	951
C16-T1	Public Awareness Compliance - The Affected Public (HP)	-	78	-	-	188	227

ID	Control/ Mitigation Name	Recorded Dollars		Forecast Dollars			
		2020 Capital[26]	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
C15-T2	Public Awareness Compliance - Emergency Officials (MP)	-	2	-	-	13	16
C16-T2	Public Awareness Compliance - Emergency Officials (HP)	-	0	-	-	3	4
C15-T3	Public Awareness Compliance - Local Public Officials (MP)	-	1	-	-	20	25
C16-T3	Public Awareness Compliance - Local Public Officials (HP)	-	0	-	-	5	6
C15-T4	Public Awareness Compliance – Excavators (MP)	-	303	-	-	228	276
C16-T4	Public Awareness Compliance – Excavators (HP)	-	72	-	-	54	66
C19	Damage Prevention Policy Activities (MP)	-	1	-	-	1	1
C20	Damage Prevention Policy Activities (HP)	-	0	-	-	0	0
C21	Prevention & Improvements-Fiber Optics (HP)	-	-	7,577	9,172	-	-
C22	Gold Shovel Standard Program (MP)	-	2	-	-	2	3
C23	Gold Shovel Standard Program (HP)	-	0	-	-	0	1
C24	Excess Flow Valve or Curb Valve Installation	915	-	2,383	3,045	-	-

ID	Control/ Mitigation Name	Recorded Dollars		Forecast Dollars			
		2020 Capital[26]	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
C25	Pipeline Patrol and Pipeline Markers (MP)	-	83	-	-	79	101
C26	Pipeline Patrol and Pipeline Markers (HP)	-	459	-	-	451	576
C27	Company Excavator Training (MP)	-	217	-	-	321	411
C28	Company Excavator Training (HP)	-	34	-	-	36	47
C29	Warning Mesh (MP)	273	-	753	911	-	-
C30	Warning Mesh (HP)	65	-	180	218	-	-
C31	Ticket Risk Assessment and Evaluating City Permit Data (MP)	-	310	-	-	181	232
C32	Ticket Risk Assessment and Evaluating City Permit Data (HP)		74	-	-	43	55
C33	Enhance Ticket Management Software (MP)	179	6	465	594	7	8
C34	Enhance Ticket Management Software (HP)	43	2	111	142	2	2
C35	Leverage Data Gathered by Locating Equipment (MP)	124	-	355	454	-	-
C36	Leverage Data Gathered by Locating Equipment (HP)	30	-	85	108	-	-
C37	Pipeline Monitoring Technologies (HP)	43	-	5,378	7,768	169	244
M1	Automate Third Party Excavation Incident Reporting (MP)	-	-	-	-	63	80

ID	Control/ Mitigation Name	Recorded Dollars		Forecast Dollars			
		2020 Capital[26]	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
M2	Automate Third Party Excavation Incident Reporting (HP)	-	-	-	-	15	19
M3	Locate and Mark Photographs (MP)	-	-	-	-	392	501
M4	Locate and Mark Photographs (HP)	-	-	-	-	87	112
M5	Electronic Positive Response (MP)	-	-	Included with C33		-	-
M6	Electronic Positive Response (HP)	-	-	Included with C34		-	-
M7	Leverage Technology for Difficult Locates (MP)	-	-	Included with C35		-	-
M8	Leverage Technology for Difficult Locates (HP)	-	-	Included with C36		-	-
M9	Outreach for Latent 3rd Party Damages (MP)	-	-	-	-	16	21
M10	Outreach for Latent 3rd Party Damages (HP)	-	-	-	-	4	5

Table 8: Risk Control & Mitigation Plan - Units Summary

ID	Control/Mitigation Name	Units Description		2022-2024 Capital (Low)	2022-2024 Capital (High)	Forecast Units	
		Capital[27]	O&M			TY 2024 (Low) O&M	TY 2024 O&M (High)
C1	Locate & Mark Training (MP)	Training Hours		-	-	6,363	7,702
C2	Locate & Mark Training (HP)	Training Hours		-	-	543	657
C3	Locate & Mark Activities (MP)	Ticket Count		-	-	805,392	974,949
C4	Locate & Mark Activities (HP)	Ticket Count		-	-	192,324	232,813
C5	Locate and Mark Annual Refresher Training and Competency Program (MP)	Training Hours		-	-	863	1,044
C6	Locate and Mark Annual Refresher Training and Competency Program (HP)	Training Hours		-	-	244	295
C7	Locate and Mark Operator Qualification (MP)	FTE Headcount		-	-	1	1
C8	Locate and Mark Operator Qualification (HP)	The units for this control are included in C7.					
C9	Locate and Mark Quality Assurance Program (MP)	Program		1	1	1	1
C10	Locate and Mark Quality Assurance Program (HP)	The units for this control are included in C9.					
C11	Damage Prevention Analyst Program (MP)	FTE Headcount		-	-	10	13

[27] Pursuant to D.14-12-025 and D.16-08-018, the Company provides the 2020 "baseline" capital costs associated with Controls. The 2020 capital amounts are for illustrative purposes only. Because capital programs generally span several years, considering only one year of capital may not represent the entire activity.

ID	Control/Mitigation Name	Units Description				Forecast Units	
		Capital[27]	O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 O&M (High)
C12	Damage Prevention Analyst Program (HP)	The units for this control are included in C11.					
C13	Locating Equipment (MP)	This control comprises costs from pieces of equipment of varying prices. As a result, units cannot be calculated.					
C14	Locating Equipment (HP)	This control comprises costs from pieces of equipment of varying prices. As a result, units cannot be calculated.					
C15-T1	Public Awareness Compliance - The Affected Public (MP)	Number of Communications Sent		-	-	5,656,392	6,847,211
C16-T1	Public Awareness Compliance - The Affected Public (HP)	Number of Communications Sent				1,350,720	1,635,082
C15-T2	Public Awareness Compliance - Emergency Officials (MP)	Number of Communications Sent		-	-	1,845	2,234
C16-T2	Public Awareness Compliance - Emergency Officials (HP)	Number of Communications Sent				417	533
C15-T3	Public Awareness Compliance - Local Public Officials (MP)	Number of Communications Sent		-	-	2,223	2,840
C16-T3	Public Awareness Compliance - Local Public Officials (HP)	Number of Communications Sent				531	678
C15-T4	Public Awareness Compliance – Excavators (MP)	Number of Communications Sent		-	-	258,518	312,943
C16-T4	Public Awareness Compliance – Excavators (HP)	Number of Communications Sent				61,733	74,729
C19	Damage Prevention Policy Activities (MP)	This control contains numerous cost types. As a result, units cannot be calculated.					

ID	Control/Mitigation Name	Units Description				Forecast Units	
		Capital[27]	O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 O&M (High)
C20	Damage Prevention Policy Activities (HP)	This control contains numerous cost types. As a result, units cannot be calculated.					
C21	Prevention & Improvements-Fiber Optics (HP)	This control contains numerous cost types. As a result, units cannot be calculated.					
C22	Gold Shovel Standard Program (MP)	Memberships		-	-	1	1
C23	Gold Shovel Standard Program (HP)	The units are included in C22					
C24	Excess Flow Valve or Curb Valve Installation (MP)	Number of Installations		94,659	120,953	-	-
C25	Pipeline Patrol and Pipeline Markers (MP)	The units are included in C26					
C26	Pipeline Patrol and Pipeline Markers (HP)	Number of Items		-	-	2,181	2,640
C27	Company Excavator Training (MP)	Training Hours		-	-	5,376	6,508
C28	Company Excavator Training (HP)	Training Hours		-	-	620	750
C29	Warning Mesh (MP)	Number of Warning Mesh Rolls		14,243	17,242	-	-
C30	Warning Mesh (HP)	Number of Warning Mesh Rolls		3,400	4,117		
C31	Ticket Risk Assessment and Evaluating City Permit Data (MP)	FTE Headcount				5	7
C32	Ticket Risk Assessment and Evaluating City Permit Data (HP)	FTE Headcount		-	-	1	2
C33	Enhance Ticket Management Software (MP)	This control contains numerous cost types. As a result, units cannot be calculated.					

ID	Control/Mitigation Name	Units Description				Forecast Units	
		Capital[27]	O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 O&M (High)
C34	Enhance Ticket Management Software (HP)	This control contains numerous cost types. As a result, units cannot be calculated.					
C35	Leverage Data Gathered by Locating Equipment (MP)	This control contains numerous cost types. As a result, units cannot be calculated.					
C36	Leverage Data Gathered by Locating Equipment (HP)	This control contains numerous cost types. As a result, units cannot be calculated.					
C37	Pipeline Monitoring Technologies (HP)	Fiber		3	3	3	4
M1	Automate Third Party Excavation Incident Reporting (MP)	This mitigation contains numerous cost types. As a result, units cannot be calculated.					
M2	Automate Third Party Excavation Incident Reporting (HP)	This mitigation contains numerous cost types. As a result, units cannot be calculated.					
M3	Locate and Mark Photographs (MP)	FTE Headcount		-	-	5	6
M4	Locate and Mark Photographs (HP)	FTE Headcount		-	-	1	1
M5	Electronic Positive Response (MP)	The units are included with C33.					
M6	Electronic Positive Response (HP)	The units are included with C34.					
M7	Leverage Technology for Difficult Locates (MP)	The units are included with C35.					
M8	Leverage Technology for Difficult Locates (HP)	The units are included with C36.					
M9	Outreach for Latent 3rd Party Damages (MP)	This mitigation contains numerous cost types. As a result, units cannot be calculated.					

ID	Control/Mitigation Name	Units Description				Forecast Units	
		Capital[27]	O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 O&M (High)
M10	Outreach for Latent 3rd Party Damages (HP)	This mitigation contains numerous cost types. As a result, units cannot be calculated.					

Table 9: Risk Control & Mitigation Plan - Quantitative Analysis Summary (Direct After Allocations, In 2020 $000)

ID	Control/Mitigation Name	LoRE	CoRE	Risk Score	RSE
C1	Locate & Mark Training (MP)	See Table 10			
C2	Locate & Mark Training (HP)	See Table 10			
C3	Locate & Mark Activities (MP)	32351	0.52	16911	767
C4	Locate & Mark Activities (HP)	0.62	3114	1930	55
C5	Locate and Mark Annual Refresher Training and Competency Program (MP)	2912	0.52	1522	23.1
C6	Locate and Mark Annual Refresher Training and Competency Program (HP)	0.7	3114	2178	121
C7	Locate and Mark Operator Qualification (MP)	See Table 10			
C8	Locate and Mark Operator Qualification (HP)	See Table 10			
C9	Locate and Mark Quality Assurance Program (MP)	0.7	3114	2172	21
C10	Locate and Mark Quality Assurance Program (HP)	2903	0.52	1518	3
C11	Damage Prevention Analyst Program (MP)	2777	0.52	1451	48
C12	Damage Prevention Analyst Program (HP)	0.7	6114	2169	36

ID	Control/Mitigation Name	LoRE	CoRE	Risk Score	RSE
C13	Locating Equipment (MP)	2747	0.52	1436	24
C14	Locating Equipment (HP)	0.69	3114	2153	31
C15-T1	Public Awareness Compliance - The Affected Public (MP)	2874	0.52	1503	25
C16-T1	Public Awareness Compliance - The Affected Public (HP)	0.7	3114	2173	34
C15-T2	Public Awareness Compliance - Emergency Officials (MP)	2914	0.52	1523	14
C16-T2	Public Awareness Compliance - Emergency Officials (HP)	0.7	3114	2180	22
C15-T3	Public Awareness Compliance - Local Public Officials (MP)	2911	0.52	1522	63
C16-T3	Public Awareness Compliance - Local Public Officials (HP)	0.7	3114	2180	97
C15-T4	Public Awareness Compliance – Excavators (MP)	2890	0.52	1511	52
C16-T4	Public Awareness Compliance – Excavators (HP)	0.7	3114	2176	78
C19	Damage Prevention Policy Activities (MP)	See Table 10			
C20	Damage Prevention Policy Activities (HP)	See Table 10			
C21	Prevention & Improvements-Fiber Optics (HP)	0.7	3114	2175	10
C22	Gold Shovel Standard Program (MP)	See Table 10			
C23	Gold Shovel Standard Program (HP)	See Table 10			
C24	Excess Flow Valve or Curb Valve Installation (MP)	2895	0.52	1514	105
C25	Pipeline Patrol and Pipeline Markers (MP)	2904	0.52	1518	62

ID	Control/Mitigation Name	LoRE	CoRE	Risk Score	RSE
C26	Pipeline Patrol and Pipeline Markers (HP)	0.69	3114	2161	39
C27	Company Excavator Training (MP)	See Table 10			
C28	Company Excavator Training (HP)	See Table 10			
C29	Warning Mesh (MP)	2913	0.52	1523	19
C30	Warning Mesh (HP)	0.707	3114	2177	484
C31	Ticket Risk Assessment and Evaluating City Permit Data (MP)	2914	0.52	1523	1
C32	Ticket Risk Assessment and Evaluating City Permit Data (HP)	0.7	3114.36	2180	10
C33	Enhance Ticket Management Software (MP)	2895	0.52	1513	86
C34	Enhance Ticket Management Software (HP)	0.7	3114	2177	115
C35	Leverage Data Gathered by Locating Equipment (MP)	2914	0.52	1523	4
C36	Leverage Data Gathered by Locating Equipment (HP)	0.7	3114	218	2
C37	Pipeline Monitoring Technologies (HP)	See Table 10			
M1	Automate Third Party Excavation Incident Reporting (MP)	2911	0.52	1522	58
M2	Automate Third Party Excavation Incident Reporting (HP)	0.7	3114	2180	70
M3	Locate and Mark Photographs (MP)	2914	0.52	1523	13
M4	Locate and Mark Photographs (HP)	0.7	3114	2180	20
M5	Electronic Positive Response (MP)	Included in C33			
M6	Electronic Positive Response (HP)	Included in C34			
M7	Leverage Technology for Difficult Locates (MP)	Included in C35			

ID	Control/Mitigation Name	LoRE	CoRE	Risk Score	RSE
M8	Leverage Technology for Difficult Locates (HP)	Included in C36			
M9	Outreach for Latent 3rd Party Damages (MP)	See Table 10			
M10	Outreach for Latent 3rd Party Damages (HP)	See Table 10			

Table 10: Risk Control & Mitigation Plan - Quantitative Analysis Summary for RSE Unavailability

ID	Control/Mitigation Name	RSE Unavailability
C1	Locate & Mark Training (MP)	Providing Locator training is standard practice across the industry. The need for in-depth knowledge of the use of proper tools and resources is paramount for the efficient and accurate application of L&M procedures. There are no known sources to find data associated with operators who do not have a training program and SMEs are unable to reliably speculate on the quantitative benefits of training.
C2	Locate & Mark Training (HP)	Providing Locator training is standard practice across the industry. The need for in-depth knowledge for the use of proper tools and resources is paramount for the efficient and accurate application of L&M procedures. There are no known sources to find data associated with operators who do not have a training program and SMEs are unable to reliably speculate on the quantitative benefits of training.
C7	Locate and Mark Operator Qualification (MP)	Locate & Mark Activities are "covered tasks" as defined in 49 CFR 192.801. As such the Op Qual program is required for all individuals performing the tasks. The program was mandated in 2004. Data representing the status of the L&M program before that time is not available to provide comparison to

ID	Control/Mitigation Name	RSE Unavailability
		the pre-Op Qual environment, and SMEs are unable to reliably speculate on the quantitative benefits of this longstanding program.
C8	Locate and Mark Operator Qualification (HP)	Locate & Mark Activities are "covered tasks" as defined in 49 CFR 192.801. As such the Op Qual program is required for all individuals performing the tasks. The program was mandated in 2004. Data representing the status of the L&M program before that time is not available to provide comparison to the pre-Op Qual environment, and SMEs are not able to speculate on the quantitative benefits of this longstanding program.
C19	Damage Prevention Policy Activities (MP)	This activity involves the proactive participation at meetings and workshops with the Dig-Safe Board, CARGA, both California One-Call centers, and meetings with State Assembly and Senator staff to advocate from the Operator/Excavator perspective, for sensible and comprehensive enhancements to state laws and regulations. Participation provides the opportunity to make positive and beneficial changes. Choosing not to participate could lead to poor, costly, and ineffective regulations. The Damage Prevention Strategies group began this activity in 2018 and are not aware of meaningful data that would provide for an RSE calculation at this time. SMEs are unable to quantify the benefits of this activity.
C20	Damage Prevention Policy Activities (HP)	This activity involves the proactive participation at meetings and workshops with the Dig-Safe Board, CARCGA, both California One-Call centers, and meetings with State Assembly and Senator staff to advocate, from the Operator/Excavator perspective, for sensible and comprehensive enhancements to state laws and regulations. Participation provides the opportunity to make positive and beneficial changes. Choosing not to participate could lead to poor, costly, and ineffective regulations. The

ID	Control/Mitigation Name	RSE Unavailability
		Damage Prevention Strategies group began this activity in 2018 and are not aware of meaningful data that would provide for an RSE calculation at this time. SMEs are unable to quantify the benefits of this activity.
C22	Gold Shovel Standard Program (MP)	Participation in this program is one component of SoCalGas's contractor performance management program and applies to a small subset of the excavator community – those contractors who perform construction work on SoCalGas's behalf. SoCalGas has been working with the GSS organization to develop useful metrics, but is currently unaware of their availability. SMEs are unable to quantify the benefits of this program.
C23	Gold Shovel Standard Program (HP)	Participation in this program is one component of SoCalGas's contractor performance management program and applies to a small subset of the excavator community, those contractors who perform construction work on SoCalGas's behalf. SoCalGas has been working with the GSS organization to develop useful metrics but is currently unaware of their availability currently. SMEs are unable to quantify the benefits of this program.
C25	Pipeline Patrol and Pipeline Markers (MP)	Pipeline Patrol and Pipeline Markers for medium pressure lines are both activities with specific federal requirements (49 CFR 192.707, 192,721). For Dig-Ins, frequent patrolling seeks to identify and mitigate undesirable encroachments to the pipeline. Patrolling also validates and/or mitigates for proper placement of pipeline markers to help communicate the presence of underground gas pipelines to avoid rogue excavation and prevent damages. These are both industry requirements and standard operating practices. No known data is available to provide damage prevention information without having these programs in place, and SMEs are unable to reliably speculating on the quantitative benefits of these activities.

ID	Control/Mitigation Name	RSE Unavailability
C26	Pipeline Patrol and Pipeline Markers (HP)	Pipeline Patrol and Pipeline Markers for high pressure lines are both activities with specific federal requirements (49CFR192.705, 192,707). For Dig-Ins, frequent patrolling seeks to identify and mitigate undesirable encroachments to the pipeline. Patrolling also validates and/or mitigates for proper placement of pipeline markers to help communicate the presence of underground gas pipelines to avoid rogue excavation and prevent damages. These are both industry requirements and standard operating practices. No known data is available to provide damage prevention information without having these programs in place. No known data is available to provide damage prevention information without having these programs in place, and SMEs are unable to reliably speculate as to the quantitative benefits of these activities.
C27	Company Excavator Training (MP)	Providing training is a common, necessary, and expected practice regardless of the industry. It is important to properly train employees on the safe use of excavation implements or machines. When working around a hazardous material, such as natural gas, many safety practices and protocols have been developed internally and by institutions such as OSHA to promote safety and personal wellbeing. It is unknown where data can be found to represent an entity that does not provide adequate training, and SMEs cannot determine the quantitative effects of these activities.
C28	Company Excavator Training (HP)	Providing training is a common, necessary, and expected practice regardless of the industry. It is important to properly train employees on the safe use of excavation implements or machines . When working around a hazardous material such as natural gas, many safety practices and protocols have been developed internally and by institutions such as OSHA to promote safety and personal wellbeing. It is unknown where data can be found to represent an

ID	Control/Mitigation Name	RSE Unavailability
		entity that does not provide adequate training, and SMEs cannot determine the quantitative effects of these activities.
M5	Electronic Positive Response (MP)	The data associated with Electronic Positive Response is closely integrated with and therefore included within the RSE for C-33 Enhance Ticket Management Software (MP)
M6	Electronic Positive Response (HP)	The data associated with Electronic Positive Response is closely integrated with and therefore included within the RSE for C-33 Enhance Ticket Management Software (HP)
M7	Leverage Technology for Difficult Locates (MP)	RSE is included in C-35 Leverage Data Gathered by Locating Equipment (MP)
M8	Leverage Technology for Difficult Locates (HP)	RSE is included in C-36 Leverage Data Gathered by Locating Equipment (HP)
M9	Outreach for Latent 3rd Party Damages (MP)	This is a new mitigation with no historical data. SoCalGas's intent is to attempt to identify an excavator who damaged a pipeline in the past (via historic permit or USA ticket information) to provide the opportunity for outreach and education to minimize or prevent a similar occurrence in the future. With no historical data to provide any indication for a potential success rate, calculation of an RSE is infeasible, as it would require SME speculation about this activity.
M10	Outreach for Latent 3rd Party Damages (HP)	This is a new mitigation with no historical data. The intent is to attempt to identify an excavator who damaged a pipeline in the past (via historic permit or USA ticket information) to provide the opportunity for outreach and education to minimize or prevent a similar occurrence in the future. With no

ID	Control/Mitigation Name	RSE Unavailability
		historical data to provide any indication for a potential success rate, calculation of an RSE is infeasible, as it would require SME speculation about this activity.
C37	Pipeline Monitoring Technologies (HP)	Increasing the ability to monitor and control the natural gas system is a prudent safety and reliability measure for California's energy grid. The CCM will allow for the system to be controlled or isolated faster in the event of a system incident. Likewise, the CCM will allow for potential issues in the system to be identified sooner, as opposed to patrols or a system with fewer monitor points, and potentially resolved before becoming an incident. This can include dig-in detection and response, over/under pressure awareness and response as well as increased flexibility to respond to the varying demands on the system throughout the year. Increased remote control can also alleviate employee exposure while operating equipment prior to, during or after an incident. Overall, the CCM will decrease the consequences of system incidents through the opportunity for quicker identification, more timely response, and fewer human asset involvement in potentially hazardous conditions. Since the CCM is still in the design phase and not operational yet, there is no historical data available to develop an RSE for the risk mitigations of Dig-Ins, and SME input cannot fill the information gap.

VI. ALTERNATIVES

Pursuant to D.14-12-025 and D.16-08-018, SoCalGas considered alternatives to the risk control and mitigation plan for the Dig-in on the System risk. Typically, analysis of alternatives occurs when implementing activities to obtain the best result or product for the cost. The alternatives analysis for this risk control and mitigation plan also took into account modifications to the plan and constraints, such as budget and resources.

A. A1: Virtual Reality Training

The virtual reality Locate and Mark training simulator provides a portable and scenario-based training system. It allows for instructors to simulate a variety of real-world locate and mark scenarios. Virtual reality provides more flexibility in training curriculum and allows for more focused educational opportunities. More research is needed to identify system requirements and standardization scores, and identify impacts to existing locate equipment and performance management software.

B. A2: GPS Tracking of Excavation Equipment

SoCalGas has supported the Gas Technology Institute (GTI) and other research organizations in their efforts to help the industry improve damage prevention practices. Past and ongoing efforts included real-time GPS tracking of excavation equipment operating in pipeline rights-of-way and quick-shut breakaway meter set valves.

Real-time tracking of excavation is done using a “black box” attached to the excavation equipment such as a backhoe, grader, etc. The black box monitors the location of the equipment and can sense when the equipment is getting ready to dig. There is sophisticated software that monitors the GPS data in relation to its proximity to spatial pipe locations. If the box is detected near a Company asset, then an alarm is triggered on the equipment alerting the equipment operator that there is a pipeline in the area. There is also an alert that is sent to the Company, so action may be taken to investigate the location.

The technology is not being pursued currently as the initial experience demonstrated false positives. Follow-up is needed to validate technology maturity.

Table 11: Alternate Mitigation Plan - Forecast Dollars Summary[28]
(Direct After Allocations, In 2020 $000)

ID	Alternate Mitigation Name	Forecast Dollars			
		2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
A1	Virtual Reality Training	-	-	94	120
A2	GPS Tracking of Excavation Equipment	-	-	306	391

Table 12: Risk Control & Mitigation Plan - Units Summary

IID	Control/Mitigation Name	Units Description		Forecast Units			
		Capital	O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
A1	Virtual Reality Training (MP)	This mitigation contains numerous cost types. As a result, units cannot be calculated.					
A2	GPS Tracking of Excavation Equipment	This mitigation contains numerous cost types. As a result, units cannot be calculated.					

Table 13: Alternate Mitigation Plan - Quantitative Analysis Summary
(Direct After Allocations, In 2020 $000)

ID	Control/Mitigation Name	Forecast			
		LoRE	CoRE	Risk S	RSE
AA1	Virtual Reality Training (MP)	2914	0.52	1523	0.1
AA2	Virtual Reality Training (HP)	0.7	3114	2180	0.009
AA3	GPS Tracking of Excavation Equipment (MP)	2914	0.52	1523	0.1
A4	GPS Tracking of Excavation Equipment (HP)	0.7	3114	2180	0.003

[28] Recorded costs and forecast ranges are rounded. Additional cost-related information is provided in workpapers. Costs presented in the workpapers may differ from this table due to rounding. The figures provided are direct charges and do not include company loaders, with the exception of vacation and sick. The costs are also in 2020 dollar amounts and have not been escalated to 2021 amounts. The capital presented is the sum of the years 2022, 2023, and 2024, or a three-year total. Years 2022, 2023 and 2024 are the forecast years for SoCalGas's Test Year 2024 GRC Application.

APPENDIX A: SUMMARY OF ELEMENTS OF THE RISK BOW TIE

APPENDIX A: SUMMARY OF ELEMENTS OF THE RISK BOW TIE

Table 14: Dig-in on the System: Summary of Elements of the Risk Bow Tie

ID	Control/Mitigation Name	Elements of the Risk Bow Tie Addressed
C1	Locate & Mark Training (MP)	DT.4, DT.5, DT.6, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C2	Locate & Mark Training (HP)	DT.4, DT.5, DT.6, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C3	Locate & Mark Activities (MP)	DT.4, DT.6, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C4	Locate & Mark Activities (HP)	DT.4, DT.6, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C5	Locate and Mark Annual Refresher Training and Competency Program (MP)	DT.4, DT.5, DT.6, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C6	Locate and Mark Annual Refresher Training and Competency Program (HP)	DT.4, DT.5, DT.6, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C7	Locate and Mark Operator Qualification (MP)	DT.4, DT.5, DT.6, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C8	Locate and Mark Operator Qualification (HP)	DT.4, DT.5, DT.6, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C9	Locate and Mark Quality Assurance (MP)	DT.4, DT.5, DT.6, DT. 8, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C10	Locate and Mark Quality Assurance Program (HP)	DT.4, DT.5, DT.6, DT. 8, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C11	Damage Prevention Analyst Program (MP)	DT.1, DT.2, DT.6, DT.3, DT.4, DT.5, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C12	Damage Prevention Analyst Program (HP)	DT.1, DT.2, DT.3, DT.4, DT.5, DT.6, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C13	Locating Equipment (MP)	DT.4, DT.6, DT.7, DT.8, DT.9, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C14	Locating Equipment (HP)	DT.4, DT.6, DT.7, DT.8, DT.9, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6

ID	Control/Mitigation Name	Elements of the Risk Bow Tie Addressed
C15-T1	Public Awareness – Affected Public (MP)	DT.1, DT.3, DT.6, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C16-T1	Public Awareness – Affected Public (HP)	DT.1, DT.3, DT.2, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C15-T2	Public Awareness – Emergency Officials (MP)	DT.1, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C16-T2	Public Awareness – Emergency Officials (HP)	DT.1, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C15-T3	Public Awareness – Local Public Officials (MP)	DT.1, DT.3, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C16-T3	Public Awareness – Local Public Officials (HP)	DT.1, DT.3, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C15-T4	Public Awareness – Excavators (MP)	DT.1, DT.3, DT.6, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C16-T4	Public Awareness – Excavators (HP)	DT.1, DT.2, DT.3, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C17	Increase Reporting of Unsafe Excavation (MP)	DT.1, DT.2, DT.3, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C18	Increase Reporting of Unsafe Excavation (HP)	DT.1, DT.2, DT.3, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C19	Damage Prevention Policy (MP)	DT.1, DT.2, DT.3, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C20	Damage Prevention Policy (HP)	DT.1, DT.2, DT.3, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C21	Prevention & Improvements-Fiber Optics (HP)	DT. 1, DT. 2, DT. 3, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C22	Gold Shovel Standard Program (MP)	DT.1, DT.2, DT.3, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C23	Gold Shovel Standard Program (HP)	DT.1, DT.2, DT.3, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C24	Excess Flow Valve or Curb Valve Installation (MP)	DT.1, DT.3, DT.4, DT.6, DT.7, DT.8, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C25	Pipeline Patrol and Pipeline Markers (MP)	DT.1, DT.2, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6

ID	Control/Mitigation Name	Elements of the Risk Bow Tie Addressed
C26	Pipeline Patrol and Pipeline Markers (HP)	DT.1, DT.2, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C27	Company Excavator Training (MP)	DT.3, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C28	Company Excavator Training (HP)	DT.3, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C29	Warning Mesh (MP)	DT.1, DT.3, DT.4, DT.2, DT.7, DT.8, DT.9, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C30	Warning Mesh (HP)	DT.1, DT.2 DT.3, DT.4, , DT.7, DT.8, DT.9, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C31	Ticket Risk Assessment and Evaluating City Permit Data (MP)	DT.1, DT.2, DT.3, DT.4, DT.5, DT.6, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C32	Ticket Risk Assessment and Evaluating City Permit Data (HP)	DT.1, DT.6, DT.3, DT.4, DT.5, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C33	Enhance Ticket Management Software (MP)	DT.2, DT.4, DT.5, DT.9, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C34	Enhance Ticket Management Software (HP)	DT.4, DT.5, DT.2, DT.9, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C35	Leverage Data Gathered by Locating Equipment (MP)	DT.4, DT.8, DT.6, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C36	Leverage Data Gathered by Locating Equipment (HP)	DT.4, DT.6, DT.8, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C37	Pipeline Monitoring Technologies (HP)	DT. 1, DT. 2, DT. 3, DT. 4, DT. 5, DT.6, DT. 7, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
M1	Automate Third Party Excavation Incident Reporting (MP)	DT.2, DT.4, DT.6, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
M2	Automate Third Party Excavation Incident Reporting (HP)	DT.2, DT.4, DT.6, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
M3	Locate and Mark Photographs (MP)	DT.4, DT.6, DT.8, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
M4	Locate and Mark Photographs (HP)	DT.4, DT.6, DT.8, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6

ID	Control/Mitigation Name	Elements of the Risk Bow Tie Addressed
M5	Electronic Positive Response (MP)	DT.2, DT.4, DT.5, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
M6	Electronic Positive Response (HP)	DT.2, DT.4, DT.5, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
M7	Leverage Technology for Difficult Locates (MP)	DT.5, DT.6, DT.8, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
M8	Leverage Technology for Difficult Locates (HP)	DT.5, DT.6, DT.8, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
M9	Outreach for Latent 3rd Party Damages (MP)	DT.1, DT.2, DT. 3, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
M10	Outreach for Latent 3rd Party Damages (HP)	DT.1, DT. 3, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6

APPENDIX B: QUANTITATIVE ANALYSIS SOURCE DATA REFERENCES

Appendix B: Quantitative Analysis Source Data References

The Settlement Decision directs the utility to identify potential consequences of a risk event using available and appropriate data. The below provides a listing of the inputs utilized as part of this assessment.

Annual Report Mileage for Natural Gas Transmission & Gathering Systems
Agency: Pipeline and Hazardous Materials Safety Administration (PHMSA)
Link: *https://cms.phmsa.dot.gov/data-and-statistics/pipeline/annual-report-mileage-natural-gas-transmission-gathering-systems*

Annual Report Mileage for Gas Distribution Systems
Agency: Pipeline and Hazardous Materials Safety Administration (PHMSA)
Link: *https://cms.phmsa.dot.gov/data-and-statistics/pipeline/annual-report-mileage-gas-distribution-systems*

Distribution, Transmission & Gathering, LNG, and Liquid Accident and Incident Data
Agency: Pipeline and Hazardous Materials Safety Administration (PHMSA)
Link: *https://www.phmsa.dot.gov/data-and-statistics/pipeline/distribution-transmission-gathering-lng-and-liquid-accident-and-incident-data*

United States Census Bureau Quick Facts
Agency: United States Census Bureau
Link: *https://www.census.gov/quickfacts/fact/table/US/PST045219*

Real Estate Property Costs
Agency: National Association of Realtors
Link: *https://www.nar.realtor/research-and-statistics/housing-statistics/county-median-home-prices-and-monthly-mortgage-payment*

SoCalGas high-pressure pipeline miles
Source: 2020 internal SME data

DIRT - Damage Information Reporting Tool
Source: Internal Incident Data

Warning Mesh Usage Information
Source: Internal Cost (Labor and Material) and Mileage Data

Excess Flow Valve (EFV) Installation Data
Source: Internal Cost (Labor and Material) and Scope Data

Risk Assessment and Mitigation Phase

(Chapter SCG-Risk-3)

Incident Related to the Medium Pressure System (Excluding Dig-in)

May 17, 2021

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RISK: INCIDENT RELATED TO THE MEDIUM PRESSURE SYSTEM (EXCLUDING DIG-IN)

I. INTRODUCTION

The purpose of this Chapter is to present SoCalGas's risk control and mitigation plan for the Incident Related to the Medium Pressure System (Excluding Dig-in) risk, (Medium Pressure Incident) risk. Each chapter in this Risk Assessment Mitigation Phase (RAMP) Report contains the information and analysis that meets the requirements adopted in Decision (D.) 16-08-018 and D.18-12-014 and the Settlement Agreement included therein (the Settlement Decision).[1]

SoCalGas has identified and defined RAMP risks in accordance with the process described in further detail in Chapter RAMP-B of this RAMP Report. On an annual basis, SoCalGas's Enterprise Risk Management (ERM) organization facilitates the Enterprise Risk Registry (ERR) process. The ERR process influenced how risks were selected for inclusion in this 2021 RAMP Report, consistent with the Settlement Decision's directives, as discussed in Chapter RAMP-C.

The RAMP Report's purpose is to present a current assessment of key safety risks and the proposed activities for mitigating those risks. The RAMP Report does not request funding. Any funding requests will be made in SoCalGas's General Rate Case (GRC) application. The costs presented in this 2021 RAMP Report are those costs for which SoCalGas anticipates requesting recovery in its Test Year (TY) 2024 GRC. SoCalGas's TY 2024 GRC presentation will integrate developed and updated funding requests from the 2021 RAMP Report, supported by witness testimony.[2] This 2021 RAMP Report is presented consistent with SoCalGas's GRC presentation, in that the last year of recorded data (2020) provides baseline costs and cost estimates are provided for years 2022-2024, as further discussed in Chapter RAMP-A. This 2021 RAMP Report presents capital costs as a sum of the years 2022, 2023, and 2024 as a three-year total; operations and maintenance (O&M) costs are only presented for TY 2024 (consistent with the GRC). Costs for each activity that directly address each risk are provided where those costs are available and within the scope of the analysis required in this RAMP Report.

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[1] D.16-08-018 also adopted the requirements previously set forth in D.14-12-025. D.18-12-014 adopted the Safety Model Assessment Proceeding (S-MAP) Settlement Agreement with modifications and contains the minimum required elements to be used by the utilities for risk and mitigation analysis in the RAMP and GRC.

[2] *See* D.18-12-014 at Attachment A, A-14 ("Mitigation Strategy Presentation in the RAMP and GRC").

Throughout this 2021 RAMP Report activities are delineated between controls and mitigations, consistent with the definitions adopted in the Settlement Decision's Revised Lexicon. A "control" is defined as a "[c]urrently established measure that is modifying risk."[3] A "mitigation" is defined as a "[m]easure or activity proposed or in process designed to reduce the impact/consequences and/or likelihood/probability of an event."[4] Activities presented in this chapter are representative of those that are primarily scoped to address SoCalGas's Medium Pressure Incident risk; however, many of the activities presented herein also help mitigate other areas.

As discussed in Chapters RAMP-A and RAMP-C, SoCalGas has endeavored to calculate an RSE for all controls and mitigations presented in this risk chapter. However, for controls and mitigations where no meaningful data or subject matter expert (SME) opinion exists to calculate the Risk Spend Efficiency (RSE), SoCalGas has included an explanation why no RSE can be provided, in accordance with California Public Utilities Commission (CPUC or Commission) Safety Policy Division (SPD) staff guidance.[5] Activities with no RSE value presented in this 2021 RAMP Report are identified in Section VII below.

SoCalGas has also included a qualitative narrative discussion of certain risk mitigation activities that would otherwise fall outside of the RAMP Report's requirements, to aid the Commission and stakeholders in developing a more complete understanding of the breadth and quality of the Company's mitigation activities. These distinctions are discussed in the applicable control and mitigation narratives in Section III.

A. Risk Overview

Typically, medium pressure systems use a series of mains (pipes with larger diameter) to feed service lines, regulator stations, meters, and other appurtenance piping. Service lines are smaller diameter pipes that feed customer homes, businesses, and some commercial applications. Medium pressure pipelines are made of steel or plastic material.

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3 *Id*. at 16.

4 *Id.* at 17.

5 *See* Safety Policy Division Staff Evaluation Report on PG&E's 2020 Risk Assessment and Mitigation Phase (RAMP) Application (A.) 20-06-012 at 5 ("SPD recommends PG&E and all IOUs provide RSE calculations for controls and mitigations or provide an explanation for why it is not able to provide such calculations.") (November 25, 2020).

For safety and compliance, Title 49 of the Code of Federal Regulations (CFR) Part 192, General Order (GO) 58, and GO 112 are the leading sources of requirements for SoCalGas's distribution pipelines (among other legal and regulatory provisions). Title 49 CFR Part 192 prescribes safety requirements for pipeline facilities and the transportation of gas at the federal level. GO 112 and GO 58 complement and enhance the requirements of 49 CFR 192 at the state level.

SoCalGas currently operates approximately 100,000 miles of medium pressure mains and services, with over 22,000 miles of steel mains and approximately 25,000 miles of plastic mains. These medium pressure pipelines serve over 21.8 million SoCalGas consumers.

Various causes and events can lead to incidents related to the medium pressure pipeline system. Drivers can range from natural forces (such as natural disasters, fires, earthquakes), improper installation techniques, material defects, aging/environmental factors such as corrosion and material degradation, improper operations, and inadequate maintenance of the pipeline infrastructure. For the purposes of this Chapter, the Medium Pressure Incident risk focuses on risk events that result in serious injuries, fatalities, or significant impact to the infrastructure.

SoCalGas notes that when the loss of gas cannot be resolved by lubing, tightening, or adjusting, it is defined as a "leak." A leak in and of itself may cause little-to-no risk of serious injury or fatality. Risk to the public and employees can increase when leaks are in close proximity to an ignition source and/or where there is a potential for gas to migrate into a confined space. The safety concern caused by the leak is addressed by SoCalGas's leak indication prioritization and repair schedule procedures. In most cases, a pipe with a leak will continue to transport gas, and therefore is not considered a pipeline "failure" using the definition in American Society of Mechanical Engineering (ASME) Code section B31.8S.[6]

SoCalGas's many risk mitigating activities focus on the safety of employees, customers, and the public. This is driven by a safety-first culture stemming from the Company's core values of customer and public safety. An example of SoCalGas's focus on safety as related to this risk is the safety-related customer communications that are an integral part of after the meter incident

[6] American Society of Mechanical Engineering standard B31.8S: Managing System Integrity of Gas Pipelines. AMSE B31.8S is specifically designed to provide the operator with the information necessary to develop and implement an effective integrity management program utilizing proven industry practices and processes.

prevention in a customer's home, whether or not a SoCalGas employee visits the premises. These communications are a proactive approach to inform customers and the public how to detect possible safety issues within their homes, how to identify potential hazards, and how to avoid hazards that may result from damage occurring during a risk event. Gas Public Safety Communications and Field and Public Safety are two customer and public safety baseline controls that will be discussed in greater detail within this chapter.

B. Risk Definition

For purposes of this RAMP Report, SoCalGas's Medium Pressure Incident risk is defined as the risk of asset failure, caused by a medium pressure pipeline system[7] event, which results in serious injuries or fatalities. This risk concerns a gas public safety event on a medium pressure distribution plastic or steel pipeline and/or its appurtenances (*e.g.*, valves, meters, regulators, risers) as well as on and beyond the customer meter.

In SoCalGas's 2019 RAMP report SoCalGas presented a stand-alone risk chapter associated with Customer & Public Safety that contained Customer Services type mitigations, *e.g.*, call center services, advanced meter activities, meter set assemblies, and beyond the meter activities, among others. In this RAMP report, the definition of the Medium Pressure Incident risk has been expanded to include all aspects of the medium pressure system and may include incidents downstream of the gas meter. Therefore, certain customer and public safety related mitigations are presented within scope to this chapter.

C. Scope

Table 1 below provides what is considered in and out of scope for the Incident Related to the Medium Pressure System (Excluding Dig-in) risk in this RAMP Application.

Table 1: Risk Scope

In-Scope:	The risk of damage, caused by a medium pressure system (maximum allowable operating pressure (MAOP) at or lower than 60 psig) failure event, which results in serious consequences such as injuries, fatalities, or outages and includes consequences beyond the customer meter.
Data Quantification Sources:	SoCalGas engaged internal data sources for the calculation surrounding risk reduction; however, if data was insufficient, Industry or National data was supplemented and adjusted to fit the risk profile associated with the operating locations and parameters of the utilities. For example, certain types of incident events have not occurred within the SoCalGas

[7] Maximum Allowable Operating Pressure (MAOP) at lower than 60 psig.

	service territory; therefore, expanding the quantitative needs to encompass industry data where said incident(s) have been recorded to provide a proximate is justified in establishing a baseline of risk and risk addressed by activities. See Appendix B for additional information.

II. RISK ASSESSMENT

In accordance with the Settlement Decision,[8] this section describes the risk bow tie, possible drivers, potential consequences, and the risk score for the Medium Pressure Incident risk.

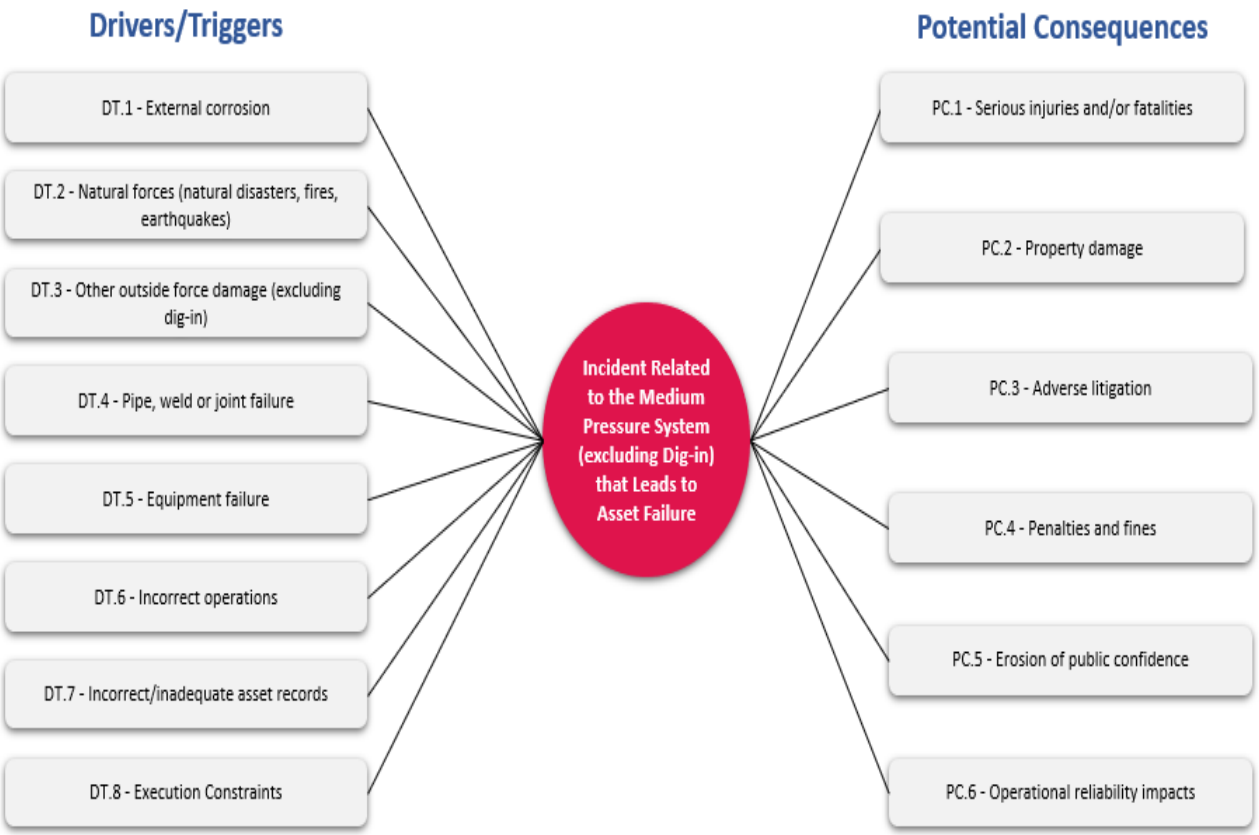
A. Risk Bow Tie and Risk Event Associated with the Risk

The risk bow tie is a commonly used tool for risk analysis, and the Settlement Decision[9] instructs the utility to include a risk bow tie illustration for each risk included in RAMP. As illustrated in the risk bow tie shown below in Figure 1, the risk event (center of the risk bow tie) is Medium Pressure Incident that Leads to Asset Failure, the left side of the risk bow tie illustrates drivers/triggers that lead to a Medium Pressure Incident Asset Failure, and the right side shows the potential consequences of a Medium Pressure Incident Asset Failure. SoCalGas applied this framework to identify and summarize the information provided in Figure 1. A mapping of each mitigation to the element(s) of the risk bow tie addressed is provided in Appendix A.

[8] D.18-12-014 at 33 and Attachment A, A-11 ("Bow Tie").

[9] *Id.* at Attachment A, A-11 ("Bow Tie").

Figure 1: Risk Bow Tie



B. Cross-Functional Factors

The following CFFs have programs and/or projects that affect this risk chapter: Asset and Records Management, Energy Resilience, Emergency Preparedness and Response and Pandemic, Foundational Technology Solutions, Physical Security, Safety Management Systems (SMS), and Workforce Planning / Quality Workforce. As an example, the training of SoCalGas emergency response personnel and activation of SoCalGas's emergency operations control center, as discussed in the Emergency Preparedness and Response and Pandemic CFF addresses some of the potential consequences of this risk. Another example is the customer service-based quality assurance activities discussed in the SMS CFF. Additional information is provided in the narratives for the referenced CFFs.

C. Potential Drivers/Triggers[10]

The Settlement Decision[11] instructs the utility to identify which element(s) of the associated risk bow tie each mitigation addresses. When performing the risk assessment for the Medium Pressure Incident risk, SoCalGas identified potential leading indicators, referred to as drivers or triggers. These include, but are not limited to:

- **DT.1 - Corrosion:** External corrosion is a naturally occurring phenomenon commonly defined as the deterioration of a material (usually a metal) that results from a chemical or electrochemical reaction with its environment. Internal corrosion is the deterioration of the interior of an asset as a result of the environmental conditions on the inside of the pipeline.[12] In pipelines, corrosion can occur internally and/or externally, both potentially resulting in a pipeline incident; therefore, both internal and external corrosion will be referred to as "corrosion" in the remainder of this chapter, unless otherwise needed.
- **DT.2 - Natural forces (natural disasters, fires, earthquakes):** Attributable to causes not involving humans, but includes effects of climate change, such as earth movement, earthquakes, landslides, subsidence, heavy rains/floods, lightning, temperature, thermal stress, frozen components, wildfires, and high winds.
- **DT.3 - Other outside** force **damage (excluding dig-in):** Attributable to outside force damage other than excavation damage or natural forces, such as damage by car, truck, or motorized equipment not engaged in excavation.
- **DT.4 - Pipe, weld, or joint failure:** Attributable to material defect within the pipe, component, or joint due to faulty manufacturing procedures, design defects, improper construction or fabrication, or in-service stresses such as vibration, fatigue, and environmental cracking.
- **DT.5 - Equipment failure:** Similar to DT.4, but unrelated to pipe (main and services). These failures are attributable to the malfunction of a component including, but not limited to, regulators, valves, meters, flanges, gaskets, collars,

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[10] An indication that a risk could occur. It does not reflect actual or threatened conditions.

[11] D.18-12-014 at Attachment A, A-11 ("Bow Tie").

[12] ASME B31.8S, "Managing System Integrity of Gas Pipelines"

and couples. This driver/trigger is specific to the material properties related to the manufacturing process or post installation of the equipment.

- **DT.6 - Incorrect** operations**:** May include a pipeline incident attributed to insufficient or incorrect operating procedures or the failure to follow a procedure.
- **DT.7 - Incorrect/**inadequate **asset records:** The use of inaccurate or incomplete information that could result in the failure to (1) construct, operate, and maintain SoCalGas's pipeline system safely and prudently, or, (2) to satisfy regulatory compliance requirements.
- **DT.8 - Execution** constraints**:** Constraints including third-party vendor issues, Quality Assurance/Quality Control issues related to materials and operational oversight, resource constraints (*e.g.*, workforce, material), re-allocation or unexpected maintenance or regulatory requirements or the inability to be able to complete projects initiatives or meet operational compliance.

D. Potential Consequences of Risk Event

Potential consequences[13] are listed to the right side of the risk bow tie illustration provided above. If one or more of the drivers/triggers listed above were to result in an incident, the potential consequences, in a reasonable worst-case scenario, could include:

- **PC.1 - Serious injuries and/or fatalities**
- **PC.2 - Property damage**
- **PC.3 - Adverse litigation**
- **PC.4 - Penalties and fines**
- **PC.5 - Erosion of public confidence**
- **PC.6 - Operational reliability impacts**

These potential consequences were used in the scoring of the Medium Pressure Incident that occurred during the development of SoCalGas's 2020 Enterprise Risk Registry.

[13] D.18-12-014 at 16 and Attachment A, A-8 ("Identification of Potential Consequences of Risk Event").

E. Risk Score

The Settlement Decision requires a pre- and post-mitigation risk calculation.[14] Chapter RAMP-C of this RAMP Application explains the Risk Quantitative Framework that underlies this chapter, including how the Pre-Mitigation Risk Score, Likelihood of Risk Event (LoRE), and Consequence of Risk Event (CoRE) are calculated.

Table 2: Pre-Mitigation Analysis Risk Quantification Scores[15]

	LoRE	CoRE	Risk Score
Incident Related to the Medium Pressure System	544.99	5.63	3,071

Pursuant to Step 2A of the Settlement Decision, the utility is instructed to use actual results, as well as available and appropriate data (*e.g.,* Pipeline and Hazardous Materials Safety Administration data).[16]

Historical PHMSA data and internal SME input was used to estimate the frequency of incidents. To determine the incident rate per year for SoCalGas, the national average incident rate per mile per year was applied to the medium-pressure pipeline miles at SoCalGas.

The safety risk assessment primarily utilized data from PHMSA, the reliability risk assessment was based on internal data, and the financial risk assessment was estimated based on both PHMSA and internal data. Internal SME input, based on recent repair costs, was used to estimate the financial consequence of incidents. Historical PHMSA medium-pressure gas incidents were also used in estimating financial and safety consequences. The reliability incident rate per year was estimated using internal data. Additionally, Monte Carlo simulation was performed to understand the range of possible consequences.

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[14] D.18-12-014 at Attachment A, A-11 ("Calculation of Risk").

[15] The term "pre-mitigation analysis," in the language of the S-MAP Settlement Agreement Decision (Attachment A, A-12 ("Determination of Pre-Mitigation LoRE by Tranche," "Determination of Pre-Mitigation CoRE," "Measurement of Pre-Mitigation Risk Score")), refers to required pre-activity analysis conducted prior to implementing control or mitigation activity.

[16] *Id.* at Attachment A, A-8 ("Identification of Potential Consequences of Risk Event").

III. 2020 CONTROLS

This section "[d]escribe[s] the controls or mitigations currently in place" as required by the Settlement Decision.[17] The activities in this section were in place as of December 31, 2020. Controls that will continue as part of the control & mitigation plan are identified in Section IV.

As stated above, the Medium Pressure Incident risk is the risk of asset failure, caused by a medium pressure system event, which could result in serious injuries and/or fatalities. The risk mitigation plan includes both controls that are expected to continue and projected mitigations for the period of SoCalGas's TY 2024 GRC cycle. The controls are those activities that were in place as of 2021, most of which are compliance driven and have been implemented over decades, plus the addition of the Distribution Integrity Management Program (DIMP) that has been developed over recent years, to address this risk. SoCalGas's mitigation plan for this risk consists of controls based on compliance with 42 CFR Part 192, GO 58, GO 112-F, and forecasted enhancements within existing controls.

For this RAMP chapter, the makeup of the portfolio of controls is a combination of compliance requirements and additional programs implemented by the DIMP. The DIMP is continually evaluating system threats and risk to determine if additional mitigations are appropriate. The threat and risk evaluation leverages leak repair, incident data, and SME input to evaluate and rank risk. As programs are developed, available data sets are leveraged to develop specific risk ranking, which supports risk-based prioritization of mitigations. For example, the Distribution Risk Evaluation and Monitoring System (DREAMS) steel replacement program utilizes leak rates, condition of the pipe, soil, and other factors to prioritize medium pressure and high pressure segments for replacement.

Not all programs and activities that would mitigate the Medium Pressure Incident risk are included in this risk mitigation plan. For example, the Mobilehome Park Utility Upgrade Program (MHP) is converting master-metered/sub-metered natural gas and/or electric services to direct utility services in mobile home parks and manufactured housing communities to improve the safety and reliability of service for residents of mobile home parks currently served by

[17] *Id.* at 33.

master-metered gas systems. The MHP is not included in this mitigation plan because MHP costs are not anticipated to be forecasted in SoCalGas's next GRC.[18]

A. C1: Cathodic Protection Base Activities

Corrosion is a natural process that can deteriorate steel assets and potentially lead to leaks or asset failure. If a leak migrates to a confined space and an ignition source is introduced, there is the potential for injuries. Although SoCalGas operations groups respond immediately to these leak situations, such conditions have the potential to lead to a pipeline incident. Cathodic Protection (CP), coating and monitoring can protect and extend the life of a steel asset by mitigating corrosion. The application of a CP current is necessary to overcome local corrosion currents along the pipeline, that left unabated would result in localized corrosion at anodic sites. Cathodic protection can be achieved by the installation of sacrificial anodes or impressed current systems.[19] Each cathodic protection rectifier or other impressed current power source must be inspected six times each calendar year, but with intervals not exceeding 2 1/2 months, to ensure that it is operating.[20] SoCalGas plans to continue this schedule for these cathodic protection base activities.

The directives prescribed by 49 CFR 192 Subpart I, and followed by SoCalGas, include the monitoring of CP areas, remediation of CP areas that are out of tolerance,[21] and preventative installations to avoid out of tolerance areas.

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[18] The Mobile Home Park Conversion Program began as a pilot program (authorized by and discussed in D.14-03-021 and Resolutions E-4878 (September 28, 2017) and E-4958 (March 14, 2019) and has evolved into a post-piloted Mobile Home Park Utility Conversion Program per D.20-04-004. Cost recovery is via a balancing account with a reasonableness review occurring in the GRC.

[19] SoCalGas utilizes both impressed current and magnesium anode (galvanic) systems to provide CP to existing pipelines. Impressed current systems utilize rectifiers for the generation of the direct current. Both systems utilize sacrificial anodes as a primary component in the system. Anodes are installed in wells drilled into the surrounding soil by third-party drilling contractors. Each protected pipe segment requires multiple anodes, collectively referred to as an "anode bed." The number of anodes needed to achieve the desired level of protection and the average life of the anode bed can vary based on pipeline length, coating effectiveness, soil conditions and interference that may occur on the system.

[20] 49 CFR § 192.465(a) and (b).

[21] Out of tolerance areas are defined as areas where CP reads are outside of pre-determined read tolerances, and if left unaddressed, CP measures may not effectively mitigate the effect of the corrosive environment on steel assets.

B. C2: Cathodic Protection- CP10 Activities

SoCalGas also tests each pipeline that is under cathodic protection as prescribed by 49 CFR § 192.465. The following summarizes the required intervals for completing preventative measures, like CP10, as prescribed in 49 CFR § 192.465 External Corrosion Control (Monitoring).

- Each pipeline that is under cathodic protection must be tested at least once each calendar year, but with intervals not exceeding 15 months, to determine whether the cathodic protection meets the requirements of §192.463. However, if tests at those intervals are impractical for separately protected short sections of mains or transmission lines, not in excess of 100 feet (30 meters), or separately protected service lines, these pipelines may be surveyed on a sampling basis. At least ten percent of these protected structures, distributed over the entire system must be surveyed each calendar year, with a different ten percent checked each subsequent year, so that the entire system is tested in each ten-year period.

SoCalGas plans to continue these CP10 activities according to this schedule.

C. C3: Cathodic Protection- 100mV Requalification

In addition to meeting federal and state requirements, based on feedback from the Commission's Safety and Policy Division[22] during a 2018 safety audit, SoCalGas issued new guidelines requiring the re-evaluation of existing 100 mV polarization shift areas[23] at least once every ten years to verify their effectiveness as a measurement for adequate Cathodic Protection of an area. A pipeline utilizing the 100 mV polarization shift criteria must achieve a minimum of 100 mV of polarization along its entirety through the application of Cathodic Protection. This activity supports the safety and integrity of the system and mitigates risks defined in this RAMP chapter.

D. C4: Meter & Regulator (M&R) Station and Electronic Pressure Monitors (EPM) Inspection and Maintenance

Regulator stations reduce the pressure of gas entering the distribution system from high-pressure pipelines to provide a lower pressure to be used on the distribution pipeline system. A

[22] At the time, it was called the Safety and Enforcement Division.

[23] 49 CFR Part 192, Appendix D (Criteria for Cathodic Protection and Determination of Measurements).

failure of a regulator station due to mechanical failure, corrosion, contamination, or other cause could result in over-pressurization of the gas distribution system, which may compromise the integrity of medium pressure pipelines and/or jeopardize public safety resulting from potential over-pressure events.

Regulator stations are critical pressure control installations in the gas distribution system. Title 49 CFR § 192.739 requires inspections/tests to be conducted annually, not to exceed 15 months to maintain these stations and EPMs in good mechanical condition. Functional tests of regulation and monitoring equipment is performed as part of the annual inspections. If any device does not perform properly, internal maintenance and inspections are conducted. This consists of disassembling, inspecting, and cleaning the internal components of the regulator. Any worn, corroded, or damaged components are repaired/replaced, and the regulator is reassembled and verified to be in working order prior to placing back into service. SoCalGas has an internal program that requires all "soft-parts" to be replaced on a 15-year interval.

As regulator stations age, their parts and equipment can begin to wear and become harder to disassemble, increasing maintenance requirements. Regulator stations are designed to maintain continued safe and reliable operation of the station in the event of a failure within either of the two runs. Annual maintenance and inspections are used to record the condition of each station and EPM and identify items that require immediate and long-term action. The overall inspection of the station includes evaluation of the design, condition of the equipment, valves, vaults and EPMs, and exposure to other outside forces including flooding and traffic conditions.

The following summarizes the requirements, which are followed by SoCalGas, for completing these preventative measures as prescribed within 49 CFR § 192.739 Pressure limiting and regulating stations: Inspection and testing:

- Each pressure limiting station, relief device (except rupture discs), and pressure regulating station and its equipment must be subjected at intervals not exceeding 15 months, but at least once each calendar year, to inspections and tests to determine that it is:
  - (1) In good mechanical condition;
  - (2) Adequate from the standpoint of capacity and reliability of operation for the service in which it is employed.

(3) Except as provided in paragraph (b) of this section, set to control or relieve at the correct pressure consistent with the pressure limits of §192.201(a);

(4) Properly installed and protected from dirt, liquids, or other conditions that might prevent proper operation.

E. C5: Regulator Station Replacements/Installs

SoCalGas's operating and maintenance practices allow the useful lives of regulator stations to be extended. However, it is prudent to proactively replace regulator stations prior to the end of their useful life to reduce overall system risk. SoCalGas has developed a district regulator station (DRS) risk assessment tool to assess prioritizing enhancements and replacements of stations. Concurrent with starting this new risk model, SoCalGas plans to utilize the results of the model more fully by increasing the number of regulator station replacements specifically to reduce safety risks. The new risk model, similar to DIMP DREAMS for pipeline segments, includes likelihood of failure and consequence of failure related data for all regulator stations. Risk reduction is achieved when addressing both equipment failure probability and consequences. Best practices and philosophies have evolved to modernize antiquated stations designs to essentially reduce over/under pressure and outside force risks. SoCalGas will prioritize the replacement of DRSs across operating regions while continuing to enhance the prioritization methodology to validate the number of regulator station replacements performed each year. This regulator station replacement risk assessment effort is an example of modernizing SoCalGas's aging infrastructure and will be used as a model to review other facilities and equipment in a similar fashion.

While stations have been replaced in the past to reduce safety risk, this new risk model allows prioritization and focus of this particular replacement work based solely on safety, and allows for this work to become a multi-year program moving forward.

F. C6: Meter Set Assembly (MSA) Inspection and Maintenance

Meter and regulator activities include maintaining, inspecting, or replacing approximately ten percent of the total 102,010 medium and large M&R MSAs in the SoCalGas service territory. The MSAs reduce the pressure of natural gas and measure the volume of natural gas delivered to the customer. General Order 58-A requires that meters, regulators, and other components be maintained, repaired, and tested periodically to meet customers' capacity requirements, measure gas volume accurately, and deliver natural gas at an adequate pressure for the houseline and

home appliances. Additionally, if MSAs are housed in vaults, the vaults must be inspected and repaired, if necessary, to protect the MSA. Should the regulators fail, a household could potentially see a much higher pressure of natural gas which could lead to an incident. Scheduled inspections of meter set assemblies proactively target the risk of equipment failures, corrosion, and outside force before operation and safety issues arise. In addition, as required by 49 CFR § 192.481, above ground piping facilities such as MSAs must be inspected for atmospheric corrosion no less than once every three calendar years and at intervals not to exceed 39 months.

G. C7: Electronic Pressure Monitor (EPM) Replacement & Installs

The purpose of Electronic Pressure Monitoring (EPM) is to monitor and record system operating pressures, and generate alarms when pressures exceed or drop below alarm set points, monitoring for maximum allowable operating pressure (MAOP) exceedance or under-pressure conditions as required by 49 CFR 192.741, 192.201(a), 192.739(a)(2), and GO 112F 122.2. Pressure alarms are maintained and evaluated and the appropriate corrective actions such as new installs and replacements are taken to ensure public safety and operation of Company infrastructure. The pressure zones and pressure districts are monitored and reported as part of GO 112-F requirements for Over-MAOP and Under-Pressure events. EPMs are required to indicate the gas pressure in each distribution system supplied by more than one district pressure regulating station. In addition, for distribution systems supplied by a single district pressure regulating station, it is up to the operator to determine the necessity of installing an EPM. EPM installations and replacements are ongoing activities.

H. C8: Leak Survey

SoCalGas performs leak survey monitoring activities by conducting a thorough search for gas leak indications in an assigned area and reporting all detectable leaks using an approved survey method.

The monitoring and inspections must follow certain prescribed processes included in the Code of Federal Regulations[24] and incorporated into SoCalGas's Gas Standards.

- For medium pressure pipelines operating at 60 psig or less, the following apply:
  (1) Survey all pipe (including services) in business districts at intervals not exceeding 15 months, but at least once each calendar year.

[24] 49 CFR § 192.721.

(2) Survey Non-State-of-the-Art polyethylene (PE) main pipe and connected services where the main is not located in a business district once every calendar year, at intervals not exceeding 15 months.

(3) Survey cathodically unprotected main pipe and connected services where the main is not located in a business district at least once every three calendar years at intervals not exceeding 39 months.

(4) Survey PE and cathodically protected main pipe and connected services where the main is not located in a business district once everyfive calendar years at intervals not exceeding 63 months.

- High pressure pipelines operating over 60 psig, not including Department of transportation (DOT) transmission pipelines.

  (1) Survey all pipelines and associated taps, cross-over piping, services and other piping every 15-months; but at least once every calendar year for all location classes.

- Special Survey

  Special leak surveys are one-time, additional surveys to the routine scheduled survey that is driven by a specific circumstance. Perform special leak survey:

  (1) Upon discovery that the MAOP of a pipeline is exceeded by 10% or more at any time during the life of the pipeline;

  (2) After the occurrence of any significant incident (*e.g.*, train derailment, explosion, earthquake, flooding, landslides, etc.) over or adjacent to high pressure pipelines or related facilities;

  (3) There is the danger of public exposure to leaking gas; the special survey is performed using the appropriate leak detection method. Document the reason, location, limits, and results of all special leak surveys on the appropriate Company inspection record;

  (4) When increasing the MAOP of a pipeline;

  (5) When the routine scheduled survey frequency is not considered adequate because of pipe condition, limited opportunity for gas to vent safely, or other reasons. When the special surveys will be ongoing and scheduled,

efforts shall be made to identify the segment of pipe to be at the greater frequency in SAP and EGIS, and be scheduled as routine;

(6) There is a need to monitor pipe condition for special situations, such as: material evaluations, proposed street improvement projects, as a mitigated measure for the Integrity Management Program; and

(7) Special leak survey may also be considered in conjunction with major underground construction projects.

I. C9/C10/C11: Pipeline Monitoring (Pipeline Patrol, Bridge & Span Inspections, Unstable Earth Inspection)

SoCalGas conducts pipeline monitoring and inspection activities to proactively target risk factors before operation and safety issues arise. These monitoring activities include pipeline patrols (C9), bridge and span inspections (C10), and unstable earth inspections (C11) to observe surface conditions on and adjacent to the pipeline right-of-way for indications of leaks, construction activity, and other factors affecting safety and operation to comply with 49 CFR §§ 192.705, 192.721. Pipeline patrols are conducted by trained personnel familiar with the location and operation of the pipeline. Qualified distribution Field Employees are responsible for using Pipeline Patrol Maps that depict the location of pipe and the frequency in which the pipe should be patrolled, to aid in pipeline patrol activities.

Distribution pipeline spans, pipe supported on bridges, above ground (or jacketed) pipelines, and all other exposed pipeline (as installed) are inspected for atmospheric corrosion. As-found conditions that are corrected upon discovery are identified and reported, and the remedial action taken are also noted. For all transmission pipeline and distribution main additional (special) patrols are conducted as deemed necessary immediately after events that could cause pipeline movement or loading conditions to change. These events may include earthquakes, heavy rain, flooding, sinkholes, landslides, or indications of earth movement, surface subsidence or cracking, that would result in unstable earth conditions.
Pipeline monitoring activities are preventative in nature and should reduce or eliminate conditions that might lead to an incident by detecting and addressing emergent issues. Pipeline monitoring activities also increase public and employee safety by mitigating various risk sources, including corrosion and degradation, for example. Safety risks will be proactively reduced on a regular basis as result of the continual, ongoing nature of pipeline monitoring activities.

Minimizing safety threats has the additional benefits of reducing reconstruction costs from equipment failure, reducing risk to property, and the potential benefit of improved service reliability. These inspections are critical since they are intended to observe assets over time to determine if abnormal conditions exist prior to becoming a concern. For example, a span that is no longer coated appropriately due to recent weather conditions can be identified for re-coating before corrosion that could lead to a leak begins.

J. C12: Valve Inspection & Maintenance

Valve maintenance is a program that validates that the valves within the system operate at optimum effectiveness, enhancing public safety by providing SoCalGas with the ability to control the pressure and flow of gas in the system. The maintenance activities vary by type of valve, and may include flushing, lubrication, parts replacement, cleaning, and testing of operability.

Valves are installed for control of pressure and flow of gas. Their location and purpose determine their criticality: fire valves at regulator stations isolate the high- and medium pressure systems; emergency valves isolate segments of pipelines in case of pipe damage or for operational purposes; and isolation valves segment portions of the system in the event of a widespread emergency, such as an earthquake and reduce the impact of resulting pipeline damage. A valve that is operating at its optimum effectiveness means that, for example, in the case of an earthquake or fire where an area needs to be isolated to reduce the risk of incident, these valves will operate as intended and fully isolate the area. A second example, which occurs more frequently, when excavation damage occurs, these valves can be operated to allow for a safe environment to complete the repairs and minimize the risk of furthering the incident.

The following summarizes the requirements for completing these preventative measures as prescribed within the 49 CFR § 192.747 and followed by SoCalGas:

- Each valve, the use of which may be necessary for the safe operation of a distribution system, must be checked and serviced at intervals not exceeding 15 months, but at least once each calendar year.
- Each operator must take prompt remedial action to correct any valve found inoperable, unless the operator designates an alternative valve.

K. C13: Valve Installs and Replacements

Each "critical" valve, the use of which may be necessary for the safe operation of a distribution system must be inspected, serviced, lubricated and/or flushed (when required) and partially operated at intervals not exceeding 15 months, but at least once each calendar year. Each operator must take prompt remedial action to correct any "critical" valve found inoperable unless the operator designates an alternate valve.

"Critical" valves are open valves considered necessary for the safe operation of the distribution system. Examples may include but are not limited to:

- Sectionalizing valves in supply lines.
- "Shut-off" valves upstream and downstream of regulator stations. This may be completed as part of the Regulator Station Inspection.
- Isolation area valves.
- Bridge approach valves.
- All other valves, as determined by Distribution Engineering to be critical to the safe operation of the distribution system.

After scheduled inspections, if the conditions of valves that are identified as "hard to operate," "inaccessible," "inoperable," or "sanded-in are not resolved, Distribution Planning and Engineering personnel must be informed to create an alternate shutdown procedure in addition to working with Distribution Planning on a possible valve replacement or new valve installation plan.

L. C14: Cathodic Protection – Install/Replace Impressed Current Systems

Buried steel pipelines will revert back to their natural state as an iron oxide (corrode) without proper intervention. Corrosion on pipelines increases the risk for leaks and may reduce the useful life of the pipelines. In addition to the application of coating and electrical isolation, cathodic protection (CP) is a method for mitigating external corrosion on steel pipelines. CP combats corrosion by imposing an electric current flow toward the surface of the pipeline, which means keeping the pipeline negatively charged (cathodic) with respect to the surrounding soil. This results in reduced corrosion on the pipeline system. Title 49 C.F.R. § 192, Subpart I, and GO 112-F set forth the regulatory standards that govern pipeline corrosion control. SoCalGas utilizes impressed current systems to provide CP to existing pipelines. Impressed current systems utilize a rectifier for the generation of the direct current and sacrificial anodes as primary

components in the system. Anodes are installed in wells drilled into the surrounding soil by third-party drilling contractors. Each protected pipe segment requires multiple anodes, collectively referred to as an "anode bed." The number of rectifiers and anodes needed to achieve the desired level of protection and the average life of the anode bed can vary based on pipeline length, coating effectiveness, soil conditions, and interference that may occur on the system. Impressed current cathodic protection system maintenance, installation, and replacement are all ongoing activities.

M. C15: Inspection of Company and Contractor Work on Gas Pipelines.

Company Authorized Representatives (CAR) shall inspect and score construction work performed by SoCalGas and contractors to ensure Company quality standards are met. The inspection is documented on Form Number 2849 Construction Inspection Report (CIR) and made available electronically from Company databases. SoCalGas manages all aspects of gas pipeline construction projects daily and oversees contractor work at construction sites to ensure that the project is built to Company Gas Standards. SoCalGas personnel physically inspect gas pipeline construction projects and preside over high- and medium-pressure control operations and inspect all welding, materials, testing, coating, excavating, backfilling, paving, and repairs on pipeline projects. All work performed by contractors and subcontractors is subject to the inspection and approval of the Company at all times, but such right of inspection of the work by the Company does not relieve the contractor of responsibility for the proper performance of the work. The CAR acts as the Company representative on-site and the liaison between the Company and contractors for submittals, schedules, material requirements, change orders, environmental issues, operator qualifications, invoices, engineering designs, etc.

Supervisors and SoCalGas representatives conduct documented job-site safety inspections of contractors working at a facility, property, or worksite owned, operated, or managed by the Company (including leased premises and rights-of-ways) on SoCalGas projects at a frequency of once per week per contractor. When there are multiple crews for a specific contractor working on similar projects, one safety inspection per contractor per week meets this requirement. The CIR, built in ISNetworld, a vendor platform for contractor management services, must be used for documenting such inspections and the Report of Contractor's Performance, Form Number 6350, also built in ISNetworld, must be used for documenting the contractor's performance.

Qualified Company personnel must perform inspections of contractor crews performing work under blanket contractor agreements and document the observations on Form Number 2849 CIR at least two times each week over a minimum of two days or (more), as needed. Observations of Company crews and the contractors' work, tools, equipment, and materials used, employee qualifications, and procedural adherence all provide opportunity to identify, assess, and resolve potential hazards.

N. C16: Capital CP 10 Service Replacement

Service Replacements are for routine replacement of isolated medium pressure distribution service pipelines to maintain system reliability. One of the main drivers for Service Replacements is corrosion, which also involves underground (UG) shorts, and/or ineffective coating, for example if a -1.0 Volt direct current minimum pipe-to-soil (P/S) potential cannot be achieved, the service should be replaced. Service Replacement costs associated with main replacements are captured in the forecast for main replacements.

SoCalGas has a total of 320,065 CP10 services that will continue to be monitored, inspected, and maintained on a ten-year cycle. CP10 services are separately protected service lines that are surveyed on a sampling basis where at least ten percent of system inventory is sampled each year, so that the entire system is tested in a ten-year period.

O. C17: Main & Service Leak Repair

This control establishes guidelines and requirements for assessing the degree of hazard and coding of leaks or leak indications found on the Company's below ground piping system, and actions required to provide for public safety and repair of the leak as required by SoCalGas' Gas Standards. Leak indications on Company facilities are classified by trained and qualified employees according to location, spread, concentration of gas, possibility for accumulation of gas, possible sources of ignition, potential migration, and imminence of hazard to people or property. Classifications of leaks or leak indications are based on the relative degree of hazard and examples listed are intended only as a guide. The judgment of the person evaluating the leak or leak indication, after consideration of all factors involved, is the primary criterion for classification and mitigation. Hazardous indications of underground leaks are reported, and action is taken according to the applicable Gas Standard until the hazard has been eliminated and the leak has been either temporarily or permanently repaired; or until it is determined that the leak is from a source other than the Company piping system. Existing leaks are verified using

the “Shop Papers” under the “Attachments” tab within the Leak Survey Order. Once verified, existing leaks are identified with the Equipment number. Existing Code 2 and Code 3 (Steel and Plastic) leak indications are displayed on the Leak Survey Map and identified with the Equipment number. Leak indications detected over existing leaks within the path of survey are recorded.

If indications are still present and additional leakage is suspected, the Company issues a Recheck Leak Order when conditions are non-hazardous and current leak investigation procedures can no longer be performed, or it is impractical to continue. Recheck Leak orders are dispatched at or after 60 days and must be completed within 90 days from the completion of the original Leak Repair Order. Recheck Leak orders must not be revaluated.

The taking of below ground leak samples with an approved combustible gas indicator is conducted to the extent that the belowground leak spread is determined or to ensure that the belowground area is free from concentrations of natural gas. Leak investigations where leakage is not readily detected must include at a minimum, but is not limited to, all belowground gas facilities for 150’ ft in all directions (both sides of street/alley way) over the main and services from the initial location where the leak or odor was reported.

Each segment of pipeline that becomes unsafe must be repaired, altered, or removed from service. Each imperfection or damage that would impair the serviceability of PE pipe or fittings must be repaired or removed. Appropriate temporary repairs such as plugging, or clamping shall be made if permanent repairs are not possible at the time of discovery.

P. C18: Residential Meter Protection Project

The Residential Meter Protection Project (RMPP) addresses the prevention of potential vehicular damage associated with above-ground distribution facilities at residential properties. This control minimizes the potential for vehicular damage for above ground gas equipment (*e.g.*, the meter set assembly, or MSA) by placing various forms of physical devices or barriers to mitigate damage in case of a potential collision. Barriers are intended to be a visual, not a structural, deterrent and are not intended or capable of stopping all vehicular traffic, particularly large vehicles. Where adequate mitigation cannot be achieved, gas equipment can be relocated or removed. Additionally, RMPP addresses the concerns PHMSA expressed under its regulations that require operators to address identified threats of low frequency but potentially high consequence events.

RMPP anticipates there are as many as 300,000 locations where need for mitigation from vehicular damage is warranted. RMPP is expected to last as a project for approximately 10-12 years.

Q. C19: Main Replacements- Leakage, Abnormal Op. Conditions, CP Related

Activities under Main Replacements include installation of new mains to replace existing ones, main replacements in advance of public infrastructure projects, and service line replacements, existing service line tie-overs, and meter set rebuilds in connection with newly installed replacement mains. Replacements are due to leakage and anticipated leakages, defects, corrosion, deterioration of pipes, and to meet cathodic protection mandates.

Leakage is often the driving factor for pipeline replacements; however, there are other considerations. Other criteria taken into consideration are whether the steel pipe meets cathodic protection mandates, or the main is found to have active corrosion. In addition, the pipeline may be deemed unsafe or unfit for service under pressure due to manufacturing or other defects. Leak history and pending leaks on individual segments are the primary factors in identifying the majority of SoCalGas's main replacements. These replacements are critical to sustain operational reliability and public safety.

R. C20: Distribution Integrity Management Program - Distribution Riser Inspection Program (DRIP)

The Distribution Riser Inspection Project (DRIP) is one of the Programs/Projects and Activities to Address Risk (PAAR) under the DIMP and addresses the threat of failure of anodeless risers due to corrosion. Anodeless risers (ALRs) are service line components that have shown a propensity to fail before the end of their useful lives. ALRs were first introduced in the 1970s as a new technology replacing steel risers to transition from the underground plastic pipe to the above ground steel meter set. When an ALR was originally installed, it was set at a height where the gas carrying portion of the ALR was above ground. However, as grade conditions change due to landscaping and hardscaping, this gas carrying portion may no longer be at the proper height above the ground. When the gas carrying portion of the ALR is buried or set too low it can potentially corrode due to contact with the soil. The consequence of this component failing can be significant in that risers are attached to the meter set assembly, which is usually located next to a residence.

SoCalGas's research-based efforts to develop an effective means of mitigating above-ground and ground level corrosion on anodeless risers has led to the implementation of the epoxy composite wrap, which provides a protective barrier for the above-ground section of the riser under the environmental conditions that are typical of riser installations, in lieu of replacement of the riser. Where the threat of failure of an ALR is present, SoCalGas will remediate the issue by implementing an epoxy composite wrap to provide a protective barrier for the above-ground section of the ALR.

S. C21: Distribution Integrity Management Program - Distribution Risk Evaluation and Monitoring System (DREAMS)

The DREAMS program is an additional control developed and managed as part of the DIMP. Within DIMP, the DREAMS tool is used to prioritize risk mitigation on early vintage plastic and steel pipeline segments. The risk algorithm includes pipe attributes, operational conditions, and potential impact on population. The results of the analysis determine appropriate action to address risk for each segment and prioritize replacement investments based on a failure analysis.

As SoCalGas's infrastructure continues to age and more leak data is accumulated through annual inspections, SoCalGas plans to continue increasing the level of replacement while monitoring performance to continually review the benefits and risk reduction accomplished through the replacement program through indicators such as leak repair and incident rates related to early vintage plastic as part of DIMP regulations. Although the initial outlook is for a continued increase in scope for DREAMS (as previously stated), program metrics will be monitored on a continual basis to determine increased or decreased levels in scope.

1. C21-T1: Vintage Integrity Plastic Plan (VIPP)

The Vintage Integrity Plastic Plan (VIPP) falls within the umbrella of DREAMS. Plastic pipe manufactured and used for gas service from the 1960s through the early 1980s exhibit a brittle-like cracking characteristic that could cause a leak to grow and release additional natural gas than would otherwise be released, increasing the risk of natural gas gathering and igniting, and potentially causing injuries and/or fatalities. Given the potential for a higher release of gas, the leak survey frequency has been increased to yearly versus every five years for plastic pipelines within this vintage. The initial focus of the VIPP is early vintage plastic manufactured pre-1973. This vintage of plastic exhibits the brittle-like cracking characteristics discussed, but

also exhibits a Low Ductile Inner Wall (LDIW) issue that further exacerbates the brittle-like cracking issues since it expedites crack initiation when external loads are applied. This issue in the manufacturing practice has been the focus of earlier notices as issued by the manufacturer DuPont and PHMSA. Therefore, the focus is on wholesale replacement of pre-1973 plastic pipe, with priority given to poor performing segments, by utilizing a relative risk model and dynamic segmentation. The secondary focus is to leverage the same relative risk model and dynamic segmentation to continue to focus on the replacement of poor performing early vintage plastic for all pre-1986 plastic pipe.

As mentioned, SoCalGas anticipates continuing to increase the level of replacement while monitoring performance to continually review the benefits and risk reduction accomplished through VIPP through indicators such as leak repair and incident rates related to early vintage plastic.

2. C21-T2: Bare Steel Replacement Program (BSRP)

The Bare Steel Replacement Plan (BSRP) falls within the umbrella of DREAMS and will continue to focus on the replacement of bare steel with the highest leak rates. SoCalGas plans to target 35 miles of steel mains and associated services in 2021 for replacement above and beyond routine replacements. SoCalGas continues monitoring performance to review the benefits and risk reduction accomplished through BSRP through indicators such as leak repair and incident rates related to bare steel. The lack of protective coating makes bare steel a high-risk family of pipe and has been identified by DOT and PHMSA as a family of pipe that should be evaluated for an accelerated replacement program.

T. C22: Distribution Integrity Management Program - Gas Infrastructure Protection Program (GIPP)

The Gas Infrastructure Protection Project (GIPP) addresses prevention of potential third-party vehicular damage associated with above-ground pressurized natural gas facilities. An incident involving vehicular damage of a distribution facility can cause serious injuries or fatalities due to the possibility of ignition. The GIPP is an additional control developed and managed as part of the DIMP. This program is responsive to PHMSA guidance indicating that operators should address low frequency, but potentially high consequence, events through the

DIMP.[25] Although the DIMP guidelines do not prescribe what programs operators should implement, the prescriptive sections result in the need to take action to reduce system risk.

GIPP identifies, evaluates, recommends, and implements damage prevention solutions for at risk above-ground pressurized gas facilities that are exposed to vehicular impacts. The solutions reduce the number of incidents to pressurized piping and/or reduce the potential consequences caused from escaping natural gas after vehicular collisions. Major actions include investigating historical claims data and developing risk assessment algorithms, conducting record reviews and physical inspections of facilities, developing risk exposure categories, identifying and implementing mitigation measures, updating policies/practices/procedures, and developing performance measures and program tracking.

GIPP remediation measures include the construction of barriers between facilities and vehicular traffic (bollards or block wall), relocation of a facility, or installation of an excess flow valve. Barriers are intended to be a visual, not a structural deterrent and are not intended or capable of stopping all vehicular traffic, particularly large vehicles. The installation of excess flow valves can aid in the reduction of unrestrained gas flows. Considerations for the relocation of a facility include the type of road nearby, the volume of traffic, and the type of area (*e.g.*, commercial or residential). The prioritization of GIPP inspections and remediations is based on field assessments.

Among MSAs, which is the largest population of facility type, the most vulnerable are high pressure residential first stage regulation meter sets and commercial and industrial MSAs. GIPP is focusing on these meter sets and MSAs, which account for approximately 500,000 facilities in the SoCalGas territory. Since the development and implementation of the program in 2011, approximately 475,000 sites with above-ground distribution facilities have been inspected and over 45,000 sites have been remediated.

U. C23: Distribution Integrity Management Program - Sewer Lateral Inspection Project (SLIP)

The SLIP project is an additional control developed and managed as part of the DIMP. SLIP addresses the concerns PHMSA expressed under the DIMP regulations that require operators to address identified threats of low frequency, but potentially high consequence events

[25] U.S. Department of Transportation PHMSA, DIMP Enforcement Guide (Dec. 7, 2015), *available at https://www.phmsa.dot.gov/pipeline/enforcement/dimp-enforcement-guidance*.

concerning pipeline damage within sewer laterals. Threats to pipeline integrity can occur if the trenchless installation inadvertently crosses a sewer line (or "lateral") and penetrates, or bores, through the sewer line, creating what is referred to as a "cross bore." For instance, through the SLIP, SoCalGas is proactively inspecting gas services for points of intrusion into house sewer lines. Should an intrusion be found, the service is remediated, which mitigates the potential of an incident due to a homeowner or plumber attempting to clear a house sewer line when a clog is present. For example, a plumber or the property owner may unknowingly uses a cleanout technology, such as a sewer-line auger, to clean out what is seemingly normal sewer debris and blockage. Following this work, the sewer line appears to be unclogged, but in reality, the sewer-line auger has pierced the gas line. Depending on how extensive the damage caused by the sewer-line auger, the gas line, which has now been breached, will leak gas into the sewer line and elsewhere. This unwanted gas migration can pose significant risks of bodily injury and damage to property.

Since the start of the program in 2010, approximately three million services have been reviewed and over 450,000 services inspected in the field. The SLIP forecast for remaining records review is about two million services; the number of remaining services to be inspected depends on the findings of the records review, but is anticipated to add another 300,000-350,000 services, based on current estimates. At the present rate, SLIP records research is anticipated to be completed by 2025.

V. C24: Control Center Modernization (CCM) Distribution Field Asset Real Time Monitoring and Control Site Installations/Upgrades & New Control Room Technologies

The Control Center Modernization organization will enhance distribution field assets by installing control and real-time pressure monitoring capabilities. Increased operational awareness through the implementation of a centralized data management system and real time monitoring capabilities will help Gas Control personnel to quickly identify abnormal operating pressures within the system and will provide Gas Control personnel with remote control functionality to help prevent an overpressure. With the introduction of these new field assets and capabilities, the CCM will introduce new processes, training, and increase workforce. Additionally, these field assets will be supported by the implementation of new control room and Information Technology (IT) system and network technologies.

The new control room technology features will focus on employee safety, security, ergonomics, training, and decision making while the CCM IT functionality will integrate both new and existing IT platforms to provide system-wide viewing of daily health and alarm information from new field pipeline technologies. Operators and Region personnel will be able to leverage these new systems and data analytics to troubleshoot issues and/or perform proactive mitigations to prevent abnormal operating conditions. The installation and deployment of these CCM field assets and technology will ramp up in 2020 and be on-going throughout the next GRC cycle and beyond.

W. C25: Field Employee Skills Training

Training is an integral part of how SoCalGas mitigates the Medium Pressure Incident risk. All field service technicians must complete and pass mandatory training. This training includes classroom and situational field exercises to educate employees on safety processes and procedures to perform work in a manner that meets all applicable rules, regulations, and SoCalGas internal policies and procedures. Formal skills training reduces the likelihood of employees deviating from Company policy or procedure because field service technicians do not work customer orders on their own until they are fully trained to do their jobs adequately and safely. Once the field service employees successfully pass formal training, they are permitted to work customer orders on their own.

X. C26: Staff Employee Skills Training

Field instructors within the Customer Services staff area conduct the mandatory training for field service technicians based on safety process and procedures to perform work in a manner that meets all applicable rules, regulations, and SoCalGas internal policies and procedures. A follow-on quality assurance assessment is then performed by Field Instructors to confirm that the field service technicians have retained the training knowledge and skills required to safely perform their duties.

Y. C27: Emergency Calls

Customers call SoCalGas's Customer Contact Center (CCC) to request service for many different reasons, including potential gas leaks and other emergency orders. As it is often the first point of Company contact for emergencies; the CCC provides a critical support role in the safety of the SoCalGas system and the public's well-being. Gas leak calls are given top priority,

and customer service representatives are trained to identify the different types of emergencies and manage calls to see that appropriate field personnel are sent in an order prioritizing the necessary response in accordance with 49 Part § 192.615.

These types of requests include, but are not limited to:

- General Leaks – at appliances, at gas meters, inside structures-source unknown, ignited leaks;
- Outside Leaks- damaged gas lines or meter, dying vegetation;
- Carbon Monoxide (CO) – customer experiencing symptoms or not, CO safety checks, CO alarm/Detectors activated or not;
- Miscellaneous Safety-Related issues – Odor Fade, appliance recalls; and
- Other Urgent Situations – water heater not cycling off (water steaming), bomb threats.

The CCC also helps to mitigate risk related to the medium pressure system during non-emergency situations by issuing customer requested appliance inspection and maintenance orders.

Z. C28: Quality Assurance Program

As referenced in C26, SoCalGas performs regular Quality Assurance (QA) assessment of the quality of work of its field personnel. The QA function regularly includes in-field sampling of completed customer service field orders to assess employee work quality and compliance with Company policies and procedures. QA Specialists receive random orders previously completed by customer service field representatives and make in-home visits. The purpose of the QA program is to have QA Specialists verify that customer service field representatives recognize and address safety issues with customer-owned appliances and Company-owned equipment. The efforts of the QA program promote improved consistency while adhering to Company policies and processes and a reduction in work errors that may pose a risk to customer and public safety.

AA. C29: DCU/Pole Inspections

SoCalGas conducts cyclical inspections of Data Collector Units (DCUs) and poles to identify structural problems and/or hazards in support of public safety and a reliable network communication. Although SoCalGas is only mandated to inspect SoCalGas-owned poles, SoCalGas goes above and beyond and inspects all DCU units on an annual basis, including third

party poles. The pole inspection process identifies structural problems and/or hazards in support of public safety and system reliability.

Qualified SoCalGas field resources perform this work in accordance with the CPUC's General Order 165. The purpose of this General Order is to establish requirements for electric distribution and transmission facilities (excluding those facilities contained in a substation) regarding inspections in order to ensure safe and high-quality electrical service. Inspection results are logged and maintained by the Network Maintenance & Construction team for compliance reporting.

BB. C30: Meter Set Assembly (MSA) Inspection Program

As required by the Department of Transportation CFR Title 49 §192.481 regarding inspections of above-ground piping facilities for atmospheric corrosion, Meter Set Assemblies (MSAs) and exposed above ground piping must be inspected no less than once every three calendar years and at intervals not exceeding 39 months. In addition to atmospheric corrosion, SoCalGas has proactively expanded the inspection criteria to include other physical conditions at the MSA that may pose the potential risk to safety and reliability. All remedial activities are conducted within required timelines and/or prioritization based on conditions found at the time of the inspection or in an abundance of caution.

CC. C31: Personal Protective Equipment (PPE)

The purpose of SoCalGas's PPE Program is to protect employees from the risk of injury by creating a barrier against workplace hazards. The PPE Program addresses eye, face, head, foot, and hand protection. OSHA standards require employers to conduct and certify workplace hazard assessments for the use of PPE at facility locations that are representative of the types of ongoing work operations. SoCalGas does not have to perform a hazard assessment at each location, but if a hazard assessment is performed, for example, at a transmission facility, then that assessment is representative of other similar transmission facilities and would also apply to those locations. SoCalGas provides its employees with the PPE required to safely perform work (*e.g.*, flame-retardant suits, eye protection, and gloves). The Company maintains processes and procedures so that employee hearing and respiratory functions are not impaired due to exposure to harmful environmental conditions. When work is performed that could expose customers or the public to injury, controls are implemented to mitigate the risk. The costs associated with protective equipment and specific occupational safety programs are included in this category.

DD. C32: Safety Related Field Orders

Field service technicians respond to the customer orders taken by the CCC, described above in C25 Emergency Calls. They are trained to rectify safety hazards on customer premises in order to maintain safe operations of Company facilities. Some of these customer requests are safety related, such as checking appliances upon move in. However, any customer call about a gas leak, both hazardous and non-hazardous, is dispatched to a field service technician to perform a gas leak investigation. SoCalGas requires that all hazardous and non-hazardous leak orders are responded to by a field technician within the same day of receiving the customer call, with the response to the highest priority gas leak orders within 30 minutes.

IV. 2022-2024 CONTROL & MITIGATION PLAN

This section contains a table identifying the controls and mitigations comprising the portfolio of mitigations for this risk.[26]

As reflected in the Table below, all the activities discussed in Section III above are expected to continue during the TY 2024 GRC. For clarity, a current activity that is included in the plan may be referred to as either a control and/or a mitigation. For purposes of this RAMP, a control that will continue as a mitigation will retain its control ID unless the size and/or scope of that activity will be modified, in which case that activity's control ID will be replaced with a mitigation ID. The table below shows which activities are expected to continue.

Table 3: Control and Mitigation Plan Summary

Line No.	Control/ Mitigation ID	Control/Mitigation Description	2020 Controls	2022-2024 Plan
1	C1	Cathodic Protection Base Activities	X	X
2	C2	Cathodic Protection - CP10 Activities	X	X
3	C3	Cathodic Protection - 100mV Requalification	X	X
4	C4	Meter & Regulator Station Inspection and Electronic Pressure Monitors (EMP) Inspection and Maintenance	X	X
5	C5	Regulator Station Replacements/Installs	X	X
6	C6	Meter Set Assembly (MSA) Inspection and Maintenance	X	X
7	C7	EPM Maintenance & Installs	X	X

[26] *See* D.18-12-014, Attachment A at A-14 ("Mitigation Strategy Presentation in the RAMP and GRC")

Line No.	Control/ Mitigation ID	Control/Mitigation Description	2020 Controls	2022-2024 Plan
8	C8	Leak Survey	X	X
9	C9/C10/C11	Pipeline Monitoring (Pipeline Patrol, Bridge & Span Inspections, Unstable Earth Inspection)	X	X
10	C12	Valve Inspection & Maintenance	X	X
11	C13	Valve Installs and Replacements	X	X
12	C14	Cathodic Protection – Install/Replace Impressed Current Systems	X	X
13	C15	Company and Contractor Inspections on Gas Pipelines	X	X
14	C16	Capital CP 10 Service Replacement	X	X
15	C17	Main & Service Leak Repair	X	X
16	C18	Residential Meter Protection	X	X
17	C19	Main Replacements- Leakage, Abnormal Op. Conditions, CP Related	X	X
18	C20	Distribution Integrity Management Program (DIMP) - Distribution Riser Inspection Program (DRIP)	X	X
19	C21-T1	DIMP - Distribution Risk Evaluation and Monitoring System (DREAMS): Vintage Integrity Plastic Plan (VIPP)	X	X
20	C21-T2	DIMP – DREAMS: Bare Steel Replacement Program (BSRP)	X	X
21	C22	Distribution Integrity Management Program - Gas Infrastructure Protection Program (GIPP)	X	X
22	C23	Distribution Integrity Management Program - Sewer Lateral Inspection Project (SLIP)	X	X
23	C24	CCM Distribution Field Asset Real Time Monitoring and Control Site Installations / Upgrades & New Control Room Technologies	X	X
24	C25	Field Employee Skills Training	X	X
25	C26	Staff Employee Skills Training	X	X
26	C27	Emergency Calls	X	X
27	C28	Quality Assurance Program	X	X
28	C29	DCU/Pole Inspections	X	X
29	C30	Meter Set Assembly (MSA) Inspection Program	X	X
30	C31	Personal Protective Equipment (PPE)	X	X

Line No.	Control/ Mitigation ID	Control/Mitigation Description	2020 Controls	2022-2024 Plan
31	C32	Safety Related Field Orders	X	X

For activities SoCalGas plans to perform that remain unchanged, please refer to the description in Section III. If changes to the various activities are anticipated, such modifications are further described in the section below.

EE. Changes to 2020 Controls

SoCalGas plans to continue each of the existing mitigations discussed above in Section III through the 2022 – 2024 period without any significant changes.

FF. 2022 – 2024 Mitigations

SoCalGas is currently not planning any new mitigations during the 2022 – 2024 period.

V. COST, UNITS, AND QUANTITATIVE SUMMARY TABLES

The tables in this section provide a summary of the risk control and mitigation plan, including the associated costs, units, and the RSEs, by tranche. When an RSE could not be performed, an explanation is provided. SoCalGas does not account for and track costs by activity or tranche; rather, SoCalGas accounts for and tracks costs by cost center and capital budget code. The costs shown were estimated using assumptions provided by SMEs and available accounting data.

Table 4: Risk Control and Mitigation Plan - Recorded and Forecast Dollars Summary[27]
(Direct After Allocations, In 2020 $000)

ID	Control/Mitigation Name	Recorded Dollars		Forecast Dollars			
		2020 Capital[28]	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
C1	Cathodic Protection Base Activities	-	11800	-	-	10850	13130
C2	Cathodic Protection- CP10 Activities	-	1225	-	-	875	1160
C3	Cathodic Protection- 100mV Requalification	-	5	-	-	1105	1335
C4	Meter & Regulator (M&R) Station and Electronic Pressure Monitors (EPM) Inspection and Maintenance	-	3047	-	-	3395	4150
C5	Regulator Station Replacements/Installs	1750	-	8215	10870	-	-
C6	Meter Set Assembly (MSA) Inspection and Maintenance	-	1620			1455	1780
C7	Electronic Pressure Monitor (EPM) Replacement & Installs	190	-	1270	1680	-	-
C8	Leak Survey	-	8400	-	-	7180	8690

[27] Recorded costs and forecast ranges are rounded. Additional cost-related information is provided in workpapers. Costs presented in the workpapers may differ from this table due to rounding. The figures provided are direct charges and do not include company loaders, with the exception of vacation and sick. The costs are also in 2020 dollar and have not been escalated to 2021 amounts. The capital presented is the sum of the years 2022, 2023, and 2024, or a three-year total. Years 2022, 2023 and 2024 are the forecast years for SoCalGas's Test Year 2024 GRC Application.

[28] Pursuant to D.14-12-025 and D.16-08-018, the Company provides the 2020 "baseline" capital costs associated with Controls. The 2020 capital amounts are for illustrative purposes only. Because capital programs generally span several years, considering only one year of capital may not represent the entire activity.

ID	Control/Mitigation Name	Recorded Dollars		Forecast Dollars			
		2020 Capital[29]	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
C9/C10 /C11	Pipeline Monitoring (Pipeline Patrol, Bridge & Span Inspections, Unstable Earth Inspection)	-	160	-	-	160	195
C12	Valve Inspection & Maintenance	-	1005			1215	1475
C13	Valve Installs and Replacements	1000	-	2440	2980	-	-
C14	Cathodic Protection – Install/Replace Impressed Current Systems	5855	-	17695	23400	-	-
C15	Company and Contractor Inspection on Gas Pipelines	1670	350	4380	5795	305	405
C16	Capital CP 10 Service Replacement	13400	-	36545	44220	-	-
C17	Main & Service Leak Repair		17300	-	-	12840	15695
C18	Residential Meter Protection Project	4760	-	23745	31405	-	-
C19	Main Replacements- Leakage, Abnormal Op. Conditions, CP Related	23000	-	63000	83320	-	-
C20	Distribution Integrity Management Program - Distribution Riser Inspection Program (DRIP)	-	19820	-	-	22260	28445
C21-T1	DIMP – DREAMS: Vintage Integrity Plastic Plan (VIPP)	106945	4095	501070	606560	45515	55100

[29] Pursuant to D.14-12-025 and D.16-08-018, the Company provides the 2020 "baseline" capital costs associated with Controls. The 2020 capital amounts are for illustrative purposes only. Because capital programs generally span several years, considering only one year of capital may not represent the entire activity.

ID	Control/Mitigation Name	Recorded Dollars		Forecast Dollars			
		2020 Capital[30]	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
C21-T2	DIMP – DREAMS: Bare Steel Replacement Program (BSRP)	73630	3055	214745	259955	19505	23615
C22	DIMP: Gas Infrastructure Protection Program (GIPP)	13575	2110	49145	62800	10430	13325
C23	DIMP: Sewer Lateral Inspection Project (SLIP)	-	15970	-	-	22260	28445
C24	CCM Distribution Field Asset Real Time Monitoring and Control Site Installations/Upgrades & New Control Room Technologies	5805	46	49675	71755	3870	5590
C25	Field Employee Skills Training	-	5710	-	-	9904	11989
C26	Staff Employee Skills Training	-	3070	-	-	2432	2944
C27	Emergency Calls	-	3664	-	-	3396	4112
C28	Quality Assurance Program	-	763	-	-	771	933
C29	DCU/Pole Inspections	-	257	-	-	251	304
C30	Meter Set Assembly (MSA) Inspection Program	-	24650	-	-	21065	25499
C31	Personal Protective Equipment (PPE)	-	113	-	-	160	193
C32	Safety Related Field Orders	4878	61126	16965	20540	90198	109187

[30] Pursuant to D.14-12-025 and D.16-08-018, the Company provides the 2020 "baseline" capital costs associated with Controls. The 2020 capital amounts are for illustrative purposes only. Because capital programs generally span several years, considering only one year of capital may not represent the entire activity.

Table 5: Risk Control & Mitigation Plan - Units Summary

ID	Control/Mitigation Name	Units Description		Recorded Units		Forecast Units			
		Capital	O&M	2020 Capital	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 (High) O&M
C1	Cathodic Protection Base Activities	No. of Base CP orders		-	43718	-	-	41378	50068
C2	Cathodic Protection- CP10 Activities	No. of CP 10 orders		-	13977	-	-	9999	13224
C3	Cathodic Protection- 100mV Requalification	No. of 100mV Requalification areas		-	10	-	-	230	282
C4	Meter & Regulator (M&R) Station and Electronic Pressure Monitors (EPM) Inspection and Maintenance	No. of M&R inspections and maintenance orders		-	10410	-	-	9830	12015
C5	Regulator Station Replacements/Installs	No. of replacements and/or installations		-	5	23	31	-	-
C6	Meter Set Assembly (MSA) Inspection and Maintenance	No. of MSA inspections and maintenance orders.		-	8388	-	-	7549	9227
C7	Electronic Pressure Monitor (EPM) Replacement & Installs	No. of replacements/installs		62		413	546	-	-
C8	Leak Survey	Leak survey mileage		-	31529	-	-	27095	32786
C9/ C10/ C11	Pipeline Monitoring (Pipeline Patrol, Bridge & Span Inspections, Unstable Earth Inspection)	No. of inspection orders		-	1404	-	-	1439	1759

ID	Control/Mitigation Name	Units Description		Recorded Units		Forecast Units			
		Capital	O&M	2020 Capital	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 (High) O&M
C12	Valve Inspection & Maintenance	No. of Valve inspection & maintenance orders.		-	7126	-	-	6830	8264
C13	Valve Installs and Replacements	No. of replacements and installations		21	-	51	60	-	-

ID	Control/Mitigation Name	Units Description		Recorded Units		Forecast Units			
		Capital	O&M	2020 Capital	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 (High) O&M
C14	Cathodic Protection – Install/Replace Impressed Current Systems	No. of deep well installations and replacements		43	-	130	171	-	-
C15	Company and Contractor Inspection on Gas Pipelines	No. of inspections on pipeline		18039	7811	47058	62235	6792	8983
C16	Capital CP 10 Service Replacement	No. of replacements		2186		5962	7214	-	-
C17	Main & Service Leak Repair	No. of main & service leak repairs orders		-	34689			30022	36694
C18	Residential Meter Protection Project	No. of meter guard installations projects		10420	-	47491	62807	-	-
C19	Main Replacements- Leakage, Abnormal Op. Conditions, CP Related	Footage replaced		71429	-	157500	208294	-	-
C20	DIMP - DRIP	Inspections			184881	-	-	153000	195500
C21-T1	DIMP – **DREAMS: VIPP**	Miles replaced		83	-	270	327	-	-

ID	Control/Mitigation Name	Units Description		Recorded Units		Forecast Units			
		Capital	O&M	2020 Capital	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 (High) O&M
C21-T2	DIMP – DREAMS: BSRP	Miles replaced		33	-	115	139	-	-
C22	DIMP - GIPP	Mitigations	Inspections	4377	5096	2970	3795	1800	2300
C23	DIMP - SLIP	No. of inspections		-	73122	-	-	54000	69000
C24	CCM Distribution Field Asset Real Time Monitoring and Control Site Installations/Upgrades & New Control Room Technologies	Control: No. of sites installed/inspected Real-time: No. of sites installed/inspected		-	-	Control: 55 Real-time: 137	Control: 78 Real-time: 197	Control: 40 Real-time: 79	Control: 57 Real-time: 114
C25	Field Employee Skills Training	FTE		-	63	-	-	110	133

ID	Control/Mitigation Name	Units Description		Recorded Units		Forecast Units			
		Capital	O&M	2020 Capital	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 (High) O&M
C26	Staff Employee Skills Training	FTE		-	29	-	-	26	31
C27	Emergency Calls	Calls		-	460768	-	-	449517	544152
C28	Quality Assurance Program	FTE		-	7	-	-	9	10
C29	DCU/Pole Inspections	Inspections		-	4416	-	-	4478	5421
C30	Meter Set Assembly (MSA) Inspection Program	Orders		-	3186617	-	-	2611887	3161758
C31	Personal Protective Equipment (PPE)	FTE		-	1370	-	-	1879	2275
C32	Safety Related Field Orders	Orders		38281	1082800	132417	160295	1514143	1832910

Table 6: Risk Control & Mitigation Plan - Quantitative Analysis Summary

ID	Control/Mitigation Name	Forecast			
		LoRE	CoRE	Post Mitigation Risk Score	RSE
C1	Cathodic Protection Base Activities	470	5.63	2,648	34.4
C2	Cathodic Protection-CP10 Activities	537	5.63	3,028	115.2
C3	Cathodic Protection-100mV Requalification	541	5.63	3,050	50.8
C4	Meter & Regulator (M&R) Station and Electronic Pressure Monitors (EPM) Inspection and Maintenance	485	5.63	2,731	92.5
C5	Regulator Station Replacements/Installs	545	5.63	3,069	4.7
C6	Meter Set Assembly (MSA) Inspection and Maintenance	518	5.63	2,918	80.7
C7	Electronic Pressure Monitor (EPM) Replacement & Installs	542	5.63	3,052	106.6
C8	Leak Survey	See C8/C17 below			
C9[31]	Pipeline Monitoring (Pipeline Patrol, Bridge & Span Inspections, Unstable Earth Inspection)	544.63	5.63	3069	21.3
C10		544.92	5.63	3,071	5.2
C11		544.88	5.63	3,070	91.5
C12	Valve Inspection & Maintenance	530	5.63	2,989	63.9
C13	Valve Installs and Replacements	545	5.63	3,071	3.4

[31] There are three different types of pipeline monitoring activities, each with a different cycle. The activities are treated as a single event for dollar and unit purposes but separately for RSE purposes to align with the different cycles.

ID	Control/Mitigation Name	Forecast			
		LoRE	CoRE	Post Mitigation Risk Score	RSE
C14	Cathodic Protection – Install/Replace Impressed Current Systems	538	5.63	3,033	28.1
C15	Company and Contractor Inspection on Gas Pipelines	See Table 7			
C16	Capital CP 10 Service Replacement	543	5.63	3,062	1.9
C8/C17	Leak Survey[32] and Main & Service Leak Repair	459	5.63	2,585	23.2
C18	Residential Meter Protection Project	526	5.63	2,963	91.4
C19	Main Replacements-Leakage, Abnormal Op. Conditions, CP Related	545	5.63	3,070	0.3
C20	Distribution Integrity Management Program - Distribution Riser Inspection Program (DRIP)	535	5.63	3,017	21.2
C21-T1	DIMP – DREAMS: Vintage Integrity Plastic Plan (VIPP)	540	5.63	3,045	1.2
C21-T2	DIMP – DREAMS: Bare Steel Replacement Program (BSRP)	543	5.63	3,063	0.9
C22	DIMP: Gas Infrastructure	401	5.63	2,258	221.0

[32] Leak Survey is a standalone activity with costs and units tracked as such. For purposes of calculating an RSE, Leak Survey was combined with Main & Service Leak Repair as Leak Survey is only the work associated with inspections wherein risk mitigation thereof occurs in the Main & Service Leak Repair activity.

ID	Control/Mitigation Name	Forecast			
		LoRE	CoRE	Post Mitigation Risk Score	RSE
	Protection Program (GIPP)				
C23	DIMP: Sewer Lateral Inspection Project (SLIP)	540	5.63	3,044	10.7
C24	CCM Distribution Field Asset Real Time Monitoring and Control Site Installations/Upgrades & New Control Room Technologies	See Table 7			
C25	Field Employee Skills Training	545	5.63	3,068	0.4
C26	Staff Employee Skills Training	See Table 7			
C27	Emergency Calls	See Table 7			
C28	Quality Assurance Program	544	5.63	3,064	7.6
C29	DCU/Pole Inspections	See Table 7			
C30	Meter Set Assembly (MSA) Inspection Program	495	5.63	2,790	11.9
C31	Personal Protective Equipment (PPE)	See Table 7			
C32	Safety Related Field Orders	381	5.63	2,147	3.0

Table 7: Risk Control & Mitigation Plan - Quantitative Analysis Summary for RSE Exclusions

ID	Control/Mitigation Name	RSE Exclusion Rationale
C15	Inspection of Company & Contractor Work on Gas Pipelines	Quality assurance and control of pipeline construction jobs is a crucial safety activity conducted by the Company; however, there is insufficient internal data to tie the risk addressed by this mitigation to the drivers described in the bow tie. The Company possess metrics around inspections completed and forecasted as well as when issues may be found (*e.g.*, when construction is not completed to Company standards); however, the data to specifically tie incident causes to the lack of inspections or insufficient inspections does not exist. Likewise, there is no data, internal or external, to explicitly state a consequence would decrease by a quantifiable amount due to the implementation of inspections. The inspections exist to determine compliance with construction standards or to determine if work was not completed. As such, no quantifiable means exists to determine the increase in likelihood or consequence due to inspecting pipeline construction projects. Similarly, no SME input exists that can explicitly tie the increase or decrease of a risk thereof; hence, an RSE could not be calculated.

ID	Control/Mitigation Name	RSE Exclusion Rationale
C24	CCM SCG Distribution Field Asset Real Time Monitoring and Control Site - Installations/Upgrades & New Control Room Technologies	Increasing the ability to monitor and control the natural gas system is a prudent safety and reliability measure for California's energy grid. The CCM will enable SoCalGas to control or isolate the faster in the event of a system incident. Likewise, the CCM will enable SoCalGas to identify potential issues in the system sooner, as compared to patrols or a system with fewer monitor points, and potentially resolve those issues before they become an incident. This can include dig-in detection and response, over/under pressure awareness and response, as well as increased flexibility to respond to the varying demands on the system throughout the year. Increased remote control also alleviates employee exposure to operating equipment prior to, during, or after an incident. The CCM overall decreases the consequences of system incidents by allowing the gas system to react faster to incidents with fewer human asset involvement in potentially hazardous conditions. SoCalGas tracks many sets of data that could be used to quantify partial aspects of the CCM, like response time to incidents, valve closure times, over/under pressure events, dig-in responses, SCADA installations/repairs, capacity analysis, etc.; however, in terms of an RSE, no singular data set or combination thereof can be used to appropriately and accurately quantify the decrease in the likelihood or consequence of a medium pressure system incident due to the CCM. Likewise, no SME input could be determined that could quantify a decrease in the number of system incidents attributable to the installation of the CCM.

ID	Control/Mitigation Name	RSE Exclusion Rationale
C26	Staff Employee Skills Training	Training employees on how to receive, direct, and resolve customer service calls is a standard safety procedure for the Company. Metrics exist internally on how many employees are trained or refreshed annually as well as types of calls received and resoled. There does not exist data, however, that ties the cause of a medium pressure incident to the lack of training or improper direction given by an employee to a customer which led to an incident. Additionally, there is no data, internally or externally, that ties an increase in consequence due to the improper training of an employee during a medium pressure incident. SoCalGas employees are trained to ensure the safety of the public if they receive a call that could be a potential incident, *i.e.* customer odor complaints or notification of excavation damage. Likewise, no SME input could be used to determine an explicit quantification of an increase in likelihood or consequence due to discontinuing training Customer Services Staff.
C27	Emergency Calls	The Company receives thousands of emergency calls annually as described above. The Customer Contact Center is a critical safety component of the Company's interaction with the public. Reporting leaks, odors, or faulty appliances are just some of the critical safety functions the Contact Center handles and while data exists around types of calls received and orders issued for dispatching Company crews, no data exists to determine the increase in likelihood or consequence of a medium pressure pipeline incident if the Contact Center was not active. No viable assumptions could be made of the data present (*i.e.* number of calls attributed to a pipeline leak) to provide an explicit value associated with a cause or result of an incident. Additionally, the activity associated with this mitigation solely relates to receiving and responding to emergency calls. Any measurable risk reduction would occur when a leak is remediated, or appliance

ID	Control/Mitigation Name	RSE Exclusion Rationale
		fixed, which takes place outside of this control. As such no RSE could be calculated for this activity.
C29	Data Collector Unit (DCU)/Pole Inspections	As described above SoCalGas inspects all poles that have a Data Collection Unit attached as part of a prudent safety and reliability measure. The purpose is twofold, to monitor network reliability of the smart meters and public safety by ensuring the poles remain standing. A medium pressure system incident involving a DCU pole would be in the realm of a pole collapsing onto a member of the public or public/customer property. Although SoCalGas possesses data on the inspections of said poles including any issues that may be found with said units *i.e.*, vandalism, downed poles, etc., there exists no data, internally or externally, to directly relate the inspections to a decrease in likelihood or consequence of a medium pressure system event. Furthermore, SoCalGas SMEs could not explicitly relate the increase in incidents if inspections discontinued.
C31	Personal Protective Equipment (PPE)	Issuing personal protective equipment to employees is a standard safety practice for the Company. SoCalGas would not dispatch employees without the proper PPE and PPE upkeep/replacement is standard procedure. Although internal data exists surrounding employee incidents that may occur due to lack of or failed PPE, there is no data to directly link an employee without PPE, increasing the likelihood or consequence of a medium pressure incident. Further, it can be argued that an employee without PPE may increase the consequence of a medium pressure incident *i.e.* an injury may become a fatality if an employee lacked goggles or a hardhat during a pipeline failure; however, internal or external data does not exist which correlates the risk of a medium pressure incident to not issuing standard PPE to employees. Likewise, no SME input could be used to determine a direct increase in the risk associated with issuing or discontinuing PPE use by employee; therefore, no RSE could be calculated.

VI. ALTERNATIVES

Pursuant to D.14-12-025 and D.16-08-018, SoCalGas considered alternatives to the Risk Mitigation Plan for the Incident Related to the Medium Pressure System (Excluding Dig-in) risk. Typically, analysis of alternatives occurs when implementing activities to obtain the best result or product for the cost. The alternatives analysis for this plan also took into account modifications to the plan and constraints, such as budget and resources.

A. A1: Technician Refresher Training

SoCalGas considered increasing the frequency of employee refresher training as an alternative to the training program set forth in SoCalGas's Risk Mitigation Plan, above (Field Employee Skills Training, C23). Currently, SoCalGas reviews policies and procedures on a periodic basis, with the time interval being dependent upon the nature of the policy/procedure. When policies and procedures are updated, the updates are shared with gas service technicians, and are accessible to field service technicians on their mobile data terminals.

This alternative proposal considered that all field service technicians complete periodic refresher training sessions at the Company's training facility at Pico Rivera. The refresher training would provide greater reinforcement of the gas service technician job skills. The training would include both classroom and hands-on scenario-based modules reinforcing that policies and procedures are being followed and confirming that updates to policies and procedures are understood.

This alternative proposal is not currently being implemented. The high percentage results seen for the service technician QA program validate the adequacy of the current practice of periodic policy and procedure reviews. Expanding the scope of training by adding periodic refresher training would require additional resources.

B. A2: Post-Training Follow-up Field Evaluations

Another alternative proposal considered by SoCalGas is for field service technicians to receive a scheduled, formal field evaluation with a QA Specialist six months after graduation from formal training. The QA Specialist would field ride with the employee to observe the employee's adherence to Company policies and procedures following formalized training. Any deficiencies would be addressed with the employee. The findings from the field rides would be compiled to determine if formal training enhancements are needed and/or if the system wide refresher training is needed.

This alternative proposal is not currently being implemented. Like the previous proposal, the high percentage results seen for the service technician QA program validate the adequacy of the current practice of periodic policy and procedure reviews. Implementing the QA Program field rides would require additional resources.

Table 8: Alternate Mitigation Plan - Forecast Dollars Summary[33]
(Direct After Allocations, In 2020 $000)

ID	Alternate Mitigation Name	Forecast Dollars			
		2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
A1	Technician Refresher Training	-	-	315	405
A2	Post-Training Follow-up Field Evaluations	-	-	194	248

Table 9: Alternate Mitigation Plan - Units Summary

ID	Control/Mitigation Name	Units Description		Forecast Units			
		Capital	O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 (High) O&M
A1	Technical Refresher Training	FTE		-	-	135	173
A2	Post-Training Follow-up Field Evaluation	FTE		-	-	2	2

Table 10: Alternate Mitigation Plan - Quantitative Analysis Summary
(Direct After Allocations, In 2020 $000)

ID	Control/Mitigation Name	Forecast			
		LoRE	CoRE	Risk Score	RSE
A1	Technical Refresher Training	544.99	5.63	3,071	1.3
A2	Post-Training Follow-up Field Evaluation	544.90	5.63	3,071	2.1

[33] Recorded costs and forecast ranges are rounded. Additional cost-related information is provided in workpapers. Costs presented in the workpapers may differ from this table due to rounding. The figures provided are direct charges and do not include company loaders, with the exception of vacation and sick. The costs are also in 2020 dollar and have not been escalated to 2021 amounts. The capital presented is the sum of the years 2022, 2023, and 2024, or a three-year total. Years 2022, 2023 and 2024 are the forecast years for SoCalGas's Test Year 2024 GRC Application.

APPENDIX A: SUMMARY OF ELEMENTS OF THE RISK BOW TIE

APPENDIX A: SUMMARY OF ELEMENTS OF THE RISK BOW TIE

INCIDENT RELATED TO THE MEDIUM PRESSURE SYSTEM (EXCLUDING DIG-IN): SUMMARY OF ELEMENTS OF THE RISK BOW TIE

ID	Control/Mitigation Name	Elements of the Risk Bow Tie Addressed
C1	Cathodic Protection Base Activities	DT.1, DT.2, DT.3 PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C2	Cathodic Protection - CP10 Activities	DT.1, DT.2, DT.3 PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C3	Cathodic Protection - 100mV Requalification	DT.1, DT.2, DT.3 PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C4	Meter & Regulator (M&R) Station Inspection and Electronic Pressure Monitors (EMP) Inspection and Maintenance	DT.1, DT.2, DT.3, DT.4, DT.5, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C5	Regulator Station Replacements/Installs	DT.1, DT.2, DT.3, DT.4, DT.5 PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C6	Meter Set Assembly (MSA) Inspection and Maintenance	DT.1, DT.2, DT.3, DT.4, DT.5, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C7	Electronic Pressure Monitor (EPM) Replace & Installs	DT.1, DT.2, DT.3, DT.4, DT.5, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C8	Leak Surveys	DT.1, DT.2, DT.3, DT.4, DT.5, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C9/C10 /C11	Pipeline Monitoring (Pipeline Patrol, Bridge & Span Inspections, Unstable Earth Inspection)	DT.1, DT.2, DT.3, DT.4, DT.5, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C12	Valve Inspection and Maintenance & Replacements	DT.1, DT.2, DT.3, DT.4, DT.5, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C13	Valve Installs and Replacements	DT.1, DT.2, DT.3, DT.4, DT.5 PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C14	Cathodic Protection – Install/Replace Impressed Current Systems	DT.1, DT.2, DT.3, DT.5, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C15	Company and Contractor Inspections on Gas Pipelines	DT.6, DT.7, DT.8 PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C16	Capital CP10 Service Replacement	DT.1, DT.2, DT.3, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C17	Main and Service Leak Repair	DT.1, DT.2, DT.3, DT.4, DT.5, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C18	Residential Meter Protection	DT.2, DT.3, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6,
C19	Main Replacements- Leakage, Abnormal Op. Conditions, CP Related	DT.1, DT.2, DT.3, DT.4, DT.5, DT.7 PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C20	Distribution Integrity Management Program (DIMP) - Distribution Riser Inspection Program (DRIP)	DT.1, DT.2, DT.3, DT.4, DT.5, DT.6, DT.7

ID	Control/Mitigation Name	Elements of the Risk Bow Tie Addressed
		PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C21-T1	DIMP - Distribution Risk Evaluation and Monitoring System (DREAMS): Vintage Integrity Plastic Plan (VIPP)	DT.2, DT.4, DT.6, DT.7 PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C21-T2	DIMP – DREAMS: Bare Steel Replacement Program (BSRP)	DT.1, DT.4, DT.7 PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C22	DIMP - Gas Infrastructure Protection Program (GIPP)	DT.1, DT.2, DT.3, DT.4, DT.5, DT.6, DT.7 PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C23	DIMP - Sewer Lateral Inspection Project (SLIP)	DT.3, DT.6, DT.7 PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C24	CCM Distribution Field Asset Real Time Monitoring and Control Site Installations/Upgrades & New Control Room Technologies	DT.1, DT.2, DT.3, DT.4, DT.5, DT.6, PC.1, PC.2, PC.4, PC.5, PC.6
C25	Field Employee Skills Training	DT.1, DT.2, DT.3, DT.4, DT.5, DT.6, DT.7, DT.8 PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C26	Staff Employee Skills Training	DT.1, DT.2, DT.3, DT.4, DT.5, DT.6, DT.7, DT.8 PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C27	Emergency Calls	DT.1, DT.2, DT.3, DT.4, DT.5, DT.6, DT.7 PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C28	Quality Assurance Program	DT.1, DT.2, DT.3, DT.4, DT.5, DT.6, DT.7 PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C29	DCU/Pole Inspections	DT.1, DT.2, DT.3, DT.4, DT.5, DT.6, DT.7 PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C30	Meter Set Assembly (MSA) Inspection Program	DT.1, DT.2, DT.3, DT.4, DT.5, DT.6, DT.7 PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C29	Personal Protective Equipment (PPE)	DT.1, DT.2, DT.4, DT.5, DT.6, DT.8 PC.1, PC.2, PC.3, PC.5, PC.6
C30	Safety Related Field Orders	DT.1, DT.2, DT.3, DT.4, DT.5, DT.6, DT.7 PC.1, PC.2, PC.3, PC.4, PC.5, PC.6

APPENDIX B: QUANTITATIVE ANALYSIS REFERENCED DATA

APPENDIX B: QUANTITATIVE ANALYSIS REFERENCED DATA

The Settlement Decision directs the utility to identify potential consequences of a risk event using available and appropriate data.[34] The list below provides the inputs used as part of this assessment.

Annual Report Mileage for Natural Gas Transmission & Gathering Systems
Agency: Pipeline and Hazardous Materials Safety Administration
Link: *https://www.phmsa.dot.gov/data-and-statistics/pipeline/annual-report-mileage-natural-gas-transmission-gathering-systems*

Annual Report mileage for Gas Distribution Systems
Agency: Pipeline and Hazardous Materials Safety Administration
Link: *https://www.phmsa.dot.gov/data-and-statistics/pipeline/annual-report-mileage-gas-distribution-systems*

Distribution, Transmission & Gathering, LNG, and Liquid Accident and Incident Data
Agency: Pipeline and Hazardous Materials Safety Administration (PHMSA)
Link: *https://www.phmsa.dot.gov/data-and-statistics/pipeline/distribution-transmission-gathering-lng-and-liquid-accident-and-incident-data*

SoCalGas medium-pressure pipeline miles
2020 internal SME data

SoCalGas annual leakage data
2012-2017 data according to material

SoCalGas overpressure/underpressure data

SoCalGas quality assurance program internal data
5 years aggregated error data

SoCalGas inspection data
Bridge and span inspections
Pipeline patrols
Unstable earth inspections

Gas industry sales customers
Agency: AGA (2016Y)
Link:
https://www.aga.org/contentassets/d2be4f7a33bd42ba9051bf5a1114bfd9/section8divider.pdf

[34] D.18-12-014, *Attachment* A at A-8 (Identification of Potential Consequences of Risk Event).

SoCalGas end user natural gas customers
Source: SNL (2016Y, from the FERC Form 2/2-F, 3/3-A or EIA 176)
Link:
https://platform.mi.spglobal.com/web/client?auth=inherit&newdomainredirect=1&#company/report?id=4057146&keypage=325311https://platform.mi.spglobal.com/web/client?auth=inherit&newdomainredirect=1&#company/report?id=4057146&keypage=325311

Real Estate Property Costs
Agency: National Association of Realtors
Link: *https://www.nar.realtor/research-and-statistics/housing-statistics/county-median-home-prices-and-monthly-mortgage-payment*

Risk Assessment and Mitigation Phase

(Chapter SCG-Risk-4)

Incident Related to the Storage System (Excluding Dig-In)

May 17, 2021

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RISK: INCIDENT RELATED TO THE STORAGE SYSTEM (EXCLUDING DIG-IN)

I. INTRODUCTION

The purpose of this chapter is to present Southern California Gas Company's (SoCalGas or Company) risk control and mitigation plan for the Incident Related to the Storage System (Excluding Dig-In) (Storage risk). Each chapter in this Risk Assessment Mitigation Phase (RAMP) Report contains the information and analysis that meets the requirements adopted in Decision (D.) 16-08-018 and D.18-12-014 and the Settlement Agreement included therein (the Settlement Agreement Decision).[1]

SoCalGas has identified and defined RAMP risks in accordance with the process described in further detail in Chapter RAMP-B of this RAMP Report. On an annual basis, SoCalGas's Enterprise Risk Management (ERM) organization facilitates the Enterprise Risk Registry (ERR) process. The ERR process influenced how risks were selected for inclusion in this 2021 RAMP Report, consistent with the Settlement Decision's directives, as discussed in Chapter RAMP-C.

The RAMP Report's purpose is to "identify key safety risks and propose[d] programs to mitigate those risks," and is based on past incidents for the Company and industry.[2] The RAMP Report does not request funding. Any funding requests will be made in SoCalGas's General Rate Case (GRC) application. The costs presented in this 2021 RAMP Report are those costs for which SoCalGas anticipates requesting recovery in its Test Year (TY) 2024 GRC. SoCalGas's TY 2024 GRC presentation will integrate developed and updated funding requests from the 2021 RAMP Report, supported by witness testimony.[3] This 2021 RAMP Report is presented consistent with SoCalGas's GRC presentation, in that the last year of recorded data (2020) provides baseline costs and cost estimates are provided for years 2022-2024, as further discussed in Chapter RAMP-A. This 2021 RAMP Report presents capital costs as a sum of the years 2022,

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[1] D.16-08-018 also adopted the requirements previously set forth in D.14-12-025. D.18-12-014 adopted the Safety Model Assessment Proceeding (S-MAP) Settlement Agreement with modifications and contains the minimum required elements to be used by the utilities for risk and mitigation analysis in the RAMP and GRC.

[2] D.19-09-051 at 4.

[3] *See* D.18-12-014 at Attachment A, A-14 ("Mitigation Strategy Presentation in the RAMP and GRC").

2023, and 2024 as a three-year total; operations and maintenance (O&M) costs are only presented for TY 2024 (consistent with the GRC). Costs for each activity that directly address each risk are provided where those costs are available and within the scope of the analysis required in this RAMP Report.

Throughout this 2021 RAMP Report activities are delineated between controls and mitigations, consistent with the definitions adopted in the Settlement Decision's Revised Lexicon. A "control" is defined as a "[c]urrently established measure that is modifying risk."[4] A "mitigation" is defined as a "[m]easure or activity proposed or in process designed to reduce the impact/consequences and/or likelihood/probability of an event."[5] Activities presented in this chapter are representative of those that are primarily scoped to address SoCalGas's Storage risk; however, many of the activities presented herein also help mitigate other areas.

As discussed in Chapters RAMP-A and RAMP-C, SoCalGas has endeavored to calculate a Risk Spend Efficiency (RSE) for all controls and mitigations presented in this risk chapter. However, for controls and mitigations where no meaningful data or Subject Matter Expert (SME) opinion exists to calculate the RSE, SoCalGas has explained why no RSE can be provided, in accordance with California Public Utilities Commission (CPUC or Commission) Safety Policy Division (SPD) staff guidance.[6] Activities with no RSE value presented in this 2021 RAMP Report are identified in Section V below.

A. Risk Overview

Gas storage assets, including underground and above ground facilities, are a necessary and critical component of California's reliable gas delivery infrastructure because gas storage supplies over 22 million customers and approximately half of the electric generation in SoCalGas's territory. SoCalGas operates four underground gas storage facilities: Aliso Canyon,

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4 *Id*. at 16.

5 *Id.* at 17.

6 See Safety Policy Division Staff Evaluation Report on PG&E's 2020 Risk Assessment and Mitigation Phase (RAMP) Application (A.) 20-06-012 at 5 ("SPD recommends PG&E and all IOUs provide RSE calculations for controls and mitigations or provide an explanation for why it is not able to provide such calculations.") (November 25, 2020).

La Goleta, Honor Rancho, and Playa del Rey with a current combined working capacity of approximately 84.4 Bcf.[7]

- Aliso Canyon is in Northern Los Angeles County and is the largest of the gas storage fields that deliver gas to the Los Angeles pipeline loop. Aliso Canyon has a design capacity of approximately 86 Bcf.[8] The current interim range of Aliso Canyon storage capacity is zero to 34 Bcf.[9] Aliso Canyon has 78 injection/withdrawal/ observation wells.[10]
- Honor Rancho is also located in Northern Los Angeles County, approximately ten miles north of Aliso Canyon, with a working capacity of approximately 27 Bcf and delivers to the Los Angeles pipeline loop. Honor Rancho has 35 gas injection/withdrawal wells and is designed for a maximum withdrawal capability of 1.0 Bcf per day.[11]
- La Goleta is in Santa Barbara County and provides service to the northern coastal area of the SoCalGas territory. La Goleta has a working capacity of approximately 21 Bcf. La Goleta has 12 gas injection/withdrawal/observation wells and is designed for a maximum withdrawal capability of 0.4 Bcf per day.[12]
- Playa del Rey, located in central Los Angeles County, has a working capacity of approximately 2.4 Bcf. Playa del Rey has 34 gas injection/withdrawal /observation wells.[13] Playa del Rey is designed for a maximum withdrawal rate of 0.4 Bcf per day to meet residential, commercial and industrial loads throughout the western part of Los Angeles, including electric generators and oil refineries.

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7 The volumetric capacity of a natural gas storage field reservoir is measured in units of billion cubic feet (Bcf).

8 Pipeline and Hazardous Materials Safety Administration (PHMSA), Underground Natural Gas Storage Facility Annual report for Calendar Year 2018 – Supplemental Report (May 20, 2019).

9 *See* D.20-11-044 ("Decision Setting The Interim Range Of Aliso Canyon Storage Capacity At Zero To 34 Billion Cubic Feet").

10 Withdrawal capacity is dependent on well availability and inventory.

11 PHMSA Annual Report, *supra*.

12 *Id.*

13 *Id.*

This chapter considers risks associated with the following storage facility components: storage wells and reservoir, including casing, tubing, and tree/wellhead, compressor stations, dehydration and purification equipment, and other above ground piping and facilities. These risks are evaluated in the context of recent federal and state regulations of natural gas storage facilities, including:

- U.S. Department of Transportation (DOT) Pipeline and Hazardous Materials Safety Administration's (PHMSA) Underground Storage regulations, 49 Code of Federal Regulations (CFR) § 192.12 Final Rule, effective March 13, 2020, which, among other things, adopts certain provisions of American Petroleum Industry (API) Recommended Practice 1171, Functional Integrity of Natural Gas Storage in Depleted Hydrocarbon Reservoirs and Aquifer Reservoirs.
- The California Geologic Energy Management Division (CalGEM, formerly Division of Oil, Gas, and Geothermal Resources or DOGGR) Underground Gas Storage Regulations, 14 California Code of Regulations (CCR) §1726, effective October 1, 2018, which includes, among other things, requirements for operators to submit project-specific Risk Management Plans, Emergency Response Plans, project data requirements, a Records Management Program, well construction requirements, mechanical integrity testing requirements, and monitoring and reporting requirements.
- California Air Resources Board (CARB), Oil & Gas Rule. effective October 1, 2017, which describes monitoring requirements for natural gas underground storage facilities. SoCalGas has developed and received approval from CARB and the local air quality management districts for four individual storage monitoring plans. These include installation of continuous air monitoring to measure upwind and downwind ambient concentrations of methane and continuous leak screening at each injection/withdrawal wellhead assembly and attached pipelines.

SoCalGas has implemented activities and measures to comply with new federal and state regulations at an accelerated pace and has incorporated additional industry leading safety enhancements and improvements. These activities and measures are part of the implementation of SoCalGas's Storage Integrity Management Program (SIMP). SoCalGas's SIMP was initially

modeled after the federally mandated distribution and transmission integrity management programs, and was designed to provide a forward looking, methodical, and structured approach, using state-of-the-art inspection technologies and risk management disciplines to address storage reservoir and well integrity issues.

SoCalGas has also introduced a suite of advanced leak-detection technologies and practices that allow for the early detection of leaks and to help quickly identify anomalies, such as changes in well pressure. These enhancements include:

- Around-the-clock monitoring of the pressure in all wells from each storage facility's 24-hour operations center;
- Continuous upwind/downwind ambient air monitoring and meteorological stations at each storage facility;
- Daily well inspections and/or continuous/real-time wellhead monitoring; and
- Enhanced training for employees and contractors.

SoCalGas also continues to support industry experts in their research efforts to advance storage safety.

B. Risk Definition

For purposes of this RAMP Report, SoCalGas's Incident Related to the Storage System (excluding dig-in) risk (Storage risk) is defined as the risk of damage to the storage system, including wells, reservoirs, and surface equipment, which results in serious injuries, fatalities and/or damages to the infrastructure.

C. Scope

Table 1 below provides what is considered in and out of scope for the Incident Related to the Storage System (excluding dig in) risk in this RAMP Application.

Table 1: Risk Scope

In-Scope:	The risk of damage to the storage system including, wells, reservoirs and surface assets (compressors, laterals, oil/brine systems, etc.) which results in consequences such as injuries, fatalities or outages.
Data Quantification Sources:	SoCalGas used internal data sources for the calculation surrounding risk reduction; however, if internal data was not available or was insufficient, Industry or National data was utilized and was adjusted appropriately to fit the risk profile associated with the operating locations and parameters of the utilities. For example, certain types of incident events have not

	occurred within the SoCalGas service territory; therefore, SoCalGas examined industry data where those incident(s) have occurred to establish a baseline of risk. See Appendix B for additional information.

II. RISK ASSESSMENT

In accordance with the Settlement Decision,[14] this section describes the risk bow tie, possible drivers, potential consequences, and the risk score for the Storage risk.

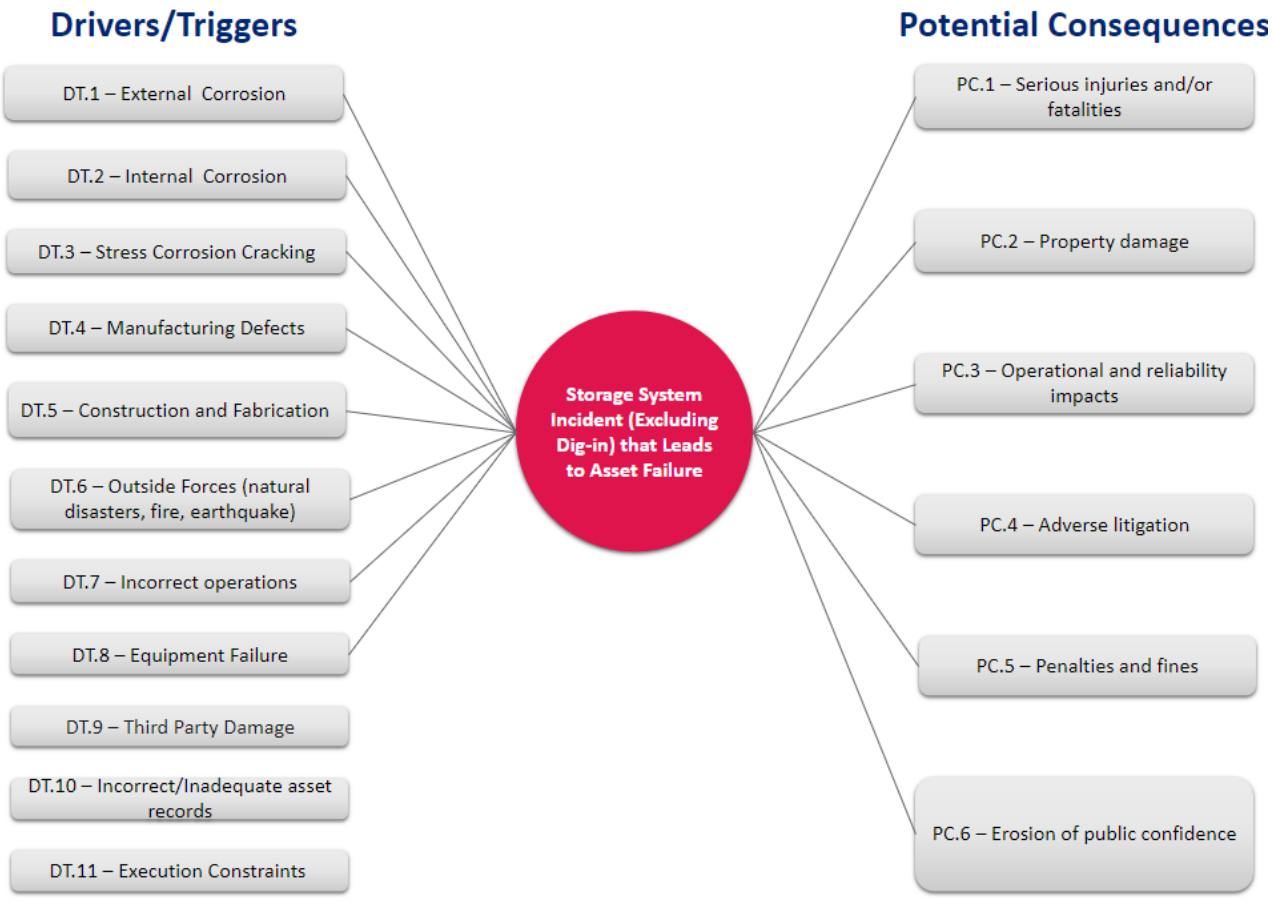
A. Risk Bow Tie and Risk Event Associated with the Risk

The risk bow tie is a commonly used tool for risk analysis, and the Settlement Decision[15] instructs the utility to include a risk bow tie illustration for each risk included in RAMP. As illustrated in the risk bow tie shown below in Figure 1, the risk event (center of the bow tie) is the storage system incident (excluding dig-in) that leads to asset failure, the left side of the bow tie illustrates drivers/triggers that lead to the storage system incident that leads to asset failure, and the right side shows the potential consequences of the storage system incident that leads to asset failure. SoCalGas applied this framework to identify and summarize the information provided in Figure 1. A mapping of each mitigation to the element(s) of the risk bow tie addressed is provided in Appendix A.

[14] D.18-12-014 at 33 and Attachment A, A-11 ("Bow Tie").

[15] *Id.* at Attachment A, A-11 ("Bow Tie").

Figure 1: Risk Bow Tie



B. Cross-Functional Factors

The following CFFs have programs and/or projects that affect this risk chapter: Asset and Records Management, Energy Resilience, Emergency Preparedness and Response and Pandemic, Foundational Technology Systems, Physical Security, Safety Management System (SMS), and Workforce Planning / Quality Workforce. As an example, efforts discussed in the Energy Resilience Cross-Functional Factor chapter address specific drivers to the asset-based risks. Additional information is provided in the narratives for the referenced CFFs.

C. Potential Drivers/Triggers[16]

The Settlement Decision[17] instructs the utility to identify which element(s) of the associated risk Bow Tie are addressed by each mitigation. When performing the risk assessment for Storage, SoCalGas identified potential leading indicators, referred to as Drivers or Triggers. These include, but are not limited to:

- **DT.1 –External corrosion**: A naturally occurring phenomenon commonly defined as the deterioration of a material (usually a metal) that results from a chemical or electrochemical reaction with its environment.[18] This risk driver is based on the potential for corrosion on the external surface of such assets as steel tubing, casing, and pipelines that are exposed to corrosive environments.
- **DT.2 – Internal corrosion:** Deterioration of the interior of an asset as a result of the environmental conditions on the inside of the pipeline.[19] This risk driver is based on the potential for corrosion on the internal surface of such assets as steel tubing, casing, and pipelines. Internal corrosion may be caused by the corrosive effect of fluid, sand, and/or reactive constituents such as carbon dioxide in the gas withdrawn from the storage formations.
- **DT.3 – Stress Corrosion Cracking**: A type of environmentally assisted cracking usually resulting from the formation of cracks due to various factors in combination with the environment surrounding the pipe that together reduce the pressure-carrying capability of the pipe.[20]
- **DT.4 – Manufacturing Defects**: This risk driver is based on the potential for failure of storage assets due to defects introduced during the manufacturing process. It is attributable to material defect within the pipe, component or joint due to faulty manufacturing procedures, design defects, or in-service stresses such as vibration, fatigue and environmental cracking.

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16 An indication that a risk could occur. It does not reflect actual or threatened conditions.

17 D.18-12-014 at Attachment A, A-11 ("Bow Tie").

18 See American Society of Mechanical Engineers (ASME) B31.8S.

19 *Id.*

20 *Id.*

- **DT.5 – Construction and Fabrication**: This risk driver is based on the potential for failure of storage assets due to defects introduced during the construction and fabrication process. It is attributable to the construction methodology applied during the installation of pipeline components specifically based on the vintage of the construction standards, fabrication techniques (welding, bending, etc.) and overall guiding regulations.
- **DT.6 – Outside forces (natural disasters, fire, earthquake):** This risk driver includes both natural forces and those from external sources that can affect the integrity of the storage facilities. Examples of natural forces include ground movement, landslides, and subsidence from earthquakes.
- **DT.7 – Incorrect Operations:** This risk driver is based on the potential for maintenance or inspection functions to be performed incorrectly by employees or contractors.
- **DT.8 – Equipment Failure**: This risk driver is based on the potential for failure of storage equipment not due to either manufacturing or construction related defects. It is attributable to malfunction of components, including but not limited to, regulators, valves, meters, flanges, gaskets, collars, couples, etc.
- **DT.9 – Third Party Damage (except underground damages)**: This risk driver is based on the potential for damage to a storage asset by an outside party other than those performing work for SoCalGas.
- **DT.10 – Incorrect/Inadequate Asset Records:** This risk driver is based on the potential for inaccurate or incomplete information that could result in the failure to construct, operate, and maintain SoCalGas's storage assets safely.
- **DT.11 – Execution Constraints:** This risk driver refers to constraints (excluding damages caused by outside forces) that may result in disruptions to the business or impede the completion of projects or initiatives. These may include, for example, operational compliance, quality assurance and control, delayed timeliness in response and awareness of operational issues, resource constraints, inefficiencies and re-allocation (human and material), unexpected maintenance or unanticipated regulatory requirement.

D. Potential Consequences of Risk Event

Potential consequences[21] are listed to the right side of the risk bow tie illustration provided above. If one or more of the drivers/triggers listed above were to result in an incident, the potential consequences, in a reasonable worst-case scenario, could include:

- Serious injuries[22] and/or fatalities;
- Property damage;
- Operational and reliability impacts;
- Adverse litigation;
- Penalties and fines; or
- Erosion of public confidence.

These Potential Consequences were used in the scoring of Storage Risks that occurred during the development of SoCalGas's 2020 Enterprise Risk Registry.

E. Risk Score

The Settlement Decision requires a pre- and post-mitigation risk calculation.[23] Chapter RAMP-B of this RAMP Application explains the Risk Quantification Framework which underlies this Chapter, including how the Pre-Mitigation Risk Score, Likelihood of Risk Event (LoRE), and Consequence of Risk Event (CoRE) are calculated.

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[21] D.18-12-014 at 16 and Attachment A, A-8 ("Identification of Potential Consequences of Risk Event").

[22] As defined by Cal/OSHA as "any injury or illness occurring in a place of employment or in connection with any employment which requires inpatient hospitalization for a period in excess of 24 hours for other than medical observation or in which an employee suffers a loss of any member of the body or suffers any serious degree of permanent disfigurement, but does not include any injury or illness or death caused by the commission of a Penal Code violation, except the violation of Section 385 of the Penal Code, or an accident on a public street or highway." (Available at: *http://services.claremont.edu/ehs/wp-content/uploads/sites/16/2017/03/calosha-serious-injury-definition.pdf).*

[23] D.18-12-014 at Attachment A, A-11 ("Calculation of Risk").

Table 1: Pre-Mitigation Analysis Risk Quantification Scores[24]

	LoRE	CoRE	Risk Score
Incident Related to the Storage System	0.29	9,306	2,721

Pursuant to Step 2A of the Settlement Decision, the utility is instructed to use actual results, available and appropriate data (*e.g.,* Pipeline and Hazardous Materials Safety Administration data).[25]

The safety risk assessment primarily considered historical occurrences of unintended releases from underground gas storage facilities of varying severity as described in the "Analysis of Occurrences at Underground Fuel Storage Facilities and Assessment of the Main Mechanisms Leading to Loss of Storage Integrity" paper referenced in Appendix B below. The incident rates with safety consequences were calculated as the product of the national average (the frequency of an incident per field) and the number of fields SoCalGas operates currently. The safety risk was evaluated using a Monte Carlo simulation.

The reliability assessment considered internal and national data. Internal and PHMSA data over the past five years indicates no storage risk incidents which led to loss of service to customers; therefore, SME input was utilized to determine the reliability impacts due to a storage incident.

The financial assessment was estimated based on historical data from the U.S. Natural Gas Storage Risk-Based Ranking Methodology and Results[28] and further supported by input from Company subject matter experts (SMEs). The data includes storage field incidents dating back approximately 70 years and their respective estimated financial impacts.

III. 2020 CONTROLS

This section "[d]escribe[s] the controls or mitigations currently in place" as required by the Settlement Decision.[26] The activities in this section were in place as of December 31, 2020.

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[24] The term "pre-mitigation analysis," in the language of the S-MAP Settlement Agreement Decision (Attachment A, A-12 ("Determination of Pre-Mitigation LoRE by Tranche," "Determination of Pre-Mitigation CoRE," "Measurement of Pre-Mitigation Risk Score")), refers to required pre-activity analysis conducted prior to implementing control or mitigation activity.

[25] *Id.* at Attachment A, A-8 ("Identification of Potential Consequences of Risk Event").

[26] S-MAP Settlement Agreement Decision at 33.

Controls that will continue as part of the risk controls and mitigation plan are addressed in Section IV.

A. C1: Integrity Demonstration, Verification, and Monitoring Practices

SoCalGas performs integrity inspections on gas storage wells to verify the pressure containing capability of the well, detect possible leaks, and identify metal loss anomalies in the tubing and casing. Types of inspections include pressure testing, noise and temperature surveys, magnetic flux leakage (MFL) inspection, and ultrasonic (UT) inspection. Pressure testing and wall thickness inspections (MFL or UT) are currently required for each gas storage well at a two-year recurring frequency.[27] Temperature and noise surveys are required at least annually at Aliso Canyon and Honor Rancho. Temperature surveys are required semiannually, and noise surveys are required annually, at La Goleta and Playa del Rey.

Remediation activities performed during, or as a result of integrity demonstration, verification, and monitoring practices can reduce the risk of failure during operations. These activities may include replacement of the wellhead, replacement of valves, replacement of the tubing and packer, installation of an inner casing string or liner, and installation of shallow-set subsurface safety valves.

In addition, SoCalGas has integrated its Risk Management for Gas Storage Operations into SoCalGas's Integrity Management organization, aligning the underground gas storage integrity management practices with its transmission and distribution integrity management practices. The Integrity Management organization is tasked with such responsibilities as developing and implementing processes and procedures to manage storage well integrity and compliance with new underground storage regulations; advancing the approach to data management, data governance and risk assessment; developing and tracking training of Company employees on procedures pertinent to storage integrity management; and supporting execution of drills and exercises to evaluate emergency response plans. Since the Integrity Management organization supports numerous efforts aimed at reducing the risk of an incident related to the storage system, the costs for this control are allocated across the other underground storage controls.

[27] 14 CCR § 1726.6(a)(3).

As discussed in the SMS CFF chapter, SoCalGas has been implementing the Company's SMS, which includes the principles set forth in the American Petroleum Institute (API) Recommended Practice 1173 Pipeline Safety Management System. API 1173 is a systematic way to identify hazards and control risks while validating that these risk controls are effective, and places strong emphasis on process safety and safety culture. SoCalGas also highlights several new regulations that support this implementation and which share elements of API 1173:

- PHMSA Underground Storage regulations, 49 CFR § 192.12, adopts API 1171, Functional Integrity of Natural Gas Storage in Depleted Hydrocarbon Reservoirs and Aquifer Reservoirs into regulation, and is an integral component of creating an SMS for Underground Storage. Specifically, "[s]torage design, construction, operation, and maintenance include activities in risk management, site security, safety, emergency preparedness, and procedural documentation and training to embed human and organizational competence in the management of storage facilities."[28]
- CalGEM Requirements for California Underground Gas Storage Projects, 14 CCR § 1726.3, which includes, among other things, incorporation of human factors into risk management plans.[29]

B. C2: Well Abandonment and Replacement

Under certain circumstances, SoCalGas may abandon a well rather than continue to utilize it for gas storage operations. The decision to plug and abandon a well is driven by various factors including, but not limited to, well-specific information; location-specific information; deliverability; operation and maintenance history; and operational needs. To abandon a well, SoCalGas isolates the well from injection and withdrawal operations, removes the wellhead and casing to a certain depth, and fills the wellbore with cement. Depending on the impact of abandonments to gas storage operations, new wells may need to be drilled to replace the injection and withdrawal capabilities of the abandoned wells.

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[28] American Petroleum Institute, Recommended Practice 1171 at "Preamble" (September 2015), available at *http://www.api.org/~/media/files/publications/whats%20new/1171_e1%20pa.pdf*.

[29] 14 CCR § 1726.3.

C. C3: Pressure Monitoring and Alarming

SoCalGas has implemented continuous, real-time pressure monitoring at gas storage wells in each storage facility. Monitoring devices are installed at each tubing and casing annulus, with certain setpoints established to reflect normal operating conditions. Through automated alerts, exceedance of a setpoint will notify local operations, enabling SoCalGas to investigate a potential abnormal condition. The equipment functions continuously unless it needs to be deactivated on a temporary basis for maintenance purposes. In those instances, pressure reads are conducted manually.

D. C4: Wellhead Leak Detection and Repair

Wellhead leak detection and repair entails performing a daily audio-visual inspection, as well as a quarterly leak survey with the use of optical gas imaging. Inspections are performed on each active and idle injection/withdrawal wellhead assembly owned and operated by SoCalGas.

SoCalGas also has implemented and follows a CARB-approved monitoring plan for its underground storage facilities in compliance with the CARB Oil & Gas Rule, 17 CCR § 95668(h) as of August 6, 2019. This monitoring plan addresses three CARB Oil & Gas Rule regulatory requirements: (1) continuous ambient air monitoring, (2) wellhead daily or continuous leak screening, and (3) well blowout procedures. The CARB Oil & Gas Rule requires daily or continuous leak screening at each injection/withdrawal wellhead assembly and attached pipelines according to one or both of the following methods: (1) daily leak screening with the use of an U.S. Environmental Protection Agency Reference Method 21 instrument, or the use of Optical Gas Imaging, or (2) continuous leak screening with the use of automated instruments and a monitoring system with an alarm system.[30]

Additionally, pursuant to the CARB Oil & Gas Rule regulations, on or after January 1, 2020, any component with a leak measuring total hydrocarbon concentrations greater than or equal to 1,000 parts per million volume (ppmv), but not greater than 9,999 ppmv, will be successfully repaired or removed from service within 14 calendar days of initial leak detection. Component leaks with measured total hydrocarbon concentrations greater than or equal to 10,000 ppmv, but not greater than 49,999 ppmv, will be successfully repaired or removed from service within five (5) calendar days of initial leak detection. Component leaks with measured

[30] 17 CCR § 95668(h).

total hydrocarbon concentrations greater than or equal to 50,000 ppmv will be successfully repaired or removed from service within two (2) calendar days of initial leak detection. Critical components or critical process units will be successfully repaired by the end of the next process shutdown or within 12 months from the date of initial leak detection, whichever is sooner.

E. C5: Storage Field Maintenance

SoCalGas uses its storage assets to efficiently meet gas balancing requirements on its transmission pipeline and distribution system. To satisfy these needs, the individual storage facilities act as "gas suppliers" or "consumers," depending upon the withdrawal or injection requirements, as managed by SoCalGas's Gas Control department. Fluctuating demands may require storage operations to perform gas injection or withdrawal functions at any hour of the day, 365 days per year. Storage fields are continually staffed with operating crews and on-call personnel to support these critical 24/7 operations.

Storage is critical to maintain a reliable supply of natural gas in Southern California, particularly during periods of extreme weather conditions occurring locally or out of state, unforeseen pipeline maintenance, or the temporary reduction of interstate supplies for other reasons. Continuous maintenance activities and ongoing investments are necessary to make certain that the storage system remains capable of providing supply during such periods.

Aboveground operation and maintenance activities include pipeline patrols, inspections, and corrosion control and other maintenance on a regular basis throughout the year.

F. C6: Compressor Overhauls

Storage compressor units increase the pressure of natural gas so it can be injected into the underground reservoirs. Examples of equipment within this area include engines and high pressure gas compressors. Periodic overhauls of this equipment are necessary to uphold safety, maintain or improve system reliability, extend equipment life, achieve environmental compliance, and meet required injection capacities.

This mitigation will inspect, repair or replace, as needed, engine and compressor parts, such as, cranks, bearings, seals, cylinder heads, pistons, and connecting rods. These inspections and repair activities on the storage compressor units help to keep them in good working order and help to reduce the likelihood of failures of components, such as camshafts, heads, pistons, valves, bearings, and gaskets, that could result in the release of natural gas inside the compressor

building or catastrophic failure of a compressor or engine that could result in fire, injury to personnel, extensive property damage, or environmental damage.

G. C7: Upgrade to Purification Equipment

Purification equipment is used primarily for the removal of impurities from, or the conditioning of, natural gas withdrawn from storage. Examples of equipment included in this area are dehydrators, coolers, scrubbers, boilers and tanks. Upgrades to this equipment will allow SoCalGas to address potential safety issues related to uncontrolled releases due to equipment failures, maintain or improve reliability, meet regulatory and environmental requirements, and meet the required capacities and specifications of various purification systems.

Upgrades to purification equipment help to mitigate the risk of the failure of pressure vessels, heat exchangers, or piping components that could result in the release of natural gas or liquids. Dehydration equipment that does not function properly could result in gas that does not meet the pipeline gas quality specifications (Rule 30), potentially resulting in safety issues or impacts to customer service due to the possible formation of liquids in downstream piping.

IV. 2022-2024 CONTROL & MITIGATION PLAN

This section contains a table identifying the controls and mitigations comprising the portfolio of mitigations for this risk.[31]

As reflected in the Table below, all of the activities discussed in Section III above are expected to continue during the TY 2024 GRC. For clarity, a current activity that is included in the Plan may be referred to as either a Control and/or a Mitigation. For purposes of this RAMP Report, a control that will continue as a mitigation will retain its control ID unless the size and/or scope of that activity will be modified, in which case that activity's control ID will be replaced with a mitigation ID. The table below shows which activities are expected to continue.

[31] *See* D.18-12-014, Attachment A at A-14 ("Mitigation Strategy Presentation in the RAMP and GRC").

Table 2: Control and Mitigation Plan Summary

Line No.	Control/ Mitigation ID	Control/Mitigation Description	2020 Controls	2022-2024 Plan
1	C1	Integrity Demonstration, Verification, and Monitoring Practices	X	X
2	C2	Well Abandonment and Replacement	X	X
3	C3	Pressure Monitoring and Alarming	X	X
4	C4	Wellhead Leak Detection and Repair	X	X
6	C5	Storage Field Maintenance	X	X
7	C6	Compressor Overhauls	X	X
8	C7	Upgrade to Purification Equipment	X	X
9	M1	Facilities Integrity Management Program (FIMP)	No	X

For activities SoCalGas plans to perform that remain unchanged, please refer to the description in Section III. If changes to the various activities are anticipated, such modifications are further described in this section below.

SoCalGas plans to continue implementing each of the activities discussed above without any significant changes.

A. 2022 – 2024 Mitigations

1. M1: Facilities Integrity Management Program (FIMP)

SoCalGas is developing a Facilities Integrity Management Program (FIMP) based on principles developed by the Canadian Energy Pipeline Association and the Pipeline Research Council International. FIMP is not intended to duplicate any systems or processes that may already exist; rather, it is intended to supplement the already existing programs (*e.g.*, SIMP, Transmission Integrity Management Program, and Distribution Integrity Management Program) and current integrity processes to enhance the safety and integrity of SoCalGas's facility assets. FIMP will apply integrity management principles to particular above ground facility assets to

reduce risks and promote operational excellence. Initial FIMP activities include program development and data collection and integration efforts on pressure vessels, tanks, and certain piping at storage facilities and compressor stations.

V. COSTS, UNITS, AND QUANTITATIVE SUMMARY TABLES

The tables in this section provide a summary of the risk control and mitigation plan, including the associated costs, units, and the RSEs, by tranche. When an RSE could not be performed, an explanation is provided. SoCalGas does not account for and track costs by activity or tranche; rather, SoCalGas accounts for and tracks costs by cost center and capital budget code. The costs shown were estimated using assumptions provided by SMEs and available accounting data.

Table 3: Risk Control and Mitigation Plan - Recorded and Forecast Dollars Summary[32] (Direct After Allocations, In 2020 $000)

ID	Control/Mitigation Name	Recorded Dollars		Forecast Dollars			
		2020 Capital[33]	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
C1	Integrity Demonstration, Verification, and Monitoring Practices	66,676	13,413	263,720	319,240	14,834	17,957
C2	Well Abandonment and Replacement	14,926	-	120,625	146,020	-	-
C3	Pressure Monitoring and Alarming	-	284	-	-	387	468
C4	Wellhead Leak Detection and Repair	-	7,913	-	-	7,490	9,066
C5	Storage Field Maintenance	-	36,295	-	-	33,599	40,672

[32] Recorded costs and forecast ranges are rounded. Additional cost-related information is provided in workpapers. Costs presented in the workpapers may differ from this table due to rounding. The figures provided are direct charges and do not include Company loaders, with the exception of vacation and sick. The costs are also in 2020 dollar and have not been escalated to 2021 amounts. The capital presented is the sum of the years 2022, 2023, and 2024, or a three-year total. Years 2022, 2023 and 2024 are the forecast years for SoCalGas's Test Year 2024 GRC Application.

[33] Pursuant to D.14-12-025 and D.16-08-018, the Company provides the 2020 "baseline" capital costs associated with Controls. The 2020 capital amounts are for illustrative purposes only. Because capital programs generally span several years, considering only one year of capital may not represent the entire activity.

ID	Control/Mitigation Name	Recorded Dollars		Forecast Dollars			
		2020 Capital[33]	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
C6	Compressor Overhauls	1,959	-	13,232	17,902	-	-
C7	Upgrade to Purification Equipment	1,136	-	17,070	23,095	-	-
M1	Facilities Integrity Management Program (FIMP)	-	1,801	-	-	1,330	2,470

Table 4: Risk Control & Mitigation Plan - Units Summary

ID	Control/Mitigation Name	Units Description		Recorded Units		Forecast Units			
		Capital	O&M	2020 Capital	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 (High) O&M
C1	Integrity Demonstration, Verification, and Monitoring Practices	# wells having undergone integrity assessment		52	52	174	210	58	70
C2	Well Abandonment and Replacement	# wells abandoned		9	-	23	28	-	-
C3	Pressure Monitoring and Alarming	# storage wells with annulus monitoring		-	118	-	-	108	112
C4	Wellhead Leak Detection and Repair	# storage wells subject to wellhead leak detection and repair activities		-	118	-	-	108	112
C5	Storage Field Maintenance	The variety of work activities makes it infeasible to identify a single unit of measurement							
C6	Compressor Overhauls	# compressor overhauls		4.5	-	12	18	-	-
C7	Upgrade to Purification Equipment	# storage fields		4	-	12	12	-	-

ID	Control/Mitigation Name	Units Description		Recorded Units		Forecast Units			
		Capital	O&M	2020 Capital	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 (High) O&M
M1	Facilities Integrity Management Program (FIMP)	# of Storage Fields		-	4	-	-	1	4

Table 5: Risk Control & Mitigation Plan – Quantitative Analysis Summary (Direct After Allocations, In 2020 $000)

ID	Control/Mitigation Name	Forecast			
		LoRE	CoRE	Post Mitigation Risk Score	RSE
C1	Integrity Demonstration, Verification, and Monitoring Practices	0.29	9,306	2,676	0.3
C2	Well Abandonment and Replacement	0.27	9,306	2,534	2.8
C3	Pressure Monitoring and Alarming	See Table 6			
C4	Wellhead Leak Detection and Repair	See Table 6			
C5	Storage Field Maintenance	0.16	9,306	1,479	35.1
C6	Compressor Overhauls	0.26	9,306	2,440	82.7
C7	Upgrade to Purification Equipment	0.28	9,306	2,603	5.7
M1	Facilities Integrity Management Program (FIMP)	See Table 6			

Table 6: Risk Control & Mitigation Plan - Quantitative Analysis

Summary for RSE Exclusions

ID	Control/Mitigation Name	RSE Exclusion Rationale
C3	Pressure Monitoring and Alarming	While the Company possesses data, such as well pressures, well monitor repairs and replacements, etc., the data to link the decrease in likelihood or consequence of a storage incident does not exist. Although this activity is expected to reduce the likelihood of a storage-related incident, quantitative information linking monitors to risk reduction does not exist, either internally or externally. Additionally, SMEs are unable to reliably quantify a risk-reduction benefit of this activity.
C4	Wellhead Leak Detection and Repair	Similar to Control 3, it is not possible to quantify the risk-reduction benefit of this activity due to an absence of relevant data, and SMEs are unable to reliably quantify a risk-reduction benefit.
M1	Facilities Integrity Management Program	Due to the program still being in a development stage, the activities that will be included in the program are still being identified. When program scoping is completed, activities that have been included will be tracked and risk mitigations will be defined and subsequently quantified, if feasible.

VI. ALTERNATIVES

Pursuant to D.14-12-025 and D.16-08-018, SoCalGas considered alternatives to the risk control and mitigation plan for the Storage risk. SoCalGas typically analyzes alternatives when implementing activities to obtain the best result or product for the cost. The alternatives analysis for this risk control and mitigation plan also took into account modifications to the plan and constraints, such as budget and resources.

A. A1: Risk-based well casing inspection frequency

Per existing regulation, SoCalGas is required to perform metal loss inspections on gas storage well casings on a 24-month recurring frequency. SoCalGas has evaluated an alternate approach that assigns a well-specific inspection interval, determined in accordance with prior inspection results and an engineering evaluation of the casing's ability to contain pressure. This

alternative would likely result in less frequent inspections, which could mitigate risks associated with frequent well interventions stemming from the temporary reconfiguration of well barriers, the potential for incorrect operations during complex well entry activities, and the higher presence of personnel that is required on-site during these activities. While this represents SoCalGas's preferred approach, approval from CalGEM is required before this alternative can be implemented. SoCalGas continues to discuss this approach with CalGEM.

B. A2: Alternate technology for methane monitoring

As described in Section III of this chapter, SoCalGas currently has a control in place for wellhead leak detection and repair. Each gas storage well is equipped with methane monitoring that is set to alert operations personnel if methane concentrations reach certain thresholds, which could indicate leaks from the well or connected piping. Leak indications are followed up on by operations personnel, with corrective action taken as necessary. As technologies develop and improve, there may be opportunities to supplement or upgrade the current monitoring devices to further improve measurement accuracy, reduce the required calibration frequency, and lessen sensitivity to non-methane environmental conditions.

Table 7: Alternate Mitigation Plan - Forecast Dollars Summary[34]
(Direct After Allocations, In 2020 $000)

ID	Alternate Mitigation Name	Forecast Dollars			
		2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
A1	Risk-based well casing inspection frequency	18,398	84,914	-	-
A2	Alternate technology for methane monitoring	3,800	3,800	-	-

[34] Recorded costs and forecast ranges are rounded. Additional cost-related information is provided in workpapers. Costs presented in the workpapers may differ from this table due to rounding. The figures provided are direct charges and do not include Company loaders, with the exception of vacation and sick. The costs are also in 2020 dollar and have not been escalated to 2021 amounts. The capital presented is the sum of the years 2022, 2023, and 2024, or a three-year total. Years 2022, 2023 and 2024 are the forecast years for SDG&E's Test Year 2024 GRC Application.

Table 8: Alternate Mitigation Plan - Units Summary

ID	Control/Mitigation Name	Units Description		Forecast Units			
		Capital	O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 (High) O&M
A1	Risk-based well casing inspection frequency	Wells		13	60	-	-
A2	Alternate technology for methane monitoring	Monitors		276	276	-	-

Table 9: Alternate Mitigation Plan - Quantitative Analysis Summary (Direct After Allocations, In 2020 $000)

ID	Control/Mitigation Name	Forecast			
		LoRE	CoRE	Post Mitigation Risk Score	RSE
A1	Risk-based well casing inspection frequency	0.29	9,306	2,710	0.8
A2	Alternate technology for methane monitoring	0.29	9,306	2,715	7.1

APPENDIX A: SUMMARY OF ELEMENTS OF THE RISK BOW TIE

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Storage Risk: Summary of Elements of the Risk Bow Tie

ID	Control/Mitigation Name	Elements of the Risk Bow Tie Addressed
C1	Integrity Demonstration, Verification, and Monitoring Practices	DT.1, DT.2, DT.4, DT.6, DT.8, DT.9
C2	Well Abandonment and Replacement	DT.1, DT.2, DT.6, DT.8, DT.9
C3	Pressure Monitoring and Alarming	DT.4, DT.5, DT.8, DT.10
C4	Wellhead Leak Detection and Repair	DT.4, DT.5, DT.8, DT.10
C5	Storage Field Maintenance	DT.1, DT.2, DT.6, DT.7, DT.8, DT.10
C6	Compressor Overhauls	DT.4, DT.5, DT.6, DT.8
C7	Upgrade to Purification Equipment	DT.1, DT.2, DT.5, DT.6, DT.7, DT.8, DT.10
M1	Facilities Integrity Management Program (FIMP)	DT.1, DT.2, DT.3, DT.4, DT.5, DT. 6, DT.7, DT.8, DT.9, DT.10, DT.11, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6

APPENDIX B: QUANTITATIVE ANALYSIS SOURCE DATA REFERENCES

APPENDIX B: QUANTITATIVE ANALYSIS SOURCE DATA REFERENCES

The Settlement Decision directs the utility to identify Potential Consequences of a Risk Event using available and appropriate data. The below provides a listing of the inputs utilized as part of this assessment.

Analysis of Occurrences at Underground Fuel Storage Facilities and Assessment of the Main Mechanisms Leading to Loss of Storage Integrity
Conference: 51st US Rock Mechanics/Geomechanics Symposium, at San Francisco, California
Authors: Evans, David J. British Geological Survey, UK; Schultz, Richard A. Petroleum and Geosystems Engineering, The University of Texas at Austin, USA
Link:
https://www.researchgate.net/publication/317873326_Analysis_of_Occurrences_at_Underground_Fuel_Storage_Facilities_and_Assessment_of_the_Main_Mechanisms_Leading_to_Loss_of_Storage_IntegrityLink: Annual Report mileage for Gas Distribution Systems

Historical Failures Chapter 4. Integral Engineering, 2020.

SoCalGas Well Summary Report which provides well count data according to well type across SoCalGas storage fields.

Number of Depleted Fields, Underground Natural Gas Storage Capacity
Agency: U.S. Energy Information Administration (EIA)
Link: *https://www.eia.gov/dnav/ng/ng_stor_cap_a_EPG0_SA2_Count_a.htm*

U.S. Natural Gas Storage Risk-Based Ranking Methodology and Results
Agency: Argonne National Laboratory (U.S. Department of Energy laboratory)
Link: *https://publications.anl.gov/anlpubs/2016/12/132436.pdf*

Annual Report Mileage for Natural Gas Transmission & Gathering Systems
Agency: Pipeline and Hazardous Materials Safety Administration
Link: *https://cms.phmsa.dot.gov/data-and-statistics/pipeline/annual-report-mileage-natural-gas-transmission-gathering-systems*

Distribution, Transmission & Gathering, LNG, and Liquid Accident and Incident Data
Agency: Pipeline and Hazardous Materials Safety Administration
Link: *https://www.phmsa.dot.gov/data-and-statistics/pipeline/distribution-transmission-gathering-lng-and-liquid-accident-and-incident-data*

Risk Assessment and Mitigation Phase

(Chapter SCG-Risk-5)

Incident Involving an Employee

May 17, 2021

TABLE OF CONTENTS

RISK: INCIDENT INVOLVING AN EMPLOYEE

I. INTRODUCTION

The purpose of this chapter is to present SoCalGas's risk control and mitigation plan for the Incident Involving an Employee risk (IIE risk). Each chapter in this Risk Assessment Mitigation Phase (RAMP) Report contains the information and analysis that meets the requirements adopted in Decision (D.) 16-08-018 and D.18-12-014 and the Settlement Agreement included therein (the Settlement Decision).[1]

SoCalGas has identified and defined RAMP risks in accordance with the process described in further detail in Chapter RAMP-B of this RAMP Report. On an annual basis, SoCalGas's Enterprise Risk Management (ERM) organization facilitates the Enterprise Risk Registry (ERR) process. The ERR process influenced how risks were selected for inclusion in this 2021 RAMP Report, consistent with the Settlement Decision's directives, as discussed in Chapter RAMP-C.

The RAMP Report's purpose is to present a current assessment of key safety risks and the proposed activities for mitigating those risks. The RAMP Report does not request funding. Any funding requests will be made in SoCalGas's General Rate Case (GRC) application. The costs presented in this 2021 RAMP Report are those costs for which SoCalGas anticipates requesting recovery in its Test Year (TY) 2024 GRC. SoCalGas's TY 2024 GRC presentation will integrate developed and updated funding requests from the 2021 RAMP Report, supported by witness testimony.[2] This 2021 RAMP Report is presented consistent with SoCalGas's GRC presentation, in that the last year of recorded data (2020) provides baseline costs and cost estimates are provided for years 2022-2024, as further discussed in Chapter RAMP-A. This 2021 RAMP Report presents capital costs as a sum of the years 2022, 2023, and 2024 as a three-year total; operations and maintenance (O&M) costs are only presented for TY 2024 (consistent with the GRC). Costs for each activity that directly address each risk are provided where those costs are available and within the scope of the analysis required in this RAMP Report.

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[1] D.16-08-018 also adopted the requirements previously set forth in D.14-12-025. D.18-12-014 adopted the Safety Model Assessment Proceeding (S-MAP) Settlement Agreement with modifications and contains the minimum required elements to be used by the utilities for risk and mitigation analysis in the RAMP and GRC.

[2] *See* D.18-12-014 at Attachment A, A-14 ("Mitigation Strategy Presentation in the RAMP and GRC").

Throughout this 2021 RAMP Report activities are delineated between controls and mitigations, consistent with the definitions adopted in the Settlement Decision's Revised Lexicon. A "control" is defined as a "[c]urrently established measure that is modifying risk."[3] A "mitigation" is defined as a "[m]easure or activity proposed or in process designed to reduce the impact/consequences and/or likelihood/probability of an event."[4] Activities presented in this chapter are representative of those that are primarily scoped to address SoCalGas's IIE risk; however, many of the activities presented herein also help mitigate other areas.

As discussed in Chapters RAMP-A and RAMP-C, SoCalGas has endeavored to calculate a Risk Spend Efficiency (RSE) for all controls and mitigations presented in this risk chapter. However, for controls and mitigations where no meaningful data or SME opinion exists to calculate the RSE, SoCalGas has included an explanation why no RSE can be provided, in accordance with California Public Utilities Commission (CPUC or Commission) Safety Policy Division (SPD) staff guidance.[5] Activities with no RSE value presented in this 2021 RAMP Report are identified in Section V below.

A. Risk Overview

At SoCalGas, the safety of employees is a core value. SoCalGas's approach to safety is built on a tradition of providing safe and reliable service for 150 years and is captured in the Company's seven Safety Values and summarized in SoCalGas's Commitment to Safety statement (included in the annual Gas Safety Plans and Safety Management System (SMS) Plan), which is embraced and endorsed by every member of the senior management team:

> SoCalGas' longstanding commitment to safety focuses on three primary areas – employee/contractor safety, customer/public safety and the safety of gas delivery system. This safety focus is embedded in what we do and is the foundation for who we are – from initial employee training, to the installation, operation and

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3 *Id*. at 16.

4 *Id.* at 17.

5 See Safety Policy Division Staff Evaluation Report on PG&E's 2020 Risk Assessment and Mitigation Phase (RAMP) Application (A.) 20-06-012 at 5 ("SPD recommends PG&E and all IOUs provide RSE calculations for controls and mitigations or provide an explanation for why it is not able to provide such calculations.") (November 25, 2020).

> maintenance of our utility infrastructure, and to our commitment to provide safe and reliable service to our customers.[6]

To promote these principles and safety values throughout, and to foster a culture of continuous safety improvement, SoCalGas strives for a work environment where employees at all levels can raise concerns about pipeline infrastructure, customer safety, and employee safety and offer suggestions for improvement. SoCalGas encourages two-way formal and informal communication between its employees and management in order to identify and manage safety risks before incidents occur, as further described below in SCG-2-C7 and the RAMP Chapter on Safety Culture.

The IIE risk was included in SoCalGas's 2020 Enterprise Risk Registry and is defined as the risk of conditions and practices that may lead to an incident threatening employee health and safety caused by non-adherence to Company policies, procedures and programs, or by external factors. This IIE risk chapter focuses on controls and mitigations that address education, training, compliance, programs, behaviors, culture, and other internal procedural, process, and cultural enhancements. This safety focus is embedded in everything the Company does. SoCalGas's safety efforts start at the top with appropriate safety governance. SoCalGas's Board of Directors includes senior officers with extensive operational and safety experience specific to a natural gas utility and provides oversight at the highest level. As further described below, SoCalGas has an Executive Safety Council (ESC), which is chaired by the Chief Operating Officer, who is also the Chief Safety Officer. The ESC sets goals and direction, provides resources, and reviews results of direct feedback from the frontline employees.

While the Employee Safety risk scope is limited for purposes of this Chapter, it is important to note that the operational risks and cross-functional factors addressed in this RAMP Report can result in an incident where an employee is seriously injured, or a fatality occurs. Thus, the risk mitigation activities presented in other Chapters of this RAMP Report also address the Employee Safety risk. Following the Settlement Decision and SoCalGas's enterprise risk management methodology, a potential risk scenario of SoCalGas's Employee Safety risk is the risk of conditions and practices that may lead to an incident threatening employee health and

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[6] SoCalGas, *2020 Safety Management System Plan* (April 23, 2020) at 4, *available at https://sempra.sharepoint.com/sites/safety/Shared Documents/Forms/AllItems.aspx?id=/sites/safety/Shared+Documents/2020+Safety+Management+System+Plan.pdf&parent=/sites/safety/Shared+Documents.*

safety caused by non-adherence to Company policies, procedures and programs, or by external factors.

In addition to promoting employee safety within the Company, SoCalGas also seeks to supplement its workforce by using contractors who are equally committed to safety and the Company employs numerous mitigation measures to protect the safety of SoCalGas's customers and the public at large. The contractor safety and customer and public safety mitigations are discussed in separate chapters of this RAMP report. While this chapter focuses on Employee Safety risk, many of the activities described herein also help to mitigate these other risks.

B. Risk Definition

For purposes of this RAMP Report, SoCalGas's IIE risk is defined as the risk of conditions and practices that may lead to an incident that threatens the safety of a SoCalGas employee, contractor or the public caused by non-adherence to Company policies, procedures, and programs, or by external factors. The risk definition captures an incident either caused by employees harming themselves and/or other employees/contractors and/or the public as well as external factors that could harm employees.

C. Scope

Table 1 below provides what is considered in scope for the IIE risk in this RAMP Application.

Table 1: Risk Scope

In-Scope for purposes of risk assessment:	The risk of an employee safety incident that causes serious injuries[7] or fatalities while on duty.
Data Quantification Sources:	SoCalGas engaged internal data sources for the calculation surrounding risk reduction; however, if data was insufficient, Industry or National data was supplemented and adjusted to fit the risk profile associated with the operating locations and perimeter of the utilities. For example, when certain types of incident events have not occurred within the SoCalGas & SDG&E territory, SoCalGas considered industry data where said

[7] As defined by Cal/OSHA, as "an injury or illness occurring in a place of employment or in connection with any employment which requires inpatient hospitalization for a period in excess of 24 hours for other than medical observation or in which an employee suffers a loss of any member of the body or suffers any serious degree of permanent disfigurement, but does not include any injury or illness or death caused by the commission of a Penal Code violation, except the violation of Section 385 of Penal Code, or an accident on a public street or highway." 8 California Code of Regulations (CCR) § 330(h).

	incident(s) have been recorded to provide an proximation to establish a baseline of risk and risk addressed by activities. See Appendix B for additional information.

II. RISK ASSESSMENT

In accordance with the Settlement Decision,[8] this section describes the risk Bow Tie, possible Drivers, potential Consequences, and the risk score for the IIE risk.

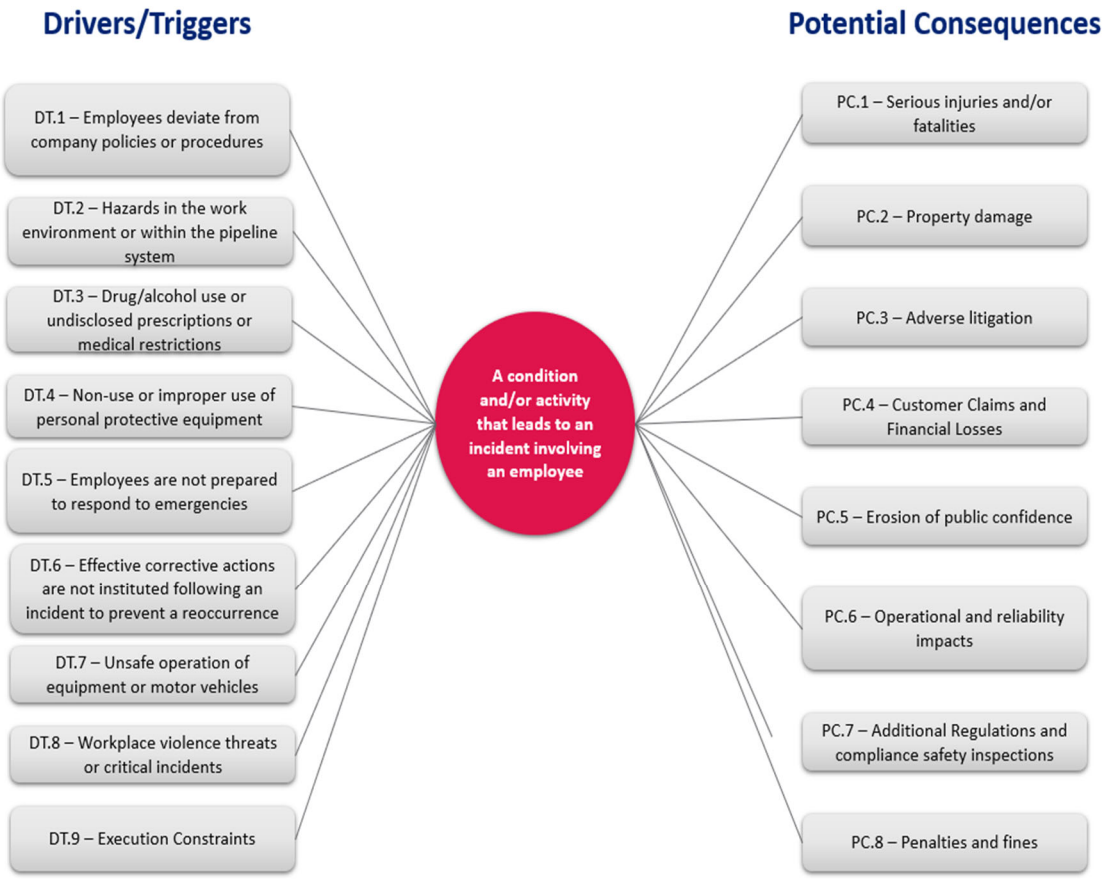
A. Risk Bow Tie and Risk Event Associated with the Risk

The risk bow tie is a commonly used tool for risk analysis, and the Settlement Decision[9] instructs the utility to include a risk bow tie illustration for each risk included in RAMP. As illustrated in the risk bow tie shown below in Figure 1, the risk event (center of the bow tie) is a condition and/or activity that leads to an IIE, the left side of the bow tie illustrates drivers/triggers that lead to the IIE, and the right side shows the potential consequences of the IIE. SoCalGas applied this framework to identify and summarize the information provided in Figure 1. A mapping of each mitigation to the element(s) of the risk bow tie addressed is provided in Appendix A.

[8] D.18-12-014 at 33 and Attachment A, A-11 ("Bow Tie").

[9] Id. at Attachment A, A-11 ("Bow Tie").

Figure 1: Risk Bow Tie



B. Cross-Functional Factors

There is one overarching factor and four cross-functional factors that impact the IIE risk. They are the overarching Safety Culture factor, and the SMS, Emergency Preparedness and Response and Pandemic, Asset and Records Management, and Workforce Planning / Quality Workforce cross-functional factors. Each of these factors, if poorly managed can become a potential driver adversely impacting the safety of employees. On the other hand, successfully managing each of these factors can help in preventing incidents and ensuring the safety of employees. As such, many of the activities, associated with these cross-functional factors are included in this risk, but by reference only to avoid duplication.

C. Potential Drivers/Triggers[10]

The Settlement Decision[11] instructs the utility to identify which element(s) of the associated risk bow tie each mitigation addresses. When performing the IIE risk assessment, SoCalGas identified potential leading indicators, referred to as drivers or triggers. These include, but are not limited to:

- **DT.1 – Employees deviate from Company policies or procedures:** SoCalGas's policies and procedures are defined in Gas Standards. Similarly, the Company's general safety rules are defined in the Employee Responsibilities section of the Illness and Injury Prevention Program (IIPP). An employee not adhering to such Company safety policies and procedures could result in a safety-related event.
- **DT.2 – Hazards in the work environment or within the pipeline system:** Unsafe work environments, including work locations, roadways and parking places, customer premises, gas equipment condition, lead from paint, asbestos, or fumigation chemicals, for example, could lead to a safety event.
- **DT.3 – Drug/alcohol use or undisclosed prescriptions or medical restrictions:** Unknown drug/alcohol use while on the job or medical restrictions can impede the safe conduct of work which could lead to a safety event.
- **DT.4 – Non-use or improper use of personal protective equipment:** Safety equipment serves to protect employees and contractors from avoidable injuries. Failure to wear personal protection and safety equipment can lead to a safety incident.
- **DT.5 – Employees are not prepared to respond to emergencies:** Failure to respond accordingly during an emergency may increase the likelihood of serious injuries and/or fatalities.
- **DT.6 – Effective corrective actions are not instituted following an incident to prevent a reoccurrence:** Lessons learned, and the appropriate follow-up actions or training, can help prevent future safety events from occurring. The failure to

[10] This refers to an indication that a risk could occur. It does not reflect actual or threatened conditions.

[11] D.18-12-014 at Attachment A, A-11 ("Bow Tie").

implement corrective actions following an event can lead to the recurrence of safety events.

- **DT.7 – Unsafe operation of equipment or motor vehicles:** Non-adherence to motor vehicle laws or not utilizing equipment according to safety standards could result in serious injuries and/or fatalities.
- **DT.8 – Workplace violence threats or critical incidents:** Workplace violence incidents can increase the likelihood of employees being seriously injured or killed.
- **DT.9 – Execution constraints:** Events (excluding those covered by outside force damages) that impact the Company's ability to perform as anticipated. Examples include but are not limited to: materials and operational oversight, delays in response and awareness, resource constraints, and/or inefficiencies and reallocation of (human and material) resources, unexpected maintenance, or regulatory requirements.

D. Potential Consequences of Risk Event

Potential consequences[12] are listed to the right side of the risk bow tie illustration provided above. If one or more of the drivers/triggers listed above were to result in an incident, the potential consequences, in a reasonable worst-case scenario, could include:

- PC.1 – Serious injuries[13] and/or fatalities
- PC.2 – Property damage
- PC.3 - Adverse litigation
- PC.4 - Customer claims and financial losses
- PC.5 - Erosion of public confidence
- PC.6 - Operational and reliability impacts
- PC.7 - Additional regulations and compliance safety inspections
- PC.8 - Penalties and fines

[12] D.18-12-014 at 16 and Attachment A, A-8 ("Identification of Potential Consequences of Risk Event").

[13] 8 CCR § 330(h).

These potential consequences were used in the scoring of an IIE that occurred during the development of SoCalGas's 2020 Enterprise Risk Registry.

E. Risk Score

The Settlement Decision requires a pre- and post-mitigation risk calculation.[14] Chapter RAMP-C of this RAMP Report explains the Risk Quantitative Framework which underlies this Chapter, including how the Pre-Mitigation Risk Score, Likelihood of Risk Event (LoRE), and Consequence of Risk Event (CoRE) are calculated.

Table 2: Pre-Mitigation Analysis Risk Quantification Scores[15]

	LoRE	CoRE	Risk Score
Incident Involving an Employee (IIE)	553.09	5	2,667

Pursuant to Step 2A of the Settlement Decision, the utility is instructed to use actual results, as well as available and appropriate data (*e.g.,* Pipeline and Hazardous Materials Safety Administration data).[16]

For this risk, SoCalGas utilized a combination of internal and external data sources to develop the pre-mitigation risk score.

The evaluation of employees' injuries, illnesses, and fatalities utilized historical internal Occupational Safety and Health Administration (OSHA)-reportable employee injury rates to estimate the likelihood of an event occurring. The safety consequence assessment utilized internal safety consequence data and severe injury report data from OSHA. The financial consequence assessment utilized data from the Center for Disease Control, National Safety Council.

The evaluation of vehicular incidents utilized historical internal vehicular incident rate data to estimate the likelihood of an event occurring and the financial assessment utilized internal financial consequence data.

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[14] D.18-12-014 at Attachment A, A-11 ("Calculation of Risk").

[15] The term "pre-mitigation analysis," in the language of the S-MAP Settlement Agreement Decision (Attachment A, A-12 ("Determination of Pre-Mitigation LoRE by Tranche," "Determination of Pre-Mitigation CoRE," "Measurement of Pre-Mitigation Risk Score")), refers to required pre-activity analysis conducted prior to implementing control or mitigation activity.

[16] *Id.* at Attachment A, A-8 ("Identification of Potential Consequences of Risk Event").

The evaluation of workplace violence incidents utilized data from the Bureau of Labor Statistics to estimate the likelihood of an event occurring. The safety consequence assessment utilized data from the Federal Bureau of Investigation and the financial consequence assessment utilized data from the National Institute of Occupational Safety and Health.
See Appendix B for more information.

III. 2020 CONTROLS

This section "[d]escribe[s] the controls or mitigations currently in place" as required by the Settlement Decision.[17] The activities in this section were in place as of December 31, 2020. Controls that will continue as part of the risk mitigation plan are addressed in Section IV.

A. Control 1-Employee Health and Safety Programs and Standardized Policies

SoCalGas's employees receive extensive training because SoCalGas believes safety starts with proactive upstream measures to prevent a safety incident from occurring. SoCalGas's Mandatory Employee Health and Safety Programs and Standardized Policies comprise the following elements, as required by the California Code of Regulations (CCR):

Injury & Illness Prevention Program (IIPP): In California, every employer is required by law to provide a safe and healthful workplace for its employees.[18] Further, Title 8 of the California Code of Regulations[19] requires every employer to have an effective IIPP. SoCalGas's IIPP is a written plan for preventing injury and illness that includes procedures. The plan is comprehensive and covers all aspects of employee health and safety requirements and expectations of the workforce. The elements included in SoCalGas's IIPP are:

- Management commitment/assignment of responsibility;
- Safety communication system with employees;
- System for assuring employee compliance with safe work practices;
- Scheduled inspections/evaluation system;
- Accident investigation;
- Procedures for correcting unsafe or unhealthy conditions;
- Safety and health training instruction;

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17 S-MAP Settlement Agreement Decision, D.18-12-014 at 33.

18 Cal. Labor Code § 6400.

19 8 CCR § 8350.

- Recordkeeping and documentation; and
- Safety programs.

Employee Safety Standards: The employee safety standards are a collection of information, instructions, policies, and procedures intended to promote safe work practices. The purpose of the Health and Safety policies and procedures is to guide and direct all employees to work safely and prevent injury to themselves and others.

Safety standards are specifications designed to promote the safety of work activities or processes. Standards are rules that describe the methods that employers use to protect their employees from hazards. They are used to communicate policy to the workforce as well as key stakeholders and others at SoCalGas.

Industrial Hygiene Program: SoCalGas has a robust Industrial Hygiene program in compliance with Cal/OSHA regulations. Industrial Hygienists are responsible for monitoring changes in employee safety and health regulations, developing internal safety policies and procedures to promote compliance with the applicable regulations, and managing Company-wide implementation of key industrial hygiene programs, such as Hazard Communications, Hearing Conservation, Respiratory Protection, Mold, Asbestos, and Lead Exposure Management.

B. Control 2-Drug and Alcohol Testing Programs

SoCalGas has implemented an employee drug and alcohol testing program managed in accordance with state and federal regulations. SoCalGas's Substance Abuse Prevention policy prohibits the use and/or possession of alcohol during working hours or reporting to work with alcohol, illegal drugs, or impairing prescribed controlled substances in the system. All employees are responsible for knowing and complying with Company policy. Violations are cause for disciplinary action up to and including termination of employment.

In compliance with the Drug-Free Workplace Act of 1988[20] (which requires SoCalGas, as a federal contractor and grant recipient, to implement a comprehensive drug and alcohol-free workplace policy (DAFWP)), SoCalGas has a longstanding commitment to provide a safe and productive work environment for employees, and safe and efficient service for customers and the public. Because alcohol and drug abuse pose a threat to the health and safety of SoCalGas employees, the public, and to the security of the Company's equipment and facilities,

[20] 41 United States Code Service (U.S.C.) § 81.

SoCalGas is committed to providing a drug and alcohol-free workplace. The use of illegal drugs, impairing prescribed controlled substances, and the misuse of alcohol is contrary to these high standards. All employees in non-safety-sensitive and safety-sensitive positions are subject to the Company's DAFWP. Testing under this policy is limited to pre-employment and reasonable cause, return-to-duty, and follow-up testing (when applicable). Under the DAFWP, SoCalGas tests for additional (*e.g.*, generally prescribed) impairing drugs not tested for under the Department of Transportation (DOT) testing program. This policy also requires employees to pre-duty disclose their use of impairing medications that may affect their ability to safely perform safety-sensitive duties.

In addition, SoCalGas also complies with the DOT drug and alcohol program requirements[21] and has implemented a Drug and Alcohol Misuse Prevention Plan and Policy (DAMPPP) for employees in safety-sensitive positions, subject to these regulations and testing requirements. The purpose of the DAMPPP is to reduce accidents and injuries that may result from the use of illegal drugs, impairing prescribed controlled substances, and misuse of alcohol, thereby reducing fatalities, injuries, and property damage, and to comply with federal and state regulations. To comply with the DOT regulations, the Company implemented two random testing pools as required by 49 Code of Federal Regulations (CFR) Part 199 (Drug and Alcohol Testing Procedures and regulations for PHMSA-covered employees) and Part 382 (Drug and Alcohol Testing Procedures for FMCSA-covered employees (applicable to Commercial Motor Vehicle Drivers)). PHMSA-covered employees are those employees who perform operations, maintenance, or emergency response functions associated with gas pipeline or liquified natural gas facilities and are regulated by 49 CFR Part 192, 193, and 195. FMCSA-covered employees are commercial motor vehicle drivers required to hold a commercial Class A, Class B, or commercial C driver's license. Each of these agencies has established its own additional testing policies and regulations to comply with 49 CFR Part 40 testing procedures and set their testing rates annually. For example, PHMSA requires random testing for drugs (current annual test rate for 2021 is 50% of the pool), while FMCSA requires testing for both drugs and alcohol (current annual test rate for 2021 is 50% of the pool for drugs and 10% for alcohol). In addition to random testing, both agencies require testing (as needed) for: pre-employment/pre-assignment,

[21] 49 CFR Part 40.

reasonable cause, post-accident, return-to-duty, and follow-up testing, as well as require a drug and alcohol background history check be conducted prior to placing employees in safety-sensitive functions.

C. Control 3- Employee Wellness Programs

SoCalGas's Employee wellness program objective is to design comprehensive "Wellbeing" programs that reflect the Company's commitment to employees and their social communities. Further, the wellness program builds a culture of health and safety at work and in personal life. It also has a positive impact on SoCalGas's medical plan population morbidities and creates an understanding of the incremental impact that a collective wellbeing program presence can have on helping SoCalGas continue its high performance and achievement of organizational goals.

SoCalGas's Wellbeing Program goals are to:

- increase employee awareness of personal health and safety;
- empower and educate employees about making healthy lifestyle choices; and
- improve employee and their social communities' quality of living.

According to the CDC, preventable chronic conditions are a major contributor to the costs of insurance premiums and employee medical claims and lost productivity. Effective worksite wellness programs can result in significant, positive outcomes such as:

- Better employee health;
- Less absenteeism and sick leave;
- Higher job performance and productivity;
- Lower health insurance costs;
- Fewer safety incidents and workers' compensation claims; and
- Happier, more satisfied employees.

The Company Wellbeing programs strive to offer programs under the following wellness pillars:

- Move More (Physical Fitness and Activity);
- Eat Right (Healthy Eating and Weight Management);
- Prevent It. Manage It. (Disease Prevention and Mgmt., Biometric Screenings);
- Stress Less. Focus More. (Mental/Emotional Wellbeing);

- My Money (Financial Wellbeing and Saving);
- My Community (Giving Back – Engagement, Volunteerism and Awareness);
- At Your Fingertips (Interactive Tools, Guides & Resources); and
- Achieve It! (Incentives and recognition).

In addition, based on medical plan utilization and experience, educational programs target the following areas:

- Diabetes;
- Cancer;
- Heart Disease;
- Obesity;
- Stress;
- Coronary Arterial Disease (CAD);
- Asthma and Chronic Obstructive Pulmonary Disease (COPD); and
- Tobacco Cessation.

D. Control 4- Employee Safety Training and Awareness Programs

Training, education, and awareness are elements of a strong Injury and Illness Prevention Program. As stated above in SCG-2-1, SoCalGas employees receive extensive training because SoCalGas believes safety starts with proactive upstream measures to prevent a safety incident from occurring. Front-line employees are trained in behavior-based safety programs. At SoCalGas, safety is a core value, so the Company provides all employees with the training necessary to safely perform their job responsibilities.

A strong safety culture requires the right people at the right job with the right skills. The Human Resources function, with support from the operating organizations and the Safety Management System (SMS) organization at SoCalGas, supports SoCalGas's safety culture by attracting, developing, training, and retaining employees who have the skills and abilities to perform their jobs safely and operate and maintain a safe and reliable system. To achieve the accountability of enhancing the safety culture, the SMS organization, the operating organizations, and the Human Resources function are responsible for performance management, organizational effectiveness, and safety. SoCalGas develops training plans by job classification that include courses required to perform certain work, meet Company objectives, and satisfy

required compliance training. Training plans are maintained in SoCalGas's Learning Management System (cornerstone) and accessed by supervisors and employees through the MyInfo application. Each department is responsible for maintaining training plans and ensuring employees complete initial and periodic refresher training requirements. Contractor compliance, maintenance of DOT-required programs, improving driver safety via training, and in-vehicle instruction are also top priorities for SoCalGas.

In addition, SoCalGas deploys a "Safety Essentials for Supervisors" training program which is a one-day workshop developed for new and existing supervisors to provide a comprehensive understanding about safety culture and leadership for supervisors to effectively manage safety programs at their respective work location. This training is mandatory for all new supervisors and is offered as a refresher to existing supervisors. Safety Department and Employee Assistance Program (EAP) & Wellness Department execute these programs to maintain employee safety.

SoCalGas also has a Safety-First program. This program involves the rollout of safety committee member training to prepare safety committee members to better influence the safety culture. The focus of this training is to enhance the skills of safety committee members, so safety improvement projects and person-to-person interaction are more effective. SoCalGas seeks to enhance the mindset that employees are "one-another's keeper" when it comes to safety. SoCalGas provides initial and refresher safety leadership training to safety committee members. The safety committee members include union employees, and in the operating organizations, the safety committees typically consist of mostly union employees. The training is available to all job classifications. These individuals are safety advocates and are in safety leadership roles. They help define and instill the safety culture at their respective work location.

SoCalGas uses an Environmental and Safety Compliance Management Program (ESCMP) to track and document completion of the above-noted training courses, as well as compliance requirements, awareness, goals, monitoring, and verification related to all applicable environmental, health and safety laws, rules and regulations, and Company standards. SoCalGas's annual ESCMP certification process involves submittal of information into a database used to collect and record employee and facility compliance. For this submittal, two types of checklists are available and completed in the online system: an employee-based checklist and a facility-based checklist. Through this process, the Environmental and Safety

departments can review submittals in the online system and confirm required inspections were completed, assigned training was done, and all corrective actions were addressed.

E. Control 5- Safe Driving Programs

SoCalGas's safe driving programs aim to increase driver safety awareness to prevent and minimize the risk of motor vehicle incidents. With senior management's commitment and employee involvement, SoCalGas is driving a safety culture committed to safe driving. This commitment includes written policies and procedures and the following program elements:

Alert Driving Program: FleetDefense® by AlertDriving is a state-of-the-art online Driving Safety Program designed to increase skills that will help keep employees safe and reduce traffic incidents. The FleetDefense® web-based training uses targeted defensive driving courses to assess employees' safe driving behaviors and evaluate drivers' defensive skills using actual footage of near-collision situations. The training features an online hazardous driving assessment called the Hazard Perception Evaluation (HPE). Once the HPE is completed, each driver is assigned monthly online training modules.

DMV Drivers' License Pull Program: The California DMV Pull Notice Program allows SoCalGas to monitor the driver's license records of employees who drive on the Company's behalf. SoCalGas is enrolled in the Class A Pull Notice Program, which also enrolls the employee in the random alcohol and drug testing program, per Company policy, which is managed by the Employee Care Services department. The ability to monitor driving records assists the Company in improving employee and public safety and helps minimize overall risk and liabilities. The program automatically sends a notice when an employee has an action against his or her license, such as a suspension or a DUI. This information also helps to reveal problem drivers or driving behavior through notice of accidents and failures to appear.

Commercial Drivers' License Program: In accordance with the FMCSA Drug and Alcohol Testing Regulations,[22] SoCalGas's EAP and Wellness department must subject the Company's commercial drivers who operate a commercial motor vehicle (*i.e.*, vehicles with a GVWR of 26,001+ pounds, or are placarded for hazardous materials) to random drug and alcohol testing. Details of this program are outlined under the Drug and Alcohol Testing section above (*see*, SCG-2-C2). To manage this pool, the EAP and Wellness department collaborates

[22] 49 CFR Part 382.

with the Gas Systems Integrity Staff and Programs department (which manages the DMV Pull Notice Program) to determine that each commercial driver in the random testing pool has a valid commercial driver's license and medical card. In addition, this group also provides information on new drivers that need to be added to the pool, or inactive drivers that need to be removed from the pool. The EAP and Wellness team closely monitors this pool by gathering monthly driver data from the DMV Pull Notice department, and prior to the next month's random selection, to determine that the pool is not diluted with inactive drivers and/or that new employees are promptly added to the pool. EAP and Wellness also conducts required DOT drug and alcohol history background checks for all new drivers that enter the CMV driver pool. Effective January 4, 2020, FMCSA will require that the Company also register with their FMCSA Driver National Clearinghouse. The EAP and Wellness team is required to check the Clearinghouse for drug and alcohol violations prior to hiring new drivers, and thereafter on an annual basis. The team must also report violations to this Clearinghouse within three days of any driver drug and alcohol program violations.

F. Control 6- Personal Protective Equipment (PPE)

The purpose of SoCalGas's PPE Program is to protect employees from the risk of injury by creating a barrier against workplace hazards. The PPE Program addresses eye, face, head, foot, and hand protection. OSHA standards require employers to conduct and certify workplace hazard assessments for the use of PPE at facility locations that are representative of the types of ongoing work operations. SoCalGas does not have to perform a hazard assessment at each location, but if a hazard assessment is performed, for example, at a transmission facility, then that assessment is representative of other similar transmission facilities and would also apply to those locations. SoCalGas provides its employees with the PPE required to safely perform work (*e.g.*, flame-retardant suits, eye protection, and gloves). The Company maintains processes and procedures so that employee hearing and respiratory functions are not impaired due to exposure to harmful environmental conditions. When work is performed that could expose customers or the public to injury, controls are implemented to mitigate risk. The costs associated with equipment and specific occupational safety programs are included in this category.

G. Control 7- Near Miss, Stop the Job, and Jobsite Safety Programs

All SoCalGas employees, regardless of rank or title, are given the authority to "stop the job" at any time if they identify a safety hazard, and are encouraged to raise a red flag whenever

they feel it is needed. SoCalGas recognizes the importance of learning from close calls and near-misses to reduce the potential for a serious incident or injury in the future.[23] SoCalGas encourages employees to report close calls. The information is submitted to Safety Management for review and is shared with other employees on a weekly basis, so they understand and benefit from lessons learned. Front-line employees are trained to "Stop the Job," a SoCalGas safety best practice that empowers employees to stop the job at any time, without fear of retaliation, if they see a condition that might be unsafe. Following invocation of "Stop the Job," the job can only resume once all concerns have been addressed and safety precautions have been taken.

SoCalGas also maintains a quality assurance program to assess the work quality of many of its field personnel. Job observations and field rides are conducted by management personnel based upon behavior-based safety principles. SoCalGas's job observation program is a proactive approach to safety and health management, focusing on principles that recognize at-risk behaviors as a frequent cause of both minor and serious injuries. The purpose of the job observation and field ride process is to reduce the occurrence of at-risk behaviors by modifying an individual's actions through observation, feedback, and positive interventions aimed at developing safe work habits. Employees are also provided feedback and coaching so that their work conforms to policy and procedure.

H. Control 8- Safety Culture Programs

SoCalGas promotes a vigilant focus among all employees by investing in regular events on safety issues and facilitating discussion of safety practices. Safety meetings are important to SoCalGas and, therefore, are scheduled on a regular basis. These meetings include: weekly reviews of relevant policies and procedures; safety tailgates to discuss workplace hazards, work plans, and responsibilities; safety stand-downs to discuss safety incidents, close calls, bulletins or other safety topics; safety committee meetings to develop and present material on various safety topics; annual safety stand-downs at SoCalGas's operating districts; annual safety congresses for employees and contractors; and dialogue meetings with Company and department leadership.

Safety and Health Congress: Since 1999, SoCalGas has held annual Safety and Health Congresses to provide a forum for safety committee members (composed of represented

[23] The National Safety Council describes a close call or near-miss as an unplanned event that did not result in injury, illness, or damage, but had the potential to do so.

employees) to share and exchange safety information and ideas. Recipients of the Individual and Committee Safety Excellence Awards are announced at the events, recognizing safety standouts who embrace the safety culture and demonstrate safety leadership. Historically, there have been two congress events scheduled every year principally benefiting the transmission, distribution, customer services, underground and aboveground storage and other operating organizations.

Beginning in 2019, SoCalGas added an additional safety congress event for the benefit of the multitude of staffing/office organizations located at SoCalGas's Gas Company Tower in Los Angeles. This inaugural milestone event took place in September 2019. Due to the restrictions of the COVID-19 pandemic in 2020, these safety congress events were all combined and offered virtually. Safety and health congresses are expected to further improve the safety awareness and ownership amongst office employees and help reduce ergonomic and other office related injuries and incidents.

Executive Safety Council (ESC): The ESC has been in place for well over a decade and its purpose is to provide safety oversight and executive interactions with employees over safety matters. The ESC is led by the Chief Safety Officer of SoCalGas and includes all executives with operations responsibilities and the Chief Risk Officer. The ESC meets on a quarterly basis at various operating locations to engage with represented employees, supervisors, and managers associated with an operating district or a region. Unique and separate employee dialogue sessions are held to provide a forum for employees to share their candid feedback on what is going well in safety and what needs to be improved. Issues brought up are discussed and resolved during the dialogue session or carried forward as action items for later resolution. These sessions, which have been well-received by employees, enable executives and employees to share their perspectives on safety successes, challenges, and opportunities.

Beginning in 2019, SoCalGas expanded the frequency of these interactions from quarterly to monthly to enable reaching out to more operating districts and more employees in the Company. The four quarterly sessions are continuing as is, but the supplemental monthly sessions are less structured and more integrated with local safety stand-downs managed by each operating district. In the monthly sessions, executives actively participate in the operating district's routine safety stand-down activities. The primary goal with the monthly interactions is to demonstrate support by executives for front-line employees (management and represented) and local safety committees to learn how executives can better support safety. In 2020, due to

the restrictions of the COVID-19 pandemic, the monthly sessions were curtailed, but will resume at a normal frequency, once the pandemic risk is safely mitigated.

Safety Culture Survey: SoCalGas regularly assesses its safety culture and encourages two-way communication between employees and management as a means of identifying and managing safety risks. SoCalGas conducts and invites/encourages all employees to participate in the National Safety Council (NSC) Barometer Survey every two to three years (Safety Culture Survey). The first survey was conducted in 2013, followed by two more surveys in 2016 and 2018. Safety Culture Survey results are shared with all employees, improvement opportunities are identified, corrective actions implemented, and progress measured by comparing results from survey to survey. SoCalGas strives to continually improve its safety program and culture using a variety of means, including using the Safety Culture Surveys.

Safety Stand-downs: A Safety Stand-down is a voluntary event for employers to talk directly to employees about safety. These events provide an opportunity to discuss hazards, protective methods, and the Company's safety policies, goals, and expectations. SoCalGas has about five dozen operating districts and each district typically conducts a safety stand-down every year. The purpose of these safety stand-downs is to bring district employees together to raise awareness about safety, health, and wellness. Local management and the local safety committees select topics of interest to the district and the topics change from year to year. This practice has been in place for more than a decade.

Safety Tailgates: Safety tailgate talks are short informational meetings held with employees to discuss work-site related safety. The purpose of a tailgate is to inform employees of specific hazards associated with a task and the safe way to do a job. Tailgate talks also serve as a reminder to employees of what they already know while establishing the supervisor's credibility and conscientiousness about his or her role related to safety and work oversight.

Safety Meetings: The main objective of a safety meeting is to remind employees of **s**afe practices they have already learned or to introduce and build awareness of new techniques, new equipment, or new regulations that must be observed.

I. Control 9- Utilizing Industry Best Practices and Benchmarking

SoCalGas collaborates through participation in various industry groups to benchmark with other utilities, industries, and leaders in safety performance. SoCalGas benefits from

building relationships with other safety leaders, accessing best practices on employee and contractor safety, and benchmarking on leading indicators and key safety program elements.

SoCalGas participates in safety benchmarking forums to compare health and safety processes and performance with others to learn how to reduce incidents, improve compliance, and discuss best management practices as efforts to improve the safety and health of the Company. Our end goal is to send every employee home safely every day. Some of the key organizations the Company benchmarks against are the American Gas Association (AGA), Western Energy Institute (WEI), and American Petroleum Institute.

Additionally, SoCalGas attends the California Independently Owned Utility (IOU) and Municipality group meetings to discuss employee and contractor safety. This dedicated forum is a utility benchmarking initiative addressing new regulations, legislation, best management practices, and other safety topics of interest.

Of equal importance are outreach activities with local first responder agencies, county coordinators (emergency management), and other public officials which occur on a yearly basis, focusing on how the Company can partner with first responders, agencies, and officials during an emergency incident response. This includes a review of infrastructure location information, hazard awareness and prevention, leak recognition and response, emergency preparedness and communications, damage prevention, and integrity management. In addition, SoCalGas partners with these stakeholders throughout the year on joint drills, exercises, tabletops, and preparedness fairs to enhance our coordination and response during emergencies. SoCalGas has also established liaisons with appropriate fire, police, and other public officials across its service territory, which includes over 100 fire agencies. Examples of this include SoCalGas's deployment of emergency response services to northern and southern California following weather-related events, as well as assistance to the Boston area following a pipeline overpressure occurrence.

J. Control 10- Workplace Violence Prevention Programs

SoCalGas considers workplace violence to be a violent incident related to the workplace, resulting in emotional or physical harm to an employee(s) or third parties. Emotional harm or distress includes, but is not limited to, mental distress, mental suffering, or mental anguish. Physical harm refers to physical injury to the body, including an injury that caused, either temporarily or permanently, partial or total physical disability, incapacity, or disfigurement.

SoCalGas classifies this as part of the IIE risk because it affects people, an incident can occur in any department, and is a function of employee or former employee conduct. The United States Department of Labor outlines the components of an effective workplace violence program, including:

- Work Environment – creating a professional, healthy, and caring work environment
- Security – maintaining a secure and physically safe workplace
- Education – communicating awareness regarding workplace violence
- Performance/Conduct Indicators – identifying conduct that may present warning signs
- Employee Support Services – assisting employees in dealing with personal/professional issues

SoCalGas's workplace violence mitigation program addresses each of these components as described below.

1. Physical Security Systems

Physical security are the systems and activities that maintain the safety of employees, contractors, vendors, the public, SoCalGas facilities, and infrastructure, through people, processes, and technology. The three primary categories of physical security are described as follows:

- People – employees, contractors, vendors, their skill and expertise which implement and support physical security.
- Process – goals, regulations, guidelines, and instructions establishing actions for risk management (plans, policies, procedures, training, awareness, etc.)
- Technology – hardware and software of the physical security system designed to deter, delay, detect, assess, communicate, and respond to potential physical threats (barriers, CCTV system, access management system, video analytics, electronic keys, etc.)

Physical security systems provide protection enhancements to facilities or infrastructure to improve access control, intrusion detection, and interdiction capabilities to deter, detect, delay, assess, communicate, or respond to undesirable events. Examples include, but are not limited to:

- Physical Barriers – Physical barriers are natural and man-made structures that physically and psychologically deter and delay adversaries, and channel traffic through specified entry/exit points. Types of barriers include berms, fences, walls, gates, vehicle anti-ramming measures (bollards, engineered planters and benches, landscaping boulders, etc.) window barriers, ravines, drainage ditches, security doors, etc.
- Access Control System - Access control systems limit or detect access to facilities and are commonly integrated across all security layers. They provide separation between common areas and higher security areas or critical assets. Access controls are typically found in the form of the electronic control systems (proximity card readers or electronic keys) and mechanical locks/keys.
- Intrusion Detection System (IDS) - IDS are an array of sensors, surveillance devices, and associated communication systems used to increase the probability of detection and the assessment of potential unauthorized access to facilities. The technologies used in IDS systems range from electrical contact mechanisms, tamper sensors, motion, heat, sound, or vibration sensors, radar, duress alarms, video analytics, and other devices.
- Closed Circuit Television (CCTV) – CCTV is a self-contained surveillance system comprising of cameras, recorders, control equipment, and displays for monitoring activities in real time. The function of the CCTV system is intended to be an overt deterrent, used to assess real time security events, and as forensic tool for investigations following an incident.

2. Contract Security

In addition to physical security systems, SoCalGas employs contract security (security guards) to secure and protect assets and people. Security personnel are located at critical facilities and other work locations. Security personnel are used to complement and supplement existing security measures. Security personnel can also provide increased security capabilities as an overt deterrence during security incidents, or emergencies. Security personnel may be deployed permanently at a facility based on criticality, facility population, compliance, etc. or temporarily based on the threat environment, criminal activity, and/or past incidents.

3. Corporate Security Planning, Awareness, Risk Management, and Incident Management

Planning, awareness, risk management, and incident management are the product of corporate security projects and programs to prevent, mitigate, or respond to security incidents. This control also includes a case management system which is used to track security incidents and investigations. The control incorporates services provided by Corporate Security, including:

Training

The Company offers a variety of training opportunities to employees to increase awareness regarding the identification and response to criminal activity, including workplace violence. Active Shooter Training has been provided to thousands of employees and focuses on the actions employees should take during an active shooter scenario. The training was developed by Corporate Security and is based upon the Department of Homeland Security (DHS) training titled "Run, Hide, Fight." Through interactive discussion, this training provides basic awareness of an active shooter situation and how to respond accordingly. Topics include:

- Active Shooter Definition
- Active Shooter Incidents
- Active Shooter Characteristics and Triggers
- Run, Hide, Fight Concepts
- Last Resort Survival Measures
- Police Arrival

Additionally, Workplace Violence Training is provided every two years to Corporate Security, Human Resources (HR), and Legal representatives by a board-certified forensic psychologist who consults to numerous federal, state, and local law enforcement agencies. This training instructs on the use of Workplace Assessment of Violence Risk (WAVR-21), a screening tool used by workplace violence mitigation teams.

Investigations

Corporate Security works closely with Legal, HR, affected business units, and, when necessary, law enforcement, to thoroughly investigate allegations of workplace violence, including unfriendly incidents. This process assists with gathering or validating information needed for decision makers to act accordingly.

Risk Management and Intelligence Analysis

Corporate Security has established a Risk Management and Intelligence Analysis program to collect, analyze, and disseminate intelligence that assists with decision making regarding energy operations and security planning. An intelligence program helps anticipate, identify, and assess threats that could harm the Company, its employees, guests, or assets, and provides actionable strategic and tactical intelligence to mitigate risk. The program develops and maintains regular contact with local, national, and international law enforcement and intelligence community partners on a regular basis. The program also creates a risk management process to prioritize and mitigate threats, vulnerabilities, and consequences. As part of intelligence analysis, the Company uses social media monitoring services for emergency notifications, incident updates, threat identification, and to identify the misuse of branding. In a security setting, these tools can provide real-time updates to incidents, which may affect the safety or security of employees. These tools also can provide insight into emerging or imminent threats to Company employees or infrastructure.

Incident/Case Management System

Corporate Security maintains an incident/case management system to track incidents and investigations, such as, burglary, theft, vandalism, and workplace violence. The system provides data necessary for analysis of security programs and assists with strategic planning to improve security and safety of Company facilities, employees, and the public.

4. New Hire Screening Processes

The country's electric and natural gas transmission and distribution systems have an interdependent role with life/safety, emergency response, and national security issues, thereby providing a basis for heightened security and identity verification processes for new hires. SoCalGas performs a criminal background check in accordance with federal, state, and local laws prior to beginning on-boarding for persons offered employment.

5. Workplace Violence Mitigation Team (WVMT)

The Workplace Violence Mitigation Team (WVMT), formed in 2011, is a joint team of Manager, Director, and Officer level representatives within Corporate Security, HR, and Legal. The team is specifically trained to assess and respond to the threat posed by an individual that may be prone to violence. The WVMT is responsible for developing and executing an

effective Workplace Violence Prevention program that includes, but is not limited to:

- Training supervisors and employees to detect early warning signs of possible workplace violence
- Investigating and mitigating potential workplace violence incidents
- Responding appropriately to threat-related emergencies
- Identifying and enlisting the assistance of qualified professionals in workplace violence assessment, security, and incident management
- Documenting all activities related to workplace violence prevention and control.

The WVMT uses various threat management tools provided by outside professional resources or developed and adapted by the WVMT. These tools are intended to guide the WVMT in data collection and decision making throughout the management of a case. The tools may be used in conjunction with appropriate degrees of professional threat management consultation. The WVMT meets as needed when an individual displays signs that he/she may be prone to violence or engages in violent action on Company property.

IV. 2022-2024 CONTROL & MITIGATION PLAN

This section contains a table identifying the controls and mitigations comprising the portfolio of mitigations for this risk.[24] Controls and mitigations in the Employee Incident risk have the same risk profile; thus, they are not further tranched.

Activities discussed in Section III above are expected to continue during the TY 2024 GRC. For clarity, a current activity that is included in the risk mitigation plan may be referred to as either a control and/or a mitigation. For purposes of this RAMP Report, a control that will continue as a Mitigation will retains its control ID unless that the size and/or scope of that activity will be modified, in which case that activity's control ID will be replaced with a mitigation ID. The table below shows which activities are expected to continue.

[24] *See* D.18-12-014, Attachment A at A-14 ("Mitigation Strategy Presentation in the RAMP and GRC")

Table 3: Control and Mitigation Plan Summary

Line No.	Control/ Mitigation ID	Control/Mitigation Description	2020 Controls	2022-2024 Plan
1	C1	Employee health and safety programs and standardized policies	X	X
2	C2	Drug and alcohol testing programs	X	X
3	C3	Employee wellness programs	X	X
4	C4	Employee safety training and awareness programs	X	X
5	C5	Safe driving programs	X	X
6	C6	Personal protection equipment (PPE)	X	X
7	C7	Near Miss, Stop the Job, and jobsite safety programs	X	X
8	C8	Safety culture programs	X	X
9	C9	Utilizing industry best practices and benchmarking	X	X
10	C10	Workplace violence prevention programs	X	X
11	M1	OSHA construction certification training	No	X
12	M2	Industrial hygiene program refresh	No	X
13	M3	Proactive monitoring for indoor air quality and chemicals of concern	No	X
14	M4	Creation of a safety video library	No	X
16	M5	Expanded Safety Culture Assessments	No	X
17	M6	Industrial Hygiene program expansion	No	X
18	M7	Workplace Violence Prevention Program Enhancements	No	X

For activities SoCalGas plans to perform that remain unchanged, refer to the description in Section III. If changes to the various activities are anticipated, such modifications are further described in this section below.

A. Changes to 2020 Controls

SoCalGas's comprehensive employee safety program consists of efforts all aimed to reduce the risk of a safety event involving an employee. Given the vast number of activities SoCalGas performs to mitigate employee safety risk, SoCalGas grouped similar activities with similar risk profiles into mitigation programs. Since all employees have the potential for serious

safety injuries and fatalities, and each of the safety risk controls and mitigations have the same goal of reducing the frequency and consequence of safety events involving employees, all controls and mitigations have the same risk profile and are not further tranched.

B. 2022 – 2024 Mitigations

1. Mitigation 1 - OSHA Construction Certification Training

OSHA 10-hour and 30-hour construction training are part of OSHA's Outreach Training Program, a voluntary training program OSHA started in 1971. According to OSHA, its purpose is to promote workplace safety and health and to make workers more knowledgeable about workplace hazards and their rights. The OSHA Outreach Training Program alone does not, however, fulfill the training requirements found in OSHA standards. For example, there are separate OSHA standards for energy isolation programs (*i.e.,* Lock-out and Tag-out programs), the confined space program, the lead standard, and the asbestos standard. There are specific compliance training requirements for employees who are involved in these activities. The Outreach 10-hour and 30-hour training covers many of those hazards, but it is considered non-mandatory training and is over and above the compliance training mandated by OSHA standards. Therefore, employers are responsible for providing additional training for their employees on the specific hazards of their job, as noted in many OSHA standards. OSHA's Outreach Training Program provides training on the recognition, avoidance, abatement, and prevention of workplace hazards. Through its national network of OSHA Training Institute (OTI) Education Centers, qualified individuals become authorized OSHA Outreach trainers and deliver 10-hour and 30-hour outreach classes to workers. According to OSHA, between FY 2012 and FY 2016, more than 3.94 million workers were trained in job hazard recognition and avoidance through the program.

SoCalGas plans to add this new training for employees directly involved in and overseeing construction jobs performed by Company employees. This mitigation would provide the 10-hour training to management employees overseeing construction activities and 30-hour training to field supervisors and field represented employees directly involved in construction and operations activities [*e.g.*, Gas Operations, Gas Transmission Operations, Customer Services Field, Storage Operations, Construction Projects/Programs (like PSEP, MHP, PI, and TIMP/DIMP/SIMP)]. The purpose of providing employees with this new training is to further enhance their skills in hazard identification and help them gain certification that is recognized by

regulatory agencies nationwide. By becoming better at identifying hazards, employees are expected to contribute to reducing the risk of injuries.

2. Mitigation 2 - Industrial Hygiene Program Refresh

An important component of the industrial hygiene program is to conduct exposure assessments for issues of concern to employee health and safety and to establish appropriate mitigation measures and controls. SoCalGas has been conducting such assessments for over three decades, in conjunction with the various industrial hygiene programs, to promote employee health and safety as well as compliance with various Cal/OSHA regulations.

An important component of conducting exposure assessments is to review these assessments and periodically refresh or update them to confirm that they still support the decisions made on mitigation controls to promote employee health and safety. There are no specific regulatory requirements defining the frequency at which the initial assessments should be reviewed and updated, except when the conditions of exposure have significantly changed. SoCalGas recognizes the need to review all past records and identify records that are older than ten years or more to assess whether those assessments need to be refreshed and updated.

In addition, SoCalGas plans to take a proactive approach in conducting additional assessments in areas where regulations may become more stringent in the future and gradually work towards achieving compliance prior to new requirements coming into play. For example, noise generating equipment and machinery at many facilities have changed since SoCalGas originally conducted noise surveys for employees to assure compliance with the Hearing Conservation Program. Obtaining more current data through implementation of this program will help to document the noise levels for employee job tasks and alert SoCalGas to any new areas of concern. It should also be noted that noise dosimetry monitoring technology has also significantly advanced, improving the accuracy of the data collected and method of documentation. Implementation of this program will include a re-sampling that will assist us in ensuring Company data has been collected and documented in sync with best practices.

As another example, Cal/OSHA is proposing regulation changes for occupational lead exposure. One of the changes will be a lower Permissible Exposure Limit (PEL): down to 10 ug/m3 from 50 ug/m3, and a lower Action Limit (AL): down to 2 ug/m3 from 30 ug/m3. Most of our industrial hygiene exposure assessment data for lead removal tasks was gathered before 2012 and was based on complying with the current exposure limits. Employee tasks will need

to be monitored again to determine if they comply with the proposed lower exposure limits. The tasks may need to be modified or deleted depending on the air monitoring results.

3. Mitigation 3 - Proactive Monitoring for Indoor Air Quality and Chemicals of Concern

SoCalGas treats indoor air quality (IAQ) issues that are raised by employees as safety concerns. Such issues have been addressed in the past at large headquarters facilities, where employees work indoors on a full-time basis. To evaluate and address IAQ concerns, SoCalGas adopted a new Proactive Monitoring program to conduct annual IAQ assessments at the six large headquarters facilities in its service territory. This mitigation measure, in combination with other existing and new mitigation measures, is expected to reduce SoCalGas's occupational injury rates based on the last five years' historical trend.

4. Mitigation 4 - Creation of a Safety Video Library

SoCalGas has a safety video library comprised of training videos on a variety of safety topics. The collection consists of several hundred titles covering around 50 primary safety topics, with typically a single copy available for physical checkout by SoCalGas employees. The collection is outdated with virtually all titles available only in a format that is no longer useful, and the video check-out and check-in process is cumbersome, disincentivizing its use.

To streamline the library, SoCalGas plans to subscribe to a third-party online streaming service provider to get access to the latest safety training materials from a reputable training source. Having 24/7 ready access to relevant and updated safety training materials to use during safety stand-downs, daily morning safety meetings, daily tailgate meeting for field crews, and other safety events will help SoCalGas employees and supervisors tremendously.

5. Mitigation 5 - Expanded Safety Culture Assessments

As stated above (SCG-2-C8), since 2013, SoCalGas has retained the National Safety Council to use its Safety Barometer Survey to engage our employees to provide input on safety, gain benchmarking insight, and identify improvement opportunities (Safety Culture Survey). SoCalGas has now completed three cycles of the Safety Culture Survey (2013, 2016, and 2018) and has ranked consistently high, above the 90th percentile of 580 similarly surveyed companies. More important than the ranking, the Safety Culture Survey has helped to identify safety areas of alignment and strength as well as opportunities for potential improvement.

Moving forward, SoCalGas plans to expand the assessments to include focus group discussions, employee interviews, and field observations of employee job activities to view safety culture in action and further supplement the feedback received from the Safety Culture Surveys. SoCalGas also plans to tap into grass-roots activities of its local safety committees and integrate that insight into safety culture assessment. The purpose of these additional methods and approaches is to gain further insight in areas of success and potential weakness within the safety management system or programs and identify more relevant and specific opportunities of improvement. This mitigation measure, in combination with other existing and new mitigation measures, is expected to reduce SoCalGas's occupational injury rates based on the last five years' historical trend.

6. Mitigation 6 - Industrial Hygiene Program Expansion

SoCalGas is planning to expand its' Safety Department staff by increasing the number of certified industrial hygiene professionals available to support the continued expansion of this role as further described below in managing safety during normal business operations and during responses to emergencies. The demand has particularly increased for responding to emergency incidents and associated new regulatory requirements.

The Safety Department is part of the Safety Management System organization and is responsible for positioning SoCalGas employees to lead healthy, safe, and productive lives. The services provided by this department include, but are not limited to, safety and industrial hygiene education and compliance, and incident prevention, analysis, and reporting. The Safety Department is responsible for ensuring SoCalGas is, at a minimum, in compliance with all required safety and health regulations (*e.g.*, Department of Transportation (DOT) and Cal/OSHA), as well as being responsible for positively influencing the SoCalGas safety culture and working closely with SoCalGas personnel to provide education and training to support an incident-free workplace.

Ensuring employees are prepared to respond to emergencies is another SoCalGas effort the Safety Department supports. Being prepared to respond effectively during an emergency decreases the likelihood of serious injuries, illnesses, and/or fatalities. Safety Management has supported major natural disasters and emergencies throughout the Company's service territory. In the past couple of years, the Safety Department has supported multiple wildfire incidents by monitoring the Air Quality Index in the affected areas and being a part of the Company's

Incident Command System (ICS) when incidents trigger the activation of the Company's Emergency Operations Center (EOC). The Safety and Health group is also present in the field during incidents to provide frontline supervisors and employees with safety support. The Safety and Health group provides safety guidance and conducts observations of work performed in the field during emergencies focusing on Company safety best practices and ensuring Company safety policies are being followed. New emergency regulations were put into place by Cal/OSHA to respond to increased exposure to wildfire related smoke. Safety Department developed a new safety standard addressing these requirements and provided training and appropriate PPE for use during wildfire incidents. The Safety Department also supported the Montecito mudslide response, and has provided in-person mutual aid to other utilities in the United States (SDG&E, PG&E and Columbia Gas). Most recently, Since 2020, the Safety Department has supported the COVID-19 pandemic Company effort. The Safety Department monitors and examines guidelines and directions from the Center for Disease Control and Prevention (CDC) as well as other city and county guidelines including the California Department of Public Health (CDPH) and Cal/OSHA. The Safety Department continues to work closely with other internal Company departments such as Human Resources and has established internal Company guidelines and protocols to prevent the spread of the COVID-19 virus in the workplace. Some of these COVID-19 Company guidelines and protocols include:

- Physical Distancing Guidelines
- Temperature and Health in-person screening by medically trained professionals
- Self-screening guidelines before coming into work
- Face Covering, Surgical Mask, and N95 Respirator guidelines
- Disinfection guidelines
- Hand Sanitizer Safety
- Face to face meeting and gathering guidelines
- Single Person per Vehicle Safety Protocol
- Safety Signage requirements
- Ergonomics at Home

The Safety Department also established the COVID-19 Safety Observation Program to ensure the guidelines and protocols in place are effective and being followed. The group also works closely with contractors to ensure they have established COVID-19 protocols and adhere

to SoCalGas's protocols when working at Company sites and interacting with SoCalGas employees.

7. Mitigation 7 - Workplace Violence Prevention Program Enhancements

The program controls outlined in Section 4 above related to workplace violence will continue to be performed in the proposed plan to maintain the current residual risk level. In addition, SoCalGas is proposing, beginning in 2021 and onwards, to expand or add the following mitigations.

SoCalGas proposes to continue supporting the use of physical security systems and contract security personnel. The purpose of these activities is to reduce the likelihood of a workplace violence event by increasing protective measures at Company facilities that have employees. Similarly, the presence of security guards increases protection with the aim of reducing the likelihood of an event. SoCalGas will be adding Physical Security System upgrades that will replace end of life equipment, improve integration, reduce nuisance alarms, and embrace recent industry security technology enhancements. Security enhancements to facilities and infrastructure improve access control, intrusion detection, and interdiction capabilities to deter, detect, delay, communicate, and respond to undesirable events. Currently, an electronic key system to replace mechanical keys is being implemented. The electronic key system will provide logging and audit capabilities, can be placed in remote locations without a network connection, and can be disabled by an administrator or set to disable after a period of time.

SoCalGas also proposes to replace the incident/case management system. The current incident/case management system manages security incidents by capturing information from investigations and providing historical querying capability. This system is over ten years old. With the increase of requests for information and data calls from state and federal regulatory entities, SoCalGas recommends that this system be upgraded or replaced. The current system does not allow for querying of data at the appropriate level of detail. Simple changes that may provide some additional functionality to assist with querying will be expensive and may only provide some of the necessary upgrades. It is possible alternate systems already used by Sempra may provide suitable incident/case management services to meet this increased need. Costs of upgrading the existing system are currently being compared to other options. This mitigation

measure, in combination with other existing and new mitigation measures, is expected to reduce SoCalGas's occupational injury rates based on the last five years' historical trend.

V. COST, UNITS, AND QUANTITATIVE SUMMARY TABLES

The tables in this section provide a summary of the risk control and mitigation plan, including the associated costs, units, and the RSEs, by tranche. When an RSE could not be performed, an explanation is provided. SoCalGas does not account for and track costs by activity or tranche; rather, SoCalGas accounts for and tracks costs by cost center and capital budget code. The costs shown were estimated using assumptions provided by SMEs and available accounting data.

Table 4: Risk Control and Mitigation Plan - Recorded and Forecast Dollars Summary[25] (Direct After Allocations, In 2020 $000)

ID	Control/Mitigation Name	Recorded Dollars		Forecast Dollars			
		2020 Capital[26]	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
C1	Employee Health and Safety Programs and Standardized Policies	0	882	0	0	838	1,015
C2	Drug and Alcohol Testing Programs	0	498	0	0	473	572
C3	Employee Wellness Programs	0	2,648	0	0	2,516	3,045
C4	Employee Safety Training and	0	438	0	0	416	504

[25] Recorded costs and forecast ranges are rounded. Additional cost-related information is provided in workpapers. Costs presented in the workpapers may differ from this table due to rounding. The figures provided are direct charges and do not include Company loaders, with the exception of vacation and sick. The costs are also in 2020 dollar and have not been escalated to 2021 amounts. The capital presented is the sum of the years 2022, 2023, and 2024, or a three-year total. Years 2022, 2023 and 2024 are the forecast years for SoCalGas's Test Year 2024 GRC Application.

[26] Pursuant to D.14-12-025 and D.16-08-018, the Company provides the 2020 "baseline" capital costs associated with Controls. The 2020 capital amounts are for illustrative purposes only. Because capital programs generally span several years, considering only one year of capital may not represent the entire activity.

ID	Control/Mitigation Name	Recorded Dollars		Forecast Dollars			
		2020 Capital[26]	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
	Awareness Programs						
C5	Safe Driving Programs	0	1,179	0	0	1,120	1,356
C6	Personal Protection Equipment (PPE)	0	1,139	0	0	1,082	1,309
C7	Near Miss, Stop the Job and jobsite safety programs	0	438	0	0	416	504
C8	Safety Culture Programs	0	810	0	0	814	977
C9	Utilizing Industry Best Practices and Benchmarking	0	1,066	0	0	1,012	1,225
C10	Workplace Violence Prevention Programs	1,296	1,357	3,328	4,068	1,196	1,447
M1	OSHA Construction Certification Training	0	0	0	0	0	0
M2	Industrial Hygiene Program Refresh	0	0	0	0	961	1,262
M3	Proactive Monitoring for Indoor Air Quality and Chemicals of Concern	0	0	0	0	59	78
M4	Creation of a Safety Video Library	0	0	0	0	50	65
M5	Expanded Safety Culture Assessments	0	0	0	0	45	60
M6	Industrial Hygiene Program Expansion	0	0	0	0	149	195

ID	Control/Mitigation Name	Recorded Dollars		Forecast Dollars			
		2020 Capital[26]	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
M7	Workplace Violence Prevention Program Enhancements	0	0	658	950	0	0

Table 5: Risk Control & Mitigation Plan - Units Summary

ID	Control/Mitigation Name	Units Description		Recorded Units		Forecast Units			
		Capital	O&M	2020 Capital	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 (High) O&M
C1	Employee Health and Safety Programs and Standardized Policies	FTEs		0	18	0	0	17	21
C2	Drug and Alcohol Testing Programs	FTEs		0	6	0	0	6	7
C3	Employee Wellness Programs	FTEs		0	6	0	0	6	7
C4	Employee Safety Training and Awareness Programs	FTEs		0	18	0	0	17	21
C5	Safe Driving Programs	FTEs		0	18	0	0	17	21
C6	Personal Protection Equipment (PPE)	FTEs		0	18	0	0	17	21
C7	Near Miss, Stop the Job and jobsite safety programs	FTEs		0	18	0	0	17	21
C8	Safety Culture Programs	FTEs		0	18	0	0	17	21
C9	Utilizing Industry Best Practices and Benchmarking	FTEs		0	18	0	0	17	21
C10	Workplace Violence Prevention Programs	FTEs		2	30	6	6	28	32

ID	Control/Mitigation Name	Units Description		Recorded Units		Forecast Units			
		Capital	O&M	2020 Capital	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 (High) O&M
M1	OSHA Construction Certification Training	Attendees		0	0	0	0	50	65
M2	Industrial Hygiene Program Refresh	FTEs		0	0	0	0	19	25
M3	Proactive Monitoring and Indoor Air Quality and Chemicals of Concern	FTEs		0	0	0	0	6	8
M4	Creation of a Safety Video Library	FTEs		0	0	0	0	1	1
M5	Expanded Safety Culture Assessments	Survey		0	0	0	0	1	1
M6	Industrial Hygiene Program Expansion	FTEs		0	0	0	0	2	3
M7	Workplace Violence Prevention Program Enhancements	FTEs		0	0	3	3	0	0

Table 6: Risk Control & Mitigation Plan - Quantitative Analysis Summary
(Direct After Allocations, In 2020 $000)

ID	Control/Mitigation Name	Forecast			
		LoRE	CoRE	Risk Score	RSE
C1	Employee Health and Safety Programs and Standardized Policies	See Table 7			
C2	Drug and Alcohol Testing Programs	548	4.8	2653	29
C3	Employee Wellness Programs	552	4.8	2662	2
C4	Employee Safety Training and Awareness Programs	547	4.8	2648	44
C5	Safe Driving Programs	518		2654	11
C6	Personal Protection Equipment (PPE)	See Table 7			
C7	Near Miss, Stop the Job and jobsite safety programs	551	5.1	2649	41
C8	Safety Culture Programs	552	4.8	2661	7
C9	Utilizing Industry Best Practices and Benchmarking	553	4.8	2662	5
C10	Workplace Violence Prevention Programs	553	4.3	2362	498
M1	OSHA Construction Certification Training	553	4.82	2666	33
M2	Industrial Hygiene Program Refresh	553	4.82	2667	0.4
M3	Proactive Monitoring	553	4.82	2667	17
M4	Creating of a Safety Video Library	553	4.82	2666	22
M5	Expanded Safety Culture Assessments	553	4.82	2667	9
M6	Industrial Hygiene Program Expansion	552	4.81	2658	60
M7	Workplace Violence Prevention Program Enhancements	553	4.82	2665	19

Table 7: Risk Control & Mitigation Plan - Quantitative Analysis Summary for RSE Exclusions

ID	Control/Mitigation Name	RSE Exclusion Rationale
C1	Employee Health and Safety Programs and Standardized Policies	Employee Health and Safety Programs are a foundational aspect of how SoCalGas creates a safe and healthy workplace environment for its employees. No data exists either internally or externally that directly relates this activity to the reduction in incident rates or the consequences thereof. Additionally, no SME could establish a quantifiable value for the effectiveness of this control activity.
C6	Personal Protection Equipment (PPE)	The procurement and usage of Personal Protection Equipment (PPE) is a fundamental aspect of how SoCalGas conducts operations and maintains the safety of its employees. No data exists, neither internally or externally, that directly relates this activity to reduction in incident rates or the consequences thereof. Additionally, no SME could establish a quantifiable value for the effectiveness of the control activity.

VI. ALTERNATIVES

Pursuant to D.14-12-025 and D.16-08-018, SoCalGas considered alternatives to the Risk Mitigation Plan for the IIE risk. SoCalGas typically analyzes alternatives when implementing activities to obtain the best result or product for the cost. The alternatives analysis for this risk mitigation plan also took into account modifications to the plan and constraints, such as budget and resources.

A. Alternative 1 - Develop internal expertise for expanded safety culture assessments

SoCalGas considered adding two full-time internal resources to conduct periodic safety culture assessments as an alternative to utilizing a third-party consulting firm. SoCalGas concluded that the alternative of adding professionals with specialized expertise is just as expensive as the current option of using the National Safety Council but comes with less credibility and independence and lack of benchmarking abilities. SoCalGas also considered utilizing vendors other than the National Safety

Council who are generally competitive in their costs and concluded that the benefit of using the non-profit and nationally renowned National Safety Council with their extensive benchmarking capabilities outweighs the potential benefits of using other similar assessment methodologies. Therefore, SoCalGas is not seeking additional internal resources to conduct Safety Culture Surveys at this time but will continue to evaluate the cost and effectiveness of the use of the National Safety Council.

B. Alternative 2 - OSHA Voluntary Protection Program

The Federal and California Voluntary protection programs (Cal/VPP) is a labor-management-government cooperative program designed to recognize workplaces that manage outstanding health and safety management systems for protection of workers and go beyond minimal compliance with the Federal and Cal/OSHA Title 8 California Code of Regulations. OSHA's Voluntary Protection Programs[27] (VPP) recognize employers who have implemented effective safety and health management systems and maintain injury and illness rates below national BLS averages for their respective industries. In VPP, management, labor, and OSHA work cooperatively and proactively to prevent fatalities, injuries, and illnesses through a system focused on: hazard prevention and control; worksite analysis; training; and management commitment and worker involvement. To participate, employers must submit an application to OSHA and undergo a rigorous onsite evaluation by a team of safety and health professionals. VPP participants are re-evaluated every three to five years to remain in the programs.

Implementation of an OSHA VPP serves as a proactive approach to identify and address potential workplace safety and health hazards and therefore avoid potential consequences. OSHA's VPP assessments are a proactive way to identify strengths and opportunities for enhancing safety. VPP physical inspections, document reviews, and interviews are components in this process. Sites with VPP work together in partnership with Federal OSHA and Cal/OSHA to systematically identify and correct hazards. VPP assessments provide insight into baseline safety and health hazards to establish initial levels of exposures for comparison to future levels so change can be identified. Implementing findings/results and acting on results helps move safety from its current "as is" state to the desired future state.

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[27] United States Department of Labor, *Voluntary Protection Programs*, *available at* *https://www.osha.gov/dcsp/vpp/.*

SoCalGas is not proposing implementation of a VPP program as part of its Risk Mitigation Plan included herein but may present this program in a future GRC. SoCalGas is in the initial stages of its assessment of this program and will weigh the anticipated costs and benefits before deciding to move forward with implementation of this program.

C. Alternative 3 – Workplace Violence Prevention Training Alternative

SoCalGas considered alternatives to the proposed mitigations as it developed the incremental mitigation plan for the Workplace Violence risk. Typically, alternatives analysis occurs when implementing activities, and with vendor selection in particular, to obtain the best result or product for the cost. The alternatives analysis for this risk plan also took into account modifications to the proposed plan and constraints, such as budget and resources. The following represents alternatives for training and for physical security. The viability of this alternative was determined through discussions with stakeholders.

A potential alternative for training is to outsource training or develop computer-based training. Although this alternative may have an increased cost in the short term (*i.e.*, to hire the outside agency or develop the training), it would generally reduce costs in the future. Current training uses Corporate Security agents as instructors. Ideally, it is best to use Corporate Security agents as they provide greater insight into Company employees, history, locations, and operations. Accordingly, this alternative was dismissed. However, as demand increases for security-related training, it may be necessary to further explore this alternative.

Table 8: Alternate Mitigation Plan - Forecast Dollars Summary[28]
(Direct After Allocations, In 2020 $000)

ID	Alternate Mitigation Name	Forecast Dollars			
		2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
A1	Develop internal expertise for expanded safety culture assessments	0	0	200	250
A2	OSHA Voluntary Protection Program	0	0	300	400
A3	Workplace Violence Prevention Training Alternative	0	0	45	65

Table 9: Alternate Mitigation Plan - Units Summary

ID	Control/Mitigation Name	Units Description		Forecast Units			
		Capital	O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 (High) O&M
A1	Develop internal expertise for expanded safety culture assessments	FTEs		0	0	2	2
A2	OSHA Voluntary Protection Program	FTEs		0	0	1	1
A3	Workplace Violence Prevention Training Alternative	Program		0	0	1	1

Table 10: Alternate Mitigation Plan - Quantitative Analysis Summary (Direct After Allocations, In 2020 $000)

ID	Control/Mitigation Name	Forecast			
		LoRE	CoRE	Risk Score	RSE
A1	Develop internal expertise for expanded safety culture assessments	553	4.82	2667	2
A2	OSHA Voluntary Protection Program	553	4.82	2662	15
A3	Workplace Violence Prevention Training Alternative	553	4.82	2667	16

APPENDIX A: SUMMARY OF ELEMENTS OF THE RISK BOW TIE

APPENDIX A: SUMMARY OF ELEMENTS OF THE RISK BOW TIE

Incident Involving an Employee (IIE): Summary of Elements of the Risk Bow Tie

ID	Control/Mitigation Name	Elements of the Risk Bow Tie Addressed
C1	Employee health and safety training programs and standardized policies	DT.1, DT.2, DT.4 - DT9 PC.1 - PC.8
C2	Drug and alcohol testing program	DT.3 PC.1 - PC.8
C3	Employee wellness programs	DT.2, DT.3, DT.8 PC.1
C4	Employee safety training and awareness programs	DT.1 - DT.9 PC.1 - PC.8
C5	Safe driving programs	DT.1 - DT.3, DT.6, DT.7 PC.1 - PC.3, PC.8
C6	Personal protection equipment (PPE)	DT.1, DT.2, DT.4, DT.6 PC.1, PC.8
C7	Near Miss, Stop the Job, and jobsite safety programs	DT.1 - DT.9 PC.1 - PC.8
C8	Safety culture programs	DT.1 - DT.9 PC.1 - PC.8
C9	Utilizing industry best practices and benchmarking	DT.2, DT.8, DT.9 PC.1, PC.2, PC.6, PC.7
C10	Workplace violence prevention programs	DT.8 PC.1
M1	OSHA construction certification training	DT.2, DT.4, DT.5, DT.7 PC.1, PC.2
M2	Industrial hygiene program refresh	DT.1, DT.2 PC.1, PC.8
M3	Proactive monitoring for indoor air quality and chemicals of concern	DT.1, DT.2 PC.1, PC.8
M4	Creation of a safety video library	DT.1, DT.2, DT.4, DT.5, DT.7 PC.1, PC.2
M5	Expanded safety culture assessments	DT.1 - DT.9 PC.1 - PC.8
M6	Industrial Hygiene Program Expansion	DT.1, DT.2, DT.4, DT.5, DT.6, DT.8, DT.9 PC.1 - PC.8
M7	Workplace violence prevention program enhancements	DT.8 PC.1

APPENDIX B: QUANTITATIVE ANALYSIS SOURCE DATA REFERENCES

APPENDIX B: QUANTITATIVE ANALYSIS SOURCE DATA REFERENCES

The Settlement Decision directs the utility to identify potential consequences of a risk event using available and appropriate data.[28] The list below provides the inputs used as part of this assessment.

OSHA Reportable Incident Rate and Safety Consequences
Source: Historic SoCalGas employee injuries, fatalities

Vehicular Incident Rates and Claims
Source: Historic SoCalGas motor vehicle incident data

Workplace Violence Incident Rate
Agency: Bureau of Labor Statistics
Link: *https://www.bls.gov/iif/oshcfoi1.htm*

Workplace Violence Injuries and Fatalities
Agency: Federal Bureau of Investigation
Link: *https://www.fbi.gov/about/partnerships/office-of-partner-engagement/active-shooter-resources*

Medically Consulted Injury Financial Impact
Agency: National Safety Council
Link: *http://www.injuryfacts.nsc.org/work/costs/work-injury-costs/*

Serious Injury Associated Financial Impact
Agency: Center for Disease Control
Link: *https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6438a5.htm?s_cid=mm6438a5_w*

Emergency Department Injury Associated Financial Impact
Agency: Center for Disease Control
Link: *https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6438a5.htm#Tab1*

Workplace Violence Associated Financial Impact
Agency: National Institute of Occupational Safety and Health
Link: *https://www.cdc.gov/niosh/index.htm*

Severe Injury Assumption:
Agency: Occupational Safety and Health Administration (OSHA)
Link: *https://www.osha.gov/severeinjury/index.html*;

Drug and Alcohol - Related Injury Incident Rate

[28] D.18-12-014, Attachment A at A-8 (Identification of Potential Consequences of Risk Event).

Agency: National Council on Alcoholism and Drug Dependence
Link: *www.ncadd.org*

Drug and Alcohol - Related Vehicular Incident Rate
Agency: National Highway Traffic Safety Administration
Link: *http://www.nhtsa.gov/Driving+Safety/Research+&+Evaluation/Impaired+driving+(drug-related)+reports*

Quality Assurance Effectiveness
Source: Internal Quality Management Data

Private Sector Workplace Violence Statistics
Agency: Department of Justice
Link: https://www.bjs.gov/content/pub/pdf/wvage9411.pdf#7

Online Training Effectiveness Assumption
Agency: Proceedings of the National Academy of Sciences of the United States of America
Link: *https://www.pnas.org/content/110/16/6313*

Workplace Hygiene and Air Quality
Agency: National Library of Medicine
Link: *https://pubmed.ncbi.nlm.nih.gov/26593933/*

Risk Assessment and Mitigation Phase

(Chapter SCG/SDG&E-Risk-6)

Cybersecurity

May 17, 2021

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RISK: CYBERSECURITY

I. INTRODUCTION

The purpose of this chapter is to present Southern California Gas Company's (SoCalGas) and San Diego Gas & Electric Company's (SDG&E) (collectively, the Companies) risk mitigation plan for the Cybersecurity risk. This risk chapter is identical for both Companies given that Cybersecurity risk is currently managed centrally at the Companies. Each chapter in this Risk Assessment Mitigation Phase (RAMP) Report contains the information and analysis that meets the requirements adopted in Decision (D.) 16-08-018 and D.18-12-014 and the Settlement Agreement included therein at Attachment A (the Settlement Decision).[1]

SoCalGas and SDG&E have identified and defined RAMP risks in accordance with the process described in further detail in Chapter RAMP-B of this RAMP Report. On an annual basis, SoCalGas' and SDG&E's Enterprise Risk Management (ERM) organizations facilitate the Enterprise Risk Registry (ERR) process. The ERR process influenced how risks were selected for inclusion in this 2021 RAMP Report, consistent with the Settlement Decision's directives, as discussed in Chapter RAMP-C.

The RAMP Report's purpose is to present a current assessment of key safety risks and the proposed activities for mitigating those risks. The RAMP Report does not request funding. Any funding requests will be made in SoCalGas' and SDG&E's General Rate Case (GRC) application. The costs presented in this 2021 RAMP Report are those costs for which SoCalGas and SDG&E anticipate requesting recovery in its Test Year (TY) 2024 GRC. SoCalGas' and SDG&E's TY 2024 GRC presentation will integrate developed and updated funding requests from the 2021 RAMP Report, supported by witness testimony.[2] This 2021 RAMP Report is presented consistent with SoCalGas' and SDG&E's GRC presentation, in that the last year of recorded data (2020) provides baseline costs and cost estimates are provided for years 2022-

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[1] D.16-08-018 adopted the requirements previously set forth in D.14-12-025. D.18-12-014, the Phase Two Decision Adopting Safety Model Assessment Proceeding (S-MAP) Settlement Agreement With Modifications, adopted the Settlement Agreement Among Pacific Gas and Electric Company, Southern California Edison Company, Southern California Gas Company, San Diego Gas & Electric Company, The Utility Reform Network, Energy Producers and Users Coalition, Indicated Shippers, and the Office of Ratepayer Advocates, which contains the minimum required elements to be used by the utilities for risk and mitigation analysis in the RAMP and General Rate Case.

[2] *See* D.18-12-014 at Attachment A, A-14 ("Mitigation Strategy Presentation in the RAMP and GRC").

2024, as further discussed in Chapter RAMP-A. This 2021 RAMP Report presents capital costs as a sum of the years 2022, 2023, and 2024 as a three-year total; operations and maintenance (O&M) costs are only presented for TY 2024 (consistent with the GRC). Costs for each activity that directly address each risk are provided where those costs are available and within the scope of the analysis required in this RAMP Report.

Throughout this 2021 RAMP Report, activities are delineated between controls and mitigations, consistent with the definitions adopted in the Settlement Decision's Revised Lexicon. A "control" is defined as a "[c]urrently established measure that is modifying risk."[3] A "mitigation" is defined as a "[m]easure or activity proposed or in process designed to reduce the impact/consequences and/or likelihood/probability of an event."[4] Activities presented in this chapter are representative of those that are primarily scoped to address SoCalGas' and SDG&E's Cybersecurity risk; however, many of the activities presented herein also help mitigate other areas.

As discussed in Chapters RAMP-A and RAMP-C, SoCalGas and SDG&E have endeavored to calculate a Risk Spend Efficiency (RSE) for all controls and mitigations presented in this risk chapter. However, for controls and mitigations where no meaningful data or Subject Matter Expert (SME) opinion exists to calculate the RSE, SoCalGas and SDG&E have included an explanation why no RSE can be provided, in accordance with California Public Utilities Commission (CPUC or Commission) Safety Policy Division (SPD) staff guidance.[5] Activities with no RSE value presented in this 2021 RAMP Report (if any) are identified in Section V below.

A. Risk Overview

At the Companies, cybersecurity is critical to the safe and reliable delivery of electric and gas service to our customers, including critical infrastructure providers in our Southern California service territory (*e.g.*, financial services, telecommunication providers, other utilities).

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3 *Id*. at 16.

4 *Id.* at 17.

5 *See* Safety Policy Division Staff Evaluation Report on PG&E's 2020 Risk Assessment and Mitigation Phase (RAMP) Application (A.) 20-06-012 (November 25, 2020) at 5 ("SPD recommends PG&E and all IOUs provide RSE calculations for controls and mitigations or provide an explanation for why it is not able to provide such calculations.").

Our service territory includes millions of people, one of the nation's busiest ports, largest cities, most critical military bases, countless defense contractors and small businesses.

Cybersecurity is a unique risk, as compared to other risks driven by operations and asset management because it deals with intelligent adversaries that are attempting to achieve their objectives by gaining access to Company systems or information through artifice or other improper means. In addition, gaining information about the Companies' security controls and mitigation plans could be useful to an adversary – and not only directly harm the Companies, but also indirectly harm the Companies' stakeholders. Cybersecurity threats have continued to increase and have become more complex and impactful year over year. For these reasons, publishing the Companies' cybersecurity-related controls, intelligence, strategies, and tactics in the public record could aid our adversaries, the bad actors that are attempting to disrupt our systems and society. Sensitive details associated with the content of this Chapter are available upon Commission request for discussion in person.

The criticality of cybersecurity is evidenced by the breadth of adversaries the Companies face. These adversaries include diverse types of actors with varying intent to cause harm; they are not just criminal entities or hackers looking to make a political statement or achieve financial gain. They also include advanced adversaries, often aligned to nation-states, that are targeting critical infrastructure for economic exploit, espionage, or covert action in preparation for some overt act (*e.g.*, disrupting energy supply). The Companies believe their investment and spend in cybersecurity is prudent and reasonable to address the existing and growing threat.

Adversaries continue to use an evolving and increasingly more sophisticated set of tools and strategies to conduct attacks on the energy sector. Their suite of capabilities includes advanced malware, complex phishing attacks, identification of non-public vulnerabilities, ransomware, among others. A current example of increased threat complexity and impact is the recent SolarWinds breach.[6] This breach was so significant in breadth and depth that the effect and impact, as of this writing, are still being investigated and understood. The United States (US) Department of Energy (DOE) and the Federal Energy Regulatory Commission (FERC) were two of many entities affected by this breach. In fact, a directive by the Cybersecurity and

[6] *See* E&E News, Cybersecurity, *'This is bad.' Hacking chaos engulfs FERC, DOE, Microsoft* (December 18, 2020), *available at https://www.eenews.net/stories/1063721065.*

Infrastructure Security Agency (CISA) and a "North American Electric Reliability Corporation (NERC) Alert- Essential Action" have been issued for this breach.[7]

Most recently, another significant cybersecurity incident occurred on May 8, 2021 at Colonial Pipeline. Colonial is the operator of the largest fuels pipeline in the US. This cybersecurity ransomware attack affected their information technology (IT) and operations technology (OT) systems, requiring them to shut down operations. The Colonial cybersecurity incident further illustrates the growing emerging threat to the Companies' critical infrastructure given the trends cited below:

- Cyberattacks targeting critical infrastructure or key companies, some by suspected foreign actors, have become a growing area of concern for the US national security officials.[8]
- "Cybersecurity analysts say companies have been targeted with ransomware for several years, and that the attacks are becoming more brazen and costly, particularly since the start of the pandemic."[9]
- "As companies shifted to remote work, fewer employees worked exclusively within protected networks, creating more opportunities for hackers to break into their systems, cybersecurity analysts say."[10]
- According to Homeland Security Secretary Alejandro Mayorkas, "The rate of ransomware attacks increased 300% in 2020."[11]

Energy regulators have also recognized the threat cyberattacks pose to the energy sector. In a recent Notice of Proposed Rulemaking (NOPR), FERC notes that the energy sector "faces numerous and complex cybersecurity challenges at a time of both great change in the operation of the transmission system and an increase in the number and nature of attack methods." The NOPR also recognizes that "[t]hese ever-expanding risks create challenges in defending the

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[7] NERC has responsibility for oversight of the Bulk Power System and to provide guidance and insight such as via alerts like this. *See* Cybersecurity & Infrastructure Security Agency, Alert (AA20-352A), *Advanced Persistent Threat Compromise of Government Agencies, Critical Infrastructure, and Private Sector Organizations* (revised April 15, 2021), *available at https://us-cert.cisa.gov/ncas/alerts/aa20-352a.*

[8] *See, e.g.*, Collin Eaton and Dustin Volz, *U.S Pipeline Cyberattack Forces Closure*, The Wall St. Journal (WSJ), May 8, 2021; James Rundle and David Uberti, *How Can Companies Cope with Ransomware*, WSJ, May 9, 2021. *See also*, Collin Eaton, *Pipeline's Shutdown Exposes Cyber Threat to Power Sector*, WSJ, May 10, 2021.

[9] James Rundle and David Uberti, *How Can Companies Cope with Ransomware*, WSJ, May 9, 2021.

[10] *Id.*

[11] *Id.*

digitally interconnected components of the grid from cyber exploitation."[12] This acknowledgment has been underscored by the realization of various threats. For example, in 2016, a Ukrainian utility experienced an OT attack on utility infrastructure that resulted in the loss of electric load to approximately 200,000 customers.[13] Cybersecurity-related attacks were also experienced in 2019 and 2020 on other gas and electric operators that caused unforeseen disruptions to business operations.[14]

Given that the Companies' cybersecurity threats continue to evolve rapidly, the Companies' strategy to counter cybersecurity threats must be flexible and allow us to adapt to these evolving threats over time. Accordingly, timely and accurate Cybersecurity Threat Intelligence (CTI) is key to staying abreast of this ever-changing threat landscape. We rely on Federal, State, and Local government partnerships for intelligence feeds along with peer utility industry relationships and private (subscription) based services for Industrial Control Systems (ICS) cybersecurity threat intelligence. We also obtain cybersecurity threat intelligence from a variety of entities and sources, including Information Sharing and Analysis Centers (ISACs), the Federal Bureau of Investigations (FBI), FERC, the DOE, the Department of Homeland Security (DHS), CISA, Transportation Security Administration (TSA) and a variety of US intelligence community agencies. Information from threat intelligence sources in the utility industry continues to reveal adversaries that are using advanced tradecraft in their attempts to access our nation's utility systems.

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[12] Federal Energy Regulatory Commission, *FERC Proposes Incentives for Cybersecurity Investments by Public Utilities* (December 17, 2020), *available at https://www.ferc.gov/news-events/news/ferc-proposes-incentives-cybersecurity-investments-public-utilities*.

[13] *See* Cybersecurity & Infrastructure Security Agency, ICS Alert (IR-ALERT-H-16-056-01) *Cyber-Attack Against Ukrainian Critical Infrastructure* (revised August 23, 2018), *available at https://www.us-cert.gov/ics/alerts/IR-ALERT-H-16-056-01*.

[14] *See* Kate O'Flaherty, *U.S. Government Issues Powerful Cyberattack Warning As Gas Pipeline Forced Into Two Day Shut Down*, Forbes, February 19, 2020, *available at https://www.forbes.com/sites/kateoflahertyuk/2020/02/19/us-government-issues-powerful-cyberattack-warning-as-gas-pipeline-forced-into-two-day-shut-down/?sh=3dcb3d8d5a95*.

A representative sample of recent threats facing our industry is provided below:

OT Attacks on Utility Infrastructure

Title: Ransomware Attack Shuts Down Biggest U.S. Gasoline Pipeline

Link: *https://www.bloomberg.com/news/articles/2021-05-08/u-s-s-biggest-gasoline-and-pipeline-halted-after-cyberattack*

Summary: 05/08/21: The operator of the biggest gasoline pipeline in the US shut down operations late Friday following a cybersecurity attack that has threatened to roil energy markets and upend the supply of gas and diesel to the East Coast. Colonial is a key artery for the eastern half of the US. It is the main source of gasoline, diesel, and jet fuel for the East Coast, with a capacity of about 2.5 million barrels a day on its system from Houston to as far as North Carolina and another 900,000 barrels a day to New York.

Title: Hackers try to contaminate Florida town's water supply through computer breach

Link: *https://www.reuters.com/article/us-usa-cyber-florida/hackers-try-to-contaminate-florida-towns-water-supply-through-computer-breach-idUSKBN2A82FV*

Summary: 02/08/21: Hackers remotely accessed the computer system of a facility that treats water for about 15,000 people near Tampa, Florida, and sought to add a dangerous level of additive to the water supply. This breach illustrates the connection between cybersecurity and the potential consequence of serious injury/harm.

Title: Energy company EDP confirms cyberattack, Ragnar Locker ransomware blamed

Link: *https://www.zdnet.com/article/edp-energy-confirms-cyberattack-ragnar-locker-ransomware-blamed/*

Summary: 07/07/2020: EDP Renewables North America (EDPR NA) disclosed a cyberattack in which ransomware infected parent company Energias de Portugal's (EDP) systems, potentially leading to information exposure. The energy firm denied the loss of customer data. Attackers claim to have stolen ten terabytes of business records.

Title: U.S. Government Issues Powerful Cyberattack Warning as Gas Pipeline Forced into Two Day Shut Down

Link: *https://www.forbes.com/sites/kateoflahertyuk/2020/02/19/us-government-issues-powerful-cyberattack-warning-as-gas-pipeline-forced-into-two-day-shut-down/?sh=3dcb3d8d5a95*

Summary: 02/19/20: A major cyberattack targeted a gas compression facility, forcing it to shut it down for two days as it struggled to recover, according to an alert from the US government.

Title: 'Denial of service' attack caused grid cyber disruption: DOE

Link: *https://www.eenews.net/stories/1060254751*

Summary: 03/05/2019: A recent cyber disruption to the US grid involved a "denial of service condition" at a Western utility.

Title: Attack on Ukrainian Electric Operator

Link: *https://www.us-cert.gov/ics/alerts/IR-ALERT-H-16-056-01*

Summary: 02/25/2016: This was a well-publicized and understood attack by a nation-state on the electrical transmission system in Ukraine. This was an advanced attack that migrated from the IT to OT system and resulted in the loss of electric load to approximately 200,000 customers.

Insider Attacks

Title: Arizona Utility Worker Charged

Link: *https://www.officer.com/home/news/10251659/ariz-waste-water-worker-charged-with-terrorism*

Summary: 04/02/2011: A City of Mesa Water Resources employee was charged with terrorism and making terrorist threats after he turned off numerous wastewater treatment operating systems at a facility overnight.

Title: Capital One former insider

Link: *https://www.bloomberg.com/news/articles/2019-07-29/capital-one-data-systems-breached-by-seattle-woman-u-s-says*

Summary: 07/29/2019: An insider, formerly employed by Amazon Web Services (AWS), illicitly penetrated vulnerabilities in the AWS configurations to enable access to the Capital One customer data.

Supply Chain

Title: SolarWinds Breach

Link: *https://www.businessinsider.com/solarwinds-hack-explained-governmentagencies-cyber-security-2020-12*

Summary: 12/24/2020: SolarWinds, a major US information technology firm, was the subject of a cyberattack that spread to its clients and went undetected for months. Foreign hackers, who some top US officials believe are from Russia, were able to use the hack to spy on private companies like the elite cybersecurity firm FireEye and the upper echelons of the US Government, including the Department of Homeland Security and Treasury Department.

Title: Major hack of US agencies may have started with software company SolarWinds

Link: *https://www.cnet.com/news/major-hack-of-us-agencies-may-have-started-with-software-company-solarwinds/*

Summary: 12/15/2020. In a filing with the Securities and Exchange Commission, SolarWinds said the vulnerable Orion updates were delivered to customers between March and June, and as many as 18,000 customers may have downloaded the software.

Title: Russian attack on electric utility suppliers

Link: *https://www.wsj.com/articles/americas-electric-grid-has-a-vulnerable-back-doorand-russia-walked-through-it-11547137112)*

Summary: 01/10/2019: Reports that a Russian group accessed an electric utility via one of the utility's smaller vendors. The Companies are monitoring a growing concern in cyber with respect to harmful vulnerabilities introduced in the supply chain.

IT Cybersecurity

Title: Hackers are using DDoS attacks to squeeze victims for ransom

Link: *https://www.techradar.com/news/hackers-are-using-ddos-attacks-to-squeeze-victims-for-ransom*

Summary: 01/09/21: A major Fortune Global 500 company was targeted by a Ransom DDoS (RDDoS) attack in late 2020. This extortion attempt was part of a wider trend of ransom campaigns that unfolded throughout last year. Cybercriminals will likely continue to use similar methods as they have been quite successful.

Title: An Old Bot's Nasty New Tricks: Exploring Qbot's Latest Attack Methods

Link: *https://research.checkpoint.com/2020/exploring-qbots-latest-attack-methods/*

Summary: 08/27/20. An Electricity Information Sharing and Analysis Center (E-ISAC) partner shared a report of Qakbot malware and Cobalt Strike tools beaconing in their environment. The E-ISAC has tracked similar activity that use Qakbot and Cobalt Strike for installation of malicious payloads, including ProLock ransomware, against multiple organizations in the United States. Open-source investigation of the indicators convey a fixed association with either Qakbot phishing email or command and control activity using Cobalt Strike.

Title: ThreatConnect Research Roundup: Spoofing SharePoint

Link: *https://threatconnect.com/blog/threatconnect-research-roundup-spoofing-sharepoint/*

Summary: In April 2020, a government partner report identified the registration of a lookalike domain of a US-based energy engineering company by unknown threat actors. The company being imitated, HPI Energy Services Ltd., specializes in turbine and utility

plant control systems integration. According to the report, the threat actors created a primary and two sub-domains that host fake Microsoft SharePoint-themed login pages for a probable credential harvesting campaign. These fake sites are likely aimed at collecting credentials of HPI Energy Services employees.

B. Risk Definition

For purposes of this RAMP Application, the Companies' Cybersecurity risk is defined as the risk of a major cybersecurity incident, which results in disruptions to electric or gas operations (*e.g.*, Industrial Control Systems, supply, transmission, distribution, storage) and/or damage or disruption to the Companies' operations, reputation, or disclosure of sensitive customer or Company data.

C. Scope

Table 1 below provides what is considered in scope for the Cybersecurity risk in this RAMP Application.

Table 1: Risk Scope

In-Scope:	The scope of this risk includes gas and electric control systems, all company data and information systems, operational technology systems, and related processes.
Data Quantification Sources:	SoCalGas & SDG&E engaged internal data sources for the calculation surrounding risk reduction; however, if data was insufficient, industry or national data was supplemented and adjusted to fit the risk profile associated with the operating locations and perimeter of the utilities. For example, certain types of incident events have not occurred within the SoCalGas & SDG&E territory; therefore, expanding the quantitative needs to encompass industry data where said incident(s) have been recorded provide a proxy and is justified in establishing a baseline of risk and risk addressed by activities.

Additional information on data quantification sources for the Cybersecurity risk, the potential gas system impacts, and electric system impacts is provided in Appendix B.

II. RISK ASSESSMENT

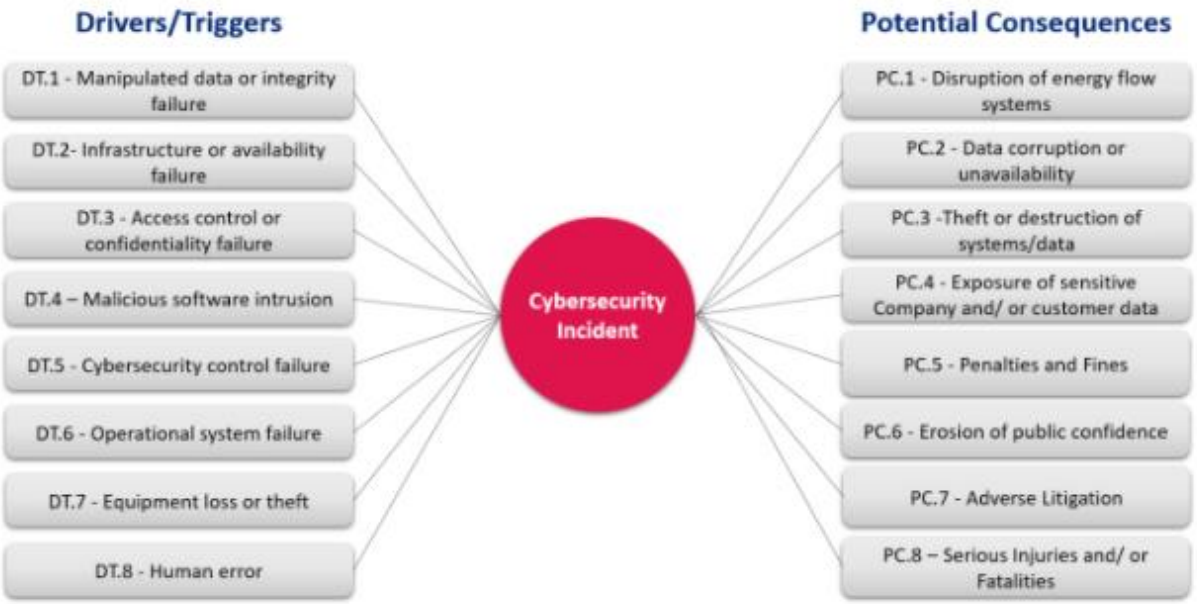
In accordance with the S-MAP Settlement Decision,[15] this section describes the risk Bow Tie, possible Drivers, potential Consequences, and the risk score for the Cybersecurity risk.

[15] D.18-12-014.

A. Risk Bow Tie and Risk Event Associated with the Risk

The risk bow tie is a commonly used tool for risk analysis, and the Settlement Decision[16] instructs the utility to include a risk bow tie illustration for each risk included in RAMP. As illustrated in the risk bow tie shown below in Figure 1, the risk event (center of the bow tie) is a cybersecurity event, the left side of the bow tie illustrates drivers/triggers that lead to a cybersecurity event, and the right side shows the potential consequences of a cybersecurity event. SoCalGas and SDG&E applied this framework to identify and summarize the information provided in Figure 1. A mapping of each mitigation to the element(s) of the risk bow tie addressed is provided in Appendix A.

Figure 1: Risk Bow Tie



B. Overarching & Cross-Functional Factors

Cross-functional factors (CFF) refer to initiatives (drivers, consequences, and/or mitigations) that are associated with, but are not specific to, any specific RAMP risk. Cybersecurity does not operate in a vacuum. It touches upon, and its focus is, to protect every technology system in the Companies.

[16] *Id.* at Attachment A, A-11 ("Bow Tie").

An important cross-functional factor that impacts the Cybersecurity risk is the safe and reliable operation of Foundational Technology Systems. As explained in RAMP Chapters SCG-CFF-4/SDG&E-CFF-4, these systems are used in every aspect of operations, customer engagement, and emergency response. These systems encompass the Companies' critical software application systems, communication networks, monitoring systems, end-user systems, and hardware and software platforms hosted in the Companies' data centers and on internal and external Cloud Platforms. The security and reliability of operations depends on Foundational Technology Systems; thus, it is critical for these systems to be secure, resilient, and recoverable to mitigate risks.

Cybersecurity threats, if successful, can impact the Companies' Foundational Technology Systems. Impacts to Foundational Technology Systems can negatively affect critical business operations and processes that rely on these systems. The following four factors relate to Foundational Technology Systems:

(1) Technology systems have become the foundation for operational, business, and customer engagement needs across the enterprise, where even the most routine tasks rely on an interdependent network of systems and services. The interdependencies of such systems can create an increased Cybersecurity risk.

(2) Technology can quickly become obsolete and require lifecycle management activities such as maintenance, upgrades, and replacements. Neglecting these activities may result in downstream impacts, performance issues, and/or cybersecurity vulnerabilities.

(3) The industry is faced with constantly evolving threats from both domestic and foreign adversaries, as well as supply chain risks, third-party and insider threats, and natural hazards. Collectively, the dependency on technology systems and the dynamic nature of technology threats, hazards, and risks requires that the Companies' controls and mitigations leverage the latest security solutions on the market and constantly adapt to securely, safely, and reliably provide services to the workforce and customers.

(4) Cloud technology is the delivery of computing services—including servers, storage, databases, networking, software, analytics, and intelligence – to offer faster innovation, flexible resources, and economies of scale. Implementing and operating in a secure cloud enables the use of a broad set of policies, technologies, applications, and controls provided by the Cloud

Platforms to assist in protecting sensitive Company data, applications, services, and the associated infrastructure.

Cloud technology provides a shared responsibility model between Cloud Platforms and the Company. Although the Company is ultimately accountable for ensuring cybersecurity protections are in place and effective, our Cloud Platform partners are responsible for protecting the infrastructure that runs the services offered in the cloud. Specifically, the cloud provider manages the security of the cloud, while security in the cloud is the responsibility of the Company.

By prioritizing Cloud Platform as a service, the Companies are decreasing the Cybersecurity risk raised by traditional Information Technology (IT) systems and manual techniques. Cloud providers manage security, patching, and updates at the platform level, allowing the Companies to focus on driving business value and increasing enterprise resiliency.

C. Potential Drivers/Triggers[17]

The Settlement Decision[18] instructs the utility to identify which element(s) of the associated risk Bow Tie each mitigation addresses. When performing the risk assessment for Cybersecurity, SoCalGas and SDG&E identified potential leading indicators, referred to as Drivers or Triggers. These include, but are not limited to:

- **DT.1 - Manipulated data or integrity failure**: Any unintended changes to data as the result of a storage, retrieval or processing operation, including malicious intent, unexpected hardware failure, and human error.
- **DT.2 - Infrastructure or availability failure**: An unplanned, severe, extensive and/or large-scale system outage caused by a cybersecurity-related event or incident.
- **DT.3 - Access control or confidentiality failure**: Inability to effectively perform identification, authentication and authorization of users and entities by evaluating required login credentials that can include passwords, personal identification numbers (PINs), biometric scans, security tokens or other authentication factors.

[17] An indication that a risk could occur. It does not reflect actual or threatened conditions.

[18] D.18-12-014 at Attachment A, A-11 ("Bow Tie").

- **DT.4 - Malicious software intrusion**: Any malicious program or code that is harmful to systems. For example, malware seeks to invade, damage, or disable computers, computer systems, networks, tablets, and mobile devices, often by taking partial control over a device's operations.
- **DT.5 - Cybersecurity control failure**: A general failure of a cybersecurity control(s). *E.g.,* a vulnerability scanner ceases functioning, allowing an exploitable vulnerability to go unnoticed in the environment.
- **DT.6 - Operational system failure**: A system failure occurring due a cybersecurity event/incident, causing the system to freeze, reboot, function counter to its design or stop functioning.
- **DT.7 - Equipment loss or theft**: A type of data breach where there is a loss of a laptop, mobile device, or storage device such as backup tapes, hard drives, and flash drives whether by accidental loss or through malicious intent.
- **DT.8 - Human error (*e.g.*, clicking on a phishing email):** An accidental cybersecurity event/incident conducted by a human.

D. Potential Consequences of Risk Event

Potential Consequences[19] are listed to the right side of the risk Bow Tie illustration provided above. If one or more of the Drivers/Triggers listed above were to result in an incident, the potential Consequences, in a reasonable worst-case scenario, could include:

- PC.1 - Disruption of energy flow systems
- PC.2 - Data corruption or unavailability
- PC.3 - Theft or destruction of systems/data
- PC.4 - Exposure of sensitive Company and/ or customer data
- PC.5 - Penalties and fines
- PC.6 - Erosion of public confidence
- PC.7 - Adverse litigation
- PC.8 – Serious injuries and/ or fatalities

[19] D.18-12-014 at 16 and Attachment A, A-8 ("Identification of Potential Consequences of Risk Event").

These potential Consequences were used in the scoring of Cybersecurity that occurred during the development of SoCalGas' and SDG&E's respective 2020 Enterprise Risk Registries.

E. Risk Score

The Settlement Decision requires a pre- and post-mitigation risk calculation.[20] Chapter RAMP-C of this RAMP Application explains the Risk Quantitative Framework that underlies this Chapter, including how the Pre-Mitigation Risk Score, Likelihood of Risk Event (LoRE), and Consequence of Risk Event (CoRE) are calculated.

Table 2: Pre-Mitigation Analysis Risk Quantification Scores[21]

SoCalGas	LoRE	CoRE	Risk Score
Cybersecurity	0.09	10,829	975
SDG&E	**LoRE**	**CoRE**	**Risk Score**
Cybersecurity	0.08	16,446	1,316

Pursuant to Step 2A of the Settlement Decision, the utility is instructed to use actual results, available and appropriate data.[22] Given the emerging and evolving nature of Cybersecurity risk, particularly in the Operational Technology (OT) domain, there is limited information to assess the risk using historical information. Therefore, the Companies used multiple indicators in predicting the likelihood and consequence of such an event, such as SME and industry data to inform the likelihood and consequence values. The risk of a Cybersecurity incident was evaluated with a consideration for the different risk profiles of the OT infrastructure of the gas and electric systems. Additional information and the evaluation on Cybersecurity risk and the potential gas system impacts and electric system impacts is provided in Appendix B.

III. 2020 CONTROLS

This section "[d]escribe[s] the controls or mitigations currently in place" as required by the Settlement Decision.[23] The activities in this section were in place as of December 31, 2020. Controls that will continue in 2022-2024 are addressed below in Section IV.

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[20] *Id.* at Attachment A, A-11 ("Calculation of Risk").

[21] The term "pre-mitigation analysis," in the language of the S-MAP Settlement Decision (Attachment A, A-12 ("Determination of Pre-Mitigation LoRE by Tranche," "Determination of Pre-Mitigation CoRE," "Measurement of Pre-Mitigation Risk Score")), refers to required pre-activity analysis conducted prior to implementing control or mitigation activity.

[22] *Id.* at Attachment A, A-8 ("Identification of Potential Consequences of Risk Event").

[23] D.18-12-014 at 33.

The controls discussed in this chapter focus on activities performed or supported directly by the Cybersecurity department as a shared service for SoCalGas, SDG&E, and Sempra Energy. The Cybersecurity department manages cybersecurity risks across the enterprise.

The Cybersecurity program utilizes risk management frameworks, including but not limited to the National Institute of Standards and Technology (NIST) Cybersecurity Framework, Center for Internet Security (CIS-20), NIST 800-53, and MITRE ATT&CK framework. Additionally, the Companies comply with all applicable laws and regulations both at the State and Federal level.

The Companies have considered the evolving threat and regulatory landscape of cybersecurity risk in the design of their planned controls. The Companies have adopted a comprehensive and enhanced control portfolio that balances risk mitigation and cost effectiveness while also establishing foundational security capabilities that will serve to mitigate risks from evolving threats. The planned controls are designed to provide adequate risk reduction to offset the projected Cybersecurity risk increase to maintain this risk at a manageable level.

A. Control 1: Perimeter Defenses

The Perimeter Defenses program includes activities that the Companies take to protect the external access points of their internal information technology systems. Perimeter Defenses are designed to prevent attacks, protect the integrity of, and detect unauthorized access to the Companies' internal information technology systems. The information technology environment includes the entire business technology system, including email, information storage, billing and customer records among others. The operational technology environment also uses Perimeter Defenses to protect operational technology assets.

A robust set of controls at the perimeter of corporate systems contributes to the Companies' *defense-in-depth* strategy. The purpose of the defense-in-depth strategy is to manage risk with diverse defenses so that if one layer of defense turns out to be inadequate, the additional layers of defense will prevent and detect further impacts and/or a potential breach.

Perimeter Defenses are an important component of defense-in-depth but can only reduce the probability of an adversary having unauthorized access to internal systems and data. This control includes enhancements to firewalls and other intrusion protection measures to maintain

the risk at the current manageable level and keep up with the increasing potential threats to our perimeter.

Perimeter Defenses reduce the frequency or probability of successful attacks. As a security strategy, it accomplishes this by limiting access to authorized users, reducing the likelihood that malicious code will enter the information technology environment, and delaying or frustrating potential attackers. This strategy also helps the Companies to understand the number of pathways into or out of the perimeter while simultaneously monitoring the perimeter in real time.

Accordingly, the Perimeter Defenses control addresses several Drivers/Triggers as outlined above in Figure 1 and in Appendix A including: Manipulated data or integrity failure (DT.1), Infrastructure or availability failure (DT.2), Access control or confidentiality failure (DT.3), Malicious software intrusions (DT.4), Cybersecurity control failures (DT.5), Operational system failures (DT.6), Equipment Loss or Theft (DT.7), Human error (DT.8). In addition, the Perimeter Defenses control helps to reduce the Potential Consequences of: Data corruption or unavailability (PC.2), Theft or destruction of systems/data (PC.3), Exposure of internal data (PC.4), Erosion of public confidence (PC.6).

Perimeter Defenses projects presented in this control include:

- Firewall upgrades and process automation,
- Web Application Firewall Protection,
- Distributed Denial of Service Protection,
- System security assessment efforts,
- Browser isolation/sandboxing,
- IoT (Internet of Things) Sensors, and
- Perimeter Defense mechanisms.

B. Control 2: Internal Defenses

Internal Defense program activities are designed to detect and prevent unauthorized users, those misusing authorized credentials and malicious software (*i.e.*, malware) from propagating inside of the perimeter, moving within the IT system or into the OT system. The enhancements to the Companies' IT and OT systems' Access Management system reduces the risk to internal assets, Foundational Technology Systems, and the likelihood and impact of a Cybersecurity incident.

As another layer of defense-in-depth, the activities within this category include investments that will directly reduce the risk to internal assets and information. The controls in this category are designed to detect unauthorized users from moving laterally or vertically within the IT system or into the OT system, which improves the ability to identify and respond to threats more quickly. The enhancements to the IT and OT systems' Access Management system will allow the Companies to keep the current risk level steady.

Use of "browser based" and Virtual desktop infrastructure (VDI) further helps improve the effectiveness of Internal Defense mitigations. VDI is defined as the hosting of desktop environments on a central server. It is a form of desktop virtualization, as the specific desktop images run within virtual machines (VMs) and are delivered to end clients over a network. This IT strategy reduces the attacker's threat surface by limiting their ability to compromise and establish a foothold on any one device or endpoint and then pivot to other resources on the network.

Based on the foregoing, Internal Defenses address several Drivers/Triggers and Potential Consequences including: Manipulated data or integrity failure (DT.1), Infrastructure or availability failure (DT.2), Access control or confidentiality failure (DT.3), Malicious software intrusions (DT.4), Cybersecurity control failures (DT.5), Operational system failures (DT.6), Equipment Loss or Theft (DT.7), Human error (DT.8), Data corruption or unavailability (PC.2), Theft or destruction of systems/data (PC.3), Exposure of internal data (PC.4), Erosion of public confidence (PC.6).

Internal Defenses projects presented in this control include:

- Endpoint Security Monitoring,
- Threat and Vulnerability Management,
- Insider Threat Detection and User Behavior Analytics,
- Incident Management,
- Third Party External Privileged Access Management,
- Data Loss Prevention (DLP)
- Supply Chain Risk Management, and
- Cloud Access Security

C. Control 3: Sensitive Data Protection

Sensitive Data Protection is a core component of the Companies' defense-in-depth strategy for cybersecurity. The Sensitive Data Protection projects outlined below enhance technology to reduce the risk of unauthorized access. The Sensitive Data Protection control helps reduce the risk of unauthorized access to the Companies' information by understanding where sensitive data is stored, how it is transmitted, and how it is used. This helps to further protect customer and Company information. The activities for this control will help the Companies continue the prudent management of sensitive data.

Sensitive Data Protection addresses several Drivers/Triggers and Potential Consequences including: Manipulated data or integrity failure (DT.1), Access control or confidentiality failure (DT.3), Cybersecurity control failures (DT.5), Human error (DT.8), Data corruption or unavailability (PC.2), Theft or destruction of systems/data (PC.3), Exposure of internal data (PC.4), Penalties and fines (PC.5), Erosion of public confidence (PC.6), Adverse litigation (PC.7).

The Companies' current control activities target sensitive data within information technology systems, including laptops and other mobile computing devices. Sensitive Data Protection controls are designed to include:

- Identity Access Management Enhancements,
- Data Loss Prevention & Enhancements,
- Forensics Infrastructure Enhancements,
- Mobile Device Security, and
- Data Crawler Technology.

D. Control 4: Operational Technology (OT) Cybersecurity

The OT Cybersecurity program focuses on securing the electric and gas control systems for the Companies. OT environments enable critical business functions, including safe and reliable energy delivery to customers throughout the service territory. Network anomaly detection, endpoint detection, and security event monitoring improves visibility into the OT environment, which allows for faster response and remediation. Enhanced secure access technologies help reduce risk of unauthorized access. These risk mitigation activities strengthen our capabilities by securing the foundation of OT security. These enhancements are necessary to maintain a secure OT system and mitigate the increasing potential threat on that critical system.

OT Cybersecurity requires a specialized approach in order to balance operational needs with cybersecurity risk. Improving asset management helps identify unauthorized systems, which could potentially be a source of an attack. Anomaly detection, endpoint detection, and security event monitoring improves visibility into the OT environment, which allows for faster response and remediation. Enhanced secure access technologies help reduce risk of unauthorized access. These risk mitigation activities strengthen our capabilities by securing the foundation of OT security. These enhancements are necessary to maintain a secure OT system and mitigate the increasing potential threat on that critical system.

This specialized OT Cybersecurity addresses several Drivers/Triggers and Potential Consequences including: Infrastructure or availability failure (DT.2), Access control or confidentiality failure (DT.3), Malicious software intrusions (DT.4), Cybersecurity control failures (DT.5), Operational system failures (DT.6), Human error (DT.8), Disruption of energy flow systems (PC.1), Data corruption or unavailability (PC.2), Penalties and fines (PC.5), Erosion of public confidence (PC.6), Adverse litigation (PC.7), Serious Injuries and Fatalities (PC.8).

The Companies' cybersecurity program prioritizes operational technology controls, including: the management of its existing technology assets, improving threat intelligence and vulnerability management, and securing the communication infrastructure. The Companies are focused on maintaining a secure operational environment to support safe, reliable gas and electric systems and service.

The Companies' OT Cybersecurity projects presented in this control include:

- OT Cybersecurity Tools Hosting Environment Enhancements
- OT Network Anomaly Detection
- OT Application Whitelisting
- OT Advanced Security Incident Management (SIEM) and Analytics
- OT Asset Inventory Control
- OT Environment Network Access Control
- OT Environment Endpoint Detection Response
- OT Network Anomaly Detection Critical Facilities
- OT Malware Defense
- OT Secure Remote Connection

E. Control 5: Obsolete Information Technology (IT) Infrastructure and Application Replacement

One of the fundamental practices that supports a strong cybersecurity program is the refresh of technology, both hardware and software, at regular intervals, to minimize risks posed by obsolete technologies that lead to security risks. This is frequently referred to as "Foundational Technology Systems Lifecycle Management."

Technology lifecycles are short and require frequent upgrades to meet modern security standards and capabilities. In addition to technology obsolescence, this approach also addresses security obsolescence. Security obsolescence refers to cybersecurity tools and processes that are no longer effective, or potentially could create new vulnerabilities.

Vulnerabilities inherent in legacy technology can provide a foothold for entry or movement within the Companies' environment. Failure to invest in modern technologies could degrade the value of modern investments due to compatibility restrictions. Replacing legacy technology is a necessary method of managing cybersecurity risk.

In addition, there are fundamental control activities required to support and effectively manage the cybersecurity capabilities listed in the previous sections. These baseline activities referenced in the O&M (Operations & Maintenance) budget outlook (see Tables 4 and 5 below) support the capital investments. Some examples of these baseline controls include, but are not limited to:

- A security policy framework
- Risk management and assessments
- Cybersecurity awareness and training
- Security assessment
- Asset management
- Protective technologies (Network, User, Application)
- System authentication – public key infrastructure (PKI)
- Security Operations Center
    - Monitors security-related activities in systems and applications
    - Anomaly detection
    - Security event detection and escalation
    - Monitors detection infrastructure systems to investigate security events

- Incident response
- Exercises/drills

Obsolete IT Infrastructure and Application Replacement addresses several Drivers/Triggers and Potential Consequences as outlined above in Figure 1 and in Appendix A. These include: Manipulated data or integrity failure (DT.1), Infrastructure or availability failure (DT.2), Access control or confidentiality failure (DT.3), Malicious software intrusions (DT.4), Cybersecurity control failures (DT.5), Operational system failures (DT.6), Disruption of energy flow systems (PC.1), Data corruption or unavailability (PC.2), Theft or destruction of systems/data (PC.3), Exposure of sensitive Company and customer data (PC.4), Erosion of public confidence (PC.6).

The projects presented in this control include:

- Technology refreshes, including, but not limited to:
  - Infrastructure
  - Operating systems
  - Middleware
  - Applications
- System maintenance to confirm continued secure configurations, patching, upgrading, among others.
- Use of effective architecture and other mechanisms to confirm high availability and service continuity for critical systems.

IV. 2022-2024 CONTROL & MITIGATION PLAN

This section contains a table identifying the controls and mitigations comprising the portfolio of mitigations for this risk.[24] All of the activities discussed in Section III above are expected to continue during the TY 2024 GRC. For clarity, a current activity that is included in the 2022-2024 plan may be referred to as either a control and/or a mitigation. For purposes of this RAMP, a control that will continue as a mitigation will retain its control ID unless the size and/or scope of that activity will be modified, in which case that activity's control ID will be replaced with a mitigation ID. The table below shows which activities are expected to continue.

[24] *See id.* at Attachment A, A-14 ("Mitigation Strategy Presentation in the RAMP and GRC").

Table 3 Mitigation Plan Summary

Line No.	Control/ Mitigation ID	Control/Mitigation Description	2020 Controls	2022-2024 Plan
1	C1	Perimeter Defenses	X	X
2	C2	Internal Defenses	X	X
3	C3	Sensitive Data Protection	X	X
4	C4	OT Cybersecurity	X	X
5	C5	Obsolete IT Infrastructure and Asset Replacement	X	X

A single tranche is appropriate for a Cybersecurity risk event as there is no logical disaggregation of assets or systems related to the controls presented in the mitigation plan. The controls for this risk are evaluated at the program level due to the availability of data, the rapidly changing threats, and applicable counter measures. As mentioned in the Risk Overview section above, sharing specific details of the individual risk mitigation activity can provide an adversary crucial information that could aid their ability to disrupt our systems. Therefore, the level of granularity for quantifying RSE (Risk Spend Efficiency) is currently at the operational program level (*i.e*., Perimeter Defenses, Internal Defenses, Sensitive Data Protection, OT Cybersecurity and Obsolete IT Infrastructure and Asset Replacement) rather than each individual risk mitigation activity for the Cybersecurity risk.

A. Changes to 2020 Controls

The Companies plan to continue each of the existing controls discussed above in Section III through the 2022 – 2024 period without any significant changes.

B. 2022 – 2024 Mitigations

The Companies are currently not planning any new mitigations during the 2022 – 2024 period.

V. COSTS, UNITS, AND QUANTITATIVE SUMMARY TABLES

The tables in this section provide a summary of the risk mitigation plan, including the associated costs, units, and the RSEs, by tranche. When an RSE could not be performed, an explanation is provided. SoCalGas and SDG&E do not account for and track costs by activity or tranche; rather, SoCalGas and SDG&E account for and tracks costs by cost center and capital budget code. The costs shown were estimated using assumptions provided by SMEs and available accounting data.

Table 4: SoCalGas Risk Control and Mitigation Plan - Recorded and Forecast Dollars Summary[25]
(Direct After Allocations, In 2020 $000)

ID	Control/Mitigation Name	Recorded Dollars		Forecast Dollars			
		2020 Capital	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
C1	Perimeter Defenses	$8,037	$1,032	$10,445	$13,347	$1,251	$1,599
C2	Internal Defenses	$4,658	$3,124	$10,816	$13,821	$3,158	$4,035
C3	Sensitive Data Protection	$0	$2,377	$7,054	$9,014	$2,351	$3,004
C4	OT Cybersecurity	$127	$896	$14,790	$18,898	$1,066	$1,362
C5	Obsolete IT Infrastructure and Asset Replacement	$206	$1,083	$8,928	$11,408	$1,297	$1,657

[25] Recorded costs and forecast ranges are rounded. Additional cost-related information is provided in workpapers. Costs presented in the workpapers may differ from this table due to rounding. The figures provided are direct charges and do not include company loaders, with the exception of vacation and sick. The costs are also in 2020 dollars and have not been escalated to 2021 amounts. The capital presented is the sum of the years 2022, 2023, and 2024, or a three-year total. Years 2022, 2023 and 2024 are the forecast years for the Company's Test Year 2024 GRC Application.

Table 5: SDG&E Risk Control and Mitigation Plan - Recorded and Forecast Dollars Summary[26]
(Direct After Allocations, In 2020 $000)

ID	Control/Mitigation Name	Recorded Dollars		Forecast Dollars			
		2020 Capital	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
C1	Perimeter Defenses	$10,231	$811	$10,013	$12,795	$984	$1,257
C2	Internal Defenses	$4,312	$2,457	$9,405	$12,018	$2,483	$3,173
C3	Sensitive Data Protection	$0	$1,869	$6,807	$8,698	$1,849	$2,362
C4	OT Cybersecurity	$458	$704	$16,245	$20,758	$838	1,071
C5	Obsolete IT Infrastructure and Asset Replacement	$1,326	$852	$7,921	$10,121	$1,020	$1,303

[26] *See*, *supra*, n. 25.

Table 6: SoCalGas Risk Control & Mitigation Plan - Units Summary

ID	Control/Mitigation Name	Units Description		Recorded Units		Forecast Units			
		Capital	O&M	2020 Capital	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 (High) O&M
C1	Perimeter Defenses	The cybersecurity mitigations have multiple different types of units of measure. For example, in the Perimeter Security mitigation area there are devices involved, network users, data consumed, service contracts, etc. It would not be accurate or consistent to identify one unit of measure.							
C2	Internal Defenses								
C3	Sensitive Data Protection								
C4	OT Cybersecurity								
C5	Obsolete IT Infrastructure and Asset Replacement								

Table 7: SDG&E Risk Control & Mitigation Plan - Units Summary

ID	Control/Mitigation Name	Units Description		Recorded Units		Forecast Units			
		Capital	O&M	2020 Capital	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 (High) O&M
C1	Perimeter Defenses	The cybersecurity mitigations have multiple different types of units of measure. For example, in the Perimeter Security mitigation area there are devices involved, network users, data consumed, service contracts, etc. It would not be accurate or consistent to identify one unit of measure.							
C2	Internal Defenses								
C3	Sensitive Data Protection								
C4	OT Cybersecurity								
C5	Obsolete IT Infrastructure and Asset Replacement								

Table 8: SoCalGas Risk Control & Mitigation Plan - Quantitative Analysis Summary (Direct After Allocations, In 2020 $000)

ID	Control/Mitigation Name	Forecast			
		LoRE	CoRE	Risk Score	RSE
C1	Perimeter Defenses	0.10	13,482	1,356	160
C2	Internal Defenses	0.11	13,482	1,544	95
C3	Sensitive Data Protection	0.14	13,482	1,918	62
C4	OT Cybersecurity	0.05	10,829	497	112
C5	Obsolete IT Infrastructure and Asset Replacement	0.13	13,482	1,731	102

Table 9: SDG&E Risk Control & Mitigation Plan - Quantitative Analysis Summary (Direct After Allocations, In 2020 $000)

ID	Control/Mitigation Name	Forecast			
		LoRE	CoRE	Risk Score	RSE
C1	Perimeter Defenses	0.10	13,482	1,356	160
C2	Internal Defenses	0.11	13,482	1,544	95
C3	Sensitive Data Protection	0.14	13,482	1,918	62
C4	OT Cybersecurity	0.04	16,466	672	142
C5	Obsolete IT Infrastructure and Asset Replacement	0.13	13,482	1,731	102

VI. ALTERNATIVES

Pursuant to D.14-12-025 and D.16-08-018, the Companies considered alternatives to the risk mitigation plan for the Cybersecurity risk. The risk mitigation plan for the Cybersecurity risk is defined as the planned portfolio of control programs. Typically, analysis of alternatives occurs when designing the portfolio to obtain the best result or product for the cost. The alternatives analysis considered modifications to the risk mitigation plan and constraints, such as budget and resources.

The Companies considered two alternative portfolios of mitigation activities in addition to the planned portfolio control program to address the Companies' Cybersecurity risk. The alternative portfolios were analyzed in the context of risk-spend efficiency, as outlined in the tables below.

For the alternative analysis, the Companies analyzed the effectiveness of three portfolios:

1. The risk mitigation plan for the Cybersecurity risk,
2. Alternative Portfolio 1, and
3. Alternative Portfolio 2.

To create these three different portfolios, the Companies first assessed the potential impact of each capital project under consideration, identifying each as high/medium/low based on several criteria:

- The project implementation's impact on the maturity of cybersecurity at the Companies;

- The extent to which each project addresses recommendations from CSC 20,[27] ICS-CERT,[28] and other frameworks;
- The extent to which each project addresses threats to cybersecurity of high impact and likelihood; and
- The effectiveness in mitigating a credible attack impacting safety.

After each project was tagged as High/Medium/Low, the following three portfolios were developed: The risk mitigation plan for the Cybersecurity risk, Alternative Portfolio 1 and Alternative Portfolio 2.

A. The Risk Mitigation Plan for the Cybersecurity risk

The Companies' risk mitigation plan includes a mix of "high" impact and "medium" impact projects. The identified high-impact and medium-impact projects were grouped into the five programs described above:

1. Perimeter Defenses,
2. Internal Defenses,
3. Sensitive Data Protection,
4. Operational Technology Cybersecurity, and
5. Obsolete IT Infrastructure and Application Replacement.

The quantitative analysis conducted by the Companies shows that the Companies' Plan of high- and medium-impact projects is the most cost-effective portfolio for managing the increase in Cybersecurity risk, as is demonstrated by the high RSE compared to other alternative portfolios.

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[27] CSC-20: The Twenty (20) Critical Security Controls (CSC) for Cyber Defense are a culmination of exhaustive research and development of information security initiatives that advocate a "offense must inform defense approach," as noted by the SANS institute, available at *https://www.sans.org/critical-security-controls*.

[28] ICS-CERT: The Industrial Control Systems Cyber Emergency Response Team (ICS-CERT) provides a control system security focus in collaboration with US-CERT (*https://us-cert.cisa.gov/ics*) to:

- Conduct vulnerability and malware analysis
- Provide onsite support for incident response and forensic analysis
- Provide situational awareness in the form of actionable intelligence
- Coordinate the responsible disclosure of vulnerabilities/mitigations
- Share and coordinate vulnerability information and threat analysis through information products and alerts.

B. Alternative Portfolio 1

The Companies' Alternative Portfolio 1 consists of "high" impact projects only. The identified high-impact projects were grouped into the same five programs described above. The quantitative analysis conducted by the Companies shows that the Companies' Alternative Portfolio 1, comprising only high-impact projects, is estimated to have a lower RSE than the Plan when considering the RSE of the individual categories, as shown below. In addition, this portfolio does not provide enough risk reduction to address the increasing rate of Cybersecurity risk. The effectiveness of the projects in this alternative portfolio is lower than the growth rate of the risk. If Alternative Portfolio 1 is executed, the Cybersecurity risk will increase compared to the Companies' risk mitigation plan.

The quantitative analyses for each of the five utility-focused operational cybersecurity categories are presented below. As stated above, these projects, when combined into an alternative portfolio, is lower than the Companies' Plan.

1. Alternative Portfolio 1 – C1 (High-impact Perimeter Defenses)
2. Alternative Portfolio 1 – C2 (High-impact Internal Defenses)
3. Alternative Portfolio 1 – C3 (High-impact Sensitive Data Protection)
4. Alternative Portfolio 1 – C4 (High-impact OT Cybersecurity)
5. Alternative Portfolio 1 – C5 (High-impact Obsolete IT Infrastructure and Application Replacement)

C. Alternative Portfolio 2

Alternative Portfolio 2 consists of all cybersecurity projects under consideration (*i.e.,* high-impact, medium-impact and low-impact). Whereas the Companies' risk mitigation plan includes high- and medium-impact projects, and Alternative Portfolio 1 includes only high-impact projects, Alternative Portfolio 2 includes all projects that the Companies have currently identified. Alternative Portfolio 2 has the highest cost, and the most risk reduction. Alternative Portfolio 2 has an RSE lower than the Companies' Plan since the additional projects in the portfolio (the low-impact projects not included in the Companies' risk mitigation plan for the Cybersecurity risk) provide an incremental benefit; however, that incremental benefit is less effective relative to its incremental cost.

1. Alternative Portfolio 2 – C1 (High-, Medium-, and Low-impact Perimeter Defenses)
2. Alternative Portfolio 2 – C2 (High-, Medium-, and Low-impact Internal Defenses)
3. Alternative Portfolio 2 – C3 (High-, Medium-, and Low-impact Sensitive Data Protection)
4. Alternative Portfolio 2 – C4 (High-, Medium-, and Low-impact OT Cybersecurity)
5. Alternative Portfolio 2 – C5 (High-, Medium-, and Low-impact Obsolete IT Infrastructure and Application Replacement)

The costs and RSEs for Alternative Portfolio 1 and Alternative Portfolio 2 are presented in the tables that follow.

Table 10: SoCalGas Alternate Mitigation Plan - Recorded and Forecast Dollars Summary[29] (Direct After Allocations, In 2020 $000)

ID	Control/Mitigation Name	Forecast Dollars			
		2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
A1	Alternative Portfolio 1	$47,984	$61,312	$9,122	$11,656
A2	Alternative Portfolio 2	$81,319	$103,907	$9,122	$11,656

Table 11: SDG&E Alternate Mitigation Plan - Recorded and Forecast Dollars Summary[30] (Direct After Allocations, In 2020 $000)

ID	Control/Mitigation Name	Forecast Dollars			
		2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
A1	Alternative Portfolio 1	$20,159	$25,759	$7,173	$9,166
A2	Alternative Portfolio 2	$21,104	$26,966	$7.173	$9,166

[29] *See, supra*, n. 25.

[30] *Id.*

Table 12: SoCalGas Alternate Mitigation Plan - Units Summary

ID	Alternative Mitigation Name	Units Description		Forecast Units			
		Capital	O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 (High) O&M
A1	Alternative Portfolio 1	The cybersecurity mitigations have multiple different types of units of measure. For example, in the Perimeter Security mitigation area there are devices involved, network users, data consumed, service contracts, etc. It would not be accurate or consistent to identify one unit of measure.					
A2	Alternative Portfolio 2						

Table 13: SDG&E Alternate Mitigation Plan - Units Summary

ID	Alternative Mitigation Name	Units Description		Forecast Units			
		Capital	O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 (High) O&M
A1	Alternative Portfolio 1	The cybersecurity mitigations have multiple different types of units of measure. For example, in the Perimeter Security mitigation area there are devices involved, network users, data consumed, service contracts, etc. It would not be accurate or consistent to identify one unit of measure.					
A2	Alternative Portfolio 2						

Table 14: SoCalGas Alternate Mitigation Plan - Quantitative Analysis Summary (Direct After Allocations, In 2020 $000)

ID	Control/Mitigation Name	Forecast			
		LoRE	CoRE	Risk Score	RSE
A1-C1	Perimeter Defenses	0.12	13,482	1610	157
A1-C2	Internal Defenses	0.13	13,482	1746	85
A1-C3	Sensitive Data Protection	0.15	13,482	2019	56
A1-C4	OT Cybersecurity	0.06	10,829	627	110
A1-C5	Obsolete IT Infrastructure and Application Replacement	0.14	13,482	1883	98
A2-C1	Perimeter Defenses	0.09	13,482	1238	154
A2-C2	Internal Defenses	0.11	13,482	1449	88
A2-C3	Sensitive Data Protection	0.14	13,482	1899	57
A2-C4	OT Cybersecurity	0.04	10,829	474	112
A2-C5	Obsolete IT Infrastructure and Application Replacement	0.13	13,482	1703	98

Table 15: SDG&E Alternate Mitigation Plan - Quantitative Analysis Summary (Direct After Allocations, In 2020 $000)

ID	Control/Mitigation Name	Forecast			
		LoRE	CoRE	Risk Score	RSE
A1-C1	Perimeter Defenses	0.12	13,482	1610	157
A1-C2	Internal Defenses	0.13	13,482	1746	85
A1-C3	Sensitive Data Protection	0.15	13,482	2019	56
A1-C4	OT Cybersecurity	0.05	16,465	847	110
A1-C5	Obsolete IT Infrastructure and Application Replacement	0.14	13,482	1883	98
A2-C1	Perimeter Defenses	0.09	13,482	1238	154
A2-C2	Internal Defenses	0.11	13,482	1449	88
A2-C3	Sensitive Data Protection	0.14	13,482	1889	57
A2-C4	OT Cybersecurity	0.04	16,466	672	139
A2-C5	Obsolete IT Infrastructure and Application Replacement	0.13	13,482	1703	98

APPENDIX A: SUMMARY OF ELEMENTS OF THE RISK BOW TIE

Appendix A: Summary of Elements of the Risk Bow Tie

Cybersecurity: Summary of Elements of the Risk Bow Tie

Control ID	Control Name	Elements of the Risk Bow Tie Addressed
C1	Perimeter Defenses	DT.1, DT.2, DT.3, DT.4, DT.5, DT.6, DT.7, DT.8 PC.2, PC.3, PC.4, PC.6
C2	Internal Defenses	DT.1, DT.2, DT.3, DT.4, DT.5, DT.6, DT.7, DT.8 PC.2, PC.3, PC.4, PC.6
C3	Sensitive Data Protection	DT.1, DT.3, DT.5, DT.8, PC.2, PC.3, PC.4, PC.5, PC.6, PC.7
C4	Operational Technology (OT) Cybersecurity	DT.2, DT.3, DT.4, DT.5, DT.6, DT.8 PC.1, PC.2, PC.5, PC.6, PC.7, PC.8
C5	Obsolete Information Technology (IT) Infrastructure and Application Replacement	DT.1, DT.2, DT.3, DT.4, DT.5, DT.6, PC.1, PC.2, PC.3, PC.4, PC.6

APPENDIX B: QUANTITATIVE ANALYSIS SOURCE DATA REFERENCES

Appendix B: Quantitative Analysis Source Data References

Cybersecurity: Quantitative Analysis Source Data References

The Settlement Decision directs the utility to identify potential consequences of a risk event using available and appropriate data.[31] The list below provides the inputs used as part of this assessment.

Gas Systems Impacts

The scoring for a cybersecurity attack's impact on the gas system was conducted using SME input and industry data as a proxy for historical cybersecurity attacks on the gas system. A number of potential cybersecurity attacks on the gas system were evaluated to determine safety, financial, and reliability consequences of an event. A cybersecurity attack with high safety consequences could involve the inundation of the Company's Contact Center (call center) by attackers, rendering the call center inoperable. This might prevent customers and employees from being able to alert the Company about time-sensitive gas operations emergencies in the field. Which, in turn, could result in a delayed Company response to the gas emergency, exacerbating the safety and reliability consequences of the event. For example, a gas leak, if left unreported and unremedied, under some circumstances might lead to an explosion or ignition. To determine the safety impacts of a cybersecurity attack on the call center, the Company has relied on historical Company evacuations data to estimate the number of customers who may not be evacuated during a gas leak if unable to contact the Company due to a cybersecurity attack on the call center. The financial consequences of a cybersecurity attack on the call center include the cost of stolen customer records, as informed by Ponemon Institute's 2020 "Cost of a Data Breach Report."[32] In addition to financial consequences, the theft of customer records can lead to reputational consequences for the Company.

A cybersecurity attack on the gas system may result in the attacker gaining access to the gas control or Supervisory Control And Data Acquisition (SCADA) systems and manipulating, or disarming alarms to cause operational and safety consequences. The 2008 Turkey Oil Pipeline explosion is a historical example of this type of cybersecurity attack. During this attack, attackers

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[31] D.18-12-014, Attachment A at A-8 (Identification of Potential Consequences of Risk Event).

[32] *See*, DigitalGuardian, *What Does a Data Breach Cost in 2020?* (August 18, 2020), available at *https://digitalguardian.com/blog/what-does-data-breach-cost-2020.*

gained access to the pipeline's surveillance systems and valve stations and over-pressured the pipeline without triggering alarms.[33] The overpressure resulted in an explosion that cost over a million dollars and resulted in thousands of barrels of oil spilled near a water aquifer. To determine the safety impacts of a cybersecurity attack impacting gas control at the Company, SMEs analyzed the safety consequences of national Pipeline and Hazardous Materials Safety Administration (PHMSA) transmission incident events without SCADA in place. The average value of safety impacts for these events was used as a proxy for a cybersecurity attack on the gas control system at the Company. Financial consequences for an attack on the gas control/SCADA systems were informed by industry research, including a Center for Strategic and International Studies report, which calculated the cost of a cybersecurity attack on oil and gas SCADA systems at an estimated $8.4 million per day.[34] SME input estimates the time to rebuild the SCADA system as one month in a worst-case scenario. A cybersecurity attack on the gas control center can also have major reliability consequences. To determine the operational consequences of this type of event, SMEs used the average reliability impacts of incidents on the transmission system at the Companies (*see* Incident Related to the High Pressure System (Excluding Dig-in) RAMP chapters SCG-Risk-1/SDG&E-Risk-3). A cybersecurity attack may result in outages and lead to a gas curtailment.

Several data points and sources were used by the Companies' SMEs to estimate the likelihood of events on the electric and gas systems. According to the 2015 Lloyd's Emerging Risk Report, "there have been 15 suspected cyber attacks or events on the US electricity grid since 2000"[35] to 2015. The estimate of the likelihood of this event occurring based on that report is in the order of 2% (1 in 50 years). In addition, a 2017 industry research report by Accenture,

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[33] Bloomberg, *Mysterious '08 Turkey Pipeline Blast Opened New Cyberwar* (December 10, 2014), available at *https://www.bloomberg.com/news/articles/2014-12-10/mysterious-08-turkey-pipeline-blast-opened-new-cyberwar*.

[34] McAfee, Inc. *In The Crossfire: Critical Infrastructure In The Age of Cyber War* (2010), available at *https://img.en25.com/Web/McAfee/NA_CIP_RPT_REG_2840.pdf*.

[35] Lloyd's Emerging Risk Report – 2015, *Business Blackout: The Insurance Implications of a Cyber Attack on the US Power Grid* (2015) at 53, available at *https://www.lloyds.com/~/media/files/news%20and%20insight/risk%20insight/2015/business%20blackout/business%20blackout20150708.pdf*.

"Cost of Cyber Crime Study,"[36] indicates a rapidly evolving risk increasing at an annual rate of 27%. The 2019 study reflected a similar rate of increase at 11%. Given this information, the Companies' SMEs provide a likelihood of 2% for the cyber risk or 1:50 years. This frequency was also used as a proxy for cybersecurity attacks on the gas system with low safety consequences, such as attacks on the gas control center. An attack with high safety consequences on the gas system, such as an attack on the Company Contact Center, was given a frequency of 1 incident in 25 years based on SME input.

Electric System Impacts

To determine the potential consequences for the electric system, SMEs evaluated relevant industry event scenarios to determine a credible worst-case scenario of a cybersecurity attack at the Companies. Historical examples used to inform estimates of potential consequences of a cybersecurity attack on the electric system include:

- Ukraine (2015 and 2016) – In 2015, remote cyber intrusions caused outages at three regional electric power distribution companies, impacting approximately 225,000 customers for 6 hours in Ukraine. In 2016, hackers used a more sophisticated malware ("Crash Override") in an attempt to disable protective relay devices through a denial of service (DoS) attack. Although the 2016 attack only caused a one-hour outage, recent research suggests that hackers intended to inflict lasting damage that could have led to outages for weeks or even months.
- Southwest US Outage (2011) – In 2011, a maintenance procedure in Yuma, Arizona caused a cascade of power failures across the Southwest resulting in widespread outages in SDG&E's service territory. As the failure spread, grid operators were unaware of many rapid-fire events outside their territories. Electrical service was restored to most of SDG&E's customers within 12 hours.
- Northeast US Outage (2003) – The biggest blackout in North America occurred in 2003. High voltage power lines came into contact with vegetation, and a

[36] Ponemon Institute, LLC and Accenture, *2017 Cost of Cyber Crime Study: Insights on the Security Investments that Make a Difference* (2017) at 2, ("*... there are over 130 large-scale, targeted breaches in the U.S. per year, and that number is growing by 27 percent per year."*), available at *https://www.accenture.com/_acnmedia/pdf-62/accenture-2017costcybercrime-us-final.pdf#zoom=50.*

combination of human error and equipment failures resulted in outages for 50 million people.

- Lloyds Scenarios (Scenario 1) – A report produced by Lloyd's of London and the University of Cambridge considered the impact of a hypothetical cybersecurity attack. In the scenario, malware infects generation control rooms in the Northeast US. The malware goes undetected until triggered and tries to take control of generators. While power is restored to some areas within 24 hours, others remain without electricity for weeks.

Risk Assessment and Mitigation Phase

(Chapter SCG-Risk-7)

Incident Involving a Contractor

May 17, 2021

TABLE OF CONTENTS

RISK: INCIDENT INVOLVING A CONTRACTOR

I. INTRODUCTION

The purpose of this Chapter is to present SoCalGas's risk control and mitigation plan for the Incident Involving a Contractor (Contractor Incident) risk. Each chapter in this Risk Assessment Mitigation Phase (RAMP) Report contains the information and analysis that meets the requirements adopted in Decision (D.) 16-08-018 and D.18-12-014 and the Settlement Agreement included therein (the Settlement Decision).[1]

SoCalGas has identified and defined RAMP risks in accordance with the process described in further detail in Chapter RAMP-B of this RAMP Report. On an annual basis, SoCalGas's Enterprise Risk Management (ERM) organization facilitates the Enterprise Risk Registry (ERR) process. The ERR process influenced how risks were selected for inclusion in this 2021 RAMP Report, consistent with the Settlement Decision's directives, as discussed in Chapter RAMP-C.

The RAMP Report's purpose is to present a current assessment of key safety risks and the proposed activities for mitigating those risks. The RAMP Report does not request funding. Any funding requests will be made in SoCalGas's General Rate Case (GRC) application. The costs presented in this 2021 RAMP Report are those costs for which SoCalGas anticipates requesting recovery in its Test Year (TY) 2024 GRC. SoCalGas's TY 2024 GRC presentation will integrate developed and updated funding requests from the 2021 RAMP Report, supported by witness testimony.[2] This 2021 RAMP Report is presented consistent with SoCalGas's GRC presentation, in that the last year of recorded data (2020) provides baseline costs and cost estimates are provided for years 2022-2024, as further discussed in Chapter RAMP-A. This 2021 RAMP Report presents capital costs as a sum of the years 2022, 2023, and 2024 as a three-year total; operations and maintenance (O&M) costs are only presented for TY 2024 (consistent with the GRC). Costs for each activity that directly address each risk are provided where those costs are available and within the scope of the analysis required in this RAMP Report.

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[1] D.16-08-018 also adopted the requirements previously set forth in D.14-12-025. D.18-12-014 adopted the Safety Model Assessment Proceeding (S-MAP) Settlement Agreement with modifications and contains the minimum required elements to be used by the utilities for risk and mitigation analysis in the RAMP and GRC.

[2] *See* D.18-12-014 at Attachment A, A-14 ("Mitigation Strategy Presentation in the RAMP and GRC").

Throughout this 2021 RAMP Report activities are delineated between controls and mitigations, consistent with the definitions adopted in the Settlement Decision's Revised Lexicon. A "control" is defined as a "[c]urrently established measure that is modifying risk."[3] A "mitigation" is defined as a "[m]easure or activity proposed or in process designed to reduce the impact/consequences and/or likelihood/probability of an event."[4] Activities presented in this chapter are representative of those that are primarily scoped to address SoCalGas's Contractor Incident risk; however, many of the activities presented herein also help mitigate other areas.

As discussed in Chapters RAMP-A and RAMP-C, SoCalGas has endeavored to calculate an RSE for all controls and mitigations presented in Section V of this risk chapter.

A. Risk Overview

SoCalGas relies on support from its contractors to perform a significant amount of construction related work on its gas infrastructure assets located throughout its service territory, which encompasses parts of Central and Southern California. Such work is frequently performed in public space and exposed to external factors, such as vehicular traffic in populated areas. Contractors support SoCalGas during normal operating conditions as well as during emergency situations resulting from events, such as wildfires, mudslides, and earthquakes.

SoCalGas has many safety-related policies and procedures for contractors to follow. There are myriad instances that could implicate this risk, including:

- Failure of a contractor to adhere to a Company safety policy or procedure which could result in a safety-related event involving serious injuries and/or fatalities while conducting work on behalf of the Company.
- Contractors failing to report safety incidents, including serious near misses, and sharing lessons learned from such incidents with SoCalGas, can result in the incident occurring again with potentially more adverse results.
- Driving distractions due to increased vehicles on the road and/or use of mobile technology may result in more vehicle related incidents.
- Personnel turnover and movement within the contracting industry can impact availability of experienced workers with a resulting impact on safety.

[3] *Id*. at 16.

[4] *Id.* at 17.

- Pandemics and their potential recurrence may create additional work-related contractor illness cases and impact safety results (*e.g.*, OSHA recordables, lost time incidents, etc.).

To address potential risk drivers and consequences, SoCalGas has implemented strong controls as part of its contractor safety oversight efforts. These include developing and implementing a Contractor Safety Manual, establishing a third-party vetting process requiring membership in ISNetworld, a vendor platform for contractor management services used to pre-qualify contractors on safety practices, and engaging with contractors to strengthen the sharing of best safety practices. SoCalGas plans to further expand its oversight over contractors by establishing an enterprise-wide audit function. The purpose of implementing strong controls and mitigations to oversee contractors is to enhance the safety of SoCalGas construction projects from inception to completion.

B. Risk Definition

For purposes of this RAMP Application, SoCalGas's Contractor Incident risk is defined as the risk of an incident that threatens the safety of the contractor, SoCalGas employees, or the public caused by the contractor's non-adherence to the Company's and/or contractor's policies, procedures, and programs, or by external factors. The risk definition captures an incident either caused by a contractor harming themselves and/or other employees/contractors and/or the public as well as external factors that would harm contractors.

C. Scope

Table 1 below provides what is considered in scope for the Contractor Incident risk in this RAMP Application.

Table 1: Risk Scope

In-Scope:	The risk of a work-related safety incident, as defined by the Occupational Safety and Health Administration (OSHA), involving a Class 1 contractor(s), while conducting work on behalf of SoCalGas, which causes serious injuries or fatalities. SoCalGas focuses its Contractor Safety Program on Class 1 Contractors, which are defined as: "A Class 1 Contractor is a Contractor engaged by the Company to perform work that can reasonably be anticipated to expose the Contractor's employees, subcontractors, SoCalGas employees, or the general public to one or more hazards that, if not properly mitigated, have the potential to result in Serious Safety Incident. Examples of a

	Class 1 Contractor include contractors that are subject to and covered by the Operator Qualification Program and contractors performing construction, repair, or maintenance work on any aspects of SoCalGas' natural gas pipeline system and appurtenances, including gas distribution, transmission, or storage systems or any building construction, repair, or maintenance work involving elevated work surfaces, confined space, energized equipment, hazardous chemicals, or other similar hazards."[5]
Data Quantification Sources:	SoCalGas engaged internal data sources for the calculation surrounding risk reduction; however, if data was insufficient, Industry or National data was supplemented and adjusted to fit the risk profile associated with the operating locations and perimeter of the utilities. For example, when certain types of incident events have not occurred within the SoCalGas & SDG&E territory; therefore, expanding the quantitative needs to encompass industry data where said incident(s) have been recorded provide a proximate and is justified in establishing a baseline of risk and risk addressed by activities. See Appendix B for additional information.

II. RISK ASSESSMENT

In accordance with the Settlement Decision,[6] this section describes the risk bow tie, drivers/triggers, potential consequences, and the risk score for the Contractor Incident risk.

A. Risk Bow Tie and Risk Event Associated with the Risk

The risk bow tie is a commonly used tool for risk analysis, and the Settlement Decision[7] instructs the utility to include a risk bow tie illustration for each risk included in RAMP. As illustrated in the risk bow tie shown below in Figure 1, the risk event (center of the bow tie) is a condition and/or activity that leads to the risk of a Contractor Incident, the left side of the bow tie illustrates drivers/triggers that lead to the condition and/or activity that leads to the risk of a Contractor Incident, and the right side shows the potential consequences of the condition and/or an activity that leads to the risk of a Contractor Incident. SoCalGas applied this framework to

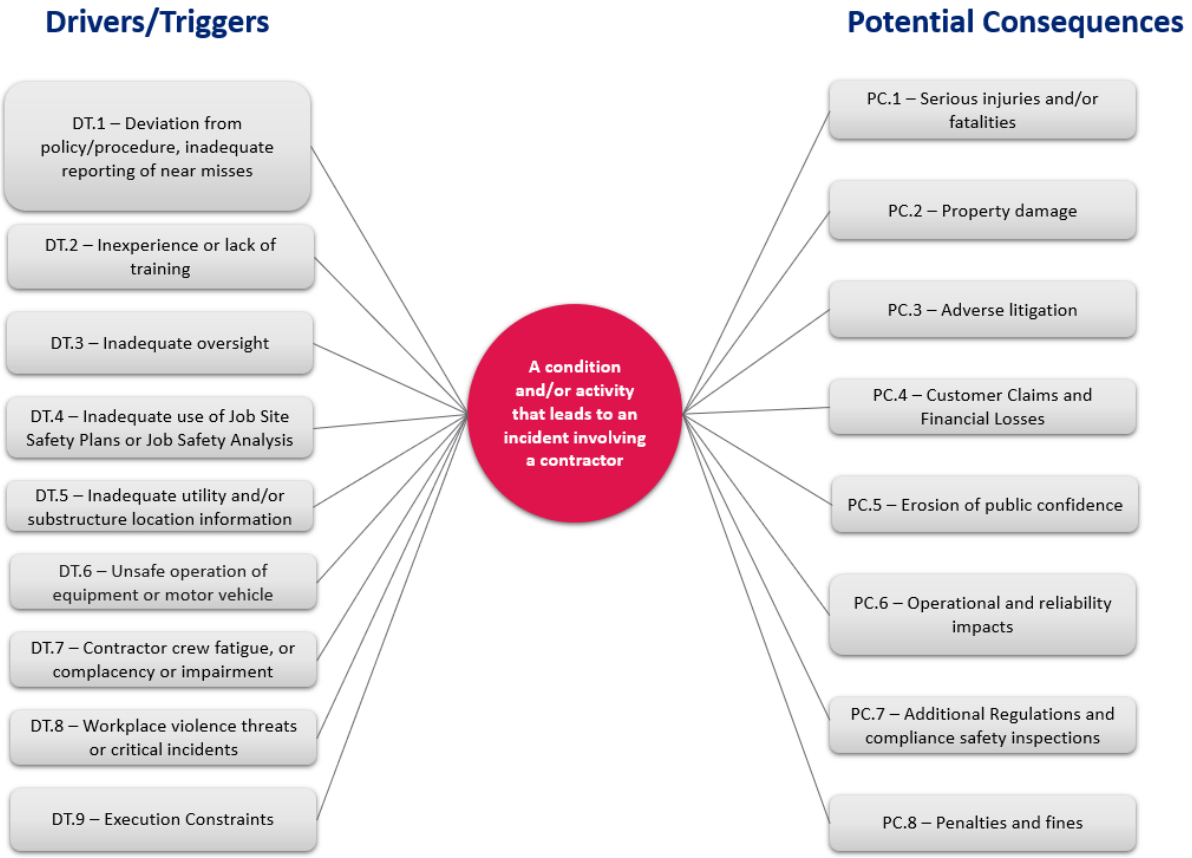
[5] SoCalGas Company Operations Standard 167.04, Section 2.4.1.

[6] D.18-12-014 at 33, and Attachment A, A-11 ("Bow Tie").

[7] *Id.* at Attachment A, A-11 ("Bow Tie").

identify and summarize the information provided in Figure 1. A mapping of each Mitigation to the element(s) of the risk bow tie addressed is provided in Appendix A.

Figure 1: Risk Bow Tie



B. Cross-Functional Factors

There are two CFFs that impact the Contractor Incident risk. Safety Management System and Emergency Preparedness and Response and Pandemic are cross-functional factors. In addition, SoCalGas's Safety Culture, addressed in RAMP D, is an overarching factor impacting this risk. A poor safety culture, safety management system, and/or emergency preparedness and response can become a potential driver adversely impacting the safety of contractors. On the other hand, a strong safety culture, safety management system, and/or emergency management and response can help in preventing and/or responding to incidents and improving the safety of contractors. As such, most if not all activities associated with the two CFFs are included in this risk, but by reference only, to avoid duplication. Similarly, most if not all activities, controls, and mitigations associated with the Contractor Incident risk are included in the safety

management system, and emergency management and response CFFs, again by reference only to avoid duplication.

C. Potential Drivers/Triggers[8]

The Settlement Decision[9] instructs the utility to identify which element(s) of the associated risk bow tie each mitigation addresses. When performing the risk assessment for the Contractor Incident risk, SoCalGas identified potential indicators, referred to as Drivers or Triggers. These include, but are not limited to:

- **DT.1 – Deviation from policy/procedure, inadequate reporting of near misses:** SoCalGas has many safety-related policies and procedures for contractors to follow. Failure of a contractor to adhere to a Company safety policy or procedure could result in a safety-related event. In addition, contractors failing to report near misses and sharing lessons learned with SoCalGas can result in the incident occurring again with potentially more adverse results.
- **DT.2 – Inexperience or lack of training:** Contractors and sub-contractors used by SoCalGas are expected to hire experienced employees and provide adequate training personnel to perform the work required. Failure of contractors to hire experienced employees, as well as a failure to provide training for the jobs they are required to perform may lead to an increase in the occurrence of a safety-related event.
- **DT.3 – Inadequate oversight:** Oversight is an integral part of managing work performed by contractors, not only from a quality of work perspective, but also to verify that safe work practices are being followed. The lack or failure to engage in overseeing the work of a contractor can lead to departures from safe work practices that could result in a safety-related event.
- **DT.4 – Inadequate use of Job Site Safety Plans or Job Safety Analysis:** Insufficient knowledge of the work environment or improper planning for potential job hazards may lead to contractors sustaining a safety-related event while on the job.

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[8] An indication that a risk could occur. It does not reflect actual or threatened conditions.

[9] D.18-12-014 at Attachment A, A-11 ("Bow Tie").

- **DT.5 – Inadequate utility and/or substructure location information:** Contractors need to have proper information about the assets, systems, or infrastructure that are part of the SoCalGas facilities they are contracted to work on, but also the auxiliary substructures in the vicinity of their work activities. Inadequate or inaccurate utility and/or substructure information can lead to instances of serious injuries to contractors.
- **DT.6 – Unsafe operation of equipment or motor vehicle:** Contractors may utilize their own company vehicles/equipment or vehicles/equipment owned by SoCalGas. The unsafe operation of vehicles or equipment may lead to consequences, such as serious injuries or fatalities.
- **DT.7 – Contractor crew fatigue, complacency, or impairment:** Contractors working excessive hours can create unsafe work environments. Complacency may reduce the level of awareness to hazards, which can lead to a safety-related event. Also, factors such as heat, night work, high-risk work locations (*e.g.*, busy roadways), may make working conditions more difficult and increase the likelihood of a serious injury occurring.
- **DT.8 – Workplace violence threats or critical incidents:** Workplace violence incidents associated with SoCalGas projects involving contractors can increase the likelihood of contractors being seriously injured or killed.
- **DT.9 – Execution Constraints:** Events (excluding those covered by outside force damages) that impact the Company's ability to perform as anticipated. Examples include, but are not limited to: materials and operational oversight, delays in response and awareness, resource constraints, and/or inefficiencies and reallocation of (human and material) resources, unexpected maintenance, or regulatory requirements.

D. Potential Consequences of Risk Event

Potential consequences[10] are listed to the right side of the risk bow tie illustration provided above. If one or more of the drivers/triggers listed above were to result in an incident, the potential consequences, in a reasonable worst-case scenario, could include:

- PC.1 - Serious injuries and/or fatalities
- PC.2 - Property damage
- PC.3 - Adverse litigation
- PC.4 - Customer claims and financial losses
- PC.5 - Erosion of public confidence
- PC.6 - Operational and reliability impacts
- PC.7 - Additional regulations and compliance safety inspections
- PC.8 - Penalties and fines

These potential consequences were used in the scoring of the Contractor Incident risk that occurred during the development of SoCalGas's 2020 Enterprise Risk Registry.

E. Risk Score

The Settlement Decision requires a pre- and post-mitigation risk calculation.[11] Chapter RAMP-C of this RAMP Report explains the Risk Quantitative Framework that underlies this Chapter, including how the Pre-Mitigation Risk Score, Likelihood of Risk Event (LoRE), and Consequence of Risk Event (CoRE) are calculated.

Table 2: Pre-Mitigation Analysis Risk Quantification Scores[12]

	LoRE	CoRE	Risk Score
Contractor Incident	144.77	3	469

[10] D.18-12-014 at 16 and Attachment A, A-8 ("Identification of Potential Consequences of Risk Event").

[11] D.18-12-014 at Attachment A, A-11 ("Calculation of Risk").

[12] The term "pre-mitigation analysis," in the language of the S-MAP Settlement Agreement Decision (Attachment A, A-12 ("Determination of Pre-Mitigation LoRE by Tranche," "Determination of Pre-Mitigation CoRE," "Measurement of Pre-Mitigation Risk Score")), refers to required pre-activity analysis conducted prior to implementing control or mitigation activity.

Pursuant to Step 2A of the Settlement Decision, the utility is instructed to use actual results, as well as available and appropriate data (*e.g.,* Pipeline and Hazardous Materials Safety Administration data).[13]

For this risk, SoCalGas utilized a combination of internal and external data sources to develop the pre-mitigation risk score.

The evaluation of employees' injuries, illnesses, and fatalities utilized historical internal OSHA reportable contractor injury rates to estimate the likelihood of an event occurring. The safety consequence assessment utilized internal safety consequence data and severe injury report data from OSHA. The financial consequence assessment utilized data from the Center for Disease Control, National Safety Council.

The evaluation of vehicular incidents utilized historical internal vehicular incident rate data to estimate the likelihood of an event occurring and the financial assessment utilized internal financial consequence data.

The evaluation of workplace violence incidents utilized data from the Bureau of Labor Statistics to estimate the likelihood of an event occurring. The safety consequence assessment utilized data from the Federal Bureau of Investigation and the financial consequence assessment utilized data from the National Institute of Occupational Safety and Health.

See Appendix B for more information.

III. 2020 CONTROLS

The following section "[d]escribe[s] the controls or mitigations currently in place" as required by the Settlement Decision.[14] The activities in this section were in place as of December 31, 2020. Controls that will continue as part of the risk mitigation plan are further addressed in Section IV.

A. Control 1 - Contractor Safety Oversight

SoCalGas's longstanding commitment to safety focuses on three primary areas: employee safety, customer safety, and public safety. This commitment to safety is embedded in all activities – from initial employee training, to the installation, operation, and maintenance of SoCalGas's infrastructure, to providing safe and reliable service to customers. When working on

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[13] *Id.* at Attachment A, A-8 ("Identification of Potential Consequences of Risk Event").

[19] *Id.* at Attachment A, A-14 ("Mitigation Strategy Presentation in the RAMP and GRC").

SoCalGas projects, SoCalGas employees and contractors are expected to adhere to SoCalGas's commitment to safety.

SoCalGas's Contractor Safety Oversight consists of contractor safety program policies and procedures, the Contractor Safety Manual for Class 1 Contractors, field inspections and oversight, post-job safety evaluation, stop-the-job, near-miss and close-call reporting, internal audits, enforcement actions, and management of the pipeline safety risk by the pipeline safety oversight committee. The purpose of having these key controls in place is to enhance the safety of SoCalGas construction projects from inception to completion. Each specific aspect of this control is further described below:

Internal Contractor Safety Standard: SoCalGas has formalized its contractor safety program in the Company Operations Standard 167.04 – Contractor Safety Program. The standard is for internal use only and applies to SoCalGas employees who oversee Class 1 contractors and subcontractors on behalf of the Company. The standard establishes the policy, scope, and approach used by SoCalGas to manage contractor safety, requirements for pre-qualification of contractors, roles and responsibilities for various employees who work with contractors, and expectations on contractor oversight, periodic safety inspections, and investigations of contractor safety incidents.

Contractor Safety Manual for Class 1 Contractors: In 2017, SoCalGas issued a contractor safety manual for use by all Class 1 contractors. This manual consolidated in one place all the safety requirements and expectations SoCalGas has established for contractors working for SoCalGas. These include:

- The Contractor must comply with all applicable federal, state, regional, municipal, and local laws, ordinances, rules, codes, regulations, and executive orders, including all laws, ordinances, rules, codes, regulations, and executive orders applicable to health and safety, the SoCalGas Contractor Safety Manual, and all contract terms as set forth in the contract entered into with the Company, and must confirm that all employees and subcontractors working on Contractor's behalf meet or exceed these same requirements.
- Contractors must provide a safe working environment for their employees and subcontractors and make sure their operations do not adversely impact the safety

of SoCalGas employees or the public. Contractors are responsible for the personal safety of their employees and subcontractors.

- The Company reserves the right to take action, including, but not limited to, issue warnings, withhold payment, suspend work, require the removal of contractor personnel from the project, notify enforcement agencies, and terminate the contract if the Contractor does not comply with applicable laws, all site and system-related safety requirements, the SoCalGas Contractor Safety Manual, and all terms and conditions required by the contract entered into with the Company.
- A process for pre-qualification of contractors for safety, including a defined set of pre-qualification criteria as listed in the table below:

Criteria	Target	Below Target
3-Year TRIR (Total Recordable Incident Rate)	Equal to or less than BLS (Bureau of Labor Statistics) industry average for applicable NAICS (North American Industry Classification System) code	Greater than BLS industry average for applicable NAICS code
3-Year DART (Days Away Restricted/Transfer Rate)	Equal to or less than BLS industry average for applicable NAICS code	Greater than BLS industry average for applicable NAICS code
EMR (Experience Modification Rate) *	Equal to or less than 1.1	Greater than 1.1
5 -Year Fatality Data	Zero (0) fatalities within the last five (5) years	One (1) or more fatalities within the last five (5) years
5-Year Non-Fatal, Serious Safety Incident Data (*e.g.,* life altering/life threatening, including incidents affecting the public)	Zero (0) non-fatal, serious safety incidents within the last five (5) years	One (1) or more non-fatal, serious safety incidents within the last five (5) years
3-Year OSHA Serious, Willful, or Repeat Citations	Zero (0) serious, willful, or repeat OSHA citations within the last three (3) years	One (1) or more serious, willful, or repeat citations within the last three (3) years
3-Year OSHA Non-Serious Citations	Zero (0) non-serious OSHA citations within the last three (3) years	One (1) or more non-serious citations within the last three (3) years

Criteria	Target	Below Target
Written Safety Programs	Company has written safety programs that are in compliance with environmental, health, and safety laws and regulations and are specific to the hazards associated with the work to be performed.	Company does not have written safety programs that are in compliance with environmental, health, and safety laws and regulations and are specific to the hazards associated with the work to be performed.
Drug and Alcohol Plan	Company has a written drug and alcohol plan that is in compliance with applicable laws and regulations.	Company does not have a written drug and alcohol plan that is in compliance with applicable laws and regulations.
Subcontractor Management Plan	Company has a written plan to monitor subcontractors and hold them accountable for the same requirements as themselves.	Company does not have a written plan to monitor subcontractors and hold them accountable for the same requirements as themselves.
Employee Disciplinary Action Plan	Company has a written employee disciplinary action plan.	Company does not have a written employee disciplinary action plan.
Safety Culture Evaluation	Company has a positive safety culture that it is working to advance.	Company does not have a positive safety culture that it is working to advance.

* Experience Modification Rate (EMR) is a number insurance companies use to represent a business's prior workers' compensation claims and potential for future injuries.

In addition, the manual provides guidelines on the process to be followed in managing safety construction projects, including reviewing applicable compliance requirements, providing appropriate oversight on contractor work, and reporting safety incidents.

Construction Inspections and Contractor Performance Review: SoCalGas requires its representatives overseeing contractors to conduct documented job-site safety inspections of contractors working at a facility, property, or worksite owned, operated, or managed by the Company (including leased premises and rights-of-ways) on SoCalGas projects at a frequency of once per week per contractor. When there are multiple crews for a specific contractor working on similar projects, one safety inspection per contractor per week meets this requirement. The Construction Inspection Report, Company Form 2849, built in ISNetworld, is used for documenting such inspections.

The SoCalGas representative must also complete a post-job safety evaluation of Class 1 contractors at the completion of every contract or annually, whichever is earlier, including the

final at the end of the term for Master Services Agreements and multi-year contracts. Company Form Number 6350, Report of Contractor's Performance, built in ISNetworld, is used to appraise and document the safety performance of contractors performing work for the Company.

Finally, large capital projects have dedicated, full-time, on-site safety oversight provided by SoCalGas as well as the contractor(s) to ensure the safety of the project throughout its implementation and completion (*e.g.*, Blythe compressor station modernization project).

The inspections, evaluations, and on-site monitoring fulfill SoCalGas's oversight responsibilities and are designed to provide valuable feedback on contractors' overall performance on SoCalGas projects.

Corporate Safety Audits, Ad Hoc Contractor Audits, and Enforcement Activities: SoCalGas utilizes mechanisms to monitor and evaluate safety requirements for Class 1 Contractors, including conducting formal safety audits, requiring contractors to conduct their own evaluations, and imposing corrective actions in response to safety issues identified as a result of its oversight activities. SoCalGas has implemented a Contractor Oversight Plan, managed by the Construction Operations group, to address enforcement actions when contractors are found to not meet SoCalGas's requirements. Under the Contractor Oversight Plan, a coordinated effort is put underway to inform and receive input from all stakeholders who use a particular contractor under scrutiny to ensure awareness and consistency in applying enforcement actions and reach appropriate decisions. For example, in 2018 and 2020, based on observing serious close-call incidents associated with a prime contractor, SoCalGas utilized several measures to address the risk of a potential serious injury or fatality. This included stopping the job, putting the contractor on probation, conducting an audit of its safety program, asking the contractor to evaluate its safety culture, and following up on all the corrective actions resulting from this effort to emphasize the importance of safety on SoCalGas projects.

More recently, additional safety-related incidents with contractors have resulted in contractors' suspensions, with a request that a safety culture evaluation by a third-party vendor specializing in safety analysis be conducted on each company, the results shared with SoCalGas, and any improvements deemed appropriate upon review of the results be completed before the contractor could be cleared to return to work for SoCalGas.

The results of these outside assessments helped the contractors gain awareness of potential gaps and areas of improvement in their internal operations, allowing them to

implement systematic fixes to their safety processes, as well as leading them to accelerate their push towards developing their own comprehensive safety management systems. Further, a new requirement has been added to SoCalGas's contracts with contractors and is discussed further in Control 2 below.

Pipeline Safety Oversight Committee: SoCalGas has established a high-level internal committee comprised of executives and directors to oversee pipeline safety programs and activities, including oversight over contractors. This committee meets periodically and reviews progress made in the contractor safety area and provides direction on steps needed to be taken to continue to reduce contractor safety risk. This committee and its oversight serve as a proactive approach to enable a senior level committee to oversee the development, implementation, and growth of the contractor safety program to address the overall safety risk associated with hiring contractors. The committee also serves to strengthen public trust.

Contractual Requirements: The contractual requirements control is in place to add appropriate language to contracts to hold Class 1 Contractors accountable to follow the Class 1 Contractor Safety Manual. All new and existing contracts and Master Service Agreements between SoCalGas and a primary contractor include Contractor Safety Program related requirements as part of the contract terms and conditions. Moreover, contractors are made aware of the Class 1 contractor safety requirements upfront during the Request for Proposal (RFP) bid process.

The requirement to perform Safety Culture Assessments, at the contractor's expense, has now been included in the new multi-year contracts being issued. The benefits of the enforcement actions taken that are discussed in Control 1 above have led SoCalGas to conclude that rather than only implementing this requirement as a punitive measure in situations where problems already exist, it would be in both the Company's and contractor's best interest if SoCalGas fosters the safety management system "Plan/Do/Check/Act" mentality and requires all contractors with multi-year contracts coming out of the current and future RFPs to arrange and pay for these studies at the onset and mid-point of their contracts to ensure their commitment to continuous safety improvement is strong.

Stop the Job/Near Miss/Close Call Reporting Program: SoCalGas requires all its Class 1 contractors to develop and implement a Stop the Job policy on SoCalGas projects. Stop the Job is a critical process and gives authority to everyone onsite to stop a job or task if an unsafe work

condition, behavior, or activity is identified. All work must immediately cease in the area of concern once the Stop the Job is declared until site supervision and the involved contractor(s) have done an investigation, the identified situation is abated, controlled, or otherwise determined to be safe, and the situation and outcome are explained to affected personnel. SoCalGas also encourages its contractors to report near miss or close calls or good catch incidents so that everyone can learn from these incidents and prevent injuries and/or reduce/eliminate safety risks on the job and to our pipeline delivery system. These incidents are shared with contractors so that SoCalGas and the contractors can learn from one another.

SoCalGas defines a Near Miss/Close Call as follows:

- Non-Serious Near Miss: A Work-Connected incident in which Property Damage is less than $122,000 or an injury or illness (other than a Serious Safety Incident) could have occurred but did not.
- Serious Near Miss: A Work-Connected incident in which Property Damage, or a Spill/Release results in damages of $122,000 or more, or a Serious Safety Incident could have occurred but did not.

B. Control 2 - Third-Party Administration Tools

SoCalGas utilizes three best-in-class third-party tools to manage various aspects of its contractor safety. These are discussed below.

ISNetworld: The purpose of the ISNetworld platform (created and managed by ISN) is to pre-qualify, vet, and monitor Class 1 contractors for safety. ISNetworld is an online contractor and supplier management platform of data-driven products and services that help manage risk through data collected across the contractors' operations nationally. ISNetworld helps reduce unnecessary duplication associated with traditional qualification processes. It streamlines the contractor pre-qualification process and is intended to improve workplace safety. Each Class 1 contractor currently performing or seeking to perform work for SoCalGas must have an ISN account. Before performing any work for SoCalGas, Class 1 contractors must upload the information specified in the SoCalGas Pre-Qualification Criteria to ISN. ISN's Review and Verification Services (RAVS) Team reviews self-reported information against regulatory requirements. ISN safety experts also review contractor safety compliance programs and validate accuracy and completeness. ISN uses an "A," "B," "C," and "F" grading system to measure contractors' safety performance against criteria established by SoCalGas. Contractors

who receive an "A" or "B" grade and continue to maintain an "A" or "B" grade, are deemed qualified and are approved to work for SoCalGas. Contractors who receive a "C" or "F" grade, and those whose grade changes from an "A" or "B" to a "C" or "F," must be approved through SoCalGas's Variance Request Process. Variances are approved at the director and officer levels. This process promotes the use of safer contractors by SoCalGas and thereby reduces the risk of safety incidents on SoCalGas projects.

Veriforce®: SoCalGas utilizes Veriforce® to centrally track records for covered task qualifications, along with related certifications and training. SoCalGas also utilizes Veriforce® to monitor contractors' compliance with the Pipeline and Hazardous Materials Safety Administration/Department of Transportation (PHMSA/DOT) Drug and Alcohol (D&A) program requirements. Veriforce® delivers a comprehensive solution for D &A compliance, combining software with audit services to help streamline management of the contractor D&A compliance program and drive improvements that mitigate contractor risk. The purpose of utilizing the Veriforce® platform is to streamline Operator Qualification (OQ) program administration and facilitate compliance with PHMSA OQ Rule requirements for Class 1 contractors who work on safety sensitive tasks. Veriforce® delivers a comprehensive solution for DOT/PHMSA OQ Rule compliance that supports OQ processes from end to end, uniting software with audit, consulting, and training services to support the management of SoCalGas's OQ program.

Gold Shovel Standard: Gold Shovel Standard (GSS) is a nonprofit organization committed to improving workforce and public safety and the integrity of buried infrastructure. GSS believes that greater transparency in all aspects of damage prevention among buried-asset operators, locators, and excavators is essential to drive continuous improvement, and vital to increasingly safe working conditions and communities. GSS works to prevent life-threatening damages, empower field teams to operate safely, and protect excavation crews and the public. SoCalGas utilizes the GSS platform to enhance excavation safety associated with its pipeline infrastructure projects. SoCalGas requires all of its prime gas infrastructure contractors to be members of the GSS and follow best practices in promoting excavation safety.

To obtain GSS Certification, an excavator must have a complete Damage Prevention-Safety Management System (DP-SMS). This includes:

- A leadership and management commitment to infrastructure damage prevention

- Requiring specific training for all workers on jobs with excavation
- Enforcing whistleblower and stop work responsibility for workers
- Maintaining a policy to adhere to specialized best practices of excavation operations
- Maintaining a policy to hire Gold Shovel Standard subcontractors with few exceptions
- Using thorough investigation and corrective action procedures
- Using specialized software to track and manage their operations to prevent damages

In the past, businesses often learned about potential excavation risks by their occurrence. A quality DP-SMS reveals risks before they happen, giving businesses the opportunity to improve without catastrophic catalysts.

C. Control 3 - Contractor Engagement

SoCalGas aims to reinforce its strong safety culture by engaging contractors in a variety of ways, including hosting an annual Contractor Safety Congress and three Quarterly Meetings with SoCalGas's Class 1 contractors.

SoCalGas's annual Contractor Safety Congress was initiated in 2015 to share safety best practices and learn from one another's experiences. The event is expected to continue to further strengthen SoCalGas and contractors' collective "safety culture" and provide a foundation for safety improvement. Attendees include representatives from a wide variety of contractors, including diverse business enterprises, and select representatives from SoCalGas who oversee contractors. The forum provides an opportunity for SoCalGas executives to share their safety vision and expectations with contractors and offers an opportunity for contractors to showcase their safety successes and challenges, as well as share serious safety incidents and lessons learned so others can benefit from their experience and improve their own safety performance.

The quarterly meetings, on the other hand, are limited to signatory contractors who perform the vast majority of pipeline construction work for the Company. These meetings are established as a forum to give contractors the opportunity to collaborate with SoCalGas on safety, share issues and challenges faced by contractors on SoCalGas projects, communicate new requirements, and foster an improved safety culture for contractors and the Company.

D. Control 4 – Construction Contractor Field Oversight

In order to develop a specialized team of professionals, the responsibility for contractor safety oversight moved to the Construction Operations organization in 2020. In 2020, additional employees were added to both the Construction Risk team and the Construction Contractor Management (CCM) team within the Construction Operations organization. The Construction Risk team is responsible for conducting documented field safety observations of contractor construction projects and the CCM advisors' responsibilities include analyzing the safety observation results to identify and address potential risks as well as enhance the effectiveness of the oversight element in its contractor safety program. SoCalGas's safety professionals select, on an annual basis, a representative number of large, medium, and small construction projects performed by Class 1 contractors throughout the Company's service territory, and perform detailed reviews of contractors' safety programs, audit pipeline contractors' field crews, oversee contractor safety incident investigations, and share corrective actions and lessons learned from incidents and audits within SoCalGas and with other SoCalGas contractors to promote continual risk reduction and improvement. As a result of this program, SoCalGas will be able to further assess contractors' adherence to SoCalGas's Contractor Safety Manual and contractual requirements, identify strengths and potential weaknesses in the contractors' safety programs, and assist with taking corrective actions to prevent incidents. This program will also benefit SoCalGas field supervisors who oversee contractors and manage construction projects to enable them to learn from the audits and integrate lessons learned into their routine oversight to prevent injuries associated with contractor construction projects. This audit program will utilize external vendor support for audit protocols and checklists covering construction safety, as well as for audit training and certifications to ensure consistency and effectiveness of the work performed. Expansion of the Company's Contractor Oversight Program is expected to result in a measurable impact on Class 1 contractor OSHA recordable injuries and would allow SoCalGas to effectively oversee all Class 1 contractor work and confirm compliance with the contractor safety program enterprise wide.

IV. 2022-2024 CONTROL & MITIGATION PLAN

This section contains a table identifying the controls and mitigations comprising the portfolio of mitigations for this risk.[15] Controls and mitigations in the Contractor Incident risk have the same risk profile; thus, they are not further tranched.

Many of the activities discussed in Section III above are expected to continue during the TY 2024 GRC. For clarity, a current activity that is included in the plan may be referred to as either a control and/or a mitigation. For purposes of this RAMP, a control that will continue as a mitigation will retain its control ID unless the size and/or scope of that activity will be modified, in which case that activity's control ID will be replaced with a mitigation ID. The table below shows which activities are expected to continue.

Table 3: Control and Mitigation Plan Summary

Line No.	Control/ Mitigation ID	Control/Mitigation Description	2020 Controls	2022-2024 Plan
1	C1	Contractor Safety Oversight	X	X
2	C2	Third-Party Administration Tools	X	X
3	C3	Contractor Engagement	X	X
4	C4	Construction Contractor Field Oversight	X	X

For activities SoCalGas plans to perform that remain unchanged, refer to the description in Section III. If changes to the various activities are anticipated, such modifications are further described in the section below.

A. Changes to 2020 Controls

As part of the Contractual Requirements, defined in Control 1 above, SoCalGas's contractors are now contractually responsible for conducting their own safety culture assessments. While the cost incurred to perform this activity is absorbed by the contracting agency, there is an associated incremental administrative cost that SoCalGas will incur.

[15] *See* D.18-12-014, Attachment A at A-14 ("Mitigation Strategy Presentation in the RAMP and GRC")

All other controls are anticipated to function at a similar level on an ongoing basis.

B. 2022 – 2024 Mitigations

SoCalGas is currently not planning any new mitigations during the 2022 – 2024 period.

V. COST, UNITS, AND QUANTITATIVE SUMMARY TABLES

The tables in this section provide a summary of the risk control and mitigation plan, including the associated costs, units, and the RSEs, by tranche. SoCalGas does not account for and track costs by activity or tranche; rather, SoCalGas accounts for and tracks costs by cost center and capital budget code. The costs shown were estimated using assumptions provided by SMEs and available accounting data.

Table 4: Risk Control and Mitigation Plan - Recorded and Forecast Dollars Summary[16]
(Direct After Allocations, In 2020 $000)

ID	Control/Mitigation Name	Recorded Dollars		Forecast Dollars			
		Capital[17]	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
C1	Contractor Safety Oversight	0	1,669	0	0	1,586	1,920
C2	Third-Party Administration Tools	0	49	0	0	47	57
C3	Contractor Engagement	0	11	0	0	10	13
C4	Construction Contractor Field Oversight	0	303	0	0	287	348

[16] Recorded costs and forecast ranges are rounded. Additional cost-related information is provided in workpapers. Costs presented in the workpapers may differ from this table due to rounding. The figures provided are direct charges and do not include company loaders, with the exception of vacation and sick. The costs are also in 2020 dollar and have not been escalated to 2021 amounts. The capital presented is the sum of the years 2022, 2023, and 2024, or a three-year total. Years 2022, 2023 and 2024 are the forecast years for SDG&E's Test Year 2024 GRC Application.

[17] Pursuant to D.14-12-025 and D.16-08-018, the Company provides the 2020 "baseline" capital costs associated with Controls. The 2020 capital amounts are for illustrative purposes only. Because capital programs generally span several years, considering only one year of capital may not represent the entire activity.

Table 5: Risk Control & Mitigation Plan - Units Summary

ID	Control/Mitigation Name	Units Description		Recorded Units		Forecast Units			
		Capital	O&M	2020 Capital	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 (High) O&M
C1	Contractor Safety Oversight	FTE		0	2	0	0	2	2
C2	Third-Party Administration Tools	License		0	3	0	0	3	3
C3	Contractor Engagement	Events		0	5	0	0	5	5
C4	Construction Contractor Field Oversight	FTEs		0	4	0	0	4	4

Table 6: Risk Control & Mitigation Plan - Quantitative Analysis Summary (Direct After Allocations, In 2020 $000)

ID	Control/Mitigation Name	Forecast			
		LoRE	CoRE	Risk Score	RSE
C1	Contractor Safety Oversight	135	3.34	451	11
C2	Third-Party Administration Tools	140	3.29	460	182
C3	Contractor Engagement	144	3.25	467	202
C4	Construction Contractor Field Oversight	144	3.25	467	5

VI. ALTERNATIVES

Pursuant to D.14-12-025 and D.16-08-018, SoCalGas considered alternatives to the risk mitigation plan discussed in the prior section for the Contractor Incident risk. Typically, analysis of alternatives occurs when implementing activities to obtain the best result or product for the cost. The alternatives analysis for this plan also took into account modifications to the plan and constraints, such as budget and resources.

A. Alternative 1 - Use Internal Resources and Tools to Vet Contractors for Safety

This alternative would involve developing an in-house electronic platform using internal Information Technology (IT) resources customized for Company-specific needs. For example, third-party platforms are compliance driven and generally use lagging key performance indicators for contractor vetting purposes. An internally designed system can expand the focus to include leading key performance indicators, such as safety culture assessments. However, this alternative would result in substantial time delays to develop such a platform and require hiring several safety professionals (estimated at five FTEs) at a cost much greater than the subscription fees incurred for third-party services, like ISNetworld, to review contractor compliance programs on an ongoing basis for accuracy and completeness for meeting regulatory requirements. Based on experience of approximately four years with using ISNetworld, this alternative was judged to be not a cost-effective option.

B. Alternative 2 - Use a Different Third-Party Administration Tool to Vet Contractors for Safety

SoCalGas utilizes another third-party electronic platform, Veriforce®, for managing contractors for Operator Qualification and Drug & Alcohol program compliance. Veriforce® also has the ability to vet contractors for employee safety and recently has strengthened its offering by merging with PEC Safety, a service that provides services similar to ISNetworld. The cost of these third-party platforms is competitive, and SoCalGas ended up selecting ISNetworld in 2016 after a competitive bidding process. SoCalGas has had good experience and success with ISNetworld thus far, but as the landscape of third- party providers change, SoCalGas will consider this alternative through another round of competitive bidding process and make appropriate adjustments. As of now, switching to another provider may not save any money but may add costs to contractors for switching over to another platform. Should we ever plan to switch the platforms, it must be done with long lead time to make it efficient all around.

Table 7: Alternative Mitigation Plan - Forecast Dollars Summary[18]
(Direct After Allocations, In 2020 $000)

ID	Alternative Mitigation Name	Forecast Dollars			
		2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
A1	Use Internal Resources and Tools to Vet Contractors for Safety	0	0	499	604
A2	Use a Different Third-Party Administration Tool to Vet Contractors for Safety	0	0	29	36

[18] Recorded costs and forecast ranges are rounded. Additional cost-related information is provided in workpapers. Costs presented in the workpapers may differ from this table due to rounding. The figures provided are direct charges and do not include Company loaders, with the exception of vacation and sick. The costs are also in 2020 dollar and have not been escalated to 2021 amounts. The capital presented is the sum of the years 2022, 2023, and 2024, or a three-year total. Years 2022, 2023 and 2024 are the forecast years for SoCalGas's Test Year 2024 GRC Application.

Table 8: Alternative Mitigation Plan - Units Summary

ID	Alternative Mitigation Name	Units Description		Forecast Units			
		Capital	O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 (High) O&M
A1	Use Internal Resources and Tools to Vet Contractors for Safety	FTEs		0	0	5	5
A2	Use a Different Third-Party Administration Tool to Vet Contractors for Safety	Contractor		0	0	1	1

Table 9: Alternative Mitigation Plan - Quantitative Analysis Summary (Direct After Allocations, In 2020 $000)

ID	Alternative Mitigation Name	Forecast			
		LoRE	CoRE	Risk Score	RSE
A1	Use Internal Resources and Tools to Vet Contractors for Safety	140	3.29	460	97
A2	Use a Different Third-Party Administration Tool to Vet Contractors for Safety	143	3.26	466	17

APPENDIX A: SUMMARY OF ELEMENTS OF THE RISK BOW TIE

APPENDIX A: SUMMARY OF ELEMENTS OF THE RISK BOW TIE

Contractor Incident: Summary of Elements of the Risk Bow Tie

ID	Control/Mitigation Name	Elements of the Risk Bow Tie Addressed
C1	Contractor Safety Oversight	DT.1 – DT.9, PC.1 - PC.8
C2	Third-Party Administration Tools	DT.1 – DT.6, PC.1, PC.2 PC.4, PC.6, PC.8
C3	Contractor Engagement	DT.1 – DT.9, PC.1 – PC.8
C4	Construction Contractor Field Oversight	DT.1 – DT.9, PC.1 – PC.8

APPENDIX B: QUANTITATIVE ANALYSES SOURCE DATA REFERENCES

APPENDIX B: QUANTITATIVE ANALYSES SOURCE DATA REFERENCES

The Settlement Decision directs the utility to identify potential consequences of a risk event using available and appropriate data.[19] The list below provides the inputs used as part of this assessment.

OSHA Reportable Incident Rate and Safety Consequences
Source: Historic SoCalGas contractor injuries, fatalities

Vehicular Incident Rates and Claims
Source: Historic SoCalGas motor vehicle incident data

Workplace Violence Incident Rate
Agency: Bureau of Labor Statistics
Link: *https://www.bls.gov/iif/oshcfoi1.htm*

Workplace Violence Injuries and Fatalities
Agency: Federal Bureau of Investigation
Link: *https://www.fbi.gov/about/partnerships/office-of-partner-engagement/active-shooter-resources*

Medically Consulted Injury Financial Impact
Agency: National Safety Council
Link: *http://www.injuryfacts.nsc.org/work/costs/work-injury-costs/*

Serious Injury Associated Financial Impact
Agency: Center for Disease Control
Link: *https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6438a5.htm?s_cid=mm6438a5_w*

Emergency Department Injury Associated Financial Impact
Agency: Center for Disease Control
Link: *https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6438a5.htm#Tab1*

Workplace Violence Associated Financial Impact
Agency: National Institute of Occupational Safety and Health
Link: *https://www.cdc.gov/niosh/index.htm*

Severe Injury Assumption:
Agency: Occupational Safety and Health Administration (OSHA);
Link: *https://www.osha.gov/severeinjury/index.html*;

[19] D.18-12-014, Attachment A at A-8 (Identification of Potential Consequences of Risk Event).

Incident Rate for ISN Energy Customers
Agency: ISN
Link: *https://www.isnetworld.com/Publications/2017USEnergy.pdf*

Incident Rate for Energy Industry
Agency: Bureau of Labor Statistics
Link: *https://www.bls.gov/iif/oshwc/osh/os/ostb4753.pdf*

Risk Assessment and Mitigation Phase Cross-Functional Factor

(SCG-CFF)

Introduction

May 17, 2021

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I. INTRODUCTION

SoCalGas's inclusion of this cross-functional factor (CFF) Volume is similar to the cross-cutting factors first presented by PG&E in their 2020 RAMP submission, providing additional information regarding foundational, safety-related initiatives that are associated with more than one RAMP risk. In response to feedback received, the Companies created the CFF volume to address some of the various topics raised by parties that would not be standalone risk chapters. The CFFs provide this information in chapter format for ease of presentation, rather than dispersing it throughout the RAMP Report.

SoCalGas's CFF Volume comprises the following eight chapters:

A. CFF-1: Asset and Records Management

Enterprise Asset Management (EAM) at SoCalGas is integrated with our adoption of the national International Standards Organization (ISO) 55000 standard as a guide, and is a core component of our Safety Management Systems (SMS) organization, aligned with the American Petroleum Institute (API) 1173 recommended practice for pipeline safety. Similar to the SDG&E Asset Management and Records Management CFFs, this CFF spans multiple lines of business and helps address several RAMP risks in this Report

B. CFF-2: Energy System Resilience

The purpose of this CFF is to present the adaptation assessment and mitigation plan of SoCalGas for the safety-related threats to gas infrastructure posed by global climate change and the resulting natural forces stemming therefrom. This "adaptation assessment" amounts to the identification of options to adapt to actual or expected climatic changes. In addition, this CFF will address and offer a narrative around the importance of maintaining and investing in the gas grid to support reliability and resiliency of the energy infrastructure as well as the clean transportation, hydrogen energy storage, and other clean energy efforts and plans for SoCalGas. This CFF also discusses some of the investments SoCalGas is undertaking to decarbonize the gas grid. Our commitments include, but are not limited to, replacing our gas supply with RNG and advancing the role green hydrogen could play in attaining California's goal of achieving carbon neutrality.

C. CFF-3: Emergency Preparedness and Response and Pandemic

Emergency Preparedness and Response and Pandemic is defined as the preparation to respond to potential hazard events which may impact the safe, reliable, and clean storage,

transmission, and distribution of natural gas. Operational disruptions have the potential to adversely affect the health and safety of the workforce or the general public, may negatively impact operations, and/or company assets. This CFF presents a comprehensive set of capabilities for emergency response measures.

D. CFF-4: Foundational Technology Systems

Foundational Technology Systems is included as a 2021 RAMP CFF because of the criticality and necessity of providing SoCalGas a means to communicate with the public, first responders and employees. These systems are used in every aspect of operations, customer engagement, and emergency response. Included are a significant portion of the Companies' software application systems, communication networks, monitoring systems, end-user systems, and hardware and software platforms. The safety and reliability of operations depends on Foundational Technology Systems; thus, it is critical for these systems to be resilient and recoverable to allow focus on mitigation risks.

E. CFF-5: Physical Security

Physical security encompasses the systems and activities that maintain the safety of employees, contractors, vendors, the public, SoCalGas facilities, and infrastructure, through people, processes, and technology. Having a strong physical security program is foundational to many of our RAMP risks.

F. CFF-6: Safety Management Systems (SMS)

The implementation of its SMS is anchored in SoCalGas's Safety Values. In 2019, SoCalGas formally adopted seven safety values: Leadership Commitment; Risk Management; Employee & Stakeholder Engagement; Competence, Awareness & Training; Emergency Preparedness & Response; Safety & Compliance Assurance; and Continuous Improvement. All of SoCalGas's RAMP risks and cross-functional factors are associated with the SMS cross functional factor. This is due to the design of the SMS framework, which covers every aspect of SoCalGas's business when it comes to safety. As such, SMS Safety Values guide the ongoing implementation and improvements in each risk area and, in turn, the controls and mitigations covered in all RAMP risks demonstrate how various safety programs adhere to the safety values and support the effectiveness of SMS.

G. CFF-7: Workforce Planning / Qualified Workforce

The workforce planning/qualified workforce CFF addresses having an appropriate number of employees with the right skills to meet business needs. Many factors impact the Company's ability to recruit, retain, and train qualified employees. While the lack of qualified workforce could have several impacts to operations, the activities presented in the CFF focus on safety only. This is a cross functional factor which affects all operational business units and other risks identified by the Company.

Risk Assessment and Mitigation Phase Cross-Functional Factor

(SCG-CFF-1)

Asset and Records Management

May 17, 2021

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CROSS-FUNCTIONAL FACTOR: ASSET & RECORDS MANAGEMENT

I. INTRODUCTION

The Asset & Records Management (EAM) Cross-Functional Factor (CFF) describes how Enterprise Asset Management and Records Management activities impact the risks described in SoCalGas's Risk Assessment Mitigation Phase (RAMP) risk chapters.

SoCalGas is presenting CFF information in this RAMP Report to provide the Commission and parties additional information regarding the risks and mitigations described in its RAMP risk chapters. CFFs are not in and of themselves RAMP risks. Rather, CFFs are drivers, triggers, activities or programs that may impact multiple RAMP risks. CFFs are also generally foundational in nature. Therefore, SoCalGas's CFF presentation differs from that of its RAMP risk chapters (e.g., no risk spend efficiency calculations or alternatives are provided). SoCalGas's CFF chapters provide narrative descriptions of the CFF projects and programs that impact multiple SoCalGas RAMP risk chapters through the 2022-2024 time frame. Related cost forecasts are provided as available, consistent with an expected test year (TY) 2024 general rate case (GRC) request.

As described below, EAM is an enterprise-wide framework that provides a standardized approach for managing risk and safety across assets and activities. The EAM CFF therefore spans multiple lines of business and helps to mitigate several RAMP risks in this Report.

II. OVERVIEW

EAM at SoCalGas was integrated at the Company with the adoption of the International Standards Organization (ISO) 55000 standard as a guide. It is a core component of the Safety Management Systems (SMS) organization, aligned with the American Petroleum Institute (API) 1173 recommended practice for pipeline safety. The alignment with international, national, and industry standards promotes continued adherence to leading practices and continuous improvement across SoCalGas's asset and safety initiatives. By adopting the ISO 55000 as a guide, EAM enables SoCalGas to proactively mitigate asset-related risks by managing asset health and lifecycles in a strategic, data-driven method. As noted in ISO 55000,[1] asset management should be based on certain fundamentals:

[1] International Standards Organization, ISO 55000:2014 Asset Management—Overview, Principles and Terminology (2014), at 3.

- Value: Assets exist to provide value to the organization and its stakeholders.
- Alignment: Asset management translates the organizational objectives into technical and financial decisions, plans, and activities.
- Leadership: Leadership and workplace culture are determinants of realization of value.
- Assurance: Asset management gives assurance that assets will fulfill their required purpose.

Consistent with these fundamentals, the five goals of SoCalGas's EAM program are to (1) develop people, process and technology capabilities to integrate and assess asset data, (2) enable long term planning on asset health and criticality, (3) support capital investment prioritizations and risk reduction strategies, (4) prioritize investment decisions across the portfolio of company assets, and (5) provide information to evaluate the cost and risk reduction mitigations.

The ISO 55000 fundamentals align with SoCalGas's asset management system mission ("Support leading records, data governance practices, controls and integration for the accessibility, accuracy, completeness, security, traceability and validity of all operational records"). SoCalGas's planned asset management system is to be made up of four key components: (1) a foundational asset information data lake, (2) an asset investment planning system, (3) an operating model, and (4) a records management process and system. Consistent with ISO 55000, SoCalGas defines an "asset" as an item, entity, or person that has potential to add value to an organization. This definition covers the following five sections: Human Assets, Financial Assets, Information Assets, Physical Assets, and Intangible Assets. Following the guidance from ISO 55000, SoCalGas defines "Enterprise Asset Management System" as the systematic and coordinated activities and practices through which an organization optimally and sustainably manages its assets and asset systems, and their associated performance, risks, and expenditures over their life cycles, for the purpose of supporting the organization's strategic plan.

EAM is also a structural component directly influenced by SoCalGas's risk management and investment management practices. Specifically, by understanding asset health and criticality based on data, EAM can mitigate the likelihood, frequency, and impacts from asset failure. Asset management therefore informs investment prioritization to ensure SoCalGas makes strategic and focused commitments to mitigate risks.

A. Current State of EAM

EAM's commitment to continue developing a comprehensive enterprise-wide asset management system has evolved out of SoCalGas's Integrity Management Programs (IMPs). These programs focus on the integrity of essential operational functions and facilities. The following section provides a brief overview of the current-state IMPs, followed by the transition and adoption towards a holistic enterprise-wide asset management system. Embracing an enterprise asset management program does not overlap with existing integrity management initiatives, but rather complements them through a more comprehensive, data and analysis-driven approach towards mitigating asset-related risks.

The Transmission Integrity Management Program (TIMP) was developed in accordance with Code of Federal Regulations (CFR) 192, Subpart O - Gas Transmission Pipeline Integrity Management, in order to perform assessments and integrity improvements on transmission pipelines by outlining responsible parties, timelines for each process element, incorporating lessons learned, and a best practices methodology.[2] The Distribution Integrity Management Program (DIMP) was developed in accordance with 49 CFR 192, Subpart P - Gas Distribution Pipeline Integrity Management. The program's purpose is to improve pipeline safety by having operators identify and reduce risks on distribution pipelines.[3] The Storage Integrity Management Program (SIMP) was established to mitigate safety-related risks and validate and enhance storage surface assets, well, and reservoir integrity.[4] SoCalGas is developing a Facilities Integrity Management Program (FIMP) based on principles developed by the Canadian Energy Pipeline Association and the Pipeline Research Council International. The FIMP is not intended to duplicate any systems or processes that may already exist; rather, it is intended to supplement the already existing programs (e.g., SIMP, Transmission Integrity Management Program (TIMP), and Distribution Integrity Management Program (DIMP)) to enhance the safety and

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[2] See SCG-1 Incident Related to the High Pressure System (Excluding Dig-In) for more information about the TIMP program and corresponding mitigations.

[3] *See* SCG-3 Incident Related to the Medium Pressure System (Excluding Dig-In) for more information about the DIMP program and corresponding mitigations.

[4] *See* SCG-4 Incident Related to the Storage System (Excluding Dig-In) for more information about the SIMP program and the corresponding mitigations.

integrity of SoCalGas's facility assets. FIMP will apply integrity management principles to facilities assets to reduce risks and promote operational excellence.[5]

SoCalGas's EAM program, while meeting or exceeding compliance requirements, lacks advanced data analytics on asset health and lifecycle projections, as well as integration of additional data sources across operational platforms. As SoCalGas matures its asset management capabilities, outlined in the next section, SoCalGas will have a more targeted and proactive approach to mitigate risk, creating a safer work environment and reducing costs associated with asset failure or unnecessary maintenance and replacement.

The current EAM operating model is limited because the implementation of the ISO 55000 guidelines and EAM processes are in nascent stages. The existing EAM organization is responsible for developing a vision, mission, objectives and project budgets for SoCalGas's implementation of EAM. To fulfill today's EAM plans the organization has had to work across SoCalGas with the departments mentioned above. This approach has allowed EAM to identify existing gaps in source data, processes, and systems. It is intended that the existing operating model will have to evolve to support the implementation of a future, more comprehensive SoCalGas EAM.

B. Future State

SoCalGas's vision for the future state of the EAM program is aimed at adding capabilities through advanced technologies and analytics to increase the knowledge and accountability of asset owners through a more robust and comprehensive operating model. EAM's mission is to:

- Support leading records and data governance practices, controls and integration for improving all operational records by:
    - Creating a comprehensive risk informed approach to integrate pipeline assets and work management using core enterprise systems;
    - Replacing single business applications with an integrated set of systems and capabilities; and

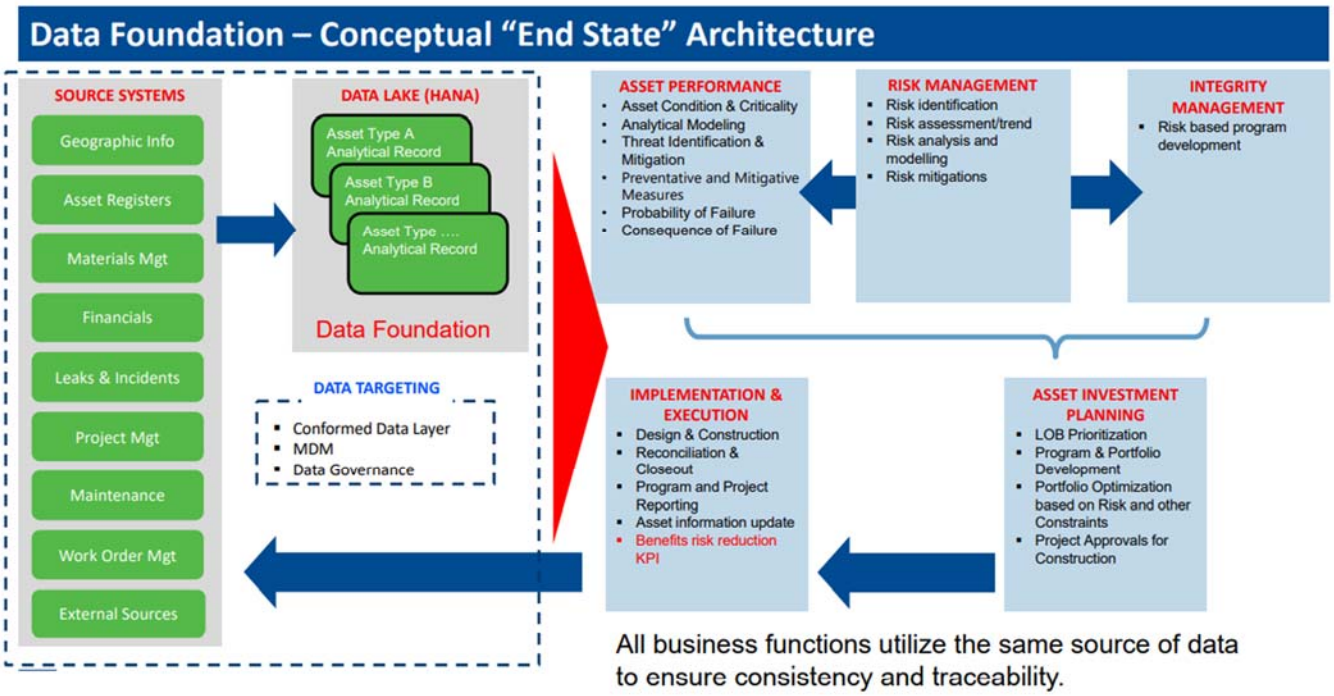
[5] Based on industry definitions, there are a variety of types of facilities. Facilities are highly complex. a variety of equipment/asset types exist within facilities, and in this context facilities are not considered building structures. *See* SCG-4 Incident Related to the Storage System (Excluding Dig-In) for more information about the FIMP program.

- Continuing the journey to improve business performance and for meeting regulatory compliance requirements.

The specific EAM objectives are:

- Enhance the completeness, accuracy, and accessibility of operational records and associated records;
- Enhance pipeline data analytics to support continuous improvement;
- Replace paper records and manual data entry with electronic forms and foster increased automation;
- Provide secure anytime, anywhere access to integrated critical pipeline information associated data capture, reporting, and analysis tools;
- Enhance compliance through work standardization and documentation; and
- Enhance existing records and data governance practices by embedding these practices and controls into the EAM operating model, systems, and applications.

SoCalGas's EAM initiative will provide asset health indices and additional analytics to support the IMPs and provide asset information not addressed within the IMPs. The EAM initiatives include: (1) creation of a data lake to capture the asset data, (2) incorporating a tool for asset investment planning to optimize the expenditures, (3) creating an operating model to govern asset management activities, and (4) further implementation of records management to enhance documentation of criteria used to make decisions. The graphic below provides an overview of the planned EAM initiatives.



SoCalGas is focused on utilizing data-driven analytical processes across the EAM organization and envisions having a foundational data lake, as the repository, to capture data from the following asset sources: Geographical Information, Asset Registers, Materials Management, Financials, Leaks/Incident Reports, Project Management, Work Orders, and External Sources. The data lake will aggregate the data by asset class, to identify risks and, ultimately, allocate resources to mitigate the likelihood, frequency, and/or impact from asset failure risks. Implementing a repository composed of integrated asset data and lifecycle attributes is necessary to form comprehensive analytical records and asset health histories.

Asset Investment Planning, which includes process, people, and technology, provides SoCalGas with an increased ability to optimize investments, on an as-needed basis (but no less than annually). Historically, asset decisions have been based on each integrity management program's analytics. SoCalGas's AIP tool will use the multi-attribute models referenced above, thereby allowing for the creation of a risk-based cross functional portfolio of projects.

The third initiative being implemented as part of EAM is an enterprise operating model that will address interactions across SoCalGas including: Asset Management, Enterprise Risk Management, Integrity Management/Engineering, Planning, Capital Planning, Capital Project Management, Operations, Operations Project Management, Accountability Reporting, and

Regulatory. The adoption of ISO 55000 and the implementation of an enterprise asset management solution affects numerous SoCalGas departments, systems, and processes. Therefore, it is critical to have a well-established operating model and governance structure to assist in documenting how data management and decision-making processes are made.

Finally, SoCalGas has existing Records Management policies and practices which are largely de-centralized. Integrating data systems and creation of common taxonomy are activities the Company is looking to implement. There are a variety of risks that can be attributed to inconsistent records management policies and practices in critical areas associated with RAMP chapters (including those concerning gas incidents). Records management is considered an extension of larger procedures and protocols that must be followed in order to reduce risk.

III. ASSOCIATED RISK EVENTS

As noted above, enterprise asset management affects most of the risk events discussed in other chapters. For example, having a comprehensive records management system where asset data is readily accessed will reduce the likelihood of employees or contractors having inaccurate information when undertaking a repair on a pipe or other facility including storage assets. Similarly, asset information will support more accurate pipeline locating activities, thereby reducing the potential for dig-ins. EAM is a CFF affecting several risks including Incident Related to the Medium Pressure System, Incident Related to the High Pressure System, Incident Related to the Storage System (Excluding Dig-In), and Excavation Damage (Dig-In) on Gas System. EAM is an enterprise-wide framework that provides a standardized approach for managing risk and safety across assets and activities. The EAM CFF therefore spans multiple lines of business and helps to mitigate several RAMP risks.

IV. 2020 PROJECTS AND PROGRAMS

EAM is a program that will leverage data and records to enhance the safety culture at SoCalGas and provide tools to make risk informed decisions associated with asset management. SoCalGas operates and maintains numerous record management systems that contain multitudes of various data and information. These systems serve to collect, store, and provide access to information, and allow for reporting as needed.

A. Administration of Records Management Policies

SoCalGas has a Records and Information Management (RIM) program in place that administers corporate policy and procedure and acts as a steward for individuals and assigned records coordinators in each workgroup to apply and adhere to policy and practices in their own organization. The RIM program policies include topics such as Information Management, Information Classification, Information Protection, Legal Hold, Storage Media, and Record Retention Schedule. The RIM Program is an important element of SoCalGas's safety culture because it provides a consistent and structured way to manage SoCalGas's safety related information. SoCalGas conducts activities and implements policies that promote individual accountability for all levels of employees from entry level to executive leadership.

B. Training on Records Management Policies and Procedures

All employees are required to complete annual records management training. Since every employee is responsible for records management, including administrative records, this training reinforces guidelines about SoCalGas's records management policies and procedures. It is a web-based training curriculum that is automatically assigned to each employee through an individual My Learning account. The topics included in the training are record management policies and systems containing records, definition and identification of records, organizing records (both paper and electronic), retention and disposal, among other topics. Also included is a comprehension assessment to validate understanding of the policy with a minimum passing grade required. All newly hired employees are required to complete training during the calendar year they were hired. The departmental Information Management (IM) Coordinators receive additional training to assist their groups in maintaining compliance with policies and administering the records management procedures.

Costs are not included in Table 1 for this activity due to the inability to identify the labor costs associated with Training on Records Management Policies and Procedures. The costs identified with this program are generally included in the overheads of O&M training. Training on Records Management Policies and Procedures costs are not individually and specifically tracked.

C. Annual Monitoring and Self-Verification

An annual Record Retention and clean up/disposal effort is organized through the Enterprise Risk & Compliance group and the local IM Coordinators. Both onsite and offsite

records must be reviewed and aligned with the corporate-approved master and departmental retention schedule. This department-level effort focuses on the retention timeframe for the department's records and allows the record owners the opportunity to review and evaluate the records retention period to determine proper disposition. The IM Coordinators may also use this time to review their department's record retention schedule and update as needed. The annual records cleanup effort leads up to the annual leadership compliance certification questionnaire that confirms each workgroup has completed its due diligence to clean up records in compliance with corporate policy. In addition, the annual review and clean-up supports the need for employees and contractors to safely perform their duties.

Departmental records retention schedule owners (VP, director, and manager) are required to certify that they have complied with the Sempra Energy IM policy. If any certification includes an "In-Process," or "No" response, the record owner must include a corrective action plan that includes the reason and a targeted completion date. The records owner follows up with them until they have completed their responsibilities and the appropriate certification is provided. Subsequent certification cannot be completed until all prior certifications have been completed.

Costs for this activity are not included in Table 1 due to the inability to identify the labor costs associated with Annual Monitoring and Self-Verification. The costs identified in this program are included in the overheads of O&M training. Annual Monitoring and Self-Verification costs are not individually and specifically tracked.

D. Operational Compliance and Oversight

SoCalGas has established an Information Governance (IG) group to continue executing on the records management element of EAM, and to improve records management capabilities and oversight of day-to-day activities. In alignment with SoCalGas's safety culture, this organization provides operational oversight for records management processes in specific operational areas. For example, the IG group has launched an IG Steering Committee comprised of representatives from various business areas as a forum to address IG questions and concerns and to provide guidance and interpretation on corporate and regulatory policies and requirements.

In addition, the IG group initiated an effort to evaluate current policies and procedures and develop a detailed strategy for improving program maturity, reducing risk, and achieving IG

and records management goals by implementing recommended changes and improvements. The program seeks to develop policies, guidelines, and job aids to foster consistent practices to manage corporate information for use by all employees and contractors for the safe performance of their day-to-day work.

E. Information Management Systems

SoCalGas hosts a variety of information systems to fulfill the unique needs of all workgroups, including critical records, maintenance, safety, legal, fiscal, and contractual records. Applications maintained on foundational technology systems allow employees to track and retain accurate records and complete their day-to-day tasks. To make more effective use of and enable more integrated data analytics and decision-making capabilities, an EAM department has been established to evaluate existing systems and processes in a more holistic manner, to determine more effective ways to manage the operational information, to leverage technology to enhance the value of the data, to identify other potential opportunities to improve the records management program, and to perform oversight of day-to-day activities. To this end, one of the efforts underway is to consolidate various data in a common platform. This involves developing a more common set of metadata and taxonomy to allow for efficient data searches and integration.

V. 2022-2024 PROJECTS AND PROGRAMS

Many of the activities discussed in the 2020 Projects and Program section above are expected to continue during the TY 2024 GRC. For purposes of this RAMP, ongoing projects or programs for which the size and/or scope of that activity will be substantively modified are included and further described for 2022-2024 below.

A. Enhancements of Continuing Records Management Activities

The Information Governance (IG) program team (Section IV(D), above) intends to further assess the maturity of the current IG procedures and practices, and maps out the path to the future state in areas needing improvement or adjustment. As SoCalGas's EAM team proceeds with the new projects and programs listed below, specifically, establishing the data lake and an AIP tool, the team working on the IG program will collaborate with EAM to define records and data management requirements and practices, and the implementation of these requirements in the records management platform. This work is critical to continuing safe performance of work activities. For example, without accurate records, crews dispatched to address leaks or other system issues may present an unnecessary safety risk to themselves or the

public. The IG team will also collaborate with the corporate RIM Program to refine roles and responsibilities of records and information management as the new programs are developed. The IG team is to provide additional training and guidelines to allow for a more systematic and consistent approach to the management of the records throughout their lifecycle.

B. Establish a Data Lake

Although all new initiatives are important, SoCalGas's primary focus will initially be on developing and implementing the data lake and compiling the source data being used to populate the data lake. This first step is critical for capturing data that is accurate and can be used to enhance SoCalGas's risk-based decision making. SoCalGas envisions having a foundational data lake as the repository to capture data from the following asset sources: Geographical Information, Asset Registers, Materials Management, Financials, Leaks/Incident Reports, Project Management, Work Orders, and External Sources. The data lake will aggregate the data by asset class to identify risks and, ultimately, allocate resources to mitigate the likelihood, frequency, and/or impact from asset failure risks.

The data lake will allow SoCalGas to have one source for data gathered through all systems and processes to assess asset health. This approach is consistent with the statements made by the Commission in recognizing the value of adopting ISO 55000:

> We reviewed the forecast for Asset Management and find it to be reasonable and supported by the evidence. The benefits of applying ISO 55000 standards include: (a) greater optimal balance of asset cost, asset risk, and asset performance; (b) greater internal consistency; and (c) helps ensure that employees at all levels understand their role in supporting the goals of the organization.[6]

The foundational data lake will support the creation of an enterprise portal that will be the single source of pipeline data. The portal will provide customized map views of the system, highlight compliance needs, integrate spatial and non-spatial data, enhance real-time analytics and create a platform for enterprise-wide collaboration on safety and reliability issues. Thus, the foundational data lake and portal will allow for one source of asset data to address asset condition and criticality, and likelihood of failure and consequence of failure. They will also support innovative solutions when evaluating failing assets in terms of safety, reliability, and financial impact. SoCalGas's goal is to augment existing cross-functional coordination through an

[6] D.19-09-051 at 265.

effective approach of analytical modeling, where dashboards are maintained by data scientists supported by data integrity management staff, and data accountability leads.

C. Asset Investment Planning (AIP) Tool

An AIP tool and decision-making processes are needed to evaluate risk and optimize investments at SoCalGas. The assessments provided by the AIP tool will provide risk quantification criteria to enhance risk-based decision making capabilities. This will allow for the mitigation of potential asset failures and allow SoCalGas to respond to new business challenges and opportunities. The output from asset investment planning mitigation will allow SoCalGas and its ratepayers to receive the maximum benefit for the dollars invested.

SoCalGas plans to implement an AIP tool to optimize SoCalGas's portfolio because of the number and complexity of projects/programs and because of the associated complexity of the risk frameworks and modeling. This tool would enable SoCalGas to create asset lifecycle plans to meet risk-based EAM objectives, use a risk-based approach to managing assets, and document asset investment decision-making criteria.

SoCalGas will also create an EAM Organization to implement an asset investment prioritization process for evaluation of projects and programs across SoCalGas. The process will be required to provide, among other things, decision-making transparency and accessibility. This will formalize governance of asset management and support meeting the requirements of ISO 55000.

D. Establish an Enterprise Asset Management Operating Model

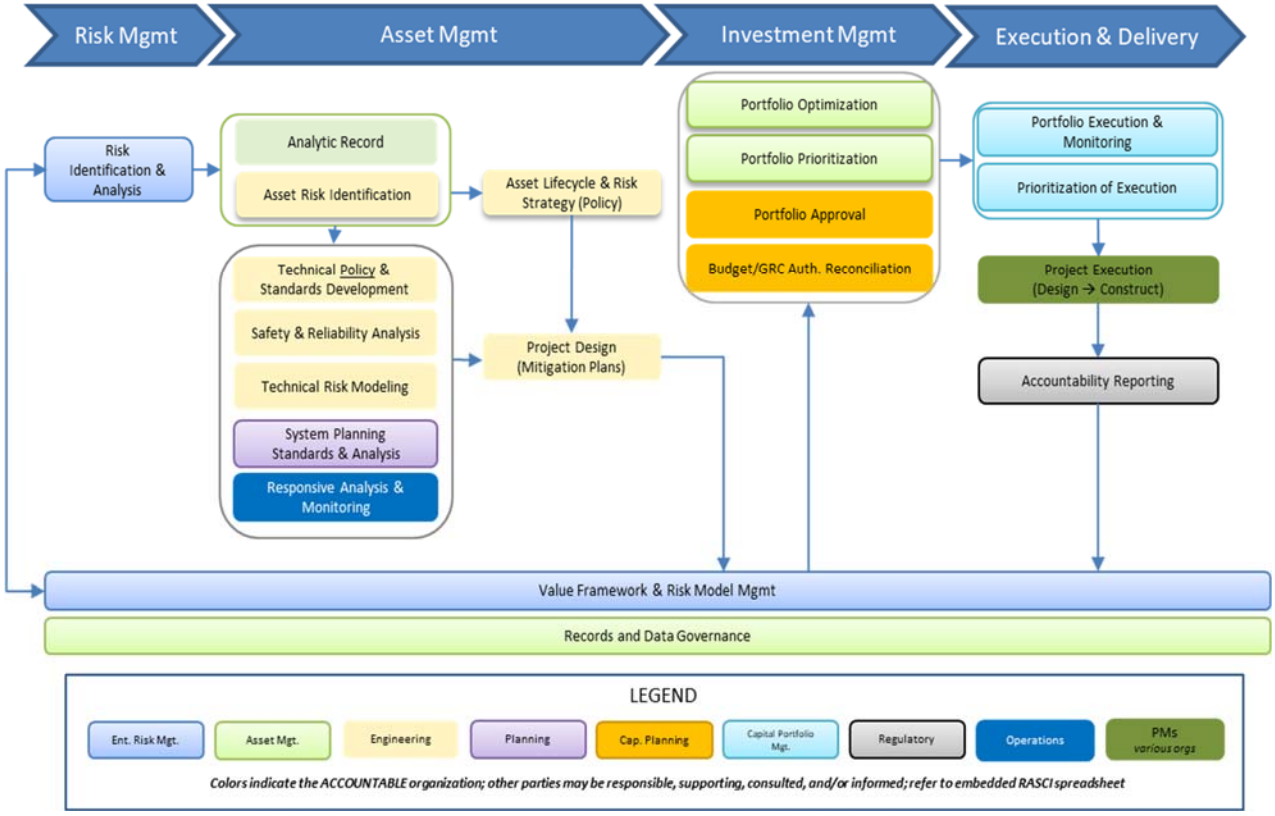
The current EAM operating model is limited because the implementation of the ISO 55000 guidelines and EAM processes are in nascent stages. The future EAM operating model will be required to:

- Further engage SoCalGas leadership in the implementation of the EAM;
- Establish an EAM organization;
- Develop the strategic EAM plan, including asset health indices and asset life cycle management in collaboration with the IMPs and Enterprise Risk Management (ERM);
- Develop algorithms for recommended intervals based upon risk management, heath indices, and life cycle management;

- Coordinate the development and implementation of new systems (e.g. Data Lake, Asset Investment Planning, Records Management);
- Create processes that improve the accuracy and rigor of source information and related data;
- Develop and implement a change management strategy including communications and training regarding new process and structures;
- Coordinate with the IMPs and ERM organizations to support the further implementation of risk-based decision-making including alignment of risk models to support day-to-day management and regulatory processes; and
- Establish processes for capturing lessons learned, accountability report, and continuous improvement.

In order to accomplish these objectives, the existing EAM organization will expand to provide the policy direction, program management, coordination management, and change management required to implement the EAM.

With an expanded EAM organization, the operating model will ultimately be structured as described below:



VI. COSTS

Table 1 contains the 2020 recorded and forecast dollars for the programs and projects discussed in this CFF.

Table 1: Costs (Direct After Allocations, in 2020 $000)[7]

Line No.	Description	Recorded		Forecast			
		2020 Capital	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
1	Administration of Records Management Policies	0	42	0	0	38	48
2	Operational Compliance & Oversight	0	239	0	0	215	275
3	Information Management Systems	19,838	12,371	59,100	75,517	12,889	16,469
4	Continuous Improvement of Records Management	0	0	0	0	Included in Lines 1-3	Included in Lines 1-3
5	Establishing a Data Lake	0	0	8,867	12,808	2,925	4,225
6	Asset Investment Planning (AIP) Tool	0	0	6,743	9,740	686	991
7	Establish an Enterprise Asset Management Operating Model	0	0	10,530	15,210	1,890	2,730

[7] The figures provided are direct charges and do not include Company loaders, with the exception of vacation and sick. The costs are also in 2020 dollars and have not been escalated in forecasts beyond 2020.

Risk Assessment and Mitigation Phase Cross-Functional Factor

(SCG-CFF-2)

Energy System Resilience

May 17, 2021

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CROSS-FUNCTIONAL FACTOR: ENERGY SYSTEM RESILIENCE

I. INTRODUCTION

This Energy Resilience Cross-Functional Factor (CFF) Chapter describes how Energy Resilience activities impact the risks described in SoCalGas's other Risk Assessment Mitigation Phase (RAMP) Chapters.

SoCalGas is presenting CFF information in this RAMP Report to provide the Commission and parties additional information regarding the risks and mitigations described in its RAMP Chapters. CFFs are not in and of themselves RAMP risks. Rather, CFFs are drivers, triggers, activities, or programs that may impact multiple RAMP risks. CFFs are also generally foundational in nature. Therefore, SoCalGas's CFF presentation differs from that of its RAMP risk chapters (*e.g.*, no risk spend efficiency calculations or alternatives are provided).

As described below, Energy Resilience spans multiple lines of business and helps to mitigate several RAMP risks in this Report. The following risk chapters are affected by Energy Resilience: Incident Related to the High/Medium Pressure System, Incident Related to the Storage System and Excavation Damage. For example, the increased knowledge gained from vulnerability assessments or geological hazard identification influence projects and programs instituted to reduce incident risks to the gas system.

II. OVERVIEW

A. The Increasing Need for Energy Resilience

Californians deserve a reliable and affordable supply of energy that is clean, safe, and resilient. While it is impossible to predict what the energy ecosystem will look like over the next two decades, SoCalGas knows it must be safe, reliable, and resilient. Californians will need an increasingly integrated and decarbonized portfolio of energy sources and tools that are affordable, scalable, and can meet critical peak periods of energy demand. California's future and quality of life depend on it.

SoCalGas also knows its customers and the California economy cannot afford to wait for others to secure this future. SoCalGas is intent on leading the transition to resilient decarbonized energy. Innovation and rapid development of new technologies will be critical to achieve success. As the first gas utility in America to install advanced meters, a pioneer in the development of renewable natural gas, and a leader in hydrogen innovations, SoCalGas has

surpassed mandated emissions reduction targets,[1] and continues to incorporate technological advancements into its operations. Through collaboration and partnership, California can lead the transition to affordable and resilient clean energy solutions at scale and serve as a global beacon for energy innovation.

The purpose of this Chapter is to address a critical category of challenges that are not risk events themselves, but rather, transcend multiple risk categories by influencing the likelihood and/or consequence of other identified risks. In this Chapter, SoCalGas describes how its commitment to securing a resilient energy future for California traverses multiple RAMP risk categories and underpins its next GRC. SoCalGas's spending on projects and activities that lead to a decarbonized grid goes hand-in-hand with furthering energy resilience in California's clean energy future.

B. What is Energy Resilience?

Resilience is defined as a system's ability to prevent, withstand, adapt to, and quickly recover from a high-impact, low likelihood event. In contrast, **reliability** refers to a system's ability to maintain energy delivery under standard operating conditions, including normal fluctuations in demand and supply.[2] A resilient energy system is vital to every critical function and sector of the U.S. economy and to the communities that depend upon its services.[3]

SoCalGas envisions a resilient, clean energy future founded upon an integrated energy system with decarbonized molecules and electrons working together to drive down emissions and safely and reliably meet all Californians' energy needs. To achieve this future state, continued investments in maintaining the resilience and performance of California's gas system infrastructure *as it decarbonizes* is essential.

C. Energy as Foundational to Modern Life

Today, more than ever, Californians are increasingly dependent on energy to fuel their lives. As recently explained by the Commission, electricity and natural gas are essential services

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[1] As part of the Senate Bill (SB) 1371 Leak Abatement program, SoCalGas has made significant advancements in surveying, recording and repair that have reduced methane emissions across SoCalGas's service territory.

[2] American Gas Foundation, *Building a Resilient Energy Future: How the Gas System Contributes to US Energy System Resilience* (January 2021) at 9, *available at https://gasfoundation.org/2021/01/13/building-a-resilient-energy-future/*.

[3] *Id*. at 9.

that are necessary to maintain a healthy living standard and to meaningfully participate in society:

> Electricity and natural gas are essential services, and consumers necessarily must purchase them to maintain a healthy living standard and meaningfully participate in society. Unlike other products or services, which customers are able to forego if prices rise too high, essential utility services will continue to be consumed regardless of price. This means that for low-income households, increases in utility bills will crowd out other purchases rather than affect energy usage behavior.[4]

Energy powers our homes, recharges our telephones and computers, and fuels our vehicles. Without a reliable source of energy, we would be unable to engage in the most basic of day-to-day activities, such as communicating with others outside our home, powering up appliances, cooking food, and taking warm showers. Without a reliable source of energy to fuel cellular telephones, enable Wi-Fi connections, and power up computers, many Californians would be unable to work.

Because energy is increasingly foundational to modern life, Californians' need for a resilient energy system that is capable of withstanding low-likelihood, high impact events is also increasing.

D. Climate Change is Increasing the Need for Energy Resilience

Global climate change is driving an increased need for energy resilience in California in two distinct, yet interrelated ways. First, global climate change is driving an increased need for energy resilience due to the increasing frequency and intensity of extreme weather events. As recognized by the Commission in its Climate Change Rulemaking, "California utilities are already experiencing impacts from climate change such as increased temperatures, an increased number of wildfires, sea level rise, and severe drought."[5] Second, climate change is driving an increased need for energy resilience in California due to the actions California is taking as a global leader to address climate change through decarbonization of the energy system. As the transformation of California's energy system accelerates, interdependence of the gas and electric

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[4] CPUC, *Utility Costs and Affordability of the Grid of the Future: An Evaluation of Electric Costs, Rates, and Equity Issues Pursuant to P.U. Code Section 913.1* (Feb. 2021) (Affordability Whitepaper) at 86.

[5] Order Instituting Rulemaking to Consider Strategies and Guidance for Climate Change Adaptation (Rulemaking (R.) 18-04-019) (Climate Change Adaptation OIR), at 11.

systems increases. Therefore, the more the State's grid system relies upon intermittent electric resources, the more long-duration, dispatchable capacity is needed. Gas is currently the primary means to complement renewable energy and to maintain a reliable, resilient, and affordable electric grid, as well as to provide long-duration storage.

The Commission has initiated a rulemaking to consider strategies to integrate climate change adaptation matters into relevant Commission proceedings, determining that "robust climate adaptation planning in a time of worsening climate impacts is a prudent next step to ensure the safety and reliability of all investor-owned public utilities."[6] The Commission has identified the first steps toward electric and gas sector climate resilience – examining all the climate change-related vulnerabilities of the system, and then envisioning all the potential remedies to those vulnerabilities.[7] SoCalGas has been studying climate change issues, potential impacts, and adaptation for several years and has undertaken considerable efforts to confront the risks posed by such impacts. This Chapter includes SoCalGas's assessment of the gas system's ability to weather the safety and reliability-related threats posed by global climate change and plan to enable the deployment of solutions to address those vulnerabilities.

Table 1 below summarizes the top climate change related hazards and potential consequences to the SoCalGas gas system.

Table 1: Hazard, Events, and Potential Consequences

Hazard	Events	Potential Consequences
Increased Frequency and Severity of Storm Events	Storm surge (El Niño events), flooding, high winds, and heavy snow.	1. Increased frequency of emergency response from Gas Emergency Centers (GECs) and SoCalGas crews. 2. Levee erosion or failure necessitating asset repair, replacement, or relocation to low-lying above- and below- ground gas assets. 3. Exposure of underground pipelines.

[6] *Id.* at 1.

[7] *Id.* at 14.

Hazard	Events	Potential Consequences
Change in Precipitation Patterns and Droughts	Subsidence, landslides, mudslides, weakened soil structure, drought-induced vegetation loss.	1. Horizontal subsidence causes compressive stresses resulting in buckling of gas pipelines.[8] 2. Exposure of underground pipelines. 3. Reduced access to pipeline rights-of-way. 4. Diminished effectiveness of cathodic protection system, which can lead to increased corrosion. 5. Damage to pipelines in bridges or spans due to mudslides.
Sea Level Rise	Erosion, coastal inundation, and flooding potential.	1. Levee erosion or failure necessitating asset repair, replacement, or relocation to low-lying above- and below-ground gas assets. 2. Exposure of underground pipelines.
Change in Temperature Extremes	Increased gas demand for electric generation to meet demand on more cooling days and/or for air conditioning (HVAC) demand. Increased ambient temperatures.	1. Increased cycling of compressor station and maintenance schedules along with additional design requirements for compressor stations to support the increased cycling. 2. Damage to pipelines in bridges or spans due to thermal expansion.

[8] SoCalGas is not aware of research indicating that the climate change threats noted would result in horizontal subsidence; however, oil extraction and water extraction can potentially cause subsidence.

SoCalGas's adaptation, assessment, and commitment to meet the challenges posed by climate change, discussed below, align with the Commission's guidance to the State's electric and gas utilities to incorporate climate change adaptation in utility planning to maintain safe, reliable, and affordable energy services in the future's more difficult operating environment.

E. SoCalGas's Commitment to Securing a Resilient Energy Future

SoCalGas is committed to meeting the energy resilience challenges posed by Californians' increased reliance on energy and by global climate change. The resilience of the gas system is well-noted. As reliance on renewable fuels increases, so will energy interdependence, and this resilience will be critical for maintaining the energy system overall. In addition, a diverse fuel supply will further support system resilience. While maintaining this resilience, SoCalGas commits to driving rapid innovation and the deployment of new clean energy solutions. SoCalGas further commits to maintaining the affordability of its gas service to support the State's economy and preserve Californians' quality of life while moving toward this energy future.

1. Resilience of the Gas System

The resilience of California's gas system is well-recognized. In 2018, SoCalGas actively participated in a study commissioned by the CEC to assess the potential impacts of climate hazards on the gas grid.[9] The CEC found "gas assets and services are likely to experience limited impacts from climate hazards. Widespread disruptions are not expected due to limited projected exposure to climate hazards and existing physical protections that limit potential impacts."[10] SoCalGas's gas grid and services are inherently resilient to natural and man-made disasters, because most of SoCalGas's infrastructure is belowground and less vulnerable to climate hazards than aboveground infrastructure.[11] Additionally, "operational flexibility is

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[9] *See* California Energy Commission Report CCCA4-CEC-2018-009, Potential Climate Change Impacts and Adaptation Actions For Gas Assets In The San Diego Gas and Electric Company Service Area (August 2018), at 1.

[10] *See* California Energy Commission Report CCCA4-CEC-2018-009, Potential Climate Change Impacts and Adaptation Actions For Gas Assets In The San Diego Gas and Electric Company Service Area (August 2018), at 61.

[11] "Case Studies of Natural Gas Sector Resilience Following Four Climate-Related Disasters in 2017," ICF, 2018, at 79. *Available at https://www.socalgas.com/1443742022576/SoCalGas-Case-Studies.pdf.*

designed into the gas system within a set of system standards that ensure the system's safety and security."[12]

The inherent resiliency of the gas delivery system lends itself to diverse energy solutions and technologies and addresses customer and public safety concerns during constrained energy supply periods, such as during emergencies—including those caused by climate change—and/or extreme weather. For example, SoCalGas's compression stations are capable of continuing to operate during power outages, as these stations can self-start or black-start (restoring power without relying on the external electric power transmission) the energy generated onsite to power the compressors.

The characteristics of SoCalGas's system, including significant storage capacity, underground location of assets, and dispatchability, enable and complement the use of intermittent renewables by providing reliability and resilience. This resilient gas system can enable the State's transition to an integrated energy system of the future with decarbonized molecules and electrons working together to lower emissions and safely and reliably meet Californians' energy needs.

2. Energy Interdependence Increases the Need for Energy Resilience

As the transformation of California's energy system accelerates, interdependence of the gas and electric systems increases. Therefore, the more the State's electric energy grid relies upon intermittent electric resources, the more long-duration, dispatchable capacity is needed. Gas is currently the primary means to complement renewable energy and to maintain an affordable, reliable, and resilient electric grid, as well as to provide long-duration storage. Existing gas infrastructure will continue to play a critical role in maintaining an integrated energy system, providing the flexibility for intermittent renewable resources to be seamlessly added to the grid without interruption. For example, the Summer of 2020 brought severe climate-related heat waves and wildfires that significantly impacted California's demand for and supply of generation.[13] All of SoCalGas's storage assets were employed to fill the gap between

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[12] American Gas Foundation, *Building a Resilient Energy Future: How the Gas System Contributes to US Energy System Resilience*, January 2021, at 3, *available at* *https://gasfoundation.org/2021/01/13/building-a-resilient-energy-future/*.

[13] California Independent System Operator. *Final Report the Root Cause Analysis: Mid-August 2020 Extreme Heat Wave* (Jan. 13, 2021), at 21, *available at* *http://www.caiso.com/Documents/Final-Root-Cause-Analysis-Mid-August-2020-Extreme-Heat-Wave.pdf*.

abnormally high electric demand, driven by increased cooling loads, and low renewable energy generation, due to smoke from wildfires.[14] SoCalGas's gas system helped avert a crisis within a crisis, providing an essential solution to intermittency, storability and dispatchability challenges.

The recent climatic events also demonstrate the need for a resilient gas system to support a solar/wind-based energy system. The power outages experienced in August and September of 2020 illustrate the critical need for the long-duration storage provided by California's gas system to bridge the gap between energy demand and reliable supply. A recent report by the California Independent System Operator (CAISO) found that "[i]n transitioning to a reliable, clean, and affordable resource mix, resource planning targets have not kept pace to ensure sufficient resources that can be relied upon to meet demand in the early evening hours. This made balancing demand and supply more challenging during the extreme heat wave."[15]

Recent power outages similarly highlight the fundamental difference between renewable energy, which is variable and only available during a limited timeframe, and firm capacity, which is available on-demand. In contrast to intermittent energy resources, the gas grid provides a reliable source of dispatchable, on-demand energy, allowing for the generation of electricity to meet peak energy demand. It also plays a critical role in managing the daily and seasonal ramping needs of the electric grid, which are expected to increase in magnitude and frequency given California's greater reliance on intermittent renewables (*i.e.*, solar and wind). These ramping services, coupled with the State's gas grid, have proven invaluable in responding to the rapid fluctuations of an increasingly volatile energy system.

In short, continued investments in maintaining the gas system's performance and resilience are essential to achieve State climate goals and support the State's increasing reliance on renewable electric generation.

3. Energy Resilience through Diversification of Fuel Supply

Due to climate change, extreme weather events are increasing in intensity and frequency. Thus, a critical capability of the gas grid is its resilience to operate during electric system

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[14] U.S. Energy Information Administration, *Today in Energy: Smoke from California wildfires decreases solar generation in CAISO* (Sept. 30, 2020), *available at* *https://www.eia.gov/todayinenergy/detail.php?id=45336*.

[15] California Independent System Operator. *Final Report the Root Cause Analysis: Mid-August 2020 Extreme Heat Wave* (Jan.13, 2021), at 4, *available at* *http://www.caiso.com/Documents/Final-Root-Cause-Analysis-Mid-August-2020-Extreme-Heat-Wave.pdf*.

disruptions caused by extreme weather events. SoCalGas will continue to enable California to provide a clean, safe, reliable, and resilient supply of energy in the face of increasing climate change challenges.

SoCalGas's long-term storage infrastructure plays an essential role in preserving this energy system reliability and resilience. Without long-term storage, a catastrophic climatic event could potentially have a significant effect on the safety and wellbeing of Southern Californians. For instance, an event similar in gravity to that of the 2014 Polar Vortex in the Northeast United States[16] or the 2021 Texas Storm Uri[17] could foreseeably cause a curtailment in the importation of gas supply statewide. Such curtailments could put both electric and gas customers at risk,[18] which could in turn lead to significant injuries and/or loss of life (as experienced in Texas during the 2021 Storm Uri). For example, it has been reported that 111 people died as a result of Texas Storm Uri.[19] Such potentially devastating impacts to Californians are mitigated by the characteristics of the existing gas system, which is comprised of both pipelines and storage facilities.

A 2018 Western Interconnection Gas – Electric Interface Study[20] undertook a quantitative analysis of the probability of such an incident and found that there is an estimated 12 percent probability of a disruption in gas supply over a ten-year period due to a freeze. The study further indicated, "[t]he various freeze-off scenarios result in conditions in which the

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[16] *See* North American Electric Reliability Corporation, *Polar Vortex Review (*September 2014), *available at* *https://www.nerc.com/pa/rrm/January%202014%20Polar%20Vortex%20Review/Polar_Vortex_Review_29_Sept_2014_Final.pdf*.

[17] *See* ERCOT Letter to the Members of the Texas Senate and the Texas House of Representatives (March 4, 2021), *available at* *http://www.ercot.com/content/wcm/lists/226521/ERCOT_Letter_Re_Feb_2021_Generator_Outages.pdf*.

[18] *See* Wood Mackenzie Public Report, *Western Interconnection Gas-Electric Interface Study (*June 2018), at 15, *available at* *https://www.wecc.org/Reliability/Western%20Interconnection%20Gas-Electric%20Interface%20Study%20Public%20Report.pdf*.

[19] Shawn Mulcahy, "At least 111 people died in Texas during winter storm, most from hypothermia," THE TEXAS TRIBUNE (March 25, 2021), *available at https://www.texastribune.org/2021/03/25/texas-deaths-winter-storm/#:~:text=At%20least%20111%20people%20died,winter%20storm%20%7C%20The%20Texas%20Tribune*.

[20] *See* Wood Mackenzie Public Report, *supra*, at 15.

electricity system is stretched to its limits and may face reliability challenges."[21] These recent experiences in the Northeast and Texas demonstrate customers could face a serious safety risk should similar conditions occur in California because of climate change. SoCalGas's storage facilities currently mitigate these risks, which are also mitigated by technologies such as microgrids and fuel cells. Today, the most critical function of the gas grid infrastructure (pipeline and storage) is its resilience and continued operation during climate induced energy supply disruptions. Thus, SoCalGas is committed to continuing to ensure a safe, reliable, resilient, and increasingly renewable gas grid for its customers.

The benefits of a diverse supply of energy are realized not just at the system level, but also at the customer level. For example, residents of a home fueled solely by electricity may be forced to endure the inability to cook food and the loss of hot water during an electric shut-off or other unplanned outage. In contrast, residents fueled by both gas and electricity may maintain the ability to heat their homes, cook and take hot showers during an electrical power outage.[22] SoCalGas remains mindful of the critical role gas plays in maintaining the quality of life for Californians and is committed to maintaining the resiliency of the gas system for its customers.

4. Transition to Clean Fuels to Further Enhance Energy Resilience

SoCalGas is studying how the resilient gas transmission and delivery system can be leveraged to transport low to zero-carbon gases, such as hydrogen and Renewable Natural Gas (RNG), as California moves to decarbonize the energy system. Hydrogen has the potential to provide emissions-free sustainable energy in a variety of end uses, such as fuel cell electric vehicles, stationary power, heat for buildings, backup power, industrial heat and feedstock, and distributed as well as central station generation.[23] Further, hydrogen is one of few feasible carbon-neutral solutions for hard to abate industries (*e.g.*, shipping, aviation, heavy-duty long-

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[21] *Id*.

[22] This benefit was recently evident during the Texas Storm Uri, where two in five residential customers were able to consistently heat their homes with gas despite the electric outages. Steffy, Loren, "Despite Losing Power for Days, Texans Will Pay Higher Power Bills—Perhaps for Decades to Come," TEXAS MONTHLY (March 4, 2021).

[23] M.W. Melaina et al., National Renewable Energy Laboratory, Blending Hydrogen into Natural Gas Pipeline Networks: A Review of Key Issues (March 2013), *available at* https://www.nrel.gov/docs/fy13osti/51995.pdf.

haul transportation, iron and steel production, chemical, and manufacturing processes that require high-temperature industrial heat such as aluminum, glass and cement.[24]

Abroad, hydrogen is being blended into the gas grid at low levels[25] with no or minimal changes to the pipeline system or end use equipment. Over time, it may be possible to retrofit the gas grid to transport higher levels of hydrogen to support energy resilience while helping to achieve the goal of carbon neutrality. Hydrogen blended into natural gas is most compatible with newly installed, plastic infrastructure that is isolated from legacy materials. The natural gas network in California is interconnected, and consequently, the system is limited by its assets that have the lowest tolerance for blended hydrogen. SoCalGas and SDG&E proposed demonstrations of hydrogen blending in lieu of a preliminary hydrogen injection standard in Application (A.20-11-004).[26] Blending of hydrogen into the existing gas system will provide a significant boost towards achieving gas pipeline decarbonization in California. Furthermore, blending, where feasible, could be a lower cost option of transporting hydrogen than developing new hydrogen transmission and distribution infrastructure. With technological progress and sufficiently large, sustained, and localized demand, gas pipelines can be one of the most cost-effective long-term choices for hydrogen delivery. Achieving commercialization and cost reductions for the deployment of low and zero-carbon hydrogen at scale would help decarbonize many sectors (including industry, thermal power plants, and the transportation sector, including light-, medium- and heavy-duty vehicles, goods movement, and air travel) and accelerate progress towards the State's climate, clean air, and clean energy goals.

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[24] Kobad Bhavnagri, Bloomberg NEF, Hydrogen Economy Outlook (2020), available at *https://data.bloomberglp.com/professional/sites/24/BNEF-Hydrogen-Economy-Outlook-Key-Messages30-Mar-2020*.

[25] The GHRYD project in France blended up to 20% hydrogen into the gas network serving a new residential community around 200 homes without any modifications to the gas system or customer appliances. Blending demonstration projects in other countries produced similar results. Engie, "The GRHYD demonstration project," *available at* *https://www.engie.com/en/businesses/gas/hydrogen/power-to-gas/the-grhyd-demonstration-project*.

[26] *See* Application (A.) 20-11-004. SoCalGas and SDG&E also proposed a Hydrogen Blending Demonstration Program in this application. The first project will blend hydrogen into an isolated section of primarily polyethylene (PE) plastic distribution system in SoCalGas's service territory. The initial hydrogen blend level is planned at one percent and may increase to as much as twenty percent. SoCalGas expects to choose the location of the initial project in 2021.

SoCalGas has also partnered with the National Fuel Cell Research Center (NFCRC) at the University of California, Irvine (UCI) to launch the first U.S. Power-to-Gas (P2G) project -- an electrolyzer powered by the on-campus solar electric system that feeds its renewable hydrogen to the campus power plant. This research showed that P2G technology can increase the use of renewable energy and should be an important component in meeting California's clean energy and greenhouse gas reduction goals.[27] Delivering zero-emissions energy via the gas grid can help the State transition to a zero-emissions energy future. Furthermore, the research lays the groundwork for leveraging the existing gas grid for the storage and transmission of renewable energy.

Along these lines, SoCalGas sponsored Assembly Bill (AB) 3163 (Chapter 358, Statutes of 2020) which expands the definition of biomethane to include gas from cellulosic waste like dead trees and agricultural material.[28] The expansion of this definition will help prevent cellulosic organic waste from being sent to landfills or openly burned, which releases massive amounts of GHG emissions. The California State Senate Committee on Energy, Utilities and Communications found that biomass conversion cuts GHG emissions by 98 percent compared to open burning or wildfire.[29] This legislation will help to convert organic waste into pipeline quality biomethane to be used as a source of clean and renewable energy. This new law is expected to increase supplies of RNG and help turn the State's organic waste problem into a cost-effective renewable energy solution. In fact, SoCalGas is committed to replacing 20 percent of the gas delivered to core customers with RNG by 2030. The RNG could then be used for heating, hot water, and cooking in commercial buildings, and for stoves, clothes dryers, water heaters, fireplaces, and heating in residential homes.

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[27] *See* PRNewswire, "SoCalGas and University of California Irvine Demonstrate Power-to-Gas Technology Can Dramatically Increase the Use of Renewable Energy," (Mar. 30, 2017) (noting that preliminary research showed that UCI could increase its use of renewable energy ten-fold, up to 35 percent with power-to-gas strategy), *available at https://www.prnewswire.com/news-releases/socalgas-and-university-of-california-irvine-demonstrate-power-to-gas-technology-can-dramatically-increase-the-use-of-renewable-energy-300432101.html*.

[28] *See* California State Legislature Assembly Bill No. 3163, *available at http://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200AB3163*.

[29] *See* California State Senate Committee on Energy, Utilities and Communications Bill Analysis, (July 31, 2020), *available at http://leginfo.legislature.ca.gov/faces/billAnalysisClient.xhtml?bill_id=201920200AB3163#*.

Furthermore, the California Air Resource Board (CARB) has called for the use of RNG to not only reduce the usage of fossil gas, but to serve as a resilient source of renewable fuel for vehicles and electricity generation.[30] This is further specified in the "Low Carbon Energy"[31] and "Transportation"[32] sections of CARB's 2017 Climate Change Scoping Plan that specifically lay out the pathway for RNG usage in the residential, commercial, and industrial sectors as well as in the transportation and electricity sectors.

Further, the existing body of knowledge indicates that fuel reduction (*i.e.*, removing this biomass) is effective and can be used strategically to reduce risks in key areas. The gas grid could participate and support fuel biomass reduction efforts. A recent report by Lawrence Livermore National Laboratory found that converting waste biomass to fuels and storing carbon dioxide (CO_2) holds the greatest potential for negative emissions (approximately -84 $MtCO_2$ annually) because biomass is readily available across California.[33] About 56 million tons per year of waste biomass is available from trash, agricultural waste, sewage and manure, logging and fire prevention activities.[34] Another opportunity for RNG production is through livestock manure, which emitted about 12 $MTCO_2e$ in 2018.[35] Because agriculture and dairies comprise a large part of the California economy, waste biomass presents an abundant source of resilient decarbonized energy.[36]

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[30] *See* California Air Resource Board 2017 Climate Change Scoping Plan, *available at* *https://ww2.arb.ca.gov/sites/default/files/classic//cc/scopingplan/scoping_plan_2017.pdf*.

[31] *Id.* at 69.

[32] *Id.* at 91.

[33] Lawrence Livermore National Laboratory, *Getting to Neutral: Options for Negative Carbon Emissions in California* (Jan. 2020), *available at* *https://www-gs.llnl.gov/content/assets/docs/energy/Getting_to_Neutral.pdf*.

[34] *Id.* at 4.

[35] *See* California Air Resource Board, *Greenhouse Gas Emission Inventory – Query Tool for years 2000 to 2018,* at year 2018 for livestock manure, *available at* *https://www.arb.ca.gov/app/ghg/2000_2018/ghg_sector.php*.

[36] Per SB 1383 (Chapter 395, Statutes of 2016), beginning January 1, 2022 local governments must procure minimum levels of recovered organic products that include (1) compost; (2) mulch; and/or (3) renewable energy (transportation fuel, heat, and electricity) from anerobic digestion and electricity from biomass conversion. *See* California Department of Resources Recycling and Recovery SB 1383 Final Regulations Text, *available at* *https://www2.calrecycle.ca.gov/Docs/Web/118371*.

5. Microgrid and Fuel Cell Energy Resilience Programs

To help communities plan and prepare for risks from climate change, SoCalGas is also developing new energy resilience projects for its customers to be deployed across its service territory to spur energy resilience investments by its customers. Specifically, SoCalGas is exploring opportunities presented by microgrid and fuel cell technologies. A microgrid is "an interconnected system of loads and energy resources, including, but not limited to, distributed energy resources, energy storage, demand response tools, or other management, forecasting, and analytical tools, appropriately sized to meet customer needs, within a clearly defined electrical boundary that can act as a single, controllable entity, and can connect to, disconnect from, or run in parallel with, larger portions of the electrical grid, or can be managed and isolated to withstand larger disturbances and maintain electrical supply to connected critical infrastructure."[37] An important function of a microgrid is to operate during power outages that may be caused by climatic hazards. Thus, microgrids are mitigation tools communities can implement to adapt to climate change. To fulfill this function, a microgrid must be supported by a reliable fuel transportation system and source, which can be used in stationary fuel cells, fuel cell electric vehicles, as well as clean combined heat and power applications and microturbines.

A fuel cell can use the chemical energy of hydrogen (or another fuel) to cleanly and efficiently produce electricity.[38] Fuel cells provide an essential power supply when it is most needed and can generate electricity from gas or biogas, in addition to hydrogen. These fuel sources not only provide flexible and reliable generation but can also provide energy storage. Hydrogen, for instance, can be stored and later used to generate power when needed. Fuel cells enable businesses, residents, and local governments to invest in adequate preparation for the worst-case scenarios of climate change. Additionally, combined heat and power technologies provide reliable energy in the form of electricity and heat. Diversification of power sources throughout a community helps ensure that residents receive dependable energy and feel safer in the event of climatic hazards and risks. Moreover, when deployed by essential service providers, such as fire stations, hospitals, and schools, these critical service providers secure their ability to remain operational during extreme hazardous events.

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[37] SB 1339.

[38] *See* United States Department of Energy Fuel Cells Program site at *https://www.energy.gov/eere/fuelcells/fuel-cells*.

6. Affordability

Californians deserve an affordable supply of energy to fuel their lives and maintain their standard of living. As acknowledged by the Commission in the Climate Change Rulemaking, electricity and natural gas are essential services that Californians must purchase to maintain a healthy living standard and meaningfully participate in society. Unlike other products or services, consumers do not have the option to forego the use of energy—they must pay for these essential utility services regardless of price. A February 2021 report prepared by the Energy Institute at Haas, UC Berkeley, states that California's electric utility rates are among the highest in the country.[39] In contrast, SoCalGas's residential bills are among the lowest in the nation.[40] This remains one of the top reasons gas customers report high levels of satisfaction with their gas service year after year,[41] and is a source of great pride among the employees of SoCalGas who work safely and efficiently to maintain this affordability for customers. SoCalGas is ever mindful of the imperative to provide an affordable supply of energy to Californians.

Three climate-related events outside California illustrate how SoCalGas's gas system currently preserves affordability of California's electric system during extreme weather events. In 2014, the Midwest and Northeast United States experienced a polar vortex that led to curtailment of gas supplies for electric generation and other related shortages. This impacted the price for a megawatt hour of electricity, which increased from $160 per MWh to $1,800 per MWh.[42] In 2011,[43] and again in February 2021, a curtailment of gas supply occurred in Texas due to cold weather events.[44] Regulators are examining the Texas energy market after natural

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[39] Borenstein, *et al.*, Designing Electricity Rates for an Equitable Energy Transition, Energy Institute at Haas WP 314 (Feb. 2021), *available at https://haas.berkeley.edu/wp-content/uploads/WP314.pdf*.

[40] A.17-10-007/-008 cons., June 18, 2018 Rebuttal Testimony of Sharim Chaudhury at ISC-4.

[41] *See, e.g.,* Ernst & Young, *Fuels of the future — what is powering the US energy transition?* (2019), at 5, *available at https://assets.ey.com/content/dam/ey-sites/ey-com/en_us/topics/power-and-utilities/ey-fuels-of-the-future-v21.pdf*.

[42] *See* North American Electric Reliability Corporation, *supra*.

[43] *See* Federal Energy Regulatory Commissions and North American Electric Reliability Corporation Report on *Outages and Curtailments During the Southwest Cold Weather Event of February 1-5, 2011: Causes and Recommendations* (August 2011), *available at https://www.ferc.gov/sites/default/files/2020-04/08-16-11-report.pdf*.

[44] *See* ERCOT Letter, *supra*.

gas prices soared 10,000 percent following Texas Storm Uri.[45] During Storm Uri, SoCalGas utilized its Aliso Canyon, Honor Rancho, La Goleta, and Playa Del Rey storage fields to supply sufficient gas to its customers, including to the electrical grid, without relying on Texas imports. This ability to operate SoCalGas's storage facilities "on-demand" enabled SoCalGas to proactively respond to climatic events and contributed to the stabilization of energy prices for Californians.

Moreover, affordability is critical to achieving the long-term objective to combat global climate change. As recently acknowledged by the Commission in its affordability whitepaper, *Utility Costs and Affordability of the Grid of the Future: An Evaluation of Electric Costs, Rates, and Equity Issues Pursuant to P.U. Code Section 913.1*, "[i]f handled incorrectly, California's policy goals could result in rate and bill increases that would make other policy goals more difficult to achieve and could result in overall energy bills becoming unaffordable for some Californians."[46] SoCalGas aspires to lead the industry in climate change adaptation to serve as a catalyst for a global transition to clean energy. If this transition to a decarbonized energy system is demonstrated to be financially feasible, SoCalGas believes other states and nations will follow California's lead. If, on the other hand, this transition proves to be unduly costly, few are likely to follow.

Mindful of the fact that natural gas is essential to the health, wellbeing, and quality of life of Californians, and the critical role its gas system plays in maintaining reliability, resilience and affordability of energy in California, SoCalGas is committed to maintaining energy affordability as California decarbonizes its energy system to adapt to global climate change.

III. 2020 PROGRAMS

Energy resilience projects and programs initiated by SoCalGas in 2020 are discussed below. While this is not an exhaustive list of all such activities, the programs and projects summarized below illustrate SoCalGas's broad efforts and commitment to secure energy resilience for California while simultaneously continuing to decarbonize the energy system.

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[45] Matt Egan, "Regulators examine Texas energy market after natural gas prices soared 10,000%," CNN BUSINESS (Feb. 23, 2021), *available at https://www.cnn.com/2021/02/23/investing/texas-natural-gas-investigation-cftc/index.html*.

[46] Affordability Whitepaper at 3.

From 2016 through 2020, SoCalGas's Gas Engineering Department developed gas infrastructure resiliency and vulnerability reports with the help of external experts to provide guidance to internal operations and engineering design of long-term strategies for climate change adaptation. These reports are being used to support cities and counties subject to Senate Bill (SB) 379,[47] which requires updates to municipalities' safety elements to address climate adaptation and resilience. Beginning in 2021, SoCalGas undertook a system-wide climate change vulnerability assessment to assess all SoCalGas assets, operations, and services to understand what current and future climate hazards pose threats. The assessment examines three future time horizons and identifies vulnerabilities considering a multitude of climate hazards, including, but not limited to, extreme temperatures, extreme precipitation, sea level rise, and wildfire. The assessment will inform enhancements and investments to the gas grid. This assessment is being conducted pursuant to the Climate Change Adaptation OIR issued by the Commission on April 26, 2018,[48] and will be iterated on four-year cycles.

The hazards of climate change potentially impact every community within SoCalGas's service territory. SoCalGas is committed to promoting equity relative to climate adaptation of the Company's infrastructure, operations, and service in impacted communities. Of particular concern are communities faced with high socioeconomic burdens and high exposure to one or more adverse climate hazards. These disproportionately-impacted communities, designated in the Climate Change Adaptation OIR, will require specific attention and extra resources to adapt to climate change. SoCalGas's Community Engagement Plan will help identify and prioritize utility climate adaptation investments in these designated communities. The Community Engagement Plan will serve as a guiding document, outlining how SoCalGas will engage with these impacted communities and implement best practices for outreach to local jurisdictions and other non-governmental organizations. This plan will be iterated on four-year cycles.

SoCalGas's Gas Engineering organization continues to improve upon existing evaluation tools for the analysis and assessment of Geological Hazards to provide recommendations related to geological, civil, and structural engineering designs impacted by weather- and climate-driven events. For example, these climate driven events include areas impacted by wildfire and

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47 *See* California State Legislature Senate Bill No. 379.

48 *See* CPUC's Climate Adaptation OIR, R.18-04-019 (September 3, 2020).

potential landslides triggered by heavy rain events. In addition, Gas Engineering will continue identifying locations of the gas infrastructure where it would be beneficial to install strain gauges to monitor pipelines that could potentially be exposed to excessive stresses from land movement as new information is assessed from the geological hazard and satellite monitoring programs. SoCalGas will continue its efforts to identify projects and areas where pipelines may be prone to slope instability and erosion.

SoCalGas is committed to decarbonizing its fleet of vehicles, equipment, and related infrastructure to help reduce greenhouse gas emissions. As an example, SoCalGas has already converted over 30% of its fleet to renewable compressed natural gas vehicles (RCNGV) and has built a network of internal-facing fueling infrastructure nodes. As new zero-emission vehicles and equipment come to market, SoCalGas plans to accelerate transitioning its fleet to support SoCalGas's Aspire 2045 Climate Commitment ("Climate Commitment").[49] The Climate Commitment identifies goals to replace 50% of the SoCalGas Fleet with less carbon intense vehicles by 2025 and 100% zero-emissions vehicles and equipment by 2035. SoCalGas plans to diversify its fleet further by investing in Battery Electric Vehicles (BEV), and/or Fuel Cell Electric Vehicles (FCEV), and related infrastructure to advance SoCalGas's climate goal.

SoCalGas is committed to decarbonizing its facilities by completing numerous energy efficiency and power generation projects to help reduce greenhouse gas emissions. For example, SoCalGas has already installed oxide fuel cells to generate electricity at two of its most prominent sites—Monterey Park and Pico Rivera. As more energy-efficient equipment and technology comes to market, SoCalGas plans to accelerate greening its facilities to support the advancement of its Climate Commitment, which identifies a goal to achieve net-zero energy for 100% of SoCalGas's buildings by 2035. As discussed above, SoCalGas is committed to evaluating technology and research in microgrids, fuel cells, renewable natural gas, and hydrogen that will maintain energy resilience while enabling the decarbonization of the energy system. Based on prior research, SoCalGas committed to replacing 20 percent of its conventional gas supply with RNG by 2030. Although these activities are primarily focused on hydrogen and reflect investments related to the Hydrogen Blending Application, in the future this

[49] *https://www.socalgas.com/sites/default/files/2021-03/SoCalGas_Climate_Commitment.pdf*.

work may include additional projects to support other clean energy innovation and advance technology-based solutions.

IV. 2022-2024 PROGRAMS

The activities listed above are expected to continue during the TY 2024 GRC as ongoing projects that are part of SoCalGas's long-term energy resilience efforts. Many of the activities are cyclical in nature and may require reevaluation each year to identify and implement new mitigations as weather conditions change. Certain evaluation processes are being expanded to include other related conditions such as post-wildfire analyses. Notable expansions to the above activities and new activities are discussed below.

To achieve the Climate Commitment, SoCalGas is exploring options to accelerate its energy efficiency and power generation strategies. SoCalGas has initiated alternative energy planning and feasibility studies to optimize its facility operations and implement a variety of climate change and clean energy projects that could maximize opportunities on identified high-priority areas, including renewable energy generation, energy efficiency, and technology. Several options that SoCalGas is considering for meeting its sustainability goals at its facilities include:

- Construction of a facility powered by on-site renewable energy, including wind, solar, automated controls, fuel cell, and battery storage, to minimize reliance on conventional power;
- Implementation of energy efficiency audits and identification of conservation goals for each facility type (headquarters, branch payment office, etc.); and
- Identification of opportunities for future facility integration with smart devices.

The initial assessments and potential upcoming work are an essential component of SoCalGas's commitment to identifying and promoting innovative climate solutions that conserve energy and reduce carbon footprints. SoCalGas is currently evaluating the potential costs of implementing its sustainability strategy and will provide these costs in a future GRC (or other) application where recovery is sought, as applicable. SoCalGas remains committed to maintaining energy affordability for its customers and is actively pursuing partnerships, grants, and other opportunities to fund sustainability initiatives.

SoCalGas is also working on several low carbon programs and projects in line with its energy resilience efforts, which are further described below. These low carbon projects are in various stages of advancement.

The Customer Energy Resiliency Program focuses on providing power resilience and reliability solutions to customers located in Tier 2 or Tier 3 High Fire Threat Districts during unplanned outages or when electric utilities de-energize powerlines during Public Safety Power Shutoff (PSPS) events to mitigate the risk of wildfires. The program will target two customer segments: 1) vulnerable residential customers with critical energy resilience needs; and 2) critical facilities (*e.g.*, fire stations, police stations, city halls, etc.). For residential customers, SoCalGas is proposing a long duration fuel cell plus battery storage solution with islanding capabilities. For critical facilities, SoCalGas will develop customized solutions that may include and are not limited to fuel cells, battery storage, solar photovoltaic, and combined heat and power technologies. SoCalGas anticipates incorporating hydrogen into this program in the future.

The Hydrogen Integrated Program aims to develop a network of hydrogen refueling stations to support SoCalGas's zero emissions fleet. The program will include expanding the functionality of its existing network of NGV stations to provide hydrogen refueling services and a compact pipeline network connecting those refueling stations with local small-scale production facilities.

In addition, SoCalGas is exploring the feasibility of constructing a long-haul pipeline to deliver hydrogen at large-scale to the Los Angeles basin. SoCalGas is also assessing the feasibility of constructing a long-haul CO_2 pipeline to transport CO_2 at large scale from the Los Angeles basin to areas of permanent sequestration.

Risk Assessment and Mitigation Phase Cross-Functional Factor

(SCG-CFF-3)

Emergency Preparedness and Response and Pandemic

May 17, 2021

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CROSS-FUNCTIONAL FACTOR: EMERGENCY PREPAREDNESS AND RESPONSE AND PANDEMIC

I. INTRODUCTION

This Emergency Preparedness and Response (EP&R) and Pandemic Cross-Functional Factor (CFF) Chapter describes how EP&R activities impact the risks described in SoCalGas's Risk Assessment Mitigation Phase (RAMP) Chapters and also describes the activities initiated in 2020 in response to the COVID-19 pandemic.

SoCalGas is presenting CFF information in this RAMP Report to provide the Commission and parties additional information regarding the risks and mitigations described in its RAMP Chapters. CFFs are not in and of themselves RAMP risks. Rather, CFFs are drivers, triggers, activities or programs that may impact multiple RAMP risks. CFFs are also generally foundational in nature. Therefore, SoCalGas's CFF presentation differs from that of its RAMP risk chapters (*e.g.*, no risk spend efficiency calculations or alternatives are provided).

As described below, EP&R is an enterprise-wide framework that provides a standardized approach for managing risk and safety across assets and activities. The EP&R CFF therefore spans multiple lines of business and helps to mitigate several RAMP risks in this Report. Also described below are the temporary and permanent activities SoCalGas implemented in 2020 to address safety and health related issues associated with the current COVID-19 pandemic and potential future pandemics.

II. OVERVIEW

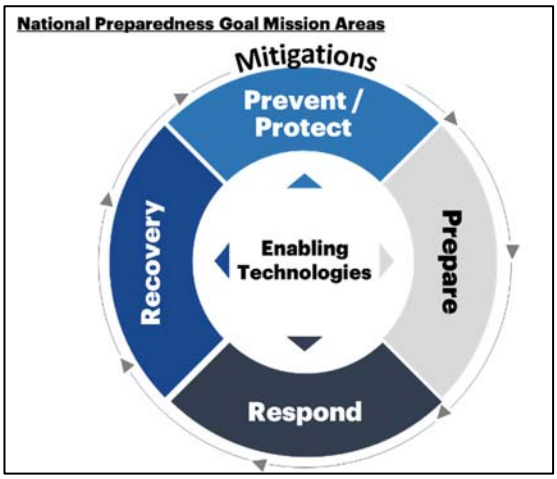
A. Emergency Preparedness and Response

SoCalGas takes enormous pride in understanding and applying Emergency Preparedness concepts and capabilities to enable a safe work environment and reduce the likelihood and impacts from major events and disruptions. At its core, EP&R creates the foundation to prepare, respond, and recover from All-Hazards.[1] SoCalGas has policies and procedures to promote effective emergency incident management and response and address emergency and crisis situations. This includes employees who are trained and equipped to respond promptly to protect

[1] The term All-Hazards is defined by the Federal Emergency Management Agency (FEMA) as "Natural, technological, or human-caused incidents that warrant action to protect life, property, environment, and public health or safety, and to minimize disruptions." *https://www.fema.gov/pdf/plan/slg101.pdf*

people first and then property, maintain system reliability, and safely restore the affected system and Company operations to normal status.

Terminology. SoCalGas's approach to EP&R is rooted in national standards and related guidance materials from FEMA, the Pipeline and Hazardous Materials Safety Administration, the American Gas Association, the California Office of Emergency Services (OES), and state regulators, including the California Public Utilities Commission. As the industry continues to evolve and mature, a more holistic approach around resilience to risks and emergencies has emerged as a strategic way to align and integrate related activities across emergency preparedness and response, and cyber and physical security. SoCalGas is exploring a similar maturation from emergency management towards resiliency, however, for the sake of consistency this chapter will use the term *Emergency Preparedness and Response*. We also recognize that the success of the programs and projects are a shared responsibility and require a collaborative approach across multiple organizations.



A structured approach. In September 2015, FEMA published the second edition of the National Preparedness Goal. This document defines what it means for the whole community to be prepared for all types of disasters and emergencies, and highlights that preparedness is a shared responsibility, beginning with individuals, private and non-profit sectors, faith-based organizations, and all levels of government. The better prepared SoCalGas is, the better SoCalGas can reduce and/or mitigate the impacts, costs, and recovery times following a disaster. SoCalGas recognizes it is an integral part of the community across Southern California, and its commitment to preparedness directly contributes to overall safety, resilience, and risk reduction of its employees, contractors, customers, infrastructure and surrounding communities.

The projects and programs outlined in this chapter align with the five mission areas of the National Preparedness Goal. An additional project is discussed that focuses on the enabling technologies related to the EP&R CFFs.

The Emergency Management (EM) Department. SoCalGas's EM department coordinates safe, effective, and risk-based emergency management activities to prepare for, respond to, and recover from all threats and hazards. The EM department sustains preparedness through training, Business Continuity Plans, Emergency Action and Fire Prevention Plans, First Responder Outreach, exercises and drills, and technology.

The EM department sits within the Safety Management System organization, reporting to the EM Director. Within the department, there is a manager who oversees three sections: Emergency Operations Center (EOC), Stakeholder Engagement Exercises and Drills, and Training, Compliance and Documentation. Each section is led by a Team Lead and performs a variety of functions to help achieve EM's goal of effectively planning, preparing, and responding to incidents.

Outside of the department, SoCalGas utilizes an organizational structure that integrates EP&R into its operations. Employees are trained and equipped to make prompt responses, to direct their actions toward safely protecting people first and then property, to maintain gas services to customers when safe to do so; and, following an emergency or disaster, to safely restore services and operations to normal. This cross-coordination and alignment of roles and responsibilities is designed to help mitigate cross functional risks by promoting accountability across the enterprise.

B. Pandemic

SoCalGas has taken an all-hazards approach with EM, and the significance and impacts associated with the COVID-19 pandemic warrant specific attention to acknowledge the relationship to Emergency Preparedness. This Chapter provides a brief overview of the actions taken to directly reduce the risks associated with COVID-19. The activities identified will apply to future public-health risks based on the lessons learned from COVID-19.

Response to COVID-19. SoCalGas monitored county, state, and federal guidance to align all activities with leading industry and science-based information. As new information became available, it was critical for SoCalGas to modify and create mitigation strategies, internal policies, and workforce engagement efforts to remain compliant with the local, state, and federal

guidelines. In addition to monitoring official guidance, SoCalGas began and continues to monitor seven-day averages, ICU bed availability in local hospitals, and local COVID-19 infection rates to understand local and regional risks. These indicators help inform decisions to extend work-from-home requirements, in order to prevent the risk of additional spread to the workforce and the public.

During the onset of the COVID-19 pandemic, several infectious disease medical experts were engaged in an advisory capacity to discuss strategies and workforce concerns. New work-from-home policies were established, including resources for reimbursement for home office equipment and supplies, and remote work stipends to enable remote work wherever feasible. SoCalGas focused on increasing the access and use of virtual conferencing technologies, cloud-based filesharing, and remote access to secure internal systems and databases. SoCalGas implemented proactive health screening efforts to reduce the risk of transmission of COVID-19, such as Center for Disease Control (CDC) recommended COVID-19 screening questions amongst employees, and the addition of temperature screenings and health question surveys at critical locations. Additionally, SoCalGas developed and implemented the Self-Screening Application for Employees (SAFE) which allows employees and onboarded contractors the ability to provide responses to the CDC-provided COVID-19 self-screening questions prior to coming into the workplace. Within each of SoCalGas's staffed facilities, state and federal guidelines were used to design programs for reducing workplace risks associated with facility usage, including upgrading or changing Heating, Ventilation, and Air Cooling Systems (HVAC) filtration systems, rearranging workstations within six feet of one another, increasing frequency and intensity of cleaning and sanitation protocols, enforcing unidirectional traffic wherever possible, as well as limiting access to communal areas to reinforce physical distancing requirements. SoCalGas engaged employees to provide supplies of, and training with appropriate use of Personal Protective Equipment (PPE), and increased the availability of hand-washing stations and sanitizing solutions across its facilities. Contact tracing processes were also established to identify and notify employees who may have been in close contact to a suspected or confirmed case while in the workplace. These notifications, along with the mandatory self-quarantine that follow, reduce the risk of further transmission across the workforce and general public. SoCalGas's comprehensive approach to pandemic risks, along with proactive planning, communication, and execution continue to prevent the risk of further transmission of the virus.

SoCalGas will continue to monitor the COVID-19 situation, and continue to adjust strategies, workforce communication, and other policies and procedures to align with industry-leading practices and mandated activities. Also, SoCalGas established a cross-functional return to workplace team with representatives from Enterprise Risk Management, Human Resources, Legal, Facilities & Fleet, Communications, Emergency Management, and others to align and coordinate activities and employee engagement.

III. ASSOCIATED RISK EVENTS

A. Emergency Preparedness and Response

EP&R is a CFF affecting all seven of SoCalGas's 2021 RAMP Risks: Incident Related to the Medium Pressure System (Excluding Dig-in), Incident Related to the High Pressure System (Excluding Dig-in), Incident Related to Storage (Excluding Dig-in), Excavation Damage (Dig-In) on Gas System, Incident Involving an Employee, Incident Involving a Contractor, and Cybersecurity. Operational disruptions have the potential to adversely affect the health and safety of the workforce or the general public, may negatively impact operations, and/or Company assets. SoCalGas's ability to reduce the impact or likelihood of occurrence of events is achieved through implementing a comprehensive set of capabilities using EP&R programs and projects that align with the National Preparedness Goal. SoCalGas has two levels of emergency management support:

- Field response for isolated local emergencies or incidents (*e.g.,* dig-ins) managed with district/area resources.
- Regional EOCs that support larger emergencies and significant events (*e.g.,* earthquakes, mudslides, wildfires) that may involve a large number of customers across regions or an event that may require the coordination and communication with multiple internal and/or external organizations (*e.g.,* fire, police, etc.), including mutual assistance.

B. Pandemic

SoCalGas implemented various policies and programs to address health and safety concerns of the Company's employees and customers associated with the COVID-19 pandemic while continuing to provide safe and reliable energy services. These measures provided continued safe working environments for SoCalGas's office and field employees and have been modified, as appropriate, based on federal and state guidelines as well as feedback from

employees, management, and union representation. The level and duration of these programs and activities will be adjusted to align with the level of risk.

IV. 2020 PROJECTS AND PROGRAMS

EM programs and/or projects are segmented below to align with the five areas of the FEMA's National Preparedness Goal: Prevention, Protection, Preparedness, Response, and Recover. There is one additional program, "enabling technology," which supports all aspects of EP&R.

A. EP&R: Prevent & Protect

Prevent & Protect factors revolve around the capability to avoid, prevent, or stop a threat or risk before it is realized. As a means to align with the overall structure of SoCalGas's 2021 RAMP, programs and projects associated with Prevent and Protect are outlined in the Physical Security CFF (CFF-5).

B. EP&R: Preparedness

Preparedness is any activity, program, or initiative that is put in place before an emergency and can be used to support and improve the response to an emergency, thereby reducing the impact of the event. The following controls are all related to preparedness.

1. Policies and Procedures

SoCalGas has a Gas Emergency Management Preparedness and Response Policy that serves as the foundation of the policies and procedures in place for how SoCalGas prepares for, responds to, and recovers from emergencies. This policy utilizes and is up to standard with the emergency response requirements imbedded in Public Utilities Code Section 961, as well as the emergency response standard procedures listed by 49 Code of Federal Regulations § 192.615.

Additionally, the EOC Resource Guide provides SoCalGas with a clear understanding of procedures, roles and responsibilities to manage emergency crisis situations and other related incidents that may disrupt operations. These procedures should be considered as a guide to help inform priorities and establish clear lines of authority but are not absolute in nature. Furthermore, this guide can be utilized to familiarize staff on EOC functions and position roles and responsibilities prior to an incident as well as provide guidance during an actual EOC response to an incident.

In addition to the Resource Guide, SoCalGas also conducts regular Business Continuity Planning to provide continuous operation or resumption of critical functions in the event of a

major disruption. As of 2020, there are 46 Business Continuity Plans completed, and annual workshops are conducted to refine and enhance these plans.

In addition, facilities with ten or more employees have an Emergency Action Plan (EAP) that provides for the safety of employees during emergencies and complies with state and federal guidelines. The EAP describes the roles and responsibilities of employees and Emergency Response Teams during workplace emergencies.

2. Training, Exercises and Drills

Training. SoCalGas conducts regular emergency preparedness drills and exercises at various levels of the Company to enhance employee proficiency in emergency assignments and validate the effectiveness of emergency plans. These exercises may include external agencies and cover a wide range of emergencies, including threats to employee, public, and pipeline safety. The effectiveness of the response is evaluated following these emergency exercises via an after-action report or through an improvement plan, where corrective actions are identified. These may include plan or process revisions, training and drills, including collaboration with external agencies and organizations, and lessons learned.

Additionally, SoCalGas emergency responders are required to complete FEMA training consistent with their assigned responsibilities. This training may include Incident Command System (ICS) and/or first responder training for field management personnel that may respond to emergencies. In addition to ICS training, SoCalGas invests in On-Call Training, Message Center Reporting (MCR) training, and EOC Responder Training.

On-Call staff are trained to respond to any emergency within an hour of activation. During the period they are on-call, they are required to be reachable by telephone, radio, or pager and are required to both stay in the SoCalGas service territory. Training enables employees to more readily respond to emergencies and allows for the rapid response of controls to lessen the impacts of a disaster.

EOCs are activated during major incidents, and employees who respond follow protocols in the Operations Emergency Manual. Training employees on those procedures and familiarizing them will enable employees to fit into the ICS structure and create a command capability to assess and respond to hazards.

SoCalGas developed its MCR program to provide employees an efficient way to communicate regarding an incident that has taken place. Training is provided to all management

employees with the potential to open an MCR. It is utilized to communicate timely and factual information to internal stakeholders. That information is reviewed and verified by EM, Pipeline Safety & Compliance department personnel, and Environmental Department personnel, who determine reporting requirements to government agencies. When an incident occurs, the responding supervisor will initiate an MCR by contacting the dispatch office, and a chain of further communications is set in motion until the incident is closed. In 2020, EM held 15 sessions and trained 415 management employees. This training is typically conducted in-person, however, due to the COVID-19 pandemic, SoCalGas shifted to a virtual training process. Through continuous improvement methods, SoCalGas identified a way to use Microsoft Teams to continue training while meeting Company and government physical distancing guidelines.

Exercises and Drills. The departments involved in emergency operations conduct annual exercises to maintain employee readiness and proficiency in their emergency assignments and validate the Organization's emergency plan. Training includes:

- Tabletop: Participants walk through potential emergency situations, discussing and describing the actions they would take.
- Functional/Full Scale-Exercises: Participants engage in Company-wide scenarios that provides hypothetical emergency information to the participants at intervals for decision-making and action as the exercise progresses.
- Drills: Personnel engage in drills to test their emergency response and decision making specific to their departments and organizations.

Emergency Management is responsible for identifying groups to plan, organize, conduct, and critique exercises, with support from other departments. Where appropriate, exercises may be coordinated with local public service agencies and include the element of surprise to more closely simulate actual emergency conditions.

3. EP&R: Stakeholder Outreach

SoCalGas conducts a robust outreach program with first responders on a routine basis. The Emergency Management department, in conjunction with Regional Public Affairs and operations departments, conducts outreach to meet with first responders (*e.g.,* fire, police and emergency officials) to discuss pipeline safety and communication.

These first responders may also participate in Company drills and exercises both as participants and observers.

SoCalGas's service territory encompasses twelve counties, each with designated emergency county coordinators. On an annual basis, a representative from EM or a delegate will meet with each county coordinator to discuss pipeline safety and awareness.

SoCalGas maintains a public awareness program to inform and educate customers, affected members of the public, pertinent public officials, and persons engaged in excavation-related activities about the prevention and recognition of gas pipeline emergencies. This program (discussed further in SCG-2: Excavation Damage (Dig-In) on the Gas System Risk) also includes the process for reporting an incident to SoCalGas and the appropriate public officials, including first responders.

C. EP&R: Response

SoCalGas's response program is built to address the immediate and short-term effects of an emergency. The Company's capabilities are designed to prioritize the safety of the workforce and public during a response and protect assets.

1. Incident Command System

The ICS is a standardized approach to incident management that can be used for all kinds of events, by all organizations, and enables a coordinated response, consistent processes, and allows for the integration of internal and external resources within a common structure. This has become an industry standard for responding to incidents and is also universally used across the public sector and at all levels of government in responding to hazards. SoCalGas uses the ICS to guide EP&R activities, thereby reducing risk through the application of the following tenets:

- **Chain of Command and Unity of Command.** Promotes a clear line of authority to set priorities and objectives during the incident.
- **Common Terminology.** Using common terminology helps to define organizational functions, incident facilities, resource descriptions, and position titles. When all individuals across the response organization are using common terminology, roles and responsibilities are quickly understood and the right resources are identified and assigned efficiently.
- **Integrated Communications.** Incident communications are facilitated through the development and use of a communications plan to provide consistent messaging in alignment with operations and addresses the unique needs of stakeholder groups.

A key component of ICS is the use of standardized positions to help manage the response consistently, where individuals have familiarity with their expected roles and responsibilities. The following are just two examples of ICS positions and duties:

INCIDENT COMMANDER

- Oversees and assesses the overall event and response
- Establishes immediate priorities and sets incident objectives, strategies, next steps
- Mobilizes an appropriate response organization
- Coordinates with key staff and officials
- Approves requests for resources and release of resources
- Authorize the release of incident information for internal and external sources

PLANNING SECTION CHIEF

- Manages activities and provides policy guidance to Planning section
- Oversees resource assignments, notifications and activations
- Oversees documentation, reporting and situation status report dissemination
- Provides notifications to state and local agencies
- Provides incident response guidance to Incident Command
- Facilitate mutual assistance requests

Adopting the ICS structure and processes allows SoCalGas to align its emergency response and support operations by using a standardized approach to the command, control, coordination, and emergency management best practices.

2. Mutual Assistance

SoCalGas maintains mutual aid agreements and membership in the Western Regional Mutual Aid Group, California Utilities Emergency Association, American Gas Association, and the City of Long Beach. When member organizations require assistance, they can request it through official channels, and resources from other organizations will assist in the response. By being a part of mutual aid organizations, SoCalGas shares resources with other organizations and shares capabilities to respond to emergency events. In the last two years, SoCalGas responded to six mutual assistance calls to help restore the functionalities of different organizations. SoCalGas benefits by having workers gain experience in responding to different events, enhancing preparedness should a similar SoCalGas event occur. SoCalGas's involvement with

these groups will also make resources available to the Company in the event SoCalGas needs assistance. Mutual Assistance will continue to be performed by SoCalGas as the Company continues building a coalition of resources ready to support in response to disasters and emergencies.

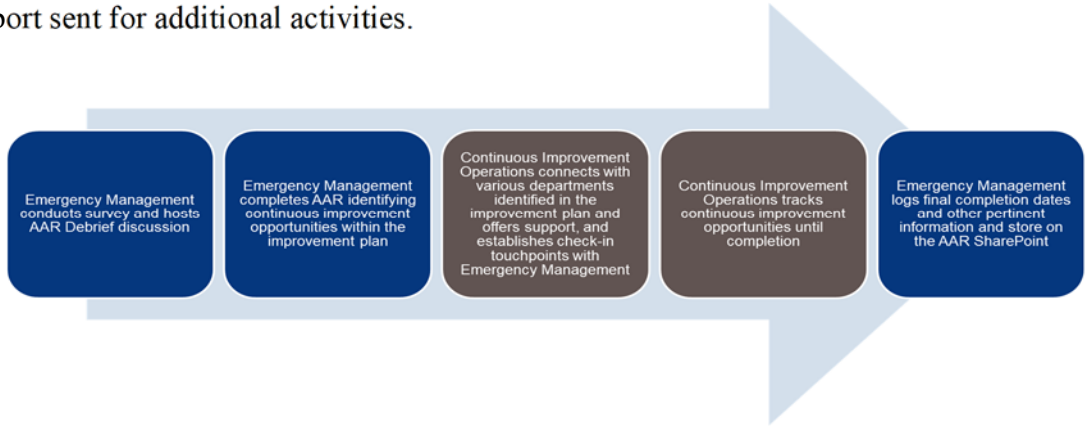
D. EP&R: Recover

The recover area is described as the long-term and post-emergency initiatives that are used to return the business and community back to normal, or in a better state than before the disaster. This includes the analysis and advancement of current procedures and initiatives after a disruption to improve upon the current state. This process is also an ongoing measure that continuously enhances readiness in preparation for the next emergency.

1. After Action Review Program

SoCalGas's After-Action Review (AAR) Program is built on FEMA's guidance to have a system that can assess the Company's responses, take the lessons learned, and take corrective action for continuous improvement opportunities. These include plan or process revisions, training and drills, analysis on collaboration with external agencies, and lessons learned. We take this approach of continuous improvement of capabilities and benchmark Company procedures with industry standards.

SoCalGas has an AAR procedural flowchart manual that guides when and how we conduct AARs. Activations of AARs can be initiated by any executive, at the discretion of the Emergency Management office, after drills/exercises, and for any ICS activation that is a Level 2 or higher. Data is then gathered and input into the Company's continuous improvement processes to identify areas of improvement, establish check-ins and touch points with stakeholders involved, and present findings to leadership. A debrief is then conducted and a report sent for additional activities.



The AAR program facilitates continuous improvements by providing constructive feedback into the Company's internal processes. This allows SoCalGas to be an even more responsive and forward leaning organization, and better equipped to handle future disasters by implementing the lessons learned into Company processes.

E. Enabling Technologies (Crisis Communication)

SoCalGas recognizes the benefits of enhancing the use of technologies to help prevent/protect, respond to, and recover from emergencies. The use of technology enables access to quicker and more accurate data to support decision-making capabilities and allow the Company to communicate and respond more effectively during an actual crisis.

1. Crisis Communication Technology

SoCalGas recognizes that communications during a crisis are critical to organizing, establishing priorities, and sharing information with key stakeholders. Current capabilities include technology for Emergency Response Command Centers and a Satellite Communication Program. Emergency Response Command Centers are equipped with technology that provides high-speed internet access, enabling mobile communications and providing the flexibility for SoCalGas first responders to stay connected throughout the duration of an emergency in any area of the service territory. The mobile command center also has a 12,500-watt generator, restroom and kitchenette, five workstations, satellite internet and mobile hotspot capabilities, cable TV, a public address system and on-demand printer and plotter. In the Satellite Communication Program, SoCalGas currently maintains over 140 satellite phones that are located at Company facilities. These satellite phones are intended to support emergency events where traditional methods of communications like a cell phone or landline are not available. When a damaging wildfire or earthquake happens, operating directors and executives can use their satellite phones, which enables them to report, communicate, and support emergency response and recovery. To expand upon current capabilities, SoCalGas is committed to enhancing its mobile command centers, increasing the number of satellite phones, and acquiring Government Emergency Telecommunications Service cards to improve communications and coordination of responses. This will enhance the Company's disaster response communication capabilities, and thus facilitate critical communication that will organize resources to address disasters.

F. Pandemic: Public Health Safety

1. Public Health: PPE and Sanitation Supplies

A major pandemic supply chain risk has been adequacy of essential PPE, materials and equipment to provide PPE to employees and contractors. Establishing a reserve inventory of PPE and essential materials and equipment, as well as building out a procurement infrastructure that can adequately source supplies during emergencies, is crucial and will help make SoCalGas more effective in emergency response, especially for longer duration emergencies.

2. Public Health: Facilities

a. Additional Cleaning Services

Due to the biohazardous nature of the pandemic, SoCalGas added additional cleaning services for all facilities. An electrostatic disinfecting process for surfaces is currently being used. SoCalGas has also increased the frequency and scope of cleaning. This has led to more frequent cleanings and disinfecting of all high-touch surfaces throughout the day, and deep cleaning whenever needed.

Having this capability allows for SoCalGas to be more prepared for another hazard that requires frequent and deep sanitation.

b. Installation of HVAC and Filter Systems

Another measure that SoCalGas took to protect employees and contractors was to upgrade HVAC systems and install filters that align with CDC guidelines. SoCalGas converted the air filters in Company facilities to high-efficiency MERV 13 filters and installed air sanitizing equipment in facility air-conditioning units. Additionally, SoCalGas increased preventative maintenance of filtration systems and filter replacements by 50%. SoCalGas also implemented structural changes to increase the amount of outside air being circulated throughout Company buildings. These changes to SoCalGas's maintenance activities elevate the level of the Company's preparedness for any hazards affecting the air we breathe.

c. Additional Physical Enhancements

In addition to the HVAC and filter system changes, SoCalGas also implemented structural changes to some facilities. To reduce the impacts of the pandemic, plexiglass partitions and other pandemic-specific barriers have been installed throughout Company facilities. This protects employees and contractors by creating physical separation between people.

3. Public Health: Medical Services

a. Third-Party Vendors for Temperature Screening

During the pandemic, SoCalGas hired contractors to regularly conduct onsite temperature and COVID-19 symptom checking for employees, contractors, and visitors at critical facilities. This is done to maintain the safety of all who visit our facilities.

b. Purchasing Rapid Antigen Testing Kits

In addition to symptom checking and temperature screening, SoCalGas also invested in purchasing Rapid Antigen Testing kits and contracted with healthcare workers to administer such tests. These rapid nasal swabs return COVID-19 test results quickly and can help SoCalGas contain any potential spreads of the disease within Company facilities.

c. Hiring Contact Tracing Staff

SoCalGas hired third-party vendors to conduct contact tracing in the event employees or contractors tested positive for COVID-19, and to help the infected individuals quarantine and self-isolate in accordance with CDC guidelines.

d. Expert Medical Consulting

Since the beginning of the pandemic, SoCalGas has retained a medical professional/ director to serve as an expert on the pandemic to provide operational guidance. This capability allows SoCalGas to have direct access to experts in the field to assist with decision-making so that SoCalGas can best handle medical risks.

In the event of a potential pandemic exposure, a third-party safety consultant is brought onsite. This consultant will assess that there is proper PPE and that technicians can don/doff PPE properly. In an emergency event, even after the pandemic, having access to a safety consultant will provide SoCalGas with an additional resource who is specifically trained in biohazard disasters.

e. COVID-19 Self-Screening

The COVID-19 self-screening attestation process is the daily process of confirming that employees have self-screened for COVID-19 symptoms and exposure, and requires employees attest to their readiness to enter a SoCalGas facility or worksite. Since the pandemic began, SoCalGas has required anyone entering a Company work location to self-screen by asking themselves the provided self-screening questions before entering. These questions have become standard not only at SoCalGas, but in many other businesses, schools, and public spaces

(consistent with CDC, state, county, and local public health guidelines). In addition to providing the self-screening questions, SoCalGas developed and implemented SAFE, a web-based application which is accessible through any smart device (*i.e.* phone, tablet, computer) with an internet connection. This application allows employees and onboarded contractors to provide responses to the self-screening questions and alerts the necessary departments if follow-up is necessary.

4. Public Health: Fleet

a. Sanitizing Vehicle Fleet

Since the beginning of the pandemic, SoCalGas has implemented a COVID-19 protocol established by its Safety and Fleet Services departments for cleaning and disinfecting Company-owned/ operated vehicles and trucks that have been used by employees or contractors that have either tested positive for COVID-19 or been in contact with someone who tested positive for COVID-19. The thorough cleaning of the vehicles both prevents the further spread of COVID-19 and reduces the overall risk of the disease to those who utilize the Company owned/ operated vehicles.

Even after the pandemic, this disinfection protocol can still be used for non-pandemic hazards that may contaminate the vehicles.

b. Alternative Site Work Trailers

To adhere to physical distancing protocols and limiting the number of employees working within a facility, additional work sites such as trailers may need to be set up. SoCalGas has the capability to rapidly set up these worksites to either accommodate employees or contractors/ vendors. This also includes equipment and maintenance to allow these worksites to function independently for multiple days, 24-hours a day. For example, this involves housing Gas Control staff at a Company facility, if this team is sequestered on site for two-week assignments and does not leave the premises. This capability can reduce the impacts on business continuity and allow employees to continue to work safely.

5. Public Health: Hybrid and Remote Work

a. Pandemic Dashboards and Tracking Technology

To better coordinate the response and address budding or potential risks, SoCalGas is working to develop a Pandemic Dashboard/Tracking System. This system will be used for data analytics, case management, and business objects contact tracing. A dashboard that can

aggregate and then segment data for analysis is crucial in SoCalGas's ability to both prevent outbreaks and respond to situations more effectively by providing decision-makers with the most accurate and up to date information.

b. Pandemic Planning

Pandemic planning is crucial to enhance SoCalGas's ability to prepare for both the pandemic and future similar disasters. These plans reduce risks to the organization and create the standard operating procedures used to respond to a disaster and to facilitate business continuity for stakeholders.

c. Remote Work Setup

Due to the pandemic, many employees transitioned to work-from-home. SoCalGas set up infrastructure to maintain equipment and added support capabilities, such as furniture and supply stipends to pay for home office supplies. These activities help employees to work from home by providing the services and support they need to continue doing their jobs safely and effectively during the pandemic.

d. IT Systems and License

In addition to the physical support for employees and contractors working remotely, SoCalGas also augmented information technology infrastructure. This has enabled secure remote access and other support equipment to provide employees and contractors with a secure connection to continue their work. These pieces are crucial in business continuity as work is still able to be completed while working remote.

e. Vacation/Sick Leave Policies

SoCalGas is committed to providing a safe and healthy workplace while supporting employees who are impacted by the COVID-19 pandemic. SoCalGas understands that the COVID-19 pandemic is an unprecedented event that is impacting employees in various ways. Accordingly, SoCalGas implemented a policy was to alleviate some of the stress and financial burden that may result from this event. The policy provides paid time off for eligible employees who need to take time away from work for reasons stemming from the COVID-19 pandemic and modifies when employees can use their sick extended leave before using their current or carry over sick leave accruals to sustain pay.

V. 2022 – 2024 PROJECTS AND PROGRAMS

A. EP&R: Watch Desk

SoCalGas's existing MCR program was developed to provide the Company with an efficient way to send a communication regarding an incident that has taken place. Training is provided to all management employees with the potential to open a Message Center Notification. It is utilized to communicate timely factual information to internal stakeholders; that information is reviewed and verified by Emergency Management, Pipeline Safety & Compliance, and Environmental personnel who will determine reporting criteria to government agencies.

In 2020, Emergency Management held fifteen sessions and trained 415 management employees. This will enable the MCR to run efficiently and effectively respond to future emergencies. By expanding the MCR, SoCalGas is preparing to establish a daily Watch Desk that will provide real-time data to increase situational awareness of hazards, create executive notifications, and provide predictive analytics capabilities to help anticipate where a future disruption may arise. This capability will enhance response capability and allows SoCalGas to address potential risks before they happen and take a forward-leaning posture for our emergency response.

B. EP&R: Expert Advisory Support

SoCalGas will leverage external advisory support services and expertise for guidance to help inform how to best handle risks and apply leading industry practice. These advisors may help to inform training and exercise activities, or update policies and procedures. Several examples include:

- Using meteorology services to inform gas operations, crew safety, and help predict impacts from severe weather. Utilizing a meteorologist will allow SoCalGas to prepare for incoming adverse weather events more effectively and accurately. This will improve preparedness capabilities and allow SoCalGas to effectively respond to incidents.
- Gaining insight from Dr. Lucy Jones, formerly from U.S. Geological Survey (USGS) to assist with earthquake preparedness.
- Employing medical professional services to help manage our COVID-19 response.

- Expanding our use of Geographic Information Software (GIS) mapping support and ICS coaches to help enhance our emergency response.

C. EP&R: EOC Enhancement Project at Pico Rivera

The SoCalGas EM department is housed in the EOC, which is currently located at the Gas Company Tower and has a capacity of approximately twenty people. The vision for the department is to be an industry leader in emergency preparedness, response, and management through the enhancement of existing programs and use of innovative technologies, partnering with key stakeholders, and integrating best management practices for the protection of employees, customers, public safety and the environment. Moving the EOC to Pico Rivera, which is a more central location within SoCalGas's service territory, will give the EM department more space and capabilities to house more responders when fully activated for an incident. While activated during emergencies only, the new EOC will house sixteen full-time day-to-day employees, and up to 68 employees, when fully activated.

SoCalGas developed and maintains an EOC for use during significant emergencies to allow Company employees to efficiently collaborate and take appropriate action for the response to that emergency. During an EOC activation, over 50 subject matter experts may be brought into the EOC from across the Company, to provide strategic direction, coordination, and to facilitate all aspects of the emergency response throughout the event duration.

The EOC is the hub from which incident management, response, and communication is coordinated and/or directed. As such, the EOC serves a critical support function to allow SoCalGas to respond effectively and efficiently to hazards it may encounter, thereby protecting the safety of its employees, stakeholders, customers, the public, contractors, and any other resources or individuals in its service territory.

D. EP&R: Emergency Management Technology

Currently, SoCalGas is utilizing and expanding its use of different technologies to track and boost situational awareness for emergency management. GIS is currently used to provide the EP&R organization with geographical data, mapping, facilities analysis, and even storage and retrieval of data. SoCalGas also utilizes an external tool called Data Capable, which the EP&R On-Call team uses to assist with awareness of incidents and situational monitoring. It provides alerts and notifications of significant events, such as wildfires and planned demonstrations. Data Capable offers a dashboard displaying relevant incidents impacting

SoCalGas employees and/or facilities. Another tool currently used by SoCalGas is the Incident Management System. This platform provides tracking of day-to-day incidents for internal and external reporting purposes. The incident management system allows for the creation of a situation record enabling teams with reporting responsibilities to store incident critical information such as Operations assessments, activation documents, with real-time integration with GIS for mapping incident locations.

To further expand the Company's capabilities, SoCalGas intends to enhance the capabilities of a multi-year Company-wide situational awareness software tool, Noggin. Noggin supports mission-critical functions of the EOC and gas operations. The system is a single platform to track, coordinate, and communicate information related to incidents during and after an event.

SoCalGas also plans to obtain command vehicles for its Emergency Command Vehicle Centers. SoCalGas utilizes emergency command vehicle centers to support incidents in the field. These centers provide field employees and first responders a place to conduct meetings and provides them with access to communication tools (*e.g.,* phone, satellite, and internet) and mapping and printing capabilities. The command vehicles will be used to tow around the Emergency Command Vehicle Centers, providing an expedited delivery to Company facilities or to the location of an incident.

VI. COSTS

A. EP&R

Table 1 contains the 2020 recorded and forecast dollars for the programs and projects discussed in this CFF.

Table 1: Costs (Direct After Allocations, in 2020 $000)[2]

Line No.	Description	Recorded		Forecast			
		2020 Capital	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
1	Policies & Procedures	0	85	0	0	105	130
2	Training, Exercises, and Drills	0	85	0	0	105	130
3	Stakeholder Outreach	0	85	0	0	105	130
4	Incident Command Structure	0	230	0	0	290	355
5	Mutual Assistance	0	20	0	0	20	20
6	After Action Review Program	0	250	0	0	315	385
7	Crisis Communication Technologies	0	250	0	0	315	385
8	Watch Desk	0	0	0	0	760	1,100
9	Expert Advisory Services	0	0	0	0	175	255
10	EOC Enhancement Project	0	0	0	0	180	260
11	Emergency Management Technology	0	0	0	0	700	910

B. Pandemic

Because of the unique characteristics of the current and any future pandemics, SoCalGas does not include forecast pandemic related costs.

[2] Costs presented in the workpapers may differ from this table due to rounding. The figures provided are direct charges and do not include Company loaders, with the exception of vacation and sick. The costs are also in 2020 dollars and have not been escalated in forecasts beyond 2020.

Risk Assessment and Mitigation Phase Cross-Functional Factor

(SCG/SDG&E-CFF-4)

Foundational Technology Systems

May 17, 2021

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CROSS-FUNCTIONAL FACTOR: FOUNDATIONAL TECHNOLOGY SYSTEMS

I. INTRODUCTION

This Foundational Technology Systems Cross-Functional Factor (CFF) Chapter describes how Foundational Technology Systems activities impact the risks described in Southern California Gas Company's (SoCalGas) and San Diego Gas & Electric Company's (SDG&E) Risk Assessment Mitigation Phase (RAMP) risk chapters.

SoCalGas and SDG&E (the Companies) present CFF information in this RAMP Report to provide the Commission and parties additional information regarding the risks and mitigations described in their RAMP risk chapters. CFFs are not in and of themselves RAMP risks. Rather, CFFs are drivers, triggers, activities, or programs that may impact multiple RAMP risks. CFFs are also generally foundational in nature. Therefore, SoCalGas and SDG&E's CFF presentation differs from their RAMP risk chapters (*e.g.*, no risk spend efficiency calculations or alternatives are provided). SoCalGas's and SDG&E's CFF chapters provide narrative descriptions of the CFF projects and programs that impact multiple SoCalGas and SDG&E RAMP risk chapters through the 2022-2024 timeframe. Related cost forecasts are provided as available, consistent with an expected test year (TY) 2024 general rate case (GRC) request.

As described below, Foundational Technology Systems is an enterprise-wide framework that provides a standardized approach for managing risk and safety across assets and activities. Therefore, the Foundational Technology Systems CFF spans multiple business lines and helps to mitigate several RAMP risks in this Report.

II. OVERVIEW

Foundational Technology Systems are necessary to provide safe and reliable service to the public. These systems are used in every aspect of operations, customer engagement, and emergency response. These systems include a significant portion of each company's software application systems, communication networks, monitoring systems, end-user systems, and hardware and software platforms hosted in data centers and on internal and external cloud platforms. The safety and reliability of operations depend on Foundational Technology Systems; thus, it is critical for these systems to be resilient and recoverable.

Three factors create a continuing need to invest in Foundational Technology Systems:

(1) Technology systems have become the foundation for operational, business, and customer engagement needs across the enterprise, where even the most routine tasks rely on an interdependent network of systems and services.

(2) Technology can quickly become obsolete and often requires lifecycle management activities such as maintenance, upgrades, and replacements to remain reliable and secure. Neglecting these activities may result in downstream impacts, performance issues, and/or security vulnerabilities.

(3) The industry is faced with constantly evolving threats from both domestic and foreign adversaries, as well as supply chain risks, third-party and insider threats, and natural hazards. Collectively, the dependency on technology systems, the pace of technology obsolescence, and the dynamic nature of technology threats, hazards, and risks requires that the Companies evaluate and leverage the latest solutions on the market and constantly adapt to securely, safely, and reliably provide services to the workforce and customers.

The initiatives associated with Foundational Technology Systems discussed herein work to reduce the frequency and consequences of technology-related system outages.[1] Technology outages can be caused by drivers such as ineffective processes, hardware malfunctions, legacy system infrastructure issues, natural disasters, power outages, software failures, or human error. A technology outage can have varied consequences to safety, business operations, customer service, and system reliability.

SoCalGas and SDG&E have identified three tenets – Resiliency, Recovery, and Lifecycle Management – that represent the Foundational Technology Systems initiatives outlined in this chapter, as described below:

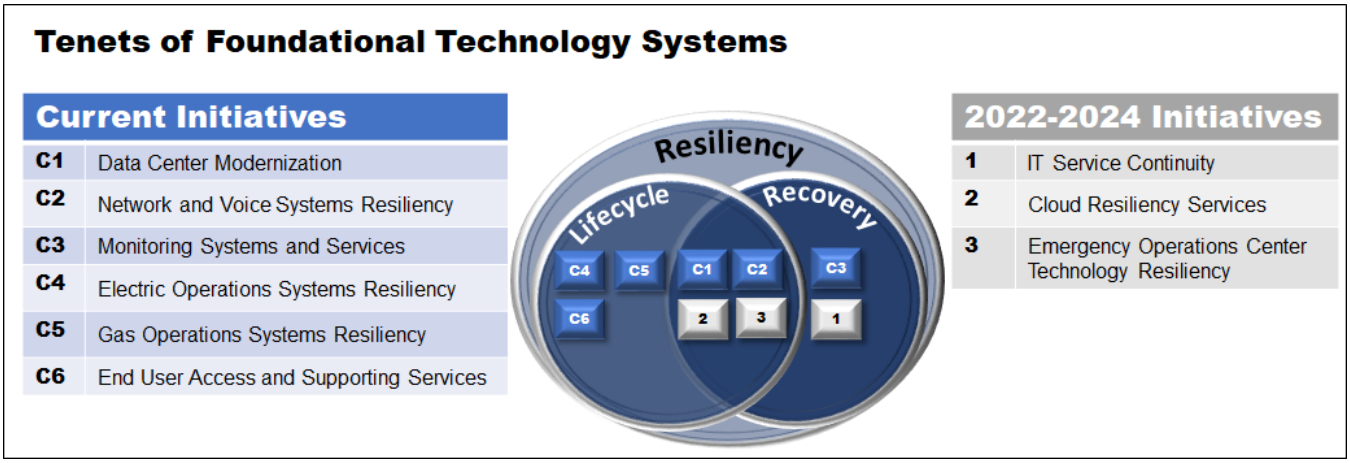
- **Technology resiliency** includes architectures, technologies, and processes for applications and infrastructure that focus on being prepared for any type of disruption – planned or unplanned – to mitigate the risk of downtime.

[1] The term "outage(s)" is used throughout this document interchangeably in reference to prolonged or extensive outages related to technology systems.

- **IT disaster recovery** is the ability to quickly recover systems and data after a disruption. Resilient systems and recovery work in tandem because increased resiliency reduces potential impacts and diminishes recovery implications.
- **Lifecycle management** is the holistic approach to maintenance, upgrades/replacement, and the planning process to ensure systems continue to operate as intended or to transition or retire legacy systems.

Figure 1 below shows the relationship between these tenets and the initiatives.

Figure 1



III. ASSOCIATED RISK EVENTS

Technology system outages can impact the frequency or consequences of the Companies' RAMP risks or Cross-Functional Factors and the ability to provide safe and reliable service. Foundational Technology System risks are not limited to one risk or risk event but rather impact several risks contained within this RAMP report. Given the varying degree by which an outage can impact the Companies' risks, only the risks that rely most heavily on technology systems are highlighted in this section.

- **Wildfire** - Wildfires Involving SDG&E Equipment, addressed in RAMP chapter SDG&E-Risk-1, may be more likely to occur without the use of monitoring tools dependent on Foundational Technology Systems. For example, SDG&E has various situational awareness programs that use advanced technologies to monitor weather conditions to evaluate the fire potential in SDG&E's service territory. If these situational awareness programs (*e.g.*, weather monitoring applications, cameras, and dashboards) did not operate or function as intended, there could be

adverse consequences. Unmonitored equipment failure due to outages in electronic monitoring and data management systems could cause ignitions and wildfires. For example, SDG&E uses critical software applications to track vegetation growth in relation to the electric infrastructure. One particular application supports all orders for vegetation management work and facilitates monitoring and response to vegetation-related events. SDG&E's wildfire mitigation programs, therefore, are susceptible to the overall health of Foundational Technology Systems.

- **Emergency Management and Climate Change Adaptation -** The inability to utilize electronic communication methods during a wildfire could inhibit a coordinated internal or external response to an event, which could create safety implications for the public and the workforce. Various emergency notification systems allow the Companies to alert customers and public safety partners regarding important safety notices. As discussed in the Wildfire section above, SDG&E's Weather Awareness System, dashboards, and other meteorology applications provide real-time situational awareness necessary for efficient wildfire response. For any activation, including wildfire response and Public Safety Power Shutoff (PSPS) events, the Emergency Operations Center (EOC) relies on critical safety and monitoring systems. During emergency events, the EOC's function could be impaired due to a technology outage.
- **Records Management, Enterprise Asset Management, Dig-ins, and Gas Incidents -** The availability and accessibility of accurate electronic data across the Companies can be affected during an outage. Many operational procedures depend on real-time data in order to conduct safe operations. If a technology outage were to occur, the lack of accessible data may result in an increased frequency of dig-in incidents, as accurate asset information is important to efficiently perform locate and mark activities. Enterprise Geographic Information System (GIS) is one example that uses asset records and data such as equipment type or valve position (open or closed) to create digital maps. These tools enable field personal to layer-in additional information onto the map, such as roads and facilities. During an outage, if employees in the field cannot access these

systems, marking of underground electric and natural gas facilities become inefficient and potentially less accurate. The underground service alert ticket management system allows excavators to request a callout for utilities, this technology coupled with the mobile GIS application reduces the likelihood of a dig-in. For electric transmission and distribution, GIS includes the electric connectivity model that feeds the electric network management application, allowing for the safe and reliable operation of the electric system. If these critical systems were unavailable, it could impact the performance of gas and electric operations at both Companies.

- **High-Pressure System Incident -** An outage could also increase the impact related to the Companies' Incident Related to the High-Pressure System RAMP risk chapters. As discussed in RAMP chapters SCG-Risk-1 and SDG&E-Risk-3, these risks are defined as the damage caused by a high-pressure pipeline that results in serious injuries, fatalities, and/or damage to the infrastructure. Pressure monitoring systems proactively detect operational issues to prevent safety incidents on the gas system. An incident on the high-pressure system could have exacerbated safety consequences if the incident is not detected using Foundational Technology Systems. Remediation and response efforts after high-pressure incidents during an outage could be hindered without access to supporting applications.
- **Gas Storage Incident -** SoCalGas's gas storage system's monitoring capabilities could be affected and require human intervention during a prolonged outage. SoCalGas utilizes advanced leak-detection technologies and practices that allow for early detection of leaks, helping to quickly identify anomalies. SoCalGas monitors the pressure of wells around-the-clock.. In addition, real-time wellhead gas monitors for leak detection and upwind/downwind ambient monitoring and SoCalGas meteorological stations are maintained using Foundational Technology Systems.
- **Electric Infrastructure Integrity -** Electric Infrastructure Integrity could be compromised as a result of an outage. As explained in RAMP chapter SDG&E-Risk-2, the Electric Infrastructure Integrity risk is defined as the risk of an asset

failure, caused by degradation, age, or operation outside of design criteria due to unexpected events or field conditions. The safe operation of electric infrastructure depends on many technological tools and applications for asset monitoring and awareness in the field. For example, SDG&E's outage and distribution management systems are systems used by distribution operators to support safe operations related to outage restoration. Supervisory Control and Data Acquisition (SCADA) provides operational data from electric assets in order to proactively monitor for and remediate asset failure. SCADA reduces the need for field personnel to perform manual operations, thus minimizing the safety risks to employees and/or contractors.

IV. 2020 PROJECT AND PROGRAMS

A. Data Center Modernization

This initiative enhances the data center infrastructure and applications to improve the recoverability, resiliency, and availability of the Companies' business systems. A data center is a physical location (facility) that houses networked (connected) information technology (IT) infrastructure, such as servers, and is primarily used to receive, store, process, and transmit large volumes of data. For example, a data center is used to store customer account data and process customer billing. Activities in this initiative relate to all three tenets of Foundational Technology Systems – resiliency, recovery and lifecycle management enhancements and upgrades.

Aging and overly complex system infrastructure can increase the probability of outages. The Data Center Modernization initiative focuses on simplifying and standardizing the Companies' data center infrastructure to reduce risks related to aging and obsolete systems and drive resilient operations. Part of a resilient data center strategy includes creating a secondary data center to mitigate effects of a natural disaster and minimize recovery time during outage events. Also, part of this strategy is to ensure data and system capacity requirements are met and easily scalable as needed.

Data center modernization improves and secures our data center network by isolating and separating each of the Companies' workloads, limiting the spread of the impact to the rest of the systems. It also improves the core hardware and simplifies the network design for the new server environment. In addition, an upgrade and expansion to the current backup and recovery

systems further enhances the recoverability of applications and systems at the secondary data center.

B. Network & Voice System Resiliency

This initiative enhances network and voice systems through maintenance and improved functionality. As a result, the risk of communication failures or lack of communication in remote locations of the service territory is reduced. Activities in this initiative are associated with the tenets of resiliency, recovery and lifecycle management enhancements and upgrades.

Networks are foundational at the Companies and enable the operation of key safety and reliability capabilities. In the event of an operational emergency, the inability to communicate in remote sites could inhibit the Companies' ability to receive information and respond to incidents. As part of this initiative, critical communication infrastructure and systems in the data center and in remote worksites leverage maintenance and improved functionality. The improvement of network and voice functionality minimizes the safety and operational risks associated with the inability to communicate in areas of the service territory without access to commercial cell coverage. For example, the implementation of a private Long-Term Evolution (LTE) network in SDG&E's service territory enables crews working in remote locations to remain connected to operations. Additionally, dispatch systems rely on technology to operate and communicate with employees. An outage may prevent the Companies from dispatching employees in a timely manner or responding to customer requests.

The Customer Contact Centers, which require a very robust and resilient network and phone systems, are also enhanced as part of this initiative. It is essential that customers can contact a call center to report safety-related and time-sensitive situations. Network issues impacting voice and Customer Contact Center Interactive Voice Response (IVR) functions can impede the Companies' ability to field safety-related emergency calls from customers. IVR is one of several main channels for enabling self-service for customers. The application acts as a first channel of customer support, so that customer calls are expeditiously addressed. An outage impacting data and communication tools in a contact center may inhibit the Companies' ability to respond to safety issues and meet customers' needs. Upgraded voice, IVR, and data technologies has allowed the Companies to communicate using a global standard to meet current and future communications needs.

C. Monitoring Systems and Services

This initiative enhances the IT system monitoring capabilities and dashboard software used to proactively identify potential issues and allow for early detection, which helps mitigate the risk of outages. Activities in this initiative include resiliency and recovery enhancements and upgrades.

This initiative improves the Companies' critical monitoring system's resilience by creating a failover capability for the system and establishing a framework and foundational capabilities for monitoring systems and applications in the cloud. These capabilities provide identification of network, system, and application anomalies, which allows support teams the ability to identify and potentially prevent an incident. The implementation of application performance monitoring capabilities provides insights into the health and performance of critical applications. This initiative improves the Companies' ability to monitor an application's availability by simulating user transactions against the application.

D. Electric Operations Systems Resiliency

This initiative enhances electric operations resiliency through electric system application upgrades and lifecycle management activities, allowing SDG&E to more effectively manage and operate the electric distribution and transmission grid.

Many critical applications that are used in day-to-day operations on the electric system require upgrades, enhancements, or replacements in order to operate effectively. Several examples are described below:

- Technology and application enhancements impacting the Corrective Maintenance Program (CMP) are made as part of this initiative. Enhancements to the CMP mobile application allows field employees to more effectively perform the CMP function and conduct required electric operations.
- GIS mobile application replacement and enhancement is also conducted as part of this initiative. GIS is used to identify location and specifics of equipment installed in the field, which reduces the incorrect identification and operation of assets.
- The grid management system used by distribution operators to conduct safe operations during outage restoration is linked to the call center and dispatch to predict electric outages and expedite the restoration of power to customers.

Improved integration with the SCADA system provides a number of safety benefits such as outage detection, recloser operation to mitigate fire risk and the de-energization of electrical equipment. This activity is responsible for issuing safety documents used for switching operations.

- Condition Based Maintenance is an application that uses data collected from transformers and other substation monitors to notify maintenance crews of any potential equipment failures/malfunctions. This application is continuously improved as warranted.

E. Gas Operations Systems Resiliency

This initiative enhances the resiliency of gas operations through application system upgrades and lifecycle management activities required for safe operations. These safety systems reduce the risk of gas incidents and improve recoverability after an incident. Activities in this initiative include resiliency and lifecycle management enhancements and upgrades.

Applications that prevent gas emergencies depend on Foundational Technology Systems. The enhancements within this initiative impact multiple applications needed for safe operations. Several examples are described below:

- Field sensors that collect, manage, and present real-time data to monitor the safety of the gas system. Electronic gas pressure monitoring and alarm data is sent to SCADA and stored in a real-time reporting system, where it is monitored by operators and engineers.
- GIS provides field crews with accurate asset information to prevent the incorrect identification and operation of assets and reduce the likelihood of a gas incident.
- SCADA is essential Operational Technology used to manage gas system infrastructure. SCADA allows for the remote operation of devices and data gathering/monitoring. With SCADA operations, there is a decreased need for field personnel to perform manual operations, which reduces employee-related safety incidents.

F. End-User Access and Supporting Services

This initiative enhances the security of Company systems and software by upgrading the tools and technology used for remote access. The threats and risks presented by malicious attempts to access Company systems have the potential to result in major safety, operational, and

business impacts. Activities in this initiative include resiliency and lifecycle management enhancements and upgrades.

The projects in this initiative enable end-users to remotely access the Companies' systems and networks through secure and reliable laptops, desktops, and communication software. Remote access software upgrades enable employees and contractors to securely access virtual desktops remotely to conduct work. Additional context on this initiative tied to end-user access and supporting services is outlined in the Emergency Preparedness and Response and Pandemic chapter (SDG&E-CFF-3), which includes activities associated with the COVID-19 Pandemic response.

V. 2022-2024 PROJECTS AND PROGRAMS

Many of the activities discussed in the 2020 Projects and Program section above are expected to continue during the TY 2024 GRC. For purposes of this RAMP, a project or program that continues, and the size and/or scope of that activity will be modified, is included and further described in the activity for 2022-2024 below.

A. IT Service Continuity

The IT service continuity initiative, along with the Data Center Modernization initiative, will improve the ability of critical systems to recover from outages through better governance and new technology enhancements. Activities in the IT service continuity initiative include resiliency and recovery enhancements and upgrades.

This initiative involves the rollout of a new IT Service Continuity Management program, which focuses on developing the processes for technology resilience. Efficient program design will be essential in allowing the Companies to quickly resume service after an outage. As part of the service continuity strategy development, application and data center recovery processes and business impact analyses (BIA) will be developed to minimize outage impacts based on business priorities. Disaster recovery tests, which improve the ability to respond to an outage, will be conducted as part of this initiative. The maturity of recovery strategy through automation will allow for quick resumption of critical systems. Annual maturity assessments will be conducted as part of this initiative.

B. Cloud Resiliency Services

Cloud technology is the delivery of computing services – including servers, storage, databases, networking, software, analytics, and intelligence – to offer faster innovation, flexible

resources, and economies of scale. Cloud enables the Companies' systems to be more resilient through highly available services, redundant systems, rapid deployment, and a robust suite of automated recovery capabilities across the technology portfolio. Activities in this initiative include resiliency, recovery, and lifecycle management enhancements and upgrades.

The Companies are investing in building cloud foundations, starting with the use of cloud processes, tools, and capabilities that enable resilient cloud-based business applications. Cloud allows the Companies to purchase the exact computing resources required and offers the flexibility to more quickly adjust the amount of resources needed and enables the Companies to capture increased operational efficiency by taking advantage of the cloud platforms' expertise in infrastructure management. In addition, cloud platforms allow the Companies to cost-efficiently take advantage of significant investments in new capabilities made by the cloud providers.

This initiative focuses on foundational components like the high-speed connection to the cloud platforms, the secured flow of information, and the ability to monitor our critical systems running in the cloud.

C. Emergency Operations Center (EOC) Technology Resiliency

This initiative allows for the improvement of IT services and systems needed for the EOC to continue functioning during an EOC activation. Activities in this mitigation include resiliency, recovery, and lifecycle management enhancements and upgrades.

The EOC utilizes numerous safety systems to respond to emergencies effectively and to operate a unified command with critical community stakeholders and partners. Maintaining communications with customers is critical during an emergency event. Communication tools allow the Company to notify customers and public safety partners of PSPS and other emergency events.

The future state for EOC critical systems is to enable modernization of EOC applications by adopting a cloud-based platform service and modifying systems to run in multiple geographic locations. Details involve migrating the EOC applications running on our internal infrastructure and some of our critical GIS applications into a cloud environment. For resiliency, the Companies will enable a local and multi-region recovery approach. To manage the new environments, the Companies will establish more structured and automated processes to develop and manage EOC applications and services. This will reduce the risk of an unavailable system

during EOC activations and also improves notifications of emergency events to both customers and public safety partners.

VI. COSTS

The table below contains the 2020 recorded and forecast dollars for the programs and projects discussed in this CFF. Some of the dollars reflected below may also be reflected in the SoCalGas Asset and Records Management, SDG&E Asset Management, and SDG&E Wildfires Involving SDG&E Equipment (SCG-CFF-1, SDG&E-CFF-1 and SDG&E-Risk-1) Chapters.

SoCalGas Costs (Direct After Allocations, in 2020 $000)[2]

Line No.	Description	Recorded		Forecast			
		2020 Capital	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
1	Data Center Modernization	24,944	2,276	65,534	83,738	2,049	2,618
2	Network & Voice System Resiliency	10,880	3,862	40,176	51,335	3,476	4,442
3	Monitoring Systems and Services	2,535	1,583	7,070	9,033	2,222	2,839
4	Gas Operations Systems Resiliency	20,068	6,526	109,051	139,342	5,873	7,505
5	End User Access and Support Services	1,513	1,640	30,419	38,869	1,724	2,203
6	IT Service Continuity	0	2,709	14,455	18,470	2,555	3,265
7	Cloud Resiliency Services	0	203	3,130	3,999	3,989	5,097
8	Emergency Operations Center (EOC) Technology Resiliency	1,424	983	3,505	4,478	884	1,130

[2] Costs presented in the workpapers may differ from this table due to rounding. The figures provided are direct charges and do not include company loaders, with the exception of vacation and sick. The costs are in 2020 dollars and have not been escalated in forecasts beyond 2020.

SDG&E Costs (Direct After Allocations, in 2020 $000)[3]

Line No.	Description	Recorded		Forecast			
		2020 Capital	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
1	Data Center Modernization	20,568	1,801	13,411	17,136	1,621	2,071
2	Network & Voice System Resiliency	41,129	4,359	82,541	105,469	3,923	5,013
3	Monitoring Systems and Services	1,519	1,018	4,800	6,134	1,543	1,971
4	Electric Operations Systems Resiliency	26,740	3,031	89,918	114,895	2,728	3,486
5	Gas Operations Systems Resiliency	3,004	2,031	16,122	20,600	1,828	2,336
6	End User Access and Support Services	2,590	1,117	18,999	24,277	1,201	1,534
7	IT Service Continuity	0	2,230	9,720	12,420	2,099	2,682
8	Cloud Resiliency Services	4,601	159	3,130	3,999	3,137	4,008
9	Emergency Operations Center (EOC) Technology Resiliency	0	901	7,655	9,781	811	1,036

[3] Costs presented in the workpapers may differ from this table due to rounding. The figures provided are direct charges and do not include company loaders, with the exception of vacation and sick. The costs are in 2020 dollars and have not been escalated in forecasts beyond 2020.

Risk Assessment and Mitigation Phase Cross-Functional Factor

(SCG-CFF-5)

Physical Security

May 17, 2021

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CROSS-FUNCTIONAL FACTOR: PHYSICAL SECURITY

I. INTRODUCTION

This Physical Security Cross-Functional Factor (CFF) Chapter describes how Physical Security activities impact the risks described in SoCalGas's Risk Assessment Mitigation Phase (RAMP) risk chapters.

SoCalGas presents CFF information in this RAMP Report to provide the Commission and parties additional information regarding the risks and mitigations described in its RAMP risk chapters. CFFs are not in and of themselves RAMP risks. Rather, CFFs are drivers, triggers, activities, or programs that may impact multiple RAMP risks. CFFs are also generally foundational in nature. Therefore, SoCalGas's CFF presentation differs from that of its RAMP risk chapters (*e.g.,* no risk spend efficiency calculations or alternatives are provided). SoCalGas's CFF chapters provide narrative descriptions of the CFF projects and programs that impact multiple SoCalGas RAMP risk chapters through the 2022-2024 time frame. Related cost forecasts are also provided as available, consistent with an expected test year (TY) 2024 general rate case (GRC) request.

As described below, Physical Security is an enterprise-wide framework that provides a standardized approach for managing risk and safety across assets and activities. The Physical Security CFF therefore spans multiple lines of business and helps to mitigate several RAMP risks in this Report.

II. OVERVIEW

Physical security encompasses the systems and activities that maintain the safety of employees, contractors, vendors, the public, SoCalGas facilities, and infrastructure, through people, processes, and technology. The three primary categories of physical security are described as follows:

- People – the skill and expertise of employees, contractors, and vendors, who implement and support physical security.
- Process – the goals, regulations, guidelines, and instructions that establish actions for risk management (*e.g.,* plans, policies, procedures, training, and awareness).
- Technology – the hardware and software of the physical security system that is designed to deter, delay, detect, assess, communicate, and respond to potential

physical threats (*e.g.*, barriers, closed circuit television (CCTV) system, access management system, video analytics, and electronic keys).

Physical security mitigates incidents such as theft, robbery, burglary, vandalism, sabotage, terrorism, and trespassing, which may result in a gas leak, fire, explosion, and/or operational outages. Physical security incidents may have direct safety consequences, such as the potential for serious injury or death related to gas leaks or explosions, or may have indirect safety consequences, such as the disruption of gas operations causing downstream outages affecting the general public. Effective physical security is essential to protecting the facilities, assets, and people that provide safe and reliable gas services.

SoCalGas implements a layered security system to protect employees, facilities, and infrastructure. Often referred to as "concentric circles of security" or "defense in depth," this principal involves using multiple layers of security to protect high-value assets. At each boundary, there is an opportunity to deter, detect, delay, assess, communicate, or respond to an adversary. This approach improves the opportunity for intruders to be interdicted at each layer with an appropriate security response.

III. ASSOCIATED RISK EVENTS

Physical security is a cross-functional factor affecting several risks including: Incident Related to the Medium Pressure System, Incident Related to the High-Pressure System, Excavation Damage (Dig-In) on Gas System, Incident Related to the Storage System, Incident Involving an Employee, Incident Involving a Contractor, and Cybersecurity. Physical security is a factor in protecting operational reliability, ensuring the safety of employees and the public, and maintaining compliance with government regulations or guidelines.

IV. 2020 PROJECTS & PROGRAMS

A. Physical Security Systems

Physical security systems provide protection enhancements to facilities or infrastructure to improve access control, intrusion detection, and interdiction capabilities to deter, detect, delay, assess, communicate, or respond to undesirable events. Examples include, but are not limited to:

- Physical Barriers – Physical barriers are natural and man-made structures that physically and psychologically deter and delay adversaries, and channel traffic through specified entry/exit points. Types of barriers include berms, fences, walls, gates, vehicle anti-ramming measures (*e.g.,* bollards, engineered planters

and benches, and landscaping boulders) window barriers, ravines, drainage ditches, and security doors.

- Access Control System - Access control systems limit or detect access to facilities and are commonly integrated across all security layers. They provide separation between common areas and higher security areas or critical assets. Access controls are typically found in the form of the electronic control systems (proximity card readers or electronic keys) and mechanical locks/keys.
- Intrusion Detection System (IDS) - IDS are an array of sensors, surveillance devices, and associated communication systems used to increase the probability of detection and the assessment of potential unauthorized access to facilities. The technologies used in IDSs range from electrical contact mechanisms, tamper sensors, motion, heat, sound, or vibration sensors, radar, duress alarms, video analytics, and other devices.
- Closed-Circuit Television (CCTV) – CCTV is a self-contained surveillance system comprising cameras, recorders, control equipment, and displays for monitoring activities in real time. The CCTV system is intended to be an overt deterrent used to assess real-time security events and act as a forensic tool for investigations following an incident.

Corporate Security is making physical security planning, implementation, and maintenance more efficient through automation, analysis, and testing. A new access management reporting tool was introduced in 2020 to allow for analysis of access. The reporting tool will assist Corporate Security with identifying information such as locations with high alarm rates and badge access card usage. In addition, a new automated access request process was implemented to streamline the access request and approval process, to allow for performance metrics and analysis, and to reduce labor hours associated with providing access. Finally, a new security equipment testing lab was created to integrate and test the functionality of new security equipment prior to installation.

B. Contract Security

In addition to physical security systems, SoCalGas employs contract security (security guards) to secure and protect assets and people. Security personnel are located at critical facilities and other work locations. Security personnel are used to complement and supplement

existing security measures. Security personnel can also provide increased security capabilities as an overt deterrence during security incidents or emergencies. Security personnel may be deployed permanently at a facility based on factors such as criticality, facility population, or compliance, or temporarily based on factors such as the threat environment, criminal activity, and past incidents.

C. Corporate Security Planning, Awareness, Risk Management, and Incident Management

The Corporate Security organization develops planning, awareness, risk management, and incident management projects and programs to prevent, mitigate, or respond to security incidents. This control includes Corporate Security labor (training, investigations, etc.), intelligence services, and the Case Management System, which is used to track security incidents and investigations. This control incorporates services provided by Corporate Security, including:

- Physical security operations responsible for planning, design, development, testing, implementation, maintenance, integration, and coordination of physical security systems.
- Risk management to identify, assess, control, and monitor physical security risks potentially impacting the Company.
- Intelligence analysis to continually assess threats and develop actionable intelligence for risk mitigation, security planning, infrastructure protection, and employee safety.
- Investigation of security incidents to determine and assist with corrective actions, litigation, and security practice improvement.
- Training, exercises, and drills of employees and public safety agencies to improve security awareness and response.
- Incident management to respond to incidents and coordinate with public safety agencies or other appropriate parties.
- Security oversight to establish and enforce regulations, guidelines, plans, policies, and procedures.

V. 2022-2024 PROJECTS AND PROGRAMS

Planning, Awareness, Risk Management, and Incident Management controls are tracked through a variety of methods. Physical security operations incorporate bi-weekly meetings to

plan, design, develop, test, implement, maintain, and coordinate physical security systems. Risk management occurs at various levels including annual risk assessments, ongoing threat evaluations, and vulnerability assessments. Security incidents and investigations are tracked within a case management database. Analysis and a review of security incidents are performed on a monthly and on an ad hoc basis by the director and managers of Corporate Security. Security guidelines, plans, policies, and procedures are reviewed regularly to complete appropriate updates.

A. Physical Security Upgrades

SoCalGas plans to expand physical security upgrades to replace end-of-life equipment, improve integration, reduce nuisance alarms, and incorporate recent industry security technology enhancements. Security enhancements to facilities and infrastructure improve access control, intrusion detection, and interdiction capabilities to deter, detect, delay, communicate, and respond to undesirable events. For example, an electronic key system is planned to replace the existing mechanical keys-and-locks. The electronic key system will provide logging and audit capabilities. It can be placed in remote locations without requiring the use of a Local Area Network (LAN) connection. Lastly, an administrator is able to customize access, activating or disabling access within a specified period of time.

VI. COSTS

Table 1 contains the 2020 recorded and forecast dollars for the programs and projects discussed in this CFF.

Table 1: Costs (Direct After Allocations, in 2020 $000)[1]

Line No.	Description	Recorded		Forecast			
		2020 Capital	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
1	Physical Security	190	1	6,654	8,133	17	21
2	Contract Security	24	629	94	116	532	650
3	Planning, Awareness, Risk Management, and Incident Management	0	878	0	0	841	969
4	Physical Security Upgrades	Included in line 1	0	Included in line 1	Included in line 1	0	0

[1] Costs presented in the workpapers may differ from this table due to rounding. The figures provided are direct charges and do not include company loaders, with the exception of vacation and sick. The costs are also in 2020 dollars and have not been escalated in forecasts beyond 2020.

Risk Assessment and Mitigation Phase Cross-Functional Factor

(SCG-CFF-6)

Safety Management System

May 17, 2021

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CROSS-FUNCTIONAL FACTOR: SAFETY MANAGEMENT SYSTEM

I. INTRODUCTION

This Safety Management System Cross-Functional Factor (CFF) Chapter describes how Safety Management System activities impact the risks described in SoCalGas's Risk Assessment Mitigation Phase (RAMP) risk Chapters.

SoCalGas presents CFF information in this RAMP Report to provide the California Public Utilities Commission (CPUC or Commission) and parties additional information regarding the risks, controls, and mitigations described in its RAMP risk chapters. CFFs are not in and of themselves RAMP risks. Rather, CFFs are drivers, triggers, activities, or programs that may impact multiple RAMP risks. CFFs are also generally foundational in nature. Therefore, SoCalGas's CFF presentation differs from its RAMP risk chapters (*e.g.,* no risk spend efficiency calculations or alternatives are provided). SoCalGas's CFF chapters provide narrative descriptions of the CFF projects and programs that impact multiple SoCalGas's RAMP risk chapters through the 2022-24 time frame. Related cost forecasts are provided as available, consistent with an expected test year (TY) 2024 general rate case (GRC) request.

As described below, a Safety Management System (SMS) is an enterprise-wide framework that provides a standardized approach for managing safety across assets and activities. The SMS CFF, therefore, spans multiple lines of business and helps to mitigate several RAMP risks in this Report.

II. OVERVIEW

SoCalGas began the process of adopting a formal pipeline safety management system in 2016, soon after the release of the American Petroleum Institute Recommended Practice 1173 (API RP 1173) in 2015. Initially, SoCalGas focused on addressing pipeline safety; however, SoCalGas gradually expanded the scope of its safety management system to address all aspects of safety relevant to SoCalGas's business, creating one holistic safety management system. The adoption of SoCalGas's SMS in its current structure began in 2019 when SoCalGas created a new dedicated and consolidated safety-focused organization, named the Safety Management System organization, reporting directly to SoCalGas's Chief Safety Officer. Figure 1 below illustrates the SMS organizational structure at SoCalGas.

Figure 1: Safety Management System Organization

The scope of this SMS CFF chapter focuses on the SMS organization identified in Figure 1 above, and includes activities that are not specifically covered in other risk chapters or CFF chapters. For example, looking at the SMS organization in Figure 1 above, Safety Management group activities are incorporated in two RAMP Risks: Incident Involving an Employee and Incident Involving a Contractor. As such, the activities, projects, and programs of the Safety Management group are not specifically itemized in this SMS CFF chapter. Similarly, activities of the Emergency Management group are incorporated in the Emergency Preparedness and Response CFF chapter. As such, the activities, projects, and programs of the Emergency Management group are not specifically itemized in this SMS CFF chapter. Consequently, the scope of this SMS CFF chapter is limited to the activities of the remaining four groups: SMS Strategy, Pipeline Safety and Compliance, SMS Continuous Improvement, and Technology and Analytics. It is also important to note that SoCalGas's SMS is a framework that is designed to connect a multitude of safety activities, safety programs, safety policies, safety compliance plans, safety controls, and safety mitigations that have existed and have been evolving over a long period of time prior to the establishment of the API RP 1173 benchmark in 2015 and SoCalGas's SMS organization in 2019. For example, regulatory compliance and assurance are important elements of API RP 1173, and are the focus of one of SoCalGas's seven Safety Values (discussed below) and, as such, regulatory compliance activities that have been in place for a long time are all connected and addressed by the SMS framework. SoCalGas's SMS focuses on

being more deliberate and intentional about everything the Company has been doing, with the goal of fostering continuous improvement in all areas of safety.

The vision of the SMS is to provide a framework that integrates and connects everything SoCalGas does when it comes to safety with the goal to continuously enhance the safety of operations, strengthen the safety culture, and improve overall safety performance.

The implementation of its SMS is anchored in SoCalGas's Safety Values. In 2019, soon after establishing the dedicated Safety Management System organization identified in Figure 1 above, SoCalGas formally adopted the following seven Safety Values:

1. Leadership Commitment - SoCalGas leadership is fully committed to safety as a core value. SoCalGas's Executive Leadership is responsible for overseeing reported safety concerns and promoting a strong, positive safety culture and an environment of trust that includes empowering employees to identify risks and to "Stop the Job."

2. Risk Management - SoCalGas manages risk through a structured, increasingly data-driven approach that identifies threats and hazards, assesses and prioritizes risks, implements mitigation efforts, and engages in assessments and reviews to understand risk mitigation effectiveness.

3. Employee and Stakeholder Engagement – SoCalGas encourages and expects employees to take ownership and actively engage in safety practices and openly share and receive information with one another, our contractors, and external stakeholders to continuously enhance our safety practices.

4. Competence, Awareness and Training - SoCalGas is committed to providing employees the proper tools, resources, training, and oversight to promote safe operations. This includes training tailored to specific roles and educating employees on why our training, policies, and procedures are important to safety.

5. Emergency Preparedness and Response - SoCalGas maintains readiness to promptly respond to emergency incidents and events through an Incident Command System that incorporates response planning, training and equipping of personnel, and coordination with first responders and external stakeholders.

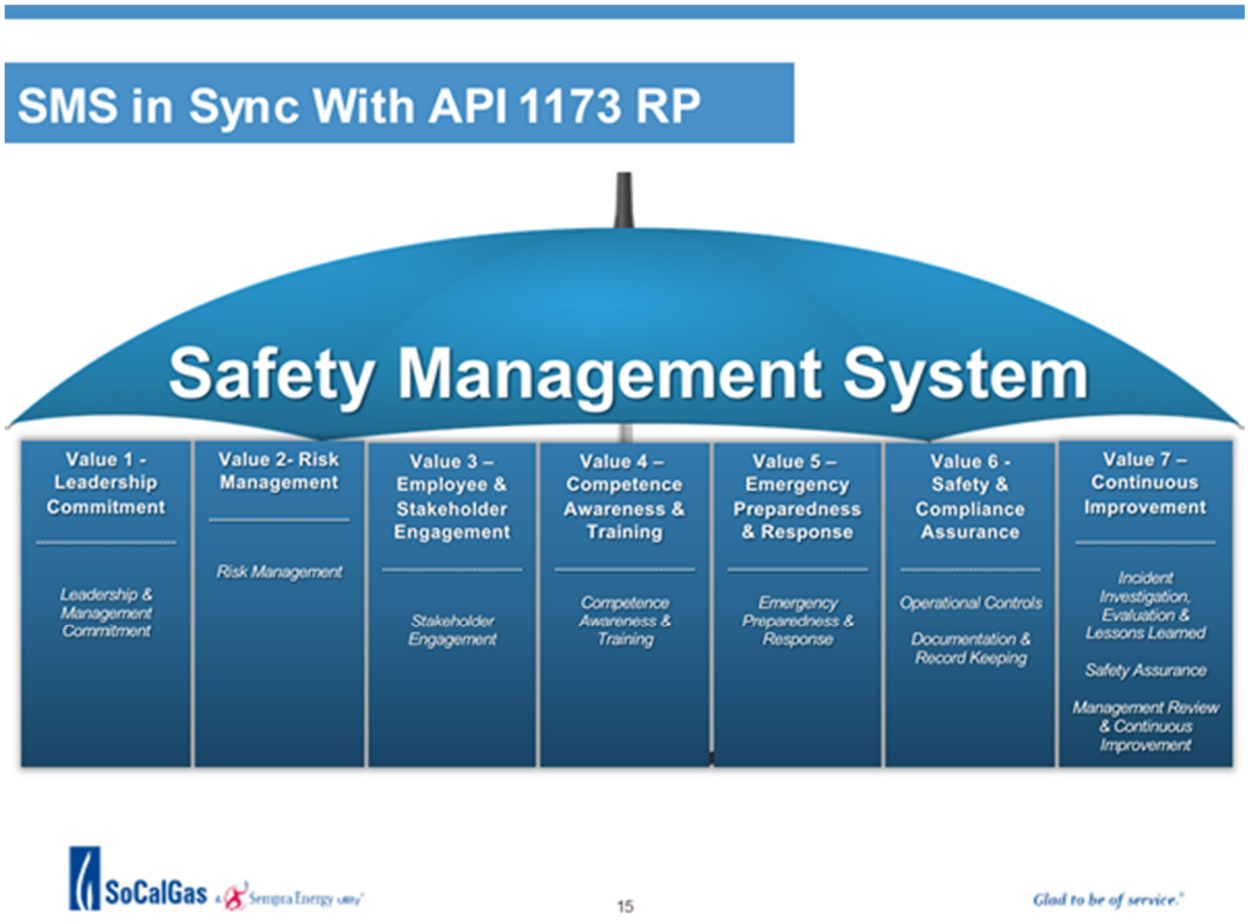
6. Safety and Compliance Assurance - SoCalGas maintains operational policies and procedures that document safety practices and standards, and compliance with applicable

regulations, and follows a "management of change" process to structure change when new policies and procedures are implemented.

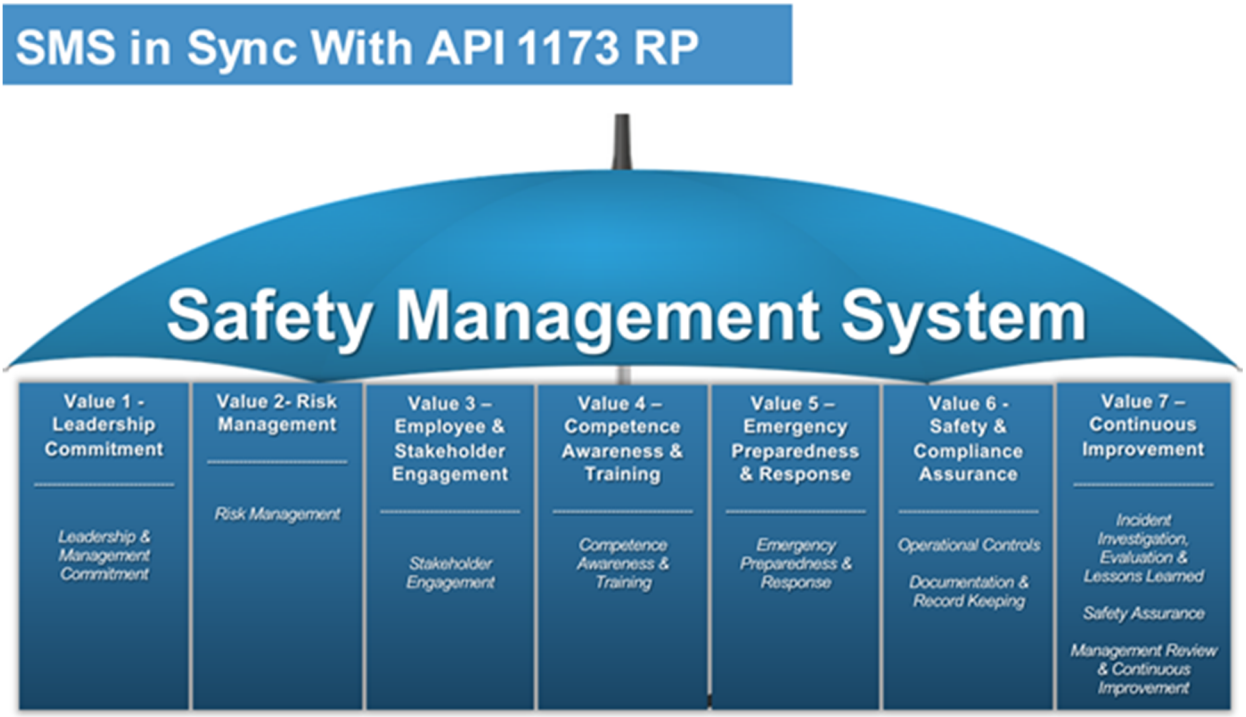
7. ***Continuous Improvement*** - SoCalGas strives to continuously improve and strengthen its safety performance and culture by setting clear and measurable goals, assessing safety performance through audits and self-assessments, inviting employee feedback, and applying lessons learned from incidents and near-miss events. SoCalGas also learns from and shares safety best practices among peer gas utilities and best in class companies in other industries.

These seven Safety Values, and how they align with API RP 1173 ten elements, are reflected in Figure 2 below:

Figure 2: SoCalGas Safety Values



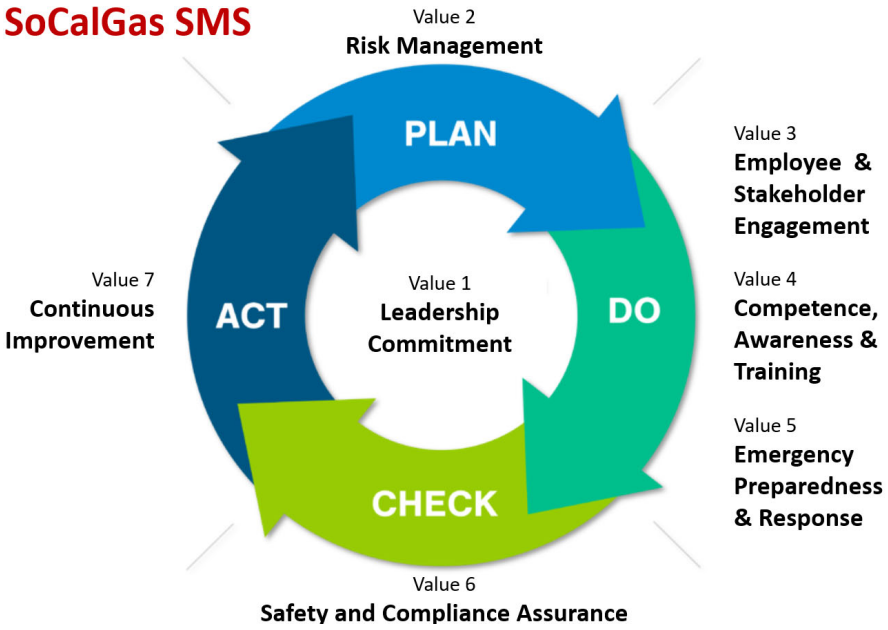
SoCalGas's SMS takes a broad and holistic view of safety management. SMS is intended to encompass all aspects of safety that are relevant to SoCalGas's business, including employee safety, contractor safety, natural gas infrastructure safety, customer safety, and public safety. SMS applies to every employee in the Company, including executives, directors, managers, supervisors, and front-line employees. SoCalGas's SMS integrates the ten elements of API RP 1173 within seven Safety Values as they relate to Company infrastructure, assets and operations, including transmission and distribution pipelines, compressor and regulator stations, gas control operations, underground and aboveground storage operations, gas engineering, buildings and facilities, engineering operations, construction operations and customer service operations. In addition, SoCalGas requires its Class 1 contractors to support the implementation of SoCalGas's SMS when working on any SoCalGas project. This support includes working safely, using "Stop the Job" authority as needed, and identifying and reporting safety risks and gaps in operating procedures for resolution. SoCalGas encourages its Class 1 Contractors to adopt a similar SMS appropriate for their size of operations and circumstances.



SoCalGas has established responsibilities at various levels to promote, support, develop, implement, and continuously improve our SMS in an effective and efficient manner.

As noted in API RP 1173: "Managing processes requires different techniques than managing individual activities. Pipeline safety management includes determining needs throughout the pipeline life cycle, provisioning sufficient qualified human and financial resources, identifying the proper sequence of a series of activities, monitoring and measuring the effectiveness of the activities performed, and applying changes or corrections to those activities as needed."[1] As SoCalGas continues the implementation of API RP 1173 and the SMS, there will be continued focus on assessing and strengthening the safety components of all work processes. This drive for continuous improvement in SoCalGas's processes and associated safety performance is nested in the "Plan-Do-Check-Act" cycle (PDCA), as reflected in Figure 3 below:

Figure 3: Plan-Do-Check-Act



As shown in Figure 3 above, PDCA is a core principle of a continuous improvement framework. PDCA is a four-step iterative cycle designed to achieve continuous improvement

[1] American Petroleum Institute, Recommended Practice 1173 (July 2015), at vii.

and is at the core of many management systems. Its principal aim is to encourage creating strategies and plans, executing those strategies and plans in line with guidelines, checking those actions for conformity, and using those results to adjust the next generation of plans. SoCalGas's seven Safety Values, presented in Figure 2, are consistent with the PDCA and the elements of API RP 1173. With this systematic approach to managing safety, SoCalGas's SMS aims to establish accountability and includes an organizational structure, policies, and procedures to support its implementation. It is comprehensive and iterative in nature, designed to identify, manage, and reduce risks. Safety incidents, including serious injuries to employees, contractors, and the public, are consequences we strive to eliminate through our SMS. For additional details on SoCalGas's SMS and the relationship with its safety culture, please refer to Chapter SCG RAMP-D, the safety culture chapter.

III. ASSOCIATED RISK EVENTS

All of SoCalGas's RAMP risks and other CFFs are connected with the SMS CFF. This connection is due to the SMS framework, which covers every aspect of SoCalGas's business when it comes to safety. As such, SMS Safety Values guide the ongoing implementation and improvements in each risk area. In turn, the controls and mitigations covered in all RAMP risks demonstrate how various safety programs adhere to the Safety Values and support SMS effectiveness. For example, the RAMP risk of Excavation Damage (Dig-In) on the Gas System benefits from SMS by requiring establishment of appropriate leading and lagging key performance indicators to measure the effectiveness of the various mitigation programs, and using the PDCA mindset to continually improve the program. Each RAMP risk will be guided by the Safety Values and will be subject to periodic assessments to evaluate the health of the programs and needed improvements.

IV. 2020 PROJECTS AND PROGRAMS

As noted in Section II above, the scope this SMS CFF Chapter is limited to the activities of the following four groups within the SMS organization identified in Figure 1 that are not captured in other RAMP risks or CFF Chapters: SMS Strategy, Pipeline Safety & Compliance, SMS Continuous Improvement, and Technology & Analytics.

A. SMS Framework

SoCalGas's SMS provides a framework that integrates and connects everything the Company does when it comes to safety in order to continuously enhance the safety of operations,

strengthen the safety culture, and improve overall safety performance. SoCalGas's SMS provides a framework that integrates and connects everything the Company does when it comes to safety in order to continuously enhance the safety of operations, strengthen the safety culture, and improve overall safety performance. This framework includes the following six focus areas (whereby each focus area is shown to relate to one or more of the seven Safety Values and highlights activities performed by the SMS Strategy group within that focus area):

1. Safety Management System Policy, Scope, Commitment, and Responsibilities

This focus area is covered under SoCalGas's Safety Value of "Leadership Commitment."

The purpose of this focus area is to maintain and continually improve foundational policies of SoCalGas's SMS. These include SoCalGas's Safety Values (discussed in Section II), SMS responsibilities (discussed in Section II), and the SMS standard. These policy documents establish the scope, objectives, and oversight responsibilities associated with Company-wide implementation of the SMS.

SoCalGas has developed a standard for internal SMS-related operations. The purpose of this standard is to establish a framework to define, develop, implement, maintain, and continue to improve SoCalGas's SMS. The standard identifies "Objectives" for each Safety Value of the SMS, along with a listing of key "Controls" that are in place and "Responsibilities" of various individuals and/or organizations to help achieve the stated objectives.

2. SMS Plan and Gas Safety Plan

This focus area is covered under SoCalGas's Safety Value of "Leadership Commitment."

The SMS Plan and Gas Safety Plan, further described below, are overarching policy documents that demonstrate how SoCalGas manages safety covering all aspects of our business.

SMS Plan

SoCalGas published its inaugural SMS Plan in 2020. This plan is a voluntary initiative of SoCalGas and is not driven by regulation or required by any regulatory agencies. The SMS Plan communicates the focus and direction of SoCalGas's efforts pertaining to all aspects of safety that are relevant to its business, including employee safety, contractor safety, customer safety, infrastructure safety, and public safety. It further demonstrates how everything SoCalGas does is connected to the Safety Values, and guides how the Company can continuously improve its safety culture. The 2020 SMS Plan serves as a baseline description of the SMS framework,

explains what aspects of safety, Company operations, and programs are covered by the framework, and demonstrates SoCalGas's commitment to achieving continuous improvement of safety culture and performance. The 2020 SMS Plan serves as a baseline description of the SMS framework, explains what aspects of safety, Company operations, and programs are covered by the framework, and demonstrates SoCalGas's commitment to achieving continuous improvement of safety culture and performance. SoCalGas intends to refine and publish the SMS Plan on an annual basis.

Gas System Operator Safety Plan (Gas Safety Plan)

The Gas Safety Plan is a statutory requirement established by the California Legislature in 2011,[2] which requires all gas corporations to develop a plan for the safe and reliable operation of Commission-regulated gas pipeline infrastructure. SoCalGas's Gas Safety Plan describes the Company's overarching safety strategy and performance encompassing all its plans, programs, and policies associated with meeting pipeline safety requirements. Each year, the Gas Safety Plan is reviewed and updated to highlight the changes from the prior year and is submitted to the CPUC in March. According to the Commission, "the rationale for developing a gas safety plan is to motivate a gas utility to reflect upon its existing methods and for it to change, to optimize, or to enhance the existing methods, using … the lessons learned from the San Bruno incident, as appropriate, to ensure that the gas utility has a prudent plan in place to protect public safety and worker safety."[3] The gas system operator safety plans convey the Company's safety performance expectations, policy principles, and goals/objectives for a gas utility's safety performance. SoCalGas has designed its annual Gas Safety Plan to satisfy each of these directives, and to implement "the policy of the state that the commission and each gas corporation place safety of the public and gas corporation employees as the top priority."[4]

3. Employee & Stakeholder Engagement

This focus area falls under SoCalGas's Safety Values of "Employee and Stakeholder Engagement" and "Competence, Awareness and Training."

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2 See Senate Bill 705 (Leno 2011) (adding P. U. Code §§ 961 and 963).

3 Decision (D.) 12-04-010 at 19.

4 Pub. Util. Code § 963.

The successful execution of the SMS is critically dependent on the actions of SoCalGas's employees and external stakeholders. SoCalGas relies on them to identify and resolve safety risks and adopt and implement safety practices to strengthen and protect SoCalGas infrastructure.

SoCalGas has developed an SMS Stakeholder Engagement Plan, which explains communication and engagement activities for internal and external stakeholders regarding risk identification and management, safety performance, and as appropriate, other elements of the SMS. SoCalGas relies on front-line employees and contractors to bring safety issues to the attention of management for assessment and resolution. Therefore, SoCalGas regularly engages with front-line workers to raise awareness and understanding of their roles and responsibilities within the SMS framework and facilitating a healthy safety culture of non-punitive reporting of safety concerns. The SMS Stakeholder Engagement Plan will be reviewed periodically using the PDCA methodology to address gaps and integrate emerging best practices.

In 2021 and going forward, SoCalGas plans to develop additional training and competence tools to further improve employee and contractor skill sets. The goal of the additional training is to fully integrate and mature SMS components, including the PDCA methodology, the concept of cascading failures and how to recognize such failures, the intentional focus on revealing risks, and the granular details of the SMS framework. These engagement efforts require the support of vendors for instructional design, development, and deployment of training materials, videos, posters, badge cards, conducting engagement surveys, using analytics and technology platforms, and other items to help embed and gauge the effectiveness of the messages within the workforce.

4. Centralized Electronic Management of Change Process

This focus area is part of operational controls covered under SoCalGas's Safety Value of "Safety and Compliance Assurance."

Management of Change (MOC) is an integral component of operational controls. It is a process that systematically recognizes and communicates to the necessary parties changes of a technical, physical, procedural or organizational nature that can impact system integrity. Its purpose is to reduce the possibility of introducing additional risk, or inadvertently increasing the risk, to public or employee health and safety, the environment, or the community as the result of a change. Under normal (non-emergency) circumstances, the MOC process requires that

technical, procedural, organizational, and operational changes are reviewed, documented, and communicated internally and externally to impacted stakeholders as appropriate prior to implementation. When circumstances dictate (*e.g.*, emergency situations), SoCalGas may implement a change prior to MOC review to preserve the health and safety of the public, employees, community, or a pipeline system.

SoCalGas has well-established MOC processes within its Integrity Management, Gas Control, and Gas Standards management programs. With the broader MOC initiative under the SMS framework, SoCalGas is in the process of consolidating various MOC processes into one centralized electronic MOC process to provide greater consistency and rigor for managing changes throughout the Company. This centralized electronic MOC process will establish minimum requirements for Company-wide operations. Furthermore, the process will identify the types of changes that must be managed, levels within the organization that have the authority to approve the changes, a threshold for changes that need to go through the centralized electronic MOC process. The centralized electronic MOC process will also help facilitate communications and sharing of approved changes with impacted organizations.

5. SMS Maturity Assessments

This focus area is covered under SoCalGas's Safety Value of "Continuous Improvement."

Assessment of a safety management system on an ongoing basis is essential to assuring that the system is achieving its desired goals and objectives and is making progress towards effective risk management and improved safety performance. The purpose of such an assessment is to examine the conformity of a safety management system with appropriate external benchmarks and evaluate the system's growth and development beyond conformance, otherwise known as maturity assessment.

SoCalGas's SMS includes a variety of methods to conduct assessments on an ongoing basis. These include:

- Reviews and assessments that are an integral part of various safety programs, such as the integrity management programs, and self-assessments and inspections performed pursuant to its Environmental & Safety Compliance Management Program;

- Annual management reviews of its entire SMS led by the SMS organization under the direction of SoCalGas's leadership;
- Periodic reviews and/or audits performed by the independent audit group of its parent company, Sempra Energy;
- Peer reviews performed by industry associations (such as the American Gas Association); and
- External third-party audits and assessments conducted of its SMS.

To maintain independence and objectivity, SoCalGas will periodically conduct conformance and maturity assessments utilizing external third-party industry experts.

There are several benchmarks available for assessing the effectiveness of a safety management system. One such benchmark that is relevant to SoCalGas business is API RP 1173. SoCalGas has retained the American Petroleum Institute and is in the process of conducting its first inaugural conformance and maturity assessment which is planned to be completed in 2021.

Regardless of the methods employed to conduct the assessments, the results of such assessments will be shared with impacted stakeholders through the annual SMS Plan for follow-up and closure of improvement opportunities identified by the assessments. SoCalGas also plans to utilize the assistance of expert consulting companies to assist with developing and/or implementing improvement opportunities generated from internal and external assessments.

6. SMS Benchmarking

Benchmarking is an important component of SoCalGas's SMS. This focus area is covered under SoCalGas's Safety Value of "Continuous Improvement." SoCalGas's SMS Benchmarking includes both comparing SoCalGas practices to those of other best-in-class companies to improve safety performance and reviewing other industry benchmarks outside of the natural gas utility environment.

SoCalGas is actively involved in a variety of industry groups to share best practices and learn from industry peers. For example, SoCalGas participates with the American Gas Association, American Petroleum Institute, and Western Energy Institute. This participation includes leading committee and subcommittee efforts on many industry initiatives, participating as speakers at industry events, and serving on planning committees for educational conferences

and workshops. Recently, SoCalGas presented its safety journey and development of its SMS at an AGA SMS Workshop conducted virtually during April/May 2020.

SoCalGas also has ongoing informal outreach efforts with several peer utility companies within and outside of California. This collaboration with peer companies and with external standards is an important source of ideas for continuous improvement.

B. Pipeline Safety and Compliance Oversight

The Pipeline Safety and Compliance group located within the SMS organization acts as the intermediary to state and federal regulatory agencies and divisions, including the CPUC, Safety and Enforcement Division (SED), Pipeline Hazardous Materials Safety Administration (PHMSA), CalFire (Dig Safe Board), and California Geological Energy Management Division (CalGEM). The Pipeline Safety and Compliance group is the primary point of contact to those agencies in audits, inspections and investigations and provides the groundwork for related compliance reporting as well as continuous improvement opportunities resulting from regulatory agency interaction activities described below. This program includes the following three focus areas:

1. Monitoring, Distributing and Tracking CPUC and DOT/PHMSA Regulations

This focus area is covered under SoCalGas's Safety Values of "Safety & Compliance Assurance," "Employee & Stakeholder Engagement," and "Continuous Improvement."

SoCalGas has a process and dedicated resources to monitor, distribute and track regulatory actions that impact pipeline safety, and distribute crucial notices that provide interpretive guidance and/or key insights to internal stakeholders for managing compliance with the pipeline safety regulations. Staff identifies key issues, ramifications of proposed rules, final rules, or other activities related to regulatory action.

SoCalGas has a process for learning and identifying improvement opportunities from external gas infrastructure safety incidents. This process includes a dedicated resource for tracking and sharing pipeline safety-related incidents that occur across the nation and updates on findings and recommendations for improvements from various regulatory agencies, including the CPUC, DOT/PHMSA, and National Transportation Safety Board (NTSB)

2. Incident Monitoring and Reporting

This focus area is covered under SoCalGas's Safety Value of "Emergency Preparedness and Response," "Safety and Compliance Assurance," and "Competence, Awareness and Training."

The Pipeline Safety and Compliance group monitors incidents 24 hours a day, 365 days a year through Message Center Reports (MCRs) for both SoCalGas and the gas operations of SDG&E. Reporting of certain incidents is mandated by Title 49 of the Code of Federal Regulations to be reported to the PHMSA. Incidents defined and mandated by General Order (GO) 112F are to be reported to the CPUC. Each reported incident to PHMSA and the CPUC may have multiple follow-up reports required to those agencies. The team also conducts annual training on the MCR process with operations groups to ensure understanding of the importance of timely opening of MCRs and consequences of late reports to the agencies.

CPUC Decision 16-09-055, related to Natural Gas and Electric Safety Citation Programs, made reporting of certain self-identified violations voluntary. The Pipeline Safety and Compliance group supports internal operations organizations with addressing and reporting items covered by this program. The Pipeline Safety & Compliance group also facilitates responding to CPUC data requests and customer complaints relating to safety.

3. Regulatory Audits and Inspections

This focus area is covered under SoCalGas's Safety Value of "Continuous Improvement.

Each year, the CPUC conducts audits of operations districts, areas, storage fields along with other specialized audits on programs such and Drug and Alcohol, Operator Qualifications, Emergency Management, Control Room Management, Integrity Programs, and other programs. In 2018, the CPUC reorganized and created a new division called the "Regional Division" with the intent to focus on gas utility construction projects throughout the state. The CPUC construction inspections (some of which are unannounced) may involve reviewing work plans, checking worker knowledge and competence through Operator Qualification evaluation, checking that the correct procedures are being used and that the crew is following the procedures, witnessing welding or fusing of pipe, witnessing pressure tests and proper back-filling. Audits are also conducted by CalGEM. The Pipeline Safety and Compliance group supports all internal stakeholders during these audits.

C. Continuous Improvement and Quality Assurance

The purpose of continuous improvement in SoCalGas's SMS Plan is to create an environment and culture where feedback mechanisms are part of decisions and to create processes that result in collective participation and learning from events to achieve the safest outcomes. This is necessary to achieve safety excellence by listening, assessing, and learning.

Continuous Improvement (CI) gathers information from three primary areas: Incidents, Feedback, and Performance Measurement. Internal and external incidents are analyzed, and lessons learned are extrapolated. These incidents include motor vehicle incidents, contractor and subcontractor incidents, and gas system safety incidents. Feedback is gathered from employees, contractors, regulatory agencies, safety culture surveys, and audits & assessments. Performance Measurement includes analyzing data, reviewing Key Performance Indicator trends, and benchmarking. In addition, through gathering information and management review, SoCalGas identifies, pursues, and monitors safety-focused projects utilizing PDCA cycle. The ultimate goal of CI is to create a safety culture that is integrated into every activity and process with the help of every SoCalGas employee. This program includes the following four focus areas:

1. Incident Evaluation Process

This focus area is covered under SoCalGas's Safety Value of "Continuous Improvement."

For pipeline safety incidents involving operations, SoCalGas established the Incident Evaluation Process (IEP) to identify gaps in processes and procedures from a systematic perspective and provide recommendations through corrective action that lead to enterprise-wide process improvements. The incident evaluations are an integral part of the natural gas industry's continuous improvement.

The IEP strives to produce a consistent, structured process for a causation analysis on specific events that may have impacts to the safety, integrity, or reliability of the natural gas pipeline system. The IEP is applied to evaluate the system, policy and/or process cause(s) from an incident, determine the cause that led to the condition, identify corrective actions that would minimize the possibility of a recurrence. The lessons learned from the incident evaluation enables SoCalGas to strengthen policies and procedures and to anticipate risk mitigation.

After larger-scale events, such as natural disasters or major operational disruptions, a comprehensive after-action analysis is performed to identify lessons-learned and opportunities

across the entire response and recovery process. This concept is further explained in the Emergency Preparedness and Response Chapter CFF-3.

2. Incident Lessons Learned/Effectiveness Review

This focus area is covered under SoCalGas's Safety Value of "Continuous Improvement."

Lessons learned and effectiveness reviews are key components of an organizational culture committed to continuous improvement and risk management review. The lessons learned process flow is comprised of defining the objective, collecting the information, verifying applicability, storing the information, and disseminating the outcome. Lessons learned identified in corrective actions are periodically evaluated and reviewed for the effectiveness of the implemented procedures and processes. The effectiveness review is conducted to review potential consequences and opportunities on significant events to see if there are patterns or trends related to the corrective action items.

3. Quality Management Assessments

This focus area is covered under SoCalGas's Safety Value of "Continuous Improvement."

The goal of quality management is to provide independent and objective assessment of the gas operations and construction processes. SoCalGas verifies that quality is planned, defines quality control and quality assurance activities, and collaborates with key stakeholders to drive continuous improvements. The team contributes to the "Check" and drives "Act" portions of the PDCA continuous improvement cycle utilized by the Company's SMS. The assessments performed constitute a check of Gas Operations and Construction procedures and processes, and the corrective actions that result from these reviews improve these procedures and processes. This group proactively uses tools and processes to enhance system safety and reliability through the implementation of continuous improvement across the Company.

4. Compliance Assurance

This focus area is covered under SoCalGas's Safety Value of "Safety & Compliance Assurance."

Compliance Assurance monitors assets and data to ensure the Company remains compliant per Company Gas Standards and Federal Code of Regulations. Specifically, Compliance Assurance: (1) analyzes operational data (*e.g.,* leak survey data) and reports (*e.g.,*

inspection history reports) to identify opportunities for process change either in the field or administrative processes, (2) develops business requirements for changes/enhancements to supported systems to meet business needs (*e.g.,* automation of maintenance planning activities), (3) supports the Information Technology team in testing and implementation of existing and new software and technology solutions for operations, and (4) maintains standard reports (*e.g.,* monthly Leakage metrics) and creates new standard reports (*e.g.,* Cathodic Protection Out of Tolerance report) to support operations.

D. Technology and Analytics

SoCalGas continues to find ways to link key performance indicators, data, and technology to enhance safety performance and safety culture. This program includes the following two focus areas:

1. Performance Indicator Monitoring, Tracking and Reporting

Performance indicator monitoring, tracking, and reporting is covered under SoCalGas's Safety Value of "Continuous Improvement."

Continuous improvement occurs when performance is measured and quantified. This is accomplished using Key Performance Indicators (KPIs), including analyzing data and trends generated from SoCalGas operations activities. There are numerous lagging, leading, and process KPIs that are vital to measuring the effectiveness of our operations, risk management, and adequacy of our SMS. Lagging KPIs include incidents involving injuries, and property damage; leading KPIs include measures demonstrating risk reduction, such as corrective actions implemented based on audits, inspections, and incident investigations; process KPIs demonstrate completion or improvement of activities and their supporting processes and procedures. SoCalGas has worked closely with the CPUC, within the Safety Model Assessment Proceeding (S-MAP), to identify metrics that would enable us to monitor our safety performance and the CPUC to compare metrics across California utilities and over time.

SoCalGas maintains a process for the identification, collection, and analysis of data generated from operations and maintenance, integrity management, audits and evaluations, management reviews, and other relevant sources related to the suitability and effectiveness of our SMS.A dashboard was developed to provide a consistent platform to visualize KPIs, which include elements of employee safety, contractor safety, pipeline safety, compliance, and damage prevention, all of which are part of the S-MAP metrics adopted in D.19-04-020.

Also included are other operational dashboards and reports designed to deliver and view KPI and other business reporting metrics for SoCalGas's operations. SoCalGas will continually identify leading and lagging indicators to enhance the safety of our operations.

2. Integration of New Technology and Enhanced Data and Analytics Capabilities for Continuous Safety Improvement

This focus area is covered under all of SoCalGas's seven Safety Values.

As described in the Enterprise Risk Management Framework Chapter RAMP-B , SoCalGas implements a comprehensive Enterprise Risk Management framework to manage risk through a structured, increasingly data-driven approach that identifies threats and hazards, assesses, and prioritizes risks, implements mitigation efforts, and engages in assessments and reviews to understand risk mitigation effectiveness. Continuous improvement is a foundational value of both the SoCalGas SMS framework and the Enterprise Risk Management framework. Integration of new technology is needed to support data analytics and continuously improve upon SoCalGas's SMS and risk management frameworks and enable greater visibility of enterprise risk and risk mitigation performance. SoCalGas is currently working on several projects to upgrade the technology used for various activities covered by the SMS. These include enhancing:

- SMS related data collection and analytics with the use of technology
- Incident Management System/Situational Awareness Platform to support emergency response and preparedness
- Safety Incident Management System with the new SAP Environment, Health, and Safety Management (EH&S) platform

A robust SMS needs an infusion of new technology so that it continues to evolve with the changing business environment. One such area SoCalGas plans to explore is an application/system that manages large amounts of safety and operational data (*e.g.,* observations, indicators) obtained from key sources (*e.g.,* people, assets, programs, processes) by using artificial intelligence in a way that it allows SoCalGas to better anticipate issues.

V. 2022-2024 PROJECTS AND PROGRAMS

SoCalGas anticipates integrating the programs identified in this section into its TY 2024 GRC Application. Given the "cross-cutting" nature of SoCalGas's SMS (*i.e.,* spans all lines of

business), the SMS's specific impacts to each operating unit will be presented within SoCalGas's next GRC.

A. Develop Incident Evaluation Central Database and Further Enhance Causal Analysis Training

As the IEP (*see* Section IV.C.1) evolves, it is anticipated that SoCalGas will also need to enhance the capability to build a centralized database for all incidents and near-miss reports across the Company. The development of this centralized database will allow for further integration, oversight, and analysis to identify trends and other insights and support compliance documentation.

Maintaining a skilled, qualified, and dedicated workforce is critical to SoCalGas's success, as discussed in CFF-7 of this RAMP Report addressing Workplace Planning. A supplemental training for causal analysis will further enhance SoCalGas's strong safety culture given its focus on learning from incidents and continuous improvement. SoCalGas seeks to continue developing more comprehensive, consistent, and centralized incident evaluation training across the Company that aims to help employees: (1) build the timeline of events that represents our understanding of what took place (which is the foundation of a causal analysis); (2) identify the cause for each causal factor (why the error/failure happened); (3) develop meaningful corrective actions (to mitigate the issue in order to avoid reoccurrence); (4) develop and share lessons learned that might help reduce the potential of recurrence; and (5) periodically review the incident evaluation process and procedure and benchmark against industry's best practices.

B. Expand Quality Assessment Program

SoCalGas plans to expand quality assessments and enhance consistent quality oversight across the Company (see Section IV.C.3). SoCalGas also plans to enhance a selection process for adding new quality assessment programs through a risk ranking approach by analyzing available data sources and benchmarking with external organizations. These efforts will also include the development and implementation of an electronic data collection tool for field and office assessments to increase efficiency, accuracy, and data sharing capabilities. The data will be gathered and analyzed to identify trends or other insights that will provide information to monitor and enhance internal processes.

C. Expand Compliance Assurance Program

Beginning in 2021, SoCalGas plans to expand operational assets and data monitoring to continue identifying and mitigating compliance data accuracy risks so that the Company remains compliant per Gas Standards and Federal Code of Regulations. As we continue to evolve the Compliance Assurance Program (see Section IV.C.4), we anticipate a need to enhance the capability to (1) automate all maintenance planning activities for Gas Distribution asset types; (2) implement new and enhance existing Inspection Forecasting reports for all Gas Distribution asset types; (3) produce new asset exception reports to identify potential data concerns; and (4) create new custom user interfaces in asset management system for additional user groups.

D. Pipeline Safety Self Assessments

Pipeline and Safety Compliance group is planning to implement a new self-assessment program focusing on pipeline safety compliance. The program includes field pre-audits and inspections for operations groups to review compliance items in a proactive manner. Under this program, staff will perform Odor Intensity Tests, pre-audit dry runs, and other inspection types with the employees to increase their comfort while completing their tasks in front of an audience of assessors who are attempting to proactively identify and mitigate hazards, risks, and safety incidents. Utilizing the PDCA tool, this program is designed to reveal and mitigate risks in a proactive manner to continue to improve SoCalGas's pipeline safety performance.

VI. COSTS

The table below contains the 2020 recorded and forecast dollars for the programs and projects discussed in this CFF.

Table 1: Costs (Direct After Allocations, in 2020 $000)[5]

Line No.	Description	Recorded		Forecast			
		2020 Capital	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
1	SMS Framework	0	823	0	0	782	946
2	Pipeline Safety & Compliance Oversight	0	718	0	0	682	825
3	Continuous Improvement and Quality Assurance	0	2,042	0	0	1,940	2,349
4	Technology & Analytics	0	553	0	0	525	636
5	Develop Incident Evaluation Central Database and Further Enhance Causal Analysis Training	0	0	0	0	100	145
6	Expand Quality Assessment Program	0	0	0	0	113	164
7	Expand Compliance Assurance Program	0	0	0	0	300	434
8	Pipeline Safety Self Assessments	0	0	0	0	300	434

[5] Costs presented in workpapers may differ from this table due to rounding. The figures provided are direct charges and do not include company loaders, with the exception of vacation and sick. The costs are presented in 2020 dollars and have not been escalated in forecasts beyond 2020.

Risk Assessment and Mitigation Phase Cross-Functional Factor

(SCG-CFF-7)

Workforce Planning/ Qualified Workforce

May 17, 2021

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CROSS-FUNCTIONAL FACTOR: WORKFORCE PLANNING/ QUALIFIED WORKFORCE

I. INTRODUCTION

This Workforce Planning/Qualified Workforce Cross-Functional Factor (CFF) Chapter describes how workforce planning/qualified workforce activities impact the risks described in SoCalGas's Risk Assessment Mitigation Phase (RAMP) risk chapters.

SoCalGas presents CFF information in this RAMP Report to provide the Commission and parties additional information regarding the risks and mitigations described in its RAMP risk chapters. CFFs are not in and of themselves RAMP risks. Rather, CFFs are drivers, triggers, activities, or programs that may impact multiple RAMP risks. CFFs are also generally foundational in nature. Therefore, SoCalGas's CFF presentation differs from that of its RAMP risk chapters (*e.g.,* no risk spend efficiency calculations or alternatives are provided). SoCalGas's CFF chapters provide narrative descriptions of the CFF projects and programs that impact multiple SoCalGas RAMP risk chapters through the 2022-2024 time frame. Related cost forecasts are provided as available, consistent with an expected test year (TY) 2024 general rate case (GRC) request.

As described below, workforce planning/qualified workforce is an enterprise-wide framework that provides a standardized approach for managing risk and safety across assets and activities. The workforce planning/qualified workforce CFF therefore spans all lines of business and helps to mitigate all the RAMP risks presented in this Report.

II. OVERVIEW

The Workforce Planning/Qualified Workforce CFF addresses the objective to have an appropriate number of employees with the right skills to meet business needs. Many factors impact the Company's ability to recruit, retain, and train qualified employees. While the lack of a qualified workforce could have several impacts to operations, the discussion below focuses solely on safety-related programs. This is a cross-functional factor that affects all business units and other risks identified by the Company.

Safety is foundational at SoCalGas, and it begins with the tone at the top. The successful integration of the Workforce Planning/Qualified Workforce cross-functional factor depends on leadership demonstrating its commitment to safety and leading by example. SoCalGas strives for an incident-free workplace and acknowledges that success depends on the Company's ability

to minimize mistakes that are inherent with human behavior. Therefore, the programs outlined within this Chapter focus on what can realistically be achieved.

III. ASSOCIATED RISK EVENTS

Potential drivers of a safety incident pursuant to the Workforce Planning CFF can be caused by human factors such as a gap in experience or knowledge, lack of adequate workforce to respond to an emergency incident, and a lack of leadership skills potentially impacting employee engagement and adherence to safety protocols. All risks in the 2021 RAMP are impacted by Workforce Planning related activities. Some examples of potential risk events due to the risk drivers are detailed below:

- **Insufficient staffing level leads to delay in compliance or customer-generated work**: Lack of a properly trained workforce can lead to delays in completing compliance or customer-initiated work. Work plans and schedules are developed based on the availability of employees at each operating base, and an insufficient number of available employees with the required skills can impart delays in work schedules. Continued and/or significant understaffing can result in work schedule delays causing compliance windows to be missed and/or customer projects to experience lengthy delays.
- **Increased competition for qualified employees**: As the economy trends towards more high-tech jobs, the number of qualified candidates could drop. The Company may face higher competition for the smaller number of candidates with the right skills. This can increase time and costs associated with the hiring of new employees, which could result in more vacancies going unfilled for a longer period. This risk is greater in highly-specialized or technical positions that require more training.
- **Aging workforce leads to higher attrition**: SoCalGas has a large number of retirement-eligible employees. The number of employees retiring increased in 2020 compared to 2019. This can lead to higher attrition within the Company and other potential impacts. Many of the employees retiring have served with the Company for multiple decades. During their careers, they have built valuable stores of institutional knowledge that is hard to replicate or replace. This has the

potential to have a negative impact on the Company's operation in terms of efficiency and safety.

- **Changing demographic of workforce will change how the Company works**: As more of the Company's workforce is replaced with younger employees, the internal dynamic of career progression can be affected. Millennials are forecasted to become the majority of the country's workforce in the coming years. Millennials, on average, are more mobile and tend to move between departments, or even companies, more often. This can be disruptive to operations as it increases the need for training, transitions, and leaves more vacancies.

IV. 2020 PROJECTS AND PROGRAMS

A. Workforce Planning

Workforce Planning provides SoCalGas with the ability to identify, focus on, and overcome workforce gaps in critical roles within the organization. Critical roles are roles that have significant safety and operational consequences (*e.g.,* roles in departments such as System Protection, Gas Operations, Customer Services, etc.). Workforce Planning also helps with employee development so that employees have the right skills for current and future jobs within SoCalGas. Workforce Planning aligns business units with the Company's strategic goals by ensuring that Human Resources (HR), Training, Fleet, and Facilities, and Business Planning can support and better anticipate current and future workforce needs. The lack of comprehensive Workforce Planning capabilities, including critical role identification and operational headcount planning, can result in a shortage of employees with the right skills, in the right place at the right time to prevent safety-related incidents.

B. Succession Planning/Knowledge Transfer

In the next five years, over 50% of managers at SoCalGas will be retirement eligible. In addition, many employees will transition or advance to other roles. These two factors combined may lead to loss of critical knowledge within the Company. Currently, SoCalGas conducts a formal annual succession planning and talent review process to identify a pipeline of talent for all director and officer level positions and has efforts in place to support accelerated development for high potential employees. These efforts help to proactively identify and develop employees and mitigate knowledge gaps that could lead to safety incidents. These efforts will continue and be expanded to a broader audience.

C. Training

Leadership training, such as the New Supervisor Onboarding Program, Leadership Training Camp, Leadership Challenge, and the Director Development Program are necessary vehicles to communicate the Company's safety culture and to communicate the importance of the Company's safety values. Due to increased retirements and movement throughout the Company, equipping management with the necessary leadership skills, such as communicating SoCalGas's vision, engaging employees in the work that they perform, and instilling the Company's safety culture, are essential to the successful implementation of safety-related practices and risk management. These training activities will help SoCalGas appropriately address skills gaps in leadership and technical skills to promote the safe execution of work. Training for frontline supervisors is continually updated in conjunction with the Safety group and expanded based on Company safety data to help reduce employee safety incidents. Training at the manager level and above focuses on how to engage with employees about safety and how to instill the Company's safety culture in employees. Enhancing and expanding leadership development training at all leadership levels is also in line with SoCalGas's Safety Management System, which lists Leadership Commitment as Safety Value #1. SoCalGas leaders are responsible for overseeing safety concerns and promoting a strong, positive safety culture and environment of trust that includes empowering employees to identify risks and "Stop the Job."

D. Non-HR Technical Training

Since Workforce Planning is a cross-functional factor that impacts safety across the entire Company, it is important to focus attention on technical training conducted by various business units, in addition to the available training sponsored by HR and the centralized Learning and Development team. Activities within the scope of technical training include revamping and redesigning current technical training on an enterprise-wide basis. The importance of skills training for employees to perform their jobs safely are discussed in more detail in the following RAMP Risk Chapters: Incident Involving an Employee, Incident Involving a Contractor, Incident Related to the High Pressure System (Excluding Dig-In), Incident Related to the Medium Pressure (Excluding Dig-In), Excavation Damage (Dig-In) on the Gas System, and Incident Related to the Storage System (Excluding Dig-In). These activities are included here to address the cross-functional nature of this Chapter and illustrate the impact Workforce Planning has on safety across the entire organization. The centralized Learning and Development team

provides training support for some non-HR technical training on various projects related to safety and risk mitigation. For example, instructional designers work to develop and improve existing training for employees related to COVID-19 safety measures, new hire training programs to ensure the safety of the operators, customers, and community, and new training for inventory material traceability procedures.

V. 2022-2024 PROJECTS AND PROGRAMS

A. Workforce Planning

SoCalGas plans to expand workforce planning programs in 2021 to meet the increasing demands from business units, with a focus on integrating workforce planning into operations. This expansion, which will in part be accomplished by increasing the labor resources of the dedicated workforce planning team, is designed to: (1) support development and implementation of workforce planning models in additional business units, (2) provide analytics support to optimize the workforce level over time, and (3) support the integration of workforce planning into HR, Business Planning, and Fleet and Facility, supporting departments for employee onboarding, financial accountability, vehicle and workplace assignment.

Planned future activities include: (1) the development and maintenance of workforce planning models, (2) integration of workforce planning into the HR job requisition process, Business Planning, and capital planning for Facilities and Fleet, and (3) identification of workforce gaps, including development of staffing/hiring plans across additional operating areas throughout the Company. This program includes labor and non-labor resources as well as costs associated with time for participating in the planned activities (employee participation time in trainings, planners' time conducting workforce planning, etc.). These workforce planning activities will help SoCalGas appropriately plan to staff critical, safety-related roles. Critical role identification will be an integral part of this program, which will also facilitate knowledge management and succession planning activities.

Due to the complexity and unique challenges of each business unit's operational requirements, a single comprehensive workforce model for all of SoCalGas is not feasible. SoCalGas has chosen instead to deploy workforce models that are tailored to accommodate the needs of each business unit. The results from every business unit can then be aggregated to produce an enterprise-wide workforce plan for the Company. Implementing the workforce models will require identifying all work streams, forecasting future workloads, and forecasting

the required workforce to complete the forecasted workload. Successfully deployed workforce models will be used to optimize the workforce level by simulating impacts of changes in work order volumes, which will help business units more efficiently and effectively develop staffing plans, control overtime expenses, and allocate resources across SoCalGas's 52 field operations districts. The resulting staffing plan will inform operational support departments such as HR, Business Planning, and Fleet and Facilities of enterprise wide needs. HR will utilize aggregated staffing plans to anticipate and identify targeted pools of candidates to meet staffing needs. Business Planning uses staffing plans to inform forecasts of employee-related expenses and Fleet and Facilities each use the plans to guide vehicle and facility investments. Fleet will review the current inventory and location of vehicles to determine if additional Company vehicles are needed. Facilities will use the workforce information to proactively review workplace needs such as workstations, parking spaces, and other job enablers for the employee to perform their job. The expanded workforce planning provides an enterprise view of the business needs and the opportunity for the supporting departments to proactively plan and optimize existing resources.

In addition to the dedicated workforce planning team mentioned above to assist the supporting departments and various business units, the business units themselves will also require additional resources to maintain and utilize the newly deployed workforce planning models. SoCalGas plans to add labor resources amongst the business units that will have a deployed workforce planning model. The responsibilities of these additional resources are to update the model as assumptions and conditions changes, lead monthly planning meetings using the model, and provide data and analyses to support decision-making. These resources will be embedded within the business unit and are expected to have in depth operational knowledge as they will be responsible for the practical application of the workforce planning model.

B. Knowledge Transfer

SoCalGas intends to increase efforts to implement, refresh, and expand specific knowledge management strategies and programs to a broader audience. Additional efforts will be focused on employees in, and with potential to occupy, critical positions. It is essential that SoCalGas not only focus on accelerating advancement and development for high potential employees, but also for a broader range of mid-level technical employees and managers as they will likely take over key roles for retiring and rotating employees. For example, a mid-level manager or technical expert who possesses critical knowledge would not currently participate in

the succession planning process, which creates a risk of knowledge loss if the employee vacates the role. Thus, planning for and proactively developing a broader pool of successors for critical roles will help to mitigate knowledge gaps that could lead to safety incidents.

This program will aim to provide employees with the structure, support, and resources necessary to transfer unique knowledge related to critical jobs. Activities included as part of the knowledge transfer program may include knowledge workshops and the formation of specialized groups within certain technical areas who have a common goal and engage on an ongoing basis (*i.e.,* Communities of Practice), technology development and implementation, and knowledge transfer plans. Because of the high number of retirement-eligible employees, the need to accelerate skill-building through knowledge transfer and employee development is key to the success of SoCalGas's focus on safety, especially in specialized/critical roles, such as safety-related roles like cathodic protection or gas compression maintenance roles. These knowledge transfer activities (*e.g.,* workshops, Communities of Practice, technology development, etc.) will help SoCalGas create knowledge transfer plans for critical, safety-related roles. The expansion of these activities will focus on safety-related roles that will be identified through the planned expanded workforce planning activities.

C. Training

As addressed above, SoCalGas currently offers several trainings as part of its Leadership Training Program, including Leadership Training Camp, the New Supervisor Onboarding Program, the Leadership Challenge, and the Director Development Program. SoCalGas's Leadership Training Program is being modified starting in 2021 to reflect the following expansions, enhancements, and replacements:

- Expanding: Expanding the use of technology to support the need for virtual training. In part highlighted by the impact COVID-19 has had on both trainers and trainees, SoCalGas is revamping/redesigning current training practices to more effectively utilize new and emerging technologies as a greater percentage of the workforce continues to work remotely, either partially or fully. Costs for this effort include incremental labor resources and software to create technology-based training solutions.

- Expanding: Developing additional training opportunities designed for SoCalGas's represented workforce. Training will include both leadership and soft-skills training, to supplement existing technical training.
- Enhancing: Revamping and modernizing *Leadership Training Camp*. This redesigned program will help grow leaders' effectiveness in addressing complex challenges, engaging employees, and creating a culture of safety on their teams.
- Replacing: *Essentials of Supervision* T*raining* has been replaced with a completely redesigned *New Supervisor Onboarding Program*. This onboarding program provides a more robust process for equipping new supervisors with the tools and support needed to be successful. Front line supervisors oversee processes that may be hazardous to employees and/or the public, therefore, the expanded supervisor training program will help minimize potential safety incidents.
- Revamping/Replacing: *The Leadership Challenge* will be reevaluated to ensure it is effective in equipping mid-level managers and leaders to meet the complex challenges facing SoCalGas in executing on the Company's mission.
- Enhancing: The *Director Development Program* will be expanded to address the needs of emerging executive leaders, specifically to include senior managers, as they shape culture and engagement within their groups.

These training activities will help SoCalGas appropriately address skills gaps in all levels of leadership and technical skills to promote the safe execution of work.

D. Non-HR Technical Training

SoCalGas's centralized Learning and Development team will continue supporting non-HR led technical training by addressing various safety-related training needs across the Company. Instructional designers will partner with business groups to assess skill gaps and associated risks with outdated training in order to design and develop new (and revise where applicable) virtual and instructor led training. These training activities increase awareness and utilization of safety innovations for employees and supervisors, thereby decreasing the rate of safety-related incidents.

VI. COSTS

The table below contains the 2020 recorded and forecast dollars for the programs and projects discussed in this CFF.

Costs (Direct After Allocations, in 2020 $000)[1]

Line No.	Description	Recorded		Forecast			
		2020 Capital	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
1	Workforce Planning	0	585	0	0	940	1,105
2	Knowledge Transfer	0	35	0	0	140	195
3	Training	0	1,115	0	0	620	750
4	Training – Technical non-HR	0	295	0	0	280	340
5	Workforce Planning – Enhance		Included in Line 1			Included in Line 1	Included in Line 1
6	Knowledge Transfer – Enhance		Included in Line 2			Included in Line 2	Included in Line 2
7	Training – Enhance		Included in Line 3			Included in Line 1	Included in Line 3
8	Training – Technical non-RH - Enhance		Included in Line 4			Included in Line 4	Included in Line 4

[1] Costs presented in the workpapers may differ from this table due to rounding. The figures provided are direct charges and do not include company loaders, with the exception of vacation and sick. The costs are in 2020 dollars and have not been escalated in forecasts beyond 2020.