PG&E's 2020 RAMP Workshop #3
August 26

Motor Vehicle Safety Incident
2020 RAMP Post-Filing Workshop

Enterprise Health and Safety
Jim Powell
August 26, 2020

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Agenda

Objective | Provide overview of PG&E's Motor Vehicle Safety Incident Assessment and Mitigation Program going into 2023 General Rate Case

I. Introduction
   a. *Definition & RAMP Risk Scores*
   b. *Regulatory Proceedings & Risk Modeling Summary*
II. Risk Assessment
   a. *Risk Bowtie Overview*
   b. *Cross Cutting Factors Overview*
III. Mitigations and Controls
   a. *Mitigations*
   b. *Controls*
   c. *Alternatives Analysis*
IV. Appendix

Motor Vehicle Safety Incident Definition

Definition	Any motor vehicle accident involving a PG&E vehicle (or one operated on behalf of PG&E) resulting in recordable injuries or fatalities for employees or the public, property damage, and other consequences
Scope	**In Scope:** Any recordable motor vehicle incident involving a PG&E vehicle (or one operated on behalf of PG&E. Includes preventable and non-preventable incidents **Out of Scope**: Motorized equipment, off-road vehicles, off-road driving, unique or specialized vehicles, non-staff augmentation contractors, and other drivers
Background[1]	The risk exposure is based on the more than 141 million miles that PG&E employees drive each year. Of the 914 motor vehicle incidents that occur on average each year, 57% of those are classified as non-preventable motor vehicle incidents (NPVMI). The remaining 43% are considered preventable motor vehicle incidents (PVMI). Of 43% PMVI's, 23% are attributed to hitting a stationary object or backing. The mitigations PG&E will implement from 2020 to 2026 are designed to address these key risk drivers

(1) Source: Ch. 18, Risk Assessment and Mitigation Phase 2020

PG&E RAMP Risk Scores

			2023 RAMP Score	
Rank	LOB	Safety Risks	Safety Risk Score	Multi-Attribute Risk Score
1	EO	Wildfire	9,856	25,127
2	EHS	Third-Party Safety Incident	887	944
3	GO	Loss of Containment on Gas Transmission Pipeline	128	281
4	EHS	Contractor Safety Incident	97	97
5	EHS	Employee Safety Incident	86	90
6	GO	Loss of Containment on Gas Distribution Main or Service	72	99
7	SS	Real Estate and Facilities Failure	69	97
8	PGEN	Large Uncontrolled Water Release (Dam Failure)	41	70
9	EO	Failure of Electric Distribution Overhead Assets	18	525
10	EHS	Motor Vehicle Safety Incident	16	17
11	EO	Failure of Electric Distribution Network Assets	6	7
12	GO	Large Overpressure Event Downstream of Gas M&C Facility	5	13

The Motor Vehicle Safety Incident risk modeling has evolved since the RAMP 2017 filing

PG&E Regulatory Filings addressing Risks

Nov. 2017 — *Nov. 2018* — *Jun. 2020*

Risk Assessment Mitigation Phase (RAMP) 2017

- Quantitative assessments of Utility's top risks
- Describes current mitigation plan for 2017-2019
- Describes proposed mitigation plan (incl. cost forecasts) for 2020-2022

General Rate Case 2020

- Includes all of Utility's proposed controls, mitigations and associated cost forecasts for 2020-2022

Risk Assessment Mitigation Phase (RAMP) 2020

- Quantitative assessments of Utility's top risks as determined by magnitude of potential safety consequences
- Describes proposed mitigation plan and cost forecasts for 2023-2026

Evolution of Motor Vehicle Safety Incident risk modeling

Nov. 2017 — *Nov. 2018* — *Jun. 2020*

- **1st generation RAMP** model using Excel with @Risk add-in
- **Risk drivers based on PG&E's accident data** and Bureau of Transportation Statistics data, they included Equipment, Human Error, and Outside Forces
- **No tranches**

- 1st generation RAMP model using Excel with @Risk add-in
- The mitigations were refined during the GRC filing process

- **2nd Generation RAMP** Model using open source Python
- Risk drivers use **PG&E specific motor vehicle incident data** for preventable and non-preventable incidents
- Risk analysis **includes eight tranches** based PG&E vehicle classifications
- Mitigation effectiveness analysis completed. Additional analysis being performed by UCLA consultants as part of RAMP to GRC refresh

Risk Assessment – Bowtie Development

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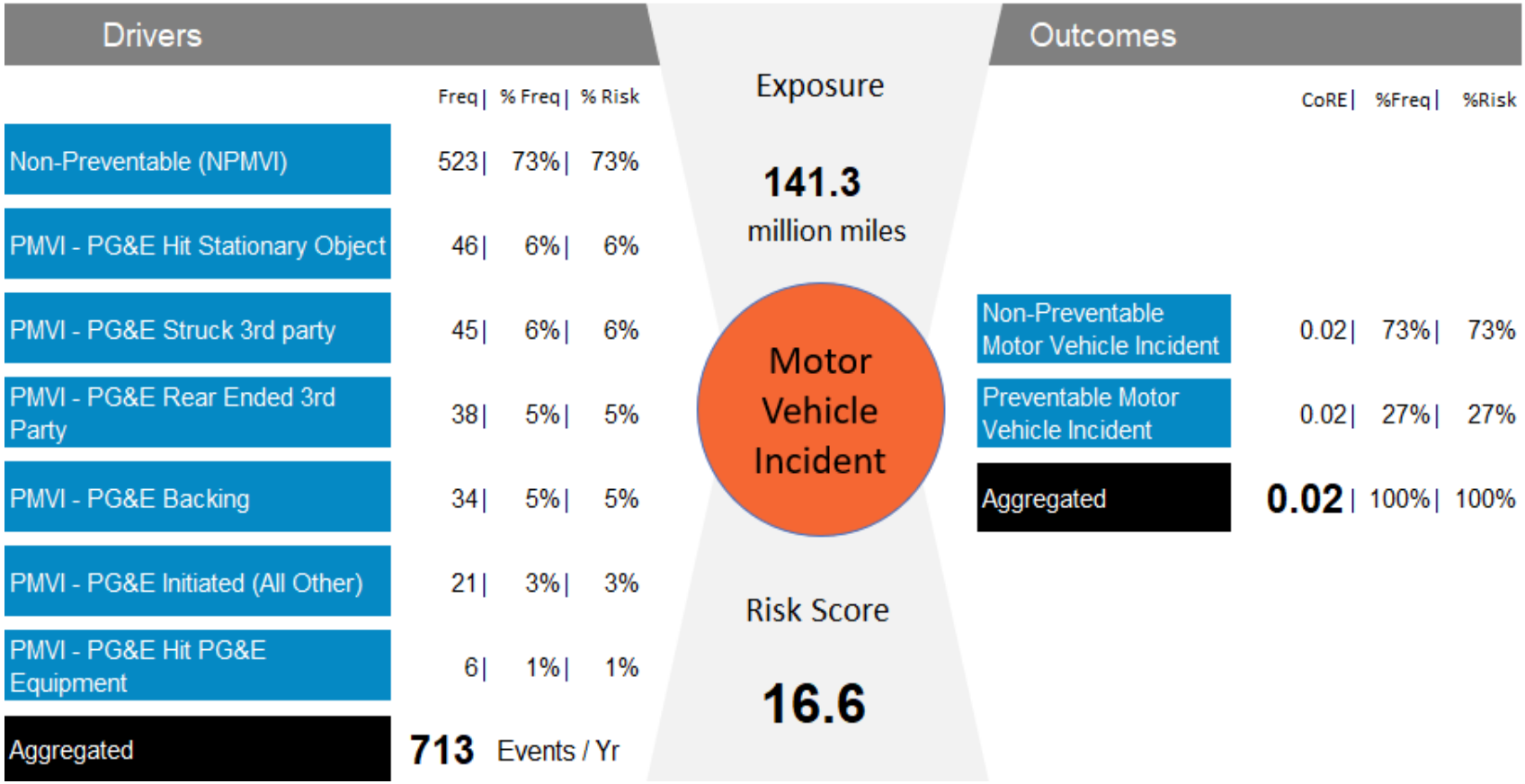
Risk Bowtie Overview



(1) Risk score represents Test Year Baseline Risk Score for 2023 (i.e. pre-mitigation risk score for 2023, post 2020-2022 mitigations, post all controls)

Cross-Cutting Factors Overview

One cross-cutting factor is being considered with the Motor Vehicle Safety Incident risk model

Cross-Cutting Factor	Impacts Likelihood	Impacts Consequence	
Records and Information Management		X	Could impact Financial Consequences, reflecting the state of records management maturity based on the current records management practice. Modeling methodology will be reviewed as part of the GRC filing

Additional Cross-Cutting Considerations:

- **Climate Change**: This cross-cutting factor is considered by PG&E to impact the RAMP risk. PG&E plans to conduct a Climate Vulnerability Assessment (CVA) to further assess how its assets, operations, and employees are vulnerable to the projected impacts of climate change. Based on this assessment PG&E may identify measures (such as fewer miles driven) to mitigate the risk

Risk Assessment – Controls & Mitigations

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Motor Vehicle Safety Incident Risk Reduction Programs Overview

2017 RAMP

Controls

- Commercial Driving School
- Driver Qualification
- Distracted Driving Training
- Smith Driving Courses
- Defensive Driving – The Critical 5
- Vehicle Tie-Down Equipment Training
- Reasonable Suspicion Supervisor Training
- DMV Employer Pull Notice Program
- Fitness for Duty Training
- Phone Free Driving Standard
- Company Pool Vehicle Standard
- Commercial Driver's Fatigue Management Procedure
- Drug/Alcohol Testing program (DOT and Gas Employees)
- "How Am I Driving" hotline Reporting and Supervisor Review
- Preventative Maintenance On Time Performance and Monitoring
- Driver Visual Inspection Report (DVIR) and Audit

2017 RAMP Mitigations

- Motor Vehicle Safety (MVS) Standard
- Vehicle Safety Technology (VST) Program Standardized Reporting
- Driving Expectations and New Laws
- Standardized Employee Motor Vehicle Training
- Training acknowledgement for valid license
- Implement Driver Accountability
- 2017 and 2018 VST Install and Activate
- Revise License Verification Process for Non-DOT Covered Drivers
- VST in personal vehicles
- Driver Selection Program
- MVS Management System

2020 RAMP

Controls added

- MVS Standard – created SAFE-1002S
- Vehicle Safety Technology (VST) Program Standardized Reporting
- Standardized Employee Motor Vehicle Training from SAFE-1002S
- Driving Expectations and New Laws – all employees
- Safe Driver Coaching Program – Drivers Alert
- Training acknowledgement for valid license- all employees

2020 RAMP Mitigations

- Update VST Install and Activate all PG&E units
- Post incident review - Dashboard
- 360 Walk Around App
- Partnering with UCLA to conduct risk assessment
- Safe Backing Training available to all

For 2020 RAMP analysis

- System wide Cell Phone Activity Blocking
- Data enhancement/improvement plan for improved collection and usage of data from UCLA study

For 2020 RAMP analysis as Alternatives

- Smith Driving Training - for personal vehicle use for work
- Enhancement to Pool Vehicle Reservation System
- In-Cab camera technology
- Driver Selection Program

RSE and Risk Reduction Scores

	Mitigation	Risk Reduction	RSE (NPV Risk Reduction/$000 2023-2026)	Commentary
M19	Cell Phone Activity Blocking	3.1	0.42	▪ This mitigation provides an engineering control to block phone activity and use while driving. The technology will not block emergency cell phone features. This mitigation is in the initial proposal phase and will be informed by information developed in the proposed UCLA analysis. *Reduces the risk by eliminating driver distraction created by cell phone use*
M17	Data Quality Plan for enhanced and improved collection and usage of data	-	-	▪ Improvements to risk analysis data quality informed by UCLA Risk Assessment Study recommendations

Alternatives Considered

Alternative Mitigation	Description	Rationale for Not Selecting
Driver Selection Program	▪ This alternative is implementation of the Driver Selection Program that integrates all sources of driver information in order to create a holistic assessment of individual driver risk	▪ The current RSE for this alternative is 15.89 and is under further evaluation as part of the UCLA Study
Enhancement to Pool Vehicle Reservation System	▪ This alternative considers an enhancement to the existing control, the Company Pool Vehicle Standard. It would require electronic proof of valid license prior to reserving pool vehicles.	▪ This alternative is under further evaluation as part of the UCLA Study
In-Cab camera technology	▪ This alternative is implementation of In-Cab camera technology that monitors both external and in-cab activities triggered by specific parameters and operation of the vehicle (i.e. braking, cornering, acceleration, speeding)	▪ This current RSE for this alternative is 19.08 and is under further evaluation as part of the UCLA Study
Smith Driving for driving personal vehicles on PG&E time	▪ This alternative is implementation of the Smith Driving course for those who drive a personal vehicle for work. Training is conducted with the employees' personal vehicle	▪ This alternative is under further evaluation as part of the UCLA Study

Employee Safety Incident
2020 RAMP Post-Filing Workshop

Enterprise Health and Safety
Becky Johnson
August 26, 2020

Together, Building
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Agenda

Objective

Provide overview of PG&E's Employee Safety Incident Assessment and Mitigation Program going into 2023 General Rate Case

I. Introduction
   a. *Definition & RAMP Risk Scores*
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Employee Safety Incident Definition

Definition	Any PG&E event resulting in a employee recordable injury or fatality, excluding events resulting from asset failure
Scope	**In Scope:** PG&E employee recordable injuries and fatalities that are not the result of an asset failure **Out of Scope**: PG&E employee recordable injuries and fatalities resulting from the failure of an asset
Background[1]	Exposure to this risk is measured against the approximately 22,000 members of PG&E's employee workforce. The risk model includes an average of 620 risk events each year, 60% of which are due to overexertion and bodily injury. The Employee Safety incident risk includes two tranches: office-based employees, representing 60% of the workforce, and field employees, representing 40% of the workforce. Approximately 75% of recordable injuries happen among field employees

(1) Source: Ch. 16, Risk Assessment and Mitigation Phase 2020

PG&E RAMP Risk Scores

			2023 RAMP Score	
Rank	LOB	Safety Risks	Safety Risk Score	Multi-Attribute Risk Score
1	EO	Wildfire	9,856	25,127
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4	EHS	Contractor Safety Incident	97	97
5	EHS	Employee Safety Incident	86	90
6	GO	Loss of Containment on Gas Distribution Main or Service	72	99
7	SS	Real Estate and Facilities Failure	69	97
8	PGEN	Large Uncontrolled Water Release (Dam Failure)	41	70
9	EO	Failure of Electric Distribution Overhead Assets	18	525
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12	GO	Large Overpressure Event Downstream of Gas M&C Facility	5	13

The Employee Safety Incident risk modeling has evolved since the RAMP 2017 filing

PG&E Regulatory Filings addressing Risks

Nov. 2017

Risk Assessment Mitigation Phase (RAMP) 2017

- Quantitative assessments of Utility's top risks
- Describes current mitigation plan for 2017-2019
- Describes proposed mitigation plan (incl. cost forecasts) for 2020-2022

Nov. 2018

General Rate Case 2020

- Includes all of Utility's proposed controls, mitigations and associated cost forecasts for 2020-2022

Jun. 2020

Risk Assessment Mitigation Phase (RAMP) 2020

- Quantitative assessments of Utility's top risks as determined by magnitude of potential safety consequences
- Describes proposed mitigation plan and cost forecasts for 2023-2026

Evolution of Employee Safety Incident risk modeling

Nov. 2017

- 1st generation RAMP model using Excel with @Risk add-in
- Risk drivers based on **PG&E employee recordable OSHA recordable data categories** based on OSHA classifications
- No tranches
- **Assessed as two risks:**
  - Employee Safety
  - Lack of Fitness for Duty Program Awareness

Nov. 2018

- 1st generation RAMP model using Excel with @Risk add-in
- The mitigations were refined during the GRC filing process

Jun. 2020

- 2nd Generation RAMP Model using open source Python
- Risk driver **categories subdivided into 35 drivers** specific to Cal/OSHA recordable injury claim cause data
- Risk analysis includes **two tranches**: office-based and field employees
- Comprehensive mitigation effectiveness analysis for the **combined risk**

Risk Assessment – Bowtie Development

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Risk Bowtie Overview

(1) Risk score represents Test Year Baseline Risk Score for 2023 (i.e. pre-mitigation risk score for 2023, post 2020-2022 mitigations, post all controls)

(2) Top nine drivers only are included in this representation of the bow tie. The "Others" category includes the remaining 26 drivers and their combined frequency

Cross-Cutting Factors Overview

Four cross-cutting factors are considered with the Employee Safety Incident risk model

Cross-Cutting Factor	Impacts Likelihood	Impacts Consequence	Methodology
Climate Change	X		This cross-cutting factor is considered by PG&E to impact the RAMP risk, but data limitations precluded a statistically meaningful quantification of its impact. PG&E plans to conduct a Climate Vulnerability Assessment (CVA) to further assess how its assets, operations, and employees are vulnerable to the projected impacts of climate change
Physical Attack	X		Physical attack is included as a risk event driver as "violence and other injuries by persons or animals". There are an estimated 1.4 events per year which equates to 0.26 percent of the risk
Records and Information Management		X	A 2.9% multiplier was applied to heighten Financial Consequences, reflecting the state of records management maturity based on the current records management practice
Skilled and Qualified Workforce	X		There are an estimated 19 risk events per year that can be attributed to the skilled and qualified workforce cross-cutting risk which equates to 3.0 percent of the risk

Risk Assessment – Controls & Mitigations

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Employee Safety Incident Risk Reduction Programs Overview

2017 RAMP

Controls (Employee Safety)

- PG&E Safety and Health Standards
- Enterprise Corrective Action Program
- Employee Knowledge and Skills Assessments (including Academy Training)
- SafetyNet safety observations
- Safety Leadership Development

Controls (Fitness for Duty)

- Benefit Plans and Policy
- Employee Wellness
- Training and Communication

Mitigations (Employee Safety)

- Safety Management System (ESMS) Planning and Implementation
- Serious Incident and Fatality (SIF) Incident Investigation Review
- Safety Observation Tool
- Job Hazards Analysis
- One PG&E Health and Safety Plan
- Musculoskeletal Disorder (MSD) Program
- Industry roundtable participation
- Enterprise Safety Communication Plan
- Learning Organization
- Safety Leadership Development
- Injury Management
- Health and Wellness

Mitigations (Fitness for Duty)

- Mandatory Fitness for Duty Training
- Redesigned time off policy and Voluntary Plan
- Telemedicine Kiosks
- Onsite Clinics

2020 RAMP

Controls added

- Employee Health and Wellness: 1. Emotional Health - Employee Assistance Program and Peer Volunteer Program; 2. Physical Health - Employee Health Screenings and Health Coaching
- Enhanced Fitness for Duty (FFD) Metrics
- Return to Work Task Program
- Nurse Care Line
- SIF Prevention program and SIF Program process improvements
- PG&E's Leader in the Field initiative

2020 RAMP Mitigations

- Enterprise Safety Management System (ESMS) planned implementation
- On-Site Clinics
- Mobile Medics
- Fit 4 U pilot
- Enhanced SafetyNet Use safety observations and reporting
- MSD Programs continued strengthening:
  - Industrial Athlete
  - Vehicle Ergonomics
  - Industrial Ergonomics
  - Office Ergonomics
- Industrial Hygiene (IH) Program Compliance Improvements (Phase 1)

RSE and Risk Reduction Scores

	Mitigation	Risk Reduction	RSE (NPV Risk Reduction/$000 2023-2026)	Commentary
M1B	Enterprise Safety Management System (ESMS) planned implementation	29.6	13.00	▪ The ESMS consists of a series of capabilities (people, process, governance, and technology systems) required to define, plan, implement, and continuously improve workforce safety. It will be based on a consistent and comprehensive enterprise safety controls framework reinforced with system assurance. *Reduces the risk of recordable injuries with an enterprise-wide safety and health program management system in alignment with Cal/OSHA Injury and Illness Prevention Program requirements*
M11	On-site Clinics	19.0	2.21	▪ Establish on-site clinics available to PG&E employees. The on-site clinics are expected to provide employees with convenient access to health care services in support of a healthier workforce by reducing the duration of Days Away From Work and Restricted Duty (DART) cases. *Reduces the risk of injury severity by providing employees with increased access to health care services*
M17	Mobile Medics	1.9	0.68	▪ PG&E will place Emergency Medical Technicians (EMTs) throughout seven locations with the highest OSHA-recordable injuries. EMTs will be available during regular business hours to respond to injuries and provide immediate care to mitigate the severity of injuries and reduce OSHA and DART cases. *Reduces the risk of injury severity by providing employees with increased access to health care services*

RSE and Risk Reduction Scores

	Mitigation	Risk Reduction	RSE (NPV Risk Reduction/$000 2023-2026)	Commentary
M6a	Musculoskeletal Disorder (MSD) Program - Office Ergonomics	2.6	0.37	▪ This is a continued effort on Program change management including Supervisor early symptom recognition and action training. Work with facility partners to ensure furnishings meet ergonomic design specifications and enhance reporting. *Reduces the risk through preventing and reducing the severity of overexertion and bodily reaction recordable injuries for primarily office-based personnel*
M6b	MSD Program – Industrial Ergonomics	3.5	1.13	▪ This is a continued effort to educate employees about industrial ergonomics risk factors, while making the Velocity software fully operational across PG&E for use by prevention specialists and industrial ergo teams. The software facilitates the assessment of work activity ergonomic risk factors to determine possible risk reduction measures. *Reduces the risk through preventing and reducing the severity of overexertion and bodily reaction recordable injuries for field personnel*
M6c	MSD Program - Industrial Athlete	8.4	0.64	▪ Program expansion to reduce discomfort cases and prevent muscle strains and sprains. Program objectives include targeted interactions with an on-site prevention specialist that focus on high risk areas identified by Supervisors, SafetyNet observations, surveys, and biomechanical observations. *Reduces the risk through preventing and reducing the severity of overexertion and bodily reaction recordable injuries for field personnel*
M6d	MSD Program - Vehicle Ergonomics	5.9	7.11	▪ Utilize PG&E-owned vehicles design review committee to fully understand the work performed while using the vehicles and recommend technology changes. *Reduces the risk through preventing and reducing the severity of overexertion and bodily reaction recordable injuries for field personnel*

Alternatives Considered

Alternative Mitigation	Description	Rationale for Not Selecting
Additional IH Program Compliance Improvements	▪ This alternative considers the implementation of additional Industrial Hygiene (IH) Program Compliance improvements to expand the program and provide additional LOB support with compliance assurance including IH monitoring and surveillance. Field surveillance is an important part of reducing work location exposures to hazardous substances and environments	▪ The RSE for this alternative is 0.2. It was not selected given the lower RSE and lower risk reduction compared to the proposed mitigations
Employee Safety Field Inspections	▪ This alternative considers the implementation of Safety Field Inspections for PG&E employee workplaces and locations. This program would be similar to the Contractor Safety Field Inspections however is anticipated to require additional resources in order to inspect all PG&E field and office locations. Inspection programs are an important part of reducing recordable injuries and fatalities as they place increased attention on adhering to safety and health compliance requirements and working safely	▪ The RSE for this alternative is 2.3. It was not selected given the lower RSE and lower risk reduction compared to the proposed mitigations

Contractor Safety Incident
2020 RAMP Post-Filing Workshop

Enterprise Health and Safety
Kristin Hollinger
August 26, 2020

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Objective

Provide overview of PG&E's Contractor Safety Incident Assessment and Mitigation Program going into 2023 General Rate Case

I. Introduction
   a. *Definition & RAMP Risk Scores*
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IV. Appendix

Contractor Safety Incident Definition

Definition	Any PG&E event resulting in a contractor recordable injury or fatality, excluding events resulting from asset failure
Scope	**In Scope:** PG&E contractor recordable injuries and fatalities that are not the result of an asset failure for contractors performing high- and medium-risk work **Out of Scope**: PG&E contractor recordable injuries and fatalities resulting from the failure of an asset
Background[1]	For the RAMP 2020 filing, risk analysis data improvements include the use of Safety Prequalification Vendor injury reporting for 2017 through 2019 to differentiate workplace injury categories for PG&E contractors. These data were not available for the RAMP 2017 filing as the Contractor Safety Program was new This risk results from the Kern Order Instituting Investigation (OII) Settlement Agreement with California Public Utilities Commission (CPUC) related to a contractor fatality that occurred in 2012

(1) Source: Ch. 17, Risk Assessment and Mitigation Phase 2020

PG&E RAMP Risk Scores

			2023 RAMP Score	
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1	EO	Wildfire	9,856	25,127
2	EHS	Third-Party Safety Incident	887	944
3	GO	Loss of Containment on Gas Transmission Pipeline	128	281
4	EHS	Contractor Safety Incident	97	97
5	EHS	Employee Safety Incident	86	90
6	GO	Loss of Containment on Gas Distribution Main or Service	72	99
7	SS	Real Estate and Facilities Failure	69	97
8	PGEN	Large Uncontrolled Water Release (Dam Failure)	41	70
9	EO	Failure of Electric Distribution Overhead Assets	18	525
10	EHS	Motor Vehicle Safety Incident	16	17
11	EO	Failure of Electric Distribution Network Assets	6	7
12	GO	Large Overpressure Event Downstream of Gas M&C Facility	5	13

The Contractor Safety Incident risk modeling has evolved since the RAMP 2017 filing

PG&E Regulatory Filings addressing Risks

Nov. 2017

Risk Assessment Mitigation Phase (RAMP) 2017

- Quantitative assessments of Utility's top risks
- Describes current mitigation plan for 2017-2019
- Describes proposed mitigation plan (incl. cost forecasts) for 2020-2022

Nov. 2018

General Rate Case 2020

- Includes all of Utility's proposed controls, mitigations and associated cost forecasts for 2020-2022

Jun. 2020

Risk Assessment Mitigation Phase (RAMP) 2020

- Quantitative assessments of Utility's top risks as determined by magnitude of potential safety consequences
- Describes proposed mitigation plan and cost forecasts for 2023-2026

Evolution of Contractor Safety Incident risk modeling

Nov. 2017

- 1st generation RAMP model using Excel with @Risk add-in
- Exposure based on available contractor injury and hours worked data
- Risk drivers based on **PG&E employee recordable injury classifications** as the Contractor Safety program was not fully implemented
- Risk mitigations grouped into **bundles** focused on key Contractor Safety Program objectives

Nov. 2018

- 1st generation RAMP model using Excel with @Risk add-in
- Exposure based on available contractor injury and hours worked data
- The mitigation bundles were refined during the GRC filing process

Jun. 2020

- 2nd Generation RAMP Model using open source Python
- Exposure based on number of PG&E contractors (3 year average)
- Risk drivers based on **PG&E contractor injury and OSHA classifications data**
- Comprehensive mitigation effectiveness analysis by mitigation (bundles removed)

Risk Assessment – Bowtie Development

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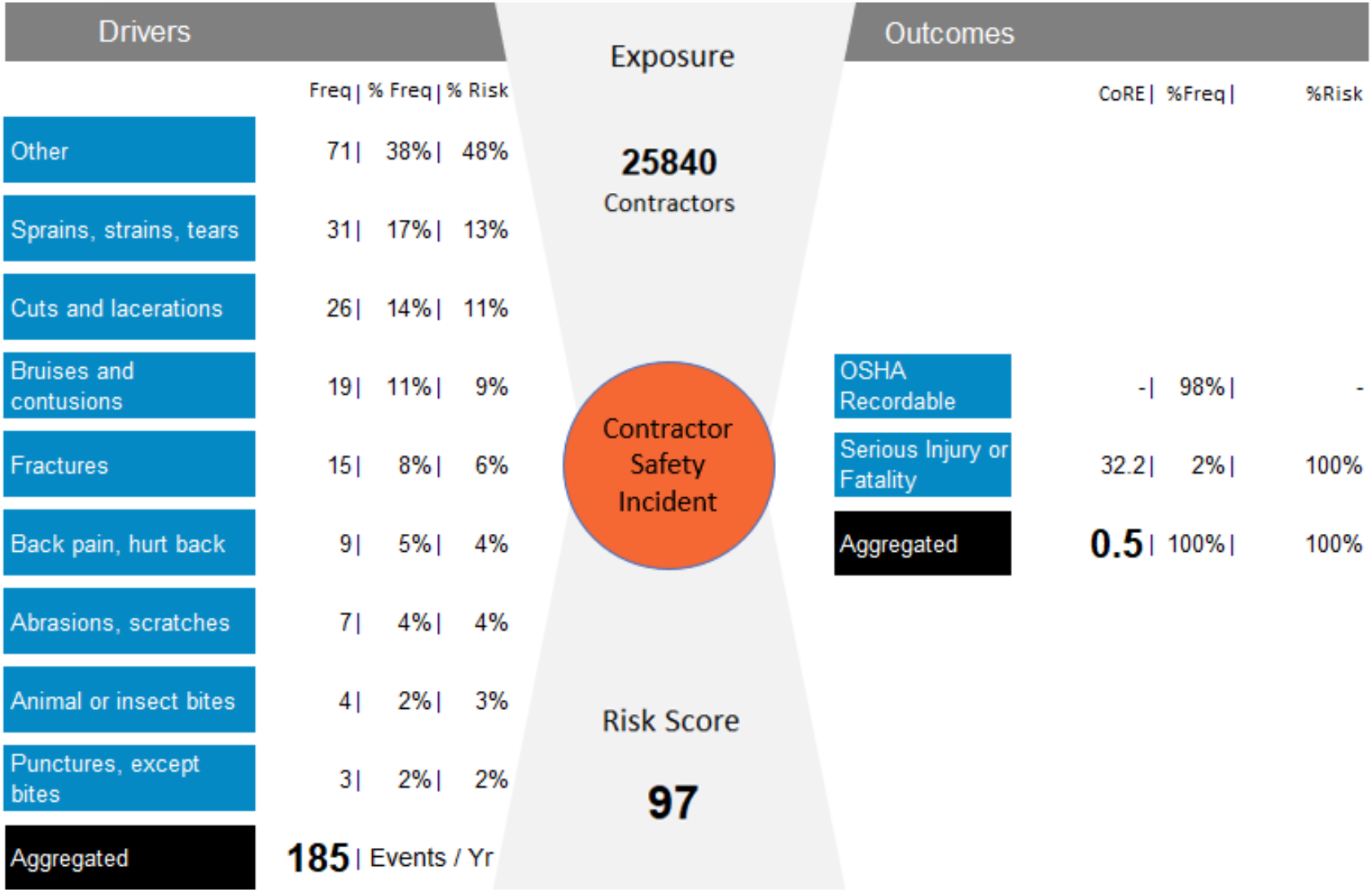
Risk Bowtie Overview



(1) Bowtie image as of July 17 errata

(2) Risk score represents Test Year Baseline Risk Score for 2023 (i.e. pre-mitigation risk score for 2023, post 2020-2022 mitigations, post all controls)

Cross-Cutting Factors Overview

One cross-cutting factor is being considered with the Contractor Safety Incident risk model

Cross-Cutting Factor	Impacts Likelihood	Impacts Consequence	
Records and Information Management		X	Could impact Financial Consequences, reflecting the state of records management maturity based on the current records management practice. Modeling methodology will be reviewed as part of the GRC filing

Additional Cross-Cutting Considerations:

- **Physical Attack**: Data were not available to quantify in the risk model for RAMP 2020 process; PG&E plans to evaluate this cross-cutting risk as part of the GRC filing

Risk Assessment – Controls & Mitigations

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Contractor Safety Incident Risk Reduction Programs Overview

2017 RAMP	2020 RAMP
Controls ▪ Enhanced Standard Contract Terms and Conditions ▪ Contractor Safety Pre-Qualification ▪ Contractor Safety Standard and Lines of Business (LOB) Contractor Oversight Procedures ▪ Contractor Safety Plans ▪ Contractor hazard analysis/daily tailboards ▪ LOB Contractor Safety Oversight ▪ LOB Compliance Assessments ▪ CAP for contractor issues ▪ Contractor Safety Post Job Safety Performance Review	**Controls added** ▪ SIF Incident Governance and Oversight ▪ ISN Rapid Growth Tracking and Contractor Evaluations ▪ Standardized Safety Plan and JSA Templates ▪ PG&E employees bi-annual program compliance training ▪ LOBs Contractor Forums with their contractors on multi-year agreements ▪ Contractor Post-Job Performance Evaluation scorecard criteria ▪ ISN Automated system for tracking, trending and generating reports
2017 RAMP Mitigations ▪ Serious Injury and Fatality (SIF) Incident Governance and Oversight ▪ Contractor Safety Officer Criteria ▪ CAP Issues Criteria ▪ ISNetworld (ISN) Rapid Growth Tracking and Contractor Evaluations ▪ Standardized Safety Plan and JSA Templates ▪ PG&E Specific Hazards Communication Process ▪ Mitigation Bundles: Governance, Process Improvements, Knowledge, Tools and Technology	**2020 RAMP Mitigations** ▪ ISNs individual badge feature ▪ Contractor Safety Officer Criteria ▪ Safety Scorecard ▪ Contractor Safety Handbook ▪ Contractor Near-hits/Good-Catches ▪ Contractor Safety Field Inspections ▪ OSHA Programs Training Requirements ▪ Contractor Onboarding ▪ Work Permits ▪ Tracking Contractor Workers

RSE and Risk Reduction Scores

	Mitigation	Risk Reduction	RSE (NPV Risk Reduction/$000 2023-2026)	Commentary
M11b	Work Permits	16.0	192.0	▪ Establish a process for PG&E to evaluate critical high-risk work activities and ensure all safety controls are in place before commencement. *Reduces the risk through strengthening contractor oversight of safe work planning and execution*
M13	Contractor Onboarding	16.0	3.4	▪ Includes minimum criteria and requirements for consistently onboarding contractors throughout the enterprise. *Reduces the risk through strengthening contractors qualifications and safe work planning and execution*
M14	Contractor Safety Field Inspections	12.8	1.2	▪ Enterprise Safety and Health will perform unannounced field visits in addition to LOB Compliance Assessments already in place. *Reduces the risk through strengthening contractor oversight of safe work planning and execution*
M16	Tracking Contractor Workers	16.0	3.6	▪ Establish a platform for tracking contractor work status and crew locations. The proposed system will enhance existing processes to allow tracking of work schedules and locations. *Reduces the risk through strengthening contractor oversight*
M17	OSHA Programs Training Requirements	12.8	29.4	▪ Identifies additional safety training for contractors and PG&E employees who oversee contractors to ensure they are qualified to oversee the work from a safety perspective. *Reduces the risk through strengthening workforce qualifications and safe work planning and execution*

Alternatives Considered

Alternative Mitigation	Description	Rationale for Not Selecting
Removes Contractor Work Status Tracking	▪ This alternative considers the removal of the Contractor Work Management System for tracking contractor work status and crew locations	▪ The RSE for this alternative is 2.7. It was not selected as tracking contractor crew locations supports increased oversight and is critical to the success of the Contractor Safety Program and reducing the risk
Increase in Contractor Field Safety Inspections resources	▪ This alternative considers the addition of resources to the contractor safety field inspections teams	▪ The RSE for this alternative is 1.6. It was not selected as significantly expanding the field safety inspections beyond what is currently planned increases the program cost without a proportionate increase in reducing the risk

Third-Party Safety Incident
2020 RAMP Post-Filing Workshop

Enterprise Health and Safety
Diane Thurman
August 26, 2020

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Objective

Provide overview of PG&E's Third-Party Safety Incident Assessment and Mitigation Program going into 2023 General Rate Case

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9	EO	Failure of Electric Distribution Overhead Assets	18	525
10	EHS	Motor Vehicle Safety Incident	16	17
11	EO	Failure of Electric Distribution Network Assets	6	7
12	GO	Large Overpressure Event Downstream of Gas M&C Facility	5	13

Third-Party Safety Incident Definition

Definition	Any recordable injury or fatality to a third-party due to interaction with or during the use of a PG&E facility, not involving asset failure
Scope	**In Scope:** PG&E recordable third-party (public, non-PG&E contractor) injuries or fatalities due to interaction with or during the use of a PG&E facility, not involving asset failure **Out of Scope**: Third-party recordable injuries or fatalities resulting from the failure of an asset. Third-party gas dig-in recordable injuries or fatalities are included as key drivers for Gas Operations Loss of Containment Risks. Non-preventable motor vehicle incidents involving third-party interaction are included in the Motor Vehicle Safety Incident risk
Background[1]	The Third-Party Safety Incident risk is a NEW RAMP risk for the 2020 filing Recordable injuries include those which may result in a serious injury in alignment[2] with the Division of Occupational Safety and Health (DOSH, aka Cal/OSHA) definition or a fatality. With PG&E facilities located throughout northern and central California, third-party (public) interaction with them is inevitable. Public contact with PG&E facilities is addressed by PG&E's operating lines of business: Gas Operations, Electric Operations, and Power Generation, who have developed and have implemented or are continuing to implement programs to address third-party safety incidents unique to their facilities To quantify Third Party Safety Incident risk exposure, PG&E's RAMP model analysis utilizes data from the PG&E Serious Incidents Report and the CPUC Electric Incident Report (EIR)

(1) Source: Ch. 15, Risk Assessment and Mitigation Phase 2020
(2) PG&E reviewed the third-party injuries and aligned to the OSHA definition using data available

Risk Assessment – Bowtie Development

Together, Building
a Better California

Risk Bowtie Overview

(1) Risk score represents Test Year Baseline Risk Score for 2023 (i.e. pre-mitigation risk score for 2023, post 2020-2022 mitigations, post all controls)

Risk Assessment – Controls & Mitigations

Together, Building
a Better California

Third-Party Safety Incident Risk Reduction Programs Overview

2020 RAMP Controls

PG&E Enterprise

- PG&E Code of Safe Practices including job site traffic management
- Safe Kids Program - comprehensive electric, gas, and hydroelectric public safety awareness classroom materials to all K through 8th schools in PG&E service territory

Electric Operations

- Electric Operations Public Awareness Programs:
  - Worker Beware Program,
  - Logging Safety program Outreach,
  - Third-Party Tree Workers Program,
  - Mind-the-lines program
- PG&E-owned conventional streetlights to LED technology
- PG&E Electric Design Pole Location Requirements
- Visibility Strips on Electric Distribution Poles and Guy Markers
- Anti-Climbing Guard Assemblies for Steel Towers

Gas Operations

- Gas Operations Public Awareness Programs
- Gas Operations Physical Security controls:
  - Security Guards,
  - Facility fencing and security cameras,
  - Ballistic protection around critical components,
  - Anti-climbing and concrete barriers, Visual/audible alarm systems
- Gas Operations Meter Protection Program (MPP) to protect meters and risers that are vulnerable to vehicular damage

Power Generation

- Hydroelectric Public Safety Plans
- Hydroelectric Early Warning Technologies
- PG&E campground and land management activities
- Hydro Facility Unusual Water Releases and Water Safety Warning Standard and accompanying procedure
- PG&E Dam Safety Surveillance and Monitoring Program

Third-Party Safety Incident Risk Reduction Programs Overview

2020 RAMP Mitigations	
Electric Operations	
▪ System Hardening	▪ This program is an ongoing, long-term capital investment program to rebuild portions of PG&E's overhead electric distribution system that includes replacement of bare conductors with covered conductor to reduce the likelihood of faults due to trees, branches, and environmental impacts. Risk reduction for this mitigation is analyzed with the Electric Distribution Overhead Asset Failure risk
▪ 3A and 4C Line Recloser Controller Replacement	▪ This program replaces older recloser controllers and improves PG&E's ability to isolate faults and re-energize circuits in the event of an outage. Line reclosers are also categorized as protective devices, and are programmed to protect customers from safety hazards due to fault conditions including wire-down incidents, sustained outages etc. Risk reduction for this mitigation is analyzed with the Electric Distribution Overhead Asset Failure risk
Gas Operations	
▪ Gas Operations Exposed Pipe Replacement	▪ This program replaces pipe that is vulnerable to exposure from third parties or has become exposed due to natural forces. Risk reduction for this mitigation is analyzed with the Loss of Containment on Gas Transmission Pipeline risk
Power Generation	
▪ Canal and Waterway Safety	▪ Installation of additional barriers along portions of PG&E's hydroelectric canals and waterways to reduce the likelihood of a third-party drowning
▪ Emergency Action Plans (EAPs) for all significant and high hazards dams	▪ PG&E maintains EAPs for responding to an emergency such as an unplanned water release for all significant and high hazards dams. This mitigation is associated with asset failure and provides an indirect benefit and is not included in the risk analysis
▪ Time Sensitive Dams/Sudden Failure Assessments	▪ This program assesses the detection, verification, notification and emergency management response compared to the arrival of a flood inundation wave. This mitigation is associated with asset failure and provides an indirect benefit and is not included in the risk analysis

RSE and Risk Reduction Scores

	Mitigation	Risk Reduction	RSE (NPV Risk Reduction/$000 2023-2026)	Commentary
M4	Canal and Waterway Safety: Installation of barriers along PG&E's canal systems	3.8	1.7	▪ In 2019, Power Generation installed 10,497 linear feet of barrier fencing along PG&E's canal systems. Most of these fencing projects were completed in the Drum system and were identified through a systematic risk ranking assessment. In 2020 PG&E is forecasting 14,000 linear feet of barrier fencing installation with additional installations proposed in future years. *Reduces the risk of a third-party drowning due to interaction with a hydroelectric canal or waterway*

Alternatives Considered

Alternative Mitigation	Description	Rationale for Not Selecting
Two year delay in the installation of barriers along PG&E's canal systems	▪ This alternative considers delaying the installation of canals and waterways safety barriers by two years. PG&E prefers to maintain the planned schedule. It is possible that this mitigation could be delayed due to resource limitations and/or work planning or coordination issues	▪ The RSE for this alternative is 3.8. PG&E did not select this alternative because it would delay important safety work
Targeted Third Party Electric Safety Pilot Program	▪ PG&E will design and conduct a pilot program to target regions or circuits that have a high number of, or high rate of, third party contact with electric assets incidents. The pilot program will evaluate the physical locations and types of incidents to determine which potential mitigation options are most likely to reduce the third-party electric contact risk in each specific location	▪ The RSE for this alternative is 147. PG&E will provide an update about this pilot program in the 2023 GRC

Real Estate and Facilities Failure Risk RAMP Presentation

August 26

Thomas Crowley

Agenda

- Overview of the Risk
- 2017 RAMP Comparison
- Quantitative Risk Assessment and Presentation of the Bowtie
- Proposed Mitigation Plan
- Alternatives Considered

Real Estate and Facilities Failure Risk Overview

Definition

The risk of an event which causes a building, facility or property within PG&E's service area to be deemed unsafe, or inaccessible for operation or occupancy, such that PG&E is unable to use the building or property to support operational needs.

Scope

Buildings, facilities or property owned or leased by PG&E. All other non-facility related PG&E assets such as electric and gas transmission and distribution systems, dams, and substations are covered under other risks., e.g., Failure of Substation Assets

Background

This risk is new to the RAMP filing and not represented in 2017 RAMP

Forecast

The inputs for this risk are primarily based on modeling facilities that are high population density and/or focused on high seismic areas as well as critical facilities

Seismic is the most significant driver for this risk. Due to the potential occurrence of significant seismic activity and aging of PG&E's facilities, the risk trend is increasing

Risk Rank

7

Safety Risk Score = 69.3
Financial Risk Score = 27.3
Total Risk Score = 96.6

Mitigation Forecast Cost 2023-2026

$20 Million/yr. (C)
$1 Million/yr. (E)

Overall Risk Reduction 2023 to 2026

10%

Risk Spend Efficiency

0.83

Real Estate and Facilities Failure Risk: 2017 RAMP Comparison

Definition

- **2020 RAMP Filing: Real Estate Facilities Failure Risk**: The risk of an event which causes a building, facility or property within PG&E's service area to be deemed unsafe, or inaccessible for operation or occupancy, such that PG&E is unable to use the building or property to support operational needs.
- **Risk was <u>not</u> part of 2017 RAMP Filing, but was part of previous department level Legacy Session D risks**:
  - **Seismic Vulnerability Risk:** Risk that facilities managed by CRESS are not prepared to handle a seismic event, potentially causing safety and operational impacts due to building damage
  - **Fire Life Safety Risk:** Failure to properly maintain fire and life safety equipment at CRESS managed facility resulting in injuries and fatalities, and regulatory fines and lawsuits

Risk Exposure and Key Risk Drivers

Risk exposure: Facilities failing due to unplanned catastrophic event

Key risk drivers:
- Flood
- Landslide
- Building Fire
- Physical attack
- Seismic Event (Sub-drivers: Level of Seismic Event)

Work Execution Plans

Existing Controls

1. Regional Optimization[1]
2. Service Center Optimization[1]
3. CSO Optimization
4. Facilities Management Preventive Maintenance Program
5. Site Design Structural and Engineering Reviews
6. Segregation of Assets
7. Facility Inspection Program
8. Security System Hardening

Existing Controls

2019
$106 M (Cap)
$45 M (Exp)

Mitigations & Forecasts

New Mitigations and Alternatives

Renovate or Relocate Facilities Other than SFGO

Additional Mitigation Implementation Forecast

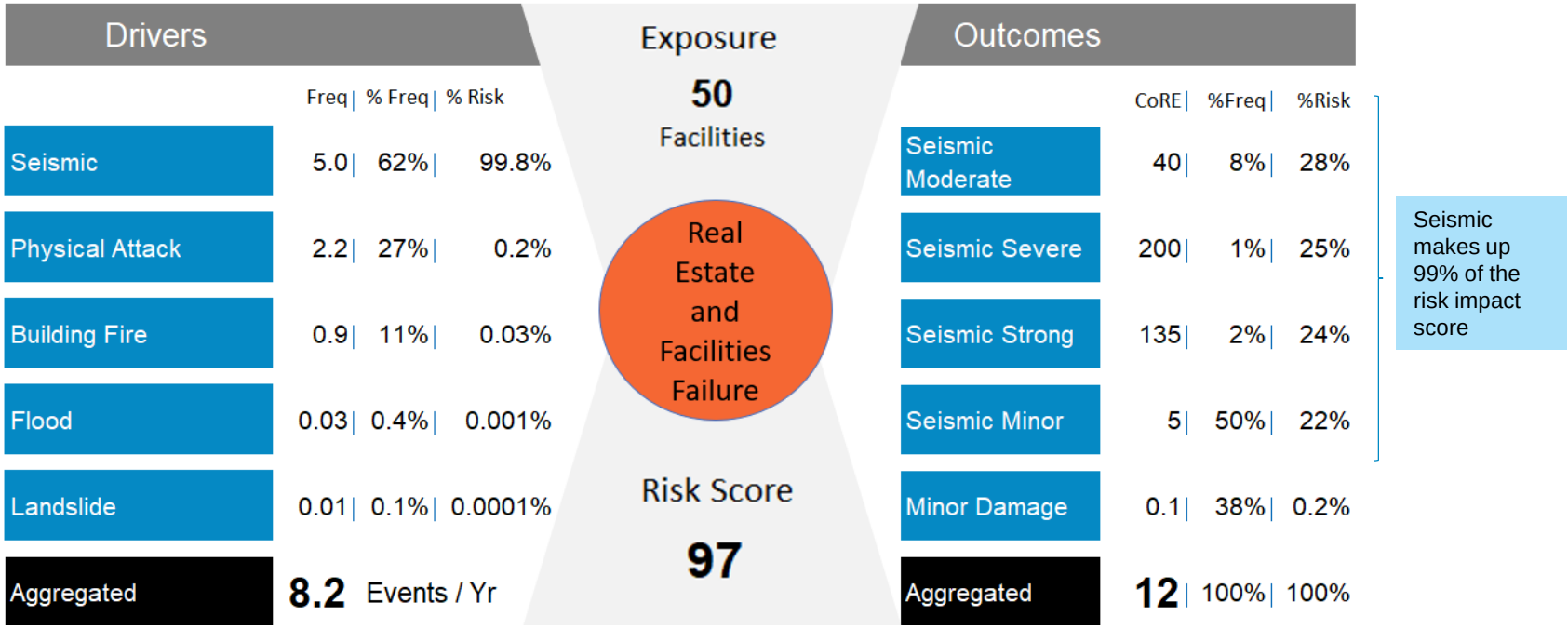
2023	2024	2025	2026
$20.0 M	$20.0M	$20.0M	$20.0M (Cap)
$1.0 M	$1.0M	$1.0M	$1.0M (Exp)

[1] Currently paused

Real Estate and Facilities Failure Risk: Quantitative Risk Assessment and Bow Tie

Key Takeaways

- **Key Driver:** A seismic event is the key driver of the Real Estate and Facilities Failure Risk representing 99% of the total risk impact score
- **Current Status:** Due to the potential occurrence of significant seismic activity and aging of PG&E's facilities, the risk trend is increasing
- **Risk Response:** Reduce the risk frequency and impact by targeting the seismic risk driver. PG&E will update its standard for seismic building performance to consider type and use
- PG&E will systematically review its current building portfolio to ensure a base level of performance based on building type and use, and renovate or relocate its buildings to achieve the desired performance levels



*Risk Score represents Test Year Baseline Risk Score for 2023 (*i.e.*, pre-mitigation risk score for 2023, post 2020-22 mitigations, post all controls)

Real Estate and Facilities Failure Risk: Cross Cutter Factors Impacting the Risk

Key Takeaways

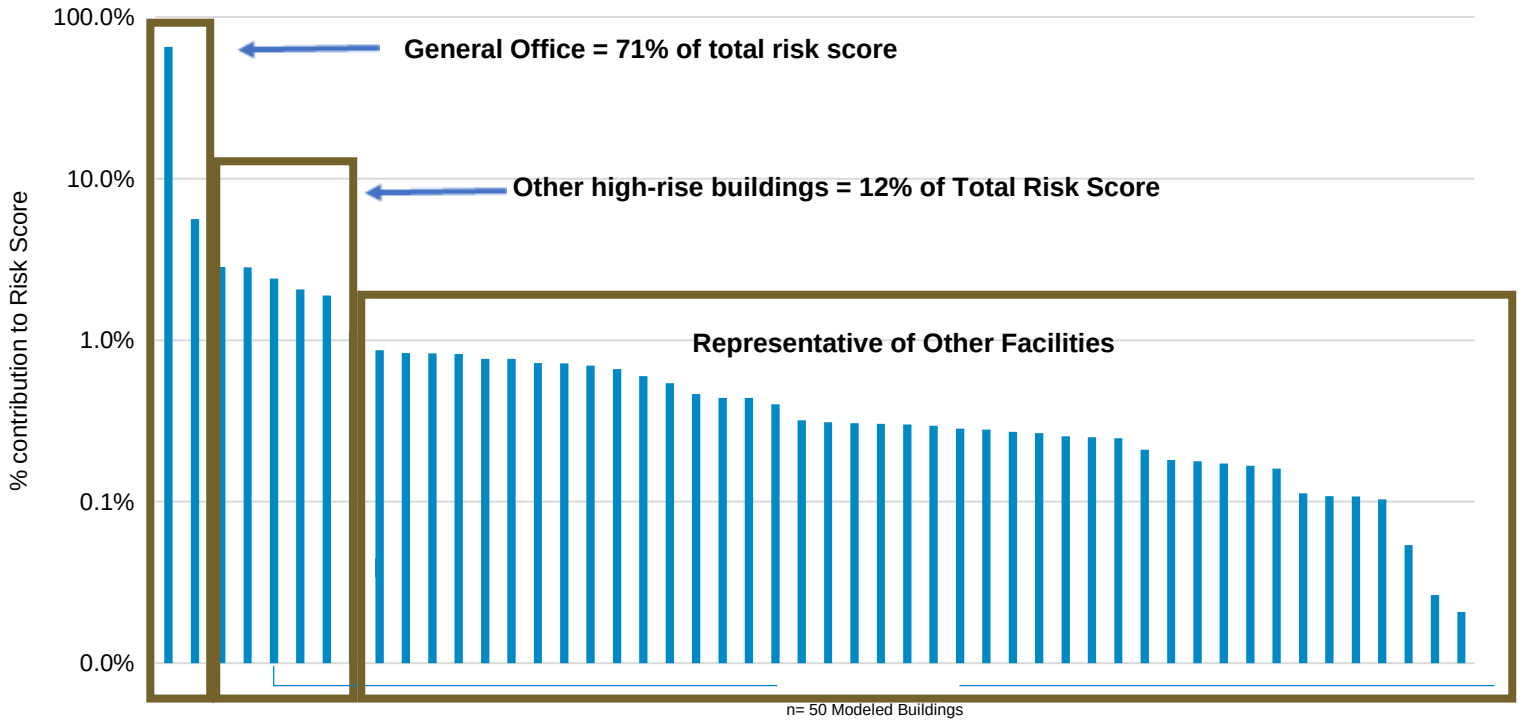
- A seismic event and physical attack are the key cross cutters of the Real Estate and Facilities Failure Risk.
- Climate Change is integrated into the flood risk driver and is a mitigation alternative should PG&E choose to relocate targeted facilities out of flood zones or further mitigate facilities in place
- Records management is included as a consequence multiplier for financial consequences for each of the event based risks
- Emergency Preparedness and Response is applicable in mitigating risk consequences but does not act as a risk driver

Applicable Cross-Cutter	Climate Change	Seismic	IT Asset Failure	Physical Attack	Cyber Threat	Skilled & Qualified Workforce	Records & Information Management	Emergency Preparedness & Response
Applicability to Real Estate and Facilities Failure Risk	Applicable but currently minimal; refined integration outlined in Climate Alternative	Is a driver and applicable for safety consequences **(99%)**	Not considered to be able to cause risk event	Physical attack is a risk driver that results in minor impact (.15%)	Not affected by a Cyber Attack	Not considered to be able to cause risk event	Included as a consequence multiplier for financial consequences	Applicable in mitigating risk consequences

Real Estate and Facilities Failure Risk: Percent Contribution to Risk Score

Key Takeaways

- The San Francisco General Office Complex (SFGO) makes up 71% of the total risk score based on location size/height, and population density (Since filing PG&E has decided to sell the SFGO complex and relocate its general office to Oakland Lakeside which will replace SFGO within the risk evaluation process)
- All other buildings greater than four stories, e.g., Concord, San Ramon, San Jose, make up 12% of the total risk score
- Relocation or renovation of SFGO may reduce the risk depending on location and type of building, but not completely resolve the risk unless employee population was relocated to lower seismic areas and/or recently built low rise buildings



Real Estate and Facilities Failure Risk: PG&E Will Update its Seismic Policy and Review its Building Portfolio to Ensure a Base Level of Performance

Key Takeaways

- PG&E buildings were built to contemporaneous codes and standards. However, based on further seismic experiences some are believed to be at risk of failure when experiencing an earthquake greater than the design earthquake used at the time of construction
- All buildings are to be categorized by type and age and assessed to determine the necessary performance level and reviewed for seismic performance against potential damage. CRESS's updated seismic standard will ensure PG&E properties perform at least to the minimum criteria below, and will focus first on high risk/population density buildings managed by CRESS
  - Mission Critical Facilities perform to the Fully Operational level
  - Business Critical Facilities perform to the Operational level
  - Occupied buildings perform to the Life Safety level
  - Non-occupied structures perform to the Collapse Prevention level
- Continued validation is required to appropriately classify buildings and understand their seismic risk as business needs, buildings age and seismic modeling sophistication changes
- Facility retrofits or relocations to resolve seismic risk will be informed by business and operational needs, strategic management decisions, and/or triggered by a) immediate risk reduction or b) incremental investments to maintain functionality

Seismic Performance Levels and Damage Index

Performance Levels	Fully Operational	Operational	Life Safety	Collapse Prevention	Collapse
					
Damage Index	**No damage, continuous service**	**Most operations and functions can resume immediately**	**Damage is moderate. Structure is damaged but remains stable**	**Structural damage is severe but collapse is prevented. Nonstructural elements may fail**	**Portions of primary structural system collapse or complete structural collapse**
Applicable Facilities	Mission Critical Facilities, e.g., Data, Control and Emergency Response Centers	Business Critical Facilities, e.g., Call and Billing Centers	Most office and workplace uses	Support structures, e.g. some warehouses, storage facilities	Not applied to PG&E facilities

Real Estate and Facilities Failure Risk: PG&E will Renovate or Relocate its Buildings to Achieve the Desired Performance Levels

Key takeaways

- Corporate Real Estate will focus on reducing seismic risk across its building portfolio by focusing on **three efforts** shown below to renovate or relocate facilities that do not meet minimum performance criteria
- Planning, design, and analysis for these buildings will occur in 2020-2022 with renovation or relocation efforts occurring 2023-2026 (RAMP mitigation period) and beyond

Effort 1: Renovate or Relocate Low Rise Facilities

- Systematically evaluate and retrofit or relocate all low rise facilities such as service centers and office buildings that do not meet a minimum seismic performance level to reduce seismic risk
- Seismically driven building renovations or relocations will be completed through the CRESS capital portfolio plan as funded through the GRC and informed by the 2020 RAMP Filing

Effort 2: Renovate or Relocate Mid Rise and High Rise Structures (Other than SF General Office)*

- Review mid rise and high rise structures against the minimum seismic performance criteria and renovate or relocate facilities accordingly
- Building renovation or relocation will be dovetailed to support Company regionalization efforts

Effort 3: Renovate or Relocate the San Francisco General Office (Now replaced by Oakland Lakeside*)

- Resolving seismic concerns related to the San Francisco General Office complex has the greatest impact on seismic risk reduction
- The SFGO Complex is now replaced by Oakland Lakeside and will be included in the 2020-2022 analysis/risk evaluations

Real Estate and Facilities Failure Risk: Risk Spend Efficiencies (RSE) and Cost Forecast

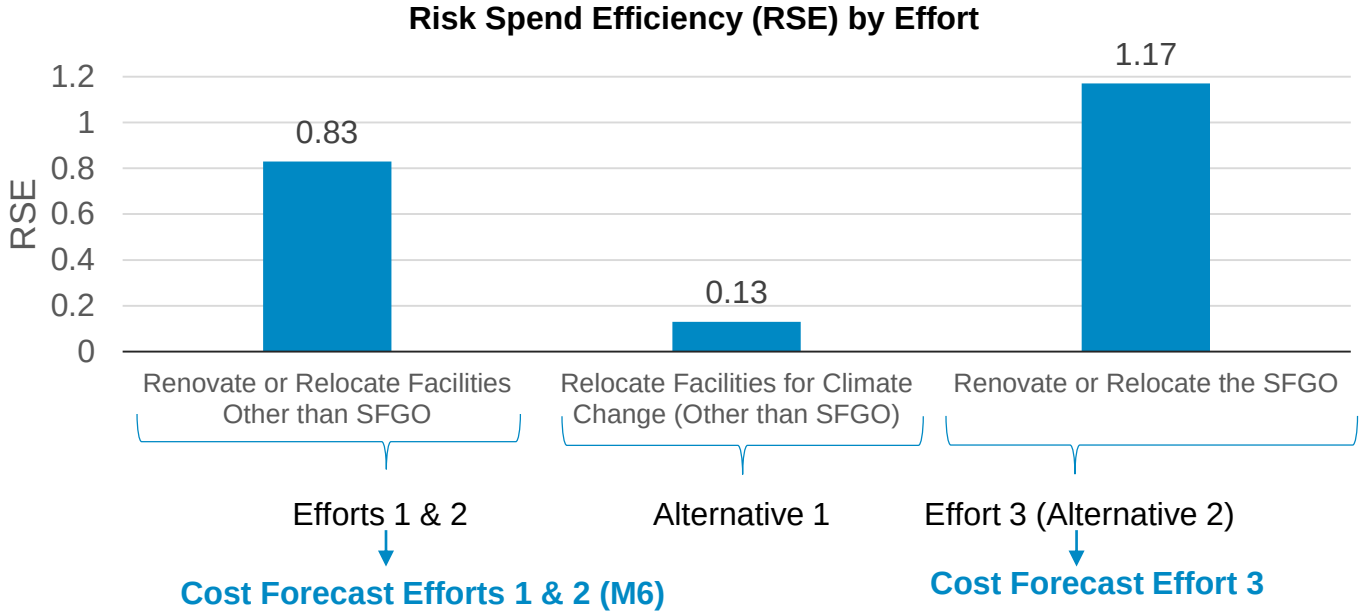
Key Takeaways

Effort 1 & 2: Renovate or Relocate Low, Mid and High Rise Facilities (Other than SFGO)

- PG&E will systematically evaluate and retrofit or relocate all low-rise facilities such as service centers and office buildings that do not meet a minimum seismic performance level to reduce seismic risk.
- PG&E will review midrise and high-rise structures against the minimum seismic performance criteria and renovate or relocate facilities accordingly.
- PG&E believes the proposed mitigation plan is appropriate because facilities that pose the greatest seismic risk to the Company are prioritized for review and corrective actions.

Effort 3: Renovate or Relocate the SFGO

- Had the highest contribution to risk impact, and was under consideration at the time of this testimony. In early June 2020 PG&E announced plans to relocate the SFGO to Oakland and to sell the current General Office complex.



Cost Forecast Efforts 1 & 2 (M6)

$21M per year plus potential relocation costs **up to $500M per year** between 2023-2026. Up to 2-3 buildings can be addressed per year. The Climate Change Alternative is included in the Effort 1 & 2 cost forecast

Cost Forecast Effort 3

~$750M total for seismic renovation or relocation of employees to new or leased facility

Real Estate and Facilities Failure Risk: Additional Variables for Consideration

Key Takeaways

- Initial risk quantification and understanding of the various tranches informed the risk reduction strategy/mitigations
- The level of risk is calculated based on the seismic fragility curves which modeled geographic location, employee density, type of building or structure, and magnitude of seismic event
- Business decisions to consolidate employees into high- or mid-rise office buildings drives the largest risk within the CRESS portfolio as shown in the 2 high-rise and 5 mid-rise structures
- CRESS actively develops and implements day-to-day control programs to mitigate facilities risk, enhance safety, and/or maintain compliance, and establishes methods to ensure performance levels for buildings and systems are adequate and maintained
- The proposed mitigations will further inform and potentially reduce risk related to relatively dense office buildings or complexes as well as the overall portfolio

PG&E 2020 RAMP Report
Large Overpressure Event Downstream of Gas Measurement & Control Facility Risk Overview

August 26, 2020

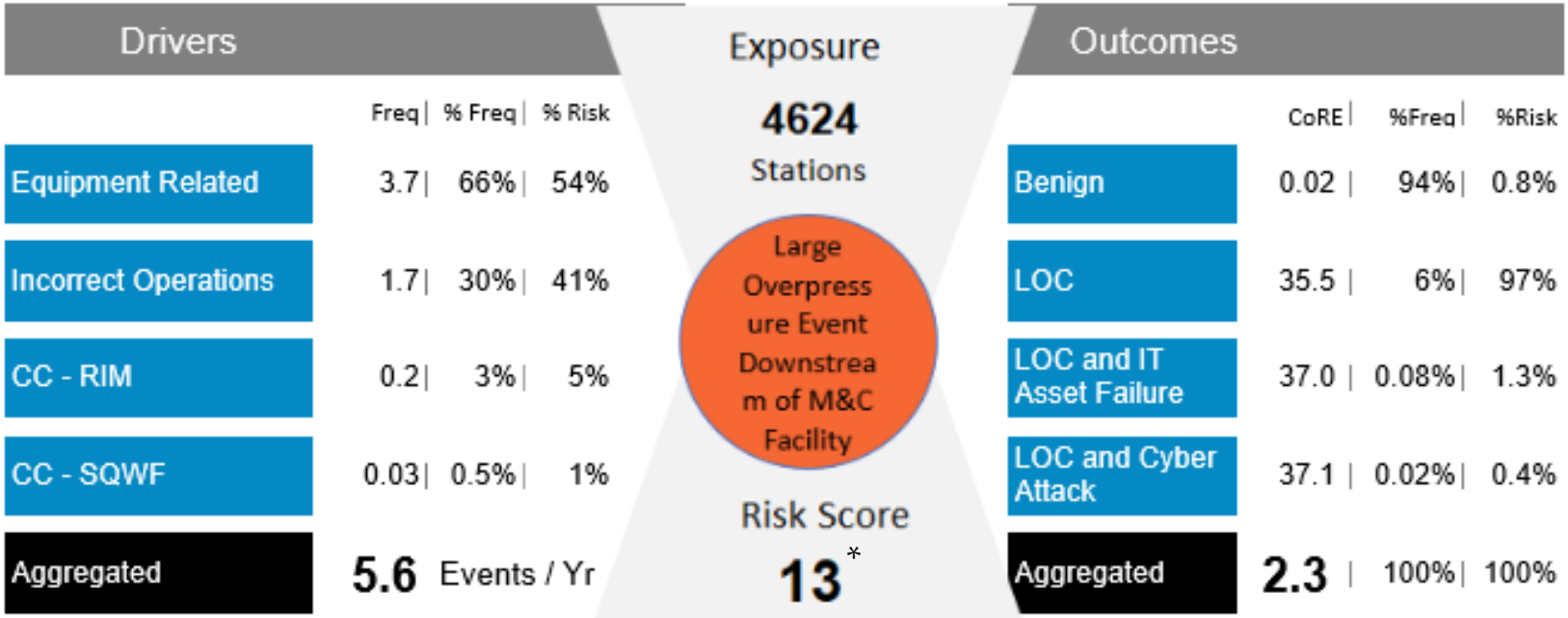
PG&E RAMP Risk Scores

			2023 RAMP Score	
Rank	LOB	Safety Risks	Safety Risk Score	Multi-Attribute Risk Score
1	EO	Wildfire	9,856	25,127
2	SHED	Third Party Safety Incident	887	944
3	GO	Loss of Containment on Gas Transmission Pipeline	128	281
4	SHED	Contractor Safety Incident	94	94
5	SHED	Employee Safety Incident	86	90
6	GO	Loss of Containment on Gas Distribution Main or Service[1]	72	99
7	SS	Real Estate and Facilities Failure	69	97
8	PGEN	Large Uncontrolled Water Release (Dam Failure)	41	70
9	EO	Failure of Electric Distribution Overhead Assets	18	525
10	SHED	Motor Vehicle Safety Incident	16	17
11	EO	Failure of Electric Distribution Network Assets	6	7
12	GO	Large Overpressure Event Downstream of Gas M&C Facility	5	13

[1] This risk event reflects the combined Loss of Containment (LOC) on Gas Distribution Pipeline – Non-Cross Bore and LOC on Gas Distribution Pipeline – Cross Bore risks that were discussed separately at the February 4, 2020 CPUC Workshop (Workshop #3). See Pages 8-5 to 8-7 of PG&E's 2020 RAMP Report for more information.

"Large Overpressure Event Downstream of Gas M&C Facility" Risk Overview

Risk Event Definition	Failure of a Gas Measurement and Control (M&C) station to perform its pressure control function resulting in a large overpressure event that can lead to significant impact on public safety, employee safety, contractor safety, property damages, financial losses, and the inability to deliver natural gas to customers.
Scope	▪ **In scope:** Large overpressure (OP) events. ▪ **Out of scope:** Small overpressure (OP) events.
Background	▪ This risk is the 3rd highest ranked Gas Operations Risk. ▪ This risk was included in the 2017 RAMP. However, the scope of the 2020 RAMP risk has been expanded to encompass all consequences of a Large OP event ▪ Mitigation activities developed for this risk have been informed by analysis of PG&E's large OP events between 2012-2019.



* Risk Score represents Test Year Baseline Risk Score for 2023.

Bowtie reflects Post-Filing Errata submitted in July.

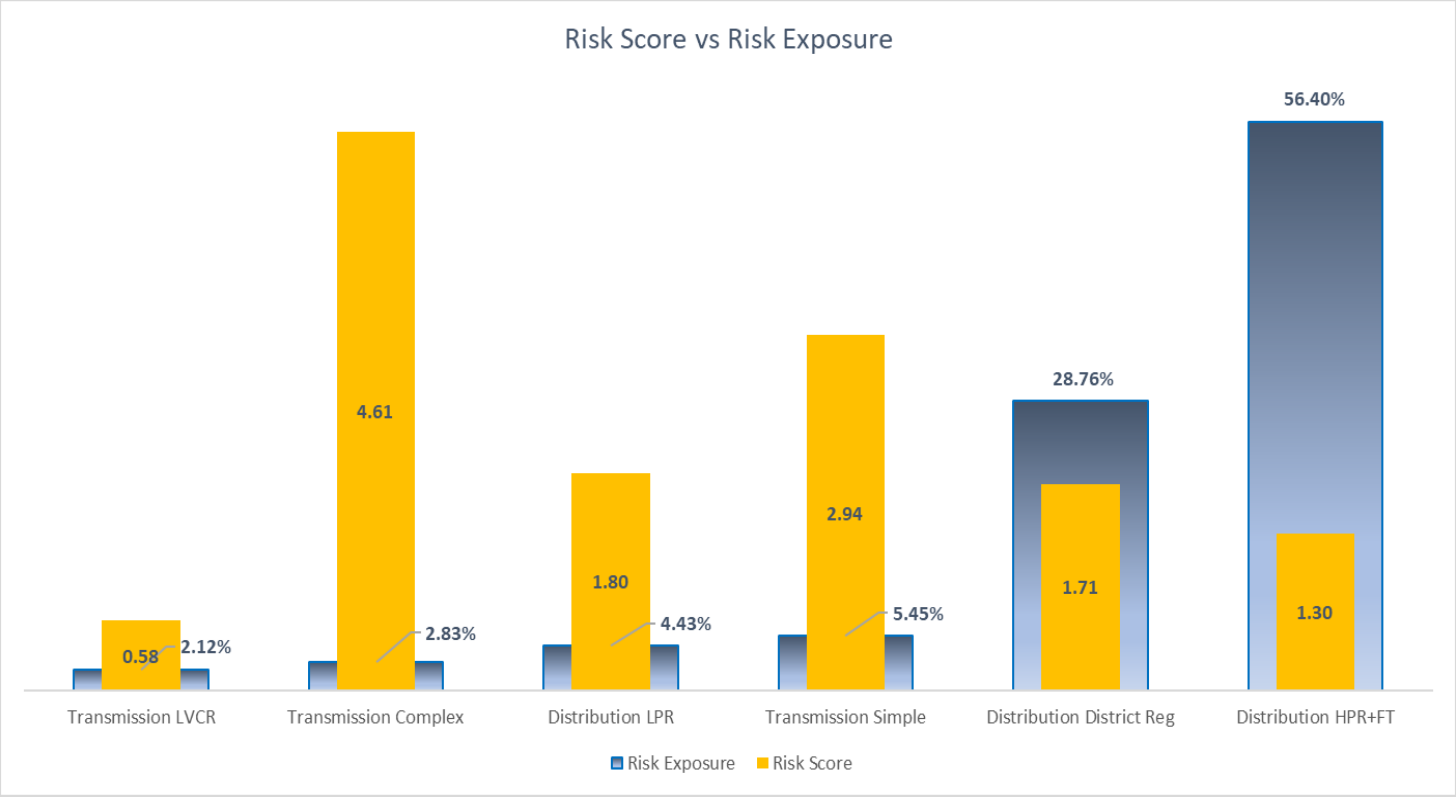
Exposure and Tranche Overview

Tranche	Tranche Definition	Exposure	% of Total Exposure
Transmission – Complex	These stations have complex controls and operation including either a Programmable Logic Controller (PLC) or Remote Terminal Unit (RTU) to provide control and/or data transmission. This tranche also includes PG&E's three gas terminals that function as hubs in the gas transmission system to route gas from the backbone transmission lines to local transmission lines.	131 Stations	3%
Transmission – Simple	These pilot-operated stations have simple control and operation. Stations within this category may include instrumentation and RTUs, provided they are for monitoring and data transmission purposes only.	252 Stations	5%
Transmission – Large Volume Customer Regulator (LVCR) Sets	Large volume customers are those served by a PG&E facility that is capable of delivering 40,000 standard cubic feet per hour (scfh) or more. LVCR Sets are those that have separate regulating stations (i.e., primary regulation) upstream of the typical regulation that occurs at meter set assemblies.	98 Stations	2%
Distribution – District Regulator Stations (Non-HPR-Type)	These pilot-operated stations serve two or more service lines and typically serve hundreds to thousands of customers. These stations normally receive gas from the high-pressure transmission pipeline system.	1,330 Stations	29%
Distribution – District Regulator Stations (HPR-Type) and Farm Taps	These district regulator stations (HPR-type) are spring-operated. A farm tap is a service line that is connected directly from a transmission line or gathering line to serve customers other than a large volume customer.	2,608 Stations	56%
Distribution – Low-Pressure District Regulator Stations	Low-pressure district regulator stations regulate gas pressure into "low-pressure distribution systems" with operating pressures below 1 psig.	205 Stations	4%
	Total	4,624 Stations	100%

- **Five cross-cutting factors were quantified in the Large OP risk model.**

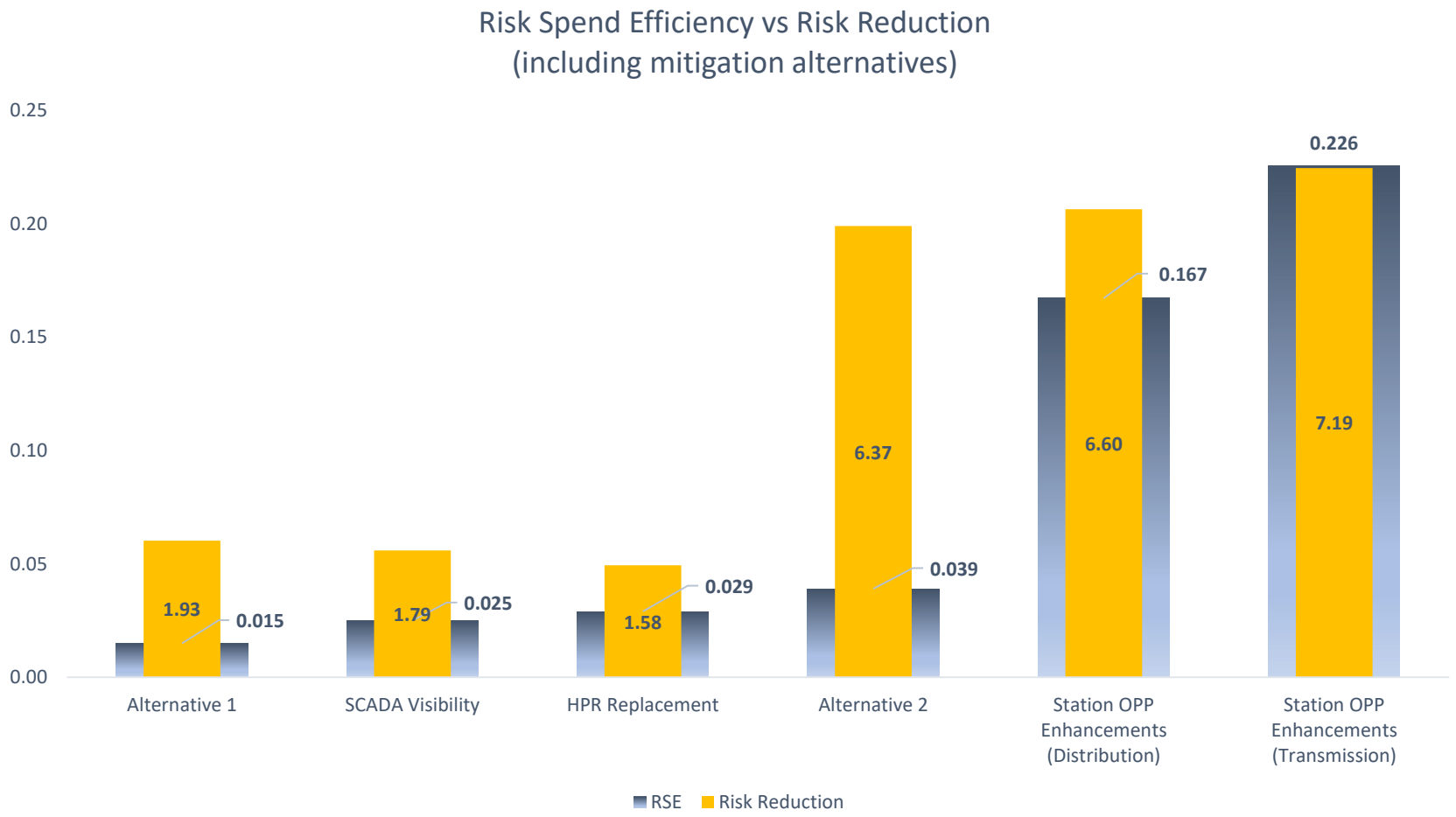
Cross-Cutting Factor	Impacts Likelihood	Impacts Consequence
Skilled and Qualified Workforce	X	
Records and Information Management	X	X
Emergency Preparedness and Response		X
Information Technology Asset Failure		X
Cyber Attack		X

Risk Model Results (2023 Test Year Baseline)



Tranche	Percent Exposure	Safety Risk Score	Reliability Risk Score	Financial Risk Score	Total Risk Score	
Transmission Complex	2.83%	0.29	4.29	0.03	4.61	36%
Transmission Simple	5.45%	0.18	2.74	0.02	2.94	23%
Distribution LPR	4.43%	1.56	0.04	0.21	1.80	14%
Distribution District Reg	28.76%	1.45	0.16	0.10	1.71	13%
Distribution HPR+FT	56.40%	1.10	0.12	0.08	1.30	10%
Transmission LVCR	2.12%	0.55	0.00	0.04	0.58	5%
Total	**100%**	**5.13**	**7.34**	**0.48**	**13**	**100%**

Values reflect Post-Filing Errata submitted in July.



Alternative 1: Rebuild DREG Stations
Alternative 2: Rebuild and Retrofit DREG Stations

Values reflect Post-Filing Errata submitted in July.

PG&E 2020 RAMP Report
Loss of Containment on Gas Distribution Main or Service Risk Overview

August 26, 2020

PG&E RAMP Risk Scores

			2023 RAMP Score	
Rank	LOB	Safety Risks	Safety Risk Score	Multi-Attribute Risk Score
1	EO	Wildfire	9,856	25,127
2	SHED	Third Party Safety Incident	887	944
3	GO	Loss of Containment on Gas Transmission Pipeline	128	281
4	SHED	Contractor Safety Incident	94	94
5	SHED	Employee Safety Incident	86	90
6	GO	Loss of Containment on Gas Distribution Main or Service[1]	72	99
7	SS	Real Estate and Facilities Failure	69	97
8	PGEN	Large Uncontrolled Water Release (Dam Failure)	41	70
9	EO	Failure of Electric Distribution Overhead Assets	18	525
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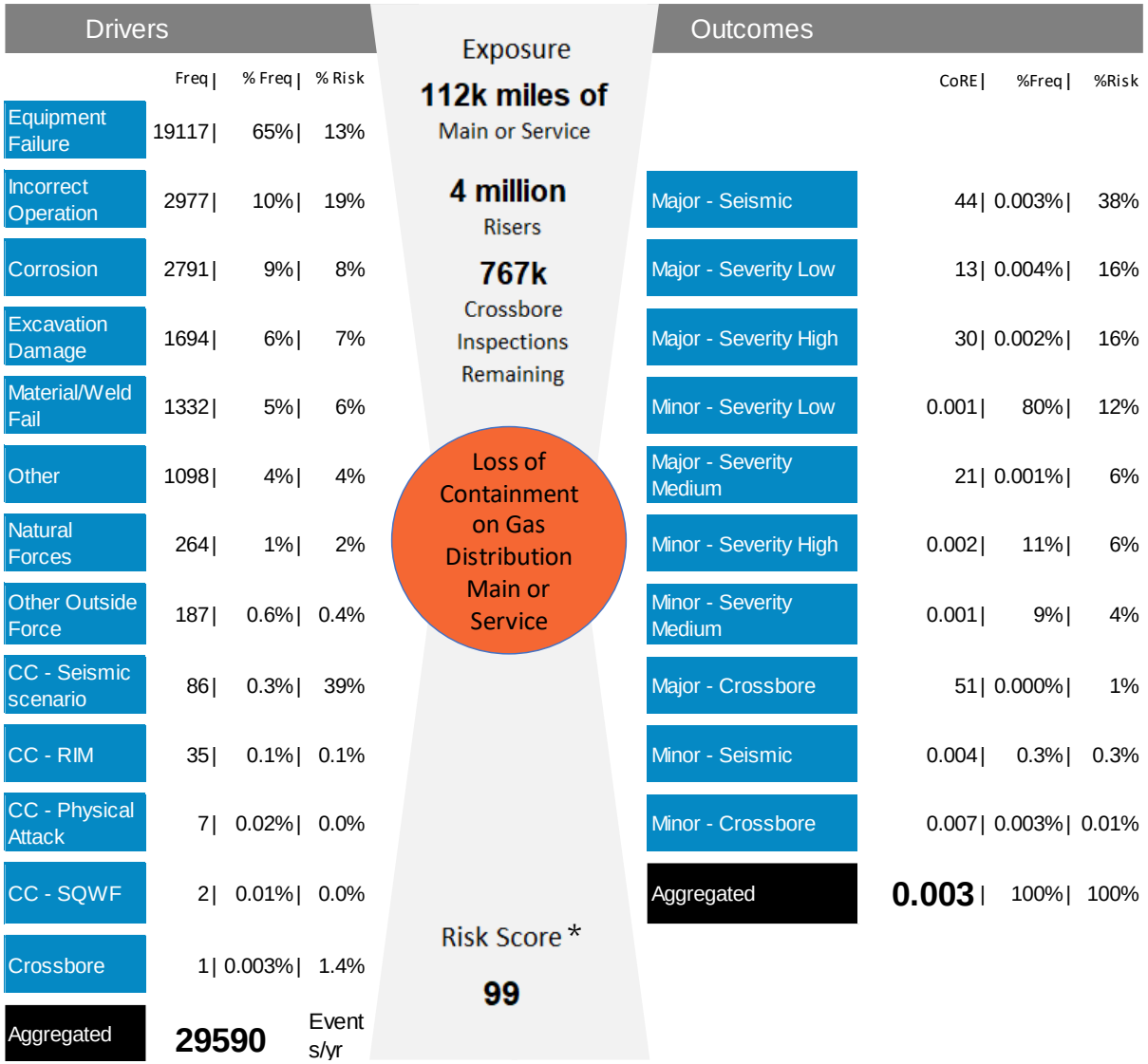
11	EO	Failure of Electric Distribution Network Assets	6	7
12	GO	Large Overpressure Event Downstream of Gas M&C Facility	5	13

[1] This risk event reflects the combined Loss of Containment (LOC) on Gas Distribution Pipeline – Non-Cross Bore and LOC on Gas Distribution Pipeline – Cross Bore risks that were discussed separately at the February 4, 2020 CPUC Workshop (Workshop #3). See Pages 8-5 to 8-7 of PG&E's 2020 RAMP Report for more information.

"Loss of Containment on Gas Distribution Main or Service" Risk Overview

Risk Event Definition	Failure of a gas distribution main or service resulting in a loss of containment, with or without ignition, that can lead to significant impact on public safety, employee safety, contractor safety, property damages, financial losses, and the inability to deliver natural gas to customers.
Scope	▪ **In scope:** Failure of a distribution pipeline that leads to a minor or major loss of containment. ▪ **Out of scope:** A loss of containment driven by Large Over-pressurization (OP) Events (included in "Large OP Event" risk model) and by Customer Connected Equipment (included in "Other Safety Risks" RAMP chapter).
Background	• This risk is the second highest ranked Gas Operations risk. • This risk was included in the 2017 RAMP. However, the scope of the 2020 RAMP risk has been expanded to encompass all consequences of a distribution loss of containment event. Additionally, the cross bore risk was combined into this risk due to the new tranching capabilities of the 2020 risk model framework.

Risk Bowtie Overview



* Risk Score represents Test Year Baseline Risk Score for 2023.

- There are a total of 12 tranches.
- 10 of the 12 tranches (Mains, Services, Risers) are separated by three factors – asset type, material type, and population density – to represent the different risk profiles.
- The other two tranches represent cross bores (SF & Non-SF), which were a separate risk event in PG&E's 2017 RAMP Report.
- The cross bore exposure is measured in the number of inspections remaining.

Tranche	Tranche Definition	Exposure	% of Tranche Exposure
Mains [4 Tranches]	1. Main – Plastic – Population Density High 2. Main – Plastic – Population Density Low 3. Main – Steel – Population Density High 4. Main – Steel – Population Density Low	5,476 miles 17,767 miles 4,882 miles 15,079 miles	13% 41% 11% 35%
Services [4 Tranches]	1. Service – Steel – Population Density High 2. Service – Steel – Population Density Low 3. Service – Plastic – Population Density High 4. Service – Plastic – Population Density Low	8,114 miles 14,894 miles 15,819 miles 30,095 miles	12% 22% 23% 44%
Risers [2 Tranches]	1. Riser – All – Population Density High 2. Riser – All – Population Density Low	1,318,433 risers 2,256,822 risers	37% 63%
Cross Bore [2 Tranches]	1. Cross Bore – San Francisco 2. Cross Bore – Non-San Francisco	28,000 inspections remaining 739,000 inspections remaining	4% 96%

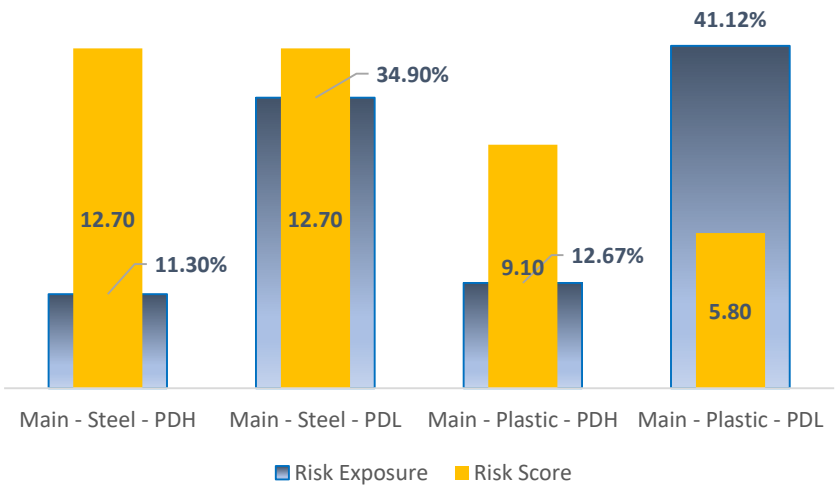
- **Five cross-cutting factors were quantified in the Loss of Containment on Gas Distribution Main or Service risk model.**

Cross-Cutting Factor	Impacts Likelihood	Impacts Consequence
Emergency Preparedness and Response		X
Physical Attack	X	
Records and Information Management	X	X
Seismic	X	X
Skilled and Qualified Workforce	X	

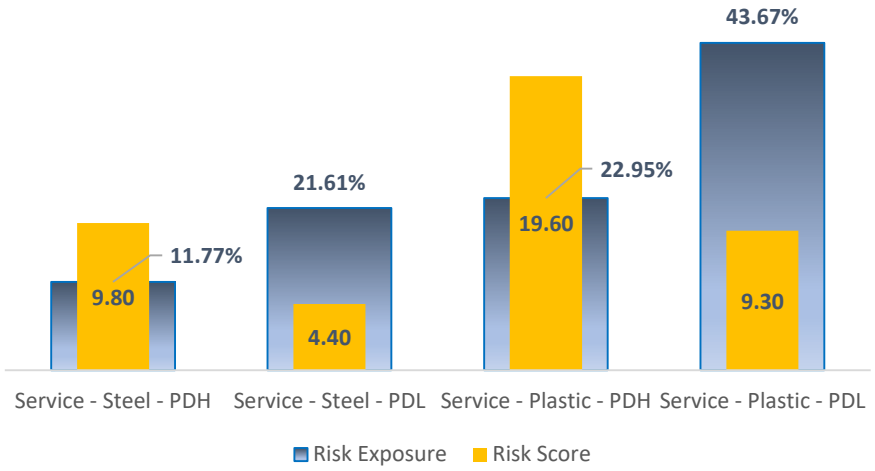
Note: Table 8-3, Cross-Cutting Factor Summary, of PG&E's 2020 RAMP Report contains two typos. The table incorrectly includes Climate Change and Seismic should also have a check for impacting consequence.

Risk Model Results (2023 Test Year Baseline)

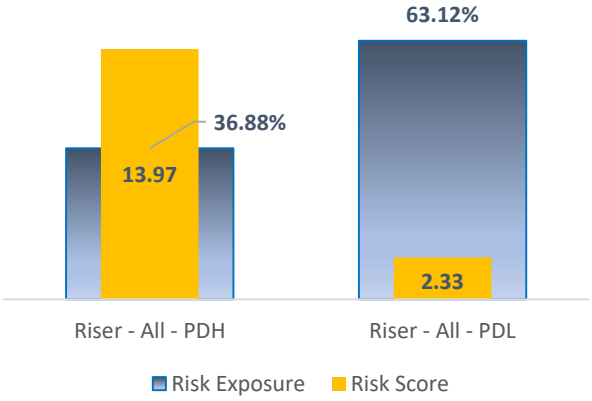
Risk Score vs Risk Exposure (Main)



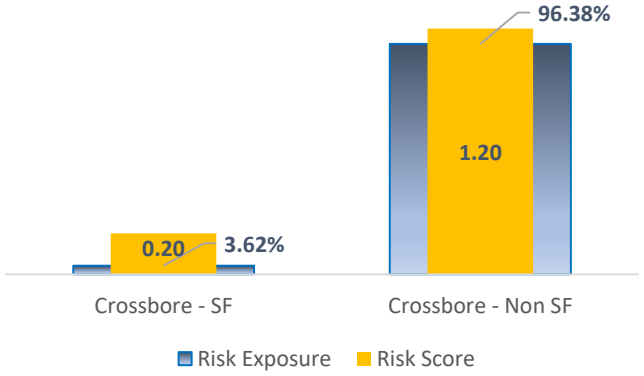
Risk Score vs Risk Exposure (Services)

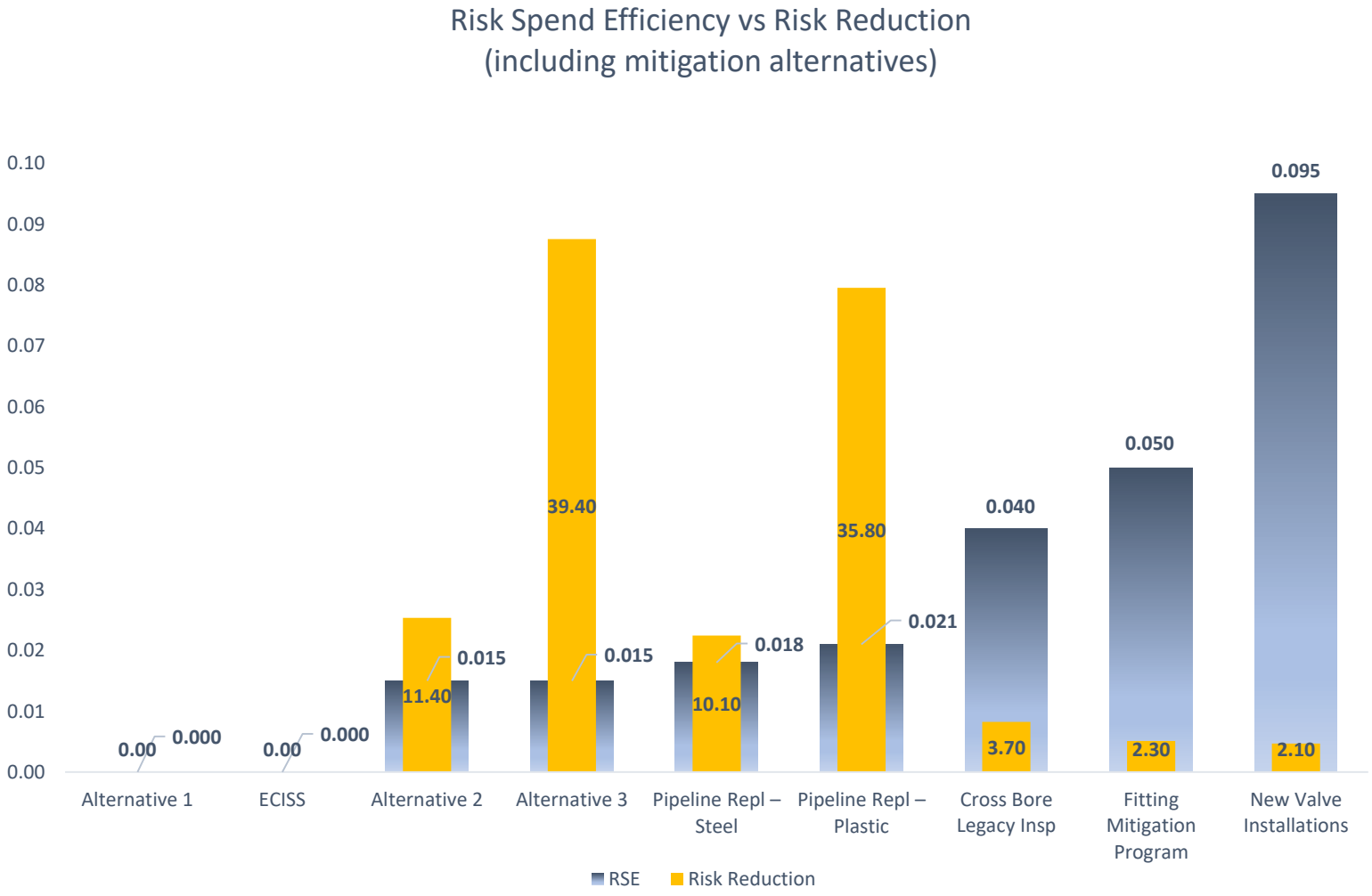


Risk Score vs Risk Exposure (Risers)



Risk Score vs Risk Exposure (Cross Bore)





Alternative 1: Use of Fire Retardants to Prevent Ignition and Fire Spread around Plastic Spans
Alternative 2: Electrification - Steel
Alternative 3: Electrification - Plastic

PG&E 2020 RAMP Report
Loss of Containment on Gas Transmission Pipeline Risk Overview

August 26, 2020

PG&E RAMP Risk Scores

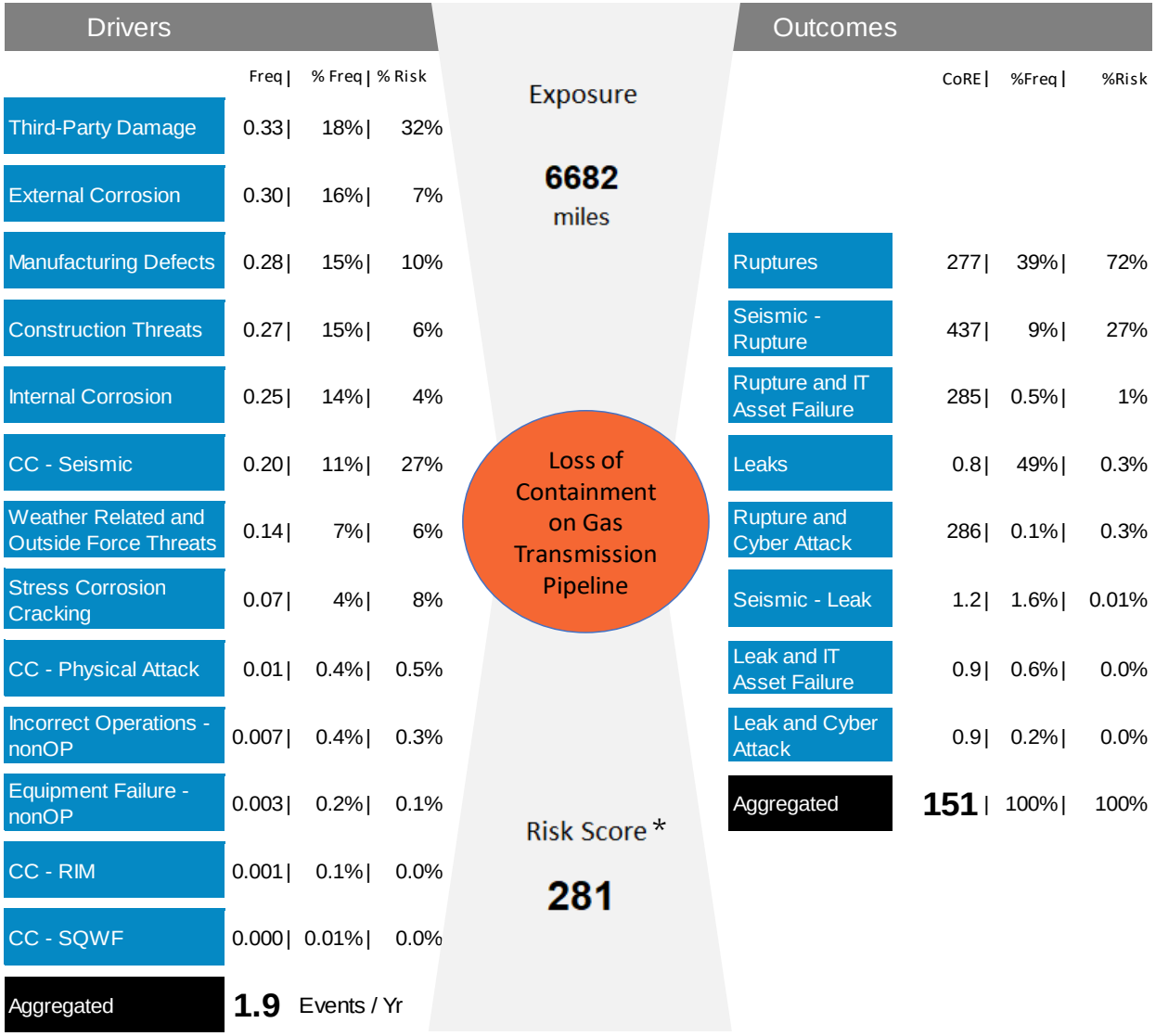
			2023 RAMP Score	
Rank	LOB	Safety Risks	Safety Risk Score	Multi-Attribute Risk Score
1	EO	Wildfire	9,856	25,127
2	SHED	Third Party Safety Incident	887	944
3	GO	Loss of Containment on Gas Transmission Pipeline	128	281
4	SHED	Contractor Safety Incident	94	94
5	SHED	Employee Safety Incident	86	90
6	GO	Loss of Containment on Gas Distribution Main or Service[1]	72	99
7	SS	Real Estate and Facilities Failure	69	97
8	PGEN	Large Uncontrolled Water Release (Dam Failure)	41	70
9	EO	Failure of Electric Distribution Overhead Assets	18	525
10	SHED	Motor Vehicle Safety Incident	16	17
11	EO	Failure of Electric Distribution Network Assets	6	7
12	GO	Large Overpressure Event Downstream of Gas M&C Facility	5	13

[1] This risk event reflects the combined Loss of Containment (LOC) on Gas Distribution Pipeline – Non-Cross Bore and LOC on Gas Distribution Pipeline – Cross Bore risks that were discussed separately at the February 4, 2020 CPUC Workshop (Workshop #3). See Pages 8-5 to 8-7 of PG&E's 2020 RAMP Report for more information.

"Loss of Containment on Gas Transmission Pipeline" Risk Overview

Risk Event Definition	Failure of a gas transmission pipeline resulting in a loss of containment, with or without ignition, that can lead to significant impact on public safety, employee safety, contractor safety, property damages, financial losses, and the inability to deliver natural gas to customers.
Scope	▪ **In scope:** Failure of a transmission pipeline that leads to a significant loss of containment (leak or rupture). ▪ **Out of scope:** A loss of containment driven by Large Over-pressurization (OP) Events (included in "Large Overpressure Event Downstream of Gas M&C Facility" risk).
Background	This risk is the highest ranked Gas Operations risk. Gas transmission pipeline ruptures can have significant safety impacts, the largest of which was the PG&E San Bruno Incident in September 2010.

Risk Bowtie Overview



* Risk Score represents Test Year Baseline Risk Score for 2023.

Bowtie reflects Post-Filing Errata submitted in July.

Exposure and Tranche Overview

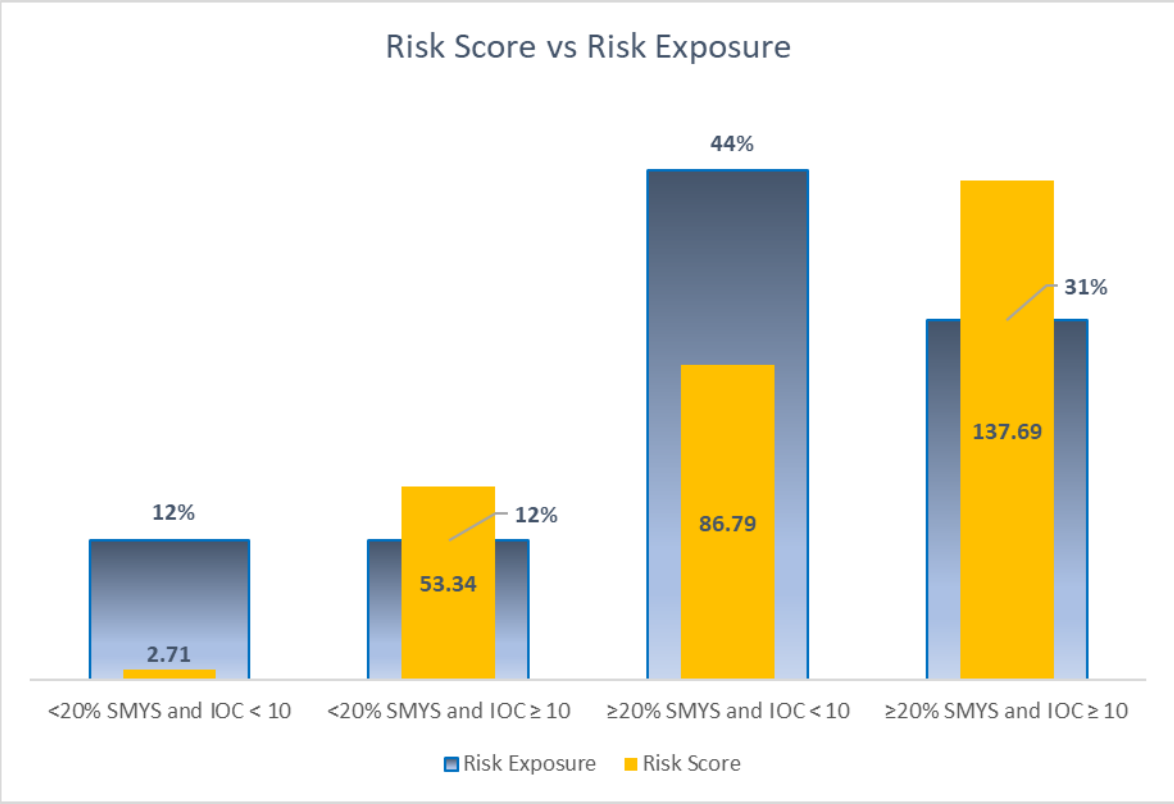
- Tranche development based on Transmission Integrity Management Program (TIMP) risk model outputs.
- %SMYS captures the likelihood of an event. Ruptures are more likely to happen at >20% SMYS.
- Impacted Occupancy Count (IOC) captures the consequence of the event. The IOC boundary was based on PG&E IOC estimates data which showed a bi-modal distribution, with 10 being the approximate boundary.

Tranche	Tranche Definition	Exposure	% of Total Exposure
<20% SMYS and IOC <10	Less than 20% Specified Minimum Yield Strength (SMYS) in area with estimated number of people impacted <10	828 miles	12%
<20% SMYS and IOC ≥10	Less than 20% SMYS in area with estimated number of people impacted ≥10	816 miles	12%
≥20% SMYS and IOC <10	Equal or greater than 20% SMYS in area with estimated number of people impacted <10	2,949 miles	44%
≥20% SMYS and IOC ≥10	Equal or greater than 20% SMYS in area with estimated number of people impacted ≥10	2,089 miles	31%
	Total	6,682 miles	100%

- **Seven cross-cutting factors were quantified in the Loss of Containment on Gas Transmission Pipeline risk model.**

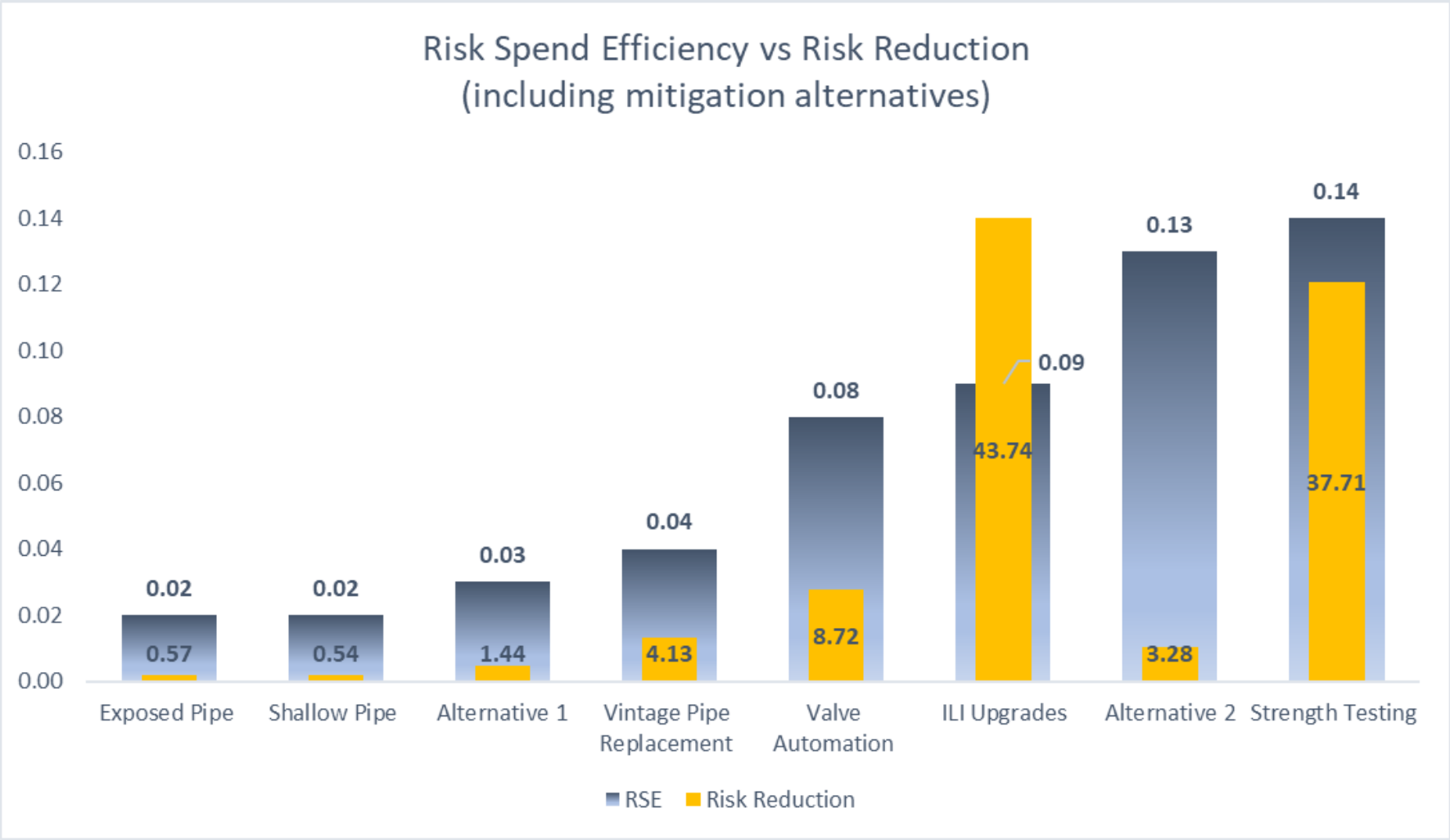
Cross-Cutting Factor	Impacts Likelihood	Impacts Consequence
Cyber Attack		X
Emergency Preparedness and Response		X
Information Technology Asset Failure		X
Physical Attack	X	
Records and Information Management	X	X
Seismic	X	X
Skilled and Qualified Workforce	X	

Risk Model Results (2023 Test Year Baseline)



Tranche	Percent Exposure	Safety Risk Score	Reliability Risk Score	Financial Risk Score	Total Risk Score	
<20% SMYS and IOC < 10	12%	1.52	0.59	0.59	2.71	1%
<20% SMYS and IOC ≥ 10	12%	47.32	4.48	1.53	53.34	19%
≥20% SMYS and IOC < 10	44%	4.85	80.14	1.80	86.79	31%
≥20% SMYS and IOC ≥ 10	31%	74.05	60.82	2.83	137.69	49%
Total	**100%**	**127.74**	**146.04**	**6.75**	**280.53**	**100%**

Values reflect Post-Filing Errata submitted in July.



Alternative 1: Mitigate Transmission Pipeline Impacted by Climate Change
Alternative 2: Mitigate Transmission Pipeline Third Party Damage Events

Values reflect Post-Filing Errata submitted in July.

Workshop #3 (8/26)
APPENDIX

Motor Vehicle Safety Incident APPENDIX

2020-2026 Proposed Mitigation Plan Financials

Motor Vehicle Safety Incident Cost Forecast ($000)[1]

Mitigation	2020	2021	2022	2023	2024	2025	2026	Total
360 Walk Around App	$ 63	$ -	$ -	$ -	$ -	$ -	$ -	$ 63
Post Incident Review	$ 68	$ 68	$ -	$ -	$ -	$ -	$ -	$ 136
Safe Backing Training	$ 36	$ -	$ -	$ -	$ -	$ -	$ -	$ 36
VST Installation and Activation[2]	$ 2,570	$ 2,570	$ 2,570	$ -	$ -	$ -	$ -	$ 7,710
Cell Phone Activity Blocking	$ -	$ -	$ -	$ 1,035	$ 2,070	$ 3,050	$ 4,140	$ 10,295
Total (000s)	**$ 2,737**	**$ 2,638**	**$ 2,570**	**$ 1,035**	**$ 2,070**	**$ 3,050**	**$ 4,140**	**$ 18,240**

(1) Cost escalation value of 2.5% not yet applied
(2) Includes Estimated Transportation Services forecast

Employee Safety Incident APPENDIX

2020-2026 Proposed Mitigation Plan Financials

Employee Safety Incident Cost Forecast ($000)[1]

Mitigation	2020	2021	2022	2023	2024	2025	2026	Total
On-Site Clinics	$ 1,011	$ 1,505	$ 1,510	$ 1,789	$ 4,350	$ 2,810	$ 2,810	**$ 15,645**
Fit 4 U pilot[2]	$ 526	TBD	TBD	$ -	$ -	$ -	$ -	**$ 526**
Mobile Medics	$ 1,800	$ 1,544	$ 1,323	$ 1,103	$ 882	$ 882	$ 882	**$ 8,416**
MSD Program - Office Ergonomics	$ 2,235	$ 2,235	$ 2,235	$ 2,410	$ 2,410	$ 2,410	$ 2,410	**$ 16,345**
MSD Program - Industrial Ergonomics	$ 1,050	$ 1,050	$ 1,050	$ 1,050	$ 1,050	$ 1,050	$ 1,050	**$ 7,350**
MSD Program - Industrial Athlete	$ 4,274	$ 4,274	$ 4,274	$ 4,402	$ 4,402	$ 4,402	$ 4,402	**$ 30,430**
MSD Program - Vehicle Ergonomics	$ 275	$ 275	$ 275	$ 283	$ 283	$ 283	$ 283	**$ 1,957**
Enhanced SafetyNet Use	$ 127	$ 64	$ -	$ -	$ -	$ -	$ -	**$ 191**
ESMS planned implementation	$ 1,575	$ 1,725	$ 925	$ 725	$ 725	$ 925	$ 725	**$ 7,325**
Industrial Hygiene (IH) Program Compliance Improvements (Ph 1)	$ 100	$ 100	$ -	$ -	$ -	$ -	$ -	**$ 200**
Total (000s)	**$ 12,973**	**$ 12,772**	**$ 11,592**	**$ 11,762**	**$ 14,102**	**$ 12,762**	**$ 12,562**	**$ 88,525**

(1) Cost escalation value of 2.5% not yet applied
(2) Dependent on pilot implementation. Decision will be included in the 2023 GRC filing

Contractor Safety Incident APPENDIX

2020-2026 Proposed Mitigation Plan Financials

Contractor Safety Incident Cost Forecast ($000)[1]

Mitigation	2020	2021	2022	2023	2024	2025	2026	Total
Contractor Safety Officer Criteria	$ -	$ 17	$ 17	$ -	$ -	$ -	$ -	**$ 34**
OSHA Programs Training Requirements	$ -	$ 492	$ 148	$ 148	$ 148	$ 148	$ 148	**$ 1,231**
Safety Scorecard	$ -	$ 181	$ -	$ -	$ -	$ -	$ -	**$ 181**
ISN's individual badge feature	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ -**
Contractor Near-hits/Good-Catches	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ -**
Contractor Onboarding	$ -	$ -	$ 1,625	$ 1,625	$ 1,625	$ 1,625	$ 1,625	**$ 8,125**
Contractor Safety Field Inspections	$ -	$ 3,740	$ 3,740	$ 3,740	$ 3,740	$ 3,740	$ 3,740	**$ 22,440**
Contractor Safety Handbook	$ -	$ 216	$ -	$ -	$ -	$ -	$ -	**$ 216**
Tracking contractor workers	$ -	$ -	$ -	$ 1,501	$ 1,501	$ 1,501	$ 1,501	**$ 6,005**
Work Permits	$ -	$ -	$ -	$ 58	$ 17	$ 17	$ 17	**$ 109**
Total (000s)	**$ -**	**$ 4,646**	**$ 5,530**	**$ 7,071**	**$ 7,031**	**$ 7,031**	**$ 7,031**	**$ 38,341**

(1) Cost escalation value of 2.5% not yet applied

Third Party Safety Incident
APPENDIX

Third-Party Safety Incident Cost Forecast ($000)[1]

Program	2020	2021	2022	2023	2024	2025	2026
Canal and Waterway Safety: Installation of barriers along PG&E's canal systems	$ 675	$ 695	$ 716	$ 738	$ 760	$ 783	$ 806
Total (000s)	**$ 675**	**$ 695**	**$ 716**	**$ 738**	**$ 760**	**$ 783**	**$ 806**

(1) Cost escalation value of 2.5% not yet applied

Real Estate & Facilities Failure APPENDIX

Real Estate and Facilities Failure Risk: Development Since RAMP Workshop #3 (February 2020)

What was Presented

Discussion: Discussion focused on risk definition, scope, risk assessment, bow tie analysis, ranking, key drivers, and data sources

Feedback from Parties

CPUC Feedback:

- Feedback resulting from CPUC discussion. The CPUC would like: 1) A translation of severe outcome (1/500) into Richter scale units, and 2) PG&E to clarify if the risk score based on past events or using USGS data sources

CPUC Response

CPUC Testimony Responses:

- **Translation of severe outcome into Richter Scale Units:** The Moment Magnitude Scale measures an earthquake's magnitude based on its seismic moment. The potential earthquake magnitudes considered for modeling this risk **range from small (~M5) to large (M7+)**. However, the location of the earthquake has a significant impact on the shaking levels (measured in units of gravity "g") that will be experienced at various facilities, i.e., buildings close to the fault shake harder than buildings further away.

- **Past Events or Using USGS Data Sources:** The risk score from PG&E's model considers the probability of seismic events based on rates of peak ground acceleration exceedance. **The USGS Hazard Analysis used in PG&E's model does not rely solely on historical events;** but rather, uses data collected from both past seismic events, models of ground motion and the potential recurrence of those events.

Additional Modifications to the Risk Model since 2/4/2020

Risk Model Modifications:

- Added additional buildings that were focused on high density and seismic areas
- Removed insignificant seismic events from bow tie analysis because it included a high number of annual events of no consequence. Average annual frequency moved from 123.5 events to 8.2 events per year

Real Estate and Facilities Risk: Quantitative Risk Assessment and Bow Tie

Bowtie Element	Element Type	PG&E Data Source	Industry Source	SME Source
Exposure	Exposure	FM:Interact (FMI) - CRESS Facility Database		
Physical Attack	Driver	PG&E Facility records	CAPindex aggregated property crime evaluation FBI crime data	
Seismic	Driver	PG&E Facility records	USGS seismic studies HB-Risk Group (FEMA P-58)	PG&E Geosciences
Building Fire	Driver			CRESS Facilities Services team
Flood	Driver		FEMA GIS Flood Zone Data	
Landslide	Driver			PG&E Meteorology Department Data
Outcomes	Outcome		HB-Risk Group (FEMA P-58)	PG&E Geosciences
Financial Consequence	Consequence	PG&E project-based rebuild cost data	Average total cost to rebuild structure	Data modified based on type of building and geographical area
Safety Consequence	Consequence	FM:Interact (FMI)		Based on PG&E occupancy analysis

PG&E RAMP Risk Scores

			2023 RAMP Score	
Rank	LOB	Safety Risks	Safety Risk Score	Multi-Attribute Risk Score
1	EO	Wildfire	9,856	25,127
2	SHED	Third Party Safety Incident	887	944
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11	EO	Failure of Electric Distribution Network Assets	6	7
12	GO	Large Overpressure Event Downstream of Gas M&C Facility	5	13

Large OP Event Downstream of M&C Facility
APPENDIX

2020-2026 Forecast (in 000's)

	Mitigation	2020	2021	2022	2023	2024	2025	2026	Total	%
M1	Critical Documents Program	7,623	8,268	7,998	-	-	-	-	**23,889**	4%
M2	HPR Replacement	55,201	57,800	59,245	17,861	18,307	18,765	19,234	**246,413**	37%
M3	SCADA Visibility	32,990	34,160	34,646	29,714	30,458	30,955	4,345	**197,268**	30%
M4	Station OPP Enhancements	39,287	32,994	26,438	28,359	24,949	25,257	13,874	**191,158**	29%
	Total	**135,101**	**133,222**	**128,327**	**75,934**	**73,714**	**74,977**	**37,453**	**658,728**	100%

	Alternative	2020	2021	2022	2023	2024	2025	2026	Total
A1	Rebuild or Retrofit DREG Stations	-	-	-	48,079	48,164	48,252	48,341	**192,836**
A2	Rebuild or Retrofit Subset of DREG Stations	-	-	-	58,492	57,313	57,629	48,341	**221,775**

Loss of Containment – Distribution Mains & Services APPENDIX

2020-2026 Forecast (in 000's)

	Mitigation	2020	2021	2022	2023	2024	2025	2026	Total	%
M2	New Valve Installations	6,743	6,940	7,113	7,291	7,473	7,660	7,890	**51,110**	1%
M3	Enhanced CP Survey and Unprotected Main Evaluation	5,468	6,431	-	-	-	-	-	**11,899**	0.2%
M4	Electrically Connected Isolated Steel Service (ECISS) Program	3,582	3,961	4,060	4,161	-	-	-	**15,764**	0.3%
M5	Pipeline Replacement Program (Steel)	114,830	138,424	140,968	181,245	192,043	190,413	208,006	**1,165,929**	23%
M6	Pipeline Replacement Program (Plastic)	304,721	404,132	484,361	517,776	555,372	595,226	639,921	**3,501,509**	70%
M7	Cross Bore Legacy Inspection Program	31,187	29,535	30,831	31,050	31,815	32,580	33,435	**220,433**	4%
M8	Fitting Mitigation Program	-	-	-	14,402	14,762	15,131	15,585	**59,880**	1%
M9	Mechanical Fitting Replacement Program	1,000	996	1,021	-	-	-	-	**3,017**	0.1%
	Total	**467,531**	**590,419**	**668,354**	**755,925**	**801,465**	**841,010**	**904,837**	**5,029,541**	100%

	Alternative	2020	2021	2022	2023	2024	2025	2026	Total
A1	Use of Fire Retardants to Prevent Ignition and Fire Spread around Plastic Spans	-	-	-	63	65	66	68	**262**
A2	Electrification Steel	-	-	-	223,291	253,693	240,931	290,425	**1,008,340**
A3	Electrification Plastic				834,960	876,287	913,116	930,114	**3,554,477**

Loss of Containment – Transmission Pipeline APPENDIX

2020-2026 Forecast (in 000's)

	Mitigation	2020	2021	2022	2023	2024	2025	2026	Total	%
M1	ILI Upgrades	167,785	144,000	147,600	151,290	155,072	158,949	162,923	**1,087,619**	49%
M2	Strength Testing	39,622	39,521	40,707	90,357	93,067	95,859	98,735	**497,868**	23%
M3	Vintage Pipe Replacement	23,957	45,300	35,446	33,631	19,192	42,750	51,317	**251,593**	11%
M4	Valve Automation	24,056	28,800	29,520	34,040	34,891	35,764	35,472	**222,543**	10%
M5	Shallow Pipe	6,941	6,941	7,150	7,364	7,585	7,813	8,047	**51,841**	2%
M6	Exposed Pipe	10,311	18,126	19,835	7,643	11,653	12,002	12,362	**91,932**	4%
	Total	**272,672**	**282,688**	**280,258**	**324,325**	**321,460**	**353,137**	**368,856**	**2,203,396**	100%

	Alternative	2020	2021	2022	2023	2024	2025	2026	Total
A1	Mitigate Transmission Pipeline Impacted by Climate Change	-	-	-	18,179	18,724	19,286	19,864	**76,053**
A2	Mitigate Transmission Pipeline Third Party Damage Events	-	-	-	3,556	7,174	11,007	12,611	**34,348**