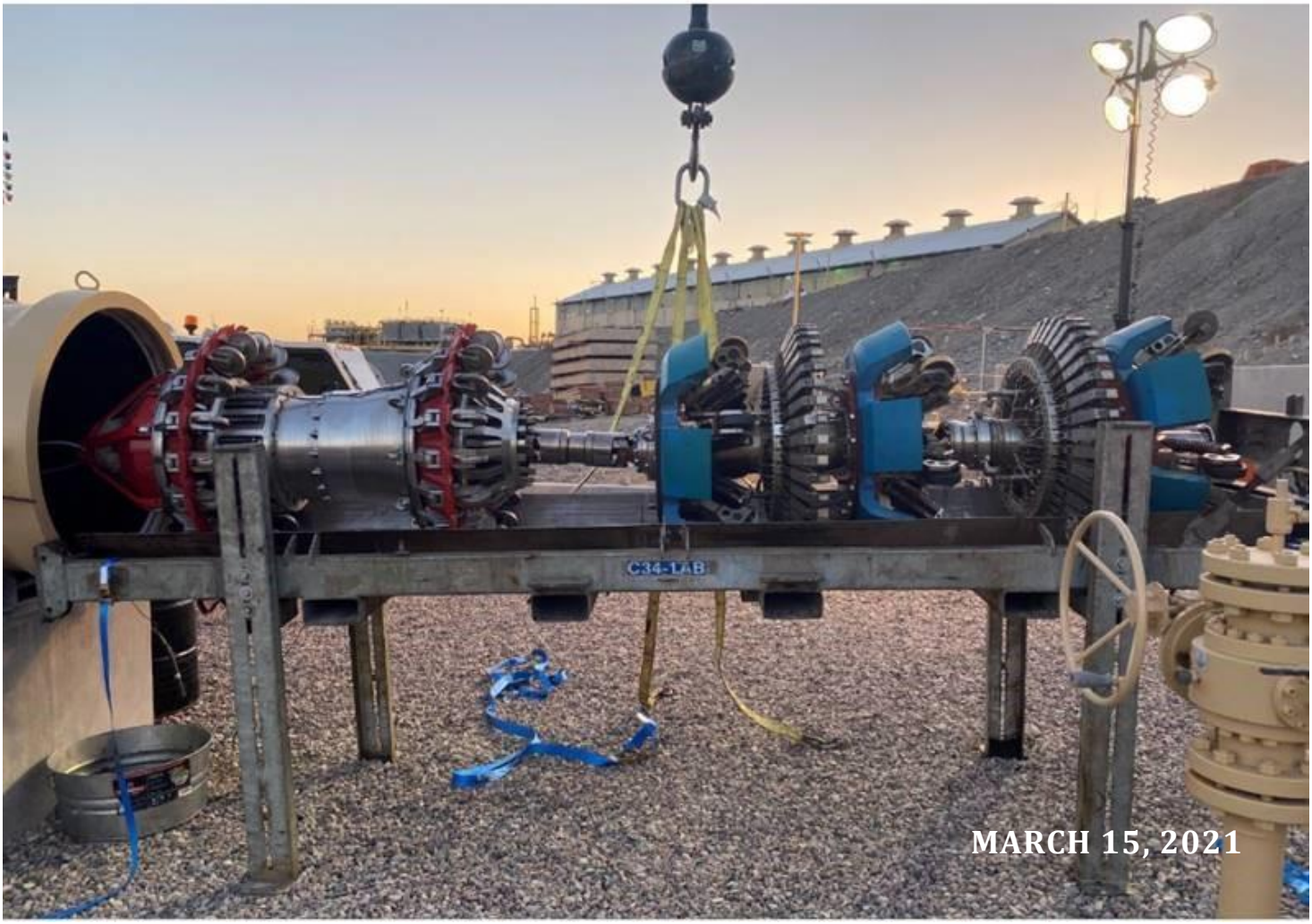
Appendix E
Gas Safety Plan

Pacific Gas and Electric Company®

2021 GAS SAFETY PLAN



MARCH 15, 2021

PACIFIC GAS AND ELECTRIC COMPANY
GAS SAFETY PLAN

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Photo Credit: Pictured on the front page is ROSEN's 34x36' RoGeo XT geometry in-line inspection tool configured to includes their SCU (Speed Control Unit). Utilizing their SCU allows operators to flow at a higher through put during the in-line inspection as it allows for product bypass reducing the tools velocity for optimal data acquisition.

PACIFIC GAS AND ELECTRIC COMPANY
GAS SAFETY PLAN

I. INTRODUCTION

Pacific Gas and Electric Company (PG&E or the Company or the Utility) works every day to safely transport natural gas under pressure through approximately 6,600 miles of transmission pipelines, 43,000 miles of gas distribution pipelines, and 4.6 million meters. The PG&E natural gas system serves millions of Californians from Eureka in the North to Bakersfield in the South, and from the Pacific Ocean in the west to the Sierra Nevada in the east. PG&E's employees work around the clock, 365 days a year to keep the public, customers, contractors, and employees safe. PG&E's mission is to safely and reliably deliver affordable and clean energy to our customers and communities every single day, while building the energy network of tomorrow.

While there is more work to do to achieve PG&E's mission, PG&E's Gas Safety Plan (Plan) provides a view into the safety activities PG&E pursues every day and highlights the specific safety work in 2020. PG&E annually reviews and updates its Plan in accordance with General Order 112-F Section 123.2(k), and Public Utilities Code (Pub. Util. Code) Sections 961 and 963.[1] Figure 1, on the following page, provides a summary of PG&E's performance in key areas.

Gas Operations Safety Improvements

Gas Operations progress since 2010 demonstrate our commitment to becoming the safest, most reliable gas company in the country.

GAS ODOR RESPONSE TIMES	2010	2020
Average response time in minutes	33.3	20.5
Percent response within 60 minutes	94.4%	99.6%
SCADA VISIBILITY AND CONTROL POINTS		
Transmission pressures and flows	1,300	2,569
Transmission control points	870	963
Distribution pressures and flows	290	4,147
LEAK BACKLOG		
Grade 2 open leak average duration (Target: 150 days)		92 days
DIG-IN REDUCTION		
Third party gas dig-ins/1,000 USA tickets	3.5	1.05
GAS TRANSMISSION	**2010**	**2011-20**
Miles of pipeline replaced	9	>272.1
Miles of pipeline strength tested	0	>1,534.2
Miles of pipeline made piggable	130	>1,780
Automated valves installed	0	381
GAS DISTRIBUTION		
Miles of main replaced[1]	27	994

SINCE 2011 PG&E HAS ALSO

- Completed GPS survey for 100% of the accessible transmission pipeline system using highly precise mapping tools
- Opened a state-of-the-art Gas Control Center in San Ramon, California
- Opened a world-class Gas Safety Academy located in Winters, California
- Opened the Center for Gas Safety and Innovation located in Dublin, California

Certifications received for Gas Operations:

In 2014, PG&E Gas Operations became one of the first utilities ever to earn two of the highest internationally recognized asset management certifications—the International Organization for Standardization (ISO) 55001 and Publicly Available Specification (PAS) 55-1.

- Gas Operations was recertified for both of these standards in 2017 and 2020 (Stage 1)*.

In 2015, PG&E Gas Operations became the first company in the U.S. to receive certification of compliance for the industry standard on pipeline safety management systems, the American Petroleum Institute Recommended Practice (API RP) 1173.

- Gas Operations was successfully recertified as compliant with API 1173 in 2018 and 2020 (Stage 1)*.

In 2019, PG&E Gas Operations was certified as compliant with API RP 754, Process Safety Performance Indicators, in so far as it meets its business operations.

- Lloyd's Register confirmed Gas Operations' continued compliance with API RP 754 in 2020.

[1]In 2014 all known remaining cast-iron pipe was decommissioned.
*Stage 2 recertification audit will be conducted in 2021.

Figure 1 – Key Gas Performance Metrics

1. Structure of the Gas Safety Plan

The 2021 Plan reports on the progress PG&E has made on its goal to become the safest, most reliable gas company in the United States (U.S.), and details the work performed in 2020. The Plan reiterates PG&E's commitment, mission, and vision to safely and reliably deliver affordable and clean energy to our customers and communities. In alignment with California's regulatory framework,[2] this Plan explains how PG&E puts the safety of the public, customers, employees and contractors first, and how the Company has made safety investments in processes and infrastructure that are consistent with best practices in the gas industry.

The following sections of the Plan provide more information on how PG&E is achieving Gas Safety Excellence, and include updates on the Company's safety goals and commitments to public, customer, employee, and contractor safety.

- **Gas Safety Excellence Management System (GSEMS):** This integrated safety management system provides the framework and structure to drive operational excellence to create industry-leading safety and reliability performance across the organization. It is a systematic process to protect, manage, and improve performance in dimensions of safety that are critical to reducing risks. This section describes PG&E Gas Operations' integrated safety management system that permeates every aspect of gas operations known as the "GSEMS."
- **Safety Culture, Process Safety, and Asset Management:** Safety culture, process safety, and asset management together form the foundation of Gas Safety Excellence. These sections outline how PG&E manages risk—both the inherent risk of the assets *and* the risk of working on those assets safely. This section describes how the Company identifies risk, prioritizes risks and then works to mitigate them, highlighting the three major categories of gas system risk the Company manages: loss of containment, loss of gas supply, and inadequate emergency response.
- **Workforce and Compliance Framework:** These sections review how PG&E qualifies, trains, and engages the workforce to mitigate risk by working on assets safely and performing work right the first time. These sections include information about PG&E's workforce training and qualifications programs, and how PG&E achieves compliance.
- **Continuous Improvement (CI):** This section presents PG&E's efforts to continuously improve processes and procedures.

2. Gas Safety Excellence Management System

Gas Safety Excellence is demonstrated by:

- Putting ***SAFETY*** and people at the heart of everything
- Investing in the ***RELIABILITY*** and integrity of PG&E's gas system
- Continuously improving the effectiveness and ***AFFORDABILITY*** of PG&E's processes
- Supporting emissions reduction and working to advance PG&E's comprehensive ***CLEAN*** energy goals

Figure 2 – PG&E Gas Safety Excellence Management System

GSEMS is PG&E Gas Operations' integrated safety management system developed to achieve the vision of becoming the safest, most reliable, affordable, and clean gas utility in the nation. This safety management system provides the structure to systematically manage and maintain operational excellence in asset management, safety culture, and process safety, with a commitment to continuous improvement and in compliance with best-in-class industry standards. GSEMS consists of the following sixteen elements that focus on supporting performance management to achieve our goals:

1. Leadership Commitment, Accountability and Employee Participation
2. Asset Management and Life Cycle Planning
3. Risk Assessment and Management
4. Incident Investigation and Corrective Action(s)
5. Compliance with Legal, Regulatory and other Operational Requirements
6. Operational Planning and Control(s)
7. Communication and Stakeholder Engagement
8. Information, Documentation and Records Management
9. Contractor Management and Third-Party Services
10. Training, Competency and Awareness
11. Management of Change
12. Monitoring and Measurement
13. Emergency Preparedness and Response
14. Auditing
15. Quality Management and CI
16. Management Review

PG&E's GSEMS strives to enable employees to do their work right the first time to deliver high-value, quality services.

3. PG&E'S GOALS

Gas Operations annual strategic goals are developed through the "Line of Sight" process. This process incorporates the Company's focus areas and the updated plans or results from the Quarterly Business Review (QBR) process to develop three to five year objectives, annual objectives, and initiatives that are linked. The Line of Sight goals, as well as new targets for the ongoing work, are incorporated into the QBR process. "Line of Sight" goals in 2020 aligned business strategy with six key themes: Safe, Reliable, Affordable, Customer, People, and Compliance. This planning process results in strategic goals to drive action throughout the business. Related goals and metrics cascade throughout the organization to provide each employee a line of sight to how their actions support PG&E's vision. These items are discussed in more detail throughout this update.

a) PUBLIC SAFETY

In 2020, PG&E had success in three primary safety areas: In-Line Inspections (ILI), Third-Party Dig-Ins, and Leak Repair Effectiveness.

- **In-Line Inspections:** In 2020, PG&E increased piggability to roughly 43 percent of the approximately 6,600 miles of the Gas Transmission system.
- **Third-Party Dig-Ins:** In 2020, PG&E experienced In 2020, PG&E experienced 1.05 third-party dig-ins per 1,000 Underground Service Alert (USA) tickets, outperforming its 2020 target of 1.44 total dig-ins per 1,000 tickets.
- **Leak Repair Effectiveness**: In 2020, PG&E's Grade 2 leaks remained open an average of 92 days, exceeding the target of <150 days.

b) WORKFORCE SAFETY

PG&E's goal is to continually reduce risk to keep our customers, our communities, and our workforce (employees and contractors) safe. Our focus is to continue building an organization in which we have designed every work activity to facilitate safe performance, every member of our workforce knows and practices safe behaviors, and every individual is encouraged to speak up if they see unsafe or risk behavior and has confidence that their concerns and ideas will be heard and followed up on. In 2020, PG&E developed its 2025 Workforce Safety Strategy, which has been reviewed by senior leadership and the Board of Directors and has driven our execution through the back half of 2020. The 2025 Workforce Safety Strategy includes two major pillars: systems and culture. Systems refers to risk management, equipment,

processes, and procedures. Culture refers to employee engagement, adherence to established requirements, sense of urgency for safety, and leadership.

PG&E aspires to eliminate work-place fatalities and reduce the number of serious safety incidents. PG&E established Days Away, Restricted or Transferred (DART)[3] targets for 2020 to move the rate from 4th quartile to 3rd quartile. In 2020, Gas Operations had 126 DART cases at a rate of 2.16. This was a reduction of 52 cases and a rate reduction of 1.99 from 2019. Although there were substantial improvements, Gas Operations closed the 2020 year end in the 4th quartile, missing out 3rd quartile target. The top three DART nature of injury trends were Sprain/Strain, Musculoskeletal, and Nervous System related. These injuries were sustained mainly within Gas Service Representatives, General Construction Operators, and Gas Compliance. Gas employees were involved in 40 Lost Time Injuries, which was an increase of seven from 2019. In 2020, the California Occupational Safety and Health Administration (OSHA) recordable rate decreased by approximately 36.3 percent. This is likely a result of early intervention from PG&E's 24 hour, seven days a week Nurse Care Line (NCL), early reporting and Industrial Athlete (IA) utilization. In 2020, 75.5 percent of employees who called the NCL reported discomfort or an injury within 24 hours, which was a 4.4 percent decrease from 2019. The emphasis on early intervention has had a positive effect on workforce injuries. Based on the review of our data, PG&E believes that speaking to a healthcare professional about an injury or illness within 24 hours contributes greatly to the reduced severity and recovery time of an injury or illness. Figure 3 illustrates the downward trend in severity of incidents. Through consistent application of reporting and preventative efforts, the serious lost time injuries have begun to follow the OSHA recordable curve and shows improvement.

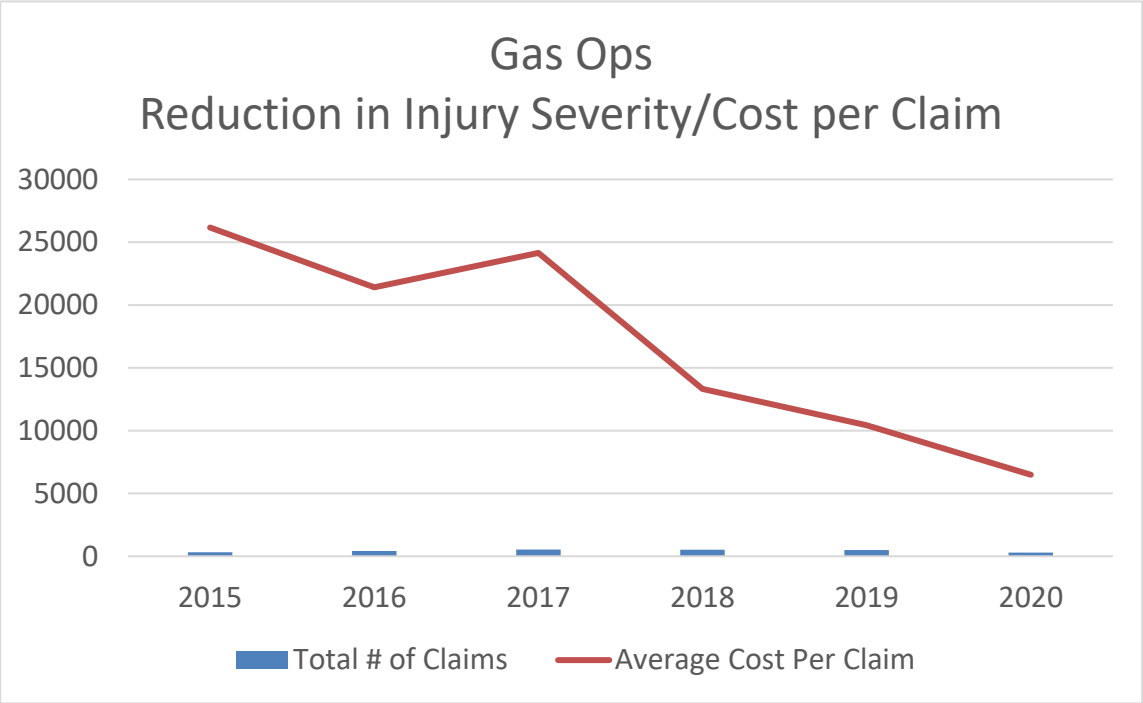


Figure 3 – Reduction in Injury Severity

In 2020, Gas Operations had six safety incidents that had the potential to cause a Serious Injury and Fatality (SIF). A SIF review team, composed of department representatives, evaluates the incident to determine if there was a high probability that the hazard/operational failure would result in life-threatening or life-altering injury. Once an incident is determined to have a potential to be a SIF, a cause evaluation team is assembled to investigate the facts of the incident, and identify the causal and contributing factors. The team also develops comprehensive corrective actions to minimize and/or prevent reoccurrence. Upon completion of the internal investigation, a written report is presented to the Corrective Action Review Board to evaluate and accept the corrective actions. A third party then evaluates and scores the quality of the corrective actions. PG&E added additional evaluation measures, such as Timely Corrective Action Completion and Quality of Corrective Actions, to focus on the quality and timely closure of corrective actions from SIF investigations. In 2020, Gas Operations completed 79 percent of the corrective actions in a timely manner, with a goal of 90 percent. This is a decrease of 21 percent from the prior year. The decrease is directly related to coronavirus (COVID-19) impacts and a policy change which required SIF corrective actions to be completed as planned. For 2020, the SIF quality of Corrective Actions score was 13.2, exceeding the target of 12. SIF quality was no longer tracked after August based on a determination that scoring was not adding substantial value.

Another area of focus continues to be Motor Vehicle Safety. In 2020, there were 13 Serious Preventable Motor Vehicle Incidents (SPMVI), an 8 percent increase from 2019. In 2017, the Company installed an in-cab coaching technology to over 2,600 gas vehicles and developed a metric to score employees' driving behaviors. The technology alerts drivers when their vehicle accelerates too fast or brakes too hard. These are both leading indicators to incidents that have the potential to cause extensive damage or a SPMVI. This ratio yields a Safe Driving Rate in which a lower ratio is preferred. In 2019, Gas Operations scored a Safe Driving Rate of 4.9. In 2020, Gas Operations finished with a Safe Driving Rate of 4.5, an 8 percent reduction from the previous year.

Figure 4 – Examples of PG&E Gas Motor Vehicles

The Company continues to improve its motor vehicle safety program, conduct more driver observations, evaluate backing sensor technology, enhance driver safety training, and promote awareness campaigns. PG&E will continue to reduce OSHA recordable injuries, DART rate, and motor vehicle incidents.

4. Rewarding Safety Excellence

PG&E's performance goals reinforce expectations regarding management decisions and allocation of resources. PG&E awards employees and contractors for their safety excellence by encouraging safe behavior and practices. These awards include:

- **Eagle Eye Award** – Recipients of this award are those who submit Corrective Action Program (CAP) items identifying and addressing issues that result in significant improvements to safety, reliability, compliance, cost reduction, or process. Any employee can submit an Eagle Eye nomination.
- **Caught Being Safe** – Under this program, rewards and recognition are provided for employees who demonstrate safe behavior, speak up and take action to promote a positive safety culture, and/or support the 2025 Workforce Safety Strategy. As a token of appreciation, the employees who nominate them are also eligible to receive rewards and recognition. In 2020, most employees continued to find ways to recognize each other through the program with the change to remote work. In 2020, 41 Caught Being Safe nominations were submitted recognizing 26 individuals.
- **Process Safety Ambassador Award** – This award recognizes teams and individuals for going above and beyond in applying the keys to Process Safety to their work, such as having a

questioning attitude, taking time to evaluate the hazards prior to starting a task, and reporting a CAP.

II. Safety Culture

PG&E's commitment to strengthening our safety culture and performance is reinforced in the Company's Mission, Vision, and Culture. Figure 5 illustrates PG&E's mission, vision and culture statements that are the foundation of our decision-making process.

Gas Operations Safety and Leadership worked to improve workforce safety through building a culture focused on the hearts and minds of our employees and building a deeper partnership between Gas Operations leadership, Grassroots Safety Teams and the Labor Unions. The goals of the partnership were to focus on preventing and reducing employee injuries, promoting healing and return to work; and ensuring quality and appropriate medical care for our employees. In 2020, with leadership support, Gas Safety continued its focus on preventing and reducing employee injuries, promoting healing and return to work, and ensuring quality and appropriate medical care for our employees.

Figure 5 – PG&E's Mission, Vision, and Culture Statements

With the introduction of COVID-19 as a potential risk to our workforce and customers, Gas Operations developed and implemented COVID-19 protocols early in the pandemic. These protocols set the framework for a Gas Operations COVID-19 Plan that was leveraged for a large segment of 2020 until an Enterprise Plan was adopted across all Line of Business (LOB). As office employees adapted to their working remote environment, Gas Operations in conjunction with Enterprise Health and Safety ensured employees were equipped with the necessary ergonomic equipment and provided virtual ergonomic assessments to reduce the potential for ergonomic related injuries. Field employees adapted to ever changing COVID-19 guidelines and identified best practices to ensure the health and safety of their fellow employees and our customers. In addition to the COVID-19 measures, the Gas Safety team leveraged insights from the Gas Safety Oversight Council through its continuous improvement journey.

The organization built upon the prior years benchmark learnings and improved upon the Gas Safety Council charter to include active participation and updates from Grassroots members and other participants. The Grassroots Rally room was expanded to a broader group of key participants to improve collaboration and resolution of identified safety concerns. There was also an increase in problem solving sessions to identify improvements in communications and leader engagement. Gas Operations continued

to champion IA utilization for frontline employees and provide leaders with the necessary injury data to aid in implementation of injury prevention measures.

The ongoing implementation and improvements of learning identified through benchmarking continued to show tremendous improvement in different safety behaviors and shifting the culture, including the following:

- Problem solving sessions were created to address issues such as motor vehicle improvement, tool safety and process or procedure safety allowing for immediate sharing of lessons learned.
- The focus on early reporting and prevention contributed to the reduction in injury severity. The average cost of claims in Gas Operations has reduced by 79 percent since 2012.
- IA engagement and utilization in cities identified as having higher risks and exposures. The IAs focused on observing employee biomechanics, ergonomics and risk behaviors resulting in identification of corrective actions and recommendations.
- Gas initiated Industrial Ergonomic evaluations of higher risk task through utilization of Humantech tool to identify likely points of injury. This data enabled employees to be coached on specific equipment, body positioning, and stretches that can assist in injury prevention.

Virtual Ergonomic Assessments for Remote Workstations. In alignment with the enterprise requirement for office based employees to complete preventative virtual ergonomic evaluations, 1,753 Gas Operations employees completed virtual ergonomic assessments. This was a 98 percent response rate of the 1,784 evaluations requested. Gas Safety's 2020 focus provided Gas Operations with the awareness and tools to be successful beyond this initiative. Gas Leadership, in partnership with Grassroots Safety Teams and Labor Unions, will continue to reinforce PG&E's commitment to safety and encourage its employees to work safely. Gas Operations will continue to utilize Industrial Ergonomics to minimize hazards related to work equipment, environment, tools and processes through prioritization of frequency of activity by work type, looking for quick wins by changing out tools and sharing immediate lessons learned with others to reduce hazards.

As an organization, PG&E's ongoing focus is to influence behaviors to change by connecting with those that do the work, build/improve our Safety Culture through focusing on the hearts and minds of our employees, and continue to build a deeper partnership between Gas and Labor Unions to drive safety.

1. Employee Engagement

PG&E continues to reinforce the various initiatives to enhance employee engagement. These initiatives included: Lean Management (Lean), Safety Leadership Development, and Leader in the Field.

Lean Management. Gas Operations continues to support and reinforce the importance of "huddles" throughout the organization. Huddles are quick, structured conversations among team members that typically occur weekly, daily or several days a week. Huddles provide a platform for employees to speak up and raise issues, share resolutions and information, discuss progress on metrics and targets at each level, identify areas for improvement, align on priorities, and recognize individuals and/or teams for great work and successes. Separately, employees have designated time for Problem Solving sessions where roadblocks are identified and employees are given the opportunity to help develop a solution.

Lean also encourages leaders within Gas Operations to spend more time engaging with their employees directly. Leaders regularly visit locations where the work is occurring to meet employees, hear firsthand their thoughts on what is working well and where improvements are needed, and to observe the work being performed to see for themselves what opportunities for improvement exist.

Safety Leadership Development. Beginning in 2017, the *Leading Forward: Safety Leadership* program was delivered to all operational leaders. The program included three workshops: Shaping a Safety Culture; Identifying and Controlling Exposure; and You Are Not Alone. In 2020, leaders continued to sustain the program by having periodic discussions in which best practices, lessons learned and collaboration for solving issues occurred. A total of 77 Gas Operations leaders (20 Crew Leads, 57 Supervisors and Superintendents) completed the program.

Leader in the Field. Since March 2020, Leader in the Field continues with a focus on the supervisors and managers being in the field with their employees to assist in removing barriers and resolving safety concerns. Across all PG&E supervisors, reported year to date, time in the field has increased from 27 percent at start of 2020, to 52 percent at end of 2020, exceeding the target of an average of 50 percent of their working hours spent in the field with frontline workers. For Gas Operations, supervisors spent 47 percent of their working hours in the field. For managers, year to date Leader in the Field levels similarly improved from 16 to 27 percent, exceeding the goal of 25 percent. For Gas Operations, managers spent 18 percent of their working hours in the field.

a) Corrective Action Program

The CAP is an integral part of our safety culture in Gas Operations. PG&E's continued use and support of the CAP demonstrates to our employees, our regulators, and our customers, that we have an unwavering commitment to delivering safe, reliable, affordable, and clean energy. The CAP process ensures that notifications are categorized, assessed for risk, and assigned to the appropriate owner to resolve issues and implement effective corrective actions to help prevent recurrence. Our goal is to move Gas Operations from a reactive approach of solving issues, to a proactive analysis that helps prevent issues before they result in an incident. The CAP provides real-time data and ensures transparency and

accountability. The system is designed to provide trending capabilities and a continuous improvement loop to capture lessons learned and to improve the safety and reliability of PG&E's operations.

The Gas CAP team is composed of CAP operation specialists and cause evaluators. The operation specialists handle the day-to-day management of CAP submissions, including assignments, coaching and training, reviewing closed CAP issues, trending analysis, data requests, and metrics. The cause evaluators facilitate the end-to-end process of an investigation, or cause evaluation (root, apparent or common cause), including team training, interviews, analysis, report writing and working with the functional leader for approvals. The cause evaluation team is also responsible for all SIF investigations and works in conjunction with Corporate Safety to ensure effective implementation of the process.

What Gets Reported into CAP

PG&E encourages employees to identify issues related to gas assets, processes and overall safety of our employees, contractors and the public to be entered into CAP for resolution and tracking. There are a few issues that may fall outside the scope of CAP (e.g., Information Technology (IT), Compliance and Ethics, facility requests); however, we do not discourage their entry, but will transfer the CAP notification to the most appropriate tool/program for follow up.

How the Gas CAP Process Works

Initiation: The initiator, who can be any PG&E employee (or contractor with network access), can submit any issue or process improvement idea into the CAP. They have several ways to submit an issue such as through the CAP website, the mobile CAP App, calling the CAP helpline, submitting a paper form, via SAP, or by e-mailing the CAP help desk. Once the CAP is in submitted status in Gas Operations, the Gas CAP team will process it for assignment. On average, Gas employees submit 30 CAP notifications each day.

Assignment and Resolution: The CAP process employs a standardized approach (Figure 6) to reviewing and assigning CAP notifications. This process is facilitated by the Gas CAP Review Team (CRT). The Gas CRT is composed of Subject Matter Experts (SME) from various Gas departments that meet regularly to review newly submitted CAP notifications. The CRT's function is to categorize each notification, assess it for risk (using the enterprise CAP risk matrix), and assign it to an issue owner. After the CRT meeting the CAP team finalizes each issue and prepares them for release to the agreed upon issue owner. Excluding routine mapping corrections, on average, the CRT reviews 100 CAP notifications per week.

Once the CAP is assigned to an issue owner, it is the issue owner's responsibility to review the notification, identify the causes underlying the issue, and address them appropriately by implementing any necessary corrective actions to mitigate risks and/or prevent recurrence (based on risk and evaluation level).

After a CAP notification has been submitted and released to an issue owner, initiators receive an e-mail detailing to whom their notification was assigned. They also receive an e-mail again when their notification is closed. This gives the initiator the opportunity to learn how the issue was resolved, and to provide feedback on their satisfaction with the results.

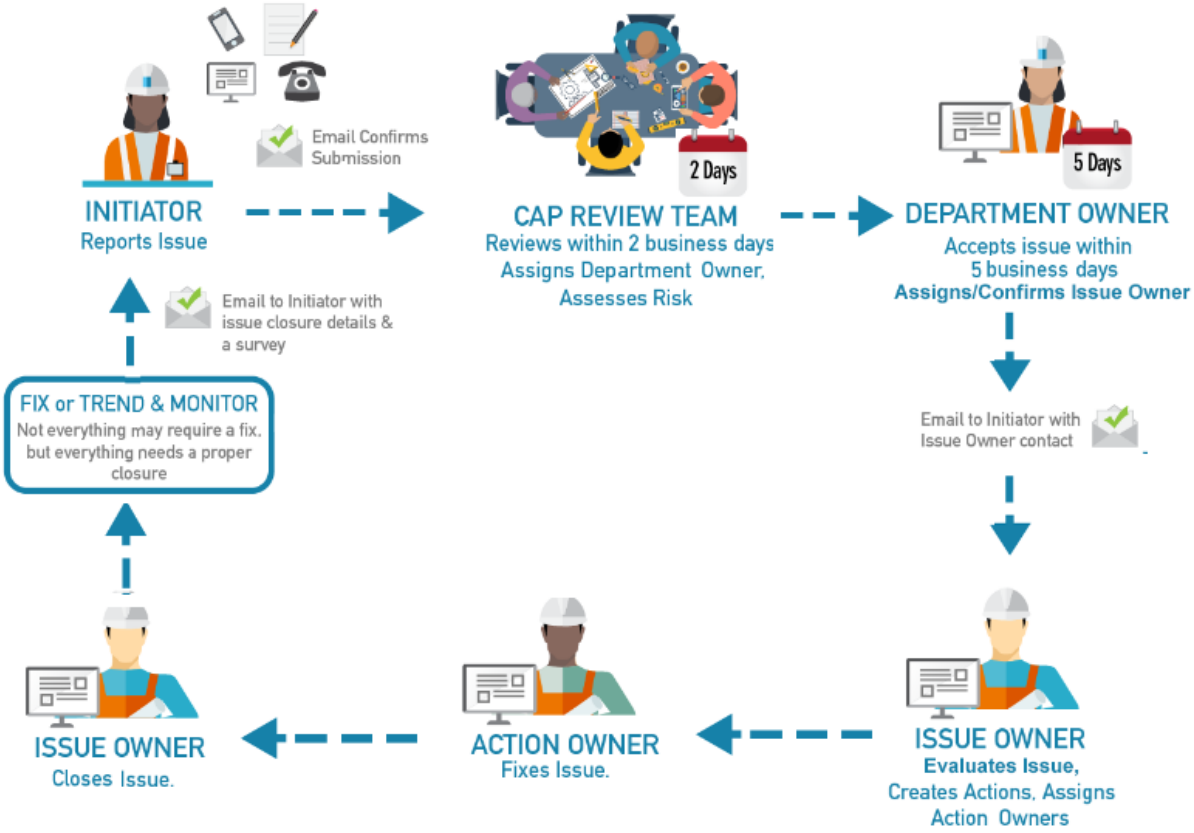


Figure 6 – CAP Process

<u>How Notifications are Risk Ranked</u>

Risk matrices are used to rate and compare risk of hazardous events by considering the likelihood and consequence of an event happening, to increase visibility and help with decision making on risk reduction processes. Risk and safety are highly dependent on an individual's perception, meaning risk and safety mean different things to different people. Risk matrices are designed to minimize individual influence and normalize risks to be uniform, regardless of who is risk ranking hazards. Risk matrices, especially when assessed qualitatively, provide only an estimated assessment of risk and are used to provide initial decision guidance and do not produce definitive risk assessments. Quantitative risk assessment methods are available when a better estimate of risk is required to better allocate resources. The CAP risk matrix is a qualitative risk assessment.

The initial risk ranking of a CAP notification is based on the information available and application of the following calculation to assist reviewers with combining known facts to identify the risk of the CAP notification:

Probability of Event Occurrence x Severity of Consequence = CAP Notification Risk

- **Probability of Event Occurrence**: The extent to which an incident, event, or condition has occurred or recurred (frequency).
- **Severity of Consequence**: The result of an incident, event, or condition by considering the degree[4] the public, employee(s), or property was in jeopardy of harm or loss (severity). This includes an assessment of the risk associated to safety, asset damage, reliability, financial impact, compliance, environmental, and reputation.

The CAP notification risk level is used to determine the appropriate evaluation type that will be assigned and provides Gas operations with the ability to prioritize CAP notifications. Cause evaluations are necessary to identify the cause of an incident, issue or error, to prevent or minimize the probability of reoccurrence and to apply continuous improvement processes. There are four types of cause evaluations:

- **Root Cause Evaluation (RCE):** An RCE is a formal and rigorous investigation that uses industry-accepted analysis methods to determine the root cause(s) of a problem. The RCE identifies required corrective actions that prevent or reduce the likelihood of a recurrence of the problem for the same or similar root cause(s).
- **Apparent Cause Evaluation (ACE):** An ACE is an evaluation based on readily available information that provides reasonable assurance that the cause of a problem is determined and will be corrected. An ACE is conducted when management determines a formal but less rigorous cause evaluation is necessary.
- **Work Group Evaluation (WGE):** A WGE is a logical evaluation of an issue to identify reasonable corrective or preventive actions needed to resolve an issue. Resolution of the issue may be addressed by another process, or a simple explanation of why something does or does not happen.
- **Common Cause Evaluation (CCE):** A CCE is an analysis method that can be used to identify common underlying elements among different, unique, but similar events or issues. The underlying elements may be anything from a common failure mechanism to a common cause that may or may not require further investigations. CCE can only be conducted when the individual issues have been evaluated on their own merits (i.e., ACE or WGE report completed) and causes and corrective actions have been identified.

A cause evaluation can be related to a wide range of topics in Gas Operations, such as asset failures, reliability (e.g., dig-ins, overpressure (OP) events), and workforce safety incidents (i.e., SIF incidents). A cause evaluation can be requested by an employee on any CAP notification; however, an RCE is generally assigned to incidents where the consequence severely impacts public or employee safety, or reliability, and warrants rigorous analysis. All CAPs require a WGE, and formal (documented) WGEs are required for non-conformances and high-risk quality findings. Gas completed 169 formal WGEs in 2020. Figure 7 shows the total number of evaluations completed in 2020.

RCE	ACE	WGE	CCE
1	62	15,980	0

Figure 7 – Cause Evaluations Completed in 2020

How CAP Success is Measured

In 2020, Gas Operations' goal was to engage at least 33 percent of its workforce to use CAP, and at year-end it had engaged 28 percent. In 2020, Gas Operations employees submitted 11,131 notifications—averaging just over 927 per month—and closed 16,057 notifications.

To ensure transparency, leaders receive an Executive CAP Dashboard Report (Figure 8) each week that details how their organization is performing on their CAP items. Key performance indicators reported in 2020 include:

- Percent of Unique Initiators – This is the number of employee submissions divided by the total count of employees. The 2020 goal was greater than or equal to 33 percent of unique initiators.
- CAP Throughput – This number measures the volume of work being completed by the organization. The 2020 goal was 1.0, meaning that the volume of closed notifications equals the volume of submitted notifications.
- Average closure satisfaction (1-5 scale) is the sum of survey scores divided by the number of survey submissions. The 2020 goal was an average closure satisfaction greater than or equal to 3.5, where 5 is "very satisfied" and 1 is "did not meet expectations."
- Quality closure (percent) is the number of CAP notifications passing quality review divided by the number of CAP notifications reviewed. The 2020 goal for quality closure was greater than or equal to 92 percent.
- Average Age of Open High-Risk Notifications (days) – This is the number of days high-risk notifications are open divided by the number of open high-risk notifications. The 2020 goal for average age of open high-risk notifications was 230 days.
- Average Age of Open Medium-Risk Notifications (days) – This is the number of days medium-risk notifications are open divided by the number of open medium-risk notifications. The

2020 goal for average age of open medium-risk notifications was less than or equal to 230 days.

Figure 8 shows how Gas Operations performed against the above-mentioned key performance indicators in 2020.

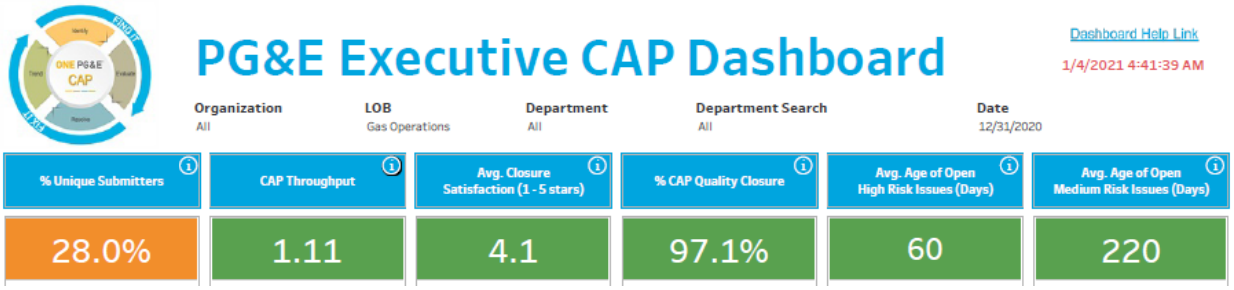


Figure 8 – CAP Metrics

Continuous Improvement and Speak Up Culture

The Gas CAP process continues to mature and serves an important role in Gas Operations to identify and mitigate operational and safety issues and implement process improvements. The Gas CAP department also looks for ways to improve how it supports the business and continues to bring added value to operations.

Eagle Eye Program: The Eagle Eye Program was created to recognize employees who use the CAP to identify and address issues that result in significant improvements to safety, reliability, compliance, cost reduction, or process. The program was so successful in Gas Operations that all of PG&E's lines of business adopted the Gas model when CAP was deployed company-wide. In 2020, the CAP Department logged 48 Eagle Eye nominations, which included nominations for identifying and submitting "good catch" issues and for efforts in resolving those issues. In 2020, nine Gas Operations employees received Eagle Eye awards.

Trending: The CAP team improved its methodologies and capabilities within the trending program to track and analyze similar or repeat issues. As part of our efforts, the process evolved from capturing cognitive trends during CRT meetings by standing up a new structured potential trend process. The potential trend process complements the cognitive trend process by creating a formalized systematic statistical approach. Using these processes, the team is able to capture emerging trends that can be further analyzed and communicated to key stakeholders within Gas Operations. These trends are categorized by issue type, subtype, functional team, and risk level to further identify common issues and trends.

Through this approach, the CAP team discovered 14 potential trends in 2020 and provided analysis and recommendations to the respective functional team in Gas Operations.

Quality Closure Review (QCR): QCR is a process in which the CAP team reviews closed notifications to determine if the responses meet the minimum quality closure requirements. To meet QCR the notification must meet the following: 1. Well defined issue; 2. Not closed to promise; 3. Sufficient documentation; 4. Justification for no action taken; and 5. Extent of Condition performed (if required). Gas CAP reviews 100 percent of all closed notifications on a weekly basis. If the CAP team determines that a notification did not meet the minimum requirements of QCR, then a team member will reach out to the issue owner and coach them on what a quality closure should look like. This process adds value to the organization by creating an expectation on how a notification should be resolved and closed.

b) Compliance and Ethics Helpline

PG&E's Compliance and Ethics (C&E) Helpline is a toll-free telephone number and website available to employees, contractors, consultants, suppliers, and customers 24 hours a day, 7 days a week. The C&E Helpline, managed for PG&E by NAVEX Global, enables reporting parties to request guidance about our Code of Conduct (Code) or make a good-faith report of violations such as fraud, accounting issues, or illegal activity. Callers may remain anonymous.

Concerns raised with C&E through its Helpline or any other method are documented and tracked to closure. PG&E has a strict policy against retaliation against anyone who speaks up or is involved in an investigation. The C&E Helpline is part of PG&E's commitment to fostering a workplace where everyone feels safe to ask for guidance, share ideas or raise concerns—and one where everyone is confident that those concerns will be heard and taken seriously.

In addition to the C&E Helpline, PG&E's Federal Court-Appointed Monitor[5] has a dedicated hotline, e-mail, and website that employees and the public can submit concerns. Although the hotline is not equipped to handle safety emergencies or other issues requiring immediate attention, it is another resource for employees to raise issues or concerns.

c) Material Problem Reporting

PG&E also encourages employees to report and act on problems with any materials, tools, gas/electric/other equipment or infrastructure through the Material Problem Reporting (MPR) system. PG&E leverages the CAP reporting process to route material related problems to the MPR system. The MPR process is cross-functional and relies on employees at all levels of the business to identify potential safety issues stemming from material problems.

MPRs can be identified from two different sources:

1) As material arrives at PG&E's facilities, the PG&E team may identify "Incoming MPRs."
2) As work is performed with materials, personnel may identify "Field MPRs."

Incoming MPRs that are quality tested and found to fail at receipt prompt the creation of a Supplier Corrective Action Request (SCAR), requiring the supplier to resolve the issue. The SCAR process and system is managed by Supplier Quality Assurance (SQA) to ensure proper corrective actions are implemented. In 2020, this process had an average cycle time of 13 days, with a target of 20 days.

Field MPRs tend to be more complex, and as a result, may require more time to resolve. They require collecting the part from the field, shipping it to engineering, performing an investigation and interviews on method of installation, and material testing in a test lab to validate the method of failure. After the conditions and method of failure are determined, the material may be sent back to the manufacturer if it is proven to be defective. In 2020, Field MPR resolution had a 195-day average cycle as compared to its target of 70 days. To improve the resolution times, MPR closures will be risk rank driven, evaluators will be required to take mandatory MPR training, and an MPR closure target will be added to the evaluators' safety metrics.

2. PG&E Corporate and Gas Safety Committees

PG&E's safety governance structure drives a consistent safety culture and aligns to PG&E's safety strategy and results. Table 1 describes PG&E's Corporate and Gas Operations safety committees.

Table 1 – Safety Committees	
Board of Directors Safety and Nuclear Oversight Committee	Provides oversight and review of (i) policies, practices, goals, issues, risks, and compliance relating to safety (including public and employee safety), and compliance issues related to PG&E's nuclear, generation, gas and electric transmission, and gas and electric distribution operations and facilities ("Operations and Facilities"), (ii) significant operational performance and other compliance issues related to such Operations and Facilities, and (iii) risk management policies and practices related to such Operations and Facilities.
Safety Technical Council	Orchestrate PG&E's efforts in managing workforce safety risk in a coordinated, proactive, effective, and efficient manner. The objectives include: Tactical problem solving; Coordination across business areas on the implementation of tools, fixes, solutions; Contribute to a strategic approach and roadmap for workforce safety by incubating ideas and reviewing draft projects before they go for approval; Inform software needs and technology projects when needed; and Follow a risk-based approach to assess major adaptation needs, if any.
Gas Operations Safety Council	Sponsors initiatives to improve LOB safety. Monitors LOB's safety performance and initiatives so that safety initiatives adequately address risks.
Gas Operations Grassroots Safety Teams	Employee-led efforts to identify opportunities to improve safety, define and validate possible solutions, and implement and promote safety initiatives.

a) Gas Operations Safety Council

The Gas Operations Safety Council meets on a monthly basis and is facilitated by the Senior Director of Safety, Quality and Contracts Management. The Council is composed of all Gas Operations Senior Leadership. Invited attendees include the Labor Unions, Grassroots Safety Teams,[6] the Federal Monitor,

Gas Safety, Corporate Safety and other key stakeholders as needed. The primary objective is to provide overall governance of safety, guide department safety strategy, ensure compliance with Company safety standards, execute Chairman's Risk and Safety Committee directives, and promote positive safety culture change. In 2020, the Gas Operations Safety Council charter was improved upon with a significant emphasis on increasing Grassroots engagements and updates.

b) Gas Operations Grassroots Safety Teams

Gas Operations Grassroots Safety Teams are composed of Chairs, Co-Chairs and members from Transmission & Distribution (T&D) Operations, Gas T&D Construction, Asset Management & System Operations, and Safety Quality & Contract Management. Chairs meet on a regular cadence to discuss issues, strategy, concerns, successes, roadblocks and any barriers that may exist. As of December 2020, Grassroots had over 180 members.

In 2020, the Grassroots Rally Room further expanded its participants through inclusion of organizational leaders both within Gas Operations and within Shared Services. This expansion helped streamline issue elevation and resolution. It additionally improved upon the organizations cohesive approach to safety strategy. On a quarterly basis, Grassroots leadership meetings are held to inform and obtain leadership endorsement of the sustainable approach to Gas Operations Grassroots Safety.

III. Process Safety

Process Safety Management[7] focuses on preventing low frequency, high consequence incidents, and mitigating the consequences from these incidents. The Process Safety Management System is used for engineering new facilities, modifying existing facilities, maintaining equipment, and ensuring safe operation.

The Process Safety Management System consists of four foundational areas (Figure 9): Commit to Process Safety, Understand Hazards and Risk, Manage Risk, and Learn from Experience. PG&E is improving process safety performance by strengthening performance in each of these areas. Process Safety Management System is well integrated within the GSEMS, [see Section I.2 *Gas Safety Excellence Management System*] to safely manage the planning, construction, operation, decommissioning and maintenance of gas assets and associated activities and ensure the safe, reliable, affordable and clean delivery of natural gas.

Figure 9 – The PG&E Process Safety Management System

When process safety performance gaps are identified, plans are developed and implemented to close them. A follow-up assessment is conducted to ensure progress remains on track and to verify performance improvement.

Process Safety Highlights from 2020 include:

Commit to Process Safety. Guided by the elements set by the Center for Chemical Process Safety, PG&E's commitment to implement process safety aligns with American Petroleum Institute (API) Recommended Practice (RP) 754 *Process Safety Performance Indicators for the Refining and Petrochemical Industries*.[8] A risk-sorting criterion to track and trend process safety leading and lagging indicators is used to identify emerging issues before incidents occur.

The Process Safety team continued to review changes to existing procedures and standards and new procedures and standards in order to help Gas Operations operate and maintain safe facilities and consistently implement process safety practices.

Understand Hazards and Risk. Process Safety Management is a key component in reducing PG&E's Operational Risk Exposure. In 2020, PG&E used process safety principles in its large OP event reduction initiative [see Section IV.5.l. *Mitigating the Risk of Loss of Containment: Overpressure Elimination Initiative*]. The Process Safety team continued to lead the investigations of large OP events. The team also continued to focus on maturing design risk assessments, simplifying project design-phase Process Hazard Analysis (PHA) activities and checklists, and conducting complex projects and facility PHAs.

Manage Risk. Process Safety efforts support risk mitigation. In 2020, risk mitigation continued through Management of Change (MOC) (Figure 10) process improvements. The Process Safety team continued working with stakeholders to close the identified gaps as identified in the MOC effectiveness review and gap analysis conducted in 2019. At the end of 2020, 94 percent of MOC effectiveness review recommendations were completed. The focus of the MOC program is to assure that changes in operations, procedures, standards, facilities, materials, or organizations are evaluated to identify hazards and ensure associated risks are effectively managed. MOC ensures the changes achieve their intended purpose without compromising workforce, public, and environmental safety. This systematic approach helps to maintain the continued safety of the workforce throughout the process. As such, Gas Operations revised and published the following MOC procedures, amongst others:

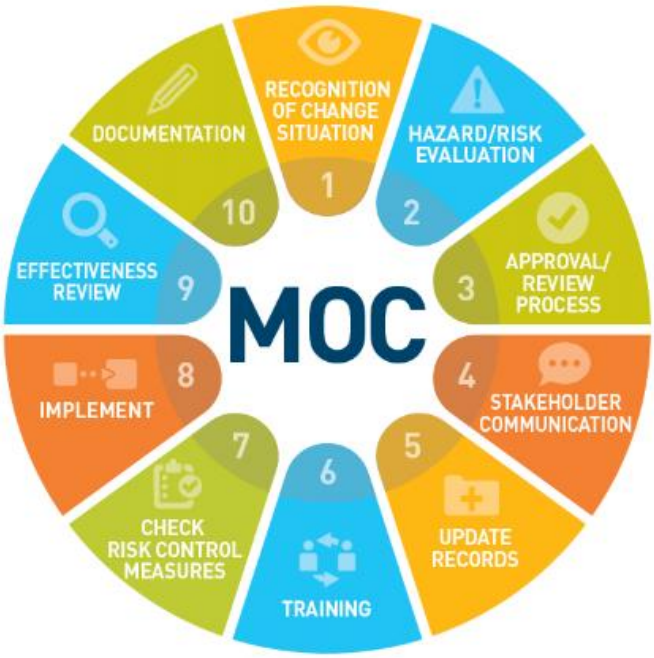


Figure 10 – Gas Operations MOC Process

- Gas Operations Management of Organizational Change (MOOC) Procedure9
- Field Design Change Process for Transmission Pipelines and Transmission Station Designs10
- MOC Process for Gas Meter Set Assembly Asset Changes11
- MOC Process for Stations[12]

In addition, MOC ambassadors and stakeholders have been engaged in the MOC Community of Practice, first launched in 2019. This endeavor serves as a platform to engage and communicate best MOC best practices and lessons learned among diverse Gas Operations teams. Additional accomplishments in 2020 to promote MOC training, awareness and communication included the development of three MOC videos produced by Grassroots Safety, publication of the first MOC quarterly newsletter, MOC awareness survey, and revision of the Field Design Change web-based training.

The Process Safety team also continued to update the Pre-Startup Safety Reviews (PSSR) and PHA checklists, and updated PHA and PSSR trainings. The Process Safety team revised and focused the Process Safety Management training to reach a larger population within Gas Operations.

Learn from Experience. PG&E strives to continuously improve in process safety. Process Safety engineers support investigations and lead cause evaluations related to OP events, as described under the Understand Hazards and Risk section above and as part of the CAP process. Cause evaluations are

conducted to identify the cause of an incident, the issue, or why an error or failure occurred, to implement recommendations or safeguards that will reduce the risk (severity and/or probability) of recurrence and to apply continuous improvement. In addition, lessons learned from incidents are shared through Process Safety Moments. Process Safety Moments are a standing agenda item within Gas Operations' monthly Risk and Compliance Committee (RCC) meetings. Cross functional teams are assigned to present Process Safety Moments during these RCC meetings.

In 2020, Gas Operations continued the journey of Process Safety Management maturity. Gas Operations continued to be compliant, per a third-party assessment, with the intent of API RP 754, Process Safety Performance Indicators, demonstrating a commitment to incident prevention. The Process Safety Indicator (PSI) dashboard, based on a pyramid framework where the most leading indicators are at the bottom of the pyramid (Figure 11), has been reviewed monthly with Mega Process Owners (PO) and presented monthly at Operational Review Meetings and other senior leadership platforms. Aligning metric owners by Mega Process strives to drive ownership and accountability and ensure leading indicators (Tier C and D) are acted upon to prevent a major gas incident (Tier A and B) that can lead to serious injuries, fatalities, or cause significant interruption to the gas business. Metrics are evaluated continuously and calibrated at the beginning of the year to ensure that Gas Operations drive the right continuous improvement conversations.

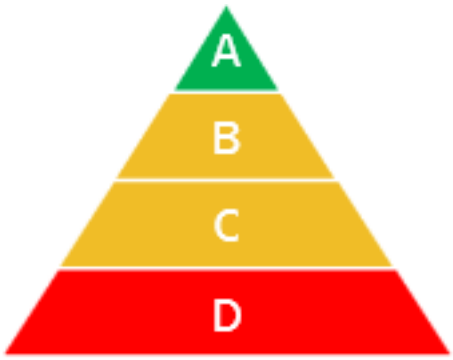


Figure 11 – Pyramid Framework for PSI Dashboard

IV. Asset Management

PG&E builds, operates, and maintains natural gas infrastructure to transport, store, and deliver gas to customers over Northern and Central California. PG&E faces inherent risks associated with operating an asset system that passes through populated areas and a wide variety of terrain. The three primary risks confronting PG&E's natural gas system are a loss of gas containment, a loss of gas supply, and an inadequate response to emergencies. The third component of PG&E's GSEMS is an asset management system to address these categories of risk and find the balance between asset risk, cost, and performance. The basis of achieving safety through asset management is to know PG&E assets and their condition, understand the risks to those assets, implement risk reduction strategies, and optimize asset risk, cost, and performance. The following section describes PG&E's asset management system, the asset families, how PG&E's Gas Operations manages risk, and the current risk portfolio.

1. Asset Management System

PG&E maintains an asset management system to help drive the business toward achieving its commitment to the safe, reliable, affordable management and operation of PG&E's gas assets. Using the international Publicly Available Specification (PAS) 55-1, International Organization for Standardization (ISO) 55001, and API RP 1173 standards as guidance, PG&E's asset management system focuses on:

- Identifying and reducing operational and enterprise risk;
- Maintaining an asset management framework and directing organizational focus on the most important asset risks and opportunities;
- Proactively managing the condition of gas assets; and
- Meeting or exceeding the requirements of federal, state, and local codes, regulations and requirements in an environmentally sustainable manner.

The Gas Safety Excellence Policy lays the foundation for PG&E's Gas Asset Management system, while the vision and strategy for enhancing the system is documented in the Strategic Asset Management Plan. PG&E also maintains risk-based Asset Management Plans for each of its nine gas asset families. Finally, PG&E reports regularly to the California Public Utilities Commission (CPUC or the Commission) on its safety and reliability investments.[13]

2. Asset Family Structure

Since assets can face different types of risk, PG&E developed an asset family structure to recognize and manage these differences, yet drive consistency in the way PG&E thinks about and addresses risks. PG&E identified nine asset families within Gas Operations which are illustrated in Figure 12.

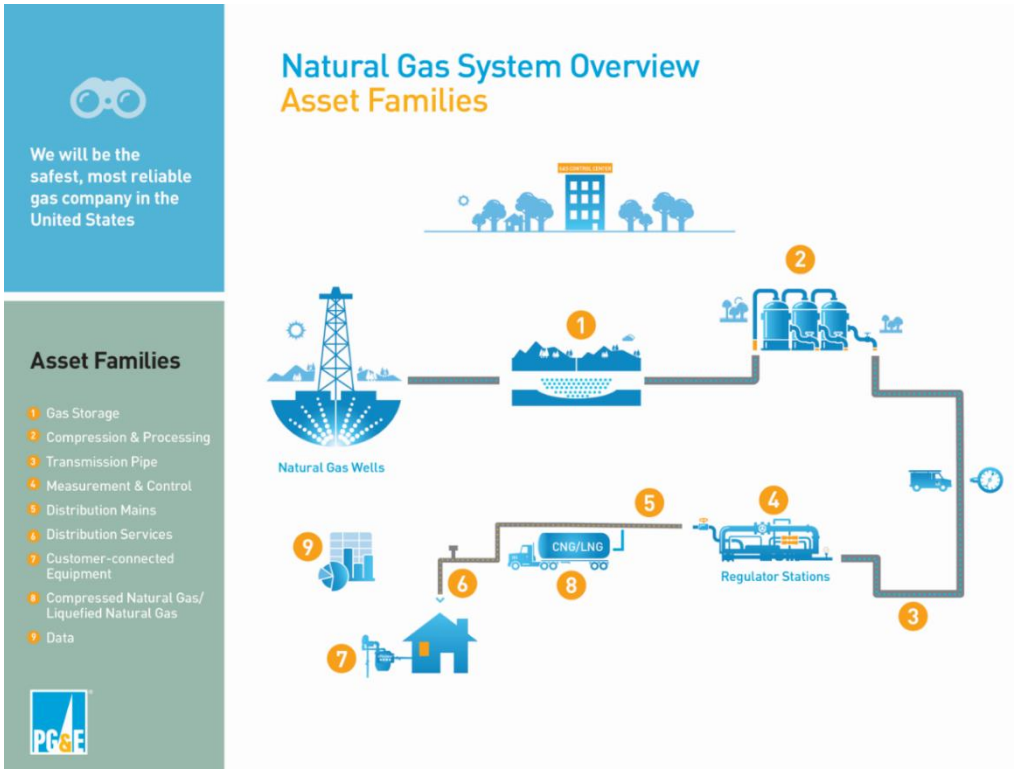


Figure 12 – Natural Gas System Overview – Asset Families

Each asset family has an Asset Family Owner who is responsible for knowing the asset condition and the risks to the assets, and developing a risk-based Asset Management Plan, which is a five-year plan for managing gas assets. For 2020 changes to PG&E's Asset Management Plans, please see Attachment 2.

By associating each asset with a family, and designating an Asset Family Owner, Gas Operations works to (1) adequately identify each threat; (2) appropriately assess the condition of the asset and the quality of the data about the asset; (3) identify and assess the threats and risks facing the asset; and (4) develop and execute effective mitigation efforts. The Asset Family Owner leads the preparation of the Asset Management Plan for each asset family that describes:

- Asset inventory and condition
- Asset threats and risks
- Desired state for the assets and strategic objectives for achieving desired state
- Programs and risk mitigations
- Areas for continual improvement

These Asset Management Plans are living documents evolving as new asset information becomes available. The following section summarizes the types of assets in each family, the function these assets serve in the gas system, and progress towards achieving Asset Management Plan objectives.

a) Gas Storage

Presently, the Gas Storage Asset Family includes PG&E's owned and operated underground natural gas storage facilities at McDonald Island, Los Medanos (LM), and Pleasant Creek (PC). The primary assets within this family include 109 storage wells, 14 miles of transmission pipe, well controls for each injection and withdrawal wells, and 3,404 acres of storage reservoirs with over 102 billion cubic feet (Bcf) of working gas capacity.

Figure 13 – Rig and Well Platform

However, demand forecasts are expected to decline as California works to meet its Greenhouse Gas (GHG) emissions goals and new regulations that have initiated major changes to the requirements around design, risk and integrity management, and operations and maintenance for wells and reservoirs impact our current asset structure and reliability model. Moreover, regulations are not settled and are expected to change.

The U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) issued its Final Rules in January 2020, adopting all of the API's RPS 1170[14] and 1171[15] outlining requirements around risk and integrity management, design standards, emergency response, and training. Likewise, the California Geologic Energy Management Division (CalGEM, formerly known as DOGGR) introduced final regulations effective on October of 2018 requiring modifications to the well design and construction to eliminate the single point of failure changing the configuration of the wells to tubing and packers resulting in an estimated reduction of the withdrawal capacity of about 40 percent.

Furthermore, D.19-09-025 in PG&E's 2019 Gas Transmission and Storage (GT&S) Rate Case adopted the Natural Gas Storage Strategy (NGSS) that proposed modified storage services with an effective date of April 1, 2020. The NGSS includes the selling or decommissioning of the PC (2 Bcf working gas) and LM (11 Bcf working gas) storage fields. On January 31, 2020, PG&E filed Advice Letter 4210-G with the CPUC, outlining the process for selling and/or decommissioning of the PC storage field and filed the decommissioning plan with CalGEM in August of 2020; feedback and approval of this plan from CalGEM remains pending.

In response to these regulatory changes, PG&E's Gas Storage Asset Family completed an evaluation of both PHMSA's and CalGEM's final regulations, amended its Well Risk and Integrity Management Plan, and in March 2019 filed a seven-year plan for review and approval by CalGEM to meet the deadlines established by the regulations to periodically inspect wells and retrofit all of its storage wells to tubing and packer by 2025. In December 2020, PG&E received correspondence from CalGEM indicating the proposed testing schedule coupled with conversion was not satisfactory and a revised testing schedule

was required to be submitted to CalGEM in January 2021. This plan is pending with CalGEM leadership for review and approval.

The Gas Storage Asset Management Plan describes the strategy for mitigating and managing risk for this asset family and achieving the established asset management objectives. Examples of key objectives included in the Asset Management Plan are shown in Table 2.

Table 2 – Gas Storage Asset Management Plan Strategic Objectives and Progress To-Date

Overall Objective/Goal	Progress Towards Goal
Complete baseline well production casing assessments on 109* wells by 2025 *8 Wells Plugged & Abandoned from 2017-2020, for a net remaining wells of 109	Number of baseline assessments performed: 2013 – 2016: 27 wells 2017: 8 wells 2018: 13 wells 2019: 15 wells and additional 33 wells not previously assessed for casing integrity inspected using through tubing technology (new). 2020: 20 wells
Evaluate and incorporate Well Risk & Integrity Management Plan (WELL) enhancements	2016: Submitted final WELL documentation to CalGEM for approval and identified improvements to WELL to incorporate in scheduled revisions of the publication. 2017: Published updates of WELL to include enhanced design. 2018: Amended WELL and submitted to CalGEM in April 2018. Completed evaluation of final CalGEM regulations when issued. 2019: Revised WELL and filed with CalGEM on 3/31/19 per final regulations for review and approval. 2020: Reviewed and revised WELL with sections re-rewritten as either standards, procedures or guidance
Assess work on transmission pipeline through Transmission Integrity Management Program (TIMP)	2016: Completed written monitoring and assessment plans; Began development of 10-Year Storage Pipe Plan to assess pipe integrity. 2017: 2019 GT&S Rate Case submission included funding request for strength testing pipeline in the Storage Asset Family. 2018: Replaced 1.65 miles of transmission pipe. (Whiskey Slough east) 2019: No replacement projects due to construction scheduling conflicts. 2020: Installed single line 1.6miles and removed 2.6 miles of dual lines transmission pipe on the west side of Whiskey Slough.
Continue PHA and PSSR on all well, surface equipment, and pipeline in storage asset family	Number of PHAs and PSSRs complete: 2014: 2 PHAs and 0 PSSRs 2015: 3 PHAs and 7 PSSRs 2016: 4 PHAs and 11 PSSRs 2017: 2 PHAs and 10 PSSRs 2018: 15 PHAs and 5 PSSRs 2019: 24 PHAs and 12 PSSRs; incorporated API RP 754 classifying events according to their tier system. 2020: 38 PHAs, 15 PSSR

The Gas Storage Asset Management Plan describes these objectives in more detail.

b) Compression and Processing (C&P)

PG&E's C&P facilities move gas from receipt points to customer delivery locations and provide for injection and withdrawal of gas at PG&E's underground gas storage facilities. Gas processing equipment provides gas that is free from particulates and is sufficiently dehydrated and odorized so that it can be transported to the gas transmission and distribution systems meeting quality requirements. The C&P asset family includes nine transmission compressor stations. Storage compressors are also installed at

PG&E's three underground storage facilities. Major assets include the 38 company-owned compressor units, as well as associated equipment such as filter-separators, pumps, motor control centers, station piping, among others. Additionally, this asset family includes approximately 100 gas odorizer units installed systemwide. Together, these stations support the system's reliability and the odor added to gas helps keep PG&E customers safe when gas arrives at their service point.

Figure 14 – Delevan Compressor Station Turbine Exchange

The C&P Asset Management Plan describes PG&E's strategic objectives related to the C&P assets. Key strategic objectives for C&P assets include the following:

Table 3 – Compression and Processing Asset Management Plan Strategic Objectives and Progress To-Date

Overall Objective/Goal	Progress Towards Goal
Codify the Facility Integrity Management Program in published guidance document and utilize by end of 2020.	• Facility Integrity Management Program standard will be published before end of Q1 2021.
Maintain total number of compressor unscheduled outages at current target in 2020.	• Number of unscheduled shutdowns (including rental units) well below do-not-exceed target in 2020. Target = 224; Actual = 161.
Complete ECA1 for all transmission stations and pilot a facility through regulatory-approved ECA2 process by end of 2020.	• ECA1: Continued ECA1 production; improved safety on PG&E system through remediation of Maximum Allowable Operating Pressure (MAOP) validation flags at 29 facilities in 2020; actively working to improve data accessibility. • ECA2: Completed field activities for material property verification for 135 features and MAOP reconfirmation for 141 features. Presented at multiple industry conferences.
Complete critical documents defined by TD-4551S for all facilities by 2021.	• Continued full-scale production. • Submitted 61 facilities; 245 total facilities completed out of 464.

The C&P Asset Management Plan describes these objectives in more detail.

c) Transmission Pipe

The Transmission Pipe asset family consists of approximately 6,600 miles of line pipe and major components, such as valves and fittings, used in transporting natural gas.[16] PG&E's TIMP governs how PG&E identifies and evaluates risks, reduces risk through risk mitigation activities, and assesses integrity performance within the Transmission Pipe asset family. TIMP is a core foundation of PG&E's ongoing efforts to provide safe and reliable service, consistent with industry best practices,

Figure 15 – Pipe SP3 ILI upgrade at Los Medanos

and based on the federal TIMP regulations.[17] The Transmission Pipe Asset Management Plan describes the roadmap for mitigating and managing risk for this asset family and achieving the established asset management objectives. The plan's objectives include the following:

Table 4 – Transmission Pipe Asset Management Plan Strategic Objectives and Progress To-Date	
Overall Objective/Goal	**Progress Towards Goal**
Apply integrity management principles to transmission pipelines covering 100 percent of population living along transmission pipelines by 2030	• 88 percent of population living within Potential Impact Radius covered by Integrity Management principles. • Developed a new Threat Identification model for the Selective Seam Weld Corrosion Threat. • Upgraded 464 miles for ILI inspection capability • 43.1 percent of system is now piggable • See Section IV.5.g for additional information on ILI. • Formalized implementation of Megarule Crack Management requirements into TIMP procedures • Developed GT FERA - Fire Emergency Response Application to support wildfire emergency response • Developed ANAGRAM – a TIMP project risk analysis tool to visualize risk reduction for TIMP project alternatives
Meet 100 percent of system capacity obligations and eliminate high risk manual operations in peak day conditions by 2021	• High risk manual operations increased from 6 in the 2019-20 winter to 10 for the 2020-21 winter. • 6 of 9 transmission regions meet all expected load conditions. • See Section IV.6.a for more information on system capacity and reliability
Update PG&E's gas transmission assets and technology to improve recognition and response to significant transmission events by 2030	• See Section IV.7.a for additional information on system visibility progress. • Installed 21 automated valves in 2020. • Installed 5 local transmission Supervisory Control and Data Acquisition (SCADA) sites.
Maintain a first quartile Damage Prevention program to further reduce transmission dig-ins	• See Section IV.5.a for more information on PG&E's Damage Prevention Program and progress. • See Section IV.5.b for more information on Line Marker progress.

The Transmission Pipe Asset Management Plan describes these objectives in more detail.

d) Measurement and Control (M&C)

PG&E's M&C assets monitor, measure, and control pressure and flow within the gas transmission and distribution systems. The assets in this family perform a critical role in system safety by protecting downstream assets from system pressure excursions and gas quality degradation. Additionally, in concert with the C&P Asset Family, these assets perform a key role in overall system reliability.

Figure 16 – M&C Complex Station-Above Ground

The physical assets within this family include three gas terminals, 378 gas transmission stations (both simple and complex), 433 transmission large volume customer meters, 92 automated valve sites, 2,446 distribution district regulator stations, 1,618 farm taps, 26 large customer meter sets, and 77 gas quality analyzers. PG&E's M&C equipment is located above and below ground, as well as within vaults and buildings. Examples of M&C complex and large volume transmission stations are shown in Figure 16 and Figure 17.

Figure 17 – Large Volume Customer Transmission Station

The M&C Asset Management Plan describes PG&E's strategic objectives for the M&C assets. The strategic objectives for M&C assets are the following:

Table 5 – M&C Asset Management Plan Strategic Objectives and Progress To-Date

Overall Objective/Goal	Progress Towards Goal
Codify the Facility Integrity Management Program in published guidance document and utilize by end of 2020.	• Facility Integrity Management Program standard will be published before end of Q1 2021.
Install secondary OP protection at 50 percent of H-14 facilities by 2022.	• Large OP events per year: 2015 – 7; 2016 – 10; 2017 – 11; 2018 – 5; 2019 – 11; 2020 – 9. • Published first revision of OP Long-Term Plan. Strategy for mitigation of facilities that are most susceptible to large OP events has been developed and is in execution. • Continued installation of secondary OP protection devices. Over 20 percent of H-14 facilities currently have devices installed.
Complete ECA1 for all transmission stations and pilot a facility through regulatory-approved ECA2 process by end of 2020.	• ECA1: Continued ECA1 production; improved safety on PG&E system through remediation of MAOP validation flags at 29 facilities in 2020; actively working to improve data accessibility. • ECA2: Completed field activities for material property verification for 135 features and MAOP reconfirmation for 141 features. Presented at multiple industry conferences.
Complete critical documents defined by TD-4551S for all facilities by 2021.	• Continued full-scale production. • Submitted 61 facilities; 245 total facilities completed out of 464.

The M&C Asset Management Plan describes these objectives in more detail.

e) Distribution Mains and Services

This asset family includes approximately 43,000 miles of pipeline that connects to the gas M&C asset family on the upstream side and transports natural gas to customers throughout the service area. It also includes over 3.5 million service lines that deliver gas from the distribution mains to the assets in the Customer Connected Equipment family on the downstream side. The programs associated with the

Figure 18 – Employee Working on Distribution Service

Distribution Mains and Services asset family are focused on the inspection, maintenance, and replacement of Distribution Mains and Services assets. PG&E continues to identify and assess threats to Distribution Mains and Services assets and works to mitigate those threats, including through its Distribution Integrity Management Program (DIMP). Some key strategic objectives include the following:

Table 6 – Key Distribution Mains and Services Metrics

Overall Objective/Goal	Progress Towards Goal
Achieve and maintain 1st quartile for 3rd-party gas dig-ins	PG&E set an overall dig-In target of 1.44 dig-ins per 1,000 tickets for 2020. In 2020, PG&E experienced 1.05 dig-ins per 1,000 tickets for third-party dig-ins.
Achieve a removal rate of pre-1985 pipe that limits asset age to 100 years by 2030	2013: 69 miles replaced 2014: 66 miles replaced 2015: 102 miles replaced 2016: 120 miles replaced 2017: 145 miles replaced(exceeded the target of 130 miles) 2018: 165 miles replaced (exceeded target of 163 miles) 2019: 126 miles replaced (exceeded target of 125 miles) 2020: 131 miles replaced (exceeded COVID adjusted target of 125.6 miles)
Finalize legacy cross bore inspection scope by 2025 and re-establish the inspection timeline	Inspections planned 2013 through 2020: 239,706 Inspections completed 2013 through 2020: 241,756

The Distribution Mains and Services Asset Management Plan describes these objectives in more detail.

f) Customer Connected Equipment

The Customer Connected Equipment Asset Family is composed of approximately 4.6 million gas meters and associated regulators, over-protection devices, shut-off valves, piping, and fittings that connect the gas distribution service to the customer. Customer meters are used to measure gas usage to support the billing function.

Figure 19 – PG&E Employee Working on CCE (Photo Captured Pre COVID-19)

The Customer Connected Equipment Asset Management Plan provides an overview of the assets, threats to these assets and efforts underway to manage these threats. The plan presents the asset inventory, an assessment of condition and overview of key risks to these assets. The plan also includes long term strategic objectives and an overview of the key programs in progress to mitigate these risks. The plan's key objectives are included in Table 7:

Table 7 – Customer Connected Equipment Asset Management Plan Strategic Objectives and Progress To-Date

Overall Objective/Goal	Progress Towards Goal
Reach a steady state of 60,000-70,000 pending non-hazardous meter set leaks for repair annually	2020 end of year inventory: 152,698 (a plan is in place to get back on track with this strategic objective)
Identify and remove problematic regulators by 2022	381 removed in 2020 vs 1,128 planned.

The Customer Connected Equipment Asset Management Plan describes these objectives in more detail.

g) Liquefied Natural Gas and Compressed Natural Gas

The Liquefied Natural Gas (LNG)/Compressed Natural Gas (CNG) asset family consists of portable assets that provide natural gas supplies utilizing either LNG and/or CNG to offset or supplement pipeline flowing supplies for planned outages, winter peak load shaving, unplanned outages, and in emergency situations. The LNG/CNG asset family consists of over 200 portable assets with the recent inclusion of PG&E owned portable cross compression which is utilized to move isolated methane to an adjacent pipeline reducing overall raw methane emissions during pipeline work. In 2020, there were no loss of containment incidents for portable assets [see Table 8].

The LNG/CNG asset family also includes 32 CNG station assets to supply the natural gas that fuels PG&E and third-party vehicles and provides very high-pressure gas supply to the portable CNG equipment. Over the last few years, PG&E has instituted an industry-leading inspection program to assure the integrity of customer CNG vehicle fuel systems. In 2020, 100 percent of PG&E's natural gas fueling customers authorized to fill at our stations submitted their three-year vehicle certificates of inspection. In 2020, there were no significant loss of containment incidents for CNG Station assets.

Figure 20 – A Large-scale LNG Injection Site

Table 8 – Liquefied Natural Gas/Compressed Natural Gas Asset Management Plan Strategic Objectives and Progress-to-Date	
Overall Objective/Goal	**Progress Towards Goal**
Driving towards zero significant LNG/CNG loss of containment incidents	2020 Activities: Continued maintenance of LNG/CNG equipment and assets. LNG/CNG equipment training development and operating training. Improvements in quality control program to verify overall effectiveness of maintenance and training programs.
Implementing an industry-leading inspection program to improve safety inspection certifications from less than 20 percent to 100 percent of CNG fuel customer vehicles	2020: 100 percent of natural gas fueling customers authorized to fill at our facilities have submitted their presented three-year cylinder certification.
Reduce risk of portable natural gas transportation traffic incidents by reducing equipment issues through an improved maintenance program	2020: Continued maintenance of LNG/CNG portable over-the-road assets by dedicated fleet mechanics have resulted in continued decrease of trailer below the deck reliability issues.

The LNG/CNG Asset Management Plan describes these objectives in more detail.

h) Data

In 2018, PG&E Gas Operations determined that creating an asset family specifically for data is consistent with industry best practice and will provide the appropriate attention and resources to the essential data sets required for the safe and efficient operation of PG&E's gas business. Data should be

properly managed to have an appropriate life cycle, generation and disposal considerations, and quality control check points.

In 2020, PG&E established an Enterprise Data Management organization, with a Director of Data Governance reporting directly to the Vice President of Compliance & Ethics & Deputy General Council. This organization is responsible for developing the enterprise level data strategy, policies, standards and objectives. Gas Operations has developed a Data Management organization to guide the Gas Operations data strategy, data quality efforts, and data management efforts. This organization will establish the overall priorities, standards, and processes to manage data critical to the safe operation of our assets. Implementation of the gas data strategy will be led by the Gas Data Management organization in partnership with the Enterprise Data Management team, our IT business partners and Gas Operations business units. Centralization of the data management function helps ensure alignment of data strategies across Gas Operations and the enterprise and improves PG&E's ability to make data-driven decisions around reducing risk within our systems.

Also in 2020, PG&E Corporation contracted with Palantir to implement the Foundry enterprise data platform to centralize, curate, and transform data into business insights through creation of data products. Foundry currently is connected to 50+ largely Electric-focused source systems, which contain billions of records relevant to asset health analytics such as Geographic Information System (GIS) and SAP. The number of connected systems, records, and enabled analytics models will continue to grow as additional data products are developed. The data platform does not replace the underlying source data systems of record, but rather provides a central platform to enable data integration/visualization and access, support for data management and advanced analytics.

Gas Operations is developing several data product suites in 2021 that are designed to target the integration of critical, foundational datasets from disparate data systems, and enable effective asset management. These data product suites are currently being identified.

Strategic goals, and progress towards those goals are listed in Table 9, below:

Table 9 – Data Asset Management Plan Strategic Objectives and Progress to Date	
Overall Objective/Goal	**Progress Towards Goal**
Develop an Asset Management Plan for data in Gas Operations	Initial Data Asset Management Plan drafted, revisions and consistency with other Asset Management Plans added in 2019. One major revision and one minor revision based on feedback from Lloyd's register were completed in 2020.
Develop an asset register with essential datasets and pertinent metadata including the quality, condition, and location of the data	Developed initial Data Asset Register by working with 50+ groups within Gas Operations. Register contains 1,450+ essential datasets. As of July 2020, the Asset Register is housed in Collibra. Next steps include operationalization of the registry within Collibra. 1. Identify individual stewards for each asset. 2. Define locations of data. 3. Ensure that all business-critical assets are managed in systems of record. 4. Work with Stewards to identify pertinent metadata including the quality and condition of data sets.
Develop a framework to assess risk for Gas Operations data	• Development of qualitative assessment process complete, currently being used to assess the Gas Data Quality Improvements worklist for 2021. • A "proof of concept" was completed in 2020 using three hypothetical TIMP projects to demonstrate that we could calculate Risk Spend Efficiencies (RSEs) as a quantitative assessment. The RSE process was determined to be very labor intensive and had to be performed on a project-by-project basis so is likely not scalable to the entire gas portfolio.
Develop Data Governance Standard including clearly defined data owners, stewards, and systems of record	Gas is working in lock-step with the Enterprise program to establish the Data Governance program. Enterprise document published on 12/31/20. A Gas Standard to follow, expected mid-Q2 2021.
Improve completeness and accuracy of digital data to support data-driven risk management and work prioritization by 2022	Created initial Asset Register for essential datasets in Gas Operations with assessment of current data quality. In 2020, the Gas Data Management team began the creation and tracking of a data quality improvement portfolio.
Create all required data asset-related standards and procedures, including a data standard and data dictionary by 2023	Initial drafting of data governance started. Enterprise Data Management published their first Standard on 12/31/20. Going forward, Gas Operations will: • Define Data Dictionaries • Define Master Data and create documentation to support. • Define Reference Data, standardize where appropriate and create documentation to support.

The Data Asset Management Plan describes these objectives in more detail.

3. Risk Management Process

Transporting natural gas involves moving a flammable product under pressure. As a result, risk management is an important part of the natural gas business. PG&E's Enterprise and Operational Risk Management team prioritizes risks based on how likely an incident is to occur and how severe it might be. While the hazards and risks associated with natural gas are inherent, multiple layers of protection placed

on top of one another safeguard against the failure of any one layer. Therefore, PG&E builds in multiple layers of protection into Company processes and plans.

To identify and address risk, PG&E follows a comprehensive enterprise and operational risk management process. PG&E's Enterprise and Operational Risk Management plans allow PG&E to manage assets and risks at an enterprise and operational level. PG&E defines "Enterprise Risks" as any risk that could potentially have a catastrophic impact to the company. Enterprise Risks and associated mitigation plans are reported to the Board of Directors annually.

Operational risks are actively managed at the LOB level, with oversight provided by each LOB's RCC, which at a minimum meet quarterly. The Gas Operations RCC meets monthly. Each LOB RCC is charged with oversight of risk management activities within the LOB including, but not limited to, reviewing risk assessments, approving risk response plans, and overseeing their implementation. By assessing and managing risks from both points of view, PG&E can better manage the interdependencies and drive for consistency in risk management across the Company. In addition there is an Enterprise Risk Committee of VPs from LOBs who meet monthly, following an annual work plan derived from Session D areas of focus and commitments.[18] These include risk management program strategy, deep dives, and challenge sessions for specific top risks. This process increases Senior Management and Board engagement in risk-informed decision-making by involving them in decisions as the process unfolds, and gives those individuals charged with managing specific assets line of sight to other risks across the enterprise. Since the appointment of the Federal Monitor in 2017, the monitor has continued to be actively engaged in PG&E's risk analyses and helping to improve operations. For example, the monitor attends and participates in Gas Operations' RCC meetings, and also is actively engaged in our integrity management analyses.

Gas Operations identifies, assesses and ranks its risks in a Corporate Risk Register in accordance with the Enterprise and Operational Risk Management guidelines. The Gas Operations risks within the Corporate Risk Register are governed by the Gas Operations RCC. Gas Operations' risks can be communicated to PG&E's executive leadership team at the Enterprise Risk Committee, or at Session D. Risks, including the key risks for each asset family identified during an annual risk refresh, are captured within the Asset Management Plans, mitigation programs, and work projects. As the result of the annual risk refresh process, Gas Operations identified nine risks as part of the Corporate Risk Register for 2020. These risks are summarized in Table 10 below.

Table 10 – 2020 Gas Operations Risks in the Corporate Risk Register	
Risk	**Description of Risk and Risk Drivers**
Loss of Containment on Gas Transmission Pipeline	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. Drivers Include: Equipment Failure, External/Internal Corrosion, Incorrect Operations, Manufacturing Defects, Stress Corrosion Cracking (SCC), Third Party/Mechanical Damage, Weather Related and Outside Force Threats, and Construction Threats.
Loss of Containment on Gas Distribution Main or Service	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. Drivers include: Equipment Failure, Corrosion, Incorrect Operation, Excavation Damage, Material Failure of the Distribution Pipeline or Weld, Natural or Other Outside Force, and Crossbore.
Large OP Event Downstream of Gas Measurement & Control Facility	Failure of a Gas M&C facility to perform its pressure control function resulting in a large OP event downstream 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. Drivers Include: Equipment Related and Incorrect Operations.
Loss of Containment on Gas Customer Connected Equipment	Failure of gas customer connected equipment 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. Drivers Include: Corrosion, Equipment Failure, Incorrect Operation, Material/Weld Fail, Natural or Other Outside Force.
Loss of Containment at Natural Gas Storage Well or Reservoir	Failure at a gas storage well or reservoir resulting in loss of containment, with or without an unplanned 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. Drivers Include: Third-Party/Mechanical Damage, Incorrect Operations, Casing Wall Loss, Equipment Related, Manufacturing Related Defects, Weather Related/Outside Forces, and Welding/Fabrication Related.
Loss of Containment at Gas M&C or Compression and Processing Facility	Failure at a Gas M&C or Compression and Processing station resulting in a loss of containment 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. Drivers Include: Incorrect Operations, Welding/Fabrication Related, External/Internal Corrosion, SCC, Third-Party/Mechanical Damage, Weather Related/Outside Forces, Manufacturing Related Defects, and Equipment Related.
Loss of Containment on CNG Station Equipment	Failure of CNG station equipment during operations resulting in a loss of containment 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. Drivers include: Third Party Damage, Equipment Related, Incorrect Operations, and Corrosion.
Loss of Containment on LNG/CNG Portable Equipment	Failure of LNG/CNG portable equipment during operations resulting in a loss of containment 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. Drivers include: Equipment Related, Incorrect Operations, Corrosion, Equipment or Personnel Constraints, and Motor Vehicle Incident.
Insufficient Capacity to Meet Customer Demand	Failure to maintain capacity on the system on high demand days. Drivers include: Pipeline Outage, Integrity Finding, Delayed/Deferred Capacity Projects, Inadequate Design, Design Deviation, and Unexpected System Restriction.

Factors impacting more than one LOB risk as a unique risk driver, or a component of an existing risk driver, are called Cross-Cutting Factors. As such, these factors can impact the likelihood or consequence of a risk event. The Cross-Cutting Factors are owned by a single LOB, with other impacted Lines of Business providing their input and subject matter expertise. These factors also follow the Enterprise and Operational Risk Management process. Gas Operations is impacted by several Cross-Cutting Factors owned by other LOBs as displayed in Table 11 below.

Table 11 – Enterprise Risk Management: Cross-Cutting Factors

Cross-Cutting Factor	Description
Seismic	Seismic events can be a significant driver of failure in LOB assets. Seismic events contribute to the likelihood of asset failure events and to the associated safety, reliability and financial consequences of those events.
Cyber Attack	A coordinated malicious attack purposefully targeting PG&E's core business functions and resulting in a loss of control of Company information or systems used for gas, electric or business operations. The consequences of a cyber attack are potentially catastrophic and could impact the safety and reliability of PG&E's operational systems.
Skilled and Qualified Workforce	Impact of human performance, workforce continuity and employee skills and qualifications that affect PG&E's risk drivers and consequences.
IT Asset Failure	Failure of IT systems or infrastructure, resulting in outages, or system unavailability for mission critical assets impacting operations, or the ability to support public safety events.
Records and Information Management (RIM)	The risk of not having an effective RIM program may result in the failure to construct, operate and maintain a safe system and may lead to property damage and/or loss of life.
Physical Attack	An attack on PG&E physical assets or personnel, that could result in damage to property, business impacts, or injury/fatality.
Emergency Preparedness and Response	Examines the drivers and consequences of inadequate planning or response to catastrophic emergencies. Inadequate emergency planning or response could have significant safety, reliability, and regulatory impacts.
Climate Change	Climate change presents ongoing and future risks to PG&E's assets, operations, employees, customers, and infrastructure adjacent communities.

PG&E continues to improve its risk management process. PG&E is an active participant in the CPUC's proceedings to advance a "risk-informed" process. In D.14-12-025, the CPUC adopted a risk-based decision-making framework into the Rate Case Plan for energy utilities. The framework includes the Safety Model Assessment Proceeding (S-MAP) and the Risk Assessment and Mitigation Phase (RAMP). S-MAP's focus is on the models each utility is using to evaluate risk with the intent of developing a single model for all utilities. RAMP's focus is on risk mitigation, alternatives analysis, risk spend efficiency, and a quantitative measure of expected risk reduction. PG&E filed its 2020 RAMP report on June 30, 2020, which is the initial phase of PG&E's upcoming 2023 General Rate Case. The 2020 RAMP report represents progress on the joint efforts of the Commission and its Safety Policy Division, PG&E, California's other large investor-owned utilities, and other stakeholders over the past several years to enhance risk-informed decision-making through the S-MAP and RAMP reports. The RAMP report reflects PG&E's first implementation of the methodologies adopted in the S-MAP Settlement Decision (D.18-12-014).

On July 6, 2020, the CPUC issued an Order Instituting Rulemaking to Further Develop A Risk-Based Decision-Making Framework for Electric and Gas Utilities (R.20-07-013) to consider ways to strengthen

the risk-based decision-making framework that regulated energy utilities use to assess, manage, mitigate and minimize safety risks. The rulemaking will build on requirements for a utility risk framework adopted in the S-MAP Proceeding (A.15-05-002 et al.) and in R.13-11-006, the Risk-Based Decision-Making proceeding, with the goal to further the prioritization of safety by electric and gas utilities. PG&E will continue to have an active role in this new proceeding to support improved risk management practices.

4. Records and Information Management

PG&E's Enterprise Records and Information Management (ERIM) Program, focuses on the deployment of consistent, integrated processes that support records development associated with operational safety, regulatory compliance, and knowledge management. ERIM works with all of PG&E to assess and inventory physical and electronic records and implement tools to manage the lifecycle of records, establish specialized plans for vital records in partnership with the business, and monitor the process controls for protecting and storing records. Examples of RIM accomplishments in 2020 include:

- Continued physical records remediation in field offices;
- Information Governance Maturity Model (IGMM) maintained at Level 3 as assessed by Lloyd's Register;
- Identified mission critical records at risk, developed remediation plans to secure records, and ensured proper controls and testing were applied;
- In support of Gas Transmission Recordkeeping Order Instituting Investigation (OII) remedy PricewaterhouseCoopers LLP (PwC) E.5, ERIM implemented RecordPoint in SharePoint Online (SPO), supported SharePoint OnPrem migration to SPO. The remaining sites are in progress to migrate by end of 2021; and
- In support of Gas Transmission Recordkeeping OII remedy PwC E.6, which was closed in May 2020, ERIM published GOV-7115S: Email Management Standard that provides the retention periods for email folders contained within Outlook to address the use of email as a data store and GOV-7113S: Electronic Communications Retention Standard providing that records should not be stored in communication applications and remediated records in Personal Storage Tables.

The RIM Ambassador network, composed of ERIM staff and representatives from Gas Operations, continues to be an effective way of communicating records management information throughout the LOB. In addition to the mandatory records training that all PG&E employees receive, the ERIM team provides quarterly training to the ambassadors and supports them as they coach their peers in meeting PG&E's records management requirements. These offerings will continue to be available to all of PG&E.

Additionally, the full-time ERIM Coordinator network supports all LOBs and all territories throughout PG&E by providing records management resources to the field.

ERIM continues to implement and refine the comprehensive roadmap which was initially launched in May 2014. The ERIM roadmap defines and tracks progress of projects and initiatives to support compliance and risk reduction. Table 12 details some key RIM roadmap initiatives and drivers.

Table 12 – Gas Operations Records and Information Management Roadmap Highlights

Key Roadmap Initiatives	Roadmap Drivers
ERIM Program Compliance	• Records-related remedies and recommendations adopted by the CPUC in the San Bruno OII Penalties decision issued in April 2015 and outlined in PG&E's Initial Compliance Plan associated with Investigation (I.) 14-11-008, an OII associated with PG&E's gas distribution records management practices. • ARMA International's Information Governance Maturity Model. • Continued certification of PAS 55-1 and ISO 55001, and API RP 1173.
SharePoint Records Management	
File Share Cleanup and Migration	
Disposition Program Implementation	

5. Mitigating the Risk of Loss of Containment

PG&E takes a proactive approach to reducing the risk of loss of containment, or the unintended release of natural gas. The mitigation programs and projects to address loss of containment vary significantly in size and scope, from actively promoting "Call Before You Dig" and installing pipeline markers over the assets as visual identifiers, to inspecting, testing, and replacing assets that may be deemed beyond their useful lives. PG&E remains focused on identifying the right work to protect the public from a loss of containment incident.

a) Damage Prevention

Damage Prevention consists of multiple processes working in collaboration to educate excavation contractors and homeowners about safe excavation practices near underground infrastructure. Activities, reviewed annually and described in the next sections, include Public Awareness, Dig-in Reduction Team (DiRT), Locate and Mark, and Pipeline Patrol.

Damage Prevention includes marking the field location of underground facilities as requested through the USA One-Call system—commonly referred to as 811, USA ticket management, investigations associated with dig-ins and damage claims, and Public Awareness. The marking of underground utilities is governed by California Government Code 4216 and the process is driven by regulatory requirements and industry best practices. Table 13 describes other key Damage Prevention programs.

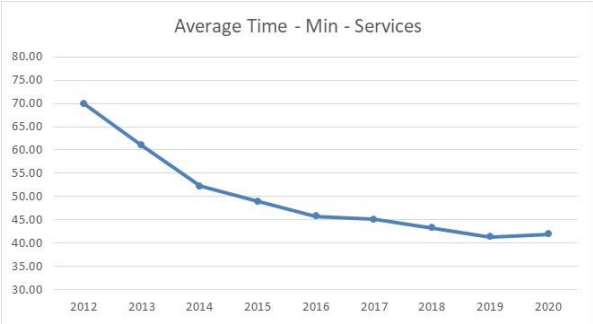
Table 13 – Damage Prevention Programs	
811 Ambassador	The 811 Ambassador Program provides a response mechanism for PG&E employees to take corrective action when they observe excavation with no delineation or markings. All PG&E employees are 811 Ambassadors. Employees learn how to identify excavation-related delineations and utility operator markings as required by the California One Call Law. If an employee observes excavation without the required marks, they call the Damage Prevention Hotline and in response, a DiRT member is notified to assess whether the excavation complies with California's One Call Law. If the excavation is found to be in non-compliance with California's One Call Law, the DiRT member takes several actions. They request all excavation be stopped, educate the excavator about the requirements of California's One Call Law and the reason for the non-compliance, provide excavation safety materials, and instruct the excavator to correct the noncompliance activity prior to continuing any excavation. In 2020, the Damage Prevention Hotline received 1,824 calls.
Gold Shovel Standard	PG&E continues to participate in the Gold Shovel Standard. PG&E began this program that is now run by a third-party and available to utilities across the nation. The program sets safety criteria that second-party contractors are required to meet to be eligible to do work on behalf of the Utility. The Gold Shovel Standard became an internationally recognized program, with companies in Canada adopting and implementing its certification requirements. The Gold Shovel Standard program is one way that PG&E is making its own communities safer, but also bringing best safety practices to the industry. PG&E requires contractors excavating on behalf of PG&E to obtain the Gold Shovel certification. PG&E acknowledges all contractors who practice safe excavation and monitor offenders who fail to demonstrate safe practices. Unsafe contractors lose their certification.
Damage Prevention Manual and Training	Providing clear and concise instruction around dig-in prevention measures like troubleshooting "difficult to locate" facilities.

In addition, since 2012, PG&E has improved its "Shut-In The Gas Performance", which tracks the company's ability to quickly stop the flow of gas when the company is notified of potentially dangerous public safety events such as dig-ins, impacts to meters from vehicles, pipe ruptures, explosions, or material failures. The Shut-In The Gas Performance specifically measures the number of minutes required for a qualified PG&E responder to arrive onsite and stop the flow of gas from PG&E's distribution network. PG&E measures performance for damages impacting either gas service lines or meters/risers (Services) or damages impacting gas mains. In 2020, PG&E's Shut-In The Gas Performance was on average 41.9 minutes for services and 93.7 minutes for mains.

Table 14 – Shut-In The Gas Performance (average number of minutes)

	2012	2013	2014	2015	2016	2017	2018	2019	2020
Services	70.00	61.00	52.20	49.00	45.76	45.16	43.30	41.40	41.93
Mains	192.00	147.00	120.77	102.80	104.43	103.78	88.77	85.13	93.72

Since 2012, PG&E has improved its overall make safe performance on events involving services by 40 percent, and events involving mains by 49 percent.



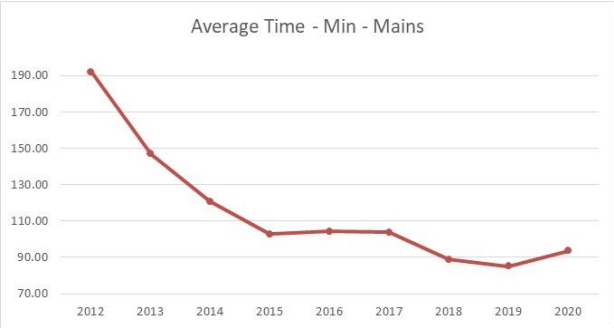


Figure 21 – Shut-In The Gas Performance

PG&E will continue its efforts to improve its Shut-In The Gas Performance.

i) Public Awareness

PG&E's Public Awareness Program conducts educational outreach activities for excavators, local public officials, emergency responders, and the public who live and work in PG&E's service territory. The program communicates safe excavation practices, required actions prior to excavating near underground pipelines, availability of pipeline location information, and other gas safety information through a variety of methods throughout the year including bill inserts, e-mails, brochures, mass media advertising, press releases and participation in community meetings and events.

PG&E conducted 39 "811 Call Before You Dig" contractor workshops, reaching 895 attendees

PG&E communicates gas safety information multiple times each year, and in 2020, reached approximately 3.5 million paper bill customers and sent approximately 3 million e-mails to those customers who receive paperless billing. In addition to the bill inserts and e-mail campaigns, PG&E also sent a targeted direct mail piece to over 2.3 million businesses and residents within 2,000 feet of a PG&E gas transmission pipeline, explaining their proximity to the transmission line, information about how to locate nearby gas pipelines, damage prevention measures (811), how to identify gas leaks, and what to do in the event of a gas leak. Additional targeted mailings were sent to school administrators, excavators, emergency responders, public officials, landscapers, sewer and plumbing companies, farmers, master meter accounts, and those who live or work near PG&E's storage and compressor facilities. Table 15 identifies highlights from the Public Awareness Program's 2020 activities.

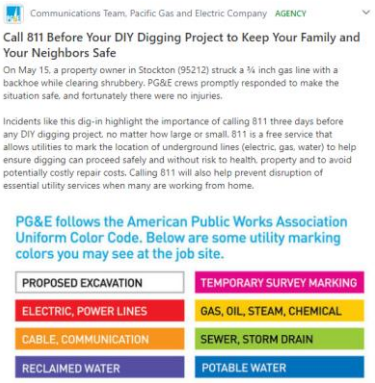


Figure 22 – Example of NextDoor 811 awareness post

Table 15 – Public Awareness Highlights
Began posting weekly 811 awareness messaging on the NextDoor app, targeting zip codes where pipeline damages were caused by homeowners who did not have a one-call ticket.
Executed a social media campaign targeting homeowners and contractors in areas with high damage rates, promoting the importance of calling 811 before digging. These campaigns reached over 512,000 customers.
Continued to conduct targeted outreach in cities with a high number of dig-ins. The outreach included job site visits, 811 training for top damaging companies and meeting with local leadership to discuss continued partnership for community safety. These targeted efforts resulted in over 4,742 field visits.
Completed seven bilingual 811 workshops, with 230 participants (farm workers), in partnership with local Spanish language radio stations. Conducted an interview with each radio station to further expand on the 811 free service. In addition, our Spanish 811 jingle was aired over 1,000 times reaching approximately 145,000 Spanish speaking customers.

ii) Dig-In Reduction Team

PG&E continues to push for improved performance in dig-in prevention by conducting factual investigations of excavation damage to PG&E's facilities, identifying process improvements to reduce damages, and actively pursuing cost recovery from excavators responsible for excavation damage. The DiRT is a proactive program that directly and positively affects public and employee safety by striving to reduce the number of excavation damage incidents through outreach, education and incident investigations. PG&E's Dig-In Reduction programs were instrumental in managing the number of third party gas dig-ins per 1,000 USA tickets at 1.04 in 2019 and 1.05 in 2020.

Table 16 below provides information on some dig-in prevention projects or process improvements.

Table 16 – Dig-In Reduction Team Programs Under Damage Prevention	
PG&E's Commitment to Safety	**Promoting Safety**
DiRT	Deploys investigators to oversee and enhance PG&E's ability to investigate dig-ins, patrol active excavations, and intervene when unsafe excavation activities are identified.
Pipeline Patrol	Identifies and intercepts surface threats to the transmission system via aerial and ground patrolling. Pipeline Patrol notifies DiRT as needed. DiRT will perform tasks listed above, as appropriate.
811 Workshops	Conduct safe digging workshops throughout the service territory.

* Beginning January 1, 2016, contractors who wish to excavate or subcontract out excavation work for PG&E must obtain Gold Shovel Standard Certification by making a commitment to safe digging practices in accordance with the California "One Call Law" (California Government Code 4216) and the Common Ground Alliance best practices for excavation.

iii) Locate and Mark Program

The Locate and Mark Program is designed to mitigate the potential risk of damage to underground facilities by identifying and marking assets for potential excavators within a 48-hour window. Federal pipeline safety regulations[19] and California state law[20] require that PG&E belong to, and share the cost of operating, the regional "one-call" notification system. Builders, contractors, and others planning to excavate, must use this system to notify underground facility owners, like PG&E, of their plans to excavate. PG&E then provides the excavators with information about the location of its underground facilities, including natural gas, electric, and fiber optic. Information is typically provided by having a PG&E locator visit the work site and place color-coded surface markings to show where underground pipes and wires

are located. Because of its large service territory, PG&E belongs to two regional notification centers which share a common toll-free, 3-digit "811" telephone number. The California one-call systems are commonly referred to as USA. In 2020, PG&E received over 1.53 million USA tickets.

In December 2018, the CPUC opened an OII involving data that PG&E maintained from 2012 to 2017 regarding the timeliness with which it responded to 811 notifications.[21] PG&E takes the issues raised in the OII seriously and has worked hard to correct them since they were brought to senior management's attention. As such, PG&E implemented a comprehensive corrective action plan (Compliance Plan) with demonstrated results. This Compliance Plan identified 30 corrective actions across five core areas: Cultural, Process & Procedures, Tools & Technology, Employees & Contractors, and Internal & External Controls. Of the Compliance Plan's 30 corrective actions, all 30 were completed in 2019.

In October of 2019, PG&E entered into a settlement agreement to undertake several enhancement initiatives to the entire Damage Prevention program, all at shareholder expense. In addition to the enhancements to the Damage Prevention programs, PG&E agreed to take specific actions to reinforce its commitment to a Speak Up culture, expectations on identifying and reporting fraud and holding leaders accountable for violations of its Code of Conduct.

The Locate and Mark OII Settlement agreement was amended and approved by the Presiding Officer on February 14, 2020 and approved by the Bankruptcy court, establishing the settlement agreement effective date as April 24, 2020. PG&E has made significant progress on implementing the items contained within the settlement agreement including, but not limited to:

- Developing an internally created USA ticket management system with improved controls, increasing internal locating staffing;
- Hiring qualified electrical workers within the Locate and Mark Department;
- Updating training for locators, requiring contracted locating companies to obtain special training accreditation;
- Enhancing Quality Control (QC) measures; and
- Continuing to investigate all dig-ins resulting in a gas release or a damaged electric cable.

PG&E has been, and continues to be on a mission to improve its safety, compliance and ethics culture and to foster a non-retaliatory environment where all employees can confidently and safely speak up, and leaders are consistently listening to and following up on issues raised by employees. Such transformations take time, and PG&E is steadfastly committed to this important work.

iv) Pipeline Patrol

Pipeline Patrol is a federally required activity that is essential to protecting the integrity of PG&E gas transmission facilities from external threats and in doing so, helps to increase public safety. Patrol is performed by operator-qualified personnel who observe surface conditions near the Right-of-Way (ROW) of transmission pipelines and select distribution facilities. Patrollers identify and report a variety of observations and surface conditions, including unauthorized excavation (e.g., digging, farm-field ripping, boring, blasting, etc.), geohazards, damage to company facilities such as pipeline markers, encroachments, and new construction that may affect class locations and identification of High Consequence Areas. PG&E primarily utilizes aerial methods to conduct patrols, with ground personnel dispatched to investigate observations made from the air. Exceeding federal requirements, PG&E's Pipeline Patrol Program seeks to patrol 100 percent of the gas transmission system on a monthly basis. HCA Patrols are performed a second time each month, as conditions permit. Special patrols may also be performed following natural disasters or other incidents as necessary. Aerial patrols provide real-time knowledge of on the ground activities and the surveillance helps PG&E to identify and stop unsafe excavation practices before dig-ins occur.

Exceeding federal requirements, PG&E's Pipeline Patrol Program seeks to conduct patrols of the entire transmission system monthly.

Figure 23 – Patrol Aircraft With Wing Mounted Camera

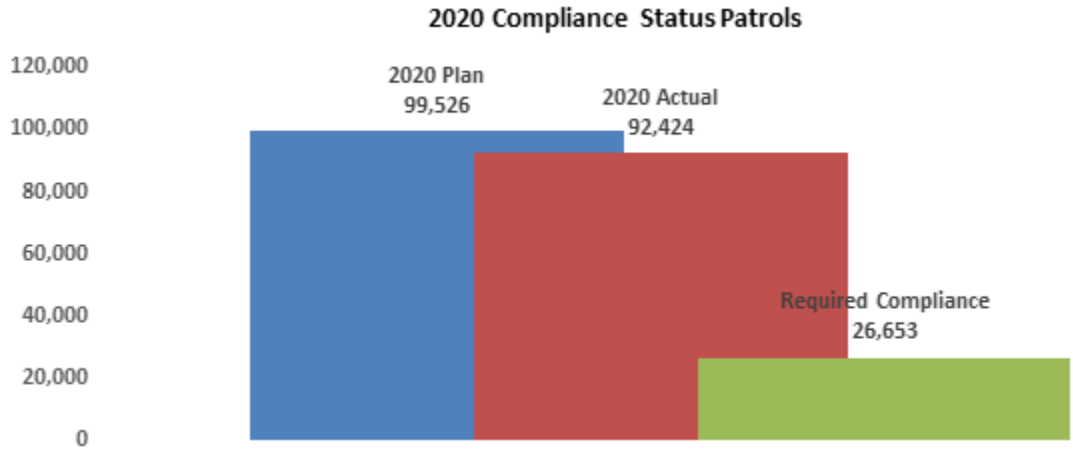


Figure 24 – 2020 Patrols Compliance Status

PG&E patrols an average of 9,000 Gas Transmission miles per month using a combination of fixed wing aircraft and helicopters. In 2020, 60 percent of aerial observations were related to excavation, 18 percent to new construction, and the remaining include right of way encroachments, geohazards, and pipeline damages.

b) Pipeline Markers

Pipeline markers and indicators are important damage prevention tools used to indicate the approximate location of the respective pipeline along its route, to prevent "dig-ins" from occurring. Installing markers is required by pipeline safety regulations because markers contribute to public awareness and damage prevention, which in-turn reduces the risk of loss of containment.

Pipeline Markers are signs on the surface above or near the natural gas pipelines located at frequent intervals along the pipeline ROW. The markers are typically found at various important points along the pipeline route including highway, railway, navigable waterway intersections, spans, angle points (bends), and other road crossings. These markers display the name of the operator and a telephone number where the operator can be reached in the event of an emergency. They are meant to be highly visible along the ROW and appear in different forms as the examples in Figure 25.

Figure 25 – Types of Pipeline Markers

In the event of an emergency or natural disaster, markers may be the only indication to the public and emergency responders that natural gas pipelines are in the area, subject to third-party removal or damage, despite being properly installed.

c) Distribution Pipeline Replacement

An important element of providing safe gas distribution service is replacing aging or at-risk assets. PG&E uses relative risk in prioritizing its pipeline replacement projects. Risk factors include age, material type, leak history, Cathodic Protection (CP), seismic impact, proximity to the public, and other operational factors. In addition to gas main replacement, the program covers related service replacement and meter relocation work.

PG&E has three pipeline replacement programs: Gas Pipeline Replacement Program (GPRP), Plastic Pipe Replacement Program, and Main Replacement Reliability Program. PG&E's objective is to achieve a removal rate of pre-1985 pipe that limits asset age to nearly 100 years by 2030.

Table 17 – Pipeline Replacement		
GPRP	**Plastic Pipe Replacement Program**	**Main Replacement Reliability Program**
PG&E began the GPRP Program in 1985, which has focused on the replacement of cast iron and pre-1941 steel pipe, and has enabled PG&E to deactivate all known cast iron main (over 830 miles of pipe). GPRP is now focused on replacing pre-1941 steel pipe. In 2020, the GPRP Program replaced 24.4 miles of pipe.	Since PG&E began its Plastic Pipe Replacement Program in 2012, PG&E has replaced about 500 miles. In 2020, 87.4 miles of Aldyl-A were replaced. PG&E continues to increase the replacement of Aldyl-A year-over-year in recognition of the approximately 4,800 miles of known inventory.	The Main Replacement Reliability Program focuses on the replacement of pipeline not covered by the GPRP or Aldyl-A programs and will continue to help move the distribution systems average age closer to the national average. In 2020, PG&E replaced 19.2 miles of distribution pipe through this program.

Figure 26, below, demonstrates the company's main replacement progress from 2010 to 2020.

Main Replacement 2010-2020 Actuals & Plan

Program			2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
14A	GPRP	Replacement of all cast iron and some steel main installed pre-1940	24.8	28.1	23.4	31.6	26.8	27.5	30.4	36.0	43.6	20.0	24.4
14D	Aldyl-A	Replacement of Aldyl-A plastic and similar plastic installed pre-1985	0.0	0.0	17.6	30.7	32.5	63.5	80.4	95.1	90.9	90.0	87.4
50A	Reliability	Replacement of gas facilities that have reliability concerns but do not qualify for replacement under the GPRP or Aldyl-A Plastic Replacement Programs	3.7	6.4	7.9	8.2	6.6	13.7	15.8	13.8	30.5	15.8	19.2
Total			28.4	34.4	48.9	70.5	65.9	104.7	126.6	144.9	165.0	125.7	131.0
Trend				21%	42%	44%	-7%	59%	21%	14%	14%	-24%	4%

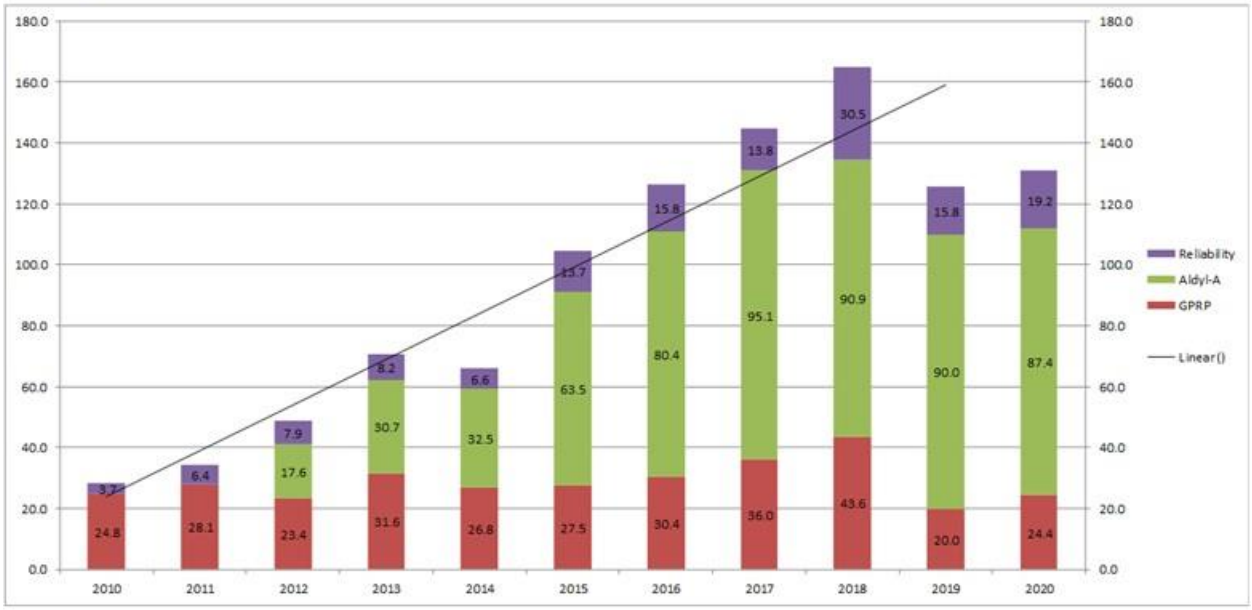


Figure 26 – Main Replacement Progress 2010-2020 (in miles)

d) Cross-Bore Mitigation

A cross-bore[22] is a gas main or service that has been installed unintentionally, using trenchless technology, through a wastewater or storm drain system. PG&E has an inspection program to identify and remediate gas cross-bores, and a public outreach program that provides safety information to PG&E customers, sewer districts, and public works agencies. In addition, PG&E has implemented a Gas Cross-Bore Inspection Program that uses video camera inspections to verify no damage has occurred to sewer lines when using trenchless construction methods on new construction projects.

Cross Bore Statistics			
Year	Inspections Completed	Cross Bores Found	Inspections Planned
2013	19,298	148	25,000
2014	33,804	188	38,000
2015	23,530	100	24,000
2016	22,981	94	23,570
2017	35,628	55	30,000
2018	46,043	46	42,500
2019	43,623	37	41,636
2020	16,675	56	15,000

Figure 27 – Cross Bore Statistics

The goal of PG&E's Cross-Bore Inspection Program is to identify cross-bores by completing inspections of potential conflict locations and repairing all occurrences as they are discovered. PG&E completed approximately 16,675 inspections in 2020. In 2020, PG&E found approximately 1 cross-bore per 298 inspections.

e) Strength Testing

PG&E's transmission pipeline strength testing program is designed to allow PG&E to find pipeline defects that could subsequently cause a rupture or leak, and then repair these defects or anomalies in the pipeline. The strength testing takes a pipeline out of service, clears it of gas, cleans it internally, then fills it (typically with water) to pressures consistent with and pursuant to 49 CFR, Part 192, Subpart J testing and documentation requirements or Minimum Test Pressures for Existing Pipelines in High Consequence Areas (HCAs) to meet the Seven Year Integrity Assessment Interval per American Society of Mechanical Engineers (ASME) B31.8S-2004, Section 5, Table 3. This process also results in a test record that establishes the operating pressures the pipe can withstand. A secondary benefit of strength testing for PG&E is that the pipeline is typically upgraded to allow for navigation of the cleaning tools (pigs), allowing PG&E to run ILI tools at later dates [see Section IV.5.g *In-Line Inspection*]. Thus, strength testing is one tool PG&E uses to maintain the margin

Figure 28 – Strength Test in Progress

of safety for the transmission pipeline and reduce the likelihood of future loss of containment incidents that could pose a risk to public safety.

PG&E continues to strength test or replace untested transmission pipelines in compliance with Pub. Util. Code Section 958. In 2020, PG&E completed approximately 39 miles of strength testing (Table 18), of which 18 miles were re-tested for specific Integrity Management (IM) purposes. This work brings PG&E to a total of approximately 1,535 miles strength tested since 2011. The pipeline miles strength tested in 2020 were prioritized based on a risk informed mix of integrity management threats and testing untested pipe lacking a traceable, verifiable, and complete record to meet the National Transportation Safety Board (NTSB) D.11-06-017 requirements.

Table 18 – Strength Testing Program

Strength Test (miles)	2011-2013	2014	2015	2016	2017	2018	2019	2020	Total
PSEP	539	135	N/A	N/A	N/A	N/A	N/A	N/A	674
Subsequent Testing	0	0	79	89	253	286	115	39	861
Total	**539**	**135**	**79**	**89**	**253**	**286**	**115**	**39**	**1,535**

PG&E will continue to concentrate on assessing shorter pipeline segment tests addressing NTSB commitments (D.11-06-017) and re-assessing pipeline segments with integrity management threats for both manufacturing related defects and time dependent corrosion threats.

f) Vintage Pipe Replacement

A significant portion of PG&E's natural gas transmission pipeline system, approximately 47 percent, was designed, manufactured, constructed, and installed before the advent of California's 1961 pipeline safety laws. While age alone does not pose a threat to pipeline integrity, PG&E has determined, consistent with industry practice, that some vintage pipeline features, pipelines with certain welds, bends, and fittings located in areas subject to land movement, are most appropriately managed through replacement.

In 2019, PG&E refreshed its program information using new risk results from the previous year. This update continued with our strategic risk prioritization approach to replacing pipe where PG&E defines high-risk land movement areas, prioritizes projects based on total risk, and defines pipe with lower risk to be monitored for risk change through our ILI and Geohazard programs in lieu of replacement or retirement. Based off this risk methodology and updated risk results, PG&E has now identified approximately 123 miles (Tier 1 and Tier 2) of transmission pipe,[23] with some of the characteristics that make it more susceptible to certain construction threats. Of those 123 miles identified, PG&E has further identified approximately 118 miles (Tier 1) of high risk pipe targeting replacement or retirement where vintage fabrication and construction threats interact with high likelihood of land movement in populated areas.[24] Additionally, PG&E is monitoring an additional 1,866 miles of pipeline with vintage

characteristics through the ILI and Geohazard programs. In 2020, approximately 1.32 miles of vintage pipe was replaced.

Figure 29 – Vintage Pipe Replaced in American Canyon

Table 19 – Vintage Pipe Replacement Program			
	Miles Replaced	Additional Miles Addressed	Percentage of High Risk Mileage Addressed[(a)]
Pre-2015	20.2 miles	1.3 miles	20 percent
2015	5.9 miles	12.7 miles	41 percent
2016	6.7 miles	8.8 miles	45 percent
2017	3.5 miles	11.5 miles	61 percent
2018	20.6 miles	0 miles	74 percent
2019	2.06 miles	0.75 miles	75 percent
2020	1.32 miles	0 miles	77 percent
Program Target:	123 miles		100 percent

(a) High risk mileage addressed includes pipeline retirements and mileage replaced in other pipe replacement programs from 2015-2020 that have the vintage threat.

As PG&E continues to monitor and assess characteristics of vintage pipelines interacting with land movement through improved data quality and collection, its replacement or retirements are prioritized by addressing sections of pipeline closest to highest density population areas with a high likelihood of ground movement. At PG&E's current and planned rate, the program will address the risk of pipe containing vintage fabrication and construction threats that interact with high risk of land movement for high population density areas by 2027.

g) In-Line Inspection

PG&E's ILI Program uses technologically advanced inspection tools, often called "smart pigs," to reliably assess the condition of transmission pipe so that action can be taken when issues are identified. Prior to running an ILI tool in a pipeline, a pipeline must be modified with installation of "launchers" and "receivers" to insert and remove the tool. Pipeline features that would obstruct the passage of the tool to make the pipeline piggable must also be replaced. After the pipeline is upgraded to accommodate an ILI tool, cleaning and inspection "runs" are conducted to collect data about the pipe. This data is analyzed for pipeline anomalies that must be remediated through the Direct Examination and Repair process where the anomaly is exposed, examined and repaired as necessary. The information from Direct Examination and Repair is used to generate mitigation activities to improve the long-term safety and reliability of the pipeline.

Figure 30 – Electro Magnetic Acoustic Transducer (EMAT) Tool Before an Inspection on L-210C

In-Line Inspection is the MOST RELIABLE pipeline integrity assessment tool currently available to natural gas pipeline operators to assess the internal and external condition of transmission line pipe.

As of 2020, approximately 43 percent of the system is piggable. In 2020 alone, PG&E upgraded 464 miles which is a six percent increase to overall piggable mileage. In addition, PG&E inspected a total of 359.7 miles with 299.7 of those miles assessed with ILI for the first time. Much of PG&E's pipeline was installed decades before ILI was invented. Today, about 31 percent of the PG&E system is not capable of supporting the running of traditional ILI tools because of design elements like low pressure and/or low flows, small diameter pipelines, and short sections of pipeline or facility configurations, such as drips or blow downs. Figure 31 details PG&E's progress to-date to upgrade pipelines to make them capable of accepting traditional ILI tools.

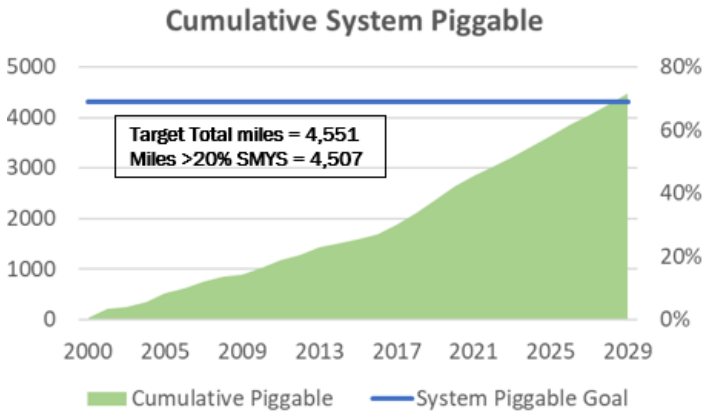


Figure 31 – Progress to-date to upgrade pipelines

h) Corrosion Control

All of PG&E's metallic assets are susceptible to corrosion—a natural, time-dependent process where metal degrades (rusts) due to its interaction with the environment. Gas transmission, storage, and distribution assets primarily composed of steel pipe carrying CNG may experience degradation due to External Corrosion, Internal Corrosion, or SCC. External Corrosion is degradation of the pipe due to interaction of the steel with the atmosphere, soil (buried piping), and/or water (submerged piping). qInternal Corrosion is degradation of the pipe due to interaction of the steel with the natural gas being transported or with unintended product such as water, solids, salts, etc. SCC is degradation of the pipe due to cracks induced from the combined influence of tensile stress[25] and a corrosive environment. The material degradation associated with all forms of corrosion may reduce the integrity of steel assets and threaten PG&E's ability to safely and reliably transport natural gas. PG&E assesses the risk of External Corrosion, Internal Corrosion, and SCC independently because each requires a different form of mitigation.

Figure 32 – PG&E Employee Installing a Cathodic Protection Rectifier (Photo Captured Pre COVID-19)

Given the risk profile associated with corrosion, PG&E has sought out highly qualified corrosion experts from around the country, enhanced procedures, and incorporated systematic, risk-infomed methodologies to its corrosion control approach. PG&E's efforts are resulting in more accurate data on which to make decisions related to the identification and mitigation of corrosion risks, improving the safety and reliability of PG&E's assets.

For example, PG&E mitigates the threat of External Corrosion by installing assets with appropriate coatings and by applying CP to buried or submerged structures. CP mitigates corrosion through administering direct current through the soil and/or water to steel piping. Coatings mitigate corrosion by forming a barrier between the steel and environment. As coating systems on buried and submerged piping systems cannot readily be inspected for degradation, the use of CP in conjunction with coatings provides additional protection for buried or submerged assets.

PG&E also monitors for conditions that may limit the ability to maintain adequate levels of CP on buried or submerged assets. Such conditions include contacted casings and electrical interference from electric transmission equipment, municipal rail systems, and other operators' corrosion control systems. Overall, corrosion control at PG&E consists of the programs below:

Table 20 – Corrosion Control Programs	
Program	**Program Description**
Atmospheric Corrosion	Addresses deterioration of coating systems on assets designed for above ground use. Program includes field inspections and mitigation.
Casings	Identifies and remediates contacted cased crossings.
CP New, CP Replace, 850 Off	Designs, installs, and maintains CP systems to prevent corrosion. In addition, PG&E is implementing a more conservative CP criterion for its transmission piping system.
Close Interval Survey	Collects CP readings at approximate three-foot intervals on transmission piping to verify levels of CP between established monitoring points.
Corrosion Investigations	Investigates the cause of corrosion control deficiencies and/or corrosion damage and recommends mitigating solutions.
Enhanced CP Resurvey	Evaluates distribution piping CP area boundaries, monitoring locations, protection status, and updates documentation to ensure proper operation of CP systems.
Electrical Interference – AC	Evaluates and mitigates the threat of alternating current interference on gas piping systems.
Electrical Interference – DC	Evaluates and mitigates the threat of direct current interference on gas piping systems.
Internal Corrosion	Evaluates and mitigates the threat of Internal Corrosion in gas pipelines.
Routine Maintenance	Routine monitoring of corrosion control system effectiveness, to include rectifier inspections and maintenance; pipe-to-soil monitoring, casing-to-soil monitoring, and atmospheric corrosion inspections.
Test Stations	Installs or replaces test stations in areas along the piping system where CP monitoring is required.

PG&E continues to advance in its goal of building a best-in-class corrosion control program by incorporating industry corrosion control standards, peer operator experience, third-party evaluations, and corrosion research into its standards and procedures. PG&E actively participates in corrosion research conducted by the Pipeline Research Council International (PRCI) and supports efforts to incorporate the results of such research into corrosion control regulations and standards through its participation in the Association for Material Protection and Performance (formerly National Association of Corrosion Engineers (NACE) International and the Society for Protective Pipe Coatings), the Interstate Natural Gas Association of America (INGAA), and the American Gas Association (AGA).

i) Earthquake Fault Crossings

PG&E's Fault Crossings Program addresses the specific threat of land movement at active earthquake faults that subject a pipeline to external loads due to seismic events. The program is consistent with California law that requires natural gas operators to prepare for and minimize damage to pipelines from earthquakes. PG&E performs system-wide studies to address both the anticipated geologic movement and pipeline mechanical properties to manage the integrity of the pipe (Table 21). Additional mitigation work is then prioritized, following each study, by considering the likelihood of failure (the probability that

the fault will trigger a seismic event), and the consequences of failure (including the impact on the local population, PG&E system reliability, and the environment). Mitigation typically includes modified trench designs, trench adjustment, pipe replacement, or installation of automated isolation valves.

Table 21 – Earthquake Fault Crossing Program

	Studies[g]	Crossings Mitigated[h]
Pre-2015	52	24
2015	65	18[a]
2016	65	6[b]
2017	22	7[c]
2018	34[i]	25[d]
2019	12	12[e]
2020	38[f]	4

(a) 2015 – 14 crossings were Fit-for-Service (FFS) per current design. 4 crossings replaced.

(b) 2016 – 3 crossings were FFS per current design. 3 crossings replaced.

(c) 2017 – 5 crossings were FFS per current design. 2 crossings replaced

(d) 2018-20 crossings were FFS per current design and 2 were considered mitigated by existing Valve Automation. 3 crossings were replaced.

(e) 2019 – 6 crossings were FFS per current design and 6 crossings were replaced.

(f) 2020 – 17 crossings were FFS per current design and 4 crossings were replaced.

(g) Studies are conducted to determine if pipe is FFS with geological, pipe assessments.

(h) Crossing is mitigated if pipe meets or is designed, retrofitted, or replaced to satisfy the FFS criteria.

(i) The difference between this report and PG&E's Transmission Pipeline Compliance Report 2019-01 submitted on January 30, 2019 is timing of data confirmation.

Figure 33 – 2020 Pipeline Replacement for Green Valley Fault in Fairfield

j) Leak Survey

Pipeline safety regulations require PG&E to conduct routine leak surveys on its gas system to find gas leaks. The frequency of the leak surveys depends on the type of facility, operating pressure, and class location of the pipe.

PG&E outlines current requirements, standards, and guidelines for the Leak Survey and Detection Program in its procedures. In 2020, PG&E surveyed over 1.7 million gas distribution pipeline services, over 13,000 gas transmission pipeline miles, and performed daily leak surveys on 115 wells in compliance with CalGEM's emergency gas storage regulations. In addition, PG&E performed quarterly surveys in compliance with California Air Resources Board (CARB) regulations at PG&E's gas storage facilities and compressor stations. PG&E conducts leak surveys on more assets today in accordance with the CPUC's General Order (GO) 112-F, which changed the survey frequency for some gas transmission pipelines.

PG&E conducts three-year leak surveys consistent with Best Practice 15 in the Leak Abatement Order Instituting Rulemaking (OIR) D.17-06-015. PG&E will continue its expanded use of the Picarro technology[26] in all of its divisions, completing at least 75 percent[27] of its gas distribution compliance survey. The expanded use of the Picarro technology and the acceleration of leak survey cycle will continue to support PG&E in its ability to: (1) find and fix more leaks, thereby eliminating more potential hazards to the public; and (2) reduce GHG emissions.

In addition, in 2020, PG&E continued the Super Emitter survey across the entire distribution service territory in response to the Leak Abatement OIR, Best Practice 21. PG&E defines a Super Emitter leak as one that emits more than 10 standard cubic feet per hour of methane. As a result, in 2020, PG&E completed the Super Emitter survey on 100 percent of its gas distribution services. The purpose of this survey is for Picarro to identify and measure the leak flow rates of Super Emitters as they are found during compliance survey. The data will then inform PG&E of the prevalence of these leaks and the emission reduction that can be gained by repairing them quickly.

To further enhance its Leak Survey process, in 2019, PG&E implemented technology to enable an end-to-end paperless transmission leak survey process and integrated with enterprise systems. Initiatives are in progress to continue to build and support a full end-to-end paperless process for distribution leak survey. In 2019, PG&E implemented an application that allowed Leak Survey to create and document all leaks electronically.

Lastly, in 2019, PG&E implemented a series of process improvement initiatives to mitigate the significant backlog of 20,000+ Leak Survey Can't Get In (CGI) inspections. PG&E developed an online customer scheduling portal to schedule hundreds of appointments without a single phone call. In addition, PG&E implemented an electronic appointment dispatching tool and electric remote disconnection process all in an effort to reduce non-conformances. In 2020, PG&E began the year with 6,772 CGIs in the backlog. Due to the unforeseen events of COVID-19 and inability to perform timely inspections due to limited access to customer homes and shelter in place orders, PG&E had to halt for several months before reinstating. PG&E was granted a waiver by the CPUC and continued to report monthly on the status of the backlog created by the shelter in place orders. In addition, PG&E has had to abstain from service disconnections since the pandemic began. As a result, PG&E's 2020 end of year backlog increased to 19,421 CGIs. Summaries of PG&E's 2020 Leak Survey cycles for its distribution and transmission pipeline systems are shown in Table 22 below:

Table 22 – Leak Survey Frequency		
Facility Types		**Survey Frequency**
All Company facilities within business districts and public buildings	Distribution (MAOP <60 psig)	Annual
Buried metallic facilities not under CP and not covered by an annual requirement		3 years
Balance of underground distribution facilities		3 years
Department of Transportation All Odorized Transmission	Transmission (MAOP > 60 psig)	Semi-Annual
Gathering: Class 1, 2, 3 and 4	Transmission (MAOP > 60 psig)	Semi-Annual
Stations: Class 1, 2, 3, and 4	Transmission (MAOP > 60 psig)	Semi-Annual
Perimeter of Enclosed Electric Substations and Switching Stations		Every 6 months
Wellhead, attached pipelines, and surrounding area	Gas Storage	Daily
Method 21 on all above ground components at 3 Underground Storage Facilities and 9 Compressor Stations	Gas Storage and Compressors	Quarterly

k) Leak Repair

Pipeline safety regulations and California state code require PG&E to repair certain leaks. In 2020, PG&E's trained and operator-qualified personnel assigned leaks based on the severity and location of the leak, the risk the leak presents to persons or property, and the likelihood that the leak will become more serious within a specified amount of time. PG&E's leak grading practices for Grade 3 leaks exceed industry guidance, as set by GO 112-F. In addition to rechecking annually, as required, PG&E repairs above-ground Grade 3 leaks on its distribution system within 36 months of discovery. In 2020, PG&E repaired 191 below-ground Grade 3 distribution leaks to further reduce GHG emissions.

In 2020, PG&E used its continuous improvement approach to continue more efficiently bundling and scheduling leak repairs. Having all the work required in an area at one time provides opportunity to bundle work locations and effectively maximize the utilization of resources. In 2020, PG&E repaired over 24,000 gradable leaks on the gas distribution and transmission system.

In 2020, PG&E also focused on improving Leak Repair effectiveness and efficiency by maintaining a level-loading approach, managing the average days open for gradable leaks rather than the inventory of Grade 2 leaks at the end of the year. PG&E set an internal target for average age of open Grade 2 leaks of <150 days and exceeded that goal with the average days open of 92 days for 2020.

Figure 34 – PG&E's Maintenance & Construction Crew at Work

PG&E continues to review and improve its standards, procedures, field processes and equipment to further reduce the public safety risk of and the emissions from gas leaks.

l) Overpressure Elimination Initiative

A pipeline that operates at higher than the MAOP presents an operational risk to the safety of the public, employees, and contractors working on the facilities. When a pipeline operates above its MAOP, it is known as an abnormal operating condition and is described as an OP event. OP events have the potential to overstress pipelines and may lead to loss of containment. Large OP events (see Figure 35) pose significant safety and operational impacts to PG&E's gas system. A large OP event is defined as any verified pressure reading that exceeds the design limits set forth in the Code of Federal Regulations (CFR) – 49 CFR 192.201. PG&E has identified human performance and equipment failure as the two most common causes for OP events. Actions to eliminate OP events were implemented including: station design and construction best practices; lock-out/tag-out process improvements; and distribution of information around associated OP risk factors through training and communication initiatives. PG&E installed SCADA points to increase system real-time visibility in the Gas Control Center (GCC); along with installing sulfur filters on pilot-operated equipment. Large Volume Customer primary regulation sets also received accelerated inspections.

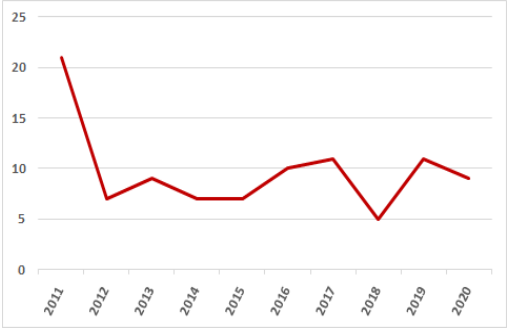


Figure 35 – Large OP Events

In 2018, PG&E began its strategy to install secondary over pressure protection devices on pilot-operated regulation equipment.[28] PG&E has a strategic goal of eliminating the common failure mode at 50 percent of our pilot-operated sites by the end of 2022. This objective will be met predominantly by the installation of secondary OP protection devices (slam shut devices). The reasons why pilot-operated regulation equipment is particularly vulnerable to large OP events are twofold: (1) they can fail due to gas quality issues, such as debris, sulfur, liquids, or black powder; and (2) they tend to have a design that causes both the regulator and the monitor to fail in an open position (common failure mode), therefore resulting in a loss of regulation. PG&E currently has 1,535 distribution pilot-operated regulation stations and 638 transmission pilot-operated stations. At the end of 2020, PG&E had a total of 510 pilot-operated stations in which the common failure mode has been mitigated.

PG&E's overpressure management achieves top quartile results among benchmarked domestic pipelines.

At the end of 2018, the NTSB published a Safety Recommendation Report in response to a September 2018 OP event in Merrimack Valley, Massachusetts, also known as the Merrimack event. The recommendations in the NTSB report focused on the specific causes of this event, including implementation of professional engineering review, record completeness, MOC process, and additional

control procedures during operations. For PG&E's low-pressure systems, the approach to reduce the likelihood of a Merrimack-type event and other reasonable possible drivers of an OP event is to augment code-required pressure control and OP protection devices (first layer) with a slam-shut (second layer) that will provide protection against an OP event. In addition, PG&E has developed controls to ensure damage to a sensing line cannot create an OP event. Work is on-going to explore additional controls in this area. OP events can be caused by several different drivers, which can include design-related issues similar to the Merrimack event, equipment-related causes, construction activities, third-party damage, and human performance issues during maintenance. PG&E's strategy is to protect our assets and operations against all possible modes of failure.

In 2019, the first annual version of the Long Term Overpressure Elimination Roadmap was published. This comprehensive document describes in detail past, current, and proposed future activities related to OP elimination. The second iteration of the plan was published in July 2020. The plan is for the Roadmap to be updated annually.

PG&E continues to review operations and look for opportunities to perform work to further limit potential MAOP exceedances. Each activity builds on the goal to eliminate large OP events, thereby contributing to system safety.

m) Community Pipeline Safety Initiative

PG&E's Community Pipeline Safety Initiative is a shareholder-funded program that focuses on enhancing the safety of the gas pipeline by addressing items located too close to the pipe that pose a safety and emergency access concern. When items such as structures and trees are located too close to the pipeline, they can delay critical access for first responders and safety crews and potentially cause damage to the pipe.

In December 2013, the program conducted a comprehensive centerline survey that allowed PG&E to locate its pipeline and collect data on items such as trees, brush and structures located above the pipeline. Based on the survey results, PG&E identified 1,553 vegetation miles and 360 structures miles with items that needed to be addressed. The program was initially anticipated as a five-year initiative ending in December 2017 but has been extended through December 2021 due to long-lead permitting and outstanding municipality and customer agreements. To date, the program has cleared 1,543.84 vegetation miles and 359.85 structure miles. The remaining 9.16 miles of vegetation and 0.15 miles of structure clearing is planned for this year, pending approvals from municipalities, customers and receipt of long-lead permits. The remaining CPSI projects include:

- **Structure Projects:** The remaining structure projects are located in the cities of Palo Alto and Lafayette. Land Agents are actively pursuing agreements with impacted customers in the City

of Palo Alto. The cross-functional team is developing a strategy for structures in Lafayette, due to ongoing litigation and community sensitivities with the vegetation work.

- **Vegetation Projects:** The project team continues to work with the cities of Palo Alto, Lafayette, San Jose (District 6) and Santa Cruz County to determine a path forward for this work. The team is also reviewing any other potential mitigation measures that can address the safety risks identified. PG&E is also following the approved escalation and litigation process for private property customers who have refused work.
- Below please find a chart showing CPSI miles addressed per year.

VEGETATION MILES ADDRESSED

	Act + Fcst	%	Complete
2013	115.0	7%	115.0
2014	146.0	17%	146.0
2015	380.0	41%	380.0
2016	540.0	76%	540.0
2017	258.0	93%	258.0
2018	86.7	98%	86.7
2019	18.6	99%	16.57
2020	8.7	100%	0.0
Total	1,553.0		1,542.27

As of 11/14, over 99% of vegetation miles have been addressed

STRUCTURE MILES ADDRESSED

	Act + Fcst	%	Complete
2013	5.0	1%	5.0
2014	110.0	32%	110.0
2015	93.0	58%	93.0
2016	114.0	89%	114.0
2017	30.0	98%	30.0
2018	7.6	99%	7.6
2019	0.25	99%	0.12
2020	0.15	100%	0.0
Total	360.0		359.72

As of 11/14, over 99% of structure miles have been addressed

Figure 36 – Overall Community Pipeline Safety Initiative Program Metrics (2013-2020)

For areas with completed CPSI work, PG&E remains committed to keeping the area above and around the pipeline clear through our ongoing Operations and Maintenance Program.

Operations and Maintenance

Following the CPSI, PG&E's Gas Operations and Maintenance Program continues monitoring the area above and around the gas transmission pipeline as part of our routine patrols. During patrols, crews look for any new brush, resprouted vegetation, newly planted trees or newly installed structures, as well as confirm none of the trees previously left in place as part of CPSI have developed into a safety concern.

This program includes patrolling at least one-third (approximately 2,270 miles) of the gas transmission pipeline system each year. Vegetation and structures found through these patrols are worked the following calendar year. In 2020, crews patrolled 3,068 miles of gas transmission pipeline. In addition, vegetation crews cleared 250.16 miles that had new brush, resprouted vegetation or trees that posed a safety risk to the pipeline. This included removing more than 3,131 trees. As part of this program, PG&E requests the property owner self-perform the identified vegetation work but will remove the vegetation at no cost to the owner if they are unable to self-perform. The team also addressed

20 structure encroachments. For any structure encroachment identified, PG&E works with the property owner to remove or relocate the structure, at the property owner's expense.

6. Mitigating the Risk of Loss of Supply

In 2020, PG&E transported and delivered about 985 billion cubic feet of gas.[29] PG&E works year-round to assure system reliability through its management of system pressure, capacity, monitoring, and controls. The following sections discuss PG&E's programs designed to mitigate the risk of losing gas supply.

a) System Pressure and Capacity

PG&E designs and operates its gas system to ensure safe pressure regulation and adequate gas supplies. PG&E continuously monitors the pressure of its system [see Section IV.7.a *Gas System Operations and Control*]. Additionally, PG&E measures and works to reduce OP incidents. PG&E's gas systems are designed to meet all expected core demands (residential and small commercial customers) with noncore demand (such as large commercial or industrial customers) assumed fully curtailed at a design temperature that is the coldest temperature that may be exceeded once in every 90 years, on average (referred to as an Abnormal Peak Day, or APD). Also, PG&E's gas systems are designed to meet all expected demand, core and noncore, at the coldest temperature that may be exceeded once in every two years, on average (referred to as a Cold Winter Day, or CWD). In addition to noncore curtailments, temporary winter operations are used to increase available capacity on the gas system or shift flow to alleviate system constraints [see Section IV.2.c *Transmission Pipe* for Strategic Objective on meeting system capacity].

PG&E's gas system was successfully tested in real-time in December 2013, when it experienced three days below the one-day-in-two-year CWD threshold defined at the time. PG&E was able to provide continuous gas service to all core customers and consistent with gas system planning, requested curtailments in the Sacramento area of 67 noncore customers, whose rate agreement includes a curtailment provision.

Insufficient capacity can result in reliability issues that pose significant public health and safety risks. For instance, a lack of pipeline capacity could lead to a loss of gas service that customers depend on for daily life activities including space heating, water heating, and cooking. In very cold weather, loss of space heating can itself be life-threatening and can prompt customers to use unsafe heating alternatives. Loss of gas service can also lead to extinguished pilots and the subsequent potential for uncombusted gas entering affected buildings. In some scenarios, loss of gas service due to insufficient local pipeline capacity could affect electric generation, which could also result in health and safety concerns.

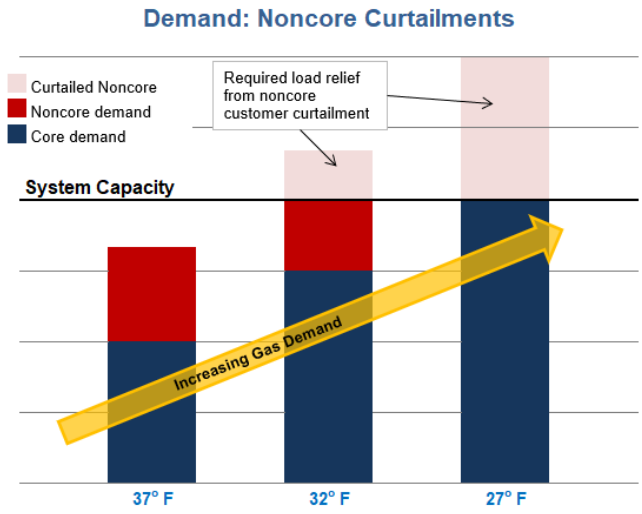


Figure 37 – How Demand Affects Capacity

PG&E drives the quality of its planning effort through a matrix of tools, processes, personnel, standards, internal and external data, and documentation that provides the appropriate level of oversight and control to its management team.

b) Operations Clearance Procedure

An important part of public and employee safety is the use of the Gas Clearance procedure. The Clearance procedure provides an added safety step or layer of protection to confirm that a plan and procedure to protect employee and public safety is in place before work is performed on the gas system. The Clearance Procedure is used for all work that impacts gas flows, pressures, remote monitoring and control, or gas quality. As part of the clearances and per the Purging Gas Facilities Standard A-38, a written purge plan is required, with clearance sketches, to illustrate purge control points and purge point locations. All clearances are approved by Gas Control.

In Q4 2020, an Elevated Review Process (ERP) pilot was established. The ERP consists of a Designated Review Team of persons familiar with site-specific operations that will perform the elevated review to eliminate OP drivers in clearances.

7. Mitigating the Risk of Inadequate Response and Recovery

In addition to the programs that PG&E has in place to mitigate the risk of loss of containment and loss of supply, PG&E is prepared to respond to and recover from incidents. PG&E's policies and procedures have been revised to provide effective system controls for both equipment and personnel to limit damage from accidents, explosions, fires and dangerous conditions. It is PG&E's policy to:

- Plan for natural and manmade emergencies such as fires, floods, storms, earthquakes, cyber disruptions, and terrorist incidents;
- Respond rapidly and effectively, consistent with the National Incident Management System principles, including the use of the Incident Command System, to protect the public and to restore essential utility service following such emergencies;
- Help alleviate emergency related hardships; and
- Assist communities to return to normal activity.

All PG&E emergency planning and response activities are governed by the following priorities:

- Protect the health and welfare of the public, PG&E responders, and others;
- Protect the property of the public, PG&E, and others;
- Restore gas and electric service and power generation;
- Restore critical business functions and move towards business as usual; and
- Inform customers, governmental agencies and representatives, the news media, and other constituencies.

Objective	Description
Establish Command	Determine the Incident Commander, set up an Incident Command Post (ICP), activate Emergency Center(s), if necessary
Assess Situation	Gather information about emergency, assess the situation in coordination with appropriate 911 agency(ies) and PG&E GCC
Make Safe	Make area safe for public, employees and others
Communicate/Notify	Communicate to/notify the appropriate PG&E personnel, regulatory agencies, public agencies such as fire, police, city and county emergency operations, GCC, customers and media
Restore	Restore gas service
Recover	Deactivate ICP and/or Emergency Centers and return to business as usual

Figure 38 – Key Incident Response Objectives

PG&E uses the structure of the Incident Command System to complete key steps in responding to incidents. The key incident response objectives in Figure 38 represent a typical process flow through the cycle of an incident. However, incidents may not necessarily follow this exact sequence. For example, it may be appropriate to "Make Safe" at several points during the response process and not just after "Assess the Situation."

The next section discusses programs in place to mitigate threats to enable PG&E to respond in a timely manner.

a) Gas System Operations and Control

PG&E's GCC monitors and controls the flow of gas across PG&E's system 24 hours a day, 365 days per year, so that natural gas is received and delivered safely and reliably to customers. The GCC provides near instantaneous visibility on the gas system. This allows PG&E to prevent, quickly react to, and mitigate issues that may pose a safety risk to the public and PG&E employees.

Figure 39 – PG&E's Gas Control Center Features a 90 Foot-Long Video Wall With Current Operational Information to Augment The Gas SCADA System (Photo Captured Pre COVID-19)

PG&E's Gas Transmission Control Center, Gas Distribution Control Center, and Gas Dispatch functions are co-located in a single facility. The co-location of these three functions enables the company to better communicate, share information, and monitor the systems to provide superior emergency response coordination. This visibility, monitoring, control, and response capability is important to PG&E's Gas Safety Excellence vision. For the GCC to be effective, a key control need is situational awareness—the ability to identify, process, and comprehend the critical elements of information about what is happening. Billions of data records, composed of a mix of near real-time gas system operational data and a variety of geospatial, time dependent, and historical information that relates to the gas system provide critical information to Gas Control to aid in decision-making. This data interacts with alarms to focus the operators' attention on abnormal situations. They are also bundled to display clear information to operators so they can quickly assess a developing issue.

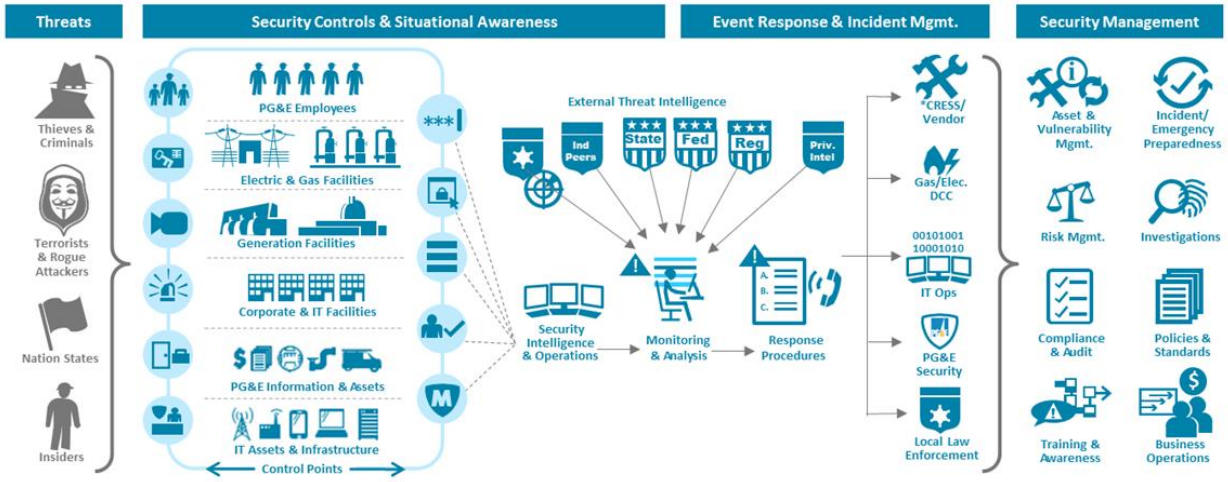
Transmission	20.2K Transmission SCADA points(1)	100% Visibility into Transmission system Backbone	56% Visibility into Transmission local transmission	120 Transmission Devices installed 2011-2020
Distribution	29.7K Distribution SCADA points(1)	66% Visibility into Distribution system		1,775 Distribution Devices installed 2011-2020

(1) **Note: PG&E is in the process of evaluating and implementing different measures to represent the extent and capabilities of the SCADA system with the intent of improving the clarity and meaningfulness of this table's information. In some cases, future year categories and their respective values may differ from those currently shown.**

Figure 40 – PG&E's Progress in Enhancing System Visibility Through SCADA

b) Security

PG&E's commitment to security directly contributes to our mission to deliver safe, reliable, affordable and clean energy. PG&E's Security Program (which includes both cyber and physical security aspects) effectively manages security risks and proactively adapts to evolving threats and changing business needs. The Security Program, based on industry best practices, is designed to enable informed risk decision making necessary to support PG&E's mission.



*CRESS is Corporate Real Estate Strategy and Service

Figure 41 – PG&E Unified Cyber/Physical Security Program Effectively Manages Risk and Proactively Adapts to Evolving Threats and Changing Business Needs

PG&E's Threat Intelligence team tracks evolving cybersecurity threats. Trends include a growing prevalence and sophistication of ransomware, destructive malware and the growth of file-less malware on endpoints. Additionally, supply chain exploits continue to grow in sophistication and prevalence.

PG&E's Security Awareness and Training Program is an enterprise security strategy focused on maintaining and strengthening the security culture at PG&E. Regular security communications educate employees on how to keep the Company's people, assets and information secure. The PG&E Security Awareness and Training Program communicates and trains on security standards, best practices, tips, and risks, and helps employees understand the importance of protecting the people, information and assets at PG&E. The Security Awareness and Training Program establishes employee engagement themes based on security assessments and threat intelligence information, and ultimately reduces security risk.

Protecting PG&E from the ever-changing cybersecurity threats landscape enables us to conduct our work in a secure manner that protects our customers, employees, and assets. PG&E Cybersecurity's mission is to deliver and maintain an integrated program to safeguard PG&E digital assets by:

- Identifying cybersecurity risks and defining mitigating strategies
- Building, deploying, and operating effective security technologies and processes

- Proactively monitoring for and responding to cyber-threats
- Collaborating with public and private entities to drive standards and best practices

Figure 42 – Examples of Active PG&E Government Partners

PG&E's natural gas operations incorporate significant risk management activities, including those that address cyber-attack threats. PG&E's Cybersecurity organization advises Gas Operations on cybersecurity risk remediation and mitigation activities to protect information and operational technology, with a focus on control systems. PG&E's gas control systems are considered critical digital assets, and therefore require higher levels of protection through security controls and mitigation improvements. Security controls and mitigation investments are reviewed and updated on an annual basis.

Given continual security threats and the evolving sophistication of adversary attacks, PG&E's Security Program is regularly assessed to validate strategic direction and improve alignment with current industry best practices. Assessments and improvements can occur through participation in security events, such as the 2019 PG&E GridEX V Functional Exercise. This two-day exercise for utilities and other stakeholders from North America provides an opportunity for the organization to exercise how it would detect, respond, and recover from simulated severe cyber and physical attacks. Participants simulate internal and external operational activities as they would during an actual event. Exercise objectives include the following: exercise incident response plans; expand local and regional response; engage critical interdependencies; increase supply chain participation; improve communication; gather lessons learned; and engage senior leadership. It is through the results of security exercises that PG&E is better able to identify and plan control improvements that strengthen Gas Safety.

c) Valve Automation

PG&E's Valve Automation Program is designed to accelerate emergency response and minimize the time of exposure in the event of an unintended release of gas. The Valve Automation Program allows certain gas transmission pipelines to be rapidly isolated through remote and automatic control valve technology. Installation of automated isolation capabilities on transmission pipelines in populated areas may reduce property damage and danger to emergency personnel and the public in the event of a pipeline rupture. PG&E's control room personnel have received training to develop a "bias for action." This training helps them recognize and act on system conditions warranting immediate isolation of pipeline

systems and planned SCADA installations to continue to increase system visibility are ongoing [see Section IV.7.a. *Gas System Operations and Control*].

The Valve Automation Program builds upon the scope and principles in PG&E's Pipeline Safety Enhancement Plan that replaced, automated, and upgraded gas shut-off valves across PG&E's gas transmission system starting in 2011 for a total of 360 through 2019. In 2020, an additional 21 valves were automated through the Valve Automation Program.

d) Emergency Preparedness and Response

PG&E's Gas Emergency Response practice is documented primarily in the Gas System Operations Control Room Management Manual and the Gas Emergency Response Plan (GERP).

i) Gas System Operations Control Room Management Manual

Gas Control is responsible for the overall operation of PG&E's gas system, and therefore closely monitors and coordinates emergency notifications, dispatching, system isolations, and restorations.

Gas Control personnel primarily use SCADA system data to monitor and control critical assets remotely. The SCADA system alerts Gas Control of gas system irregularities via alarms. When these alarms go off, Gas Control can immediately initiate and execute shutdown zone plans or direct field personnel to respond to critical locations for the execution of manual valve operations. In addition, Gas Control notifies appropriate 911 agencies and departments within PG&E so that emergency response resources are informed and dispatched.

To maintain compliance and aid in the management of abnormal and/or emergency operating conditions, PG&E regularly trains gas control personnel on the Gas System Operations Control Room Management Manual.

ii) Company Emergency Response Plan

The purpose of the Company Emergency Response Plan (CERP) is to assist the gas and electric businesses with a safe, efficient, and coordinated response to an emergency. For changes to PG&E's CERP, please see Attachment 2.

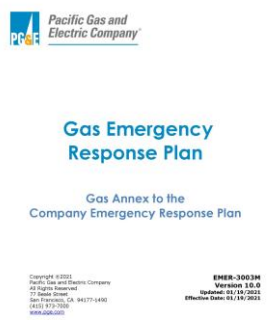
The CERP provides a broad outline of PG&E's organizational structure and describes the activities undertaken in response to emergency situations. The CERP presents a response structure with clear roles and responsibilities and identifies coordination efforts with outside organizations (government, media, other gas and electric utilities, essential community services, vendors, public agencies, first responders, and contractors).

The CERP follows a logical flow from general emergency response concepts and guidelines to specific emergency management organizational structure, roles, responsibilities, and processes. When appropriate, the plan also references supporting procedures and other response materials.

In addition, PG&E maintains business continuity plans, which describe how PG&E will continue its critical business processes in the event of a disruption to facilities, technology or personnel.

iii) Gas Emergency Response Plan

The GERP[30] provides detailed information about PG&E's response to gas emergencies. It supports the response to all emergencies broadly as "One PG&E" through the integration with the CERP and the other LOB emergency response plans, which are annexes to the CERP. For 2020 changes to PG&E's GERP, please see Attachment 2.


Pacific Gas and Electric Company

Gas Emergency Response Plan

Gas Annex to the Company Emergency Response Plan

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EMER-3003M Version 10.0 Updated: 01/19/2021 Effective Date: 01/19/2021

Figure 43 – The Gas Emergency Response Plan as of January 19, 2021

The GERP provides an outline of the Gas Operations organizational structure and describes the activities undertaken in response to incidents. It provides a response structure with clear roles and responsibilities, a communication framework, and identifies coordination and response integration efforts with outside organizations and community first responder agencies.

The GERP outlines gas specific criteria to PG&E's Incident Levels that are provided in the CERP. The Incident Levels categorize and support PG&E in understanding the complexity of an incident and the actions that may be employed at each level (e.g., emergency center activations, resources requests, etc.). To ensure a consistent and well-coordinated response to emergencies, the Company has adopted the following incident classification system:

- Incident Level 1 – Routine
- Incident Level 2 – Elevated
- Incident Level 3 – Serious
- Incident Level 4 – Severe
- Incident Level 5 – Catastrophic

iv) Gas Emergency Preparedness Team

The Gas Emergency Preparedness Team assists Gas Operations with emergency planning, preparedness, response, and review. This group maintains the GERP, leads exercises, facilitates after action reviews, and participates in industry activities designed to impart best practices. The group

facilitates the use of the Incident Command System: a systematic, proactive approach for all levels of governmental and non-governmental organizations and the private sector to work together during an incident to reduce the loss of life, damage to property and harm to the environment. Further, the team supports the Gas organization's local emergency centers, called Incident Management Teams, and the Gas Emergency Center, which is co-located with the GCC. These centers are activated according to criteria outlined in PG&E's GERP.

Throughout 2020, the Gas Emergency Preparedness Group:

- **Completed 100% of IMT (Incident Management Team) and GEC (Gas Emergency Team) team ICS (Incident Command System) 100/200 training**
- **Facilitated 4 Incident Management Team exercises**
- **Facilitated 4 Gas Emergency Center exercises (which included senior leadership participation in command and general staff Incident Command System roles)**
- **Supported the response to 11 emergency activations impacting Gas Operations**

Frequent outreach to first responders helps strengthen how PG&E coordinates when emergencies happen. Due to mandated COVID-19 safety protocols, the PG&E Public Safety Specialists (PSS) were limited to distanced-based (virtual) outreach engagements, beginning in late Q1 2020. Additionally, COVID-19 considerations appreciably impacted the availability of external public safety partners in their engagement with PSS members. In 2020, Public Safety Emergency Preparedness completed the following efforts in partnership and close coordination with first responders and local governments:

Figure 44 – Delivered 90 First Responder Workshops to more than 2,000 first responders. These workshops train First Responders to safely respond to gas and electric emergencies and exactly how to access the PG&E gas transmission pipeline mapping system. (Photo Captured Pre COVID-19).

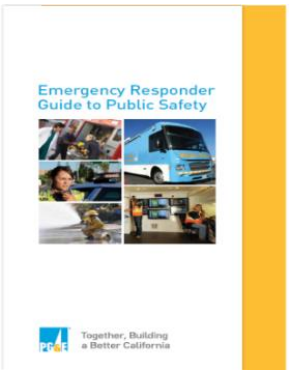


Figure 45 – Met with the 367 fire departments responding to gas incidents. These meetings focused on contingency plans in the event of an emergency.

Figure 46 – Hosted two Public Safety Liaison Meetings across the service territory to share PG&E's emergency response plans. Representatives from federal, state, county and city governmental agencies attended these meetings. (Photo Captured Pre COVID-19).

Figure 47 – Emergency Management and Public Safety attended and presented Public Safety materials for both gas and electric at two Safety Fairs and Conferences reaching over 650 people, including first responders and the public. (Photo Captured Pre COVID-19).

Figure 48 – Supported incident response activities (including dig-ins). Public Safety Emergency Preparedness acted as an Agency Representative between PG&E and the first responder community. (Photo Captured Pre COVID-19).

Figure 49 – Supported nine 811 Dig-In Reduction and safety-related activities in collaboration with the Damage Prevention team to improve safety within PG&E's communities and reduce the incidents of third party dig-ins. (Photo Captured Pre COVID-19).

V. Workforce

PG&E's work requires well-trained personnel to correctly perform work activities. As a result, the Company invests in recruiting and retaining, provides ongoing development and training, and maintains supportive controls for employee and contractor work. Well-trained, fully-engaged employees are a key component of Gas Safety Excellence.

For example, employees are required to don the appropriate Personal Protective Equipment (PPE) when they are in the field. Employees can refer to PG&E's PPE Matrix which documents the minimum PPE required when performing a certain task. PG&E annually reviews its PPE Matrix to evaluate the appropriateness of current PPE requirements. Employees in the field also document the controls for any identified hazards associated with their tasks using a Job Site Safety Analysis (JSSA) form. PG&E's PPE Matrix and JSSA are vital resources for employees as they plan their work prior to executing in the field.

In addition to typical PPE, the onset of COVID-19 in 2020 required leaders and employees to adapt to new COVID-19 PPE requirements. The Pandemic Response Team (PRT) was established to interpret and implement ever changing CDC guidance, as well as state and local regulatory requirements. PRT made frequent updates to Gas and Enterprise COVID-19 PPE guidelines and communications with a heavy emphasis on employee and public safety.

1. Workforce Size

PG&E's internal employee workforce works in conjunction with qualified contractors to perform quality work and maintain the safety of PG&E's gas system. Gas Operations engages the Workforce Planning function and Human Resources partners to determine the appropriate workforce size and types of roles that are required to fulfill our annual work objectives. We recruit qualified and talented employees and, at times, rely on the unique capabilities of various contracting firms during periods of peak or unique workload. PG&E has robust training programs and training facilities to develop its workforce so each of our employees has the knowledge to perform his or her job safely and confidently. Safety training starts on day one as part of new employee orientation and continues throughout each employee's career.

2. Workforce Safety Projects

In 2020, PG&E deployed several projects designed to improve employee safety. The focus was on taking care of employees before an injury gets worse. The following summarizes the proactive measures taken by Gas Operations in 2020 and their progress and successes:

RSI Guard – Gas Operations activated the RSI Guard software on employee computers and enabled set break/microbreak frequency to promote breaks, stretches and microbreak awareness to perform computer work in a healthy and safe way. Gas Operations performed at 95.7 percent overall break compliance in 2020, exceeding the goal of 85 percent compliance.

Remote Office Ergonomic Evaluations – Gas Safety coordinated efforts with Enterprise Health and Safety to ensure that proactive and discomfort evaluations were completed for employees working remotely as a result of COVID-19 impacts. In 2020, 1,753 Gas Operations employees working remotely received proactive ergonomic evaluations, with a 98 percent response rate from those that submitted evaluation requests. Discomfort cases were prioritized and proper equipment was identified, ordered and delivered to the employee's residence to resolve the discomfort.

Nurse Care Line – If an employee feels any pain or illness, they are encouraged to call the NCL for medical advice which can reduce the severity of an injury, if treated early. Nurse Care line timely reporting has increased between 2013 and 2019. In 2020 there was a decrease in reporting of injuries within the first day by 5.3 percent (as seen below):

Table 23 – Gas Operations - NCL Timely Reporting

	2013	2014	2015	2016	2017	2018	2010	2020
Total	61.8%	64.3%	63.1%	69.5%	74.0%	77.7%	80.8%	75.5%

Even with the slight decline in 2020, the focus on early reporting and prevention has contributed to the downward trend of injury severity and reduction in average cost per claim (see Figure 3 in Section I.3.b

Workforce Safety). While the total number of claims has increased since 2013, the majority are minor claims with fewer medical costs. We anticipate this downward injury trend will continue with increased timely reporting, IA utilization, Industrial Ergonomic evaluations, and Health and Wellness programs.

Industrial Athlete Utilization – Increased focus on PG&E's IA engagement and utilization in cities identified as having higher risks and exposures. IA's are trained physical therapists who focus on observing employee biomechanics, ergonomics and risk behaviors that result in identification of corrective actions and recommendations.

Industrial Ergonomics – Increased assessment of individual tasks being performed through the utilization of Humantech to identify the strategy for reducing discomfort and injury.

3. Workforce Training

PG&E's Gas Safety Academy in Winters, California, is a state-of-the art gas training facility that opened in August 2017. The facility includes a utility village, which provides realistic residential and commercial scenarios for leak survey, leak pinpointing, and emergency response. Other features include the Miller® LiveArc™ welding performance management system with a simulation/pre-weld setup mode and live-arc training mode allowing learners the opportunity to fine-tune their foundational welding skills, build confidence, become familiar with body mechanics, and build muscle memory prior to welding. Beginning in 2020, the Gas Safety Academy also accommodates the Aviation Services' Wildfire Drone Training program.

At the Gas Safety Academy, fundamental safety and code requirements are embedded within every course. Safety is non-negotiable and our standards align with the requirements of federal OSHA, Cal/OSHA, National Commission for Certification of Crane Operators, NACE, American Weld Society, and the California Department of Motor Vehicles. In 2020, the Gas Safety Academy rose to meet the unique safety challenges presented by COVID-19 by implementing and exceeding the county, state and federal guidelines. For instance, to ensure the safety of participants, instructors and facility staff, a new facility entry screening process was implemented which requires each individual on campus to pass a temperature check, submit a medical questionnaire, and wear a face covering. Class sizes were reduced, and classroom furniture was reconfigured to align with social distancing requirements. Additionally, the lunch distribution process was changed to provide prepackaged meals in individual containers with distribution by trained staff wearing gloves.

Table 24 – PG&E Number of Courses Developed or Enhanced from 2012 through 2020

2020	224
2019	112
2018	122
2017	162
2016	214
2015	107
2014	78
2013	88
2012	14
Total	**1,121**

In 2020, Gas Operations trained approximately 13,697 student days at the technical, apprentice, and leadership levels. As of December 31, 2020, PG&E had developed or enhanced 1,121 courses since 2012

(Table 24). PG&E continues to enhance and continuously improve the training, so that all classifications in Gas Operations have initial and refresher training.

Highlights from 2020 include:

- The implementation of the Leading with Safety program, which reimagined the new hire training journey for Utility Gas Service Representatives and Gas Utility Representatives to begin with an emphasis on safety through a multi-day blended learning experience aimed at improving physical and mental resilience and preventing injuries and accidents during their work activities.
- The Locate and Mark training program was re-accredited in 2020 by the National Utility Locating Contractors Association as an accredited locating training company.
- The M&C flow lab valves received an update as an ongoing approach to upgrade equipment to ensure alignment with changes in the industry.

In addition to providing employees training, the Gas Delivery team, in conjunction with the Gas Field Safety Specialist, provides First Responder training for local fire departments on how to safely respond to gas emergencies.

The Gas Safety Academy made significant improvements in 2020 to technologies used to facilitate learning. Mobile MyLearning was introduced to allow learners the ability to complete safety and compliance training on company smart devices without needing to travel to a headquarters. In addition to being a COVID-safe option, Mobile MyLearning provides the opportunity for on demand training and immediate content updates in the field. Furthermore, the Gas Safety Academy went paperless by converting class reference books to a digital format. A digital format allows notetaking on classroom iPads using Smart Mobile Workforce (SMW), learner access to classroom materials outside the classroom through SMW, material updates for learners after attending class, and a reduction in cost through the elimination of printed classroom materials.

The goal of PG&E Academy is to continuously maintain our curriculum to ensure it mirrors current safety practices, procedures, regulatory requirements and new equipment in the field. The recommendations in Table 25 are the output of a partnership between the LOB, SMEs, and PG&E Academy. The partnership starts with Gas Training Governance and is led by leaders within Gas Operations to ensure that PG&E Academy's projects are aligned to key initiatives and high-risk, high consequence tasks utilizing SME expertise to ensure that the training mirrors actual field conditions and scenarios. The Training Governance charter outlines the partnership with a mission to provide oversight, control, decision making, and coordination of its policies and processes that successfully supports PG&E Gas Operations' strategic objectives and operational goal of becoming the safest, most reliable Gas and Electric Company.

Table 25 – Gas Operation Training Recommendations 2012-2021	
2012 Recommendation	**Progress as of Dec 31, 2020**
Develop programs that support employees throughout their career	• Courses developed and aligned to business need and results are measurable. • Completed and enhanced apprentice and new employee programs developed to advance employees to journey-level competency. • Increased focus on refresher training to maintain skill and competence of existing workforce.
Broaden technology solutions and leverage external curriculum	• Deployment of mobile web-based training solutions available on iPad and iPhone. • Performance support solutions available via portal platform for most functional areas in Gas Ops. • A Virtual Learning (VL) studio was commissioned and placed in service at the Gas Safety Academy in Winters. Additional topic areas were taught as VL in 2019 – which reduces non-productive time and travel costs and increases consistency and quality of procedural updates and training.
Implement continuous training improvement processes	• Gas Operations Training Governance Committee continues to review and approve all major redesigned and new curriculum and training requirements. • The Academy partnered with the LOB and the Gas Qualifications department to develop technical training and qualification profiles for Gas Operations employees to ensure consistency amongst job classifications and to provide line of sight into who is trained and qualified to perform the work. • Training materials archived and verified supporting records management initiative.

4. Gas Operator Qualifications

PG&E's Gas Qualifications Department maintains and implements qualification programs covering welding, plastic pipe joining, and operator qualifications pursuant to federal and state regulations and industry best-practices.

PG&E requires that all employees, contractors and third-party installers of pipelines be appropriately trained, and possess all requisite qualifications to perform tasks on pipeline facilities. A qualified operator has the expertise to complete work correctly and is part of the team that helps PG&E meet its commitment to public and employee safety.

Figure 50 – Employees Taking Written Operator Qualification Exam (Photo Captured Pre COVID-19).

Pipeline tasks require specific competencies to be performed safely and reliably. These competencies are reflected in the "Knowledge, Skills, and Abilities" (KSA) needed for each task; KSAs are determined by a group of SMEs specific to each topic. An individual's KSAs are assessed via a combination of written and performance (practical demonstration) evaluations and candidates must score 100 percent on each component of an exam to be "qualified." Evaluations are primarily geared towards safety and recognizing and addressing Abnormal Operating Conditions (AOC). Qualifications must be renewed every six months, one year or three years depending on the task and applicable regulations.

Personnel utilize task specific Span-of-Control practices to gain hands-on experience working under the direction and observation of a qualified individual. Working under the direction and observation of a

qualified person allows a person in training to practice his or her skills in real-world conditions and gives the qualified person the opportunity to advise, to correct, and if required for safety, to take over the performance of the task.

By maintaining a qualified workforce, PG&E is in position to quickly and competently recognize and respond to any AOCs that may pose a threat to the safety of the public, employees or assets.

PG&E's Gas Qualifications Department actively participates in benchmarking and process improvement initiatives with other utilities and other industries across the country to continuously find ways to increase the expertise of the workforce.

5. Contractor Safety and Oversight

Contractors are an important aspect of PG&E's technical workforce. Since contractors often work with PG&E's assets and infrastructure that directly impact employee and public safety, the Company holds contractors to the same standard of safety as PG&E employees. The CPUC's Safety Culture OII proceeding (I.15-08-019) included a report that evaluated PG&E's safety practices, including those in Gas Operations. The report recommended that the Gas organization update the contractor safety procedure to clarify responsibilities and reflect current organizations and processes, including guidelines regarding frequency of field observations. The Contractor Oversight Procedures follow a four-step process (Figure 51) for contractor safety and oversight. Other revisions included updates to various responsibilities (Competent Site Representatives and Project Team), enhanced the contractor safety observation criteria, and added requirements for PG&E Safety Representative.

Figure 51 – Four-Step Process to Contractor Safety and Oversight

Prior to starting a job, PG&E *pre-qualifies* contractors and subcontractors, and confirms they are qualified to complete the contracted work through internal and third-party (ISN) reviews. PG&E continues to improve its contractor pre-qualification process and update to meet and exceed corporate requirements. PG&E evaluates the contractor's qualifications and performance results, including a host of personnel injury performance metrics. As part of this qualification, contractors on major capital and expense projects such as strength testing, pipe replacement, valve automation, and ILI, are also given in-person and computer-based training on PG&E's quality and safety expectations, and typical hazards associated with the work.

Once construction on a project has started, PG&E carries out a *plan* for contractor performance and clearly communicates contract terms that hold contractors accountable for safety and quality. Job-site observations start during pre-job walk-throughs to evaluate site specific hazards prior to starting work.

PG&E then schedules regular meetings with contractors to *oversee* their work and confirm expectations are met. In addition to regular oversight, PG&E inspects contractor work and a Quality Assurance (QA) team randomly checks project completion from beginning to end. On a quarterly basis, PG&E's leadership and contractor leadership meet to understand opportunities to improve the overall Contractor Safety and Oversight Program, analyzing both quantitative and qualitative trends in data from on-site observations and inspections.

After the job is complete, PG&E *evaluates* the contractor's performance using a scorecard that includes metrics on safety performance and contractual obligations. Contractors also have the opportunity to provide feedback to PG&E through a similar scorecard.

Contractor performance is tracked throughout the year and compared to Company performance. Figure 52 provides 2020 metrics on injuries and motor vehicle incidents. Note that in 2019, PG&E Construction Crews and Contractors outperformed in all performance metrics with the exception of OSHA recordable incidents when compared to PG&E as a whole. Construction Crews and Contractors worked over 8 million hours performing higher risk work.

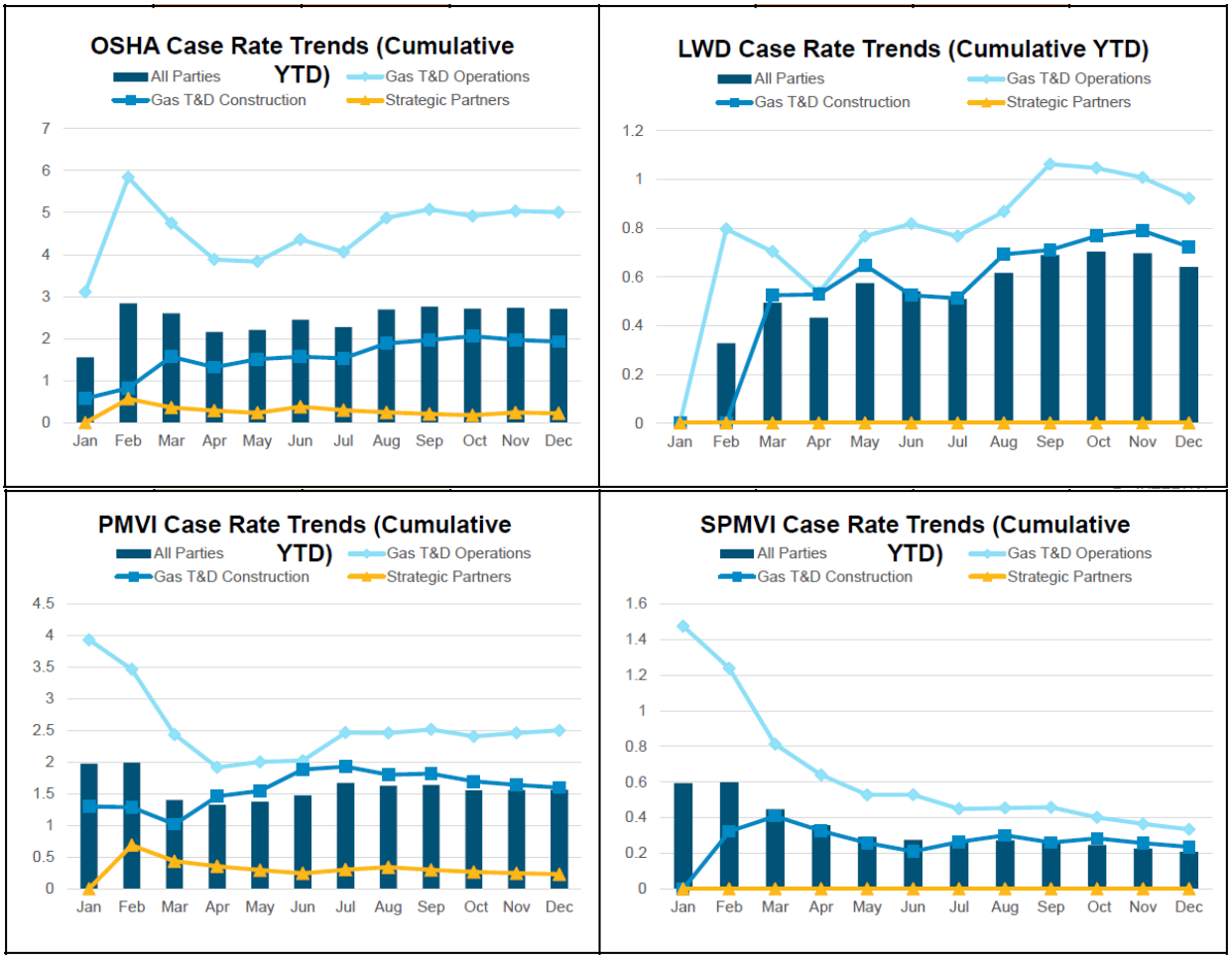


Figure 52 – 2020 Gas Safety Performance

Year-over-year reductions in all four categories show the shift in safety behaviors and culture for Strategic Partners. As depicted in Figure 53, the data demonstrates that between 2018 through 2019, OSHA recordables (ORI) had an increase in 2019 and improved in 2020. Preventable Motor Vehicle incidents saw similar increases in 2019 with an improvement in 2020. Comprehensive Site Specific Safety Plans, Increased hazard recognition and ongoing utilization of the backing/spotter plan has helped reduce the number of backing incidents in 2020, which contributed to the lower rates.

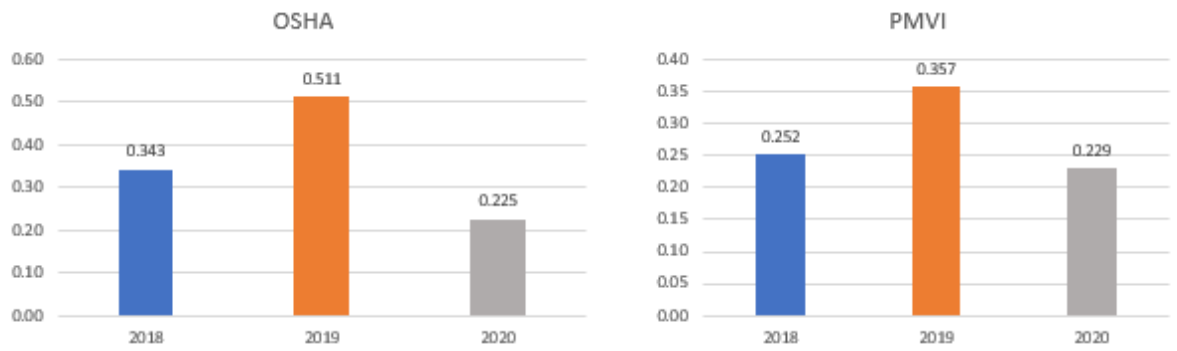


Figure 53 – Strategic Partner Safety Year Over Year Performance

PG&E believes that employees who are engaged at work and who feel recognized are far more likely to work safer, be more productive, make better decisions and produce higher quality work.

As PG&E strives to improve project safety, quality and productivity, the Company takes every opportunity to acknowledge when people are doing things right and recognize them for their specific efforts, innovations, contributions, hard work, safe work practices, good decisions, great planning, timely completion or any other specific accomplishment--no matter how small. In 2020, there were 519 "Good Catches" turned in to PG&E's safety and construction management function. This is a 42 percent decrease compared to 2019, which is a direct result of operational impacts from COVID-19. Everybody that turned in a "Good Catch" was recognized and the "Good Catches" were shared on a weekly call with all PG&E construction and contractor leadership. Contractors continue to speak up to raise awareness and share best practices

6. Partnership With Labor Unions

Union-represented employees make up almost 75 percent of PG&E's Gas workforce, and are integral to the Company providing safe and reliable gas service. PG&E frequently works with its union partners to identify opportunities for training, process improvement, and other investments in the safety of its union-represented employees and the public. In 2020, PG&E continued to collaborate with union leadership on projects such as improving emergency response and "make safe" times for blowing gas situations, over pressure events, enhanced lines of progression, Estimator in Training Program, Grassroots Safety Committee Partnership, and PG&E's Leak Survey Optimization Program.

The line of progression effort has updated job duties, training and certification for almost every represented field-based position. These changes have driven improved training and certifications for the Company's workforce (NACE certification[31] for corrosion mechanics, as one example), improving the safe and compliant delivery of service.

VI. Compliance Framework

PG&E transports and stores natural gas under the requirements of state and federal safety regulations. In 2016, PG&E adopted the Compliance Maturity Model to standardize and assess its regulatory compliance processes against industry best practices. The Model is composed of eight elements and five maturity levels. Figure 54 below shows the framework's eight elements and Gas Operations' maturity level for each of these elements at the end of 2020.

Figure 54 – Gas Operations Compliance Maturity Scores by Element

This framework provides Gas Operations a uniform outline from which to assess the performance of PG&E's compliance processes against their regulatory requirements. The Compliance Maturity Model also aims to bring visibility to PG&E's regulatory requirements, validate that controls are in place to meet those requirements, and structure the monitoring and testing of those controls for effectiveness while maintaining adequate programmatic oversight to keep compliance at the core of the work that we do. This approach aligns with the "Plan, Do, Check, Act" (PDCA) management method that PG&E employs throughout its operations as part of Gas Safety Excellence.

In 2016, a baseline performance assessment was conducted, and in 2017 the business began the work of aligning federal and state regulatory requirements to our processes and conducted periodic re-assessments against the framework's tiered performance thresholds. In 2019, although Gas Operations did not achieve an overall level three for its compliance maturity model, gaps were identified in all eight elements of the program. In 2020, Gas Operations developed a remediation plan to address these gaps, which included strengthening programmatic and process controls to manage compliance with current and future regulations. As a result, Gas Operations made significant progress in advancing to the next maturity level for five of the eight elements and achieving Level 3 maturity for three elements during the year-end assessment.

While the Compliance Maturity Model structures PG&E's strategic approach to compliance, day-to-day compliance performance continues to be built upon four key enablers:

- Employee expertise
- Providing employees the right information at the right time
- Making available the right resources at the right time
- Implementing supportive controls

1. Building Expertise

PG&E employees require specialized skills to be able to perform their jobs constructing, operating and maintaining the natural gas systems. As detailed in *Workforce Training* (Section V.3.) and *Gas Operator Qualifications* (Section V.4), the Company recognizes that its employees are a critical element in the compliant operation of the pipeline system every day; competent and capable employees perform work safely, effectively, and efficiently while using their knowledge and experience to identify and raise opportunities for continuous improvement.

2. The Right Information to Do the Work

A highly-skilled workforce is most effective when enabled with timely, accurate information from which to work. Gas pipeline work is highly technical, and if not performed correctly, could result in serious safety concerns. To enable the consistent performance of work across our service territory, written guidance documents, such as procedures and job aids, are utilized. These documents are stored electronically in the Technical Information Library and are reviewed on a routine basis so that that they reflect both regulatory requirements and best practices, as well as any lessons learned from Company or industry experiences. While this review and revision practice keeps the Company's processes at a state-of-the-industry level, it also requires significant efforts to keep all personnel performing work in accordance with these documents, are made aware of any changes and are provided with the requisite training and provided access to SME to maintain compliance.

PG&E continued the monthly publication schedule to pace the changes experienced by people performing the work, allowing for more time to receive and digest each change to their work between the publication date and the effective date of any given change. E-mail communications are sent out that separates changes based on several categories, allowing employees to more efficiently determine relevant changes.

In addition to technical guidance, employees need accurate and timely information about PG&E's pipeline assets. PG&E has two pipeline GIS mapping systems—one for transmission assets, and another for distribution assets. These systems contain geospatial information about the pipeline system including, in majority of the cases, detailed information about asset history, materials, manufacturer, and location.

These systems help PG&E to effectively conduct integrity management program work, locate mains and services, and plan for construction. PG&E works continuously to improve the quality of the information in both mapping systems. Given the volume of work performed on the pipeline systems every day, it is critical to have processes that update these mapping systems accurately, and in a timely manner. As prescribed in the Compliance Maturity Model, compliance goals need to be accompanied by effective controls and performance monitoring.

3. The Right Resources to Do the Job

Once the correct work has been identified, PG&E determines the number of internal and external resources needed to complete the portfolio of work efficiently. PG&E maintains agreements with multiple contractors and maintains a database of construction qualifications in order to assign work to the appropriate and most efficient resources. PG&E utilizes workplans comparing anticipated level of effort, including emergent work forecasts, to internal resource capacity, in order to signal the need for additional overtime, contractor resources, etc.

4. Supportive Controls

A compliant company utilizes numerous processes and programs to perform at a high level; some are aimed at monitoring or improving internal processes with corresponding compliance requirements and others are aimed externally, to help PG&E identify opportunities for continuous improvement or pending regulatory changes. Table 26 below details some of these processes and programs.

Table 26 – Compliance Processes and Programs
Quality Management (QM) – The QM group assesses and provides direct feedback on the work quality for PG&E's important safety programs, including locate and mark, regulator station maintenance, and as-built record development. [See Section VII.3 *Quality Management*].
Internal Audit (IA) – PG&E's IA team performs arm's length reviews for all the Company's lines of business, including Gas Operations, and is responsible for assessing control adequacy.
Non-compliance Self-Reporting – PG&E is committed to self-reporting compliance issues and taking prompt mitigative and corrective action to prevent recurrence. PG&E filed two Self-Reports in 2020 in accordance with the Safety Citation Decision.
Participation in Safety and Enforcement Division (SED) Inspections – In advance of CPUC SED inspections, PG&E self-evaluates gas divisions, districts and programs, such as Operator Qualification, Emergency Management and IM, and shares findings with the SED. PG&E's assessors spent approximately 11,000 hours in 2020 managing data response issues and supporting resolution. PG&E strives to resolve identified issues within the same inspection cycle and respond to any data requests within the duration of the inspection.
Cause Evaluation – Similar to the continuous improvement mechanism in PG&E's Process Safety management framework, cause evaluations are post-incident investigations that include an incident analysis and recommendations to prevent or mitigate future reoccurrence. Cause evaluations are conducted based on business determination of identified issues. The Gas CAP team completed 62 ACEs in 2020.
Evaluation of NTSB Reports – The NTSB investigates all serious pipeline incidents. PG&E SMEs routinely review NTSB reports to learn from pipeline incidents. As a result, PG&E may adopt new approaches to addressing threats, change work procedures or develop new training.
Evaluation of PHMSA Bulletins – PHMSA regularly issues safety advisories for pipeline operators. As new safety information comes to light at other gas companies in the US, PHMSA issues bulletins to help operators take preventative action.

Since 2019, Gas Operations has developed a Compliance Action Plan by analyzing historical compliance data from SED inspections and self-reports to identify improvement opportunities. Leveraging the process management framework (See Section VII.2 *Process Management*) and data analytics, the Regulatory Compliance team was able to organize our top compliance challenges by seven non-conformance drivers and partner with our POs and Process Managers (PM) in developing specific action items to address these top challenges. As a result of making data-driven decisions, Gas Operations made significant improvements in our compliance performance, reducing non-conformance by 80 percent in 2019 and another 40 percent in 2020.

In 2020, the Regulatory Compliance team advanced our continuous improvement efforts by partnering with the QM team. For the first time, the two teams performed a cross-functional data analysis to identify improvement opportunities in our quality assurance process. As a result, Gas Operations created new quality assurance programs and is working with POs and PMs to implement additional controls in their processes to prevent non-conformances.

VII. Continuous Improvement

Continuous Improvement is the mechanism through which PG&E continues to evolve from being reactive to proactive in the journey to Gas Safety Excellence. By continuously taking a critical eye to existing practices, and identifying the cause of challenges that arise, PG&E can move to correct problems before they result in compliance violations or in harm to PG&E employees or the public. While continuous improvement is embedded in PG&E programs, a few programs are highlighted below.

1. Lean Capability Center

In 2017, Gas Operations deployed a Lean System across the entire gas organization. The Lean Capability Center (LCC)[32] was created as the centralized hub to support each of the functions within Gas Operations in their deployment of Lean tools and practices. Lean is Gas Operations' approach to running Gas Operations now and into the future. It is an integrated system of principles, practices, and techniques for operational excellence based on empowering the front-line, identifying waste in our processes, and finding opportunities to continuously improve, all supporting the relentless pursuit of serving customers better. Lean improves safety, quality, and efficiency while enabling meaningful performance conversations up and down the organization.

Lean is a system of complementary tools that are incorporated into the four pillars of our Lean system, which are referred to as "loops" because they must happen in continual cycles. These tools are critical to the success of the system.

Figure 55 – Lean Management System in Gas Operations

Examples of Lean tools and practices include: huddles, visual performance management, standard work, waste identification, problem solving, and leader standard work. The LCC is primarily responsible for establishing a consistent Lean strategy for all of Gas Operations, developing Lean curriculum, facilitating training, sharing best practices, building tools to ensure the sustainability of Lean, and supporting the functional teams.

Huddles are quick, structured conversations among team members that occur daily or several days a week. Huddles provide a platform for employees to speak up and raise issues, share resolutions and

information, discuss progress on goals and targets at each level, and recognize individuals and/or teams for great work and successes. A huddle board is a visual performance management tool that helps facilitate the huddle discussion. Huddles cascade throughout the organization and follow the same general agenda to ensure consistency. Information is moving more freely than before from front line supervisors to the Executive level, and vice versa. LCC provides expertise, capability building and targeted Lean support.

In 2020, the LCC accomplished the following successes:

- Developed a Change Management Toolkit to help ensure improvement initiatives achieve desired outcome;
- Developed Continuous Improvement Initiative Management System (CIIMS) tool to track and manage improvement initiatives to completion;
- Launched the Supervisor Central Program, which is a leadership development program for frontline supervisors within Gas Operations; and
- Leveraged Hoshin Strategic Planning to improve the goal setting process.

Hoshin Strategic Planning is intended to improve goal setting process at the Top Level and align goals throughout the organization. The benefits of Hoshin are:

- Achieve better alignment through strategic thinking and goal setting;
- Improve communication among teams across the organization;
- Focus efforts on the most important work; and
- Everyone understands how their work contributes to organization's goals.

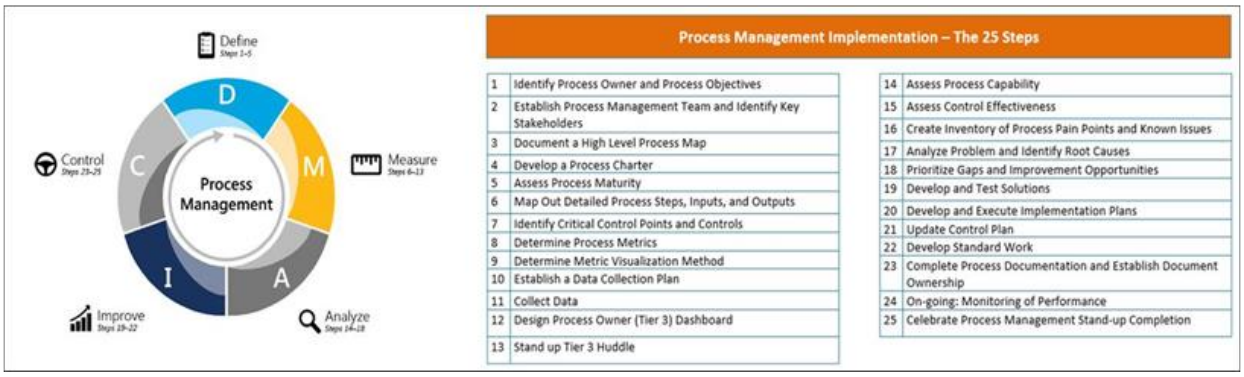
The Focus of the LCC in 2020 was to help teams achieve business objectives. Below are examples of Continuous Improvement Projects completed:

- Operator Qualifications Field Control Documentation;
- Process Architecture Refinement;
- Enterprise Corrective Action Program Risk Matrix;
- Cause Evaluation cycle time;
- MAOP Responsible, Accountable, Consulted, Informed;
- Enterprise Work Management: transforming the way we work during a pandemic and beyond;
- Asset Program Owner Roles & Responsibilities Matrix;
- Over Pressure Reporting Process; and
- Materials Traceability – new Transmission Mega Rule.

2. Process Management

Process Management involves planning, monitoring, and controlling the performance of a business process with the goal of meeting customer and business requirements. Process Management enables individual functions to understand and work towards common process goals. As such, Process Management promotes safety, reduces costs, increases quality and efficiency, and ensures process controls are in place. With a well-defined process, work can also be optimized across functions. Process management involves the application of knowledge, skills, tools, techniques and systems to manage a process. It helps to set up the foundation, where Process Improvement can continue evolving the process performance.

The Process Management Playbook uses a 25-step approach to establish process management, which incorporates Lean principles and includes developing metrics, confirming the right controls are in place, and ongoing monitoring of performance. Process Management efforts focused on processes with a significant impact (those with a high safety and/or quality risk, high number of compliance findings, etc.). In 2019, each process stood up their Tier 3 Huddle (Step 13) and a Tier 4 huddle was stood up for all four mega processes. The benefit of these huddles is to provide a venue for POs and Managers to meet with the end-to-end process stakeholders to review metrics and discuss performance, improvements and issues. Additionally, each process created or updated standard work documents (Step 22) and posted them to the centralized and universally accessible Gas Operations Knowledge Portal and 18 of 39 processes completed all 25-steps of process maturity (see Figure 56 below).



Process Management Implementation – The 25 Steps

1	Identify Process Owner and Process Objectives
2	Establish Process Management Team and Identify Key Stakeholders
3	Document a High Level Process Map
4	Develop a Process Charter
5	Assess Process Maturity
6	Map Out Detailed Process Steps, Inputs, and Outputs
7	Identify Critical Control Points and Controls
8	Determine Process Metrics
9	Determine Metric Visualization Method
10	Establish a Data Collection Plan
11	Collect Data
12	Design Process Owner (Tier 3) Dashboard
13	Stand up Tier 3 Huddle
14	Assess Process Capability
15	Assess Control Effectiveness
16	Create Inventory of Process Pain Points and Known Issues
17	Analyze Problem and Identify Root Causes
18	Prioritize Gaps and Improvement Opportunities
19	Develop and Test Solutions
20	Develop and Execute Implementation Plans
21	Update Control Plan
22	Develop Standard Work
23	Complete Process Documentation and Establish Document Ownership
24	On-going: Monitoring of Performance
25	Celebrate Process Management Stand-up Completion

Figure 56 – 25-Steps of Process Maturity

Process Management teams include POs, PM, Process Analysts, and other key stakeholders. To assist in on-boarding new POs and PMs, the LCC team designed, coordinated and rolled out of Lean Web Based Training and the Process Management Playbook. As we continue to deploy the Lean System, POs with support from the LCC will continue applying the Process Management Framework to improve the maturity of Gas Operations' processes.

In 2020, the LCC accomplished the following successes in Process Management:

- Refined Process Architecture to improve clarity and accountability
- Supported **29 processes to complete all 25 steps** of maturity (of which eight are not in the Process Architecture)
- Created **process performance visibility** and effectiveness—stood up all Tier 3 and Tier 4 huddles

3. Quality Management

Gas QM is comprised of QA at the Gas Operations level and QC situated within the functional work groups. QC looks for defects in the work being performed and in the corresponding records. QA is a combination of Quality Verification assessments that validate the effectiveness of QC looking for nonconformances to procedures and QA audits that look to prevent defects by identifying process gaps and recommending corrective actions. Together, QA and QC along with Compliance under the Quality Management System umbrella are working together to drive down noncompliance risks. The following illustration depicts the layers of defense working to mitigate noncompliance risk.

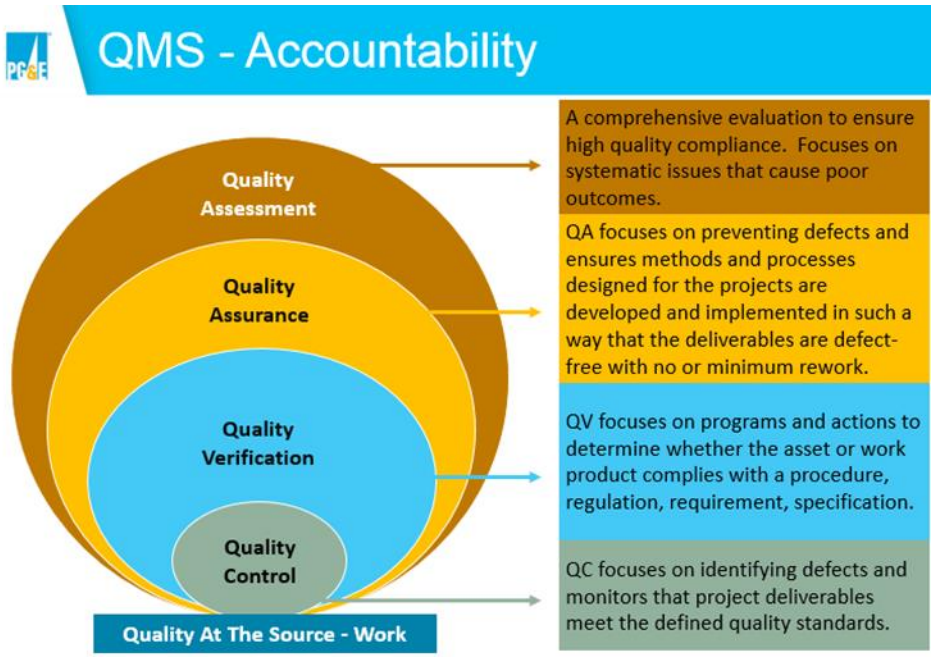


Figure 57 – Layers of Defense Against Noncompliance Risk

The QMS and collaborative approach to quality allows for continuous improvement and drives consistency by identifying non conformances, recommending corrective actions and following up with mentoring and coaching people doing the work. It also continues to be in alignment with the fundamental principles of the QMS which leverages the "PDCA" framework (Figure 58 below). PDCA being the iterative four-step management method used in business for the control and continuous improvement of processes and products. Just as a circle has no end, the PDCA cycle should be repeated for continuous improvement.

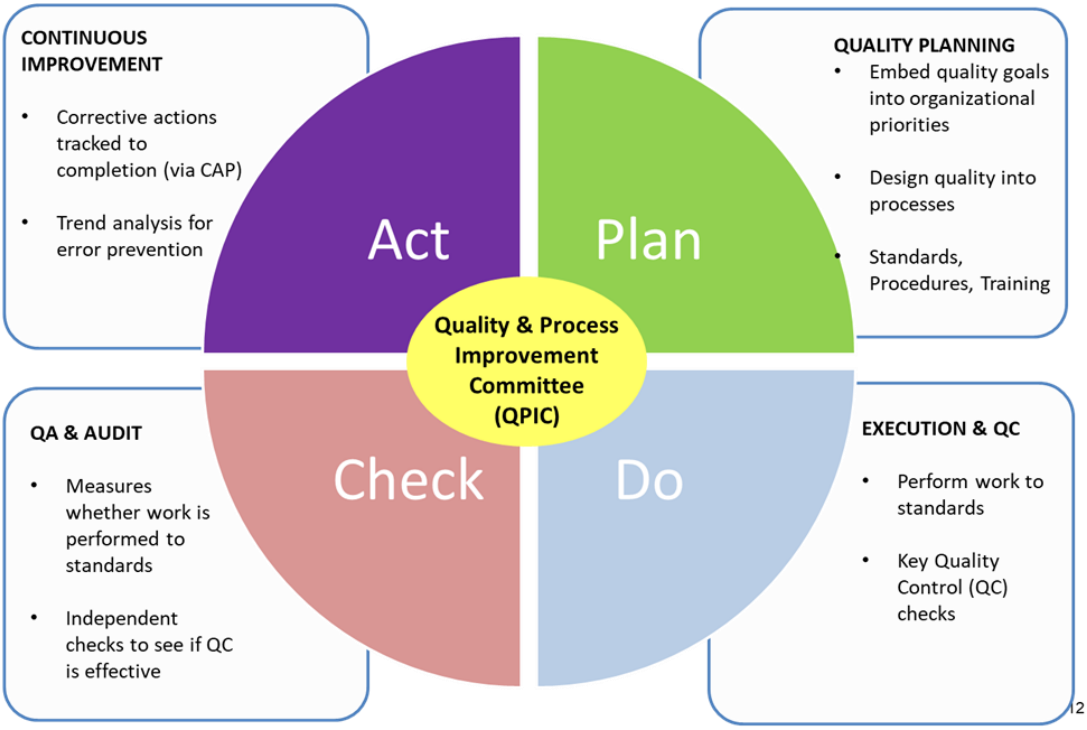


Figure 58 – QMS Fundamental Principles

In 2020 T&D construction, regulator stations and valves and As-Built job packages continued to be reviewed by QC and QA. Gas Operations shifted QC to local leadership for locate & mark, leak survey and corrosion field work. Compliance records continued to be reviewed by our Compliance Desk Field Engineers. Field Service QC and QA remained unchanged. There are currently 17 active QA programs as of December 2020 and are shown in Table 27 below.

Table 27 – List of Quality Management Programs as of 2020	
Leak Survey (including Atmospheric Corrosion Meter Inspections)	Post-Repair Leak Survey
Locate and Mark	Distribution Construction
Field Service	Transmission Construction
Valve Maintenance	Regulator Station Maintenance
Corrosion Control	Rotary Meter Installation and Maintenance
Internal Records Review	Gas Transmission and Distribution As-Builts
Chain of Custody	Post Construction Asset Validation
QA Pipeline Features List (PFL)	GT Alignment
Scanning & Attributing	

In keeping with our QMS maturity journey and expansion of our quality oversight we also accomplished the following in 2020:

- Implemented Natural Error Rate for Quality Performance Metrics;
- Mapped QA/QC data with Compliance drivers to allow gap analysis of comparable non-conformances and non-compliance Notice of Violations and Self Reports;
- Developed a Quality Auditing playbook;

- Incorporated QA Audits into standard work;
- Defined roles and responsibilities within QMS;
- Increased American Society for Quality Certified Quality Improvement Associate certifications by four percent;
- Expanded QM Corrosion Program assessment scope to include Exposed Pipe and Casings;
- Performed 2,490 quality assessments in the field and 5,241 records reviews;
- Developed and delivered As-Built Job Package quality review training for QC to further knowledge and consistency across QA and QC;
- Implemented standard process to ensure version control across multiple work locations that store Operating Maps and Operating Diagrams; and
- Migrated MS Excel/Access data to SQL database creating a single source for quality data and eliminating reliance on multiple data sources.

In 2020, quality performance across Gas Operations was measured in terms of a natural error rate where all nonconformances (regardless of high, medium or low risk ranking) were equal and the rate was calculated by dividing the number of nonconformances found by the number of items assessed. This shift was to drive corrective actions for all nonconformances versus those considered high risk. Over the past few years high risk non conformances have been vastly reduced allowing us to expand our focus. PG&E continues to track high risk findings and track the corrective actions required to remedy a nonconformance.

Gas Operations Quality Assurance Metric - FIELD						
2020 YTD Findings						
	High	Medium	Low	Total Findings	Total Checked	Error Rate
Overall QA Metric - FIELD	40	253	720	1,013	88,986	0.0114 (1.138%)

Gas Operations Quality Assurance Metric - RECORDS						
2020 YTD Findings						
	High	Medium	Low	Total Findings	Total Checked	Error Rate
Overall QA Metric - RECORDS	14	138	147	299	73,860	.0040 (0.405%)

Figure 59 – 2020 QA Field Performance Metric

4. SQA FOR DISTRIBUTION AND TRANSMISSION

The SQA organization is responsible for assuring the safety and quality of material provided by PG&E's suppliers. If non-conforming material is purchased to be used in pressurized gas systems it might introduce a safety risk to employees, the public, and to the gas infrastructure.

PG&E's SQA group collaborates with engineering, construction, and supply chain to enforce rigorous standards for incoming material and assures that qualified suppliers provide material that meets PG&E's product qualification requirements. SQA has significantly reduced Defective Parts Per Million (DPPM) since 2014. The 2020 DPPM performance was 321 against the target of 344. For 2020, SQA introduced two new DPPM metrics (DPPMs = standard products inspected historically, and DPPMn = newly introduced products to be inspected) which will aid PG&E in refocusing its quality efforts and allow to inspect more products while supporting material risk reduction initiatives.

SQA achieved significant performance since 2013 for quality programs driving supplied material to an ultimate goal of being defect free. Ninety-three percent of PG&E's supply base has achieved third-party ISO 9001 certification of their QMS. SQA was re-certified to ISO 9001:2015 QMS and had zero non-conformities for all audits. Through PG&E's cross functional teams and supplier partners, SQA processed 151 Supplier Change Requests in 2020 and seven supplier material recalls. In addition, SQA conducts an annual supplier survey to identify improvement opportunities.

5. RESEARCH AND DEVELOPMENT AND INNOVATION

The Research and Development and Innovation (R&D and Innovation) Group brings innovative technologies and solutions from industry, government, and academia to PG&E's Gas Operations.

R&D and Innovation is embedded within Gas Operations through Gas Safety Excellence and the continuous improvement process. R&D and Innovation's work is prioritized based on the results of the Risk Management Process, so projects and innovations align with the most critical needs of the business [see Section IV.3. *Risk Management Process*]. R&D and Innovation projects and their results are directly included within each Asset Family Safety Plan to assure that new technologies and methods are effectively leveraged to improve the safety, reliability and cost effectiveness of PGE's assets.

In 2020, the R&D and Innovation team has managed and implemented a broad portfolio of more than 200 active projects covering seven priorities in collaboration with leading U.S. and overseas utilities and R&D organizations:

- Understanding the conditions of our assets focusing on inspection techniques including In Line Inspection, Non-Destructive Examination for steel and plastic pipelines;
- Extending the safe operational life of our assets, addressing corrosion and ground movement issues;

- Developing proactive operations through new data collection and processing methods and technologies;
- Reinventing leak management including methane emission abatement;
- Preventing dig-ins by improving asset localization, introducing new excavation management methods and developing new underground asset detection technologies;
- Improving construction method with an emphasis on ergonomics and personal safety; and
- Decarbonizing California's energy system through new fuels including Renewable Natural Gas, Biomethane and hydrogen.

PG&E also uses the Center for Gas Safety and Innovation in Dublin, California. Opened in 2017, this facility consists of work and lab space with advanced tools, testing capabilities and lab resources, with the goal of continuing to lead in the development of new methods and technologies to enhance gas safety. The work performed at this facility includes, among other things, working with other industry participants to find and test new products and processes, testing and evaluating M&C devices that contribute to the safety of PG&E's gas system, and conducting Non-Destructive Examination on PG&E's pipelines to ensure asset integrity.

PG&E participates in collaborative efforts with national and international R&D organizations such as PRCI, NYSEARCH, Operations Technology Development and Utilization Technology Development. PG&E also works closely with R&D programs at the California Energy Commission, PHMSA, the CARB, the Department of Energy and multiple universities including Stanford (through the Natural Gas Initiative), University of California, Berkeley, University of California, Davis, University of California, Irvine, etc.

Examples of 2020 results include the following:

- R&D and Innovation identified an opportunity to improve the accuracy of our gas distribution maps by capturing high accuracy GPS data during the Locate & Mark process (about one million gas tickets received each year). In 2016, the R&D and Innovation team conducted a pilot to compare the GPS locations between the above ground locate mark versus the actual location of the exposed asset to understand the quality and accuracy of the data collected from the locator. As a result of the successful pilot, three PG&E-approved locator vendors initiated the integration of high accuracy GPS within their systems. A major milestone was reached in 2020 when Vivax-Metrotech launched its new GNSS-enabled vLoc3 RTK-Pro locator to the public that was initiated from a request by R&D and Innovation. This commercialized tool will allow Locate & Mark field users to capture with minimal impact on their current workflow precise asset locations that can potentially be digested into our GIS.
- PG&E's Gas R&D and Innovation became the leader of PRCI's hydrogen initiative under the new Emerging Fuels program. In 2020, PG&E led PRCI's hydrogen state-of-the-art study with over

30 organizations to identify the R&D needed across a timeline for companies to safely and reliably inject hydrogen into their pipelines at certain blend levels. The top three challenges were identified that PRCI is uniquely positioned to address. PG&E will continue driving research efforts forward for PRCI and the industry.

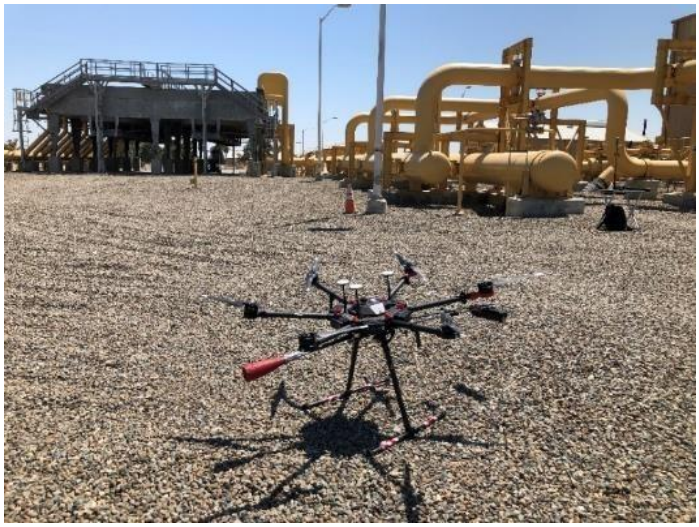


Figure 60 – Drone equipped with RKI's high sensitivity methane sensor to assess methane emissions at a compressor station

Figure 61 – Using the Vivax-Metrotech GNSS-enabled vLoc3 RTK-Pro locator to collect GPS coordinates of an underground asset

6. Benchmarking and Best Practices

Benchmarking is an important step in PG&E's overall continuous improvement effort and is used to identify industry best practices. Best practices include, but are not limited to, widely-recognized natural gas practices that directly enhance public and personnel safety over time. Benchmarking is one

component of understanding what may constitute an industry best practice and is accomplished by both formal and informal means. There may also be more than one single industry "best practice" in any given program area. Therefore, PG&E's best practice identification often begins with identifying a published industry standard that provides guidance and sets overall direction for a program or technical discipline and discussing with other utilities. When standards are not readily identifiable, PG&E may employ various methods, such as reaching out to industry associations, experts, and other utilities, to discuss best program approaches, and then develop detailed procedure manuals to document the practices. PG&E relies on various outlets for benchmarking best practices such as reviewing standards written by SMEs and public agency publications, and participating in industry associations. How PG&E utilizes each of these outlets is described in the next sections.

a) Industry Standards Written by SMEs

One informal benchmarking practice that PG&E pursues is identification and use of standards written and reviewed by SMEs. Sometimes these standards are referred to as "consensus" standards, meaning that the publisher believes that they represent proven practices in that particular field. In addition to seeking best practice standards that originate in the U.S., PG&E identifies international standards for best practices, including European and ISO. PG&E has adopted for use several European standards. In another example, PG&E pursued the certification of ISO 55001, the international asset management standard, and has both achieved and sustained certification.

PG&E relies on associations such as the ASME and the API, to facilitate the development of best practices, prescribe codes and standards for the natural gas industry, to provide forums such as conferences and meetings for like members to learn about relevant best practices, publish best practice literature, industry reports, and relevant industry statistics, and to provide technical continuing education. Some of PG&E's foundational risk management and gas program activities follow ASME standards and API consensus standards that are referenced in code, such as B31.8S, Managing System Integrity of Pipeline Systems and RP 1162, Public Awareness programs.

b) Agency Publications

PG&E reviews relevant agency documents to gain insight into what regulatory and investigation agencies view as best practices. PG&E incorporates input from previous proceedings and reviews, including the CPUC, the NTSB, PHMSA, and reviewers contracted by these entities.

As an example, PG&E has a procedure to ensure appropriate responses to PHMSA advisories and any proposed or final rulemaking notices from other regulatory agencies. The procedure expedites reviewing, assigning, and tracking of all Gas T&D related advisory bulletins and proposed or final rulemaking notices from any regulatory agency in a timely manner.

c) Peer Associations

Benchmarking is performed with a variety of utility and non-utility entities to improve PG&E's understanding of how other companies manage various operational programs, including best practices related to safety. For instance, PG&E personnel learn about best practices from interacting with peers and industry experts in organizations such as the INGAA, AGA, NACE International (formerly known as the National Association of Corrosion Engineers), API, ASME, Southern Gas Association, Public Service Enterprise Group (PSEG), the Common Ground Alliance and other organizations.

PG&E employees participate in and present at a variety of industry conferences. These conferences are gatherings of industry representatives with similar backgrounds to discuss best practices, review emerging practices, share operating information, and build networks for future best practice sharing. Some of the peer-to-peer associations PG&E participates in are described below in more detail.

d) American Gas Association

As part of PG&E's continuous improvement commitment to safety in Gas Operations, the Company is an active member of the AGA. The AGA helps PG&E share, validate and learn about gas safety best practices through targeted Operating Committees and Discussion groups with peer organizations. For example, PG&E participates in the AGA SOS Survey Program by both distributing and responding to surveys with topic-specific information requests throughout the year and utilizes the data provided by other U.S. utility gas companies.

e) Interstate Natural Gas Association of America

The INGAA and the INGAA Foundation develop consensus guidelines and position papers based on the input of its members. PG&E considers these materials to constitute evidence of natural gas transmission pipeline companies "best practices" and are widely recognized in the industry as such. INGAA has a membership base that owns approximately 200,000 miles of natural gas pipeline in North America. PG&E relies on INGAA to facilitate the identification, development and sharing of best practice materials.

f) NACE International

PG&E also relies on NACE International to identify and develop standards, test methods and material recommendations that are widely regarded as best in the field of corrosion and specifically for CP and coatings. NACE International creates these materials through the subject matter expertise of its members. NACE International has over 28,000 members in over 100 countries.

g) Western Energy Institute

The Western Energy Institute (WEI) is the premier Western association of energy companies that implements strategic, member-driven forums, identifies critical industry issues and facilitates dynamic and timely employee development opportunities. WEI provides forums for exchanging timely information on critical industry issues, information about industry best practices and skills training. PG&E also participates on several committees.

h) Public Service Enterprise Group

The PSEG is a publicly traded diversified energy company headquartered in Newark, New Jersey and was established in 1985. The company's largest subsidiary is Public Service Electric and Gas Company (PSE&G).

The Gas and Electric Utility Peer Panel was established in 1993 and is a collaborative effort between member utility companies that focus on sharing benchmark data on an annual basis.

PSE&G developed the panel of companies for exchanging accurate and meaningful data on key performance metrics.

i) Additional Benchmarking Efforts

In addition to the numerous associations, PG&E also uses informal means of benchmarking including using the expertise brought to the Company by new-hires and contractors with industry experience, by attending trade conferences, and by information sharing with other utilities.

PG&E also uses benchmarking to facilitate continuous improvement. When possible, PG&E benchmarks metrics to understand performance against peers.

Industry performance also informs target-setting. The following chart lists a few key safety metrics that PG&E benchmarks against other utilities:

Table 28 – Key Benchmarking Metrics

PG&E's Commitment to Safety	Measurement
Emergency Odor Response	Average response time
Year-End Grade 2 Leak Backlog	Per 1,000 miles of mains and services
Year-End Grade 3 Leak Backlog	Per 1,000 miles of mains and services
Lost Work Day Case Rate [(a)]	LWD per 200,00 hours worked
Third Party Dig-In Reduction	Number of dig-in incidents per 1,000 tickets

(a) This measure is benchmarked at the Company level.
Comparative data associated with these benchmarks may be protected by confidentiality or non-disclosure agreements.

VIII. CONCLUSION

The 2021 Plan update demonstrates PG&E's commitment and progress in implementing processes, programs, and procedures to achieve its vision to becoming the safest and most reliable natural gas utility in the nation. The GSEMS guides how PG&E operates, conducts, and manages all parts of its business by putting the safety of the public, PG&E's customers, and PG&E's employees and contractors at the center of its work; investing in the reliability and integrity of its gas system; and, by continuously improving the effectiveness and affordability of its processes. PG&E has made continued progress, but recognizes that there is more to be done in its journey to Gas Safety Excellence.

IX. ENDNOTES

1 See Attachment 1 for a Table of Concordance that provides a mapping between the Public Utilities Code Sections 961 and 963 and the Gas Safety Plan sections.

2 In October 2011, the California legislature signed into law SB 705, which declared "[i]t is 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." SB 705 was codified as Public Utilities Code §§ 961 and 963(b)(3).

3 DART: Injury that results in days away, restricted or transferred duty, rate based on 200,000 hours worked.

4 Degree considerations can include: physical harm vs. immediate life threatening; redundancy vs. single point failure; recovery vs. point of no return; local vs. widespread, monetary impact.

5 In 2017, a Federal Court-Appointed Monitor was assigned to PG&E to oversee PG&E's safety performance for the period of PG&E's court-ordered probation stemming from its conviction in connection with the San Bruno incident and resulting NTSB investigation.

6 An employee-led team that promotes safe work habits, shares information and best practices, promotes open and honest communications, and finds innovative methods to perform work safely.

7 This system was designed based on the elements of Process Safety developed by the Center for Chemical Process Safety, a branch of the American Institute of Chemical Engineers.

8 API RP 754 identifies leading and lagging indicators for nationwide public reporting, as well as indicators for use at individual facilities including methods for the development and use of performance indicators. This comprehensive leading and lagging indicators program provides useful information for driving improvement and when acted upon contributes to reducing risks of major hazards (e.g., by identifying the underlying causes and taking action to prevent recurrence). The indicators are divided into four tiers that represent a leading and lagging continuum. Tier A is the most lagging and Tier D is the most leading.

9 See Attachment 3.

10 See Attachment 4.

11 See Attachment 5.

12 See Attachment 6.

13 See PG&E's 2019-02 Gas Transmission & Storage Safety Report (submitted on May 15, 2020) and PG&E's 2019 Gas Distribution Pipeline Safety Report (submitted on March 31, 2020).

14 American Petroleum Institute (API) Recommended Practices (RP) 1170, Design and Operation of Solution-mined Salt Caverns Used for Natural Gas Storage. API RP 1170 provides functional recommendations and covers facility geomechanical assessments, cavern well design and drilling, solution mining techniques & operations, including monitoring, and maintenance practices.

15 API Recommended Practices (RP) 1171, Functional Integrity of Natural Gas Storage in Depleted Hydrocarbon Reservoirs and Aquifer Reservoirs. API RP 1171 recommends that operators manage integrity through monitoring, maintenance and remediation practices and applies specific integrity assessments on a case-by-case basis.

16 The Transmission Pipe asset family includes valves outside of station boundaries and not otherwise included in the M&C asset family, which are those valves defined in TD-4551S – Station Critical Documentation. An example of valves included in the Transmission Pipe asset family includes manually operated mainline valves.

17 As set forth in 49 CFR Part 192, Subpart O.

18 In early 2021, the Enterprise Risk Committee was renamed the Public Safety Risk Council. The council's strategic objective is to develop and monitor the strategic planning and execution of risk management by providing independent review and challenge of key risks, ensuring executive leadership knowledge of all key risks, and driving risk management best practices consistently across the Enterprise.

19 49 CFR §192.614.

20 California Government Code §4216.

21 Investigation (I).18-12-007 Order Instituting Investigation and Order to Show Cause on the Commission's Own Motion into the Operations and Practices of PG&E with Respect to Locate and Mark Practices and Related Matters.

22 The term cross-bore is broadly defined as an intersection of an existing underground utility or underground structure by a second utility resulting in direct contact between the transactions of the utilities. The cross bore can compromise the integrity of either utility or underground structure. Examples include gas, telecom, water, storm, and sewer among others.

23 Identified mileage does not include girth welds or branch connections. Additionally, it does not include the miles of pipe that would be necessary when pipe replacements are rolled into engineered projects.

24 This program does not address the threats posed when natural gas pipelines that cross active earthquake faults. Please refer to PG&E's Earthquake Fault Crossing Program in Section IV.5.i.

25 Tensile stress is when equal and opposite forces are applied on a body, in this case a pipeline.

26 In 2015, PG&E implemented the use of an advanced leak detection technology, Picarro Surveyor, into a standard leak management operating model. Since 2017, PG&E's operating model is being used in each division as a standalone process. This has created additional efficiencies and lower overall cost to the Company. Using this model, PG&E has been able to complete its compliance survey in a more timely fashion. The second step in the model's process is to immediately repair all hazardous leaks identified during the survey and to schedule for repair all identified leaks that meet the schedulable leak criteria. Finally, PG&E bundles the scheduled leak repair job packages allowing a more efficient and effective repair strategy.

27 2017 GRC Exhibit (PG&E-3), Chapter 6C, page 6C-4, fn. 10, "It will never be possible to survey the entire system with the Picarro Surveyor due to Abnormal Operating Conditions (AOC) and physical conditions that lessen the coverage of the technology…" PG&E surveyed one hundred percent of its divisions with the technology in 2020 and in doing so it covered seventy-five percent of the distribution system.

28 An extensive benchmarking effort with European operators plus a review of European regulations led to the development of a strategy that supports the goal to eliminate OP events with the deployment of a secondary overpressure protection device under certain conditions.

29 PG&E's California Gas Transmission Pipe Ranger website Supply and Demand Archives, https://www.pge.com/pipeline/operations/cgt_supplydemand_search.page. Execute search for December 31, 2020 and preceding 366 days, then add values listed in "Total System Supply" row.

30 The GERP complies with CFR Title 49, Transportation, Part 192—Transportation of Natural and other Gas by Pipeline: Minimum Federal Safety Standards,

Section (§) 192.615, "Emergency plans." and (§)192.605 "Procedural manual for operations, maintenance, and emergencies."

31 NACE, formerly known as the National Association of Corrosion Engineers, is an international organization focused on developing industry standards for corrosion management, teaching best practices, and researching corrosion issues. NACE provides multiple certificate programs in a variety of corrosion management areas.

32 Created as part of Gas Stewardship and was formerly known as Super Gas Operations (SGO) and Process Excellence. The LCC includes a select group of leaders from the organization to implement the Lean Management System in Gas Operations organization.

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