



Testimony of

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National Transportation Safety Board

Before the

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— On —

Gas Safety Retrospective: A Decade Since San Bruno

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Chairman Hill and Members of the Subcommittee, thank you for the opportunity to testify today concerning the National Transportation Safety Board's (NTSB) investigation of the pipeline rupture and fire in San Bruno, California, that occurred a little over 10 years ago, and the progress that has been made in pipeline safety since that accident.

More than 2.5 million miles of pipelines crisscross the nation, delivering important resources such as natural gas, oil, and other hazardous liquids, to consumers. Pipelines are integral to our economy, providing the fuel that powers our homes and industries. Pipelines are one of the safest and most efficient modes of transportation, but, as the community and residents of San Bruno experienced, when their integrity is compromised, the consequences can be devastating, especially when safety standards are not observed or implemented.

On February 4, 2019, we announced our Most Wanted List of Transportation Safety Improvements for 2019–2020.¹ This list identifies 10 focus areas for transportation safety improvements based on issues identified through our investigations. Many of the issues on the Most Wanted List address multimodal challenges for improving safety, including alcohol and other drug impairment and fatigue. One issue area is specific to pipeline safety: Ensuring the Safe Shipment of Hazardous Materials.

The NTSB has completed more than 120 investigations of hazardous liquid pipeline ruptures and natural gas pipeline explosions since 1967, which have demonstrated the potential for loss of life and property damage. In response to these accident investigations, the NTSB has issued more than 1,300 recommendations to federal, state, and local agencies, and industry. More than 80 percent of these recommendations have been closed favorably, meaning they have been adopted by their recipients, mandated by Congress, or implemented through oversight agency action, resulting in significant improvements in pipeline safety. The purpose of our investigations and our recommendations is to prevent other similar accidents from happening again. The tragic San Bruno pipeline rupture was a watershed event for pipeline safety, and the lessons learned from it compelled positive actions to be taken to minimize the safety risks that underground pipelines present.

San Bruno Investigation and Safety Impact

The NTSB determined that the probable cause of the pipeline rupture was Pacific Gas and Electric Company's (PG&E's) (1) inadequate quality assurance and quality control in 1956 during its Line 132 relocation project, which allowed the installation of the substandard and poorly welded pipe section with a visible seam weld flaw that, over time grew to a critical size, causing the pipeline to rupture during a pressure increase stemming from poorly planned electrical work at PG&E's Milpitas Terminal where Line 132 originates – approximately 39 miles south of where the rupture occurred; and (2) an inadequate pipeline integrity management program, which failed to detect and repair or remove the defective pipe section. Contributing to the accident were the actions taken decades ago by the pipeline safety regulator within the state of California, the California Public Utilities Commission (CPUC), and the U.S. Department of Transportation (DOT) to grandfather pre-1961 and pre-1970 pipelines, respectively, from the regulatory requirement for pressure testing, which likely would have detected the installation defects. Also

¹ National Transportation Safety Board, *2019–2020 Most Wanted List*.

contributing to the accident was the CPUC's failure to detect the inadequacies of PG&E's pipeline integrity management program. Additionally, contributing to the severity of the accident were the lack of either automatic shutoff valves or remote control valves on the line and PG&E's flawed emergency response procedures that delayed the isolation of the rupture to stop the flow of gas.²

As the result of our investigation, we made 39 recommendations to the U.S. Secretary of Transportation, the Pipeline and Hazardous Materials Safety Administration (PHMSA), the governor of the state of California, the CPUC, PG&E, the American Gas Association, and the Interstate Natural Gas Association of America.³ We are pleased that 33 of these recommendations have been closed acceptably (or were superseded by subsequent recommendations) as a result of the recipients completing actions to meet the objective of the recommendation.

One of the significant recommendations we made as a result of San Bruno that is still open urges the use of automatic shutoff or remote control valves in high consequence areas (HCAs).⁴ We found that the 95 minutes it took PG&E to stop the flow of gas was excessively long and contributed to the extent and severity of property damage and increased the life-threatening risks to the residents and emergency responders. Use of automatic shutoff or remote control valves would have significantly reduced the amount of time taken to stop the flow of gas and to isolate the rupture. We recommended that PHMSA directly require that automatic shutoff or remote control valves in HCA and in class 3 and 4 locations.⁵ Current PHMSA regulations leave the decision of whether to install an automatic shutoff or remote control valve up to operators, based on their evaluation of certain factors. The NTSB believes the requirement should be mandatory.

Three months after the recommendation was issued, Congress passed the *Pipeline Safety, Regulatory Certainty, and Job Creation Act of 2011* requiring the use of automatic shutoff or remote control valves within two years. However, almost ten years later, PHMSA has initiated but not completed the rulemaking process for this Congressional mandate. Unfortunately, PHMSA's proposed requirements would not have helped mitigate the natural gas explosion that occurred in San Bruno.⁶ We have asked PHMSA to address our comments on the proposed rulemaking and issue a final rule that addresses the safety recommendations.

There are three areas where the findings of the San Bruno investigation have had a positive impact on pipeline safety.

Traceable, Verifiable, and Complete Records

According to PG&E records, Line 132 was constructed using 30-inch-diameter seamless steel pipe with a maximum allowable operating pressure (MAOP) of 400 pounds per square inch,

² NTSB, *Pacific Gas and Electric Company Natural Gas Transmission Pipeline Rupture and Fire San Bruno, California on September 9, 2010*, Rpt. No. NTSB/PAR-11/01 (August 30, 2011).

³ See Appendix for list of recommendations.

⁴ HCAs are defined by federal regulation and are areas where a release could have the most significant adverse consequences, including populated areas, areas with a number of structures, drinking water sources, and unusually sensitive areas.

⁵ National Transportation Safety Board, Safety Recommendations: P-11-011

⁶ NTSB comments on PHMSA Notice of Proposed Rulemaking, *Pipeline Safety: Amendments to Parts 192 and 195 to Require Valve Installation and Minimum Rupture Detection Standards*, (March 25, 2020).

gauge. The NTSB's examination of the ruptured pipe segment revealed that the pipeline in the area of the rupture was constructed of five sections of pipe, some of which were short pieces measuring about 4 feet long. These short pieces of pipe contain different longitudinal seam welds of various types, including single- and double-sided welds. Consequently, the short pieces of pipe of unknown specifications in the ruptured pipe segment may not be as strong as the seamless steel pipe that was listed in PG&E's records. It is critical to know all the characteristics of a pipeline in order to establish a valid MAOP below which the pipeline can be safely operated. We issued two urgent recommendations to PG&E to (1) aggressively and diligently search for all records relating to pipeline system components for their natural gas transmission lines; and (2) use those traceable, verifiable, and complete records to determine the valid MAOP, based on the weakest section of the pipeline or component to ensure safe operation, of their natural gas transmission lines in class 3 and class 4 locations and class 1 and class 2 high consequence areas that have not had a MAOP established through prior hydrostatic testing.⁷ The NTSB recognizes that this was a major undertaking, as it entailed validation of the MAOP of 2,088 miles of these transmission pipelines, and both of these recommendations have been closed acceptably.

Even though these recommendations were directed to PG&E, other operators across the country recognized the safety issues concerning unverified and incomplete records, and undertook such reviews of their own pipeline systems in order to help ensure that a similar accident did not occur on their systems.

Safety Management Systems (SMS)

Both the San Bruno accident and a July 25, 2010, pipeline rupture in Marshall, Michigan involved errors at the management and operator levels in both pipeline integrity and control center operations. In both cases, pipeline ruptures were inadequately identified and delays in identifying and responding to the leaks exacerbated the consequences of the initial pipeline ruptures. Therefore, in our report for the Marshall, Michigan accident, we concluded that pipeline safety would be enhanced if pipeline companies implemented SMSs.⁸

The NTSB has long recommended the implementation of SMS across all modes of transportation. For example, SMS is becoming a standard of practice among Part 121 commercial aviation operators. There are four components to SMS per Federal Aviation Administration Order:

- a safety policy that sets out what the organization is trying to achieve; outlines the requirements, methods, and processes the organization will use to achieve the desired safety outcomes; establishes senior leadership's commitment to incorporate and continually improve safety in all aspects of the business; and reflects management's commitment to implementing processes and procedures for establishing and meeting safety objectives and promoting a safety culture.

⁷ NTSB Safety Recommendations P-10-02 and -03.

⁸ NTSB, *Enbridge Incorporated Hazardous Liquid Pipeline Rupture and Release, Marshall, Michigan, July 25, 2010*, Rpt. No. NTSB/PAR-12/01. (July 10, 2012).

- a safety risk management process that identifies all hazards, analyzes the risk, assesses the risk, controls the risk, and then continually evaluates whether those risk management strategies are working.
- a safety assurance process that evaluates the continued effectiveness of, and compliance with, requirements and implemented risk control strategies and supports the identification of new hazards.
- a safety promotion program which includes training, communication, and other actions to create a positive safety culture within all levels of the workforce.

We recommended that the American Petroleum Institute (API) facilitate the development of a SMS standard specific to the pipeline industry.⁹ In 2015, API issued Recommended Practice 1173, Pipeline Safety Management Systems (PSMS), to assist pipeline operators in reviewing an existing PSMS or developing and implementing a new PSMS. This provided an important framework for the pipeline industry's continuous improvement efforts and exceeded the objective of our safety recommendations. The adoption of SMS in the pipeline industry has been important in improving safety.

Integrity Management - Ending Direct Assessment

Besides San Bruno, we investigated additional major gas transmission pipeline accidents in which deficiencies with the operators' integrity management (IM) programs and PHMSA oversight were identified as a concern. In January 2015, NTSB conducted a safety study using the results from completed investigations and additional research to identify weaknesses in the implementation of gas transmission pipeline IM programs in HCAs.¹⁰ The study found that, although PHMSA's gas IM requirements have kept the rate of corrosion failures and material failures of pipe or welds low, no evidence exists to show that the overall occurrence of gas transmission pipeline incidents in HCA pipelines has declined. Rather, the study identified areas where improvements need to be made to further enhance the safety of gas transmission pipelines in HCAs.

In particular, the study found that of the four different integrity assessment methods (pressure test, direct assessment, in-line inspection, and other techniques), in-line inspection yields the highest per-mile discovery of pipe anomalies, and the use of direct assessment as the sole integrity assessment method has numerous limitations. Compared to their interstate counterparts, intrastate pipeline operators rely more on direct assessment and less on in-line inspection.

Direct assessment relies on the examination of the pipeline at pre-selected locations to evaluate a pipeline for external corrosion, internal corrosion, or stress corrosion cracking threats. This method requires the identification of regions within the pipeline segments for excavation and direct examination. Therefore, even though a pipeline segment may be inspected with direct assessment, only a small sub-segment is directly examined. As a result of the safety study, we

⁹ NTSB Safety Recommendation [P-12-17](#).

¹⁰ National Transportation Safety Board, *Integrity Management of Gas Transmission Pipelines in High Consequence Areas*, No. NTSB/SS-15/01 (January 27, 2015).

recommended that PHMSA eliminate the use of direct assessment as the sole integrity assessment method for gas transmission pipelines.¹¹

On October 1, 2019, PHMSA published a final rule which, among other things, clarified that pipeline operators could not use direct assessment as a sole assessment method that neglects other threats, or for threats that are not suitable for direct assessment. Although the rule did not eliminate the use of direct assessment as the sole integrity assessment method for gas transmission pipelines, by clarifying the threats for which the direct assessment method is suitable and prohibiting direct assessment where it is inappropriate, we believed that PHMSA addressed this safety issue and classified the recommendation as “Closed – Acceptable Alternate Action.

Merrimack Valley Natural Gas Overpressurization, Explosions, and Fires – P.E. Approval of Projects

Almost exactly eight years after San Bruno, on September 13, 2018, a series of structure fires and explosions occurred after high-pressure natural gas was released into a low-pressure natural gas distribution system in the northeast region of the Merrimack Valley in the Commonwealth of Massachusetts. One person was killed and 22 individuals, including three firefighters, were transported to local hospitals due to injuries; seven other firefighters incurred minor injuries. The fires and explosions damaged 131 structures, including at least five homes that were destroyed in the city of Lawrence and the towns of Andover and North Andover.

Our investigation focused on several longstanding issues that we have seen in pipeline accidents, including adequacy of natural gas regulations, project documentation, constructability review, project management, risk assessment, SMS, and emergency response.¹² Another significant safety issue was the lack of a requirement for licensed professional engineer (P.E.) approval of natural gas projects in Massachusetts. P.E. approval and stamping of drawings is a required practice for engineering projects to assure the safety of the public throughout the United States. Projects requiring P.E. approval and stamping include, but are not limited to, roadways, bridges, tunnels, dams, and building structural design. At the time of our investigation, according to the National Council of Examiners for Engineering and Surveying, 31 states exempted public utilities from this requirement even though proper design is necessary for public safety. In many cases, this exemption creates a loophole because there is no requirement to have work performed by an engineer at all. The State of California is one of those states that we recommended should amend its statute to remove the exemption so that all future natural gas infrastructure projects require licensed professional engineer approval and stamping.¹³ At this time, we are still awaiting a response from the State.

Closing

The accident in San Bruno was a horrific and tragic event. But as we carry out our mission at the NTSB, we draw knowledge from tragedy to improve the safety of us all. The actions by government and industry in response to the San Bruno pipeline rupture have improved safety, but

¹¹ NTSB Safety Recommendation P-15-21.

¹² NTSB, *Overpressurization of Natural Gas Distribution System, Explosions, and Fires in Merrimack Valley, Massachusetts, September 13, 2018*. Rpt. No. NTSB/PAR-19/02. (September 24, 2019).

¹³ NTSB Safety Recommendation P-19-016.

there is still work to be done to ensure that we are not investigating a similar accident in the future. This concludes my testimony, and I would be happy to answer any questions you may have.

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Safety Recommendations Issued Following San Bruno Pipeline Rupture and Fire

Recommendation #	Overall Status	Date Closed	Recommendation
P-10-001	CLOSED - ACCEPTABLE ACTION	02/14/11	TO THE PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION: Through appropriate and expeditious means such as advisory bulletins and posting on your website, immediately inform the pipeline industry of the circumstances leading up to and the consequences of the September 9, 2010, pipeline rupture in San Bruno, California, and the National Transportation Safety Board's urgent safety recommendations to Pacific Gas and Electric Company so that pipeline operators can proactively implement corrective measures as appropriate for their pipeline systems. (Urgent)
P-10-002	CLOSED - ACCEPTABLE ACTION	03/13/12	TO THE PACIFIC GAS AND ELECTRIC COMPANY: Aggressively and diligently search for all as-built drawings, alignment sheets, and specifications, and all design, construction, inspection, testing, maintenance, and other related records, including those records in locations controlled by personnel or firms other than Pacific Gas and Electric Company, relating to pipeline system components, such as pipe segments, valves, fittings, and weld seams for Pacific Gas and Electric Company natural gas transmission lines in class 3 and class 44 locations and class 1 and class 25 high consequence areas ⁶ that have not had a maximum allowable operating pressure established through prior hydrostatic testing. These records should be traceable, verifiable, and complete. (Urgent)
P-10-003	CLOSED - ACCEPTABLE ACTION	03/14/13	TO THE PACIFIC GAS AND ELECTRIC COMPANY: Use the traceable, verifiable, and complete records located by implementation of Safety Recommendation P-10-2 (Urgent) to determine the valid maximum allowable operating pressure, based on the weakest section of the pipeline or component to ensure safe operation, of Pacific Gas and Electric Company natural gas transmission lines in class 3 and class 4 locations and class 1 and class 2 high consequence areas that have not had a maximum allowable operating pressure established through prior hydrostatic testing. (Urgent)

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P-10-004	OPEN - ACCEPTABLE RESPONSE		TO THE PACIFIC GAS AND ELECTRIC COMPANY: If you are unable to comply with Safety Recommendations P-10-2 (Urgent) and P-10-3 (Urgent) to accurately determine the maximum allowable operating pressure of Pacific Gas and Electric Company natural gas transmission lines in class 3 and class 4 locations and class 1 and class 2 high consequence areas that have not had a maximum allowable operating pressure established through prior hydrostatic testing, determine the maximum allowable operating pressure with a spike test followed by a hydrostatic pressure test.
P-10-005	CLOSED - ACCEPTABLE ACTION	09/19/14	TO THE CALIFORNIA PUBLIC UTILITIES COMMISSION: Develop an implementation schedule for the requirements of Safety Recommendation P-10-2 (Urgent) to Pacific Gas and Electric Company (PG&E) and ensure, through adequate oversight, that PG&E has aggressively and diligently searched documents and records relating to pipeline system components, such as pipe segments, valves, fittings, and weld seams, for PG&E natural gas transmission lines in class 3 and class 44 locations and class 1 and class 25 high consequence areas ⁶ that have not had a maximum allowable operating pressure established through prior hydrostatic testing as outlined in Safety Recommendation (P-10-2) (Urgent) to PG&E. These records should be traceable, verifiable, and complete; should meet your regulatory intent and requirements; and should have been considered in determining maximum allowable operating pressures for PG&E pipelines. (Urgent).
P-10-006	OPEN - ACCEPTABLE RESPONSE		TO THE CALIFORNIA PUBLIC UTILITIES COMMISSION: If such a document and records search cannot be satisfactorily completed, provide oversight to any spike and hydrostatic tests that Pacific Gas and Electric Company is required to perform according to Safety Recommendation (P-10-4).
P-10-007	CLOSED - ACCEPTABLE ACTION	03/29/11	TO THE CALIFORNIA PUBLIC UTILITIES COMMISSION: Through appropriate and expeditious means, including posting on your website, immediately inform California intrastate natural gas transmission operators of the circumstances leading up to and the consequences of

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the September 9, 2010, pipeline rupture in San Bruno, California, and the National Transportation Safety Board's urgent safety recommendations to Pacific Gas and Electric Company so that pipeline operators can proactively implement corrective measures as appropriate for their pipeline systems. (Urgent)

P-11-001	CLOSED - SUPERSEDED	09/26/11	TO THE PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION: Issue guidance to operators of natural gas transmission and distribution pipelines and hazardous liquid pipelines regarding the importance of sharing system-specific information, including pipe diameter, operating pressure, product transported, and potential impact radius, about their pipeline systems with the emergency response agencies of the communities and jurisdictions in which those pipelines are located. (Superseded by P-11-8)
P-11-002	CLOSED - SUPERSEDED	09/26/11	TO THE PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION: Issue guidance to operators of natural gas transmission and distribution pipelines and hazardous liquid pipelines regarding the importance of control room operators immediately and directly notifying the 911 emergency call center(s) for the communities and jurisdictions in which those pipelines are located when a possible rupture of any pipeline is indicated. (Superseded by P-11-9)
P-11-003	CLOSED - ACCEPTABLE ACTION	08/29/12	TO THE PACIFIC GAS AND ELECTRIC COMPANY: Require your control room operators to notify, immediately and directly, the 911 emergency call center(s) for the communities and jurisdictions in which your transmission and/or distribution pipelines are located, when a possible rupture of any pipeline is indicated.
P-11-004	CLOSED - ACCEPTABLE ACTION	07/29/14	TO THE UNITED STATES DEPARTMENT OF TRANSPORTATION: Conduct an audit to assess the effectiveness of the Pipeline and Hazardous Materials Safety Administration's oversight of performance-based safety programs. This audit should address the (1) need to expand the program's use of meaningful metrics; (2) adequacy of its inspection protocols for ensuring the completeness and accuracy of pipeline operators' integrity management program data; (3) adequacy of its

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inspection protocols for ensuring the incorporation of an operator's leak, failure, and incident data in evaluations of the operator's risk model; and (4) benefits of establishing performance goals for pipeline operators.

P-11-005	CLOSED - ACCEPTABLE ACTION	07/29/14	TO THE UNITED STATES DEPARTMENT OF TRANSPORTATION: Include in the audit conducted pursuant to Safety Recommendation P-11-4 a review of the Pipeline and Hazardous Materials Safety Administration's enforcement policies and procedures, including, specifically, the standard of review for compliance with performance-based regulations.
P-11-006	CLOSED - ACCEPTABLE ACTION	07/29/14	TO THE UNITED STATES DEPARTMENT OF TRANSPORTATION: Conduct an audit of the Pipeline and Hazardous Materials Safety Administration's state pipeline safety program certification program to assess and ensure state pipeline safety programs and Federal pipeline safety grants are used effectively to conduct oversight of intrastate pipeline operations, including an evaluation of state inspection and enforcement activities.
P-11-007	CLOSED - ACCEPTABLE ACTION	11/02/15	TO THE UNITED STATES DEPARTMENT OF TRANSPORTATION: Ensure that the Pipeline and Hazardous Materials Safety Administration amends the certification program, as appropriate, to comply with the findings of the audit recommended in Safety Recommendation P-11-6.
P-11-008	CLOSED - ACCEPTABLE ALTERNATE ACTION	02/21/18	TO THE PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION: Require operators of natural gas transmission and distribution pipelines and hazardous liquid pipelines to provide system-specific information about their pipeline systems to the emergency response agencies of the communities and jurisdictions in which those pipelines are located. This information should include pipe diameter, operating pressure, product transported, and potential impact radius. (Supersedes Safety Recommendation P-11-001)
P-11-009	OPEN - ACCEPTABLE		TO THE PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION: Require operators of natural gas transmission and distribution pipelines and hazardous

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	ALTERNATE RESPONSE		liquid pipelines to ensure that their control room operators immediately and directly notify the 911 emergency call center(s) for the communities and jurisdictions in which those pipelines are located when a possible rupture of any pipeline is indicated. (Supersedes Safety Recommendation P-11-002)
P-11-010	OPEN - ACCEPTABLE RESPONSE		TO THE PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION: Require that all operators of natural gas transmission and distribution pipelines equip their supervisory control and data acquisition systems with tools to assist in recognizing and pinpointing the location of leaks, including line breaks; such tools could include a real-time leak detection system and appropriately spaced flow and pressure transmitters along covered transmission lines.
P-11-011	OPEN - ACCEPTABLE RESPONSE		TO THE PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION: Amend Title 49 Code of Federal Regulations 192.935(c) to directly require that automatic shutoff valves or remote control valves in high consequence areas and in class 3 and 4 locations be installed and spaced at intervals that consider the factors listed in that regulation.
P-11-012	CLOSED - ACCEPTABLE ACTION	12/01/17	TO THE PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION: Amend Title 49 Code of Federal Regulations 199.105 and 49 Code of Federal Regulations 199.225 to eliminate operator discretion with regard to testing of covered employees. The revised language should require drug and alcohol testing of each employee whose performance either contributed to the accident or cannot be completely discounted as a contributing factor to the accident.
P-11-013	CLOSED - ACCEPTABLE ACTION	04/24/12	TO THE PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION: Issue immediate guidance clarifying the need to conduct postaccident drug and alcohol testing of all potentially involved personnel despite uncertainty about the circumstances of the accident.
P-11-014	CLOSED - ACCEPTABLE	01/23/20	TO THE PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION: Amend Title 49 Code of Federal Regulations 192.619 to delete the grandfather clause and require that all gas transmission pipelines

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	ALTERNATE ACTION		constructed before 1970 be subjected to a hydrostatic pressure test that incorporates a spike test.
P-11-015	CLOSED - ACCEPTABLE ACTION	01/23/20	TO THE PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION: Amend Title 49 Code of Federal Regulations Part 192 of the Federal pipeline safety regulations so that manufacturing- and construction-related defects can only be considered stable if a gas pipeline has been subjected to a postconstruction hydrostatic pressure test of at least 1.25 times the maximum allowable operating pressure.
P-11-016	CLOSED - ACCEPTABLE ACTION	04/08/15	TO THE PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION: Assist the California Public Utilities Commission in conducting the comprehensive audit recommended in Safety Recommendation P-11-22.
P-11-017	CLOSED - SUPERSEDED	02/10/15	TO THE PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION: Require that all natural gas transmission pipelines be configured so as to accommodate in-line inspection tools, with priority given to older pipelines. (Safety Recommendation P-11-17 was superseded by Safety Recommendation P-15-18)
P-11-018	CLOSED - ACCEPTABLE ACTION	02/21/18	TO THE PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION: Revise your integrity management inspection protocol to (1) incorporate a review of meaningful metrics; (2) require auditors to verify that the operator has a procedure in place for ensuring the completeness and accuracy of underlying information; (3) require auditors to review all integrity management performance measures reported to the Pipeline and Hazardous Materials Safety Administration and compare the leak, failure, and incident measures to the operator's risk model; and (4) require setting performance goals for pipeline operators at each audit and follow up on those goals at subsequent audits.
P-11-019	CLOSED - ACCEPTABLE ACTION	04/08/15	TO THE PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION: (1) Develop and implement standards for integrity management and other performance-based safety programs that require operators of all types of pipeline systems to regularly assess the effectiveness of their programs using clear and meaningful metrics, and to identify and then

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correct deficiencies; and (2) make those metrics available in a centralized database.

P-11-020	CLOSED - ACCEPTABLE ACTION	12/05/16	TO THE PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION: Work with state public utility commissions to (1) implement oversight programs that employ meaningful metrics to assess the effectiveness of their oversight programs and make those metrics available in a centralized database, and (2) identify and then correct deficiencies in those programs.
P-11-021	CLOSED - ACCEPTABLE ACTION	03/20/13	TO THE STATE OF CALIFORNIA: Expediently evaluate the authority and ability of the pipeline safety division within the California Public Utilities Commission to effectively enforce state pipeline safety regulations, and, based on the results of this evaluation, grant the pipeline safety division within the California Public Utilities Commission the direct authority, including the assessment of fines and penalties, to correct noncompliance by state regulated pipeline operators.
P-11-022	CLOSED - ACCEPTABLE ACTION	09/19/14	TO THE CALIFORNIA PUBLIC UTILITIES COMMISSION: With assistance from the Pipeline and Hazardous Materials Safety Administration, conduct a comprehensive audit of all aspects of Pacific Gas and Electric Company operations, including control room operations, emergency planning, record-keeping, performance-based risk and integrity management programs, and public awareness programs.
P-11-023	OPEN - ACCEPTABLE RESPONSE		TO THE CALIFORNIA PUBLIC UTILITIES COMMISSION: Require the Pacific Gas and Electric Company to correct all deficiencies identified as a result of the San Bruno, California, accident investigation, as well as any additional deficiencies identified through the comprehensive audit recommended in Safety Recommendation P-11-22, and verify that all corrective actions are completed.
P-11-024	CLOSED - ACCEPTABLE ACTION	03/14/13	TO PACIFIC GAS AND ELECTRIC COMPANY: Revise your work clearance procedures to include requirements for identifying the likelihood and consequence of failure associated with the planned work and for developing contingency plans.

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P-11-025	CLOSED - ACCEPTABLE ACTION	08/29/12	TO PACIFIC GAS AND ELECTRIC COMPANY: Establish a comprehensive emergency response procedure for responding to large-scale emergencies on transmission lines; the procedure should (1) identify a single person to assume command and designate specific duties for supervisory control and data acquisition staff and all other potentially involved company employees; (2) include the development and use of trouble-shooting protocols and checklists; and (3) include a requirement for periodic tests and/or drills to demonstrate the procedure can be effectively implemented.
P-11-026	CLOSED - ACCEPTABLE ACTION	05/15/15	TO PACIFIC GAS AND ELECTRIC COMPANY: Equip your supervisory control and data acquisition system with tools to assist in recognizing and pinpointing the location of leaks, including line breaks; such tools could include a real-time leak detection system and appropriately spaced flow and pressure transmitters along covered transmission lines.
P-11-027	CLOSED - ACCEPTABLE ACTION	12/01/15	TO PACIFIC GAS AND ELECTRIC COMPANY: Expedite the installation of automatic shutoff valves and remote control valves on transmission lines in high consequence areas and in class 3 and 4 locations, and space them at intervals that consider the factors listed in Title 49 Code of Federal Regulations 192.935(c).
P-11-028	CLOSED - ACCEPTABLE ACTION	08/29/12	TO PACIFIC GAS AND ELECTRIC COMPANY: Revise your postaccident toxicological testing program to ensure that testing is timely and complete.
P-11-029	CLOSED - ACCEPTABLE ACTION	11/14/13	TO PACIFIC GAS AND ELECTRIC COMPANY: Assess every aspect of your integrity management program, paying particular attention to the areas identified in this investigation, and implement a revised program that includes, at a minimum, (1) a revised risk model to reflect the Pacific Gas and Electric Company's actual recent experience data on leaks, failures, and incidents; (2) consideration of all defect and leak data for the life of each pipeline, including its construction, in risk analysis for similar or related segments to ensure that all applicable threats are adequately addressed; (3) a revised risk analysis methodology to ensure that assessment methods are selected for each pipeline

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segment that address all applicable integrity threats, with particular emphasis on design/material and construction threats; and (4) an improved self-assessment that adequately measures whether the program is effectively assessing and evaluating the integrity of each covered pipeline segment.

P-11-030	CLOSED - ACCEPTABLE ACTION	11/14/13	TO PACIFIC GAS AND ELECTRIC COMPANY: Conduct threat assessments using the revised risk analysis methodology incorporated in your integrity management program, as recommended in Safety Recommendation P-11-29, and report the results of those assessments to the California Public Utilities Commission and the Pipeline and Hazardous Materials Safety Administration.
P-11-031	CLOSED - ACCEPTABLE ACTION	03/14/13	TO PACIFIC GAS AND ELECTRIC COMPANY: Develop, and incorporate into your public awareness program, written performance measurements and guidelines for evaluating the plan and for continuous program improvement.